DEFAULT RISK, SIZE, AND EQUITY RETURNS: EVIDENCE FROM AN EMERGING STOCK MARKET

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Abstract

Although the relationship among default risk, size, and equity returns is comprehensively investigated in developed stock markets, the analysis is still lacking for Vietnam, an important emerging market in Southeast Asia. The key aim of this research is to examine the relationship among default risk, size, and equity returns in the Vietnamese stock market, and compare the explanatory power of the default-risk factor to the size factor in asset pricing models. We use an option-based model to obtain the proxy of default risk for approximately 360 listed firms in Vietnam. Empirical results show that distance-to-default is negatively related to stock returns. When size is controlled, the default effect exists in different size-ranked portfolios. In asset pricing models, the default-risk factor is more powerful in explaining Vietnamese equity returns compared to the size factor of Fama and French (1993). As a result, default risk is a significant factor in Vietnamese stock returns, consistent with the risk-based point of view.

Keywords: Stock Returns, Default Risk, Distance-to-Default, Financial Markets, Organizational Finance

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1. INTRODUCTION

Default risk refers to the probability that a company would be unable to meet its debt obligations. The relationship between default risk and equity returns has a significant association with the risk-reward trade-off prediction. When default risk is systematic, the equities of high-risk firms tend to be highly correlated, then it is impossible to diversify their default risk. For bearing this risk, investors should be compensated with a positive risk premium. Therefore, the relation between default risk and equity returns should be positive. Furthermore, many distressed firms are small firms with high financial leverage and cash flow problems (Chan & Chen, 1991; Fama & French, 1996). On the one hand, many papers find a positive risk premium for holding small stocks with high distress risk (Hwang et al., 2010; Lin et al., 2012; Cakici et al., 2019; Liu et al., 2019; Asis et al., 2021). On the other hand, several papers document that no positive relation could be found between default risk and equity returns (Campbell et al., 2008; Garlappi et al., 2008; de Groot & Huij, 2018; Xu et al., 2022).

Quy Duong and Bertrand (2022) document that investing in the smallest portfolio leads to a superior return, which is concentrated in firms faced with higher default risk. Additionally, if the default-risk neutrality is imposed, the explanatory power of the size factor would be negatively affected. However, Quy Duong and Bertrand (2022) focus on the size effect instead of directly examining the relationship between default risk and stock returns. Hence, the first aim of this research is to investigate whether returns on the equity of firms with high default risk are higher than that of firms with low default risk. We use the distance-to-default (DD) developed by Merton (1974) to proxy for default risk. A lower distance-to-default implies a higher default risk. By dividing Vietnamese stocks into deciles based on the distance-to-default, we find that the lower the distance-to-default, the higher the average return. In other words, there is a positive risk premium for holding stocks with high default risk in the Vietnamese stock market.

Secondly, the relationship between default risk and the size effect is also examined. By double-sorting, we document that by holding the size constant, the average returns of portfolios decrease monotonically with their distance-to-default. The size premium is concentrated in high default-risk stocks, consistent with Quy Duong and Bertrand (2022). Finally, following Gharghori et al. (2009) and Lin et al. (2012), we run asset-pricing models with the default-risk factor and the size factor of Fama and French (1993). If the default-risk factor replaces the size factor, the average absolute of intercepts drops substantially. According to Barillas and Shanken (2017), if the default-risk factor is an explanatory variable, the size factor is redundant. Therefore, the default-risk factor has a better explanatory power of equity returns than the size factor.

This research makes two important contributions. First, the risk-reward trade-off prediction is confirmed in the Vietnamese stock market. Investors in Vietnam demand a higher return for bearing default risk, consistent with the risk-based explanation. Second, this paper contributes to the literature on asset pricing models in emerging markets. Although the distance-to-default of Vietnamese stocks is estimated in several papers (Vo et al., 2019; Vu et al., 2019; Trinh et al., 2021), it is the first paper that incorporates the distance-to-default into the asset pricing model in Vietnam. Our findings suggest that default risk would be considered as a relevant factor explaining the expected returns of Vietnamese stocks.

The remainder of this article is structured as follows. Section 2 introduces the literature review, followed by details of the data sources and the estimation of distance-to-default in Section 3. The relationship among default risk, size, and equity returns is analyzed in Section 4. The final section, Section 5, gives concluding remarks.

