Corporate financial distress and stock return: Empirical evidence from the French stock market

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Abstract

This study examines whether financial distress, liquidity, and Value-at-Risk are sources of priced systematic risk in stock returns of the French stock market. In particular, we investigate the explanatory power of Fama and French (1993) model augmented by and substituted for these three risk factors for distressed and non-distressed firms. For this purpose, we construct nine portfolios composed of non-distressed firms and a portfolio consisting only of distressed firms. We find that for the portfolios of non-distressed firms, financial distress factor is significant only in the absence of the size and book-to-market factors. Not surprisingly, the financial distress is a systematic risk factor for the portfolio of distressed firms. Our findings point out also that liquidity is priced for the portfolios of distressed and non-distressed firms. Furthermore, our empirical results show that only investors in the portfolios of non-distressed firms are rewarded for bearing VaR risk. Likewise, our findings indicate that the alternative model underperforms the Fama and French (1993) model, which, in its turn, underperforms the considered augmented models.

Keywords: Equity pricing, Financial distress, Liquidity, Value-at-Risk, Systematic risk factors

1- Introduction:

One of the most important objectives in empirical studies about financial markets over the last years has been the pricing of equity returns. Finance theory suggests that equity returns are affected by systematic risks related to common factors and, in equilibrium, assets whose returns are more sensitive to risk factors must compensate investors for holding the equity by offering higher returns (Lin et al., 2011). Research in finance has been significantly marked by the seminal study of Fama and French (1993) who propose a three-factor model for pricing equities. Numerous studies confirm the outperformance of the Fama and French (1993) model over the Capital Asset pricing Model (CAPM). While the CAPM perceives that excess returns can be explained only by the market premium, the Fama and French (1993) model shows that equity returns are affected by market, size and book-to-market premiums. Subsequently, several studies introduce additional factors to the three-factor model of Fama and French (1993) to provide a more reliable explanation of average excess returns. Within the context of financial distress, a number of studies show that as financial distress is imminent or is ongoing, equity returns are affected. Asset pricing theory stipulates that investors will require a premium for investing in such stocks. The idea is that firms with a high probability of financial distress tend to move together and accordingly their risk cannot be diversified away (Campbell et al., 2008). This justifies the empirical concern in whether or not investors are compensated for bearing the risk of financial distress. In a separate area of financial literature, researchers examine whether liquidity is a source of priced systematic risk (Ho and Chang, 2015; Lin et al., 2011; Naranyan and Zheng, 2010; Pastor and Stambaugh, 2003). Literature provides evidence on the emergence of the market liquidity risk factor as an important determinant of equity pricing. In another stream of research, only a few studies have surprisingly examined the Value-at-Risk (hereafter VaR) as an additional risk factor to the Fama and French (1993) model. The VaR as a proxy of the predicted worst loss over a target horizon and within a given confidence level is a pertinent risk factor and is an appropriate risk measurement that summarizes the global exposure to market risks and hence could have a good explanatory power in stock returns (Jorion, 1996).

The aim of this study is to test whether financial distress, liquidity, and VaR are sources of priced systematic risk in the French stock market. This allows us to address the issue of whether augmented models and/or alternative ones outperform the three-factor model of Fama and French (1993). Additionally, the objective of our study is to identify the risk factors that best capture the financial distress risk in French market from 1998-2012.

In particular, we pose the following questions: **1) Do financial distress, liquidity, and VaR risk factors explain French stock returns? 2) Does the inclusion of these additional risk factors enhance the performance of Fama and French (1993) model? 3) Do financial distress, liquidity, and VaR risk factors subsume the size and book-to-market risk factors of Fama and French (1993)? 4) Is the behavior of risk factors the same for portfolios of distressed and non-distressed firms?**

Our main motivation is that, to the best of our knowledge, our study, which incorporates liquidity and VaR as systematic risk factors in the French context, is unique. More noteworthy is that our study is among a few number of studies that focus on the equity prices of distressed portfolios. Moreover, as far as we know, we are the first to consider the combination of financial distress, liquidity and VaR in the context of equity pricing and that we try to examine its explanatory as additional and alternative risk factors to the three factors of Fama and French (1993).

Findings show that for the portfolios of non-distressed firms, liquidity and VaR are priced. Moreover, financial distress factor is significant only in the absence of the size and book-to-market factors. For the portfolio of distressed firms, we find that financial distress and liquidity are systematic risk factors. Likewise, the VaR risk is not significant for the portfolio of distressed firms. Interestingly, we find that the explanatory power of the liquidity and VaR risk factors gets better when the latters are included together in the pricing model. Furthermore, our findings show that the alternative model, consisting of the market, financial distress, liquidity and VaR factors, underperforms the Fama and French (1993) model as well as the augmented models.

The rest of the paper is organized as follows. Section 2 discusses the previous studies. In section 3, we introduce the methodology, data and the models. Empirical results are presented in Section 4 and discussed in Section 5. Section 6 concludes.

2- Literature review

One of the fundamental pricing models in financial theory is the CAPM as developed by Sharpe (1964), Lintner (1965) and Black (1972). Nonetheless, many criticisms of CAPM have emerged over time and several empirical studies reject its validity. A number of authors suggest alternative models to improve the CAPM, afterwards. Fama and French (1992) present one of the major empirical arguments against the CAPM model. The authors observe that two classes of stocks tend to outperform the market as a whole: stocks with small caps and stocks with a high book-to-market equity ratio. Subsequently, Fama and French (1993) propose their three-factor model by the inclusion of the size (SMB) and book-to-market (HML) factors in the CAPM in order to reflect the portfolio's exposure.

Notwithstanding that a great number of researchers examine the validity of the Fama and French (1993) model in different contexts, few studies examine the French context. For instance, Molay (2000) confirm the robustness of the Fama and French (1993) model in the French context. Nevertheless, unlike Fama and French (1993, 1996, 1998), the positive relationship between HML and returns is less significant. Similarly, Malin and Veeraraghavan (2004) examine the robustness of the Fama and French (1993) model for equities listed in France, Germany and U.K. In the French context and for the value premia, their results challenge the findings of Fama and French (1996) who assert that high book-to-market equity firms produce higher returns since they are distressed. Indeed, Malin and Veeraraghavan (2004) find that growth stocks generate higher returns than value stocks for all three markets examined in this study. The authors recommend that investors who want to take additional risks can invest in small and low book-to-market equity firms in addition to the market portfolio to generate superior returns. Additionally, Lajili (2005) explores the effect of size, book to market and leverage on the French Stock Market. The author mentions the explanatory power of the three factors model of Fama and French augmented by leverage in explaining returns.

Another stream of research focuses on the robustness of the Fama and French (1993) model and its extensions in the context of financial distress. These studies base their researches on the findings of Fama and French (1993 and 1995). According to Fama and French (1993), the average HML return is a premium for a state variable risk linked to relative distress. Further, Fama and French (1994) find that variations through time in the loadings of industries on HML correctly reflect periods of industry power or distress. Likewise, Fama and French (1996) suggest that their three-factor model is an equilibrium pricing model that captures much of the variations in the cross-section of average stock returns and absorbs a number of anomalies that have plagued the CAPM. The authors argue that SMB and HML factors proxy for financial distress.

To briefly sum up, a great number among the presented studies identifies SMB and HML as risk factors that capture the default risk. For the size factor, SMB, the evidence suggests that small firms must generate higher equity return than big firms since small firms are more likely to fail than big ones during recession periods. Hence, considerable positive variations in the SMB factor should be related to systematic default risk. For the HML factor, the fact that firms with high book-to-market value tend to have persistent low earnings makes them less creditworthy than low book-to market value firms. For this reason, HML can be seen as a default risk factor. These findings go along with the following hypothesis:

H1: The size factor, SMB, is a systematic risk factor that captures the firm's financial distress.

H2: The value factor, HML, is a systematic risk factor that captures the firm's financial distress.

While the Fama and French (1993) model outperforms the CAPM, its performance against other multifactor models is generally inconclusive (Rahim and Nor, 2006). Indeed, Fama and French (1996) assert that their model, like any other model, has some weaknesses and cannot be able to explain all asset returns (Liu, 2006). Motivated by this assertion, two streams of research have emerged. The first stream does not consider SMB and HML as systematic factors and proposes other risk factors able to capture the missing beta risk. Hence, alternative models come into sight. The second stream of research proposes additional risk factors to the three-factor model of Fama and French (1993) so that augmented models emerged. In this study, we examine the two streams of research and we consider three risk factors that can be added to or substituted for the size and book-to-market factors of Fama and French (1993). These three risk factors are financial distress, liquidity, and VaR.

