Optimal capital structure for JSE listed companies.

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Abstract

This report details a study of capital structure for JSE listed companies. The study considered historical financial information for JSE listed companies over the period 1987 to 2009 and asked two central questions, with the benefit of hindsight. Firstly, could JSE listed companies have used more debt to finance their operations during this period? Secondly, how much additional debt could these companies have used and thereby increase shareholder value? An optimal debt ratio maximises shareholder value by optimising tax benefits of debt.

This study analysed data for 97 companies that were within the top 160 JSE listed companies. For each year of data, debt was increased while maintaining certain pre-selected debt service ratios, to determine how much additional debt these companies could have had. These ratios were interest coverage, cash coverage and DSCR.

The results indicate that in most sectors of the JSE companies could have used significantly more debt to finance their operations over the past 22 years. By so doing these companies would have increased shareholder value over the years.

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

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Murangi Ratshikuni Date

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1 Introduction to Research Problem

1.1 Introduction

Capital structure decisions offer opportunities to create value for shareholders. Yet these opportunities are often neglected because of the difficulties in identifying the optimal capital structure that will maximise shareholder value (Opler, Saron and Titman, 1997). Researchers in the field of capital structure have observed that many firms are geared below the optimal levels that are predicted by theory (Graham, 2000; Strebulaev, 2007).

In an American based study Graham (2000) found that by gearing up a typical firm could add 15.7% to firm value. Furthermore 44 percent of sampled firms could double interest payments and still expect to realise the full tax benefit from their tax deductions. In a study of the top 25 companies listed on the Johannesburg Securities Exchange (JSE) between 1990 and 1997, Wimberley (2001) concludes that these companies could have realised a 3% to 14% increase in value through the increased use of debt. Wimberley (2001) also found that many of these top 25 companies had the necessary cash on the balance sheet to accommodate increased debt levels.

Harrison (2003) found that South African firms have substantially lower leverage than those in G7 countries.

The central question of this research was: “Can South African companies, listed on the JSE, afford more debt?”

1.2 Research Aim

The aim of this research was to study capital structures of the top 160 JSE listed companies (by market capitalisation) over the 22 year period between 1987 and 2009 and determine whether these companies could have used more debt to finance their operations and thereby increase shareholder value. The study looked at the historical financial performance of these companies and with the benefit hindsight sought to determine how much additional debt, if any, they could have had while still being able to meet their debt service obligations.

1.3 Research Purpose

The purpose of the study was to help company managers, investors and lending institutions realise how much additional debt companies could add to their balance sheets without defaulting on their obligations. The results of this study could help managers to maximise shareholder value through the use of the appropriate capital structure. The results of the study could also help shareholders to realise the value that is left on the table when managers use too little debt to finance their operations.

2 Literature Review

2.1 Introduction

Bradley, Jarrell and Kim (1984) suggested that one of the most contentious issues in the theory of finance during the preceding quarter century was the theory of capital structure. Today, another quarter of a century later it appears that there is still no consensus on the theory of capital structure. Myers (2001) – one of the leading researchers on capital structure – stated that "there is no universal theory of the debt-equity choice and no reason to expect one". However, several theories on capital structure have been developed over many years.

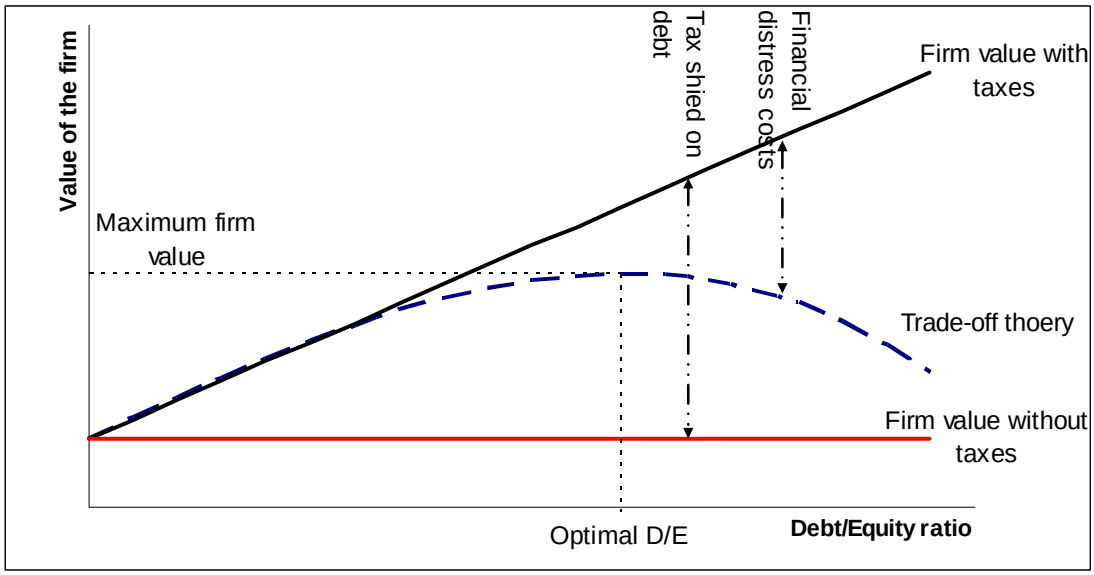
2.2 The static trade-off theory

The theory of optimal capital structure always starts with the Modigliani and Miller value-invariance Proposition I (Myers, 2001). M&M Proposition I stated that, under certain conditions, the value of the firm is independent of its capital structure (Firer, Ross, Westerfield and Jordan, 2008). One of these conditions was the absence of taxes. However, in the real world taxes do exist and specifically interest payments on debt are tax deductible. Thanks to the tax deductibility of interest, the value of a firm will increase as the debt/equity ratio increases (Miller, 1988). Another way of stating M&M Proposition I, with taxes, is that the value of a levered firm is equal to the value of a firm with no debt plus the present value of the interest tax shield. The interest tax shield is the

benefit that results from the fact that profits are only taxed after interest payments have been deducted. The tax benefits of debt give a clear reason for firms to borrow rather than issue equity (Opler et al., 1997).

In Figure 2.1 the value of the firm is plotted against the debt/equity ratio (Firer et al., 2008). M&M proposition I is illustrated by the horizontal line (firm value without taxes). In this case the value of the firm remains constant regardless of the debt/equity ratio. The increase in firm value as a result of the tax deductibility of interest is illustrated by the upward sloping line. This line suggests that the optimal capital structure might be all debt (Miller, 1988). However, a run of very bad years might actually find a highly-levered firm unable to meet its debt service requirements resulting in bankruptcy (Miller, 1988).

Figure 2.1 The optimal capital structure and the value of the firm



The static trade-off theory hypothesises that firms have optimum debt levels that are reached when firms tradeoff the tax benefits of debt financing against financial distress or bankruptcy costs (Harford, Klasa and Walcott, 2009). These tax benefits of debt as well as financial distress costs are indicated in Figure 2.1. The static trade-off theory says that firms borrow up to the point where the tax benefit from an extra rand of debt is exactly equal to the cost that comes from the increased probability of financial distress (Firer et al., 2008). This is the point of optimal capital structure.

Figure 2.2 (Firer et al., 2008) illustrates the static trade-off theory in terms of cost of capital. Modigliani and Miller had a second proposition which showed that when Proposition I held the cost of equity capital was a linear increasing function of the debt/equity ratio. Thus any gains from using more of what might seem to be cheaper debt capital would be offset by the correspondingly higher cost of the now riskier equity capital. This proposition implied that the weighted average of these costs of capital to a firm would remain the same no matter what combination of financing sources the firm actually chose (Miller, 1988). This as discussed earlier is in a world of no taxes and no bankruptcy costs.

Figure 2.2 The optimal capital structure and the cost of capital

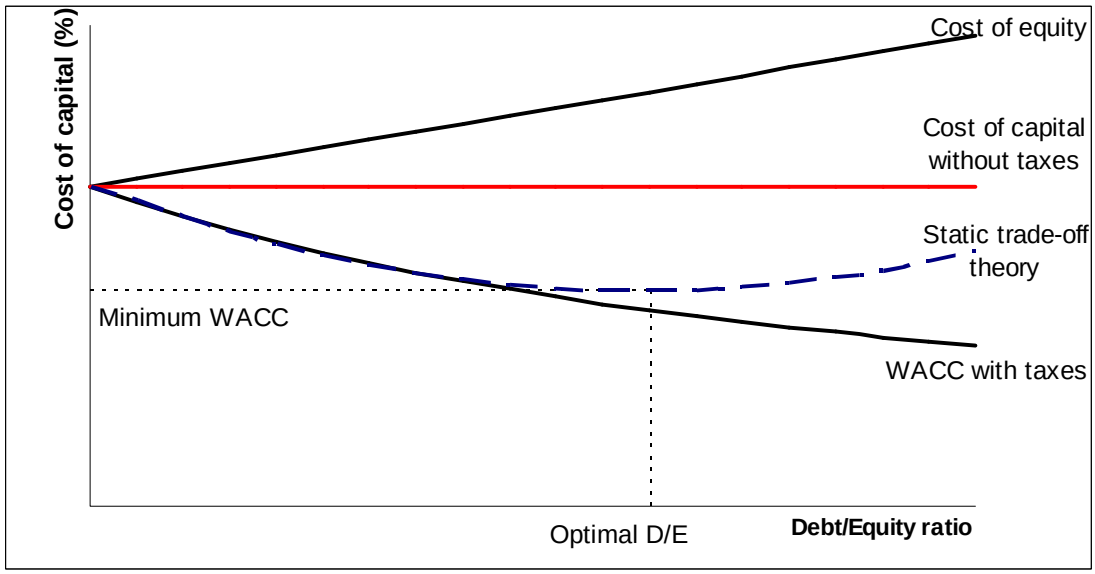


Figure 2.2 illustrates that with corporate taxes the weighted average cost of capital (WACC) decreases as the amount of debt increases (Firer et al., 2008). The static trade-off theory hypothesises that with corporate taxes and bankruptcy costs, WACC will decrease up to a point that coincides with the maximum value of the firm. This is the point of minimum WACC and optimal capital structure.