2. LITERATURE REVIEW

The pioneering article on the relationship between distress risk and equity returns is by Chan and Chen (1991). They state that the size premium is primarily driven by high default-risk firms, which are characterized by market capitalization, high financial leverage, and issues in cash flows. Later on, a positive risk reward for holding small stocks faced with higher distress risk is discovered in many papers. In the post-1963 period, since the capital asset pricing model (CAPM) is unable to explain the value effect, Fama and French (1993) develop the three-factor model. They declare that small firms tend to be engaged in some sort of financial distress. It leads to the Fama–French (FF) three-factor model in which the size proxies for default risk. The impact of default risk on equity returns is evaluated by Vassalou and Xing (2004). Based on Merton's (1974) option pricing model, they calculate the default probabilities for the US companies during 1971–1999. Since the size effect only exists in the portfolio with the highest default probability and smaller firms have substantially higher default risk, they argue that the size effect is driven by the distress risk. Similar results are reported by Cakici et al. (2019). Investigating the US market during 1963–2013, they state that the average return differential between high and low distress likelihood stocks is significantly positive. The distress risk premium only exists for small equities. According to Gharghori et al. (2009), the size premium in the Australian equity market is only documented in companies with high bankruptcy risk, then the default risk accounts for the size premium. The size effect in the US from 1934 through 2006 could be captured by the CAPM augmented with a credit spread factor representing default risk (Hwang et al., 2010). Because of the high slopes to the credit spread factor, small-cap stocks are more sensitive to changes in the excess credit spread. The size premium could be attributed to the undiversifiable credit spread, representing the default risk. Analyzing the Taiwan stock market during 1996–2007, Lin et al. (2012) document that although size cannot proxy for default risk, both size and default risk have significant effects on stock returns. The adjusted R^2 for the CAPM and the FF three-factor models are approximately 0.6 and 0.67, respectively. By contrast, the adjusted R^2 for the regression model with the default factor is around 0.71. It is evident that the explanatory power over Taiwanese stock returns is considerably enhanced by adding the default-risk factor. Using the credit risk premia to measure distress risk exposures for US stocks from 1980 to 2010, Anginer and Yildizhan (2017) confirm a higher expected return for a stock with high credit risk. The monthly return differential between the highest and lowest distress risk is statistically significant, at roughly 0.5%. Liu et al. (2019) find a remarkably positive default risk premium of 0.475% per month in China during 2003–2005. Based on more than 60,000 stocks in 25 emerging markets, Asis et al. (2021) find strong evidence of the existence of a default risk premium. Future one-year returns for the riskiest and safest portfolios are 1.55% and 0.95% per month, respectively.

On the other hand, several papers document that no positive relationship could be found between default risk and equity returns. Using Ohlson's model to compute indicators of financial distress, Dichev (1998) observe a negative relation between distress risk and the US equity returns during 1981–1995. Similarly, Campbell et al. (2008) state that financially failed equities do not provide higher average returns than other equities. Based on data from non-financial US firms between 1969 and 2003, Garlappi et al. (2008) conclude that higher default probabilities are not associated with higher expected equity returns. For example, the average value-weighted return for stocks with the highest default probabilities is 0.82% per month, whereas the average value-weighted return for the stocks with the lowest default probabilities is 0.96% per month. According to Chen and Lee (2013), the default effect in the Taiwanese equity market between 1986 and 2008 disappears after controlling for size. Although the default-risk factor has some influence on stock returns, it becomes an insignificant factor if other risk factors are included in the regression. Using both the accounting and structural model and credit spread to calculate default probabilities, de Groot and Huij (2018) found that default risk cannot account for the size effect in the US equity market. Low-risk small-size equities yield up to 6% higher annualized average returns than high-risk small-size equities. If the distress risk level of small firms is higher than big firms, they should underperform big firms in economic downturns. In contrast, it seems that small firms outperform big firms in both states of the US economy. Moreover, the explanatory power of the size factor to equity returns does not arise from bankruptcy risk. Sorting the US stocks by their lagged default probabilities, Xu et al. (2022) show that the default risk premium does not exist. The average monthly abnormal returns for low-risk stocks is 1.38%, whereas the figure for high-risk stocks is only 0.76%.

