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Dynamics in capital structure determinants in South Africa

Anil Ramjee and Tendai Gwatidzo
School of Economic and Business Sciences, Witwatersrand University, Johannesburg, South Africa

Abstract

Purpose – The purpose of this paper is to use a dynamic model to investigate capital structure determinants for 178 firms listed on the Johannesburg Stock Exchange for the period 1998-2008. The sample of firms is also used to examine the cost and speed of adjustment towards a target debt ratio.

Design/methodology/approach – A target adjustment model is estimated using a generalized method of moments technique to examine the cost and speed of adjustment towards a target debt ratio. The determinants of target capital structure for South African listed firms are also examined.

Findings – The results show that South African firms adjust relatively fast towards a target leverage level. It is also found that asset tangibility, growth, size and risk are positively related to leverage, while profitability and tax are negatively related to leverage. The results also suggest that capital structure decisions of South African listed firms follow both the pecking order and trade-off theories of capital structure.

Research limitations/implications – The sample chosen focused on listed firms, thus the results cannot credibly be generalized to all South African firms (listed and unlisted). Also, whilst a lot can be gleaned from the results, they may not be readily applicable to firms in other African countries.

Originality/value – The issue of dynamic adjustment towards a target or optimal debt ratio has not received sufficient attention in developing economies. Using data from an emerging economy, this paper attempts to fill this gap in the literature. A target adjustment model is estimated using a generalized method of moments technique.

Keywords Optimal capital structure, Generalized method of moments, Cost of adjustment, Pecking order theory, Trade-off theory, Republic of South Africa, Capital structure, Financial reporting

Paper type Research paper

1. Introduction

Capital structure is at the core of contemporary corporate finance. The seminal contribution by Modigliani and Miller (1958, 1963) triggered the debate on capital structure and resulted in an exponential growth of the literature on capital structure[1]. The suggestion by Zingales (1995) that not much is known about capital structure and Myers' (2001) view that capital structure remains a puzzle together suggest that, more than half a century since Modigliani and Miller's contribution, the debate on capital structure is far from over.

At the core of the debate are two main theories of capital structure: trade-off and pecking order theories. The other theories are free cash flow, signalling and market

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timing theories. According to the trade-off theory, there are costs and benefits associated with using debt. The benefits of debt include increased tax shields and reduced agency costs; the costs associated with high debt levels include increased risk of financial distress, bankruptcy costs, reorganisation costs, underinvestment and asset-substituting problems. Negash (2001), Frank and Goyal (2003) and de Wet (2006) agree that there is a tax incentive for leverage. A firm weighs the benefits against the costs of debt and will achieve an optimal capital structure if it equates the present value of the marginal benefits to the present value of the marginal costs (Shyam-Sunder and Myers, 1999). Pecking order theory is based on the hypothesis that there exist information asymmetries between managers and investors. As a result, managers prefer to choose financing sources with the least information cost first. Myers and Majluf (1984), who formalized the pecking order theory, argue that firms prefer internal funds to external funds and that when external funds are the only option, firms tend to prefer debt over equity.

A lot of research effort has been expended trying to test these theories in different contexts. See, for example, Titman and Wessels (1988) and Shyam-Sunder and Myers (1999) on developed economies and Booth *et al.* (2001), Prasad *et al.* (2001), Agarwal and Mohtadi (2004), Glen and Singh (2004), Abor and Biekpe (2007) and Gwatidzo and Ojah (2009) on developing or emerging markets. These studies have, however, tended to use a static framework of capital structure, which assumes that there is no difference between actual and desired or optimal leverage targets (Drobetz and Wanzenried, 2006). As a result, the observed debt ratio is used to proxy for a firm's optimal leverage ratio. However, firms may not be operating at their targeted or desired leverage levels all the time. Different shocks can move firms away from the target capital structure. Further, such shocks can also move the target such that firms may be forced to attempt to move towards a moving target. Moreover, if adjustment costs are high, it may be expensive to go back to the optimal level, so firms may actually not adjust even when they are aware that the actual capital structure is not optimal. This implies that it may be more useful to study financing decisions in a dynamic rather than a static framework.

The issue of dynamic adjustment towards a target or optimal debt ratio has not received sufficient attention in developing economies. This paper attempts to fill this gap in the literature. A target adjustment model is estimated using a generalized method of moments (GMM) technique to address the following questions: do South African firms have target debt ratio? If South African firms are forced to move away from the target leverage ratio, how fast do they revert back to the target leverage ratio, and what role do adjustment costs play in the process? What role do firm-specific characteristics play in the adjustment process?

