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CAPITAL STRUCTURE: AN APPLICATION OF TRADE-OFF THEORY TO A SMALL E&P OIL AND GAS COMPANY

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Abstract

Afren PLC, is a UK based company that has a growing composition of assets in Sub-Saharan Africa. Confronted with the task of meeting enormous financing needs, an after effect of the financial crisis, the credit risk perception on these small oil and gas companies including Afren PLC becomes much higher as these companies barely have sufficient credit history or stable cash flows to give assurance of credit worthiness. It is as a result that this study, applying the trade-off theory, examined the capital structure of Afren PLC. On the average, Afren has a higher cost of debt, and cost of capital than its peer firms due to a more aggressive use of debt financing. By adopting the cost of capital approach under a trade-off theoretical framework, we find that the company can further minimize its cost of capital and increase its value by de-leveraging to a 40% debt to capital ratio. More crucial from the results is that the cost of being overleveraged by 5% is significantly higher than the cost of being underleveraged by the same magnitude of deviation.

Keyword: Capital Structure, Trade-off Theory, Debt Financing, Cost of Capital, Afren PLC

INTRODUCTION

The weakening of financial institutions, credit squeeze and rising cost of funds; direct results of the global financial crises since 2007 have redirected the corporate decisions, financing policies and attitude of companies towards risk. These are particularly crucial for the oil and gas industry associated with heavy financial requirements, where significant risks and uncertainties are inherent features. However, while the big oil companies have robust cash flows and good access to global credit markets as a result of proven track records and strong relationships built with financial institutions over time, the implications are more severe for the small/midsized oil companies. Faced with the challenge of meeting enormous financing needs with the age of cheap and easy oil over, the credit risk perception on them is much higher in light of the fact that these companies barely have sufficient credit history or stable cash flows to give assurance of credit worthiness. A key objective function for these companies is optimizing their capital structure subject to internal and external financial constraints under the overarching goal of maximizing shareholder value.

Capital structure essentially refers to a firm's combination of debt and equity financing (Brealey et al. 2007). A major distinction between the two instruments is that the former creates a financial obligation to repay a principal sum plus an interest thereupon, while the latter accrues any residual earnings to its holders. Financial leverage denotes the debt intensity of a company. A broad measure of leverage vastly used in literature is the ratio of financial debt to asset; variations arise from whether long term or total debt is used and whether book or market values are used. According to Megginson and Smart (2005) while capital structure assessment by market values which measure investors' valuation of securities appeal to economists, corporate practitioners prefer book value measurements since they are not subject to market fluctuations. Fernandez (2007) also argues that firm's set target capital structure based on book values which are more realistic. Rajan and Zingales (1995) and more recently Welch (2011) noted a subtle flaw in the common measurement of leverage; comparing financial debt to asset which has elements of non-financial liabilities (like accounts payable which is normally used for transaction purposes) will tend to understate leverage.

Against this backdrop, this study examines the capital structure of small and mid-sized oil and gas independent companies in the UK. In doing this, the effect of financial constraints on smaller oil companies and the implications on their financing behavior was considered. Specifically, the study used Afren PLC, a UK based company as a case study. This choice of Afren PLC was based on its growing composition of assets in Sub-Saharan Africa. The study adopts an empirical approach based on the underpinnings of the trade-off theory of capital structure to assess the financing decisions of the company, with the aim of exploring an optimal

financing mix. Specifically, we estimate and make comparative analysis of the cost of debt, equity and overall capital among Afren and its peer companies (20 companies) and assess whether the financing decisions of a small/midsized independent oil company should be firm-specific or align with that of its peer firms/industry.

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

The capital structure irrelevance theorem (proposition I) laid down by Modigliani and Miller (1958) provides a benchmark for studying the financing decision of firms. Based on a static partial equilibrium approach under the assumptions of complete and perfect capital markets, they derive a basic proposition that the value of a firm cannot be improved by adjusting its capital structure through leverage. Although recognising in a 1963 correction paper, that debt creates significant advantages through tax deductibility of interest, Miller (1977) refuted the existence of an optimal capital structure for an individual firm on the ground that tax savings from debt interest is offset by personal income tax at the investor level and thus an optimal debt position is illusory.

Theories of Capital Structure

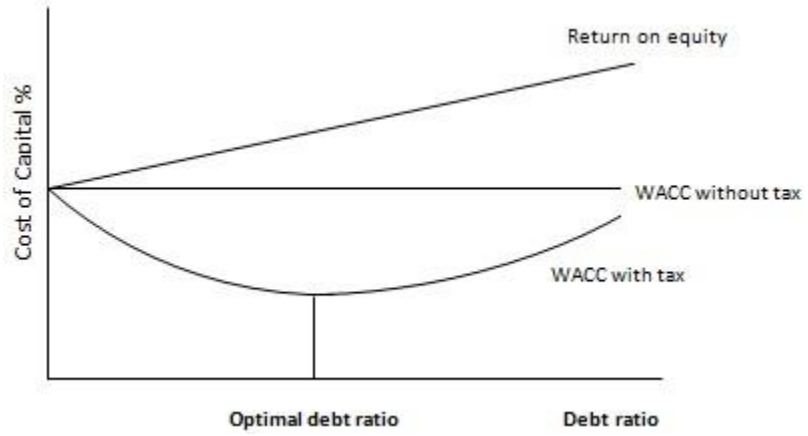
Trade-off theory

The center piece of this theory is that in a world of market frictions, leverage brings tax benefits due to interest deductibility of pre-tax earnings, but at the risk of financial distress and potential bankruptcy. This is because debt creates a financial obligation with legal backing, a breach of which is actionable in law. Major proponents of this theory Kraus and Litzenberger (1973) opined that firms' financing decisions involve a trade-off between the tax benefits and bankruptcy costs of debt and presented a simple model for valuation of a leveraged firm, given as the value of the firm in an unleveraged state plus the present value of tax-shield minus the present value of financial distress.

V_L = Vu + [*tax rate*debt*] – [(1-*tax rate*) * PV cost of financial distress]..... (1)

Graham (2001) argues that the explicit use of corporate tax rate assumes that firms are always profitable and will derive the full value of tax deductions at all times. Incorporating the possibility of loss scenarios require the use of an effective tax rate in lieu of actual tax rate.