In the Vietnamese stock market, Quy Duong and Bertrand (2022) report that a small-cap portfolio earns the highest annual mean return, at approximately 19.3%. Furthermore, most of the size premiums are concentrated in equities with high default risk. Quy Duong and Bertrand (2022) also build the neutral size factor by sorting Vietnamese equities on their risk proxies. They document a decline in the explanatory power over Vietnamese stock returns when the neutral size factor is included in the asset-pricing model. Hence, the size premium in Vietnam is attributed to default risk. Several caveats apply to their findings. Firstly, the relationship between default risk and stock returns is not directly investigated. Secondly, the influence of default risk on stock expected returns is unclear. The question is whether the default-risk factor can replace the size factor in asset pricing models for the Vietnamese stock market.

3. RESEARCH METHODOLOGY

3.1. Data

There are two stock exchanges in the Vietnamese stock market: the Ho Chi Minh Stock Exchange (HOSE) and the Hanoi Stock Exchange (HNX). Since the market capitalization of many firms listed in the HNX is less than $5 million, their stock prices as well as financial statements are very likely to be manipulated, leading to potential financial distress. The regulations and lifetime of the HNX are shorter than the HOSE nearly 10 years. Therefore, investigating firms listed in the HNX does not help in understanding well how investors actually value shares in Vietnam (Tran, 2020). Our data sample contains all non-financial shares in the HOSE. Due to the missing data problem in the Vietnamese stock market before 2011, the sample period is from 2012 to 2022.

Data is collected from Fiingroup, one of the leading service providers of Vietnamese financial data. Following Ince and Porter (2006), we remove all weekly returns that are above 35% or below -35%. To eliminate the thin trading, a stock would be removed from the data sample if its trading volume of a stock is less than $5,000 per day. The final sample contains about more than 360 firms.

3.2. Default risk proxies

The Merton-based model could be considered as a qualified default risk measure in the Vietnamese equity market (Trinh et al., 2021). Quy Duong and Bertrand (2022) also document that if default risk is measured by distance-to-default (DD), the size premium primarily arises from distress risk. Therefore, the DD of Merton (1974) is used as the proxy for default risk.

According to Merton (1974), a firm would bankrupt if its asset value is less than its debt due at time *T*. The assets value (*V*) is assumed to follow a geometric Brownian motion:

$$dV = \mu_V V dt + \sigma_V V dz \quad (1)$$

where, μ_V and σ_V are the expected rate of return on *V* and the volatility of assets value. Both of them are assumed to be constants. *z* follows a Wiener process.

From Itô's lemma, a function *G* of *V* and *T* would follow the process:

$$dG = \left(\frac{\partial G}{\partial V}\mu_V V + \frac{\partial G}{\partial t} + \frac{1}{2}\frac{\partial^2 G}{\partial V^2}{\sigma_V}^2 V^2\right)dt + \frac{\partial G}{\partial V}\sigma_V V dz \quad (2)$$

Let $G = lnV$, so we have:

$$\frac{\partial G}{\partial V} = \frac{1}{V};\ \frac{\partial^2 G}{\partial V^2} = \frac{-1}{V^2} \text{ and } \frac{\partial G}{\partial t} = 0 \quad (3)$$

Then, we replace Eq. (3) into Eq. (2):

$$dG = \left(\frac{1}{V}\mu_V V + 0 - \frac{1}{2V^2}{\sigma_V}^2 V^2\right)dt + \sigma_V V dz = \left(\mu_V - \frac{{\sigma_V}^2}{2}\right)dt + \sigma_V dz \quad (4)$$

As μ_V and σ_V are constants, $G = lnV$ follows a generalized Wiener process with a constant drift rate of $\left(\mu_V - \frac{{\sigma_V}^2}{2}\right)$ and a constant variance of ${\sigma_V}^2$. Hence, the change in lnV during a period *T* would follow a normal distribution:

$$lnV_t - lnV \sim N\left(\left(\mu_V - \frac{{\sigma_V}^2}{2}\right) * T, {\sigma_V}^2 * T\right) \quad (5)$$

$$lnV_t \sim N\left(lnV_0 + \left(\mu_V - \frac{{\sigma_V}^2}{2}\right) * T, {\sigma_V}^2 * T\right) \quad (6)$$

