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Does the Characteristic- Pricing Model or the Factor-Pricing Model Explain Size and Book-To-Market Effects on the Tunisian Stock Exchange

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Abstract

In the literature, there is a controversy about which of the two competing models better explain size and book-to-market effects: the factor-pricing model or the characteristic pricing model. This paper extends the previous literature by comparing the two models in explaining stock returns in the small emerging market of Tunisia. Specifically, we test whether high returns of high BE/ME and small size stocks can be attributed to their factor loadings or they directly relate to their characteristics for reasons that have nothing to do with risk. To distinguish the explanatory power of the factor loadings from that of the characteristics, we use the methodology of Daniel and Titman (1997). We construct characteristic-balanced portfolios, which are long and short assets with equal characteristics and have high loadings on the HML, SMB or MKT factors of Fama and French (1993).The evidence we found indicates that it is the factor loadings rather than the characteristics which seem to explain the cross-sectional variation in stock returns in the Tunisian Stock Exchange. Results of our study provide an out-of sample evidence on the robustness of the risk-based explanation of size and book-to-market effects.

Keywords: Factor-pricing model, Characteristic-pricing model, Size effect, book-to-market effect, Tunisian Stock Exchange.
JEL Classification: G01.G11.G12

1. Introduction

Several empirical studies in finance confirm that stock returns of firms with a small market capitalization are on average significantly higher than those of firms with a large market capitalization. Similarly, stock returns of firms with a high book-to-market (BE / ME) ratio are significantly higher than those of firms with low BE / ME. These results are confirmed **in the United States** (Banz, 1981; Keim(1983), Rosenberg et al., 1985; Fama and French 1992, 1993, 1995, 1996; Lewellen, 1999; Horowitz et al., 2000; Zhao, 2014) in **other developped markets** (Brown et al., 1983; Bryant and Eleswanapu, 1999; Chan et al., 1991; Elfakhai et al., 1998; Daniel, et al., 2001; Fama and French, 2012; Cakili and Tan, 2014) and **in some emerging markets** (Chui and Wei, 1998; Fama and French, 1998; Rowenhorst, 1999; Drew et al, 2003; Fama and French, 2012; Bergaoui, 2015). However, the interpretation of these results remain controversial.

In line with rational asset pricing, Fama and French (1993, 1995, 1996) suggest that these variables proxy for sensitivity to common risk factors in returns. The traditional explanation proposed by Fama and French (1993, 1995) is that small and high BE/ME firms are potentially in distress and they may be more sensitive to certain business cycle factors, like changes in credit conditions, than firms that are financially less vulnerable. Therefore, the authors have developed a three-factor asset-pricing model, which relates the expected returns of a portfolio to three factors. Excess return on a market portfolio, a book-to market equity factor (HML) (High BE/ME portfolio minus low BE/ME portfolio's returns) and a size factor (SMB) (Small capitalization portfolio minus large capitalization portfolio's returns). Fama and French (1993, 1995, and 1996) consider HML and SMB as risk premiums that compensate for additional risk associated with size and Book-to market equity ratio. However, Daniel and Titman (1997) give a different interpretation of the relationship between the BE/ME ratio and the ME with stock returns. These authors reject the risk-based hypothesis for the size effect and the BE/ ME ratio effect in favor of an explanation based on the characteristics: A low BE/ME ratio, which is the characteristic of strong firms (growth stocks), financially produces low returns that do not necessarily correspond to the risk of this category of stocks. Similarly, a high BE/ ME ratio, which is the characteristic of weak firms (value stocks), financially produces high returns regardless of risk. According to Daniel and Titman (1997), investors like growth stocks and dislike value stocks. The result is a premium (low prices and high-expected returns for value stocks relative to growth stocks) that is not due to risk. They find that, although high BE/ME stocks co-vary strongly with other high BE/ME stocks, covariances do not result from particular distress-associated risks, but rather reflect the fact that high BE/ME firms tend to have similar properties (E.g they might be in related lines of business, in the same industries or from the same regions). Specifically, they find that their covariances were equally strong before the firms became distressed. Daniel and Titman (1997) argue that the Fama and French (1993) factors appear to be priced only because the loadings are correlated with firm characteristics like size (ME) and BE/ME. According to these authors, the characteristic-based pricing model covers anything that produces a premium for the high BE/ME characteristic relative to low BE/ME characteristic and it is not the result of risk. The Characteristics-based model is consistent with the behavioral overreaction story of Lakonishock et al (1994). Indeed, high BE/ME stocks tend to be firms that are weak on fundamentals. Investors overreact to performance and assign irrationaly low values to weak firms and irrationaly high values to strong firms. When overreaction is corrected, weak firms have high stock returns and strong firms have low returns

