

# The impact of operating leverage on the capital structure of Johannesburg Stock Exchange-listed firms before and after the 2008 global financial crisis

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The financial leverage-operating leverage trade-off hypothesis states that as financial leverage increases, management of firms will seek to reduce the exposure to operating leverage in an attempt to balance the overall risk profile of a firm. It is the objective of this study to test this hypothesis and ascertain whether operating leverage can indeed be added to the list of factors that determine the capital structure of South African firms. Forty-six firms listed on the Johannesburg Stock Exchange between 1994 and 2015 are analysed and the impact of operating leverage is determined. The results are split into two periods, that is, the period before the global financial crisis (1994–2007) and after the global financial crisis (2008–2015). The impact of operating leverage during these two periods is then compared to determine whether a change in the impact of operating leverage on the capital structure can be observed especially following the crisis. The results show that the conservative nature of South African firms leading up to 2008 persisted even after the global financial crisis. At an industry level, the results reveal that operating leverage does not have a noticeable impact on capital structure with the exception of firms in the industrials sector of the South African economy.

## Introduction

Following the global financial crisis of 2008, academic literature has been inundated with research investigating the factors that may have contributed to the crisis. Amongst these factors is the role of leverage, in particular financial leverage. Since the seminal work of Modigliani and Miller in 1958, capital structure theory has been a much researched topic. Researchers have carried out extensive research on the factors that determine the capital structure of firms. Most of the research on capital structure and its determinants have been performed on firms in developed economies. Only recently have these theories been tested on firms in developing economies in order to identify whether there are any noticeable differences between the behaviour of management in developed economies and the actions of management in developing economies. Many of the studies asserted that the financial decisions in developing economies differed from those undertaken by companies in developed countries. Booth et al. (2001:87) challenged this finding. They found that, contrary to what was previously believed, the financial decisions in developing and developed economies are affected by the same variables.

Leverage is not merely the extent of debt within the capital structure of a firm. Leverage consists of both financial leverage and operating leverage. Operating leverage has not received much attention within the context of capital structure theory. Mandelkher and Rhee (1984:56) found that a negative relationship exists between the two types of leverage. This relationship became known as the financial leverage-operating leverage trade-off hypothesis. It is therefore the objective of this study to establish whether this relationship exists between the operating leverage and the financial leverage of South African firms listed on the Johannesburg Stock Exchange (JSE). In addition, this study will not only examine this relationship from 1994 to 2015 but it will also compare the relationship of operating leverage and financial leverage before the global financial crisis of 2008 and after the crisis to ascertain whether the crisis may have had an impact on the relationship between operating and financial leverage. Lastly, the study will examine the aforementioned at an industry level to identify whether the type of industry has a bearing on the relationship between operating leverage and financial leverage and the impact of the global financial crisis on the capital structure of each of these industries. The results of this research will be useful to management of South African firms in making capital structure decisions, investment decisions and decisions to optimise overall levels of risk. In addition, lenders, analysts and potential investors can cast their eyes wider by including the levels of operating leverage as a measure of the financial health of an organisation.

The following section contains a brief discussion of the South African economy during the period under investigation and a review of capital structure theory and theories on operating leverage. This is followed by a discussion of the hypotheses to be tested and a discussion on the research methodology employed by this study. Finally, the results of the analysis are presented, culminating with the conclusions and recommendations for future research.

## Literature review

Since 1994, the South African economy recorded 14 successive years of positive real gross domestic product (GDP) growth. Fixed investment as a percentage of GDP increased from 15.0% in 2000 to approximately 19.0% in 2006, reaching an estimated ratio of 21.0% in 2007 (Hanival & Maia 2008:2). Although growing at a positive rate, GDP per capita has grown only at an average rate of 1.2% per annum since 1994. The financial crisis has had significant effects on developing countries worldwide. This was not the first financial crisis experienced by the country. The East Asian crisis of 1998 saw the objectives of the growth, employment and redistribution programme (GEAR), one of the country's growth and development programmes, adversely affected. The crisis that provides the backdrop for this study will focus on the global financial crisis of 2008; therefore, any further reference to 'crisis' will refer to the 2008 crisis and not the East Asian crisis of 1998.

Initially, it was expected that South Africa, albeit a developing economy, would emerge from the global financial crisis relatively unscathed, in part, because of South Africa's highly regulated banking system. In addition, the strength of the balance sheets of South African banks enabled them to provide finance to firms in the country. Also, tight exchange controls imposed by the South African Reserve Bank (SARB) shielded South African firms from the impact of the financial crisis. All this said, South Africa's position on the African continent as Africa's gateway to the world made it more vulnerable to the effects of the crisis than most African countries. This was evident when, following the crisis, it experienced its first recession in two decades (Arieff, Weiss & Jones 2010). The JSE all-share index fell from a high of 32 542 on 23 May 2008 to a low of 18 066 on 21 November 2008. This was as a result of foreign investors redirecting their investments away from emerging market economies back to their own faltering economies (Padayachee 2012:5). It is therefore necessary that the present research seeks to identify whether the crisis had an effect on decision-making of management in South African firms when it came to decisions on capital structure.