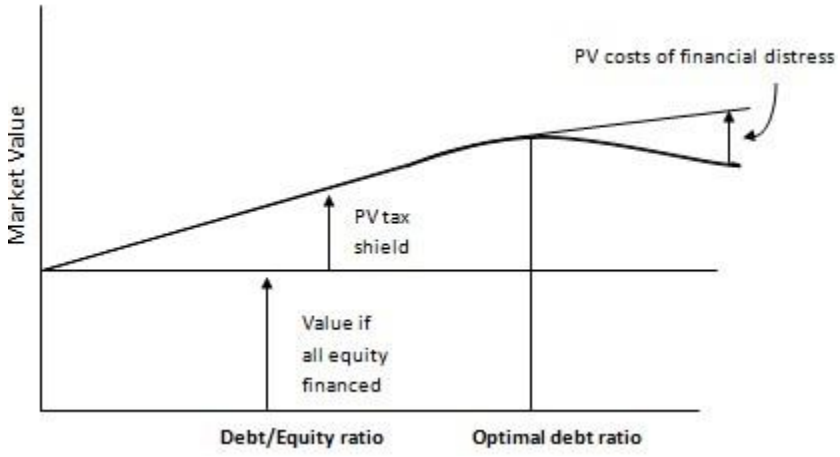
Figure 1: Relationship between leverage, return on equity and WACC



Source: Brealey et al. 2007

From the figure 1, leverage increases the expected return on equity but leaves WACC constant because the higher equity returns offset the savings emanating from debt. But with corporate tax, the after-tax cost of debt reduces causing a downward slope in the WACC which eventually slopes upwards when the firm's tolerable debt capacity is exceeded.

Figure 2: Relationship between market value of firm and leverage



Source: Brealey et al. 2007

The figure 2 shows the implications of the trade-off theory. Financial distress costs measure the potential direct and indirect cost of bankruptcy to a firm (Brealey et al. 2007). As leverage increases, investors' risk perception and the probability of credit default of a firm increase thus creating the possibility that it will incur future bankruptcy costs. As such, following equation (1) the current market value of the firm (shown by the thick line figure 2) increases or reduces to the

extent of the difference between the tax-shield gains of debt and the potential cost of bankruptcy. By implication, the minimum level of WACC in figure 1 coincides with the optimal debt ratio in figure 2 which maximises the value of the firm. DeAngelo and Masulis (1980), opine that in the absence of distress costs so far there are non-debt tax shields like depreciation/depletion allowance and investment tax credits, a firm will still have a 'unique interior' optimal capital structure.

Pecking Order Theory

Set out in the work of Myers and Majiluf (1984), this theory does not focus on a path to an optimal capital structure but gives a different explanation of the financing decision of firms based on the path of least resistance. They argue that equity is a last financing resort because asymmetric information between managers and investors about a firm's prospects and opportunities create adverse signals that lead to mispricing and undervaluation of stocks when new shares are issued. Thus, managers prefer internally generated funds (retained earnings) and if more funds are needed to augment, they introduce debt which is less likely to send wrong signals. Although noting that information asymmetry raises adverse selection costs of issuing equity, Halov and Heider (2011) argue that this direction of financing hierarchy may not always hold because for companies without a credit rating, information asymmetry about the degree of firm risk could affect access to credit and borrowing costs such that equity financing may be preferred over debt.

Agency Theory

This is a non-tax theory of capital structure that considers the cost and benefit of debt based on the principal-agent relationship. Two major conflicts of interest exist in this theory – conflict between shareholders and bondholders; and conflict between management and shareholders. In the first case, agency costs of debt increase for highly leveraged firms at the verge of financial distress as management has an incentive to substitute value destroying projects that have high probability of low payoff and low probability of high pay off for safer projects with low positive net present values (NPV) (Harris and Raviv 1991; Myers, 2001). This is because safe projects yield just enough to pay bondholders, leaving nothing on the table for shareholders. On the other hand, if risky projects are successful and yield high returns shareholders gain the upside while bondholders bear the loss if unsuccessful. The other conflict of interest arises for firms with substantial cash flow over what is necessary to fund positive NPV projects. Managers have an incentive to engage in profligate spending and empire building at the expense of shareholders' interests (Jensen, 1986). He proposes debt financing as the antidote to the

agency costs associated with excessive free cash flow because it enforces managerial discipline and control due to the commitment of loan repayment. However, Griffin (1988) tested the hypothesis in the industry for the period 1979-1985 on a set of 25 firms and gives evidence of a hybrid free cash flow model (a combination of standard profitability criteria and free cash flows in making investment decisions) driving investments during the period rather than pure cash flow hypothesis given by Jensen (1986).

In summary, scholars have tried to incorporate the agency benefit and cost of debt to the tax shield benefit of trade-off theory vis-a-vis bankruptcy costs in determining the optimal debt ratio for a firm. While claiming that debt creates value for firms with heavy cash flows, agency theory has less relevance in explaining how firms with 'just enough cash flows' should be financed. Myers (1977) argues that deriving optimal capital structure from the trade-off proposition is less compelling because bankruptcy costs are trivial relative to tax savings from debt making it difficult balance them. Weiss (1990) from a sample of 37 New York American firms between 1979 and 1986 estimated that on the average that direct bankruptcy costs, which include professional and legal fees amount to about 3.1% of firm value one year before bankruptcy. However, it must be pointed that indirect costs not easily observable like the strain in business relationship from creditors/customers as well as decline in inventory and asset valuation could be more substantial than the direct costs. This occurs when assets are forced to be sold below intrinsic values under distress periods. The trade-off theory does not sufficiently explain why some firms with high profit margins still have little debt even with potentially substantial tax savings (Myers 1993; Brealey et al. 2007). For instance, ExxonMobil has consistently maintained a very low leverage ratio (10% for 2011 fiscal year). Although Pecking order theory bridges this gap by predicting that financing with retained earnings is of first order for firms, it does not adequately account for smaller firms that may rely more on equity due to low retained earnings, little access to funds and high borrowing costs.

Determinants of Leverage: Evidence on Main Factors Synthesized by Theories

Theoretical and empirical studies on the determinants of leverage is exhaustive and support a number of recurring factors correlated with leverage including; firm size, asset tangibility, profitability, growth opportunities (Titman and Wessels 1988; Rajan and Zingales 1995; Binsbergen et al. 2011), and peer average (Leary and Roberts 2010).

Size effect

Castanias (1983) stressed that large firms with diversified assets have lower earnings variability and are better positioned to cushion debt than small sized firms. In a cross-sectional study on

leverage and probability of failure, using total assets as a proxy for firm size he estimates a negative significant relationship between total assets and failure rate. This is consistent with implication of the trade-off theory that smaller firms face higher risk of bankruptcy and will use debt less aggressively.

Asset tangibility

Titman and Wessels (1988), underscore that firms with substantial tangible assets (ratio of net property plant and equipment to total assets) are better able to access funds as they can use such assets as collateral to secure debt. More so, since tangible assets unlike intangibles have efficient markets, lower information asymmetry about their true valuation reduces lenders' risk perception. This might explain why some companies in capital intensive industries (like utilities) could still thrive with heavy debt financing. However, Giambona and Schwienbacher (2008) argue that increasing the share of tangible assets to improve debt capacity is only relevant within the context of firms constrained from accessing credit and as such a strong positive relationship between tangibility and leverage may not be necessary for financially unconstrained firms with easy access to debt markets.

