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The impact of stock liquidity on stock price crash risk: Empirical research on listed firms in Vietnam

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ABSTRACT

Vietnam's stock market is now highly developed and significant to the economy of the country. Many previous researches have studied the factors that affect stock prices on the stock market. Therefore, in this article, the authors examine the impact of stock liquidity on stock price crash risk with a sample space of companies on the Ho Chi Minh City Stock Exchange (HOSE) from 2016 to 2022. By using the linear regression research model, the authors found that stock liquidity has a negative impact on stock price crash risk. In this model, stock price crash risk will be the dependent variable, whereas stock liquidity will be the explanatory variable, which will ultimately determine the accuracy and suitability of the model through observed data. This topic provides considerable value to the depth of knowledge on stock liquidity and stock price crash risk in emerging markets and is helpful for emerging markets to monitor stock liquidity there. Additionally, this study offers potential strategies to manage stock price crash risk, which is valuable information for investors, authorities, regulators, and policymakers.

Contribution/ Originality: This study uniquely contributes by investigating the direct impact of stock liquidity on stock price crash risk, a less-explored factor in Vietnam's emerging market. By applying a linear regression model to data from the Ho Chi Minh City Stock Exchange (2016–2022), it provides new insights for market stability strategies aimed at investors and policymakers.

1. INTRODUCTION

For the previous 20 years, the Vietnamese stock market has evolved into a vital component of the economy, attracting both domestic and foreign investors while offering diverse investment opportunities. The development of the bond and derivatives markets has accompanied this growth, enriching investment options and bolstering risk management capabilities (Nguyen & Vo, 2021). Consequently, investing in stocks has become increasingly appealing to a diverse group of investors.

The stability of stock returns is paramount for investors, as volatile returns deter investment. Economic conditions, information dissemination, and business performance are identified as key factors influencing stock price crash risk (Vietnam Investment Review, 2023). Economic stability and growth foster positive stock market sentiments, while adverse economic situations lead to downturns. Additionally, information flow and investor

psychology play pivotal roles, as rumors can trigger significant market fluctuations. Moreover, business performance directly impacts investor decisions, with favorable prospects attracting buyers and driving stock prices upward.

Stock liquidity is instrumental in financial markets, facilitating capital mobilization and ensuring investment flexibility and safety. High liquidity enables swift asset conversion, which is crucial for individual investors during market volatility. Stock liquidity assessment benefits not only investors but also issuing companies, aiding in solvency evaluation and risk management. Low liquidity increases the risk of default or bankruptcy, underscoring its importance in financial stability (Amihud, Mendelson, & Pedersen, 2006).

The study of the connection between stock liquidity and stock price crash risk looks at how these two things are connected, how they are calculated, and how they can be used in real life. It focuses on financial companies listed on the HOSE in the Vietnamese stock market. The study spans from 2016 to 2022, a period marked by market expansion and maturation. The research findings are designed to provide a framework for guiding investment strategies, informing the formulation of financial policies, and improving risk management approaches. By addressing these areas, the study contributes to reducing the risk of stock price crashes for publicly listed companies and financial institutions, thereby promoting greater stability in the financial markets (Nguyen & Vo, 2021). A thorough understanding of the factors influencing stock price crashes allows market regulators to implement more efficient preventive actions and improve risk management efforts, ultimately fostering market resilience. Investors, in turn, benefit from the research findings by gaining essential insights for risk evaluation, empowering them to decide on investments in a more calculated and strategic manner.

This research is one of the few studies on stock liquidity and stock price crash risk in the Vietnamese stock market. The study approaches stock liquidity from a new perspective. While most previous studies conducted in Vietnam focus solely on factors affecting liquidity and rarely address the impact of liquidity on other aspects, this research fills that gap. Secondly, the Vietnamese stock market differs from other global markets in both its scale and the unique challenges it faces, many of which have not been addressed in prior empirical studies. These distinctions underscore the necessity for specialized research that caters to the unique features of Vietnam's market. Notable differences include the following: the investor structure in the stock market of Vietnam is predominantly individual investors, and the legal framework still requires improvement and harmonization to align more closely with international practices. This is an important aspect that previous studies have not fully addressed; therefore, the goal of this study is to fill that gap in the body of existing literature. Specifically, according to the amended Library of Legal Documents (2019) regulations on information disclosure and transparency need consistency across legal documents. Issues related to ownership rights, trading behaviors, penalties, and enforcement measures also need attention, as noted by Dr. Can Van Luc (a financial and banking expert).

There are five primary sections of the research. The first section introduces the study, while section two conducts a literature review. Section three delineates the employed methodology, while section four presents the results. Finally, the last section comes to the end of the study with key findings and offers recommendations for further action.

2. LITERATURE REVIEW

2.1. Background Theory on the Relationship Between Stock Liquidity and Stock Price Crash Risk

Chang, Chen, and Zolotoy (2017) and Chauhan, Kumar, and Pathak (2017) talk about two main theories that help us understand how liquidity can affect price stability and the chance of price crashes in financial markets: (1) Agency problem and governance theory—Increasing stock liquidity contributes to increasing governance mechanisms, limiting agency problems, and leading to reduced risk of price crash, and (2) Short-termism theory—Increasing stock liquidity exacerbating short-termism increases the risk of price crash.

