THE CAPITAL STRUCTURE CHOICE AND FINANCIAL MARKET LIBRELIZATION: A PANEL DATA ANALYSIS AND GMM ESTIMATION IN JORDAN

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Abstract

This paper examines the nature and determinants of the capital structure choice of Jordanian non-financial listed companies. It also studies the impact of the financial and economic liberalization on the capital structure choice of these companies. The move from a relatively highly controlled to a more liberalized financial system since the early-1990s should have a significant impact on the extent and nature of the financial decisions of companies. The findings suggest that while much of the explanatory powers of main stream capital structure theories are applicable to the Jordanian companies.

The empirical evidence also shows that the 1990s liberalization did affect their financial decisions. Moreover, the findings of the paper suggest that Jordanian companies have target leverage ratios and following the financial liberalization, their speed of adjustment to these ratios have, as unexpected, decreased.

JEL Classification: G0, G3, G30.

Keywords: capital structure; Jordan; asset tangibility; profitability; adjustment process; liberalization; panel data; GMM.

1. Introduction

Although the capital structure issue has received importance attention in the U.S and other developed countries (see for example, Marsh, 1982; Bradley *et al.*, 1984; Titman and Wessels, 1988; Rajan and Zingales, 1995; and Bevan and Danbolt, 2000), it has remained

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neglected in the developing countries. Actually, few empirical works have attempted to shed light on the capital structure in developing countries (see for example, Singh and Hamid, 1992; Singh, 1995; Demirguc-Kunt and Maksimovic, 1995; and Booth *et al.*, 2001). Furthermore, the most existing empirical works on the capital structure in developing countries have been conducted in the period characterized by strongly interventionist and regulated regime. Particularly, these studies conducted the capital structure issue using data from the eighteens where the corporate sector faced several constraints on their choices regarding sources of funds. Credit ceiling, direct credit to certain sectors, interest rate controls on deposit and lending, subsidized credits, compulsory sale banks of government paper at below market rates, liquidity requirements among other interventions were widely used. Access to equity markets was either regulated, or limited due to the undeveloped stock market. Against this backdrop, the findings of these studies could have been largely constraint-driven and hence less illuminating. Since the late 1980s and early 1990s a number of developing countries were introduced many market-oriented reforms in their financial sector. They eased or lifted bank interest rate ceiling, lowered compulsory reserve requirements and entry barriers, reduced government inference in credit allocation decisions, and privatized many banks and insurance companies. Also they actively promoted the developed of local stock markets, and encouraged entry of foreign financial intermediaries. The moving toward the free market, coupled with the widening and deepening of various financial markets, including the capital market, should have significant impact on the corporate sectors to optimally determine their capital structure. Furthermore, such a new environment gives a unique opportunity for a further testing of the validity of capital structure theories. Put another way, if the exiting theories of capital structure are valid, they could provide greater explanatory power in liberalized market conditions than in conditions correspond more closely to the assumptions of the models generating the theories[1].

[1] A common feature of theoretical models in this area is their assumption that capital market satisfies the perfect criteria (i.e. fewer restrictions on capital market access).

This paper attempts to study the capital structure issue in a developing country of Jordan during the period characterized by a two sharply differing degrees of financial market liberalization. Thus, the Jordan experience provides us with a natural opportunity to analyze not only the explanatory power of main stream capital structure theories by testing them in a less developed country but also in testing them in two different kinds of market conditions (pre-and post-financial liberalization). Consequently, this paper investigates the factors that affect decisions about the capital structure (and in particular about bank debt) of Jordanian companies and examines how the financial liberalization affects the capital structure decisions of these companies. This study makes the following contributions to the literature of capital structure. First, it represents the first study that examines empirically the capital structure choice using Jordanian firm-level data. Thus, an "emerging" market which experienced a two sharply differing degrees of financial environments presents an excellent research opportunity to add to the capital structure literature. Second, unlike most previous capital structure studies, this study employs a dynamic adjustment model. This model allows us to understand the nature of the capital structure dynamic adjustment process of firms. Finally, in order to estimate our dynamic model consistently from a short panel data the Generalized Method of Moments (GMM) with instrumental variables estimation procedure is used[2].

2. The Jordanian Financial Sector: Some Stylized Facts

In Jordan, there are 28 banks, of which 14 are commercial, 5 branches of foreign banks, and the rest are development and investment banks. These 28 banks have 466 branches and 144 banking offices. That means approximately one branch for each

[2] For more detailed discussion about using panel data see for Arllano (2003).