Profitability

Empirical evidence shows a negative relationship to exist between profitability and leverage (Myers and Majluf 1984; Rajan and Zingales 1995). Using the listed companies in the Pakistani oil and gas sector, Sabir and Malik (2012) regressed profitability, among other explanatory variables on firm leverage and find its coefficient to be statistically significant and negatively correlated to leverage.

Investment growth opportunities

The underlying idea presented in several studies (Myers 1977; Hovakimian et al. 2001) is that mature firms with few investment opportunities will be more leveraged while high growth firms with greater investment opportunities but higher distress cost will use less debt in the current period as a way of saving 'life lines' for future borrowings when needed. Using market-to-book ratio as a proxy for growth opportunities, Rajan and Zingales (1995) corroborate this idea empirically and estimated a negative correlation between market-to-book ratio and leverage for non-financial public firms across countries in the G-7 between 1987 and 1991.

In addition to these factors Desai et al. (2008) in a study on political risk and capital structure of multinational firms in America between 1982 and 1999, found risk associated with foreign investment in politically and economically unstable countries of significant influence in

the leverage policies of these firms. Higher risks and uncertainties in terms of government regulations, unstable fiscal regimes, and weak institutional frameworks in such countries increase earnings volatility for firms and they respond by adopting lower debt ratios to ameliorate financial risks. However, the validity of this argument would depend on the degree to which these multinationals have diversified portfolios across countries to effectively minimise overall risk.

Eldomiaty and Ismail (2008) used 10 different information selection criteria to identify which theory explains capital structure in 99 selected firms in Egypt. The results showed that the determinants so far discussed were significant. Although the factors represented by the trade-off theory were found to dominate, there was no one-fit-all theory that sufficiently accounted for firms' financing decisions.

Relationship between investment and financing decisions

Modigliani and Miller (1958) underscore that from an ex-ante position the choice of financing instruments and their relative proportions are unrelated to the basic decision to invest in a project. They posit that a firm will exploit an opportunity if and only if the return on the investment is greater than or equal to the cost of capital and since capital structure does not affect the cost of capital then it should have no bearing on investment decisions. To prove this, they also tested for the correlation between WACC and leverage for 43 large electric utilities between 1947 to 1948 and 42 oil companies for 1953, and found a positive relationship and statistically insignificant coefficients near zero

Myers (1974) argues that this assertion is not practical outside a perfect market framework because when a firm has series of investment opportunities, it will not only decide which projects to undertake but must determine a financial plan for each period. Furthermore, given that the debt-equity mix determines the effective cost of capital, the logical inference is that it will ultimately influence the decision to accept or reject a project. This is because, the cost of capital is effectively the rate used to discount cash flows from projects and it could be below, equal to or even above the rate of return on an investment.

If the decision to invest is purely based on the traditional static (NPV is static because of the standard rule of accept or reject a project now) discounted cash flow analysis like the NPV criteria, management might be concerned about finding the optimal debt-equity combination that will minimize the WACC and maximize the firm's value from all positive yielding NPV projects. However, with the recent surge of real options analysis and a growing focus on the value of flexibility in the valuation of real assets for capital budgeting, taking advantage of these flexibilities may present more complex nuances in the transmission channel between investment

and short-long run financing decisions. Real options is defined as the right but not the obligation to buy or sell an underlying real asset at a specified exercise price on or before a specified expiration date (Berk and DeMarzo, 2007).

Flexibility is interpreted in the context of the option to defer, expand, contract or abandon a project (Busby and Pitts 1997). Dixit and Pindyck (1994) emphasize that managerial flexibility, uncertainty and irreversibility of investment are necessary conditions for real options analysis to be of relevance. Considering the irreversible huge capital investment required at the different stages of oil and gas projects, the application of real options would have an appeal in determining the nature and timing of investments. Also, the fact that investment in oil projects are driven by highly uncertain 'below-ground' factors like reserve size and 'above-ground' factors like oil prices imply that the option to defer high risk projects could prove valuable.

Adopting real options techniques, a firm might assess that deferring some potentially viable investment opportunities to a future period is indeed more valuable than commencing immediately perhaps due to uncertainty about oil price or fiscal changes. In that regard, management will consider it worthwhile to conserve current use of debt financing to enable borrowing at a future period when such uncertainties are resolved. In such a case we might observe low leverage in the short-run and higher leverage in the long-run. Strategic decisions such as this have been used by Byoun (2011) to explain how the demand for flexibility influences firms' leverage policies at different stages as observed in practice.

In summary, the literature review showed industries with peculiar features like the oil and gas sector, with larger firms have better access to global credit market, smaller companies face acute funding difficulties which limit the option to and extent of debt financing. The evidence on capital structure in practice shows that firms often make dynamic decisions that are at variance with academic propositions.

METHODOLOGY

Research Approach

The method employed in this study is largely driven by the framework of the trade-off theory as it accounts for the tax benefits of debt as well as indirectly incorporating the distress cost of debt through increased default spreads as debt intensity increases. An analytical approach is adopted in assessing the financing structure of Afren vis-a-vis other comparative mid-cap companies. We measure their debt intensities as a ratio of debt (short and long term financial liabilities) to capital over the period 2005 to 2011. The Weighted average cost of capital (WACC) approach is used to estimate the overall cost of capital used for valuation and capital budgeting.

The WACC is composed of two magnitudes; the required return on equity (K_e), and post-tax cost of debt (K_d) weighted by their proportions;

$WACC = K_e [E/D+E] + K_d [D/D+E]$..... (1)

The Capital Asset Pricing Model (CAPM) for pricing risky securities developed by Sharpe (1964) and Lintner (1965) are used to estimate the required return on equity for the companies. A study by Graham (2002) reveals that 74% of public firms use the CAPM in estimating equity cost of capital. The model specifies a linear relationship between the required return on equity and a firm's Beta. Beta measures the magnitude of risk or sensitivity of a company's stock in relation to a market index;

$K_e = R_f + \beta_L [E (Rm)-R_f]$..... (2)

Where:

R_f = risk-free rate

β_L= firm Beta adjusted for financial leverage

$E (Rm)-R_f$ = market risk premium

Each company's Beta was obtained from Reuters DataStream. It estimates the leveraged Beta (β_L) of a company by taking the weighted average of individual assets Betas which is the covariance between the rates of return on an asset and the market portfolio divided by the variance of market return.

$B_L = Cov (r_a, rm)/Var (r_m)$..... (3)

The market/equity risk premium is the excess of market returns over the riskless rate. Data of historical market returns and yield on government bond with 20-year maturity from 1970-2011 was obtained from Morningstar. It should be noted that some analysts use historical data from 1926; however, others believe a 30-year data history is sufficient. The benchmark market index is the Morgan Stanley Capital Global Equity Index (MSCI) which covers at least 60% of local market stocks weighted by their capitalisation in the index. Although expected market risk premium is unobservable, the common practice overtime has been the use of historical returns as a proxy measure.