Testing capital structure theories in emerging economies is important for a number of reasons. First, this enables us to test capital structure theories developed with Western or developed economies in mind, using firms from developing economies whose institutional environment[2] may not be the same as those in developed economies. The results from emerging or African economies can then be compared with those from Western economies[3]. To the extent that the financing decisions of South African firms are similar to Western or other emerging countries, they provide us with independent samples to test existing capital structure theories; and to the extent that South African firms have different institutional structures this will increase economists' ability to discriminate among the alternative theories and thus enable them to develop theories that apply to the South African context or the general African context (Gwatidzo, 2008, p. 7).

Second, South Africa is especially important for other reasons: it is considered to be the gateway to Africa (the recent decision to join the BRIC group[4] may also be important), it has a more developed economy than other African countries, and other countries may wish to follow its growth trajectory. That is, what works in South Africa (another African country) may work for other African countries as well. This is especially important given South Africa's economic role in Africa. South Africa contributes more than 19 per cent to the continent's economy (Grobbelaar, 2004; South Africa Foundation, 2004). Moreover, since 1994, South African firms have significantly increased investment into other African countries. Examples include firms like MTN, Vodacom, SABMiller, Mvelaphanda Holdings, ABSA and First National Bank, which all have operations in different African countries.

This study shows that South African firms adjust relatively fast towards a target leverage level. It is also found that asset tangibility, firm growth, firm size and risk are positively related to leverage, while profitability and tax are negatively related to leverage.

The study is structured as follows. Section 2, which provides a review of literature on capital structure, is followed by Section 3, which presents a brief discussion of the factors that affect firm capital structure. The methodology and data source are described in Section 4. Results are discussed in Section 5. Section 6 concludes the study.

2. Empirical literature on target capital structure

The empirical literature on target capital structure is growing rapidly. This may partly be due to the failure of the static capital structure models to explain the financing behaviour of firms. There is, however, a general agreement in the literature that firms seek to establish an optimal debt ratio (Graham and Harvey, 2001; Fama and French, 1998; Flannery and Rangan, 2006; Drobetz and Wanzenried, 2006; Haas and Peeters, 2006). Random shocks can push firms away from the target debt ratio, and firms must gradually return to this long-run target ratio. The optimal and actual debt ratios may therefore be different for some firms. This dynamic phenomenon cannot be captured by standard capital structure models, which implicitly assume that the two are the same (Drobetz and Wanzenried, 2006). A relatively new strand of literature which acknowledges this possibility and adopts a dynamic framework to explain the financing decisions of firms has thus emerged. See, for example, Yeh (2011), Reinhard and Li (2010), Nunkoo and Boateng (2010), Byoun (2008), Hass and Peeters (2006) and Flannery and Rangan (2006), among others.

Just like the literature on static capital structure models, the literature on target capital structure has overly concentrated on developed economies. The aim of this section is to review some of the important contributions to this strand of literature, which include Flannery and Rangan (2006), Drobetz and Wanzenried (2006) and Hovakimian and Li (2010, 2011).

Using a partial adjustment model, Flannery and Rangan (2006) investigate the leverage targeting behaviour of firms and find that firms do indeed identify a target towards which they gravitate. Flannery and Rangan argue that firms tend to return relatively quickly to their target leverage ratios, with an average firm closing 30 per cent of the leverage gap in a year. Negash (2001) use the same approach and find corroborating evidence. They use a dynamic model to investigate the determinants of target capital structure of Canadian firms over the period 1996-2004 and find that

Canadian firms have long-run target leverage ratios. They also find that the speed of adjustment (SOA) to the target is relatively low, with only 12 per cent of the difference between actual and optimal capital structure (also called leverage gap) being covered in a given year. Ozkan (2001) also investigates the determinants of target capital structure using UK non-financial firms for the period 1984-1996 and finds that the firms have a long-run optimal capital structure towards which they gravitate relatively fast; suggesting that the costs of being away from the target ratios and the costs of adjustment are important for UK firms.