In the literature, there is a controversy about which of these two models better explain cross sectional variation in stock returns : the factor-pricing model or the characteristic pricing model. Some studies confirm that the risk model provides a better story for the relationship between BE/ME and ME with average stock returns (Lewellen, 1999 and Davis et al.; 2000) in the American stock market, Ajili, 2007 in the French stock market). Others reject the risk-based model and fail to reject the characteristic-based model (Daniel et al.; 2001) in the Japanese stock market)

Our paper extends the previous literature by making such a comparison on the Tunisian stock markey. To the best of our knowledge, this is the first study that compares the three-factor model of Fama and French (1993) and the characteristic-based model of Daniel and Titman (1997) to explain stock returns in an emerging and a small market such as the Tunisian Stock Exchange (TSE). Specifically, we test whether high returns of high BE/ME and small size stocks can be attributed to their factor loadings or it is the characteristics rather than risk that seem to explain the cross sectional variations in stock returns.

The paper proceeds as follows. Section 2 describes the characteristic pricing model and the factor-pricing model. In section 3, we present the methodology used to construct the HML and SMB factors of Fama and French (1993) in the Tunisian context. Section 4 describes the methodology used to construct the test portfolios that exhibit low correlation between their factor loadings and their characteristics. Section 5 presents the formal tests and the empirical results that show that after controlling for firm characteristics, estimated factor loadings do explain cross-section variation in stock returns. The final section summarizes and concludes the main findings.

2. Factor-based Pricing model Versus Characteristic-based Pricing Model: Literature Review

2.1 Fama and French (1993)'s Three-Factor Model

The basic idea of Fama and French (1993) is that size and the BE/ME ratio are considered to be risk factors that are remunerated. Then, they developed a three-factor model, in which expected returns on a portfolio in excess of a risk-free rate ($E(R_i)$-R_f)) are explained by the sensitivity of its return to three factors: (*i*) excess returns on a broad market portfolio (R_{mt}-R_f); (*ii*) the difference between the returns on a portfolio of small stocks and the returns on a portfolio of large stocks (SMB: Small minus Big, size related factor) and (iii) the difference between the returns on a portfolio of high BE/ME stocks and the returns on a portfolio of low BE/ME stocks (HML: High minus Low, BE/ME ratio related factor). Specifically, expected excess returns on portfolio (*i*) is:

$$E(R_i)-R_f=\beta_i(E(R_m)-R_f)+S_iE(SMB)+h_i\,E(HML) \quad (1)$$

Where ($E(R_m)$-R_f); $E(SMB)$ and $E(HML)$ are expected premiums;

β_i, S_i, h_i are factor sensitivity or loadings. They are slopes in the time series regression.

Fama and French (1993) show that this model is a good description of returns on portfolios formed on size and the BE/ME ratio in the American stock exchange.

The model predicts that smaller, riskier, firms will tend to have positive slopes on the size premium (*SMB*) and hence have higher average returns. Similarly, relatively distressed firms with persistently high book-to-market equity ratios tend to load positively on the book-to-market premium (HML) that also implies higher expected returns.