In estimating the cost of debt for the companies, we use the interest rates reported in the company's annual report on recent outstanding bank facilities and/or bonds weighted against their principal amounts. Where the bond is issued at face value/par we use the stated coupon rates on such bonds. Afren issued some of its bonds at discounts (below face value); the applicable rate is the yield to maturity on such bonds i.e. the discount rate that equates the present value on the bond's future cash flows to the bond price.

Bond Price= $\sum C/ (1+y)^{t} + F/ (1+y)^{tm}$..... (4)

Where:

C = periodic coupon payment (usually semi-annual)

y = Yield to maturity

t = Time to maturity

F= Face value paid at maturity

t_m = Time to maturity * number of payment periods in a year

We use the *IRR* function in excel to estimate the yield to maturity based on known variables in the equation which are reported in the company's annual report. We further adjust the estimated cost of debt for tax benefits by multiplying by (1-tax rate) to arrive at the after-tax cost of debt. For companies that completely offset current tax charge with deferred tax credit, the pre-tax cost of debt is used since no tax is paid. For companies without debt, the cost of capital is simply the required return on equity. The cost of debt at each level is estimated as;

K_d = [Riskless rate + credit default spread]. By adjusting for the tax benefit of debt financing, the equation becomes;

K_d = [Riskless rate + credit default spread] [1-tax rate]..... (5)

The default spread measures the premium or additional yield over the risk-free rate (yield on 20-year UK government bond) required for holding a risky security (in this case bond or loan). A company's credit rating indicates its potential risk on loan default and the applicable default spread. Anginer and Yildizhan (2010) among others have empirically shown that credit spreads account for a significant portion of default risk and are a good proxy measure. Generally, this spread is higher for smaller riskier firms and will increase as a company's credit quality falls. To determine the firm's credit rating at each level of debt, the study adopted a synthetic rating approach (Damodaran 2010). This is done by estimating the company's debt service capacity (the ability to pay interest on outstanding debt from its earnings) at each debt level and assigning a typical credit rating (we use the Damodaran's ratings and default spread data for each class of bond rating updated in January 2012, (*see Appendix I)*). According to Mckinsey & Company et al. (2010), debt service capacity measured by interest coverage; the ratio of earnings before interest and tax (EBIT) to debt interest is the most significant driver of credit ratings, and while some other ratios might be correlated to credit rating they have little explanatory strength. As the interest coverage ratio falls, the company's credit quality falls, and the default risk and credit spread increases. The number of iterations at each debt level is dependent on when the interest coverage achieves stability.

Following the argument of Graham (2001), that a company may not always be profitable under all scenarios to derive the full benefit of tax, we use an effective tax rate to estimate the after-tax cost of debt and equity Beta. The effective tax rate at each level of debt is the corporate tax rate adjusted for a reduction in tax shield benefits after a cut-off point when debt interest becomes greater than the company's earnings.

Effective tax rate = corporate tax rate * minimum (1, EBIT/debt interest) ……..... (6)

As the company increases its leverage, the required return on equity also increases as shareholders residual earnings become more volatile; hence we estimate the required return on equity at each debt level. From equation (2) all the 'right hand side' parameters remain constant except β_L which increases as the company increases leverage.

We first determine the Beta of the firm without leverage (β_U) using the Hamada (1972) equation, it shows the effect of leverage on a firm's systematic risk;

$\beta_L = \beta_U * [1+ (1-Tax) * (D/E)]$..... (7)

Where:

β_L is equity Beta obtained from Data stream and

β_U is unleveraged Beta

This equation can be re-arranged as;

$\beta_U = \beta_L / [1+ (1-Tax) * (D/E)]$..... (8)

By substituting known current values of the right-hand side of equation (8), we find the company's unleveraged Beta, β_U. In other to determine the value of β_L at each incremental debt level we adjust for the new values of (D/E) and the effective tax rate in equation (7).

The value of β_L at each debt level is then substituted into the cost of equity equation (2);

$K_e = R_f + \beta_L [E (R_m) - R_f]$ to derive the firm's required return on equity. By substituting the cost of debt and equity at each debt level into the standard WACC formula in equation (1), the financing mix that minimizes the overall cost of capital is effectively determined. We estimate the value of the firm over the range of debt levels based on the current WACC and implied optimal WACC and compare these values to the unlevered firm value to determine the net benefit or cost of additional debt to the firm.

The apriori expectation is that the minimum WACC will be associated with the highest firm value. Although the company was not in a tax paying position as at the time of this study due to the utilization of tax credits on loss carry forward, we model the capital structure and compare the implied optimal debt ratio and WACC to the company's current debt ratio and WACC all under a 30% corporate tax rate (CITA company income tax rate in Nigeria where most of Afren's producing assets are located) which is expected to be implemented in the subsequent year.

The Data

The required estimates used in the study includes cost of debt, required return on equity as well as overall cost of capital used for comparative analysis between Afren its peer group firms. Thus, this study essentially makes use of secondary based quantitative data obtained from Thomson Reuters EIKON and DataStream, Bloomberg, Morningstar, Damodaran, Companies' Annual Report and 10-k sec filings. The startup year for Afren was 2005 and 35% of its comparative companies hence we use panel data from 2005 to 2011 on debt, equity and other financial variables for the 20 Comparative firms (Rock hopper is excluded because its financial year end is different from the rest companies and would be problematic for comparison) obtained from Data stream at local currency (GBP). Form its 2011 annual report, Afren selects its peer companies based on the following criteria: industry of operation, market capitalisation, turnover and number of countries of operation as well as UK listing.

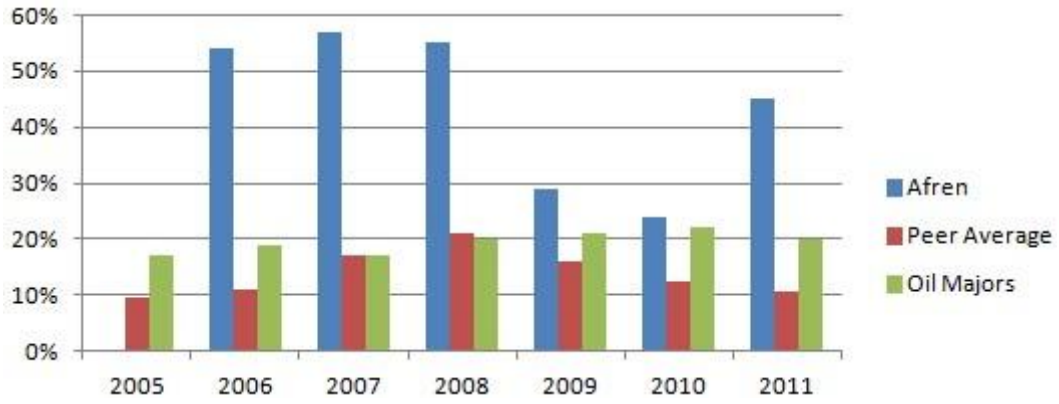
ANALYSIS AND RESULT

Comparative Result Analysis

Trend of capital structure

A holistic view of the trend of capital structure for Afren, the peer group and the super majors is presented in the figure below for the period 2005 to 2011. There has been a steady decline in the peer average debt ratio down to 10% (2011) from its 2008 peak level of 20% and Afren has consistently been more leveraged than the other two categories through the period except in 2005 (inception year). The 2008 financial crisis ushered a very uncertain economic climate, tightening the credit market and in response the company significantly de-leveraged from 55% to 29% in 2009; increasing again to 45% in 2011 after gaining access into the international bond market.

