Analysis of the Impact of Leverage on Various Measures of Corporate Performance, using Arellano and Bond Dynamic Panel Data Estimation Technique

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Abstract

This paper is an attempt to look into the issue of the effect of leverage and adjustment costs on various measures of corporate performance for three hundreds and seventy four non-financial firms listed on Karachi Stock Exchange of Pakistan. This study covered only Pakistan equity market. A panel data set spanning 1988 to 2008 is used for the purpose. The Arellano and Bond dynamic panel data estimation technique (a variant of GMM) is used to capture the role of adjustment costs and the dynamic behavior of corporate performance. The results, thus obtained, are essentially mixed. The coefficients of the adjustment variable (lagged corporate performance) are positive for ROCE (Return on capital employed) and EPS (Earnings per Share) but ironically negative for ROE (Return on Equity). Similarly the effect of leverage on ROCE is negative but insignificant and positive significant when EPS is used as a measure of corporate performance. Whereas the relationship between leverage and ROE (another measure used in the paper for corporate performance) is negative and significant which implies that high leverage force the managers to perform optimally due to higher interest burden and agency cost. The negative effect of leverage is consistent with dynamic picking order theory that increase in debt reduce firms value by reducing its safe debt capacity and causes underinvestment in the long run. The positive effect of the size of a firm on performance is confirmed for all the three measures of corporate performance. Furthermore, the positive and statistically significant impact of short term liabilities implies that high short term liabilities exert pressure on corporate managers to perform efficiently in the competitive market. In Pakistan equity market the leverage overall impact on corporate performance was positive indicating that firms can increase profits through debt financing instead of equity financing. The current study was among the few that used The Arellano and Bond dynamic panel data estimation technique (a variant of GMM) to investigate corporate performance.

Keywords: Corporate Performance, Leverage, adjustment costs, Panel Data

In corporate finance literature one of the much debated issues is the relationship between leverage and corporate performance. This debate started with the celebrated irrelevance theorem of Miller and Modigliani (1958) which brought about a revolution in corporate finance. According to this theorem in a perfect capital market, where there are no transaction costs and where perfect rationality and certainty prevails, the capital structure choice is of no relevance. Some of the other renowned contributions to corporate finance are by Jensen and Meckling (1976) "agency theory" and Myers (1984) "pecking order" theory. The origin of pecking order theory, as proposed by Myers, is asymmetric information, meaning that company has more information about company affairs then the outsiders. The view of Jensen and Meckling (1976) is that shareholders prefer high risky and high pay-off projects because they have limited liability if project fail, on the contrary if the project is successful then the shareholders enjoy high residual cash flows after paying the debts. However after a series of modifications made by Jensen and Meckling (1976), it was revealed that the level of debt in a firm financing does have impact on a firm's behavior and its performance.

On the other side, as leverage increases it increase the agency costs because the interests of shareholders and debt holders are different resulting in an increase in the total cost of the company. Therefore, leverage may be negatively correlated with performance (Jensen and Meckling, 1976; and Myers, 1977). The extant literature varies over the conclusion if leverage is positively or negatively related to corporate performance. The reasons behind these diverging views can be many; different performance measures and/or different estimation techniques. The contribution of the present paper is twofold; first three different performance measures are used in order to check the divergence in the results due to different measures, second Generalized Method of Moments (GMM) is used to capture the dynamics of the model. The use of GMM has also enabled to unfold the role of adjustment costs in the determination of corporate performance.

Rest of the paper is organized as follows: section 2 presents a brief overview of extant literature, section 3 contains model specification and data description, section 4 has the discussion of results while section 5 concludes with policy implications.

Literature Review

There are very limited studies in the extant literature to have had analyzed the relationship between leverage and corporate performance. To the authors knowledge there is no such study conducted for Pakistan to date. However studies carried out for other countries generally differ in choosing a proxy for corporate performance. Broadly categorizing, the literature can be divided into two different strands on the basis of measures used for performance. The first strand uses total factor

productivity (Pushner 1995; Nickell et al. 1997; Nickell and Nicolitsas, 1999). The second strand of literature uses basic accounting measures of performance (Majumdar 1997); Kinsmen and Newman, 1999). All of these studies have different results due either to the measure used for performance or due to the econometric technique employed. Weill (2008) asserts that the link between performance and leverage differs across different countries. He, moreover, maintains that it's the legal system of the country that primarily determines corporate performance.