Research investigating the impact of operating leverage on the systematic risk of companies has its roots in the ground breaking capital structure theories of Modigliani and Miller (1958). This is no different with this study. Much of the research on capital structure and operating leverage has focused on public, non-financial companies with access to American or international capital markets (Myers 2001:82). Myers (2001:82)

explains that most capital structure knowledge stems from data collected from firms in developed economies. He further states that the borrowing patterns of firms in developing economies are very different to those in developed economies. The study by Booth et al. (2001:87) finds that, in contrast to previous studies, the financial decisions in developing and developed countries are in fact affected by the same variables as depicted in Table 1.

From a developing economy perspective, Table 2 provides a comparison of the overall indebtedness of G7 countries as compared to developing economies. Gwatidzo (2008:93–94) made the following findings with regard to the capital structure of firms in developing countries:

**TABLE 1:** Impact of capital structure determinants on capital structure.

Factor	Association with leverage	Author(s)	Capital structure theory
Profitability	Negative	Serghiescu and Videan (2014)	Pecking order
		Ramjee and Gwatidzo (2012)	
		Gwatidzo (2008)	
		Frank and Goyal (2009)	
		Huang and Song (2005)	
		Booth et al. (2001)	
Profitability	Positive	Moyo, Wolmarans and Brummer (2013)	Trade-off
		Frank and Goyal (2009)	
Tax	Negative	Gwatidzo (2008) Booth et al. (2001)	Pecking order
Age/growth rate	Positive	Ramjee and Gwatidzo (2012) Gwatidzo (2008)	Pecking order
Age/growth rate	Negative	Gwatidzo (2008) Frank and Goyal (2009) Huang and Song (2005)	Trade off
Risk	Positive	Gwatidzo (2008)	
Size	Positive	Serghiescu and Videan (2014)	Trade-off and Pecking order
		Ramjee and Gwatidzo (2012)	
		Gwatidzo (2008)	
		Frank and Goyal (2009) Huang and Song (2005)	
Asset tangibility	Negative	Serghiescu and Videan (2014)	Pecking order
		Moyo, Wolmarans and Brummer (2013)	
		Gwatidzo (2008) Booth et al. (2001)	
Asset tangibility	Positive	Ramjee and Gwatidzo (2012)	Trade-off
		Frank and Goyal (2009)	
		Huang and Song (2005)	
		Demirguc-Kunt and Maksimovic (1994)	
Liquidity	Negative	Serghiescu and Videan (2014)	Pecking order
		Moyo, Wolmarans and Brummer (2013)	
Capital expenditure	Positive	Moyo, Wolmarans and Brummer (2013) Frank and Goyal (2009)	Pecking order
Non-debt tax shields	Negative	Frank and Goyal (2009)	Trade-off
		Huang and Song (2005)	
		Demirguc-Kunt and Maksimovic (1994)	
Financial distress	Negative	Moyo, Wolmarans and Brummer (2013)	Trade-off
		Frank and Goyal (2009)	

**TABLE 2:** Capital structures in different countries.

Country	Total debt to total assets (book value, %)	Long-term debt to total debt (book value, %)
<b>Developed G7</b>		
United Kingdom	54	28
Canada	56	39
United States	58	37
Japan	69	53
Italy	70	47
France	71	48
Germany	78	38
<b>Developing</b>		
Malaysia	42	13
Jordan	47	12
Turkey	59	24
Pakistan	66	26
India	67	34
South Korea	73	49
South Africa	79	62

Source: Adapted from De Wet, J.H.v.H., 2006, 'Determining the capital structure: A practical contemporary approach', *Meditari Accountancy Research* 14(2), 1–16. <https://doi.org/10.1108/10222529200600009>

- The largest firms made more use of external finance together with more equity finance.
- Management seeks to maintain control in the hands of the existing shareholders; therefore, less reliance is placed on additional equity finance.
- Because of the uncertainty experienced, many firms in developing countries prefer short-term debt to long-term debt.
- Firms in developing countries have less leverage than firms in developed countries. The findings by Gwatidzo (2008:93–94) are line with the study undertaken by De Wet (2006:2). These studies both concur that, on average, firms in developed countries borrow more than companies in developing countries.

Furthermore, Table 2 shows the following:

- The riskiness of firms in developing countries may result in a reluctance to incorporate additional debt into their capital structures.
- Firms in South Africa are highly geared compared to firms in the other developing countries. This could perhaps be because of the perceived stability of South African firms. South African firms may have predicted future profitability, therefore anticipating that they would have sufficient earnings to service their debt.
- In the years preceding the global financial crisis, South African banks may have taken advantage of their well-capitalised balance sheets, that is, they were in a better position to lend out more to borrowers, confident that any losses would not be significant enough to wipe out their capital bases.

The studies of operating leverage and its impact on the systematic risk of a company's shares are an extension of the earlier capital structure theory. The discussions on the role of operating leverage in determining the systematic risk of a company's shares have their roots in the works of Hamada

(1972:451). The study recognised that approximately a quarter of the systematic risk of companies could be attributable to financial leverage. Both Rubenstein (1973:178) and Lev (1974:94) found that operating leverage could be identified as a determinant of the systematic risk of a firm affecting both the systematic risk and overall firm risk. A study by Mandelkher and Rhee (1984:56) examined the combined effect of both the degree of financial leverage (DFL) and the degree of operating leverage (DOL) on the systematic risk of firms. This seminal work in operating leverage research by the 'fathers of capital structure theory proved that the capital structure of companies increases the riskiness of the company's shares'. In addition, the Mandelkher and Rhee study sought to identify if, and to what extent, other factors could be responsible for the remaining 75% of the riskiness of a company's shares. Their findings concluded that a positive relationship could be observed between overall firm risk as depicted by the DFL and the DOL with the systematic risk of a firm's shares.

