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The impact of leverage on investment decisions for South African firms with different growth opportunities

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Research has documented a significant relationship between financial leverage and investment decisions, however divergent views exist about whether this relationship is explained by the underinvestment hypothesis or the overinvestment hypothesis. This study examines the relationship between financial leverage and investment decisions for firms with different growth opportunities, it is based on a sample of 51 industrial sector firms listed on the Johannesburg Stock Exchange (JSE), South Africa, over the period from 2008 to 2014. Using panel data and after controlling for heterogeneity across firms, we report a negative relationship between leverage and investment. However, the relationship is significant for firms with high growth opportunities and insignificant for firms in the low growth category. The results support the underinvestment theory that debt overhang reduces the incentives of firms exploiting valuable opportunities.

Introduction

In this article, we examine the impact of leverage on capital investments in the South African context. We extend the theoretical and empirical literature that challenged the proposition of Modigliani and Miller (1958). Under Modigliani and Miller (1958), capital investments are not influenced by the leverage position of the firm but by fundamental factors like profitability, cash flows, interest rates, current and future demand and production technology. However, literature has evolved to criticise this view and to recognise that the amount of leverage on the firm's balance sheet does affect capital investments (Ahn, Denis & Denis 2006; Aivazian, Ge & Qiu 2005), and it does so in two different ways: firstly, leverage disincentivises firms from taking on investments, leading to underinvestment (referred to as the underinvestment hypothesis). Proponents of this hypothesis argue that leverage has the potential to reduce the incentives, for the 'shareholder-management coalition', to invest in capital projects because the benefits will partially accrue to bondholders (Ahn et al. 2006). In addition, the need to pay interest on debt reduces the cash available for investments. Secondly, leverage plays a role in curbing overinvestment (referred to as the overinvestment hypothesis) by self-centred management who desire to serve their personal interests (e.g. through empire building), while destroying shareholder value (Aivazian et al. 2005).

Archival studies documented a significant relationship between leverage and investment. However, the results are inconclusive on whether the underinvestment or overinvestment hypothesis prevails. Aygun, Suleyman and Sayim (2014), Dang (2011), Franck, Huyghebaert and Hogeschool (2008) and McConnell and Servaes (1995) found evidence in support of the underinvestment hypothesis. They found leverage to be negatively related to investment and the relationship to be more significant in firms with high growth opportunities. On the flip side, Aivazian et al. (2005), Fernandez (2011) and Lang, Ofek and Stulz (1996) found evidence in support of the overinvestment hypothesis. They found the negative relationship between leverage and investment to be stronger in firms with low growth opportunities. Overall, the results from prior studies show some consensus that leverage does affect investment; however, the results are inconclusive on which hypothesis prevails (the underinvestment or overinvestment hypothesis). Possible reasons for the inconclusive results include (1) focusing on different countries and regions which are characterised by unique and different institutional settings, prior studies focused on countries like the United States, the United Kingdom, Turkey, Brazil, Chile, Mexico, and Mauritius and (2) focusing on different time periods ranging from 1982 to 2014.

The inconclusive results from prior studies and the dearth of empirical studies focusing on South Africa calls for further investigation into this topic. The South African market deserves special attention for the following reasons: firstly, South Africa is an emerging market with a rapidly

growing but relatively smaller, less liquid and less efficient debt market in comparison to developed countries (Adelegan & Radzewicz-Bak 2009; Mu, Phelps & Stotsky 2013). Secondly, unlike other economies, South Africa has experienced a decline in the level of investment (as a percentage of the gross domestic product [GDP] over the years [World Bank 2015]). This raises the question of whether this decline has anything to do with the amount of leverage that firms have accumulated over the years. The South African corporate debt market has been growing at an annual compounded growth rate of 8% over the period 2000–2014, from being 0.63% of the GDP to being 1.02% of the GDP (Tendulkar & Hancock 2014). Thirdly, unlike developed markets which are characterised by fragmented ownership structures, the South African setting is characterised by high institutional and concentrated ownership structures (Jallow et al. 2012; Ntim 2015; Ntim et al. 2015). High institutional ownership improves board monitoring and consequently mitigates agency problems (Burns, Kedia & Lipson 2010). Given that the overinvestment hypothesis is anchored in agency theory, this characteristic can potentially influence the results of this topic.