Hackbarth, Hennessy and Leland (2007) concluded that the trade-off theory is sufficient to explain broad generalisations regarding capital structure. Kayhan and Titman (2007) concluded that over time capital structures of firms tend to move toward target debt ratios that are consistent with the trade-off theories of capital structure. However, in the short term factors such as cash flows and investment needs may lead to deviations from these targets (Kayhan and Titman, 2007).

Hovakimian and Titman (2002) found evidence consistent with the dynamic trade-off theory, which says that companies take measures that move them to an optimal capital structure target in the long run.

As mentioned earlier the issue of capital structure is a contentious one and there does not appear to be a universal theory of capital structure. According to Myers (1993) the most telling evidence against the static trade-off theory is the strong inverse correlation between profitability and financial leverage. Myers is a proponent of the pecking order theory of capital structure.

2.3 Pecking order theory

The pecking order theory was first postulated by Myers and Majluf (1984). According to the pecking order theory firms follow a hierarchy in financing their operations with a preference for internal over external finance, and for debt over equity (Shyam-Sunder and Myers, 1999). The pecking order theory says that firms first use internal equity, then debt, and only then do they use external equity (Myers, 1984). In the pecking order theory, there is no well-defined optimal debt ratio. The trade-off between tax benefits of debt financing and financial distress costs is assumed to be of second-order importance (Shyam-Sunder and Myers, 1999). Leary and Roberts (2005) find evidence consistent with the predictions of the modified pecking order theory in that firms are less likely to use external capital markets when they have sufficient internal funds, but are more likely when they have large investment needs.

In contrast Hovakimian, Opler and Titman (2001) found that, consistent with the traditional trade-off theory, profitable companies are more likely than less profitable firms to issue debt rather than equity and are more likely to repurchase equity rather than retire debt. Hovakimian et al. (2001) also suggested that although past profits are an important predictor of observed debt ratios, firms often make financing and repurchase decisions that offset these earnings-driven changes in their capital structures. Specifically, when firms either raise or retire significant amounts of new capital, their choices move them toward the target capital structures suggested by the static trade-off models, often more than offsetting the effects of accumulated profits and losses.

Although the pecking order theory differs from the trade-off theory, its existence does not invalidate the trade-off theory. In other words the fact that there is some evidence that firms do not target specific optimal debt ratios does not negate the existence of an optimal debt ratio for these firms. An optimal debt ratio that maximises shareholder value by optimising tax benefits of debt. It could just mean that these firms are not as highly levered as they could be and are thus leaving shareholder value on the table.

2.4 The agency theory

According to the agency theory, firms use more debt in their capital structure when investors seek to pressure management to use funds more efficiently (Frielinghaus, Mostert and Firer, 2005). Stulz (1990) concluded that financing

policy matters because it reduces the agency cost of managerial discretion. These costs exist when management values investments more than shareholders do and has information that shareholders do not have. Jensen (1986) argued that debt reduces the agency costs of free cash flow by reducing the cash flow available for spending at the discretion of mangers. Stulz (1990) concluded that management tends to over-invest in projects when cash flow is high and under-invest when cash flow is low. Stulz (1990) concluded that financing policies can influence the resources under management's control and thereby reduce the cost of over- and underinvestment.

2.5 The existence of an optimal capital structure

Optimal capital structure is the one with the highest net benefits for shareholders (Opler et al., 1997). In a study of 821 firms (Bradley, Jarrell and Kim, 1984) found that there is strong intra-industry similarities in firm leverage ratios and persistent inter-industry differences. They also found a significant inverse relationship between firm leverage and earnings volatility. (Bradley et al., 1984) concluded that these findings supported the existence of optimal capital structure. In other words intra-industry similarities and inter-industry differences indicate that there exists target or optimum gearing levels in each industry. While the inverse relationship between leverage and earnings volatility suggests that managers will target certain leverage levels depending on the earnings volatility of their firms and industries. Consistent with the trade-off theory Bradley et al. (1984) show that optimal capital structure is inversely related to expected costs of financial distress.

2.6 Capital structure in practice

In a review of capital structure literature Harris and Raviv (1991) found that leverage was positively correlated with firm value. However Strebulaev (2007) concluded that firms seem to use debt financing too conservatively and the leverage of stable, profitable firms appeared particularly low – the so called "low leverage puzzle". This refers to the observation that the median corporate debt-to-capital ratio in the United States over 1965 to 2000 averaged only 31.4%, with two out of five firms having an average debt-to-capital ratio of less than 20%, while traditional trade-off models predict substantially higher ratios (Strebulaev, 2007).

Deesomsak, Paudyal and Pescetto (2004) stated that higher volatility in earnings increases the probability of financial distress, since firms may not be able to fulfil their debt servicing commitments. Graham (2000) found that 44 percent of firms in his sample could double interest payments and still expect to realise the full tax benefit from interest payments. Graham (2000) concluded that even extreme estimates of distress costs could not justify observed debt policies. This suggests that many firms can increase their debt levels and still not reach the point of financial distress. Since the potential tax benefits would result in increased shareholder value, it stands to reason that many firms are "leaving value on the table" by not gearing up to their optimal levels.

2.7 Corporate credit rating

"Most executives would agree that, ceteris paribus, it is better to have a good credit rating. Yet very few firms have either a "AAA" or a "AA" rating. The reason is that achieving a high rating requires a firm to include a substantial amount of equity in its capital structure, and this can be very costly" (Hovakimian, Kayhan and Titman, 2009, p. 6).

In a survey of 392 CFO's Graham and Harvey (2001) found that a good credit rating, assigned by rating agencies, is the second most important factor of concern to CFO's in determining their capital structure. With 57.1% of CFO's saying a good credit rating was important or very important in how they chose the appropriate amount of debt for their firms. Graham and Harvey (2001) conclude that this can be viewed as an indication of concern about distress. Hovakimian et al. (2009) argued that credit ratings are a more precise measure of a firm's default probability than measures of capital structure which are based only on the firm's balance sheet because they bring together information from various sources and include soft as well as hard information.

2.7.1 Credit rating criteria

This section is primarily based Standard & Poor's Corporate Ratings Criteria (2008). "Ratings incorporate many subjective judgments, and remain as much an art as a science. Two companies with identical financial metrics are rated very differently, to the extent that their business challenges and prospects differ" (Standard & Poor's, 2008, p. 20). Having said that, Standard & Poor's

has developed a matrix to make explicit the rating outcomes that are typical for various business risk/financial risk combinations. The rating matrix, shown in Table 2.1, is a guideline which shows what is typically observed and is not meant to give guarantees of rating opinions. However actual ratings should be within one notch of the rating indicated on the matrix (Standard & Poor's, 2009). Some matrix cells are blank because the underlying combinations are highly unusual and presumably would involve complicated factors and analysis (Standard & Poor's, 2009).

Table 2.1 Standard & Poor's rating matrix

	Financial Risk Profile					
Business Risk Profile	**Minimal**	**Modest**	**Intermediate**	**Significant**	**Aggressive**	**Highly Leveraged**
Excellent	AAA	AA	A	A-	BBB	-
Strong	AA	A	A-	BBB	BB	BB-
Satisfactory	A-	BBB+	BBB	BB+	BB-	B+
Fair	-	BBB-	BB+	BB	BB-	B
Weak	-	-	BB	BB-	B+	B-
Vulnerable	-	-	-	B+	B	CCC+
Financial Risk Indicative Ratios						
Cash Flow: Funds From Operations/Debt (%) *	> 60	45-60	30-45	20-30	12-20	< 12
Debt/EBITDA (x)*	< 1.5	1.5-2	2-3	3-4	4-5	> 5
Debt/Capital (%)*	< 25	25-35	35-45	45-50	50-60	> 60

The categories underlying business risk assessments include country risk, industry factors, competitive position and profitability (Standard & Poor's, 2008). Factors included in financial risk assessments are governance, accounting policies, cash flow adequacy, capital structure and liquidity. There are no predetermined weights to each of these categories. The significance of

specific factors varies from situation to situation. However, cash flow adequacy is usually the single most critical aspect of credit rating decisions (Standard & Poor's, 2008).

2.7.2 The impact of credit ratings on capital structure decisions

Kisgen (2006) stated that a firm's credit rating affects operations of the firm, access to other financial markets such as commercial paper and disclosure requirements for bonds (e.g., speculative-grade bonds have more stringent disclosure requirements). Credit ratings can also affect bond covenants, which can contain ratings triggers whereby a ratings change can result in changes in coupon rates or a forced repurchase of the bonds. Kisgen (2006) found that concerns for the benefits of credit rating upgrades and the costs of downgrades directly affect managers' capital structure decisions. Kisgen (2006) further found that if these rating-dependent costs (benefits) are material, managers will balance these costs (benefits) against the traditional costs and benefits implied by the trade-off theory. "In certain cases, the costs associated with a change in credit rating may then result in capital structure behavior that is different from that implied by traditional trade-off theory factors. In other cases, the trade-off theory factors may outweigh the credit rating considerations" (Kisgen, 2006, p. 1041).

