# Testing Debt Signaling Hypothesis for Making Investment Decisions in Transitional Market: Evidence from Egypt

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## Abstract

This paper examines the relationships between changes in firm's debt and its effects on firm's market value in a transitional market. The market value is considered as a measure of the investment worthiness. The signaling effect refers to the effects of debt on firm's market value. The paper examines the signaling effects of the determinants of capital structure that are relevant to a transitional market. These determinants cover the basics of tradeoff model, pecking order hypothesis and free cash flow hypothesis. The methodology begins with the determination of the relevant determinants of debt in a transitional economy. Next, the potential signaling effects of the relevant determinants of debt are examined. The robustness of the signaling effect is examined using the 'Extreme Bound Analysis.' The overall results indicate that the worthiness of the investment (market value) is determined by interest rates (macro factor) and financial flexibility (firm-specific factor). These two factors have robust and significant signaling effects.

**JEL classification**: G32

**Key words:** Capital Structure, Financial Signaling Hypothesis, Transitional Markets, Egypt.

## Introduction

The objective of this study is to show the dynamic relationships between changes in firm's capital structure and their effects on firm's market value under different systematic risk classes. When a firm changes its capital structure, it actually changes the relative position and the market values of its capital suppliers' securities holdings. Accordingly, to the extent the capital suppliers are interested in their securities' market value, the firm's market value changes. This is the basic premise of the signaling effect of capital structure. The possible link between investment worthiness and firm's capital structure can be outlined as follows. Investors are assumed to make informative investment decisions when they invest in the firms that use an amount of debt that enhances firm's market value.

The two dimensions considered in this paper are changes in firm's capital structure and its market value. By examining the relevant subfactors that can affect or determine the firm's capital structure, this study is to show the combined effects of three theories of capital structure: tradeoff theory, pecking order theory and free cash flow theory. Furthermore, this paper attempts to provide one criterion, which is the firm's market value, for making any changes in firm's capital structure.

The paper is organized as follows. Section II discusses the theoretical underpinnings of the relationship between firm's capital structure and market value. The general orientation in this section is to show that changes in capital structure have a signaling effect, which affects firm's market value. Section III outlines the research variables/proxies examined in the study. Section IV describes the nature and sources of data used in the study in addition to a description and the procedures of the econometric model used for the analysis. Section V describes the results and a discussion of the analysis respectively. Section VI concludes.

## Capital Structure, Market Value and Financial Agency- Signaling Theory

The literature on the theory and practice of capital structure is extensive. It has been trying to provide answers to what are the factors that affect the decisions to change firm's capital structure. Changes in capital structure bring about changes in the relative position and/or power of capital providers (e.g., stockholders and debtors). When they are aware enough of the effects of

changing capital structure, they presumably react accordingly. This is the focal point of the theory of signaling. Masulis (1983) studied the relationship between changes in capital structure and firm value. Masulis's results (1983) indicate that both stock prices and firm values are positively related to changes in debt level and leverage. This evidence is consistent with models of optimal capital structure and with the hypothesis that changes in debt level release information about changes in firm value.

The theory of signaling states that information asymmetry between a firm and outsiders leads the former to make certain changes in its capital structure. Ross (1977), Myers & Majluf (1984) and John (1987) have shown that under asymmetric information, firms may prefer debt to equity financing. In other cases, the asymmetric information may leave corporate insiders with a degree of residual uncertainty leading to the pecking order effect, i.e., the relative preference of equity financing (Noe, 1988). The outcome of the prevailed information asymmetry is that outsiders do not know quite enough and/or accurate information about the firm's future decisions. This may lead the firm to make certain changes in its capital structure to send certain signals to the outsiders concerning the quality of its financial decisions.

The central point in the literature is the theory of optimal capital structure. In the early beginnings, Modigliani and Miller (1958) presented their first model of firm capital structure that assumes that the market value of a firm is independent of its capital structure. They based that relationship on certain assumptions (e.g., market imperfections) that include the absence of taxes; transaction costs, and bankruptcy costs which are called the irrelevance proposition. Stiglitz (1969), Hamada (1969), Mossin (1969) and Fama and Miller (1972) have reached part of Modigliani and Miller's (1958) conclusion that the value of the firm would be invariant to its capital structure even when there is a positive probability of bankruptcy, but only as long as there are no transactions costs associated with bankruptcy. However, Miller and Modigliani (1966) presented another model as a criterion of the optimality phase of capital structure. The model has shown a positive relationship between the value of the firm and its leverage due to a debt tax shield effect. Other researchers such as Robichek and Myers, 1966; Baxter, 1967; Kraus and Litzenberger, 1973; Scott, 1976; Brennan and Schwartz, 1978; Chen, 1979 and Chen and Kim, 1979, have shown the effects of bankruptcy costs and tax deductibility of interest payments on firm's capital structure and its market value. The conclusion they have reached is that firm's capital structure will affect the value of the firm. Therefore, firms that seek to maximize value may choose optimal capital structures consisting of both debt and equity.

Some research has shown the association between changes in firm value and changes in its capital structure. Boness et al. (1974), Kim et al. (1977) and Masulis (1980) found significant relationships between leverage changes and stock price changes. Taggart (1977) developed a model of corporate financing patterns that shows the effects of the market value of firm's securities on its capital structure. He reached a conclusion that movements in the market values of long- term debt and equity are important determinants of corporate security issues. Myers (1977) found a positive association between part of firm's capital structure, e.g., debt financing, and profitability measured in terms of expected future value of the firm's assets. Harris & Raviv (1990) developed a model that incorporates the firm's market value to show that investors use information about the firm's prospects to decide whether to liquidate the firm or continue current operations. Their results show that leverage-increasing changes in capital structure are accompanied by increases in firm value. Kjellman & Hansen (1995) provided another evidence from the listed firms in Finland that they seek to maintain a target capital structure in order to maximize firm value by minimizing the costs of prevailing market imperfections.