2-1 Financial distress risk factor:

A large strand of the literature considers that size and value factors of Fama and French (1993) proxy for financial distress. This finding makes a restricted number of studies interested in examining the explanatory power of a financial distress risk factor in explaining assets returns. Ferguson and Shockley (2003) propose two-factor model constructed on relative distress and relative leverage and show that the two factors subsume the powers of Fama and French (1993)'s factors in explaining the cross-sectional average returns of the 25 portfolios sorted by size and book-to-market. Likewise, Vassalou and Xing (2004) study the impact of default risk on equity returns. The authors regress the returns of 27 equally weighted portfolios sorted by default risk, size, and book-to-market on market and a default risk and show that default is a priced systematic risk. Then, the authors incorporate the SMB and HML factors of Fama and French (1993) in the model. Empirical results stipulate that when SMB and HML are included, the loadings of the default risk are lessened for all portfolios showing that SMB and HML include important information related to default and hence proxy for the default risk. In addition, Chou et al. (2010) investigate whether relative distress and relative leverage totally explain the asset-pricing anomalies. They put forward an augmented five-factor model, which combines Ferguson and Shockley (2003)'s factors with the Fama and French (1993) three-factor model. The empirical results show that neither the Fama and French (1993) factor model nor the Ferguson and Shockley (2003) factor model prevails in explaining the common asset-pricing anomalies. Besides, it is found that the augmented five-factor model is able to explain almost all anomalies. In the same stream of research, Campbell et al. (2011) examine the performance of distressed firms using CAPM and Fama and French (1993) model. They find that distressed firms significantly underperform safe stocks. Besides, portfolios of distressed firms have high levels of volatility and high market betas, which means that they are risky and must require a high risk premium. A strategy that buys a portfolio of safe stocks and sells the one of distressed stocks is found to be promotable. This result suggests that the market has not priced distress risk appropriately. Furthermore, the authors find that the underperformance of distressed firms is present in all size and value quintiles, although the underperformance of distressed stocks is more pronounced for small firms. Besides, Nielsen (2011) wonders whether default risk is priced in equity returns and whether size and book-to-market proxy for default risk effect. Eight portfolios are formed by the intersection of independent sorting on a proxy for financial distress, book-to-market and size. The author makes use of the CAPM and Fama and French (1993) three-factor model, as well as the augmented models with the default risk factor as an additional factor. Empirical results suggest that size explains the cross-section of stock returns and is priced with a negative risk premium. However, when the product of size and default risk is included in the regression, the size effect is not significant anymore. This result is explained by the fact that size and default risk share some common information but size dominates in explaining stock returns.

Based on the presented studies, we propose to test the following hypothesis:

H_3: Financial distress is a systematic risk factor

2-2 Liquidity risk factor:

While the literature relating to the importance of liquidity has been prominent for over a decade, studies on the liquidity risk[1] have been more recent. Latest studies examine liquidity as an additional good candidate for equity pricing. This section reflects the interest of recent studies on the role of liquidity in pricing models (Bali and Cakici, 2004; Liu, 2006; Marcelo and Quiros, 2006; Chai et al., 2013; Asl et al., 2012). Most of them attribute to liquidity the role of a risk factor, similar to SMB and HML of the Fama and French (1993) model. Amihud

[1] The probability of not being liquid would suggest that there is a liquidity risk

(2002) suggests that illiquidity explains differences in expected returns across stocks. The author defines an illiquidity measure as the daily ratio of absolute stock return to its dollar volume, averaged over some period. It is found that illiquidity is priced and has a stronger impact on small firm stocks, which explain time series fluctuations in their premiums over time. According to Pastor and Stambaugh (2003), liquidity seems to be a good candidate for a priced state variable and is commonly considered as an important characteristic of the investment environment. Using the illiquidity measure of Amihud (2002), Acharya and Pedersen (2005) show that the liquidity-adjusted CAPM outperforms the standard CAPM. In the Spanish context, Marcelo and Quiros (2006) adopt the liquidity measure of Amihud (2002) and construct a mimicking portfolio for illiquidity as a risk factor to augment their three-factor model and the standard CAPM. The authors conclude that systematic illiquidity should be a key factor in asset pricing. Furthermore, Chai et al. (2013) examine the effect of liquidity on stock returns in the context of Fama and French cross-sectional framework for the Australian equity market. The authors find a significant illiquidity premium and show that liquidity explains a part of the common variation in stock returns even after controlling for size, book-to-market, and momentum. Nevertheless, findings suggest that the liquidity factor only adds marginal explanatory power to contemporary equity pricing models. Lin et al. (2011) highlight the role of liquidity risk in the pricing of corporate bonds. In the same context, Minović and Živković (2012) focus on the Serbian market and show that investors require higher size, growth, and liquidity premium as compensation for exposing themselves to different risks by investing in small firms with high book-to-market ratio and illiquidity of stocks. The authors find that the CAPM model augmented by a liquidity factor outperforms the CAPM as well as the Fama and French (1993) three-factor model. In the same stream of research, Asl et al. (2012) focus on the stock return in Tehran Stock Exchange and augment the Fama and French (1993) model by a liquidity factor. A significant relationship between portfolio excess return and liquidity premium is found. Additionally, Ho and Chang (2015) suggest that the market liquidity risk must be an essential ingredient of asset pricing models and show that this risk factor is systematically priced.

There is an acceptable theoretical literature on liquidity as a risk factor used in pricing models, but very few studies focus on how liquidity risk is priced in the context of financial distress. Among these studies, we refer to Liu (2006) who views liquidity as a pertinent issue when the economy is in or foreseen to be in a recessionary state. Everything else equal, no investor has interest in holding shares of distressed companies. Firms with a high probability of default are unattractive to investors and, hence, are less liquid. The author speculates that liquidity risk may, to some extent, capture any default premium. Besides, a liquidity factor can capture distress risk more directly than size and book-to-market factors of the Fama and French (1993) three factor model. Based on a sample of all NYSE, AMEX and NASDAQ ordinary common stocks from January 1960 to December 2003, Liu (2006) documents a significant liquidity premium robust to the CAPM and the Fama and French (1993) three-factor model and proves that liquidity risk is priced. In the Malaysian context, Rahim and Nor (2006) claim that the market factor alone is unable to capture other risks in stocks. The implication for investment and equity market is that, instead of relying merely on the market factor, investors should also be interested in firm specific factors such as distress and liquidity levels. The authors document that, rationally, small size in itself does not make a firm riskier. It is rather the firm's risk of being in distress and the risk of illiquidity that incite investors to look for higher than market-risk premiums.

To sum up, findings are unanimously in agreement with a pricing model that includes a liquidity risk factor. It seems rational that a great number of investors require higher expected returns on stocks whose returns are sensitive to liquidity. Accordingly, we can hypothesize that:

H_4: Liquidity is a systematic risk factor that captures financial distress risk

2-3 VaR risk factor:

The concept of VaR is defined in the literature as a summary and statistical measure. Marrison (2002) defines VaR as the expected value that can be lost during critical and unfavorable market fluctuations. This measure answers the following question: "*How much could we lose today given our current position and the possible changes in the market*?". Current research on asset pricing theory leaves a critical void in our knowledge, as only two empirical studies are conducted to test whether the VaR is a source of priced systematic risk in stock returns.

First, Bali and Cakici (2004) wonder whether the VaR may explain sectional expected returns. Following Fama and French (1992), the authors explore the cross-sectional variation in expected returns on the NYSE, Amex, and Nasdaq stocks for the period that spans January 1963 through December 2001. The exam of average monthly return of portfolios sorted by 1%, 5%, and 10% VaR shows that stocks with the lowest (highest) VaR are associated with the lowest (highest) average returns. Additionally, the authors form 25 size/ book-to-market portfolios following Fama and French (1993). In addition to market, SMB, and HML risk factors, a fourth factor based on VaR, HVARL (high VaR minus low VaR), is employed.

It mimics the risk factor in returns related to VaR. The liquidity factor, HILLIQL, is also constructed and is defined as the difference between the average returns for the high-illiquidity and low-illiquidity portfolios. Conclusions highlight the additional explanatory power of HVARL and HILLIQL factors in capturing the cross-sectional variation in expected returns after controlling for the effects of the market, size, and book-to-market. Likewise, following Bali and Cakici (2004), Chen et al. (2014) wonder whether, in the Taiwanese context, the VaR factor has marginal explanatory power associated with the Fama and French (1993) model. Based on 25 size/ book-to-market portfolios of Fama and French (1993), the authors find that the HAVRL factor of Bali and Cakici (2004) further captures the variation in emerging stock markets, in particular for the larger companies.

In this study, we extend the study of Bali and Cakici (2004) to the context of financial distress, and we propose testing the following hypothesis:

H5: Value-at-Risk is a systematic risk factor that captures distress risk

3- Data, methodology, and model specification:

3-1 Data:

Our sample is composed of all French-listed firms (780 firms) from 1998 to 2012. We eliminate financial and banking firms (SIC codes between 6000 and 6999), given that they have different financial, operating, and risk characteristics. Furthermore, companies with missing data are excluded. Due to the small number of French listed companies before 1998, and in order to obtain nine well-diversified size and book-to-market sorted portfolios, our study period cannot be longer. Our final sample includes 508 firms.

We use the database Diane to collect the data required to compute the probability of financial distress one-year-ahead. The construction of risk factors requires accounting and financial data acquired from the Thomson One Banker database and historical stock prices obtained from Datastream database. We use the French 1-month T-bill rate as the risk free asset.

