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Article

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The effect of financial leverage on financial performance: evidence from non-financial institutions listed on the Tokyo stock market

Financial
leverage &
financial
performance

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Abstract

Purpose – The study seeks to find the effect of financial leverage on the firm performance of non-financial companies listed in the Tokyo stock market.

Design/methodology/approach – The study collected data from 263 companies in the automobile and industrial producer sectors listed on the Tokyo stock exchange between 2001 and 2021. The generalized method of moments was used to estimate the effect of leverage on financial performance due to its ability to overcome the problems of endogeneity and autocorrelation.

Findings – The study found that the equity multiplier has a positive and statistically significant effect on return on assets (ROA), return on equity (ROE) and earning per share (EPS). The study discovered that the interest coverage ratio has a positive and statistically significant effect on ROA, ROE, EPS and Tobin's Q. The results revealed that the degree of financial leverage and debt to earnings before interest, taxes, depreciation and amortization (EBITDA) have a negative and statistically significant effect on ROE, EPS and Tobin's Q. The study also found that the capitalization ratios of the firms have a negative and statistically significant effect on ROA, ROE, EPS and Tobin's Q.

Practical implications – The use of debt financing, which presents financial leverage, indicates that the companies can make enough earnings to pay off the interest and principal (debt service obligations), which were shown by the interest coverage ratio, as well as to pay all the long-term fixed expenses, which were shown by the fixed charge coverage ratio. Interest and fixed charge coverage have a positive statistically significant effect on the financial performance of automobile and industrial producer companies.

Originality/value – The study focused on the effect of financial leverage on financial performance by relying on pecking and trade-off theories to contribute to the existing body of literature in finance.

Keywords Companies, Financial performance, Fixed charge coverage ratio, Interest coverage ratio, Trade-off theory

Paper type Research paper

1. Introduction

Companies with debt in their capital structure are said to be leveraged, while those that do not have debt are said to be unleveraged (Dakua, 2019). Leverage refers to the degree to which a company employs debt financing to exploit other investment prospects (Petty *et al.*, 2015). A business can fund its investments using debt, equity and preference shares. Financial leverage is the portion of a company's capital structure that consists of fixed-charge funding mechanisms like debt and preference shares compared to the portion that consists of owners' equity (Goel, 2010). An organization's use of financial leverage increases proportionally with the proportion of its capital structure comprised of debt financing (Ganiyu *et al.*, 2019).



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Nevertheless, costs are associated with borrowing money from an outside source, such as the necessity of paying interest. To gain access to a larger pool of capital, corporations often go public by issuing shares of stock (Fabozzi and Drake, 2009). Another external source of funds for corporations besides stock issuing is the dependence on debt. Debt financing has both advantages and disadvantages. Positives include the fact that by including debt in their capital structure, businesses can take advantage of the tax benefits associated with it (Arnold, 2013). Interest on debt is tax-deductible, and debt can be used in a company's capital structure, unlike equity, without diluting the control of existing shareholders. Most businesses choose to finance operations with debt when the cost of capital is less than the rate of return on investments. Due to the costs of floatation and administration, debt financing is a better option than equity financing (Brigham and Houston, 2021). Using debt financing is preferable to using equity funding because of the many advantages of debt financing.

Many businesses nowadays choose to use debt financing because of its many advantages. There is no universally accepted theory or technique for determining the optimal mix of debt and equity in a company's capital structure. M&M Propositions I argues that the firm's worth is independent of its debt-to-equity ratio (Miller, 1995). Nonetheless, the trade-off theory provided a hint regarding the amount of debt that can be included in the firm's capital structure. Using the trade-off theory, a company weighs the advantages of debt, such as a tax shield, against the disadvantages, like financial distress fees (Campbell and Kelly, 1994). According to the static theory of capital structure, a company will borrow up to the point where the profit from paying interest on an additional dollar of debt is exactly offset by the cost of the higher risk of bankruptcy (Vernimmen *et al.*, 2022). The optimal level of leverage exists when the marginal benefit and marginal cost of debt are equal.

There have been many questions about the optimal capital structure. The optimal capital structure maximizes the firm's value. According to M&M Propositions II, an optimal capital structure is achieved when the weighted average cost of capital (WACC) is low (Graham and Harvey, 2001). If the debt is used, WACC may be reduced. Although there are benefits to using debt financing, there are costs to doing so excessively. Increased debt usage in a company's capital structure raises the risk of financial distress and the likelihood of insolvency due to default on its payments (De Matos, 2018). The key drawback of debt capital is the potential inability to meet loan repayment commitments in full and on time. Brealey *et al.* (2018) say that lenders and investors tend to think that companies with a lot of debt in their capital structure are risky to lend money to.

Numerous studies have examined the impact of financial leverage on a firm's financial performance. Most of the studies used debt to equity, short-term to total asset, longer-term debt to total asset, equity ratio and debt ratio as proxies for financial leverage to estimate their effect on financial performance (Irungu *et al.*, 2018; Afolabi *et al.*, 2019; Kenn-Ndubuisi and Nweke, 2019; Shaferi *et al.*, 2020; Mennawi, 2020; Abubakar, 2020; Nugraha *et al.*, 2020; Lestari, 2021). These contributions have added to the existing body of literature. The interest coverage ratio and the capitalization ratio as proxies for financial leverage and their effects on financial performance have been underexplored in the literature, while the equity multiplier, degree of financial leverage, fixed charge coverage ratio and total debt/earnings before interest, taxes, depreciation and amortization (EBITDA) as proxies for financial leverage have not yet been explored for their effects on financial performance. The study aims to find the effect of financial leverage (interest coverage ratio, capitalization ratio, equity multiplier, degree of financial leverage, fixed charge coverage ratio and total debt/EBITDA) on the financial performance of non-financial institutions listed on the Tokyo Stock Exchange.

