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LEVERAGE AND MACROECONOMIC DETERMINANTS: EVIDENCE FROM UKRAINE

DEARI FITIM

South East European University, Tetovo, Macedonia

MATSUK ZORIANA

Kyiv National Economic University after Vadym Hetman, Kyiv, Ukraine

LAKSHINA VALERIYA

National Research University Higher School of Economics, Moscow, Russia

Abstract:

Viewed retrospectively since the work of Modigliani and Miller (M&M, 1958), the capital structure still remains a matter of study. The capital structure issue then is examined from different perspectives, and thus intertwining firms and macroeconomic determinants. Studies were focused to examine the relationship between leverage ratios and macroeconomic environment. Motivated from what was done earlier, we try to bring in this study evidence as well. Thus, totally 49 Ukrainian firms are selected and data are examined from 2012 to 2016. The paper is aimed at studying the process of leverage adjusting by examining five firm's characteristics and three macroeconomic determinants. We found that leverage is influenced significantly from both, firm characteristics and macroeconomic determinants. The study provides evidence those firms with higher tax shield, tangibility, net trade credit, and profitability used more leverage than counterparties. Firm's size and inflation are confirmed as insignificant determinants. On the other hand, GDP growth rate and default spread are confirmed to play a role on leverage policies.

Key words: *Leverage, Determinants, Macroeconomics*

1. Introduction

The financial market provides an important basis for the accumulation of free savings and their further transformation into the investment capital. It satisfies the needs of the economic entities in financial resources. Efficiently organized securities market is one of the most important preconditions of the country's economic growth and of its citizens' social and economic well-being.

The integration of the domestic financial market into the global financial space and the processes of globalization have influence on the process of capital structuring. Thus, economic relations in the process of investment activities are improved and the structure of

capital is transformed. The investigation of the firm's problems in the process of capital structuring and the search for the ways of their elimination causes the scientific interest and the need for their profound study.

The capital structuring is an important part of corporate policy of the firm which built its passive part of the balance with debts and equity. In defiance of the existing of a quite a few studies devoted to capital structure, there is no single theory, more over the conclusions of many papers are quite debatable. However, there is a few works which investigate the capital structure in emerging countries. But there is no sufficient work, which explains the process of the capital structuring in Ukraine. This paper explores some firm's characteristics and the selected macroeconomic factors influence on the capital structure for the sample of Ukrainian firms.

The article is organized as follows. After the introduction, we provide literature review about the capital structure and macroeconomic determinants. The third part deals with methodology and empirical results. And the last section summarizes the concluding remarks.

2. Review of Literature

Today, a significant number of scientists in their works try to identify factors that can influence on the process of the firm's structure formation. They explain what the capital structure should be, the principals of its formation and the determinants of its influence. It is considered that the first theory is the Net Income theory, which was introduced by David Durand (1952). Its main idea is that the capital structure decision is connected to the value of the firm. This means that the modification of the financial leverage can corresponding influence on the change in the overall cost of capital as well as the total value of the firm.

According to the Durand's theory if the financial leverage grows larger, then the weighted average cost of capital becomes lower. The price of the firm and the market value of the equity shares enlargers. In return, if the financial leverage becomes less, then the weighted average cost of capital gets higher. The price of the firm and the market value of the equity shares decreases.

Nowadays the leading theory is the Miller-Modigliani theory, which consists of three parts.

The first part was published by the authors F. Modigliani and M. Miller in a collective publication in 1958. It is based on two theorems about the efficient market. According to the Theory 1 the market value of the corporation doesn't depend on its capital structure. It is determined by the level of the capitalization of the forecast income of the corporation. The Theory 2 is the logical continuation of the Theory 1, and refers to the yield of shares of a corporation with a loan capital (Modigliani F. & Miller M., 1958).

The second part examines the problem of capital structure in the presence of the corporate taxes. This causes the modification of two previous theorems under the influence of the tax shield. It allows to minimize the amount of tax burden at the expense of the increase of the loan capital quotas. Thus, the corporation's value with the loan capital is higher than the corporation value, which is financed by their own resources, on the

dimension of the tax shield (1963). According to the Theorem 2 the capital structure influences the weighted average of corporation's capital value. The increase of the amount of the loan resources decreases the value of the capital, while its optimal level is actually achieved by the full loan financing (1963).

