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The Determinants of the Cost of Capital by Industry within an Emerging Economy: Evidence from Egypt

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ABSTRACT

Although many studies have been undertaken on the cost of capital, insufficient attention has been paid to the factors that drive the cost of capital in the emerging markets, in particular the Middle East region. Here, an analysis is undertaken of the cost of capital in Egypt, based on a sample of 119 companies. A number of models are used to measure the cost of equity and in turn the overall cost of capital, which is calculated on the basis of both book and market values. Broadly speaking the cost of equity is around 12.5 per cent and the overall cost of capital roughly around 12 per cent.

Step-wise multiple regressions are used to find the underlying determinants. Generally, growth and size are particularly important. Also, for actively traded companies and for heavy industries, in particular, financial and business risks are significant factors. For the contracting and real estate sector, which has a higher cost of capital, fixed asset backing is another key variable. In the food sector, liquidity is one of the important determinants. Finally, a satisfactory model was not found to explain the cost of capital in the service sector.

JEL: G35, N25

Keywords: Cost of capital; Equity; Debt; Leverage; Stock market; Egypt

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I. INTRODUCTION

The cost of capital has been a popular issue in corporate finance, yet little is known about the cost of capital on a broader menu of emerging markets (Barry *et al*, 1998). Since most of the emerging markets were established recently, i.e. in the past couple of decades, the data series of companies listed in these markets seem to be short and this might explain the scarcity of such studies in emerging markets. However, emerging markets in the Asian and Latin American regions have enjoyed a long history compared with other places, in turn some work on the cost of capital has already been performed. At the other extreme, the Middle East region has not attracted comprehensive work on the stock markets because most of these countries embarked on economic reform programmes only in the recent decades, which have enabled them to establish or resurrect their stock markets (Omran, 1999). This paper empirically investigates the cost of capital in Egypt, as Egypt can be considered as one of the most promising financial centres in this region.

Using a sample size of 119 Egyptian companies, the results indicate that the cost of equity is around 12.5 per cent and the overall cost of capital roughly around 12 per cent. As for the determinants, growth and size are found to be particularly important. Financial and business risks are significant factors for actively traded companies and for heavy industries. For the contracting and real estate sector, which has a higher cost of capital, fixed asset backing is another key variable. In the food sector, liquidity is one of the important determinants. Finally, a satisfactory model was not found to explain the cost of capital in the service sector.

The rest of the paper is organised as follows: Section II deals with the background concerning Egypt's stock market, followed by Section III which highlights some empirical studies concerning the variables that have been found to affect the cost of capital for companies. The methodology and data are given in Section IV, covering specifications of the empirical models. The empirical findings in Section V constitute the main thrust of the paper, utilising ANOVA and step-wise multiple regressions. Finally, the summary and concluding remarks are contained in Section VI.

II. BACKGROUND

The stock market activity in Egypt goes back as far as 1881. Alexandria stock exchange was the fifth established in the world after those of Inverness (1536), Amsterdam (1608), London (1666), and Paris (1808). Cairo stock exchange was later established in 1903 (Capital Market Authority, 1996a).

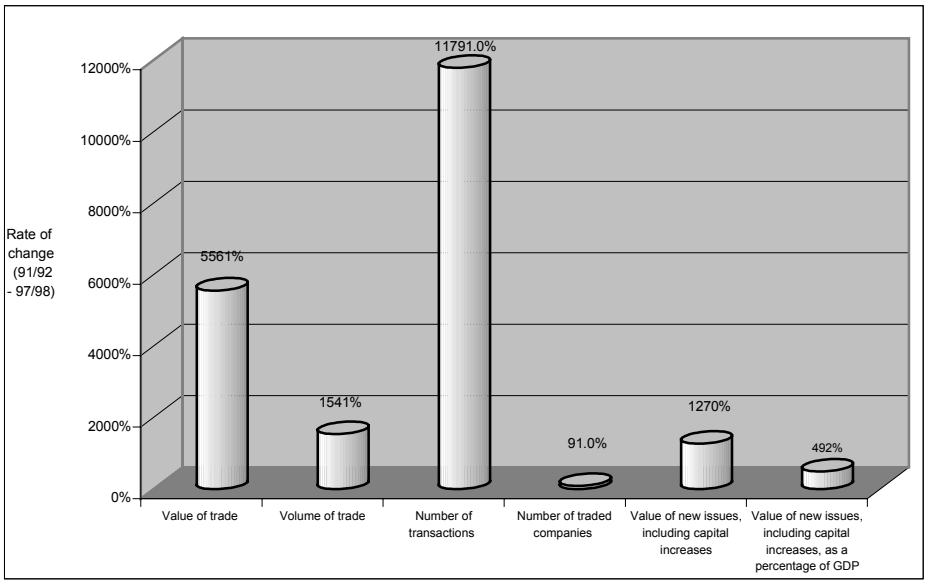
However, a significant change affected the stock market in Egypt in the late 1950s, as this period witnessed the start of massive and successive waves of nationalization that had radically changed the structure of the economy and this in turn had a devastating effect upon the stock market. The stock exchanges collapsed and the primary market became rudimentary. Until the 1970s the market remained fairly inactive. But then reforms were implemented to reactivate the private sector and aimed to attract foreign investment and mobilize domestic investment as well. But the bias in the tax code against investment in securities, structural deficiencies and practices, the

absence of a governing securities law, the inadequacy of accounting, auditing and financial disclosure, and the lack of protection to small investors made the role of the stock exchange remain minimal during this period (Capital Market Authority, 1996b).

Since the early years of this decade, Egypt has witnessed major and radical changes in its economic climate. These changes were due to the debt-rescheduling scheme with the International Monetary Fund. The Egyptian government adopted a programme of economic reform in 1991 aimed at increasing the growth rate of the economy. This objective is not likely to be achieved without increasing the level of investment. In turn, this investment can be obtained through creating a strong stock market that is capable of attracting local and foreign investment.

An economic reform programme was initiated by the government in the early 1990's. As a result, the stock market in Egypt witnessed major changes (Omran, 1999). Figure 1 indicates this point clearly.