The study selected companies from the automobile and industrial production sectors because the operation of the sectors required lump sums of money and because firms cannot depend solely on their internally generated funds but require an external source of funding in the form of debt or equity. In addition, the automobile and industrial production sectors are the top fast-growing sectors in Japan and contribute significantly to the country's economy.

The study found that the equity multiplier, which measures how much company assets are funded with equity, shows a positive and statistically significant effect on the financial performance of automobile and industrial production companies listed in the Tokyo stock market. The interest coverage ratio, which measures the ability of the companies in the automobile and industrial producer sectors to generate enough earnings to pay for the debt service obligations of the firms, has a positive and statistically significant effect on the financial performance of the firms.

2. Literature review and hypotheses development

2.1 *Pecking order theory*

The pecking order theory suggests a hierarchy of funding options for businesses. All forms of corporate financing entail some cost and risk; the decision is not made arbitrarily but rather quite blatantly by the corporation's management. Asymmetric information between the insiders and outsiders of a company is the foundation of the pecking order theory (Miglo, 2012). The pecking order theory states that debt should be issued before equity if a company needs to raise money from outside sources. When the firm's ability to raise debt financing has been exhausted, only then should equity be considered.

2.2 *Static theory/trade-off theory*

According to the static capital structure theory, a company will borrow until the additional tax advantage from an additional dollar of debt is precisely equal to the cost, with a greater chance of financial crisis (Shyam-Sunder and Myers, 1999). The static theory assumes that the firm's assets and operations are static and simply accounts for variations in the debt–equity ratio. Using the trade-off theory, each company weighs the advantages of debt, such as a tax shield, against the disadvantages, such as distress costs (Cekrezi, 2013). When the marginal benefit of debt matches the marginal cost of debt, then that is the sweet spot for leverage. Financial leverage is chosen by weighing the pros and cons of debt and equity financing, as emphasized by the trade-off theory. The marginal benefit of the debt starts to fall as the marginal cost rises as the company takes on more of it. As a result, managers must find the sweet spot where marginal costs are minimized and benefits are maximized.

2.3 *Dynamic trade-off theory*

The dynamic trade-off theory says that firms may allow their capital structures to deviate from their target leverage ratios to consider the costs and advantages of using debt and equity and the financing margin the firm anticipates in the following period. If the company has to reinvest its profits, according to Fischer *et al.* (1989), the best capital structure should be one that can adapt to its circumstances.

2.4 *Financial leverage*

Using borrowed funds to improve corporations' financial positions is an example of financial leverage (Petty *et al.*, 2015). Companies with a high level of leverage are more likely to collapse if they cannot meet their interest and principal payments on their debt. Leveraging has tax benefits and can also help the company get enough money to finance business expansions.

Fixed interest payments, the price of financial distress and bankruptcy fees all arise from businesses' inability to pay their debts as they come due, which is why some organizations avoid debt financing (Altman and Hotchkiss, 2010). Financial leverage improves a company's efficiency and performance, and it typically increases the company's value. More highly leveraged companies are more likely to seek ways to boost their operations. The proxies for financial leverage are.

2.5 Interest coverage ratio

The interest coverage ratio is a standard metric for lenders to gauge a company's solvency relative to its interest payments by comparing its earnings to its interest expenses over a given period (Eriotis *et al.*, 2007). If the ratio is high, the company brings in significantly more money than it needs to cover its interest expenses. When judging high-creditworthiness debtors, creditors usually use a coverage ratio of more than 1 as a minimum standard (Lian and Ma, 2021). Lenders may get concerned about a company's solvency if its interest coverage ratio drops below 1.

- H1. As a proxy for financial leverage, the interest coverage ratio statistically significantly influences the company's financial performance.

2.6 Equity multiplier

When comparing the financing of a company's assets between stockholder equity and debt, the equity multiplier can be used as a risk indicator (Abraham *et al.*, 2017). Companies that use a lot of debt to finance their assets have a higher equity multiplier. When the equity multiplier is low, a corporation uses less debt and is less risky.

If the equity multiplier is high, the corporation uses a lot of debt to finance its assets. A company needs a consistent cash flow stream to stay afloat, and if its debt load is high, so will its debt servicing costs (Shleifer and Vishny, 1992). A corporation with a low equity multiplier likely has few assets funded by debt. The use of debt to purchase assets requires the payment of interest and principal.

- H2. The multiplier equity as a proxy for financial leverage statistically significantly influences a company's financial performance.

2.7 Fixed charge coverage ratio

One way to evaluate financial leverage is by using the fixed charge coverage ratio. It demonstrates how much a company can cover its ongoing operating expenses (Zelalem, 2020). The fixed charge coverage ratio quantifies a company's ability to meet fixed charges such as interest and rent. It reveals whether or not a company's revenue is sufficient to cover its fixed costs. When financial institutions decide whether to extend credit to a company, they frequently consider this ratio. A company with a low fixed charge coverage ratio cannot cover its fixed charges with its current earnings. Lenders try to avoid borrowers with a low ratio because it increases the risk that they will not be repaid. A low ratio indicates that borrowers will have trouble paying fixed charges.

- H3. The fixed charge coverage ratio as a proxy for financial leverage statistically significantly influences a company's financial performance.