The third part, developed by Merton Miller (1977), reveals the previous issues in the presence of corporate and personal taxes.

The traditional theory is connected with names of J. Fred Weston and Ezra Solomon (1963). It characterizes the nature of the corporation and the investors' behavior. The main idea of the theory is that the optimal capital structure is achieved by the minimizing the weighted average cost of the corporation's capital and the maximizing its market value. The optimization of the capital structure gives an opportunity to increase its market value. This is possible due to an increase in the amount of borrowed capital to a certain limit, after which the cost of capital will begin to increase again (1963).

The compromise theory is associated with the names of scientists Alan Kraus and Thomas Litzenberger. It identifies the existence of a cost system. These costs are associated with bankruptcy or liquidation costs. The main idea of the compromise theory is as follows. The capital structure of the corporation should be based on the compromise between the tax advantages of the borrowed capital on the one hand and high interest rates and considerable expenses, which are connected to the bankruptcy on the other hand. The optimal is such capital structure in which the costs associated with the bankruptcy are offset by the benefits of the tax shield (Brigham, 2008)

The theory of the agency costs belongs to Michael C. Jensen and William H. Meckling (1973). It characterizes agency costs. These costs are associated with the management activities monitoring in order to control their implementation of all contractual obligations to creditors and shareholders (Van Horne J. C., 2008). The theory assumes that the interests between agents and principals do not always match. Agents can act not in the interests of principals, but in their own interests. Therefore, the agents' activity must be controlled. This requires additional cost – agency costs. All agency costs ultimately lay on the shoulders of the shareholders, thereby curbing the debt growth (Van Horne J. C., 2008).

The theory of asymmetric information was developed by the Nobel laureate Michael Spence. In the frameworks of this theory we are interested in Stefan Ross's scientific achievements (1977) about the research of the capital structure of the firm. The sense of this theory is that the managers having insider information give special signals to the market. That's why the theory is often called signaling theory. The important thesis of this theory is that in the capital structure must be more own resources than borrowed for the providing the reserve for the borrowed financing in the moment of appearance of new positive prospects of the firm development (Brigham E. F., 2008).

The theory of hierarchies associated with the names of Stewart Meyers and Nicholas Meylaff (1984). It explores three sources of financing for the corporation: firm's internal funds (reinvesting profits), borrowing capital, and issuing new shares. They should be used exclusively in that order. The theory of hierarchy confirms that the corporation can issue the shares only in case of their reevaluation. For this the managers of the firm must have more information than the market participants. In this, the theory of hierarchy has

similarity with the signaling theory. In the context of capital structuring, this theory does not provide an optimal structure of capital and sources of its financing. That's why the debt level of the firm depends on its real needs.

These theories help to understand the nature of corporate capital structure and identify the potential internal and external factors. Many scientists tried to identify and research the relationship between the internal and external determinants and firm's capital structure. Based on their literature review we would like to notice some key internal factors, i.e. firm's characteristics which might have significant effect on the capital structure of the firm. For instance, the relationship between the profitability and capital structure was the subject of research of such scientists as: I. Friend and L. Lang (1988), S. Barton and P. Gordon (1988), M. Harris and A. Raviv (1991), R. Rajan and L. Zingales (1995), L. Booth, V. Aivazian, A. Demircug-kunt and V. Maksimovic (2001), P. Bauer (2004), D. Bastos, W. Nakamura and L. Basso (2009), G. Bokpin (2009); B. Dincergok and K. Yalciner (2011), W. Sbeti and I. Moosa (2012), R. Keshtkar, H. Valipour and A. Javanmard (2012), and etc.

The works of J. Warner (1977), J. Ang, J. Chua and J. McConnel (1982), R. Pettit and R. Singer (1985), S. Titman and R. Wessels (1988), D. Diamond (1989), M. Harris and A. Raviv (1991), R. Rajan and L. Zingales (1995), N. Michaelas, F. Chittenden and P. Poutzioris (1999), G. Hall, P. Hutchinson and N. Michaelas (2000), A. Bevan and J. Danbolt (2002), R. Korajczyk and A. Levy (2003), P. Bauer (2004), M. La Rocca, T. La Rocca, D. Gerace and C. Smark (2009), J. Hanousek and A. Shamshur (2011), T. Nguyen and J. Wu (2011), M. Lim (2012) and etc. considered the influence of the firm's size on the capital structure.