2.1.1. Agency Problem and Governance Theory

Corporate governance is the procedure needed to establish and run businesses by using rules, guidelines, and policies that specify the rights and duties of shareholders and the board of directors. Building sustainable businesses requires effective governance, especially in joint-stock companies where many shareholders share ownership. Shareholders give the board of directors the authority to run the business, separating ownership from management. Due to this division, the board may have an "agency problem," acting more for itself than the shareholders. Shareholders use corporate governance mechanisms to ensure the board aligns with their goals, addressing conflicts of interest. Jensen and Meckling (1976) noted that supervision and control by the shareholders help ensure the board acts in their favor, making corporate governance a vital tool to resolve the agency dilemma.

2.1.2. Short-Termism Theory

Kedzior and Rozkrut (2014) define Short-term Theory as the tendency of market investors and analysts to overemphasize short-term profits at the expense of long-term strategies and business value. Sappideen (2011) argues that this emphasis on instant financial gain forces management to prioritize immediate profits, sometimes obscuring company information to satisfy investors. Over time, this behavior reduces the long-term value of the business, weakens market efficiency, and harms investors as asset values decline, exacerbating the issue of short-termism.

2.2. Empirical Research

2.2.1. Foreign Research

Short-termism-based papers show that stock liquidity raises the risk of a stock price collapse, suggesting that more liquidity encourages the hoarding and concealing of negative corporate news. Porter (1992) research on institutional investors in the US shows that most belong to the short-term investment school, seek profits within a brief timeframe, and will quickly end their positions when the company's financial report indicates a downward trend. Fang, Noe, and Tice (2014) sampled 80,404 yearly observations from 1971 to 2000 with data from religious organizations from the Association of Religious Data Archives (ARDA). According to the authors' analysis of the observed sample, the more liquid a company is, the more investors who follow this school of thinking are drawn to it since it will be simpler for them to purchase and sell securities at favorable prices due to reduced transaction costs.

Other studies agree that stock liquidity has a positive impact and reduces the risk of price crashes. Edmans, Fang, and Zur (2013) study on how liquidity affects corporate governance looked at 101 hedge funds that participated in block buybacks from 1995 to 2010. The authors said that liquidity will help strategic investors buy a lot of shares at low costs. This alleviates the issue of free riders and encourages investors to buy and accumulate more shares, ultimately resulting in the formation of large shareholders within the company. These shareholders have the right to monitor the activities of leaders and have positive impacts on corporate governance, helping company stock prices increase (Kahn & Winton, 1998; Maug, 1998). Many authors, including Edmans (2009); Admati and Pfleiderer (2009) and Edmans and Manso (2010) have used experiments to show that major shareholders can use their power and put indirect pressure on managers through market transactions. If the management board's compensation is tied to ownership of company shares, major shareholders can exert pressure by simultaneously divesting and selling off ownership shares, causing stock prices to plummet. This causes the value of managers' share ownership to decrease. These sources are limited in what they can show, though, because the results are mostly based on the U.S. stock market, which has a much more developed set of rules and institutions than emerging markets like Vietnam. The application of these findings to markets with different structures and levels of development raises concerns.

2.2.2. Domestic Research

According to Nguyen, Vo, Nguyen, and Le (2021) a company's stock price is greatly impacted by stock liquidity, with less liquid stocks more likely to experience price crash risk. They examined information from all stocks listed

between 2010 and 2019 on the Hanoi and Ho Chi Minh City Stock Exchanges. Their model indicated that stocks with lower liquidity face higher crash risks, as selling becomes more difficult. Stable liquidity boosts investor confidence, enabling better investment decisions. Nguyen et al. (2021) also noted that a high cumulative yield can inflate stock prices above their true value, raising the potential for a future price drop. However, the study focused solely on the period from 2010 to 2019, which may limit the understanding of market dynamics that have shifted post-2019, especially considering recent developments in the stock market of Vietnam. Incorporating new data, particularly after the pandemic, would provide a better grasp of changes in liquidity and stock price collapse risk.

2.3. Research Gaps

First, this study fills in a big hole in our knowledge by focusing on the Vietnamese stock market. It looks at how stock collapse risk and liquidity are related in developed countries, which have their own unique traits and ways of working. Previous research predominantly investigates factors affecting liquidity, often neglecting the impact of liquidity on stock price crash risk. This study seeks to offer empirical evidence that is specifically relevant to the Vietnamese context, offering a new perspective on how liquidity influences crash risk.

Second, the article's observation period sample is pretty short. It's based on the sample space of the two exchanges, Ho Chi Minh City Stock Exchange (HOSE) and Hanoi Stock Exchange (HNX). However, the research was done in the year before 2010, which was a time when Vietnamese stocks tended to fall (Nguyen et al., 2021). The above study used an annual range that is no longer appropriate due to the rapid changes in the stock market. Besides, research on stock price crash risk in Vietnam is limited. Most existing studies tend to focus on analyzing the impact of specific factors, such as foreign investors, while they often neglect the broader influences of common variables like business size, stock liquidity, and other fundamental factors.

