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DO FINANCIAL DISTRESS AND LIQUIDITY CRISES AFFECT VALUE AND SIZE PREMIUMS?

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ABSTRACT

This study investigates the impact of liquidity crises on the relationship between stock (value and size) premiums and default risk in the US market. It first examines whether financial distress can explain value and size premiums, and then, subsequently, aims to determine whether liquidity crises increase the risk of value and size premium investment strategies. The study employs a time-varying approach and a sample of US stock returns for the period between January 1982 and March 2011, a period which includes the current liquidity crisis, so as to examine the relationship between default risk, liquidity crises and value and size premiums. The findings indicate that the default premium has explanatory power for value and size and premiums, which affect firms with different characteristics. We also find that liquidity crises may actually increase the risks related to size and value premium strategies.

Keywords: Default Risk; Value Premium; Size Premium; Liquidity Crises

JEL Classification: G12; C22; C32

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ABSTRACT

This study investigates the impact of liquidity crises on the relationship between stock (value and size) premiums and default risk in the US market. It first examines whether financial distress can explain value and size premiums, and then, subsequently, aims to determine whether liquidity crises increase the risk of value and size premium investment strategies. The study employs a time-varying approach and a sample of US stock returns for the period between January 1982 and March 2011, a period which includes the current liquidity crisis, so as to examine the relationship between default risk, liquidity crises and value and size premiums. The findings indicate that the default premium has explanatory power for value and size and premiums, which affect firms with different characteristics. We also find that liquidity crises may actually increase the risks related to size and value premium strategies.

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1. INTRODUCTION

Fama and French (1992, 1998) and Lakonishok, Shleifer and Vishny (1994), among others, identify a value premium in U.S. stocks, hence value stocks are found to have higher average returns than growth stocks.¹ Fama and French (1992) further highlight the existence of a size premium where small stocks tend to outperform big stocks.² These phenomena led to the development of the value and size premium investment strategies, where the value premium strategy involves buying value stocks and selling growth stocks, while the size premium strategy entails buying small stocks and selling big stocks. This study examines some of the determinants of these premiums in that 1) it analyses the link between financial distress and value and size premiums; 2) it systematically analyses the link between liquidity crises and value and size premiums; 3) it investigates the volatility of size and value premiums during financial crises, with the aim of determining whether there is a risk explanation for these premiums; and 4) it compares the results for two different measures of financial distress (i.e. default premiums and credit spreads) to determine whether the choice of measure could have an impact on the determination of the link between liquidity crises and value and size premiums. In particular, this study contributes to the literature in that it is the first, to the best of our knowledge, to explicitly examine the relationship between default risk, liquidity crises and stock premiums.

This study is particularly relevant, given the recent financial crisis and corresponding increase in the risk of corporate default, in that there is mixed evidence in the literature regarding the link between default risk and the value and size premiums. Elgammal and McMillan (2014), Garlappi and Yan (2011), Griffin and Lemmon (2002), Vassalou and Xing (2004), Ivaschenko (2003) and Penman, Richardson and Tuna (2007) all suggest that the value premium increases with the level of default risk. This argument is supported by Fama and French (1996, 1998) and Black (2006) in that they argue that investors require a higher return on value stocks compared to growth stocks as a compensation for their higher vulnerability as a result of financial distress. Moreover, Elgammal and Al-Najjar (2014) report a leverage effect in the value premium indices. This being said the link between default risk and returns in stocks with different book-to-market levels is far from certain. For example, Piotroski (2000) finds that, within high book-to-market stocks, those with lower

¹ Value stocks are defined as stocks that have high book-to-market ratios, as opposed to growth stocks which are defined as stocks that have low book-to-market ratios.

² Small stocks are defined as stocks with a low market capitalisation while big stocks are stocks with a high market capitalisation.

financial health earn lower returns, while [Mohanram \(2005\)](#) points out that, within low book-to-market stocks, those with weaker growth attributes earn lower returns. More recently, [Huang, Yang, & Zhang, \(2013\)](#) argue that the value and size premiums do not appear to be driven by financial distress risk in the Chinese stock market. One should note, however, that none of these studies examines the impact that liquidity³ crises have on stock premiums.

This omission of liquidity crises from previous studies may be crucial in that one would expect there to be an increasing amount of financial distress in firms during these periods. Indeed, [Caballero and Krishnamurthy \(2009\)](#) suggests that the 2007 liquidity crisis shows that safe debts issued by financial innovations in the U.S market were, in fact, unsafe and as risky as equity. When these debt-holders recognized the extent to which they had underestimated this risk, they consequently modified their portfolios by selling equity and buying risk free debts. They further propose that this modification reduces interest rates, raises both leverage and risk premiums, and finally increases the vulnerability of the financial sector to shocks. In conjunction with this, in an earlier study [Hahn and Lee \(2006\)](#) conclude that size and value premiums are compensation for higher exposure to the risks related to changing credit market conditions and interest rates. This fact, together with the previous literature discussed above, which links financial distress and stock premiums, lends credence to our argument of a relation *between liquidity crises, default risk and stock premiums. This link is currently particularly relevant given the fact that, since the summer of 2007, the U.S. has experienced a striking contraction in wealth, an increase in risk spreads, and a deterioration in credit market functioning, all of which have affected stock markets significantly (for details, see [Reinhart and Rogoff, 2008](#); [Cornett, McNutt, Strahan and Tehranian, 2011](#); [Dick-Nielsen, Feldhütter and Lando, 2012](#); and [Cukierman, 2013](#)).

On a slightly separate note, although there is a great deal of interest in stock market volatility, there has been little analysis of the impact of volatility on stock premiums. This study therefore further contributes to the literature in that it is one of the first to link a time-varying analysis of volatility with default risk, liquidity crises and firm characteristics (value, growth, large and small firms) using a monthly data frequency. Furthermore, [Campbell, Hilscher and Szilagyi \(2008\)](#) argue that the previous researchers' results for the returns of financially distressed stocks depend on the particular measure of financial distress used. This study therefore makes an additional contribution to the literature by comparing the results for two different proxies for financial distress, i.e. the default premium and credit spread.

³ Although the term 'liquidity' has many different meanings in finance, we define liquidity as funding liquidity.

By way of preview, we can summarise the findings of this study into three main conclusions. 1) The default premium is found to have a significant and positive impact on both value and size premiums. 2) When compared to the entire sample period (January 1982 to March 2011), the value premium of large firms during the last expansion phase (November 2001 to July 2007) is found to be higher. 3) Leverage effects are found to have a significant impact on the volatility of both value and size premiums. 4) Our analysis suggests that liquidity crises have explanatory power when examining the volatility of large stocks' value premium and size premiums, regardless of whether one controls for the default premium. This result may be of concern for many investors as it indicates that a liquidity crisis may increase the risk related to size and value investment strategies. These results also support the risk explanation for size and value premiums as gives a rational explanation for the higher returns on these strategies in that these returns obtained by investors would merely be compensation for the higher risk incurred.

The remainder of the study is organised as follows: [Section 2](#) describes the properties of the sample data. [Section 3](#) outlines the methodology employed in the study. [Section 4](#) presents the empirical findings and [Section 5](#) concludes.

2. DESCRIPTION AND CHARACTERISTICS OF DATA

This study examines the impact of default premiums and liquidity crises on stock premiums for U.S. stocks using Fama-French portfolios and benchmark factors, i.e. value and size premiums. The data for these portfolios and benchmarks was collected from DataStream for the period between January 1982 and March 2011. The data consists of the intersections of two portfolios based on size, i.e. the respective market capitalisation, and three portfolios based on value, i.e. the respective book-to-market ratios.

The respective size breakpoint for each time interval, i.e. year t , is the median New York Stock Exchange (NYSE) market equity at the end of June of year t . The book-to-market ratios are based on the book equity for the last fiscal year-end in year $t - 1$ divided by the market equity for December of year $t - 1$. Following this, breakpoints were calculated as the 30th and 70th NYSE percentiles. The intersections of these factors yield six portfolios, i.e. Small Value, Small Neutral, Small Growth, Big Value, Big Neutral and Big Growth. The portfolios for July of year t to June of year $t + 1$ include all stocks listed on the NYSE, American Stock Exchange (AMEX) and NASDAQ, for which market equity data for December of year $t - 1$ and June of year t and (positive) book equity data was available.

Having formed the portfolios, we then obtained the Fama-French factors for the size and value factor from Kenneth French's website⁴. The first of these, i.e. the size factor (*SMB*), is the average return on the three small portfolios minus the average return on the three big portfolios. The second factor, i.e. the value factor (*HML*), is the average return on the two value portfolios minus the average returns on the two growth portfolios. Following this, sub-factors were calculated, as these were not available on the website at the time, to calculate the cross-effects of factors. The large stocks value premium (*LVP*) is the average return on big value portfolios minus the average return on big growth portfolios. In a similar manner, the small stocks provide the source of the small stocks value premium (*SVP*). The value stocks size premium (*VSP*) is the average return on the small value portfolio minus the average return on big value portfolios. Finally, the growth stocks size premium (*GSP*) is the difference between the small growth portfolio and the big growth portfolio. The characteristics of the value and size premiums are displayed in [Figures I and II](#), respectively.