Moreover, we can learn about the impact of the liquidity on the capital structure decision from the works of A. Ozkan (2001), S. Myers and R. Rajan (1998), W. Sbeti and I. Moosa (2012). Or about the relationship between the asset tangibility and capital structure from the research of M. Jensen and V. Meckling (1976), S. Myers (1977), J. Scott (1977), L. Titman and R. Wessels (1988), R. La Porta, F. Lopez-de-Silanes, A. Shleifer, R. Vishny (1998), L. Booth, V. Aivazian, A. Demircug-kunt and V. Maksimovic (2001), R. Korajczyk and A. Levy (2003), D. Bastos, W. Nakamura and L. Basso (2009), M. Frank and V. Goyal (2009), T. La Rocca, D. Gerace and C. Smark (2009), T. Nguyen and J. Wu (2011), W. Sbeti and I. Moosa (2012).

The connection between growth opportunity and capital structure was confirmed in the works of S. Myers (1977), S. Myers (1984), M. Jensen (1986), S. Titman and R. Wessels (1988), M. Harris and A. Raviv (1991), A. Ozkan (2001), P. Bauer (2004), N. Daskalakis and M. Psillaki (2008), T. La Rocca, D. Gerace and C. Smark (2009), M. Kouki and H. Said (2012).

The relations between all of these internal determinants and capital structure may be either positive or negative. It depends on the debt structure and the level of economic development in specific researched countries. Thus, a large part of researchers indicates that capital structure depends also on external factors due to firms are not operating in a "vacuum" environment. For example, Gross Domestic Product (GDP) is one of the most useful external financial determinants. Authors such as: Bastos, Nakamura & Basso (2009), Bokpin (2009), Dincergok & Yalciner (2011), Camara (2012) point out on the

presence of a significant negative correlation between the corporate capital structure and the growth of GDP.

Furthermore, another not less popular financial determinant is the inflation level. The thoughts of scientist about the influence of this external factor are different. In particular, Bastos, Nakamura & Basso (2009) refute the influence of inflation on the capital structure, while Sett & Sarkhel (2010), Hanousek & Shamshur (2011) point to a significant positive impact of macroeconomic conditions (including inflation rates) on capital structure. The connection between the leverage and benefits of the firm's shares is the subject of Masulis's study (1983). The scientist considers that the change of leverage is linked in proportion to the change in the yield of shares. But, Korteweg (2004), Dmitrov & Jain (2008), Artikis & Nifora (2011) concluded about the presence of negative connection between the leverage and share revenues.

Bokpin (2009) points on the significant positive effect of the interest rate on the capital structure of the corporation. Dincergok & Yalciner (2011) refute this statement and prove the presence of the negative relationship between this factor and the capital structure.

The market capitalization (the determinant of the securities market development) has positive influence on the capital structure. This thesis is confirmed by the works of Dincergok & Yalciner (2011) and Gajurel (2006). On the opposite side are conclusions of Bokpin (2009), Sett & Sarkhel (2010). They point out a negative relationship between the capital structure and the development of the stock market.

The diversity of the conclusions of scientific works about the identification and the confirmation of the connection between the macroeconomic determinants and capital structure; its modeling according to the leverage and macroeconomic determinants requires own scientific research in this direction. Beside this, despite the presence of a number of studies dedicated to "capital structure process", there is still a gap for the Ukrainian financial market to be conducted.

3. Methodology and empirical results

3.1. Description of data and variables

In our research we use data of public firms, which are listed on the Ukrainian Stock Exchange (<http://www.ux.ua/en/>) for the period from 2012 to 2016. In our analysis we include only non-financial firms. Selected firms are belonging into several business sectors such as: metallurgical sector (KSTL, IGOK, PGZK, SGOK, CGOK, MGOK, DMKD, DMPZ, NITR, NVTR, SHCHZ, ZALK and MMKI); energy sector (TATM, PREN, KOEN, DNON, ZOEN, DNEN, KIEN, CEEN and ODEN); machine building sector (MSICH, SMACH, KRAZ, DMASCH, HMBZ, LUAZ, ZAZ and DVRB), food industry sector (MZKK, ROSHEN, MYRON, SUNI, UMHP); chemical industry sector (DNAZ, FARM, HEMO, KMED, YASK, BARVA, ZFER, AVDK); oil and gas sector (GLNG, UNAF); others (KORB, IFCM, UTLN, ISKRA).