In order to stay abreast of that shift, our article focuses on the connection between stock liquidity and stock price collapse risk, how to compute and quantify stock price collapse risk, and the effect of stock liquidity on stock price collapse risk of financial companies on the Ho Chi Minh Stock Exchange on a monthly and annual basis. The research sampling period is from 2016 to 2022. This is also the time when the Vietnamese stock market is tending to go up and become more complete than in previous years. The article can also explore the practical aspects and practical applications of stock liquidity and stock price crash risk in the market.

3. RESEARCH METHODOLOGY

3.1. Data and Sample

The research uses a quantitative approach and focuses on how stock liquidity and stock price collapse risk relate to each other on the Ho Chi Minh Stock Exchange (HoSE). NCSKEW (negative conditional skewness) and DUVOL (down-to-up volatility) are the two main collapse risk metrics used in this study. They come from models created by Chang et al. (2017) and Chen, Hong, and Stein (2001). The data sample includes 350 stock codes from 2016 to 2022, with transaction data (price, volume, daily transaction value) and operational data (financial indicators) collected via FiinPro software; therefore, the analysis is conducted using STATA 14.

The reason for choosing the period 2016-2022 is because this is the period marking the development and expansion stage of the Vietnamese stock market after important reforms since 2015, allowing for a more thorough analysis of the changes and maturity of the market.

3.2. Variable Measurements

3.2.1. Stock Price Crash Risk

Chen et al. (2001) reported that their research employed two techniques to calculate the probability of stock price collapse risk for each company over a given time frame. The following formula, when applied to the first scale, yields the negative deviation in the daily (weekly) return distribution function of the stock:

$$NCSKEW_{it} = -(n(n-1)^{3/2}\sum R_{i,t}^3)/((n-1)(n-2)(\sum R_{i,t}^3)^{3/2})$$

In which: R_{it} represents the daily (weekly) return of stock i during period t, and n is the number of days (weeks) in which the stock's return occurs in period t.

In addition, the DUVOL (down-to-up volatility) method was another criterion put forth by Chen et al. (2001) to quantify the risk of a stock price drop.

The ratio of variance between observations with returns below the average return and observations with returns above the average of the return distribution function over a certain time period t is used to figure out this index. Specifically, we develop the formula as follows:

$$DUVOL_{it} = log\{(n_u - 1)\sum DOWN\, R_{i,t}^2/((n_d - 1)\sum UP\, R_{i,t}^2)\}$$

In which: $DOWNR_{i,t}$and $UPR_{i,t}$ are the values of weeks with lower (higher) average returns; n_u and n_d represent weeks with low and above-average returns, respectively. Similar to NCSKEW, the risk of a price drop increases with this ratio. Days with extreme returns have less of an impact on this strategy.

The third method for estimating stock price crash risk involves the use of a binary variable named CRASH (CRASH_COUNT), which was created and is now commonly used by Hutton, Marcus, and Tehranian (2009). However, the use of this variable in research (due to it being a binary variable) to determine boundaries is ambiguous and inaccurate, so the author chose not to use this method because the CRASH variable is meaningless in the study.

3.2.2. Stock Liquidity

The authors use the measure of Amihud (2002) to measure the stock liquidity on the HOSE.

Measure of stock illiquidity: The Illiquidity (ILL) indicator symbolizes the association between a stock's market value and return, using data collected daily over a long period, providing high representativeness. The advantage of ILL is its ability to record many facets of stock liquidity, including resilience, tightness, and depth. Stocks with low volatility and large trading value typically demonstrate low liquidity costs and the capacity to absorb large volumes without significant price fluctuations. ILL is relatively easy to calculate using market data. However, it doesn't fully account for changes in investor psychology, though it remains one of the best measures of stock liquidity, widely used in research.

Numerous measurements developed by researchers worldwide to measure the stock liquidity listed on the stock market are probably numerous. After comparing measures, Hasbrouck (2009) and Luo, Gong, Lin, and Fang (2016) all agreed that the measure of Amihud (2002) was highly appreciated.

Amihud (2002) stock illiquidity measure shows relatively complete aspects of stock liquidity and is a measure to calculate and collect data. Therefore, the authors use the measure of Amihud (2002) to measure the stock liquidity on the HOSE.

3.2.3. Choice of Measurement Method

The study chose two indexes, NCSKEW and DUVOL, to measure the risk of stock price crash because of their accuracy and comparability with other studies on the market. At the same time, the Amihud method was chosen to measure liquidity because of its high representativeness and ability to measure various aspects of it, such as depth, tightness, and market stability.

The CRASH variable of Hutton et al. (2009) was excluded because it was not suitable for defining boundaries that would ensure precision in measuring continuous variables representing downside risk.

Table 1. Measurement of the control variables.

