

DETERMINANTS OF THE EFFECTIVENESS OF CAPITAL STRUCTURE MANAGEMENT AT UKRAINIAN LISTED POWER-PRODUCING COMPANIES

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Mastiuk D. O. Determinants of the Effectiveness of Capital Structure Management at Ukrainian Listed Power-Producing Companies

This article is concerned with a theoretical and practical study on determinants of the effectiveness of capital structure management. The basic theories on the formation and management of the capital structure were allocated; other researches related to studying the capital structure of enterprises was considered. The author considers 19 independent variables of diverse effect level (micro, meso and macro levels) and one dependent variable – economically added value, which was selected as an indicator of the effectiveness of capital structure management. The studied period is 14 years from 2003 to 2016 and is based on five listed power-producing companies. Eight key determinants of the effectiveness of capital management were defined. The highest positive impact among certain factors is the rate by the National Bank of Ukraine and profitability, while the strongest negative influences are the levels of competition in the market and of inflation. On results of the study, a series of recommendations for selected power-producing equity companies in Ukraine have been proposed, with the aim of reducing negative influences and enhancing positive effects through the development and selection of financial strategies.

Keywords: effectiveness, capital structure, value added, power generation, management, determinants, equity companies, Ukraine.

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Мастюк Д. О. Фактори впливу на ефективність управління структурою капіталу українських акціонерних енергогенеруючих товариств

Дана стаття присвячена теоретико-практичному дослідженню факторів впливу на ефективність управління структурою капіталу. Висвітлено основні теорії формування та управління структурою капіталу; розглянуто попередні дослідження, пов'язані з дослідженням структури капіталу підприємств. Розглянуто 19 незалежних змінних різного рівня впливу (мікро-, мезо- та макrorівня) та одну залежну – економічно-додану вартість, яка була обрана як показник ефективності управління структурою капіталу. Період дослідження складає 14 років – з 2003 по 2016 рр. і базується на п'яти акціонерних енергогенеруючих товариствах. Визначено вісім ключових факторів впливу на ефективність управління структурою капіталу. Найсильніший позитивний вплив серед визначених факторів мають облікова ставка НБУ та прибутковність, тоді як найсильніший негативний вплив – рівні конкуренції на ринку та інфляції. За результатами дослідження запропоновано ряд рекомендацій для обраних акціонерних енергогенеруючих товариств України з метою зменшення негативного впливу та підсилення позитивного ефекту за допомогою розробки та вибору фінансових стратегій.

Ключові слова: ефективність, структура капіталу, економічно-додана вартість, енергогенерація, управління, фактори впливу, акціонерні товариства, Україна.

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Мастюк Д. О. Факторы влияния на эффективность управления структурой капитала украинских акционерных энерго- генерирующих обществ

Данная статья посвящена теоретико-практическому исследованию факторов влияния на эффективность управления структурой капитала. Выделены основные теории формирования и управления структурой капитала; рассмотрены другие научные исследования, связанные с исследованием структуры капитала предприятий. Рассмотрены 19 независимых переменных разного уровня воздействия (микро-, мезо- и макроуровня) и одна зависимая – экономическая добавленная стоимость, которая была выбрана в качестве показателя эффективности управления структурой капитала. Период исследования составляет 14 лет – с 2003 по 2016 гг. и базируется на пяти акционерных энергогенерирующих обществах. Определены восемь ключевых факторов влияния на эффективность управления структурой капитала. Самое сильное положительное влияние среди определенных факторов имеют учетная ставка НБУ и доходность, тогда как сильнейшее негативное влияние – уровни конкуренции на рынке и инфляции. По результатам исследования предложен ряд рекомендаций для выбранных акционерных энергогенерирующих обществ Украины с целью уменьшения негативного влияния и усиления положительного эффекта посредством разработки и выбора финансовых стратегий.

Ключевые слова: эффективность, структура капитала, экономически добавленная стоимость, энергогенерация, управление, факторы влияния, акционерные общества, Украина.