2.8 Degree of financial leverage

An organization's degree of financial leverage ratio indicates how vulnerable its profits per share are to shifts in its operating income as a result of changes in its capital structure (Tharshiga and Anandasayanan, 2013). The degree of financial leverage a firm chooses to use as part of its capital structure can determine how much debt or financial leverage it should choose. If a company's operating income is reliable, then its profits and earnings per share will be as well, and the firm will be able to incur substantial debt without jeopardizing its financial health. Nevertheless, if the company's operating income is unpredictable, it may be best to keep debt levels low enough to be easily managed.

- H4. The degree of the financial leverage ratio as a proxy for financial leverage statistically significantly influences a company's financial performance.

2.9 Debt to EBITDA ratio

The debt-to-EBITDA ratio shows how well a company can meet its debt obligations (Okunev, 2022). Lenders use this ratio to gauge a company's risk, while investors use it to gauge dividend payout potential. Companies with a higher debt-to-EBITDA ratio are more indebted and susceptible to financial instability. Lenders and analysts use the EBITDA ratio to gauge a company's financial health. Analysts often prefer to use EBITDA rather than net income to evaluate a company's profitability.

- H5. The debt-to-EBITDA ratio as a proxy for financial leverage statistically significantly influences a company's financial performance.

2.10 Capitalization ratio

The capitalization ratio is a financial indicator used to evaluate the degree of debt in an organization's capital structure (Blouin *et al.*, 2014). Companies can raise capital for their daily operations through either debt or equity. Companies with higher ratio results are more highly leveraged and likely to go bankrupt. While the tax advantages of debt can boost returns to shareholders, a high capitalization ratio also raises the likelihood that the company will go bankrupt. Total debt to capitalization is a financial metric used to evaluate how much debt a company has compared to its total value of assets (Ismail, 2017). The leverage ratio measures how much debt was used to acquire the company's assets. A higher debt-to-capital ratio increases the likelihood of bankruptcy.

- H6. The capitalization ratio as a proxy for financial leverage statistically significantly influences a company's financial performance.

3. Methodology

3.1 The population of the study (companies' selection)

The study used non-financial companies listed on the Tokyo stock market. Japan was selected for the study because most of the firms incorporated in the Tokyo stock market used debt financing rather than equity financing, which was the study's purpose. Also, the selected sectors required a lump sum of money to finance business activities, which is impossible for the firms to finance with their internally generated funding. Most investors have relocated to Japan or are considering relocating since the country is the world's third-largest economy and is already home to many global corporations (Schaede, 2020). Foreign companies can take advantage of Japan's burgeoning economic prospects as the country's economy continues to improve. Japan has a unique economy as it has one of the highest per capita incomes in the world. Possible investors gain peace of mind and stability from an economically robust country with a stable currency. According to Rose and Krausmann (2013), businesses do well in Japan because the country has well-developed industries and modern infrastructure.

3.2 Sampling strategy and sample size

The study used 21 years of data, starting from 2001 to 2021. A purposive sampling technique was used to select companies with 21 years of data obtained from Thomson Reuter's Eikon database. Those companies that did not have 21-year data were not considered part of the study. The study used non-financial institutions from the two sectors. The sectors are automobile and industrial producer companies. The study used 99 companies in the automobile sector and 164 industrial producer companies. The final sample size of 263 companies met the selection criteria. Therefore, the study used 5,523 firm years of observation, where companies in the automobile industry had 2,079 years of observation, and industrial production companies had 3,444 years of observation.

Variables such as degree of financial leverage, fixed charge coverage ratio, interest coverage ratio and debt-to-EBITDA ratio were outliers. The outliers were dealt with by using winsor2. Winsor2 is a command in Stata. We winsorized all variables at their 10th and 90th percentiles.

3.3 Variable selection

3.3.1 *Dependent variables.* The variables for all the studies are summarized in Table 1. The study used four independent variables that measure the firm’s financial performance: return on assets, return on equity, earnings per share and Tobin’s Q. The first explained variable was return on assets (ROA). Every firm, big or small, has an asset used for its operation. The firms are required to make a profit on the use of their assets. The return on assets is one way to evaluate a company’s financial performance. The ROA helps determine whether the corporation’s management is using the firm’s assets effectively and efficiently to generate enough earnings. The lower ROA indicates that the firms’ assets are underutilized, which shows management’s inefficiency, and the higher ROA means that the assets are efficiently utilized, showing that management is efficient.

The return on equity (ROE) was the second variable used to measure the firm’s financial performance. The ROE measures the ability of the firms to use the shareholders’ equity to generate enough returns for the corporation. Equity represents the ownership of the shareholders in the corporation. A higher ROE indicates that the management can effectively and efficiently utilize the shareholders’ equity to generate adequate earnings for the

