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FINANCIAL ECONOMICS | RESEARCH ARTICLE

Are the determinants of banks' and insurers' capital structures homogeneous? Evidence using South African data

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Abstract: This paper investigates the factors that determine capital structures of financial firms using two separate samples of banks and insurance companies and draws comparisons therefrom. It utilizes two samples of 16 South African banks and 26 South African insurance companies for the period 2006–2015. The relationship between leverage and firm-level determinants of capital structure is tested for each sample. The results show that the standard firm-level determinants of capital structure empirically observed on non-financial firms also apply for banks and insurers. Confirming the fundamental differences between banks and insurance companies, the study observed that the 2007–2009 global financial crisis (GFC) have a negative impact on capital structures of banks (meaning that they deleverage during crises). In contrast, the GFC was found to have a positive impact on capital structures of insurance companies (meaning, unlike banks, they leverage during crises). We find that banks and insurers have target capital structures. Banks adjust to this target at an adjustment speed of 44%, whereas insurers adjust at a lower rate of 21%. In conclusion, the paper finds

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PUBLIC INTEREST STATEMENT

The effects of the 2007–2009 global financial crises which mutated from the financial sector and afflicted many economies are still being experienced to date. Banks and insurance companies were the chief architects of this crisis. This was occasioned by the erosion of capital levels to sustain these institutions as a result of sub-prime lending. As such, it has become a policy imperative more than ever before to secure the financial sector. Although, the South African financial sector was largely insulated from the effects of the financial crisis due to the good regulatory architecture in place, it also experienced challenges due to economic downturn. Against this backdrop, this paper examines the financing policies of banks and insurance companies in order to establish the factors that drive their capital structures. This will also aid researchers to understand better what drives the capital structure policies of banks and insurers, which have remained a "grey area" in capital structure.

both commonalities and fundamental differences between the capital structures of banks and insurers.

Subjects: Corporate Finance; Banking; Insurance

Keywords: Banks; insurers; capital structure; firm level; regulation; South Africa
Subjects: G01; G21; G32

1. Introduction

Capital structure theory is firmly premised on the seminal works of Modigliani and Miller (1958, 1963)). They contended that firm value is invariant to capital structure choices. Sub-sequent studies have proven to the contrary, that capital structure does matter (see for instance Berger, Herring, & Szegö, 1995; DeMarzo & Duffie, 1995; Froot & Stein, 1998; Miller, 1995; Smith & Stulz, 1985). Despite banks and insurance companies occupying center stage in the economy, extant studies on capital structure have generally excluded financial firms from their analysis. This has been premised on the notion that financial firms have peculiar firm characteristics. For instance, in the context of banking and insurance institutions, the deposit taking and premium taking abilities, respectively, set them apart from other non-financial firms. This ability to generate deposits and premiums lends them an extra source of finance not ordinarily available to other firms.

The second peculiar feature of banks and insurers is that they are subject to capital regulation which could also have a bearing on their capital structure choices. The standard view is that capital regulation constitutes an additional overriding departure from the Modigliani–Miller irrelevance proposition. Though few studies have been conducted in the realm of financial firms, two dominant schools of thoughts have emerged with regard to banks' and insurers' capital structures. First, there is the "standard corporate finance" view, which proposes that bank and insurer financing patterns are similar to those of non-financial firms. The second school of thought is the "regulatory view" of capital, which argues that capital regulation is binding and solely determines banks' and insurers' capital structures.

Among others, Teixeira, Silva, Fernandes, and Alves (2014), Jucá, de Sousa, and Fishlow (2012), Ahmad and Abbas (2011), and Gropp and Heider (2010) demonstrated that there are striking similarities between the capital structures of banks and those of non-financial firms. However, there are bank-specific fixed factors that also come into play in the determination of the capital structures of banks. These include banking regulation, credit risk management and regulatory capital arbitrage opportunities. Comparatively, the research on the determinants of capital structure of insurance companies is still in its infancy stage (refer to among others Cheng & Weiss, 2012; Ahmed & Shabbir, 2014). The few studies have mainly been confined to investigating the determinants of solvency rather than capital structure. More recently, Moyo (2016) utilized a heterogeneous panel of South African insurance firms and banks institutions to test for the validity of the market timing, perking order and dynamic trade-off theories in explaining the financing behavior of financial services firms. He established that their financing behavior was consistent with the dynamic trade-off theory and contrary to the pecking order and market timing theories. However, his results did not test and correct for cross-sectional dependency inherent in the financing of financial firms; moreover, he treated the banks and insurers as homogenous entities.

This study contributes to the existing literature in a number of ways. Principally, it investigates the determinants of capital structure of banks and insurers by factoring in the cross-sectional dependence inherently present in the financing behavior of such panels. The study also extends the work of Cebenoyan and Strahan (2004) and Gropp and Heider (2010) in three ways. First, a different proxy for risk that captures credit risk is employed to examine the dynamics of bank financing. Second, the study also investigates how financial firm leverage is impacted upon by business cycles such as the global financial crisis (GFC). Lastly, the study estimates the true speed of adjustment towards the target capital structure by employing LSDV with Kiviet (1995) correction estimators. The rest of the paper is organized as follows. Section 2 reviews relevant literature. Section 3 describes research methodology followed. Section 4 presents and discusses the results, and finally, section 5 concludes.

2. Review of related literature

A number of theories have been advanced to explain firm financing in the aftermath of the M and M irrelevance propositions. Notwithstanding, extant studies on the determinants of capital structure have employed the pecking order and trade-off theories in the interpretation of their results. Suffice to say that this paper takes cue from such studies and relies on the trade-off and pecking order theories to explain the capital structure choices of financial firms.