The relationship between firm's market value and risk can be related to the agency theory and financial signaling. In corporate finance, an agency problem arises because of the existence of monitoring costs, dispersed ownership (including the free-rider problem), and conflict of interests between stockholders and bondholders (Jensen & Meckling, 1976; Fama, 1980; Fama & Jensen, 1983 a, b; Eisenhardt, 1989). The firm's decisions to change its capital structure can result in an agency problem, which may increase the degree of firm's risk. According to the agency theory, stockholders capture investment returns above those required to service debt repayments and other liabilities and at the same time have limited liabilities when returns are insufficient fully pay

debtholders. Therefore, stockholders prefer high-risk projects, in conflict with bondholders' preferences. These findings indicate that changes in capital structure affect the firm's systematic risk. This shows the necessity for examining the effects of risk levels when studying the relationship between changes in capital structure and market value in this study. In the financial signaling models, the ultimate objective of the firm's insiders is to enhance its market value to solve the agency problems (i.e., minimize the agency costs) associated with the prevailed asymmetric information. In this case, the agency problems result in *hidden information* in which firm's insiders have private information not revealed to outsiders (Arrow, 1985). Consequently, in terms of financial signaling, when insiders are trying to raise external finance by selling securities, they have to signal to outsiders the expected value of their holdings. Moreover, the firm can use its capital structure to signal the prospects of its investment decisions and growth opportunities thus support and enhance its market value. The literature implies that firm's investment decisions are one of the determinants of growth opportunities. In this sense, Myers (1977), Froot et al. (1993) and Graham (1996) indicate that investment decisions, especially among growth firms, are inversely related to the presence of long-term debt in a firm's capital structure[1].

## Research Variables and Proxies

***Dependent variable***

The dependent variable is firms' market value (MV) defined as the number of shares outstanding times the current closing price per share on the date of financial statement preparation. This variable is to measure firm's adjustment to a target value; therefore it is measured as the changes in Market value $\Delta MV_t = \left(MV_t - MV_{t-1}\right)$.

***Independent variables***

The change in firm's capital structure is measured by the Debt ratio (Total debt/Total Assets)[2]. The signaling effect of debt on firm's market value is measured by taking into account that the amount of changes in market value in a certain period [($t$) – ($t$-1)] is affected by the amount of changes [($t$) – ($t$-1)] in debt in the same period. The change in debt ratio is denoted to as $\Delta TDR = \left(TDR_t - TDR_{t-1}\right)$. According to the agency theory, we test the hypothesis that under high degrees of systematic risk, there is a positive relationship between firm's debt and its market value, and the vice versa under medium and low degrees of systematic risk. The main proposition in this regard is that, under high systematic risk, debt helps to resolve the agency conflicts between firm's managers and shareholders. As for the factors that affect firm's debt policy, the relevant literature on the determinants of capital structure provides number of factors that have been examined. It has been realized that the number of factors differs from one study to another. Therefore, this study examines as a comprehensive number of determinants of capital structure as possible. These determinants cover relatively the tradeoff theory, pecking order theory and free cash flow theory. Some determinants could not be included due to the lack of relevant data. Table 1 summarizes the capital structure determinants examined in this study, the ratio(s) or proxy for each determinant, the previous studies related to each determinant, and the expected relationship between each determinants and the firms' market value.

[1] For example, shareholders may underinvest and pass up positive NPV projects if they perceive that the profits will be used to pay off existing debtholders. In addition, firms need to maintain financial flexibility to avoid the costs of underinvestment. In sum, these works indicate that a firm can plan and use its capital structure to exploit growth opportunities, avoid the problem of underinvestment and thus enhance its market value.

[2] The debt ratio is measured in book rather than market value. Two studies have presented theoretical and empirical justification for the use of book value. Myers (1977) argues that the debt book value is related to the value of assets in place. Taggart (1977) finds that there is very little to choose between the book and market value formulations.

Table 1

List of the factors examined in the study. The 'Expected Relationship' denotes to the expected sign of the formulated hypothesis. The $\Delta$ is measured as $(t) - (t-1)$ for all variables except for $\Delta DR^* = (DR^*_{t+1} - DR_t)$

| Factors (Determinants of Capital structure) | Variables (Ratio/Proxy) | Theoretical/Empirical underpinnings | Expected Relationship |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| Target Debt Ratio[1] | $DE_{t+1}$ | Debt-equity ratio in a next period (Marsh, 1982; Auerbach, 1985) | Negative |
| | $\Delta DR^*$ | An indicator to the relationship between actual and optimal (target) capital structure (Castanias, 1983; Shyam-Sunder & Myers, 1999; Ozkan, 2001) | |
| Average Industry Leverage | $\Delta DR_{AVG}$ | An indicator to the average leverage level of other firms in the same industry (Bowen et al., 1982; Castanias, 1983) | Positive |
| Structure of Tangible Assets | $FATA_t$ (Ratio of Fixed Assets/Total Assets) | An indicator to the structure of tangible assets (Martin & Scott, 1974; Jensen & Meckling, 1976; Schmidt, 1976; Myers, 1977; Scott, 1977; Smith & Warner, 1979; Ferri & Jones, 1979; Grossman & Hart, 1982; Myers & Majluf, 1984; Stulz & Johnson, 1985; Harris & Raviv, 1991; Rajan & Zingales, 1995; Ghosh et al., 2000) | Positive |
| Relative Tax Effects | $\Delta NDTAX$ [The ratio of depreciation to total assets $(DEP/A)_t$] | A proxy for non-debt tax shields (DeAngelo & Masulis, 1980; Bradley et al., 1984; Ross, 1985; Kim & Sorensen, 1986; Titman & Wessels, 1988; Harris & Raviv, 1991; Homaifar, 1994; Ghosh, 2000; Ozkan, 2001) | Positive |
| | $ECTR_t$ (The effective corporate tax rate)[2] | A proxy for debt tax shields (Modigliani & Miller, 1963; Toy et al., 1974; Scott, 1976; DeAngelo & Masulis, 1980; Lasfer 1995; Walsh & Ryan, 1997) | |
| | $\Delta(NDT/A)$ | A direct estimate of non-debt tax shields over total assets (Titman and Wessels, 1988)[3] | |
| Growth | $CETA_t$ (Capital Expenditures over Total Assets) | Proxies for firm's future growth rate (Myers, 1977; Kim & Sorensen, 1986; Harris & Raviv; 1991; Ghosh et al., 2000) | Positive |
| | $GTA_t$ (Growth of Total Assets = percentage change in total assets) | | |
| | $SG_t$ (Sales Growth) | | |
| | $ASTURN_t$ (Assets Turnover) | | |
| Investment Growth Opportunities | Market-Book Ratio $MB_t$ (Dummy variables) | Firm's growth options (Myers, 1984; Titman & Wessels, 1988; Haris & Raviv, 1990; Lasfer, 1995; Rajan & Zingales, 1995; Ozkan, 2001; Hovakimian et al., 2001) | Negative |

