IS THERE AN OPTIMAL CAPITAL STRUCTURE IN THE UK TELECOMMUNICATION INDUSTRY?

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ABSTRACT

This research paper deals with questions concerning the corporate capital structure. How firms make their capital structure decisions has been one of the most extensively researched areas in corporate finance. Three core research questions have been raised in this paper and research was conducted on the UK telecom industry. First question deals with the characteristics of capital structure in the telecommunication industry, the next question examines any existing relationship between gearing and profitability and finally, it concludes with answering the question regarding the existence of optimal capital structure in this industry. The analysis shows that the companies in this particular industry are not highly leveraged and they also face high business risk. It also reveals that there is no feasible relationship between the gearing level and industry profitability. However, the third research question examines the optimal capital structure of the telecommunication industry and concludes that instead of an optimal capital structure point, companies try to operate in a range that places them near what they believe to be the optimal capital structure.

Key Words: *Capital Structure, Optimal Capital Structure, Corporate Finance, UK Telecommunication Industry, Cost of Capital*

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1. INTRODUCTION

How firms make their capital structure decisions has been one of the most extensively researched areas in corporate finance. Modigliani and Miller (1958) analyzed the conditions under which the value of the firm is independent of its capital structure. The theories of capital structure are among the most elegant and sophisticated in the field of finance. Much of these capital structure theories have involved examining how relevant the model is to more realistic assumptions. For example, theories such as trade off theory relies on traditional factors such as tax advantage and potential bankruptcy cost of debt while others use the asymmetric information or game theory in which debt or equity is used as a signaling mechanism or strategy tool. Many of these theories have also been empirically tested. However, the practical applications of these theories are less than fully satisfying. No exact formula is available for evaluating the optimal capital structure. If capital structure can affect firm value, the natural question arises; can firms identify an optimal capital structure, that is, a structure that maximizes firm value? It seems that there might be an optimal capital structure for each individual firm which is very appealing indeed, and that a company's profitability depends on what capital structure it has to a large extent. This creates incentives for companies to revise their current capital structure.

2. PROBLEM AND PURPOSE

The purpose is to solve the research questions stated below. It concerns the practical matter of deciding the appropriate capital structure and the possibility of improvements.

- What are the characteristics of capital structure in the UK telecommunication industry?
- Is there any relationship between capital structure and profitability?
- Is there an optimal capital structure in the telecommunication industry?

"How does a practitioner use the theory to determine optimal capital structure?" – The answer to this question is the Holy Grail of corporate finance (Copeland et al, 2005). It would be therefore very motivating to analyze and evaluate how the companies determine their capital structure. This paper also deals with how the companies can improve their capital structure and operate close to the optimal level.

3. LITERATURE REVIEW

3.1 M&M model I with no taxes

In the world of perfect capital market,

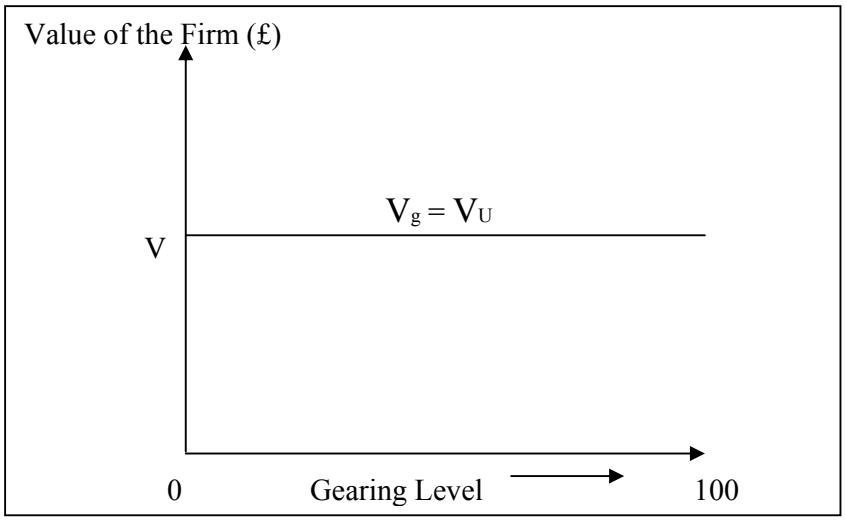
$$Vg = Vu \qquad \text{(Eq. 1)}$$

Vg = Value of geared firm

Vu = Value of ungeared firm

This model is called the M&M (Modigliani and Miller) proposition I, where the value of the ungeared firm is the same as the value of the geared firm. This means that the total value of any firm is independent of its capital structure (Modigliani and Miller, 1958).

Figure 1: M&M Proposition I with no taxes



Source: Copeland & Weston (1992)

The above figure suggests that the market value of any firm is independent of its capital structure, i.e. whatever the gearing level is adopted by the firm, it does not affect the firm value.