The probability that the assets value (V_t) is lower than the due debt (*D*) at time *T* would be:

$$P(V_t < D) = P\left(ln\left(\frac{V_t}{D}\right) < 0\right) = N\left(\frac{ln\left(\frac{V_0}{D}\right) + \left(\mu_V - \frac{{\sigma_V}^2}{2}\right) * T}{\sigma_V * \sqrt{T}}\right) \tag{7}$$

In a risk-neutral world, the expected return on equity is assumed to be equal to the risk-free rate *r*. Therefore, the *DD* is defined as:

$$\frac{ln\left(\frac{V_0}{D}\right) + \left(r - \frac{{\sigma_V}^2}{2}\right) * T}{\sigma_V * \sqrt{T}} \tag{8}$$

Hence, we have the equation of Black–Scholes:

$$E_0 = V_0 . N(d_1) - e^{-r} . D . N(d_2)$$
$$d_1 = \frac{ln\left(\frac{V_0}{D}\right) + \left(r + \frac{{\sigma_V}^2}{2}\right)}{\sigma_V} \tag{9}$$
$$d_2 = d_1 - \sigma_V$$

E is the market value of equity. *N* is the cumulative distribution function of a normal distribution with a mean of zero and a variance of one. *D* is the due debt, which equals the current debt plus 50% of the long-term debt (Campbell et al., 2008).

The following equation is the relation between the assets volatility (σ_V) and the equity volatility (σ_E):

$$V_0 \, \sigma_V \frac{\partial E_0}{\partial V} = E_0 \sigma_E \tag{10}$$

Since $\frac{\partial E_0}{\partial V_0} = N(d_1)$ (Campbell et al., 2008), we have the equation:

$$V_0 \, \sigma_V N(d_1) = E_0 \sigma_E \tag{11}$$

Two non-linear Eq. (9) and Eq. (11) are simultaneously solved. Following de Groot and Huij (2018), the volatility of equity is estimated from the standard deviation of daily stock returns:

$$\sigma_E = std\left[\frac{P_t - P_{t-1}}{P_{t-1}}\right]\sqrt{n} \tag{12}$$

where, P_t is the adjusted closing price of stock and n is the number of trading days.

4. RESULTS

4.1. Default risk and equity returns in Vietnam

To analyze the relationship between default risk and equity returns, we divide firms into quintiles, based on their DD ranking, in each year of the sample period. The annual equally-weighted average returns for the 5 portfolios are estimated. The time-series average of capitalization and DD for 10 portfolios are also calculated. The results are given in Table 1.

Table 1. Analysis of quintile portfolios formed using DD ranking

Analysis	*1-high*	*2*	*3*	*4*	*5-low*	*Average*
Annual average return (%)	17.15	15.23	12.09	8.34	7.65	12
Average capitalization ($ million)	10.84	56.44	98.52	218.2	360.8	149
Distance-to-default (DD)	1.7	2.68	4.26	5.54	7.32	4.3

There is a clear downward trend in Vietnamese stock returns as DD increases. A lower DD implies a higher default risk. Therefore, stocks faced with the highest distress risk are grouped into the first portfolio, which provides the highest annual average return, at approximately 17%. By contrast, the annual average return for the fifth portfolio including the lowest default-risk stocks is the smallest, at only approximately 7.7%. The higher the default risk, the higher the average stock returns, consistent with a risk-based explanation.

A negative relationship between size and default risk is also observed. The average market capitalization for the first portfolio is more than $10 million, whereas the average market capitalization for the fifth portfolio is approximately $360 million. It could be concluded that the smaller the market capitalization, the higher the default risk, consistent with Fama and Frenh (1993) and Quy Duong and Bertrand (2022).

4.2. Default risk and size in Vietnam

To investigate the relationship between default risk and size in the Vietnamese stock market, we use the double-sorting technique. Firstly, all sample stocks are categorized into 5 quintiles, with the first quintile of the highest default risks, and the fifth quintile of the lowest default risks. Secondly, each quintile is further divided into three portfolios based on the market capitalization, for a total of 15 portfolios. Then, the annual equally-weighted average returns, the time-series average of capitalization, and DD for 15 portfolios are calculated. The results are given in Table 2.