[1] There are alternative approaches to calculate the target ratios such as (1) the average over certain number of years; (2) by fitting an autoregressive function; (3) by taking the maximum debt ratio in the past (Marsh, 1982). However, the three approaches result in one estimate for the target ratio which gives the impression that firms look at only one certain estimate (ratio) and plan their capital structure accordingly. The method used in this paper is based on the assumption that the firm changes its target ratio generically, then the ratio a firm could achieve is considered as if it was the target ratio. This point of view takes into account the generic aspects of planning for capital structure changes. According to the literature, floatation costs, firm's size, asset structure and the market conditions change over time which necessitate planning for capital structure generically, and the target ratios are changed accordingly. However, we experimented with the three methods plus our suggested one which utilizes the two ratios ( $DE_{t+1}$ and $\Delta DR^*$ ). The results showed slightly significant increase in the $R^2$ for our suggested measures.

[2] $ECTR_t = \frac{\text{Estimated taxable profits} \times \text{Corporate tax rate}}{\text{Pre - tax profits}}$

[3] $NDT = OI - i - \frac{T}{CTR}$, where : OI = Operating Income, i = Interest payments, T = Income tax payments

CTR = Corporate tax rate

Table 1 (continuous)

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| Bankruptcy Risk | $BR_t$ [A direct measure of bankruptcy risk (White & Turnbull, 1974; Marsh, 1982)][1] | Bankruptcy risk as a proxy for the bankruptcy costs (Warner, 1977; Myers, 1977; Castanias, 1983) | Negative |
| | $DCR_t$ (Debt Coverage Ratio) | A proxy for firm's failure (Castanias, 1983; Harris & Raviv, 1990) | |
| Agency Costs | $ER_t$ (Expense Ratio = Operating expenses scaled by annual sales[2] | A measure of how effectively the firm's management controls operating costs, including excessive prerequisite consumption, and other direct agency costs (Jensen, 1986; Stulz, 1990; Ang et al., 2000) | Negative |
| | $AUR_t$ (Assets Utilization Ratio = Annual sales/Total assets) | A measure of how effectively the firm's management deploys its assets (Grossman & Hart, 1982; Maloney et al., 1993; Wruck, 1994; Ang et al., 2000) | |
| Uniqueness | $SES_t$ [Selling Expenses over Sales (Titman & Wessels, 1988)] | The relationship between specialized products and capital structure (Titman, 1984; Titman & Wessels, 1988) | Positive |
| Industry Classification | $IC_t$ (Dummy variables: 1-14 = 14 different types of non-financial industries) | The industry effects on firm's capital structure (Schwarz & Aronson, 1967; Gupta, 1969; Lev; 1969; Scott, 1972; Scott & Martin, 1975; Schmidt, 1976; Ferri & Jones, 1979; Titman & Wessels, 1988; Graham & Harvey, 2001). | Positive |
| Size | $LnAssets_t$, the natural logarithm of total assets (Dummy variable). | The effects of firm's size on the composition of capital structure (Gupta, 1969; Toy et al., 1974; Schmidt, 1976; Scott, 1977; Ferri & Jones, 1979; Kim & Sorensen; 1986; Titman & Wessels, 1988; Chung, 1993; Homaifar et al., 1994; Rajan & Zingales, 1995; Ozkan, 2001; Ghosh et al., 2000) | Positive |
| | $LnSales_t$, The natural logarithm of net sales (Dummy variable) | | |
| Profitability | $\Delta EBITDA$ (Earnings Before Interest, Taxes, and Depreciation over Total Assets) | Firm's profitability ratios, which indicate the relationship between firm's profitability and leverage (Toy et al., 1974; Martin & Scott, 1974; Schmidt, 1976; Carleton & Silberman, 1977; Marsh, 1982; Long & Maltiz, 1985; Titman & Wessels, 1988; Harris & Raviv, 1991; Whited, 1992; Rajan & Zingales; 1995; Ghosh, 2000; Ozkan, 2001) | Positive |
| | $\Delta OIS$ (Operating Income over Sales) | | |
| | $\Delta OIA$ (Operating Income over Total Assets) | | |
| | $\Delta PM$ (Profit Margin) | | |
| | $\Delta ROI$ (Return on Investment) | | |
| Financial Flexibility | $REA_{t+1}$ [The expected effect of 'Retained Earnings Ratio' as a proxy for the retention rate.] | The relationship between retention ratio and target debt-equity ratio, which has its own ground in the 'pecking order theory' (Marsh, 1982; Pinegar & Wilbricht, 1989; Opler, 1999, Graham, 2000) | Negative |
| | $\Delta REA$ (A measure of the cumulative effect retained earnings, thus the extent of firm's financial flexibility) | | |

[1] $\text{Bankruptcy risk} = \frac{\text{Fixed charges - Earnings before income and tax}}{\sigma \text{ of earnings}}$

[2] The expenses ratio is not assumed to measure all agency costs as discussed in the literature. Nevertheless, and according to the availability of data, this ratio can be considered a first-order estimate and easy-to-measure indicator of the presence of agency costs at the firm level.