Hovakimian et al. (2009) found that firms whose credit ratings were below their target tend to make financing choices that decreased their leverage whereas above-target firms tended to make choices that increased their leverage. Below target firms achieved this, for example, by issuing equity rather than

debt or retiring debt rather than repurchasing equity. On the other hand, firms whose ratings were above target would repurchase equity rather than retire debt and tended to increase their dividends (Hovakimian et al., 2009). Kisgen (2006) found that comparing credit ratings within a specific category, firms with credit ratings designated with a plus or minus sign (e.g. AA-, or AA+) issued less debt relative to equity than firms that did not have plus or minus sign (e.g. AA). The conclusion from this is that firms are more concerned about a credit rating downgrade from one rating category to another than a downgrade of one or two notches within a category. For example, firms are more concerned about dropping from an AA- rating to an A than dropping from AA to AA-.

2.7.3 Credit ratings and default rates

Table 2.2 reports cumulative average default rate percentages for different rating categories for the period 1981 to 2007 (Standard & Poor's, 2007).

Table 2.2 Cumulative default rates 1981–2007 (%)

Time Horizon (years)	AAA	AA	A	BBB	BB	B	CCC/C
1	0.0	0.0	0.1	0.2	0.8	6.3	25.6
2	0.0	0.0	0.2	0.5	2.5	12.7	34.1
3	0.1	0.0	0.3	0.9	4.6	17.8	39.0
4	0.2	0.1	0.4	1.4	6.5	21.3	41.9
5	0.3	0.2	0.6	2.0	8.4	23.8	44.5
10	0.7	0.7	1.7	4.4	14.6	30.4	49.8
15	0.8	1.1	2.6	6.5	17.3	35.0	52.5

2.8 Relevant financial ratios

2.8.1 Capital structure ratios

The literature is somewhat mixed about whether one should use market or book leverage ratios (Kayhan and Titman, 2007). Market based leverage ratios describe the relative ownership of the firm by debt holders and equity holders (Welch, 2004). Welch argued for the use of market based ratios since they are essential inputs in calculations of WACC and target leverage ratios are about minimising WACC.

A commonly used measure of market leverage in literature is debt-to-capital (Bevan and Danbolt, 2002; Kayhan and Titman, 2007; Welch, 2004). Welch (2007) argued that the financial-debt-to-asset ratio is flawed as a measure of leverage, because the converse of financial debt is not equity. This is because most of the opposite of the financial-debt-to-asset ratio is the non-financial-liabilities-to-asset ratio. Welch (2007) argued that the most appropriate measures for leverage are debt-to-capital ratio or a liabilities-to-asset ratio. The converse of either is an equity ratio. The formulas for the market and book debt-to-capital ratios are given below (Bevan and Danbolt, 2002):

$$Market\ debt\ to\ capital \quad = \quad \frac{D_B}{D_B + E_M + PS}$$

$$Book\ debt\ to\ capital \quad = \quad \frac{D_B}{D_B + E_B + PS}$$

Where: D_B = Book value of debt

E_M = Market value of equity

E_B = Book value of equity

PS = Preference shares

2.8.2 Debt service ratios

A ratio used to measure how well a company has its interest obligations covered is the interest coverage ratio (Firer et al., 2008). It is commonly defined as:

$$Interest\ Coverage = \frac{Earnings\ Before\ Interest\ and\ Taxes\ (EBIT)}{Interest\ Expense}$$

Lending institutions often impose a minimum interest coverage ratio on firms. With a minimum interest coverage ratio, creditors impose the point of default and do not leave the choice of when to default to the stockholders (Dothan, 2006). With such a covenant, the borrowing firm is in default when earnings fall below a specified minimum interest coverage. Dothan (2006) concluded that with nonlinear costs of financial distress, an interest coverage ratio covenant may create greater investor value than a endogenous default by stockholders .

In a sample of 8,004 loans made by 2,810 firms between 1989 and 1999 Dichev and Skinner (2002) found that the median interest coverage ratio for firms that did not violate their loan conditions was 3.9. Dichev and Skinner (2002) also found that firms that had violated their loan conditions in at least

one quarter had a median interest cover of 2.8. The conditions referred to here are a covenants that are imposed by lenders.

Firer et al. (2008) state that the problem with the interest cover ratio is that it is based on EBIT which is not really a measure of cash available to pay interest. Another useful ratio they suggest is the cash coverage ratio which can be defined as:

$$Cash\ Coverage = \frac{EBITDA}{Interest\ Expense}$$

Where, EBITDA is earnings before interest, taxes, depreciation and amortisation. This ratio is useful because of its simplicity, wide usage and industry reference (Standard & Poor's, 2008).

According to Standard & Poor's (2008), while EBITDA is a widely used indicator of cash flow, it has significant limitations. The limitations have to do with the fact that EBITDA derives only from income statement inputs, and can thus be distorted by the same accounting issues that limit the use of earnings as a basis of cash flow (Standard & Poor's, 2008). In this regard free cash flow (FCF) is a more comprehensive measure of cash flow as it takes into account capital expenditure and changes in working capital. FCF can be used as a proxy of a company's cash generated from core operations (Standard & Poor's, 2008).

Industry relative ratios have been found to offer several advantages over unadjusted ratios when used to predict corporate failure (Platt and Platt, 1990).

Platt and Platt (1990) suggest that this is because, over a time period, industry relative ratios measure all companies on the same scale regardless of industry and across time periods they are more stable yielding more accurate forecasts of financial status. Based on this it might be best to calculate industry optimum debt coverage ratios in determining whether companies are operating at their optimal debt coverage ratios or not.

Table 2.3 shows key ratios by rating category achieved by US industrial firms over the period 2002 to 2004 (Standard & Poor's, 2006).

Table 2.3 Key Industrial Financial Ratios, Long-Term Debt – three-year (2002 to 2004) medians.

	AAA	AA	A	BBB	BB	B	CCC
EBIT interest coverage (x)	23.8	19.5	8	4.7	2.5	1.2	0.4
EBITDA interest coverage (x)	25.5	24.6	10.2	6.5	3.5	1.9	0.9
FFO/total debt (%)	203.3	79.9	48	35.9	22.4	11.5	5
Free operating cash flow/total debt (%)	127.6	44.5	25	17.3	8.3	2.8	-2.1
Total debt/EBITDA (x)	0.4	0.9	1.6	2.2	3.5	5.3	7.9
Return on capital (%)	27.6	27	17.5	13.4	11.3	8.7	3.2
Total debt/total debt + equity (%)	12.4	28.3	37.5	42.5	53.7	75.9	113.5

2.9 Conclusions from literature

The main conclusions from the literature can be summarised as follows:

- Interest payments to debt holders are tax deductible while dividend payments to equity holders are not. This gives a clear reason for firms to borrow rather than issue equity (Opler et al., 1997).

- Leverage is positively correlated with firm value (Harris and Raviv, 1991).
- Firms seem to use debt financing too conservatively (Graham, 2000; Strebulaev, 2007).
- Firms are more concerned about a credit rating downgrade from one rating category to another than a downgrade of one or two notches within a category (Kisgen, 2006).
- Between 1989 and 199 the median interest coverage ratio for firms that did not violate their loan conditions was 3.9 (Dichev and Skinner, 2002).

3 Research questions and hypotheses

The primary purpose of the research was to determine whether South African companies, listed on the JSE, could have used more debt in the past by analysing their historical financial performance. Secondly the research sought to determine how much more debt, if any, these companies could have had for the period 1987 to 2009, without running into financial distress. The purpose of the research is stated in terms of research questions and hypotheses below.

3.1 Research question 1

Could South African companies, listed on the JSE, have used more debt to finance their operations over the past 22 years?

3.2 Research question 2

How much additional debt, if any, could JSE listed companies have used to finance their operations during the period under investigation, based on the answer to Research question one?

4 Research Methodology

4.1 Population

The target population for the study was all companies listed on the main board of the Johannesburg Securities Exchange (JSE). Only companies that were listed on the JSE at the time of sampling were considered. Companies that were de-listed from the JSE for the period that was investigated were excluded from the study.

4.2 Sampling

The sample for the study consisted of companies that were in the top 160 FTSE/JSE Index Series as updated in September 2009 (FTSE/JSE, 2009). The top 160 companies represented 99.5% of FTSE/JSE Index Series market capitalisation (FTSE/JSE, 2009). Companies in the financial industry (within the top 160) were excluded from the sample. The sample for the study thus consisted of companies from the following industries: Oil & Gas, Basic Materials, Industrials, Consumer Goods, Health Care, Consumer Services, Telecommunications and Technology. Financial services companies, such as banks, were excluded because their capital structure is to a certain extent determined by regulations. This limits their ability to, for example, take on more debt. Furthermore, mining companies were excluded from the Basic Materials industry.

4.3 Unit of Analysis

The unit of analysis was a single JSE listed company.

4.4 Data collection

Historical financial information for the companies that made up the sample was collected from various databases. Income statements, balance sheets, cash flow statements and selected market information were collected from the I-Net Bridge database. Un-levered beta for each company in the sample was sourced from McGregor BFA Research Domain. This was an average beta calculated every four weeks for the past five years using the JSE All Share Index as a comparison. Available corporate credit ratings for the companies in the sample were sourced from Bloomberg.