The capital structure adjustment process was also further investigated by Yeh (2011). Using a GMM and a dynamic capital structure model, Yeh uses Taiwanese data for the period 1982-2007 to estimate a partial adjustment model of capital structure and finds an average rate of adjustment of 26 per cent of the leverage gap. He also finds that macroeconomic conditions affect the target capital adjustment process. More specifically, the SOA during recovery or boom stages of the business cycle is found to be higher than during recessions, suggesting some asymmetry in the financing behaviour of firms. Another asymmetry emerges in Leary and Roberts (2005). Leary and Roberts (2005) find that firms are especially concerned with excessively high leverage rather than excessively low leverage. Similarly, even though firms rebalance their capital structures, they do not rebalance every period, and when they rebalance, they adjust towards a target range rather than a specific target. Leary and Roberts (2005) also emphasise the role of adjustment costs, which result in shocks having a persistent effect on leverage.

Using a sample of 90 Swiss firms for the period 1991-2001 and a dynamic capital structure model which endogenizes the adjustment process, Drobetz and Wanzenried (2006) investigate the determinants of the SOA to a target debt ratio. They find that firm characteristics and macroeconomic conditions affect the adjustment process, with the SOA being faster during good economic conditions. Qian *et al.* (2009) use a dynamic capital structure model to investigate the determinants of capital structure for 650 Chinese firms over the period 1999-2004, finding that firms adjust toward an equilibrium level of debt ratio in a given time period at a slow rate, with only about 18 per cent of the leverage gap being eliminated in a given year.

In Byoun (2008) a number of issues related to target capital structure are raised. First, Byoun asks whether firms really adjust their capital structures toward target leverage levels. Second, if they do rebalance towards a target, how and when do they adjust their capital structures? Byoun suggests a financing needs-induced adjustment framework to examine the dynamic process by which firms adjust their capital structures. Byoun (2008) also finds that even though firms move toward a target capital structure, they do not do so instantaneously. In addition, they do not rebalance as frequently as suggested by Drobetz and Wanzenried (2006), who argue that firms should adjust their capital structure more often especially during booms. Suggesting the complementary roles of pecking order and trade-off theories, Byoun (2008) also finds that firms with high adjustment costs are more likely to absorb cash flow shocks internally without resorting to external capital.

Using data from ten Central and Eastern European countries for the period 1993-2001, Haas and Peeters (2006) use a dynamic model of capital structure to investigate the capital structure SOA determinants. They find that firms have a target towards which they adjust, with profitability and age being found to be robust determinants of the capital structure targets. They also find an average SOA ranging between 4 per cent

(in Slovak Republic) and 49 per cent (in Bulgaria) and suggest that the slow rate of adjustment toward the equilibrium leverage ratio is due to significant market frictions in those economies.

In Flannery and Rangan (2006), a detailed empirical analysis of the capital structure adjustment process is undertaken. Using a sample of non-financial firms for the period 1966-2001 and a dynamic partial adjustment model, they investigate the targeting behaviour of firms and find that firms do indeed identify and pursue target capital structure. They also find that firms tend to return quite quickly to their target leverage ratios when they are shocked away from their targets, with an average firm acting to close the gap at more than 30 per cent per year.

There are, however, a number of studies whose results contradict the dynamic capital structure model postulations. These include Reinhard and Li (2010), Welch (2004), Baker and Wurgler (2002) and Lemmon *et al.* (2008). For example, Baker and Wurgler (2002) argue that firms "time" their security issues to take advantage of market conditions, and that the effects of such issuance activity on the debt ratio are quite persistent – implying that returning to an optimal or target debt ratio is not a primary concern for firms. Welch (2004) also supports this argument, arguing that debt ratio dynamics are largely determined by stock returns rather than a mere attempt to adjust to a target.

Reinhard and Li (2010) use Indonesian non-financial firms to investigate whether target capital structure models can explain the dynamic behaviour of firms when adjusting capital structures. They use a GMM approach and a sample period 1995-2007 and find that the commonly used models do not adequately identify whether firms rebalance their capital structures towards a target capital structure or not. Moreover, Reinhard and Li (2010) suggest that capital structure models, whether static or dynamic, are unable to differentiate between trade-off and pecking order theory: thus the debate on which one better explains the financing behaviour of firms is far from over.

3. The determinants of capital structure

In this section, the main variables that the literature suggests have an effect on the capital structure of a firm are reviewed[5]. Leverage, the dependent variable, is measured using two measures: total debt and long-term debt ratios. Most variables, dependent or independent, used in capital structure models may result in spurious results. This is a general weakness of most capital structure models. Titman and Wessels (1988) argue that different proxies for leverage should be used to control for possible spurious correlations.