[INSERT [FIGURES I AND II](#) ABOUT HERE]

As [Campbell, Hilscher and Szilagyi \(2008\)](#) highlight that returns on financially distressed stocks would depend on the particular measure of financial distress used; this study uses two different proxies for financial distress, i.e. the default premium and the credit spread. The default premium is defined as the difference between the interest paid by firms and the default free rate of interest, where this spread is proportional to their default probability as compensation to lenders for increased default risk. The default premium was collected from the Morgan Stanley International (MSCI) database provided by Ibbotson Associates, where the default premium index represents the difference between returns on long-term corporate bonds and long-term government bonds. Following this, we define the credit spread as the difference between the Moody BAA index and AAA index as reported by Bloomberg. Using these two different proxies for the default risk premium is further motivated by the conceptual difference between using a credit spread level and a return. In this regard, a credit spread level is a proxy for valuation; while the change in the credit spread is much more closely related to an excess return on a portfolio of corporate bonds (for more detail see [Hull, Prudescu and White, 2004](#); and [Huang and Huang, 2003](#)).

⁴ See http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

The current study also uses the yields derived from the 3-month TED spread⁵ as a proxy for a liquidity crisis. The TED spread is a good proxy for fluctuations in liquidity levels and credit risk in that it reflect the perceived risk in the global financial system. As this widens, investors believe that credit risk, and consequently default risk, increases, thereby leading them to withdraw liquidity, and vice versa. For instance, during the latest financial crisis, the 3-month TED spread jumped from 150 to 300 basis points. (For more detail on the relation TED spreads and financial crises, see [Akay, Senyuz and Yoldas, 2013](#); [Boyson, Stahel and Stulz, 2010](#); [Schwarz, 2015](#); [Nagel, 2012](#); [Marcini, Ranaldo, Wrampelmeyer, 2013](#).) The characteristics of the proxy variables, i.e. the default premium, credit spread and 3-month TED spread are displayed in [Figure III](#).

[INSERT [FIGURE III](#) ABOUT HERE]

Finally, the study also includes the most recent expansionary economic cycle, corresponding to the period between November 2001 and July 2007, as a dummy variable in the analysis. This is included in the study as, given that one of the factors being examined is the impact of the default premium on stock returns and that this cycle covers the period immediately preceding the most recent liquidity crisis, including this period as a variable may provide further understanding of the factors and reasons behind the crisis.

[INSERT [TABLE I](#) ABOUT HERE]

Having defined the variables above, [Table I](#) presents the descriptive statistics for the six different size and value premiums described above.⁶ Given that the sample comprised monthly size and value premiums from January 1982 to March 2011, we landed up with 351 observations, where average premiums ranged from -0.0779% for the growth size premium to 0.493% for the small value premium, with standard deviations ranging from 2.9737% for the size premium to 4.2631% for the small value premium. Finally, and perhaps most importantly, results from the Ljung-Box Q-statistics ([Ljung and Box, 1978](#)) and ARCH-LM tests ([Engle, 1982](#)) indicate that the some of the value premiums demonstrate significant serial correlation and that all six premiums are found to demonstrate strong evidence of ARCH effects indicating the importance of incorporating time-varying characteristics when examining their volatility.

⁵ The 3-month TED spread is defined as the difference between the yields on 3-month T-Bills and 3-month Eurodollar futures contracts with the same identical expiration months.

⁶ All variables have been tested for stationarity using the Augmented Dickey-Fuller test ([Dickey and Fuller, 1981](#)). Results indicate that all series are first difference stationary but, for reasons of brevity, are not presented here but are available upon request.

Having described the data employed in this study above, the following section outlines the various methodology used in this study to identify whether there is a significant link between default premiums, liquidity crises and stock premiums.

3. METHODOLOGY

This study employs different specifications of the Autoregressive Conditional Heteroskedasticity (ARCH) and Generalised ARCH (GARCH) models (Engle, 1982; Bollerslev, 1987) to investigate the impact of liquidity crises on the relationship between the time-varying volatility of stock premiums, default risk and liquidity crises. In doing this, this study is one of the first to link a time-varying analysis of volatility with default risk, liquidity crises and firm characteristics (value, growth, large and small firms) using monthly data. This methodology allows for the investigation of the relationships between the mean value and volatility of variables over the sample period. This may help us to examine if risks related with a liquidity crisis and both value and default move in tandem, given the impact of the recent liquidity crisis.

The motivation behind using this technique is three-fold. 1) It allows us to investigate the relationship between variables in addition to their actual volatility as measured by their conditional variance. The applied model should help in providing a more precise definition of the potential sources of macroeconomic aggregate non-diversifiable risk. 2) Although there is a great deal of interest in stock market volatility, there has been less analysis on stock premiums volatility. The work in this study, therefore, is one of the first to link this framework of analysis with default risk using firm characteristics (value, growth, large and small firms) and monthly data. 3) The time-varying volatility methodology allows us to examine the impact of leverage on stock premiums, thereby incorporating both default measures of risk and leverage, highlighting the link between the stock premiums and financial distress.

Following the approach outlined by Darrat, *et al.* (2011) and Glosten, Jaganathan and Runkle (1993), this study uses different specifications of the *GARCH*(1,1) model⁷ to investigate the relationship between default risk, liquidity crises and value and size premiums.

⁷ The research uses different versions of the GARCH model, including one or more of the following: the standard deviation, leverage effects, the first lag of the value premium, and seasonal effects. The authors also employed different versions of the ordinary least squares approach; however, as results do not significantly differ, and for reasons of brevity, all other results not presented here but are available upon request.

3.1 Default and Stock Premiums

In order to shed light on the relationship between financial distress and stock premiums, the standard *GARCH*(1,1) model is modified to include the default premium (alternately credit spread) in the mean equation as shown in [Expression \(1\)](#). We also add a dummy as well as the first-lag of the stock premiums to the mean equation so as to examine whether seasonal effects have any impact on stock premiums and whether there is any autocorrelation in premiums, respectively. Hence our model is now expressed as:

$$\begin{aligned}
 SVPs_t &= \mu + \delta SVPs_{t-1} + \phi_1 DEFAULT_t + \eta SEASON_t + \pi_1 DUMMY_t + \varepsilon_t \\
 \varepsilon_t &\sim N(0, h_t^2) \\
 h_t^2 &= \omega + \alpha \varepsilon_{t-1}^2 + \beta h_{t-1}^2 + \nu_t
 \end{aligned} \tag{1}$$

In the mean equation of [Expression \(1\)](#), *SVPs* denotes each of the six different size premiums, defined in [Section 2](#), at time t , respectively. These include the value premium (*HML*), the large value premium (*LVP*), the small value premium (*SVP*), the size premium (*SMB*), the growth size premium (*GSP*) and the value size premium (*VSP*). The first lag of *SVPs* ($SVPs_{t-1}$) denotes the respective stock premium at time $t - 1$, and *DEFAULT* denotes the default risk premium (or alternately the credit spread), defined in [Section 2](#), at time t . *DUMMY* denotes the dummy variable for the expansionary period, defined in [Section 2](#), at time t , where $DUMMY_t = 1$ if the observation falls during the period between November 2001 and July 2007 and $DUMMY_t = 0$ otherwise. Finally, *SEASON* denotes the dummy variable for the January effect, where $SEASON_t = 1$ if the current month is January and $SEASON_t = 0$ otherwise. In the variance equation, ω denotes the impact of the long-run average variance on the volatility at time t , α measures the effect of a volatility shock at time $t - 1$ on the volatility at time t , and β measures the impact of past shocks on the volatility at time t , while $(\alpha + \beta) \leq 1$ measures the persistence of volatility shocks in the model.

In order to check the robustness of the results, we also test for the presence of ARCH effects in the data both before and after we estimated the models using the ARCH-LM test. Should the residuals be non-conditionally normal distributed, we calculate the quasi-maximum likelihood (QML) covariances and standard errors using the outlined in [Bollerslev and Wooldridge \(1992\)](#) for heteroskedastic consistent covariance. This study also tests for presence of serial correlation in the variables using the Ljung-Box Q-statistics, correcting for any serial correlation using the [Bollerslev and Wooldridge \(1992\)](#) approach.

3.2 Liquidity Crises and Stock Premiums

Having outlined how this study will examine the relationship between financial distress and stock premiums, we now employ a Threshold ARCH (TARCH) model (Rabemananjara and Zakoian, 1993) to examine the relationship between liquidity crises and stock premiums. This method is employed because good news and bad news may have different impacts on volatility (Bollerslev, Chou and Kroner, 1992; Glosten, Jagannathan and Runkle, 1993; Black, 2002), therefore this model enables us to allow for and measure these asymmetric shocks to volatility. It is crucial to understand this complex relationship between liquidity crises and stock premiums if investors and fund managers are to build an investment strategy during these liquidity crises. This model is therefore expressed as follows:

$$\begin{aligned}
SVP_{S_t} &= \mu + \lambda h_t + \delta SVP_{S_{t-1}} + \chi_1 TED_t + \eta SEASON_t + \pi_1 DUMMY_t + \varepsilon_t \\
\varepsilon_t &\sim N(0, h_t^2) \\
h_t^2 &= \omega + \alpha \varepsilon_{t-1}^2 + \gamma \varepsilon_{t-1}^2 d_t + \beta h_{t-1}^2 + \chi_2 TED_t + v_t
\end{aligned} \tag{2}$$

In the mean equation in Expression (2) SVP_{S_t} , $SVP_{S_{t-1}}$, $SEASON$ and $DUMMY$ remain as in Expression (1), while h denotes the standard deviation of the respective stock premium, which is included in order to determine whether stock premiums in the U.S. follow time-varying phenomena. Finally, TED denotes the change in the 3-month TED spread, which acts as a proxy for liquidity crises. In the variance equation, ω , and β remain as in Expression (1), while d_t denotes a dummy variable where $d_t = 1$ if $\varepsilon_t < 0$ and $d_t = 0$ otherwise. This would imply that there are differential effects in the conditional variance where $\varepsilon_t < 0$, i.e. an unexpected decrease in the stock premium, denotes bad news, while $\varepsilon_t > 0$, i.e. an unexpected increase in the stock premium denotes good news. In Expression (2), α measures the impact of good news, $\alpha + \gamma$ measures the impact of bad news, γ measures the leverage effect and $(\alpha + \beta + \gamma/2) \leq 1$ measures the persistence of volatility. One should note that the leverage effect indicates that a decrease in stock prices leads to an increase in financial leverage as the value of equity falls relative to corporate debt; hence both the required return on equity and risk increase (Christie, 1982; Black, 2002). Finally, χ_2 measures the impact of changes in the 3-month TED spread on the volatility of the stock premiums.

