The role of debt maturity in stock price crash risk: a comparison of developing and developed Asian economies

Muhammad Jawad Haider
Faculty of Management Sciences, International Islamic University, Islamabad, Pakistan, and
Maqsood Ahmad and Qiang Wu
Faculty of Business, School of Accounting and Finance, The Hong Kong Polytechnic University, Kowloon, Hong Kong

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Abstract

Purpose – This study examines the impact of debt maturity structure on stock price crash risk (SPCR) in Asian economies and the moderating effect of firm age on this relationship.

Design/methodology/approach – The study utilized annual data from 432 nonfinancial firms publicly listed in six Asian countries: China, Hong Kong, Japan, Singapore, Pakistan and India. The observation period covers 14 years, from 2007 to 2020. The sample was categorized into three groups: the entire sample and one group each for developing and developed Asian economies. A generalized least squares panel regression method was employed to test the research hypotheses.

Findings – The results suggest that long-term debt has a significant negative influence on SPCR in Asian economies, indicating that firms with high long-term debt experience lower future SPCR. Moreover, firm age negatively moderates this relationship, implying that older firms may experience a more pronounced reduction in SPCR due to high long-term debt. Finally, firms in developed Asian economies with high long-term debt are more effective in mitigating the risk of a significant drop in their stock prices than firms in developing Asian economies.

Originality/value – This study contributes to the literature in several ways. To the best of the researcher's knowledge, this is the first of such efforts to investigate the relationship between debt maturity structure and crash risk in Asia. Additionally, it reveals that long-term debt influences SPCR directly and indirectly in Asia through the moderating role of firm age. Lastly, it is likely one of the first studies by a research team in Asia to compare the nonfinancial markets of developed and developing Asian countries.

Keywords Stock price crash risk, Debt maturity, Generalized least squares

Paper type Research paper

1. Introduction

According to Alcock *et al.* (2012), debt financing is one of the most important methods by which firms can raise capital. Indeed, the configuration of debt financing can potentially affect the ability of firms to continue as concerns and their ability to fulfill the objective of maximizing shareholder welfare. In perfectly competitive capital markets, Modigliani and Miller (1958) argued that a firm's capital structure has no impact on its value and that the cost

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of equity increases in proportion to the amount of debt, while Jensen and Meckling's (1976) agency theory holds that shareholders are encouraged to expropriate creditors by investing in risky, high-return projects, particularly in highly leveraged firms. Therefore, both the choice between equity and debt in a company's capital structure and the choice of debt are crucial for maximizing firm value. In other words, how the debt's expected payoff term is established (i.e. short- or long-term) is significantly impactful.

In this regard, short-term debt is considered the most effective way to address the issue of lack of investment (Myers, 1977). As the issuance of such debt can be seen as an indicator of a company's creditworthiness, firms typically raise short-term debt to send encouraging cues to the market (Shyu and Lee, 2009). By contrast, businesses may use long-term debt for three primary reasons. First, businesses in developing economies that rely chiefly on short-term debt may be more susceptible to the risk associated with interest rates (i.e. refinancing risk) when their loans are renewed (Arslan and Karan, 2006). Second, long-term loans reduce liquidity risk, which can make borrowers lose control of rents if lenders pay them off too quickly (Diamond, 1991). Finally, the tax shelter for debt also makes long-term debt more advantageous as interest rates increase, raising the firm's value (Brick and Ravid, 1985).

The global financial crisis (2007–2008) and widely known instances of corporate fraud such as WorldCom, Enron, and Satyam have compelled practitioners, researchers and regulators to investigate why and how stock market collapses occur. In this study, a stock market collapse is defined as a precipitous decline in the value of an index compared to its most recent high point (Patel and Sarkar, 1998). In addition, stock price crash risk (SPCR) refers to the possibility of sudden, large price drops, which are relatively rare. When such crashes do occur, they are usually caused by managers disguising or concealing bad news, with the sudden release of the news resulting in a large decline in stock prices (Chang *et al.*, 2017; Hutton *et al.*, 2009; Zhu, 2016). That is, the presence of potential agency conflicts leads managers to hoard and conceal unfavorable information from external stakeholders, and this secrecy is a crucial factor in stock price collapses (Callen and Fang, 2015; Hutton *et al.*, 2009; Jin and Myers, 2006; Kothari *et al.*, 2009).