Table 2. Return on quintile portfolios formed using DD ranking controlled by the size

Panel A: Annual average return					
	1-high	*2*	*3*	*4*	*5-low*
Small	18.71%	16.52%	12.23%	7.95%	7.4%
Neutral	15.44%	14.24%	12.36%	8.41%	7.21%
Big	16.9%	15.13%	11.74%	8.69%	8.26%
Small minus big	0.81%	1.39%	0.49%	-0.74%	-0.86%
Panel B: Average capitalization ($ million)					
	1-low	*2*	*3*	*4*	*5-high*
Small	5.2	30.62	55.74	173.21	210.14
Neutral	9.61	51.28	89.16	194.52	324.36
Big	17.71	87.42	150.66	286.67	547.9
Panel C: Average DD					
	1-low	*2*	*3*	*4*	*5-high*
Small	1.82	3.08	4.24	5.13	6.98
Neutral	1.61	2.7	4.51	5.48	7.16
Big	1.67	2.26	4.03	6.01	7.82

According to Panel A of Table 2, default risk influences different size-ranked portfolios. For example, the small high-risk stocks earn an annual average return of 18.71%, which equals to approximately three times the average return on small low-risk stocks (7.4%). After controlling for size, the mean returns of high-risk equities are always higher than those of low-risk equities, and the differences are significant. Hence, the default-risk reward exists across the whole sample even holding the market capitalization constant.

At the same time, the size effect is likely to disappear after controlling for default risk. For instance, the annual average returns of small high-risk and big high-risk stocks are nearly the same, at 18.71% and 16.9%, respectively. Their difference is insignificant, at only 0.81%. It is consistent with Quy Duong and Bertrand (2022).

4.3. The default-risk factor

According to Fama and French (1993), the equation for the FF three-factor model is:

$$E(R_i) = R_f + b_i * \left[E(R_m) - R_f \right] + s_i * E(SMB) + h_i * E(HML) \quad (13)$$

To estimate the b_i, s_i and h_i slopes, the three-factor regressions are run:

$$R_{it} - R_{ft} = a_i + b_i * \left[R_{mt} - R_{ft} \right] + s_i * SMB_t + h_i * HML_t + \varepsilon_t \quad (14)$$

where, R_{it} is the returns on the tested portfolios at time *t*, which are 5 size-ranked portfolios and 6 portfolios sorted on capitalization and book-to-market (B/M).

R_{mt} and R_{ft} are the return on the market portfolio and the riskless rate at time *t*. Since the research is conducted in the Vietnamese context, the one-month Vietnamese Treasury Bill is considered as a riskless asset. The chosen market portfolio is the weighted average of the VN Index and HNX Index. They are the stock indexes in the HOSE and the HNX, implying the variation of all stocks listed in these exchanges. ε_t is a zero-mean residual term following the identical independent normal distribution with a constant standard deviation of σ.

The small minus big (*SMB*) is calculated as follows. On April 1 each year, the stocks are assigned into two groups based on the market capitalization in the previous year-end. Then, the return on SMB is the difference between the weighted-average return on a small group and a large group. An identical method is applied to estimate the high minus low (*HML*) factor, which equals to the return on high-B/M stocks minus the return on low-B/M stocks.

As suggested by Gharghori et al. (2009) and Lin et al. (2012), the default-risk factor is established as follows. Firstly, based on their capitalization, stocks are classified into large and small categories. Subsequently, 30% of firms with the highest (lowest) default risk proxies are grouped into high-risk (low-risk) subcategories. Then:

$$DR = 1/2 * (big\text{-}high\text{-}risk + small\text{-}high\text{-}risk - big\text{-}low\text{-}risk - small\text{-}low\text{-}risk) \quad (15)$$

DR is the default-risk factor, and then the equation for the three-factor model with default-risk factor is:

$$E(R_i) = R_f + b_i * \left[E(R_m) - R_f \right] + d_i * E(DR) + h_i * E(HML) \quad (16)$$

Descriptive statistics and correlations of four explanatory factors are given in Table 3 and Table 4. All-time series have a positive mean. The weekly average return for the *DR* portfolio is the highest (0.102%) with a standard deviation of 1.78%. In contrast, the lowest average return (0.041%) belongs to the HML factor with the lowest standard deviation (1.42%). The default-risk factor has a mean of 0.102%, considerably higher than the standard size factor. The p-values of Jarque–Bera tests are 0, which strongly rejects the null hypothesis of normal distribution at the significance level of 5%. Consequently, it could be concluded that all-time series are not normally distributed.