Huffman (1987:90) challenged the findings of Mandelkher and Rhee and concluded that the results could only be replicated if utilities were excluded from the sample of firms under investigation. This is largely because of the fact that the management of utility firms does not have as much discretion in the determination of their respective cost structures. On the relationship between operating leverage and total company risk, inconsistent results are observed in the available literature. Li and Henderson (1991:31) found a positive relationship between the DOL and total company risk in contrast to Ang, Peterson and Peterson (1985:18), who found that operating leverage cannot explain total risk.

Ferri and Jones (1979:641) investigated the relationship between the financial structure of the company and its operating characteristics and found that management would reduce the level of fixed costs employed in the cost structure of the company as the level of debt increased. Mandelkher and Rhee (1984:56), Prezas (1987:43), Ravid (1988:97), Li and Henderson (1991:31), Duett, Merikas and Tsiritakis (1996:3) and Lowenthal and Nyman (2013:28) all found supporting empirical evidence of the financial leverage-operating leverage trade-off theory. Huffman (1987:83), Lord (1996:27) and Kristoffer (2014:20), by contrast, found no evidence to support the theory. The difference in results is mainly because of the methodology employed for calculating operating leverage that has since Hamada's (1972:435) study been a bone of contention in all research involving operating leverage.

Leading up to the global financial crisis of 2008, many companies found themselves riddled with very high levels of debt. A negative relationship between the operating leverage and financial leverage would mean therefore that as levels of debt increased, companies sought to reduce their fixed costs in a drive to maintain the overall systematic risk. Following the global financial crisis, Lowenthal and Nyman (2013:28), Saibene (2016) and Kahl, Lunn and Nillson (2014) found that the extent of fixed costs in the cost structure of companies

has increased, whilst financial leverage has declined further, thus supporting the operating leverage-financial leverage trade-off theory.

The objective of the present study is to investigate the impact of operating leverage on the capital structure of JSE-listed firms. Based on the financial leverage-operating leverage trade-off theory, Hypothesis 1 posits that one would expect that South African firms would reduce their reliance on external debt finance as the percentage of fixed costs in the operating costs structure increases. As a result of reduced profitability after a financial crisis, firms would reduce investing in fixed assets because of the uncertainty following a financial crisis, that is, the underinvestment hypothesis (Hypothesis 2). Because of an increase in operating leverage and reduced profitability after a financial crisis, lenders would not extend further finance to firms (Hypothesis 2) especially finance of a long-term nature. Hypothesis 3 asserts that as the extent of debt in the capital structure is reduced, the ability to take advantage of the tax deductibility of debt servicing costs is reduced. Larger firms would, however, still be in a position to take advantage of the ability to secure debt finance because of their perceived stability (Hypothesis 4). Reduced profitability because of the financial crisis and the increase in operating leverage would also result in a reduction in cash reserves indicating a positive relationship between long-term debt and liquidity, that is, the cash adjustment hypothesis (Hypothesis 5).

It is important to note that whilst most studies use only long-term debt or total debt as a proxy for financial leverage, the dependent variables in this research will be split into total debt, long-term debt and short-term debt in order to fully understand the impact of operating leverage on the different components of capital structure. Capital structure theory in developed economies has pointed to a reliance by developing economies on short-term debt over long-term debt because of the perceived riskiness of firms in those regions. Consequently, the hypotheses will be tested on both short-term and long-term debt models.

- **Hypothesis 1:**
  - Operating leverage has a negative relationship with long-term debt.
  - Operating leverage has a positive relationship with short-term debt.
- **Hypothesis 2:**
  - Asset tangibility has a positive relationship with long-term debt.
  - Asset tangibility has a negative relationship with short-term debt.
- **Hypothesis 3:**
  - Profitability has a positive relationship with long-term debt.
  - Profitability has a negative relationship with short-term debt.

- **Hypothesis 4:**
  - Taxation has a negative relationship with long-term debt.
  - Taxation has a negative relationship with short-term debt.
- **Hypothesis 5:**
  - Firm size has a positive relationship with long-term debt.
  - Firm size has a positive relationship with short-term debt.
- **Hypothesis 6:**
  - Liquidity has a positive relationship with long-term debt.
  - Liquidity has a positive relationship with short-term debt.

## Data and methodology

This section explains the methodologies that will be used to measure the operating leverage and capital structures of JSE-listed companies between 1994 and 2015.