The tendency of managers to disguise or mask potentially negative company-related information from external stakeholders is often driven by self-serving managerial practices. These practices can take various forms, but examples include taking on projects with a negative present value, evading taxes and obfuscating or otherwise impeding transparent financial reporting. Other concerns, such as personal career growth, compensation or benefits, motivate managers to conceal bad news for longer. The actions of such managers, which range from making investment decisions that temporarily increase stock prices to using earnings management techniques to protect an overvalued stock price, are unjustifiable and ultimately cause stock prices to crash when the facts are disclosed. Thus, combined with self-centered managers' behavior, asymmetrical information between shareholders and managers contributes to SPCR (Jin and Myers, 2006). In the context of debt maturity structure, Hasan *et al.* (2021) assert that the nature of debt contracts – particularly the maturity terms of those contracts – may serve as a key mechanism that suppresses managerial incentives to hide or hold back unfavorable news for a sustained period, thereby influencing the SPCR.

However, studies indicate that debt issuance can minimize the likelihood of a crash by pressuring managers to practice good corporate governance, either through the potential threat of bankruptcy or by direct involvement (Chauhan *et al.*, 2015; Wang *et al.*, 2020). D'Mello and Miranda (2010) argue that the presence of debt service obligations reduces the likelihood of a crash by discouraging speculative or abnormal investments, such that the choice of debt can help mitigate the risk of a crash. For example, debt renewal and refinancing require more regular debt oversight, restricting managers from concealing unfavorable news – thereby reducing conflict between managers and shareholders by providing effective

external monitoring and lowering the risk of a crash (Dang *et al.*, 2018; Hasan *et al.*, 2021). Alternatively, as lenders are hesitant to provide long-term financing to companies with asymmetrical information, a company's management can enact effective corporate governance via willful reporting policies to benefit from debt with longer maturities (Allaya *et al.*, 2022; Nguyen *et al.*, 2019). Increasing access to long-term loans through willful corporate management thus reduces stock price crashes and agency issues resulting from information asymmetries.

The SPCR remains a muddled concept. Debates on its various aspects have not yet produced agreed-upon rules or theories. Moreover, most studies concentrate on Western contexts, and little is known about the role of long-term debt in SPCR in Asian countries. Due to differences in contextual paradigms, studies conducted in Western contexts cannot be freely generalized to Asian countries. Long-term debt has also never been systematically tested with SPCR or has its predictive power been examined in Asian economies. In previous research, Habib *et al.* (2018) systematically reviewed the existing empirical literature on the SPCR to identify research gaps for future exploration, finding that the SCPR-related roles and outcomes of the debt maturity structure in Asian economies remain understudied. Therefore, it is necessary to investigate the factors that can mitigate the SCPR. This study aims to identify the factors responsible for its occurrence, understand it better, offer new insights and examine these factors in Asian economies.

This study primarily aims to bridge this gap in the literature by investigating the association between debt maturity and the SPCR in this geographic context. Notably, when firms rely heavily on short-term debt for financing, it restricts the potential for agency-related self-serving actions by firm management due to the heightened level of market scrutiny, transparency and regulatory pressure of such arrangements, as highlighted by previous research (i.e. Fung and Goodwin, 2013; Rajan and Winton, 1995). Therefore, this study specifically focuses on the utilization of long-term debt as a measure of debt maturity, as the likelihood of managerial hoarding of unfavorable information and subsequent stock price decline is reduced in this scenario; likewise, long-term loan providers are inclined to assess borrowers' adherence to debt covenants periodically (i.e. less frequently). In this context, management discretion is more likely to contribute to the accumulation of negative information.

Regarding the sample and methodology of this study, annual data from 432 nonfinancial firms publicly listed in six Asian countries (i.e. China, Hong Kong, Japan, Singapore, Pakistan and India) were collected for analysis. The observation period covers 14 years (2007–2020). The sample was categorized into three groups: one for the entire sample and a group each for developing and developed Asian economies. A generalized least squares panel regression method was employed to analyze the data and test the hypotheses.

The analysis of the data provided several findings. First, long-term debt has a significant negative influence on SPCR in Asian economies, indicating that firms with high long-term debt experience lower future SPCR. Second, the results reveal that firm age negatively moderates this relationship, implying that older firms may experience a more pronounced reduction in SPCR because of high long-term debt. Finally, firms in developed Asian economies with high long-term debt are more effective in mitigating the risk of a significant drop in their stock prices than firms in developing Asian economies.

