

DETERMINANTS OF CAPITAL STRUCTURE AND
THE 2015 FINANCIAL CRISIS: EVIDENCE FROM
KAZAKHSTAN

BY

MURATKHAN IBRAYEV

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Abstract

This study aims to investigate the determinants of capital structure in Kazakhstan and to analyze the effects of the 2015 financial crisis in Kazakhstan on the determinants of the capital structure of large firms. The sample used for the following study includes 4000 to 7000 firms from 2009 to 2017. Results obtained show significance of tangibility, growth, size and liquidity variables on the leverage and increase in the significance of profitability in the post-crisis period.

1 Introduction

Capital structure is defined as the ratio of debt to assets of a firm and the higher the value of this ratio, the more risk a company encounters. If company is mostly financed by debt, it will be more risky for investors to make a contribution for the firm; however, in some cases such an aggressive strategy of financial decisions is the main source of company's growth.

The main goals of this paper are to analyze the capital structure determinants of large firms and examine the impact of 2015 crisis on debt ratio levels of firms in Kazakhstan.

There are several theories discussing the determinants of capital structure, but the most tested theories about how firms choose their actions are trade-off theory and pecking order theory. Main point of trade-off theory is that companies determine their debt and equity ratio by taking into account potential tax benefits of debts and financial distress costs. However, pecking order theory claims that firms should be funded from internally generated sources instead of debt and equity.

Papers that study capital structure in the case of developing economies have just started to appear and there are no significant results both in terms of management's hierarchy of financing sources and capital structure deter-

minants (Sultanov, 2018). That is why studying Kazakhstan firms' capital structure will contribute to the following topic as a perfect case of a developing upper middle income economy. In addition to this, the study will take into account the impact of crisis of 2015 in Kazakhstan in order to observe and identify how economic crisis affects firms' performance and capital structure.

Preliminary results of the study show high significance of tangibility, growth and size in the pre-crisis period from 2009 to 2014. Significance of liquidity is also statistically significant, but only in case of total and short term debt ratio. In the post-crisis analysis tangibility, growth and size also resulted in statistically significant value. Significance of profitability gradually increased for total and short term debt ratios in comparison with the pre-crisis period. Cash flow showed no significant results in both pre- and post-crisis periods.

2 Literature Review

One of the original papers on determinants of capital structure was written by Modigliani and Miller (1958), who claimed in their study that financing decisions do not have an impact on the value of the firm, but that the combination of debt and equity mix do. However, the main drawback of the following theory was the assumption of "perfect market", which does not exist in the real world. Specifically, the "perfect market" shown in Modigliani and Miller (1958) had no risk of bankruptcy and need for paying the corporate taxes. However, in their next study Modigliani and Miller (1963) included the presence of taxes in their model because debt is tax deductible. Since then, several authors have tried to explain the capital structure of firms suggesting new modifications and insights, for example Myers and Majluf (1984), Myers (2001), Fama and French (2002).

Today there are many empirical works that have investigated the determinants of capital structure of firms in various countries. For example, study by

Handoo and Sharma (2014) analyzed determinants of capital structure of companies in India for the period 2001-2010 and found that profitability, growth, asset tangibility, size, cost of debt, tax rate and debt servicing capacity significantly affect the debt ratios. Other research, conducted by Reznakova et al (2010), examined capital structure determinants using data from Slovakia. The data contained information on non-financial firms from 2002 to 2007. The findings of the study show significance of profitability, firm size, and non-debt tax shields. Similarly, in study by Bajramovic (2017), determinants of capital structure were Bosnia and Herzegovina was investigated. Firms that were used in the study were non-financial and that had all the financial statements from 2011-2015. The results obtained from the research showed statistical significance of tangibility, firm size and non-debt tax shields. Among the recent studies there is also research made by Vo (2017) about the determinants of capital structure in Vietnam; his results suggest that determinants of capital structure for short and long term leverage are different. However, in terms of total debt ratio tangibility, growth, size and liquidity appear to be statistically significant variables for capital structure.