Figure 1
Stock market performance in Egypt between 1991/92-1997/98
1/1 – Market Activity



Source: - Capital Market Authority, Unpublished reports, (Cairo: CMA, 1998)

Figure 1 (continued)
1/2- Market Size

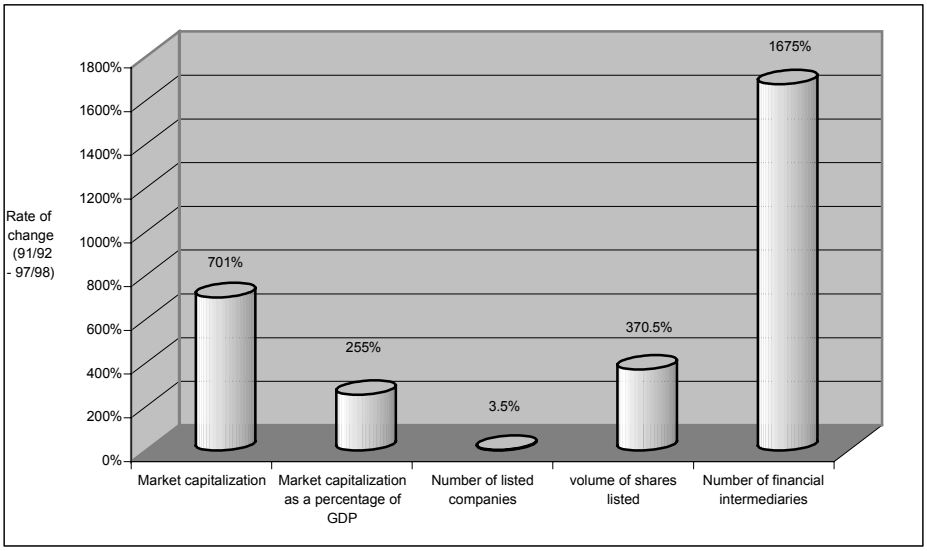
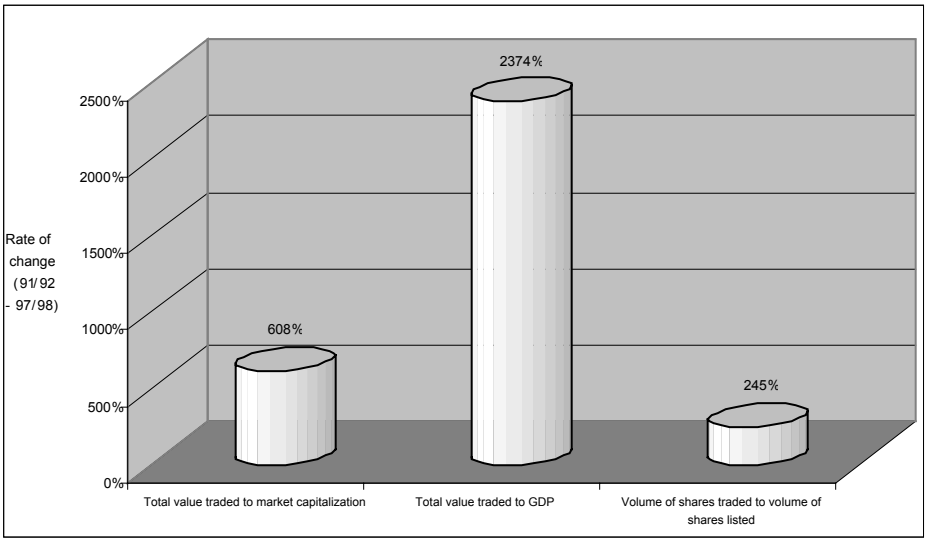
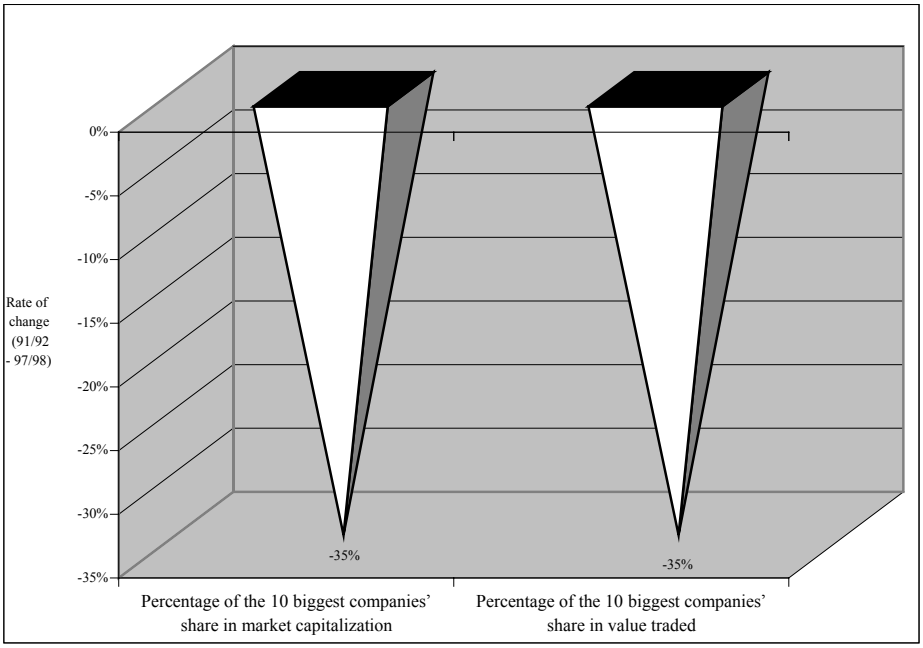


Figure1 (continued)
1/3- Market Liquidity



Source**: -** Capital Market Authority, Unpublished reports, (Cairo: CMA, 1998)

Figure1 (continued)
1/4- Market Concentration



Source: - Capital Market Authority, Unpublished reports, (Cairo: CMA, 1998)