The present study contributes to the literature in several ways. It extends the knowledge of long-term debt and SPCR relationships by elaborating on how long-term debt influences SPCR and contributing to how the role played by long-term debt in SPCR is understood. Second, the findings of this study may contribute to a better understanding of long-term debt and its impact on SPCR in Asian economies. As noted above, this study undertakes a pioneering effort in studying Asian economies, providing theoretical contributions to the literature on this region and addressing the gap regarding how long-term debt and SPCR

relationships function in a specifically Asian context. Specifically, the study finds that firms in developed Asian economies with high long-term debt are more effective in mitigating the risk of a significant drop in their stock prices than comparable firms in developing Asian economies. Third, this study finds that older firms with high levels of long-term debt experience a more significant decline in SPCR, which is a key explanation for this phenomenon.

2. Literature review and hypothesis development

2.1 Debt maturity and stock price crash risk

Although Miller and Modigliani (1961) propose that firms should be insensitive between debt and equity in a frictionless capital market, Jensen and Meckling (1976) assert in their investigation of capital structure that having a larger debt-to-equity ratio results in lower agency costs. Similarly, Barclay and Smith (1995) and Guedes and Opler (1996) support the notion that the choice of debt is critical to minimizing agency conflicts. Because it is frequently renewed, short-maturity debt helps reduce agency costs by ensuring creditors monitor manager activities more frequently (Stulz, 2001). Some scholars have found that informationally opaque firms put lenders at greater risk of experiencing serious moral hazard issues, which require lenders to use debt with short-term maturity to handle informational issues (Berger and Udell, 1998; Ortiz-Molina and Penas, 2008). Finally, studies have confirmed that a company's debt structure influences its accounting conservatism, investment choices and credit quality (Aivazian *et al.*, 2005; Gopalan *et al.*, 2014).

Fan *et al.* (2012) reported that a company's choices related to debt maturity are determined by country-specific effects, such as tax, legal and other institutional factors. The preferences of capital providers operating within a specific country can also affect debt maturity choices. Alcock *et al.* (2012) – who noted that most studies on the economic effects of debt maturity choices have been conducted in the United States of America—researched Australian companies and reported that short-term maturity debt is used to signal the firm's commitment to good governance and transparency in the market: high dependency on short-term debt can increase the risk of refinancing if lenders ascertain that companies are violating debt covenants. As a comparison, the present study employed a sample of six developed and developing Asian economies to study the relationship between the debt maturity structure and SPCR.

Debt holders are likely to interpret a company's debt maturity decision as a sign of its assurance of greater transparency and lower agency expenses. The preference for long-term debt can worsen agency problems between managers and external stakeholders, as managers may engage in ambiguous and self-serving arrangements at the expense of the company's shareholders. As managers' decisions may transfer risk to debt holders while retaining the possible benefits associated with those decisions, these agency conflicts may intensify between debt holders and managers (Francis *et al.*, 2022; Jensen and Meckling, 1976). According to Barclay and Smith (1995), a firm's management preference for short-maturity debt may indicate to other stakeholders that the company encourages more frequent reviews and scrutiny of debt agreements. Thus, short-maturity debt is effective in reducing agency-related problems, such as market frictions, the extraction of rent and information.

Debt lenders, such as banks, have a vested interest in protecting their investments by closely monitoring companies' financial reports and debt covenants. Banks can exert control by undertaking regular and ongoing evaluations of debt covenant compliance and by either refusing or approving an increase in refinancing costs. Companies in such a condition are also under additional stress due to the need to indicate quality by providing timely and reliable information to the market. A company's dependence on short-term debt as a choice of funding

assists in limiting the agency-related self-centered attitude of managers due to the enhanced market oversight, transparency and monitoring mechanisms linked with these choices (Fung and Goodwin, 2013; Rajan and Winton, 1995). Consequently, the possibility that managers will hoard unfavorable information and that the equity price will collapse in such a situation is decreased. In previous research, Dang *et al.* (2018) explored the effect of debt maturity on SPCR, arguing that their findings on the existence of a negative association between short-term debt and SPCR align with short-term financial obligations, which function to forestall the managerial concealment of unfavorable news and thus, minimize the possibility of a stock price crash. Wang *et al.* (2020) studied the association between debt and SPCR, finding that debt financing significantly increases SPCR and that creditor monitoring reduces unfavorable information hoarding, thus lowering the possibility of a crash.