Firms data (property, plant and equipment; trade receivables; total current assets, total assets, trade liabilities; total current liabilities; short-term debt-loan; long-term debt-

loan; total liabilities; total capital; sales revenues; EBIT; depreciation expenses and profit/loss) are taken from their official reporting: balance sheets and income statements (<https://smida.gov.ua/>). Data are organized in form of panel data and totally 49 firms are examined. On the other hand, market data (term spread, default spread, GDP growth rate and inflation) are taken from Official State Statistic of Ukraine (<http://www.ukrstat.gov.ua/>). Table 1 presents definition of variables and abbreviations for both, firms' characteristics and macroeconomic factors.

Table 1: Definition of variables

Variable	Abbreviation	Calculation
<i>Firm characteristics - Dependent variable</i>		
Leverage	LEV1	Total liabilities / Total assets
<i>Firm characteristics - Independent variables</i>		
Tax shield	TaxS	Depreciation expenses / Total assets
Tangibility	Tan	Property, plant and equipment/ Total assets
Net trade credit	NTC	(Account receivables – account payables) / Sales
Profitability	Prof3	EBIT / Total assets
Profitability	Prof2	Profit (loss) / Total assets
Firm's size	Size	Logarithm of sales
<i>Macroeconomic determinants</i>		
Economic growth	gdpgrowthrate	$GDP_{current\ year} / GDP_{previous\ year} * 100\ \%$
Default spread	defaultspread	Yield of government bond _{Ukraine} – – Treasury bond yields _{USA}
Inflation	inflation	$(Consumer\ Price\ Index_{current\ year} / Consumer\ Price\ Index_{previous\ year} - 1) * 100\ \%$

From data distributions we can see that majority of observations come, first of all, from metallurgical sector (13 firms or 27% of overall number of firms), energy (9 firms or 18%), chemical industry (8 firms or 16%), machine building (8 firms or 16%), food industry (5 firms or 10%), others (4 firms or 8%) and oil and gas sector (2 firms or 4%). A common characteristic for selected firms can be that they have long-production cycle.

As Table 2 shows selected firms used on average high level of leverage. We chose to use this form of calculation for the leverage since it captured both, financial and non-financial liabilities (for example, creditors, i.e. accounts payables). On average, firms have financed assets 91% with liabilities, which in turns mean that rest 9% are financed with equity. Leverage has increased sharply during the examined period (see Fig. 2 and Fig. 3).

On average, firms have calculated and reported low level of depreciation expenses over total assets. It can be explained by several factors why this is so, but mainly probably from used depreciation methods. Since, selected firms have long production cycles that indicates using of heavy machineries (on average 41%), property, equipment, technologies etc. and thus longer usage life, i.e. lower depreciation rates.

On average firms used more trade credit than provided and thus there is a negative net trade credit. From the time value of money perspective this is welcomed since have bought more than sold on credit and used account payables as an alternative financing fund.

Moreover, there is a positive EBIT over total assets as an alternative measure of profitability (see Prof3).

On the other hand, on average there is a significant increased percentage of the country GDP, but in same time of inflation too.

Table 2: Summary statistics

	Min.	1stQ.	Mean	Median	3rdQ.	Max.	St.dev.	Skewn.	Kurt.
LEV1	0.04	0.34	0.91	0.53	0.79	27.06	2.57	8.91	83.28
TaxS	0	0.02	0.05	0.04	0.07	0.7	0.06	6.07	55.59
Tan	0	0.19	0.41	0.41	0.62	0.94	0.25	0.16	-1.08
NTC	-290109	0.02	-1181.89	0.16	0.61	1652.04	18573.08	-15.43	237.01
Prof3	-0.21	0.04	0.14	0.1	0.21	0.62	0.14	1.04	1.28
Prof2	-9.42	-0.05	-0.1	0	0.06	0.7	0.82	-9.41	95.31
Size	0.69	13.36	14.49	14.99	16.02	17.79	2.09	-1.78	7.19
defaultsread	5	6	7.55	7.5	9.23	10	1.89	-0.02	-1.55
gdpgrowthrate	104.3	107.7	113.3	107.8	120.4	126.3	8.53	0.48	-1.5
inflation	99.8	100.5	116.18	112.4	124.9	143.3	16.4	0.56	-1.12

Most of the variables have non-standard asymmetric distributions with high positive or negative kurtosis. 60% of variables are skewed positively, revealing longer right tail. The distributions of some variables have outliers, for example, *NTC*, *LEV1* and *Prof2*. The outliers are clearly observed on histograms, presented on Fig. 1.