The Main Board of the JSE hosts the majority of the JSE's market capitalisation. The Financial Times Stock Exchange (FTSE)/JSE All Share Index covers 99% of the market capitalisation of the Main Board (Johannesburg Stock Exchange; 2013). The financial sector of the JSE will not form part of the study as the composition of their respective capital structures is determined to a large extent by the Basel Accord and therefore management does not have full say as to how the capital structure will be made up. The final requirement for inclusion in the sample is that the chosen firms must have been listed for the full 22-year period of investigation. This results in an automatic exclusion of those firms listed on the Alternative exchange that was founded in 2003. As a result, the final sample of firms consists of 46 non-financial firms listed on the JSE from 1994 to 2015. Financial statements will be sourced off the IRESS database (2016). Capital structure, as the dependent variable, will be expressed in the form of the total debt, long-term debt ratio (LDR) and short-term debt ratio (SDR). This is done to provide a more meaningful analysis of the results:

Long-term debt ratio

$$\frac{\text{Long term debt}}{\text{Total Assets}} \times 100 \quad [\text{Eqn 1}]$$

Short-term debt ratio

$$\frac{\text{Short-term debt}}{\text{Total Assets}} \times 100 \quad [\text{Eqn 2}]$$

For the purposes of this study, operating leverage is defined as the sensitivity of the growth in operating costs to innovations in the growth rate of the company's sales because of a change in the output of production, and consequently, sales. To this effect, equation 3 is used to determine the expected operating cost and sales for each year:

Operating costs and sales expectations (Kahl et al. 2014:9):

$$E[S_{i,t}] = S_{i,t-1} \left( \frac{S_{i,t-1}}{S_{i,t-3}} \right)^{\frac{1}{2}} \text{ and } E[X_{i,t}] = X_{i,t-1} \left( \frac{X_{i,t-1}}{X_{i,t-3}} \right)^{\frac{1}{2}} \quad [\text{Eqn 3}]$$

Where:

$S_{i,t}$  represents sales

$X_{i,t}$  represents operating costs

$i$  represents firm

$t$  represents the period.

Once the forecasted sales (and operating costs) have been determined based on the assessment of the previous 2 years, Kahl et al. (2014:9) calculated the innovation in the growth rate of sales (and operating costs) using equation 4:

Innovations in growth rates

$$\mu_{i,t}^S = \frac{S_{i,t} - E[S_{i,t}]}{S_{i,t-1}} \text{ and } \mu_{i,t}^X = \frac{X_{i,t} - E[X_{i,t}]}{X_{i,t-1}} \quad [\text{Eqn 4}]$$

Following the determination of the innovation in growth rates, for each year, operating leverage will be determined using equation 5:

Operating leverage

$$\omega = \frac{\mu_{i,t}^X}{\mu_{i,t}^S} \quad [\text{Eqn 5}]$$

where:

$\omega$  represents operating leverage.

The variables and definitions applicable are provided in Table 3. To use the DOL would require access to the split of the operating costs of each of the firms in the sample into fixed and variable components which are not publicly available. Earnings-based measures of operating leverage such as sales over earnings before interest and taxes (EBITs) may result in a distortion of the results should EBIT be zero or negative. Equation 5 is therefore a better indication for operating leverage. The results will be analysed using descriptive statistics and then multiple regression analysis because of the presence of more than one independent variable or predictor that can explain the capital structure of a firm. To achieve this, the known independent variables will

**TABLE 3:** Definition of independent variables.

Variables	Definition of the variable
Operating leverage	The innovations in the growth rate of operating costs to the innovations in sales
Asset tangibility	Fixed assets divided by total assets
Profitability	EBIT divided by total assets
Taxation	Income tax divided by EBIT
Size	Natural logarithm of total assets
Growth	Market capitalisation divided by equity
Liquidity	Cash divided by total assets

EBIT, Earnings before interest and tax.

be entered simultaneously into the long-term debt, short-term debt and total debt models for the period before the crisis in 2008 and after the crisis.

The model is expressed as follows:

$$T_{\text{debt}} = b_0 + b_{\text{asset tangibility}} + b_{\text{firm size}} + b_{\text{liquidity}} + b_{\text{profitability}} + b_{\text{taxation}} + b_{\text{operating leverage}} + \varepsilon,$$

$$LT_{\text{debt}} = b_0 + b_{\text{asset tangibility}} + b_{\text{firm size}} + b_{\text{liquidity}} + b_{\text{profitability}} + b_{\text{taxation}} + b_{\text{operating leverage}} + \varepsilon,$$

$$ST_{\text{debt}} = b_0 + b_{\text{asset tangibility}} + b_{\text{firm size}} + b_{\text{liquidity}} + b_{\text{profitability}} + b_{\text{taxation}} + b_{\text{operating leverage}} + \varepsilon, \quad [\text{Eqn 6}]$$

Where:

$T_{\text{debt}}$  = Total debt

$LT_{\text{debt}}$  = Long-term debt

$ST_{\text{debt}}$  = Short-term debt

$\varepsilon$  = Standard error.

## Empirical results

This section provides an analysis of the study. The results are presented for the total sample and then at an industry level comparing the 1994–2007 and 2008–2015 periods.