Table 1 (continuous)

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| Liquidity Position | $\Delta$QR (Quick Ratio) | The relationship between assets' liquidity and the use of debt (Prowse, 1990; Ozkan, 2001) | Negative |
| | $\Delta$WCR (Working Capital Ratio). | | |
| | $\Delta$CashR (Cash Ratio) | | |
| | $\Delta$CR (Current Ratio) | | |
| Interest Rate | $IR_t$ (Interest Rate on bank loans) | The relationship between market interest rate and issuing debt (Bosworth, 1971; White, 1974; Solnik & Grall, 1975; Taggart, 1977) | Negative |
| Timing Effect | $\Delta$PE (Price/Earnings Ratio) | The relationship between stock prices and issuing equity (Bodenhammer, 1968; Baxter & Cragg, 1970; Bosworth, 1971; Brealey et al., 1976; Taggart, 1977; Lucas & McDonald, 1990; Hovakimian et al., 2001) | Positive |
| Transaction Costs | $DPR_t$ (Dividend Payout Ratio) | The effects of transaction costs of issuing or retiring debt on the choice of capital structure (Martin & Scott, 1974; Marsh, 1982; Fisher et al., 1989; Gilson, 1997) | Negative |
| Free Cash Flow | $FCF_t$ | Jensen & Meckling, 1986 | |

## Data and Methodology

### *Data*

The data used in this paper are extracted form many sources. The data related to firms' income statement and balance sheet are obtained from Kompass Egypt Financial Year Book (Fiani & Partners). The interest rate data are published by the IMF: International Financial Statistics. The data cover seven years – 1997-2003. The total number of firms included in the study is 99. These firms cover fourteen different non-financial industries. Firms were selected based on two criteria. First, the non-financial firms amongst the 100 actively trading firms in Egypt stock market. Second, the non-financial firms amongst the 100 firms with the highest market value.

### *Methodology*

The methodology examines the effects of changes in firm's capital structure, and its relevant determinants, on changes in firm's market value. The general estimating equation is as follows.

$$y_{tk} = \alpha_k + \sum_{i=1}^{n} \beta_{nk} X_{ntk} + \varepsilon_{tk},$$

where $t = 1,\ldots,5$ $k$ = number of firms in each group

The desired change in market value is measured as $\mathbf{y}y_t = \Delta MV_t = \left(MV_t - MV_{t-1}\right)$.

### *Methodological Procedures*

The methodology adopted in this paper runs in three stages: (1) testing for the issue of multicollinearity where all variables entered in the analysis have VIF<5, (2) testing and correcting for the issue of heteroskedasticity[1], and (3) testing for the issue of autocorrelation where the D-W test is employed.

[1] The significance of the heteroskedasticity affects the predictive power of regression models. The rationale is that the conventional OLS coefficient standard errors are incorrect, and therefore, the conventional test statistics based on them are invalid. This is the very reason of using the Heteroskedasticity-Corrected Standard Errors (HCSE) methods for correcting the estimated standard error, thus the significance of the estimates. (For more details, see Johnston and DiNardo, 1997).

***Robustness of the Methodology***

*Robustness of the measurement of time*

The measurement of the time effects for each of the variables examined in this paper varies from one variable to another. According to the literature review, it has been realized that examining the changes in the level of an explanatory variable $\Delta X$ may address and/or result in some new generic insights. In addition, some variables are examined in lag effects in this paper to address the dynamic effects of changes in the level of the determinants of firm's capital structure on the firm's market value. This presents one of the usefulness of such studies to corporate managers when they need to plan for some changes in the capital structure and, at the same time, explore the effects of those changes on the firm's market value. To test for the robustness of the measurement of time, I experimented with the same variables twice, with and without considering the time lag effects. There were some differences realized between both cases, which indicate that the time lag has an effect to be examined thoroughly. Other variables are measured in a static form ($X_t$) as they cannot be anticipated, thus, planned for, in advance. Therefore, their effects are examined like the usual pattern in the other studies in the literature.

*Robustness of the Estimates*

In the literature on capital structure, selective reporting is highly likely given the very large number of potential regressors. For this, a sensitivity analysis using the 'Extreme Bound Analysis' (EBA) avoids the pitfalls of selective reporting by directly incorporating prior information and following a systematic approach for testing the fragility of coefficient estimates. As indicated by Leamer (1983, 1985), Leamer and Leonard (1983) and Levine and Renelt (1992), the EBA uses equation that takes the form

$$Y = \beta_i I + \beta_m M + \beta_z Z + u,$$

where $Y$ = The proxy for capital structure (long-term debt and short-term debt).

$I$ = Set of variables always included in the regression. These are the determinants of capital structure commonly referred to in the literature.

$M$ = The variables of interest. In this study, these variables are the statistically significant ones included in the results, which are the basic proxies for the three theories of capital structure. These variables refer to the speed of adjusting the long-term debt ratio (or short-term debt ratio) in the partial adjustment model, the relative tax effects, the bankruptcy risk, and financial flexibility.

$Z$ = Subset of variables chosen from a pool of variables identified by past studies as potentially important explanatory variables that affect the dependent variable. In this study, these variables refer to assets' tangibility ($FATA_t$), firm's growth ($GTA_t$), and profitability ($\Delta EBITDA_t$).