In this study, we add to the literature by examining the relationship between leverage and investments in South Africa. Furthermore, we investigate whether this relationship is influenced by a firm's growth opportunities. We use a sample of 51 industrial firms listed on the Johannesburg Stock Exchange (JSE) over the period 2008–2014. To account for heterogeneity among firms, we apply the fixed effects and random-effects regression model. The contributions of this article can be summarised along two dimensions; Firstly, this is the first study to investigate the relationship between leverage and investment in an emerging market characterised by concentrated and high institutional shareholding. Secondly, the study uses the South African market setting to update and confirm the studies by Aygun et al. (2014), Dang (2011), Franck et al. (2008) and McConnell and Servaes (1995) who reported a negative relationship between leverage and investment, in support of the underinvestment theory. Our results support the underinvestment hypothesis, which says debt overhang reduces the incentives for firms to exploit valuable opportunities.

The next section discusses the theoretical framework and empirical literature. The 'Data and methodology' section describes the sample and data used. The 'Results' section outlines the research methods used, and the 'Discussion and analysis of results' section reports and analyses the results. Finally, the 'Conclusion' section concludes the study.

Theoretical framework and literature review

Under the proposition put forth by Modigliani and Miller (1958), investment decisions are solely driven by fundamental factors such as profitability and cash flows of the firm. A nascent stream of research has challenged this proposition, arguing that debt plays a significant role in influencing investment decisions. Two hypothesis (the underinvestment and overinvestment hypothesis) have been put forward to explain how leverage affects investments.

With the underinvestment hypothesis, debt has the effect of reducing capital investment, leading to lower levels of investment despite available growth opportunities (Myers 1977). Under this hypothesis, debt influences investment in two ways. The commitment to interest and principal payments reduce liquidity or cash that can be channelled to investment. Myers (1977) concurs with this view, pointing out that levered firms forego some of the projects with positive net-present value owing to liquidity problems induced by debt finance commitments. In addition, debt brings an additional stakeholder with first priority in receiving proceeds in the event of liquidation. This disincentivises the shareholder-management coalition from investing in capital projects because the benefits will partially accrue to bondholders. Hence, firms with long-term debt are less likely to invest in valuable opportunities (Ahn et al. 2006; Aivazian et al. 2005). The underinvestment hypothesis predicts a significant negative relationship between leverage and investment in companies with high growth opportunities than those with low growth opportunities.

Empirical evidence exists to support the underinvestment hypothesis. Using a sample of UK firms over the period 1996–2003, Dang (2011) reports a significantly stronger relationship between leverage and investment for firms with high growth opportunities. Aygun et al. (2014), Dang (2011), Franck et al. (2008) and McConnell and Servaes (1995) report similar results; however, their studies were based on different countries and different time periods. The study by Aygun et al. (2014) was based on 135 Turkish firms listed on the Istanbul Stock Exchange from 1992 to 2007. The study by Franck et al. (2008) focused on a sample of 64 246 Belgian private firms over the period 1996–2005.

On the flip side, the overinvestment theory argues that leverage reduces the overinvestment problem that can arise owing to agency problems (Aivazian et al. 2005; Firth, Lin & Wong 2008). Management running the firm may have conflicting interests with shareholders, which will result in the management engaging in empire building by continuously taking on more investments to fulfil their personal interests, while destroying shareholder value (Shleifer & Vishny 1997). Debt comes with a commitment to pay the interest regularly and the principal on maturity, failure of which can result in the company being summoned to a bankruptcy court. The need to make regular payments on specific dates provides an incentive for management to operate efficiently and to desist from taking on projects that generate negative net-present values or projects that destroy shareholder value (Agrawal & Knoeber 1996; Denis 2001; Jensen 1986). Debt reduces the discretion that management has over the cash flows. The overinvestment hypothesis predicts a stronger and significant negative relationship between leverage and investment in firms with low growth opportunities than those with high growth opportunities.