3.2 M&M model II with no taxes

An implication of the M&M theory I is that the rate of returns required by shareholders increases linearly as the debt-to-equity ratio increased, as seen in equation 2.

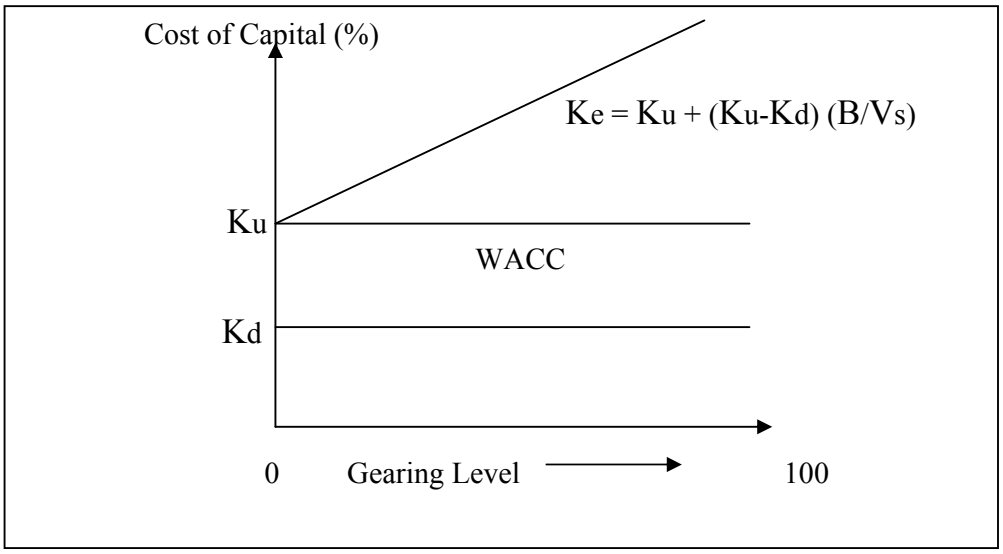
$$Ke = Ku + (Ku-Kd)\ (B/Vs) \qquad \text{(Eq. 2)}$$

Ke represents the cost of equity to the geared firm, Ku is the cost of equity to the ungeared firm, Kd is the interest rate on the debt, B is the amount of debt financing, Vs is the amount of equity financing. The important point to observe in equation 2 is that a risk premium is associated with the cost of equity financing when leverage is involved (Block et al., 2003). M&M thus say a firm cannot reduce the cost of capital or increase the valuation of the firm

because any benefits from cheaper debt are offset by the increased cost of equity financing. That is:

$$Ke = Ku + \text{Risk premium}$$

Figure 2: M&M Proposition II with no taxes



Source: Copeland & Weston (1992)

Figure 2 shows that as the firm raises its debt-equity ratio, the increase in gearing raises the risk of the equity and therefore the required return or cost of equity. It also shows that the WACC does not depend on the debt-equity ratio.

3.3 M&M proposition I with Corporate taxes

As is true of many economic models, M&M made a number of assumptions in their initial theory of cost of capital that tended to simplify the analysis. The most critical simplifying assumption was to ignore the impact of corporate taxes on the cost of capital to the firm. Once M&M began to consider the effect of taxes (1963), their whole outlook changed. Because, interest on debt is a tax-deductible expense, the tax effect greatly reduces the cost of debt and the associated cost of capital. Furthermore, with a reduced cost of capital, there is an increased valuation for the firm (Block et al, 2003). In other words, a geared company pays less tax than an all-equity company does. Thus, the sum of debt plus equity is greater for the geared firm.

The value of the geared firm is equal to the value of an ungeared firm plus the present value of the tax shield provided by debt, as seen in equation 3.

$$Vg = V_U + TB \qquad \text{(Eq. 3)}$$

Where "T" is the corporate tax rate

When the assumption of no taxes is relaxed, the market value of the company increases by taking on more risk-free debt. Consequently the company should take on 100% debt to optimize company value. This is the M&M theory I with taxes (Modigliani & Miller, 1963).

3.4 M&M proposition II with corporate taxes

Once corporate taxes are introduced, it is assumed that every increment of debt reduces the cost of capital, eventually down to the cost of debt itself. Furthermore, the more debt a firm has, the higher its valuation. However, the only constraint to this proposition is that the amount of debt cannot exceed the amount of assets (Block et al, 2003).

The rate of return required by the shareholders increases linearly as the debt equity ratio increased (as adjusted for tax).