2.1. Trade-off theory

The trade-off theory is associated with Kraus and Litzenberger (1973). They postulated that firms desire to attain an optimal leverage which reflects a trade-off between the tax benefits of debt and the deadweight costs of bankruptcy. Myers (1984) further advanced this theory in his static trade-off framework in which he asserted that firms set a target debt-to-value ratio and gradually moves towards it, the same way that firms adjust dividends to move towards a target dividend pay-out ratio. Quintessentially, a firm has two sources of financing at its disposal, namely; debt and equity. Within a trade-off framework, the firm will utilize more debt in order to benefit from the debt interest tax shield up to a point where the bankruptcy costs outweigh the present value of interest tax shield. Beyond this point it is prudent that the firm finances out of equity.

2.2. Pecking order theory

The pecking order theory was advanced by Myers and Majluf (1984). They postulated that it is generally better to issue safe securities than risky ones. Firms should go to bond markets for external capital, but raise equity by retention if possible. In other words, external financing using debt is better than financing by equity. In this pecking order model, a financial hierarchy descends from internal funds, to debt, to external equity (Chirinko & Singha, 2000, 418). Put in other words, managers will tend to have the priority to fund projects by using retained earnings, and issue debts when the retained earnings are exhausted, and lastly they will only turn to the issuance of equity when it is not sensible to issue any more debts (Rasiah & Kim, 2011, 151). Within a pecking order framework, the firm has no well-defined target debt-to-equity ratio (Myers, 1984). This theory implies that corporate managers making financing decisions are not really thinking about a long-run target debt-to-equity ratio. Instead, they take the path of least resistance and choose what at the time appears to be the lowest-cost financing vehicle—generally debt—with little thought about the future consequences of these choices (Barclay & Smith, 2005). The pecking order theory is classified as an information cost theory. Implicit in the pecking order theory is information asymmetry. Information asymmetry arises as a result of managers (insiders) having more information than investors (outsiders), which they use to their advantage. As such, within this setting long term debt is considered as a last resort in financing.

2.3. Standard firm-level determinants of capital structure

Extant studies on capital structure have isolated a number of factors to have an effect on firm leverage (see for instance, Al-Najjar & Hussainey, 2011; Frank & Goyal, 2009; Gropp & Heider, 2010; Rajan & Zingales, 1995; Shyam-Sunder & Myers, 1999; Titman & Wessels, 1988, among other studies). These are profitability, asset tangibility (collateral), size, market-to-book value (growth) and risk.

2.3.1. Profitability

The pecking order predicts a negative relationship between profitability and firm leverage. Indeed, most empirical studies have confirmed this prediction (see Bartoloni, 2013; Booth, Aivazian, Demirguc-Kunt, & Maksimovic, 2001, 117; Rajan & Zingales, 1995, 1457; Shyam-Sunder & Myers, 1999: 221, among other studies on non-financial firms). Similarly, studies on financial firms have also bolstered this prediction (refer to Ahmad & Abbas, 2011, 211; Gropp & Heider, 2010, 598 and Jucá et al., 2012, 23, among other studies). On the contrary, the trade-off theory predicts a positive association between firm profitability and firm leverage. The trade-off theory predicts that highly

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profitable firms are more likely to finance out of debt in order to enjoy the benefits of debt tax-deductibility. However, this benefit seems to accrue the most to large and very large firms, who have generated goodwill on the debt market and as such are rated favorably and can access debt at preferential terms. Danis, Rettl, and Whited (2014, 424) lend credence to the trade-off theory positive leverage-profitability prediction as they establish that at times when firms are at or close to their optimal level of leverage, the relationship is positive. Furthermore, their results document that the relationship is negative at other times. Notwithstanding, the pecking order prediction seems to be the most plausible one and most empirical studies seem to lend credence more to the negative prediction.

2.3.2. Asset tangibility

On the one hand, the trade-off theory predicts a positive relationship between asset tangibility and firm leverage. Among other studies on financial firms, Gropp and Heider (2010, 598) and Jucá et al. (2012, 23) found a positive relationship between asset tangibility and firm leverage. Yet, on the other hand, the pecking order theory predicts an inverse relationship between asset tangibility and firm leverage. This can be attributed to low information asymmetry associated with tangible assets, making equity issuances less costly. Empirical support of this prediction can be found in Bradley, Jarrell, and Kim (1984, 874), Ahmad and Abbas (2011, 208), and Al-Najjar and Hussainey (2011, 333), for instance. Nonetheless, the positive prediction is the most persuasive.

2.3.3. Size

The effect of size on financial leverage can be twofold. From the pecking order theory vantage point, as firms grow, they are bound to generate more retained earnings. As such, they should be in a position to fund their operations more out of retained earnings and hence substitute debt. Therefore, a negative relationship is predicted to exist between firm leverage and size, whereas the trade-off theory predicts that large firms should be highly leveraged as compared to small firms as they stand to enjoy the benefits of debt interest tax shields. As such, from the trade-off theory point of view the prediction is that firm leverage is positively associated with size. Notwithstanding, empirical support for the positive firm leverage and size relationship is overwhelming (see, for instance, Ahmed, Ahmed, & Ahmed, 2010, 9; Antoniou, Guney, & Paudyal, 2008, 73; Al-Najjar & Hussainey, 2011, 334; Bartoloni, 2013, 142; Lemma & Negash, 2014, 81; and Lim, 2012, 197, among other scholars).

2.3.4. Growth

Frank and Goyal (2009, 8) contend that growth increases the costs of financial distress, reduces free cash flow problems and exacerbates debt-related agency problems. Growing firms place a greater value on stakeholder co-investment. Therefore, the trade-off theory predicts that growth reduces leverage. Antoniou et al. (2008) contended that internal resources of growing firms may not be sufficient to finance their positive NPV investment opportunities and, hence, they may have to raise external capital. In essence, if firms require external finance, they issue debt before equity according to the pecking order theory. Therefore, growth opportunities and leverage are positively related in terms of the pecking order theory.

2.3.5. Risk

The trade-off theory predicts a negative relationship between firm leverage and risk. In other words, a firm that has highly volatile cash flows must avoid debt financing. The intuition behind this is that highly volatile cash flows could result in financial distress. As such, to avoid going bankrupt, firms with high levels of volatile cash flows must desist from debt financing. According to Antoniou et al. (2008, 64), firms with high earnings volatility carry a risk of the earnings level dropping below their debt-servicing commitments.