Variable	Formulas	Authors
<i>Dependent variables</i>		
Return on asset	Net income after tax/average total assets * 100	Rehman (2013), Lestari (2021)
Return on equity	Net income after tax/average total equity * 100	Maina <i>et al.</i> (2018)
Earnings per share	Net income after tax/average total outstanding share	Kenn-Ndubuisi and Nweke (2019)
Tobin’s Q	Total market value of firm/Total asset of firm	Dey <i>et al.</i> (2018)
<i>Independent variables</i>		
Equity multiplier	Total assets/total shareholder equity	Abraham <i>et al.</i> (2017), Okunev (2022)
Interest coverage	EBIT/interest expense	Vishwanath (2007), Graham and Harvey (2001)
Fixed charge coverage ratio	(EBIT + fixed charges before tax)/(fixed charges before tax + interest)	Graham and Harvey (2001), Brealey <i>et al.</i> (2018)
Degree of financial leverage	% changes in net income/% changes in EBIT	Vernimmen <i>et al.</i> (2022), Brealey <i>et al.</i> (2018)
Debt to EBITDA	Total debt/EBITDA	Striscek (2001), Ross <i>et al.</i> (2008)
Capitalization ratio	Total debt/(total debt + shareholder equity)	Blouin <i>et al.</i> (2014), Brealey <i>et al.</i> (2018)
<i>Controlling variables</i>		
Age	The number of years the companies have been on the stock market	Mamaro and Legotlo (2021)
Sales growth	(Current year sales – previous year sales)/previous year sales * 100	Dey <i>et al.</i> (2018), Afolabi <i>et al.</i> (2019)
Size of the firm	Natural log of total asset of the manufacturing companies	Mamaro and Legotlo (2021), Kalash and Bilen (2021)
Source(s): Authors’ own work		

Table 1.
Summary of
dependent,
independent and
controlling variables

corporation, and a lower ROE shows that the management of the corporation uses the shareholders' equity less.

The earning per share (EPS) was the third financial performance measure variable. It shows the amount a corporation pays out of the earnings on each share. Shareholders seek better earnings per share. Higher EPS indicates that the management can generate enough earnings to give shareholders good earnings, and lower EPS suggests that the corporation pays shareholders less on their shares based on the corporation's profit. Tobin's Q is the market value of a corporation divided by the cost to replace its assets. Tobin's Q value of less than 1 means the firms are undervalued, and greater than 1 means the firms are overvalued.

3.3.2 Independent variables. The study used six independent variables that measure the firms' financial leverage: the equity multiplier, degree of financial leverage, fixed charge coverage ratio, interest coverage ratio, debt to EBITDA and capitalization ratio. The variables are used as proxies for financial leverage. The equity multiplier shows the percentage of corporate assets funded by debt or equity. The degree of financial leverage shows the percentage change in a corporation's earnings compared to the percentage change in its EBIT. The fixed charge coverage ratio assesses the ability of the corporation to pay its debt service obligations and fixed expenses.

The interest coverage also assesses the ability of the firms to pay off their debt service obligations from their earnings. The capitalization ratio also shows the percentage of debt the firms employ in their entire capital structure. Debt/EBITDA is a ratio that measures the income available to pay a debt before interest, taxes, depreciation and amortization are deducted.

3.3.3 Controlling variables. The study used three control variables: the size of the firms, sales growth and the age of the firms listed on the Tokyo Stock Exchange. The size of the firms was obtained by applying a log to their total assets. Sales growth measure changes in the corporation's sales.

3.4 Model specification

The study used four models to ascertain the impact of the financial leverage of automobile and industrial producer companies on financial performance. The Arellano–Bond estimation uses the generalized method of moments (GMM) and starts by changing all regressors, usually by differentiating them.

$$\begin{aligned} ROA(t)y = & \beta_0 + \beta_1 ROA(t-1) + \beta_2 EQMP(t)y + \beta_3 INCE(t)y + \beta_4 FCCR(t)y \\ & + \beta_5 DOFL(t)y + \beta_6 LVGRA(t)y + \beta_7 \Delta CAPR(t)y + \beta_8 AGE(t)y \\ & + \beta_9 SALGW(t)y + \beta_{10} SIZE(t)y + \varepsilon(t)y \end{aligned}$$

Model (1)

$$\begin{aligned} ROE(t)y = & \beta_0 + \beta_1 ROE(t-1) + \beta_2 EQMP(t)y + \beta_3 INCE(t)y + \beta_4 FCCR(t)y \\ & + \beta_5 DOFL(t)y + \beta_6 LVGRA(t)y + \beta_7 CAPR(t)y + \beta_8 AGE(t)y \\ & + \beta_9 SALGW(t)y + \beta_{10} SIZE(t)y + \varepsilon(t)y \end{aligned}$$

Model (2)

$$\begin{aligned} EPS(t)y = & \beta_0 + \beta_1 EPS(t-1) + \beta_2 EQMP(t)y + \beta_3 INCE(t)y + \beta_4 FCCR(t)y \\ & + \beta_5 DOFL(t)y + \beta_6 LVGRA(t)y + \beta_7 CAPR(t)y + \beta_8 AGE(t)y \\ & + \beta_9 SALGW(t)y + \beta_{10} SIZE(t)y + \varepsilon(t)y \end{aligned}$$

Model (3)

$$\begin{aligned} TOB(t)y = & \beta_0 + \beta_1 TOB(t-1) + \beta_2 EQMP(t)y + \beta_3 INCE(t)y + \beta_4 FCCR(t)y \\ & + \beta_5 DOFL(t)y + \beta_6 LVGRA(t)y + \beta_7 CAPR(t)y + \beta_8 AGE(t)y \\ & + \beta_9 SALGW(t)y + \beta_{10} SIZE(t)y + \varepsilon(t)y \end{aligned}$$

Model (4)

The return on assets was represented by “ROA”, the return on equity was represented by “ROE”, earnings per share was represented by “EPS” and Tobin’s Q was represented as “TOB”. ROA($t-1$), ROE($t-1$), EPS($t-1$), TOB($t-1$) are the first lag order of the dependent variables included in the GMM regression models as independents. Equity multiplier was represented by “EQMP”, interest coverage was represented by “INCE”, fixed charge coverage was represented by “FCCR”, degree of financial leverage was represented by “DOFL”, debt to EBITDA was represented by “LVGRA”, capitalization ratio was presented by “CAPR”, age was represented by “AGE”, sales growth was represented by “SALGW”, the size of the firm was represented by “SIZE”, the companies were presented by “y”, time was presented by “t” and the error term was presented by “ ε ”.