It can be seen from Figure 1/1 that all market activity variables witnessed a dramatic change: the value of trade increased by 5,561 per cent between 91/92 and 97/98, the volume of trade increased by 1,541 per cent, the number of transactions increased by 11,791 per cent and the number of traded companies increased by 91 per cent. The value of new issues (including capital increases), and also when expressed as a percentage of GDP, increased by 1,270 per cent and 492 per cent respectively for both variables. As for market size as indicated in Figure 1/2, market capitalization increased by 701 per cent, market capitalization as a percentage of GDP increased also by 255 per cent. Meanwhile, the volume of shares listed increased by 370.5 per cent. On the other hand, it can be seen that the number of listed companies just increased by 3.5 per cent, while the number of financial intermediaries increased sharply by 1,675 per cent. In the mean-time, the market liquidity variables (Figure 1/3), also witnessed significant change. The total value traded to market capitalization increased by 608 per cent, while the total value traded to GDP increased sharply by 2,373 per cent and the volume of shared traded to the volume of shares listed increased by 245 per cent. As seen in Figure 1/4, which indicates the changes in market concentration, the percentage of the 10 biggest companies' share in market capitalization decreased by 35 per cent and the percentage of the 10 biggest companies' share in value traded also decreased by the same percentage.

III. SELECTED LITERATURE ON THE COST OF CAPITAL

At its simplest level, the cost of equity capital can be seen as comprising a dividend yield plus a capital gains component, although the former may be regarded as being more predictable than the latter. Furthermore, if capital gains are induced by retentions, then the dividend versus capital gains split may be viewed as an arbitrary division of earnings, and so an earnings yield model of the cost of equity capital may, under certain circumstances, be equivalent to a dividend growth model of the cost of equity (Karathanassis, 1983). The well-known theoretical basis of this by Miller and Modigliani (1961) follows from the assumption of perfect frictionless capital markets and ignores tax distortions. However, in practice dividends contribute more to value than earnings (Rees, 1997) and personal tax effects can be distortionary (Pointon, 1996; and Dempsey, 1997).

Growth effects can be important contributors to the cost of equity capital, especially in instances of strong brand names (e.g. Coca-Cola (Financial Times, 1998)) or a strong market position (e.g. Microsoft (Economist, 1999)). From a modelling perspective there may need to be a way of reconciling differences between dividend growth, earnings growth and asset growth (Ashton, 1995). As to earnings growth it is important not to place overemphasis on growth that may not be sustainable (Barberis, 1998; and Wadhwani, 1999). Fama and French (1998) have demonstrated that growth stocks tend to underperform compared with value stocks. Furthermore, analysts' forecasts can be over-optimistic, as evidenced by new equity offerings (Dechow *et al,* 1997). As to a sample of 42 UK analysts, Barker (1999) found that, as far as valuation models are concerned, the price-earnings ratio is preferred when analysing the services, industrials and consumer goods sectors, whereas the dividend yield is predominant in the financial and utilities sectors.

Such classifications into price-earnings and yield-valued shares were supported by regression results, revealing that retentions contribute relatively more to the value of the PE classified shares and dividends contribute more to the value of the shares which the small sample of analysts regarded as yield shares. Incidentally, for smaller US stocks, Naranjo *et al* (1998) found that the ex-ante long-run dividend yield was positively related to returns.

Krishnan and Moyer (1996) found support for Myers (1984) pecking-order hypothesis that retentions were a preferred form of finance to new equity but that debt finance is preferred to new equity. They also found size and growth to be important determinants of capital structure in several countries including the US, Germany, Japan and Italy. The link between gearing and the cost of equity, at least in terms of dividend payout ratios, has been examined by Chang and Rhee (1990) who found that the higher the payout ratio the greater the degree of US debt financing.

Firm size may also be an important key factor. Large institutional investors may not find it worthwhile to research into the performance and potential of smaller firms, since they would avoid investing too much equity in an individual firm. By contrast, their investments in larger firms would tend to push up prices and depress returns. As to emerging markets, Fama and French (1998) find that smaller stocks tend to generate higher returns than larger stocks, although their investigation did not cover Egypt.

The overall cost of capital may, of course, be affected by the capital structure of the firm. However, in a perfect, frictionless, tax-free environment the division of the net operating earnings between equity and debt should not affect total value (Modigliani and Miller, 1958). This holds within a given business risk category, of course. As to the irrelevance of taxation in a general equilibrium model, Rutterford (1988) found support for this above-mentioned proposition in her results revealing that, for several countries, tax was not a significant factor in the determination of a firm's capital structure. In a mail survey of UK and US firms Hooper (1994) also found more support for tax irrelevance than for the view that raising finance in countries with high corporate tax rates increased the value of the multinational. Nevertheless, one third of multinationals in his sample did support the value-increasing hypothesis. In another mail survey, Norton (1991) had found that key determinants of capital structure had included tax implications, as well as financial flexibility and stock market concerns. The emphasis of this study is on the cost of capital rather than capital structure *per se*. Nevertheless it is worth noting that Rajan and Zingales (1995) found the gearing was positively related to tangibility (collateral) in the US, Japan, Germany, France, Italy, the UK and Canada, positively related to size (diversified risk, although not in Germany), negatively related to the market to book ratio (perhaps since equities are issued when prices are high) and negatively related to profitability (as internal funds are preferred).

IV. METHODLOGY AND DATA

A. Empirical Models: Specifications

To achieve the objectives of the paper the cost of capital is split into component costs for equity and debt. The cost of debt is already known from market rates of interest, apart from any tax adjustment, which is determined by the corporate tax rate and whether the firm was in a tax-paying position.

The simplest model of the cost of equity that can be used as a benchmark is the inverse of the price-earnings ratio. This would normally be appropriate if: the company had constant underlying earnings that could be distributed as dividends, the equity-financed portion of any reinvestments would earn a rate of return exactly equal to the cost of equity, and all these details were communicated to shareholders and regarded as certain. This is the basis for Model 1 and is used merely as a starting point. Of course, there is no reason why earnings should be constant in the future, for companies may have growth opportunities.

This leads to Model 2. For this we took the familiar Gordon growth model (Gordon, 1962) and cast it in terms of earnings as follows:

$$k_e = d_0(1+g)/P_0 + g \quad (1)$$

$$= (e_0/P_0)(1-b)(1+g) + g \quad (2)$$

Hence:

$$k_e = (1/\text{PE ratio})[1-(e_0-d_0)/e_0](1+g) + g \quad (3)$$

where: k_e = the cost of equity capital; b = the retention ratio; d_0 = dividends per share; e_0 = earnings per share; g = the growth rate (see below), and P_0 = the current ex-div share price.