Among the studies that investigated the impact of economic crisis on capital structure, Proenca et al (2014) investigated SMEs in Portugal from 2007 to 2010. The main focus of the research was to observe effects of the 2008 financial crisis on the capital structure of Portuguese SMEs. Results obtained from the study showed that the most important factors of capital structure are liquidity, asset structure and profitability. Balios et al.(2016) researched the capital structure during the severe economic crisis in Greece. The data included SMEs in Greece from 2009 to 2012 and results showed that leverage has negative relationship with profitability and asset structure, positive relationship with growth and size and no change in the capital structure determinants was observed during the economic crisis in the country. Garcia et al (2016) made a similar research on the determinants of the capital structure

before, during and after the 2008 financial crisis. The data used in the research included firms from market oriented economy of UK and set of bank-oriented economies of Euro Zone. Their results showed particular convergence with the previous studies and also noted that 2008 financial crisis did not cause any change in the determinants of the capital structure.

There is little literature on the determinants of capital structure in Kazakhstan. A notable exception is Sultanov (2018) who tested the pecking order theory in terms of Kazakhstan firms. The methodology of this study is mainly the same as the previous works explained before. However the dataset used by Sultanov contained only data of 46 companies from 2007 to 2016, which in terms of annual data collection resulted in 451 observations. Sultanov (2018) in his study concluded that Kazakhstan firms partially follow the pecking-order theory and half of the hypotheses were confirmed.

The paper aims to analyze the determinants of capital structure in Kazakhstan from 2013 to 2016 and observe the impact of 2015 financial crisis in Kazakhstan on the determinants. The analysis will mainly follow the previous literature from the econometric point of view. In addition, compared to Sultanov (2018), this paper analyzes a much larger dataset in terms of both number of observations and econometric variables for more consistent econometric model.

3 Data

Data used for the following research were provided by Ministry of National Economy of Republic of Kazakhstan Committee on Statistics. The data are regularly collected by law and all firms with more than 100 employees. However, not all Kazakhstan firms provide their yearly reports. The data will be covering a large spectrum of variables, among which the ones that will be included in preliminary model are total, long, short ratio of debts to assets,

profitability, tangibility, growth, size, liquidity and standardized cash flow.

Data occupies years from 2009 till 2017 and number of companies per year varies from 4000 to 7000. The dataset itself was divided into two parts: before and after the 2015 crisis in Kazakhstan, which means that one part will occupy data on companies from 2009 to 2014 and second includes years from 2015 to 2017, inclusively. The following division of the dataset can be explained by the fact that starting from the crisis year, which is 2015, sample of identification numbers of the firms differ from the previous year reports. The reason for such situation might be the change in individual firm IDs or change of sample from which the data was gathered, i.e. other firms' reports were included into the data comparing with the previous year data. Thus, for this study it was decided to research the effect of crisis in and after 2015 on the determinants of leverage in short, long term and total in comparison with the pre-crisis situation.

The resulting panel data samples included 37860 and 13487 observations in case of before- and after-crisis samples, respectively. Data on companies used in the research is confidential, which is why all the companies can only be distinguished only by their identification numbers, which are permanent from year to year for each company. Thus, even though the data was collected yearly, identification numbers of the companies do not change, enabling efficient usage of dynamic panel data models.

Summary statistics of the two datasets can be seen in Tables 1 and 2 in Appendix for pre- and post-crisis periods.

4 Variables and Methodology

There are two main theories that define determinants of capital structure: Pecking Order Theory and Trade-off theory. According to Myers (1984), the main hypothesis of the Pecking Order Theory is that under conditions of

asymmetric information, equity might become underpriced. For firms it means making internal funding the main priority and preferring risk free debts in case of external funding. The second theory, Trade-off theory, states that firms maximize its value when values of marginal benefit of debt and marginal debt become equal, which results in creation of “trade-off” (Garcia et al, 2016).

4.1 Dependent Variables

Total debt ratio Total debt ratio is the ratio of total debt of the individual firm to the total amount of firm’s assets expressed in percentages. Value of the following variable can be defined in various ways depending on the industry in which firm operates. For example, firms which operate in industries with unstable cash flow might find the 30% of debt ratio to be pretty high; however, for firms in utilities sector this value of total debt ratio can easily be handled. Main point of the following correlation is possibility for investors to observe risk level of the company’s assets.

