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Impact of Financial Liberalization on Firm Risk[1]

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Abstract

Purpose: This study investigates the impact of financial liberalization on firm risk and examines the relationship between liberalization and firm risk from a global perspective by using three different measures of financial liberalization to analyze the entire sample as well as four different subsamples by using firms from different countries as our samples.

Design/methodology/approach: We use the pooled ordinary least squared (OLS) regression model and a series of robustness checks to conduct our analysis by using our sample that includes 63 countries, 18,317 firms, and 161,317 firm-year observations from 1991–2017.

Findings: Our empirical analysis concludes that financial liberalization has a significantly negative effect on firm risk. Following a series of robustness checks, we find that the results remain unchanged after categorizing our sample into subsamples according to the level of financial liberalization, controlling for changes in the economic development status, and dividing the sample periods based on the time of the financial crises. Moreover, the quantile regression reveals the asymmetric effect of financial liberalization on firm risk. The findings of our study contribute to a clear perception of how financial liberalization affects firm risk.

Originality/value: In this paper, we use the data from multination to know clearly how different countries respond to the financial liberalization policies which may affect the firm risk. Then, we conduct a series of robustness checks to make sure that our result is robust. According to the result, we can see that the negative significant relationship between financial liberalization and firm risk remains unchanged after categorizing our sample into subsamples according to the level of financial liberalization, controlling for changes in the economic development status, and dividing the sample periods based on the time of the financial crises. Furthermore, the quantile regression reveals the asymmetric effect of financial liberalization on firm risk. We note that our findings are new in the literature.

Practical Implication: The findings of our paper give suggestions to multinational corporations regarding the proper management of corporate finance in response to adjustments in financial liberalization policies.

Keywords: Liberalization, Financial Liberalization, Firm Risk, Risk Management, Economic Development.

JEL Classification: G15, G18, G30, G32, F63

1. Introduction

With the rapid improvement in technology and trading, the last 30 years have witnessed global liberalization. Equity market liberalizations allow domestic investors to invest in foreign equity securities and endow them with the right to transact in domestic equity securities. Thus, the rise in financial liberalization originates from the government liberalizing restrictions on events, such as multiple exchange rates, increased capital flows by residents and non-residents, and the growth of imports and exports. The reasons mentioned above improve and speed up the circulation of capital flows in countries and firms.

Numerous earlier studies have discussed how liberalization can affect corporate risk as well as financial management policies. In addition, most previous research has focused on a particular country or market; only a few studies analyze global data. Additionally, despite the increasing number of studies examining how liberalization affects firm risk, the empirical results of previous studies differ. The inconsistency in the results may originate from the difference in the research method, sample period, or major financial crisis included in the sample period. As a result, we chose firms from different countries as samples to run an empirical analysis of the relationship between financial liberalization and firm risk globally by using three different measures of financial liberalization.

New technologies for financial risk are important as risk management is a crucial topic in corporate finance. Broll et al. (2015) claimed that financial risks are at the core of financial intermediation. According to Trang et al. (2021), rising income from interest increases the liquidity risk and suggests that banks with growth in credit activities tend to increase liquidity risk. Adebayo et al. (2022) examined that there exist financial risk and economic risks are related in a time-frequency domain. Egozcue et al. (2015) mentioned that sometimes, risk aversion and risk loving are associated with problems involving increments/decrements of wealth. Guo and Wong (2019) investigated that linear-regret firms produce more than purely risk-averse counterparts and produce less than firms under uncertainty. Also, claimed that regret-averse firms produce less than firms produce less than firms under uncertainty only under some sufficient conditions. Even though technologies and methodologies for measuring risk have attained remarkable levels of complexity and sophistication, the financial crisis of 2007-2008 suggests that substantial improvements in financial institutions are urgently needed to measure and manage risk (Baker & Filbeck, 2014). Moreover, financial institutions could lower systematically risk by adopting suggested changes to risk management and employing innovative methods for analyzing risks and regaining both market and customers to mitigate the impact of the next financial crisis, and according to Trang et al. (2022), the profitability of firms may suffer as a result of the crisis. By using the cross-hedging strategy as opposed to real exchange rate risk exposures, Broll et al.(2001) claimed that transition economies can increase gains from international trade. Furthermore, they pointed out that cross-hedging facilitates international trade and enhances welfare. Previous findings reveal that the variable leverage (LEV) has a negative impact on ROA, but interestingly, has a positive impact on

ROE and Tobin's Q (Suu et al. 2021). In this study, we found that the leverage (LEV) shows a positive significant relationship with the firm risk while ROA shows a negative significant relationship.

Hence, many developing countries have opened their capital markets to foreign investors, creating an ideal laboratory to explore the impact of financial liberalization on firms' financial policies in emerging equity markets. Predicting volatility in capital markets is important to determine the cost of capital and firms' financial policies. An increase in volatility implies an increase in risk and cost of capital of firms, which may influence investment policies and operating decisions.

Singh (1997) mentions that a Keynesian view of expanding equity markets in developing countries suggests that volatility will increase because of accelerated transactions, which can have an unstable effect on the real economy. Jayasuriya (2005) indicates that following market liberalization, there has been a major rise in fluctuation in Colombia, Pakistan, and Venezuela.

In contrast, some financial liberalization theses predict that a decrease in volatility follows the opening up of equity markets to foreign investors. In light of the different arguments, many scholars have examined the real influence of financial liberalization on firm risk. Kwan and Reyes (1997) found that the volatility of stock returns is lower after stock market liberalization in Taiwan. Kassimatis (2002) also suggested that volatility decreased after implementing important liberalization policies. Hargis (2002) shows that volatility declines significantly with different forms of foreign investment liberalization in Latin American markets. However, there is an insignificant increase in volatility in Asian markets. Jayasuriya (2005) also finds that market volatility remains unchanged following liberalization in Chile, Greece, Jordan, the Philippines, Taiwan, Thailand, Turkey, and Zimbabwe. Moreover, Bekaert and Harvey (1997) concluded that market volatility was significantly diminished after liberalization in Mexico, Argentina, Taiwan, and Brazil, whereas Huang and Yang (2000) indicated that this kind of behavior was observed only in the market of Argentina.

Although numerous studies examine the influence of liberalization on firm risk, we find that the empirical results of past research differ. The inconsistency in results may originate from the difference in the research method, sample period, or major financial crisis included in the sample period.

This study offers several contributions. We run an empirical analysis of the relationship between liberalization and firm risk from a global perspective. Our sample includes 63 countries, 18,317 firms, and 161,317 firm-year observations from 1991–2017. The empirical findings show that financial liberalization considerably reduces corporate risk. We then conducted a series of robustness checks for more accurate and robust results. The first one is the quantile regression. It could reveal the asymmetric effect of conditional variables (financial liberalization) on the dependent variables (firm risk). Besides, we try to divide our sample into different subsamples to perform the robustness check. First, we divide our sample into subsamples according to the level

of financial liberalization. Second, we classify the countries we used in our sample according to the economic development statuses: developed economies and developing economies. Finally, we divide the sample period by the time of the financial crisis. All results show a significant negative relationship between financial liberalization and firm risk after various robustness checks. Thus, we can conclude that firm risk shows a significant negative effect on financial liberalization. The findings suggest that multinational companies should manage corporate finance appropriately in response to changes in financial liberalization policies.

The rest of the paper is structured as follows. The theoretical underpinnings of the empirical tests are described in Section 2. The methods and data are presented in Section 3 of the paper. The main empirical findings are reported in Section 4, and robustness tests are discussed in Section 5. The findings of this study are concluded in Section 6.

2. Literature Review

2.1 The Effect of Financial Liberalization on Financial Management

Many previous studies mention how liberalization can influence financial management policies. Henry (2000a) indicates that stock market liberalization is a decision by a country's government to allow foreigners to purchase shares in that country's stock market. Bekaert and Harvey (2000) and Henry (2000b) find that a country's cost of equity capital stock reduces after market liberalization. Some studies also explored the cost of equity capital (Stapleton & Subrahmanyam, 1977; Alexander et al. 1987; Stulz, 1999).

Next, we discuss the impact of stock market liberalization events on corporate financing choices. Empirical studies by Flavin and O'Connor (2010) find that stock market liberalization improves operating performance and promotes the growth of these firms (Chari & Henry, 2004; Gupta & Yuan, 2009; Henry, 2000a; Li, 2003; Mitton, 2006). To reduce the risk of a stock market crash, and improve the valuation, Nguyen et al. (2021) suggested that corporations should enrich their information disclosure through periodic reports. In addition, they also recommend strengthening corporate governance and financial supervision to maintain sustainability in the future.

2.2 The Effect of Financial Liberalization on Firm Risk

Some scholars have explored the influence of liberalization on firm risk in the past, but the empirical results have been conflicting. The inconsistency in results may originate from the difference in the research method, sample period, or major financial crisis included in the sample period.

Singh (1997) mentions that a Keynesian view of the expansion of equity markets in these developing suggests that volatility will increase because of the quicker pace of transactions, which

can be unstable in the real-world economy. By contrast, the financial liberalization theses speculate that a decrease in volatility follows the opening up of equity markets to foreign investors.