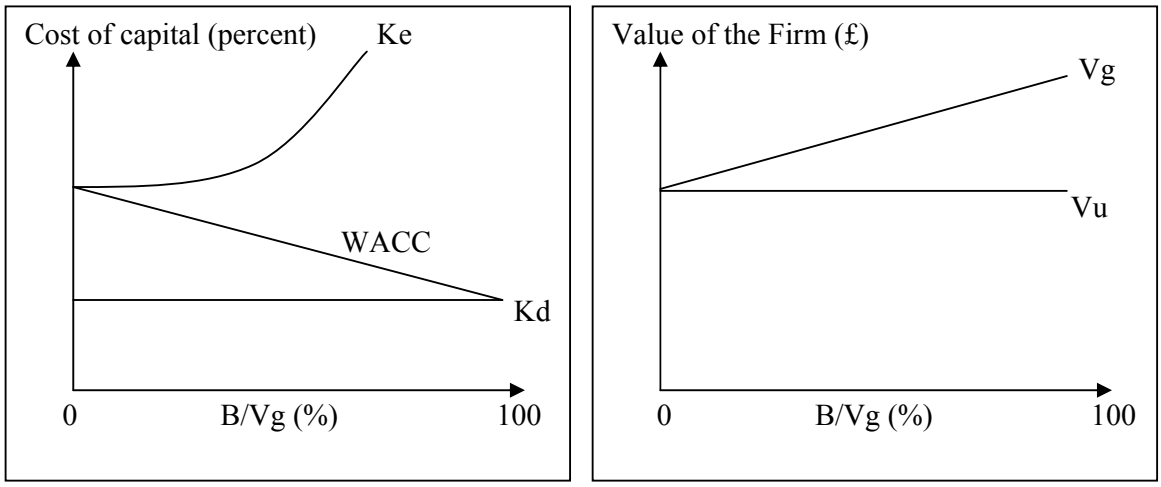
$$Ke = Ku + (Ku-Kd)(1-T)(B/Vs) \quad \text{(Eq. 4)}$$

The new WACC equation including taxes is as follows:

$$WACC = \frac{D}{D+E} * Ke + \frac{D}{D+E} * Kd\,(1-T)$$

Under the MM model II, every firm should be 100 percent financed by debt to lower its cost of capital and increase its valuation (Copeland & Weston, 1992). Figure 3 shows that a higher leverage level provides the firm with a lower WACC when corporate taxes exist.

Figure 3: M&M Proposition II with taxes



Source: Block et al, 2003

The M&M propositions have created a starting point for capital structure theory and today there are mainly three models that have made it into the mainstream of corporate finance. Out

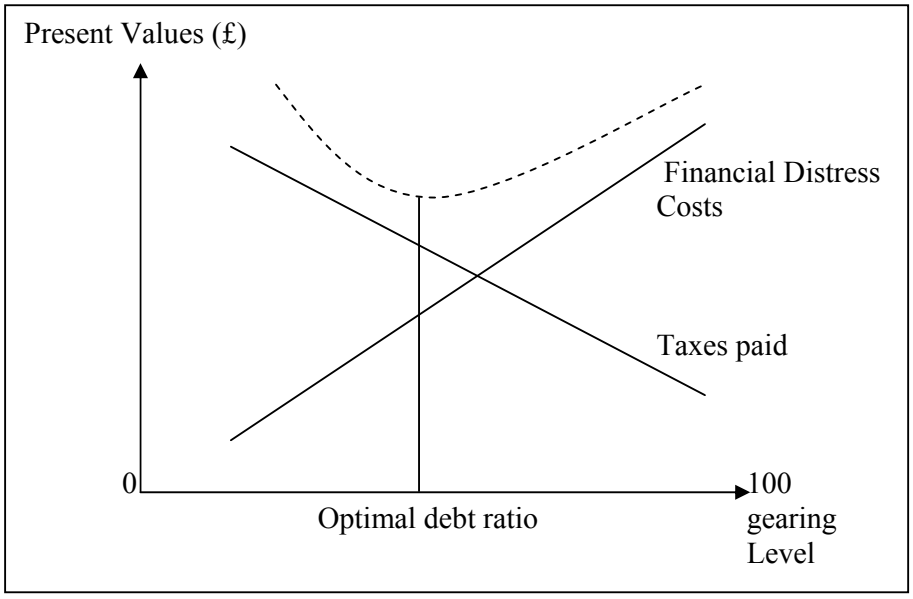
of these models it is only the Trade-off Model that provides an actual formula for calculating the optimal capital structure.

3.5 The Trade-off Model

According to Modigliani & Miller (1963), firms would prefer to be 100% debt financed, to take full advantage of the tax shield. The tax advantage of debt financing is really apparent. Allowing firms to deduct interest payments on debt and therefore reduces the amount of the firm's earnings paid in taxes, thereby making more earnings available for bondholders and shareholders. The deductibility of interest means the cost of debt is subsidized by taxpayers.

One popular perspective on selecting an appropriate debt level views the decision as a trade-off between the just noted tax advantages of debt financing and various costs a company incurs when it uses too much debt. Collectively, these costs are known as the costs of financial distress (Higgins, 2004). According to this view, the tax benefit of debt financing is the major aspect at low debt levels, but as debt increases, the costs of financial distress outweigh the tax advantages. The appropriate debt level, then, involves a judicious balancing of these costs and benefits. The costs of financial distress are more difficult to measure than the benefits of increased interest tax shields, but they are no less important to financing decisions.