3.5 Data analysis

There are four methods of modelling panel data. These are the pooled ordinary least squares model, the fixed effect model, the random effect model and the GMM. The pooled ordinary least squares model assumed no unique characteristics across sections. Using the pooled ordinary least squares model would lead to biased estimation when some independent variables are endogenous (Wooldridge, 2001). The fixed effect model also holds that distinct characteristics of an individual cross-section do not change over time. The random effect model believes some systematic random effects exist on individual cross-sections. Using fixed or random effects provides better estimation than the pooled ordinary square (Bell and Jones, 2015). But neither the pooled ordinary least squares model nor the fixed and random effect models can solve the problems of endogeneity, heteroskedasticity and autocorrelation (Racicot, 2015; Croissant and Millo, 2008).

The GMM was chosen because it has been argued to overcome the problems of endogeneity, auto-serial correlation and heteroskedasticity (Ullah *et al.*, 2021; Souza and Gomes, 2015). Therefore, the study used GMM to analyze the effect of financial leverage on the financial performance of non-financial institutions listed on the Tokyo Stock Exchange.

4. Results and discussions

Table 2 shows the descriptive statistics for all the study variables. The firms could use their assets to generate an average return of 2.405%. The average return that the firms recorded on the use of shareholder equity was 5.474%. The average earnings that the firms paid on the shares of the shareholders were 79.142 yen. The average Tobin’s Q recorded by the firms was 0.004. The average Tobin’s Q of 0.004 shows that the firms are undervalued. The average equity multiplier for the firms was 2.547, which shows that the firms’ assets are funded with a greater percentage of debt than equity. The use of debt financing requires the ability of the firms to generate enough earnings to pay for their debt service obligations (interest and principal). The average interest coverage of 43.452 shows that the firms could earn enough to pay off their debt service obligations.

The fixed coverage ratio indicates the ability of the firms to make enough earnings to pay off all their debt service obligations as well as other fixed expenses such as lease costs and rent. The average fixed charge coverage of 1.974 shows that the firms could earn enough to pay off all their debt service obligations and fixed expenses. The degree of financial leverage of 1.182% shows that the firms have less risk associated with the use of debt financing, and the changes in the firm’s capital structure where a greater percentage of debt is used will

Table 2.
Descriptive statistics

Variable	Obs	Mean	Std. dev.	Min	Max
Return on assets	5523	2.405	4.253	−42.62	65.87
Return on equity	5523	5.45	5.578	−4.71	14.04
EPS	5523	79.142	90.665	−49.994	253.956
Tobin's Q	5523	0.004	0.003	0.001	0.07
Equity multiplier	5523	2.546	1.054	1.393	4.702
Interest coverage	5523	43.452	59.654	−1.603	186.429
Fixed charge coverage ratio	5523	1.974	2.636	0	8.406
Degree of financial leverage	5523	1.182	0.903	−0.179	2.956
Debt-to-EBITDA ratio	5523	7.258	5.822	1.111	19.9
Capitalization ratio	5523	0.513	0.199	0	1.557
Age of the firms	5523	64.474	16.564	2	131
Sales growth	5523	1.608	8.829	−13.275	15.202
The size of firm	5523	7.767	0.702	6.164	10.792

Source(s): Authors' own work

attract less risk to the firms. The average capitalization ratio of 51.3% shows that, out of the total capital structure of the firm, the firm used a greater percentage of debt than equity. The average age of the firms on the Tokyo Stock Exchange was 64.474 years. The firms grew their average sales by 1.608%, and the average size of the firms was 7.767.

Table 3 shows the results for the matrix correlation analysis. The relationship that exists between the independent variables in the matrix correlation has been used by many researchers (Midi *et al.*, 2010; Yoo *et al.*, 2014; Aras *et al.*, 2010) to determine if there is perfect collinearity. One of the multiple regression assumptions Wooldridge (2015) outlined is that the independent variables should not be perfectly correlated. Cole and Preacher (2014) and Vatcheva *et al.* (2016) contend that if the coefficients of the two independent variables in the matrix correlation are greater than 0.80, they are considered perfectly correlated. The results from the matrix correlation analysis show that the independent variables are not perfectly correlated with each other.

The variance inflation factors were used to determine whether the variables correlated perfectly. Independent variables are said to be perfectly correlated when the variance inflation factor for each variable is not greater than 10 (Robinson and Schumacker, 2009; Salmerón *et al.*, 2016; Garg, 2017). The variance inflation factor for each variable was computed, and the results show that each variable's variance inflation factor is not greater than 10 (Table 4). Since the variables are not perfectly related, there is no problem with multicollinearity. Other assumptions in Wooldridge's (2015) multiple regressions are normality and heteroskedasticity. The Jarque–Bera test was used for the normality test, and the Breusch–Pagan test was used for the heteroskedasticity tests. The null hypothesis test for both the Jarque–Bera and Breusch–Pagan tests failed to be rejected. Therefore, the data is normally distributed and homoscedastic. The assumptions of normality and heteroskedasticity were also met (Table 5).