3-2 *Methodology and model specification:*

One of the objectives of this study is to explore the explanatory power of the risk factors that best capture financial distress. To this end, we separate financial distressed firms from healthy ones and we create a portfolio composed only of highly distressed firms. In order to select distressed firms, each year from 1998 to 2012, we sort firms according to their probabilities of financial distress, estimated using one year-ahead logistic model with an average accuracy of 85.71%[2]. The probability of financial distress is computed as follows:

$$P = 2.4317 - 2.8145R_1 - 0.0834\,R_2 - 0.1196\,R_3 + 9.0795\,R_4$$

Where,

P is the probability of financial distress

R_1 is the liquidity ratio

R_2 is the solvency ratio

R_3 is the debt to equity ratio

R_4 is the long term liabilities to total assets ratio

We select the top 20% of firms with the highest probability of financial distress in order to form the distressed portfolio to be tested separately afterwards. After removing highly distressed firms, healthy firms (the remaining ones) are independently sorted by size and book-to-market. The intersection of the independent sorting forms nine portfolios. Subsequently, we try to identify the risk factors that systematically determine the returns of the ten portfolios. For this purpose, we construct the SMB and HML risk factors of Fama and French (1993) as well as the financial distress, liquidity, and VaR risk factors. The financial distress risk factor, HFDL, is computed as the difference in average monthly returns between the portfolio of highly distressed firms (top 20%) and the portfolio of the least distressed ones (bottom 20%) after sorting the stocks based on their probability of financial distress. The liquidity factor, IML, is computed as the difference in average monthly returns between illiquid and liquid portfolios. Our measure of liquidity is the turnover ratio. A higher ratio means higher liquidity. This measure is used in Rouwenhorst (1999), Bekaert et al. (2007), Levine and Schmukler (2006) as well as Ho and Chang (2015). The turnover ratio is computed as the number of shares traded divided by the number of shares outstanding. Each year, all stocks are ranked according to the turnover ratio of December of the previous year. The IML factor corresponds to the difference in average monthly returns between the portfolio of firms with low turnover ratio (bottom 30%) and the portfolio of firms with high turnover ratio (top 30%). Similarly, the VaR risk factor, HVARL, is calculated as the difference in average monthly returns between the high-VaR and low-VaR portfolios. Following the construction of Fama and French's size portfolios, all stocks are ranked

[2] The logistic regression is estimated using a sample of 212 firms, among them 106 are financially distressed. The stepwise regression is used to select, among a battery of financial ratios, the financial variables that discriminate the most between distressed and non-distressed firms. For more details, see Mselmi et al. (2014).

according to the 5% VaR. The median 5% VaR value is employed to divide the stocks into two groups: high-VaR and low-VaR groups (Chen et al., 2014).

After the construction of the risk factors, we first estimate the Fama and French (1993) three-factor model (Model 1). We estimate the respective considered augmented models by adding, separately, the HFDL, IML and HVARL risk factors (Models 2, 3, 4), then jointly (model 5). Subsequently, in order to test whether the additional risk factors can substitute for the SMB and HML factors of Fama and French (1993), an alternative model that incorporates RMRF, HFDL, IML and HVARL risk factors only is estimated (Model 6).

Model 1: $R_{i,t} - R_{f,t} = \alpha_{i,t} + \beta_1 RMRF_t + \beta_2 SMB_t + \beta_3 HML_t$

Model 2: $R_{i,t} - R_{f,t} = \alpha_{i,t} + \beta_1 RMRF_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 HFDL_t$

Model 3: $R_{i,t} - R_{f,t} = \alpha_{i,t} + \beta_1 RMRF_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 IML_t$

Model 4: $R_{i,t} - R_{f,t} = \alpha_{i,t} + \beta_1 RMRF_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 HVARL_t$

Model 5: $R_{i,t} - R_{f,t} = \alpha_{i,t} + \beta_1 RMRF_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 HFDL_t + \beta_5 IML_t + \beta_6 HVARL_t$

Model 6: $R_{i,t} - R_{f,t} = \alpha_{i,t} + \beta_1 RMRF_t + \beta_2 HFDL_t + \beta_3 IML_t + \beta_4 HVARL_t$

where, $(R_i - R_f), \alpha_i$, and $RMRF$ refer to the monthly return on the portfolio *i* in excess of the risk free rate, the constant term, and the market risk premium measured by the monthly return on the market portfolio in excess of the risk free rate, respectively. $SMB, HML, HFDL, IML$, and $HVARL$ are risk factors related to size, value, financial distress, liquidity, and VaR, respectively. The β coefficients capture the sensitivity of sorted portfolio returns to the variations in the respective risk factors.

Table 1 summarizes the definitions and the measurement of dependent and independent variables that we use in our study.

4- Empirical results:

4-1 Descriptive statistics of the independent variables:

We examine summary statistics of the six risk factors' returns. Recall that the returns of the different risk factors are computed with an equally weighted average stock returns. Table 2 reports means, standard deviations, minimum, maximum, and Sharpe ratios values of monthly returns of the six risk factors. These returns correspond to risk premiums associated to these risk factors for the period 1998-2012.

Table 1. Summary of variable definitions

Variable name	Description
Dependent variables	
$(R_i - R_f)$	Return in excess of risk free rate of nine portfolios sorted by size, book-to-market and the portfolio of distressed firms.
Independent variables	
$RMRF$	Market risk premium.
SMB	Represents the size premium. This variable expresses the difference in average monthly returns between the portfolio of small-cap firms and that of large-cap firms. The arbitrage strategy is to buy the portfolio of high size firms and to sell the one of low size firms.
HML	Represents the value premium. This variable expresses the difference in average monthly returns between portfolios of firms with high book-to-market and those with low book-to-market. The arbitrage strategy is to buy the portfolio of firms with high book-to-market ratio and sell the one with low book-to-market ratio.
$HFDL$	Represents the financial distress risk premium. It expresses the difference in average monthly returns between the portfolio of highly distressed firms and the portfolio of the least distressed ones. The arbitrage strategy is to buy the portfolio of highly distressed firms and to sell the one of the least distressed ones.
IML	Represents the liquidity risk premium. This variable expresses the difference in average monthly returns between the illiquid and liquid portfolios. The arbitrage strategy is to buy the illiquid portfolio and to sell the liquid one.
$HVARL$	Represents the VaR risk premium. This variable expresses the difference in average monthly returns between the high-VaR and low-VaR portfolios. The arbitrage strategy is to buy the high-VaR portfolio and to sell the low-VaR one.

Table 2: Descriptive statistics of monthly returns of explanatory factors.

RMRF is the market risk premium, SMB is the size premium, HML is the value premium, HFDL is the financial distress premium for one year before financial distress, IML is the liquidity premium, and HVARL is the VaR premium, respectively.

Variable	RMRF	SMB	HML	HFDL	IML	HVARL
Mean	-0.0137***	0.0082***	0.0132***	-0.0066***	-0.0037	0.0031
Std. Dev.	0.0697	0.0403	0.0662	0.0254	0.0747	0.0488
Min	-0.3041	-0.0813	-0.3702	-0.1472	-0.7129	-0.1353
Max	0.1730	0.3859	0.6016	0.0734	0.2136	0.4058
Sharpe ratio	-0.1966	0.2035	0.1994	-0.2598	-0.0495	0.0635

***, **, * denote two-tailed statistical significance levels at the 1%, 5%, and 10%, respectively.

The average return of the market premium is the lowest with a value of -1.37% per month. It corresponds to the average market premium per unit of beta (market risk). Over the long-term, the market risk premium needs to be positive since it rewards investors for taking risks. Nevertheless, in some cases, market fluctuations can provoke a shift to the negative side. Arnott and Ryan (2001) and Arnott and Bernstein (2002) put forward that market risk premium can be negative or zero. Arnott and Ryan (2001) justify this stylized fact by a low dividend yield and a low expectation of dividend growth. The average premiums for the size-related factor in returns, SMB, is 0.82% per month. The positive average return of the SMB factor means that investors buying small firms and selling big firms exhibit positive average returns. We notice that this strategy beats that of the market portfolio. Moreover, the mean monthly return of HML factor is equal to 1.32%. This suggests that longing firms with high book-to-market and shorting ones with low book-to-market generate positive returns. We note that this strategy beats those of the market and size portfolios. Surprisingly, we highlight that arbitrage strategy based on financial distress generate significantly negative returns. The negative average return means that investors buying distressed firms and selling non-distressed firms exhibit negative returns. In other words, investors are not rewarded for bearing financial distress risk. Besides, the financial distress factor is the least volatile with standard deviations of 2.54%. We find also that the average return of the liquidity factor is about -0.37% showing that investors who buy illiquid firms and sell liquid ones exhibit losses. Additionally, the VaR premium is positive. Thus, investors buying firms with high VaR and selling ones with low VaR earn positive premiums. The exam of Sharpe ratios shows that the SMB factor has the highest ratio, followed by HML, HVARL, and IML factors. The market and financial distress factors have the lowest ratios. Consequently, strategies based on size, value and VaR outperform those based on liquidity, market portfolio, and financial distress.

Correlation matrices and multicollinearity diagnostic statistics for the six risk factors are computed and presented in Table 3. If risk factors are highly correlated, then it is probably that they detect similar effects. On the other hand, when risk factors are not highly correlated, not much information is likely to be lost (Chan et al., 1998). Our findings show that all the correlation coefficients are generally low which satisfy the orthogonal relations between explanatory variables as suggested by Fama and French (1993). Exceptions are for the correlation between HML and SMB (0.5824), the correlation between the liquidity factor on one hand and SMB and HML on the other hand (0.7944, and -0.6726, respectively), and the correlation between the VaR factor and the market (0.5733).

For the purpose to be certain that these correlations do not give rise to multicollinearity that can affect our results, we proceed to an analysis of Variance Inflaton Factor (VIF). We find that all ratios have VIFs lower than 10, which prove the absence of a multicollinearity problem.

Table 3: Correlation matrix and multicolinearity diagnosis statistics for the six risk factors

RMRF is the market risk premium, SMB is the size premium, HML is the value premium, HFDL is the financial distress premium for one year before financial distress, HILLIQL is the illiquidity premium, and HVARL is the VaR premium, respectively.