Data Description and Model Specification

Data set used in the study is taken from the publication by State Bank of Pakistan "Balance Sheet Analysis of Joint Stock Companies", various issues of Business Recorder and annual reports of the relevant years. The data set comprises of financial accounts of the publicly listed firms in Karachi Stock Exchange of Pakistan. A total of 374 firms which are listed on Karachi Stock Exchange for the period from 1988 to 2008 are considered.

Table 1. Classification of Industries

Industry	No. of Firms	As a % of Total
Textile	166	44.38
Chemicals	26	6.95
Engineering	36	9.63
Sugar & Allied Industries	35	9.36
Paper & Board	10	2.67
Cement	16	4.28
Fuel & Energy	18	4.81
Transport & Communication	5	1.34
Tobacco	3	0.80
Jute	6	1.60
Vanaspati & Allied Industries	7	1.87
Miscellaneous	46	12.30
Total	374	100.00

Table 1 presents a summary of the dependent and explanatory variables and their measurement.

Table 2. Variables Description and Measurement

Acronym	Dependent Variable	Measurement
ROCE	Return on Capital Employed	Ratio of net operating profit to the net operating assets
EPS	Earnings per share	Ratio of net income to the number of shares outstanding

ROE	Return on Equity	Ratio of net income to the number of shareholder's equity
	Explanatory Variables	Measurement
LEVR	Leverage of the firm	Ratio of total debt to total assets
TANG	Tangibility of Assets	Ratio of fixed assets to total assets
SIZE	Size of the firm	Natural log of total assets
STLR	Short term liabilities ratio	Ratio of short term liabilities to total liabilities

Model Specification

Dynamic panel data usually suffers from endogeneity, omitted variables bias, and heteroscedasticity. In dynamic models, the ordinary least squares (OLS) method cannot control for simultaneity bias and firm specific effects. Similarly OLS cannot deal adequately with models which have lagged dependent variables. Lagged dependent variable causes the results to be upward biased and inconsistent due to serial correlation between the lagged dependent variable and the error term. "This inconsistency would persist even when N and T grows larger" (Pesaran and Smith 1995). They have suggested that serial correlation can be removed by first differencing; they express their reservations as to the generalization of this approach. In such a situation, a dynamic panel data model with instrumental variables (IV) should provide accurate and consistent results. Accordingly Generalized Method of Moments will be employed in this paper. The general specification of the model can be written as:

$$CP_{i,t} = \quad X_{i,t}$$

Where

$CP_{i,t}$ = Corporate performance of the i[th] firm in time t

$X_{i,t}$ = Vector of explanatory variables

To be more explicit the following models are specified for different measures of corporate performance:

$$ROCE_{i,t} = \sim + \ _0ROCE_{i,t-1} + \ _1LEVR_{i,t} + \ _2LEVR_{i,t-1} + \ _3TANG_{i,t} + \ _4TANG_{i,t-1}$$
$$+ \ _5SIZE_{i,t} + \ _6SIZE_{i,t-1} + \ _7STLR_{i,t} + \ _8STLR_{i,t-1} + £ \text{----------} 1$$

Where

$ROCE_{i,t}$ = Return on Capital Employed by i[th] firm in current year

$ROCE_{i,t-1}$ = Return on Capital Employed by i[th] firm in the Previous Year

$LEVR_{i,t}$ = Leverage of the i[th] firm in current year

$LEVR_{i,t-1}$ = Leverage of the i[th] in the previous year

$TANG_{i,t}$ = Tangibility of Assets of the i[th] firm in current year

$TANG_{i,t-1}$ = Lagged tangibility of Assets of the i[th] firm

$SIZE_{i,t}$ = Size of the i[th] firm in current year

$SIZE_{i,t-1}$ = Size of the i[th] firm in the previous year

$STLR_{i,t}$ = Ratio of short term liabilities to total liabilities of the i[th] firm in current year

$STLR_{i,t-1}$ = Ratio of short term liabilities to total liabilities of the i[th] firm in the previous year

£ = Error term in the model

$$EPS_{i,t} = \sim + {}_0EPS_{i,t-1} + {}_1LEVR_{i,t} + {}_2LEVR_{i,t-1} + {}_3TANG_{i,t} + {}_4TANG_{i,t-1} + {}_5SIZE_{i,t} + {}_6SIZE_{i,t-1} + {}_7STLR_{i,t} + {}_8STLR_{i,t-1} + £ \text{----------} 2$$