Long term debt ratio Long-term debt ratio is the ratio of the portion of the total debt that lasts more than year to total assets of the company. The value normally varies for each firm depending on the industry.

Short term debt ratio Short term debt is the opposite of the long term debt; i.e., debts that are due to be paid in less than a year. Short term debt ratio is the ratio of the short term debt to total assets of the firm. The following relationship shows firm’s ability to complete its duties in short period of time, in this case one year.

4.2 Independent Variables

Profitability. Profitability is one of the variables that define pecking order theory, because according to pecking order theory firms tend to see internal

funding more important and significant than the external. Thus, by keeping the investment value fixed, debt and profitability will be negatively correlated. Whereas according to Fama and French (2002) trade-off theory implies that probability of the company's bankruptcy increases as profitability decreases.

In the recent study by Vo (2017), it was shown that more profitable firms make short-term debts less often in case of Vietnam, having negative and statistically significant coefficient. Similarly, study by Handoo and Sharma (2016) showed negative and also statistically significant coefficient of profitability on both short- and long-term leverage in case of firms in India. In addition Sultanov (2018) obtained the negative and statistically significant coefficients of profitability, confirming pecking order theory in terms of Kazakhstani firms.

The profitability variable in the following study will show the company's ability to exceed the value of revenue above all the costs, expenditures and taxes. Profitability will be measured as the ratio of earnings before interest and taxes to total assets.

Tangibility Each company consists of both material and intellectual parts and these two factors are necessary for company's correct functioning. Asset tangibility can be related to all material assets, such as land, equipment or furniture of the firm which can be counted as a certain degree of debt capacity.

Trade-off and agency theory agree on the fact that tangible assets are statistically significant and positively affect leverage. Results obtained by Handoo and Sharma (2016) confirmed these expectations by observing positive and statistically significant effect of tangibility on leverage. However, Mazur (2007) in his study on capital structure in Poland showed that according to pecking order theory tangibility has negative effect on the leverage in short-term period. Sultanov (2018) who also made study on firms in Kazakhstan observed negative coefficients for tangibility in both short and long term cases.

Tangibility in this study will be defined as the ratio of net fixed assets to total assets.

Growth Development and evolution of each company can be observed by taking into account the growth rate of the firm. If the company evolves and spreads, then it can be said that growth of the company is positive and vice versa in the opposite case.

Growth also appears to be one of the variables that separates pecking order theory and trade off theory. According to pecking order theory, growth of the company should have a positive correlation with leverage, because investments that are essential for growth imply an increase in debt financing. However, trade off theory suggests a negative relationship between growth and leverage, because future growth of the company can be under threat in case of high leverage value.

According to the results obtained by Handoo and Sharma (2016) growth has a positive coefficient in both short- and long-term leverage, but is statistically significant only in case of long-term period. The following findings were also confirmed by Proenca et al. (2014) in case of Portuguese SMEs and Vo (2017) for Vietnamese firms.

In the econometric model, growth will be measured as the ratio of the total gross assets growth rate per year and will be represented in percentages of change in comparison with the previous year.

Size According to many past studies size appears to be a significant variable for capital structure (Harris and Raviv, 1991; Rajan and Zingales, 1995). Also these papers note that many authors have claimed that larger firms happen to be more stable and less inclined to bankruptcy. According to trade off theory, large firms are more willing to make debts in comparison with the small ones (Titman and Wessels, 1988). Therefore, there should exist a

positive relationship between size and leverage. In case of pecking order theory it is hypothesized that size should have negative impact on the leverage.

Results obtained by Reznakova, who studied the capital structure of firms in Slovakia, obtained statistically significant positive coefficients of firm size. Analogically, Sultanov (2018) observed statistically significant and positive results in firms in Kazakhstan.

Companies that will be taken into account in this study are large firms, because large firms have stable cash flows and are considered to be more diversified. In addition to this larger firms have less probability of going bankrupt. Size of the firms will be measured as the natural logarithm of their total assets.

Liquidity Company's assets are not always represented in terms of cash: in most cases, a firm's goods and equipment happen to be the portion of the total assets of the company. Liquidity is the ability of the firm to immediately pay their short-term debts or convert the assets to cash. Liquidity is defined as division of total current assets by total current liabilities.