Strictly, under this formulation a constant payout ratio is assumed and hence the constant compound growth rate in dividends equals the compound growth rate in earnings. The estimate for *g* was based upon the average of the net earning's growth of the current and previous years.

Of course, predicting a growth rate is difficult. An objective and rational measure is to assume that the firm does generate a growth in earnings, but that rate is a normal rate. Such a rate can be regarded as being consistent with the rate of return on the equity financed portion of reinvested funds being equal to the cost of equity itself.

So, the third model avoids the issue of attempting to estimate separately the growth factor by assuming that earnings grow at the rate br = bk, where r is the rate of return on the equity financed portion of reinvested funds.
The earnings formulation:

$$k_e = e_1(1-b)/P_0 + br \tag{4}$$

is modified so that $r=k_e$. Hence, denoting this cost as k_e^c we have (see Appendix):

$$k_e^c = 1/[\text{PE ratio} - (e_0 - d_0)/e_0] \tag{5}$$

Even though it may be sensible to consider the Capital Asset Pricing Model, as an alternative way to derive the cost of capital this was not chosen because the betas were not publicly available through databases, such as Datastream, for Egyptian companies. However, it needs to be mentioned that, at least as far as an international capital asset pricing model is concerned, many emerging markets have very low betas, and indeed some are negative reflecting highly segmented financial markets which casts some doubt on the appropriateness of the model (see Buckley, (2000) p.480, who cites Godfrey and Espinosa, 1996; see also Harvey, 1995).

With regard to the overall cost of capital, two different versions were used. The first was based on a weighted average of debt and equity component costs according to book values of debt and equity. The second utilized market values instead. Multiple regressions were performed to explain the determinants of the cost of equity capital. From the selected literature in Section III, an initial checklist of possible independent variables are given below, together with hypothesized positive or negative relationships:

- (Reserves and retained earnings)/total investment (negative): since internal funds should avoid issue costs and reduce the cost of equity, consistent with the pecking order hypothesis (Krishnan and Moyer, 1996; Myers, 1984).
- Net Earnings' Growth (positive): since high growth should command a higher cost of equity (although paradoxically, Fama and French (1998) find that growth stocks around the world generate lower returns than value stocks);

- Net Fixed Asset Growth (positive): again since high growth should command a higher cost of equity;
- Natural Logarithm of Market Capitalisation (negative): as larger companies should have a lower cost of equity through economies of scale in raising finance, although empirically smaller firms tend to generate higher returns (see, for example, Fama and French, 1998);
- Actively Traded Dummy: a dummy variable to reflect an anticipated lower cost of equity for actively traded companies;
- Gearing (positive): to reflect the capital perspective of financial risk (total liabilities/equity) (see Chang and Rhee, 1990);
- Long term Debt/Equity (positive): a similar argument;
- Long term Debt/Total Investment (positive): again a similar argument;
- Times Interest Earned (negative): since greater coverage reduces financial risk;
- Standard Deviation of Earnings (positive): as a measure of business risk (based on five years of earnings) (see Modigliani and Miller, 1958);
- Quick Ratio (positive?): since low liquidity may constrain profitable investment, and hence it is included as an intervening variable. On the other hand, it can be argued that too much liquidity indicates an inefficient use of funds, so it is debatable whether the sign should be positive or negative;
- (Cash and Short-term Investments)/Current Liabilities (positive?): ditto;
- Fixed Assets/Total Assets (negative): since asset backing may make the business more secure and hence reduce the cost of capital.
- Tax/Net Profit Before Tax (negative): since tax reduces returns to investors and also the cost of debt may be reduced through the tax deductibility of interest (Modigliani and Miller, 1963); and
- q–ratio (positive): since a higher q value should reflect more growth opportunities and a higher cost of equity (see Krishnan and Moyer (1996), although Fama and French (1995) do not find a significant relationship between the *q* effect on earnings and its effect on returns).

Clearly, there would be too many variables if all were included in one model. Instead, step-wise regressions were performed to determine the most efficient explanation of factors governing the cost of equity capital.

In the modelling procedure it was necessary to be prepared in advance for the possible occurrence of multicollinearity. In a simple bivariate regression the correlation coefficient squared, i.e. R squared, reveals the proportion of the variation in the hypothesized independent variable that explains the variation in the hypothesized dependent variable. Hence an R square of, say, 50 per cent, would explain on 25 per cent of the dependent variable's variation. Clearly, when two hypothesized independent variables are highly correlated, say more than 50 per cent, then 25 per cent of the variation in one hypothesized independent variable is explained by the variation in the other. Normally some degree of multicollinearity exists and so there is an element of judgment as to the limit of toleration. A benchmark of an upper limit of 50 per cent

correlation, representing 25 per cent of the variation, was regarded as tolerable. However, in the event, the cross correlations did not usually approach this limit.

B. Data Set

The data were drawn from the financial information provided in *Kompass Egypt Financial Year Book 1998/99* (Fiani & Partners, 1999). This rich source of financial data displays the financial statistics of respective companies in Egypt in a consistent manner, so that selected items are on a comparable basis, following generally accepted accounting principles, where appropriate. Additionally, there are some limited data items relating to the stock market, for example, the price-earnings ratio, and market capitalization. Five years of data, until 1998, were required to determine the standard deviation of earnings. Where these were not available, companies had to be excluded, leaving 122 compares. Hence, any survivorship bias needs to be treated as a *caveat* to the results. Further outlier companies were excluded due to abnormal figures. Consequently, the final sample size was 119 companies.

V. EMPIRICAL FINDINGS

A. Analysis of Variance: Equity Cost of Capital

In Table 1, Panel A, we set out the estimates for the cost of equity capital under the three models, according to whether the shares are actively traded or not. Under Model 1 the average (mean) cost of equity is 11.28 per cent for the actively traded companies and a little higher at 14.07 per cent for the non-actively traded companies. The mean costs of equity under Model 3 are similar (11.78 and 16.36 per cent, respectively). However, the costs under Model 2 are higher and reversed (26.89 and 24.03 per cent, respectively. An ANOVA test was performed by which the variation between the two groups (active and non-active) was separated from the variation within each group. The F-ratio measures the ratio of the between-group estimate to the within-group estimate. Under Models 1 and 2, the P-Values of the F-tests exceed 0.05, so there are no statistically significant differences between the means of the actively and non-actively traded companies. However Model 3 is significant in this respect (the P-Value is only 0.0371).