No	Variable names	Variable symbols	Expectation	Measurement	Sources
1	Price to book value	PB	+	$\frac{\text{Market price per share}}{\text{Book value per share}}$	Chen et al. (2001); Hutton et al. (2009); Kim and Zhang (2014); Hamers, Renders, and Vorst (2016); Callen and Fang (2015); Chang et al. (2017); Chauhan et al. (2017) and Nguyen and Vo (2021)
2	Firm size	SIZE	+	Log (Total assets)	Kousenidis, Ladas, and Negakis (2014); Yuan, Sun, and Cao (2016); Luo et al. (2016); Li and Cai (2016); Habib and Hasan (2017a); Gao, Li, and Drougas (2017) and Nguyen and Vo (2021)
3	Detrended turnover	DTURN	+	(Trading volume t - Trading volume t-1)/ (Total number of shares outstanding for year t and t-1)	Chen et al. (2001), Nguyen and Vo (2021) and Chauhan et al. (2017)
4	Retained earnings	RET	+	Log (Retained earnings)	Chen et al. (2001); Kim and Zhang (2014); Chauhan et al. (2017) and Nguyen and Vo (2021)
5	Standard deviation	STD	+	Log (Earnings per share)	Chen et al. (2001); Gao et al. (2017), Habib and Hasan (2017b); Chauhan et al. (2017) and Nguyen and Vo (2021)
6	Return on assets	ROA	-	$\frac{\text{Net income}}{\text{Average total asset}}$	Nguyen and Vo (2021)
7	Price to earnings ratio	PE	-	$\frac{\text{Share price}}{\text{Earning per share}}$	Nguyen and Vo (2021)
8	Price to sales ratio	PS	+	$\frac{\text{Market capitalization}}{\text{Annual revenue}}$	Nguyen and Vo (2021) and Chauhan et al. (2017)
9	Price to tangible book ratio	PTB	-	$\frac{\text{Market capitalization}}{\text{Tangible book value}}$	Chauhan et al. (2017)
10	Price to cash flow ratio	PCF	-	$\frac{\text{Market capitalization}}{\text{Cash flow from operation}}$	Nguyen and Vo (2021)
11	Dividend payout ratio	DIV	-	$\frac{\text{Dividend per share}}{\text{Earning per share}}$	Chauhan et al. (2017)

3.2.4. Control Variables

Table 1 illustrates the measurement of the control variable and also indicates the authors' expectation of each variable in the model.

3.3. Research Model and Research Hypothesis

3.3.1. Research Model

Figure 1 illustrates the proposed research model, which positions stock price crash risk as the dependent variable, stock liquidity as the independent variable, and twelve control variables.

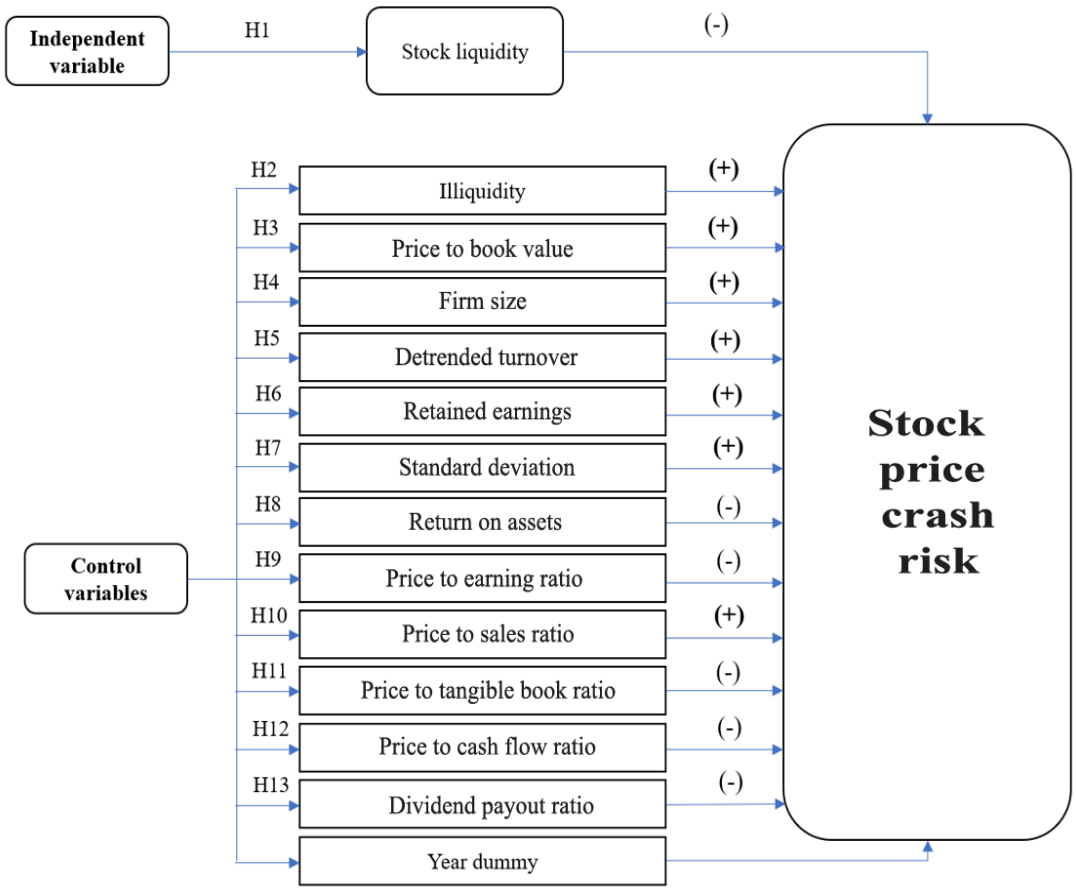

Figure 1. The research model.