The independent variables used in the study are asset tangibility, profitability, firm size, reputation, growth, taxes and risk. Asset tangibility measures the asset base of the firm. The more tangible assets a firm has, the more collateral it can offer. Thus, tangibility is positively related to leverage. The more profitable a firm is, the greater the availability of internal financing (retained earnings). According to the pecking order theory, there should be a negative relationship between profitability and leverage. Size also matters. Large firms tend to be more diversified and therefore have lower risk of financial distress (Titman and Wessels, 1988; Gaud *et al.*, 2005). Prasad *et al.* (2001) argue that the larger the firm, the smaller the information asymmetries between the firm and the market. We thus expect a positive relationship between size and leverage. Gwatidzo and Ojah (2009) explain that firms that have been in operation for a long time have developed some reputation. Haas and Peeters (2004) also argue that older firms have

longer track records, which result in greater transparency and smaller information asymmetries. These firms will find it easier to attract investors and access loans. Therefore, reputation and leverage should be positively related.

Firm growth also affects leverage. If retained earnings are insufficient to complement the growth rate of a firm, the firm may resort to external finance. Titman and Wessels (1988) and Prasad *et al.* (2001) argue that firms with substantial growth opportunities should issue equity rather than debt. Equity decreases the agency costs of asset substitution and moral hazard. For these reasons, growth should be negatively related to leverage.

Taxes also affect the amount of debt held by a firm. Cheng and Shiu (2007) explain that firms with high effective tax rates should issue more debt than equity to take advantage of interest tax shields. Therefore, a positive relationship between tax and the level of debt is expected.

Keeping in line with static trade-off theory, Prasad *et al.* (2001) explain that risk and debt are negatively related. Investors are reluctant to lend to a firm that has a high risk of default. On the contrary, Abor and Biekpe (2007) point out that researchers have also found a positive relationship between firm risk and both long-term and short-term debt ratios. Prasad *et al.* (2001) point out that there is a problem of causality. They suggest that there may be a bi-directional relationship between business risk and leverage, and as a result estimates may not be as expected.

4. Methodology, data and descriptive statistics

4.1 Methodology

To analyse the dynamic nature of capital structure decisions and the nature of the adjustment process, the research adopts the approach of Ozkan (2001) and Gaud *et al.* (2005). Ariff *et al.* (2008) explain that firms target an optimal leverage ratio which is assumed to depend on certain firm-specific factors, as explained by the theory. This can be expressed by the following equation:

$$Lv^* = f(Profitability,\ Asset\ Tangibility,\ Tax,\ Size,\ Age,\ Growth,\ Risk) \quad (1)$$

where Lv^* is the target leverage ratio and the other variables are defined and discussed in Section 3.

Ozkan (2001) points out that firms adjust slowly towards their optimal target debt ratio because adjustments are costly and managers may not find it efficient to fully adjust to the target ratio. In line with Gaud *et al.* (2005), taking adjustment costs into account and assuming firms follow a target adjustment process, the model can be written as follows:

$$Lv_{it} - Lv_{it-1} = \alpha\left(Lv_{it}^* - Lv_{it-1}\right), \quad \text{with } 0 < \alpha < 1 \quad (2)$$

The target leverage ratio is estimated by the following equation:

$$Lv_{it}^* = \beta x_{it} + \mu_{it} \quad (3)$$

with $i = 1, \ldots, N$ and $t = 1, \ldots, T$. Lv_{it} is actual leverage ratio for firm i in year t, Lv_{it}^* is target leverage ratio for firm i in year t, α is the SOA, x_{it} is a $K \times 1$ vector of explanatory variables, β is a $K \times 1$ vector of constants; and μ_{it} is an error term.

The SOA is inversely related to adjustment costs. Ariff *et al.* (2008) explain that if $\alpha = 0$ then $Lv_{it} = Lv_{it-1}$ and there is no adjustment towards the target because the cost is too high. On the contrary, when $\alpha = 1$ then $Lv_{it} = Lv^{*}_{it}$ and the firm efficiently adjusts its leverage level to the target leverage level. Combining equations (2) and (3) and making Lv_{it} the subject of the formula, we obtain the following:

$$Lv_{it} = (1 - \alpha)Lv_{it-1} + \alpha\beta x_{it} + \gamma_i + \lambda_t + \nu_{it} \quad (4)$$

where, γ_i is unobserved firm-specific effects assumed constant over t, λ_t is the unobserved time-specific effects assumed constant over i, and ν_{it} is the error term.

Ozkan (2001) explains that using panel data and equation (4), it is possible to examine the potential determinants of target leverage levels and the adjustment process.