The difference between the means under Model 3 is also confirmed using Fisher's least significance different test. At the 95 per cent confidence level there is no statistically significant difference between the means, so there is a 5 per cent risk of concluding that the pair of means is significantly different when the actual difference is zero. To examine the differences between the medians, the Kruskall-Wallis test is applied. For each of the three models the P-Value exceeds 0.05, so there are no statistically significant differences between the medians of the cost of equity capital of the actively and non-actively traded companies, at the 95 per cent level of confidence.

Table 1
Cost of equity in Egypt

Panel A. Cost of equity classified into actively traded and non-actively traded companies

	Model 1	Model 2	Model 3
Means (%)			
Active (A) (76 Companies)	11.28	26.89	11.78
Not Active (N) (43 Companies)	14.07	24.03	16.36
ANOVA F-Ratio	2.60	0.19	4.47**
Fisher's least significant difference test:	A-N	A-N	A-N**
Kruskall-Wallis Median Test Statistic:	0.0012	0.0072	0.0058
Cochran's C-test:	0.9141*	0.6042	0.9356*
Bartlett's test:	1.8697*	1.017	2.2229*

Panel B. Cost of equity classified by industry

	Model 1	Model 2	Model 3
Means (%)			
Food (A) (22 Companies)	14.20	16.86	15.77
Heavy Industries (B) (53 Companies)	11.05	24.44	11.63
Contracting (C) (23 Companies)	11.87	48.80	12.78
Services (D) (21 Companies)	11.78	18.68	12.89
ANOVA F-Ratio	0.82	5.71*	0.89
Fisher's least significant difference test:	A-B	A-B	A-B
	A-C	A-C**	A-C
	A-D	A-D	A-D
	B-C	B-C**	B-C
	B-D	B-D	B-D
	C-D	C-D**	C-D
Kruskall-Wallis Median Test Statistic:	2.7283	11.6548*	2.8447
Cochran's C test:	0.3765	0.3142	0.4210**
Bartlett's test	1.1438*	1.0100	1.2322*

*, and ** Significant at the one and five percent level, respectively.

However, for Models 1 and 3, Cochran's C test and Bartlett's test show that there are significant differences between the standard deviations of the two groups. Hence, the ANOVA test needs to be interpreted with caution.

A similar analysis is performed in Panel B for companies grouped according to industry instead. The four groups are characterised as follows:

A: Food – agriculture, food; B: Heavy industries – textiles, paper, fertilizers, pharmaceuticals, building, cement, metallurgy and engineering; C: Contracting – contracting and real estate; D: Services – tourism, social health and culture services, transport and trade and distribution.

The analysis is reported for companies grouped according to industry, in order to determine whether industrial classifications reveal significant variations. The rationale here is that the cost of equity represents the rate of return required by shareholders and that the return that can be earned depends upon what is achievable through the

employment of the assets, which in turn are applied within a given industrial sector. Different industries are susceptible to different cyclical variations, for example. In prosperous times the property sector may outperform other sectors, yet may be less insulated when the economic climate changes unfavourably. For Models 1 and 3 there are no significant differences between the various pairs of industry categories. However, under Model 2 contracting is much different (see Fisher's test). Indeed the mean cost of equity capital was 48.80 per cent, much out of line with the other sectors. However, the model overestimates the cost of capital in relation to the more conservative models 1 and 3. The medians were also statistically different for Model 2 (see the P-Values of the Kruskall-Wallis Median test result in Panel B). Once again the standard deviations of the costs of equity for different industries were statistically different for Models 1 and 3 (see Bartlett's test in Panel B).

Overall, however, the mean costs of equity were around 11 to 13 per cent (using the conservative estimates as reflected in Models 1 and 3) except for food, where the mean cost of equity was around 14-17 per cent (considering all three models). As a separate exercise, as seen in Table 2, the inverse of the price-earnings ratio was compared for 41 countries. For Egypt, the cost of equity on this basis is very high and was exceeded in 1998 by only Peru, Pakistan and Columbia. However, it can be argued that on account of the economic and political situation in Egypt, investors might ask for a higher return because they will bear more risk compared with other countries. Additionally, the risk-free rate in Egypt was around 9 per cent. Hence Egypt has a relatively high cost of capital compared with other countries. Also, these figures need to be considered within the context of Egypt as a new emerging market, so we would expect the cost to be relatively high. From an investor's perspective, however, the main issue is the extent to which this return is sustainable.

Table 2
Cost of equity estimates: an international comparison

Countries	1998	Average*
Peru	55.56	5.81
Pakistan	20.41	4.74
Colombia	12.82	5.48
South Africa	9.52	5.48
Argentina	9.09	5.88
Turkey	9.01	6.18
Norway	8.77	5.25
India	8.62	8.14
Chile	8.06	5.95
Austria	7.30	4.73

Table 2 (continued)

Countries	1998	Average*
Hong Kong	7.30	5.39
Malaysia	6.80	7.45
Poland	6.76	5.13
Philippines	6.71	5.54
Mexico	6.29	5.42
Venezuela	6.25	5.23
Luxembourg	5.99	6.08
Indonesia	5.68	6.38
Germany	5.43	5.09
Sweden	5.24	5.20
Taiwan	5.21	4.31
Canada	5.08	4.32
France	5.03	1.82
Singapore	4.95	7.70
Denmark	4.95	6.35
UK	4.85	4.77
New Zealand	4.74	7.89
South Korea	4.61	4.63
Finland	4.52	7.69
Netherlands	4.39	16.89
Bulgaria	4.37	10.35
Australia	4.33	4.93
Spain	4.24	7.42
Switzerland	4.18	5.89
Belgium	4.10	6.79
Italy	3.86	6.12
Greece	3.77	5.88
Portugal	3.66	5.55
USA	3.61	8.82
Japan	1.98	5.91
Thailand	1.94	5.42

* average over the previous five years to 1998. Source: Datastream, own calculations.