10,000 inhabitants in 2000. Commercial banks are the dominate institution in the Jordanian banking system. The commercial banks in Jordan are completely private ownership. Although the newly developing capital markets are able to compute with the banking sector, as in other developing countries, banks are still dominate in the financial system in Jordan. Since the early 1960s**,** and despite some liberalization in the 1970s, Jordan followed until the late 1980s a highly protectionist trade policy as well as active industrial policies with heavy direct involvement of the state. The financial system, composed of the banking sector, was essentially served as agents of the government channeling investment funds to selected sectors under the country's economic development policy. The government's extensive involvement in the banking sector during this period led to serious imbalances in the financial markets and in the structure of the economy. As overall financial repression intensified, the deadweight costs associated with excessive regulation adversely impacted the efficiency of the financial system and resource allocation more generally. An additional and perhaps more important implication of excessive government involvement in the banking system was the erosion of effective credit evaluation and risk assessment policies. As has been well documented, Jordanian banks had little discretion in allocating funds and therefore, little incentive to screen and monitor the activities of corporate customers. As a result, the banking sector became increasingly vulnerable to unbridled corporate expansion. When the economy experienced the recent downturn Jordanian banks suffered immensely. The subsequent ballooning of non-performing loans on bank balance resulted in banking crises. For example, by the end of 1980s, the share of uncollectible loans of Jordanian bank's portfolios was estimated at 30 percent. Until the structural adjustment program initiated 1989/90 real creditor interest rates remained negative (about -2.0% during the period 1984-1990) which is a manifestation of financial repression.

Following a balance of payments crisis in 1988/89, Jordan began implementation of stabilization program, as well as a structural adjustment program of economic and financial liberalization. The objective was to move away from a controlled economy and an administratively managed financial system towards an open and

market oriented system with a reduced direct involvement of states. Measures taken to reform the financial and banking systems since 1990 included eliminating progressively credit allocation controls by the abolishing credit ceilings and removal restrictions on interest rates (*i.e.* end of financial repression). The increased in the real interest rate from -2.0 % (1984-1990) to about +1.7% (1991-2000), as results of the end of financial repression, has bring about a number of economic benefits through a more effective mobilization of domestic savings and a more efficient allocation of scarce economic resources. In addition to the above, the Jordanian government took a number of means to strength and liberalizes the banking sector. Greater autonomy was given to bank managements, increased capital adequate requirements, promoted bank mergers and acquisitions induced the inter-bank market, and further liberalization of foreign exchange transactions and foreign investment was undertaken. The reforms have resulted in a well-developed financial sector, placing Jordan among the Middle East countries with the highest financial development. Financial depth in Jordan is become close to the highest in the developing countries (see Demirguc-Kunt and Levine, 1999). The broad money to GDP ratio increased from 82.6% in 1982 to 112% in 2000. The ratio of financial sector assets to GDP increased even more reaching 200% in 2000 compared to 102% in 1982. Credit to the private sector stood at 84% of GDP at the end of 2000, up from 40.3% in 1982. In addition, the gross interest margin (i.e. the difference between deposit and lending rates) has been declined from 6.5 pints in 1982 to less than 2.0 points in 2000, indicating an increased in efficiency and competition within the banking sector.

In Jordan, the main stock market is the Amman Stock Exchange (ASE), renamed from the Amman Financial Market that was originally established in 1978. The ASE is dominated by banks, mainly commercial ones. It is relatively small in terms of capitalization as well as volume of trade. Until 1997, the ASE was characterized by strict controls over rates of return and administrative allocation of financial resources through the banking sector and specialized public sector financial institutions. Since 1997, the ASE has seen the introduction of a number of major changes. At

the forefront of these changes has been the June 1997 allowance of foreigners to own up to 100% of the shares of all listed companies and the June 2000 implementation of the new Electronic Trading System (ETS). These events can be considered as qualitative leaps for the ASE because they mean more foreign investors in the market and competition, transparency and safety for traders and investors by entering all the selling and buying orders into the computers, matching supply and demand for securities, and electronically setting and applying prices. It is important to stress here that financial liberalization in Jordan has not yet contributed to the development of vibrant debt market. Both public and corporate bond markets remain limited with secondary market almost absent. There are several factors inhibiting the development of the bonds market in Jordan, among them is the lack of an institutional and legal infraststructure. There are no financial institutions with sufficient expertise to price, underwrite, and selling a corporate bond issue. The bond market in Jordan needs to be supported by an institutional infrastructure that includes, among other things, efficient clearing and settlement arrangements.

3. The Empirical Model and Variables

The theory of capital structure postulates that in a world of imperfect and incomplete financial markets, firms could increase their values by changing their respective leverage ratios. However, the fact that there are costs and benefits (a trade-off) involved in changing leverage ratios, implies the existence of an interior debt level for a firm (Zwiebel, 1996). The value corresponding to this optimal debt level is the maximum value of the firm given the level of its operating cash flow.Based on the above, we assume that the optimal debt-equity ratio, Y_{it}^{*}, is a function of firm specific characteristics. For the i^{th} firm at time t, we can formalize this by following equation:

$$Y_{it}^{*} = f_0 + \sum_k b_k X_{kit} + a_i + a_t + e_{it} \qquad (1)$$

such that $i = 1,...,N,$ and $t = 1,...,T.$ X stands for K variables capturing firm-specific characteristics which vary with time and across firms. a_i is an unobserved firm-specific effects and a_t captures any common period specific effects. e_{it} is the error term, which represents measurement errors in the independent variables, and any other explanatory variables that have been omitted. It is assumed to be independently and identical normally distributed with zero mean and constant variance, $((e_{it} is\ an\ iid \sim N(0, s_e^2))$.