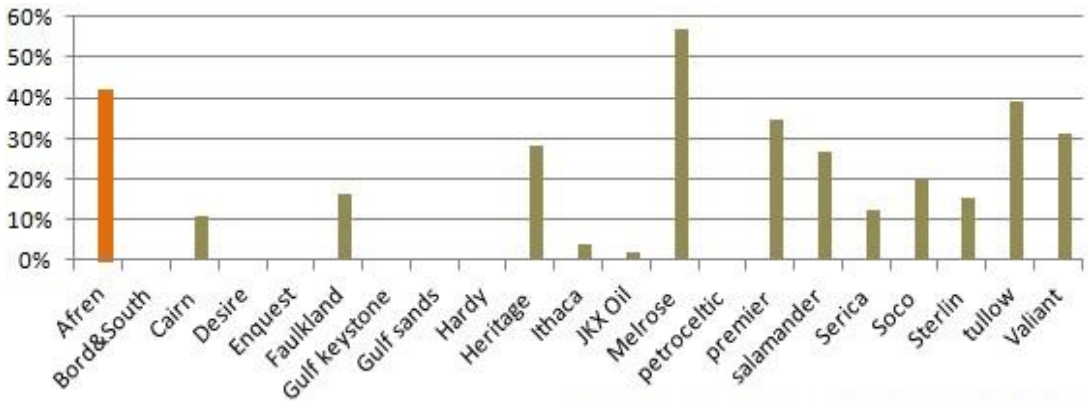
Figure 3: Debt to Capital Ratio by Year: Afren, Peer Group, Super Majors



Source: Data stream and author's calculations

The coefficient of variation (a relative measure of dispersion) in the year-to-year average leverage ratio for the super majors is 9.8%, which is much lower than that of the peer group of 29.6% for the observation period. While the majors are mature firms with an established stable pattern of capital structure, there exists a higher year-to-year variability in the capital structure of the smaller firms over the period. The review of literature suggests that peer firms in an industry do not make capital structure decisions in isolation and there exists interdependencies due to similar characteristics in operations and risks. The last five-year average financial leverage for each comparative company shown in figure 4 below reveals significant capital structure dispersion among these firms ranging from 0% to 57%. While firms like Melrose, Afren, Premier and Tullow use debt financing more significantly, others companies like Hardy Oil, and Gulf Keystone have maintained a wholly equity financing structure.

Figure 4: Individual Firm Debt Intensity: Five-year Average

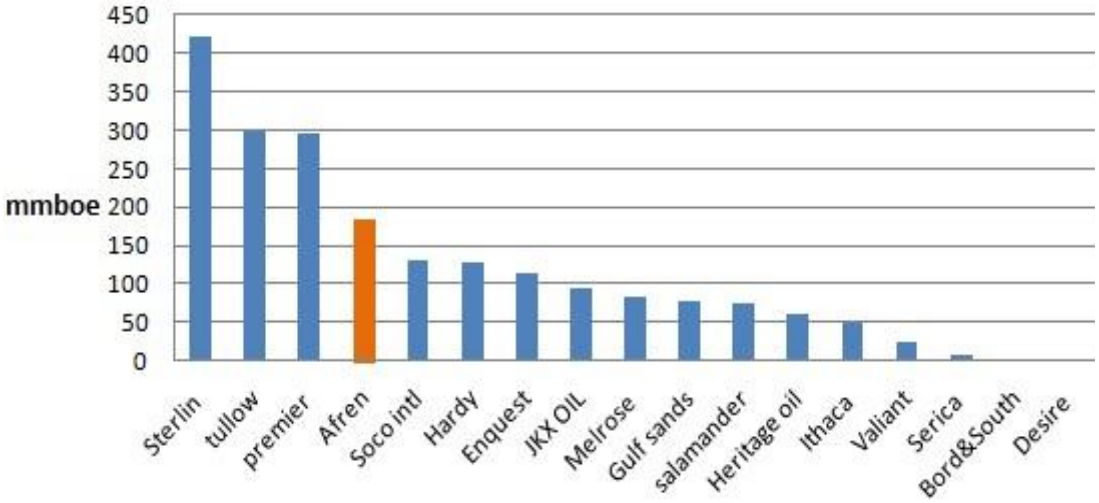


Source: Data stream and author's calculations

This suggests that firms at the start up/developing phase in the industry do not necessarily 'mimic' peer firm's financing behaviour. As firms grow towards maturity, the dispersions are replaced by stronger interdependence shown by the lower coefficient of variation in leverage found among the super majors. This also gives insight to why the peer group average would not necessarily give a useful prediction of what an optimal capital structure should be for Afren at this stage. On the average, Afren is the second most leveraged company among its peers with a five-year average of 42% after Melrose (57%).

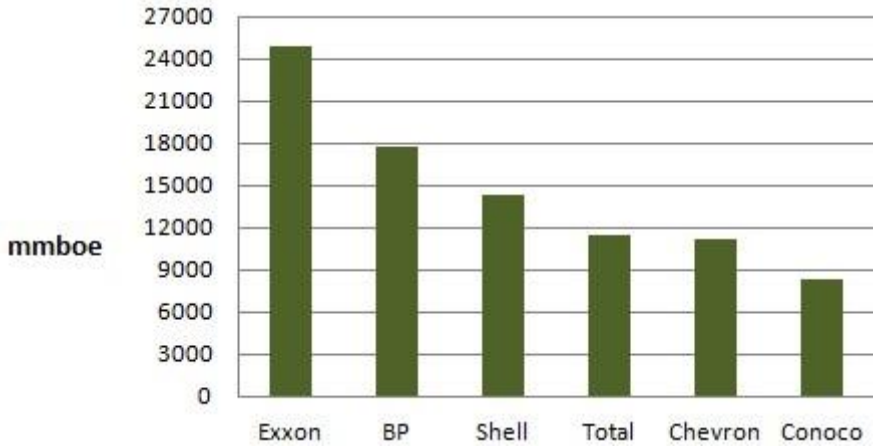
Due to the highly specific assets used in the industry that cannot be collaterised, we assess the strength of the companies' reserve base in securing loans. The distribution of reserves across the comparative firms and the super majors are presented in the figures below;