The EBA involves varying the subset of $Z$ variables to find the widest range of coefficient estimates on the variable of interest $M$ that standard hypothesis tests do not reject. The implementation goes that the first step is to choose the first $M$ variable and run a base regression that includes only the $I$ variables and the first $M$ variable. Then, each $Z$ variable is to be included in the regression equation at a time and for all possible linear combinations of the $Z$ variables, and identify the highest and the lowest values for the coefficient on each variable of interest $\beta_m$ that cannot be rejected at the 0.05 significance level. Thus, the extreme upper bound is defined by the group of $Z$ variables that produces the maximum value of $\beta_m$ plus two standard deviations. The degree of confidence that one can have in the partial correlation between the $Y$ and $M$ variables can be inferred from the extreme bounds on the coefficient $\beta_m$. If $\beta_m$ remains significant and of the same sign at the extreme bounds, then one can maintain a fair amount of confidence in that partial correlation. In such a case, we refer to the coefficient estimate as "Robust,' otherwise, it is "Fragile."

## Results and Discussion

This section is divided into three subsections. First, the results of the OLS estimates for the determinants of capital structure that are relevant to transitional market settings. These results are reported in Table 2. Second, the results of the OLS estimates of the signaling effects of the relevant determinants of capital structure are reported in Table 3. Third, the results of the sensitivity analysis (EBA) are reported in Table 4.

### *First: The Relevant Determinants of Capital Structure to Transitional Market Settings*

Table 2

Regression Coefficients for the Relevant Determinants of Capital Structure

| Determinants of Capital Structure | Measure | Capital Structure Proxies | | | |
|---|---|---|---|---|---|
| *Dependents*: | | | | | |
| *Independents*: | | $\Delta TDR_t$ | $DE_{t+1}$ | $\Delta DR^*$ | $\Delta DR_{avg}$ |
| Constant | | 0.063 | 0.907 | 0.071 | -0.056 |
| Structure of Tangible Assets | $FATA_t$ | - | - | 0.012<br>(2.72)*** | - |
| Relative Tax Effects | $\Delta NDTAX_t$ | 0.239<br>(23.78)*** | -1.12<br>(-11.03)*** | 0.021<br>(4.82)*** | -0.014<br>(-1.45) |
| | $ECTR_t$ | - | 0.003<br>(8.47)*** | - | - |
| Growth | $CETA_t$ | 0.0002<br>(1.97)** | - | - | -0.0003<br>(-1.91)** |
| | $GTA_t$ | 0.078<br>(7.32)*** | 0.156<br>(4.17)*** | - | 0.003<br>(3.72)*** |
| | $SG_t$ | - | -0.215<br>(-3.72)*** | 0.012<br>(2.77)*** | - |
| | $ASTURN_t$ | - | - | - | -0.004<br>(-2.78)*** |
| Investment Growth Opportunities | High $MB_t$ | - | 0.694<br>(2.20)** | - | - |
| | Medium $MB_t$ | 0.005<br>(1.40) | 0.289<br>(2.88)*** | - | - |
| Bankruptcy Risk | $BR_t$ | 0.0001<br>(3.06)*** | - | 0.0001<br>(3.63)*** | -0.0001<br>(-1.56) |
| Agency Costs | $AUR_t$ | - | 0.167<br>(1.95)** | - | - |
| Uniqueness | $SES_t$ | 0.032<br>(2.04)** | 0.925<br>(2.16)** | - | - |
| Type of Industry | Agriculture & Fisheries | -0.025<br>(-2.22)** | -0.617<br>(-3.93)*** | - | -0.05<br>(-4.44)*** |
| | Gas, Oil & Mining | - | - | - | -0.048<br>(-3.18)*** |
| | Food & Beverage | - | -0.652<br>(-4.83)*** | - | -0.021<br>(-2.32)** |
| | Mills & Storages | 0.007<br>(1.32) | 0.136<br>(0.78) | - | 0.002<br>(0.21) |
| | Textiles & Consumer Goods | - | - | - | -0.057<br>(-6.01)*** |
| | Paper, Packaging & Plastics | -0.01<br>(-1.26) | -0.475<br>(-3.31)*** | - | -0.024<br>(-2.01)** |

Table 2 (continuous)

| | | | | | |
|---|---|---|---|---|---|
| | Chemicals & Fertilizers | -0.007<br>(-1.12) | - | - | - |
| | Pharmaceuticals & Health Care | - | - | - | -0.045<br>(-5.14)*** |
| | Engineering & Electrical | -0.007<br>(-1.16) | -0.243<br>(-1.36) | - | -0.025<br>(-2.31)** |
| | Housing & Real Estate | - | 1.256<br>(5.30)*** | - | -0.042<br>(-4.69)*** |
| | Tourism and Leisure | - | -0.359<br>(-1.87)* | - | 0.006<br>(0.39) |
| | Utilities and Other Services | -0.038<br>(-2.42)*** | -0.719<br>(-3.88)*** | - | -0.051<br>(-2.94)*** |
| | Information Technology | - | 0.56<br>(1.27) | - | -0.082<br>(-3.28)*** |
| Size | Large size firms | -0.012<br>(-2.67)*** | 0.374<br>(2.72)*** | - | - |
| Profitability | $\Delta OIS_t$ | 0.021<br>(2.96)*** | -0.957<br>(-2.73)*** | - | - |
| | $\Delta PM_t$ | - | 0.832<br>(1.85)* | 0.01<br>(1.06) | - |
| | $\Delta ROI_t$ | - | - | -0.021<br>(-3.45)*** | - |
| Financial Flexibility | $REA_{t+1}$ | 0.009<br>(1.78)* | -3.569<br>(-9.01)*** | - | -0.015<br>(-1.67)* |
| | $\Delta REA_t$ | -0.72<br>(-12.96)*** | 0.695<br>(2.48)*** | - | - |
| Liquidity Position | $\Delta CR_t$ | -0.041<br>(-5.21)*** | - | 0.005<br>(1.51) | - |
| | $\Delta QR_t$ | - | - | -0.004<br>(-1.55) | 0.002<br>(1.46) |
| | $\Delta WCR_t$ | -0.003<br>(-6.42)*** | - | - | - |
| | $\Delta CashR_t$ | - | - | -0.001<br>(-12.59)*** | - |
| Interest Rates | $IR_t$ | -0.513<br>(-4.05)*** | 9.16<br>(2.87)*** | -0.517<br>(-3.12)*** | 0.489<br>(2.94)*** |
| Timing Effect | $\Delta PE_t$ | 0.0003<br>(4.58)*** | - | - | - |
| Transaction Costs | $DPR_t$ | - | 0.005<br>(6.22)*** | - | 0.001<br>(19.33)*** |
| Free Cash Flow | $FCF_t$ | - | - | - | 0.0002<br>(1.97)** |
| *N* | | 413 | 442 | 444 | 435 |
| F statistics | | 66.22*** | 21.83*** | 7.64*** | 7.34*** |
| $\overline{R}^2$ | | 0.76 | 0.53 | 0.13 | 0.24 |
| D-W test | | 2.11 | 1.08 | 2.21 | 1.97 |
| Theil Inequality Coefficient | | 0.24 | 0.19 | 0.66 | 0.51 |