Myers and Rajan (1998) state that, according to pecking order theory, if company liquidity is high enough there will be no need for it to take debts, thus decreasing the leverage. This means that liquidity and leverage happen to have a negative relationship with each other. In support of the trade off theory Jensen (1986) claims that in order to keep the level of cash flow in high liquidity firms high, firms should increase the debt level which implies positive correlation between liquidity and leverage ratio.

In support of the trade off theory, the findings of Handoo and Sharma (2016) show positive coefficients of liquidity, but they are not statistically significant. However, results of Proenca et al (2014), Reznakova et al (2010) and Sultanov (2018) are in complete agreement with pecking order theory, because coefficients of the variable were negative and statistically significant.

Cash flow Cash flow is the total amount of cash that is received and sent by the firm. According to Jensen (1986), a firm with a high level of cash flow is inclined to issue larger debts, so that managers were motivated to choose the correct investment choices. According to Matemilola (2014), who investigated the relationship of cash flow and leverage in South African firms, the relationship obtained showed negative correlation between cash flow and total leverage ratio which supports the pecking order theory. Findings of Sultanov (2018) shows no statistical significance for different types of leverage ratios. In this study, cash flow will be measured as the value of standardized cash flow of the firm.

4.3 Econometric Model

4.3.1 Fixed Effects Model

The first model that will be applied in this study is a Fixed Effects Model with usage of FE regression with three versions of dependent variable: short-term, long-term and total leverage. Each of the versions can be represented the following way:

$$L_{it} = \beta_0 + \beta_1 profitability_{it} + \beta_2 tangibility_{it} + \beta_3 growth_{it} \\ + \beta_4 size_{it} + \beta_5 liquidity_{it} + \beta_6 cashflow_{it} + \mu_t + \mu_i + e_{it},$$

where

L_{it} - leverage or ratio of debt to total assets

β - vector of regression coefficients of independent variables

e_{it} - error term

One of the studies that apply the following regression method, but without any fixed effects variables, was written by Handoo and Sharma (2014). Another research, written by Proenca et al (2014), include the dummy variable

of the crisis year in order to observe the significance of the crisis year on the findings. The results showed high significance of the crisis year variable in all three variations of the dependent variable: short-term, long-term and total leverage. Study by Garcia et al (2016) also used the same regression method, but the main difference was taking into account both region and period fixed effects.

Firm-specific variables are unlikely to be exogenous because possible shocks that affect the financial situation in the country are likely to influence several variables, such as profitability, size and liquidity of the companies. This issue is attempted to be addressed by using firm and year fixed effects in the model. Variables that are used as independent variables were depicted in the previous sub-section.

4.3.2 Arellano Bond Dynamic Panel Estimation

Second model which will be applied in this study is Arrelano Bond estimation and analogically, as it was in the first model, three versions of the dependent variable will be used. However, the main difference of Arrelano Bond estimation from the FE is the application of lagged dependent variable. It can be represented the following way:

$$L_{it} = L_{it-1} + \beta_0 + \beta_1 \textit{profitability} + \beta_2 \textit{tangibility} + \beta_3 \textit{growth} \\ + \beta_4 \textit{size} + \beta_5 \textit{liquidity} + \beta_6 \textit{cashflow} + \mu_t + \mu_i + e_{it},$$

where

L_{it} - leverage or ratio of debt to total assets

L_{it-1} - lagged by one period leverage or ratio of debt to total assets

β - vector of regression coefficients of independent variables

e_{it} - error term

Since the dataset used for this study is panel data, the dependent variable is observed in a number of periods and this creates a possibility of using a dynamic model, which in our case specifies a variable for an individual firm. The main advantages of Arrelano-Bond estimation are that it is a general estimator designed for cases with usage of many firms and few time periods, assumption of non-strict exogeneity between independent variables, fixed individual effects, presence of autocorrelation and heteroskedasticity within firms, but not across them (Roodman, 2009). However, as in ordinary cases of non panel dataset, serial correlation of the error term might lead to the inconsistency of the results (Cameron and Trivedi, 2010).