Empirical evidence exists to support the overinvestment hypothesis. After examining a sample of high-investment firms in Latin America (Mexico, Chile and Brazil) during the period 1997–2006, Fernandez (2011) found more support for overinvestment theory relative to the underinvestment theory. They found the relationship between leverage and investment to be negative and to be stronger in firms with low growth opportunities relative to those with high growth opportunities. Furthermore, studies by Aivazian et al. (2005), Lang et al. (1996) and Odit and Chittoo (2011) reported similar results after controlling for endogeneity. Aivazian, Booth and Cleary (2003) followed the methodology of Lang et al. (1996); however, their study focused on Canadian firms over the period from 1982 to 1999. Furthermore, they controlled for the individual firm heterogeneity which was assumed to be zero by Lang et al. (1996). The study by Odit and Chittoo (2011) was based on a sample of 27 firms listed on the Stock Exchange of Mauritius, over the period from 1990 to 2004.

Data and methodology

This section describes the data collected, variables used and the empirical model used to answer the research questions.

Data

Our sample is based on all industrial firms listed on the JSE from 2008 to 2014. The year 2007 was used as the lag year. Hence, the analysis covered a period of 7 years, and this is consistent with Aivazian et al. (2003). The industrial sector is a natural choice because of its relatively bigger influence on the GDP (Industrial Development Corporation 2013). The initial sample comprised 76 firms. After screening for missing variables and coding errors, we were left with a final sample of 51 companies and 357 observations. Splitting the sample between firms with low and high growth opportunities produces 287 and 70 observations, respectively. The data used in this article were extracted from I-NET Expert. All the analysis done in this article used the statistical package of STATA.

Variable description

The measurement of the variables used in this article follows the work of Aivazian et al. (2005), Lang et al. (1996) and Odit and Chittoo (2011). Investment is measured as a ratio of net investment to lagged net fixed assets. Net investment is measured as net capital expenditure. Similar to Aivazian et al. (2005), we use two alternative measures of leverage, the ratio of total liabilities to total assets and the ratio of long-term debt to total assets. Growth opportunities are measured as a ratio of the market value to book value of the total assets of the firm (Tobin's Q). The market value of the total assets is the summation of the total liabilities and the value of common and preferred stock. Cash flow is defined as earnings before depreciation and extraordinary activities. Both cash flow and sales are deflated by lagged net fixed assets.

Baseline model

To answer the first research question, on how leverage affects investments, we adopt the baseline specification used by Aivazian et al. (2005) and Lang et al. (1996). To answer the second research question, on whether the relationship between leverage and investment is influenced by the firm's growth opportunities, we divide the sample into two groups based on the level of growth opportunities and then run the baseline model on each. Companies with a Tobin's Q of greater than one are considered to be high growth firms, while the rest of the firms are categorised as low growth firms.

The empirical model is as follows:

$$I_{i,t}/K_{i,t-1} = \alpha_{i,t} + \beta_1(CF_{i,t}/K_{i,t-1}) + \beta_2 LEV_{i,t-1} + \beta_3 Tobin'sQ_{i,t-1} + \beta_4(Sales_{i,t-1}/K_{i,t-1}) + \mu_i + \varepsilon_{i,t} \quad \text{[Eqn 1]}$$

In the model above, the $I_{i,t}$ is the net investment for firm i at time *t*; $K_{i,t-1}$ is the lagged net fixed assets; $CF_{i,t}$ is the cash flow for firm *i* at time *t*.; Tobin's Q_{it-1} is the lagged Tobin's Q; $Lev_{i,t-1}$ is lagged leverage; $Sale_{i,t-1}$ is lagged net sales for firm i; α is a constant effect; μ_i is the individual effect of firm *i*; and $\varepsilon_{I,t}$ is the error term.

Panel data estimation

Prior studies (see Lang et al. 1996) assume that the unobserved individual effect is zero and consequently estimates Equation (1) using the pooled ordinary least squares (OLS) regression. While the pooled OLS is useful in estimating Equation (1), it fails to account for unobserved firm-level heterogeneity (fixed effects). In a similar study, Aivazian et al. (2005) and Odit and Chittoo (2011) found the pooled OLS model to be inappropriate, concluding that it has the possibility of underestimating the impact of leverage on investment. Consequently, they applied the fixed-effects model. Given that the fixed-effects model transformation can remove useful information and the possibility that individual-specific effects are random and uncorrelated with the explanatory variables, we perform the Hausman test to evaluate the best model between the fixed-effects and the random-effects model. If the individual-specific effects are correlated with the regressors, then the fixed-effect model will give consistent estimators and should be chosen. If not, the random-effect model should be used. A low *p*-value for the Hausman tests indicates the appropriateness of the fixed-effect model. If the individual effects are not correlated with the independent variables and the model is correctly specified, then estimates from these models should be the same.