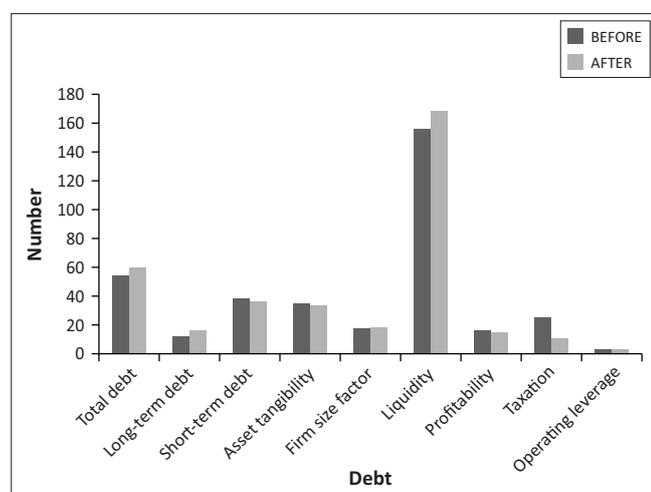
### Descriptive statistics

As depicted in Table 4, between 1994 and 2015, 47% and 61% of the capital structure of JSE-listed firms is made up of debt. That was to be expected as previous studies (De Wet 2006:3; Gwatidzo 2008:93–94) found that South African firms in general prefer to use debt as a funding source so as to maintain current ownership of the firms. In addition, South African firms have been perceived to be less risky compared to other developing markets, resulting in more stability and reliability from a lender perspective. Firms in the sample prefer short-term debt as a source of finance rather than an exposure to long-term debt covenants. Again, this result was to be expected in line with the findings of Gwatidzo and Ojah (2009:6) in their study on the corporate capital structure determinants of five African countries, including South Africa, that also explains the mean of 30% for the asset tangibility pointing to a greater investment in short-term assets in order to match the reliance on short-term debt. The mean for operating leverage is 1.14. This indicates the ability of South African firms to absorb the effects of cost changes into the sales of their products.

When comparing the summary statistics before and after 2008 as depicted in Figure 1, the average level of debt in the composition of the capital structure increased from 52.13% to 57.08%, whilst profitability decreased from an average of 13.95% to 12.19%. The effective tax rate decreased by a larger margin than the decrease in profitability (from 23.33% to 8.62%) that may be explained by either the reduced profitability after the crisis leading to less taxation or an increase in the extent of long-term debt that increased from

**TABLE 4:** Total sample level: descriptive summary statistics (1994–2015).

Variable	Minimum	Maximum	Mean	Median	Standard deviation
<b>Capital structure</b>					
Total debt %	46.87	60.54	54.28	54.95	3.98
Long-term debt %	7.96	17.94	11.81	11.45	2.68
Short-term debt %	32.11	39.87	35.85	36.54	2.17
Asset tangibility %	29.25	34.46	31.27	31.13	1.51
Firm size factor %	14.07	16.59	15.51	15.5	0.77
Age (years) %	19.00	12.07	66.15	64.5	31.52
Liquidity %	137.82	206.91	158.97	157.24	13.91
Profitability %	6.37	18.64	13.37	13.29	2.85
Taxation %	-96.74	45.79	17.45	23.85	28.12
<b>Operating leverage</b>					
Innovation in sales %	6.9	56.22	17.54	14.67	12.64
Innovation in costs %	-7.3	2965.54	150.09	12.97	628.97
Operating leverage factor %	-0.3	4.57	1.14	0.9	1.00

**FIGURE 1:** Total sample level: Mean comparison (before and after 2008).

10.03% to 14.65%. The increase in long-term debt is expected to result in an increase in the tax deductibility of costs to service the debt, that is, interest.

## Multiple regression analysis

A multiple regression model for the each capital structure (financial leverage) proxy is developed. Total debt, long-term debt and short-term debt are the dependent variables with the independent variables being asset tangibility, firm size, liquidity, profitability, taxation and operating leverage. The results for the total sample of firms are provided in Table 5, for the period leading up to the crisis.

Comparing the results of the total sample of firms before and after 2008, the predictive value of the independent variables in the total debt and long-term debt models fell from 91.69% and 70.84% to 84.94% and 41.88%, respectively (see Table 6). An opposite effect in the short-term debt model is observed with the predictive value of the independent variables increasing from 37.36% before 2008 to 93.85% from 2008 onwards. A possible reason for this could be the increased conservative nature of providers of debt finance placing greater reliance on factors other than the independent variables in this research in determining whether to extend

debt finance to South African firms. These factors could very well have been as a direct result of the financial crisis causing lenders to look at the global economy and political factors outside of factors within the control of South African firms. Because of the perceived riskiness and uncertainty associated with those uncontrollable factors, lenders would prefer to extend short-term debt over long-term debt. Larger firms with access to large, internally generated funds, capital markets and with less information asymmetries between themselves and the market are still able to obtain long-term debt.

For Hypothesis 1 (the financial leverage-operating leverage trade-off theory), the regression results are statistically significant for both the long-term debt and short-term debt models before 2008 (Table 5). After the crisis, only the short-term debt model becomes significant. This is in contrast to the operating leverage-financial leverage trade-off hypothesis at the total sample level. This is to be expected in line with the findings above reaffirming the preference of South African firms for short-term over long-term debt. In addition, this could point to the tightening of lending patterns by South African financial institutions preferring to extend short-term debt in order to limit exposure to the uncertainty associated with long-term commitments. This could also point to the operating cost structure of the firms becoming increasingly more important. A possible reason, amongst others, could be because of the increasing levels of labour costs and reduced economic activity placing management in the position of having to choose between increasing their operating costs versus obtaining short-term debt finance.