Figure 5: Proved + Probable Reserves (P50 Estimate): Afren and Comparative Firms



Source: Companies' Annual Reports 2011

Figure 6: Proved Reserves (P90 Estimate): Super Majors



Source: Companies' Annual Reports 2011 and US SEC

Although the smaller oil companies report reserves based on P50 estimates, the average P90 reserves estimates of the majors are over a hundred times greater. While most of the small companies already operate in different regions/countries, the bulk of their operations are essentially at exploration stages and the unwillingness of banks to bear high exploration risks is justifiable. Considering that banks are inclined to loan against the more conservative P90 reserves that have reasonable certainty of commercial recoverability under current economic conditions, the distribution of reserve size across peer companies shows that when compared to the majors, they lack sufficient reserves to collaterize the heavy capital funds required to further

develop proven reserves and expand. At one end are companies like Desire Petroleum and Borders & Southern Petroleum essentially at the seismic acquisition and exploration drilling stages with no proved reserves estimates. Having recorded negative earnings before tax (EBIT) since inception, these companies do not have debt servicing capacity and as a result adopt a financing policy of external share capital. More so, negative earnings imply that the tax shield benefit of debt does not apply since they have no taxable income. At the other end of the spectrum are very few companies like Tullow with modest reserves and 67 currently producing fields. In the middle position are companies like Afren, Melrose and Salamander with growing reserves and relatively fewer producing assets. Since the size of loanable funds is dependent on the lender's valuation of reserves, having a borrowing base of different producing assets provides the lending banks the comfort of loan repayment.

While few financial services companies like GE are now charting the course to providing development finance to independents through joint venture partnership, the formation of partnership deals especially between independents has also been on the increase. An example is the 2012 farm-in deal reported by (RNS, London Stock Exchange 2012) between Premier and Rockhopper which transfers to premier 60% of Rock hopper's interest in the North Falkland Basin Licenses following a $1 billion financing arrangement provided by Premier.

Empirical Result Discussion

Based on the CAPM estimations, the average cost of equity for the peer firms is 10.7% and ranges from 4.5% to 22.5%. Companies like Desire petroleum and Soco with low Betas have lower required return on equity. On the other hand, for companies with very high stock Betas like Ithaca (3.4) and Gulf keystone (2.3), the required return on equity reaches about 22.45% and 15.7% respectively reflecting the positive linear relationship between systematic risks and required return on equity.

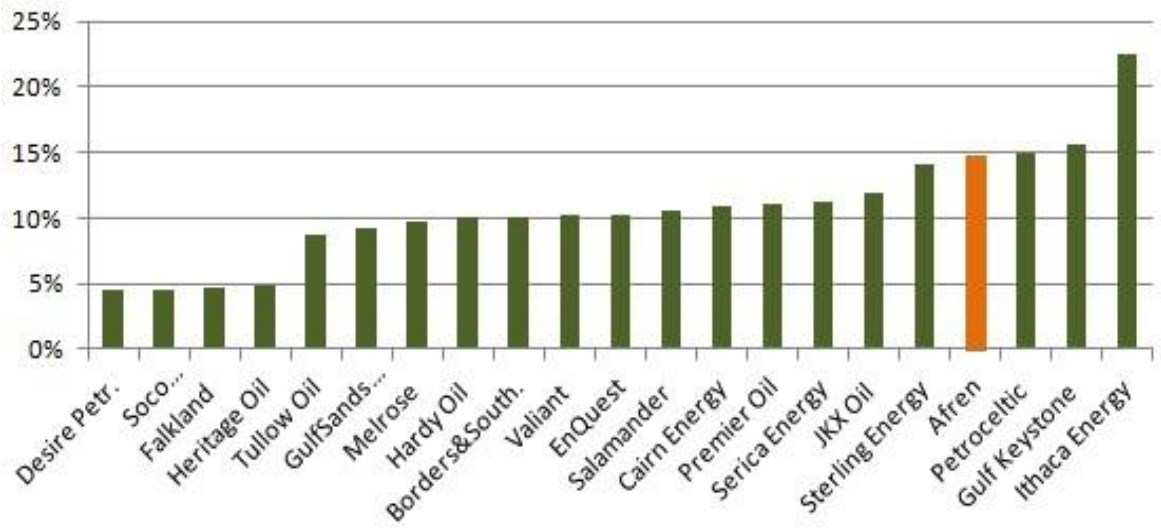
Table 1: Summary statistics of cost of capital parameters

Peer Average	Mean	Median	Minimum	Maximum
Cost of Equity (%)	10.69	10.21	4.47	22.45
Pre-tax Cost of Debt (%)	6.4	4.83	3.8	16
Post-tax cost of debt (%)	5.02	4.1	2.51	11.54
WACC (%)	10.04	10.09	4.47	22.45

Source: Author's calculations using CAPM and WACC methods

Cost of Equity

Figure 7: Required Return on Equity for Comparative Firms



Source**:** Morningstar and author's calculations

Afren's leveraged Beta is 2.1; this implies that on the average its stock returns vary by twice the magnitude of variations in the market returns (the market beta is 1). Currently, the bulk of the company's producing assets are located in Nigeria where about 92% of its 2011 revenue was generated. With such concentration in a region with high dependence on oil earnings (currently, more than 80% of federal government revenue and 95% of Nigeria's export earnings come from oil and gas (Bureau of African Affairs, 2012), political uncertainty and unstable fiscal regime, the company's exposure to business risk is significant. In contrast, ExxonMobil and Shell stocks are less volatile in relation to the market index with Betas of 0.5 and 0.66 respectively, supporting the argument that larger firms with greater asset diversification are less exposed to business risks and earnings variability and thus systematic risks. The required return on equity for Afren is estimated at 14.7% making it 37% above the peer group average of 10.7%.

Table 2: Estimates of Cost of Equity, Debt and WACC for Afren and Peer Firms

Company	Beta	Ke%	Pre-tax Kd%	Tax rate	Post-tax Kd*p* %	Debt value £'000	Equity Value £'000	WACC% = Ke[E/D+E] + Kd*p* [D/D+E]
Afren	2.11	14.74	9.2	-	9.2	628,239	777,536	12.26
Borders&South.	1.31	10.10	0	-	0	-	155,592	10.10
Cairn Energy	1.46	10.97	0	-	0	-	4,439,285	10.97
Desire Petr.	0.34	4.47	0	-	0	-	9,374	4.47
EnQuest	1.33	10.21	3.8	-	0	-	601,630	10.21
Falkland	0.37	4.65	0	-	0	-	120,540	4.65
Gulf Keystone	2.27	15.67	0	-	0	-	606,074	15.67
GulfSands Petroleum	1.17	9.29	0	-	0	-	146,952	9.29
Hardy Oil	1.29	9.98	0	-	0	-	81,219	9.98
Heritage Oil	0.41	4.88	7.96	-	7.96	89,843	602,915	5.28
Ithaca Energy	3.44	22.45	4	-	4	-	517,559	22.45
JKX Oil	1.62	11.90	16	0.28	11.54	23,958	304,065	11.87
Melrose	1.25	9.75	3.8	0.26	2.81	242,169	233,481	6.22
Petroceltic	2.14	14.91	0	-	0		245,322	14.91
Premier Oil	1.48	11.08	5.66	-	5.66	667,635	852,398	8.70
Salamander	1.39	10.56	4.83	0.48	2.51	180,024	244,059	7.14
Serica Energy	1.52	11.32	0	-	0	-	71,300	11.32
Soco International	0.35	4.53	6.6	0.36	4.19	30,458	706,676	4.52
Sterling Energy	2.01	14.16	0	-	0	-	74,795	14.16
Tullow Oil	1.07	8.71	4.3	0.17	3.55	1,980,880	3,020,618	6.66
Valiant	1.32	10.16	3.9	-	3.85	2,774	249,876	10.09