The pecking order theory, however, predicts a positive relationship between firm leverage and risk. This ought to be premised on the notion that the volatility of cash flows implies the volatility of earnings. As such, the firm becomes constrained to finance out of retained earnings. It would therefore have to seek funding from the external markets, starting off with the debt market, to avoid the problem of adverse selection. In synch with this view, Frank and Goyal (2009, 9) assert that firms with volatile shares are expected to be those about which beliefs are quite volatile. It would seem plausible that such firms suffer more from adverse selection.

2.4. Empirical evidence on the financial firms' determinants of capital structure

The empirical studies carried out in the insurance realm are very scant. Amongst others, Ahmed and Shabbir (2014) tested the pecking order theory by employing financial data of insurance companies of Pakistan over a 5-year period from 2007 to 2011. Their empirical results indicate that size, profitability, liquidity, tangibility and risk are important determinants of the capital structure of insurance companies of Pakistan. Furthermore, they report that Pakistani insurers seem to follow a pecking order pattern of financing in terms of profitability, risk, tangibility and liquidity, as all the coefficients are negative. However, with regard to size, a positive relationship subsists, which is consistent with the trade-off theory.

Cheng and Weiss (2012) conducted tests of the trade-off and pecking order theories within the US property-liability insurance industry. Their sample period for the study, 1994–2003, coincided with the institution of risk-based capital requirements in this industry. They estimated a partial adjustment model to determine whether firms have an optimal capital structure and how quickly firms adjust to the optimum when deviations from the optimum occur. The results of their research indicate that the trade-off theory dominates the pecking order theory for property-liability insurers.

There is a growing body of literature corroborating that the standard non-financial firm's determinants of capital structure also apply to the banking sector (Teixeira et al., 2014; Jucá et al., 2012; Ahmad & Abbas, 2011; and Gropp & Heider, 2010). More recently, Sorokina, Thornton, and Patel (2017, 51) extend the work of Gropp and Heider (2010) by examining the financing behavior of 1700 publicly traded US banking during the period 1973–2012. Their results document that a vast majority of the banks hold equity capital above the prescribed regulatory minimum levels. They reason that, the capital structure of banks is determined independently from regulatory requirements, until they fall within very close proximity to the required minimum and regulators explicitly force capital-related decisions upon them. Furthermore, Sorokina et al. (2017, 51) document that at other times, general market factors, market-to-book ratio, profitability, size, collateral, dividends, risk and some other macro- and micro-economic parameters drive capital structure of banks. Table 1 documents the findings of select studies that have been conducted on banking firms.

3. Research methodology

3.1. Sources of data

The sample selected for investigated consisted of all South African banks and insurance companies both listed and unlisted with complete data sets for the 10-year period running from 2006 to 2015. Data were obtained from the Bureau van Dijk Bankscope and Orbis databases. The banking panel comprised of 16 banks, whilst the insurance panel comprised of 26 insurers. The sample of banks and insurance companies is almost representative of the entire population of banks and insurance companies. This is so because the five big banks included among the total of the 16 investigated account for over 90% of bank assets, and similarly, five insurance companies included in the sample of 26 account for over 80% of insurance assets. The list of the banks and insurance companies and their sub-sectors is documented under Appendices A and B.

3.2. Variables

Standard corporate finance regression analysis has been employed in extant studies to analyze the relationship between capital structure and its determinants. It is therefore imperative that the proxies employed for the dependent variable as well as the independent variables in this study are defined.

Table 1. Empirical studies on bank capital structure

Firm-level determinant	Expected sign		Empirical evidence from the banking firms
	Pecking order theory	Trade-off theory	
Size	Positive	Positive	**Positive** Ahmad and Abbas (2011, 211) Baltaci and Ayaydin (2014, 46) Gropp and Heider (2010, 598) Jucá et al. (2012, 23) **Negative** Teixeira et al. (2014, 56)
Profitability	Negative	Positive	**Positive** Teixeira et al. (2014, 56) Berger and Di Patti (2006, 21) **Negative** Ahmad and Abbas (2011, 211) Baltaci and Ayaydin (2014,46) Gropp and Heider (2010, 598) Jucá et al. (2012, 23)
Asset tangibility	Negative	Positive	**Positive** Gropp and Heider (2010, 598) Jucá et al. (2012, 23) **Negative** Teixeira et al. (2014)
Risk	Positive	Negative	**Positive** Teixeira et al. (2014, 56) **Negative** Gropp and Heider (2010, 598) Jucá et al. (2012, 23)
Growth	Positive	Negative	**Positive** Ahmad and Abbas (2011, 211) Teixeira et al. (2014, 56) **Negative** Gropp and Heider (2010, 598) Jucá et al. (2012, 23)

Source: Sibindi (2017, 97).

3.2.1. Dependent variables

In this study, three dependent variables were employed to test the relationship between leverage and its determinants. The primary dependent variable employed for this study was book leverage. The book leverage measure (BLE) is a broad measure of leverage, defined as *one minus the ratio of book value of equity to book value of assets*. This follows from Gropp and Heider (2010), it is suffice to highlight that many proxies have been employed to define the leverage variable. There are three strands of literature in this regard. In the first instance, scholars rely on one measure of leverage. In the second strand, scholars rely on two measures of leverage, namely book leverage and market leverage. In the last strand of literature, scholars rely on the broadest measure of leverage and have three proxies for leverage, namely total debt ratio, short-term debt ratio and long-term debt ratio.