Data on the appropriate risk-free rates for South Africa for the period 1987 to 2008 was also collected. A report by the National Energy Regulator – NERSA (2008) was used as a source for this information. The report showed the marked-to-market risk-free rate for all South African government bonds with a maturity of at least 10 years, as calculated by NERSA using data from the South African Reserve Bank. The 2009 risk-free rate was taken as the average monthly yield on long-term government for the nine months up to 30 September 2009 as reported by the South African Reserve Bank.

Anginer and Yildizhan (2008) report average credit spreads by rating category, on straight fixed-coupon corporate bonds for USA firms for the period 1974 to 2006. In the absence comprehensive historical South African data on credit spreads, these USA statistics were collected for use in the analysis. This data

excluded bonds for financial firms. Table 4.1 shows a summary of the data that was collected for the study, as well as the sources of the data.

Table 4.1: Collected data

Data collected	Requirements	Source
Income statement data	1987 to 2009 (if available)	I-Net Bridge
Balance sheet data	1987 to 2009 (if available)	I-Net Bridge
Cash flow statement data	1987 to 2009 (if available)	I-Net Bridge
Selected market information: • Market capitalisation • Historical statutory tax rates	1987 to 2009 (if available)	I-Net Bridge
Un-levered company betas	Average for the past five years calculated every four weeks	McGregor BFA Research Domain
Selected company credit ratings	Long term corporate ratings	Bloomberg
South African historical risk free rate benchmark.	1987 to 2009	South African Reserve Bank quoted in NERSA (2008)
Credit spread by rating category	-	Anginer and Yildizhan (2008)

4.5 Data Analysis

In order to answer the research questions, the approach taken was to simulate increased levels of debt and the impact this would have on those companies that could take on more debt based on predetermined criteria. Debt levels were left unchanged for those companies that could not afford any additional debt in a given year, based on pre determined minimum debt service ratios. This

analysis was achieved through a Microsoft Excel based model. The following sections describe the model in more detail.

4.5.1 Estimating corporate credit ratings

Standard & Poor's rating matrix – shown in Table 4.2 – was used as the guide for estimating annual credit ratings for each company based on the financial data that was collected. The matrix cells marked with '**' were left blank in the original Standard & Poors matrix. The ratings shown in these cells were added by the author to increase the granularity of the matrix.

Table 4.2 Standard & Poor's rating matrix

	Financial Risk Profile					
Business Risk Profile	**Minimal**	**Modest**	**Intermediate**	**Significant**	**Aggressive**	**Highly Leveraged**
Excellent	AAA	AA	A	A-	BBB	BB **
Strong	AA	A	A-	BBB	BB	BB-
Satisfactory	A-	BBB+	BBB	BB+	BB-	B+
Fair	BBB **	BBB-	BB+	BB	BB-	B
Weak	BBB- **	BB+ **	BB	BB-	B+	B-
Vulnerable	BB+ **	BB **	BB- **	B+	B	CCC+
Financial Risk Indicative Ratios						
Cash Flow: Funds From Operations/Debt (%)	> 60	45-60	30-45	20-30	12-20	< 12
Debt/EBITDA (x)	< 1.5	1.5-2	2-3	3-4	4-5	> 5
Debt/Capital (%)	< 25	25-35	35-45	45-50	50-60	> 60

The first step in estimating credit ratings was to determine the three ratios in the matrix that are used to determine financial risk as defined by Standard & Poors:

a) $\frac{Funds\ \ from\ Operations\,(FFO)}{Debt}$

Where FFO was defined as profits after tax, plus depreciation & amortisation, plus deferred income tax. FFO was also adjusted for other nonrecurring items such as gains and losses on asset sales (Standard & Poor's, 2008). I-Net Bridge reports included a line item for 'extraordinary items', and this was the nonrecurring items used in the FFO calculation.

Debt was defined as the total short-term and long-term interest bearing debt minus cash and equivalents.

b) $\frac{Debt}{EBITDA}$ Debt/EBITDA

Where, EBITDA was defined as operating profit before interest, taxes, depreciation and amortisation.

c) $\frac{Debt}{Capital}$

Where Capital was defined as debt plus non-current deferred taxes plus equity (Standard & Poor's, 2008).

These ratios were calculated for all companies for each year. The ratios were then fitted into the matrix to determine each company's financial risk for each year, which ranged from minimal to highly leveraged as shown in Table 4.2. Financial risk for a company was taken as the worst risk predicted by any of the three ratios.

The second step in the process of determining the credit ratings was to determine the relative business risk for each company. Using the business risk profile together with the financial risk profile a rating could then be determined inline with the matrix. Un-levered betas were used as a proxies for business risk. These were five year average un-levered betas as reported on McGregor BFA Research Domain.

A scale for matching un-levered beta to the business risk profile categories in Table 4.2 was then developed using trial and error. This was done by comparing the model credit ratings to actual credit ratings issued by credit rating agencies for some of the companies in the sample. Breakpoints that divided beta values into different business risk profiles were setup to give the closest match to actual ratings. Table 4.3 shows how un-levered beta was matched to business risk profile. To calibrate the model, the estimated credit ratings were then compared to some actual credit ratings for 26 of the companies in the sample. A total of 72 actual corporate credit ratings, issued between 1997 and 2009, were sourced from Bloomberg and used to calibrate the model. The result from the model was estimated annual credit ratings for every company.

Table 4.3 Business risk profile vs. unlevered beta

Business Risk Profile	Unlevered Beta
Excellent	Less than 0.5
Strong	0.5 – 1.07
Satisfactory	1.07 – 1.2
Fair	1.2 – 1.3
Weak	1.3 – 1.4
Vulnerable	Greater than 1.4

4.5.2 Estimating the cost of debt

The next step in the model was to estimate the cost of debt using the modelled credit ratings. For each year each company was assigned a credit spread based on its credit rating. The spreads, shown in Table 4.4, were based on historical USA average statistics on credit spreads by rating category (Anginer and Yildizhan, 2008). The assigned credit spreads were then added to the South African risk-free rate for the relevant years to arrive at a pre-tax cost of debt for each year.

Table 4.4 Credit spread by rating category (Anginer and Yildizhan, 2008)

Rating Category (S&P)	Number of Observations	Mean Spread (basis points)	Std Dev Spread (basis points)
AAA	1157	64.3	27.47
AA+	316	87.58	32.07
AA	2973	77.51	35.7
AA-	2966	84.3	43.93
A+	5155	96.99	45.77
A	7778	102.28	51.99
A-	5397	112.24	61.65
BBB+	4801	124.45	67.24
BBB	4882	146.47	88.86
BBB-	3559	185.86	113.99
BB+	1224	272.54	142.87
BB	949	321.31	134.27
BB-	709	384.52	142.45
B+	342	405.91	129.51
B	266	448.77	156.5
B-	57	508.09	148.1
CCC+	34	455.6	117.19
CCC	29	583.79	116.17

4.5.3 Modelling the impact of increased debt

The model was setup such that an increase in debt would lead to a corresponding change in the financial risk profile, which would in turn lead an appropriate change in credit rating. The credit rating would in turn impact the credit spread which would result in a change in the cost of debt. This cost of debt and the increase in debt were used to calculate the additional interest that would need to be expensed. New debt service ratios were then calculated using the original interest expensed plus the additional interest calculated.

In addition to the interest coverage and cash coverage ratios a modified debt service coverage ratio (DSCR) was calculated and used in the analysis. The formula used to calculate this modified DSCR was:

$$DSCR = \frac{EBIT - Tax + Depriciation - increase\ in\ NWC}{Interest\ Expensed}$$

The difference between this calculation and the normal DSCR calculation is that the one used here does not take into account capital expenditure and principal payments on debt. It was found that in years when companies made significant capital expenditures the normal DSCR became negative, which distorted the analysis. Furthermore, it was impossible to calculate principal payments on debt from balance sheet and income statements alone.

The impact of increased debt was assessed by increasing debt as follows:

- Firstly it was assessed at different interest coverage, cash coverage and DSCR ratios. The impact of increased debt was assessed at a two levels of debt service ratios, namely, 1.1 and 5.0. For each of the three ratios debt was increased until the ratio reached these two levels. A cover of 1.1 was chosen to represent the minimum cover that a company could have without going into bankruptcy, bearing in mind the a company would be unable to meet its obligations if the cover went below 1.0. A cover of 5.0 was chosen to represent the minimum cover required by lending institutions. This was more conservative than the 3.9 reported by Dichev and Skinner (2002) for firms that do not violate their loan conditions. Debt was left unchanged if a company's cover was already below the two thresholds.
- Secondly debt was maximised while maintaining a drop in credit rating of not more than two notches. Kisgen (2006) found that comparing credit ratings within a specific category (for example AA+, AA and AA-) firms were more concerned about a downgrade from an AA- rating to an A rating than a downgrade from AA to AA-. Since the model gave estimated credit ratings and not actual ratings, a drop of two notches was selected to represent a downgrade from + to – within a rating category. Furthermore this analysis was done while maintaining an interest cover ratio of 5.0. Debt levels for companies whose original interest cover was already below 5.0 were left unchanged.