3.3 Controlling for Default Risk

The final model examined here is an extension of Expression (2) in that it includes the default premium. This extra parameter is included to allow us to measure the impact that leverage has on

the relationship between the size premium and liquidity measured in [Expression \(2\)](#). This new model is therefore expressed as follows:

$$\begin{aligned}
SVPs_t &= \mu + \lambda h_t + \delta SVPs_{t-1} + \phi_1 DEFAULT + \chi_1 TED_t + \eta SEASON_t \\
&\quad + \pi_1 DUMMY_t + \varepsilon_t \\
\varepsilon_t &\sim N(0, h_t^2) \\
h_t^2 &= \omega + \alpha \varepsilon_{t-1}^2 + \gamma \varepsilon_{t-1}^2 d_t + \beta h_{t-1}^2 + \phi_2 DEFAULT + \chi_2 TED_t + v_t
\end{aligned} \tag{3}$$

In the mean equation of [Expression \(3\)](#), $SVPs$, $SVPs_{t-1}$, $DEFAULT$, $SEASON$ and $DUMMY$ remain as in [Expression \(1\)](#), while h and TED remain as in [Expression \(2\)](#). In the variance equation, ω , α , β , γ and d as well as χ_2 and $(\alpha + \beta + \gamma/2) \leq 1$ remain as in [Expression \(2\)](#), while ϕ_2 measures the impact of the default premium (or alternately the credit spread) on the volatility of the stock premiums

Having outlined the methodologies employed in this study above, the following section examines the empirical results for this models and the respective implications thereof.

4. EMPIRICAL RESULTS

4.1 Default and Stock Premiums

We begin our analysis of the empirical results by examining the relationship between financial distress (proxied by the default premium) and the stock premiums using the model outlined in [Expression \(1\)](#). Since the default premium is the difference between returns on long-term corporate and government bonds, this premium reflects compensation for the additional risk associated with corporate bonds, and therefore may be positively associated with leverage, or at least capture some of the characteristics of this leverage. This argument is supported by [Ivaschenko \(2003\)](#) and [Molina \(2005\)](#) who both report a positive and significant link between the level of corporate leverage and default risk. This study extends this argument by examining this relation within the context of value and size premiums, where the results of this analysis are presented in [Table II](#).

[INSERT [TABLE II](#) ABOUT HERE]

These findings support the argument above in that they suggest that there is strong evidence of a positive and significant relation between the default premium and both value and size premiums. These results are consistent with the notion that value stocks are more vulnerable to default risk than growth stocks, given the fact that they higher levels of leverage; hence, stockholders would require higher returns for value stocks than for growth

stocks in the case of an increase in the probability of default. In addition to this, our results further support the idea that small firms are riskier than large firms during an economic downturn, given that investment in small firms requires a higher rate of return. We also find that the first-lag of the stock premium has a significant and positive impact on current premiums for three of the six stock premiums, thereby suggesting that these may have some forecasting power. The value stock size premium is also found to display a January effect, while our findings further suggest that value and large stock value premiums are higher during the most recent expansionary economic cycle.

These arguments are consistent with earlier literature in that [Fama and French \(1996\)](#) and [Chan and Chen \(1991\)](#) link value and size premiums with financial risks stating that value and small stocks tend to experience poorer performance, earnings and profitability when compared to growth and big stocks. All these factors make value and small stocks more vulnerable to the risk of default and lead investors to ask for higher returns on value stocks as the leverage increases. Additionally, [Vassalou and Xing \(2004\)](#) and [Black \(2006\)](#) suggest that book-to-market and size effects are concentrated within firms with a high risk of default, which is supported by this study's finding of a positive relationship between the default and value premiums. In other words, our findings further support the risk-explanation for the value premium proposed by [Fama and French \(1996\)](#) who imply that the value premium acts as a form of compensation for a non-diversifiable risk factor.

As robustness check, and given that [Campbell, Hilscher and Szilagyi \(2008\)](#) argue that using different proxies for default risk produces different results; we re-estimated the model using the credit spread as a substitute for the default premium.⁸ Results suggest that although there is still a positive relation between default risk and the size premium, there does not appear to be a significant relation between credit spreads and the value premium. This result therefore lends further credence to [Campbell, Hilscher and Szilagyi's \(2008\)](#) proposition that using different proxies for default risk produces different results.

4.2 Liquidity Crises and Stock Premiums

Having identified a positive a significant relation between the default premium and stock premiums as well as a significant leverage effect in stock premium volatility, we now

⁸ For reasons of brevity, these results are not presented here but are available from the author upon request (alternatively are presented in the appendix in [Table A1](#)).

examine the impact of liquidity crises (proxied by the 3-month TED spread) on stock returns using the model outlined in [Expression \(2\)](#). This argument is based on the proposition that value and size premiums are proxies for systematic risk ([Fama and French, 1992; 1998; 2006](#)), hence one expects there to be a relation between these and liquidity crises. This is crucial in that understanding the sophisticated relation between liquidity crises and stock premiums is important in order for investors and fund managers to build an investment strategy during this crisis period, where the results of this analysis are presented in [Table III](#).

[INSERT [TABLE III](#) ABOUT HERE]

These results indicate that although liquidity crises might not have a significant effect on any of the stock premiums themselves, these crises definitely do have an effect on the volatility of some of the stock premiums, namely the large stock value premium and the size and value stock size premiums. This is apparent in that the 3-month TED spread is found to have significant predictive power with respect to the volatility of these stock premiums. The observed negative relation implies that an increase in the probability of a liquidity crisis results in a decrease in the risk related to these premiums. This result is consistent with [Huang, Yang, and Zhang \(2013\)](#), who argue that value and size premiums do not appear to be driven by financial distress risk. Interestingly, these results, at least partially, fail to support the systematic risk explanation for the value and size premiums and thereby keep the ongoing debate active.

We also find evidence of a significant January effect for some size premiums, a significant relation during the most recent expansionary economic cycle and significant leverage effect on the volatility of all value and some size premiums, while the lags of some stock premiums are found to have significant forecasting power. Finally, there is a greater level of leverage effect associated with almost all stock premium strategies and the volatility of said premiums during the most recent expansionary economic cycle. These findings lends at least partial credence to the leverage hypothesis proposed by [Campbell, Lo and MacKinlay \(1997\)](#) in that this suggests the degree of leverage in a firm may be a key factor in explaining the volatility of returns, especially during a period of recession.

4.3 Controlling for Default Risk

Having identified significant relations between default premiums, leverage effects and liquidity crises and stock premiums, we conclude our analysis of stock premiums by examining the impact of liquidity crises on stock premiums after controlling for default risk using the model outlined in [Expression \(3\)](#), thereby determining the joint impact of these factors. As discussed above, the rationale for the inclusion the default premium is that, since the default premium is the differential between returns on long-term corporate and government bonds, this premium reflects compensation for the additional risk associated with corporate bonds, and therefore may be positively associated with leverage, or at least capture some of the characteristics of this leverage ([Ivaschenko, 2003](#); [Molina, 2005](#)). Continuing this, liquidity crises are included, in turn, since value and size premiums are argued to be proxies for systematic risk ([Fama and French, 1992; 1998; 2006](#)), hence one expect there to be a relation between these and liquidity crises. The results of this analysis of the joint impact of the default premium and liquidity crises on stock premiums are presented in [Table IV](#).

These findings suggest that the default premium has a significant and positive impact on both value and size premiums themselves, while it has no explanatory power for the volatility of these stock premiums. This is in almost direct contrast with liquidity crises in that these have a significant and negative impact on the volatility of all size premiums and the large value premium. We also find that there is a significant January effect in the size and growth stock size premiums; that the most recent expansionary economic cycle has a significant relation with all value premiums; and that the lag of the value, small stock value and growth stock size premiums have significant forecasting power. Finally, we find that there is a significant leverage effect for all value premiums.

A possible explanation for the positive and significant relation between the default premium and value and size premiums could be that an increase in financial leverage, proxied by the default premium, increases the risk associated with an investment in value stocks as these tend to be more levered than other firms, while the increase in the risk associated with an investment in small stocks may be as a result of the fact that these are more vulnerable to financial distress. This view is supported by [Leledakis, Davidson and Smith \(2008\)](#) who attribute the size effect to small and highly leveraged firms. In total, this result indicates that investors require higher returns on value stocks and small stocks when default risk increases.