Study by Reznakova et al (2010) also applied Arellano Bond regression method and included one period lag of the dependent variables in the model for total and long-term leverage. Values of the lagged variables showed large coefficients and statistical significance at 10% and 1%, respectively. However, study by Vo (2017) analyzed capital structure of Vietnamese firms and applied the same methodology, but all three values of the lagged dependent variables, total, long-term and short-term leverage, showed no statistical significance.

5 Results

5.1 Fixed Effects Model

Results of the regression of the first model, which is FE method, checked for robustness and year fixed effects before and after 2015 crisis, can be observed in Tables 3 and 4. All three dependent variables, total debt ratio, long term debt ratio and short term debt ratio, were regressed.

Table 3. Pre-Crisis Fixed Effects Regression Results

	Total Debt Ratio	Long Debt Ratio	Short Debt Ratio
Profitability	-1.24e-05 (-0.97)	-1.69e-05 (-0.99)	-3.73e-06 (-0.41)
Tangibility	-0.726*** (-5.45)	-0.0516 (-0.38)	-0.783*** (-6.66)
Growth	2.74e-08** (2.77)	6.17e-08*** (3.93)	1.56e-08 (1.64)
Size	-0.171*** (-4.77)	-0.0451 (-1.20)	-0.181*** (-5.87)
Liquidity	-4.32e-05* (-2.39)	2.16e-06 (0.27)	-4.14e-05** (-2.89)
Cash Flow	1.80e-09 (0.89)	6.40e-10 (0.54)	2.05e-09 (0.95)
_cons	3.419*** (6.14)	0.973 (1.70)	3.384*** (6.90)
<i>N</i>	26079	14898	26079

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3 represents results of the regression of pre-crisis dataset using FE method with check on robustness and year fixed effects. Three columns represent three different types of dependent variables, which are total, long-term and short-term debt ratios.

As it can be seen in Column 1, tangibility and size have negative relationships with the total debt ratio and both of them are statistically significant at 0.1% confidence level. However, growth is a statistically significant at 1% confidence level and has positive effect on total leverage, but its coefficient is very small, $2.74 * 10^{-8}$. Another variable whose coefficient is also small but significant at 5% confidence interval is liquidity, with $-4.32 * 10^{-5}$ coefficient and -2.39 t statistic. Profitability and cash flow variables have small coefficients and statistically insignificant t statistic.

Column 2 shows the results of regression with long-term debt ratio as dependent variable. Among all the variables only one variable appears to be statistically significant and it is growth with , analogous to Column 1, small coefficient of $6.17 * 10^{-8}$ and 3.93 t statistic. Profitability, tangibility and size have negative relationship with long term leverage and cash flow and liquidity have positive have small and statistically insignificant coefficients of $6.4 * 10^{-10}$ and 2.16^{-6} , respectively.

The last column of before crisis dataset, Column 3, shows results of the short-term leverage regression. Just as in Column 1, the coefficients of tangibility and size are both negative and statistically significant at 0.1% confidence level. Liquidity also has negative relationship with the dependent variable and its -2.89 t statistic is significant at 1% confidence level. Coefficients of cash flow and growth are positive, but very small and statistically insignificant with 0.95 and 1.64 t statistic values, respectively.

Table 4. Post-Crisis Fixed Effects Regression Results

	Total Debt Ratio	Long Debt Ratio	Short Debt Ratio
Profitability	-0.0146** (-2.64)	-0.00873 (-1.33)	-0.0104* (-1.97)
Tangibility	-0.523*** (-3.88)	-0.143 (-0.63)	-0.602*** (-8.93)
Growth	3.88e-08 (0.28)	3.24e-07*** (4.02)	-182e-07** (-2.71)
Size	-0.139** (-3.03)	-0.108 (-1.33)	-0.130*** (-6.32)
Liquidity	-6.27e-07 (-1.36)	3.67e-07 (1.15)	-1.37e-06*** (-4.33)
Cash Flow	2.13e-10 (0.82)	1.88e-10 (0.62)	1.82e-10 (0.89)
_cons	3.054*** (4.03)	2.156 (1.55)	2.653*** (8.45)
<i>N</i>	10108	5744	10108

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4 shows the results of the FE regression of the second dataset, which includes years during and after the crisis; i.e., starting from 2015 to 2017 inclusively. Similar to Table 1 the structure of Table 2 contains 3 columns and each of them represents different dependent variable, total, long term and short term leverage. Independent variables chosen for the regression are the same as in Table 1 and regression was also checked for robustness and included year fixed effects.