Consistent with the (distress) risk-based explanation, Fama and French (1995) show that depressed earnings in the past and uncertainty in the future are common characterestics among firms that have high book-to-market equity ratio. They also find a size effect in earnings (small firms tend to have lower earnings on book equity than do big firms). Chen and Zhang (1998) find that value stocks are riskier because they are usually firms under distress, they have high financial leverage and face substantial uncertainty in future earnings in the US, Japan, Hong Kong and Malysia. Ferguson and Shockley (2003) explain that the factor portfolios of Fama and French (1993) correlate with a missing beta risk related to leverage. The empirical application of their model show that relative leverage and relative distress are powerful in explaining cross-sectional returns. Avramo et al (2013) measure distress risk through credit downgrades. They argue that value strategies (like HML of Fama and French (1993) are profitable because they take long positions in high credit risk firms subject to distress risk. In a previous paper (Bergaoui (2015)), we found evidence that tunisian value stocks and small stocks are riskier because they are usually firms under distress. They have persistent poor performance, higher financial leverage and substantial uncertainty in futur earnings. In Bergaoui and Trabelsi (2016), we have explored the macroeconomic determinants of risk underlying the SMB and HML factors of Fama and French (1993). Our purpose was to test the traditional explanation proposed by Fama and French (1993, 1995) for size and BE/ME effects. in other words, small and high BE/ME firms are potentially in distress, and for that reason they may be more sensitive to certain business cycle factors, like changes in credit conditions, than firms that are financially less vulnerable. We developped a state-space version of the three-factor model, which allows factor (HML, SMB and MKT) loadings to vary with the state of the economy and with the macroeconomic fundamentals that measure changes in credit market conditions. We found that, in the Tunisian Stock Exchange, loadings of value (small) stocks on the HML (SMB) factor are strongly more affected by tighter credit market conditions than those of growth (large cap) stocks . As investors seek additional compensation for accepting higher risk, expected returns of value and small cap stocks would be higher than those of growth and large cap stocks respectively. Our results provide a general support for the rational market risk explanation of value and size premium in the Tunisian context. Could these results be challenged by the characteristic-based model of Daniel and Titman (1997)?

2.2 Daniel and Titman (1997)'s Charcteristic-based Model

Daniel and Titman (1997) argue in favor of the characteristic-based model, consistent with the overreaction view. The model competes with the three factor model of Fama and French (1993). Daniel and Titman (1997) reject the risk-based hypothesis for the size effect and the BE/ ME ratio effect in favor of an explanation based on characteristics. Indeed, investors like low BE/ME ratio stocks (growth stocks) because they belong to strong firms and dislike high BE/ ME ratio stocks (value stocks) which are the characteristics of weak firms. The result is a premium (low prices and high-expected returns for value stocks relative to growth stocks) that is not due to risk. They suggest that the three-factor model does not directly explain average returns. Instead, the model seems to explain average returns only because the factor loadings correlate with firms' characteristics (Size and BE/ME). To disentangle the explanatory power of the factor loadings from that of the characteristics, Daniel and Titman (1997) construct test portfolios by sorting stocks first on BE/ME ratios and then on factor loadings. This sorting procedure creates independent variation in the two variables. Daniel and Titman (1997) found a stronger relationship between expected returns and BE/ME, for US stocks, than between expected returns and factor loadings. They conclude that characteristics, in particular BE/ME, and not covariances determine expected stock returns. However, Davis et al (2000) show that, a three- factor risk model explains the value premium in US stock returns better than the hypothesis that the Book-to-Market characteristic is compensated irrespective of risk loadings. They test the characteristics model against the risk model for a much longer time period. Daniel and Titman (1997) study returns from July 1973 to December 1993, whereas tests of Davis et al (2000) cover the July 1929 to June 1997 period. They confirm that the evidence of Daniel and Titman in favor of the characteristics model is special to their rather short sample period. They found that the risk model better explains the relationship between BE/ME and average returns. In the same way, Lewellen (1999) show that BE/ME is strongly associated with changes in risk, as measured by the Fama and French (1993) three-factor model. The author allows loadings on Fama and French's (1993) three factors and intercepts to vary with BE/ME. He finds that loadings on the size and BE/ME factors vary positively with a portfolio's BE/ME ratio. In contrast, the intercepts of the three-factor model do not vary over time with the BE/ME ratio. Then, after controlling for risk, BE/ME provides no incremental information about expected returns. The evidence the author finds indicates that the three-factor model explains time-varying expected returns, of US stocks, better than the characteristics-based model. Daniel, et al (2001) replicated the Daniel and Titman's (1997) tests on a Japanese sample. The authors found that the Japanese stock returns are even more closely related to their book-to-market ratios than are their U.S. counterparts, and thus provide a good setting for testing whether the return premia associated with these characteristics increase because the characteristics are proxies for covariance with priced factors. Their tests reject Fama and French's (1993) three-factor model, but fail to reject the characteristic model. Ajili (2007) tested the three-factor model of Fama and French (1993) and the characteristic model of Daniel and Titman (1997) on the French stock market over the July 1976-June 2001 period. The results, which are based on Daniel and Titman's (1997) tests, fail to reject Fama and French's three-factor model. Given these contradictory conclusions, we propose in our study an out of sample test. We compare the three-factor model of Fama and French (1993) and the characteristic-based model of Daniel and Titman (1997) to explain stock returns in the Tunisian Stock Exchange. The comparison between the two competing models presents an additional test of the robustness of the rational market risk explanation of value and size premium in the Tunisian context.