B. Determinants of the Cost of Equity Capital

Multiple regressions were performed to explain the determinants of the cost of equity capital. For Model 2 the results in forthcoming tables are not shown in some instances. The reason for this is that the growth estimates that were used in the formulation for the

cost of equity, in some cases were so extreme that the moduli of the resultant coefficients in the final models were exponentially high.

In Table 3, Model 1's cost of equity, for the whole sample of companies, is determined by reserves, earnings growth, size and active trading. These factors are significant at the 1 per cent level. The negative co-efficient for size, indicating that smaller firms have a higher cost of capital, is consistent with Fama and French (1998); whereas the positive coefficient for reserves is inconsistent with Krishnan and Moyer (1996), and reveals unexpectedly that firms with higher reserves have a higher cost of capital. The latter may be due to a moderate collinear relationship with net earnings' growth, although at the time the authors did not investigate this further. The adjusted R-square is 82.33 per cent, implying an excellent explanation of the cost of equity. Model 3 is very similar except that reserves are not reflected in the final model.

For actively traded companies, the cost of equity is significantly affected by size, under Models 1 and 3, for which the natural logarithm of the market capitalisation is a significant variable. Growth potential as reflected in the q-ratio, can also be significant (see Model 1) and is consistent in sign with Fama and French (1998). However the adjusted R-squares are quite low for Models 1 and 3.

However for Model 2, financial and business risks are key factors, as indicated by gearing, times interest earned and the standard deviation of earnings. However the signs of the coefficients of variables reflecting financial risk are unexpected. The business risk factor, however, agrees with the inference of Modigliani and Miller (1958). The adjusted R-square now increases to 20.25 per cent for Model 2.

Non-actively traded companies by contrast, have costs of equity determined by reserves, earnings growth, size (agreeing with Fama and French, 1998) and business risk. The adjusted R-square for Model 1 is 85.23 per cent, so this model provides a very good explanation of the equity cost of capital. For Model 3 the adjusted R square is 33.08 per cent, although the independent variables are all significant at the 1 per cent level.

So, how do these analyses inform researchers about the differences between actively and non-actively traded companies? First, for the actively traded companies, the R squares are lower. Perhaps the reason for this is that investors in such companies place more importance upon the industrial context instead. Indeed, it will be noted later that the R squares for the industry based models, pooling both actively and non-actively traded companies, are much higher than for the actively traded companies not identified by industry. Second, Model 1 (Table 3) indicates the greater significance that market participants in actively traded company shares place upon the q ratio. Given that q is a market to book ratio this means that the greater the degree of active trading in the market, the greater the importance of the market value. As stated earlier, the Fama-French small firm effect is also evident for both actively and non- actively traded companies. Third, the more highly geared actively traded companies have lower costs of capital, as observed by the negative coefficient for gearing in Model 2 of Table 3. This result however can in part be reconciled to the evidence for the non-actively traded companies, for it suggests that firms relying on other sources of finance have higher costs of capital. Indeed for non-actively traded companies, firms utilising reserves and retentions have higher costs of capital.

Table 3: Multiple Regressions of the Cost of Equity for the Whole Sample and Classified into Actively and Non-Actively Traded Companies

	Dependent Variable: Cost of Capital								
	Whole Sample (119 Companies)			Actively Traded (76 Companies)			Non-actively Traded (43 Companies)		
Independent Variables	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Constant	0.52		0.95	0.2	-1.98	0.24	0.61		1.11
	(6.59)*		(5.62)*	(5.29)*	(-1.85)	(5.74)*	(2.87)*		(2.60)**
(Reserves and Retained Earnings)/Total Investment	0.14						0.433		0.6
	(3.02)*						(2.99)*		(2.07)**
Net Earnings Growth	0.017		0.018				0.017		
	(6.68)*		(3.27)*				(3.94)*		
Natural Log of Market Capitalisation	-0.032		-0.056	-0.007		-0.01	-0.05		-0.10
	(-4.38)*		(-3.58)*	(-2.14)**		(-2.97)*	(-2.54)**		(-2.55)**
Actively Traded Dummy	-0.085		-0.15						
	(-2.93)*		(-2.48)**						
Gearing					-0.95				
					(-2.93)*				
Times Interest Earned					5.99				
					(2.04)**				
Standard Deviation of Earnings					17.3				032
					(4.38)*				(2.80)**
Q Ratio				-0.002					
				(-2.20)**					
F-Ratio	26.03*		13.17*	7.19*	7.43*	8.81*	38.50*		5.29*
R-Squared %	83.18		34.73	16.27	23.4	10.51	87.5		40.81
Adjusted R-squared %	82.33		32.1	14.01	20.25	9.32	85.23		33.08

*, and ** Significant at the one and five percent level, respectively.

Figures between parentheses are *t* statistics.

Turning now to an individual industry sector, namely the food industry, under Models 1 and 3 the cost of equity capital is determined by liquidity, as represented by the quick ratio and the ratio of cash and short-term investments to current liabilities (see Table 4). These factors are significant at the 1 per cent level of significance. In the food retail sub-sector, liquidity factors are indeed likely to be more important than in the non-food sectors, since customers are more likely to pay by cash. In food manufacturing, the situation is, however, likely to be different. Hence it is not surprising that the quick ratio is a factor explaining the cost of capital. The adjusted R-Squares are high at 65.18 and 72.70 per cent, respectively, for Models 1 and 3, indicating a good fit. For Model 2, the cost of equity is significantly determined by income gearing and business risk, accounting for 55.89 per cent (50.70 per cent, when adjusted) of the variation in the cost of equity in the food sector.

In the heavy industries sector, 92.79 per cent (Model 1) and 53.96 per cent (Model 2) of the R-square adjusted variation in the cost of equity are determined by income gearing (times interest earned), capital gearing (long-term debt/total investment) and size (natural logarithm of market capitalisation whose coefficient agrees in sign with Fama and French (1998), as revealed in Table 4). These factors are significant at the 95 per cent level of confidence. The results for heavy industry can be partly explained in terms of the operational gearing that affects heavy industry. On account of high overhead costs, necessary to conduct business, companies are already susceptible to these operational risks. Consequently, financial risk, as depicted in income gearing and capital gearing, adds to the high operational risk with the consequence that the cost of equity is likely to be especially sensitive.