Researchers express caution when estimating dynamic capital structure models. Since the error term (ν_{it}) may be correlated with the lagged dependant variable (Lv_{it-1}) fixed effects or random effects models may produce bias and inconsistent estimates. Ozkan (2001), Gaud *et al.* (2005) and Drobetz *et al.* (2006) suggest the use of instrumental variables (IV) estimation methodology to control for any variables that may be correlated with the error term. This paper applies the two-step GMM estimation technique suggested by Arellano and Bond (1991). They recommend that equation (4) first be differenced to remove any firm-specific effects, thereby avoiding any correlation between unobservable firm-specific characteristics and explanatory variables.

It must be noted that the estimation of the model (equation (4)) may suffer from problems of endogeneity of the explanatory variables (Miguel and Pindado, 2001). Ozkan (2001) explains that the problem arises because economic shocks that affect capital structure decisions may simultaneously affect some of the regressors. For this reason, he suggests treating all variables as endogenous. In addition, Drobetz *et al.* (2006) recommend using the second lag of all the dependent variables as instruments.

Similar to Ozkan (2001) and Gaud *et al.* (2005), five test statistics are reported. AR (1) or first order serial autocorrelation of residuals and AR (2) both follow a normal distribution $N(0, 1)$ under the null hypothesis of no autocorrelation. Arellano and Bond (1991) argue that estimates are only consistent if there is no second order serial autocorrelation of the residuals. Wald 1 is used to assess the joint significance of the time dummy variables, and Wald 2 is used to assess the joint significance of the determinants of capital structure. Both these tests are asymptotically distributed as chi-squared under the null of no relationship. To test the validity of the instruments, the Sargan test of over-identifying restrictions is reported. The Sargan test is also asymptotically distributed as chi-squared under the null of instrument validity. All variables and tests are estimated using STATA 10.

4.2 Data

The sample consists of firms listed on the Johannesburg Stock Exchange (JSE) for the period 1998-2008. Firm-specific data was obtained from annually published financial statements extracted from the McGregor Database. The sample excludes financial and utility companies because these are highly regulated and face strict capital structure requirements (Abor and Biekpe, 2007). Each firm included in the sample was listed on the JSE for at least six consecutive years. The data was also trimmed to exclude outliers. The sample consists of 178 firms and a total of 1,762 observations. The panel is unbalanced because not all firms have data for every year.

Table I shows summary statistics of the variables. Total debt and long-term debt represent on average 59 and 9 per cent of assets, respectively. Asset tangibility has a mean of 0.27. Profitability is approximated by the return on assets and has a mean of 17 per cent. The average size of a firm approximated by the log of total assets is 6.16. The oldest company sampled is 158 years old, and the average age is approximately 46 years. When it comes to firm growth (where growth is defined as the market-to-book value), the average ratio of market value of assets to book value of assets over the sample period is 0.106, while the average tax rate is approximately 25 per cent. In terms of firm risk, the average standard deviation of return on assets is 0.114.

Figure A1 in the appendix graphs the average debt ratios for each year. A slight upward trend in the total debt ratio (TDR) is observed. The short-term debt ratio peaks in the year 2002 at 41.5 per cent and drops to around 38 per cent in 2008. The long-term debt ratio stays in the 9.7-13.2 per cent interval over the time period.

5. Results

Table II summarises the two-step GMM estimation of equation (4) for each of the two different measures of leverage. As explained earlier, there are several ways of calculating the *Growth* variable. For example, Hovakimian and Guangzhong (2011), Rajan and Zingales (1995), Booth *et al.* (2001), Drobetz and Wanzenried (2006), Myers (1977) and Nunkoo and Boateng (2010) use the market-to-book value. Ozkan (2001) defines *Growth* as A/B, where A – growth as book value of assets less book value of equity plus market value of equity, and B – book value of equity.

For this study, we used both definitions to check for robustness. *Growth1* is the market-to-book value and *Growth2* is as defined by Ozkan (2001). Regression results in columns 1 and 2 were derived from a model that used *Growth1*. Regression results in columns 3 and 4 used *Growth2*. As discussed earlier, the coefficients of the lagged leverage ratios represent the adjustment costs. We find that these coefficients are significant, at a 1 per cent level of significance, for both definitions of leverage.