Column 1 of Table 4 represents regression of post-crisis total debt ratio

on standard set of independent variables , which is profitability, tangibility, growth, size, liquidity and cash flow. As the regression results show all three statistically significant variables, which are tangibility, profitability and size, are negatively correlated with the total leverage. Coefficient of tangibility is -0.523 and its t statistic is -3.88 which is significant at 0.1% confidence level. Coefficients of profitability and size are -0.0146 and -0.139, respectively, and both of them are statistically significant at 1% confidence level. Growth and cash flow are positively correlated with the the dependent variable, however the their coefficients and t statistics are small and statistically insignificant.

Column 2 takes long debt ratio as a dependent variable. Profitability, tangibility and size are negatively correlated with the dependent variable and all of them are statistically insignificant. Liquidity and cash flow positively correlate with long term debt ratio, but they also have insignificant value of t statistic. Variable of growth, however, has high value of t statistic, 4.02, but coefficient is pretty small, $3.24 * 10^{-7}$.

The last column of Table 4 represents short term leverage as a dependent variable and as it can be seen only result of the cash flow are statistically insignificant with 0.89 t statistic and $1.82 * 10^{-10}$ coefficient. Liquidity, size and tangibility are all negatively correlated with coefficients $-1.37 * 10^6$, -0.130 and -0.602 , respectively, and t statistics significant at 0.1% confidence level. Growth and profitability also have negative relationship with short term leverage with -2.71 and -1.97 t statistics, respectively.

5.2 Arellano Bond Dynamic Panel Estimation

Table 5. Pre-Crisis Arellano Bond Estimation

	Total Debt R.	Long Debt R.	Short Debt R.
Lag. Total Debt R.	-0.0109 (-0.44)		
Lag. Long Debt R.		-0.240 (-0.69)	
Lag. Short DebtR.			-0.0331 (-1.08)
Profitability	-1.62e-06 (-0.13)	1.06e-05 (0.67)	-5.50e-07 (-0.05)
Tangibility	-2.247 (-1.52)	-2.537 (-1.02)	-0.418 (-0.69)
Growth	-3.26e-06 (-0.92)	-1.09e-06 (-1.18)	-2.13e-06 (-0.78)
Size	-1.907** (-2.72)	-1.411 (-1.18)	-1.523** (-2.85)
Liquidity	-1.24e-05 (-1.30)	-6.08e-06 (-0.37)	-1.26e-05* (-2.32)
Cash Flow	4.00e-09 (1.93)	1.01e-09 (1.05)	4.70e-09 (1.87)
_cons	26.89** (2.74)	20.96 (1.19)	20.74** (2.92)
<i>N</i>	16026	9071	17775

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5 represents the regression results of the second model which is Arellano Bond estimation method which, just as the FE model, was checked for robustness. As it was mentioned in the theoretical part of the model description the main point of the method is usage of lagged version of the dependent variable as a part of the regression. Independent variables used in this model are the same as in the previous regressions, but since Arellano Bond takes into account lagged dependent variable number of observations is different in comparison with the FE method.

Column 1 of Table 5 shows regression of total term debt ratio on standard set of variables with addition of lag. As it can be seen only coefficient of size is negative and statistically significant at 1% confidence level with -2.72 t statistic. Profitability, growth and liquidity have both very small coefficient value and insignificant t statistic. Tangibility also has negative coefficient, but the value of t statistic is statistically insignificant. Lag of the dependent variable with -0.0109 coefficient and -0.44 t statistic also results in insignificant variable.

The next column, which is long-term debt ratio column has absolutely no statistically significant results in any of the variables. Coefficients of tangibility and size variables are, as in the first column are large and negative, but insignificant. Remaining variables, profitability, growth, liquidity, cash flow and lag of the dependent variable appear to have small coefficients and insignificant values of t statistic.