The major contestation has been whether to employ book leverage, market leverage or both. Notwithstanding that the conundrum remains unresolved; studies that have employed both measures demonstrate that the results are robust to either proxy adopted. Therefore, the inference is largely the same irrespective of whether book leverage or market leverage was employed (see, for instance, Antoniou et al., 2008; Frank & Goyal, 2004; Gropp & Heider, 2010; Hovakimian, Opler, & Titman, 2001; Rajan & Zingales, 1995; Titman and Wessels, 1988, among others). Moreover, the justification for using book value leverage is premised on other considerations. First, capital regulation of banks is imposed on book values and not market values and hence this became the variable of interest for the purposes of this study. Second, as the sample of financial firms included firms that were not listed on the JSE, there was scant availability of market value data.

Because banks have an additional source of financing, in the form of deposits, leverage was also decomposed to analyze the dynamics of deposit financing. The secondary measures of leverage employed for banks were deposit leverage (deposit liabilities) and non-deposit leverage (non-deposit liabilities). Deposit leverage (DEPOSIT) equals the *ratio of total deposits to total assets*. Non-deposit leverage (NON-DEP) is the difference between book leverage and deposit leverage.

For the insurance sector, this study also employed secondary measures of leverage. These were non-premium liabilities ("non-premium leverage") and premium reserves ("premium leverage"). Premium leverage (PRL) equals the *ratio of total gross provisions to total assets*. Non-premium leverage (NON-PREM) is equal to *book leverage minus premium leverage*.

3.2.2. Independent variables

The independent variables consist of the firm-level determinants of capital structure as well as dummy variables. The firm-level determinants of capital structure considered were size, growth, asset tangibility, profitability, risk and reinsurance. The dummy variables employed captured the effects of the 2007–2009 GFC as well as a dummy variable to capture payment and non-payment of dividends.

- Size

To measure size, the natural logarithm of total assets was employed as in other studies (Al-Najjar & Hussainey, 2011; Antoniou et al., 2008; Booth et al., 2001; Frank & Goyal, 2009; Mukherjee & Mahakud, 2010; and Öztekin & Flannery, 2012). There is a direct relationship between size and the value of assets held. Other studies have employed the logarithm of sales or net sales to capture the effect of size (see, for instance, Barclay & Smith, 2005; Rajan & Zingales, 1995; Titman and Wessels, 1988). We preferred the total assets variable because it proxies, on the one hand, both the loan activity and investment activities of banks and, on the other hand, the underwriting and investment activities of insurance companies.

- Growth

The growth variable is defined as the annual growth rate of total assets. Taking cue from Titman and Wessels (1998) and Anarfo (2015), the higher the growth rate, the higher the growth prospects of the firm. The alternative definition that has also been used widely in empirical studies would have been to proxy growth prospects with the market-to-book value ratio (see, among others, Booth et al., 2001; Frank & Goyal, 2009; and Teixeira et al., 2014). However, we could not use this proxy because of non-availability of market value data.

- Asset tangibility

Asset tangibility is defined as the ratio of fixed assets to total assets, which ratio expresses the collateral value. If the collateral value is high, the firm would be viewed in good light in the debt market, enabling it to access loans at concessionary rates.

- Profitability

While recognizing that profitability is defined in several ways, in the study we employed the return on assets (ROA) measure as the proxy for profitability. In the case of the banking sample, this was defined as the return on average assets (ROAA).

- Risk

Risk is defined in two distinct ways. For banks, the focus was on credit risk. The proxy employed was the *ratio of impaired loans to gross loans*. For the insurance sample, the measure utilized to capture underwriting risk was the *ratio of total underwriting expenses to gross premiums written*.

- Reinsurance

The reinsurance variable is the added explanatory variable for the insurance panel. It is defined as *one minus the ratio of net premiums to gross premiums (alternatively one minus retention ratio)*. The *a priori* expectation is that reinsurance brings about diversification of risk. As such, with risk minimized, the insurance company's credit rating improves in the debt market. Debt becomes the favorable financing option. As such, a positive relation is predicted to exist between the reinsurance variable and leverage.

- Dummy variables

We employed two dummy variables. The first one is the dummy variable for dividends. The rationale was that the payment of dividend sends out a signal to the market and hence can have an impact on bank leverage. It is defined as 1 when a bank pays out a dividend and 0 when the bank does not declare a dividend. The second dummy variable (GFC) was to capture the effects of the 2007–2009 GFC. It was represented by 1 for the years when the financial crisis occurs and 0 otherwise.

3.3. Empirical model specification and estimation techniques

This study lent itself to panel data techniques. To examine the relationship between leverage and its determinants, the static panel data model was employed. A dynamic panel data model was specified to study the target leverage and determine the speed of adjustment towards the target level.

3.3.1. The static panel data model

Static panel data models were specified to test the "standard corporate finance view" of capital structure for both banks and insurance companies. The fixed effects with Driscoll and Kraay (1998) standard errors estimator, which controls for cross-sectional dependence and heteroskedasticity, was utilized to estimate the models.

To test the above-stated relationships, the static panel data models are specified for the banking and insurance panels, respectively, as follows:

$$Lev_{i,t} = x'_{i,t}\beta' + \alpha_i + \varepsilon_{i,t} \quad (1)$$

where

$Lev_{i,t}$ = leverage (BLE, DEP, NON-DEP) for bank i at time t, or leverage (BLE, PREM, NON-PREM) for insurer i at time t.

$x'_{i,t}$ = vectors of explanatory variables (size, profit, growth, asset tangibility, dividend, risk, and GFC) for bank i at time t, or (size, profit, growth, asset tangibility, reinsurance, and GFC) for insurer i at time t.

β' = a vector of slope parameters

α_i = group-specific constant term which embodies all the observable effects.

$\varepsilon_{i,t}$ = composite error term which also takes care of other explanatory variables that equally determines leverage but are not included in the model.

3.3.2. The dynamic panel data model

Extant studies have modeled the target capital structure by employing a partial adjustment framework (see, among others, Antoniou et al., 2008; De Jonghe & Öztekin, 2015; Flannery & Rangan, 2006; Mukherjee & Mahakud, 2010). We took cue from such studies and specified a partial adjustment framework in order to determine whether banks and insurance companies adjust towards target capital structures.