Table 1 shows the descriptive statistics of the variables for the whole sample period of our analysis. Our final sample consists of 357 observations and 51 companies. The mean investment ratio for our sample is 0.0058, indicating low levels of capital expenditure relative to net assets, while the standard deviation is 0.757, which is 151 times the mean. The mean of leverage is approximately 0.59, indicating a high use

TABLE 1: Descriptive statistics of the key variables.

Variable	Observations	Mean	SD	Min	Max
Investment	357	0.0058085	0.7572428	-1.289439	10.49471
Leverage	357	0.5937388	0.2037819	0.0643449	1.6375
Tobin's Q	357	0.6630491	0.326044	0.0644752	3.089734
Sales	357	1.844569	3.596198	-3.31737	27.69017
Cash flow	357	1.455849	2.882862	-1.394465	24.25673

SD, standard deviation.

TABLE 2: Correlation matrix of the variables used in the regression when long-term debt is the dependent variable.

Variable	Investment	Leverage	Tobin's Q	Sales	Cash flow
Investment	1	-	-	-	-
Leverage	0.1136	1	-	-	-
Tobin's Q	0.2465	0.0511	1	-	-
Sales	0.1867	0.0407	0.2342	1	-
Cash flow	0.2602	0.0601	0.2420	0.9669	1

TABLE 3: Correlation matrix of the variables used in the regression when total liabilities are the dependent variable.

Variable	Investment	Leverage	Tobin's Q	Sales	Cash flow
Investment	1	-	-	-	-
Leverage	-0.0503	1	-	-	-
Tobin's Q	0.2465	0.6534	1	-	-
Sales	0.1867	0.0005	0.2342	1	-
Cash flow	0.2602	-0.0297	0.2420	0.9669	1

of debt. The mean of the Tobin's Q is 0.66, indicating expectations of weak growth opportunities in the industrial sector over the sample period.

Tables 2 and 3 present the correlation matrix between the variables. The difference between the two tables is the proxy for leverage. In Table 2, leverage is represented by long-term debt to total assets, while in Table 3 it is represented by total liabilities to total assets. The correlation coefficient is below 80% for all the variables (except for the correlation between sales and cash flow); hence, the multicollinearity should not be a concern. However, the correlation coefficient for sales and cash flow is 0.9669; this is a high number but it would have been a concern for multi collinearity if the variables were perfectly correlated. The Stata package also has the capability to reject two variables that are perfectly correlated in a way that will affect the results.

Results

In this section, we examine the empirical relationship between leverage and investments using OLS regression as per Equation (1). We also present the results of the Hausman test to evaluate the more appropriate model between random and fixed effects.

Table 4 reports the results of Equation (1) when long-term debt is used as a measure of leverage. The parameters shown are estimated using random and fixed effects, while the standard errors are reported in brackets. In choosing the appropriate model to estimate our relationship, the Hausman test is used. The null hypothesis is that the unobserved individual characteristics are not correlated with the regressors. The *p*-value reported is 0.0065 which is significant at 1% level. This implies that the unobservable individual characteristics are correlated with the regressors; hence, the fixed effect is more appropriate compared to the random-effect model. In addition, the random-effect model assumes that this correlation is 0; but from the fixed-effect model it was reported to be -0.3058, that is, corr (u_i, Xb) = -0.3058 proving that the random-effect model is not appropriate.

TABLE 4: Regression results for Equation (1) using long-term debt as a proxy of leverage.

Dependent variable	Random effect		Fixed effect	
	Coefficient	*p*	Coefficient	*p*
Constant	-0.3752	0	-0.4391	0.0050
	(-0.0840)		(-0.1539)	
Leverage	1.5434	0.128	0.6548	0.6760
	(-1.0128)		(-1.5677)	
Tobin's Q	0.4466	0	0.4410*	0.0700
	(-0.1101)		(-0.2428)	
Sales	-0.2054	0	-0.0179	0.8120
	(-0.0401)		(-0.0750)	
Cash flow	0.3026	0	0.1207	0.1600
	(-0.0501)		(-0.0857)	
Hausman test	-*p* = 0.0065			
Observations	357		357	
R^2	17.35%		10.95%	

*, Significant at the 10% level.