3. Market, HML and SMB factors of Fama and French (1993)

We have examined the existence of size and BE/ME effects in the Tunisian Stock Exchange in an earlier paper (Bergaoui (2015)) over the period from July 1998 to December 2010. Our results confirm the presence of significant and strong BE/ME and size effects in the Tunisian stock returns.

We have replicated the Fama and French (1993) design in the construction of the SMB and HML factors in the Tunisian context in another paper (Bergaoui and Trabelsi (2016)), over the same period. At the end of June of each year, we formed six size-BE/ME portfolios based on the intersection of the three book-to-market categories (High, Medium and Low) and two size categories (Small and Big). The BE/ME partitioning is based on the breakpoints for the bottom 30%, middle 40% and the top 30% of the BE/ME value in December (t-1) and the ME partitioning is based on whether the June ME of stocks is above or below the median ME. The six formed portfolios are designated SH, SM, SL, BH, BM and BL.

The SMB factor (size premium) is the monthly difference between the average of the returns of the three small stocks portfolios (SH, SM and SL) and the average of the returns of the three big portfolios (BH, BM and BL) : SMB= {(SH+SM+SL)/3-(BH+BM+BL)/3}

The HML factor (value premium) is the monthly difference between the average of the returns of the two high BE/ME portfolios (SH and BH) and the average of the returns of the two low BE/ME portfolios (SL and BL): HML={(SH+BH)/2-(SL+BL)/2}. Fama and French (1993) use HML and SMB to capture the book-to-market and size effect. Market risk premium $MKT=Rm_t - r_f$, where Rm_t is the monthly return of the Tunisian Stock Market index (TUNINDEX) and r_f is the risk free rate, it is the monthly equivalent rate to the monetary market rate. Average returns from July 1998 to December 2010 of the three factors are reported in Table (1).

Table 1: Monthly average returns (in percent) from July 1998 to December 2010

	MKT	SMB	HML
Average returns	0.76	0.954	2.316
Standard deviation	3.99	9.39	10.7
t-student	2.33	1.244	2.65

Source Bergaoui and Trabelsi (2016)

The three premiums are positive which is consistent with the risk-based explanation of size and BE/ME effects of Fama and French (1993,1995). The average values of the market risk premium and size premium are higher than those found by Fama and French (1993) in the US market (the US market premium is 0.43% per month and the size premium is 0.27% per month). We note that the value premium (HML) observed on the Tunisian Stock market is remarkably more important but also more volatile than that observed in Fama and French (1993) (it is 0.44 per month with a σ =2.56 on the US stock Exchange).

4. Size, BE/ME and HML Factor Loadings Sorted Portfolios

To compare the three-factor model of Fama and French (1993) and the characteristic-based model of Daniel and Titman (1997) to explain stock returns in the Tunisian Stock Exchange, we use the methodology of Daniel and Titman (1997). We construct test portfolios to distangle the explanatory power of the factor loadings from that of the characteristics. These are portfolios that exhibit low correlation between their factor loadings and their characteristics, e.g. high BE/ME ratios but low loadings on the HML factor. We first rank all firms, listed on the TSE during the June 1998-December 2010 period, in four portfolios by their BE/ME ratios at the end of december (t-1) and their market capitalizations (ME) at the end of June of year t. Consistent with prior research (Fama and French (1993), Daniel and Titman (1997)) the sample includes only non-financial firms that trade in the TSE during 1998-2010 They are assigned to two portfolios of small (S) and Big (B) size based on whether their June market Equity (ME) is above (B) or below (S) the median ME. The same stocks are allocated in an independent sorting to two BE/ME portfolios based on whether their BE/ME is above (H) or below (L) the median BE/ME. The four formed portfolios are SH, SL, BH and BL. For each of the four groups, we form two rather than five (Daniel and Titman (1997)) portfolios based on stocks'