Figure 4: Optimal capital structure as a trade off between the interest tax shield and business disruption costs.



Source: Copeland et al (2005)

Figure 4 illustrates how an optimal capital structure results. The present value of business disruption costs rises when the debt to total capital ratio increases. At the same time, the present value of the interest tax shields decline as a function of the debt to total capital ratio. When the sum of these two costs is minimized, it results the optimal capital structure for the firm.

The empirical implications of equilibrium theories of capital structure are relatively few. As the availability of substitute non debt tax shields increases, then the value of interest tax shields should decrease, and as business disruption becomes more expensive or more likely (due to the volatility of cash flows), the firm is predicted to carry less debt (Copeland et al, 2005).

4. EMPIRICAL EVIDENCE CONCERNING CAPITAL STRUCTURE

Empirical evidence concerning capital structure is presented below which have been found through different cross-sectional studies. The cross-sectional studies try to explain observed financial leverage as a function of the firm's tax rate, type of asset, profitability, etc. It is important to recognize these patterns since there could be a reason why similar companies have positioned themselves at similar capital structures. Time series studies also show whether capital structure has an impact on firm value, through announcement effects on stock price (Eriksson & Hede, 1999).

4.1 Cross-Sectional Studies

Modigliani and Miller (1958) used the cross-section equations on data taken from 43 electric utilities during 1947-1948 and 42 oil companies during 1953. They ran regression between the weighted average cost of capital and the financial leverage. Their results show that the cost of capital is not affected by capital structure and therefore there is no gain to leverage. However, Weston (1963) criticizes the Modigliani – Miller results. First, the oil industry is not even approximately homogeneous to business risk and the assumption of the perpetual cash flow in the cost of capital valuation model was not appropriate. Weston added the growth with the valuation model and found WACC decreases with leverage, Weston's results are consistent with the existence of a gain to leverage, i.e., the tax shield on debt has value. In 1966, Miller and Modigliani also found results consistent with the result of Weston. They have found that the value of firm is attributed to the following sources:

- Value of assets in place
- Tax subsidy on debt
- Growth potential

- Size of firm

Empirical evidence indicates that the tax subsidy (i.e., the gain from leverage) on debt does contribute a significant amount to the value of the firm, about 26% on average. This is consistent with the notion that the firm's WACC falls as leverage increases (Copeland et al, 2005).

Cordes and Sheffrin (1983) examined the cross sectional differences in effective tax rates and found significant difference across industries, with the highest effective rate for tobacco manufacturing (45%) and the lowest rate (16%) for transportation and agriculture. This tends to support the DeAngelo-Masulis (1980) contention that the gain from leverage induced tax shields can be positive.

Cross-sectional work has been done by Bradley, Jarrell, and Kim (1984), Long and Malitz (1985), and Titman and Wessels (1988). Bradley, Jarrell and Kim regressed leverage against (1) earnings volatility as a proxy for bankruptcy risk (2) the ratio of depreciation plus investment tax credits to earnings as a proxy for non debt tax shields, and (3) the ratio of advertising plus research and development expenditures to net sales as a proxy for noncollateralized assets. They found that the first and third variables were significantly negative, supporting the importance of bankruptcy costs and collateral, but the second variable was significantly positive, seeming to be inconsistent with debt as a tax shield. Long and Malitz estimate a similar regression but add several additional variables. They obtain results similar to Bradley, Jarrell, and Kim but find non debt tax shields to be negatively related to leverage (Copeland et al, 2005).

Frank and Goyal (2003) examine the relative importance of 39 different factors in the leverage decisions of publicly traded U.S. firms. They find that leverage increases with median industry leverage, firm size, intangibles, collateral, and the top corporate income tax rate. On the other hand it decreases with bankruptcy risks, whether the firm pays dividends, market to book ratio, operating loss carry forward, profitability and interest rates. They conclude that their results are consistent with the trade-off theory and not consistent with the pecking order model or the market timing theory (Copeland et al, 2005).

Hovikimian, Opler and Titman (2001) test the hypothesis that first tends to move towards their target debt ratios when they raise or retire capital. Their tests based on the fact that the target capital structure of the firm can change with profitability and stock prices. They also find stock prices seem to play an important role in the firm's financing decisions.

Specifically, they report that high stock prices seem to result in debt repurchase and equity issuance.

Kemsley and Nissim (2002) point out a problem with cross-sectional studies that use the debt-equity ratio as a dependent variable and taxes, growth rates, and so on as independent variables. Because it cannot be easily measured, the present value of a firm's operating cash flows is left out of the multiple regression and is correlated with the debt capacity of the firm via causality that is not linked with the taxation. This is done by Graham (1996), who finds a positive relationship in a sample of 10,000 firms in the 1980-1992 time periods. He concluded that the firms with high tax rates issue more straight debt – a result that is consistent with a gain to leverage (Copeland et al, 2005).