In a perfectly frictionless world with no adjustment costs, the firm would immediately respond to a variation in the independent variables by varying its existing leverage ratio to equal its optimal leverage (complete adjustment). Thus, at any point in time, the observed leverage ratio of firm $i(Y_{it})$ should not be different from its optimal one (Y_{it}^*), $i.e., Y_{it} = Y_{it}^*$. This implies that the change in leverage from the previous to the current period should be exactly the change required for the firm to be at its optimal leverage at time t, $i.e. Y_{it} - Y_{it-1} = Y_{it}^* - Y_{it-1}$.

In practice however, the existence of significant adjustment costs means that the firm will not completely adjust its actual leverage to Y^*. Thus, with less than complete adjustment, the firm's observed leverage ratio at any point in time would not equal its optimal leverage ratio. Following Auerbach (1990), we can represent this by a partial adjustment model as

$$Y_{it} - Y_{it-1} = l_{it}\left(Y_{it}^* - Y_{it-1}\right) \qquad (2)$$

where l_{it}, is known as the coefficient of adjustment or the speed of adjustment. Equation (2) postulates that the actual change in the leverage ratio at any point in time for firm i is the same fraction λ of the optimal change for that period. If $l_{it} = 1$, this means that the actual leverage ratio is equal to the optimal leverage; that is, the actual leverage ratio adjusts to its target ratio instantaneously and

continuously *i.e.*, for all t a firm shall consistently be at its target leverage. If $l_{it} < 1$, the adjustment from the period $t-1$ to t falls short of the adjustment required to attain the target. However, if $l_{it} > 1$, the firm makes adjustment more than is necessary and yet is still not at its target level (over-adjustment). The above partial adjustment model can alternatively be written as

$$Y_{it} = (1 - l_{it})Y_{it-1} + l_{it}Y_{it}^{*} \qquad (3)$$

If we substitute equation (1) into equation (3) to remove the unobservable optimal leverage, Y_{it}^{*}, we get the following empirical model:

$$Y_{it} = (1 - l_{it})Y_{it-1} + l_{it}(f_0 + \sum_k b_k X_{kit} + a_i + a_t + e_{it}) \qquad (4)$$

which can be written as:

$$Y_{it} = j_0 + g_0 Y_{it-1} + \sum_k g_k X_{kit} + h_i + h_t + u_{it} \qquad (5)$$

where $j_0 = l_{it} f_0$, $g_0 = 1 - l_{it}$, $h_i = l_{it} a_i$, $h_t = l_{it} a_t$, and $u_{it} = l_{it} e_{it}$ (where u_{it} has the same properties as e_{it}). Since equation (1) represents the optimal, or long run leverage ratio, equation (5) represents the short run leverage ratio since the actual or existing leverage ratio may not be equal to its optimal one. When an equation in the form of (5) is estimated, the coefficient of the observed lagged leverage variable, Y_{it-1}, gives the estimate of one minus the partial adjustment. If the coefficient value of the lagged leverage ratio is greater than zero, we can conclude that the adjustment from period $t-1$ to t falls short of the adjustment required to attain the target. Moreover, if the coefficient is less than zero, the firm over-adjusts in the sense that it makes more adjustment than is necessary and still does not reach the optimal level.

Relative to the subject matter of this paper, the empirical literature suggests a number of factors that may influence the financial

structure of companies. As argued by Titman and Wessels (1988) and Harris and Raviv (1991), the choice of the underlying explanatory variables is fraught with difficulty. First, there may be some attributes which cannot be well represented by the available proxies, or there may be several proxies that can be used for certain attributes. Second, the attributes themselves can be related, so the chosen proxies may actually measure the effects of several different attributes. Third, measurement errors in the proxy variables may be correlated with measurement errors in the dependent variables thus creating spurious correlations[3]. In this study we focus on the following five variables that are most commonly used in the empirical studies: asset tangibility, growth, size, profitability and volatility.

Tangibility

On candidate to the set of explanatory variables is the proportion of tangible fixed assets in total assets- *tangibility* (TANG). In an uncertain world, with asymmetric information, the asset structure of a firm has a direct impact on its capital structure since tangible assets are the most widely accepted source for bank borrowing and raising secured debt. If banks have imperfect information regarding the behavior of the firm, firms with little tangible assets find it difficult to raise funds via debt financing. Consequently, the most previous studies' findings suggest that the collateral value is the major determinant of the level of debt finance (see for example, Bradley *et al*, 1984; and Rajan and Zingales, 1995).