In terms of the impact of liquidity crises, this may be explained by the fact an increase in the probability of a liquidity crisis may limit access to funds for leverage, thereby increasing the risk of financial distress, which, in turn may cause fluctuations in the returns

on these stocks. This may be especially apparent for small value stocks given that these are more vulnerable to liquidity risk, as the collapse of the credit channel during a financial crisis period has a more severe effect on them as they do not have similar access to the other credit alternatives available to larger firms ([Gisecke, Longstaff, Schaefer and Strebulaev, 2014](#); [Bernanke, 1983](#)).

These findings are consistent with those obtained by [Bali and Engle \(2010\)](#) who use the default premium, changes in the Federal Reserve effective interest rate and the term premium as the macroeconomic controlling variables in a regression model used to study the risk-return trade-off in the Intertemporal Capital Assets Pricing Model (ICAPM) framework. In their study, they found a significant and negative relationship between the changes in the Federal Reserve interest rate and expected stock returns in the short-run period. This negative relationship commonly occurs in the U.S. stock market after the Federal Reserve's unexpected increase or decrease in interest rates. They also document that changes in default spreads do not affect variations in daily stock returns. Although, this current study uses a lower data frequency than previous studies, it still reports a significant relation between default risk, liquidity crises and stock premiums.

As a robustness check, and given that [Campbell, Hilscher and Szilagyi \(2008\)](#) argue that using different proxies for default risk produces different results; we re-estimated the model using the credit spread as a substitute for the default premium.⁹ Results suggest that although there is still a positive relation between default risk and the size premium, there does not appear to be a significant relation between credit spreads and the value premium. This result therefore lends further credence to [Campbell, Hilscher and Szilagyi's \(2008\)](#) proposition that using different proxies for default risk produces different results.

4.4 Which Model Best Explains Stock Premiums?

The final step in our analysis of the relation between stock premiums, default premiums, leverage effects and liquidity crises is to determine which of the three models proposed in [Expressions \(1\), \(2\) and \(3\)](#) best explain stock premiums. In order to do this, we performed a likelihood-ratio test on those models that are nested, the results of which are presented in [Table V](#).

Test findings suggest that when examining the nested model of the relation between the default premium and stock premiums, the unrestricted version in [Expression \(3\)](#) is preferred to

⁹ For reasons of brevity, these results are not presented here but are available from the author upon request (alternatively are presented in the appendix in [Table A2](#)).

the restricted version in [Expression \(1\)](#) for all but the growth stock size premium. The results from the test further suggest that when examining the nested model of the relation between liquidity crises and stock premiums, the unrestricted version in [Expression \(3\)](#) is preferred to the restricted version in [Expression \(2\)](#). Given that the version of the two nested models in [Expression \(3\)](#) is preferred to all other versions of these models for most stock premiums, we can thus conclude that stock premiums are best explained when both the default premium and the 3-month TED spread are incorporated in the model. We therefore infer from the results presented in this paper that stock premiums are best explained when the impact of liquidity crises and financial distress on these is jointly determined.

5. CONCLUSION

This study examines some of the determinants of value and size premiums in that 1) it analyses the link between financial distress and value and size premiums; 2) it systematically analyses the link between liquidity crises (particularly the 2007-2008 financial crisis) and value and size premiums; 3) it measures the impact that volatility has on size and value premiums, with the aim of determining whether there is a risk explanation for these; and 4) it compares the results for two different measures of financial distress (i.e. default premiums and credit spreads) to determine whether the choice of measure could have an impact on the determination of the link between liquidity crises and value and size premiums. In particular, this study contributes to the literature in that it is the first, to the best of our knowledge, to explicitly examine the relationship between default risk, liquidity crises and stock premiums.

By way of summary, we can divide our results into the following main sets of findings. 1) The default premium is found to have a significant and positive impact on both value and size premiums. 2) When compared to the entire sample period (January 1982 to March 2011), the value premium of large firms during the last expansion phase (November 2001 to July 2007) is found to be higher. 3) Leverage effects are found to have a significant impact on the volatility of both value and size premiums. 4) Our analysis suggests that liquidity crises have explanatory power when examining the volatility of large stocks' value premium and size premiums, regardless of whether one controls for the default premium. This result may be of concern for many investors as it indicates that a liquidity crisis may affect the risk related to size and value investment strategies.

These findings therefore suggest that the default premium has explanatory power for the value and growth stock premiums. Since this explanatory power affects firms with

different characteristics, it provides further evidence in favour of the argument that default premiums capture systematic risk in the macro-economy and that value and growth premiums are associated with a rational decision-making on the part of investors. This is based on the proposition that value and size premiums act as a proxy for systematic risk (Fama and French, 1996; Chan and Chen, 1991). The positive association between the default premium and value and size premiums in addition to the strong evidence of a leverage effect on the volatility of these premiums thereby lend support to the risk-based explanation for the source of value and size premiums. This would therefore imply that value and size stocks that are characterised by poor performance, earnings and profitability when compared to growth stocks are more vulnerable to the risk of default, which, in turn would lead investors to require a higher return on value stocks as leverage increases. Interestingly, when re-estimating the respective models using credit spreads, rather than default premiums, given that Campbell, Hilscher and Szilagyi (2008) argue that using different proxies for default risk produces different results, we found that these only have a significant relation with size premiums, thereby lending support to Campbell, Hilscher and Szilagyi's (2008) proposition.

This paper is also one of the first to explore the impact of liquidity crises on variables that are now central to assets pricing models, i.e. the value and size premiums. The regression findings indicate that the liquidity crises have a negative association with the risk related to some value and all size premiums. One possible explanation for this is that the returns on value and size investment strategies may be less volatile in the liquidity crises period. This result is contrast with our initial hypothesis that the lack of funds may increase the risk associated with value stocks more than that of growth stocks, and result in a larger increase in the risk of small stocks than large stocks. This result open the door for further research to investigate reason behind this issue.

In conclusion, the empirical work in this paper suggests some possible answers for the initial questions about the role of financial distress and liquidity crises as macroeconomic risk factors that can explain the source of the value and size premiums. The empirical findings contribute to the existing knowledge by providing additional evidence of the positive association between financial distress and stock premiums. The results suggest that value and size premiums are working as proxy for non-diversifiable factors related to financial distress. Finally, using a different methodology, and a longer data set, our results appear to support the proposition that that value and size premiums appear to be pervasive and work as state variables that are proxies for financial distress (Fama and French, 1996; 2006; 2007).

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FIGURE I: CHARACTERISTICS OF THE VALUE PREMIUMS

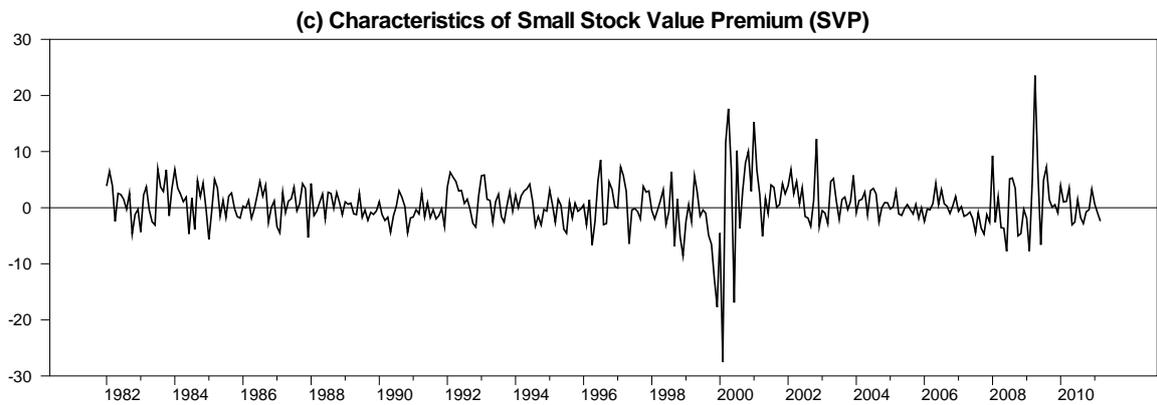
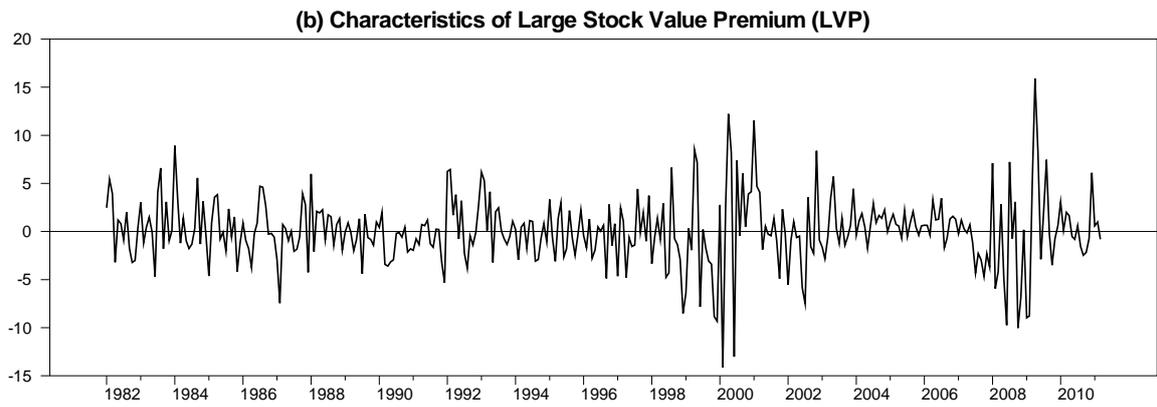
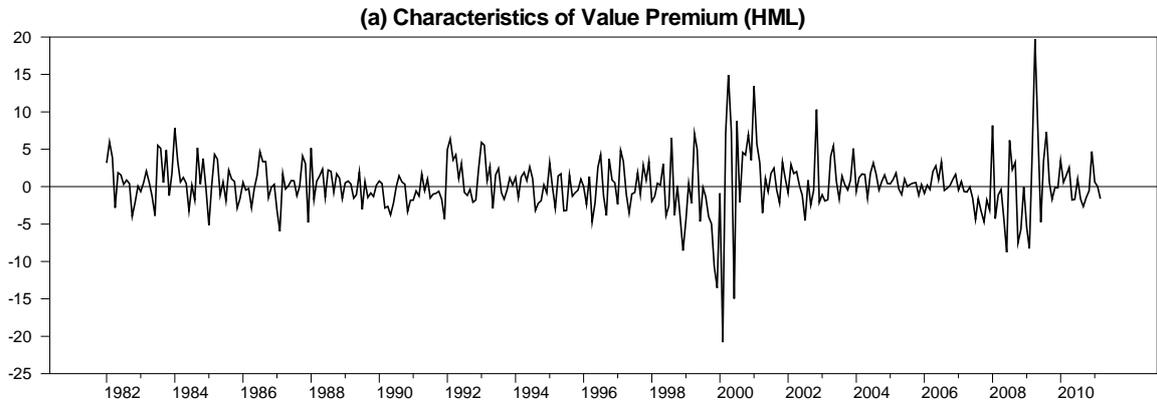