Various research studies also indicate that companies retaining short-term debt out of proportion to their long-term investments may be problematic. For instance, Custódio *et al.* (2013) and Acharya and Skeie (2011) reported that borrowing short-term debt for long-term investment (SDFLI) is an example of high-risk behavior, potentially depriving firms of adequate cash flow to settle maturing loans and creating stress related to the repayment of debt and other financial problems. Francis *et al.* (2022) claim that managers of companies under financial restrictions seem to be more inclined to conceal or disguise unfavorable information, increasing the risk of future crashes; increasing the SDFLI could endanger the financial security of businesses due to mismatches in the maturity of their financing and investments. Likewise, short-term and long-term debt providers are both likely to observe creditors' debt covenant compliance; however, they do so less frequently, so managerial discretion likely contributes more to the accumulation of negative news. Research has also found that public disclosure of accumulated negative information about a company may result in an abrupt and significant drop in the company's stock price – potentially with adverse impacts on shareholder wealth (Cheng and Fang, 2023; Callen and Fang, 2015; Chen *et al.*, 2001). Finally, Hasan *et al.* (2022) investigated the relationship between the choice of debt and the SPCR in Australia with a sample of 1,548 listed Australian companies, confirming the presence of a statistically significant relationship between debt maturity and the SPCR.

Thus, based on the empirical literature, the following relationship is expected:

H1. Long-term debt is negatively associated with SPCR in Asian economies.

2.2 The moderating role of firm age

Firm age plays a key moderating role in the relationship between debt maturity and SPCR, as companies at different stages of their life cycles may have varying levels of financial stability, risk tolerance and access to capital. On the one hand, younger firms may be more vulnerable to stock price crashes because they often lack established track records and have limited financial resources to weather economic downturns; on the other hand, older and more established firms may have a better ability to withstand financial shocks and mitigate the impact of SPCR due to experience, reputation and financial reserves (Cao *et al.*, 2016). Conversely, debt maturity can affect a company's financial risk profile. That is, firms with shorter debt maturities may face higher refinancing risks from needing to constantly roll over their debt or secure new financing, potentially exposing them to SPCR if they encounter difficulties in obtaining favorable terms or if economic conditions worsen. Longer debt maturity may provide more financial stability by reducing the frequency of debt refinancing and offering a cushion against abrupt changes in financial markets (Diamond and He, 2014).

The interaction between firm age and debt maturity suggests that the relationship between debt structure and SPCR is not uniform across companies. Due to their limited

financial history and reliance on short-term debt, which can magnify the impact of adverse market conditions, younger firms with shorter debt maturity may face a higher SPCR; by contrast, older firms with longer debt maturity may be better equipped to withstand economic fluctuations, potentially reducing their SPCR (Lotti *et al.*, 2003).

Therefore, based on a substantive review of the literature, the following relationship is expected:

H2. Firm age moderates the relationship between long-term debt and SPCR.

3. Research methodology

3.1 Sampling and data collection

The sample consists of nonfinancial firms that were publicly listed in six Asian countries: China, Hong Kong, Japan, Singapore, Pakistan and India. These countries were selected based on their shared economic characteristics. In addition, the choice of these countries as the study's unit of analysis is also consistent with Haider *et al.* (2023) research. Financial institutions were excluded, as they differ from nonfinancial firms in various aspects, including their capital structure, the high level of regulations governing liquidity (i.e. in central banks), their cash holdings and bad debts (Mahmood *et al.*, 2021). Fama and French's (1992) sampling criteria support this exclusion of financial institutions. They and other researchers have noted that financial firms should be excluded from samples in this context because of their high leverage – nonfinancial firms do not have the same high leverage as financial institutions do (Mahmood *et al.*, 2020).

Companies with many missing observations were also excluded; therefore, our final sample comprised 432 companies, totaling 5,184 firm-year observations. The observation period covers 14 years (2007–2020). The sample was categorized into three groups: one for the entire sample of Asian economies, one for developing Asian economies and one for developed Asian economies. This study used Morgan Stanley Capital International (MSCI) country classification data from 2018 to categorize the sample into developed and developed Asian economies. This classification is widely accepted in empirical research as a credible and established source for this purpose, providing a robust foundation on which countries can be categorized into developed and developing categories. Accordingly, this choice facilitated meaningful comparative analysis. Data related to all the variables were collected from the Thomson Reuters DataStream. The data were also winsorized at 0.01 and 0.99 levels, with outliers removed, to provide a control for potential accounting errors or abnormal shocks at the firm level (Bond *et al.*, 2003).