4.6 Research Limitations

The research that was conducted has the following limitations:

- The research excluded mining and financial companies that are listed on the JSE and, therefore, may not be representative of all JSE listed companies. The market capitalisation of the JSE is heavily weighted towards a few mining companies. As an example BHP Billiton and Anglo American together makeup approximately 19% of the FTSE/JSE Index Series market capitalisation.
- A Standard and Poor's rating matrix was used to determine credit ratings. Standard and Poor's states that this matrix is a guideline since ratings incorporate many subjective judgments, and remain as much an art as a science (Standard & Poor's, 2008, p. 20). Using only the matrix to arrive at a rating may be somewhat crude.
- Average credit spreads by rating category for companies in the USA were used in estimating the cost of debt due to the unavailability of comprehensive South African data. South African data may have resulted in more accurate estimates.
- The credit spreads that were used represent an average for the period 1974 to 2006. Credit spreads tend to vary with economic cycles, thus annual averages may have resulted in more accurate estimates.

The results of the research are expected to give good insights on the impact of increased debt levels for companies despite these limitations.

5 Results

5.1 Sample description

A total of 97 JSE listed companies were sampled for the study. The total company-years sampled were 1293, for the period 1987 to 2009. The companies that were sampled came from 23 different sectors of the JSE. Table 5.1 lists the different sectors and the number of companies sampled in each sector. Together these companies represented 43% of the total market capitalisation of the FTSE/JSE Index Series (FTSE/JSE, 2009).

Table 5.1 Number of companies sampled by sector

Sector Code	Sector	Number of Companies
QAAP	Oil & Gas Producers	1
QBVG	Beverages	1
QCAM	Construction & Materials	13
QEEE	Electronic & Electrical Equipment	3
QEIN	Industrial Engineering	2
QFDR	Food & Drug Retailers	4
QFLT	Fixed Line Telecommunications	1
QFOP	Food Producers	9
QFST	Forestry & Paper	2
QGIL	General Industrials	6
QGNR	General Retailers	10
QHCE	Health Care Equipment & Services	2
QHEM	Chemicals	4
QHOG	Household Goods	1
QILM	Industrial Metals	5
QITP	Industrial Transportation	3
QMDA	Media	5
QMTC	Mobile Telecommunications	4
QPOO	Personal Goods	1
QPTB	Pharmaceuticals & Biotechnology	3
QSCS	Software & Computer Services	5
QSPC	Support Services	4
QTLL	Travel & Leisure	8
	Total	**97**

Table 5.2(a) to 5.2(c) show the aggregate balance sheet for each of the sectors listed above. The aggregate balance sheet was arrived at by adding together the balance sheets of all the companies in a specific sector and calculating each item as a fraction of the sum of the book value of total assets. Furthermore the results in Table 5.2 are arranged it terms of increasing book value of debt-to-capital. Where debt is all interest bearing debt (short and long term) and capital is the book value of shareholders equity plus debt, plus deferred tax and other long term liabilities less cash and equivalents. The median debt-to-capital (book) for all companies combined for the period 1987 to 2009 was 25.1%. The median debt to total capital based on the market value of equity was 12.7% the same period.

Median interest cover, cash cover and DSCR ratios are also shown by industry in Table 5.2. The median ratios for the entire sample were: 7.1 for interest cover, 8.1 for cash cover and 6.0 for DSCR.

Table 5.2 (a) Aggregate balance sheet for by sector

Sector	Mobile Telecom.	Support Services	Media	General Retailers	Oil & Gas Producers	Health Care	Food & Drug Retailers	Food Producers
Shareholders Equity	**35.0**	**35.0**	**47.1**	**44.0**	**55.0**	**20.7**	**22.8**	**47.4**
Non-Current Liabilities	**26.4**	**10.0**	**20.0**	**14.3**	**22.7**	**65.4**	**7.3**	**13.3**
Interest Bearing Loans LT	21.2	7.5	15.1	9.0	10.2	51.0	3.7	6.6
Deferred Tax : Liability	3.2	1.3	2.0	3.0	6.3	10.6	0.5	5.1
Interest Free LT Liabilities	1.9	1.2	2.8	2.3	6.1	3.7	3.2	1.6
Current Liabilities	**38.5**	**55.1**	**33.0**	**41.7**	**22.3**	**13.9**	**69.8**	**39.3**
Interest Bearing Loans ST	8.7	9.2	6.9	5.0	5.9	4.5	1.8	13.2
Trade Creditors	20.6	41.7	20.5	31.7	8.3	8.2	64.1	22.4
Other Current Liabilities	9.2	4.2	5.6	5.0	8.2	1.2	3.9	3.8
Total Liabilities	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Total Long Term Assets	**62.1**	**35.3**	**50.9**	**21.9**	**66.2**	**84.1**	**32.3**	**46.1**
Total Current Assets	**37.9**	**64.7**	**49.1**	**78.1**	**33.8**	**15.9**	**67.7**	**53.9**
Stock & Work in Progress	2.8	19.8	7.0	22.7	11.3	2.0	33.7	18.9
Trade Debtors	15.9	31.6	13.3	41.1	13.1	10.1	17.8	23.6
Other Current Assets	2.9	0.9	5.9	4.8	4.7	0.3	1.6	2.0
Cash & Equivalent	16.2	12.3	22.9	9.6	4.7	3.4	14.6	9.4
Total Assets	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Interest cover (median)	8.7	6.3	12.2	8.2	18.0	4.8	15.7	8.1
Cash cover (median)	11.4	6.5	12.4	8.2	21.1	5.1	19.9	9.4
DSCR (median	9.8	6.2	9.0	5.3	15.1	3.8	17.7	6.6
Debt/Total Capital (median)	**12.6%**	**16.2%**	**17.0%**	**17.6%**	**17.8%**	**18.5%**	**18.8%**	**19.7%**

Table 5.2 (b) Aggregate balance sheet for by sector continued…

	Electronic & Electrical Equipment	Industrial Metals	Personal Goods	Travel & Leisure	Industrial Eng.	Construction & Materials	Fixed Line Telecom.	Chemicals
Shareholders Equity	**44.7**	**65.1**	**71.9**	**52.8**	**32.7**	**37.2**	**46.8**	**43.5**
Non-Current Liabilities	**6.3**	**14.6**	**4.1**	**24.8**	**34.9**	**9.6**	**18.4**	**14.7**
Interest Bearing Loans LT	4.9	3.9	2.0	20.4	34.3	6.9	12.0	10.6
Deferred Tax : Liability	0.8	6.5	0.8	3.3	0.1	1.6	2.6	1.5
Interest Free LT Liabilities	0.6	4.2	1.3	1.1	0.5	1.1	3.8	2.6
Current Liabilities	**49.0**	**20.3**	**24.0**	**22.3**	**32.3**	**53.1**	**34.8**	**41.7**
Interest Bearing Loans ST	6.7	3.5	10.4	7.2	2.8	6.7	10.5	10.7
Trade Creditors	35.9	12.7	6.7	11.4	26.1	37.1	10.2	26.6
Other Current Liabilities	6.4	4.1	6.9	3.7	3.4	9.3	14.1	4.4
Total Liabilities	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Total Long Term Assets	**27.3**	**57.4**	**38.3**	**80.8**	**38.3**	**34.4**	**72.8**	**48.1**
Total Current Assets	**72.7**	**42.6**	**61.7**	**19.2**	**61.7**	**65.6**	**27.2**	**51.9**
Stock & Work in Progress	22.3	16.6	27.1	1.0	33.0	13.3	2.1	19.3
Trade Debtors	29.8	10.9	7.9	5.5	19.7	30.2	10.5	26.2
Other Current Assets	1.5	1.0	1.7	1.7	0.3	1.7	12.9	1.5
Cash & Equivalent	19.1	14.0	24.9	10.9	8.7	20.5	1.8	5.0
Total Assets	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Interest cover (median)	15.1	7.0	8.0	7.5	5.6	8.4	6.2	4.4
Cash cover (median)	15.0	8.5	7.1	8.4	5.7	10.2	8.8	5.0
DSCR (median	10.2	5.1	6.9	7.5	4.8	8.5	21.0	3.9
Debt/Total Capital (median)	**19.9%**	**21.8%**	**22.3%**	**22.5%**	**22.6%**	**26.5%**	**33.0%**	**33.2%**

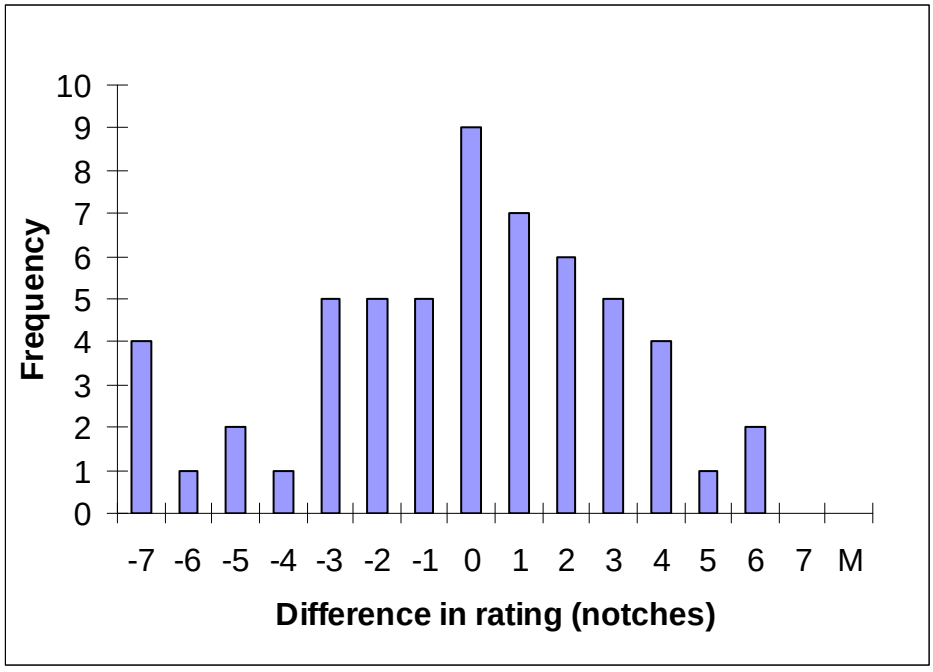
Table 5.2 (c) Aggregate balance sheet for by sector continued…