FIGURE II: CHARACTERISTICS OF THE SIZE PREMIUMS

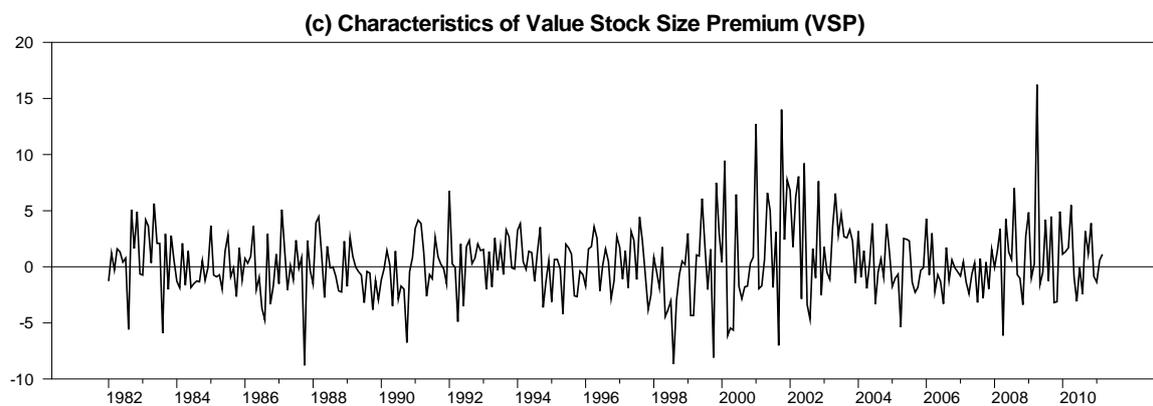
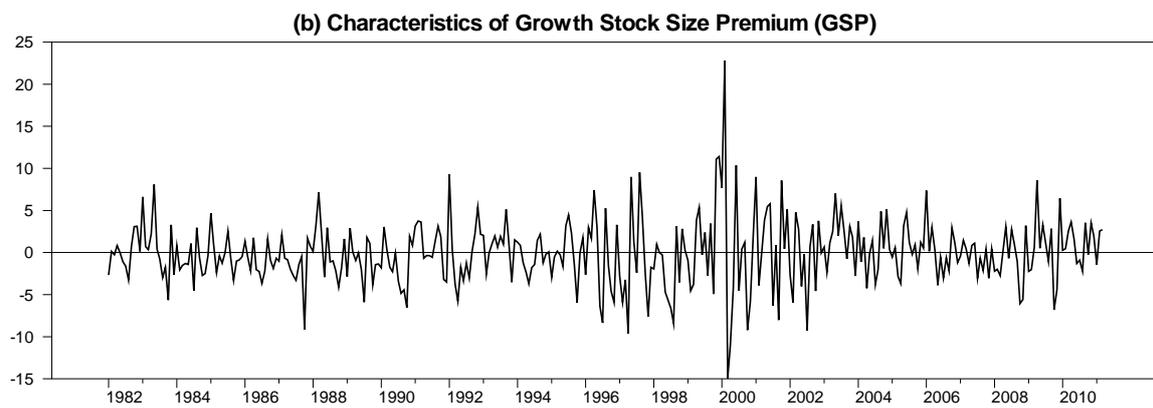
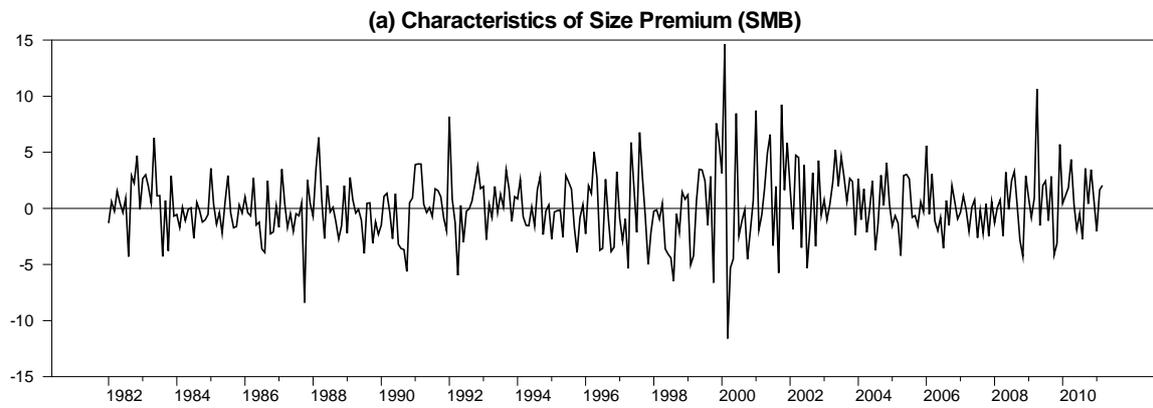


FIGURE III: CHARACTERISTICS OF THE PROXY VARIABLES

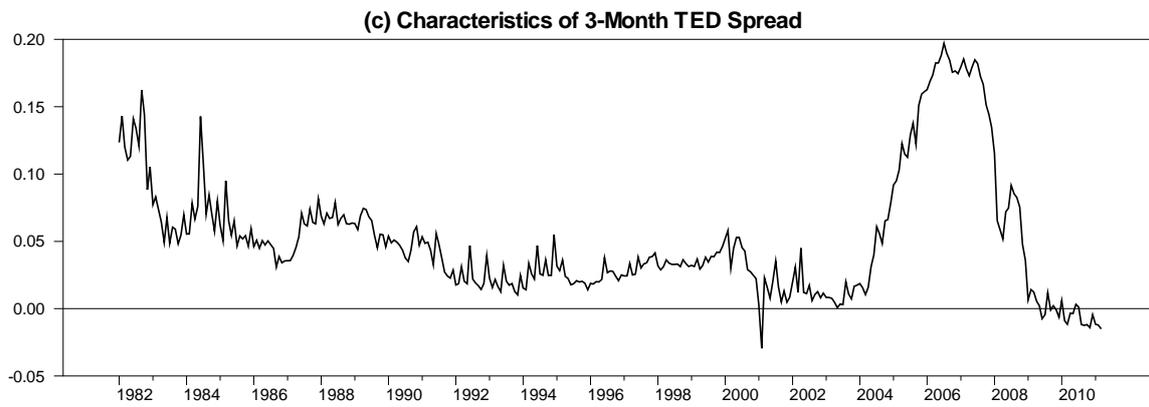
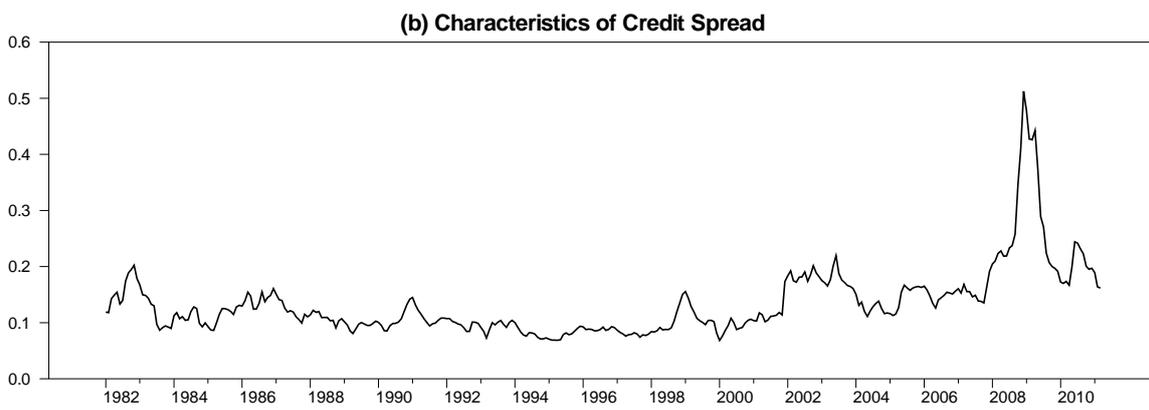
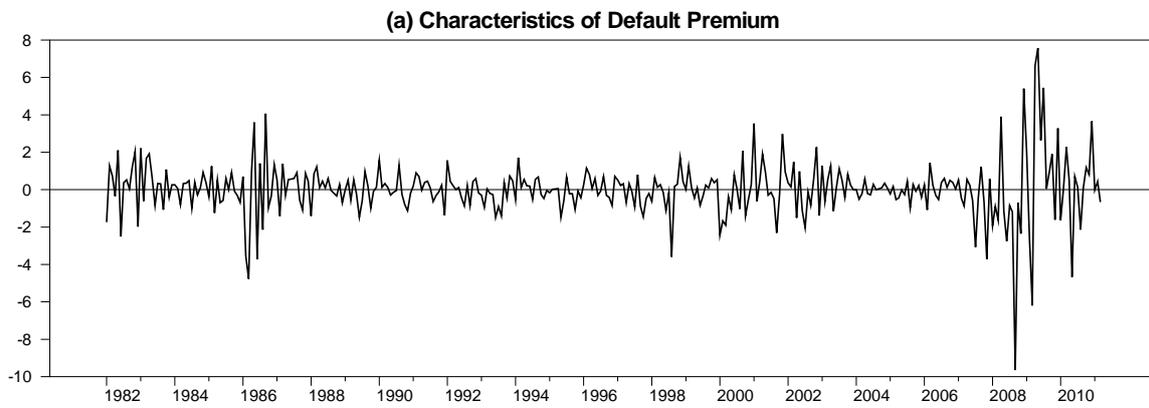