3.2 Measurement of variables

3.2.1 Dependent variable. The authors used SPCR as an endogenous variable. Following previous literature (i.e. Haider *et al.*, 2023; Murata and Hamori, 2021; Thuy *et al.*, 2022), the present study employed two proxies for the measurement of SPCR: negative conditional skewness (NCSKEW) and down-up volatility (DUVOL). These proxies use firm-specific weekly returns (FSWRs) that are calculated as the residuals from the market model. For instance, Chen *et al.* (2001) estimate the residuals as FSWRs from the subsequent expanded market model as follows:

$$r_{j\mathcal{T}} = a_j + \gamma_{1,j} r_{m,\mathcal{T}-2} + \gamma_{2,j} r_{m,\mathcal{T}-1} + \gamma_{3,j} r_{m,\mathcal{T}} + \gamma_{4,j} r_{m,\mathcal{T}+1} + \gamma_{5,j} r_{m,\mathcal{T}+2} + \varepsilon_{it} \quad (1)$$

Where j and τ show firm and week and r is stock return, calculating the nonsynchronous trading lag and lead of the market index (Dimson, 1979). The FSWRs of firm j in week τ (Wj) are estimated by taking the natural logarithm of one plus the residual return.

NCSKEW is measured by taking the ratio of the third moment of FSWRs to the standard deviation of FSWRs raised to the power three, which is then multiplied by −1. NCSKEW is estimated as

$$NCSKEW = -\left[n(n-1)^{3/2}\sum w_{i,J}^{3}\right] \Big/ \left[(n-1)(n-2)\left(\sum w_{i,J}^{2}\right)^{3/2}\right] \quad (2)$$

The second SPCR measure was DUVOL. The FSWRs are divided into two groups: "down" weeks when the returns are lower than the annual mean and "up" weeks when the returns are higher than the annual mean. The standard deviation of the FSWRs is calculated independently for each of these two groups. DUVOL is calculated by taking the natural logarithm of the ratio of the standard deviation during "down" weeks to the standard deviation during "up" weeks:

$$DUVOL_{j,t} = \log\{(n_u - 1)\sum_{Down} w_{i,J}^{2} \Big/ (n_d - 1)\sum_{Up} w_{i,J}^{2} \quad (3)$$

3.2.2 Independent variable. The authors used debt maturity as a predictor variable. Debt holders could interpret a company's choice of debt as a commitment to maximizing transparency and minimizing agency-related costs. When long-term debt is chosen, managers might participate in rent extraction at the expense of shareholders, which can lead to agency conflicts. Therefore, the present study used the ratio of long-term debt to total debt as a proxy to measure debt maturity, following Butler *et al.* (2006), Díaz-Díaz *et al.* (2016), Awartani *et al.* (2016) and Hasan *et al.* (2021).

3.2.3 Control variables. Following previous SPCR studies (Chen *et al.*, 2001; Dang *et al.*, 2018; Hasan *et al.*, 2022; Haider *et al.*, 2023) and to minimize the likely bias induced by omitted factors, this study's authors accounted for additional firm characteristics by including firm size, firm age, leverage, profitability, tangibility and earnings management as control variables. Definitions and sources of all variables are provided in Table A1[1].

3.3 Empirical model

To investigate the association between debt maturity and SPCR, the following baseline model was used:

$$\begin{aligned} SPCR_{i,j,t} = {} & \beta_o + \beta_1 SPCR_{i,j,t-1} + \beta_2 DM_{i,j,t-1} + \beta_3 EM_{i,j,t-1} + \beta_4 Age_{i,j,t-1} + \beta_5 Size_{i,j,t-1} \\ & + \beta_6 Tan_{i,j,t-1} + \beta_7 ROA_{i,j,t-1} + \beta_8 Lev_{i,j,t-1} + \mu_{i,j,t} \end{aligned} \quad (4)$$

Where β_o is the constant term, β_{3to8} are the coefficients for the control variables (earnings management, firm size, firm age, tangibility, profitability and leverage); β_2 is the coefficient of an independent variable (i.e. debt maturity); the subscripts i, j and t represent the sample firm, country and time in years, respectively; SPCR is proxied by DUVOL and NCSKEW; EM is earnings management; Age specifies the firm age; Size is the firm size; TAN is the tangibility; ROA is the profitability; LEV is the leverage and $\mu_{i,j,t}$ the error term.