preformation HML slopes (β_{HML}), like in Ajili (2007), because the number of stocks is not large.The preformation HML factor loadings (considered as stocks'future expected loadings) are estimated using information that is ex-ante observable. We regress each stock's returns on three factor portfolios (Market, HML and SMB) for the period -42 to -7 relative to the portfolio formation date (June of each year). Based on these ex-ante estimates of the factor loadings, we then divide each of the four size-BE/ME sorted portfolios into two portfolios, one with high β_{HML} (H) and the other with low β_{HML} (L). We obtain eight portfolios that contain stocks with approximately the same size and BE-ME ratios, but with different loadings on the book-to-market factor HML. The portfolios are SHH, SHL, SLH, SLL,BHH, BHL, BLH and BLL. These portfolios allow us to examine the extent to which average returns are generated by the factor loadings rather than by the characteristics.

5. Empirical Results

5.1 The Relationship between the Factor Loadings and Returns of Test Portfolios

If a factor pricing model is correct, then a high BE/ME stock with a low BE/ME factor (HML) loading should have a low average return, i.e. stock returns depend only on risk factor loadings.

However, if prices are based on characteristics rather than on factor loadings, then a high BE/ME stock should have a high expected return regardless of its factor loading.

Table 2 presents the mean excess returns of the eight portfolios described above.

Table 2: Mean excess returns (in%) of eight portfolios over the July 2004-December 2010 period

ME	BE/ME	Ex-ante HML factor loadings	
		H	L
S	H	8,5447	4,082
B	L	3,9308	-0,178
S	H	0,4070	-0,492
B	L	2,47	0,117
Average		**3.838**	**0.882**

Contrary to the results of Daniel and Titman (1997) in the US stock market and Ajili (2007) in the french stock market, we note a positive relationship between monthly excess returns and ex-ante factor loadings in the TSE, whatever the Size-BE/ME ratio group.

The difference between the average returns of high and low factor loading portfolios is 2.956 percent per month. This result implies that, after adjusting stock returns of the size and BE/ME ratio characteristics, a higher HML factor loading is associated with higher returns, which is contrary to the hypothesis of Daniel and Titman (1997). The positive relationship between loadings and returns could potentially reflect the fact that preformation betas are good predictors of postformation factor loadings. We will show that it is the case of our sample (table 3).

5.2 Results of Regressing the Postformation Excess returns of Test Portfolios on Fama and French's Three Factors

$$R_{it}-r_{ft}=\alpha+ \beta_i (R_{mt}-r_{ft})+S_i SMB_t+ h_i HML_t + e_t \quad (2)$$

Where R_m-r_f; *SMB* and *HML* are Market risk premium, size premium and value premium, respectively

β_i, S_i, h_i are factor loadings. They are slopes in the time series regression.

α: is the intercept.

$R_{it}-r_{ft}$: excess returns of test portfolios.

Rmt is the monthly return of the Tunisian stock market index (TUNINDEX) and r_f is the risk free rate; it is the monthly equivalent rate to the monetary market rate.

Table 3: Regressions for portfolios formed from sorts on size, BE/ME and HML slopes

	α	β	H	s	$\hat{R}^2$
SHH	0,0489***	0,641*	0,4995 ***	0,684 ***	0,422
SHL	0,0099	0,78 *	0,383 ***	0,503 ***	0,287
SLH	0,0487	-0,074	-0,401 ***	1,205 ***	0,133
SLL	-0,0042	0,664 ***	-0,591 ***	0,209	0,337
BHH	0,009	0,793	0,383 ***	-0,313 *	0,183
BHL	-0,0019	0,616	0,268 ***	-0,327 ***	0,255
BLH	0,0089	0,872 ***	-0,269 ***	-0,198	0,208
BLL	0,0086	0,484 *	-0,34 ***	-0,263	0,224