TABLE I: SAMPLE CHARACTERISTICS

This table presents the summary statistics for the sample of stock premiums as well as respective the Ljung-Box test for serial correlation (Ljung and Box, 1978), ARCH-LM test for ARCH effects (Engle, 1982) and Jarque-Bera test for normality (Jarque and Bera, 1980). Q_4 denotes the 4th-order Ljung-Box test, where $Q_4 \sim \chi^2$; A_4 denotes the 4th-order ARCH-LM test, where $A_4 \sim \chi^2$; and JB denotes the Jarque-Bera statistics, where $JB \sim \chi^2$. The sample comprises six sets of monthly stock premiums for the period from January 1982 to March 2011, where *HML*, *LVP*, *SVP*, *SMB*, *GSP* and *VSP* denote the value, large value, small value, size, growth size and value size premiums, respectively. Finally, (*, **, ***) denote a coefficient that is significant at 1%, 5% and 10% levels of significance, respectively.

Panel A: Summary Statistics

	<i>HML</i>	<i>LVP</i>	<i>SVP</i>	<i>SMB</i>	<i>GSP</i>	<i>VSP</i>
Observations	351.0000	351.0000	351.0000	351.0000	351.0000	351.0000
Mean	0.2690	0.0448	0.4930	0.1736	-0.0779	0.3703
Median	0.2100	-0.0700	0.2900	0.0500	-0.1400	0.1900
Standard Deviation	3.6631	3.5441	4.2631	2.9737	3.8441	3.1725
Skewness	-20.7900	-14.1300	-27.4500	-11.6000	-14.9500	-8.7900
Excess Kurtosis	3.6631	3.5441	4.2631	2.9737	3.8441	3.1725

Panel B: Results from the Ljung-Box, ARCH-LM and Jarque-Bera Tests

	<i>HML</i>	<i>LVP</i>	<i>SVP</i>	<i>SMB</i>	<i>GSP</i>	<i>VSP</i>
Q_4	11.7500**	7.2192	14.6730*	3.9573	5.1817	5.2419
A_4	82.6854*	65.0200*	88.6378*	51.2635*	71.8764*	9.6471*
JB	675.5323*	108.3127*	1236.7740*	91.8255*	260.6894*	165.5702*

TABLE II: FINANCIAL DISTRESS & STOCK PREMIUMS

This table presents the results of the GARCH (1,1) model in [Expression \(1\)](#), which examines the relationship between financial distress (proxied by the default premium) and stock premiums, where:

$$\begin{aligned} SVPs_t &= \mu + \delta SVPs_{t-1} + \phi_1 DEFAULT_t + \eta SEASON_t + \pi_1 DUMMY_t + \varepsilon_t \\ \varepsilon_t &\sim N(0, h_t^2) \\ h_t^2 &= \omega + \alpha \varepsilon_{t-1}^2 + \beta h_{t-1}^2 + \nu_t \end{aligned} \quad (1)$$

In the mean equation, δ measures the impact of past stock premiums on the current stock premium; ϕ_1 measures the impact of financial distress (proxied by the default premium); η measures the impact of the January effect on stock premiums (where $SEASON$ is a dummy variable and $SEASON = 1$ if the observation falls in January and $SEASON = 0$ otherwise); and π_1 measures the impact of the most recent expansionary period on stock premiums (where $DUMMY$ is a dummy variable and $DUMMY = 1$ if the observation falls in the period between November 2001 and July 2007 and $DUMMY = 0$ otherwise). In the variance equation, ω measures the impact of the long-run average variance on the volatility at time t ; α measures the impact of volatility shock at time $t - 1$ on the volatility at time t ; and β measures the impact of past volatility shocks on the volatility at time t . In the robustness checks, A_4 denotes the 4th-order ARCH-LM test ([Engle, 1982](#)), where $A_4 \sim \chi^2$; and $(\alpha + \beta) \leq 1$ measures the persistence of volatility. The sample comprises six sets of monthly stock premiums for the period from January 1982 to March 2011, where HML , LVP , SVP , SMB , GSP and VSP denote the value, large value, small value, size, growth size and value size premiums, respectively. Finally, (*; **; ***) denote a coefficient that is significant at 1%, 5% and 10% levels of significance, respectively.

Panel A: Mean Equation

	<i>HML</i>	<i>LVP</i>	<i>SVP</i>	<i>SMB</i>	<i>GSP</i>	<i>VSP</i>
μ	0.0429	-0.1727	0.1832	-0.0730	-0.3323***	0.0431
δ	0.1248**	0.0866	0.1874*	0.0217	0.1098***	-0.0396
ϕ_1	0.3274*	0.3844*	0.2659*	0.4851*	0.5049*	0.6416*
η	0.3317	0.4936	0.4129	0.7545	1.1270**	0.8709***
π_1	0.5869**	0.7741**	0.3748	0.3487	0.5717	0.0894

Panel B: Variance Equation

	<i>HML</i>	<i>LVP</i>	<i>SVP</i>	<i>SMB</i>	<i>GSP</i>	<i>VSP</i>
ω	0.8323**	0.5315**	1.1658**	0.5180***	0.6894**	0.4454**
α	0.3456*	0.2361*	0.3137*	0.1118*	0.1525*	0.1122*
β	0.6003*	0.7256*	0.6245*	0.8244*	0.7950*	0.8428*

Panel C: Residual Diagnostics

	<i>HML</i>	<i>LVP</i>	<i>SVP</i>	<i>SMB</i>	<i>GSP</i>	<i>VSP</i>
A_4	0.5834	2.0623	2.7804	4.4529	3.6952	3.8622
$(\alpha + \beta)$	0.9459	0.9617	0.9382	0.9362	0.9475	0.9549

TABLE III: LIQUIDITY CRISES & STOCK PREMIUMS

This table presents the results of the TARCH (1,1,1) model in [Expression \(2\)](#), which examines the relationship between liquidity crises (proxied by the TED spread) and stock premiums, where:

$$\begin{aligned}
 SVPs_t &= \mu + \lambda h_t + \delta SVPs_{t-1} + \chi_1 TED_t + \eta SEASON_t + \pi_1 DUMMY_t + \varepsilon_t \\
 \varepsilon_t &\sim N(0, h_t^2) \\
 h_t^2 &= \omega + \alpha \varepsilon_{t-1}^2 + \gamma \varepsilon_{t-1}^2 d_t + \beta h_{t-1}^2 + \chi_2 TED_t + \nu_t
 \end{aligned}
 \tag{2}$$

In the mean equation, λ measures whether stock premiums follow time-varying phenomena; δ measures the impact of past stock premiums on the current stock premium; χ_1 measures the impact of financial distress (proxied by the TED spread); η measures the impact of the January effect on stock premiums (where $SEASON$ is a dummy variable and $SEASON = 1$ if the observation falls in January and $SEASON = 0$ otherwise); and π_1 measures the impact of the most recent expansionary period on stock premiums (where $DUMMY$ is a dummy variable and $DUMMY = 1$ if the observation falls in the period between November 2001 and July 2007 and $DUMMY = 0$ otherwise). In the variance equation, ω measures the impact of the long-run average variance on the volatility at time t ; α measures the impact of good news on volatility; $\alpha + \gamma$ measures the impact of bad news on volatility; γ measures the impact of the leverage effect on volatility; β measures the impact of past volatility shocks on the volatility at time t ; and χ_2 measures the impact of liquidity crises (proxied by the TED spread) on volatility. In the robustness checks, A_4 denotes the 4th-order ARCH-LM test ([Engle, 1982](#)), where $A_4 \sim \chi^2$; and $(\alpha + \beta + \gamma/2) \leq 1$ measures the persistence of volatility. The sample comprises six sets of monthly stock premiums for the period from January 1982 to March 2011, where *HML*, *LVP*, *SVP*, *SMB*, *GSP* and *VSP* denote the value, large value, small value, size, growth size and value size premiums, respectively. Finally, (*; **, ***) denote a coefficient that is significant at 1%, 5% and 10% levels of significance, respectively.