4. Empirical results and discussion

4.1 Descriptive statistics

Descriptive statistics for the entire sample are presented in Table A2[1]. The results show that the mean value of the first measure (NCSKEW) of the dependent variable (SPCR) is 0.149, with a standard deviation of 0.786. Similarly, DUVOL, the second measure of SPCR, has an

average value of 0.04 and a standard deviation of 0.1333. The positive mean values of both measures suggest that the SPCR of the companies included in our sample is generally higher than average. These results are consistent with the findings published regarding the USA, Malaysia and China (Ertugrul *et al.*, 2017; Jin *et al.*, 2019; Kim *et al.*, 2012; Lobo *et al.*, 2020; Ben-Nasr and Ghouma, 2018).

The independent variable debt maturity has a mean value of 0.496, a standard deviation of 0.324 and a range that spans from 0 to 1. These results suggest that, on average, long-term debt comprises 49.6% of the total debt for companies in the data for the entire sample. These mean and standard deviation values are consistent with those of Hasan *et al.* (2021), who reported a mean value of 0.536 and a standard deviation of 0.390. Furthermore, summary statistics are provided for each individual country – Pakistan, India, China, Japan, Hong Kong and Singapore – in Tables 2A, 2B, 2C, 2D, 2E and 2F (in Appendix 1[1]).

4.2 Correlation analysis

Table A3[1] presents the correlations among the variables, providing preliminary support for the anticipated research hypothesis (H1). The results indicate that debt maturity is negatively and significantly correlated with NCSKEW ($r = -0.09$; $p < 0.05$) and DUVOL ($r = -0.03$; $p < 0.05$), suggesting that firms with higher levels of long-term debt tend to face lower future SPCR and vice versa.

4.3 Multicollinearity test

The variance inflation factor (VIF) test was used to determine the presence of multicollinearity among independent and control variables, such as debt maturity, leverage, profitability, earnings management, tangibility, firm age and firm size. The results of the VIF test for the entire sample and for the samples of developing and developed Asian economies are presented in Table A4[1]. The VIF scores of the results are within the acceptable range, indicating no significant multicollinearity.

4.4 Baseline regression results

This study used ordinary least squares (OLS) regressions with standard errors adjusted for heteroskedasticity and autocorrelation to test the hypotheses formally. Previous research supports this approach, recommending the use of GLS when serial correlation and heteroskedasticity are present in the data (Greene, 2007; Gujarati, 2003; Neifar and Utz, 2019). The first hypothesis of this study (H1) predicts that long-term debt is negatively linked to SPCR in Asian economies. Two measures of SPCR – NCSKEW and DUVOL – were used to test this prediction. These measures were regressed on long-term debt while controlling for firm-specific characteristics such as leverage, profitability, earnings management, tangibility, firm age and firm size. The sample consisted of data on six countries and 432 firms from developing and developed Asian economies. GLS was applied separately to each of the three sample groups (the whole sample and separate samples for developed and developing Asian economies). The results are presented in Tables A5[1] and A6[1], with each sample's results reported in separate columns and described in detail below.

The results shown in the tables indicate that a significant and negative relationship exists between long-term debt and one-year-ahead SPCR. For example, the results reported in Table A5[1] show that long-term debt has a significant and negative influence on NCSKEW across all sample categories (the full sample and the two samples of developing and developed Asian economies) with coefficients of -0.089 ($p < 0.01$), -0.127 ($p < 0.001$) and -0.129 ($p < 0.05$), respectively. Table A6[1] reveals that long-term debt has a significantly negative association with the second measure of SPCR (DUVOL) in the context of the whole

sample and that for developed Asian economies, with respective statistically significant coefficients of −0.017 ($p < 0.001$) and −0.028 ($p < 0.01$). However, this association is statistically insignificant in the sample of developing Asian economies ($\beta = -0.005, p > 0.05$).