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The continuing economic reformation and development of Ukraine is leading to extreme changes at macroeconomic and microeconomic levels in the future, but nowadays, such transformation provokes the instability of the national economy that can be observed even in common life. One of the reasons of this instability is the lack of readiness, willingness, and opportunities of enterprises to adapt their way of economic activities to the modern environment. From the other hand, the unpredictable environment creates such circumstances that are hard to estimate and prepare for them. This confrontation of the

micro-level and macro-level encourages the management of companies to search for new ways of economic, financial, and managerial behaviour and create new strategies of reacting. According to statistical information for 2016 (SSC of Ukraine, 2016), the power-producing sector of the Ukrainian economy, namely electric power industry, generates 4.5% from all realized products and services. It is one of the most powerful, biggest, and capital-intensive branches (Hanks, 2013), which is considered to be strategic for any country. Analysing the challenges that enterprises face during their activity we can underline the issues concerning their capi-

tal structure and evaluation of its effectiveness. In a very unpredictable and volatile environment, the enterprises can suffer from the lack of financing or from the inability to pay debts when they come due. Therefore, it influences the effectiveness of the capital with a defined structure and, eventually, the overall performance of the enterprise. The main aim of this paper is to investigate and identify all possible factors, from the list of the assumed ones, influencing the effectiveness of capital structure management at listed power-producing companies of Ukraine and propose some recommendations for improving the economic and financial situation in these enterprises.

Scientific sources identify capital structure in different ways. As a starting point, we can use the definition of capital structure as a particular distribution of debt and equity that makes up the finances of a company provided by the modern Oxford Dictionary (2016). Parsons and Titman (2009) as well as Nirajini and Priya (2013) define capital structure as a mix of different sources of financing, such as long-term and short-term ones. Groppelli (1995) uses the term of optimal capital structure and says that optimal capital structure is such that maximizes the value of shares by particular ratio of equity and debt. Gitman (2010) as well as Groppelli use the term of optimal capital structure and defines it as the equity-debt mix that minimizes WACC and maximizes the enterprise market value. Moreover, Watson and Head (2007) define it as equity-debt mix that at minimizing WACC maximizes NPV and therefore the well-being of the owners.

Talking about the determinants of the effectiveness of the capital structure management, we cannot avoid the definition of the term "effectiveness". Thus, effectiveness is a degree to which something is successful in producing a desired result (Bondarenko, Rosohach, Mitchenko, 2014). Oleksiuk (2009) defines effectiveness as a combination of features and parameters of the enterprise that reflect quality of its performance, economic feasibility of resources usage, production organization, exploitation of equipment and working time, labour force productivity, etc. Combination of the two previous categories gives us the understanding of the capital structure management effectiveness of the enterprise as a criterion of the capital structure optimality, which reflects positive effect from achieving the established aims, changing the structure, and making financial decisions concerning the enterprise capital.

The investigation of the enterprise capital structure, principles and methods of its formation, and optimality of the capital structure has been conducted for a very long time. In 1958, two researches, Modigliani and Miller, presented to the world their modern capital structure M&M I theory (1958). The M&M I theory uses several assumptions, such as:

- ✦ Enterprises can be grouped concerning the level of risk and risk class. The one-group enterprises bear the same level of operating risk (Modigliani, Miller, 1958).
- ✦ Cost analysis does not include expenses for issuance of shares and its support – brokerage or flotation costs do not exist (Watson, 2007). All shares

are allocated and information about the capital market is free (Gitman, 2011).

- ✦ Existence of a perfect market excludes taxes (Gitman, 2011).
- ✦ Investors can borrow at the same rate as corporations (Gitman, 2011).

Therefore, Modigliani and Miller argued that capital structure does not influence the value of a company and WACC does not depend on its gearing level. In 1963, Modigliani and Miller published the second paper continuing their research and amending their previous model by adding a corporate tax. They stated that, by gearing up more debt – companies increase the tax shield. Thus, companies tend to increase the level of debt in their capital structures as it makes the WACC decrease. Consequently, the optimal capital structure does exist when companies are 100 % geared (Modigliani, Miller, 1963).

In 1961, Donaldson (1961) introduced the pecking order theory of capital structure formation. This theory includes such phenomenon as asymmetric information – a situation when managers (agents) of a company are more familiar with the market environment and its processes than owners of this company are. It includes the following range of principles (Donaldson, 1961; Myers, 1984; Watson, 2007; Gitman, 2011):

- ✦ A company tends to use more internal resources to finance its activity, rather than debt and resources of its owners.
- ✦ If a company requires external financial resources, it will use debt financing rather than the owners' equity.
- ✦ The indebtedness ratio shows the total demand of external financing.
- ✦ The achieving of optimal capital structure is not an aim of this theory.