Note: Stepwise regression coefficients for the proxies of capital structure. The *t*-statistics are shown in brackets. The four regression equations are free from multicollinearity (VIF<5). The heteroskedastic effects were corrected using the White's HCSE, which improves the significance of the OLS estimates.

****D-W test significant at 2% two-sided level of significance.

*** Significant at 1% level.

** Significant at 5% level.

* Significant at 10% level.

The results in Table 2 show the determinants of capital structure using four proxies $\Delta TDR_t$, $DE_{t+1}$, $\Delta DR^*$ and $\Delta DR_{avg}$. Overall, the results show that the determinants of capital structure cited in the literature have relatively significant effects on firms' capital structure. Moreover, the

three basic theories of capital structure are represented on a relative basis. That is, the results under the $\Delta TDR_t$ show significant effects of the trade-off theory (relative tax effects and bankruptcy risk) and significant effects of the pecking order theory (profitability and financial flexibility). The results under $DE_{t+1}$ show significant effects of the pecking order theory only (profitability and financial flexibility). The results under the $\Delta DR^*$ show significant effects of the trade-off theory (relative tax effects and bankruptcy risk) and the pecking order theory (profitability). The results under the $\Delta DR_{avg}$ show significant effects of the pecking order theory (profitability) and free cash flow theory (direct measure of free cash flow). It is worth to note that the signs of the estimates do not conform to the assumption of each theory. Thus, the significant determinants of capital structure in this study provide extended perspectives from Egypt being taken as an example of a transitional market. The focal point in this study is to examine the signaling effect of determinants of capital structure. This requires that the statistically significant estimates reported in Table 2 are to be examined regarding their relationships with firm' market value. Accordingly, a stepwise regression run is carried out for the statistically significant determinants reported in Table 2 with the firm's market value. The results of the signaling effect are reported below in Table 3.

***Second: The Signaling Effects of the Relevant Determinants of Capital Structure to Transitional Market Settings***

Table 3

Regression Coefficients for the Signaling Effects of Capital Structure

| Dependent: $\text{Market Value}_t$ | $\Delta MV_t$ | Determinants of Financial Signaling |
|---|---|---|
| Independents: | | |
| Constant | -230487.7 | |
| Debt/Equity ratio (Proxy for target debt ratio) | $DE_{t+1}$ | -4599<br>(-4.18)*** |
| Optimal Debt ratio (Proxy for target debt ratio) | $\Delta DR^*$ | -10201.5<br>(-1.32) |
| None-debt tax shields | $\Delta NDTAX_t$ | -22642.6<br>(-3.35)*** |
| Agriculture and Fisheries | $IC1_t$ | -24739.7<br>(-2.72)*** |
| Housing & Real Estate | $IC11_t$ | -15160.1<br>(-1.24) |
| Utilities | $IC13_t$ | -22893.9<br>(-1.12) |
| Financial Flexibility | $REA_{t+1}$ | -192466.7<br>(-6.19)*** |
| Interest Rate | $IR_t$ | 2029553<br>(9.28)*** |
| N | | 404 |
| F statistics | | 36.78*** |
| $\overline{R}^2$ | | 0.42 |
| D-W test | | 1.85 |
| Theil Inequality Coefficient | | 0.45 |

Note: Regression coefficients of the significant determinants of financial signaling. The dependent variable is the firms' market value (MV). The *t*-statistics are shown in brackets. The regression equation is free from multicollinearity (VIF<5). The heteroskedastic effects were corrected using the White's HCSE, which improves the significance of the OLS estimates.

****D-W test significant at 2% two-sided level of significance.

*** Significant at 1% level.

** Significant at 5% level.

* Significant at 10% level.

The results in Table 3 show significant signaling effects of firm's debt. The estimate of the $DE_{t+1}$ is negative and statistically significant. The negative relationship conforms to the signaling assumption, e.g., the higher the amount of debt is, the higher the debt burdens are, which affects the firm's market value negatively. The tax effects are shown by the negative and statistically significant estimate of the none-debt tax shields $\Delta NDTAX_t$. The negative relationship indicates that the investors are not quite aware of tax shields and its effects on firm's borrowing decisions. Thus, this factor does not conform to the basic assumption of the trade-off theory. The type of industry also has a significant effect as the estimates show that firms in the Agriculture & Fisheries are associated with less market value. The effects of expected retained earnings as a proxy for financial flexibility show that the estimate of $REA_{t+1}$ is negative and statistically significant. The negative relationship comes against the basic assumptions of the pecking order theory, which also indicates that the investors do not regard the effects of financial flexibility. Finally, the estimate of the interest rate $IR_t$ is positive and statistically significant. This indicates that the investors are quite aware of the effects of interest rate on the borrowing decisions.

***Third: Testing the Robustness of Capital Structure Signaling Effects***

The EBA sensitivity analysis (Leamer, 1983, 1985; Leamer and Leonard, 1983; Levine and Renelt, 1992) is carried out to the estimates reported in Table 3. The $M$ variables of interest include the statistically significant estimates in Table 3. The results of the sensitivity analysis are shown in Table 4.