***Equity risk Premium: 5.6%, Risk Free Rate: 2.5% (yield on 20-year UK Government Bond)

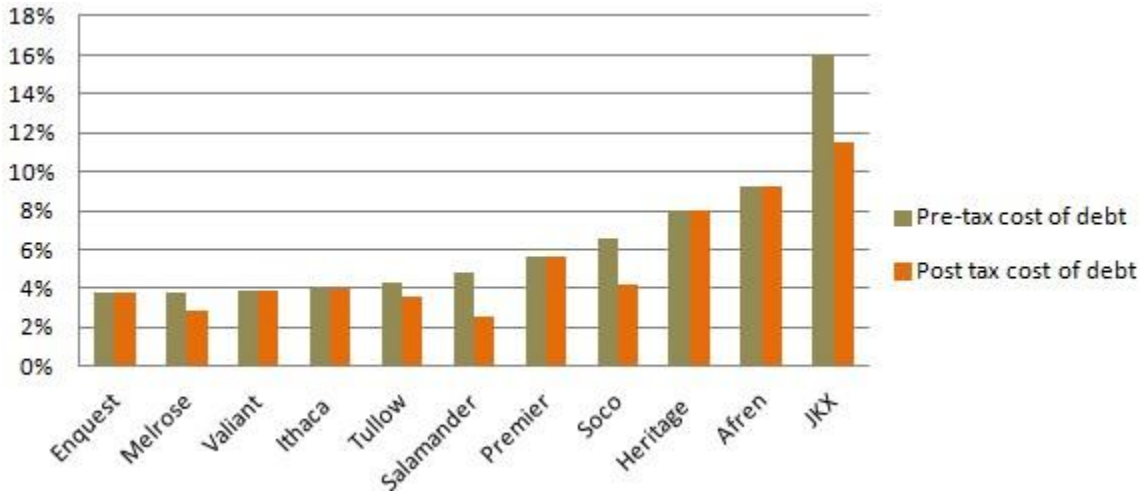
Source: DataStream, Morningstar and Author's calculations

Cost of Debt

It was discussed that adverse selection cost of debt could increase for an unrated firm due to information asymmetry about the company's risk profile. We note that apart from Afren, none of the comparative firms are currently rated by a credit rating agency. Also observed is the fact that companies that have consistently generated operating losses in the last five years are wholly financed by equity possibly because they are disadvantaged in the credit market. The cost of debt is calculated for the 11 companies (including Afren) with credit facilities and as such may

not necessarily give a complete representation of what the true average cost of debt for the peer companies should be if they were all leveraged

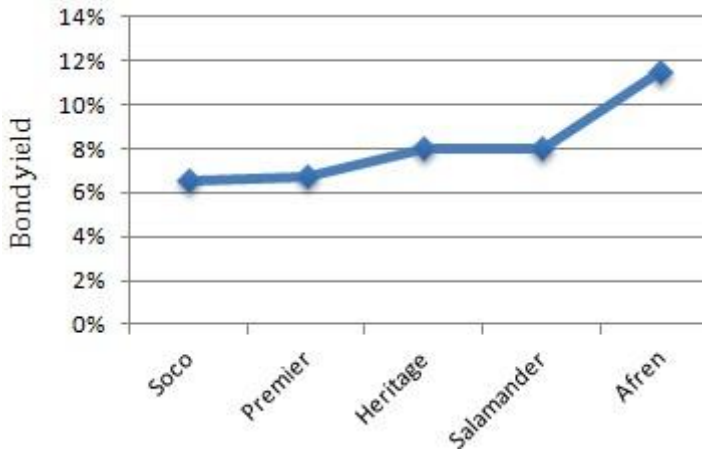
Figure 8: Cost of debt across comparative firms



Source: Companies' annual report and author's calculations

The estimated costs of debt range from about 4% to 16%. JKX oil tops the chart at 16% due to an unfavourable pre-paid swap facility with credit Suisse (The company obtained £50million development financing loan to be repaid with oil benchmarked at very high price), followed by Afren at 9.2% which is 44% above the group average of 6.4%. Afren's relatively high cost of debt is directly attributable to the fact that the company is currently assigned a 'B' rating by Standard and Poor's. It issued two high yield bonds to raise $500million at an average yield to maturity (YTM) of 11.5%.

Figure 9: Yield on corporate bonds issued by comparative companies



Source: Companies' annual report and author's calculations

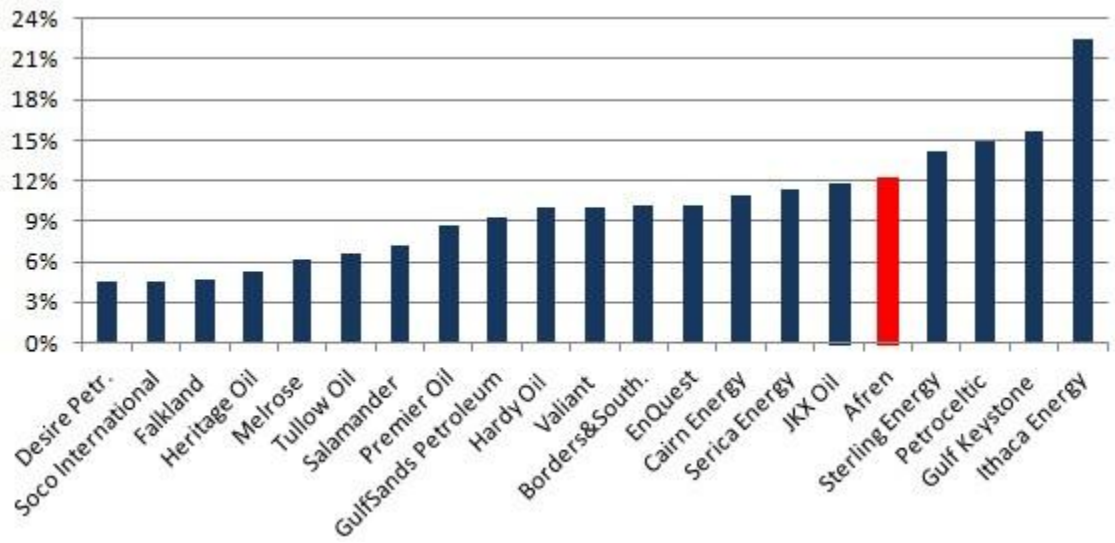
While Soco, Premier and Heritage issued corporate bonds prior to the 2008 financial crisis, Afren's bonds were issued in 2011 which could explain the high-yield of 11.5%. Although a larger percentage of the peer companies seem to have lower cost of debt, we note that their debt securities are largely syndicated loans secured against substantially all of the group's assets and hence carry lower interest rates due to pooled risks among banks. More crucial are the stringent debt covenants and penalties attached to bank loans which typically restrict these companies from any further borrowing before loan repayment is completed or impose requirements on target financial ratios that must be maintained. Dyreng (2008) notes that in a bid to prevent debt covenant violations and the associated costs, firms are forced to engage in 'earnings management' to report higher accounting incomes; thereby incurring higher tax costs due to increased tax base. By implication, while the explicit cost of debt may be moderate, strict debt covenants could effectively increase the implicit/opportunity cost of these loans to the companies.