*p-value < 10%, **p-value<5%, *** p-value <1%

Table 3 shows that the HML slopes relate to the BE/ME ratio. For each size-HML factor loading group, HML slopes increase from negative values for low book-to-market portfolios to positive values for high book-to-market portfolios and they are statistically and significantly different from zero (p-value<5%). We also note that the SMB slopes relate to size. For each BE/ME-HML factor loadings group, the SMB slopes increase from negative values for large capitalization portfolios to positive values for small capitalisation portfolios. More important, we notice that within a BE/ME-size grouping, the postformation HML factor loadings do reproduce the ordering of the preformation factor loadings. Then, it seems that the preformation factor loadings are good predictors of postformation loadings.

To discriminate between the factor-based model and the characteristics-based model, we show a particular focus on the estimated intercepts. The factor-based model predicts that the regression intercepts (α) should be zero, i.e. the mean returns of the portfolio depend only on risk factor loadings. Table 3 shows that all intercepts (except one) are non-statistically and significantly different from zero. This evidence is in favor of the risk factor model.

Meanwhile, the characteristics-based model suggest that the mean returns of the portfolios sould depend only on characteristics (Size and BE/ME) and should be independent of variation in the factor loadings. Hence, the characteristics-based model also predicts that the intercepts of the low factor-loadings portfolios should be positive (so that they have high returns) and that those of the high-factor loadings portfolios should be negative (so that they have low returns). Our results indicate that all high factor- loading portfolios have a positive α and two (over four) of the low loading portfolios have a negative α.This evidence violates the assumptions of the characteristics-based model.

5.3 Formal Test of the Factor-Pricing Model Against the Characteristics-Pricing Model

The formal test used by Daniel and Titman (1997) uses the intercepts of the regressions of the characteristic-balanced portfolios returns on the three factors of Fama and French (1993). Following the methodology of Daniel and Titman (1997), we calculate the returns of "characteristic-balanced" portfolios which, for each of the four size-BE/ME group, invest long in the high-factor loading portfolio and short in the low-factor loading portfolio (H-L). They are called "characteristic-balanced" portfolios because both long and short positions in the portfolios are constructed to have approximately equal BE/ME ratios and capitalizations. The intercepts and the three regression coefficients for each of these four portfolios, as well as their average returns, are reported in table 4.

Table 4: Regressions results for the characteristic-balanced portfolios: July 2004-December 2010.

	α	β	H	s	$\hat{R}^2$	Average return (%)
SH(H-L)	0,0189	0,505	0,420**	0,376	0.127	4,463 (t=2,119)
SH(H-L)	-0,0056	-0,463	0,238*	0,772***	.279	4,109 (t=1,9654)

	α	β	H	s	$\hat{R}^2$	Average return (%)
SL(H-L)	0,0003	0,387	0,609***	0,0655	0.240	0,898 (t=0,527)
SL(H-L)	0,0323	-1,113	0,491*	0,578*	0.079	2,353 (t=1,428)

*p-value < 10%, **p-value<5%, *** p-value <1%
t: t-statistic of the average monthly returns of the four portfolios.

The charecteristic-based model predicts that the average return of these characteristic-balanced portfolios should be indistinguishable from zero, because they are long and short assets with equal characteristics. In addition, the characteristic-based model predicts that the intercepts of the regressions of the returns of these portfolios on the Fama and French factor portfolios should be negative. In contrast, the three factor-model predicts that the average returns of the characteristic-balanced portfolios should be positive and differ from zero, because they have high loading on the HML factor.The factor model also predicts that the intercepts should be indistinguishable from zero.