Variable	Mean	SD	Min.	Max.
TDR	0.586	0.153	0.222	0.900
Long-term Dept Ratio (LTR)	0.094	0.081	0.000	0.366
Asset Tangibility	0.271	0.186	0.030	0.729
Profitability	0.170	0.095	0.001	0.753
Size	6.160	0.866	3.906	8.140
Age	46.027	34.196	2.000	158.000
Tax	0.252	0.107	0.000	0.437
Risk	0.114	0.108	0.004	3.237
Growth2	1.965	1.613	0.052	14.615
Growth1[a]	0.106	0.171	−0.166	1.457

Notes: [a]There are several definitions used to measure growth in the literature; see, for example, Hovakimian and Guangzhong (2011), Rajan and Zingales (1995), Booth *et al.* (2001), Drobetz and Wanzenried (2006), Myers (1977) and Nunkoo and Boateng (2010), who used the market-to-book value; Ozkan (2001) defined s A/B; where A – growth as book value of assets less book value of equity plus market value of equity, B – book value of equity; Growth1 is the market-to-book value and Growth2 is as defined by Ozkan (2001)
Source: Authors' calculations

Table I.
Descriptive statistics (1998-2008)

	1 *TDR*	2 *LTR*	3 *TDR*	4 *LTR*
D_{t-1}	0.345*** (0.001)	0.198*** (0.0003)	0.377*** (0.003)	0.215*** (0.001)
Asset Tangibility	0.322*** (0.009)	0.113*** (0.004)	0.125*** (0.009)	0.099** (0.04)
Profitability	−0.267*** (0.001)	−0.069* (0.004)	−0.169*** (0.004)	−0.011 (0.132)
Size	0.187*** (0.001)	0.111*** (0.001)	0.052*** (0.002)	0.047*** (0.001)
Age	−0.004*** (0.0002)	−0.003*** (0.0001)	0.001** (0.0002)	0.001*** (0.0001)
Growth1	0.016** (0.004)	0.005*** (0.0006)		
Tax	−0.155*** (0.0003)	−0.0144*** (0.0001)	−0.006*** (0.001)	−0.008*** (0.0001)
Risk	0.043*** (0.002)	−0.003 (0.002)	0.052*** (0.002)	−0.003 (0.003)
Growth2			0.002*** (0.0004)	0.006*** (0.0001)
AR (1)	−3.83***	−4.03***	−3.50***	−4.39***
AR (2)	1.0818	0.0948	1.0656	−0.5196
Wald Test 1(df)	414.44 (8)	763.19 (8)	307.38 (8)	592.57 (8)
Wald Test 2 (df)	58.97 (8)	36.91 (8)	56.82 (8)	49.25 (8)
Sargan Test (df)	90.48 (73)	144.94 (73)	166.92 (73)	169.92 (73)

Notes: Coefficient is significant at: ***1, **5 and *10 levels; D_{t-1} is defined as the lagged leverage ratios. *Asset Tangibility* is defined as the ratio of fixed assets to total assets, *Profitability* is the ratio of EBIT to total assets, *Size* is the natural log of total assets, *Age* is the number of years since the company was founded, *Growth1* is the ratio of market capitalization to book value of equity, as in Ozkan (2001) *Growth2* is defined as A/B; where A – book value of assets less book value of equity plus market value of equity, and B – book value of equity, *Tax* is the ratio of income tax to EBIT and *Risk* is the five-year rolling standard deviation of profitability; in all models the second lags of all the dependant variables are used as instruments, time dummies are included in all the models, the estimation period is 1998-2008 and robust standard errors are reported in parentheses

Table II.
Determinants of capital structure

For all four models, the AR (1) test statistic suggests that there exists negative first-order serial autocorrelation. According to Roodman (2006), this result is expected and uninformative. However, the AR (2) test statistic for all the models points out that there is no second-order serial autocorrelation of the residuals; therefore the estimates are consistent. The Wald tests for the joint significance of the time dummy variables and the determinants of capital structure are satisfied for all specifications at a 1 per cent level of significance. Gaud *et al.* (2005) argue that the significance of the time dummy variables indicates that the state of the economy plays an important role in a firm's capital structure decisions. The Sargan test confirms the validity of the IV for all the models.