As to contracting and real estate, the most important factors that should affect the cost of capital ought to be measures of growth, since this sector has experienced a rapid expansion. This is borne out by significant variables for the previous net fixed asset growth and the previous net earnings' growth. In Table 4, the previous period's (1996/97) net fixed asset growth is a significant determinant at the 95 per cent level of confidence in Model 2, and fixed assets/total assets are significant factors at the 95 and 99 per cent levels of confidence, in Models 1 and 3, respectively. Other factors include business risk (Model 2), income gearing (Models 1 and 3), previous earnings' growth (Models 1 and 3) and size (Models 1 and 3 reveal a negative sign, again consistent with the findings of Fama and French (1998)). Furthermore, the adjusted R-Squares are high (70.38 to 84.94) in the three models.

Lastly, in the service sector, the only critical variable was the tax ratio, which in itself is not very instructive, although in theory it could have been an intervening variable. Thus growth, size, business and financial risk, liquidity and asset-backing were not significant determinants in the final step-wise regression models for the service sector. A tentative explanation for this strange result is that the service sector is less homogeneous than the other sectors. The food sector, for example, is arguably more homogeneous. Also, contracting and real estate can be regarded as two sub-sectors that are each broadly affected by the similar external factors, such as the demand for property. However, given the variety of services, it is suggested that it is more difficult to explain the cost of capital in that sector.

Table 4: Multiple Regressions of the Cost of Equity Classified by Industry

	Dependent Variable: Cost of Capital											
Independent Variables	Food (21 Companies)			Heavy Industry (53 Companies)			Contracting and Real Estates (23 Companies)			Services (22 Companies)		
	Model1	Model 2	Model 3	Model1	Model 2	Model 3	Model1	Model 2	Model 3	Model1	Model 2	Model 3
Constant	0.078	-7.96	0.064	0.6		0.93	1.25	-0.11	2.38	0.069	0.11	0.07
	(3.80)*	(-2.61)**	(2.41)**	(4.40)*		(4.02)*	(7.41)*	(-0.97)	(6.80)*	(3.19)*	-1.71	(2.81)**
Times Interest Earned		26.19		-0.26		-0.29	-0.37		-0.89			
		(2.25)**		(-6.57)*		(-4.26)*	(-3.84)*		(-4.43)*			
Standard Deviation of Earnings		30.01						1.64				
		(3.7)*						(5.76)*				
Quick Ratio	0.13		0.2									
	(6.12)*		(7.21)*									
(Cash and Short-Term Investments)/Current Liabilities	-0.1		-0.17									
	(-3.17)*		(-4.14)*									
Long Term Debt/Total Investment				0.053		0.087						
				(3.46)*		(3.35)*						
Natural Log of Market Capitalisation				-0.036		-0.061	-0.09		-0.18			
				(-3.42)*		(-3.46)*	(-6.72)*		(-6.55)*			
Previous Net Fixed Asset Growth								0.35				
								(2.01)**				
Fixed Assets/Total Assets							0.84		2.66			
							(2.41)**		(3.70)*			
Previous Net Earnings Growth							0.1		0.3			
							(2.15)**		(3.10)*			
Tax/Net Profit Before Tax										0.48	0.78	0.57
										(3.87)*	(2.17)**	(3.98)*
F-Ratio	18.78*	10.77*	26.29*	155.38*		15.06*	19.96*	21.20*	84.94*	15.00*	4.71**	15.81*
R-Squared %	68.84	55.89	75.57	93.39		57.79	86	73.86	88.48	49.99	23.9	51.31
Adjusted R-squared %	65.18	50.7	72.7	92.79		53.96	81.69	70.38	84.94	46.66	18.83	48.06

*, and ** Significant at the one and five percent level, respectively.

Figures between parentheses are *t* statistics.

C. Analysis of Variance: Overall Costs of Capital

The analysis proceeds by making a comparison between the weighted average costs of capital between actively traded and non-actively traded companies using both book values and market values as weights (tables not given). For Models 1 and 3, which provide more conservative estimates, the overall cost of capital for actively traded companies is around 11-12 per cent, regardless of the choice between book and market values. For actively traded companies the costs vary between 13 and 16 per cent. Under Model 2 the estimates are higher at around 22 to 24 per cent for the non-actively traded companies and, counter-intuitively, around 17-18 per cent for the non-actively traded companies. Apart from the use of book value weights in Model 3, the ANOVA tests reveal that there are no significant differences, at the 5 per cent level of significance, between the actively traded and non-actively traded companies' overall cost of capital. This is also confirmed by Fisher's least significant difference test. Furthermore, at the 95 per cent level of confidence, there are no significant differences between the medians, as indicated by the P-Values of the Kruskal-Wallis median test statistics. However, Cochran's C-test and Bartlett's test reveal that for Models 1 and 3 only there are significances, at the 1 per cent level of significance, between the standard deviations of actively-traded and non-actively traded companies.

As to comparisons by industry, estimates of the mean overall cost of capital under Models 1 and 3 are around 14-16 per cent for food, 11–12 per cent for heavy industries, 10–11 per cent for contracting and real estate and 12–13 per cent for the service sector. Under Model 2 the estimates are much higher, namely 15–16 per cent for food, 20–21 per cent for heavy industries, 34–40 per cent for contracting and 18 per cent for services. It can be argued that the very high growth rates in the contracting and real estate sector are the reason for such a difference. Of course, there is a much higher degree of financial risk (financial leverage), which is likely to be a contributing factor.

The impact of high growth values as parameter estimates within Model 2 has already been discussed. The extent to which they are sustainable is noted. The ANOVA test reveals that under Model 2 not all the means are the same, and Fisher's least significant difference test confirms that category C, namely contracting, is different. At the 5 per cent level of significance, the Kruskal-Wallis median test statistic shows that the median weighted average costs of capital for the four industrial groupings, are not all identical, when market weights are used. As to differences in standard deviations of overall costs of capital, Cochran's C-test and Bartlett's test reveal some differences in Models 1 and 3 but not Model 2.