Last column of Table 5 shows short term debt ratio as a dependent variable and size and liquidity show statistically significant results at 1% and 5% confidence levels, respectively. Coefficients of profitability and growth are both negative, small in magnitude and insignificant statistically. tangibility also has negative and statistically insignificant coefficient. Cash flow, on the other hand, has positive coefficient, but its coefficient is $4.70 * 10^{-9}$ in value and t statistic is 1.87, which is not significant.

Table 6. Post-Crisis Arellano Bond Estimation

	Total Debt R.	Long Debt R.	Short Debt R.
Lag. Total Debt R.	-0.0171 (-0.48)		
Lag. Long Debt R.		-0.495** (-2.82)	
Lag. Short Debt R.			0.0432 (0.67)
Profitability	0.0120 (0.94)	-0.00135 (-0.43)	0.0102 (0.98)
Tangibility	-1.210 (-1.10)	-0.138 (-0.24)	-1.015 (-1.23)
Growth	3.48e-07 (0.90)	0.00216 (1.64)	-4.06e-07 (-0.61)
Size	-1.187* (-2.33)	-1.347 (-1.68)	-0.679** (-3.09)
Liquidity	-2.17e-05 (-0.89)	-6.92e-06 (-0.60)	-1.97e-06* (-2.41)
Cash Flow	8.81e-11 (0.40)	1.76e-09 (1.05)	5.23e-11 (0.55)
_cons	18.45* (2.44)	20.77 (1.72)	10.60** (3.18)
<i>N</i>	4651	3024	5979

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Results of the after crisis Arellano Bond regression model can be observed on Table 6. The structure and methodology is the same as it was in case of Table 5. The only thing that is different is dataset, which now includes years from 2015 to 2017.

Just as in before crisis results, coefficient of lagged dependent variable in Column 1 is statistically insignificant. Just as in the pre-crisis regression results, only variable of size is statistically significant, its value of t statistic is -2.33, which is significant at 5% confidence level. Profitability and tangibility have large coefficients, but they are statistically significant with 0.94 and -1.1 t statistics, respectively. Growth and cash flow are positively correlated with total debt ratio, but their t statistic values are small and thus statistically insignificant. Whereas liquidity has negative coefficient, but also statistically insignificant.

Column 2, which is long term debt ratio model, has lag of dependent variable which is significant with -2.82 t statistic, which means statistical significance at 1% confidence level. Variables of profitability, tangibility and size have negative correlation with the dependent variable, but they are not significant. Growth has statistical insignificant value of t statistic as well. Coefficients of liquidity and cash flow have very small coefficients, -6.92×10^{-6} and 1.76×10^{-9} , respectively, and insignificant t statistics.

The third column of Table 6 shows results of the short term debt ratio model regression. In the following model among independent variables size and growth showed statistical significance at 1% and 5% confidence levels with 4.06×10^{-7} and -0.679 coefficient values, respectively. Lagged dependent variable has insignificant value of t statistic with coefficient of 0.0432. Coefficients of tangibility and growth are negative and have no statistical significance to the regression. Profitability and cash flow, however, have positive coefficients but t statistic values are 0.98 and 0.55, respectively.

6 Discussion

Two different regression methods were used to determine the determinants of the capital structure in short term, long term and total and observe possible changes among variables by comparing the results before and after 2015 crisis in Kazakhstan. Arellano Bond estimation model was checked for autocorrelation in all cases of dependent variables and periods and showed no statistically significant values, which means that no autocorrelation hypothesis cannot be rejected. Thus, since autocorrelation test appears to be crucial indicator of data consistency, it can be claimed that results obtained from the regression might be inconsistent.

From the Fixed Effects model results it can also be concluded that most of the determinants show signs of pecking order theory predictions. Profitability and tangibility, both, have negative coefficients before and after the crisis year. However, signs of growth changes after the crisis year for short-term leverage regression. In two out of three versions of the dependent variables liquidity has negative coefficient, which supports the pecking order theory hypothesis. Size and cash flow show results do not support the pecking order theory hypotheses.

6.1 Pre-Crisis Analysis

Pre-crisis analysis showed that in most of the cases results obtained from the Arellano Bond estimation model are insignificant. However, size exhibits statistical significance that matches in both models. It appears to be statistically significant in regressions on total and short term debt ratio at 1% confidence level in case of Arellano Bond model and 0.1% in case of Fixed Effects model.