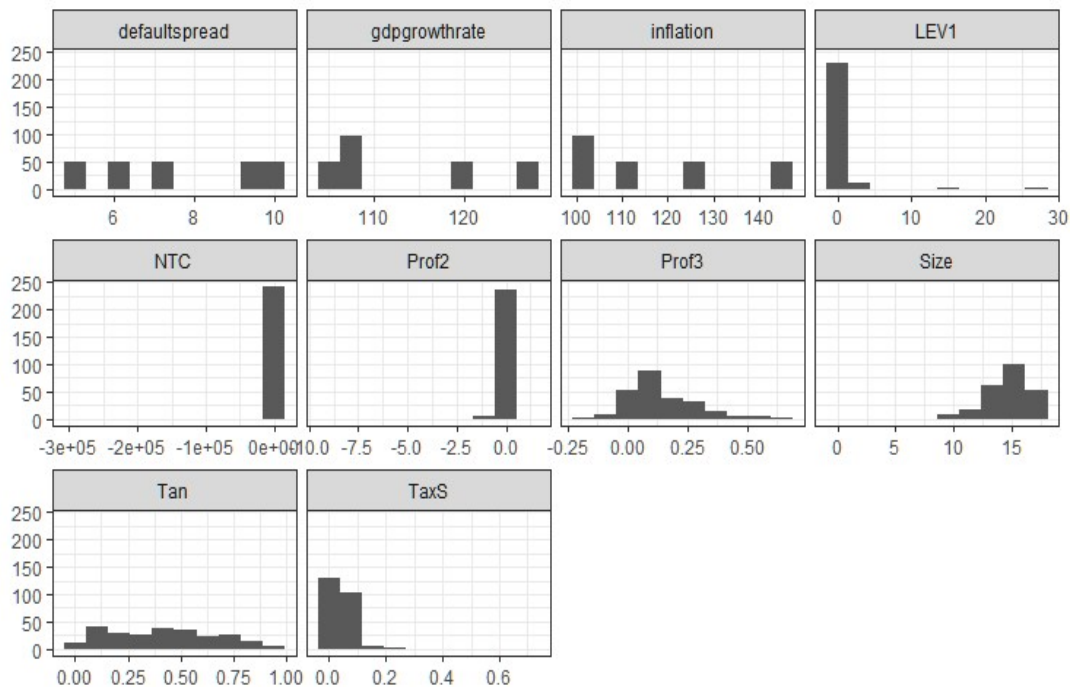


Fig. 1. Histograms for the variables under consideration.

The dependent variable *LEV1*, averaged by firms, is plotted on Fig. 2, which also contains the estimated linear trend with confidence region. Fig. 2 gives strong evidence of the existence of the uptrend in the leverage dynamics among analyzed firms during the sample period.

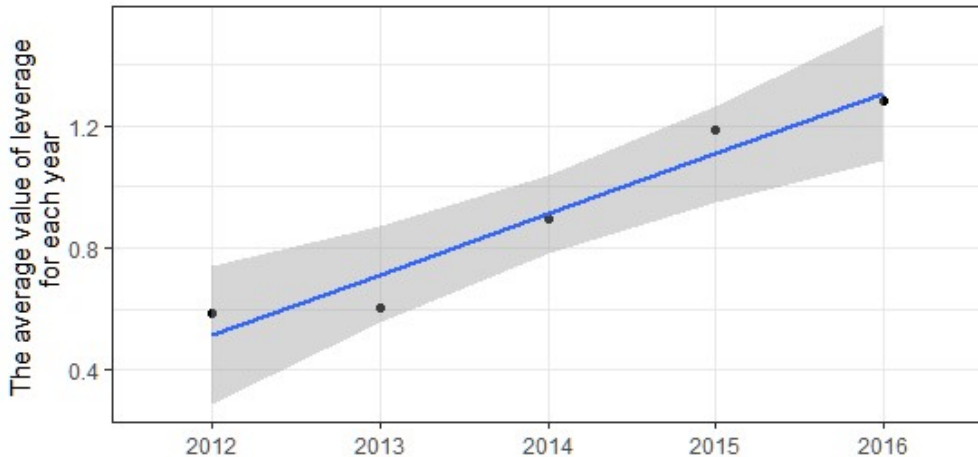


Fig. 2. The average value of leverage for each year with a trend line and confidence region.