Table 3. Descriptive statistics of risk factors

Descriptive statistics	$R_m - R_f$	*SMB*	*HML*	*DR*
Mean (%)	0.070	0.079	0.041	0.102
Median (%)	0.233	0.047	0.055	0.09
Maximum (%)	10.70	4.79	2.34	6.37
Minimum (%)	-11.05	-5.48	-3.9	-7.34
Std. Dev. (%)	2.62	1.45	1.42	1.78
Skewness	-0.35	-0.07	-0.36	0.05
Kurtosis	4.58	4.22	4.27	4.51
Jarque–Bera	84.69	42.70	45.69	49.43
Probability	0.00	0.00	0.00	0.00
Observations	515	515	515	515

Table 4. Correlations among risk factors

Factors	$R_m - R_f$	*SMB*	*HML*	*DR*
$R_m - R_f$	1.00			
SMB	0.35	1.00		
HML	0.38	0.25	1.00	
DR	-0.25	0.53	-0.23	1.00

To evaluate the explanatory power of the size and default-risk factors, Eq. (13) and Eq. (16) are estimated. The intercepts and adjusted R^2 are given in Table 5. The lower the absolute of intercept and the higher the adjusted R^2 implies a higher explanatory power.

The GRS test statistics (Gibbons et al., 1989) are also computed as follows:

$$GRS\ statistic = \frac{\sqrt{1+\widehat{\theta^{*2}}}}{\sqrt{1+\widehat{\theta_p^2}}} - 1 \sim iF(N, iT - N - L) \quad (17)$$

where, $\widehat{\theta^*}$ is the ratio of the maximum excess sample mean return to sample standard deviation and $\widehat{\theta_p}$ is the ratio of average excess return on a market portfolio to its standard deviation.

As shown in Table 5, for both classes of tested portfolios, the average absolute of intercepts drops if the default-risk factor replaces the size factor. For 5 size-ranked portfolios (Panel A), the average absolute of intercepts falls significantly from 0.051% to 0.035%. For 6 portfolios sorted on market capitalization and B/M (Panel B), there is also a decrease in the average absolute of intercepts, from 0.051% to 0.04%. Furthermore, the GRS statistic also decreases substantially, from 1.5 to less than 1. The lower the GRS statistic, the better the asset-pricing model. Therefore, the explanatory power of the default-risk factor is higher than the standard size factor.

Table 5. Summary of the FF regressions and three-factor regressions with default risk

Panel A: Five size-ranked tested portfolios								
	FF regressions				***Three-factor regressions with default risk***			
	a (%)	***t(a)***	***Adj. R^2***	***DW***	***a (%)***	***t(a)***	***Adj. R^2***	***DW***
1-big	0.03	0.77	0.93	2.12	-0.004	-0.12	0.92	2.13
2	-0.09	-1.42	0.75	1.95	-0.06	-0.97	0.75	1.90
3	-0.03	-0.47	0.77	1.92	0.03	0.45	0.72	1.84
4	-0.05	-1.02	0.82	2.01	0.04	0.54	0.87	1.93
5-small	0.06	1.08	0.77	2.02	0.05	0.67	0.74	1.76
Average absolute intercept (%)	0.051				0.035			
GRS test statistic	GRS = 1.51 (p-value = 0.18)				GRS = 0.82 (p-value = 0.53)			
Panel B: Six portfolios ranked on market capitalization and B/M								
	FF regressions				***Three-factor regressions with default risk***			
	a (%)	***t(a)***	***Adj. R^2***	***DW***	***a (%)***	***t(a)***	***Adj. R^2***	***DW***
Big-growth	0.00	0.08	0.92	2.11	-0.02	-0.45	0.91	2.17
Big-neutral	0.09	1.14	0.69	1.94	0.07	0.92	0.69	1.95
Big-value	-0.06	-0.85	0.80	2.06	-0.09	-1.40	0.83	2.08
Small-growth	-0.04	-0.65	0.73	1.75	0.05	0.70	0.67	1.71
Small-neutral	-0.02	-0.38	0.78	2.06	0.05	0.74	0.69	1.98
Small-value	0.10	1.33	0.76	1.99	0.02	0.27	0.79	1.82
Average absolute intercept (%)	0.051				0.04			
GRS test statistic	GRS = 1.55 (p-value = 0.16)				GRS = 0.92 (p-value = 0.48)			

Note: DW is acronym for the Durbin-Watson statistic. As DW statistics are approximately equal to 2, there is little evidence of autocorrelation in the regression residuals.