Again, where before the crisis, for Hypothesis 2 (the underinvestment hypothesis), asset tangibility showed a strong negative relationship to total debt extended. Following the crisis, no statistically significant relationship could be observed.

Based on the results of the operating leverage-financial leverage trade-off hypothesis, one would expect the models to predict a positive relationship between profitability and the long-term debt model and a negative relationship in the

**TABLE 5:** Multiple regression coefficients: Summary: Total sample (1994–2007).

Variable	Total debt		Long-term debt		Short-term debt	
	<i>R</i> <sup>2</sup>	Adjusted <i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup>	Adjusted <i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup>	Adjusted <i>R</i> <sup>2</sup>
	<b>0.955</b>	<b>0.917</b>	<b>0.776</b>	<b>0.708</b>	<b>0.470</b>	<b>0.374</b>
ANOVA	<i>F</i>	Sig <i>F</i>	<i>F</i>	Sig <i>F</i>	<i>F</i>	Sig <i>F</i>
<i>F</i> test	24.902	0.000 ***	11.527	0.001 ***	4.877	0.030 **
Coefficients	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>
Constant	1.197	0.033**	-0.129	0.066*	0.378	0.002***
Asset tangibility	-1.721	0.029**	-	-	-	-
Firms size	-0.001	0.928	0.017	0.002***	-	-
Liquidity	0.441	0.167	-	-	0.373	0.040**
Profitability	-0.166	0.064***	-	-	-	-
Taxation	0.010	0.021	-0.135	0.010***	-	-
Operating leverage	-0.011	0.587	0.006	0.097*	-0.004	0.582*

ANOVA, analysis of variance.

\*, 10% level of significance; \*\*, 5% level of significance; \*\*\*, 1% level of significance.

**TABLE 6:** Multiple regression coefficients: Summary: Total sample (2008–2015).

Variable	Total debt		Long-term debt		Short-term debt	
	<i>R</i> <sup>2</sup>	Adjusted <i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup>	Adjusted <i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup>	Adjusted <i>R</i> <sup>2</sup>
	<b>0.907</b>	<b>0.849</b>	<b>0.502</b>	<b>0.419</b>	<b>0.982</b>	<b>0.939</b>
ANOVA	<i>F</i>	Sig <i>F</i>	<i>F</i>	Sig <i>F</i>	<i>F</i>	Sig <i>F</i>
<i>F</i> test	15.666	0.001 ***	6.043	0.049**	22.376	0.043**
Coefficients	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>
Constant	0.066	0.792	-0.957	0.077*	8.624	0.033**
Asset tangibility	-	-	-	-	-	-
Firms size	0.013	0.378	0.068	0.049**	-2.157	0.044**
Liquidity	0.776	0.056*	-	-	-1.619	0.049**
Profitability	-0.215	0.062*	-	-	0.290	0.060*
Taxation	0.008	0.128	-	-	-0.082	0.071*
Operating leverage	0.025	0.226	-	-	-0.276	0.035**

ANOVA, analysis of variance.

\*, 10% level of significance; \*\*, 5% level of significance; \*\*\*, 1% level of significance.

short-term debt model (Hypothesis 3). The long-term debt model was insignificant for both before the crisis and after the crisis. For short-term debt, the model became significant only after 2008. This is consistent with the findings of Hypothesis 1, signalling a preference to short-term debt following the crisis as profitability became less important in determining whether additional long-term debt finance would be extended.

Because of their relatively conservative nature, South African firms are generally not as aggressive as firms in developed economies in obtaining maximum debt to optimise the tax deductibility of interest payments. As a result, it is not expected that a statistically significant relationship would exist especially in the period leading up to the crisis. However, from 2008 onwards, a negative relationship emerged between the extent of short-term debt and taxation. This confirms Hypothesis 4 that again provides additional support that South African firms are conservative. It further illustrates the importance of the role of short-term debt finance after 2008.

It is to be expected that liquidity would be statistically significant for short-term debt. The short-term debt model shows a slight increase in the significance after 2008. While a positive relationship was observed before 2008, a negative relationship was observed after the crisis, which also highlights the reliance of short-term debt finance.

At industry level for the periods 1994–2007 and 2008–2015, the results proved to be statistically insignificant. As a result, a comparison at industry level of the period before and after 2008 could not be performed. Although findings before and after 2008 could not be performed, the study produced statistically significant results for the full period.

Of the five industries investigated (Tables 7–10), only the industrials sector produced results that were statistically significant for the operating leverage-financial leverage trade-off theory (Hypothesis 1). The rest of the industries were statistically insignificant for Hypothesis 1. It follows that firms in this sector would seek to balance the overall risk of their firms by reducing their operating leverage as their financial leverage increases. Because of the nature of South African firms to prefer short-term to long-term debt and where they opt for long-term debt, they prefer low levels of long-term debt, it would therefore be expected that those firms opting to use long-term debt would look for ways to reduce their overall risk profile so as not to appear reckless relative to other listed firms in the country.