Liquidity also showed significance in Column 3 of the Arellano Bond model regression and in Fixed Effects model Liquidity was statistically significant in Columns 1 and 3, which are total and short term debt ratios.

The tangibility of growth variables show statistical significance in 2 of 3 regressions using Fixed Effects Model, but absolutely no significance in Arellano Bond model with low values of t statistic.

Profitability and cash flow, both, did not show any statistically significant results in both types of regression and coefficients resulted in very small values.

6.2 Post-Crisis Analysis

Post-crisis analysis showed statistical significance among some variables in Fixed Effects model, but when using the Arellano Bond estimation results are almost identical to those which in pre-crisis analysis. Variables of size and liquidity show significance in the Arellano Bond model. Size appears to be statistically significant at 5% and 1% confidence levels in total and short term debt ratio, respectively. Whereas in FE regression, t statistics allows to reject the null hypothesis at 1% and 0.1% confidence levels, respectively. Liquidity variable, similarly to FE, shows significance only in case of short term debt ratio using Arellano Bond estimation.

Profitability, tangibility and growth show large values of t statistic in total and short term debt ratios, but only in case of FE regression. In Arellano Bond model these variables show absolutely no significant t statistics.

Cash flow variable also has no significant values obtained, but both regression models confirm this observation, by having very small values of coefficient and t statistic.

7 Conclusion

This study has investigated and analyzed the determinants of capital structure in large firms of Kazakhstan and effect of the 2015 financial crisis in Kazakhstan on these determinants in comparison with the pre-crisis situation. There are several important changes in both data methodology that addressed

the following topic and this paper contributes and extends the existing literature. The main difference of the following study from the Sultanov (2018), who tested the pecking order theory of capital structure in Kazakhstan, is the dataset which includes years from 2009 to 2017 and from 4000 to 7000 large companies. Two different methodologies were applied to make the analysis: Fixed Effects model and Arellano Bond estimation model. However, autocorrelation test of the Arellano Bond estimation did not reject the null hypothesis of absent autocorrelation, which makes the results of this estimation inconsistent. Fixed Effects model, however, showed statistically significant values in both pre- and post-crisis periods for tangibility, growth, size and liquidity. The main change that was observed between two periods is the significance of profitability, which increases after 2015. Cash flow variable showed no significant results in both periods. Future research might update the dataset to include more post-crisis data and apply different methodology to solve the autocorrelation problem.

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9 Appendix

Table 1. Summary Statistics of the Pre-Crisis Dataset

	Mean	Stan. Deviation	Min	Max
IND	512796.2	158362.1	554	1774561
Year	2011.219	1.983219	2008	2014
Total Debt Ratio	.8793225	4.5222	0	426.6001
Long Debt Ratio	.3674293	2.907131	0	310.0391
Short Debt Ratio	.6756448	4.097301	0	426.6001
Profitability	4.407778	547.2791	-7518.621	75208.23
Tangibility	.3760826	.2875855	0	1
Growth	2447.954	239232.4	-100	3.48e+07
Size	13.09918	2.165677	1.791759	22.9341
Liquidity	22.79632	573.8149	0	60366.5
Cash Flow	52209.49	2828436	-1.87e+08	2.95e+08
<i>N</i>	43063			

Table 2. Summary Statistics of the Post-Crisis Dataset

	mean	sd	min	max
IND	725811.5	854819.2	4	3163625
Year	2015.572	1.103528	2014	2017
Total Debt Ratio	1.72062	72.45149	2.60e-06	8170.329
Long Debt Ratio	.4463203	3.221931	1.52e-07	255.014
Short Debt Ratio	1.378374	68.35987	1.31e-06	8170.329
Profitability	17.28591	1864.83	-1903.859	200000
Tangibility	.3572986	.2921317	1.77e-07	1
Growth	1157.8	39966.51	-99.99963	2895790
Size	13.94078	2.360472	0	23.02276
Liquidity	99.44249	7274.435	.0001047	763942
Cash Flow	178877.4	1.95e+07	-1.06e+09	1.69e+09
<i>N</i>	17314			