Where

$EPS_{i,t}$ = Earnings per share of the i[th] firm in the current year

$EPS_{i,t-1}$ = Earnings per share of the i[th] firm in the previous year

And rest of the variables is the same as those in model 1

$$ROE_{i,t} = \sim + {}_oROE_{i,t-1} + {}_1LEVR_{i,t} + {}_2LEVR_{i,t-1} + {}_3TANG_{i,t} + {}_4TANG_{i,t-1} + {}_5SIZE_{i,t} + {}_6SIZE_{i,t-1} + {}_7STLR_{i,t} + {}_8STLR_{i,t-1} + £ \text{----------} 3$$

Where

$ROE_{i,t}$ = Return on Equity of the i[th] firm in current year

$ROE_{i,t-1}$ = Return on Equity of the i[th] firm in previous year

And rest of the variables is the same as in model 1 and 2

Discussion and Results

It can be seen from the Table that the coefficients of the adjustment variable (lagged corporate performance) are positive for ROCE and EPS but ironically negative for ROE. The adjustment speed for ROCE is 89 percent (1-.1099605), 27.97 percent for EPS and 101.095 percent for ROE. These findings suggest that the performance of all these firms are sub-optimal thus desiring to reach to the optimal level at a quite high speed.

Table 3. Arellano-Bond Dynamic Panel-data Estimation Results

Variable	ROCE		EPS		ROE	
	Coefficient	P	Coefficient	P	Coefficient	P
ΔROCE	.1099605	0.000	.720277	0.000	-.0109482	0.000
ΔLEVRt-1	.0000345	0.000	.0066048	0.000	-.0000551	0.000
ΔLEVR	-.000189	0.153	.0021585	0.000	-.0920797	0.000
ΔTANGt-1	-.0004122	0.000	-.0034612	0.000	-.0003635	0.000
ΔTANG	.0013073	0.000	.0058389	0.000	-.0002843	0.000

ΔSIZEt-1	-.7975204	0.000	-12.59335	0.000	-.9760587	0.000
ΔSIZE	.7865054	0.000	7.717186	0.000	1.269869	0.000
ΔSTLRt-1	.0355179	0.000	-16.3255	0.000	1.119906	0.000
ΔSTLR	.0230453	0.007	15.46664	0.000	.9380895	0.000
Constant	-.0012807	0.000	.1937677	0.000	-.0504003	0.000
	Sargan test of over-identifying restrictions: $Chi^2(189) = 27.43$ Prob > Chi^2 = 0.2130		Sargan test of over-identifying restrictions: $Chi^2(189) = 27.51$ Prob > Chi^2 = 0.1621		Sargan test of over-identifying restrictions: $Chi^2(189) = 28.81$ Prob > Chi^2 = 0.0983	
	Arellano-Bond test that average auto-covariance in residuals of order 1 is 0: H0: No Autocorrelation z= -1.05 Prob > z = .2930		Arellano-Bond test that average auto-covariance in residuals of order 1 is 0: H0: No Autocorrelation z= -3.95 Prob > z = 0.0001		Arellano-Bond test that average auto-covariance in residuals of order 1 is 0: H0: No Autocorrelation z= -1.85 Prob > z = .0642	

The estimates are obtained using Stata version 9.2

The relationship of leverage with corporate performance is negative but insignificant in case of ROCE as a measure of performance. In Pakistan, decision making is concentrated in few hands representing the majority shareholders; they force management to take financial decisions that are aligned with value maximization of firm but largely to protect their own interests, which causes the agency problem and ROCE declines. Kose et al (2010) suggests that self-centered managers tend to employ more debt and have bulk of investment in fixed assets. This in turn leads to deviation from optimal leverage level which significantly effects firm's value. Further, Khwaja and Main (2005) investigate price manipulations in Pakistan equity market. They found that brokers earn 50-90 % more than outsider investors when they trade on their own behalf. The relationship between leverage and EPS is positive and significant. The positive relationship of EPS and performance indicates that leverage doesn't hinder corporate performance but simultaneously this result can be attributed to the presence of serial correlation as can be seen from table 2. Where the Arellano-Bond test that average autocovariance in residuals of order 1 is 0 rejects the null hypothesis of no autocorrelation. The coefficient of leverage in case of ROE as performance measure is negative and significant. Thus the results here give mix effects of leverage on different measures of corporate performance.