The results of the fixed-effects model show that leverage (measured as long-term debt to total assets) is positively related to investment, but the coefficient is not statistically significant. The coefficient for the Tobin's Q and cash flows show the expected positive sign, while the coefficient for sales is negative and different from the expected sign. The Tobin's Q is statistically significant at 10% level, indicating that the existence of growth opportunities have a positive effect on the levels of investments by firms. The coefficients for sales and cash flow are not statistically significant.

TABLE 5: Regression results for Equation (1) using total liabilities as a proxy of leverage.

Dependent variable	Random effect		Fixed effect	
	Coefficient	*p*	Coefficient	*p*
Constant	-0.0321	0.7760	0.1001	0.6640
	(-0.1131)		(-0.23)	
Leverage	-1.0132	0	-1.6168*	0.0020
	-1.0132		(-0.5209)	
Tobin's Q	0.8976	0	1.1436*	0.0010
	(-0.1561)		(-0.3259)	
Sales	-0.1840	0	-0.0289	0.6960
	(-0.0396)		(-0.0739)	
Cash flow	0.2636	0	0.1104	0.1920
	(-0.0501)		(-0.0845)	
Hausman test	$p = 0.0042$			
Observations	357		357	
R^2	20.69%		16.35%	

*, Significant at the 1% level.

TABLE 6: Regression results for Equation (1) based on a subsample of firms with high growth opportunities.

Dependent variable	Random effect		Fixed effect	
	Coefficient	*p*	Coefficient	*p*
Constant	0.1005	0.862	0.0746	0.9270
	(-0.5796)		(-0.8057)	
Leverage	-1.5595*	0.046	-3.1014	0.0820
	(-0.7806)		(-1.7532)	
Tobin's Q	1.0902**	0.01	2.2036	0.0980
	(-0.4242)		(-1.3102)	
Sales	-0.0583	0.785	-0.0289	0.4970
	(-0.214)		(-0.5157)	
Cash flow	0.1152	0.658	-0.3821	0.5140
	(-0.2601)		(-0.5819)	
Hausman test	$p = 0.3304$			
Observations	70		70	
R^2	22.51%		20.38%	

**, Significant at the 5% level; **, Significant at the 5% level.

TABLE 7: Regression results for Equation (1) based on a subsample of firms with low growth opportunities.

Dependent variable	Random effect		Fixed effect	
	Coefficient	*p*	Coefficient	*p*
Constant	-0.1011	0.211	-0.1019	0.5320
	(-0.0808)		(-0.1628)	
Leverage	0.267	0.377	0.3454	0.4270
	(-0.3023)		(-0.4337)	
Tobin's Q	-0.1743	0.539	-0.3390	0.3030
	(-0.284)		(-0.3286)	
Sales	-0.1777	0	-0.0460	0.2260
	(-0.0242)		(-0.0379)	
Cash flow	0.2487	0	0.1203*	0.0070
	(-0.031)		(-0.0441)	
Hausman test	$p = -0.0001$			
Observations	287		287	
R^2	22.13%		7.14%	

*, Significant at the 1% level.

Table 5 presents the regression results when total liabilities are used as a measure of leverage. The Hausman test reports a *p*-value of 0.0042 which indicates that the fixed-effect model is preferred over the random effect. The estimate for leverage from the random effect is smaller than that of the fixed effect. This indicates that ignoring the correlation between the individual effects and the independent variable will underestimate the impact of leverage on investment.

The results of the fixed-effects model show that leverage (measured by total liabilities to total assets) is negatively related to investment and the coefficient is statistically significant at 1% level.

The coefficients for the Tobin's Q and cash flows show the expected positive sign, while the coefficient for sales is negative and different from the expected sign. The Tobin's Q is statistically significant at 1% level, indicating that the existence of growth opportunities have a positive effect on the levels of investments by firms. The coefficients for sales and cash flow are not statistically significant.

Table 6 presents the results of the relationship between leverage and investment for high growth firms. In choosing the most appropriate model, the Hausman test provides a *p*-value of 0.3304, which implies that the individual-specific effects are not correlated with the independent variables; hence, the random-effect model should be used. The results of the random-effects model show that leverage is negatively related to investment and the coefficient is statistically significant at 5% level. The coefficient for the Tobin's Q and cash flows show the expected positive sign, while the coefficient for sales is negative and different from the expected sign. The coefficients of all the control variables are not statistically significant.