Using *Growth1*, the size of the coefficients of the lagged total debt and long-term debt ratios are 0.345 and 0.198, respectively. This implies that the adjustment rates, given by $1 - \alpha$, for total debt and long-term debt are 0.655 and 0.802, respectively. That is, on average, about 66 per cent of the difference between desired TDR and actual TDR (also called the leverage gap) is covered in a year. Thus, on average, the leverage gap is covered after about 1.5 years, if this speed is maintained. For the long-term debt ratio, about 80 per cent of the leverage gap is covered in a year, implying that if this speed is maintained, the gap is covered after 1.2 years. Using *Growth2* increases the sizes of the coefficients of the lagged total debt and long-term debt ratios to 0.377 and

0.215, respectively. The corresponding speeds of adjustment using *Growth2* are 0.623 and 0.785 for total debt and long-term debt ratios, respectively.

The adjustment costs for South African firms are lower than for those in developed economies. Shyam-Sunder and Myers (1999) find an adjustment coefficient (or rate of adjustment/SOA) of 0.41 for the USA, and Ozkan (2001) finds a value of 0.57 for the UK. Miguel and Pindado (2001) find that the adjustment coefficient for Spain is relatively low at 0.2095. They argue that the Spanish bond market is not as developed as those in the USA and UK. As a result, firms are forced to acquire finance through private sources. In addition, they point out that private debt has lower transaction costs than public debt. Therefore, Spanish firms would find it easier to adjust to their target debt levels than firms within the USA and the UK, resulting in a low adjustment coefficient. The same explanation may justify the relatively low adjustment coefficients found for South African listed firms. The Bond Exchange of South Africa has been operating as an exchange since 1996; compared to developed countries, the exchange is underdeveloped. Rand Merchant Bank (2001) argues that banks are still the dominant source of corporate funds in emerging market economies, especially South Africa. Rand Merchant Bank explains that because of excess capital and cheap financing from deposits, banks are able to undercharge for corporate debt. As a result, transaction costs are low, and we see a relatively low cost of adjustment coefficient.

In addition to the results for the adjustment process, the econometric analysis yields expected results for a majority of other independent variables. The results show that asset tangibility is positively related to the total and long-term debt ratios. As shown in Table II, the coefficients are significant at either 1 or 5 per cent level of significance. These results are in line with the trade-off theory, which suggests that as the proportion of tangible assets increases – the more collateral a firm can offer – the more debt it will take on. This result supports findings by Rajan and Zingales (1995), Frank and Goyal (2003) and Gaud *et al.* (2005). Profitability is found to be negatively related to both definitions of leverage, implying that more profitable firms tend to use retained earnings as a source of finance. The results, which are robust to different *Growth* proxies, support the pecking order theory and are in line with findings by Booth *et al.* (2001), Ozkan (2001), Haas and Peeters (2004) and Gwatidzo and Ojah (2009).

We find evidence of a positive relationship between size and the two measures of leverage. The size coefficients are significant at 1 per cent level of significance. This is in line with the argument that larger firms, unlike smaller firms, are less likely to default and tend to have a larger asset base. This tends to enhance their chances of accessing long-term debt. We find mixed evidence when it comes to age variable. When using *Growth1*, the age coefficient for the total and long-term debt ratios is negative at a 1 per cent level of significance (see columns 1 and 2), but when using *Growth2*, the age coefficient is negative and significant.

There is no agreement on the impact of age on leverage in the literature. For example, age can be used as a proxy for reputation. In this reputational role, older firms tend to have acquired sufficient reputation to access debt markets; thus one would expect a positive relationship between age and leverage. However, it may also be the case that firms that survive are those that are more profitable. In line with the pecking order theory, older, more profitable firms tend to use internal funds rather than debt; thus in this case one can expect a negative relationship between age and leverage.

The results show that growth is positively related to leverage. This means that South African firms with substantial growth opportunities and insufficient retained earnings prefer to issue debt rather than equity to raise funds. Drobetz *et al.* (2006) point out that the results support the hypothesis of the simple version of the pecking order theory. The coefficient of the tax variable is negatively correlated with both leverage measures at the 1 per cent level of significance. This corroborates findings by Negash (2002). However, as explained earlier, this result may be a consequence of the definition used to approximate tax.

The results for the risk variable are contrary to most previous research findings such as Bradley *et al.* (1984) and Abor and Biekpe (2007), who find a negative relationship between firm risk and leverage. We find the risk variable to be significantly positive (at the 1 per cent level of significance). As explained earlier, the problem of causation may be the reason for the unexpected results.