The partial adjustment framework is specified as follows:

$$Lev^{*}_{i,t} = x^{'}_{i,t}\beta' + \varphi_{i,t} \tag{2}$$

where

$Lev^{*}_{i,t}$ = target leverage

$x^{'}_{i,t}$ = a vector of explanatory variables (size, profitability, growth, asset tangibility, dividend, risk, and GFC) for bank *i* at time *t*

or

$x^{'}_{i,t}$ = a vector of explanatory variables (size, profitability, growth, asset tangibility, risk, reinsurance and GFC) for insurer *i* at time *t*

β' = a vector of slope parameters

$\varphi_{i,t}$ = disturbance term

Firms would adjust towards their target leverage as follows:

$$Lev_{i,t} - Lev_{i,t-1} = \delta(Lev^{*}_{i,t} - Lev_{i,t-1}) \text{ with } 0 < \delta < 1 \tag{4}$$

The parameter δ is the coefficient of adjustment or the speed of adjustment. The speed of adjustment is inversely related to adjustment costs (see, for instance, Ramjee & Gwatidzo, 2012). If δ = 1, the actual change in leverage is equal to the desired target and the adjustment is transaction cost-free. If δ = 0, there is no adjustment in leverage. The absence of adjustment is possible when adjustment costs are excessively high or the cost of adjustment is significantly higher than the cost of remaining off target (Antoniou et al., 2008).

Substituting the equation of target leverage, Equation (3), into Equation (4) yields the following:

$$Lev_{i,t} = (1-\delta)Lev_{i,t-1} + x^{'}_{i,t}\delta\beta' + \delta\varphi_{i,t} \tag{5}$$

The dynamic panel data model as specified in Equation (5) is fraught with two sources of persistence over time. These are autocorrelation due to the presence of the lagged dependent variable (Lev_{it-1}) among the regressors as well as the presence of individual effects characterizing the heterogeneity among the individuals. This renders estimation with either ordinary least-squares (OLS) or generalized least-squares (GLS) biased and inefficient. Several ways have been advanced to mitigate the problems of autocorrelation and heterogeneity. First, Anderson and Hsiao (1982) suggest first differencing to get rid of the individual effects and then using, for instance, $\Delta Lev_{i,t-2} = (Lev_{i,t-2} - Lev_{i,t-3})$ or simply $Lev_{i,t-2}$ as an instrument for $\Delta Lev_{i,t-2}$ These instruments will not be correlated with the error term as long as they are not serially correlated. This instrumental variable estimation method leads to consistent but not necessarily efficient estimates of the parameters in the model because it does not make use of all the available moment conditions (Baltagi, 2008, 148).

Second, Arellano and Bond (1991) proposed a generalized method of moments (GMM) procedure that is more efficient than the Anderson and Hsiao (1982) estimator by also differencing the model and using instruments in levels. They demonstrate that additional instruments can be obtained in a dynamic panel model if one utilizes the orthogonality conditions that exist between lagged values of the dependent variable and the disturbance term (Baltagi, 2008, 149). This estimation framework is also referred to as the differenced GMM (diff-GMM). The differenced dynamic model is specified as follows:

$$\Delta Lev_{i,t} = (1-\delta)\Delta Lev_{i,t-1} + \Delta(x_{i,t})^{'}\delta\beta' + \Delta\delta\varphi_{i,t} \quad (6)$$

To mitigate the loss of information that results from differencing, Blundell and Bond (1998) proposed a system GMM (syst-GMM) estimator to improve on the work of Arellano and Bond (1991) and Arellano and Bover (1995). This was based on the notion of exploiting the initial condition in generating efficient estimators of the dynamic panel data model when T is small. Arellano and Bover (1995) showed that by adding the original equation in levels (see, for instance, Equation 3) to the system, additional moment conditions can be brought to bear to increase efficiency. Blundell and Bond (1998) demonstrated that an additional mild stationary restriction on the initial conditions process allows the use of an extended syst-GMM estimator. This uses lagged differences of the dependent variable as instruments for equations in levels in addition to lagged levels of the dependent variable as instruments for equations in first differences. In essence, the syst-GMM estimator is more efficient than the diff-GMM estimator.

To estimate the dynamic model, first, initial diagnostics were performed on the base pooled OLS, fixed-effects and random-effects models. Subsequently, both the diff-GMM and the syst-GMM estimators were employed. The caveat is that the diff-GMM and syst-GMM estimators may not be the most efficient estimators taking cognizance of the study sample properties. Banks are dependent on one another for funding through the interbank market. Similarly, insurance companies are reliant on one another, for instance, for reinsurance in order to create underwriting capacity. As such, presumably there is cross-section dependence among the banks and insurance companies, respectively. This renders estimation within the framework of GMM inefficient and unreliable. As such, two estimators that are cross-sectional dependence-consistent were also considered. These were the FGLS (Parks, 1967; Kmenta, 1971) and LSDV (with Kiviet, 1995 correction) estimators.

4. Empirical results

4.1. Empirical results of testing the standard corporate finance view

The regression outputs for testing the relationship between leverage and firm-level determinants of capital structure for banks and insurers are presented in Tables 2 and 3, respectively. The pooled OLS and random-effects estimation results are reported simply for comparison. Suffice to highlight that the estimated coefficients and signs of the random-effects and fixed-effects estimation outputs are comparable for most of the variables. However, the analysis was based on the fixed effects with Driscoll and Kraay (1998) estimation results, which controlled for heteroskedasticity and cross sectional dependence. The results of this study documented evidence in support of this school of thought, as the standard firm-level determinants of capital structure offered significant explanatory power in terms of the leverage variable. On the one hand, the growth opportunities, risk and size variables were found to be positively related to leverage. On the other hand, a negative relationship was found to exist between profits and bank leverage. This demonstrates that the financing behavior of South African banks is consistent with the pecking order theory.