Contrary to the results of Daniel and Titman (1997) in the US stock market and Ajili (2007) in the french stock market, table 4 shows that in the TSE, the results are rather consistent with the predictions of the risk-based model. We note that the mean returns of the four characteristic-balanced portfolios are all positive. In addition, two of these means are statistically significantly different from zero. In other words, this pattern is contrary to the predictions of the characteristic-based model. Table 4 also reveals that all interceps from the time-series regressions of the four charecteristic-balanced portfolio returns on the three-factor returns are (positive) indistinguishable from zero. These results are consistent with the factor pricing model and inconsistent with the characteristic-based pricing model. Our resulds should be more conclusive than those of Ajili (2007), because the value premium (HML) in the TSE is remarquably large and statistically significantly different from zero (table1). However, in the french stock market, Ajili (2007) found that the value premium is relatively small.

6. Sorting by other Factor Loadings

Following the methodology of Daniel and Titman (1997) and Ajili (2007), we construct a set of portfolios in the manner described in the last section, except that now we sort each of the four size-BE/ME portfolios into two portfolios based on stocks'preformation SMB factor loadings then into MKT factor loadings, rather than on the HML factor loadings. Panel A of table 5 gives the inercepts, the coefficients and the associated p-values of the regressions of the eight SMB factor loadings portfolios on the three factors. Panel B of table 5 provide the intercepts, the coefficients and the p-values of the regressions of the four characteristic-balanced portfolios returns on the three factors, and the monthly average returns of the characteristic-balanced portfolios

Table 5: Regressions for portfolios formed from sorts on size, BE/ME and SMB factor loadings : July 2004-December 2010

Panel A Regression results from portfolios sorted by SMB factor loadings

Panel A	α	β	H	s	$\hat{R}^2$
SHH	0.01996	0.628 **	0.35 ***	0.502 ***	0.336
SHL	-0.0036	1.037 ***	0.314 ***	0.489 ***	0.38
SLH	0.0314 **	1.127 ***	-0.764 ***	0.385 **	0.339
SLL	-0.0094	0.456 *	-0.248 ***	0.345 ***	0.14
BHH	0.0102	0.632 **	0.336 ***	-0.267 *	0.172
BHL	-0.0005	0.854 **	0.253 *	-0.709 ***	0.258
BLH	0.0109	0.848 ***	-0.314 ***	-0.262 **	0.248
BLL	0.011	0.4612 *	-0.216 **	-0.438 ***	0.247

*p-value < 10%, **p-value<5%, *** p-value <1%

Panel B : Mean return and regression results from the Charecteristic-balanced portfolios

Panel B	α	β	h	S	$\hat{R}^2$	Average return (in %)
SH (H-L)	0.0187	-0.12	0.172	0.402 **	0.065	2.934 (t=1.754)
SL (H-L)	0.0359 *	0.395	-0.454 **	0.359 *	0.058	3.06 (t=1.914)
BH (H-L)	0.0108	-0.222	-0.083	0.442 **	0.028	1.387 (t=0.833)
BL (H-L)	0.0069	0.562	0.423 **	0.315 *	0.209 *	3.23 (t=1.94)

The characteristic-balanced portfolio returns are the difference in returns between the high SMB factor loading portfolio and the low factor loading portfolio (H-L)
*p-value < 10%, **p-value<5%, *** p-value <1%
t: t-statistic of the average monthly returns of the portfolio.

Panel A of table 5 shows that the post-formation SMB loadings do reproduce the ordering of the preformation factor loadings, thus preformation loadings do inform about postformation factor loadings.The characteristic-based model suggests that the intercepts of the regressions of the returns of the characteristic-balanced portfolios on the Fama and French's (1993) three factor portfolios should be negative. In panel B of the table 5, we note that all interceps are postive and all but one are indistinguishable from zero. This finding is contrary to the predictions of the characteristic-based model. Consistent with the factor-based model, we notice that the four characteristic-balanced portfolios, with high loadings on the SMB factor, have positive average returns. In addition, two portfolios have mean returns that are statistically and significantly different from zero (SL (H-L) and BL (H-L) with p-value <10%)), suggesting that the SMB factor loading is priced after controlling for size and BE/ME characteristics.

The analysis presented in table 6 is the same, only now we sort on the MKT factor loadings.

Tableau 6: Regressions for portfolios formed from sorts on Size, BE/ME and MKT slopes: July 2004-December 2010.