The industrials and basic materials sectors each produced a statistically significant negative relationship between asset tangibility and the total debt model (Hypothesis 2) in contrast to the theory that could again point to the conservative nature of South African firms. In addition, firms in these two sectors

**TABLE 7:** Regression coefficients – Basic materials sector (1994–2015).

Variable	Total debt		Long-term debt		Short-term debt	
	<i>R</i> <sup>2</sup>	Adjusted <i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup>	Adjusted <i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup>	Adjusted <i>R</i> <sup>2</sup>
	<b>0.856</b>	<b>0.799</b>	<b>0.836</b>	<b>0.771</b>	<b>0.768</b>	<b>0.676</b>
<b>ANOVA</b>	<i>F</i>	Sig <i>F</i>	<i>F</i>	Sig <i>F</i>	<i>F</i>	Sig <i>F</i>
<i>F</i> test	14.873	0.000***	12.784	0.000***	8.289	0.000***
<b>Coefficients</b>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>
Constant	0.330	0.326	-0.034	0.799	0.399	0.105
Asset tangibility	-0.648	0.004***	-0.057	0.484	-0.124	0.380
Firms size	0.014	0.493	0.004	0.664	-0.000	0.977
Liquidity	0.014	0.731	0.058	0.003***	-0.079	0.013**
Profitability	0.259	0.018**	-0.088	0.042**	0.156	0.039**
Taxation	-0.045	0.243	0.034	0.042**	-0.097	0.002***
Operating leverage	0.007	0.209	-0.00	0.977	0.005	0.240

ANOVA, analysis of variance.

\*\*, 5% level of significance; \*\*\*, 1% level of significance.

**TABLE 8:** Regression coefficients – Consumer goods sector (1994–2015).

Variable	Total debt		Long-term debt		Short-term debt	
	<i>R</i> <sup>2</sup>	Adjusted <i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup>	Adjusted <i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup>	Adjusted <i>R</i> <sup>2</sup>
	<b>0.657</b>	<b>0.520</b>	<b>0.635</b>	<b>0.488</b>	<b>0.870</b>	<b>0.818</b>
<b>ANOVA</b>	<i>F</i>	Sig <i>F</i>	<i>F</i>	Sig <i>F</i>	<i>F</i>	Sig <i>F</i>
<i>F</i> test	4.792	0.006 ***	4.342	0.010***	16.687	0.000***
<b>Coefficients</b>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>
Constant	-0.350	0.285	-0.999	0.009	1.088	0.000
Asset tangibility	-0.082	0.858	0.276	0.570	-0.242	0.372
Firms size	0.091	0.000 ***	0.082	0.001***	-0.022	0.058*
Liquidity	-0.296	0.003 ***	-0.124	0.182	-0.175	0.003***
Profitability	-0.198	0.485	-0.268	0.370	-0.224	0.183
Taxation	0.053	0.654	0.028	0.818	0.030	0.660
Operating leverage	0.003	0.297	0.001	0.634	0.001	0.674

ANOVA, analysis of variance.

\*, 10% level of significance; \*\*\*, 1% level of significance.

**TABLE 9:** Regression coefficients – Consumer services sector (1994–2015).

Variable	Total debt		Long-term debt		Short-term debt	
	<i>R</i> <sup>2</sup>	Adjusted <i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup>	Adjusted <i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup>	Adjusted <i>R</i> <sup>2</sup>
	<b>0.758</b>	<b>0.662</b>	<b>0.675</b>	<b>0.545</b>	<b>0.512</b>	<b>0.317</b>
<b>ANOVA</b>	<i>F</i>	Sig <i>F</i>	<i>F</i>	Sig <i>F</i>	<i>F</i>	Sig <i>F</i>
<i>F</i> test	7.850	0.001***	5.196	0.004***	2.623	0.061*
<b>Coefficients</b>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>
Constant	-0.076	0.582	-0.127	0.068	0.307	0.002
Asset tangibility	-0.225	0.685	-0.339	0.210	-0.222	0.524
Firms size	0.044	0.007*	0.026	0.001***	0.008	0.400
Liquidity	-0.007	0.628	-0.002	0.803	-0.009	0.332
Profitability	0.432	0.196	-0.208	0.191	0.623	0.007***
Taxation	-0.006	0.894	-0.022	0.278	-0.032	0.239
Operating leverage	0.031	0.161	0.009	0.357	0.015	0.260

ANOVA, analysis of variance.

\*, 10% level of significance; \*\*\*, 1% level of significance.

**TABLE 10:** Regression coefficients: Industrials sector (1994–2015).

Variable	Total debt		Long-term debt		Short-term debt	
	<i>R</i> <sup>2</sup>	Adjusted <i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup>	Adjusted <i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup>	Adjusted <i>R</i> <sup>2</sup>
	<b>0.918</b>	<b>0.886</b>	<b>0.866</b>	<b>0.813</b>	<b>0.876</b>	<b>0.827</b>
<b>ANOVA</b>	<i>F</i>	Sig <i>F</i>	<i>F</i>	Sig <i>F</i>	<i>F</i>	Sig <i>F</i>
<i>F</i> test	28.082	0.000 ***	16.175	0.000 ***		
<b>Coefficients</b>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>
Constant	0.642	0.003***	-0.335	0.158	0.985	0.000
Asset tangibility	-1.312	0.004***	-0.480	0.340	-0.697	0.063*
Firms size	0.034	0.000***	0.032	0.000***	-0.002	0.604
Liquidity	-0.048	0.340	0.139	0.040**	-0.224	0.000***
Profitability	-0.350	0.143	-0.280	0.344	0.080	0.701
Taxation	-0.042	0.334	-0.093	0.099*	0.060	0.131
Operating leverage	-0.020	0.011**	-0.017	0.070*	-0.005	0.473

ANOVA, analysis of variance.