Hargis (2002) found that volatility declines significantly with different forms of foreign investment liberalization in Latin American markets. However, there is an insignificant increase in volatility in Asian markets (South Korea, Malaysia, Taiwan, and Thailand). Jayasuriya (2005) indicates that three countries—Colombia, Pakistan, and Venezuela—experienced a huge increase in volatility, while seven countries—Argentina, Brazil, India, South Korea, Malaysia, Mexico, and Nigeria—experienced a significant decrease. The eight remaining countries—Zimbabwe, Chile, Greece, Jordan, the Philippines, Taiwan, Thailand, and Turkey—exhibited no noticeable difference in volatility after market liberalization. Huang and Yang (2000) show that Chile and the Philippines experienced diminished volatility, South Korea and Mexico suffered from greater volatility, and Brazil experienced instability and it is impossible to identify a clear pattern after market liberalization.

Moreover, Kwan and Reyes (1997) use the GARCH methodology to investigate the impact of stock market liberalization on the distribution of stock returns yielded by the Taiwan Weighted Index from 1988 to 1994. The empirical results indicate that the volatility of stock returns is lower after stock market liberalization in Taiwan. Kassimatis (2002) also suggests that volatility fell after the implementation of important liberalization policies. Bekaert and Harvey (1997) concluded that market volatility was significantly diminished after liberalization in Mexico, Argentina, Taiwan, and Brazil.

Furthermore, Suu et al. (2023) support that investors should consider the appropriate risk management activities of commercial banks to make reasonable decisions. To reduce the liquidity risk, the local commercial banks should plan suitable risk management programs and make the best decision according to the situation. Besides the liquidity risk, Naveed et al. (2023) examine the major factors that influence the household's willingness to invest in stocks. They claimed that factors such as uncertainty, trust issues, limited knowledge about finance, risk, information transparency issues, complicated processes, non-Islamic views about stock investment, and tax reduce the willingness of people to invest in stock markets. In such cases, the increase in financial liberalization may reduce those factors and can attract more households to invest in the stock market as financial liberalization reduces the firm risk and may improve economic growth.

3. Data and methodology

3.1 Data

The major objective of this study is to examine whether financial liberalization affects firm risk. Even though the proxy for financial liberalization is measured at the country level, this study is a

firm-level analysis with the majority of the data and sample being at the firm level. The primary of firm-level data is the Worldscope database, and the source for measuring firm risk in this study is the Datastream database. The financial liberalization measures are archived from the webpage of each author and will be discussed in detail in the following section. We set several criteria for constructing our sample. Both the assets and sales of the sample companies have to be positive. Financial and utilities companies are not included, because their investment and financing activities are highly regulated. Moreover, we winterize all variables at the top and bottom 1% of observations. Our sample period covers from 1991 to 2017 and the full samples of the risk determinants model include 161,317 firm-year observations.

3.2 Methodology

3.2.1 Regression Model

We first adopt the pooled (OLS) regression model to verify whether liberalization influences a firm's risk as expressed by the following equation:

$$Risk_{ijt} = \alpha_0 + \beta_1 Liber_{jt-1} + \sum_{n=1}^{N} \gamma_n CV_{nijt-1} + Country\ dummies + Industry\ dummies + Year\ dummies + \varepsilon_{ijt}, \quad (1)$$

where *i, j*, and *t* refer to the firm, country, and year, respectively; $Risk_{ijt}$ represents the risk of firm *i* in country *j* in year *t*. Firm risk is based on a market-based method which is introduced below. To control the endogeneity problem, we add lagged term of the firm's liberalization in the model; $Liber_{ijt-1}$ represents the liberalization of firm *i* in country *j* in year *t*-1; CV_{nijt-1} represents the value of the *nth* control variable in firm *i* in country *j* in the previous period (year *t*-1), which includes firm size, return on assets, market-to-book ratio, capital expenditure, leverage, sales growth, quick ratio, fixed asset ratio. We also consider the country, industry, and year fixed effects (*country*, *industry*, and *year dummies* variables, respectively).

3.2.2 Measures of Financial Liberalization

This study then adopts three different financial liberalization *de jure* measures: *Kaopen*, *CAPITAL*, and *Fin_Cur*. These indices are available on each author's website.

Chinn and Ito (2006, 2008) constructed Kaopen to identify an extensive financial liberalization index. *Kaopen* is based on binary dummy variables codifying the tabulation of restrictions on cross-border financial transactions disclosed in the Annual Report on Exchange Arrangement and Exchange Restrictions (AREAER) of the IMF. Moreover, *Kaopen* includes information on financial current accounts and capital accounts.

We also adopt indices from Quinn and Toyoda (2008). Based on the regulation of AREAER, Quinn and Toyoda (2008) structured two liberalization indices: the financial current account (*Fin_Cur*)

and capital account (*CAPITAL*) *CAPITAL* reflects the restrictions on capital outflows and inflows, which correspond to restrictions on residents and non-residents. *Fin_Cur* also distinguishes between restrictions on residents and nonresidents in terms of import payments, receipts from exports, invisible payments, and receipts from invisibles. The period of available data for *Kaopen* is 1991 to 2017, and 63 countries are matched to firm-level data. Nevertheless, the period of available data for *CAPITAL* and *Fin_Cur* is from 1991 to 2017. Only 44 countries are matched to firm-level data.

3.2.3 Measure of Firm Risk

Following Dewan and Ren (2011), we adopt the determinants of the firm risk model to examine how financial liberalization alters the determinants of firm risk. They used the standard deviation of monthly stock returns to calculate the market-based measure of firm risk. In this paper, we follow Bouslah, Kryzanowski, and M'Zali (2013) to describe our firm risk as follows. The measure of firm risk is the annualized standard deviation from daily stock return calculated over the year. We use daily stock returns to calculate the annual standard deviation. Per year, we obtained one standard deviation. To calculate the average standard deviation, we use five-year yearly return data.

3.2.4 Control variables

By related literature, namely Ashbaugh-Skaife et al. (2009), Jo and Na (2012), Sila et al. (2016), Gu and Kim (2002), and Li et al. (2019), we add a group of control variables including firm size (*SIZE*), return on asset (*ROA)*, market-to-book ratio (*MB*), capital expenditure (*CAPXR*), leverage (*LEV*), sales growth rate (*SG*), quick ratio (*QR*), fixed asset ratio (*PPEN*). *SIZE* is defined as the natural log of the market value of equity (Ashbaugh-Skaife et al., 2009). *ROA* denotes the ratio of operating income before depreciation to total assets (Jo & Na, 2012). *MB* denotes the ratio of the market value of assets to the book value of assets (Jo & Na, 2012). *CAPXR* is calculated as capital expenditure divided by total assets (Sila et al., 2016). *LEV* is defined as total debt divided by total assets (Ashbaugh-Skaife et al., 2009). *SG* represents the sales growth rate from t - 1 to t (Jo & Na, 2012). *QR* is calculated as the sum of cash, marketable securities, and accounts receivable divided by current liabilities (Gu & Kim, 2002). *PPEN* is calculated as net fixed assets divided by total assets (Li et al., 2019).

4. Empirical findings

4.1 Preliminary findings

4.1.1 Sample description

Our sample data includes 63 countries, 18,317 firms, and 161,317 firm-year observations (Table 1). Average financial liberalization shows 75.10 (*Kaopen*), 85.58 (*CAPITAL*), and 54.58 (*Fin_Cur*),

respectively, and the average firm risk (*aAVG_YSD*) is 2.64%. Our firm-year observations come mostly from Japan, the United States, China, and Korea, accounting for 21.49%, 16.05%, 8.66%, and 6.03% of the total sample size, respectively. Some European countries also participate in all sample firms. Moreover, with financial liberalization being the main variable in this study, we find that Canada, Germany, Switzerland, the United Kingdom, and the United States exhibit the highest level of liberalization. All three different measures of liberalization attain 100, whereas China exhibits the lowest level of liberalization, with *Kaopen*, *CAPITAL*, and *Fin_Cur* being 16.58, 14.19, and 49.65, respectively. Thus, most high-liberalization countries are European countries and other developed countries.

Developed countries have a high level of economic development and frequent contact with other countries regarding commerce. With frequent commercial trade, financial liberalization policies become increasingly important. Capital flows between countries have increased, and the government has also paid more attention to foreign exchange. Thus, the level of financial liberalization in a country is inseparable from the economic development and restrictions on trading.

In this paper, we used variance inflation factors (VIFs) to measure the degree of multicollinearity of each control variable in the regression models. However, our results indicated that most VIFs were less than 2. Therefore, the correlation between the variables is quite low, as is the probability of multicollinearity.

Table 1. Sample distribution, financial liberalization, and firm risk by country.