4.2 Time series studies

In general, leverage-increasing exchange offers have significant positive announcement effects on the stock price. This has been found by comparing the two-day announcement effects for a wide variety of corporate events. Leverage-decreasing events, such as exchanging debt for common stock, have been shown to have significant negative effect on the stock price. Evidence by Masulis & Korwar (1986), Asquith & Mullins (1986), Kolodny & Suhler (1985), and Mikkelson & Partch (1986) indicates that issues of seasoned equity are interpreted as bad news by the marketplace, with significantly negative announcement date effects on equity prices. This result is consistent with the Myers & Majluf (1984) pecking order hypothesis of capital structure. Firms will use equity only as a last resort where stock repurchases are at the opposite end of the spectrum. An increase in leverage is interpreted as favorable signals about the future prospects (Copeland & Weston, 1992). It can be concluded that all leverage-decreasing events have negative announcement effects, and all leverage-increasing events have positive announcement effects. Consequently, capital structure affects the value of the firm.

By taking all of the above factors into consideration a decision regarding capital structure can be made when evaluating the telecommunication industry.

4.3 Optimal capital structure

Optimal capital structure refers to the particular combination that minimizes the cost of capital while maximizing the stock price. As Brigham explained, "The optimal capital structure is the one that strikes a balance between risk and return and thereby maximizes the price of the stock and simultaneously minimizes the cost of capital." It is known that the value of the firm is maximized when the cost of capital is minimized. By using a

modification of the simple perpetuity, the value of the firm can be defined by the following equation:

$$V = \frac{EBIT \times (1 - T)}{WACC} \qquad \text{(Eq. 5)}$$

Where,

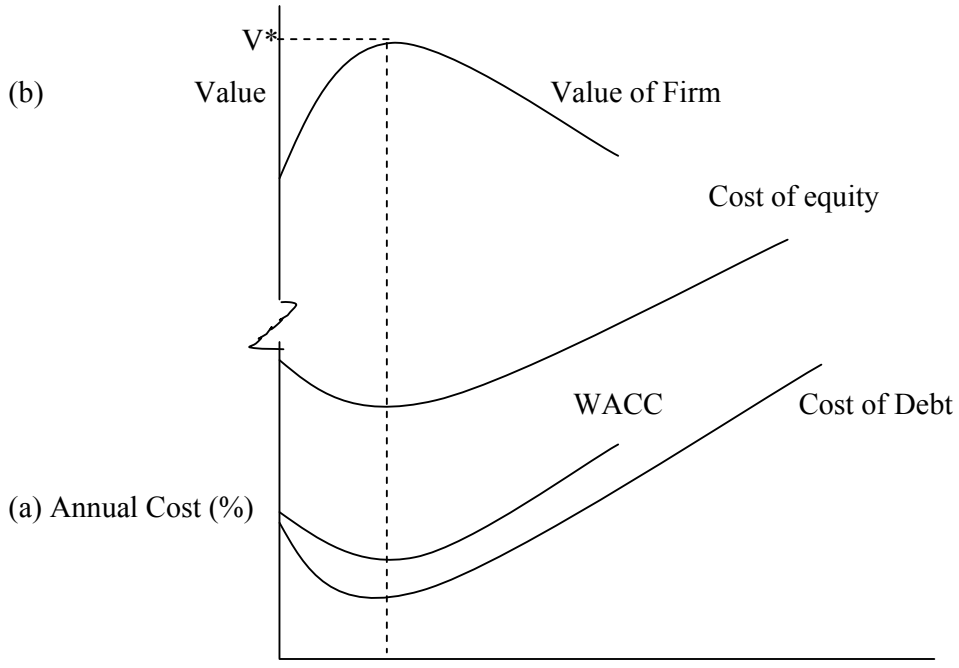
EBIT = Earnings before interest and taxes

T = Tax rate

WACC = Weighted Average Cost of Capital

Clearly, if the EBIT is assumed as constant, the value of the firm,V is maximised by minimizing the weighted average cost of capital, WACC. Because the maximization of value,V, is achieved when the overall cost of capital,WACC, is at a minimum, the optimal capital structure is therefore that at which the weighted average cost of capital, WACC, is minimized. Generally, the lower the firm's weighted average cost of capital, the greater the difference between the return on a project and this cost, and therefore the greater the owners' return. Minimizing the weighted average cost of capital allows management to undertake a larger number of profitable projects, thereby further increasing the value of the firm (Gitman & Hennessey, 2004).