Table 4

Sensitivity Analysis for Determinants of Financial Signaling (Dependent Variable: Market Value)

| *M* Determinants Financial Signaling | Variables | $\beta$ | | SE | *t* | *N* | $\overline{R}^2$ | Other Variables | Robust/ Fragile |
|---|---|---|---|---|---|---|---|---|---|
| Debt/Equity ratio (Proxy for target debt ratio) | $DE_{t+1}$ | High | 3675.2 | 1145.9 | 1.21 | 404 | 0.03 | $\Delta DR^*$ | Fragile |
| | | Base | 1220.5 | 1009.1 | 1.21 | 404 | 0.02 | - | |
| | | Low | -1062.7 | 1164.9.9 | 1.08 | 404 | 0.02 | $\Delta DR^*$, $\Delta DR_{AVG}$ | |
| None-debt tax shields | $\Delta NDTAX_t$ | High | 654.5 | 10836.2 | -1.93 | 404 | 0.03 | $DE_{t+1}$, $\Delta DR^*$, $\Delta DR_{AVG}$ | Fragile |
| | | Base | -20986.2 | 10507.9 | -1.99 | 404 | 0.02 | - | |
| | | Low | -43988.7 | 11100.4 | -1.96 | 404 | 0.03 | $\Delta DR^*$ | |
| Type of Industry | Agriculture & Fisheris | High | 14433.8 | 7431.3 | -0.05 | 404 | 0.02 | $DE_{t+1}$, $\Delta DR^*$, $\Delta DR_{AVG}$ | Fragile |
| | | Base | -1649.7 | 7042 | -0.23 | 404 | 0.01 | - | |
| | | Low | -16072.3 | 7263.3 | -0.21 | 404 | 0.03 | $\Delta DR^*$ | |
| Financial Flexibility | $REA_{t+1}$ | High | -94700.9 | 39378.4 | -4.40 | 404 | 0.27 | $\Delta DR_{AVG}$ | Robust |
| | | Base | -173638.3 | 39370.7 | -4.41 | 404 | 0.27 | - | |
| | | Low | -260237 | 39593.9 | -4.57 | 404 | 0.28 | $\Delta DR^*$ | |
| Interest Rate | $IR_t$ | High | 2916448 | 332750.9 | 6.76 | 404 | 0.15 | $\Delta DR^*$, $\Delta DR_{AVG}$ | Robust |
| | | Base | 2095553 | 274615.5 | 7.63 | 404 | 0.14 | - | |
| | | Low | 1522796 | 323363.5 | 6.71 | 404 | 0.14 | $\Delta DR^*$ | |

Note: The base $\beta$ is the estimate coefficient from the regression with the variables of interest (*M* variables) and the always-included variables (*I* variables). When the dependent variable is the short-term debt ratio, the *I* variables are, , , $CETA_t$, $GTA_t$, $SG_t$, $BR_t$, $SES_t$, IC3, IC6, IC11, IC13, Size 1, $\Delta OIS_t$, $\Delta REA_t$, $DPR_t$. The high $\beta$ is the estimate coefficient from the regression with the extreme higher bound $(\beta_m + 2\sigma)$. The low $\beta$ is the coefficient from the regression with the extreme lower bound. The "Other variables" are the *Z* variables included in the base regression that produce the extreme bounds. The "Robust/Fragile" designation indicated whether the variable of interest is robust or fragile.

The results of the sensitivity analysis show to what extent the regression estimates (Table 3) are robust. As indicated earlier, the $Z$ variables refer to the subset of variables chosen from a pool of variables identified by past studies as potentially important explanatory variables. In this study the $Z$ variables are chosen to be the different proxies for capital structure, thus referring to the possible effects of capital structure policy. The fragility/robustness indicate to what extent the regression estimates (Table 3) are affected by changes in the capital structure policy. The results in Table 4 show that two estimate only are robust, which are the $REA_{t+1}$ (as a proxy for financial flexibility) and $IR_t$ (as a proxy for timing the borrowing decision). This means that these two estimates are less likely to change their statistical significance and magnitude as the capital structure policy changes.

## Conclusion

The decision to change firm's capital structure to affect firm's market value is examined by focusing on the most significant determinants of capital structure that are relevant to Egypt as an example to a transitional market. The link between the debt signaling effect and investment worthiness is that investors are assumed to make informative investment decisions when they invest in the firms that use amount of debt that enhances firm's market value.

The results show that most of the determinants of capital structure cited in the literature have significant effects. The significant determinants include the basic factors of the three theories of capital structure: trade-off, pecking order and the free cash flow. The signs of significant determinants do not conform to the basic assumption of the three theories. Therefore, the significant determinants reported in this study pertain to the settings in a transitional market, which are expected to be different from those of developed markets. Regarding the signaling effects of the significant determinants of capital structure, the overall results show that the market value (as a measure of investment worthiness) is significantly affected by two determinants, which are financial flexibility (firm-specific factor) and interest rates (macro factor), both of which have robust and significant signaling effects. Therefore, the general conclusion that can be drawn is that, for making informative investment decisions, investors should invest in firms with considerable financial flexibility and when the interest rate is favorable. These two factors enhance the firm's market value, which is the ultimate objective for making informative investment decisions.