Company Size

Both theoretical and empirical studies argue for the relevance of a firm's size as a determinant of the optimal debt capacity. Large firms, which are more diverse, have more stable cash flows and better established operating and credit histories, can sustain more debt than small firms (Titman and Wessels, 1988). This is because these factors provide large firms with greater access to alternative sources

[3] However, we address this problem in our empirical analysis by using GMM dynamic panel estimators.

of finance in times of financial distress. Furthermore, it is argued that larger firms may have lower agency costs associated with the asset *substitutions* and *underinvestment* problems, so may encourage them to take on relatively high debt burdens. In agreement with other studies in this field (*e.g.*, Titman and Wessels, 1988; Rajan and Zingales, 1995; and Bevan and Danbolt, 2000), we use the natural logarithm of total sales as a proxy for the size of firms (*SIZE*).

Growth Opportunities

The agency theory predicts a negative relationship between growth and leverage. Myers' (1977) *underinvestment* problem suggests a negative relationship between profitable investment opportunities and debt. The argument is that a firm's growth opportunities lie in its intangible assets instead of tangible assets; the cost of financial distress which is associated with high leverage may affect a firm's ability to finance its future growth. So managers of firms with valuable growth opportunities should choose low leverage. Consistent with previous empirical studies (e.g., Titman and Wessels, 1988), we use the percentage change of total assets as an indicator of growth (*GROWTH*).

Profitability

Capital structure theories have different views on the relationship between leverage and profitability. The *pecking order theory* (Myers and Majluf, 1984) suggests that more profitable firms have less leverage, and instead rely more on internal finance. It is suggested that the observed capital structure of firms will reflect the cumulative requirement for external financing. A profitable and slow-growing firm should generate the most cash, and less profitable fast-growing firm will need significant external financing. However, asymmetric information theories argue that the choice of the firm's capital structure signals to outside investors the information of insiders, in which case investors take larger debt levels as a signal of good performance by the firm and of the management's confidence. According to this argument, the firm's value (or profitability) and leverage must be positively related. Furthermore, static trade-off theory predicts a positive relationship based on the presence of tax-shields. Higher profitability would imply more income shield.

Following Titman and Wessels (1988); Rajan and Zingales (1995); and Bevan and Danbolt (2000), we use operating income before interest, tax and depreciation to total assets as our indicator of profitability (*PROF*).

Earning Volatility

In general, firms with high earnings volatility have a greater chance of being unable to meet their debt commitments, thereby incurring a higher cost of financial distress. Accordingly, the potential financial distress implied by higher variability of a firm's earning may lead a risk-averse to have relatively lower debt targets. The relatively weak insolvency laws and their enforcement in Jordan may result in a lower risk-aversion of the managers with the corresponding higher debt ratios. However, the agency theory suggests a positive relationship between earnings volatility and leverage. This is because higher earnings may encourage greater reliance on debt since large gains accrue primarily to stockholders whereas both stockholders and debt holders share large losses. We measure earnings volatility (*VOL*), by the standard deviation of earnings before taxes and interest for the 5-year period centered on the year of observation scaled by the mean of earnings before taxes and interest for the same 5-year period. The choice of leverage proxy depends on the objective of analysis. The alternative theories of capital structure suggest various proxies to measure leverage. We intend to study factors influencing availability and a level of debt financing. An appropriate measure of financial leverage, given the scope of our study and the available data, could be the ratio of debt (both short term and long term) to total asset. An alternative measure that corrects the previous one for the effect of the gross trade credit would be the ratio of total debt to net assets, where net assets are total assets less accounts payable and other liabilities. This last measure may underestimate the company leverage by including assets held against pension liabilities. Therefore, we use one measure of financial leverage and that is total debt divided by total assets. This variable is measured in book value and not in market value because market value data for debt are unavailable.

4. The Estimation Method

This section describes the econometrics techniques that we use to estimate our dynamic panel data regressions. It is well-known that using the OLS to estimate dynamic panel models results inconsistent estimates because of many reasons including the possible correlation between unobserved firm-specific effects and other explanatory variables, the potential correlation between the lagged endogenous variables and residuals, and the possibility that the explanatory variables are not exogenous. In panel data estimation, consistent estimates of coefficients depend on the stochastic properties of the model. If the error term is orthogonal to the right hand side variables, an OLS estimator will be consistent. On the other hand, if all explanatory variables are strictly exogenous, then a fixed effect estimator will be consistent. The equation model we estimate here contains unobservable firm-specific effects, which are correlated with the explanatory variables as well as the endogenous variables. Hence, the orthogonality conditions between the error terms and the variables are not likely to be met in the OLS, fixed effect or within-group estimators to produce consistent estimators (Arellano, 2003).