Such results indicate that firms with more long-term debt experience lower future SPCR. This finding lends support to H1 and is consistent with the notion that companies with more long-term debt are typically more transparent in their financial reporting and may experience lower SPCR because of their willingness to disclose information to attract long-term debt, thus helping them lower their rollover risk, which is advantageous for companies managing their financial stability and stock price performance. These results are consistent with Wang *et al.* (2020), who reported a statistically significant and negative relationship between debt maturity and SPCR. Regarding developing economies, the second measure of SPCR (DUVOL) revealed a negative but insignificant relationship, indicating that the lag in debt maturity does not impact the SPCR of firms in these economies. Such findings are consistent with Canbaloglu *et al.* (2022), who also found a negative but statistically insignificant association between debt maturity and SPCR.

Comparing the results from developed and developing Asian economies reveals that the effect of long-term debt is relatively more pronounced in reducing the SPCR in developed Asian economies than in developing ones. In other words, firms in developed Asian economies with high long-term debt are more effective in mitigating the risk of a significant drop in their stock prices than their counterparts in developing Asian economies, as developed economies typically have more mature and well-regulated financial markets. Together, this regulation and maturity may make it easier for firms to effectively manage their long-term debt, thus reducing the SPCR.

Furthermore, our findings for the control variables align with those of previous studies. First, the lagged value of earnings management (EMt-1) shows a significant positive relationship with the SPCR. Several studies have reported a similar association between earnings management and SPCR (i.e. Cheng *et al.*, 2020; Kim *et al.*, 2012; Kim and Yasuda, 2021; Neifar and Utz, 2019; Wu and Lai, 2019), while Hasan *et al.* (2021) found a positive but insignificant association between earnings management and SPCR. Second, the lagged value of profitability (ROAt-1) shows a significant negative relationship with SPCR, similar to the findings of Kim *et al.* (2012), Jin *et al.* (2019) and Chang *et al.* (2017). These studies also found that the previous year's return on assets (ROAt-1) is inversely and significantly related to the current year's SPCR. The result of the coefficient for the lagged value of firm age coheres with Thuy *et al.*'s (2022) finding that firm age is positively and statistically significantly related to NCSKEW but that a positive and significant relationship exists between the previous year's firm size and SPCR, such that larger firms are more sensitive, making them more likely to experience SPCR. Ming-Te Lee (2016) and Kim *et al.* (2014) reported a similar association between the lagged value of firm size and SPCR.

4.5 Moderation analysis

The study employed moderation analysis to examine the interactive effects of firm age on SPCR. This analysis explores the moderating effect of firm age on the relationship between long-term debt and SPCR. The second hypothesis of this study (H2) predicts that firm age moderates the relationship between long-term debt and SPCR. The study authors thus evaluated the effect of firm age on the connection between long-term debt and NCSKEW (the first measure of SPCR) to investigate this prediction.

The results in Table A7[1] show that long-term debt has a significant negative influence on NCSKEW in all cases (i.e. the whole sample and the two sample categories for developed and developing Asian economies), with coefficients of −0.603 ($p < 0.001$), −0.622 ($p < 0.01$) and −0.477 ($p < 0.001$), respectively. Firm age significantly predicts NCSKEW in the entire

sample ($\beta = -0.167$, $p < 0.01$). However, in developed and developing Asian economies, firm age does not emerge as a statistically significant predictor of NCSKEW (respectively, $\beta = -0.109$, $p > 0.05$; $\beta = -0.152$, $p > 0.05$). The interaction term (DM*Age) of these variables has a significant negative effect on NCSKEW across all sample categories, including the full sample and the two categories for developing and developed Asian economies. The coefficients of −0.428, −0.290 and −0.425 had varying degrees of statistical significance ($p < 0.001$, $p < 0.05$ and $p < 0.01$, respectively). Accordingly, firm age negatively moderates the relationship between long-term debt and SPCR.

Next, the study authors evaluated the moderating effect of firm age on the connection between long-term debt and DUVOL (the second measure of SPCR). The findings in Table A8[1] reveal that long-term debt did not significantly predict DUVOL in the entire sample ($\beta = -0.018$, $p > 0.05$). However, it was found to be a significant predictor of DUVOL in the sample categories for developed and developing Asian economies, with statistically significant beta coefficients of −0.057 ($p < 0.05$) and −0.867 ($p < 0.01$), respectively. Firm age is shown to have a significant negative impact on DUVOL in the whole sample and in the sample for developing Asian economies, with coefficients of −0.016 ($p < 0.01$) and −0.054 ($p < 0.001$). In developed Asian economies, firm age has no significant negative influence ($\beta = -0.017$, $p > 0.05$). The interaction term (DM*Age) of these variables has a significant negative effect on DUVOL across all sample categories (i.e. the entire sample and the two sample categories for developed and developing Asian economies). The coefficients of −0.006, −0.070 and 0.098 had varying levels of statistical significance ($p < 0.05$, $p < 0.01$ and $p < 0.01$). As with the previously discussed findings, these results suggest that firm age negatively moderates the relationship between long-term debt and SPCR.