The coefficients of TANG are positive and significant when ROCE and EPS are used as performance measures but it is negative and significant when ROE is used as a measure of performance. The positive impact of tangibility on corporate performance suggests that fixed assets are

efficiently used as collateral for borrowing in the debt market. The current findings confirm the Myers (1977), Myers and Majluf (1984) empirical findings who studied the asset's structure variations and their impact on firms' financial policies. Firms may compose their assets either by the ratio of tangible assets to total assets or intangible assets to total assets ratio. They conclude that by adopting the first policy, positive relationship with the leverage prevails while in the second case negative relationship between leverage and firm policy prevails.

Size, for all the three measures of corporate performance, has positive and significant coefficients. This can be attributed to the economies of scale as larger firms have better economies to scale. Secondly larger firms can attract the best managers available in the market through lucrative incentives and big salaries. In the same vain larger firms have access to cheaper finance relative to smaller firms. The results are in conformity with the findings of Alderson and Betker (1995) who investigated the relationship between leverage and firms size by using log of assets as a proxy for firm size. They found positive relationship between leverage and firm assets.

Similarly, short term liabilities have positive and significant effect on all the three measures of corporate performance indicating sensitivity of Pakistan capital market; the early the firms settle the outsider claims the more profitable the firm will be. Rahman and Nasir (2007) finding conclude a negative relationship between profitability and payables of Pakistani listed firms, means that less profitable firms wait for a longer period to pay their bills further, early settlement of dues contribute more in the firm's profitability. Delaying payments no doubt provide opportunity for firm to use the creditors fund for more time but reduce the future profit margins in long run and will certainly face unfavorable credit terms in future.

Conclusion and Policy Recommendations

This paper attempted to look into the issue of the relationship between leverage and various measures of corporate performance for 374 non-financial firms listed on Karachi Stock Exchange of Pakistan. Arellano and Bond dynamic panel data estimation technique was used to capture the role of adjustment costs and the dynamic behavior of corporate performance. The results, thus obtained, were essentially mixed. The coefficients of the adjustment variable (lagged corporate performance) were positive for ROCE and EPS (Earnings per Share) but ironically negative for ROE (Return on Equity) the positive EPS (1988-2008) shows a robust economic growth of Pakistan equity market during the two decades.

Similarly the effect of leverage on ROCE was negative but insignificant and positive significant when EPS was used as a measure of

corporate performance. Investors in equity markets used EPS as a barometer to check the overall returns on stocks for a period, the positive EPS on Pakistan equity market represent that returns on investment is greater, when tax and cost of debt is paid, guiding the investors despite earning manipulation and absence of sufficient non-executive directors on boards still, Pakistan equity market has a potential to generate sufficient returns. Whereas the relationship between leverage and ROE (another measure used in the paper for corporate performance) was negative and significant which implies that high leverage force the managers to perform optimally due to higher interest burden and agency cost (Mahakud & Misra, 2009).

Currently in Pakistan interest rate is rising steadily thus lowering the confidence of investors to invest in high levered firms. The increase in rate of interest mainly took by the government to control the inflation that adversely affects the economies like Pakistan. The government to control the inflation instead increasing the interest's rate gives subsidy (mainly in Pakistan energy usage) to firms which cause decrease in the core costs and prices .Therefore it is suggested that investors should invest in low levered firms. Further, the stakeholders including stockholder worry about the dividends and indifferent in high leverage scenario means that in Pakistan high leverage reduce the dividend disbursement to stockholders but may increase their wealth two fold in the form of capital gains which is not tax deductible compared to India where capital gain tax is 30% and china 20%.

The positive effect of the size of firm on performance is confirmed for all the three measures of corporate performance. Positive effect of size indicates that Pakistani firms should do debt financing for future growth The positive and statistically significant impact of short term liabilities implies that high short term liabilities exert pressure on corporate managers to perform efficiently in the competitive market otherwise they would be facing the burden of debt thus decreasing the value of firm. Baum et al. (2007) studied the effect of short term liability on profitability of German and US firms by using GMM model, their findings suggest that profitability of the firms varies with changes in liability structures, the higher the firms finance through short term liabilities the more profitable are the firms. The results were found positively significant for German firms but not so for the US firms. Majority of the firms investments should be in current assets, especially the growing economies like Pakistan, it serve two purposes; first, the firms can avail any speculative opportunity available in the market e.g. decline in raw material prices, secondly, to pay its short term liabilities on time to remain credit worthy in the capital market. In our empirical findings the relationship between leverage and ROCE was negative when EPS was used as a measure of financial performance, indicating that in Pakistan majority of firms prefer capital investment which reduces their

operating profit margins. This in turn will make the investors to switch over to other firms for better investment opportunities.

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