One can achieve the orthogonality conditions under certain circumstances (through appropriate differencing of the equation). However, in our model we have a lagged dependent variable as well as possible endogenous variables as regressors. Therefore, the error terms in the differenced equation are correlated with the lagged dependent variable through contemporaneous terms in period $t + j$ even if there is no unobserved firm or time effects that correlate with the regressors. Neither the fixed effect or within-group estimator nor the OLS will produce consistent estimates. An instrumental variable estimator that can account for corrected fixed effects as well as account for the possibility of endogeneity of the regressors is therefore needed. Chamberlian (1984) has proposed a Generalized Method of Moment's (GMM) estimator that allows the regressors to be transformed to achieve orthogonality between them and error terms.

While the GMM estimator can account for firm heterogeneity, it does not account for the endogeneity of regressors. The dynamic growth effects may introduce autoregression in the error structure. Arellano and Bond (1991) have proposed a dynamic panel estimator that optimally exploits the linear moment restrictions implied by the dynamic panel model we use here. This method uses all past values of endogenous regressors as well as lagged values of all strictly exogenous regressors as instruments. Thus we use this method to estimate equation (5). Notice that the error term in our model, equation (5), has three components: unobserved firm specific effects α_i, time-specific effects α_t, and the standard innovation error term $\varepsilon_{i,t}$. In order to get consistent estimators, Arellano and Bond (1991) propose to first-difference the regression equation to eliminate the unobserved firm fixed effects. Thus, the regression equation after taking the first difference of equation (5) can be written as:

$$\Delta Y_{it} = j_0 + g_0 \Delta Y_{it-1} + \sum_k g_k \Delta X_{kit} + h_i + h_t + u_{it} \qquad (6)$$

GMM methods are used to estimate the parameters in equation (5). Given that the $u_{it}'s$ are serially uncorrelated, the GMM is the most efficient one within the class of instrumental variable estimators (Honore and Hu, 2000). In estimating (6), Y_{it-2}, or higher lagged values (wherever feasible) are valid instrumental variables. However, the consistency of the GMM estimator depends on the assumption that the lagged value of the dependent variable and the other explanatory variables are valid instruments and that the error terms do not exhibit serial correlation. To address these issues Arellano and Bond (1991) proposed two tests. First, examine the hypothesis that the error term is not serially correlated. Under the null hypothesis of no serial correlation, this test is distributed standard-normal. Second, Sargan test of over-identifying restrictions. This tests the overall validity of the instruments. Under the null-hypothesis of validity of the instruments this test is distributed χ^2 with degrees of freedom calculated as the difference between the number of instruments and the number of regressors. Failure to reject the null hypothesis of both tests gives support to model specification.

5. The Empirical Results

The annual data for our company sample which consists of 36 manufacturing companies for the period 1984-2000 were obtained from the "*Guide of Publicly Held Corporations*" published (annually) by the ASE. This guide provides the values for some of the items which appear on the balance sheet and profit and loss statements. Although the number of companies is not large, our sample accounts for about 65% of all listed manufacturing companies. Moreover, our sample includes the largest companies in terms of their market values and the ones which had all the needed data. Therefore, the number of the companies should not be considered as a shortcoming of the study since the analysis will be based on the most representative sample possible of the Jordanian capital market. In Table 1, we report summary descriptive statistics for all the variables used in this paper over the period 1984-2000. One of our main objectives for this study is to use the 1990s reform to examine the effect of financial liberalization on capital structure choice. As a result, we divided our full data set into two non-overlapping periods: pre-liberalization (1984-1990) and post-liberalization (1991-2000). The descriptive statistics over these two periods are also reported in Table 1. As can be seen from this table, the average leverage of Jordanian industrial firms is around 43 percent over the period 1984-2000. The median value in the sample is close to mean value, showing that 43 percent leverage can be seen optimal financial structure that Jordanian firms wish to prevent. The table also shows that the mean leverage ratio fell from 46.1 percent in the pre-liberalization period to 42.2 percent in the post-liberalization period. This outcome is not unexpected; being consistent with the clear body of evidence that linked liberalization with an increase in the cost of debt and decrease the cost of equity finance. Thus, this study supports the observation that financial liberalization process has helped Jordanian firms to reduce their leverage. Table 1 also indicates that the variation in individual leverage ratios increased during the post liberalization period. Again, this outcome is not unexpected. In a tightly controlled market environment with few financing options, firms are forced to adopt relatively uniform capital structures. Relaxation of these controls

allows firms to make different choices based on their specific situations.

Table 1: Summary Statistics

Leverage is defined as the ratio of total debt to total assets. Size is the natural logarithm of total sales. TANG is the ratio of fixed assets to total assets. GROWTH is the percentage change in total assets. PROF is the ratio of total profits before taxes and interest to total assets, and VOL is the standard deviation of earnings before taxes and interest for the 5 year period centred on the year of observation scaled by the mean of earnings before taxes and interest for the same 5 year period.