The tax shield benefit of debt is demonstrated in figure 8. Tullow effectively has a lower post-tax cost of debt than Valiant even though its actual cost of debt was higher. This is because it paid corporate tax in the 2011 fiscal year hence loan interest was tax-deductible. On the contrary, Valiant and Afren utilised deferred tax credits from prior years which gives tax exemption thus leaving their post-tax cost of debt unchanged.

Weighted average cost of capital

Based on our estimations, the overall WACC for the firms lie between 4.5% and 22.5%. Ithaca and Gulfkeystone have high Betas relatively to other peer firms and being wholly financed by external share capital, the cost of equity for these two firms approximates the overall cost of capital. Given that they are high risk stocks, introducing debt into the capital structure can minimise the WACC; this however is subject to the companies' ability to access debt at competitive rates sufficient to more than offset the increase in required return on equity brought about by increased volatility of shareholders' earnings. The average WACC across the comparative group is 10% and Afren's weighted average cost of capital is estimated at 12.3% (23% higher than the peer average).

Figure 10: Weighted average cost of capital by firm (WACC)



Source: Author's calculations using WACC formula

Although these estimations are based on data from credible sources, some puzzling results question the data reliability. An example is the estimated cost of equity which feed into the overall cost of capital for the firms; Desire Petroleum has most of its operations at the exploration drilling stage, and with no estimated proven reserves. Yet the company has a Beta of 0.34 (obtained from Thomson Reuters) which is much lower than the industry and peer average of 0.83 and 1.4. The estimation of Beta obviously has estimation error which is not accounted for and these are likely to increase because these firms are relatively new with little historical data on their returns. In addition, the CAPM model has been criticized by Fama and French (2004) for giving an incomplete prediction of expected return on equity since it uses only a stock's Beta, arguing for a three-factor model that also incorporates the Beta of other explanatory variables; size and book to market factors.

Variations between our results and the actual estimates of cost of debt, equity and overall capital used by the comparative firms for valuation are expected to exist to the extent that they include judgments from respective managements. Decisions regarding an applicable equity risk premium, risk free rate, company's risk assessment and Beta by all means have elements of subjectivity and will thus impact companies' own results differently.

CONCLUSION

This study focused on analyzing the financing structure of small/mid-size independents oil and gas companies using Afren plc as a case study. From the analytical review, we note that although the industry poses similar operational risks and uncertainties across firms, the distinct

feature of high asset specificity and reserve based lending criteria coupled with the long lead time between the exploration, development and production distributes different trajectories of financing profile for individual companies such that debt capacities vary not only across companies in the industry but also within individual companies at the different operational stages. For the smaller companies with the bulk of activities in exploration drilling and seismic acquisitions, equity financing is more sustainable as their debt service capacity is near zero due to absence of reserves to generate revenue. For the companies that already have producing assets, access to debt is limited to the extent of proven reserves which is essentially insufficient to meet financing needs while the more dominant firms with substantial reserves and stable earnings have higher debt capacities. As such intra industry dispersions in capital structure are bound to exist especially among the small/midsized companies and benchmarking their financing mix against the industry average is not always optimal.

The study also found that for the five-year period trailing to 2011 Afren has used debt financing more aggressively than its peer companies and based on 2011 financial information the company's cost of equity, debt and capital are estimated at 14.7%, 9.2% and 12.3%; significantly higher than the peer average of 10.7%, 6.4% and 10% respectively. The results under a base case of 30% tax rate assumption shows that subject to the company's current earnings, its debt capacity is weakened beyond a 40% leverage ratio; the company can reduce its cost of debt and overall cost of capital by deleveraging. Also, if the company projects greater future investment opportunities than it currently has, a case is made for deleveraging in other to preserve financial flexibility and enhance its future borrowing capacity. In conclusion, it should be noted that that subjective judgments made by management in Afren and the comparative companies will cause real life estimates of cost of capital parameters used in project valuations to differ from the results given here.

WAY FORWARD

The optimal capital structure was modelled at a corporate level based on the Nigerian tax system where the bulk of Afren's revenue is generated. As the company's assets in other countries start production, tax systems/codes in different jurisdictions will bring more complexities such that modelling capital structure at a corporate level will be difficult. We suggest further research into incorporating different tax effects on a firm's optimal financing decision at the corporate level.

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APPENDICES

Appendix I: Interest coverage ratios, synthetic ratings and credit default spread on traded bonds

Base spreads			
If interest coverage is greater than	≤ to	Synthetic Rating	Credit spread
-100000	0.499999	D	12%
0.5	0.799999	C	10.5%
0.8	1.249999	CC	10%
1.25	1.499999	CCC	9.25%
1.5	1.999999	B-	9%
2	2.499999	B	7.75%
2.5	2.999999	B+	6.75%
3.0	3.499999	BB	5.50%
3.5	3.999999	BB+	4%
4.0	4.499999	BBB	2.5%
4.5	5.999999	A-	1.65%
6.0	7.499999	A	1.4%
7.5	9.499999	A+	1.3%
9.5	12.499999	AA	1.15%
12.5	100000	AAA	0.7%

Source: Damodaran 2012

Appendix II: Credit spread scenarios

Credit Spread Scenarios		
50 basis point constant increase	50 basis point constant decrease	50 basis point incremental
12.50%	11.50%	15.50%
11.30%	10.30%	14.30%
10.50%	9.50%	13.50%
9.75%	8.75%	12.75%
9.50%	8.50%	12.00%
8.25%	7.25%	10.75%
7.25%	6.25%	9.75%
6.00%	5.00%	8.00%
4.50%	3.50%	6.50%
3.00%	2.00%	4.50%
2.15%	1.15%	3.15%
1.90%	0.90%	2.90%
1.80%	0.80%	2.80%
1.65%	0.65%	2.15%
1.20%	0.20%	1.20%

Source: Damodaran 2012 and author's assumptions