Similarly, for the insurance sector, evidence was found that validates the hypothesis that the firm-level determinants of capital structure have a predictive power in insurer leveraging. On the

Table 2. Banks' panel regression results with book leverage as the dependent variable

	Pooled OLS	Random effects	Fixed effects with Driscoll and Kraay (1998) standard errors
Growth	0.061	0.074***	0.076**
	(1.28)	(2.62)	(3.19)
Profit	−1.851***	−0.993***	−0.824***
	(−5.64)	(−11.67)	(−25.84)
Asset tangibility	−2.935**	−1.147	−0.205
	(−3.19)	(−0.82)	(−0.33)
Risk	−0.161**	0.212**	0.297***
	(−1.56)	(2.29)	(4.57)
Size	0.003**	0.007	0.023***
	(3.28)	(1.52)	(3.26)
Dividend	0.048***	−0.007	−0.008
	(3.62)	(−0.77)	(−1.10)
GFC	0.030***	0.003	−0. 016***
	(2.34)	(0.2)	(−2.74)
Constant	0.863***	0.808***	0.609***
	(51.46)	(12.53)	(6.84)
Adjusted R^2	0.5750	0.6343	0.6490
***F*-statistic**			249.03***
LM-statistic		75,910***	

(*)/(**) and (***) indicate the (10%), (5%) and (1%) level of significance, respectively.

one hand, the growth, size, asset tangibility and reinsurance variables were found to be positively related to leverage. On the other hand, a negative relationship was found to exist between profits and insurer leverage. The findings also demonstrate that the pecking order theory can be relied upon the most in explaining the capital structure of South African insurance companies. A summary of the hypotheses tested for both banks and insurance companies is contained in Table 4. The results of this study demonstrate that the financing behavior of financial firms mirrors that of non-financial firms. This corroborates the findings of Gropp and Heider (2010), Ahmad and Abbas (2011), and Jucá et al. (2012), among others.

Time dummies estimated for the FE and RE models are not reported here. The *t*-statistics for the pooled and FE models as well as the *z*-statistics for the RE model are reported in parentheses.

4.1.1 Banks panel regression results with alternative leverage measures employed as the dependent variable

Alternative definitions of leverage were employed and regressed on the same independent variables. The results documented in Table 5 demonstrate that the results are robust to alternative proxies of leverage and also demonstrate the effective substitution between deposit leverage and non-deposit leverage of banks. Whenever the predicted coefficient between non-deposit leverage and the explanatory variable is statistically significant, it is opposite signed to the predicted coefficient between deposit leverage and that explanatory variable. For instance, the coefficient of non-deposit leverage is positive when profit is the regressor as compared to the negative coefficient of deposit leverage when profit is the regressor.

Table 3. Insurers' panel regression results with book leverage as the dependent variable

	Pooled OLS	Random effects	Fixed effects with Driscoll and Kraay (1998) standard errors
Growth	0.112***	0.056***	0.050***
	(3.11)	(3.49)	(3.09)
Profit	−1.200***	−0.347***	−0.288***
	(−9.27)	(−5.09)	(−2.93)
Asset tangibility	0.366***	0.047	0.010
	(4.24)	(0.98)	(0.31)
Risk	0.213***	0.139***	0.171***
	(4.58)	(3.74)	(4.71)
Size	0.023***	0.053***	0.068***
	(3.50)	(6.72)	(6.14)
Reinsurance	0.203***	0.187***	0.116***
	(4.34)	(4.00)	(3.64)
GFC	0.016	0.031***	0.037***
	(0.78)	(3.51)	(4.14)
Constant	0.087	−0.579***	−0.910***
	(0.56)	(−3.11)	(−4.32)
Adjusted R^2	0.4420	0.3215	0.3397
***F*-statistic**			3667.94***
LM-statistic		112.64***	

(*)/(**) and (***) indicate the (10%), (5%) and (1%) level of significance, respectively. Time dummies estimated for the FE and RE models are not reported here. The *t*-statistics for the pooled and FE models as well as the *z*-statistics for the RE model are reported in parentheses.

4.1.2 Insurers panel regression results with alternative leverage measures employed as the dependent variable

Robustness checks were conducted with alternative definitions of leverage employed. Book leverage was decomposed into non-premium leverage (non-premium liabilities) and premium leverage (premium liabilities) and each employed as a dependent variable in turn. The FE with Driscoll and Kraay (1998) standard errors estimator was employed to run the regression. The results are documented in Table 6 and they indicate that the leverage variable was robust to either alternative definition.

4.2. Empirical results of testing for the existence of a target capital structure

The results on the existence of a target capital structure are presented in Tables 7 and 8 for banks and insurance companies, respectively. The estimation results further corroborate the results of the estimation of the static model, which was considered earlier on. It is observed that South African banks have a target capital structure and adjust to this target at a rate of (1− δ) = 1–0.558 = 44.2%. This means that South African banks are able to adjust fully towards this target once in every 2.3 years. The results bear striking similarity to the study by Gropp and Heider (2010) who find for their sample of US and EU banks the speed of adjustment to be 45%. They also reason that, the fact that banks have high speeds of adjustment towards a target capital structure negates the "regulatory view" of bank capital. In comparison, in their sample of South African non-financial firms, Lemma and Negash (2014) find the adjustment speed to be 22.7% with respect to the total debt ratio.