Generalizing, the pecking order theory explains, why the company tends to use more debt financing towards the owner's equity. Moreover, it defines why companies with higher profits gear less debt, while companies with average and low earnings operate using external funds. The developing of capital structure theories put forward the creation of the trade-off theory, which emphasizes optimal capital structure existence and includes bankruptcy and agency costs (Ghazouani, 2013). The trade-off theory can be split up into the static trade-off theory (STT) and the dynamic trade-off theory (DTT). Analysing scientific literature, we can identify some differences between the static trade-off theory and the dynamic trade-off theory (*Tbl. 1*).

Modern researches of capital structure have transformed into studying determinants that influence the capital structure providing changes in the capital of the enterprise as well as its overall performance. Ali Shah and Jam-e-Kausar (2012) investigated determinants of capital structure at 28 Pakistani leasing companies within the time span from 2003 to 2008. Their research was oriented towards identification of factors influencing the leverage, which they consider to be the indicator of capital structure. They found that the size and the growth rate of the observed companies are positively related to the leverage, while their profitabil-

Differences between the static trade-off theory and the dynamic trade-off theory

Static trade-off theory	Dynamic trade-off theory
<ul style="list-style-type: none"> - Capital structure is an important component in a company's activity; - The optimal capital structure does exist; - The bankruptcy and agency costs are included in the theory 	<ul style="list-style-type: none"> - Time and capital market imperfection influence the capital structure of a company; - Optimal capital structure is not static and changing in time; - To reach a desirable capital structure the company should make changes "today"; - Transaction and adaptation costs are included

Source: developed by the author based on (Nitzan, 2009; Parsons, Titman, 2009; Ghazouani, 2013).

ity, liquidity and taxes are negatively related to the leverage. Moreover, according to their research, inflation has strong and negative relation, while tangible assets have positive but insignificant relation to the leverage. Babalola (2016), and Amjed and Amir Shah (2016) investigate capital structure, its adjustments and effectiveness with regard to developing countries. They include macroeconomic conditions that may have an influence on capital structure. These papers provide deep insights into how macroeconomic environment of developing countries, among which Ukraine is, can affect the capital structure performance of companies.

Kramer (2015) applying fixed-effects estimations analyzed the effect of ownership on capital structure and taxation. He used companies from 40 European countries for the period from 1993 to 2009. The main variables in his research are leverage, dispersed ownership, loss carry forwards, profitability, tangibility, firm size, age, corporate tax, interest tax, GDP per capita and inflation rate.

Al Ani and Al Amri (2015) analysed five factors of influence on capital structure, which was measured as total debt ratio. They used data of Omani industrial companies, listed in the Muscat Securities Market, from three subsectors within the period from 2008 to 2012. The determinants they evaluated (ROA, riskiness, size of the company, rate of growth and assets tangibility) showed different relations to the leverage. The level of risk and tangibility of assets showed statistically positive relation to the capital structure (leverage), while the growth rate and profitability show statistically negative relation to the leverage. Besides, there is no statistically significant connection between the company size and the leverage.

Nguyen, Diaz-Rainey, and Gregoriou (2014) introduced the first insights into capital structure of Vietnamese listed companies. They have employed the Generalized Method of Moments (GMM) system estimator to define the relevant determinants of the capital structure within 116 listed non-financial companies for the period of 2007-2011. The conclusion of the research states that the studied Vietnamese companies tend to use more short-term liabilities. Moreover, it is determined that their profitability and liquidity ratios affect the leverage negatively, whereas the growth rate and state-ownership influence positively.

Norvaisiene (2012) conducted a research in the opposite direction in order to understand how capital structure influences performance indicators at Baltic companies for the period from 2002 to 2011. For the research, she used the data on 70 companies from the Baltic region, including 28 Lithuanian companies, 14 Estonian, and 28 Latvian ones.

The examination of the interaction between the indebtedness ratios that reflect the capital structure and such ratios as operating profit margin, net profit margin, ROE, ROA, liquidity ratio, capital asset turnover, and total asset turnover – showed the following result: an increase in the indebtedness level negatively affects the profitability ratios of the companies. Moreover, both financial and non-financial debts reduce the liquidity, while the financial debt has a negative relation to the capital asset turnover and total asset turnover, and the higher the level of non-financial debts the higher the level of the turnover indexes. The investigation of the capital structure determinants at 88 Chinese listed companies for the period from 1995 to 2000 provided by Chen (2004) gives us the following results: the profitability and debt have negative interrelation; the relation of the size to the total debt has a positive value; the tangibility of assets and growth opportunities have positive relation to the leverage.