The research equation is as follows:

$$CRASHRISK_{t+1,i} = \beta_0 + \beta_1 * ILL_{i,t} + \beta_2 * PB_{i,t} + \beta_3 * SIZE_{i,t} + \beta_4 * DTURN_{i,t} + \beta_5 * RET_{i,t} + \beta_6 * STD_{i,t} + \beta_7 * ROA_{i,t} + \beta_8 * PE_{i,t} + \beta_9 * PS_{i,t} + \beta_{10} * PTB_{i,t} + \beta_{11} * PCF_{i,t} + \beta_{12} * DIV_{i,t} + \varepsilon_{i,t}$$

Where:

- $CRASHRISK_{i,t+1}$: Measure price inflation risk using two quantities $NCSKEW_{t+1,i}$ and $DUVOL_{t+1,i}$ according to the scale of Chen et al. (2001); Chauhan et al. (2017) and Chang et al. (2017).
- $ILL_{i,t}$: Illiquidity index (measured according to the scale of Amihud (2002).
- $PB_{i,t}$; $SIZE_{i,t}$; $DTURN_{i,t}$; $RET_{i,t}$; $STD_{i,t}$; $ROA_{i,t}$; $PE_{i,t}$; $PS_{i,t}$; $PTB_{i,t}$; $PCF_{i,t}$; $DIV_{i,t}$: Control variables from previous studies that may impact the risk of a stock price crash.

3.3.2. Research Hypothesis

Hypothesis H_1: Stock Liquidity negatively impacts Stock Price Crash Risk.

Hypothesis H_2: Illiquidity positively impacts Stock Price Crash Risk.

Hypothesis H_3: Price to Book Value positively impacts Stock Price Crash Risk.

Hypothesis H_4: Firm Size positively impacts Stock Price Crash Risk.

Hypothesis H_5: Detrended Turnover positively impacts Stock Price Crash Risk.

Hypothesis H_6: Retained Earnings positively impacts Stock Price Crash Risk.

Hypothesis H_7: Standard Deviation positively impacts Stock Price Crash Risk.

Hypothesis H_8: Return on Assets negatively impacts Stock Price Crash Risk.

Hypothesis H_9: Price to Earnings ratio negatively impacts Stock Price Crash Risk.

Hypothesis H_{10}: Price to Sales ratio positively impacts Stock Price Crash Risk.

Hypothesis H_{11}: Price to Tangible Book ratio negatively impacts Stock Price Crash Risk.

Hypothesis H_{12}: Price to Cash Flow ratio negatively impacts Stock Price Crash Risk.

Hypothesis H_{13}: Dividend Payout negatively impacts Stock Price Crash Risk.

4. RESULTS AND DISCUSSION

4.1. Descriptive Statistics

Table 2 presents descriptive statistics for the stock price crash risk variable.

Table 2. Statistical table describing independent variables.

Variables	N	Mean	SD	Min.	Max.
NCSKEW	2236	-0.393	1.264	-7.011	6.674
DUVOL	2252	1.119	0.419	0	5
ILL	2096	563.213	11,224.92	0	498,822.3
PB	2395	1.469	1.327	-3.86	21.46
SIZE	2343	12.092	0.734	10.248	14.325
DTURN	1997	2.528	34.286	-318.92	265.812
RET	2288	11.232	0.769	8.044	13.809
ROA	2427	6.377	7.891	-62.46	54.65
PE	2395	36.643	267.119	-568.98	7995.03
PS	2395	1.281	26.966	-1285.49	156.73
PTB	2395	1.570	4.589	-6.13	193.69
PCF	2334	43.201	2504.59	-46,669.26	90,909.84
DIV	2395	0.415	1.673	-3.316	77.190
STD	2260	7.297	1.287	0	10.402

The mean value of the variable NCSKEW is -0.393, and the median value is -0.478, as can be observed in the figure. The distribution of the dependent variable's value (NCSKEW) is skewed to the right (mean>median) because the mean is higher than the median. Compared with previous studies, the calculated values of An and Zhang (2013) produced fairly uniform values. This implies that the phenomenon of price collapse risk in the Vietnamese stock market is not too sensitive compared to the US stock market. Some research articles in other markets, such as Chauhan et al. (2017) in the Indian market, showed the average value of the variables measuring negative price inflation risk, which was similar to the results of the study. The maximum value of NCSKEW, 6.674, is far more than the study publications mentioned above. It is evident that while the stock price collapse risk phenomena in the stock market of Vietnam is not as sensitive as it is in other nations, there are companies that have an increased probability of a stock price crash. This is also reasonable, given that the Vietnamese stock market, despite its strong development, is still in the nascent stages of economic growth, scale, and legal regulations.