Figure 5: Cost Functions and Value: Capital costs and the optimal capital structure



M* = Optimal capital structure Gearing Level ⟶

Source: (Gitman & Hennessey, 2004)

Figure 5(a) plots three costs functions – the after tax cost of debt, the cost of equity, and WACC – as a function of financial leverage measured by the gearing ratio (Debt to total equity). The cost of debt remains low due to the tax shield but slowly increases with increasing leverage to compensate lenders for increasing risk. The cost of equity is above the cost of debt and increases with increasing financial leverage, but generally increases more rapidly than the cost of debt. The increase in the cost of equity occures because the shareholders require a higher return as leverage increases, to compensate for the higher degree of financial risk. WACC results from a weighted average of the firm's debt and equity capital costs. As described earlier that initially, the WACC declines in relation with the increase in the debt level while after one stage it gradually increases with the increased gearing level. This behaviour results in a U-shaped weighted average cost of capital function.

Figure 5(b) plots the value of the firm resulting from substitution of WACC in Figure 5(a) for various levels of fiancial gearing into equation 5. As shown in figure 5(b), at the optimal capital structure, point M, the value of the firm is maximized at V*(Gitman & Hennessey, 2004).

5. RESEARCH METHODOLOGY:

"Method Triangulation" approach has been applied to this research in order to test the hypotheses. The propositions are tested by using appropriate research methodologies for both the Positivistic and phenomenological research approaches (e.g. cross-sectional studies and case studies) and, depending on the results of the tests, the hypotheses or results are either accepted or rejected. This type of research is also referred to as "deductive" in a sense that, from the general situation, inferences can be made about a specific example. In other words, it starts with capital structure theories that apply in every case and the data collected will either support or reject the theory. The rationale behind the applied positivistic research approach is that the results are given numerical values and mathematical and statistical (e.g. Ratio analysis, regression analysis) tools will be used to help evaluate the results.

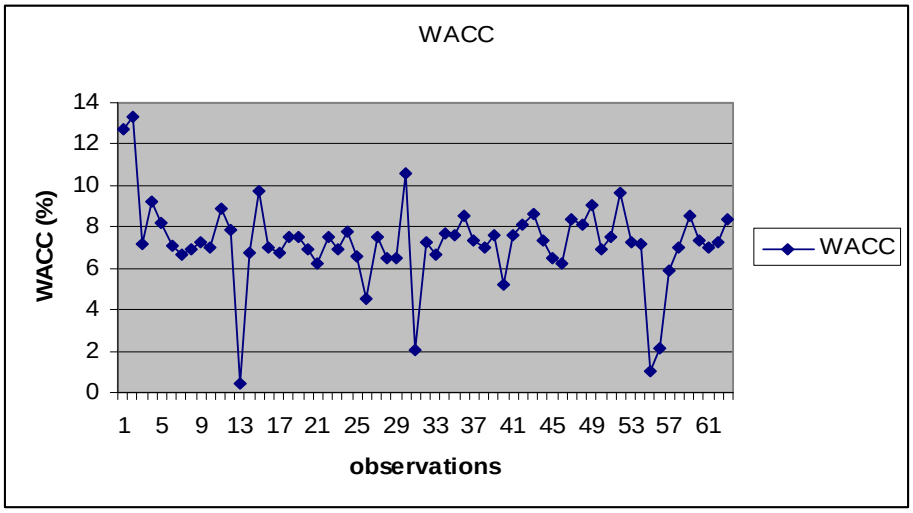
To be able to examine these kinds of questions, the UK telecommunication industry have been selected and analyzed comprehensively for this research. Nine companies in this industry have been analyzed as a case by case to avoid the errors and misinterpretations and it will also allow identifying and evaluating the possible range of gearing ratio in the telecommunication sector.

6. ANALYSIS, TESTS AND RESULTS

In order to point out any feasible relationship between profitability and gearing, return on capital employed (ROCE) and return on equity (ROE) has been calculated for all the companies in the telecommunication industry and regressed against the market value of debt-to-equity ratio. However, the tests failed to indicate any existing relationship between these variables as the p-value of all the regression output is above 0.05% (see appendix IV). These results are consistent with the linear structural modeling employed by Titman and Wessels (1988) where they showed that profitability were significantly negatively related to leverage. The output of this test also supports the Myers-Majluf (1984) pecking order theory where they argued that more profitable firms tend to use less external financing.

The third research question tries to identify any optimal capital structure in the telecommunication industry. To examine this question, market value gearing of all the companies are regressed with the respective firm's WACC. However, this analysis also fails to provide any existence of the optimal capital structure in the telecommunication industry. However, when all the firms' WACC is plotted in the following figure, it can be observed that all the companies in this particular industry operate in a range of 6 percent to 8 percent WACC level.

Figure 6: Telecommunication industry WACC level



This conclusion supports the concepts of Gitman & Hennessey (2004), where they have stated that firms generally try to operate in a range that places them near what they believe to be the optimal capital structure. In addition to that, as the optimal capital structure is dynamic, so companies try to adjust their capital structure and that's the reason for which we have observed a fluctuations in the WACC level in the diagram. This is also consistent with

the conclusion drawn by Gitman & Hennessey (2004) where they suggested that for a particular year, a company may raise required financing using reinvested profits which will change the company's capital structure. And again the company may raise financing using reinvested profits and new debt financing which will again lead to change the capital structure. However, as long as the WACC level remains within a range of 6 percent to 8 percent optimal point, a company in this particular industry, in reality, will be viewed to operating at the optimal capital structure and will minimize their cost of capital structure.