Following Barillas and Shanken (2017), we evaluate the power of the size (default-risk) factor by regressing it on the market, value, and default-risk (size) factors. The results of redundancy tests are shown in Table 6. When the default-risk factor is an explanatory variable, the size factor is redundant with an insignificant alpha of only 0.056% (t-statistic of 0.62). Meanwhile, the default-risk factor has a statistically significant alpha of 0.11% with a t-statistic of 2.06. Hence, the default-risk factor is a significant factor in explaining Vietnamese stock returns.

To sum up, the default-risk factor has a better explanatory power of securities returns than the standard size factor of Fama and French (1993).

Table 6. Results of redundancy tests

Factors	*Alpha (%)*	$R_m - R_f$	*SMB*	*HML*	*DR*	*Adj. R²*	*DW*
SMB	0.056	-0.33*	-	-0.16*	0.21*	0.319	1.78
	[0.62]	[-11.72]	-	[-3.6]	[7.27]		
DR	0.11*	0.49*	0.58*	-0.31*	-	0.313	1.89
	[2.06]	[10.47]	[7.07]	[-3.39]	-		

Note: DW is acronym for the Durbin-Watson statistic. As DW statistics are approximately equal to 2, there is little evidence of autocorrelation in the regression residuals. T-statistics are in brackets.

5. CONCLUSION

According to the risk-reward trade-off prediction, there should be a positive risk reward for holding small equities faced with higher default risk (Fama & French, 1993; Vassalou & Xing, 2004; Gharghori et al., 2009; Hwang et al., 2010; Lin et al., 2012). However, several papers document that this positive risk premium does not exist (Dichev, 1998; Campbell et al., 2008; Garlappi et al., 2008; de Groot & Huij, 2018). Although the relationship among default risk, size and equity returns is intensively investigated in developed markets, the number of studies on emerging markets is limited.

Therefore, this paper examines the relationship among default risk, size, and equity returns in Vietnam, an emerging market in Southeast Asia. The distance-to-default of Merton (1974) is used to proxy for default risk. The key results of our study could be summarized as follows. Firstly, there is a positive risk premium for holding stocks with high default risk in the Vietnamese stock market. The annual average return on the first quintile of the highest default risks is about 17%, more than doubled the average return on the fifth quintile of the lowest default risks. Secondly, the default risk reward exists when controlling for size. Holding the market capitalization constant, the mean returns of high-risk equities are substantially higher than those of low-risk equities in all size-ranked portfolios. Meanwhile, there is no size premium if we adjust for default risk, consistent with Quy Duong and Bertrand (2022). Finally, we find evidence from the asset-pricing test for the notion that default risk is a systematic risk. The average absolute of intercepts and the GRS statistic decrease considerably if the default-risk factor replaces the size factor of Fama and French (1993). Due to an insignificant alpha in redundancy tests, the size factor does not contain other important price information once we consider the market, value, and default-risk factor. Taken together, default risk has some power to explain Vietnamese equity returns and the default-risk factor could be used as a significant explanatory variable in the asset-pricing models.

There are two important implications for Vietnamese investors. First, there is a considerably high average return for stocks with high default probabilities. Then, risk seekers and venture capital funds might invest in firms faced with high default risk to harvest abnormal returns. Second, to estimate the expected return for investment decisions, Vietnamese investors should consider default risk as a factor in asset pricing models.

The empirical findings of this research are subject to several limitations. The first limitation is the disregard of transaction costs and income taxes. As presented in subsection 4.1, portfolios are revised and rebalanced periodically, and then transaction costs incur when buy and sell orders are executed. The transaction costs could be considerable, which reduces the portfolio's return significantly. Similarly, the income taxes on the stock dividends and capital gains may also have a great impact on the actual portfolio's return. Secondly, the stock market bubble is not taken into account. Since the asset pricing models such as CAPM and multifactor models depend on historical data, stock market bubbles may lead to the inappropriate estimation of betas and factors' slopes.

As a result, several directions for further studies in Vietnam should be noticed. The transaction costs and taxes should be incorporated in the return computation. Additionally, the price bubble could be considered a risk factor in asset pricing models as suggested by Lee and Phillips (2016).

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