The negative moderating effect of firm age on the relationship between long-term debt and SPCR suggests that, as companies mature and establish a track record in the market, the impact of long-term debt on their vulnerability to SPCR diminishes. This phenomenon can be attributed to several factors. First, older firms typically have a more stable financial history, making them less risky for investors and creditors; they may thus offer more favorable debt terms and lower financing costs, helping mitigate long-term debt's negative effects on SPCR. Moreover, mature firms often have more diversified business models that can help hedge against financial distress and reduce the likelihood of SPCR. Overall, these findings support H2.

4.6 Robustness tests

Roodman (2009) preferred a two-step estimation for a system generalized method of moments (GMM) approach over one-step GMM estimators due to certain limitations, such as the potential loss of too many observations in the case of missing values in the data. Arellano and Bover (1995) had previously recommended a second-order transformation to overcome this problem, but Roodman (2009) suggested that the lagged values of the regressors may be employed as instruments for controlling model endogeneity. Therefore, a two-step GMM system was used to address endogeneity issues. As these instruments are identified in the existing econometric model, they have often been termed "internal instruments." Despite the study considering the endogenous association between debt maturity and SPCR in its analyses, the results reported in Tables B1 and B2 (in Appendix 2[1]) show that the relationship between debt maturity and SPCR remains the same.

5. Conclusion and implications

This study examines the impact of debt maturity on SPCR in Asian economies and the moderating effect of firm age on this relationship. To achieve this research objective, annual

data from 432 nonfinancial firms publicly listed in six Asian countries – China, Hong Kong, Japan, Singapore, Pakistan and India – were analyzed. The observation period covers 2007–2020, a period of 14 years. The sample was categorized into three groups: the whole sample and a group each for developed and developing Asian economies. A generalized least squares panel regression method was employed to test the two research hypotheses.

The results confirm that, in Asian economies, long-term debt has a significant negative influence on SPCR, indicating that firms with high long-term debt experience lower future SPCR. Moreover, firm age negatively moderates these relationships, implying that older firms may experience a more pronounced reduction in SPCR due to high long-term debt. A comparative analysis of developed and developing Asian economies shows that the effect of long-term debt is more pronounced in reducing SPCR in developed economies than in developing ones. In other words, firms in developed Asian economies with high long-term debt are more effective at mitigating the risk of a significant drop in their stock prices than firms in developing Asian economies.

Practical implications

The findings of this study indicate that high long-term debt reduces the SPCR in Asian economies and thus has important policy implications for firm managers, regulators, policymakers and investors. Specifically, company executives and managers working on debt management strategies should increase long-term debt in their capital structures to mitigate SPCR. Nevertheless, the appropriateness of increasing long-term debt in a company's capital should be carefully considered based on individual circumstances, financial goals and market conditions. The results suggest that high long-term debt can be a strategy to reduce SPCR, especially for older firms and those in developed Asian economies. Regulators and policymakers should consider long-term debt's impact on SPCR when developing regulations and policies related to corporate finance and debt management; investors should be aware that companies in Asian economies with high levels of long-term debt may be less susceptible to SPCR and should incorporate this information into their investment strategies and risk assessments.

6. Directions for future research

This study has focused on the influence of long-term debt on SPCR in Asian economies. Future research should consider short- and long-term debts and explore the separate effects of short- and long-term debts on SPCR. How firms in developing and developed regions balance the advantages and disadvantages of short- and long-term debt is likewise a promising question for future research to explore. Finally, future investigations may examine the moderating effect of corporate governance on the relationship between debt maturity and SPCR.

Note

1. Please see it on the Online Appendix.

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Appendix

The supplementary material for this article can be found online.

Corresponding author

Maqsood Ahmad can be contacted at: Maqsood.rehamani@gmail.com