	General Industrials	Software & Computer Services	Pharm. & Biotech.	Beverages	Industrial Transport	Forestry & Paper	Household Goods
Shareholders Equity	**52.3**	**32.6**	**30.5**	**24.2**	**35.8**	**37.2**	**38.3**
Non-Current Liabilities	**17.0**	**9.6**	**15.0**	**41.2**	**28.9**	**36.7**	**28.3**
Interest Bearing Loans LT	12.0	5.8	8.7	29.9	22.3	26.5	23.2
Deferred Tax : Liability	2.5	0.3	0.8	5.7	2.0	5.4	3.7
Interest Free LT Liabilities	2.5	3.5	5.5	5.7	4.6	4.8	1.3
Current Liabilities	**30.7**	**57.3**	**54.5**	**34.6**	**35.3**	**26.1**	**33.4**
Interest Bearing Loans ST	8.6	7.0	35.9	11.1	10.8	9.2	10.3
Trade Creditors	18.5	39.4	15.9	12.3	20.7	14.8	19.0
Other Current Liabilities	3.6	10.9	2.6	11.3	3.8	2.0	4.1
Total Liabilities	**100.0**	**99.5**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Total Long Term Assets	**55.0**	**12.2**	**46.0**	**74.4**	**58.7**	**72.0**	**48.3**
Total Current Assets	**45.0**	**87.8**	**54.0**	**25.6**	**41.3**	**28.0**	**51.7**
Stock & Work in Progress	15.2	13.4	14.7	8.0	12.5	10.9	12.0
Trade Debtors	18.0	39.4	17.9	10.3	17.5	11.2	19.9
Other Current Assets	5.3	5.4	1.3	2.6	3.2	0.7	3.7
Cash & Equivalent	6.5	29.6	20.0	4.7	8.1	5.2	16.1
Total Assets	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Interest cover (median)	6.3	9.6	5.9	5.3	4.4	2.8	5.2
Cash cover (median)	7.7	11.1	5.5	6.5	5.5	4.7	5.5
DSCR (median	5.7	5.9	3.1	5.2	4.5	4.5	4.6
Debt/Total Capital (median)	**35.7%**	**40.6%**	**41.1%**	**42.0%**	**47.7%**	**48.2%**	**52.2%**

5.2 Model Verification

Good credit rating estimates were a critical part of the model as these affected the cost of debt. In order to verify the credit ratings that were estimated by the model, actual ratings (where available) were used to calibrate the model. Out of 57 actual credit ratings the model estimated nine (16%) of them to exactly those issued by rating agencies. A total of 21 (37%) ratings were estimated to within one notch, and total of 32 (56%) were estimated to within two notches. Figure 5.1 shows the distribution of the difference (in notches) between actual and model ratings. A negative number indicates where the model estimate was below the actual rating issued. Table A-1 in the appendix shows the full details of the modelled ratings compared to ratings that were issued by rating agencies.

Figure 5.1 Differences between model ratings and agency ratings. (a difference of zero means the rating was matched exactly)



5.3 Research Question One

Research question number one sought to determine whether JSE listed companies could have used more debt during the period that was investigated.

5.3.1 Debt Service Ratio Analysis (cover = 1.1)

Analysis based on the interest cover ratio revealed that in 1204 out of the 1293 company-years analysed, the sampled companies could have increased their debt and still maintained an interest coverage of 1.1. This represented 93% of the total company-years.

Using the cash cover ratio to determine the impact of increased debt revealed that in 1209 out of the 1293 company-years analysed the sampled companies could have increased their debt and still maintained a cash coverage ratio of 1.1. This represented 94% of the total company-years.

Using the modified DSCR to determine the impact of increased debt revealed that in 1165 out of the 1293 company-years analysed the sampled companies could have increased their debt and still maintained a DSCR of 1.1. This represented 90% of the total company-years.

5.3.2 Debt Service Ratio Analysis (cover = 5.0)

With a minimum interest coverage of 5.0 companies could afford to increase debt in 64% of the company-years sampled. The converse of this is that 64% of the time companies were found to have interest covers above 5.0.

Debt could be increased in 903 instances (70%) while still maintaining a cash cover ratio of 5.0. The converse of this is that 70% of the years companies were found to have maintained cash coverage above 5.0.

Debt could be increased in 724 instances (56%) while still maintaining a DSCR of 5.0. The converse of this is that 56% of the time companies were found to have maintained a DSRC of 5.0.

5.3.3 Credit Rating Based Analysis

This involved maximising debt while maintaining a credit rating downgrade of not more than two notches and an interest coverage ratio of 5.0. In this case debt could be increased in 822 instances or 64% of the total company-years. A summary of the results is shown in Table 5.3.

Table 5.3 Summary of results showing the percentage of company data years where debt could be increased.

Test	Number of company-years where debt could be increased	Percentage of total data-years
Cover = 1.1		
Interest Coverage	1204	93%
Cash Coverage	1218	94%
DSCR	1165	90%
Cover = 5.0		
Interest Coverage	823	64%
Cash Coverage	903	70%
DSCR	724	56%
Credit Rating (max drop of 2 notches	822	64%

These results support the notation that JSE listed companies could have used more debt to finance their operations in the period under investigation.

5.4 Research Question Two

Research question number two sought to determine how much additional debt the sampled companies could have taken on while still maintaining good coverage ratios. Table 5.4 shows the aggregate increase in interest bearing debt that could have been be achieved at the different coverage ratios, for all companies together. This was calculated by aggregating the modelled increase in debt for all companies and comparing it to the aggregate debt that was reported on all the balance sheets.

Table 5.4 Aggregate increase in interest bearing debt for all companies at different coverage ratios.

	Aggregate increase in debt (%)
Cover = 1.1	
Interest Coverage	606%
Cash Coverage	668%
DSCR	752%
Cover = 5.0	
Interest Coverage	103%
Cash Coverage	116%
DSCR	100%
Credit Rating (max drop of 2 notches	79.2%

Table 5.5 reports the aggregate additional interest bearing debt that could have been used, split by sector. The results were grouped into sectors, by aggregating the balance sheets per sector for the period that was investigated. In Table 5.5, the number of companies in each sector is shown in brackets. The last column in Table 5.5 shows the results obtained by maximising debt while maintaining a drop in credit rating of not more than two notches and as well as maintaining an interest coverage ratio of 5.0.

Table 5.5 Aggregate additional interest bearing debt – by sector – as a percentage interest bearing debt reported on balance sheets.

Sector (# of companies)	Cover = 1.1			Cover = 5			Rating based
	Interest Cover	Cash Cover	DSCR	Interest Cover	Cash Cover	DSCR	
Forestry & Paper (2)	68%	168%	223%	0%	4%	3%	0%
Health Care (2)	64%	81%	91%	5%	6%	5%	4%
Household Goods (1)	179%	189%	240%	8%	10%	6%	7%
Industrial Transport (3)	174%	246%	286%	10%	18%	14%	7%
Beverages (1)	228%	277%	287%	8%	18%	7%	8%
Pharmaceuticals & Biotech. (3)	317%	299%	230%	22%	20%	5%	14%
Fixed Line Telecommunications (1)	364%	563%	1568%	31%	64%	199%	16%
Industrial Eng. (2)	213%	165%	151%	17%	18%	9%	17%
Chemicals (4)	358%	446%	388%	25%	38%	14%	17%
General Industrials (6)	269%	409%	395%	23%	42%	23%	22%
Travel & Leisure (8)	340%	412%	470%	39%	48%	40%	30%
Mobile Telecom. (4)	570%	701%	796%	62%	88%	71%	35%
Software & Computer Services (5)	318%	371%	425%	37%	44%	41%	36%
Food Producers (9)	374%	415%	419%	52%	58%	37%	37%
Support Services (4)	555%	641%	652%	70%	89%	62%	48%
Media (5)	389%	427%	459%	57%	63%	45%	52%
Personal Goods (1)	635%	557%	718%	61%	47%	47%	61%
General Retailers (10)	821%	741%	694%	128%	119%	73%	74%
Construction & Materials . (13)	562%	665%	832%	99%	117%	117%	80%
Electronic & Electrical Equipment (3)	851%	873%	823%	160%	166%	109%	107%
Oil & Gas Producers (1)	770%	923%	855%	150%	181%	127%	135%
Food & Drug Retailers (4)	1699%	2065%	2515%	325%	406%	371%	218%
Industrial Metals (5)	1899%	2144%	1884%	394%	440%	284%	367%

In 36.2% of the company-years, companies could double or more than double their interest bearing debt while maintaining an interest coverage ratio of 5.0. Table 5.6 reports this statistic for all the cover ratios that were tested.