1984 - 2000	**Leverage**	**SIZE**	**TANG**	**GROWTH**	**PROF**	**VOL**
Mean	0.44	15.35	0.44	0.14	0.08	10.23
Median	0.40	15.33	0.39	0.06	0.07	7.61
Maximum	2.49	20.07	4.06	16.04	1.98	116.34
Minimum	0.01	10.58	0.02	-0.90	-0.34	0.24
Std. Dev.	0.29	1.74	0.27	0.86	0.13	10.64
Skewness	2.01	0.21	5.09	15.61	6.06	5.16
Kurtosis	17.28	3.66	67.00	268.84	89.52	44.49
Jarque-Bera	4563.95	12.81	87156.23	1486606	158390.1	37939.12
Probability	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
1984 - 1990	**Leverage**	**SIZE**	**TANG**	**GROWTH**	**PROF**	**VOL**
Mean	0.46	14.90	0.48	0.19	0.06	9.662
Median	0.47	14.81	0.46	0.07	0.06	7.88
Maximum	0.91	19.43	0.94	16.04	0.44	54.80
Minimum	0.10	10.58	0.04	-0.35	-0.19	0.242
Std. Dev.	0.20	1.73	0.29	1.20	0.10	6.58
Skewness	0.13	0.28	0.28	12.85	0.50	2.55
Kurtosis	2.18	3.73	2.29	169.95	4.63	14.90
Jarque-Bera	5.54	6.25	6.19	213880.5	27.32	1255.37
Probability	(0.06)	(0.04)	(0.04)	(0.00)	(0.00)	(0.00)
1991 - 2000	**Leverage**	**SIZE**	**TANG**	**GROWTH**	**PROF**	**VOL**
Mean	0.42	15.61	0.41	0.11	0.09	10.55
Median	0.38	15.55	0.35	0.05	0.08	7.08
Maximum	2.49	20.07	4.06	9.63	1.98	116.34
Minimum	0.01	10.71	0.02	-0.90	-0.34	0.24
Std. Dev.	0.232	1.69	0.30	0.58	0.15	12.35
Skewness	2.72	0.23	6.10	14.27	6.74	4.90
Kurtosis	22.24	3.74	73.77	233.14	89.79	37.23
Jarque-Bera	5296.35	10.01	68318.65	712578.6	102211.5	16793.14
Probability	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)

We estimate the dynamic structure model (5) using the GMM-difference technique. We use instruments dated $t-2$ and earlier. These estimators permit us to overcome the statistical problems that are associated with unobserved individual effects, endogeneity of explanatory variables, and the use of lagged dependent variables. We present only the two step-GMM estimators, since they are more efficient than the one-step estimators, and since the Sargan test of overidentifying restrictions is heteroscedasticity-consistent only if based on the two-step estimators. In Table (2) we report the results for the whole time period (1984-2000) and the two non-overlapping time periods: pre-liberalization (1984-1990) and post-liberalization (1991-2000), respectively.

As can be seen from Table (2), the regressions results support our model specification. On the other words, there is clear evidence that the GMM-difference specification is appropriate to estimate our dynamic model. More specifically, the tests for the serial correlations in residuals indicate the absence of first-and second-order serial correlations. The Sargan *J* test indicates that the instruments used in these regressions are valid and this implies that the instruments are not correlated with the error terms (*e.g.*, absence of strong unobserved firm specific effects). Furthermore, the Wald test for the joint significance of the regressors is satisfied. Time dummies are also jointly significant suggesting that the aggregate factors (*e.g.*, economic shock) exert a significant influence on the financing decisions of Jordanian companies.The results show that the coefficients of lagged leverage across the three period specifications (whole, pre- and post-liberalization periods) enter significantly and greater than zero at the 1%, 10% and 1% levels, respectively. This result clearly indicates that Jordanian firms always under-adjust in the sense that they fall short of the adjustment required to attain their target leverage levels. On the other words, the evidence seems to indicate that Jordanian companies behave as if they had target leverage ratios in mind, and they tend to adjust towards those targets. The magnitude of the adjustment coefficient l for whole period (1984-2000) which is equal to $1-g_0$ is relatively large (greater than 0.70) possibly providing evidence that Jordanian firms adjust

relatively quickly towards their target. Thus companies which are below their debt targets are quickly as possible adjust their leverage by issue debt. One possible explanation of this adjustment speed would emphasize that the costs of being far away from the target debt ratio are significant so that firms wish to reach their target ratios as quickly as possible.

Table 2: Dynamic Capital Structure Estimates

Numbers in parentheses appearing below the coefficients are White (1980) heteroskedasticity-constant t-statistics. The numbers in brackets are p-values. All models are carried out using the DPD program written in Ox. ***, ** and * indicate coefficient is significant at the 1%, 5% and 10% levels, respectively.