4.2. Regression Model

Table 3 indicates that the Fixed Effects Model (FEM) and Random Effects Model (REM) are superior to Pooled Ordinary Least Squares (OLS). The beneficial effect of stock illiquidity on stock price collapse risk is highlighted via GLS regression. It turns out that there is no multicollinearity or autocorrelation when assumption testing is done, but it does show heteroscedasticity, which suggests GLS estimation for regression.

According to the GLS model's results, all effect variables have a 5% threshold of statistical significance. Among the four variables influencing stock price crash risk, Detrended Turnover (DTURN) and Price-to-Cash Flow ratio (PCF) exert a negative impact. In contrast, illiquidity (ILL) and stock return (RET) positively affect stock price crash risk. We also found that eight variables had no significant effect. The link between how liquid a stock is and how likely it is that its price will drop is always statistically significant across all four regression models (OLS, FEM, REM, and GLS). This supports the authors' conclusions even more.

Table 3. The impact of stock liquidity on stock price crash risk using NCSKEW model.

Variables/Models' results	NCSKEW OLS	NCSKEW FEM	NCSKEW REM	NCSKEW GLS	NCSKEW VIF
ILL	-0.000048** (2.24)	-0.000039** (1.22)	-0.000048** (1.85)	-0.000036** (2.29)	1.05
PB	-0.0207** (0.45)	-0.1611** (2.25)	-0.0207** (0.42)	0.0122*** (0.29)	4.79
SIZE	-0.0195* (-0.22)	-0.0412** (-0.19)	-0.0195*** (-0.22)	-0.0626*** (-0.92)	6.32
DTURN	-0.0017*** (-2.94)	-0.0017** (-2.30)	-0.0017** (-2.37)	-0.0015*** (-3.69)	1.01
RET	0.1370* (1.78)	0.1995 (1.46)	0.1370* (1.81)	0.1792*** (3.01)	5.15
STD	-0.0404 (1.34)	-0.1476*** (2.83)	-0.0404 (1.38)	-0.0449* (1.89)	2.12
ROA	0.7202* (1.67)	-0.5183 (-0.59)	0.7202 (1.51)	0.4996 (1.36)	1.86
PE	0.000038 (0.45)	-0.000043 (-0.39)	0.000038 (0.43)	0.000014 (0.18)	1.24
PS	0.0006*** (3.11)	0.00047 (0.46)	0.00064 (0.82)	0.00069 (0.88)	1.01
PTB	-0.0424* (-1.66)	-0.0116 (-0.32)	-0.0424 (-1.30)	-0.0507 (-1.60)	3.26
PCF	-0.000012** (-1.97)	-0.000011 (-1.01)	-0.000012 (-1.28)	-0.000015** (-2.13)	3.26
DIV	0.0577 (1.36)	0.0216 (0.39)	0.0577 (1.36)	0.0403 (1.24)	1.03
_cons	-1.4947*** (-2.83)	-0.8883 (-0.37)	-1.4947*** (-2.83)	-1.4248*** (-3.69)	
Year dummy	Yes	Yes	Yes	Yes	
N	1666	1666	1666	1666	
R^2	0.188	0.048	0.092		
F-test	F(343,1310) = 0.97 Prob>F = 0.0330				
Breusch - Pagan test	Chibar2(01) = 79.66 Prob>chibar2 = 0.0000				
Hausman test	Chi2(10) = 32.50 Prob>chi2 = 0.0003				

Note: *t* statistics in parentheses; * p<0.1, ** p<0.05, *** p<0.01.

Table 4 indicates that they favor the Fixed Effects Model (FEM) and Random Effects Model (REM) over Pooled Ordinary Least Squares (OLS).

Table 4. The impact of stock liquidity on stock price crash risk using DUVOL model.

Variables/Models' results	DUVOL OLS	DUVOL FEM	DUVOL REM	DUVOL GLS	DUVOL VIF
ILL	-0.000014** (1.58)	-0.000012** (0.82)	-0.000014** (1.40)	-0.0000066** (1.08)	1.05
PB	-0.0242** (1.82)	-0.0635** (2.32)	-0.0247** (1.29)	-0.0120*** (1.19)	4.81
SIZE	-0.1381*** (-4.37)	-0.1558* (-1.92)	-0.1374*** (-4.04)	-0.1185*** (-5.18)	6.30
DTURN	-0.00107*** (-3.97)	-0.0011*** (-3.86)	-0.00107*** (-3.74)	-0.00103*** (-5.59)	1.01
RET	0.086*** (3.27)	0.0316 (0.61)	0.0866*** (2.93)	0.0779*** (3.99)	5.14
STD	-0.0417*** (3.26)	-0.0861*** (4.33)	-0.0421*** (3.69)	-0.0352*** (4.59)	2.13