Panel A: Regression results from portfolios sorted by MKT factor loadings

	α	β	h	S	$\overline{R^2}$
SHH	0.0144	0.838 **	0.392 ***	0.595 ***	0.34
SHL	-0.0065	0.762 **	0.417 ***	0.228 *	0.305
SLH	0.0867 *	1.456 **	-1.323 ***	0.397	0.229
SLL	-0.0164	-0.637 *	0.342 ***	0.457 ***	0.236
BHH	0.0028	1.199 ***	0.356 ***	-0.435 ***	0416
BHL	-0.0068	-0.331	-0.174	0.776 ***	0.155
BLH	0.0164	0.802 ***	0.289 ***	-0.214 **	0.267
BLL	-0.00156	0.545 **	-0.277 ***	-0.459 ***	0.317

*p-value < 10%, **p-value<5%, *** p-value <1%

Panel B: Mean returns and regression results from the characteristic-balanced portfolios

	α	β	h	S	$\hat{R}^2$	Average return (in%)
SH (H-L)	0.0122	0.687 *	0.365 **	0.736 ***	0.359	4.58 (t=2.502)
SL (H-L)	0.103 ***	2.093 **	-1.665 ***	-0.0606	0.326	8.63 (t=2.352)
BH (H-L)	0.0091	1.53 ***	-0.182	-1.211 ***	0.296	0.25 (t=0.1023)
BL (H-L)	0.0167	0.262	0.5517 *	0.265 **	0.321	4.033 (t=2.702)

*p-value < 10%, **p-value<5%, *** p-value <1%
t: t-statistic of the average monthly returns of the four portfolios.
The characteristic-balanced portfolio returns are the difference in returns between the high MKT factor loading portfolio and the low MKT factor loading portfolio (H-L)

Again, postformation MKT slopes do reproduce the ordering of the preformation ones (panel A of table (6)). Then, the preforming MKT slopes do inform about the postformation MKT slopes. Similarly, panel B of table 6 indicates that the characteristic-based model is rejected in favor of the

risk-based model. Indeed, we note that all interceps are postive and all but one are indistinguishable from zero. We also note that the four characteristic-balanced portfolios, with high loadings on the MKT factor, have positive average returns and all but one have mean returns that are statistically and significantly different from zero (with p-value <10%).

7. Summary and Conclusions

Daniel and Titman (1997) reject the risk- based explanation of the size and the BE/ME effects in favor of the chatracteristic-based explanation. Indeed, these authors explain the premiums associated with small cap stocks and value stocks (high BE/ME stocks) by a simple preference of investors for growth stocks and large cap stocks. The result is a premium (low prices and high-expected returns for value and small cap stocks relative to growth stocks) that is not due to risk. They suggest that the three-factor model of Fama and French (1993) does not directly explain average returns. Instead, the model seems to explain average returns only because the factor loadings correlate with firms' characteristics (Size and BE/ME). In this paper, we compared the risk-based model of Fama and French (1993) and the characteristic-based model of Daniel and Titman (1997). We used the methodology of Daniel and Titman (1997) to distinguish between the two competing explanations for size and BE/ME effects in the Tunisian context. We construct characteristic-balanced portfolios which, for each of size-BE/ME group, invest long in the high-factor loading portfolio and short in the low-factor loading portfolio (H-L). According to Daniel and Titman (1997), these portfolios should not be remunerated (mean return indistinguishable from zero) because both long and short positions in the portfolio are constructed to have approximately equal BE/ME ratios and capitalizations. However, the risk factor-based model of Fama and French (1993) indicates that these returns should be positive because the characteristic-balanced portfolios have high loadings on the HML, SMB or MKT factors. Moreover, the three factor-model predicts that the intercepts of the regressions of the returns of these characteristic-balanced portfolios on the Fama and French's (1993) factor portfolios are indistinguishable from zero. In contrast, the alternative hypothesis that the characteristic-based model assumes that these intercepts should be negative. Overall, the results of our study show that the risk-based model of Fama and French (1993) better explains the relationship between BE/ME and size with average stocks returns than the characteristic-based model. In other words, factor loadings rather than characteristics do determine expected returns in the TSE. Our evidence corroborates the results of our previous paper (Bergaoui and Trabelsi (2016)) according to which in the TSE, stocks win the premium if they have high HML or SMB factor loadings.

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