	RMRF	SMB	HML	HFDL	IML	HVARL
RMRF	1.0000					
SMB	-0.0713	1.0000				
HML	-0.0064	0.5824***	1.0000			
HFDL	-0.0387	-0.0762	0.3698***	1.0000		
IML	0.2913***	-0.7944***	-0.6726***	-0.0130	1.0000	
HVARL	0.5733***	0.4024***	0.2245***	-0.1649**	-0.0958	1.0000
VIF	1.8915	3.8814	2.7900	1.4695	4.5499	2.3040
TOL	0.5287	0.2576	0.3584	0.6805	0.2198	0.4341

***, **, * denote two-tailed statistical significance levels at the 1%, 5%, and 10%, respectively.

After examining the returns of the explanatory factors, we focus on the returns of the nine portfolios sorted by size and book-to-market and those of the distressed portfolio.

4-2 Descriptive statistics of the dependent variables:

Table 4 reports means, standard deviations, minimum, maximum, and Sharpe ratios of nine portfolios composed of non-distressed firms sorted by size and book-to-market ratio (Panel A) as well as the portfolio of distressed firms (Panel B).

Empirical results show that the average monthly returns in excess of risk free rate of most of the size and book-to-market sorted portfolios are negative. Exception is for the average monthly returns in excess of risk free rate of the LSHB portfolio. In addition, the average monthly return in excess of risk free rate of the distressed portfolio is negative with a value of -1.95%. This shows that these portfolios, excepting the LSHB portfolio, underperform the French Treasury bills-1 month (a risk-free rate).

Table 4: Descriptive statistics of portfolios sorted by size and book-to-market and portfolios of distressed firms:

Panel A summarizes descriptive statistics for nine portfolios sorted by size and book-to-market after excluding distressed firms one-year ahead. Panel B reports the results of the distressed portfolio, Default, composed of distressed firms one-year ahead.

LS: low size, MS: medium size, HS: high size, HB: high book-to-market, MB: medium book-to-market, LB: low book-to-market

Panel A : Portfolios sorted by size and book-to-market

		Size		
		LS	**MS**	**HS**
Book to Market ratio		**Mean monthly returns in excess of risk free rate**		
	HB	0.0005	-0.0152	-0.0104
	MB	-0.0139	-0.0192	-0.0164
	LB	-0.0127	-0.0191	-0.0197
		Standard deviation of monthly returns in excess of risk free rate		
	HB	0.0739	0.0701	0.0816
	MB	0.0729	0.0717	0.0747
	LB	0.0795	0.0875	0.0878
		Minimum		
	HB	-0.2528	-0.3219	-0.3411
	MB	-0.3009	-0.2982	-0.3209
	LB	-0.2404	-0.2888	-0.3105
		Maximum		
	HB	0.2415	0.1776	0.3048
	MB	0.1981	0.1865	0.2073
	LB	0.2117	0.4549	0.3751
		Sharpe Ratio		
	HB	0.0071	-0.2173	-0.1278
	MB	-0.1909	-0.2673	-0.2195
	LB	-0.1595	-0.2182	-0.2239

Panel B: Portfolio of distressed firms

	Mean	Std. Dev.	Min	Max	Sharpe Ratio
Default	-0.0195	0.0743	-0.3342	0.1811	-0.2631

We find that average returns tend to increase with book-to-market in each size quintile. This finding confirms the Fama and French (1992) evidence about the presence of a positive relationship between book-to market and average excess returns. In fact, the portfolios of firms with low book-to-market ratio underperform those of firms with high book-to-market ratio. Besides, the portfolios of firms with medium book-to-market ratio underperform those of firms with high book-to-market ratio. Moreover, the portfolios of firms with low book-to-market ratio, except for the LSLB and MSLB portfolios, underperform those of firms with medium book-to-market ratio. Additionally, the portfolios sorted by size and book-to-market confirm the Fama and French (1992) evidence about the presence of a negative relationship between size and average excess returns. In every book-to-market quintile, average returns tend to decrease with size. Indeed, the portfolios of medium sized firms underperform those of small firms. Furthermore, the portfolios of big firms underperform those of small firms. Howbeit, we find that the portfolios of big firms, except for the HSLB portfolio, outperform those of medium firms. Our findings show that the HBLS portfolio has the highest average return and the highest Sharpe ratio, showing that this portfolio outperforms the other portfolios. This is consistent with the evidence that value firms outperform growth ones and with the evidence that smaller firms tend to outperform large one. These findings are also in agreement with Molay (2000) and Lajili (2005) who confirm the outperformance of portfolios with low size and/or high B/M in the French context.

Moreover, we find that standard deviations of the portfolios of big firms are higher than those of the portfolios of small firms. Besides, standard deviations of the portfolios of growth firms are higher than standard deviations of the portfolios of value firms. The finding that value stocks and small stocks have higher returns and lower standard deviation returns than growth firms and small firms, respectively, seems to violate the risk-return trade-off and is considered somewhat of a puzzle. Prior studies consider the fact that firms with a low stock return volatility outperform firms with a high stock return volatility as a "low volatility' anomaly". Our results are in line with those of Dutt and Humphery-Jenner (2013) who find that, in emerging markets and developed markets outside of North America, low volatility stocks earn higher returns than high volatility stocks. One explanation is that the low volatility effect occurs due to "limits to arbitrage" generated by the benchmarking of institutional money management mandates. As an additional explanation, the authors argue that low volatility stocks have higher operating returns and this could account for the outperformance of low volatility stocks.

Consequently, without considering whether an investor believes that the outperformance of value and small stocks results from market inefficiency (habitual mispricing) or rational risk compensation (market efficiency), investors should include value and small stocks in their diversified portfolios.

After focusing on the descriptive side of the excess returns of the constructed portfolios, we now regress these excess returns on a set of risk factors namely the three factors of Fama and French (1993) model. We also test three augmented models and an alternative model afterwards. In order to evaluate the performance of the different models, we compare their explanatory power measured by their pricing errors and their adjusted R^2.

4-3 Equity pricing estimation results:

In this subsection, we present the results of Fama and French (1993), the augmented models and the alternative one. In particular, we focus on the loadings and the coefficients of determination since, in time-series regressions, they are a direct evidence as to whether the different risk factors capture a common variation in stock returns (Chen et al., 2014).

4-3-1 Results of Fama and French (1993):

Table 5 reports factor loadings for portfolios sorted by size and book-to-market ratio, after excluding distressed firms, as well as for the portfolio of distressed firms. Each portfolio corresponds to one column in the table. The factors' loadings are estimated from time-series regressions of monthly equally weighted portfolios' excess returns on the market, size, and book-to-market factors of Fama and French (1993) model from January 1998 to December 2012. As previously mentioned, the pricing error is among the tools used to assess the performance of pricing models. It represents the intercept of the time series regressions and corresponds to the proportion of the excess portfolio return that is not explained by the set of risk factors used in the regression. In accordance with the efficient market hypothesis, the expected value of abnormal returns, the intercept, should not be significantly different from zero. Our findings show that all the intercepts are close to zero. Moreover, except for the HSHB, LSHB, and MSMB portfolios, all the intercepts are not significant. The deviation of the intercept from zero is positive for the HSHB and LSHB portfolios and negative for the MSMB portfolio. Besides, the pricing error of the LSHB portfolio is higher than that of the HSHB portfolio. This indicates that the HSHB and LSHB portfolios outperform the MSMB portfolio and that the LSHB portfolio outperform the HSHB portfolio. These findings confirm the results of descriptive statistics. Furthermore, all loadings on the market factor are significantly positive at 1% significance level and close to one. The market factor appears to explain the time-series average returns better than size and value factors. Besides, these loadings are related to size and book-to-market ratio. In fact, in every book-to-market quintile, slopes on the market factor for portfolios of big firms are higher than slopes on the market factor for portfolios of small ones. Moreover, in every size quintile, slopes on the market factor for portfolios of growth firms are higher than slopes on the market factor for portfolios of value firms. This means that portfolios of big firms are riskier than portfolios of small firms, and that portfolios of growth firms are riskier than portfolios of value firms.