Arellano and Bond (2) are used to detect the presence of auto-serial correlation. If the null hypothesis of Arellano and Bond (2) fails to be rejected, then there is no autocorrelation (Blundell *et al.*, 2001; Rountenberg and Tabrikian, 2008). However, if the alternative hypotheses for Arellano and Bond (2) are accepted, there is a problem with autocorrelation. The results obtained for Arellano and Bond (2) indicated that the null hypotheses for all the models (1–4) failed to be rejected. Therefore, the findings show that there is no autocorrelation. The statistically significant results of Arellano and Bond (1) and the statistically insignificant results of Arellano and Bond (2) show that the models are correctly specified. According to Roodman (2009), the Sargan/Hansen tests are used to test the validity of the instruments. For the GMM model, the

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Return on assets	1.000												
(2) Return on equity	0.542	1.000											
(3) EPS	0.603	0.679	1.000										
(4) Tobin's Q	0.328	0.326		1.000									
(5) Equity multiplier	-0.218	-0.075	-0.222	-0.369	1.000								
(6) Interest coverage	0.360	0.298	0.328	0.279	-0.453	1.000							
(7) Fixed charge coverage ratio	0.326	0.230	0.256	0.260	-0.442	0.434	1.000						
(8) Degree of financial leverage	-0.044	-0.057	-0.057	-0.038	0.061	-0.037	-0.020	1.000					
(9) Debt-to-EBITDA ratio	-0.205	-0.236	-0.264	-0.356	0.493	-0.307	-0.308	0.014	1.000				
(10) Capitalization ratio	-0.242	-0.026	-0.204	-0.379	0.511	-0.470	-0.476	0.071	0.501	1.000			
(11) Age	0.051	0.081	0.168	0.019	-0.042	0.087	0.058	-0.004	-0.038	-0.026	1.000		
(12) Sales growth	0.325	0.372	0.255	0.192	-0.053	0.115	0.084	-0.005	-0.136	-0.036	-0.019	1.000	
(13) The size of firm	0.102	0.156	0.193	0.125	0.142	0.004	0.002	0.037	-0.012	0.165	0.349	0.087	1.000

Source(s): Authors' own work

	Variance inflation factor (VIF)	1/VIF	Financial leverage & financial performance
Capitalization ratio	4.364	0.257	
Equity multiplier	4.009	0.286	
Interest coverage	2.303	0.434	
Fixed charge coverage	2.293	0.436	
Debt-to-EBITDA ratio	1.396	0.716	
Size of the firm	1.21	0.826	
Age of the firm	1.158	0.863	
Capitalization ratio	1.07	0.935	
Sales growth	1.002	0.998	
Degree of financial leverage	1	1	
Mean VIF	1.9805		

Source(s): Authors' own work

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Table 4.
Variance inflation
factor

Source	χ^2	Df	P
Heteroskedasticity	35.980	54	0.972
Skewness	7.390	9	0.596
Kurtosis	1.020	1	0.314
Total	44.380	64	0.971

White's test for Ho: homoskedasticity
against Ha: unrestricted heteroskedasticity

$\chi^2(54) = 35.98$
Prob > $\chi^2 = 0.6720$

Cameron and Trivedi's decomposition of IM test
jb residuals

Jarque–Bera normality test: 0.346
Jarque–Bera test for Ho: normality

Source(s): Authors' own work

Table 5.
Heteroskedasticity and
normality tests

independent variables should be exogenous rather than endogenous (Wooldridge, 2001). The Sargan test determines whether the independent variables are exogenous or endogenous. If the null hypothesis for the Sargan test fails to be rejected, then the independent variables are considered to be exogenous (Asongu and Odhiambo, 2019). However, if the alternative hypothesis for the Sargan test is accepted, then the independent variables are endogenous. The results obtained for the Sargan tests for all four models show that the null hypothesis failed to be rejected. Therefore, the independent variables used for the study are exogenous. According to Roodman (2009), the probability value for the Hansen test should be within the range of 0.10–0.30. If the probability value for the Hansen test is less than 0.10 and greater than 0.30, then the instruments used are not valid. The results obtained for the Hansen test indicate that the probability value for the model is between 0.10 and 0.30, as outlined by Roodman (2009). Therefore, the instruments used for the study are valid, and the model is reliable.

Table 6 shows the effect of financial leverage on the financial performance of the firms listed on the Tokyo stock market. The results are discussed based on the effects on ROA, ROE, EPS and Tobin's Q. The degree of financial leverage, equity multiplier and fixed charge coverage ratio were considered endogenous variables, while the capitalization ratio, debt-to-EBITDA ratio and interest coverage ratio were considered exogenous variables. The dependent variables are lagged and were included in the model as a predetermined

Table 6.
Dynamic panel-data
estimation, two-step
robust system GMM

Variables	ROA (model 1)	ROE (model 2)	EPS (model 3)	TOB (model 4)
Lag of ROA, ROE, EPS, TOB	−0.023 *** (0.004)	0.207 *** (0.010)	0.203 *** (0.006)	0.331 *** (0.003)
Equity multiplier	0.064 *** (0.011)	0.197 *** (0.027)	0.404 *** (0.028)	0.101 (0.567)
Interest coverage	0.027 *** (0.007)	0.083 *** (0.004)	0.889 *** (0.037)	0.320 *** (0.116)
Fixed charge coverage ratio	0.085 *** (0.003)	0.337 *** (0.067)	0.660 *** (0.078)	−0.300 *** (0.104)
Degree of financial leverage	−0.046 (0.030)	−0.431 *** (0.051)	−0.759 *** (0.054)	0.772 *** (0.110)
Debt to EBITDA	0.158 *** (0.008)	−0.029 *** (0.012)	−0.120 *** (0.019)	−0.285 *** (0.103)
Capitalization ratio	−0.366 *** (0.011)	−0.131 *** (0.024)	−0.256 *** (0.021)	−0.286 *** (0.010)
Age	0.023 *** (0.016)	0.161 *** (0.020)	0.967 *** (0.219)	−0.146 *** (0.067)
Sales growth	0.064 *** (0.004)	0.173 *** (0.006)	0.216 *** (0.007)	0.198 *** (0.016)
Size of firm	−0.027 *** (0.006)	−0.126 *** (0.008)	0.335 (1.128)	0.372 *** (0.137)
Number of observations	4,900	4,974	4,875	4,974
No. of instruments	185	197	178	222
No. of group	263	263	263	263
Arellano–Bond: AR (1)	0.043	0.006	0.030	0.000
Arellano–Bond: AR (2)	0.812	0.456	0.334	0.564
Sargan test (<i>p</i> -value)	0.346	0.761	0.653	0.228
Hansen test (<i>p</i> -value)	0.234	0.112	0.265	0.123