Table 7 presents the results of the relationship between leverage and investment for low growth firms. The Hausman test provides a *p*-value of 0.0001 which is in favour of the fixed-effect model. The results of the fixed-effects model show that leverage is positively related to investment, but the coefficient is not statistically significant. The coefficient for the Tobin's Q and sales are negative and different from the expected sign, while the coefficient for cash flows is positive and of the expected sign. The coefficient for the Tobin's Q and sales are not statistically significant, but the coefficient for cash flows is statistically significant at 1% level.

Discussion and analysis of results

Overall, our results show that the relationship between leverage and investment differ depending on (1) the proxy of leverage used (long-term or total liabilities) and (2) the level of growth opportunities available to the firm. When long-term debt is used as a proxy, we find the relationship between leverage and investment to be positive but not statistically significant. This result is inconsistent with the results of prior studies (see Aivazian et al. 2005; Sheng & Hou 2014) who found a negative and statistically significant relationship between leverage and investment. However, when total liabilities (which include short- and long-term liabilities) are used as the proxy, we find a result that is consistent with the results of Aivazian et al. (2005) and Sheng and Hou (2014). We find leverage to be negatively related to investment and the relationship is significant at 1% level. This implies that

leverage plays a disciplining role in firm's decisions by limiting the cash available for investment. The obligation to pay the interest periodically and the principal on maturity reduces the cash available for investment.

After categorising the firms based on the level of growth opportunities, we find the relationship between leverage and investment to differ depending on the level of growth opportunities available to the firm. For firms with high growth opportunities, leverage has a negative effect on the level of investment and the relationship is statistically significant. This result is in line with the underinvestment investment hypothesis proposed by Myers (1977), and it is consistent with the findings of Aygun et al. (2014), Dang (2011), Franck et al. (2008) and McConnell and Servaes (1995). The results imply that firms may forego investment opportunities with a positive net-present value owing to the liquidity problems brought about by debt financing. In addition, management may be reluctant to invest in growth opportunities as the value derived by the shareholder is shared with the bond holders. This shows that financial leverage can also limit the growth of the firm as they may possibly reject projects with positive net-present values.

For firms with low growth opportunities, we also find a negative relationship between leverage and investment; however, the relationship is not statistically significant. The insignificant relationship reported implies that leverage is not relevant when low growth firms make their investment decisions. This result is inconsistent with previous studies (e.g. Aivazian et al. 2005; Lang et al. 1996) which find a significant negative relationship between leverage and investment for firms with low growth opportunities.

Conclusion

This study examines the relationship between financial leverage and investment using two different proxies of leverage. In addition, we investigate whether the relationship between leverage and investment is influenced by a firm's growth opportunities. Our sample of 51 companies is drawn from industrial companies listed on the JSE over the period from 2008 to 2014. In line with prior studies, we use fixed- and random-effect model to control for the heterogeneity across firms.

The results of the study show a significant negative relationship between leverage and investment for firms with high growth opportunities. However, the results are only significant when total liabilities are used as proxy of leverage; when long-term debt was used as a proxy, the results were not statistically significant. Extending the analysis by examining sub-categories of high and low growth firms, we find the relationship to be negative and statistically significant only for firms with high growth opportunities. The results show that debt overhang can be a constraint to investment and growth. The commitment to pay interest and the principal results in firms foregoing projects with positive net-present values. The results are in line with the underinvestment theory, and they corroborate the results of prior studies (see Aygun et al. 2014; McConnell & Servaes 1995).

Our study is not without limitations. Firstly, the study focused on one sector, the industrial sector; hence, the results may not be applicable to other sectors whose settings and characteristics are different from the sector we analysed. Future research can extend this topic by broadening the sample to include other sectors like banks. Secondly, the sample size of 51 firms is relatively low compared to sample sizes from other countries (e.g. Aygun et al. 2014; Franck et al. 2008). A smaller sample can produce biased estimates, and it provides little room to conduct further analysis by splitting the data into subsamples (Lin, Lucas & Shmueli 2013; Maas & Hox 2005). Future research can revisit this topic by examining a larger sample size, which can be split into various categories like institutional ownership and debt maturity profile.

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Competing interests

The authors declare that they have no financial or personal relationships which may have inappropriately influenced them in writing this article.

Authors' contributions

Both authors equally contributed to the research and writing of this article.

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