To conclude this section, it can be argued that different capital structure theories apply to firms under different circumstances. .There is no universal theory of capital structure. There are useful theories, however, from where the practitioners can make important capital structure decision. One factor could be dominant for some companies while the other factors might be very important for other companies (Myers, 2002).

7. CONCLUSION

It is possible to draw several important conclusions based on the analysis, tests and results. In regards to the first research question where the characteristics of telecommunication industry capital structure are evaluated, it has been observed that the average industry gearing level is 21.80%. In addition to that, as the average gearing level of telecommunication industry is lower compare to other industry, it can be assumed that the firms operating under this industry face high business risk.

The second research question tries to examine any existing relationship between the gearing and profitability in this industry. Almost all the results fail to show any existing relationship between these two variables. We can certainly decline the hypothesis of any clearly existing relationship of gearing level and profitability in the telecommunication industry and can conclude that gearing level does not affect the industry profitability only by itself. However, if the profitability is explained by the term "Return on Capital Employed", only in that case, we can observe a slight similarity in the trend where the gearing and profitability both stayed steady over the past several years.

In order to assess the third research question in regards to the optimal capital structure in the telecommunication industry, a regression test between WACC and market value gearing has been carried out. However, the test also failed to indicate any existing and apparent relationship between WACC and the gearing level in this industry. Furthermore, all the company's WACC are plotted in a graph where it clearly shows that there is no single

optimal capital structure for the entire industry. Apparently it reveals that the telecommunication companies operate within a range of 6 percent to 8 percent WACC level. With these results in mind, it can be concluded that there is no formula which can establish an optimum debt-equity ratios for all the companies in the telecommunication industry. However, there is evidence that firms behave as if they had target debt-equity ratios as all the companies in this particular industry try to maintain and operate within a range of 6 percent 8 percent WACC level. In the real world, practitioners do not follow or apply the existing theories in the capital structure decision rather they follow the industry norm. However, three important factors affecting the target debt-to-equity ratio need to be considered while making the capital structure choice are: taxes, types of assets and uncertainty of operating income.

As a practical matter, there is no way to calculate exact optimal capital structure and all the existing theories are inapplicable in practice. This is due to the fact that the models failed to take many important factors into account, e.g., profitability, tangibility of assets and growth, etc. Currently, the best theoretical model calculating an optimal capital structure is the trade-off model, but as Myers & Majluf (1984) stated, there are several factors that the trade-off model cannot explain. So, there is a scope to develop a model that is much better than the existing ones and there is certainly a scope for the researchers to come up with empirically validated theories.

APPENDICES

APPENDIX I

BT Group

Immarsat Plc

	2010	2009	2008	2007	2006
Gearing Ratio(Market Value) %	7.60	11.66	58.20	19.22	5.02
Return on Equity (ROE) %	1.75	1.59	(9.74)	(14.41)	(46.78)
WACC (%)	8.60	7.36	6.49	6.20	8.35

	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
Gearing Ratio(Market Value) %	30.00	31.60	44.88	49.87	41.69	42.09	9.16	6.95	11.85	12.50
Return on Equity (ROE) %	9.78	10.39	9.23	19.94	4.48	5.33	3.85	6.62	5.97	11.13
WACC (%)	12.70	13.30	7.13	9.25	8.16	7.07	6.63	6.89	7.29	7.04

	2010	2009	2008	2007	2006	2005
Gearing Ratio(Market Value) %	39.28	63.79	97.66	14.87	9.22	21.95
Return on Equity (ROE) %	4.58	1.84	39.87	21.53	6.63	8.82
WACC (%)	8.84	7.82	0.39	6.74	9.72	7.04

	2010	2009	2008	2007	2006	2005	2004
Gearing Ratio(Market Value)%	27.60	19.83	1.33	3.38	0.4537	4.77	0.01
Return on Equity (ROE)%	11.84	(23.12)	(0.59)	(5.04)	(9.57)	(1.48)	0.20
WACC (%)	8.13	9.02	6.90	7.53	9.66	7.27	7.14

	2010	2009	2008	2007	2006	2005
Gearing Ratio(Market Value) %	20.42	21.07	22.47	30.97	27.17	7.55
Return on Equity (ROE) %	3.4	12.56	(7.02)	(39.31)	(80.82)	(10.35)
WACC (%)	7.37	6.99	7.56	5.18	7.64	8.10