D. Determinants of the Overall Cost of Capital

The step-wise multiple regressions of the overall cost of capital for the whole sample reveal similar determinant factors to those of the equity cost of capital, although risk (as measured by the standard deviations of earnings) is also a factor for Model 3. However the adjusted R-Squares are much lower, and vary between 26.09 and 47.32 per cent.

For the overall cost of capital of actively traded companies, size (natural logarithm of market capitalisation) is not a determinant factor, although it had an

impact on the cost of equity (see Table 3). However, the R-squares are low. For the companies whose shares are not actively traded, Model 1 reveals that around 55-63 per cent of the variation (R-square) in the overall cost of capital is explained by reserves (market and book value models), size (log of market capitalization in market and book value models), risk (standard deviation of earnings in the market-based model) and growth (net earnings growth in the book based model). For Model 3, size is a critical factor although the R-square is lower.

For the food sector the models for the overall cost of capital produce high R-squares (64-78 per cent, when unadjusted and 58 to 75 per cent, when adjusted). Liquidity is the main determinant for Models 1 and 3. However for Model 2, business risk (standard deviation of earnings) and financial risk (capital gearing as indicated by long-term debt/equity, and income gearing reflected by times interest earned) are key determinants. However business risk is significant at the 5 per cent level, but not financial risk.

For heavy industry, the financial risk in the income flows (times interest earned), debt capital risk (long term debt/total investment), and size (natural log of market capitalisation) are each significant at the 5 per cent level of significance and explain 70.56 per cent (R-square adjusted) in the variation in the overall cost of capital. These factors are also equally significant in the market-value weighted version of the overall cost of capital in Model 1 and in both versions of Model 3, although the R-squares are lower.

The determinants of the overall cost of capital for the contracting and real estate sector explain 54-84 per cent (R-square adjusted) of the variation in costs. Model 2 is solely based on business risk, whereas Models 1 and 3 reflect income gearing, asset structure, growth and size.

Finally, in the services sector the overall cost of capital is determined solely by the tax ratio in the final step-wise regression. Although tax was originally identified as a possible factor, its influence is more likely to be as a possible intervening variable that may influence gearing which in turn may affect the overall cost of capital. Its appearance as the sole determinant is not very helpful. The tentative explanation of heterogeneity in the sector has already been discussed earlier.

E. Financing Behaviour and Further Research

Financing may be derived from internal or external sources, the latter typically being in the form of long-term or even revolving short-term debt. However, both types of debt increase financial risk and may have an impact on the cost of capital, as already explained. In terms of financial leverage (long-term debt plus short-term debt all divided by the book value of the equity), there are some significant differences between the means of the four industry classifications. For the whole sample, the mean level of financial leverage was 2.51. Meanwhile, in the contracting and real estate sector, the average financial leverage was over twice that amount at 5.89, although the other sectors had similar financial leverage. There was a statistically significant difference, at the 1 per cent level of significance, in the means and medians of the contracting and real estate sector compared with each of the other sectors. Using a different measure of

capital structure, namely long-term debt to the book value of equity, the mean for the total sample was 29 per cent. A test of the difference in means between sectors was not very significant, although the debt to equity ratio for contracting and real estate was higher at 63 per cent. However, there was a significant difference, at the 1 per cent level of significance, between the medians of the long-term debt to equity in the sectors overall. The median, of course, is not affected by outliers. It is suggested that further research is needed to understand the key factors that determine capital structure differences in Egyptian companies.

VI. CONCLUSION

The cost of capital has been a popular issue in corporate finance for a long time, yet insufficient attention has been paid to the factors that drive the cost of capital in the Middle East region. Here, an analysis was undertaken of the cost of capital in Egypt based on a sample of 119 companies.

Distinctions were made according to whether companies are actively traded or not, and also according to industrial groupings. Three models were used for the cost of equity and six for the overall weighted average cost of capital, of which half were based on book values and the other half on market values.

For model one, which is based on the inverse of the PE ratio, the cost of equity is around 11.9 per cent, and the overall cost of capital is around 11.7 and 11.6, using book and market values, respectively. The cost of equity for model three is around 12.9 per cent and the overall cost of capital is around 12.5 per cent for both book and market models. Under this model the equity cost assumes that the rate of return on the equity-financed portion of reinvested funds equals the cost of equity. As to the second model, the estimated cost of equity is much higher at 26 per cent and the overall cost of capital at 21 and 23 per cent based on book and market values, respectively. The reason for this is that the growth rate in dividends, which is difficult to predict, is treated as equal to the growth rate in earnings, which was generally substantial.

Using step-wise multiple regressions, growth and size are found to be among the important determinants of the cost of equity. Larger firms have lower costs of equity consistent with Fama and French (1998). However, financial and business risks also can impact upon the cost of equity of actively traded companies. Using ANOVA, the results indicate that the median costs of capital are similar for both actively and non-actively traded companies. The mean overall cost of capital, when measured by the growth-adjusted Model 2, is different for the contracting and real estate industrial sector, and depends primarily upon business risk. However, under Models 1 and 3 other factors, including fixed asset backing, are important determinants. For heavy industries, financial risk and size are particularly significant. Nevertheless, a satisfactory model to explain the factors that determine the cost of capital in the service sector was not found. By contrast, in the food industry, liquidity (as a proxy for financial flexibility) is a key determinant of the overall cost of capital in several of the models utilized.

APPENDIX

The cost of equity when r=k_e is denoted by k_e^c, such that

$k_e^c = e_1(1-b)/P_0 + br$, $k_e^c - br = e_0(1+br)(1-b)/P_0$

$k_e^c - bk_e^c = e_0(1+bk_e^c)(1-b)/P_0$, $k_e^c = e_0(1+bk_e^c)/P_0$, and $k_e^c(P_0 - e_0 b) = e_0$

Therefore $k_e^c(P_0/e_0 - b) = 1$ and $k_e^c = 1/[\text{PE ratio} - (e_0 - d_0)/e_0]$,

since $b = (e_0 - d_0)/e_0$.

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