The same trend is demonstrated by economic growth, evaluated *gdpgrowthrate* variable (see Table 1 for details). This relation is depicted on Fig. 3.

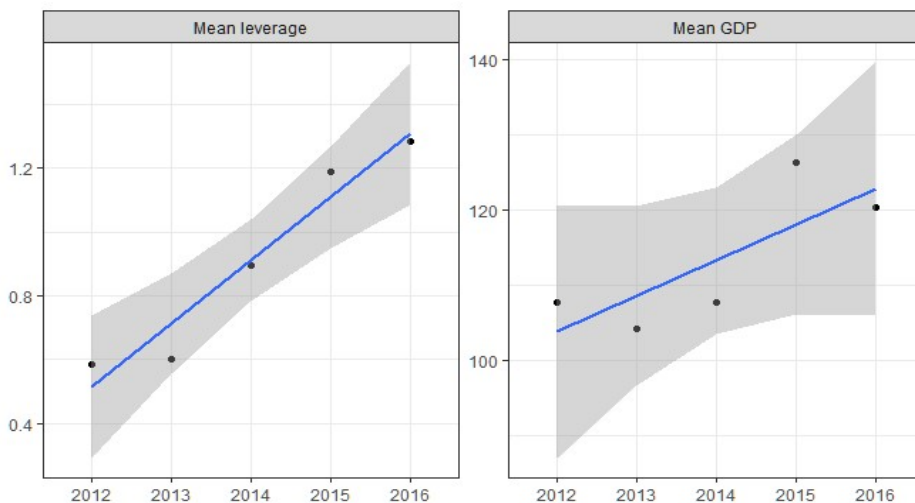


Fig. 3. The average values of leverage and GDP with trend and confidence regions.

The correlation between variables under consideration, calculated in Table 3, confirms the positive relation between *gdpgrowthrate* and *LEV1*.

From correlation results there are some preliminary findings such as: (1) firms with higher tax shield, lower tangibility, lower net trade credit and profitability used more leverage than counterparties; (2) larger firms used less leverage than counterparties; and (3) as the macroeconomic factors are increased, leverage increased too.

Table 3: Correlation between variables

	default spread	gdpgro wthrate	inflat ion	LEV 1	TaxS	Tan	NTC	Prof2	Prof3	Size
defaultspread	1	0.9	0.82	0.11	-0.08	-0.08	-0.08	-0.11	-0.01	-0.02
gdpgrowthrate	0.9	1	0.73	0.1	-0.06	-0.08	-0.1	-0.08	0.01	-0.02
inflation	0.82	0.73	1	0.08	-0.04	-0.06	-0.11	-0.13	0	-0.04
LEV1	0.11	0.1	0.08	1	0.11	-0.02	-0.63	-0.87	-0.09	-0.41
TaxS	-0.08	-0.06	-0.04	0.11	1	0.32	-0.06	-0.13	0.05	0.04
Tan	-0.08	-0.08	-0.06	-0.02	0.32	1	-0.02	-0.04	-0.09	0.07
NTC	-0.08	-0.1	-0.11	-0.63	-0.06	-0.02	1	0.73	0.06	0.42
Prof2	-0.11	-0.08	-0.13	-0.87	-0.13	-0.04	0.73	1	0.11	0.4
Prof3	-0.01	0.01	0	-0.09	0.05	-0.09	0.06	0.11	1	0.13
Size	-0.02	-0.02	-0.04	-0.41	0.04	0.07	0.42	0.4	0.13	1

3.2 Estimation methodology

In the section below are presented and discussed determinants which are used in regression analysis (Table 4).