Variables/Models' results	DUVOL OLS	DUVOL FEM	DUVOL REM	DUVOL GLS	DUVOL VIF
ROA	-0.1853 (-1.08)	-0.1816 (-0.55)	-0.1851 (-1.00)	-0.2277** (-2.00)	1.87
PE	0.000017 (0.62)	-0.0000102 (-0.24)	0.000017 (0.50)	0.000022 (1.03)	1.24
PS	0.000124** (2.01)	0.00018 (-0.47)	0.00012 (0.39)	0.00012 (0.68)	1.01
PTB	-0.00709 (1.11)	0.00068 (0.05)	0.0069 (0.55)	0.0025 (0.46)	3.28
PCF	-0.0000026** (-2.04)	-0.0000039 (-0.94)	-0.0000027 (-0.75)	-0.0000017 (-0.67)	1.04
DIV	-0.0109 (-0.71)	0.0057 (-0.27)	-0.0105 (-0.64)	-0.0140 (-1.42)	1.03
_cons	2.15609*** (11.03)	3.3884*** (0.000)	2.1537*** (0.000)	1.927*** (13.62)	
Year dummy	Yes	Yes	Yes	Yes	
N	1669	1669	1669	1669	
R^2	0.0662	0.0652	0.0547		
F-test	F (343,1313) = 11.7 Prob>F = 0.0000				
Breusch - Pagan test	Chibar2(01) = 73.36 Prob>chibar2 = 0.0000				
Hausman test	Chi2(10) = 32.50 Prob>chi2 = 0.0003				

Note: *t* statistics in parentheses; * p<0.1, ** p<0.05, *** p<0.01.

The GLS regression demonstrates a favorable correlation between the likelihood of stock price collapses and stock illiquidity. Assumption tests don't show any signs of multicollinearity or autocorrelation, but they do show heteroscedasticity, which means that GLS estimation is the right choice for the regression analysis.

The GLS model shows that four of the six factors that affect the risk of a stock price crash are negative: firm size (SIZE), detrended turnover (DTURN), standard deviation (STD), and return on assets (ROA). Meanwhile, two variables, stock return (RET) and illiquidity (ILL), positively affect stock price crash risk. Different regression methods (OLS, FEM, REM, and GLS) all show that stock liquidity has a strong positive relationship with the risk of a stock price dropping. This supports the authors' conclusions.

4.3. Discussion

ILL is a measure of how liquid a business is. The regression results for this variable show that it is 5% statistically significant in both the NCSKEW and DUVOL models. The positive coefficient in both models implies that lower stock liquidity leads to a higher risk of a price crash. This finding aligns with the research of Chauhan et al. (2017) conducted in the Indian market, which is considered relevant since both India and Vietnam are emerging markets with similar characteristics, including underdeveloped legal frameworks and unstable stock markets.

Thus, the regression results show that the less liquid a stock is, the more likely it is that a stock price drop will occur. This can be explained by the view of Edmans et al. (2013) this group of authors pointed out that stock liquidity helps strategic investors buy large volumes of stocks at a low cost. Low transaction fees encourage investors to purchase shares and become major shareholders. Low transaction fees, thereby encouraging investors to buy shares and become major shareholders. Admati and Pfleiderer (2009); Edmans (2009) and Edmans and Manso (2010) argue that large shareholders can exert influence by applying indirect pressure on management, which helps decrease the probability of stock market meltdowns. This finding also aligns with Bharath, Jayaraman, and Nagar (2013) who provide evidence of the power major shareholders have when deciding to divest. The results are consistent with studies like "Foreign Investors and SPCR: Empirical Evidence in Vietnam" (Vo, 2017) and "The Relationship between

Stock Liquidity, Corporate Governance, and Corporate Value" (Nguyen & Nguyen, 2017) both of which show a positive relationship between stock liquidity and effective corporate governance. This means that a well-managed company provides clear, transparent information to the market and creates favorable conditions for investors to effectively control the company.

The cumulative yield variable (RET) has statistical significance at the 1% level in both models and a positive regression coefficient. This means that the higher the RET, the more likely it is that prices will crash. This is similar to the viewpoint in the study of Chen et al. (2001) and Kim and Zhang (2014).

The bubble theory of Harvey and Siddique (2000) also provides an explanation for this result. Specifically, a higher cumulative average stock return in the past indicates a more skewed return distribution over time. This increased left-skewness suggests a greater potential for a future downturn, thereby raising the risk of a stock price crash in the future. For stocks whose prices rise too quickly and with high accumulated profits, thanks to the market's heat rather than their actual value, there is also a risk of a price crash afterward.

The PB index variable produces a positive regression coefficient, meaning that the more a business has a market value than its book value, the more likely its stock will slide in price. In the Vietnamese market, there is a typical example of the ROS stock price of FLC Faros Construction Joint Stock Company, where the PB index of this enterprise was very high when the price reached the threshold of two hundred thousand Vietnamese Dong. The price crash risk of returning to its true worth is also considerable since the valuation is excessively high in comparison to its actual value.

The enterprise size variable, SIZE, is statistically significant in both models. With regard to the SIZE variable, the regression coefficient is negative, suggesting that as a company's market capitalization increases, the likelihood of experiencing a stock price crash decreases. Similar findings have been observed in global studies, such as Chen et al. (2001) and Chauhan et al. (2017). In the context of Vietnam, the results from this study align with those from "Foreign Investors and Stock Price Crash Risk: Empirical Evidence in Vietnam," further supporting this relationship. Accordingly, both agree. It is seen that companies with large scale and capitalization often have a low risk of price inflation, which is completely contrary to research in developed countries. This has been explained in the above research article with the argument that most large companies all have professional departments specializing in timely reporting of corporate information to the public.