Country	Number of firm-years	Percentage	Number of firms	Percentage	*Kaopen*	*CAPITAL*	*Fin_Cur*	*aAVG_YSD*
United Arab Emirates	147	0.09%	25	0.14%	100.00	.	.	0.0269
Argentina	480	0.30%	38	0.21%	28.61	85.01	74.91	0.0248
Australia	2,949	1.83%	382	2.09%	77.10	87.50	75.00	0.0299
Austria	546	0.34%	42	0.23%	99.47	93.75	87.50	0.0219
Belgium	853	0.53%	57	0.31%	97.44	100.00	97.55	0.0216
Bangladesh	55	0.03%	24	0.13%	16.58	.	.	0.0233
Bulgaria	231	0.14%	64	0.35%	100.00	.	.	0.0369
Brazil	2,018	1.25%	208	1.14%	40.59	34.78	50.00	0.0291
Canada	3,321	2.06%	364	1.99%	100.00	100.00	100.00	0.0288
Switzerland	1,809	1.12%	147	0.80%	100.00	100.00	100.00	0.0206
Chile	989	0.61%	113	0.62%	70.38	87.37	75.47	0.0149
China	13,964	8.66%	1,991	10.87%	16.58	14.19	49.65	0.0282
Colombia	149	0.09%	27	0.15%	33.20	87.27	76.62	0.0184
Cyprus	116	0.07%	25	0.14%	88.28	.	.	0.0265
Germany	4,582	2.84%	402	2.19%	100.00	100.00	100.00	0.0251

Denmark	1,191	0.74%	74	0.40%	99.94	100.00	100.00	0.0221
Egypt	374	0.23%	68	0.37%	57.47	93.33	87.50	0.0236
Spain	1,227	0.76%	102	0.56%	97.70	99.77	90.47	0.0221
Finland	1,272	0.79%	97	0.53%	99.24	98.06	98.71	0.0229
France	5,201	3.22%	422	2.30%	98.66	93.72	95.54	0.0242
United Kingdom	5,462	3.39%	479	2.62%	100.00	100.00	100.00	0.0219
Greece	1,301	0.81%	165	0.90%	97.57	99.56	99.75	0.0344
Croatia	241	0.15%	47	0.26%	69.88	.	.	0.0286
Hungary	100	0.06%	14	0.08%	92.21	89.06	88.84	0.0271
Indonesia	1,451	0.90%	202	1.10%	63.59	75.00	57.65	0.0344
India	6,573	4.07%	1,051	5.74%	16.58	58.87	49.98	0.0295
Italy	1,867	1.16%	169	0.92%	98.55	100.00	98.80	0.0222
Jordan	346	0.21%	69	0.38%	100.00	.	.	0.0194
Japan	34,674	21.49%	2,799	15.28%	99.50	87.50	90.26	0.0241
Kenya	90	0.06%	24	0.13%	69.88	93.75	75.00	0.0267
Korea	9,724	6.03%	1,355	7.40%	58.04	74.65	64.12	0.0310
Kuwait	6	0.00%	3	0.02%	69.88	.	.	0.0231
Sri Lanka	758	0.47%	131	0.72%	33.95	72.50	50.00	0.0311
Lithuania	73	0.05%	14	0.08%	74.41	.	.	0.0245
Morocco	212	0.13%	41	0.22%	16.58	43.75	37.50	0.0206
Mexico	1,273	0.79%	95	0.52%	67.35	94.33	62.50	0.0183
Macedonia, FYR	59	0.04%	17	0.09%	44.89	.	.	0.0220
Malaysia	5,720	3.55%	666	3.64%	36.99	81.73	40.97	0.0301
Namibia	62	0.04%	8	0.04%	16.58	.	.	0.0283
Nigeria	111	0.07%	36	0.20%	30.13	.	.	0.0240
Norway	706	0.44%	80	0.44%	97.51	100.00	100.00	0.0285
New Zealand	464	0.29%	54	0.29%	100.00	100.00	97.39	0.0212
Oman	129	0.08%	35	0.19%	100.00	.	.	0.0146
Pakistan	906	0.56%	114	0.62%	16.09	51.94	37.50	0.0254
Peru	827	0.51%	102	0.56%	99.76	100.00	100.00	0.0198
Philippines	851	0.53%	104	0.57%	38.28	82.60	74.55	0.0312
Poland	1,527	0.95%	281	1.53%	48.12	85.71	70.92	0.0277
Portugal	525	0.33%	41	0.22%	98.59	100.00	87.50	0.0234
Qatar	124	0.08%	20	0.11%	100.00	.	.	0.0198
Romania	143	0.09%	40	0.22%	100.00	.	.	0.0318
Russia	517	0.32%	134	0.73%	60.19	64.71	47.79	0.0255
Saudi Arabia	488	0.30%	90	0.49%	69.88	.	.	0.0222

Singapore	3,705	2.30%	474	2.59%	99.48	100.00	98.34	0.0347
Slovenia	106	0.07%	19	0.10%	76.13	.	.	0.0213
Sweden	2,150	1.33%	223	1.22%	98.05	100.00	87.50	0.0264
Thailand	6,425	3.98%	651	3.55%	27.27	53.53	42.80	0.0206
Tunisia	148	0.09%	30	0.16%	16.58	.	.	0.0173
Turkey	1,689	1.05%	215	1.17%	36.41	75.33	78.81	0.0264
Ukraine	61	0.04%	22	0.12%	0.00	.	.	0.0260
United States	25,891	16.05%	3,196	17.45%	100.00	100.00	100.00	0.0283
Venezuela, RB	113	0.07%	14	0.08%	29.97	62.65	59.76	0.0290
Vietnam	576	0.36%	155	0.85%	41.56	.	.	0.0273
South Africa	1,669	1.03%	166	0.91%	17.21	35.29	47.57	0.0259
Sum	161,317	100.00%	18,317	100.00%				
Mean					75.10	85.58	84.58	0.0264

Notes: The firm risk (*aAVG_YSD*), is the annualized average standard deviation of daily stock returns calculated over five years following the year of the data (i.e., five observations).

Following Fama and French (1997), we classify the firms into (43) industries. Machinery, business services, and wholesale are the top three industries with the highest firm-year observations, shown as 6.20%, 5.77%, and 5.74% of the total sample size, respectively (Table 2). Different industries exhibit different levels of liberalization. Medical equipment, defense, and aircraft exhibited the highest level of financial liberalization, whereas coal exhibited the lowest level. Medical equipment reveals the highest liberalization, while *Kaopen*, *CAPITAL*, and *Fin_Cur* are 93.47, 97.53, and 96.64, respectively. Coal displays the lowest liberalization, for which *Kaopen*, *CAPITAL*, and *Fin_Cur* are 50.31, 66.71, and 68.56, respectively.

Medical equipment, defense, and aircraft rely heavily on cooperation and trade between countries. All these industries have relatively high levels of financial liberalization owing to frequent commercial transactions and the circulation of high capital flows. Nevertheless, there are relatively more restrictions on the policies of operating and trading in coal, which are part of oligopoly or monopoly industries. Thus, a low level of financial liberalization is typical in the coal industry worldwide.

Table 2. Sample distribution, financial liberalization, and firm risk by industry.

Industry	**Number of firm-years**	**Percentage**	**Number of firms**	**Percentage**	***Kaopen***	***CAPITAL***	***Fin_Cur***	***aAVG_YSD***
Agriculture	2,499	1.55%	319	1.74%	58.27	77.39	71.23	0.0257
Food Products	6,506	4.03%	702	3.83%	69.57	82.00	77.93	0.0229
Candy & Soda	1,431	0.89%	127	0.69%	76.45	85.71	80.83	0.0206

Beer & Liquor	1,612	1.00%	168	0.92%	75.54	85.89	85.42	0.0227
Tobacco Products	215	0.13%	27	0.15%	70.89	85.57	76.49	0.0214
Recreation	1,478	0.92%	160	0.87%	82.36	86.03	88.06	0.0292
Entertainment	1,511	0.94%	220	1.20%	81.05	93.02	89.80	0.0254
Printing and Publishing	1,908	1.18%	188	1.03%	79.55	90.89	89.01	0.0246
Consumer Goods	4,831	2.99%	494	2.70%	72.15	83.90	83.53	0.0257
Apparel	2,478	1.54%	258	1.41%	71.89	82.77	81.11	0.0265
Healthcare	1,128	0.70%	152	0.83%	73.88	85.93	82.62	0.0250
Medical equip.	2,671	1.66%	302	1.65%	93.47	97.53	96.64	0.0271
Pharmaceutical Products	5,003	3.10%	636	3.47%	64.13	80.27	82.33	0.0265
Chemicals	8,750	5.42%	875	4.78%	64.66	78.49	77.62	0.0257
Rubber and Plastic Products	2,079	1.29%	230	1.26%	73.62	87.40	84.73	0.0272
Textiles	3,244	2.01%	365	1.99%	56.47	75.49	74.28	0.0285
Construction Materials	8,974	5.56%	931	5.08%	71.64	86.86	83.04	0.0260
Construction	8,032	4.98%	972	5.31%	71.74	82.20	81.62	0.0271
Steel Works Etc	6,551	4.06%	726	3.96%	63.04	79.94	77.75	0.0279
Fabricated Products	913	0.57%	119	0.65%	67.17	82.22	76.87	0.0299
Machinery	10,004	6.20%	1,009	5.51%	80.10	87.73	88.90	0.0272
Electrical equip.	3,475	2.15%	377	2.06%	70.05	82.86	85.20	0.0281
Automobiles and Trucks	6,665	4.13%	637	3.48%	72.05	85.10	84.12	0.0267
Aircraft	1,081	0.67%	86	0.47%	91.77	94.14	95.24	0.0248
Shipbuilding	586	0.36%	68	0.37%	78.05	86.98	84.85	0.0277
Defense	172	0.11%	14	0.08%	89.03	98.54	100.00	0.0257
Precious Metals	1,086	0.67%	206	1.12%	85.68	88.63	87.50	0.0356
Mining	1,835	1.14%	266	1.45%	74.67	81.04	81.75	0.0293
Coal	647	0.40%	97	0.53%	50.31	66.71	68.56	0.0296
Petroleum and Natural Gas	3,439	2.13%	464	2.53%	77.28	89.13	85.35	0.0264
Communication	3,475	2.15%	422	2.30%	76.04	88.20	83.03	0.0237
Personal Services	1,109	0.69%	148	0.81%	87.63	94.10	95.37	0.0258
Business Services	9,315	5.77%	1,324	7.23%	85.46	92.14	91.80	0.0281
Computers	3,793	2.35%	455	2.48%	84.00	91.41	92.91	0.0289
Electronic equip.	7,974	4.94%	936	5.11%	80.13	88.08	88.62	0.0302
Measuring equip.	2,568	1.59%	263	1.44%	90.84	93.59	94.23	0.0294
Business Supplies	3,678	2.28%	337	1.84%	72.27	87.74	84.28	0.0258
Shipping Containers	1,208	0.75%	115	0.63%	72.34	86.79	81.53	0.0244
Transportation	5,338	3.31%	675	3.68%	76.44	84.94	84.93	0.0246
Wholesale	9,254	5.74%	993	5.42%	79.66	86.55	86.20	0.0254