The paper is aimed at studying the process of leverage adjusting. To take into account the heterogeneity of firms we use dynamic panel regression with individual effects. In line with (Drobtz, Wanzenried, 2006) we apply equation (1) below for the equity adjustment process.

$$LEV_{it} - LEV_{it-1} = \delta(LEV_{it}^* - LEV_{it-1}) \quad (1)$$

where LEV_{it} is i th firm leverage a time t , δ characterized the speed of adjustment and $0 \leq \delta \leq 1$, LEV_{it}^* is target leverage, which is modeled as in equation (2).

$$LEV_{it}^* = \beta'x_{it} + u_{it} \quad (2)$$

where x_{it} are explanatory variables, β is a vector of coefficients, u_{it} is error term. The equations above yield equation (3).

$$LEV_{it} = (1 - \delta)LEV_{it-1} + \delta\beta'x_{it} + u_{it} \quad (3)$$

The error term u_{it} can be represented as the sum of individual effects λ_i and white noise v_{it} . We estimate the last equation by GMM as proposed in Arellano and Bond (1991).

Going back to equation (1) typically can be three cases regarding adjustment speed value. Firstly, if $\delta = 0$ then $LEV_{it} = LEV_{it-1}$. This is the case where actual year leverage financing is similar as previous one.

Secondly, if $\delta = 1$ then $LEV_{it} = LEV_{it}^*$. This is the case where firms adjust full leverage financing toward the aimed ratio.

Thirdly, if $0 < \delta < 1$ then there is a deviation between actual and aimed leverage ratio. This is our examined case and the speed of adjustment is 21%. In turns, it means that firms need around 5 years to achieve the aimed full leverage level.

3.3. Empirical results

The estimates of equation (3), obtained by (Arellano, Bond 1991) method, are in Table 2. We use the second and the third lags of the dependent variable as instruments. We also add Prof2 to the instrument variable set.

Table 4: Estimation results

	Estimate	Std.Error	z-value	Pr(> z)	
LEV_{it-1}	0.7884	0.0096	82.2401	0.0000	***
TaxS	3.9621	1.9863	1.9947	0.0461	**
Tan	1.7435	0.4705	3.7058	0.0002	***
NTC	0.0000	0.0000	-15.6860	0.0000	***
Prof3	1.2497	0.4873	2.5644	0.0103	**
Size	-0.0734	0.0460	-1.5959	0.1105	
gdpgrowthrate	-0.0522	0.0106	-4.9454	0.0000	***
defaultspread	0.3764	0.0738	5.0985	0.0000	***
inflation	-0.0018	0.0015	-1.1718	0.2413	
Wald test			95905.9100	0.0000	***
Sargan-Hansen test			30.4039	0.0160	**
AR(1) in residuals test			-1.1745	0.2402	
AR(2) in residuals test			-0.6676	0.5044	

Significance level: *** - 1%, ** - 5%, * - 10%.

The regression is significant on any reasonable level according to Wald test. The null hypothesis of Sargan-Hansen test is not rejected on 5% level, indicating the validity of instruments. The estimated adjustment speed is about 0.21 and significant on any reasonable level. As for macroeconomic factors, *inflation* is insignificant. In contrast

gdpgrowthrate and *defaultspread* do influence the level of leverage. The first impacts negatively and the second increases the leverage.

It's worth mentioning that the hypotheses of the first and the second order autocorrelation absence in the regression residuals are not rejected according to the test proposed in (Arellano, Bond 1991), Table 4.

4. Conclusion

In this paper we aimed to examine the relationship between leverage and some selected firms' characteristics, and macroeconomic determinants for a sample of 49 Ukrainian firms from 2012 to 2016. Among other results we found that on average terms, firms used high level of leverage. This is less or more an ambitious finding which requires further tests why firms decided to use such high level of leverage financing.

From correlation analysis we found that firms with higher tax shield, lower tangibility, lower net trade credit and profitability used more leverage than counterparties; as the macroeconomic factors are increased, leverage is increased too; and larger firms used less leverage than counterparties. Moreover, actual leverage was significantly affected by previous ones and by firms' characteristics such as: tax shield, tangibility, net trade credit and profitability. Firm's size from regression results was confirmed not to play a role in the leverage decision making process. Also, GDP growth rates and default spread were confirmed as significant determinants on financing policies.

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