Panel A: Mean Equation

	<i>HML</i>	<i>LVP</i>	<i>SVP</i>	<i>SMB</i>	<i>GSP</i>	<i>VSP</i>
μ	-0.9364**	-0.5661	-1.0783***	-1.2648**	-0.6393	-2.0165
λ	0.3538**	0.1189	0.3979***	0.4556**	0.1032	0.6946
δ	0.1200**	0.0687	0.1523**	0.0114	0.1067***	-0.0079
χ_1	5.2829	-0.5346	4.8918	6.9459	1.7074	3.0580
η	0.2343	0.3050	0.2827	0.8312***	1.3409*	0.9966
π_1	0.6558*	0.9995*	0.5138**	0.2390	0.4696	0.1982

Panel B: Variance Equation

	<i>HML</i>	<i>LVP</i>	<i>SVP</i>	<i>SMB</i>	<i>GSP</i>	<i>VSP</i>
ω	0.6787**	0.6209*	0.7339***	0.3050***	0.7757**	3.1159**
α	0.0851***	0.0615	0.1132***	0.0296	0.1468*	0.0780
γ	0.3824*	0.2496*	0.2912*	0.1087***	0.0382	0.0502
β	0.6776*	0.7645*	0.7122*	0.8849*	0.7794*	0.5941*
χ_2	-11.5704	-71.6411*	3.8844	-36.5900*	-51.9055	-116.8292*

Panel C: Residual Diagnostics

	<i>HML</i>	<i>LVP</i>	<i>SVP</i>	<i>SMB</i>	<i>GSP</i>	<i>VSP</i>
A_4	0.0339	3.0522	3.2526	2.2185	3.9258	2.7549
$(\alpha + \beta + \gamma/2)$	0.9539	0.9507	0.9710	0.9689	0.9453	0.6972

TABLE IV: STOCK PREMIUM, DEFAULT RISK & LIQUIDITY CRISIS

This table presents the results of the TARCH (1,1,1) model in [Expression \(3\)](#), which examines the relationship between default risk (proxied by the default premium) liquidity crises (proxied by the TED spread) and stock premiums, where:

$$\begin{aligned}
 SVPs_t &= \mu + \lambda h_t + \delta SVPs_{t-1} + \phi_1 DEFAULT + \chi_1 TED_t + \eta SEASON_t + \pi_1 DUMMY_t + \varepsilon_t \\
 \varepsilon_t &\sim N(0, h_t^2) \\
 h_t^2 &= \omega + \alpha \varepsilon_{t-1}^2 + \gamma \varepsilon_{t-1}^2 d_t + \beta h_{t-1}^2 + \phi_2 DEFAULT + \chi_2 TED_t + \nu_t
 \end{aligned} \tag{3}$$

In the mean equation, λ measures whether stock premiums follow time-varying phenomena; δ measures the impact of past stock premiums on the current stock premium; ϕ_1 measures the impact of financial distress (proxied by the default premium); χ_1 measures the impact of financial distress (proxied by the TED spread); η measures the impact of the January effect on stock premiums (where $SEASON$ is a dummy variable and $SEASON = 1$ if the observation falls in January and $SEASON = 0$ otherwise); and π_1 measures the impact of the most recent expansionary period on stock premiums (where $DUMMY$ is a dummy variable and $DUMMY = 1$ if the observation falls in the period between November 2001 and July 2007 and $DUMMY = 0$ otherwise). In the variance equation, ω measures the impact of the long-run average variance on the volatility at time t ; α measures the impact of good news on volatility; $\alpha + \gamma$ measures the impact of bad news on volatility; γ measures the impact of the leverage effect on volatility; β measures the impact of past volatility shocks on the volatility at time t ; π_2 measures the impact of the most recent expansionary period on volatility (where $DUMMY$ is a dummy variable and $DUMMY = 1$ if the observation falls in the period between November 2001 and July 2007 and $DUMMY = 0$ otherwise); and χ_2 measures the impact of liquidity crises (proxied by the TED spread) on volatility. In the robustness checks, A_4 denotes the 4th-order ARCH-LM test ([Engle, 1982](#)), where $A_4 \sim \chi^2$; and $(\alpha + \beta + \gamma/2) \leq 1$ measures the persistence of volatility. The sample comprises six sets of monthly stock premiums for the period from January 1982 to March 2011, where *HML*, *LVP*, *SVP*, *SMB*, *GSP* and *VSP* denote the value, large value, small value, size, growth size and value size premiums, respectively. Finally, (*, **, ***) denote a coefficient that is significant at 1%, 5% and 10% levels of significance, respectively.

Panel A: Mean Equation

	<i>HML</i>	<i>LVP</i>	<i>SVP</i>	<i>SMB</i>	<i>GSP</i>	<i>VSP</i>
μ	-0.9244**	-0.5385	-0.9974***	-1.0359***	-0.4508	-1.9927*
λ	0.3544**	0.1130	0.3756***	0.3815	0.0503	0.8020*
δ	0.1184**	0.0652	0.1524**	0.0089	0.1156***	-0.0696
ϕ_1	0.3366*	0.3231*	0.2472**	0.4982*	0.5192*	0.6292*
χ_1	9.5132	6.5605	5.9403	7.7030	10.4700	6.0344
η	0.1077	0.2823	0.1740	0.8487***	1.3322*	0.7997
π_1	0.6466*	0.9299*	0.5339**	0.2928	0.4435	0.0959

Panel B: Variance Equation

	<i>HML</i>	<i>LVP</i>	<i>SVP</i>	<i>SMB</i>	<i>GSP</i>	<i>VSP</i>
ω	0.5943**	0.5245*	0.6469	0.3631***	0.5638**	0.2288***
α	0.1070**	0.0820	0.1315**	0.0902**	0.1551*	0.0781***
γ	0.4034*	0.2379**	0.2764**	0.0281	0.0082	0.0033
β	0.6628*	0.7596*	0.7107*	0.8516*	0.8030*	0.8934*
ϕ_2	-0.2530	-0.0552	-0.2328	-0.1699	-0.2057	-0.4595***
χ_2	6.6205	-63.6968*	12.8596	-36.5984**	-78.7022*	-38.0822*

Panel C: Residual Diagnostics

	<i>HML</i>	<i>LVP</i>	<i>SVP</i>	<i>SMB</i>	<i>GSP</i>	<i>VSP</i>
A_4	0.1083	3.0247	3.2759	2.9866	4.0141	3.5910
$(\alpha + \beta + \gamma/2)$	0.9715	0.9606	0.9804	0.9559	0.9622	0.9732

TABLE V: LIKELIHOOD RATIO TESTS

This table presents the results of likelihood ratio tests and performed to determine which of the nested models above performs best. The models tested are as follows:

$$\begin{aligned} SVPs_t &= \mu + \delta SVPs_{t-1} + \phi_1 DEFAULT_t + \eta SEASON_t + \pi_1 DUMMY_t + \varepsilon_t \\ \varepsilon_t &\sim N(0, h_t^2) \end{aligned} \quad (1)$$

$$\begin{aligned} SVPs_t &= \mu + \lambda h_t + \delta SVPs_{t-1} + \chi_1 TED_t + \eta SEASON_t + \pi_1 DUMMY_t + \varepsilon_t \\ \varepsilon_t &\sim N(0, h_t^2) \end{aligned} \quad (2)$$

$$h_t^2 = \omega + \alpha \varepsilon_{t-1}^2 + \gamma \varepsilon_{t-1}^2 d_t + \beta h_{t-1}^2 + \chi_2 TED_t + \nu_t$$

$$\begin{aligned} SVPs_t &= \mu + \lambda h_t + \delta SVPs_{t-1} + \phi_1 DEFAULT_t + \chi_1 TED_t + \eta SEASON_t + \pi_1 DUMMY_t + \varepsilon_t \\ \varepsilon_t &\sim N(0, h_t^2) \end{aligned} \quad (3)$$

$$h_t^2 = \omega + \alpha \varepsilon_{t-1}^2 + \gamma \varepsilon_{t-1}^2 d_t + \beta h_{t-1}^2 + \phi_2 DEFAULT_t + \chi_2 TED_t + \nu_t$$

$Log L$ and LR denote the model's log-likelihood and the likelihood-ratio test statistic, respectively, where $LR \sim \chi^2$. The sample comprises six sets of monthly stock premiums for the period from January 1982 to March 2011, where HML , LVP , SVP , SMB , GSP and VSP denote the value, large value, small value, size, growth size and value size premiums, respectively. Finally, (*; **; ***) denote a coefficient that is significant at 1%, 5% and 10% levels of significance, respectively.