Retail	9,149	5.67%	991	5.41%	81.20	87.90	88.52	0.0248
Restaurants, Hotels, Motels	3,314	2.05%	414	2.26%	79.81	83.88	81.81	0.0225
Other	338	0.21%	53	0.29%	83.46	94.03	94.49	0.0237
Sum	161,317	100.00%	18,321	100.00%				
Mean					75.10	85.58	84.58	0.0264

4.1.2 Difference in firm risk between high- and low-liberalization

Table 3 displays the differences in risk for the firms confronted with different levels of liberalization. We divide our sample firms into two groups according to median liberalization: low-liberalization firms (lower than median liberalization) and high-liberalization firms (above median liberalization). The variations of mean and median were evaluated using the t-test and Wilcoxon rank-sum test. Based on different calculation methods, high-liberalization firms show lower mean and median values with significance levels.

The results show that firms with higher liberalization exhibit a decrease in firm risk. For example, Panel A of Table 3 illustrates that the difference in the liberalization mean (median) with the *Kaopen* measure between low and high liberalization is 0.0020 (0.0040), both of which are statistically significant at the 1% significance level. Panel B of Table 3 shows that the difference in the liberalization mean (median) with *CAPITAL* measure between low and high liberalization is 0.0015 (0.0031), which is statistically significant at the 1% significance level. Lastly, Panel C of Table 3 demonstrates that the difference in the liberalization mean (median) with *Fin_Cur* measure between low and high liberalization is 0.0021 (0.0036), which is statistically significant at the 1% significance level.

Table 3. Difference in firm risk between high- and low-liberalization.

Panel A. The sample firms are classified based on liberalization, using the *Kaopen* measure			
	Low Liberalization	High Liberalization	The difference between mean and median
Mean	0.0276	0.0256	0.0020***
Median	0.0271	0.0231	0.0040***
Panel B. The sample firms are classified based on liberalization, using the *CAPITAL* measure			
	Low Liberalization	High Liberalization	The difference between mean and median
Mean	0.0263	0.0248	0.0015***
Median	0.0253	0.0222	0.0031***
Panel C. The sample firms are classified based on liberalization, using the *Fin_Cur* measure			
	Low Liberalization	High Liberalization	The difference between mean and median
Mean	0.0268	0.0247	0.0021***
Median	0.0258	0.0222	0.0036***

Notes: This table presents the differences in firm risk between high- and low-liberalization: low-liberalization firms (below the median of liberalization) and high- high-liberalization firms (above the median of liberalization). Differences in the mean and median are assessed using the t-test and the Wilcoxon rank-sum test. ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

4.2 Regression results

The observed results in Table 4 illustrate the impact of financial liberalization on firm risk, with financial liberalization measured by *Kaopen*. In Model 1 of Table 4, our main variable, financial liberalization (*Kaopen*), has a negative effect on firm risk (*Risk*), with significance at the 1% level. The regression coefficient was -0.0005. This means that higher financial liberalization results in lower firm risk. Although we include country, industry, and year dummies in Model 2, the result of the negative effect of financial liberalization on firm risk is similar.

Along with Models 1 and 2, we add other control variables to obtain more precise results (see Models 3 and 4 of Table 4). The effect of liberalization on firm risk remains negative, with significance at the 1% level, regardless of whether we conclude country, industry, and year dummies.

In Models 3 and 4, *SIZE* negatively affects firm risk, with significance at the 1% level. In other words, a larger firm has lower firm risk. *ROA* also affects firm risk negatively, with regression coefficients of -0.0350 (in Model 3) and -0.0340 (in Model 4). Firms can decrease their risk by improving their operating income ratio before depreciation. However, some control variables, such as *MB*, *CAPEXP*, *LEV*, *SG*, and *QR*, positive impact on firm risk, with significance at the 5% or better level. The results show that the higher the market-to-book value (capital expenditure, leverage, sales growth rate, or quick ratio), the higher the firm risk. The last control variable, the net fixed assets ratio (*PPEN*), has a significantly negative effect on firm risk. Therefore, firms can reduce risk by enhancing their net fixed assets.

Table 4. The relationship between financial liberalization and firm risk: financial liberalization using the *Kaopen* measure.

	Risk			
	(1)	(2)	(3)	(4)
Intercept	0.0271***	0.0298***	0.0382***	0.0419***
	(0.00003)	(0.0001)	(0.0002)	(0.0002)
Kaopen	-0.0005***	-0.0004***	-0.0009***	-0.0007***
	(0.00002)	(0.00002)	(0.00002)	(0.00002)
SIZE			-0.0008***	-0.0008***
			(0.00001)	(0.00001)
ROA			-0.0350***	-0.0340***
			(0.0005)	(0.0005)
MB			0.0002***	0.0001**
			(0.00003)	(0.00003)
CAPEXP			0.0075***	0.0059***
			(0.0007)	(0.0007)
LEV			0.0065***	0.0069***
			(0.0002)	(0.0002)
SG			0.0012***	0.0014***
			(0.0001)	(0.0002)
QR			0.0006***	0.0005***
			(0.000032)	(0.000032)
PPEN			-0.0033***	-0.0034***
			(0.0002)	(0.0002)
Country dummies	No	Yes	No	Yes
Industry dummies	No	Yes	No	Yes
Year dummies	No	Yes	No	Yes
Adj.R^2	0.0051	0.0563	0.1204	0.1773
F-value	833.87***	158.82***	2454.74***	504.82***
Observations	161,324	161,324	161,324	161,324

Notes: ***, **, and * represent 1%, 5%, and 10% significance levels, respectively. Newey and West (1987) heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses.

This is different from the measure of financial liberalization (see Table 4). Table 5 shows the relationship between financial liberalization and firm risk. In Model 1 of Table 5, the results indicate that our main variable, financial liberalization (*CAPITAL*), negatively affects firm risk (*Risk*) with significance at the 1% level, similar to the results in Table 4. The regression coefficients are -0.0005 in Models 1 and 2 (Model 2 includes country, industry, and year dummies). We observe that improving financial liberalization effectively reduces firm risk.

Next, we add other control variables to Model 3 (without country, industry, and year dummies) and Model 4 (with country, industry, and year dummies). The impact of liberalization on firm risk is identical to Model 3 and 4 in Table 5, and their regression coefficients are -0.0001, which is

slightly lower than the results in Table 4.

In Models 3 and 4 in Table 5, *SIZE* negatively affects firm risk, with significance at the 1% level. The results show that firms can reduce risk by enhancing the market value of equity. *ROA* negatively affects firm risk, with regression coefficients of -0.0382 (in Model 3) and -0.0376 (in Model 4), with significance at the 1% level. The higher the *ROA*, the lower the firm risk. In other words, enhancing operating income could reduce firm risk. Nevertheless, many control variables (*MB*, *LEV*, *SG*, and *QR*) still have a positive effect on firm risk, similar to the results in Table 4. However, a minor difference exists in the consequences in Models 3 and 4 in Table 5. *CAPEXP* shows no significant relationship with firm risk. Finally, the control variable *PPEN* has a significantly positive effect on firm risk. Firms can enhance their net fixed assets to reduce risk.

Table 5. The relationship between financial liberalization and firm risk: financial liberalization using the CAPITAL measure.

	Risk			
	(1)	(2)	(3)	(4)
Intercept	0.0297***	0.0304***	0.0404***	0.0403***
	(0.0002)	(0.0003)	(0.0004)	(0.0004)
CAPITAL	-0.0001***	-0.0001***	-0.0001***	-0.0001***
	(<0.00001)	(<0.00001)	(<0.00001)	(<0.00001)
SIZE			-0.0007***	-0.0007***
			(0.00002)	(0.00002)
ROA			-0.0382***	-0.0376***
			(0.0010)	(0.0010)
MB			0.0006***	0.0006***
			(0.0001)	(0.0001)
CAPEXP			0.0016	0.0023
			(0.0015)	(0.0015)
LEV			0.0095***	0.0100***
			(0.0004)	(0.0004)
SG			0.0018***	0.0018***
			(0.0003)	(0.0003)
QR			0.0008***	0.0007***
			(0.0001)	(0.0001)
PPEN			-0.0044***	-0.0048***
			(0.0003)	(0.0004)
Country dummies	No	Yes	No	Yes
Industry dummies	No	Yes	No	Yes
Year dummies	No	Yes	No	Yes

Adj.R^2	0.0104	0.0295	0.1358	0.1554
F-value	431.9***	39.79***	713.47***	188.82***
Observations	40,821	40,821	40,821	40,821

Notes: ***, **, and * represent 1%, 5%, and 10% significance levels, respectively. Newey and West (1987) heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses.