Table 5.6 Percentage of company-years where debt could have at least doubled – measured at different coverage ratios

Cover	% company-years
Cover = 1.1	
Interest Coverage	80.3%
Cash Coverage	83.9%
DSCR	79.9%
Cover = 5.0	
Interest Coverage	36.2%
Cash Coverage	38.6%
DSCR	31.6%
Credit Rating (max drop of 2 notches	31.9%

6 Discussion of Results

6.1 The results in general

The median market debt-to-capital for all the companies sampled was 12.7%. Strebulaev (2007) reported that the median market debt-to-capital ratio in the United States over the period 1965 to 2000 averaged 31.4%. This evidence suggests that South African companies use debt more conservatively than their US counterparts. Furthermore Strebulaev (2007) reported that traditional trade-off models produce substantially higher numbers than the 31.4% US figure. Therefore, if South African companies are even more conservative than this, by implication, they could be leaving a lot of shareholder value on the table. This is supported by Harrison (2003), who found that South African companies had substantially lower leverage than G7 countries.

6.2 Research Question One

Research question one asked whether South African companies, listed on the JSE, could have used more debt to finance their operations over the period 1987 to 2009.

6.2.1 Debt Service Ratios = 1.1

The results show that in over 90% of the company-years, companies could have increased their debt levels by lowering their cover ratios to a level of 1.1. However cover ratios of 1.1 are very low and could be considered too risky, bearing in mind that a cover ratio below 1.0 means that a company cannot meet its debt service requirements. Miller (1988) points out that theoretically, the optimal capital structure might be all debt, however, a run of bad years in the market might actually find a highly-levered firm unable to meet its debt service requirements resulting in bankruptcy. Furthermore, Dichev and Skinner (2002) found that the median interest coverage ratio for firms that violated their loan conditions at some point was 2.8. Thus, cover ratios of 1.1 represent the worst case scenario and companies cannot realistically be expected to operate at these levels.

6.2.2 Debt Service Ratios = 5.0

The results show that in 56%, 64% and 70% of the company-years, companies could have increased their debt levels by maintaining their DSCR, interest coverage and cash coverage ratios respectively at a level of 5.0. Dichev and Skinner (2002) found that the median interest coverage ratio for firms that did not violate their loan conditions was 3.9. Thus in 64% of the company-years, companies could be expected to increase their debt without defaulting on their debt service obligations.

With coverage ratios set at 5.0, in excess of 88% of the ratings that were estimated by the model were BBB- and higher. This points to the fact that at coverage ratios of 5.0 companies could still expect to be within investment grade ratings. This is also somewhat consistent with Standard & Poor's (2006) which reported that the median interest coverage for a BBB rating between 2002 and 2004 was 4.7.

6.2.3 Credit Rating Based Analysis

The results show that in 64% of the company-years, companies could have increased their debt levels while maintaining a credit rating downgrade of not more than two notches and an interest cover of 5.0. This was the most conservative scenario as it limited debt increase in two ways. Kisgen (2006) found that comparing credit ratings within a specific category (for example AA+, AA and AA-) firms were more concerned about dropping from an AA- rating to an A rating than dropping from AA to AA-. A drop of two notches represents a drop from + to – within a rating category. Thus this scenario somewhat takes into consideration managers concerns about credit ratings. Even with this consideration companies could afford to increase debt in a 64% of the company-years.

6.3 Research Question Two

Research question two sought to determine the quantum of additional debt that could have been 'safely' used by the sampled companies to finance their operations during the period that was investigated.

Since coverage ratios of 1.1 are too low for sustainable operation of a business as discussed before, the rest of the analysis was only done at coverage ratios of 5.0.

Overall the results showed that the aggregate additional interest bearing debt that could have been used by all companies together ranged between 79.2% and 116% (Table 5.4), depending on the ratio of analysis. In other words this sample of companies representing JSE Inc. together could have borrowed at least 79.2% and up to 116% more money to finance their operations over the years. The 79.2% takes into account managers' concerns about credit rating downgrades as a result of increased leverage, by limiting the downgrades to two notches. These potential increases represent significant shareholder value that these companies left on the table over the years.

Furthermore the results show that in at least 31.6% (Table 5.6) of the company-years, these companies could have doubled their interest bearing debt while maintaining the appropriate coverage ratios.

Looking at the data by sector reveals that some sectors had lots of room to increase leverage while other sectors had no room to do so. For example, the model shows virtually no room to increase leverage for the Forestry and Paper sector. The median interest coverage of 2.8, and debt-to-capital of 48.2% explains why this sector had no capacity to take on additional debt. Dichev and Skinner (2002) found that the median interest coverage ratio for

firms that had violated their loan conditions at some point, was 2.8. Based on this, the Forestry and Paper sector of the JSE could be considered over geared.

The Health Care, Household Goods, Industrial Transport and Beverages sectors seem to be using debt more optimally. The model estimates possible increases in debt of less that 10% for these sectors when interest coverage is held at 5.0 while allowing a credit downgrade of not more than two notches.

On the other end of the scale the industrial metals sector is shown as one with the biggest opportunity to increase debt with possible additional debt amounting to 284% of the original debt (Table 5.5). However, this has to be looked at in light of the highly cyclical nature of the metal industry. Graham (2000) states that firms may use debt conservatively if they are in an industry with volatile or cyclical cash flows. Thus, although theory might predict higher optimal leverage for the metal industry, it would not be advisable for a company in this industry to be highly geared.

7 Conclusions

This was a study on the capital structure of JSE listed companies. The study considered historical financial information for JSE listed companies for the period 1987 to 2009 and asked two central questions with the benefit of hindsight. Firstly, could JSE listed companies have used more debt to finance their operations during this period? Secondly, how much additional debt could these companies have used and thereby increase shareholder value?

7.1 Key findings

The key findings are as follows:

- Out of the 1293 company-years that were sampled, companies could have increased their debt levels in 56% of the company-years while maintaining a DSCR of 5.0.
- Out of the 1293 company-years that were sampled companies could have increased their debt levels in 64% of the company-years while maintaining an interest coverage ratio of 5.0.
- Companies could have increased their debt levels in 64% of the company-years while maintaining a credit rating downgrade of not more than two notches as well as an interest coverage ratio of 5.0.
- All the sampled companies together could have used 79% more interest bearing debt to finance their operations while maintaining a

credit rating downgrade of not more than two notches as well as an interest coverage ratio of 5.0.

- All the sampled companies together could have had 100% more interest bearing debt while maintaining a DSCR of 5.0; 103% more debt while maintaining and interest coverage of 5.0 and 116% more debt while maintaining a cash coverage ratio of 5.0.
- The results indicate that South African companies used debt more conservatively when compared to companies from the United States. This is evidenced by the median market debt-to-capital ratio of 12.7% for the sampled companies compared to a figure of 31.4% reported in literature for US companies.
- Overall, in the past South African companies listed on the JSE left significant shareholder value on the table by not taking on more debt. However, this does not apply to all sectors, notably the model estimated possible increases in debt below 10% for the following sectors: Forestry & Paper, Health Care, Household Goods, Industrial Transport and Beverages. This suggests that these industries used debt more optimally, with the Forestry & Paper sector being over geared resulting in a median interest coverage of 2.8.

7.2 Recommendations to stakeholders

South African managers of JSE listed companies should look closely at the capital structure of their companies with the aim of increasing leverage. There seems to be a culture of using debt conservatively in certain sectors of the JSE.

Shareholders of JSE listed companies should look positively at companies that increase their debt within reasonable limits as this increases shareholder value. Furthermore shareholders should actively advocate for the increased use of debt. This will help to alleviate the culture of conservative use of debt.

7.3 Recommendations for future research

Based on the findings and limitations of the current research, the following recommendations can be made for future research:

- Average credit spreads by rating category for companies in the USA were used in estimating the cost of debt due to the unavailability of comprehensive South African data. Furthermore, the credit spreads that were used represented an average for the period 1974 to 2006. A recommendation future research is for annual, South African specific credit spreads to be used to estimate credit spreads and credit ratings. This will result in more accurate estimates.