Table 5: OLS regression results of excess returns of portfolios sorted by size and book-to-market and the portfolio of distressed firms on the three factors of Fama and French (1993) model:

Panel A summarizes OLS regression results for monthly excess returns of nine portfolios sorted by size and book-to-market, after excluding distressed firms, on the three factors of Fama and French (1993) model. Panel B reports the results of the OLS regression for the distressed portfolio Default composed of distressed firms. The sample covers the period from January 1998 to December 2012. LS: low size, MS: medium size, HS: high size, HB: high book-to-market, MB: medium book-to-market, LB: low book-to-market

	Panel A: Portfolios sorted by size and book to market									**Panel B: Portfolio of distressed firms**
	HB			**MB**			**LB**			**Default**
	HS	**MS**	**LS**	**HS**	**MS**	**LS**	**HS**	**MS**	**LS**	
$\boldsymbol{\alpha_i}$	0.0046**	-0.0025	0.0097***	0.0001	-0.0028**	-0.0007	0.0028	0.0015	-0.0002	-0.0038**
	(2.2210)	(-1.3540)	(3.7600)	(0.0810)	(-2.1530)	(-0.3290)	(1.4440)	(0.7290)	(-0.0470)	(-2.5900)
$\boldsymbol{\beta_{RMRFi}}$	0.9952***	0.9028***	0.9313***	0.9833***	0.9684***	0.9478***	1.0852***	1.0925***	0.9442***	0.9941***
	(34.4300)	(35.5870)	(25.9600)	(57.4220)	(52.1590)	(28.8680)	(40.1770)	(39.2740)	(19.9360)	(49.1750)
$\boldsymbol{\beta_{SMBi}}$	-0.8458***	-0.4447***	0.2241***	-0.6023***	-0.2587***	0.3112***	-0.1897***	0.3582***	0.4278***	-0.4207***
	(-13.7290)	(-8.2230)	(2.9300)	(-16.5000)	(-6.5380)	(4.4460)	(-3.2960)	(6.0400)	(4.2370)	(-9.7640)
$\boldsymbol{\beta_{HMLi}}$	0.4125***	0.2458***	0.1289***	0.1405***	-0.0693***	-0.2056***	-0.4613***	-0.6461***	-0.2333***	0.0969***
	(11.0350)	(7.4930)	(2.7800)	(6.3470)	(-2.8850)	(-4.8420)	(-13.2050)	(-17.9570)	(-3.8090)	(3.7090)
Adjusted R^2	89.16%	88.66%	79.64%	95.47%	94.21%	82.49%	91.83%	91.27%	69.31%	93.60%
F-statistic	491.6 [0.0000]	467.3 [0.0000]	234.5 [0.0000]	1257 [0.0000]	971.1 [0.0000]	282.1 [0.0000]	671.8 [0.0000]	625 [0.0000]	135.8 [0.0000]	873.0 [0.0000]

***, **, * denote two-tailed statistical significance levels at the 1%, 5%, and 10%, respectively. Student's t-statistics and p-values are given in brackets and square brackets, respectively.

In other words, portfolios of big firms and portfolios of growth firms have a significant upside when the market goes up and a significant downside when the market takes a turn for the worst. Not surprisingly, all loadings on the size factor are significant showing that the SMB factor captures shared variation in stock returns that is missed by the other risk factors. In addition, loadings on SMB are related to size. Indeed, slopes on SMB are negative for portfolios of big firms and positive for portfolios of small firms. This finding is consistent with Fama and French (1993) stipulating that small firms earn higher returns than big firms. Subsequently, the hypothesis that size factor is a proxy for systematic risk is accepted.

Likewise, all loadings on HML factor are significant. The value factor obviously captures shared variation in stock returns missed by the market and size factors. In every size quintile, HML slopes decrease from positive values for portfolios of value firms to negative values for portfolios of growth firms, which supports Fama and French (1993) stipulating that value firms earn higher returns than growth firms. Consequently, the hypothesis that value factor is a proxy for systematic risk is accepted.

An additional measure of the model performance is the adjusted R^2. It is a measure of goodness of fit for linear models and gives an idea about the portion of the portfolio return variance explained by the risk factors. The examination of the adjusted R^2 for the nine portfolios sorted by size and book-to-market shows that the explanatory power of the Fama and French (1993) three-factor model is relatively high across the different portfolios. The adjusted R^2 ranges from 69.31% (LSLB portfolio) to 95.47% (HSMB portfolio). Furthermore, our findings show that, in every book-to-market quintile, the adjusted R^2 decreases from big firms to small ones. Additionally, in every size quintile and except for the LSLB portfolio, the adjusted R^2 increases from value firms to growth firms. Accordingly, the three factors of Fama and French (1993) explain the excess returns of portfolios of big and growth firms better than the excess returns of portfolios of small and value firms, respectively. The results from the F-test indicate a global significance of the Fama and French (1993) three-factor model.

The result of Fama and French (1993) time series regression for the equally weighted portfolio of distressed firms one year ahead show that the abnormal return is significant. Although the deviation of the intercept from zero is small, this result indicates that the returns of the portfolio Default are not completely explained by the three risk factors of Fama and French (1993). Besides, this portfolio underperforms the other portfolios of healthy firms sorted by size and book-to-market. Similar to the results of the portfolios sorted by size and book-to-market, the market factor is significantly positive at 1%, is close to one, and appears to explain the time-series returns better than size and value factors. The size factor is negative and significant at the 1% level. This result shows that the distressed portfolio does not consist mainly of small firms. Nevertheless, Campbell et al. (2008) document that in the U.S context; the high failure risk portfolios have extremely high SMB coefficients showing the prevalence of small firms among distressed stocks. The value factor is significantly positive at 1% showing that the portfolio of distressed firms includes more firms with high book-to-market ratio. This result is confirmed by Campbell et al. (2008) who suggest that high failure risk portfolios have positive loadings on HML. The adjusted R^2 is high and equal to 93.60%. Moreover, the F-test indicates a global significance of the Fama and French (1993) model for distressed portfolios. Interestingly, we can infer from our findings that the size and value factors include some information related to financial distress.

In the following, we test the Fama and French (1993) model augmented by the financial distress risk factor, for the excess returns of portfolios of non-distressed firms sorted by size and book-to-market, as well as for the portfolio of distressed firms.

4-3-2 Results of Fama and French (1993) augmented by financial distress risk factor:

Table 6 reports factor loadings for portfolios sorted by size and book-to-market ratio after excluding distressed firms, as well as for the portfolio of distressed firms. Our findings show that the addition of the financial distress risk factor does not affect the abnormal return estimates of the non-distressed portfolios. All the intercepts keep their significance and signs. Moreover, the market factor remains significantly positive and conserves its greater ability in explaining average returns by comparison with size, value and financial distress factors. The financial distress risk factor is significant and negative only for three portfolios namely LSMB, HSLB and MSLB. We can conclude that the financial distress risk factor is not systematic for all non-distressed portfolios.

The adjusted R^2 shows that the explanatory power of the augmented Fama and French (1993) three-factor model by the financial distress risk factor, compared to the one of the Fama and French (1993) model, remains almost unchanged for the portfolios of non-distressed firms. The fact that the adjusted R^2 does not considerably increase when the financial distress factor is included suggests that the latter does not improve the model more than would be expected by chance. Furthermore, the F-test show that the augmented Fama and French (1993) three-factor model by the financial distress is globally significant.

Table 6: OLS regression results of excess returns of portfolios sorted by size and book-to-market and the portfolio of distressed firms on the three factors of Fama and French (1993) model and the financial distress factor:

Panel A summarizes OLS regression results for monthly excess returns of nine portfolios sorted by size and book-to-market, after excluding distressed firms, on the three factors of Fama and French (1993) model and the financial distress factor. Panel B reports the results of the OLS regression for the distressed portfolio Default composed of distressed firms. The sample covers the period from January 1998 to December 2012. LS: low size, MS: medium size, HS: high size, HB: high book-to-market, MB: medium book-to-market, LB: low book-to-market

	Panel A: Portfolios sorted by size and book to market									**Panel B: Portfolio of distressed firms**
	HB			**MB**			**LB**			**Default**
	HS	**MS**	**LS**	**HS**	**MS**	**LS**	**HS**	**MS**	**LS**	
α_i	0.0051**	-0.0017	0.0092***	0.0005	-0.0033**	-0.0027	0.0007	-0.0022	0.0009	-0.0005
	(2.2690)	(-0.9140)	(3.3190)	(0.4210)	(-2.2990)	(-1.1130)	(0.3510)	(-1.1340)	(0.2570)	(-0.3440)
β_{RMRFi}	0.9964***	0.9049***	0.9294***	0.9846***	0.9672***	0.9417***	1.0787***	1.0812***	0.9475***	1.0043***
	(34.2990)	(35.5890)	(25.7920)	(57.3450)	(51.8900)	(28.9890)	(40.8310)	(42.0800)	(19.9370)	(56.6660)
β_{SMBi}	-0.8318***	-0.4193***	0.2018**	-0.5861***	-0.2725***	0.2402***	-0.2654***	0.2258***	0.4671***	-0.3017***
	(-12.4010)	(-7.1410)	(2.4260)	(-14.7820)	(-6.3300)	(3.2020)	(-4.3510)	(3.8060)	(4.2560)	(-7.3730)
β_{HMLi}	0.4005***	0.2241***	0.1479***	0.1267***	-0.0576**	-0.1448***	-0.3965***	-0.5328***	-0.2669***	-0.0048
	(9.1720)	(5.8630)	(2.7310)	(4.9090)	(-2.0550)	(-2.9660)	(-9.9850)	(-13.7960)	(-3.7370)	(-0.1830)
β_{HFDLi}	0.0495	0.0897	-0.0782	0.0572	-0.0483	-0.2507**	-0.2672***	-0.4673***	0.1387	0.4203***
	(0.5350)	(1.1070)	(-0.6810)	(1.0450)	(-0.8130)	(-2.4210)	(-3.1740)	(-5.706)	(0.9160)	(7.4400)
Adjusted R^2	89.11%	88.67%	79.58%	95.47	94.19%	82.96%	92.23%	92.6%	69.28%	95.11%
F-statistic	367.3 [0.0000]	351.2 [0.0000]	175.4 [0.0000]	943.9 [0.0000]	727.1 [0.0000]	218.9 [0.0000]	532.3 [0.0000]	560.9 [0.0000]	101.9 [0.0000]	870.8 [0.0000]

***, **, * denote two-tailed statistical significance levels at the 1%, 5%, and 10%, respectively. Student's t-statistics and p-values are given in brackets and square brackets, respectively.