Independent Variables	GMM-Difference **1984-2000**	GMM-Difference **1984-1990**	GMM-Difference **1991-2000**
Constant	0.003 (1.32) [0.189]	0.0127*** (4.37) [0.000]	-0.002 (-0.429) [0.669]
Y_{it-1}	0.285*** (6.48) [0.000]	0.153* (1.92) [0.058]	0.218*** (5.60) [0.001]
SIZE	0.0409*** (3.58) [0.001]	0.008* (1.66) 0.100]	0.034*** (2.60) [0.010]
TANG	0.8200*** (20.5) [0.000]	0.366*** (6.04) [0.000]	0.699*** (14.10) [0.000]
GROWTH	-0.2390*** (-21.0) [0.000]	-0.000 (-0.043) [0.965]	-0.146*** (-5.44) [0.000]
PROF	0.1357** (2.15) [0.024]	0.252** (2.42) [0.027]	0.356*** (7.99) [0.934]
VOL	-0.0004** (-2.43) [0.017]	-0.0001 (-0.285) [0.772]	-0.001*** (-2.99) [0.004]
1st Order Serial Correlation LM (1)	[0.195]	[0.211]	[0.229]
2nd Order Serial Correlation LM (1)	[0.263]	[0.652]	[0.936]
Wald Test 1	[0.000]	[0.000]	[0.000]
Wald Test 2	[0.003]	[0.000]	[0.012]
Sargan Test	[0.996]	[0.682]	[0.802]

However, the unique and the most interesting feature of our results concerns the differences in the magnitude of the lagged leverage ratio across the pre- and post-liberalization periods. In particular, the estimated coefficient of lagged leverage ratio is significantly higher during the post-liberalization period (0.14 versus 0.22). This result implies that, following the liberalization period, their speed of adjustment has slowed down. This outcome is not unexpected, and consistent with the fact that an increase in the general level of real interest rates may increase the adjustment cost of firms. The conservative policies of Jordanian banks post-liberalization period may also responsible for the slower adjustment of the Jordanian firms. This result has important policy implication for Jordanian firms; it suggests that the cost of restructuring is become more significant post-liberalization period

As far as the determinants of the financial structure of firms are concerned, Table (2) indicates that the results are remarkably similar to those of Titman and Wessels (1988) and Bevan and Dabolt (2000) for US and UK data, respectively, and to the international evidence provided Rajan and Zingales (1995). The size of firm is predominantly positively correlated to leverage ratio. This result implies that the borrowing capacity of Jordanian firms is significantly limited by their bankruptcy risk and that optimal leverage ratio of the firms with lower bankruptcy risk is high. Larger firms might be more diversified and fail less often, so firm size may serve as an inverse for the probability of bankruptcy. The results support the hypothesis relating to the role of tangibility of assets in lending decisions. The coefficient estimate of tangibility is positive and significant at any level and relatively large in magnitude. This result is consistent with the view that there are various costs (agency costs and expected bankruptcy/financial distress costs) associated with the use of debt funds and these costs may be moderated by collateral. This result also supports the significance of information problems in the credit market. Firms with high quality collateral can obtain debt at a lower premium because of the greater security for creditors. The growth opportunity is significantly and negatively related to leverage ratio. The inverse relation supports the view that the cost of financial distress of high growth firms is relatively high and agency cost of debt and agency cost is considerable. Because of

high cost of debt (lenders demand for higher rate of interest when the information asymmetry is higher) managers would be reluctant to raise debt capital causing the lower leverage ratio. The variable profits over total assets which is used as a proxy for firm's profitability enters negatively and significantly related to leverage. A relatively large negative coefficient of profitability in Jordan may suggests that Jordanian firms, whose managers are said to have a strategic advantage over the information processed by creditors, use a hierarchy of alternative financial strategies, due to serve information asymmetric in the line suggested by pecking order theory. These firms retain a relatively larger proportion of earnings and hence the need for external finance is reduced. Inconsistent with Titman and Wessels (1988) findings the evidence shows that earnings volatility of firms exerts a negative influence on their ability to obtain debt. Effectively the debt represents the put option on firm assets and the interest paid is the premium. The value of this option increases with the increase in the volatility of the underlying assets but that would also imply an upward adjustment in the premium. At some level of volatility the creditor might prefer to use the quantitative restrictions on the amount of lend.

The most important feature of our results concerns the differences in the individual estimated coefficients for the pre- and post-liberalization periods. The results show that the estimated coefficients of the factors that influence firms' capital structure became more statistically significant and more able to account quantitatively for the variations in the debt ratios across firms during the post-liberalization period. For example, the results show that after liberalization the effect of growth opportunity on the debt ratio is increased significantly. This may reflect lower transaction and financial costs in the equity market after the liberalization. Thus, the results of our empirical analysis show that the financial liberalization and end of financial repression make capital markets more perfect. Moreover, we can argue that during a period of historically high and volatile interest rates (the post-liberalization period), one cannot underestimate the importance of information symmetry and, financial risk/ bankruptcy cost. Indeed, we expect banks during high and fluctuating interest rates, to place more weight on factors like asset tangibility, profitability and earning volatility in their lending policy.