Source(s): Authors' own work

variable. To deal with the endogeneity variables, instrumental variables, which are total assets, total debt and capitalization ratio were lagged, which changed the endogeneity variables to exogenous variables.

Model 1: The effect of financial leverage on ROA

The lag of ROA included in the regression model as an explanatory variable had a negative and statistically significant effect on ROA. The firms' equity multiplier, interest coverage ratio, fixed charge coverage ratio and debt-to-EBITDA ratio have a positive and statistically significant effect on ROA at a significance level of 1 %. If the firms' equity multiplier, interest coverage ratio, fixed charge coverage ratio and debt-to-EBITDA ratio are raised by 1 %, the ROA of the firms will rise by 0.064 %, 0.027 %, 0.085 % and 0.158 %, respectively. The interest coverage ratio having a positive and statistically significant effect on ROA is consistent with the results obtained by [Enekewe *et al.* \(2014\)](#) and [Lestari \(2021\)](#). [Kothari and Japee \(2021\)](#) found a negative effect of the interest coverage ratio on ROA, which is inconsistent with the study results.

The result shows that the degree of financial leverage and capitalization ratio of the firms have a negative effect on ROA. However, the capitalization ratio of the firms has a statistically significant effect on ROA. If the firms' financial leverage and capitalization ratio are increased by 1 %, ROA will fall by 0.046 and 0.366 %, respectively. The age and sales growth of the firms have a positive and statistically significant effect on ROA at a significance level of 1 %, while the size of the firms shows a negative and statistically significant effect on ROA. [Dey *et al.* \(2018\)](#) and [Mamaro and Legotlo \(2021\)](#) found that sales growth has a positive and statistically significant effect on ROA, and the findings are the same as the study results.

Model 2: The effect of financial leverage on ROE

Model 2 shows the effect of financial leverage on ROE. The lag of ROE, which was included in the regression model as an explanatory variable, had a positive and statistically significant effect on ROE. The firms' equity multiplier, interest coverage ratio and fixed charge coverage ratio have a positive and statistically significant effect on ROE at a significance level of 1%. The results imply that if the firm's equity multiplier, interest coverage ratio and fixed charge coverage ratio are increased by 1%, there will be an increase in ROE of 0.197%, 0.083% and 0.337%, respectively. [Afolabi *et al.* \(2019\)](#) and [Onyenwe and Glory \(2017\)](#) found that the interest coverage ratio has a positive and statistically significant effect on return on capital employed (ROCE), and their findings are congruent with the study outcome.

The study found that the firm's degree of financial leverage, debt-to-EBITDA ratio and capitalization ratio have a negative and statistically significant effect on ROE. The results imply that if the firm's degree of financial leverage, debt-to-EBITDA ratio and capitalization ratio are increased by 1%, the ROE of the firms will decline by 0.431%, 0.029% and 0.131%, respectively. The age and sales growth of the firms have a positive and statistically significant effect on ROE at a significance level of 1%, while the size of the firms has a negative and statistically significant effect on ROE. [Afolabi *et al.* \(2019\)](#) found that sales growth has a positive and statistically significant effect on ROCE, which is commensurate with the study's findings. A study by [Mamaro and Legotlo \(2021\)](#) and [Kalash and Bilen \(2021\)](#) found that the size of the firms has a positive and significant effect on ROE, and the findings are commensurate with the study results.

Model 3: The effect of financial leverage on EPS

Model 3 shows the effect of financial leverage on EPS. The lag of EPS, which was included in the regression model as an explanatory variable, had a positive and statistically significant impact on EPS. The study found that the firm's equity multiplier, interest coverage ratio and fixed charge coverage ratio have a positive and statistically significant effect on EPS at a significance level of 1%. The results imply that if the firm's equity multiplier, interest coverage ratio and fixed charge coverage ratio are increased by 1%, EPS will be increased by 0.404%, 0.889% and 0.660%, respectively.

The study found that the firm's degree of financial leverage, debt-to-EBITDA ratio and capitalization ratio have a negative and statistically significant effect on EPS. The results imply that if the degree of financial leverage, debt-to-EBITDA ratio and capitalization ratio of the firms were increased by 1%, EPS would fall by 0.759%, 0.120% and 0.256%, respectively. [Kenn-Ndubuisi and Nweke \(2019\)](#) examined the effect of financial leverage on the financial performance of non-financial firms listed in the Nigeria stock market and found that the capitalization ratio has a positive effect on EPS and the results contradict with the study outcome. The capitalization ratio evaluates the degree of debt in an organization's capital structure ([Blouin *et al.*, 2014](#)). The tax advantages of debt can boost returns to shareholders, and a high capitalization ratio also raises the likelihood that the company will go bankrupt ([Ismail, 2017](#)). The capitalization ratio's negative and statistically significant effect on EPS contradicts the findings obtained by [Kenn-Ndubuisi and Nweke \(2019\)](#), who find that the capitalization ratio has a positive and significant effect on EPS. The results show that age, sales growth and the size of the firms have a positive effect on EPS. At a significance level of 1%, the age and sales growth of the firms have a statistically significant effect on EPS.