As expected, the addition of the financial distress risk factor affects the abnormal return estimates of the distressed portfolio. Actually, the intercept of the portfolio Default becomes insignificant which is an improvement as compared to the Fama and French (1993) three-factor model. The market factor preserves its greater ability in explaining excess returns of distressed portfolios. If all the priced information in SMB and HML is linked to financial distress, SMB and HML would lose their ability to explain equity returns in the presence of default risk factor (Vassalou and Xing, 2004). Our findings in Panel B of Table 6 show that when the financial distress risk factor is included in the model, the size factor remains significant at 1% and the loadings of SMB vary from -0.4207 to -0.3017. Furthermore, the value factor becomes insignificant. The variation in the coefficients of SMB following the incorporation of the financial distress risk factor indicates that the latter shares common information with SMB. Besides, the fact that HML becomes insignificant shows that it loses its explanatory power in the presence of a superior proxy of financial distress. Similarly, Agarwal and Taffler (2008) find that, after controlling for distress risk, there is a strong book-to-market effect for non-distressed stocks while it is not significant for distressed stocks. More importantly, the financial distress risk factor is significantly positive at 1%. For the portfolio of distressed firms, the presence of a positive distress risk premium means that financial distress is a systematic priced risk. In other words, this positive premium is a compensation for the risk of financial distress.

With the inclusion of financial distress factor, the average adjusted R^2 for the distressed portfolio increases from 93.60% to 95.11%. This indicates an amelioration in variations explained by the four-factor model. Additionally, the F-test shows that the augmented Fama and French (1993) three-factor model by the distress risk factor is globally significant. In like manner, Campbell et al. (2008) suggest that the anomalous poor performance of distressed stocks can be worsen rather than corrected when we correct for risk using either the CAPM or the Fama and French (1993) three-factor model.

In the following, we test the Fama and French (1993) model augmented by the liquidity factor, for the excess returns of portfolios of firms sorted by size and book-to-market, as well as for the portfolio of distressed firms.

4-3-3 Results of Fama and French (1993) augmented by the liquidity risk factor:

Our findings in Panel A of Table 7 show that the inclusion of the liquidity factor in the Fama and French (1993) model affect the abnormal returns of the non-distressed portfolios sorted by size and book-to-market.

Table 7: OLS regression results of excess returns of portfolios sorted by size and book-to-market and the portfolio of distressed firms on the three factors of Fama and French (1993) model and the liquidity factor:

Panel A summarizes OLS regression results for monthly excess returns of nine portfolios sorted by size and book-to-market, after excluding distressed firms, on the three factors of Fama and French (1993) model and the financial distress factor. Panel B reports the results of the OLS regression for the distressed portfolio Default composed of distressed firms. The sample covers the period from January 1998 to December 2012. LS: low size, MS: medium size, HS: high size, HB: high book-to-market, MB: medium book-to-market, LB: low book-to-market

	Panel A: Portfolios sorted by size and book to market									**Panel B: Portfolio of distressed firms**
	HB			**MB**			**LB**			
	HS	**MS**	**LS**	**HS**	**MS**	**LS**	**HS**	**MS**	**LS**	**Default**
α_i	0.0029	-0.0041**	0.0075***	-0.0005	-0.0028*	-0.0005	0.0039*	0.0041**	0.0004	-0.0059***
	(1.3670)	(-2.1080)	(2.7470)	(-0.3880)	(-1.9560)	(-0.1950)	(1.9130)	(1.9910)	(0.0940)	(-3.9830)
β_{RMRFi}	0.9635***	0.8725***	0.8871***	0.9715***	0.9702***	0.9534***	1.1071***	1.1435***	0.9539***	0.9530***
	(30.1160)	(31.154)	(22.4250)	(50.8300)	(46.5700)	(25.8850)	(36.7970)	(38.0970)	(17.9570)	(44.1110)
β_{SMBi}	-0.7164***	-0.3207***	0.4047***	-0.5542***	-0.2659***	0.2885***	-0.2791***	0.1499*	0.3879***	-0.2529***
	(-8.4670)	(-4.3300)	(3.8680)	(-10.9630)	(-4.8280)	(2.9610)	(-3.5070)	(1.8890)	(2.7610)	(-4.4280)
β_{HMLi}	0.4571***	0.2885***	0.1912***	0.1571***	-0.0717***	-0.2134***	-0.4921***	-0.7177***	-0.2471***	0.1547***
	(10.8460)	(7.8220)	(3.6690)	(6.2410)	(-2.6150)	(-4.3990)	(-12.4160)	(-18.1540)	(-3.5310)	(5.4370)
β_{IMLi}	0.1194**	0.1143**	0.1665**	0.0443	-0.0066	-0.0209	-0.0823	-0.1919***	-0.0367	0.1546***
	(2.2060)	(2.4140)	(2.4890)	(1.3710)	(-0.1890)	(-0.3360)	(-1.6180)	(-3.7810)	(-0.4090)	(4.2320)
Adjusted R^2	89.39%	88.96%	80.23%	95.49%	94.17%	82.40%	91.91%	0.9189	69.17%	94.16%
F-statistic	378 [0.0000]	361.5 [0.0000]	182.6 [0.0000]	948.3 [0.0000]	724.4 [0.0000]	210.5 [0.0000]	509.1 [0.0000]	507.7 [0.0000]	101.4 [0.0000]	722.1 [0.0000]

***, **, * denote two-tailed statistical significance levels at the 1%, 5%, and 10%, respectively. Student's t-statistics and p-values are given in brackets and square brackets, respectively.

Additionally, the market factor maintains its explanatory power with significant and positive coefficients that are close to one. Furthermore, the four-factor model provides evidence for size and value factors. Besides, the liquidity factor is significantly positive for the portfolios of high book-to-market and significantly negative only for the portfolio MSLB. The adjusted R^2 increases slightly for six of the nine portfolios sorted by size and book-to-market and decreases slightly for the other portfolios. Subsequently, the liquidity factor seems to improve somewhat the Fama and French (1993) model showing that it has an additional explanation power for the portfolios of non-distressed firms. The examination of F-test shows that the Fama and French (1993) three-factor model augmented by liquidity is globally significant.

As for the portfolios of non-distressed firms, the incorporation of the liquidity factor in the Fama and French (1993) model does not affect the significance and the sign of the abnormal returns of the portfolio of distressed firms (Panel B). The market factor maintains its explanatory power with significant and positive coefficient close to one. Besides, the SMB and HML factors keep their significance and signs. The liquidity factor is significantly positive showing that the portfolio of distressed stocks is rewarded by a positive liquidity premium. The F-test shows that the Fama and French (1993) model augmented by the liquidity factor is globally significant.

Consequently, we can conclude that the liquidity factor is a systematic risk factor for the portfolio of distressed firms.

4-3-4 Results of Fama and French (1993) augmented by the VaR risk factor:

Findings from the addition of the VaR risk factor to the Fama and French (1933) model are summarized in Table 8. The abnormal return estimates, the market loadings, the SMB factor coefficients, and the loadings of the HML factor of the nine portfolios of Panel A retain their significance and signs unchanged compared to those of the Fama and French (1993) three-factor model. The VaR factor is significant for six of the nine portfolios. It is negative for the portfolios of firms with high book-to-market and positive for those with low book-to-market. The adjusted R^2 shows that the incorporation of the VaR risk factor improves the Fama and French (1993) model.

The addition of the VaR risk factor to the Fama and French (1993) model does not affect the abnormal return estimate, market loading, SMB coefficient, and HML loading for the portfolio of distressed firms. Additionally, the VaR coefficient is not significant showing that the VaR factor is not priced for distressed firms. Following the inclusion of VaR factor, the adjusted R^2 decreases from 93.60% to 93.56%.

Table 8: OLS regression results of excess returns of portfolios sorted by size and book-to-market and the portfolio of distressed firms on the three factors of Fama and French (1993) model and the VaR factor:

Panel A summarizes OLS regression results for monthly excess returns of nine portfolios sorted by size and book-to-market, after excluding distressed firms, on the three factors of Fama and French (1993) model and the financial distress factor. Panel B reports the results of the OLS regression for the distressed portfolio Default composed of distressed firms. The sample covers the period from January 1998 to December 2012. LS: low size, MS: medium size, HS: high size, HB: high book-to-market, MB: medium book-to-market, LB: low book-to-market