	2010	2009	2008	2007	2006	2005	2004	2003
Gearing Ratio(Market Value) %	25.26	11.01	11.47	13.52	11.54	7.01	6.32	3.13
Return on Equity (ROE) %	(19.99)	5.08	8.19	(10.41)	(15.59)	(6.38)	0.70	1.87
WACC (%)	6.76	7.55	7.50	6.92	6.22	7.55	6.92	7.74

	2010	2009	2008	2007	2006	2005	2004
Gearing Ratio(Market Value) %	31.17	39.14	28.13	47.08	24.05	89.84	90.00
Return on Equity (ROE) %	(22.29)	5.05	(45.87)	(19.06)	9.98	(2.33)	0.28
WACC (%)	6.54	4.54	7.49	6.53	6.53	10.57	2.06

Cable & Wireless

O2

Vodafone

Kingston Communication

Vanco Plc

	2010	2009	2008	2007	2006
Gearing Ratio(Market Value) %	7.12	11.98	8.6	0.146	7.72
Return on Equity (ROE) %	2.4	3.48	1.65	(3.36)	2.84
WACC (%)	7.25	6.67	7.68	7.63	8.50

THUS Group

Colt Telecom

APPENDIX II

Industry Average

Gearing Ratio(Book Value)	43.43%
Gearing Ratio(Market Value)	21.80%
Return on Equity (ROE)	0.93%
WACC	7.93%

	2010	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**
Gearing Ratio(Market Value)%	14.81	8.75	8.37	8.27	11.39	12.03	5.80	6.44	7.26
Return on Equity (ROE)%	5.25	5.65	2.73	1.44	(11.27)	(4.17)	(1.18)	(2.74)	3.34
WACC (%)	1.00	2.10	5.90	7.00	8.55	7.38	7.00	7.29	8.33

APPENDIX III

To calculate the WACC, the following equation has been used (Copeland & Weston, 1992).

$$WACC = \frac{D}{D+E} * Ke + \frac{D}{D+E} * Kd\,(1-T)$$

Where,

D = debt

E = equity

T = tax rate

Ke = required return on equity

Kd = required return on debt

To calculate K*e* the following equation is used (Copeland & Weston, 1992) which is also known as Capital Asset Pricing Model (CAPM).

$Ke = Rf + (Rm – Rf) * \beta$

Where,

Rf = risk free interest rate (10 years UK bond yields, 4.52%)

Rm = return of the market (last 20 years' monthly FTSE 100 return)

Market values have been used when calculating WACC for all the nine companies in this industry.

APPENDIX IV

Regression Analysis I: Regression between Market Gearing and Return on Equity (ROE)

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.160744
R Square	0.025839
Adjusted R Square	0.009869
Standard Error	17.46375
Observations	63

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	493.452	493.452	1.617969	0.208203
Residual	61	18603.93	304.9824		
Total	62	19097.38			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-2.53507	3.127185	-0.81066	0.420715	-8.78827	3.718122	-8.78827	3.718122
X Variable1	0.12966	0.101934	1.271994	0.208203	-0.07417	0.333489	-0.07417	0.333489

Regression Analysis II: Regression between Market Gearing and Return on Capital Employed (ROCE)

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.034249
R Square	0.001173
Adjusted R Square	-0.0152
Standard Error	36.6389
Observations	63

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	96.16562	96.16562	0.071637	0.789872
Residual	61	81886.97	1342.409		
Total	62	81983.13			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-3.47993	6.560828	-0.53041	0.597753	-16.5991	9.639258	-16.5991	9.639258
X Variable 1	-0.05724	0.213858	-0.26765	0.789872	-0.48487	0.370396	-0.48487	0.370396

APPENDIX V

Regression Analysis I: Regression between Market Gearing and WACC

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.203059
R Square	0.041233
Adjusted R Square	0.025515
Standard Error	2.058306
Observations	63

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	11.11427	11.11427	2.623379	0.110459
Residual	61	258.4341	4.236625		
Total	62	269.5484			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	7.649617	0.368575	20.75456	2.45E-29	6.912605	8.386629	6.912605	8.386629
Gearing(MV)	-0.01946	0.012014	-1.61968	0.110459	-0.04348	0.004565	-0.04348	0.004565

APPENDIX VI

Market Value of the companies (£ million)

	2006	**2005**	**2004**	**2003**	**2002**	**2001**	**2000**	**1999**	**1998**	**1997**
BT Group	26692	25608	27685	26983	38965	44607	58426	48738	32822	21562
Immarsat Plc		10494	2860.5	1460	895	1025	898			
Vodafone	115349	119766	113076	101772	113700	160267	100817			
Kingston Communication	446	488	359	240	449	444	201			
Vanco Plc	337	192	186	68.44	64.76					
Cable & Wireless	3139	30802	3894	2328	8035	31313				
O2		18560	11794	2493	7301	7942				
THUS Group	308	232	4280	1211	1102	3957	30033			
Colt Telecom	12320	11219	12859	13925	13845	14688	24351	11103.5	8033	

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