Model 4: The effect of financial leverage on Tobin's Q

The study found that the equity multiplier, interest coverage and degree of financial leverage of the firms have a positive effect on Tobin's Q. There was a statistically significant effect of interest coverage and the degree of financial leverage on Tobin's Q. If the equity multiplier,

interest coverage and degree of financial leverage of the firms are increased by 1%, there would be a rise in the Tobin's Q of 0.101%, 0.320% and 0.772%, respectively. The study found that the fixed charge coverage ratio, debt-to-EBITDA ratio and capitalization ratio have a negative and statistically significant effect on Tobin's Q. If the firms' fixed charge coverage ratio, debt-to-EBITDA ratio and capitalization ratio are increased by 1%, there would be a decline in the Tobin's Q of the firms by 0.300%, 0.285% and 0.285%, respectively. The study found that the age of the firms has a negative and statistically significant effect on Tobin's Q. In contrast, sales growth and the size of the firms have a positive and statistically significant effect on Tobin's Q. A study by [Dey et al. \(2018\)](#) and [Mamaro and Legotlo \(2021\)](#) found that sales growth has a positive effect on Tobin's Q. The findings align with the study's outcome.

5. Conclusions

The study aimed to find the effect of financial leverage on the financial performance of firms listed on the Tokyo Stock Exchange. The study used six explanatory variables to assess the effect of the financial leverage of the firms listed on the Tokyo Stock Exchange on their financial performance. The study used ROA, ROE, EPS and Tobin's Q as proxies for the financial performance of the firms; equity multiplier, interest coverage ratio, fixed charge coverage ratio, degree of financial leverage, debt-to-EBITDA ratio and capitalization ratio as proxies for financial leverage; and age, sales growth and the size of the firms as controlling variables.

The data used for the study were downloaded from Thomson Reuter's Eikon database. The study used non-financial institutions. The non-financial institutions are automobile and industrial production companies. The study selected the automobile and industrial producers' companies only because entering that sector requires enormous sum of money, making it impossible to finance their business activities from internally generated funding but requiring external funding such as debt. The study selected 263 firms from the automobile and industrial producer sectors listed on the Tokyo Stock Exchange between 2001 and 2021 through the purposive sampling technique. The GMM method was chosen over the pooled, fixed and random effect models because it was able to deal with autocorrelation and endogeneity problems.

The study found that the equity multiplier has a positive and statistically significant effect on ROA, ROE and EPS, and their alternative hypotheses were accepted. The equity multiplier was found to have a positive but statistically insignificant effect on Tobin's Q, and the null hypothesis failed to be rejected. The study found that the interest coverage ratio has a positive and statistically significant effect on ROA, ROE, EPS and Tobin's Q, and their alternative hypotheses were accepted. The results revealed that the degree of financial leverage and debt to EBITDA has a negative and statistically significant effect on ROE, EPS and Tobin's Q, and their alternative hypotheses were accepted. The capitalization ratio of the firms has a negative and statistically significant effect on ROA, ROE, EPS and Tobin's Q, and their alternative hypotheses were accepted. The results also revealed that age and sales growth have a positive and significant effect on ROA, ROE and Tobin's Q, and their alternative hypotheses were accepted.

6. Managerial implication

The use of debt to finance business activities influenced financial performance. According to this study, companies are encouraged to use more debt financing than equity financing to take advantage of the tax shield, leading to less tax and higher earnings. However, the overdependence on a debt has drawn back so that an inability to pay interest and principal

would lead to the loss of the rights of the shareholders to the bondholder. The pecking order theory and the trade-off theory should be used to check the amount of debt or the percentage of debt and equity used to finance business operations. The trade-off theory suggests that the internal source of funds should be considered first, followed by debt financing, and finally, equity financing when all other avenues have been exhausted. The static theory also suggests that companies should not use debt where the benefit of the debt (tax shield) outweighs the cost of financial distress. The reliance on these two grand theories should serve as a guide to the amount of debt and equity that a company can have in its capital structure since there are no theories or formulae that specify the percentage of debt or equity that companies can use to finance their business activities.

7. Limitation of the study

Some limitations were encountered during the study. The first limitation was the firms with missing data. A number of firms did not have their data up-to-date when the data were downloaded from the Eikon stream. As a result of the missing data, those firms were not added as part of the study, which reduced the sample size. The second limitation of the study was that there are a number of sectors in Japan: metal, electronics, telecommunications, fashion, pharmaceuticals, mining and media. The study did not include companies from these sectors, which would have given a large sample size.

8. Future research directions

Future studies should focus on comparative studies by comparing the effect of financial leverage on the financial performance of firms in Japan, depending on the variables used for this study. The sectors should include automobiles, construction, metal, electronics, telecommunications, fashion, pharmaceuticals, mining and media. Also, debt to equity, long-term debt to total assets, and short-term debt to total assets should be used as proxies for financial leverage to find their effects on financial performance by comparing five or more sectors in Japan. Future studies should also aim to compare the effect of financial leverage on financial performance between two or more countries in Europe and Asia by using one or more sectors.

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