\*, 10% level of significance; \*\*, 5% level of significance; \*\*\*, 1% level of significance.

are made up of sizeable, reputable organisations, many with international links and exposure to foreign currency denominated transactions. As a result, this could provide management of these firms with more reason to be conservative in their approach in order to balance the overall risk profile of the entities within these sectors.

Only the results of the basic materials sector could support Hypothesis 3, particularly for the long-term debt model. A possible reason for this strong positive relationship between profitability and the long-term debt model is that generally, it can be expected when firms in this particular sector of the economy are profitable that usually points to a stable economic environment. A stable economic environment is attractive to lenders wanting to invest in these entities; therefore, they are more likely to attract not only local finance but also international finance.

Whilst a few sectors displayed statistically significant relationships between taxation and the respective debt models, none were strong enough to point to a pattern of behaviour that compares to firms in developed economies. This confirms again the conservative nature and the reluctance by firms in South Africa to take on more debt in order to benefit from the tax deductibility of interest payments.

A positive relationship is expected between firm size and liquidity; however, none of the sectors exhibit a relationship that is strong enough to conclude that these are factors of significance in the capital structure decision.

## Conclusion

The purpose of this study was to identify the impact of operating leverage on the capital structure of JSE-listed firms leading up to the economic crisis in 2008 and after the crisis. This was to identify whether the borrowing patterns of firms in South Africa changed as far as the impact of operating leverage on their capital structures is concerned as a result of the crisis. The financial leverage-operating leverage trade-off hypothesis was tested using multiple regression analysis on the total sample of firms and at industry level. The results of the multiple regression analysis revealed a negative relationship between operating leverage and financial leverage only in the industrials sector, confirming the financial leverage-operating leverage trade-off hypothesis. Although confirmed only for industrials, this is in line with the findings of Booth et al. (2001:87) that suggest that firms in developing countries are affected by the same variables as firms in developed economies. The extent of the relationship, however, has not been established.

The findings revealed a negative relationship between long-term debt and asset tangibility and a negative relationship between profitability and long-term debt; however, this relationship is positive for short-term debt. With regard to taxation, a weak negative relationship was observed for both long-term debt and short-term debt with taxation. A positive

relationship was found to exist between long-term debt and firm size and a positive relationship between long-term debt and liquidity.

Overall, the results of the present study indicate that the patterns of South African firms (with the exception of the industrials sector) are very different from the patterns of firms in developed economies as far as levels of debt assumed. This is consistent with the findings of De Wet (2006:2) and Gwatidzo (2008:93–94). Furthermore, Gwatidzo (2008:93–94) states that the uncertainty experienced by many firms in developing economies results in the said firms preferring short-term debt over long-term debt. The results of the present study agreed that South African firms show a preference towards short-term debt as opposed to long-term debt, indicating a very conservative borrowing nature contrary to what was seen leading up to 2008 in the United States and Europe. Lenders are also less keen on providing debt finance during periods of uncertainty. During the period under investigation, South African firms generally exhibited stable total, long-term and short-term debt levels.

Except for profitability, South African firms tend to follow the pecking order capital structure theory by preferring to fund their activities through retained earnings as opposed to debt both before and after 2008. The tax incentive does not appear to be a driving force behind the borrowing patterns of management, with the exception of industrials, because of its higher levels of profitability and preference for long-term debt.

For the sample, the impact of operating leverage on the capital structure is negligible and as such, it can be asserted that South African firms do not need to balance their levels of operating leverage with debt levels in their capital structures because of the high-risk aversion and conservative nature of the firms. Following 2008, management of South African firms continued to exhibit highly risk-averse behaviour. By implication, this would indicate that only firms that are already experiencing levels of high financial and or operating leverage would look for ways to reduce their overall risk by lowering either financial leverage or operating leverage. The vast majority of South African firms are not at that level yet. In addition, as indicated by Kristoffer (2014:20) and Huffman (1987:83), the reason for an absence of a negative relationship between operating leverage and financial leverage may be because of other factors, such as industry leverage (i.e. lower appetite for risk) amongst South African firms in general. An aggressive internal approach to the management of total company risk is therefore not an option available to management.

From an industry perspective, in the industrials sector, which exhibited the most aggressive borrowing patterns relative to the rest of the sectors, the role of operating leverage as a determinant of the capital structure choice for firms in this sector emerged exhibiting patterns previously only observed in developed economies.

The study therefore concludes that operating leverage does not have an impact on the capital structure of South African

firms with the exception of those firms in the industrials sector. It is recommended that further studies should include a greater spectrum of South African firms including those firms listed on the alternative exchange of the JSE in order to better understand the impact of operating leverage on South African firms and to include more firms at a sector level.

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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

M.T.M. and J.H.H. equally contributed to the research and writing of this article.

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