Table 6 shows the third measure of liberalization, *Fin_Cur*, used to explore the effect of financial liberalization on firm risk. Similarly, the effect is the same as in Tables 4 and 5. Whether we add country, industry, and year dummies, Models 1 and 2 conclude that higher financial liberalization helps reduce firm risk. Other control variables were added to Model 3 (without country, industry, and year dummies) and Model 4 (with country, industry, and year dummies). The impact of liberalization on firm risk is significantly negative, with regression coefficients of -0.0001, which are close to the results in Table 5.

In Models 3 and 4 in Table 6, *SIZE* and *ROA* negatively affect firm risk, with significance at the 1% level. The results show that firms can reduce risk by enhancing the market value of equity or improving operating income. However, some control variables, such as *MB*, *CAPEXP*, *LEV*, *SG*, and *QR*, have positive impacts on firm risk, with significance at the 1% level (*MB*, *LEV*, *SG*) or 10% level (*CAPEXP*). The last control variable, *PPEN* has the same effect (significantly positive) on firm risk, as shown in Tables 4 and 5. According to previous findings the higher the fixed assets ratio, the lower the firm risk.

Table 6. The relationship between financial liberalization and firm risk: financial liberalization using the *Fin_Cur* measure.

	Risk			
	(1)	(2)	(3)	(4)
Intercept	0.0296***	0.0306***	0.0418***	0.0420***
	(0.0002)	(0.0003)	(0.0004)	(0.0005)
Fin_Cur	-0.00005***	-0.00005***	-0.0001***	-0.0001***
	(<0.00001)	(<0.00001)	(<0.00001)	(<0.00001)
SIZE			-0.0007***	-0.0007***
			(0.00002)	(0.00002)
ROA			-0.0401***	-0.0394***
			(0.0010)	(0.0010)
MB			0.0007***	0.0007***
			(0.0001)	(0.0001)
CAPEXP			0.0028*	0.0027*
			(0.0015)	(0.0015)
LEV			0.0093***	0.0097***
			(0.0004)	(0.0004)

SG			0.0022***	0.0021***
			(0.0003)	(0.0003)
QR			0.0007***	0.0007***
			(0.0001)	(0.0001)
PPEN			-0.0053***	-0.0056***
			(0.0003)	(0.0004)
Country dummies	No	Yes	No	Yes
Industry dummies	No	Yes	No	Yes
Year dummies	No	Yes	No	Yes
Adj.R^2	0.0094	0.0243	0.1413	0.1549
F-value	389.55***	30.92***	747.54***	179.08***
Observations	40,821	40,821	40,821	40,821

Notes: ***, **, and * represent 1%, 5%, and 10% significance levels, respectively. Newey and West (1987) heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses.

5. Robustness tests

5.1 Quantile Regression

The correlation coefficient, which reveals the strength of statistical links between variables of interest, is a well-known indicator of dependence. However, this measure does not differentiate the dependence reliance during fluctuating markets or between small and large firm risks. To accurately capture the complex reliance between financial time series, a more advanced tool is needed.

Since Koenker and Bassett (1978), quantile regression has gained popularity as a tool for modeling dependence. This is because it considers a set of regression curves that vary across different quantiles of the dependent variable's conditional distribution. Compared to a standard regression model, quantile regression functions offer more exact and accurate results of how conditional variables affect the dependent variables (Koenker, 2017). Quantile regression has been used to assess value-at-risk and model the relationship of financial variables as addressed in the introduction (Engle & Manganelli, 2004; Rubia & Sanchis-Marco, 2013).

Following Mensi et al. (2014), we adopted a quantile regression model using a slightly revised version. Let's consider y to be a dependent variable assumed to be linearly dependent on the independent variable x. The τth conditional quantile function of y is thus specified as follows:

$$Q_y(\tau|x) = \alpha_0(\tau) + \beta_1(\tau)X_{jt-1} + \sum_{n=1}^{N}\gamma_n(\tau)CV_{nijt-1} + Country\ dummies +$$

$$Industry\ dummies + Year\ dummies + \varepsilon_{ijt}, \quad (2)$$

where the quantile regression coefficient $\beta(\tau)$ determines the dependence relationship between vector x and the τth conditional quantile of y. The values of $\beta(\tau)$ for $\tau \in [0,1]$ determine the complete dependence structure of y. The dependence of y based on a specific explanatory variable in vector x could be: (a) constant where the values of $\beta(\tau)$ do not change for different values of τ; (b) monotonically increasing (decreasing) where $\beta(\tau)$ increases (decreases) with the value of τ; and (c) symmetric (asymmetric) where the value of $\beta(\tau)$ is similar (dissimilar) for low and high quantiles. *Country*, *Industry*, and *Year dummies* denote the different industries, countries, and years variables showed in our sample, respectively, and α_0 refers to the intercept.

Table 7 reports the estimates of the quantile regressions for the firm risk. Following the quantile regression literature, we present statistical data for seven quantiles from 0.05 to 0.95.

Panel A of Table 7 provides results for financial liberalization using the *Kaopen* measure. The effect of financial liberalization is significant and monotonically decreasing, with the value of the coefficient decreasing from the lower to the upper quantiles. However, this implies that the dependence structure is asymmetric, where the coefficient value is dissimilar for low and high quantiles. This evidence suggests no co-movement between firm risk and financial liberalization. The estimation results for financial liberalization measured by *CAPITAL* (Panel B of Table 7) and the financial liberalization measured by *Fin_Cur* (Panel C of Table 7) also show that the coefficient value is dissimilar between different quantiles.

Table 7. Quantile regression estimates

Panel A. Quantile regression estimates for *Kaopen* measure

	5th	10th	25th	50th	75th	90th	95th
Intercept	0.0048***	0.0077***	0.0145***	0.0192***	0.0241***	0.0283***	0.0313***
	(0.0003)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0002)
Kaopen	0.0016***	0.0015***	0.0009***	-0.0001***	-0.0007***	-0.0010***	-0.0010***
	(0.00003)	(0.00003)	(0.00003)	(0.00002)	(0.00001)	(0.00001)	(0.00001)
SIZE	0.0002***	0.0002***	0.0001***	0.0001***	-0.00001	-0.0001***	-0.0003***
	(0.00002)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
ROA	0.0023***	0.0034***	0.0021***	-0.0058***	-0.0136***	-0.0192***	-0.0235***
	(0.0008)	(0.0007)	(0.0005)	(0.0004)	(0.0003)	(0.0003)	(0.0003)
MB	0.00016***	0.00008**	-0.0002***	-0.0002***	0.00003	0.00001	0.00001
	(0.00005)	(0.00004)	(0.00003)	(0.00002)	(0.00002)	(0.00002)	(0.00002)
CAPEXP	-0.0023*	-0.00001	0.0033***	0.0056***	0.0064***	0.0064***	0.0059***
	(0.0012)	(0.0010)	(0.0007)	(0.0006)	(0.0005)	(0.0005)	(0.0006)
LEV	-0.0010***	-0.0008***	-0.0007***	0.0006***	0.0026***	0.0046***	0.0055***
	(0.0003)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)

SG	-0.00020	-0.0008***	0.0007***	0.0006***	0.0013***	0.0012***	0.0012***
	(0.0003)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
QR	0.0001	0.00002	-0.0001**	-0.00003	0.0001***	0.0002***	0.0004***
	(0.00005)	(0.00004)	(0.00003)	(0.00002)	(0.00002)	(0.00002)	(0.00003)
PPEN	0.0010***	-0.0005**	-0.0012***	-0.0027***	-0.0034***	-0.0037***	-0.0038***
	(0.0003)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.R^2	0.3645	0.2643	0.1821	0.0722	0.1109	0.1240	0.1277
F-value	72.08***	148.14***	131.15***	157.87***	360.19***	498.16***	543.71***

Panel B. Quantile regression estimates for *CAPITAL* measure

	5th	10th	25th	50th	75th	90th	95th
Intercept	-0.0061***	-0.0035***	0.0046***	0.0141***	0.0246***	0.0305***	0.0330***
	(0.0008)	(0.0007)	(0.0006)	(0.0004)	(0.0003)	(0.0003)	(0.0003)
CAPITAL	0.0001***	0.0001***	0.0001***	0.00003***	-0.00004***	-0.0001***	-0.0001***
	(0.00001)	(0.00001)	(<0.00001)	(<0.00001)	(<0.00001)	(<0.00001)	(<0.00001)
SIZE	0.00021***	0.00027***	0.0003***	0.0002***	0.00004***	-0.0001***	-0.0003***
	(0.00003)	(0.00002)	(0.00002)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
ROA	0.0035*	0.0030*	0.0017	-0.0028***	-0.0118***	-0.0177***	-0.0222***
	(0.0020)	(0.0016)	(0.0012)	(0.0009)	(0.0008)	(0.0007)	(0.0008)
MB	0.00015	-0.0001	-0.0003***	-0.0004***	-0.0001***	0.0001*	0.0002***
	(0.0001)	(0.0001)	(0.00007)	(0.00005)	(0.00005)	(0.00004)	(0.00005)
CAPEXP	0.0037	0.0052***	0.0061***	0.0067***	0.0060***	0.00552***	0.00606***
	(0.0024)	(0.0019)	(0.0013)	(0.0011)	(0.0010)	(0.00108)	(0.00118)
LEV	-0.0013**	-0.0018***	-0.0017***	-0.0003	0.0024***	0.0060***	0.0079***
	(0.0006)	(0.0005)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
SG	-0.0005	-0.00001	0.0010***	0.0019***	0.0021***	0.0018***	0.0020***
	(0.0005)	(0.0004)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
QR	-0.0001	-0.0002**	-0.0001**	-0.00001	0.0001***	0.0003***	0.0005***
	(0.0001)	(0.00008)	(0.00006)	(0.00005)	(0.00005)	(0.00005)	(0.00005)
PPEN	0.0009	-0.0005	-0.0022***	-0.0033***	-0.0039***	-0.0045***	-0.0048***
	(0.0006)	(0.0004)	(0.0003)	(0.0002)	(0.0002)	(0.0003)	(0.0003)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.R²	0.3683	0.2773	0.1333	0.0467	0.0588	0.1056	0.1173
F-value	39.52***	47.15***	44.05***	27.11***	48.70***	110.69***	131.35***