	Panel A: Portfolios sorted by size and book to market									**Panel B: Portfolio of distressed firms**
	HB			**MB**			**LB**			
	HS	**MS**	**LS**	**HS**	**MS**	**LS**	**HS**	**MS**	**LS**	**Default**
α_i	0.0054***	-0.0009	0.0103***	0.0005	-0.0024*	-0.0003	0.0014	0.0008	-0.0004	-0.0038**
	(2.6320)	(-0.6030)	(3.9440)	(0.4550)	(-1.7840)	(-0.1280)	(0.7590)	(0.4380)	(-0.1230)	(-2.5730)
β_{RMRFi}	1.0671***	1.0371***	0.9794***	1.0246***	1.0159***	0.9907***	0.9534***	1.0394***	0.9202***	0.9922***
	(28.2900)	(34.3450)	(20.5790)	(45.7910)	(41.9880)	(22.7350)	(29.0920)	(28.3560)	(14.5600)	(36.7500)
β_{SMBi}	-0.7487***	-0.2632***	0.2891***	-0.5464***	-0.1945***	0.3692***	-0.3678***	0.2863***	0.3954***	-0.4232***
	(-10.8310)	(-4.7550)	(3.3140)	(-13.3230)	(-4.3880)	(4.6220)	(-6.1250)	(4.2620)	(3.4140)	(-8.5530)
β_{HMLi}	0.4066***	0.2348***	0.1249***	0.1372***	-0.0732***	-0.2092***	-0.4504***	-0.6416***	-0.2314***	0.0971***
	(11.0840)	(7.9950)	(2.7000)	(6.3030)	(-3.1100)	(-4.9340)	(-14.1330)	(-18.0000)	(-3.7640)	(3.6990)
β_{HVARLi}	-0.1692***	-0.3161***	-0.1133	-0.0974***	-0.1118***	-0.1009	0.3102***	0.1252**	0.0564	0.0043
	(-2.8860)	(-6.7340)	(-1.5310)	(-2.7990)	(-2.9730)	(-1.4910)	(6.0880)	(2.1970)	(0.5740)	(0.1030)
Adjusted R^2	89.59%	90.94%	79.80%	95.64%	94.45%	82.61%	93.22%	91.46%	69.19%	93.56%
F-statistic	386.1 [0.0000]	450.1 [0.0000]	177.8 [0.0000]	981.7 [0.0000]	763 [0.0000]	213.6 [0.0000]	616.3 [0.0000]	480.1 [0.0000]	101.5 [0.0000]	651.1 [0.0000]

***, **, * denote two-tailed statistical significance levels at the 1%, 5%, and 10%, respectively. Student's t-statistics and p-values are given in brackets and square brackets, respectively.

4-3-5 Results of Fama and French (1993) model augmented by financial distress, liquidity, and VaR risk factors:

Table 9 presents the empirical results of the time-series regression estimates of excess portfolios' returns on the three factors of Fama and French (1993) as augmented by financial distress, liquidity, and VaR risk factors. Panel A shows that, similar to the results from using the three factors of Fama and French (1993), only three abnormal returns are significant. The market loadings are all significantly positive at 1% and very close to one. Following the addition of the three factors to the factors of Fama and French (1993), the loadings on the SMB factor for the MSHB and MSLB portfolios and the loading on the HML factor for the MSMB become non-significant. This shows that for these three portfolios, SMB or HML shares common information with financial distress, liquidity and VaR risk factors. Moreover, we find that the financial distress risk factor maintains its significance and signs for LSMB, MSLB, and MSLB portfolios. Six of the nine loadings on the liquidity factor are significant. They are positive for portfolios of firms with high and medium book-to-market and negative for portfolios of firms with low book-to-market. The exam of the adjusted R^2 shows that the incorporation of financial distress, liquidity, and VaR factors improves the Fama and French (1993) three-factor model. Consequently, we can assume that financial distress, liquidity and VaR provide a significant additional explanation of the variation in portfolio's returns. Furthermore, size, book-to-market, liquidity and VaR are systematic risk factors that are priced for the portfolios of non-distressed firms.

Additionally, our results indicate that the explanatory power of VaR factor improves in the presence of the financial distress and liquidity risk factors. Except for the LSLB portfolio, the loadings of the VaR factor are all significant. They are negative for portfolios of firms with high and medium book-to-market and positive for portfolios of firms with low book-to-market. Similarly, our findings show that the explanatory power of the liquidity factor ameliorates in the presence of the financial distress and VaR risk factors.

Panel B of Table 9 reports the results for the portfolio of distressed firms. The addition of the financial distress, liquidity and VaR factors to the three factors of Fama and French (1993) model affects the abnormal return estimate of the portfolio Default. In fact, the abnormal return becomes not significant showing that the six factors explain well the average excess returns of distressed firms. In other words, the six-factor model does not leave unexplained return for the portfolio of distressed firms. The market and size factors maintain their significantly positive loadings.

Table 9: OLS regression results of excess returns of portfolios sorted by size and book-to-market and portfolios of distressed firms on the six risk factors:

Panel A summarizes OLS regression results for monthly excess returns of nine portfolios sorted by size and book-to-market, after excluding distressed firms, on the three factors of Fama and French (1993) model, the financial distress factor, the liquidity factor, and the VaR factor. Panel B reports the results of the OLS regression for the distressed portfolio Default composed of distressed firms. The sample covers the period from January 1998 to December 2012. LS: low size, MS: medium size, HS: high size, HB: high book-to-market, MB: medium book-to-market, LB: low book-to-market

	Panel A: Portfolios sorted by size and book to market									**Panel B: Portfolio of distressed firms**
	HB			**MB**			**LB**			**Default**
	HS	**MS**	**LS**	**HS**	**MS**	**LS**	**HS**	**MS**	**LS**	
α_i	0.0029	-0.0038**	0.0061**	-0.0002	-0.0033**	-0.0029	0.0018	0.0003	0.0018	-0.0023
	(1.2970)	(-2.1260)	(2.1160)	(-0.1230)	(-2.2270)	(-1.1100)	(0.9450)	(0.1220)	(0.4730)	(-1.6140)
β_{RMRFi}	1.0403***	1.0062***	0.9456***	1.0136***	1.0128***	0.9896***	0.9775***	1.0753***	0.9294***	0.9672***
	(27.3370)	(33.9920)	(19.8080)	(44.3030)	(40.7080)	(22.4160)	(29.9870)	(31.7880)	(14.2760)	(41.0810)
β_{SMBi}	-0.5581***	-0.0428	0.5165***	-0.4649***	-0.1814***	0.3469***	-0.5603***	-0.0163	0.3473**	-0.1997***
	(-5.9080)	(-0.5830)	(4.3580)	(-8.1860)	(-2.9370)	(3.1660)	(-6.9240)	(-0.1940)	(2.1490)	(-3.4180)
β_{HMLi}	0.4788***	0.3168***	0.2506***	0.1578***	-0.0429	-0.1256**	-0.4611***	-0.6143***	-0.3016***	0.0441
	(9.8310)	(8.3610)	(4.1010)	(5.3900)	(-1.3490)	(-2.2230)	(-11.0490)	(-14.1870)	(-3.6200)	(1.4610)
β_{HFDLi}	-0.0491	-0.0517	-0.1867	0.0122	-0.0855	-0.2935***	-0.1534*	-0.3846***	0.1817	0.3911***
	(-0.5340)	(-0.7230)	(-1.6190)	(0.2200)	(-1.4220)	(-2.7520)	(-1.9470)	(-4.7060)	(1.1550)	(6.8740)
β_{IMLi}	0.1656***	0.1905***	0.2215***	0.0646*	0.0268	0.0366	-0.1293***	-0.1766***	-0.0735	0.1104***
	(3.0090)	(4.4480)	(3.2070)	(1.9510)	(0.7440)	(0.5730)	(-2.7410)	(-3.6070)	(-0.7800)	(3.2400)
β_{HVARLi}	-0.2124***	-0.3653***	-0.1828**	-0.1112***	-0.1263***	-0.1379**	0.3253***	0.1288**	0.0911	0.0166
	(-3.5420)	(-7.8310)	(-2.4300)	(-3.0830)	(-3.2220)	(-1.9820)	(6.3320)	(2.4170)	(0.8870)	(0.4470)
Adjusted R^2	89.99%	91.78%	80.81%	95.69%	94.46%	83.15%	93.67%	93.13%	69.13%	95.37%
F-statistic	269.3	334	126.6	663.5	509.7	148.2	442.1	405.4	67.8	616.2
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]

***, **, * denote two-tailed statistical significance levels at the 1%, 5%, and 10%, respectively. Student's t-statistics and p-values are given in brackets and square brackets, respectively.

As expected, the HML factor loses its explanatory power in the presence of the financial distress factor. The latter as well as the liquidity factor continue to be significantly positive. The VaR factor remains not significant for the portfolio of distressed firms. The adjusted R^2 reaches the value of 95.37% showing an improvement of the pricing model. Hence, we conclude that size, financial distress, and liquidity are systematic risk factors that are priced for the portfolio of distressed firms.

To supplement the findings so far, and since the VaR factor is always non-significant for the portfolio of distressed firms, we try in what follows to examine the explanatory power of only the financial distress and liquidity factors, in addition to the three factors of Fama and French (1993), in explaining the excess returns of the distressed portfolio. Findings from Table 10 shows that the removal of the VaR factor does not affect estimates of the abnormal return as well as the other risk factors. Nevertheless, the adjusted R^2 increases to 95.40%. This indicates that the financial distress and liquidity factors in addition to the three factors of Fama and French (1993) are sufficient in explaining the excess returns of the distressed portfolio[3].

Table 10: OLS regression results of excess returns of the portfolio of distressed firms on the five risk factors:

This table reports the results of the OLS regression for the distressed portfolio Default composed of distressed firms on the three factors of Fama and French (1993) model, the financial distress factor and the liquidity factor. The sample covers the period from January 1998 to December 2012.

	α_i	β_{RMRFi}	β_{SMBi}	β_{HMLi}	β_{HFDLi}	β_{IMLi}
Default	-0.0023	0.9732***	-0.1876***	0.0461	0.3861***	0.1142***
	(-1.6270)	(50.1720)	(-3.6360)	(1.5490)	(6.9360)	(3.4630)
Adjusted R^2			95.40%			
F-statistic			742.8			

***, **, * denote two-tailed statistical significance levels at the 1%, 5%, and 10%, respectively. Student's t-statistics and p-values are given in brackets and square brackets, respectively.