The estimation results for the insurance firms reported in Table 8 were consistent among the three estimators. The estimation results further corroborated the results of the estimation of the static model considered earlier on. The speed of adjustment towards this target is at a rate of (1

Table 4. A summary of the results of the testing of the hypotheses for banks and insurers

Hypothesis	Prediction	Banking firms	Insurance companies	Theoretical explanation
H1: There is a significant relationship between profitability and financial firm leverage.	−	−	−	The estimated results for both banks and insurers conform to the pecking order theory prediction.
H2: There is a significant relationship between asset tangibility and financial firm leverage.	+	− *insignificant*	+ *insignificant*	The estimated results for banks and insurers were insignificant.
H3: There is a significant relationship between growth and financial firm leverage.	±	+	+	The estimated results for banks and insurers are consistent with pecking order theory.
H4: There is a significant relationship between dividend payout and banking leverage.	−	− *insignificant*	*n/a*	The banking firms result was insignificant.
H5: There is a significant relationship between size and financial firm leverage.	±	+	+	The estimated results are consistent with either the pecking order or trade-off theories.
H6: The global financial crisis has significant explanatory power in financial firm leveraging.	±	−	+	Banks deleveraged whilst insurance companies leveraged during the global financial crises period.
H7: Credit (Underwriting) risk has significant explanatory power in bank (insurer) leveraging.	−	+	+	Both the banking firms and insurance firms' results conform to the pecking order theory prediction.
H8: Reinsurance has significant explanatory power in insurer leveraging.	±	n/a	+	This result is consistent with the trade-off theory. Reinsurance brings about risk diversification and hence insurers have the latitude to borrow more in the debt markets.

Table 5. Robustness checks of the leverage variable for banks

Dependent variable	Book leverage	Non-deposit leverage	Deposit leverage
Growth	0.076**	0.060**	0.026
Profit	−0.824***	0.970**	−1.601**
Asset	−0.205	−0.786	0.888
Risk	0.297***	−0.555***	0.946***
Size	0.023**	0.003	0.019
Dividend	−0.008	−0.001	−0.012

(*)/(**) and (***) indicate the (10%), (5%), and (1%) level of significance, respectively.

— δ) = 1–0.794 = 20.6%. This is slower compared to banks who adjust towards their target at a rate 44.2%. Moreover, it is marginally slower than the speed of adjustment of South African non-financial firms. This suggests that the adjustment costs for insurance companies are higher as compared to both of banks and non-financial firms.

Table 6. Robustness checks of the leverage variable for insurers

Dependent variable	Book leverage	Non-premium leverage	Premium leverage
Growth	0.050***	0.066**	−0.014
Profit	−0.288***	−0.027	−0.254**
Asset tangibility	0.010	−0.255***	0.271***
Risk	0.171***	0.112*	0.059
Size	0.068***	0.124***	−0.062
Reinsurance	0.116***	0.010	0.099**

(*)/(**) and (***) indicate the (10%), (5%), and (1%) level of significance, respectively.

Table 7. Panel regression results to determine a target capital structure for banks

	Difference-GMM (one-step)	System-GMM (one-step)	FGLS (Parks, 1967; Kmenta, 1971)	LSDV with Kiviet (1995) correction
Leverage (−1)	0.554***	0.524***	0.790***	0.558***
	(3.88)	(3.97)	(20.78)	(7.98)
Growth	0.101***	0.067***	0.092***	0.080***
	(4.36)	(3.00)	(13.71)	(35.86)
Profit	−0.706***	−1.045***	−0.762***	−0.677***
	(−5.62)	(−4.76)	(−13.20)	(−47.86)
Asset tangibility	−1.294***	−1.000	−0.273	0.568
	(−2.28)	(−1.39)	(−0.81)	(1.00)
Risk	0.257***	−0.016	0.071*	0.211***
	(4.72)	(−0.19)	(1.78)	(8.47)
Size	0.007	0.001	−0.003*	0.013***
	(0.54)	(0.95)	(1.86)	(19.19)
Dividend	−0.011	0.021**	0.007***	0.003
	(−1.00)	(2.09)	(3.48)	(0.46)
GFC	0.013	0.016**	0.006**	0.013***
	(2.19)	(2.10)	(2.08)	(23.49)
AR(1) statistic	−1.75*	−1.17		
AR(2) statistic	0.846	0.965		
Sargan	7.12	27.9**		
LM-statistic			917***	

(*)/(**) and (***) indicate the (10%), (5%), and (1%) level of significance, respectively. The *t*-statistics are reported in parentheses. The above table shows the results of estimating the following regression for the sample of 16 South African banks for the period 2006–2015.

5. Conclusion

This paper offers new insights in several respects. First, the paper recognizes that banks and insurance companies are fundamentally different with regard to capital structure and regulation and so warranted separate treatment in studies. This is in contrast with recent studies that do not recognize the heterogeneity of the two types of firms. Second, to the best of our knowledge the study is the first to examine the impact of business cycles/financial crises on the financing patterns of financial firms. Confirming the fundamental differences between banks and insurance companies, the study observed that financial crises have a negative impact on capital structures of banks (meaning that they deleverage during crises). In

Table 8. Panel regression results to determine a target capital structure for insurers

	Diff-GMM (one-step)	LSDV with Kiviet (1995) correction	FGLS (Kmenta, 1971; Parks, 1967)
Leverage (−1)	0.797***	0.754***	0.794***
	(2.92)	(71.75)	(15.78)
Growth	0.043**	0.033***	0.067***
	(2.58)	(3.04)	(4.90)
Profit	−0.314***	−0.361***	−0.313***
	(−3.16)	(12.89)	(−5.61)
Asset tangibility	0.012	0.052	0.024
	(0.14)	(1.12)	(0.31)
Risk	0.029	0.041	0.062
	(0.57)	(1.40)	(0.21)
Size	0.053*	0.036***	0.080**
	(1.89)	(8.63)	(2.18)
Reinsurance	0.122***	0.059	0.041
	(3.16)	(1.02)	(1.03)
GFC	0.032**	0.028***	0.008
	(2.33)	(7.39)	(1.09)
AR(1)-statistic	−1.60		
AR(2)-statistic	−0.85		
Sargan	31.51		
LM-statistic			550***
Number of observations	260	260	260

(*)/(**) and (***) indicate the (10%), (5%), and (1%) level of significance, respectively. The *t*-statistics are reported in parentheses

contrast, financial crises have a positive impact on capital structures of insurance companies (meaning, unlike banks, they leverage during crises).

The results of this study also demonstrate that the financing behavior of financial firms mirrors that of non-financial firms. This corroborates the findings of Gropp and Heider (2010), Ahmad and Abbas (2011), and Jucá et al. (2012), among the few studies on the subject matter. The standard firm-level determinants of capital structure showed significant explanatory power in terms of the leverage variable. Crucially, a negative relationship was found to exist between profits and bank leverage demonstrating that the pecking order theory can be relied on in explaining the financing behavior of South African banks.