Panel C. Quantile regression estimates for *Fin_Cur* measure

	5th	10th	25th	50th	75th	90th	95th
Intercept	-0.0030***	0.0002	0.0072***	0.0138***	0.0228***	0.0298***	0.0419***
	(0.0007)	(0.0006)	(0.0005)	(0.0004)	(0.0004)	(0.0004)	(0.0005)
Fin_Cur	0.0001***	0.0001***	0.0001***	0.00003***	-0.00002***	-0.0001***	-0.0001***
	(<0.00001)	(<0.00001)	(<0.00001)	(<0.00001)	(<0.00001)	(<0.00001)	(<0.00001)
SIZE	0.0002***	0.0002***	0.0002***	0.0002***	0.0001***	-0.0001***	-0.0007***
	(0.00003)	(0.00002)	(0.00002)	(0.00001)	(0.00001)	(0.00001)	(0.00002)
ROA	0.0055***	0.0049***	0.0031***	-0.0018*	-0.0124***	-0.0199***	-0.0389***
	(0.0019)	(0.0016)	(0.00119)	(0.0009)	(0.0008)	(0.0008)	(0.0010)
MB	0.0002**	-0.00001	-0.0003***	-0.0004***	-0.0001**	0.0002***	0.0007***
	(0.0001)	(0.00007)	(0.00006)	(0.00005)	(0.00005)	(0.00004)	(0.00006)
CAPEXP	0.0018	0.0039**	0.0055***	0.0065***	0.0058***	0.0055***	0.0033**
	(0.0024)	(0.0020)	(0.0013)	(0.0010)	(0.0010)	(0.0011)	(0.0015)
LEV	-0.0018***	-0.0021***	-0.0016***	-0.0002	0.0025***	0.0061***	0.0096***
	(0.00065)	(0.0005)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0004)
SG	-0.0004	0.0001	0.0010***	0.0017***	0.0022***	0.0021***	0.0021***
	(0.0005)	(0.0004)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0003)
QR	0.0001	-0.0001	-0.0001**	0.00000	0.0001**	0.0002***	0.0007***
	(0.0001)	(0.00009)	(0.00006)	(0.00005)	(0.00005)	(0.00005)	(0.00007)
PPEN	0.0018***	0.0005	-0.0015***	-0.0031***	-0.0040***	-0.0049***	-0.0058***
	(0.0006)	(0.0004)	(0.0003)	(0.0002)	(0.0002)	(0.0003)	(0.0004)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.R²	0.3300	0.2484	0.1308	0.0566	0.0502	0.0933	0.1548
F-value	34.63***	39.61***	40.90***	31.42***	39.42***	91.99***	181.23***

Notes: ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

5.2 *The effect of financial liberalization on firm risk under different financial liberalization level subsamples*

We attempt to obtain more robust empirical results by dividing our sample into four subsamples according to the level of financial liberalization. Model 1 in Table 8 shows that financial liberalization measured by *Kaopen* has a significantly negative effect on firm risk only at extreme values. The low and high financial liberalization level subsamples positively impact firm risk, with significance at the 5% level or higher.

However, financial liberalization measured by *CAPITAL* has a significantly negative effect on firm risk, as shown in Model 2 in Table 8, except for the highest part. Moreover, Model 3 in Table 8, excluding the lowest part, indicates that financial liberalization measured by *Fin_Cur* negatively affects on firm risk, with significance at the 10% level or higher.

The above findings show that most different financial liberalization level subsamples have a significantly negative effect on firm risk, indicating that an improvement in financial liberalization can reduce firm risk. In the Highest Liber (P_{76}–P_{99}) group (Model 3), the total number of observations is only 1,798, the lowest among the others however, *Fin_Cur* shows a negative effect on firm risk significant at the 10% level. In the High Liber (P_{51}–P_{75}) group (Model 1), the total number of observations is 99,359, the highest among all groups, and *Kaopen* exhibits a negative effect on firm risk significantly at the 5% level. Therefore, for all three models, financial liberalization shows a significant negative relationship with firm risk from the Lowest liber (P_1–P_{25}) to the Highest liber (P_{76}–P_{99}).

Table 8. The effect of financial liberalization on firm risk under different financial liberalization level subsamples

	Model 1				Model 2				Model 3			
	Lowest *Liber* (P_1~P_{25})	Low *Liber* (P_{26}~P_{50})	High *Liber* (P_{51}~P_{75})	Highest *Liber* (P_{76}~P_{99})	Lowest *Liber* (P_1~P_{25})	Low *Liber* (P_{26}~P_{50})	High *Liber* (P_{51}~P_{75})	Highest *Liber* (P_{76}~P_{99})	Lowest *Liber* (P_1~P_{25})	Low *Liber* (P_{26}~P_{50})	High *Liber* (P_{51}~P_{75})	Highest *Liber* (P_{76}~P_{99})
Intercept	0.0394***	0.0429***	0.0418***	0.0378***	0.0309***	0.0343***	0.0533***	0.0551***	0.0290***	0.0461***	0.0508***	0.0479***
	(0.0005)	(0.0006)	(0.0003)	(0.0009)	(0.0007)	(0.0014)	(0.0012)	(0.0023)	(0.0010)	(0.0027)	(0.0005)	(0.0033)
Kaopen	-0.0006***	0.0006***	0.0002**	-0.0024***								
	(0.0001)	(0.0001)	(0.0001)	(0.0002)								
CAPITAL					-0.0001***	-0.00003***	-0.0001***	-0.00002				
					(<0.00001)	(0.00001)	(<0.00001)	(0.00002)				
Fin_Cur									0.00001	-0.0001***	-0.0001***	-0.00004*
									(0.00001)	(<0.00001)	(<0.00001)	(0.00002)
SIZE	-0.0003*	-0.0009*	-0.0012*	-0.0005**	0.00002	-0.0006*	-0.0011*	-0.0019*	-0.0001*	-0.0010*	-0.0011*	-0.0011*

	**	**	**	*		**	**	**	**	**	**	**
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(0.0004)	(0.0001)	(<0.0001)	(0.0001)	(<0.0001)	(0.0001)	(<0.0001)	(0.0002)
ROA	-0.0293***	-0.0196***	-0.0337***	-0.0315***	-0.0232***	-0.0299***	-0.0386***	-0.0375***	-0.0387***	-0.0210***	-0.0397***	-0.0093***
	(0.0010)	(0.0011)	(0.0006)	(0.0021)	(0.0020)	(0.0032)	(0.0014)	(0.0030)	(0.0024)	(0.0062)	(0.0012)	(0.0055)
MB	-0.0004***	0.0003***	0.0005***	-0.0003***	-0.0003***	0.0003	0.0012***	0.0012***	-0.0018***	0.0015***	0.0011***	0.0015***
	(0.0001)	(0.0001)	(<0.0001)	(0.0002)	(0.0001)	(0.0002)	(0.0001)	(0.0002)	(0.0002)	(0.0004)	(0.0001)	(0.0005)
CAPEXP	0.0014	0.0054***	0.0044***	-0.0029	0.0006	-0.0037	0.0073***	-0.0011	-0.0064**	0.0077	-0.0020	0.0088
	(0.0014)	(0.0012)	(0.0011)	(0.0029)	(0.0021)	(0.0048)	(0.0022)	(0.0045)	(0.0030)	(0.0057)	(0.0018)	(0.0072)
LEV	0.0085***	0.0058***	0.0062***	0.0055***	0.0127***	0.0106***	0.0077***	0.0077***	0.0123***	0.0028	0.0071***	0.0168***
	(0.0004)	(0.0003)	(0.0002)	(0.0008)	(0.0005)	(0.0011)	(0.0006)	(0.0012)	(0.0007)	(0.0017)	(0.0004)	(0.0021)
SG	0.0006**	0.0017***	0.0002	0.0008	0.0003	0.0032***	0.0019***	0.0012	-0.0024**	0.0045***	0.0042***	-0.0055***
	(0.0003)	(0.0003)	(0.0002)	(0.0006)	(0.0004)	(0.0010)	(0.0005)	(0.0009)	(0.0006)	(0.0012)	(0.0003)	(0.0014)
QR	0.0003***	0.00006	0.0006***	-0.0002	0.0001	0.0002	0.0011***	-0.0003	0.0001	-0.0008**	0.0009***	-0.0010***
	(0.0001)	(0.0001)	(<0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0002)	(0.0002)	(0.0004)	(0.0001)	(0.0004)
PPEN	-0.0053***	-0.0025***	-0.0040***	-0.0027***	-0.0031***	-0.0002	-0.0077***	-0.0055***	-0.0022***	0.0004	-0.0050***	-0.0089***
	(0.0004)	(0.0003)	(0.0002)	(0.0007)	(0.0005)	(0.0012)	(0.0005)	(0.0010)	(0.0008)	(0.0015)	(0.0004)	(0.0018)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.R^2	0.2162	0.1322	0.1976	0.1364	0.1939	0.1069	0.1792	0.2874	0.1732	0.1051	0.2145	0.1892
F-value	109.92***	129.29***	680.56***	56.54***	112.59***	24.42***	118.49***	56.94***	65.18***	8.88***	223.79***	17.13***
Observations	21,721	28,638	99,359	11,606	12,528	5,283	18,294	4,716	9,194	2,081	27,748	1,798

Notes: ***, **, and * represent 1%, 5%, and 10% significance levels, respectively. Newey and West (1987) heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses.