As an additional contribution to the asset pricing literature, we propose to explore the performance of the alternative model that can be developed as a potential improvement on the proposed models. Hence, we deviate slightly from prior studies in that in addition to the inclusion of financial distress, liquidity and VaR in the Fama and French (1993) model, we incorporate these risk factors as alternatives to Fama-French (1993) factors.

[3] We also tried to remove the VaR factor for the nine portfolios sorted by size and book-to-market and we regressed the excess returns only on the three factors of Fama and French (1993) as well as the financial distress and liquidity factors. We found that the adjusted R^2s decrease.

4-3-6 Results of the alternative model: If the alternative model describes well average excess returns, we would expect to find higher adjusted R^2s and the regression intercepts statistically indistinguishable from zero. Table 11 reports the empirical results of the alternative model.

Our findings in panel A imply that our alternative model cannot well explain the average excess returns of the portfolios sorted by size and book-to-market. In fact, we observe that five of the nine abnormal returns are significant. Hence, the alternative factors leave a proportion of excess returns not explained. We find that the market factor is significantly positive at 1% and its loadings are very close to one. Furthermore, we find that financial distress factor is significant for seven of the nine portfolios. It is positive for portfolios of firms with high book-to-market and negative for portfolios with low book-to-market. The liquidity factor is significant for six portfolios and we observe some changes in the significance and/or signs of some loadings. Additionally, we find that VaR factor is significant and negative only for four portfolios.

Overall, while the explanatory power of liquidity and VaR factors is reduced in the alternative model, the financial distress factor gains ground.

The exam of the adjusted R^2 shows that the alternative model underperforms the Fama and French (1993) model as well as the augmented models.

Findings in Panel B show that the alternative model cannot well explain the average excess returns of the portfolio of distressed firms since the abnormal return is significant. The market factor remains significantly positive. Additionally, the financial distress and the liquidity risk factors continue to be significantly positive. Besides, as for the previous results, the VaR is not significant for the distressed portfolios. We find also that the adjusted R^2 of the alternative model with a value of 95.07% is higher than that of Fama and French (1993) model but lower than that of the Fama and French model augmented by financial distress and liquidity risk factors.

Table 11: OLS regression results of excess returns of portfolios sorted by size and book-to-market and portfolios of distressed firms on the alternative risk factors:

Panel A summarizes OLS regression results for monthly excess returns of nine portfolios sorted by size and book-to-market, after excluding distressed firms, on the market, the financial distress, liquidity, and VaR factors. Panel B reports the results of the OLS regression for the distressed portfolio Default composed of distressed firms. The sample covers the period from January 1998 to December 2012. LS: low size, MS: medium size, HS: high size, HB: high book-to-market, MB: medium book-to-market, LB: low book-to-market

	Panel A: Portfolios sorted by size and book to market									**Panel B: Portfolio of distressed firms**
	HB			MB			LB			Default
	HS	MS	LS	HS	MS	LS	HS	MS	LS	
α_i	0.0092***	0.0019	0.0133***	0.0005	-0.0051***	-0.0036	-0.0095***	-0.0113***	-0.0021	-0.0025*
	(3.3960)	(1.0140)	(4.7000)	(0.3160)	(-3.6480)	(-1.4490)	(-3.8180)	(-4.2170)	(-0.5620)	(-1.8650)
β_{RMRFi}	1.1164***	1.0442***	0.9549***	1.0494***	1.0148***	0.9621***	0.9457***	1.0053***	0.8816***	0.9798***
	(22.7680)	(30.4220)	(18.5400)	(37.8290)	(40.4420)	(21.3990)	(20.8580)	(20.6340)	(13.2020)	(40.9720)
β_{HFDLi}	0.4627***	0.2723***	0.0449	0.1934***	-0.1211**	-0.4367***	-0.5969***	-1.0084***	-0.1405	0.4447***
	(4.5750)	(3.8450)	(0.4230)	(3.3810)	(-2.3390)	(-4.7090)	(-6.3830)	(-10.0330)	(-1.0200)	(9.0160)
β_{IMLi}	0.0966**	0.0146	-0.1371***	0.1538***	0.1253***	-0.0253	0.3750***	0.2041***	-0.0283	0.1633***
	(2.5700)	(0.5570)	(-3.4720)	(7.2370)	(6.5150)	(-0.7340)	(10.7900)	(5.4650)	(-0.5520)	(8.9060)
β_{HVARLi}	-0.2803***	-0.3123***	0.0244	-0.2179***	-0.1897***	-0.0599	0.0612	-0.0038	0.1325	-0.0342
	(-4.1110)	(-6.5410)	(0.3400)	(-5.6480)	(-5.4360)	(-0.9580)	(0.9700)	(-0.0570)	(1.4270)	(-1.0290)
Adjusted R^2	82.85%	88.58%	76.93%	93.46%	94.18%	81.95%	87.35%	85.28%	66.46%	95.07%
F-statistic	217.1	348.2	150.2	640.5	725.4	204.2	309.9	260.3	89.68%	864.5
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]

***, **, * denote two-tailed statistical significance levels at the 1%, 5%, and 10%, respectively. Student's t-statistics and p-values are given in brackets and square brackets, respectively.

5- Discussion:

The evidence from the previous subsections demonstrates that liquidity and VaR are priced for portfolios sorted by size and book-to-market and consequently investors are rewarded for bearing these risks. Additionally, our findings indicate that for the portfolio of distressed firms, the VaR factor is not priced and that investors investing in such portfolios are rewarded by financial distress and liquidity premiums in addition to the size and market premiums. The Fama and French (1993) augmented by financial distress and liquidity seems to be the best model in explaining the average excess returns of the distressed portfolio. Additionally, the alternative model composed of the market, financial distress, liquidity and VaR is found to underperform the Fama and French (1993) model as well as the augmented ones. This result highlights the explanatory power of the size and value factors in the pricing of distressed and non-distressed firms in the French context.

In the literature, a number of empirical studies confirm our findings. In fact, Vassalou and Xing (2004) argue that default risk is a variable worth considering in asset-pricing tests and that SMB and HML factors comprise some default-related information. Additionally, Campbell et al., (2008) explore the pricing of financially distressed firms and evidence the existence of distress premium and that value and size effects are proxies for a financial distress premium. With regard to the liquidity risk factor, Acharya and Pedersen (2005) find a highly significant liquidity premium in the U.S. market. Similarly, Ho and Chang (2015) provide empirical evidence that the market liquidity risk is systematically priced in the Shanghai stock market. With respect to the VaR risk factor, Chen et al. (2014) demonstrate that, based on 25 size/book-to-market portfolios, VaR factor captures the variation in emerging stock markets, in particular for the larger Taiwanese firms. Furthermore, Bali and Cakici (2004) find that size, liquidity, and VaR capture the cross-sectional differences in expected returns and that VaR has the best performance in terms of the coefficient of determination. Similarly, we find that the Fama and French (1993) model augmented by VaR outperforms that augmented by liquidity. Nevertheless, our findings show that the VaR factor is not a systematic risk for distressed firms. Despite the fact that our study is the first to examine the explanatory power of VaR in pricing distressed firms, we find this result somewhat surprising since the principal goal of risk management through the computation of VaR is to remove the probability of costly lower-tail outcomes that would lead to financial distress (Stulz, 1996). Another interesting finding that we report in this study is that the explanatory power of the liquidity and VaR risk factors improves when the latters are included together in the pricing model. This can be seen in the number of liquidity and VaR loadings that are significant and in the adjusted R^2s.

6- Conclusion:

In this study, we provide evidence on the role of financial distress, liquidity and VaR risk factors in the pricing of French distressed and non-distressed portfolios for the period January 1998 to December 2012. Our work is the first that combines these risk factors, applies them in the French context, and tests their abilities in explaining average excess returns of a financially distressed portfolio. It is important to notice that we discriminate between distressed and non-distressed firms using our own measure of the financial distress probability.

We estimate the Fama and French (1993) model as well as that augmented by financial distress, liquidity and VaR risk factors. Our empirical results consistently show that for the portfolios of non-distressed firms that we sort by size and book-to-market, liquidity, and VaR are systematic risk factors that are priced in addition to the three factors of Fama and French (1993). Likewise, non-distressed portfolios with high book-to-market and the distressed portfolio have a positive liquidity premium, while the non-distressed portfolios with low book-to-market have a negative premium. We find also that the distressed portfolio is rewarded by a positive distress premium. Concerning the VaR premium, we find that portfolios of non-distressed firms with high book-to-market have negative premiums whereas those of firms with low book-to-market are rewarded by positive ones. Interestingly, we find that VaR risk is not priced for the portfolio of distressed firms. While the best model for pricing the portfolios of non-distressed firms sorted by size and book-to-market is consisting of the six risk factors, the best model to price the portfolio of distressed firms is composed only of the market, size, financial distress, and liquidity factors. Additionally, our findings show that the alternative model, composed of the market, financial distress, liquidity and VaR factors, underperforms the Fama and French (1993) model as well as the augmented models.

Our findings have practical implications in that they help to promote the comprehension of the nature of distressed stocks and the different premiums from which an investor can take advantage depending on the risks that he is disposed to bear.

One can extend the research in diverse directions. For instance, a promising research avenue could consider the contribution of analyst coverage and risk taking factors in the pricing of distressed and non-distressed portfolios.

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