Panel A: Test of Expression (1) vs. Expression (3)

	<i>HML</i>	<i>LVP</i>	<i>SVP</i>	<i>SMB</i>	<i>GSP</i>	<i>VSP</i>
<i>Log L</i> for (1)	-859.5696	-872.8620	-914.6402	-840.5910	-906.0180	-865.2289
<i>Log L</i> for (3)	-844.9998	-864.3579	-904.9230	-836.7851	-903.0493	-853.6247
<i>LR</i>	29.1396*	17.0082*	19.4344*	7.6118**	5.9374	23.2084*

Panel B: Test of Expression (2) vs. Expression (3)

	<i>HML</i>	<i>LVP</i>	<i>SVP</i>	<i>SMB</i>	<i>GSP</i>	<i>VSP</i>
<i>Log L</i> for (2)	-849.4564	-868.4151	-906.4985	-849.0168	-915.6679	-871.1710
<i>Log L</i> for (3)	-844.9998	-864.3579	-904.9230	-836.7851	-903.0493	-853.6247
<i>LR</i>	8.9132*	8.1144*	3.1510***	24.4634*	25.2372*	35.0926*

TABLE A1: FINANCIAL DISTRESS & STOCK PREMIUMS (CREDIT SPREAD)

This table presents the results of the GARCH (1,1) model in [Expression \(1\)](#), which examines the relationship between financial distress (proxied by the credit spread) and stock premiums, where:

$$\begin{aligned} SVPs_t &= \mu + \delta SVPs_{t-1} + \phi_1 DEFAULT_t + \eta SEASON_t + \pi_1 DUMMY_t + \varepsilon_t \\ \varepsilon_t &\sim N(0, h_t^2) \\ h_t^2 &= \omega + \alpha \varepsilon_{t-1}^2 + \beta h_{t-1}^2 + \nu_t \end{aligned} \quad (1)$$

In the mean equation, δ measures the impact of past stock premiums on the current stock premium; ϕ_1 measures the impact of financial distress (proxied by the credit spread); η measures the impact of the January effect on stock premiums (where $SEASON$ is a dummy variable and $SEASON = 1$ if the observation falls in January and $SEASON = 0$ otherwise); and π_1 measures the impact of the most recent expansionary period on stock premiums (where $DUMMY$ is a dummy variable and $DUMMY = 1$ if the observation falls in the period between November 2001 and July 2007 and $DUMMY = 0$ otherwise). In the variance equation, ω measures the impact of the long-run average variance on the volatility at time t ; α measures the impact of volatility shock at time $t - 1$ on the volatility at time t ; and β measures the impact of past volatility shocks on the volatility at time t . In the robustness checks, A_4 denotes the 4th-order ARCH-LM test ([Engle, 1982](#)), where $A_4 \sim \chi^2$; and $(\alpha + \beta) \leq 1$ measures the persistence of volatility. The sample comprises six sets of monthly stock premiums for the period from January 1982 to March 2011, where HML , LVP , SVP , SMB , GSP and VSP denote the value, large value, small value, size, growth size and value size premiums, respectively. Finally, (*; **; ***) denote a coefficient that is significant at 1%, 5% and 10% levels of significance, respectively.

Panel A: Mean Equation

	<i>HML</i>	<i>LVP</i>	<i>SVP</i>	<i>SMB</i>	<i>GSP</i>	<i>VSP</i>
μ	0.0341	-0.2805	-0.0137	-0.9469*	-0.8693**	-1.2033*
δ	0.1269**	0.0868	0.1898*	0.0161	0.1071***	-0.0374
ϕ_1	0.0138	0.9470	1.4385	7.2459*	4.3013**	11.0274*
η	0.4418	0.6015	0.5239	0.8394***	1.3011*	0.9895***
π_1	0.6113**	0.7578**	0.3691	0.1082	0.4281	-0.2788

Panel B: Variance Equation

	<i>HML</i>	<i>LVP</i>	<i>SVP</i>	<i>SMB</i>	<i>GSP</i>	<i>VSP</i>
ω	0.8313*	0.5661**	1.0790**	0.5366***	0.7511**	0.5073**
α	0.3463*	0.2309*	0.3223*	0.1083*	0.1513*	0.0919**
β	0.6072*	0.7286*	0.6311*	0.8287*	0.7945*	0.8558*

Panel C: Residual Diagnostics

	<i>HML</i>	<i>LVP</i>	<i>SVP</i>	<i>SMB</i>	<i>GSP</i>	<i>VSP</i>
A_4	1.1948	2.1930	3.3879	4.3841	3.9389	3.5606
$(\alpha + \beta)$	0.9535	0.9595	0.9534	0.9370	0.9459	0.9477

TABLE A2: STOCK PREMIUM, DEFAULT RISK & LIQUIDITY CRISIS (CREDIT SPREAD)

This table presents the results of the TARCh (1,1,1) model in [Expression \(3\)](#), which examines the relationship between default risk (proxied by the credit spread) liquidity crises (proxied by the TED spread) and stock premiums, where:

$$\begin{aligned}
 SVPs_t &= \mu + \lambda h_t + \delta SVPs_{t-1} + \phi_1 DEFAULT + \chi_1 TED_t + \eta SEASON_t + \pi_1 DUMMY_t + \varepsilon_t \\
 \varepsilon_t &\sim N(0, h_t^2) \\
 h_t^2 &= \omega + \alpha \varepsilon_{t-1}^2 + \gamma \varepsilon_{t-1}^2 d_t + \beta h_{t-1}^2 + \phi_2 DEFAULT + \chi_2 TED_t + v_t
 \end{aligned}
 \tag{3}$$

In the mean equation, λ measures whether stock premiums follow time-varying phenomena; δ measures the impact of past stock premiums on the current stock premium; ϕ_1 measures the impact of financial distress (proxied by the credit spread); χ_1 measures the impact of financial distress (proxied by the TED spread); η measures the impact of the January effect on stock premiums (where $SEASON$ is a dummy variable and $SEASON = 1$ if the observation falls in January and $SEASON = 0$ otherwise); and π_1 measures the impact of the most recent expansionary period on stock premiums (where $DUMMY$ is a dummy variable and $DUMMY = 1$ if the observation falls in the period between November 2001 and July 2007 and $DUMMY = 0$ otherwise). In the variance equation, ω measures the impact of the long-run average variance on the volatility at time t ; α measures the impact of good news on volatility; $\alpha + \gamma$ measures the impact of bad news on volatility; γ measures the impact of the leverage effect on volatility; β measures the impact of past volatility shocks on the volatility at time t ; π_2 measures the impact of the most recent expansionary period on volatility (where $DUMMY$ is a dummy variable and $DUMMY = 1$ if the observation falls in the period between November 2001 and July 2007 and $DUMMY = 0$ otherwise); and χ_2 measures the impact of liquidity crises (proxied by the TED spread) on volatility. In the robustness checks, A_4 denotes the 4th-order ARCH-LM test ([Engle, 1982](#)), where $A_4 \sim \chi^2$; and $(\alpha + \beta + \gamma/2) \leq 1$ measures the persistence of volatility. The sample comprises six sets of monthly stock premiums for the period from January 1982 to March 2011, where HML , LVP , SVP , SMB , GSP and VSP denote the value, large value, small value, size, growth size and value size premiums, respectively. Finally, (*, **, ***) denote a coefficient that is significant at 1%, 5% and 10% levels of significance, respectively.

Panel A: Mean Equation

	<i>HML</i>	<i>LVP</i>	<i>SVP</i>	<i>SMB</i>	<i>GSP</i>	<i>VSP</i>
μ	-0.8224***	-0.2004	-1.0765***	-1.8361*	-1.2614***	-2.8966*
λ	0.3684**	0.1180	0.3944***	0.4053***	0.1069	0.7878*
δ	0.1172**	0.0612	0.1607*	0.0059	0.1031***	-0.0486
ϕ_1	-1.2592	-3.0522	0.1364	5.7863*	4.7443***	6.9520**
χ_1	4.8266	3.7849	5.7857	9.8367	6.0599	5.0113
η	0.1835	0.3586	0.3938	0.8902***	1.3281**	0.8265
π_1	0.7240*	1.0022*	0.4397	0.0157	0.3469	-0.1697

Panel B: Variance Equation

	<i>HML</i>	<i>LVP</i>	<i>SVP</i>	<i>SMB</i>	<i>GSP</i>	<i>VSP</i>
ω	0.8596	0.4506	0.4243	0.2861	0.7291	0.2922
α	0.0743	0.0597	0.1187***	0.0459***	0.1535*	0.0408**
γ	0.3966*	0.2405*	0.2769*	0.1041	0.0469	0.0656***
β	0.6835*	0.7733*	0.6977*	0.8683*	0.7646*	0.8920*
ϕ_2	-1.5090	0.9348	3.5511	0.2922	0.7683	0.2347
χ_2	-13.1764	-67.7087*	8.6058	-30.2355***	-57.0848	-38.3205**

Panel C: Residual Diagnostics

	<i>HML</i>	<i>LVP</i>	<i>SVP</i>	<i>SMB</i>	<i>GSP</i>	<i>VSP</i>
A_4	0.0874	3.2657	3.8736	3.4312	3.7956	2.4688
$(\alpha + \beta + \gamma/2)$	0.9561	0.9533	0.9548	0.9662	0.9416	0.9657