5.3 Economic Development Status

We then classify the countries into developed economies and developing economies and run Equation (1) again to control countries' economic development status. According to the World Bank, economic development status is classified as developed economies and developing economies. Table 9 shows the relationship between financial liberalization and firm risk in

developed economies and developing economies. The coefficients of *Kaopen*, *CAPITAL*, and *Fin_Cur, Risk* remain significantly negative, indicating that financial liberalization negatively correlates with firm risk. Moreover, the different economic development statuses indicate that financial liberalization and corporate risk have a stronger relation in developed economies than in developing ones. We obtained the same results regardless of whether financial liberalization was calculated using *Kaopen*, *CAPITAL*, or *Fin_Cur* measures. As exhibited in Models 5 and 6 for developing economies, the number of observations is 9,176, while the Model 1 for developed economies is 112,405. However, whether the number of observations is large or small, financial liberalization shows a significant negative relationship with the firm risk.

Table 9. The relationship between financial liberalization and firm risk: sample countries divided by economic development status

	Developed Economies			Developing Economies		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	0.0501***	0.0800***	0.0577***	0.0402***	0.0373***	0.0350***
	(0.0003)	(0.0013)	(0.0007)	(0.0005)	(0.0012)	(0.0012)
Kaopen	-0.0034***			-0.0007***		
	(<0.0001)			(0.0001)		
CAPITAL		-0.0004***			-0.00001**	
		(<0.0001)			(<0.000004)	
Fin_Cur			-0.0002***			-0.0001***
			(<0.0001)			(<0.0001)
SIZE	-0.0010***	-0.0013***	-0.0010***	-0.0008***	-0.0006***	-0.0009***
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(0.0001)	(0.0001)
ROA	-0.0346***	-0.0386***	-0.0416***	-0.0266***	-0.0287***	-0.0292***
	(0.0005)	(0.0012)	(0.0012)	(0.0010)	(0.0023)	(0.0022)
MB	0.0003***	0.0016***	0.0011***	0.0001**	0.0002*	0.0004***
	(<0.0001)	(0.0001)	(0.0001)	(<0.0001)	(0.0001)	(0.0001)
CAPEXP	0.0083***	0.0057***	-0.0015	-0.0009	0.0034	0.0041
	(0.0009)	(0.0017)	(0.0017)	(0.0011)	(0.0028)	(0.0028)
LEV	0.0074***	0.0082***	0.0079***	0.0063***	0.0121***	0.0119***
	(0.0002)	(0.0004)	(0.0004)	(0.0003)	(0.0008)	(0.0008)
SG	0.0013***	0.0024***	0.0030***	0.0009***	0.0007	0.0005
	(0.0002)	(0.0003)	(0.0003)	(0.0002)	(0.0005)	(0.0005)
QR	0.0006***	0.0007***	0.0009***	0.0000	-0.0005***	-0.0006***
	(<0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0002)
PPEN	-0.0041***	-0.0059***	-0.0052***	-0.0026***	-0.0053***	-0.0056***
	(0.0002)	(0.0004)	(0.0004)	(0.0003)	(0.0007)	(0.0007)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes

Adj.R²	0.2236	0.2025	0.1963	0.1409	0.1281	0.1350
F-value	623.65***	277.99***	250.27***	144.23***	40.66***	43.12***
Observations	112,405	31,645	31,645	48,919	9,176	9,176

Notes: ***, **, and * represent 1%, 5%, and 10% significance levels, respectively. Newey and West (1987) heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses.

5.4 Financial crises

The influence of financial liberalization on firm risk can differ between financial and normal periods. We divide the sample countries into financial and normal periods and rerun Equation (1). Reinhart and Rogoff (2011) provided the dates for the financial crisis period, which is the time frame in which a country goes through a banking or currency crisis. Table 10 illustrates the relationship between financial liberalization and firm risk throughout financial and non-financial crises. The coefficients of *Kaopen*, *CAPITAL*, and *Fin_Cur* for *firm risk* remain negative at the 1% significance level, indicating that financial liberalization negatively correlates with firm risk. These results support the notion that a financial liberalization policy can decrease firm risk. Moreover, we observe that the relationship between financial liberalization and firm risk in the financial crisis period is stronger than in the normal period, regardless of whether financial liberalization was calculated using the *Kaopen*, *CAPITAL*, or *Fin_Cur* measures. This result implies that even when the number of observations is low, the variables to measure the financial liberalization show a significant negative effect on the firm risk.

Table 10. The relationship between financial liberalization and firm risk: sample countries divided by time of financial crisis.

	Financial Crisis Period			Normal Period		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	0.0379***	0.0411***	0.0392***	0.0421***	0.0423***	0.0432***
	(0.0006)	(0.0011)	(0.0010)	(0.0002)	(0.0005)	(0.0005)
Kaopen	-0.0010***			-0.0007***		
	(0.0001)			(<0.0001)		
CAPITAL		-0.0001***			-0.0001***	
		(<0.0001)			(<0.0001)	
Fin_Cur			-0.0001***			-0.0001***
			(<0.0001)			(<0.0001)
SIZE	-0.0009***	-0.0004***	-0.0004***	-0.0009***	-0.0010***	-0.0009***
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
ROA	-0.0394***	-0.0365***	-0.0359***	-0.0327***	-0.0388***	-0.0407***
	(0.0012)	(0.0020)	(0.0020)	(0.0005)	(0.0012)	(0.0012)
MB	-0.0005***	-0.0002	-0.0004***	0.0001***	0.0011***	0.0011***
	(0.0001)	(0.0001)	(0.0001)	(<0.0001)	(0.0001)	(0.0001)
CAPEXP	0.0050**	0.0049	0.0071**	0.0060***	-0.0015	-0.0015
	(0.0021)	(0.0030)	(0.0031)	(0.0008)	(0.0017)	(0.0017)

LEV	0.0089***	0.0115***	0.0115***	0.0063***	0.0079***	0.0080***
	(0.0005)	(0.0007)	(0.0007)	(0.0002)	(0.0004)	(0.0004)
SG	0.0004	-0.0031***	-0.0026***	0.0016***	0.0044***	0.0045***
	(0.0004)	(0.0006)	(0.0006)	(0.0002)	(0.0003)	(0.0003)
QR	0.0007***	0.0006***	0.0005***	0.0004***	0.0007***	0.0006***
	(0.0001)	(0.0001)	(0.0001)	(<0.0001)	(0.0001)	(0.0001)
PPEN	-0.0036***	-0.0040***	-0.0044***	-0.0033***	-0.0043***	-0.0050***
	(0.0005)	(0.0007)	(0.0007)	(0.0002)	(0.0004)	(0.0004)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Adj.R^2	0.2454	0.1553	0.1470	0.1724	0.1765	0.1722
F-value	152.14***	65.18***	57.49***	422.21***	161.74***	149.60***
Observations	21,846	10,820	10,820	139,478	30,001	30,001

Notes: ***, **, and * represent 1%, 5%, and 10% significance levels, respectively. Newey and West (1987) heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses.

6. Conclusions

Rapid improvements in technology and trading have led people to focus on global financial liberalization over the last 30 years. Promoting financial liberalization improves and speeds up the circulation of capital flows for both countries and firms. Thus, it is critical to forecast volatility in emerging capital markets to estimate the cost of capital, analyze direct investment options, and decide how to allocate assets. To contribute to the literature in this area, our empirical analysis investigates the impact of financial liberalization on firm risk by adopting three different measures of financial liberalization by using firms from different countries as our samples.

By investigating a sample of 63 countries, 18,317 firms, and 161,317 firm-year observations from 1991–2017, we examine the impact of financial liberalization on firm risk. The results indicate that financial liberalization has a negative significant relationship with firm risk, implying that countries with a higher financial liberalization will face a lower firm risk. The findings remained consistent across the three different measures of financial liberalization we used in this study. Furthermore, we conducted a series of robustness checks in this study to get a robust result. First, we find that all three different variables (*Kaopen*, *CAPITAL*, and *Fin_Cur*) measuring financial liberalization show significantly negative relationships. Moreover, the results from quantile regression show that there exists an asymmetric effect of financial liberalization on firm risk. Second, we divide our sample into four different subsamples according to the level of financial liberalization and find that from all three models, financial liberalization shows a significant negative relationship with firm risk from the Lowest liber (P_1–P_{25}) to the Highest liber (P_{76}–P_{99}) in all subsamples. Third, we distinguish our sample countries into countries with developed economies and countries with developing economies according to the economic development status set by the World Bank and find that the coefficients of *Kaopen*, *CAPITAL*, and *Fin_Cur, Risk*

remain significantly negative, indicating that financial liberalization negatively correlates with firm risk for both developed and developing economies. Moreover, we find that both financial liberalization and corporate risk have stronger relationships in the developed economies than in the developing ones. In addition, we divide the sample periods into the financial crisis period and the normal period and find the effect of financial liberalization on firm risk for both the financial crisis period and the normal period. The results support that financial liberalization policy can reduce firm risk as we get significant negative relationships in both financial crisis periods and normal periods. Moreover, we also find that the impact of financial liberalization on firm risk has a stronger effect in the financial crisis period than in the normal period. Consequently, we can conclude that higher financial liberalization can reduce firm risk. Our findings highlight the relationship between financial liberalization and corporate risk. The results offer valuable insights to multinational firms for appropriate management in corporate finance in response to the changes in financial liberalization policy.