The difference in average turnover index, DTURN, is statistically significant at the 1% level in both models. The regression coefficient of the DTURN variable has a negative value, implying that when liquidity increases, stock prices tend to decrease due to increased selling pressure or reduced buying demand. However, this result is not following the authors' initial expectations, nor is it consistent with the results (Chauhan et al., 2017).

In the NCSKEW model, the variable Price to Cash Flow Ratio (PCF) is statistically significant at the 5% level. However, it is not in the DUVOL model. The regression analysis shows that the PCF variable has a negative impact, meaning that when it's easier to convert stocks into cash, stock prices often drop. This can happen because higher trading activity may lead to more selling pressure, pushing prices down. Alternatively, if more shares flood the market, the increased supply could also cause prices to fall. These results align with the research conducted by Nguyen (2023).

The Return on Assets (ROA) variable is not statistically significant in the NCSKEW model, but it is significant at the 5% level in the DUVOL model, which shows that it is important in some parts of the analysis. The negative regression coefficient of ROA means that when it goes down, it means the company isn't doing well, which can raise financial risks, make investors less confident, and possibly even lead to earnings manipulation. All of these factors together raise the likelihood of a stock price crash. These findings align with those of Nguyen (2023).

5. CONCLUSION AND RECOMMENDATIONS

The potential for stock price crashes is a major concern for Vietnamese stock market investors. Using data from

the Ho Chi Minh City Stock Exchange (2016–2022), several crash risk events were noted, which caused the stock market index to drop and investor confidence to wane.

Using the GLS model to do regression, we see that stock liquidity is negatively related to stock price crash risk. This means that stocks that are more liquid have a lower chance of going down in price. Specifically, the illiquidity index (ILL) shows a positive relationship with crash risk, while the inventory turnover ratio (DTURN) shows a negative relationship. This suggests that less liquid stocks and those with lower turnover ratios are at a higher risk of crashes, aligning with the findings of Chauhan et al. (2017).

Other business characteristics, such as firm size (SIZE), also play a role in crash risk. Larger firms exhibit lower crash risk, while higher values of the price-to-book ratio (PB), cumulative return (RET), and standard deviation of returns (STD) increase the likelihood of stock price crashes. Based on the results above, the authors propose the following recommendations:

Firstly, investors should consider stock liquidity (ILL), as stock price collapses are more likely when there is insufficient liquidity. Investors should think carefully before choosing to invest in businesses that seem to be breaking information disclosure laws, purposefully withholding financial reports, or exhibiting anomalous stock price increases, as the information system is directly linked to the stock liquidity. For these groups of stocks, investors need to be wise to avoid becoming victims of price crash risk in the market. Additionally, investors should evaluate cumulative returns (RET) and the price-to-book ratio (PB) to confirm the stock's solid fundamentals and avoid overvaluation. Large companies (SIZE) generally pose lower crash risks. Lastly, investors should assess stock volatility (STD returns) and cash flow (PCF), as high levels can increase risk and depress stock prices. By focusing on these factors, investors can reduce risks in the HOSE market.

Secondly, regulators must enforce clear rules to prevent illegal trading and fraud through stricter regulations and transparent price disclosures. Next, leveraging advanced technology in trading and information management can enhance liquidity and reduce the risk of stock price crashes. Furthermore, compared to other markets, the Vietnamese market still has high transaction costs, and the stock settlement period (T+2) is still relatively lengthy. The State Securities Commission of Vietnam should consider lowering transaction fees and speeding up market trading processes. In the future, measures to improve liquidity could include reducing transaction and brokerage fees while shortening the stock settlement period. Additionally, encouraging more value investors and increasing the supply of securities will enhance liquidity and promote more active trading. It's also important for the Commission to raise the quality of market regulation, closely monitor, and take strict action against price manipulation through virtual accounts or large trades that create fake liquidity. Streamlining the legislative process could further improve the efficiency of the trading system and increase market liquidity.

Thirdly, to improve financial performance and build investor trust, companies must take key actions. First, they should enhance internal controls to ensure high-quality financial reports, which strengthen transparency and reveal weaknesses in financial processes. Moreover, companies should provide timely, accurate, and comprehensive financial information, going beyond regulatory requirements to reduce information asymmetry. Next, the listed firms also need to note that effective liquidity risk management is critical to maintaining financial stability and operational resilience.

Finally, for audit firms, data should be collected from diverse sources, including audits, mandatory reports from audited units, and open online data. Next, auditing firms must rethink recruitment strategies to align with the technological demands of the 4.0 era while also focusing on systematic training to leverage new technologies. In addition, the audit industry must prioritize six key tasks: building technical and data infrastructure, developing software and analysis tools, ensuring cybersecurity, standardizing processes, and advancing human resource development. Moreover, the industry should adopt technologies such as cloud computing, Big Data, AI, and mobile applications to enhance global and domestic cooperation.

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