6. A Summary and Conclusions

The study extends the empirical work on capital structure in three ways. First, it represents one of the limited numbers of papers that examine empirically the capital structure choice using Jordanian firm-level data. Second, the study uses a dynamic model which allows us to shed light on the nature of the target debt ratio of firms and adjustment process to this target. Finally, the study employs a panel data analysis and GMM estimation techniques which allow us to control for unobserved firm-specific effects and endogeneity problem.The findings of this paper suggest that Jordanian firms have target leverage ratios and they adjust to these ratios relatively fast, implying that the costs of being away from their target ratios and the costs of adjustment are equally important for firms. However, following the 1990s financial liberalization, their adjustment speed has slowed down. This outcome is not unexpected, and consistent with the fact that an increase in the general level of real interest rates may increase the adjustment cost of firms.

We find that the variables that are relevant for explaining capital structures in U.S. and European countries are also relevant in Jordan. The results provided support for positive effect arising from size of firms, possibly reflecting the better access of large firms to financial markets, the relatively low proportion of bankruptcy cost to the value of firms or the flexibility of banks to larger firms when they are in financial distress. There is also support for the role of asset tangibility and growth options in financing decisions. These results suggest the presence of an underlying problem of asymmetric information in the credit market. Evidence also indicates that profitability has a negative impact on debt ratio, suggesting that internal finance is preferred to external finance. Again, we find evidence shows that earnings volatility of firms exerts a negative influence on their ability to obtain debt, which not lending to support the agency theory.

Finally and more importantly, the results of this paper show that these factors became more statistically significant and more able to account quantitatively for the variation in the capital structure of Jordanian firms during the post liberalization period. On the other

words, the hypothesis capital structure provides greater explanatory power in the liberalized market conditions than in the regulated market conditions. This important result is not unexpected since the liberalized conditions correspond more closely to the assumptions of the models generating the hypothesis.

References

Arellano, M. (2003). *Panel data econometrics*, Oxford U. Press.

Arellano, M. and Bond, S. (1991). "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations." *Review of Economic Studies*, 58, pp. 277-97.

Bevan, A. and Danbolt, J. (2000). "Capital structure and its determinants in the United Kingdom: a decompositional analysis." Working Paper, University of Glasgow, mimeo.

Booth, L., Aivazian, V., Demirguc-Kunt, A. and Maksimovic, A. (2001). "Capital structures in developing countries." *Journal of Finance*, 56, pp.87-130.

Bradley, M., Jarrell, G. and Kim, E. (1984). "On the existence of an optimal capital structure: Theory and evidence." *Journal of Finance*, 39, pp. 857-78.

Chamberlian, G. (1984). "Panel data." in Griliches, Z. and Intriligator M. (eds), *Handbook of Econometrics*, Elsevier.

Demirguc-Kunt, A. and Maksimovic, V. (1995). "Capital structures in developing countries: evidence from ten country cases." Policy Research Working Paper 1320, *The World Bank*.

Harris, M. and Raviv, A. (1991). "The theory of capital structure." *Journal of Finance*, 46, pp. 297-355.

Honore, B. and Hu, L. (2000). "Estimation of cross sectional and panel data censored regression models with endogeneity." Working Paper, Princeton University, mimeo.

Marsh, P. (1982). "The choice between equity and debt: an empirical study." *Journal of Finance*, 37, pp.121-44.

Myers, S. (1977). "Determinants of corporate borrowing." *Journal of Financial Economics*, 5, pp.147-75.

Myers, S. and Majluf, N. (1984). "Corporate financing and investment decisions when firms have information investors do not have." *Journal of Financial Economics*, 13, pp.187-221.

Rajan, R. and Zingales, L. (1995). "What do you know about capital structure? Some evidence from international data." *Journal of Finance*, 50, pp.1421-60.

Singh, A. (1995). "Corporate financing patterns in industrializing economics: a comparative international study." Technical Paper, International Financial Corporation.

Singh,A. and Hamid,J.(1992)."Corporate financial structures in developing countries" Tech. Paper 1, Internat. Financial Corporation.

Titman,S.(1984)."The effect of capital structure on a firm's liquidation decision" *Journal of Financial Economics*, 13, pp.137-51.

Titman, S. and Wessels, R. (1988). "The determinants of capital structure choice." *Journal of Finance*, 43, pp.1-19.

Zweibel, J. (1996). "Dynamic capital structure under management entrenchment." *American Economic Review*, 86, pp.1197-1215.