A limitation of our paper is that in this paper, we only pay attention to stock market risk when examining the effects of financial liberalization on firm risk. However, firm risk includes operating, financial, and stock market risks. Thus, future studies could extend our analysis of financial liberalization by including both operating and financial risks.

References

Adebayo, T. S., Kirikkaleli, D., & Rjoub, H. (2022). Time–frequency analysis between economic risk and financial risk in the mint nations: what causes what? *Annals of Financial Economics*, 17(02), 2250013.

Alexander, G. J., Eun, C. S., & Janakiramanan, S. (1987). Asset pricing and dual listing on foreign capital markets: A note. *Journal of Finance*, 42(1), 151-158.

Ashbaugh−Skaife, H., Collins, D. W., Kinney Jr, W. R., & LaFond, R. (2009). The effect of SOX internal control deficiencies on firm risk and cost of equity. *Journal of Accounting Research*, 47(1), 1-43.

Baker, H. K., & Filbeck, G. (2014). Investment risk management. Oxford University Press.

Bekaert, G., & Harvey, C. R. (1997). Emerging equity market volatility. *Journal of Financial Economics*, 43(1), 29-77.

Bekaert, G., & Harvey, C. R. (2000). Foreign speculators and emerging equity markets. *Journal of Finance*, 55(2), 565-613.

Bouslah, K., Kryzanowski, L., & M'zali, B. (2013). The impact of the dimensions of social performance on firm risk. *Journal of Banking & Finance*, 37(4), 1258-1273.

Broll, U., Guo, X., Welzel, P., & Wong, W. K. (2015). The banking firm and risk taking in a two-moment decision model. Economic Modelling, 50, 275-280.

Broll, U., Mallick, R., & Wong, K. P. (2001). International trade and hedging in economies in transition. *Economic Systems*, 25(2), 149-159.

Chari, A., & Henry, P. B. (2004). Is the invisible hand in discerning or indiscriminate? Investment and stock prices in the aftermath of capital account liberalizations. Working paper, Stanford University.

Chinn, M. D., & Ito, H. (2006). What matters for financial development? Capital controls, institutions, and interactions. *Journal of Development Economics*, 81(1), 163-192.

Chinn, M. D., & Ito, H. (2008). A new measure of financial openness. *Journal of Comparative Policy Analysis*, 10(3), 309-322.

Dewan, S., & Ren, F. (2011). Information technology and firm boundaries: Impact on firm risk and return performance. *Information Systems Research*, *22*(2), 369-388.

Egozcue, M., Guo, X., & Wong, W. K. (2015). Optimal output for the regret-averse competitive firm underprice uncertainty. *Eurasian Economic Review*, 5(2), 279-295.

Engle, R. F., & Manganelli, S. (2004). CAViaR: Conditional autoregressive value at risk by regression quantiles. *Journal of Business & Economic Statistics*, 22(4), 367-381.

Fama, E. F., & French, K. R. (1997). Industry costs of equity. *Journal of Financial Economics*, 43(2), 153-193.

Flavin, T., & O'Connor, T. (2010). The sequencing of stock market liberalization events and corporate financing decisions. *Emerging Markets Review*, 11(3), 183-204.

Gu, Z., & Kim, H. (2002). Determinants of Restaurant Systematic Risk: A Reexamination. *Journal of Hospitality Financial Management*, 10(1), 1-13.

Guo, X., & Wong, W. K. (2019). Comparison of the production behavior of regret-averse and purely risk-averse firms. Estudios de Economía, 46(2), 157-171.

Gupta, N., & Yuan, K. (2009). On the growth effect of stock market liberalizations. Review of Financial Studies, 22(11), 4715-4752.

Hargis, K. (2002). Forms of foreign investment liberalization and risk in emerging stock markets. *Journal of Financial Research*, 25(1), 19-38.

Henry, P. B. (2000a). Do stock market liberalizations cause investment booms? *Journal of Financial Economics*, 58(1-2), 301-334.

Henry, P. B. (2000b). Stock market liberalization, economic reform, and emerging market equity prices. *Journal of Finance*, 55(2), 529-564.

Huang, B. N., & Yang, C. W. (2000). The impact of financial liberalization on stock price volatility in emerging markets. *Journal of Comparative Economics*, 28(2), 321-339.

Jayasuriya, S. (2005). Stock market liberalization and volatility in the presence of favorable market characteristics and institutions. *Emerging Markets Review*, 6(2), 170-191.

Jo, H., & Na, H. (2012). Does CSR reduce firm risk? Evidence from controversial industry sectors. *Journal of Business Ethics*, 110(4), 441-456.

Kassimatis, K. (2002). Financial liberalization and stock market volatility in selected developing countries. *Applied Financial Economics*, 12(6), 389-394.

Koenker, R. (2017). Quantile regression: 40 years on. *Annual Review of Economics*, 9, 155-176.

Koenker, R., & Bassett Jr, G. (1978). Regression quantiles. *Econometrica: Journal of the Econometric Society*, 46(1), 33-50.

Kwan, F. B., & Reyes, M. G. (1997). Price effects of stock market liberalization in Taiwan. *Quarterly Review of Economics and Finance*, 37(2), 511-522.

Li, C., Yao, Q., Wu, J., & Wang, D. (2019). Financialization and Risk Taking of Non-Financial Corporations Empirical Evidence from Chinese Listed Companies. *Journal of Applied Finance and Banking*, 9(3), 79-107.

Li, Z. (2003). Equity market liberalization and economic performance. *Job Market Paper*.

Mensi, W., Hammoudeh, S., Reboredo, J. C., & Nguyen, D. K. (2014). Do global factors impact BRICS stock markets? A quantile regression approach. *Emerging Markets Review*, 19, 1-17.

Mitton, T. (2006). Stock market liberalization and operating performance at the firm level. *Journal of Financial Economics*, 81(3), 625-647.

Mody, A., & Murshid, A. P. (2005). Growing up with capital flows. *Journal of International Economics*, 65(1), 249-266.

Naveed, M., Sindhu, M. I., Ali, S., & Wong, W.-K. (2023). To Invest or Not to Invest? Determinants of Low Stock Market Participation: Qualitative Perspective from Pakistan Stock Exchange. Advances in Decision Sciences, 27(1), 113-171.

Newey, W. K., & West, K. D. (1987). A simple positive semi–definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica*, 55, 703-708.

Nguyen, T. T. H., Wong, W.-K., Phan, G. Q., Tran, D. T. M., & Moslehpour, M. (2021). Corporate valuation spurred by information transparency in an emerging economy. *Annals of Financial Economics,* 16(03), 2150011.

Quinn, D. P., & Toyoda, A. M. (2008). Does capital account liberalization lead to growth?. *Review of Financial Studies*, 21(3), 1403-1449.

Reinhart, C. M., & Rogoff, K. S. (2011). From financial crash to debt crisis. *American Economic Review*, 101(5), 1676-1706.

Rubia, A., & Sanchis-Marco, L. (2013). On downside risk predictability through liquidity and trading activity: A dynamic quantile approach. *International Journal of Forecasting*, 29(1), 202-219.

Sila, V., Gonzalez, A., & Hagendorff, J. (2016). Women on board: Does boardroom gender diversity affect firm risk? *Journal of Corporate Finance*, 36, 26-53.

Singh, A. (1997). Financial liberalization, stock markets and economic development. *Economic Journal*, 107(442), 771-782.

Stapleton, R. C., & Subrahmanyam, M. G. (1977). Market imperfections, capital market equilibrium and corporation finance. *Journal of Finance*, 32(2), 307-319.

Stulz, R. M. (1999). Globalization of equity markets and the cost of capital. *Journal of Applied Corporate Finance*, 12(3), 8-25.

Suu, N. D., Tien, H. T., Pan, S.-H., & Wong, W.-K. (2023). Impact of foreign ownership and foreign bank presence on liquidity risk: Evidence from Viet Nam. *Advances in Decision Sciences*, 27(1), 23-44.

Suu, N. D., Tien, H. T., & Wong, W.-K. (2021). The impact of capital structure and ownership on the performance of state enterprises after equitization: Evidence from Vietnam. *Annals of Financial Economics*, 16(02), 2150007.

Trang, L. N. T., Nhan, D. T. T., Hao, N. T. N., & Wong, W. K. (2021). Does bank liquidity risk lead to bank's operational efficiency? A study in Vietnam. *Advances in Decision Sciences*, *25*(4), 46-88.

Trang, L. N. T., Nhan, D. T. T., Phuong, D. N. T., & Wong, W.-K. (2022). The Effects of Selected Financial Ratios on Profitability: An Empirical Analysis of Real Estate Firms in Vietnam. *Annals of Financial Economics*, 17(01), 1-29.