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# Appendix

Table A

Summary Statistics

Summary statistics of the variables used for testing the signaling effect of capital structure. The market value ($\Delta MV_t$) is the dependent variable, and the other variables are the independents. The $\Delta$ is measured as (t) - (t - 1) for all variables except for $\Delta DR^* = (DR^*_{t+1} - DR_t)$. The data cover the period from 1997 to 2003. The sample consists of 99 non-financial firms.

| Variables | Ratio/Proxy | Mean | Median | SD | Min | Max |
|---|---|---|---|---|---|---|
| Market Value | $\Delta MV$ | 40149.2 | 2278.11 | 347696.5 | -1134977 | 2896463 |
| Total Debt Ratio | $\Delta TDR$ | -0.02 | -0.009 | 0.57 | -7.54 | 6.13 |
| Target Debt Ratio | $DE_{t+1}$ | 2.62 | 1.65 | 2.74 | 0 | 17.14 |
| | $\Delta DR^*$ | -0.01 | 0.0006 | 0.38 | -6.13 | 4.52 |
| Average Industry Leverage | $\Delta DR_{AVG}$ | -0.01 | -0.01 | 0.14 | -0.54 | 0.48 |
| Structure of Tangible Assets | $FATA_t$ | 0.24 | 0.18 | 0.29 | 0.002 | 5.33 |
| Relative Tax Effects | $\Delta NDTAX_t$ | -0.02 | 0 | 0.22 | -4.37 | 0.24 |
| | $ECTR_t$ | 2.002 | 0.0005 | 41.9 | 0 | 932.49 |
| | $\Delta NDTA_t$ | -0.002 | 0 | 0.08 | -0.90 | 0.79 |
| Growth | $CETA_t$ | 5.48 | 1.01 | 12.14 | 0 | 123.27 |
| | $GTA_t$ | 0.21 | 0.05 | 1.12 | -0.91 | 15.05 |
| | $SG_t$ | 0.08 | 0.02 | 0.93 | -0.95 | 8.58 |
| | $ASTURN_t$ | 0.74 | 0.56 | 0.85 | 0.01 | 13.52 |
| Investment Growth Opportunities | High $MB_t$ | 0.05 | 0 | 0.21 | 0 | 1 |
| | Medium $MB_t$ | 0.27 | 0 | 0.44 | 0 | 1 |
| | Low $MB_t$ | 0.67 | 1 | 0.46 | 0 | 1 |
| Bankruptcy Risk | $BR_t$ | -61068.7 | -14851.5 | 211041.6 | -3692500 | 18485.7 |
| | $DCR_t$ | 79.6 | 3.008 | 1146.35 | -8.81 | 25342.5 |
| Agency Costs | $ER_t$ | 0.15 | 0.11 | 0.16 | 0.006 | 1.84 |
| | $AUR_t$ | 0.74 | 0.56 | 0.85 | 0.01 | 13.52 |
| Uniqueness | $SES_t$ | 0.08 | 0.05 | 0.13 | 0 | 1 |
| Industry Classification | $IC_1$ | 0.03 | 0 | 0.17 | 0 | 1 |
| | $IC_2$ | 0.01 | 0.01 | 0 | 0.10 | 0 |
| | $IC_3$ | 0.09 | 0 | 0.28 | 0 | 1 |
| | $IC_4$ | 0.08 | 0 | 0.27 | 0 | 1 |
| | $IC_5$ | 0.06 | 0 | 0.23 | 0 | 1 |
| | $IC_6$ | 0.06 | 0 | 0.23 | 0 | 1 |

Table A (continuous)

| Variables | Ratio/Proxy | Mean | Median | SD | Min | Max |
|---|---|---|---|---|---|---|
| | $IC_7$ | 0.07 | 0 | 0.25 | 0 | 1 |
| | $IC_8$ | 0.12 | 0 | 0.32 | 0 | 1 |
| | $IC_9$ | 0.21 | 0 | 0.41 | 0 | 1 |
| | $IC_{10}$ | 0.07 | 0 | 0.25 | 0 | 1 |
| | $IC_{11}$ | 0.10 | 0 | 0.30 | 0 | 1 |
| | $IC_{12}$ | 0.03 | 0 | 0.17 | 0 | 1 |
| | $IC_{13}$ | 0.03 | 0 | 0.17 | 0 | 1 |
| | $IC_{14}$ | 0.03 | 0 | 0.17 | 0 | 1 |
| Size $\boldsymbol{Ln}\mathbf{Assets}_t$ | Large Size | 0.30 | 0 | 0.46 | 0 | 1 |
| | Medium Size | 0.34 | 0 | 0.47 | 0 | 1 |
| | Small Size | 0.35 | 0 | 0.47 | 0 | 1 |
| Profitability | $\Delta EBITDA_t$ | -0.02 | -0.006 | 0.80 | -12.25 | 12.25 |
| | $\Delta OIS_t$ | -0.003 | 0.003 | 0.27 | -3.36 | 3.43 |
| | $\Delta OIA_t$ | -0.02 | -0.006 | 0.79 | -12.24 | 12.28 |
| | $\Delta PM_t$ | 0.0003 | 0.004 | 0.26 | -3.12 | 2.30 |
| | $\Delta ROI_t$ | -0.01 | -0.002 | 0.79 | -12.42 | 12.43 |
| Financial Flexibility | $REA_{t+1}$ | 0.21 | 0.16 | 0.24 | 0 | 4.13 |
| | $\Delta REA_t$ | -0.007 | 0.007 | 0.28 | -3.73 | 3.72 |
| Liquidity Position | $\Delta QR_t$ | -0.03 | 0.02 | 0.99 | -18.38 | 2.33 |
| | $\Delta WCR_t$ | 0.29 | 0.01 | 3.40 | -35.21 | 43.46 |
| | $\Delta CashR_t$ | -0.31 | -0.0001 | 6.21 | -137.95 | 1.97 |
| | $\Delta CR_t$ | -0.01 | 0.01 | 0.99 | -18.08 | 6.13 |
| Interest Rate | $IR_t$ | 0.14 | 0.13 | 0.01 | 0.12 | 0.16 |
| Timing Effect | $\Delta PE_t$ | 6.86 | 0.02 | 107.9 | -415.08 | 2056.9 |
| Transaction Costs | $DPR_t$ | 0.93 | 0.34 | 11.31 | 0 | 251.6 |
| Free Cash Flow | $FCF_t$ | -2118.6 | -7713 | 216753.5 | -1294370 | 1702655 |
| Time Effects | $t$ | 3 | 3 | 1.42 | 1 | 5 |
| Observations | | 495 | 495 | 495 | 495 | 495 |