6. Conclusion

This study examines two major issues surrounding the capital structure of South African listed firms. First, it investigates the cost of adjustment and the SOA towards a target debt ratio. Second, it examines the determinants of target capital structure. The empirical analysis uses an unbalanced panel of 178 firms listed on the JSE for the period 1998-2008. A dynamic adjustment model was estimated using a two-step GMM estimation technique. The results suggest that a target debt-equity ratio does exist for South African firms. In addition, we find that these firms bear greater transaction costs when adjusting to a target TDR than to a target long-term debt ratio. However, they do adjust to their target ratios relatively quickly.

The study also finds that firms with a larger proportion of tangible assets have higher debt ratios, more profitable firms operate at lower levels of leverage, larger firms operate at higher levels leverage, and that fast growing firms prefer debt to equity when raising funds. Finally, it is found that when firms require finance, they prefer internal to external sources of finance. Furthermore, these firms seem to take into account the trade-off between the costs and benefits of debt when making financing decisions. Therefore, the capital structure decisions of South African listed firms seem to follow both the pecking order and the trade-off theories of capital structure.

The results of the study must, however, be cautiously interpreted. For example, how the variables are defined may result in spurious results. The sample chosen focused on listed firms, which means the results cannot credibly be generalised to all South African firms (listed and unlisted). More importantly, whilst a lot can be gleaned from the results, they may not be readily applicable to firms in other African countries. Finally, the study does not separate firms by sector; financial decisions may also be affected by the sector in which a firm operates. There are also several areas of further study that can be explored, including the following: what kind of information is conveyed by financial decisions? Do managerial incentives or compensation of management affect financial decisions? Does debt make South African firms more aggressive competitors? Does the capital structure of a firm affect the quality of employees that it attracts?

Notes

1. See for example Myers (1977, 1984, 2001, 2003), Harris and Raviv (1991), Rajan and Zingales (1995), Frank and Goyal (2008), Titman and Wessels (1988), Shyam-Sunder and Myers (1999). Studies by Booth *et al.* (2001), Prasad *et al.* (2001), Agarwal and Mohtadi (2004),

Glen and Singh (2004), Abor and Biekpe (2007) and Gwatidzo and Ojah (2009) are among the few that have looked at developing or emerging markets.

2. First, possible inefficiencies within financial and capital markets may result in irregular or incomplete financing decisions. Second, information asymmetries and agency problems tend to be greater within emerging market economies. As a consequence transaction costs will be greater, and firms may be forced to operate with a sub-optimal capital structure (Myers, 1984; Eldomiaty, 2007).
3. Myers (2003) opines that capital structure theories are conditional and not general. Frank and Goyal (2009) argue that capital structure theories work better in some conditions than in others. More reassuringly, Glen and Singh (2004) argue that the capital structure of firms in developing countries is different from that in developed economies.
4. BRIC stands for the countries Brazil, Russia India and China. It is a grouping of countries deemed to be at roughly similar stages of economic development. South Africa joined the group in 2011.
5. Appendix Table AI summarises the variables and their approximations.

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About the authors

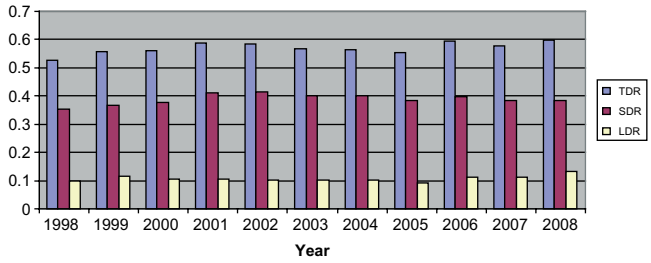
Anil Ramjee recently completed his postgraduate studies at the Witwatersrand University's School of Economic and Business Sciences.

Tendai Gwatidzo is a Senior Lecturer at the Witwatersrand University's School of Economic and Business Sciences. Tendai Gwatidzo is the corresponding author and can be contacted at: tendai.gwatidzo@wits.ac.za

Appendix

Variables	Variable definition
Dependent variables	
TDR	Total liabilities divided by total assets (total assets are measured using book values)
LTR	Long-term liabilities divided by total assets
Independent variables	
Asset Tangibility	Fixed assets divided by total assets
Profitability	EBIT divided by total assets
Size	Natural of total assets
Age	Number of years since the company was found
Growth1	Market capitalization divided by book value of equity
Growth2	(Asset book value-Book value equity + Market value equity)/Book value equity
Tax	Income tax paid divided by EBIT
Risk	Five year rolling standard deviation of profitability

Table AI.
Variables and their definitions



Source: Authors' calculations

Figure A1.
Capital structure ratios for South African firms for each year (1998-2008)