Similarly, for the insurance sector, strong evidence was found that validates the hypothesis that the firm-level determinants of capital structure have a predictive power in insurer leveraging. As in banks, a negative relationship was found to exist between profits and insurer leverage. The finding also demonstrates that the capital structure of South African insurance companies can be explained in terms of the pecking order theory.

The salient feature of the estimated results of the banking sector and insurance sector is that they bear striking uniformity. As such, this study validates the generalization that the financing behavior of financial firms mirrors that of non-financial firms. The other significance of the "standard corporate finance view" finding is that it relegates capital regulation to be of secondary importance in the determination of the capital structure of financial firms.

Unlike previous studies on financial firm capital structure such as Gropp and Heider (2010) and De Haan and Kakes (2010), this study estimated the true speed of adjustment by utilizing FGLS (Parks–Kmenta) and LSDV with Kiviet (1995) correction estimators, which are most suitable to estimate capital structure partial adjustment models in the presence of heteroskedasticity and cross-sectional dependence. For the banking panel, it was demonstrated that banks have a target capital structure that they seek to achieve in their financing and adjust towards this target faster compared to non-financial firms. It was found that the speed of adjustment of South African banks is 44% (half-life of 2.3 years) with respect to total debt. Furthermore, the speed with which South African banks adjust to attain their target level is comparable to that of banks in the developed world and is reflective of low adjustment costs. South African insurance companies adjust at a lower rate comparable to the banking sector. They adjust at a rate of 21% (half-life of 4.76 years). This could be attributable to the heterogeneity of the balance sheets of the banking and insurance panels. In essence, the profile of their liabilities is different from one another. This finding is also inconsistent with capital regulation being of first-order importance in the determination of the capital structure of financial firms. It also leads to the generalization that financial firms seek to achieve optimality in their financing behavior in the same manner as non-financial firms.

The financing behavior (capital structure targeting) of banks and insurance companies is inconsistent with those seeking to observe the minimum regulatory requirement. This finding demonstrates that at the worst case, capital regulation is not binding and may be ineffectual. This could be attributable to the individual effects banks and insurers. The policy implication that flows from these findings is that, it could be prudent for regulatory authorities to consider instituting some variant of financial firm-specific capital regulations as opposed to sector-wide (one-size-fits-all) capital regulations.

This study was undertaken during a transition period when Basel III and SAM capital regulation standards were being implemented. As such, future studies could examine the impact of the implementation of these capital standards on the financing patterns of banks and insurance companies, respectively. It could be that in future the capital regulations will become binding.

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Appendix A1: Sample of banks

	Name of bank	Specialization	Total assets in 2015 (R'mil)	Net income in 2015 (R'mil)	World rank	Country rank
1	ABSA Bank Limited	Commercial Bank	936,141	10,047	350	3
2	African Bank Limited	Commercial Bank	50,679	(7,212)	2430	8
3	Albaraka Bank Limited	Islamic Bank	4,814	40	7456	18
4	Bidvest Bank Limited	Investment Bank	6,201	263	6800	17
5	First Rand Bank Limited	Commercial Bank	851,200	12,750	270	2
6	GBS Mutual Bank	Commercial Bank	1,085	8	12,726	24
7	Grindrod Bank Limited	Commercial Bank	9,256	105	5441	12
8	Habib Overseas Bank Limited	Commercial Bank	1,207	16	12,284	23
9	HBZ Bank Limited	Commercial Bank	2,475	38	8253	19
10	Investec Bank Limited	Investment Bank	332,706	3,128	682	5
11	Mercantile Bank Limited	Commercial Bank	9,640	140	6206	15
12	Nedbank Limited	Commercial Bank	319,135	757	377	4
13	Real People Investments Holdings Pty. Limited	Investment Bank	3,755	(333)	8506	20
14	Sasfin Bank Limited	Commercial Bank	8,429	137	5861	14
15	South African Bank of Athens Limited	Commercial Bank	2,284	(58)	10,084	21
16	Standard Bank of South Africa Limited	Commercial Bank	1,276,953	12,479	266	1

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Appendix B: Sample of insurance companies

	Name of insurance company	Specialization
1	African Reinsurance Corporation	Reinsurance company
2	AIG South Africa Limited	Short-term insurance company
3	Allianz Insurance Limited	Short-term insurance company
4	Clientele Limited	Long-term insurance company
5	Credit Guarantee Insurance Corporation of Africa Limited	Short-term insurance company
6	Discovery Life Limited	Long-term insurance company
7	Export Credit Insurance Corporation of South Africa Limited	Short-term insurance company
8	Federated Employers Mutual Assurance Company Limited	Short-term insurance company
9	General Re Africa Limited	Reinsurance
10	Guardrisk Insurance Company Limited	Short-term insurance company
11	HDI-GERLING Insurance of South Africa	Short-term insurance company
12	Hollard Insurance Company Limited	Short-term insurance company
13	Hollard Life Assurance Company Limited	Long-term insurance company
14	Liberty Holdings Limited	Long-term insurance company
15	Lion of Africa Insurance Company Limited	Short-term insurance company
16	Munich Reinsurance Company of Africa Limited	Reinsurance
17	New National Assurance Company Limited	Short-term insurance company
18	Old Mutual Life Assurance Company Limited	Long-term insurance company
19	Professional Provident Society	Long-term insurance company
20	Regent Insurance Company Limited	Short-term insurance company
21	Regent Life Assurance Company Limited	Long-term insurance company
22	Renasa Insurance Company Limited	Short-term insurance company
23	Sanlam Life Insurance Limited	Long-term insurance company
24	Santam Limited	Short-term insurance company
25	Sasria Limited	Short-term insurance company
26	Zurich Insurance Company South Africa Limited	Short-term insurance company