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Appendix A-1 Actual ratings vs. modeled ratings

Company Name	Rating Agency	Month rating issued	Year	Agency Rating	Model Rating	Notch difference
Bidvest Group	GCR	Feb	2009	A+	A	-1
Bidvest Group	Fitch Nat	Dec	2008	A+	A-	-2
Imperial Group	Moody's	Dec	2008	BBB-	BBB	1
Telkom SA	Moody's	Oct	2008	A-	AA	4
MTN Group	Fitch Nat	Jul	2008	AA-	A	-2
Telkom SA	S&P	Jun	2008	BBB	AA	6
Sappi	Moody's	Jun	2008	BB	BB-	-1
AECI	GCR	Jun	2008	A-	A-	0
Netcare	GCR	May	2008	AAA	BB	-11
Massmart Holdings	GCR	Mar	2008	A+	AA	2
Nampak	GCR	Mar	2008	A+	AA	2
JD Group Ltd/South Africa	GCR	Feb	2008	A	AA	3
Imperial Group Pty Ltd	Moody's	Dec	2007	BBB	BBB	0
African Oxygen	GCR	Dec	2007	AA-	AA	1
ArcelorMittal South Africa	GCR	Dec	2007	A+	BB+	-6
Aveng Ltd	GCR	Dec	2007	A	BB-	-7
Bidvest Group	GCR	Dec	2007	AA-	A-	-3
Foschini	GCR	Dec	2007	A	AA	3
Group Five Construction	GCR	Dec	2007	A	A	0
Highveld Steel	GCR	Dec	2007	A-	A-	0
Illovo Sugar	GCR	Dec	2007	A-	AAA	6
MTN Group	GCR	Dec	2007	A+	A-	-2
Murray & Roberts	GCR	Dec	2007	A+	AA	2
Sappi	GCR	Dec	2007	A-	BB	-5
Sasol	GCR	Dec	2007	AA+	A-	-5
Steinhoff International	GCR	Dec	2007	A	A-	-1
Tiger Brands	GCR	Dec	2007	AA-	AA	1
Sappi	S&P	Oct	2007	BB	BB	0
Barloworld	GCR	Jun	2007	A+	BBB	-4
Medi-Clinic Corp	GCR	Jun	2007	A-	AA	4
Sappi	Moody's	Feb	2007	BB+	BB	-1
JD Group	GCR	Feb	2007	A+	AA	2
Medi-Clinic Corp	GCR	Dec	2006	A	AA	3
Aveng	GCR	Oct	2006	A-	AA	4
MTN Group Ltd	Moody's	Jun	2006	BBB-	BB-	-3
MTN Group Ltd	Fitch Nat	Jul	2006	A+	BB-	-8
Sappi Ltd	S&P	Jun	2006	BB+	BB-	-2
Sappi Ltd	S&P	Jun	2006	BB+	BB-	-2
Sappi Ltd	S&P	May	2006	BBB-	BB-	-3
Sappi Ltd	GCR	Mar	2006	A	BB-	-7
Barloworld Ltd	GCR	Feb	2006	AA-	A-	-3
JD Group Ltd	GCR	Feb	2006	A+	AA	2
Medi-Clinic Corp Ltd	GCR	Dec	2005	A	AAA	5
Aveng Ltd	GCR	Oct	2005	A-	A-	0
Sasol Ltd	S&P	Aug	2005	BBB+	BBB+	0
Sasol Ltd	Moody's	Jun	2005	BBB+	BBB+	0
Netcare Ltd	GCR	Apr	2005	A	AA	3

Sappi Ltd	S&P	Mar	2005	BBB-	BBB	1
Barloworld Ltd	GCR	Mar	2005	AA-	A-	-3
Imperial Group Pty Ltd	Moody's	Oct	2004	BBB+	A-	1
Imperial Group Pty Ltd	Moody's	Jul	2004	BBB+	A-	1
Steinhoff International	Fitch Nat	Nov	2003	A	AA	3
Sasol Ltd	S&P	Feb	2003	BBB	A-	2
Aveng Ltd	Fitch Nat	Mar	2002	A	A-	-1
Bidvest Group Ltd	Fitch Nat	Jan	2002	AA-	AA	1
Sappi Ltd	S&P	Jan	2002	BBB	BBB	0
Pick n Pay Stores Ltd	Fitch Nat	Aug	1997	A+	AAA	4
					Median	**0.00**
					Average	**-0.28**

Appendix A-2 Historical risk-free rate for South Africa

12 Months ending	Risk-free Rate pre-tax, nominal
31-Mar-84	13.29%
31-Mar-85	16.05%
31-Mar-86	16.83%
31-Mar-87	15.82%
31-Mar-88	15.61%
31-Mar-89	16.45%
31-Mar-90	16.61%
31-Mar-91	16.19%
31-Mar-92	16.57%
31-Mar-93	14.92%
31-Mar-94	13.59%
31-Mar-95	15.88%
31-Mar-96	15.47%
31-Mar-97	15.74%
31-Mar-98	14.23%
31-Mar-99	15.53%
31-Mar-00	14.54%
31-Mar-01	13.41%
31-Mar-02	11.39%
31-Mar-03	11.00%
31-Mar-04	9.46%
31-Mar-05	9.19%
31-Mar-06	7.88%
31-Mar-07	8.00%
25-Mar-08	8.27%
Sep-09	8.59%

Appendix A-3 Company betas *(source:* McGregor BFA)

Company Name	Un-levered Beta	Company Name	Un-levered Beta
SASOL LIMITED	1.0729	CASHBUILD LIMITED	0.421
SABMILLER PLC	0.5837	WOOLWORTHS HOLDINGS LIMITED	0.5049
PRETORIA PORTLAND CEMENT COMPANY LIMITED	0.4078	MASSMART HOLDINGS LIMITED	0.509
DISTRIBUTION & WAREHOUSING NETWORK LTD	0.3096	NETCARE LIMITED	0.0788
CERAMIC INDUSTRIES LIMITED	0.1234	MEDI-CLINIC CORPORATION LIMITED	0.1211
BUILDMAX LIMITED	0.2553	OMNIA HOLDINGS LIMITED	0.6263
WILSON BAYLY HOLMES - OVCON LIMITED	0.6052	FREEWORLD COATINGS LIMITED	0.6544
TWP HOLDINGS LIMITED	0.4595	AFRICAN OXYGEN LIMITED	0.3191
STEFANUTTI STOCKS HOLDINGS LIMITED	0.9239	AECI LIMITED	0.4404
RAUBEX GROUP LIMITED	0.5765	STEINHOFF INTERNATIONAL HOLDINGS LIMITED	0.5134
MURRAY & ROBERTS HOLDINGS LIMITED	0.6916	HULAMIN LIMITED	0.4514
GROUP FIVE LIMITED	0.6049	HIGHVELD STEEL & VANADIUM CORPORATION LIMITED	1.1612
ESORFRANKI LIMITED	0.81	ARGENT INDUSTRIAL LIMITED	0.6926
BASIL READ HOLDINGS LIMITED	1.0272	ARCELORMITTAL SA LIMITED	1.6261
AVENG LIMITED	0.9459	METMAR LIMITED	0.5911
DIGICORE HOLDINGS LIMITED	0.6015	TRENCOR LIMITED	0.2233
REUNERT LIMITED	0.5636	IMPERIAL HOLDINGS LIMITED	0.5255
ALLIED ELECTRONICS CORPORATION LIMITED	0.7303	GRINDROD LIMITED	0.7979
HUDACO INDUSTRIES LIMITED	0.2521	ELEMENTONE LIMITED	0.5176
INVICTA HOLDINGS	0.1568	CAXTON & CTP PUBLISHERS & PRINTERS LIMITED	0.4604
SPAR GROUP LIMITED	0.4047	AVUSA LIMITED	0.6366
SHOPRITE HOLDINGS LIMITED	0.5609	NASPERS LIMITED -N	0.6647
PICK `N PAY STORES LIMITED	0.3153	KAGISO MEDIA LIMITED	0.2125
CLICKS GROUP LIMITED	0.5863	VODACOM GROUP LIMITED	0.5418
TELKOM SA LIMITED	0.3193	MTN GROUP LIMITED	0.6756
TONGAAT- HULETT LIMITED	0.3869	BLUE LABEL TELECOMS LIMITED	0.8095
TIGER BRANDS LIMITED - ORDINARY	0.5892	ALLIED TECHNOLOGIES LIMITED	0.424
ILLOVO SUGAR LIMITED	0.2179	COMPAGNIE FIN RICHEMONT	0.9671
ANGLOVAAL INDUSTRIES LIMITED	0.578	CIPLA MEDPRO SA LIMITED	0.4005
RAINBOW CHICKEN LIMITED	0.6063	ASPEN PHARMACARE HOLDINGS LIMITED	0.1815
OCEANA GROUP LIMITED	0.2336	ADCOCK INGRAM HOLDINGS LIMITED	0.2204
COUNTRY BIRD HOLDINGS	0.2539	BUSINESS CONNEXION GROUP LTD	0.4909
ASTRAL FOODS LIMITED	0.4905	GIJIMA AST GROUP LIMITED	0.7233
AFGRI LIMITED	0.1963	DIMENSION DATA HOLDINGS PLC	0.8102
SAPPI LIMITED	1.0101	DATATEC LIMITED	1.3804
MONDI LIMITED	1.0552	DATACENTRIX HOLDINGS LIMITED	0.6213
REMGRO LIMITED	0.6291	ADCORP HOLDINGS LIMITED	0.475
KAP INTERNATIONAL HOLDINGS LIMITED	0.4336	MVELAPHANDA GROUP	0.4271
EQSTRA HOLDINGS LIMITED	0.361	BIDVEST GROUP	0.6174
BARLOWORLD LIMITED	0.7081	ILIAD AFRICA LIMITED	0.6635
NAMPAK LIMITED	0.3249	THE DON GROUP LIMITED	0.7067
ASTRAPAK LIMITED	0.1428	CITY LODGE HOTELS LIMITED	0.5643
TRUWORTHS INTERNATIONAL LIMITED	0.6207	SPUR CORPORATION LIMITED	0.4948
MR PRICE GROUP LIMITED	0.5033	FAMOUS BRANDS LIMITED	0.4054

FOSCHINI LIMITED	0.5515	SUN INTERNATIONAL LIMITED	0.1199
ADVTECH LIMITED	0.9435	PHUMELELA GAMING AND LEISURE LIMITED	0.2879
COMBINED MOTOR HOLDINGS LIMITED	0.7627	GOLD REEF RESORTS	0.3793
LEWIS GROUP LIMITED	0.7699	COMAIR LIMITED	0.4913
JD GROUP LIMITED	0.5614		