For this research, we investigated five power-producing companies of Ukraine, listed in PFTS stock exchange and UX stock exchange with common stocks, including PJSC Centerenergo (CEEN UK), PJSC Kievenergo (KIEN UK), PJSC DTEK Zakhidenergo (ZAEN UK), PJSC Donbasenergo (DOEN UK), and PJSC Dniproenergo (DNEN UK). The basic information for the research was imported from Bloomberg Terminal at Masaryk University in Brno, the Czech Republic, and from the Ukrainian Stock Exchange (the Ukrainian Exchange, 2016). Furthermore, we had collected annual statistical information about the chosen companies to calculate the indexes considered in the current paper. We used the data for a 14-year period, from 2003 to 2016, about the assumed factors influencing the effectiveness of capital structure management.

Analysing scientific researches about capital structure and its influence determinants (Myers, 1977; Ali Shah, Jame-Kausar, 2012; Norvaisiene, 2012; Chen, 2004; Ghazouani, 2013; Myers, 1984 etc.), we can admit that most of the authors include into their researches only microeconomic factors. These factors are easy to calculate and they are much volatile during any period, either it is an annual or a monthly analysis. Talking about Ukraine, the economy of the country is very unpredictable and, therefore, we want to understand how listed companies in power-producing sector react to changes at the micro-level, as well as to changes at the market level and macro-level. Whereas the researches include mostly microeconomic factors, we, consequently, observe factors from all the mentioned levels. For our research, we have chosen 19 independent variables, among which there

are six macroeconomic ones, three market-level ones and 10 microeconomic variables. The *Tbl. 2* below interprets the list of the variables considered in this paper.

Madhavi and Prasad (2015) performed an empirical study on Economic Value Added (EVA) and Market Value Added at Indian companies. They compared such financial performance estimators like Return on Invested Capital (ROIC), Earnings per Share (EPS), Return on Assets (ROA), Return on Sales (ROS), and Return on Equity (ROE). In their paper they support the statement that EVA is a better predictor of the company's value.

Terenteva and Ikhsanova (2016) studied the needs for optimizing the structure of financing transport infrastructure projects and proposed an indicative parameter for assessing the effectiveness of the structure of financing infrastructure projects. The parameter, according to them, is based on key performance indicators — financial performance indicator with different proportions of equity and debt capital, and different periods of the infrastructure facility exploitation.

Additionally to them, after analysing scientific literature (Stewart, 2013; Stern, Shiely, Ross, 2001; Roca, 2011; Madhavi, Prasad, 2015; Neumaier, Neumaierová, 2014), in our previous research (Mastiuk, Valouch, Krush, 2016) we stated that EVA can be used as a measurement tool of the effectiveness of capital structure management at listed power-producing enterprises. Besides, in the research we

modified the formula for calculating EVA and introduced our approach to its measurement, and showed how well the capital structure of the chosen enterprises performs. Since the main aim of the previous investigation was to understand what influences the effectiveness of capital structure management, in the hereby research we take the modified EVA as a dependent variable that explains the effectiveness of the capital structure at the chosen listed enterprises.

In this research we perform a three-step analysis of the influence factors. The first step includes analysis of the correlation matrix to identify preliminary the most valuable and at the same time statistically significant variables that have an impact on the EVA.

Such analysis gives less economically feasible and statistically valuable results; nevertheless, it carries information that is more descriptive and creates a basis for further modelling process. From here we can understand the background of factors and assume that some of them will appear relevant in the statistical model. The *Tbl. 3* represents correlation pairs with the Pearson correlation coefficient and the ratio of statistical significance.

The second step in investigating the influence determinants of the effectiveness of capital structure management includes the process of modelling the theoretically chosen factors through specialized software. Going further, we should state that the quantity of observations, which are 70,

Table 2

Crucial factors influencing the effectiveness of capital structure management at listed power-producing companies of Ukraine with indexes

No.	Index of the variable	Factor	Description
1	X_1	GDP, bln USD	Dynamics of GDP, blnUSD
2	X_2	GDP per capita, USD	Dynamics of GDP per capita, USD
3	X_3	Energy consumption	Amount of consumed electricity per capita in kWt
4	X_4	GDP per capita per kWt	Ratio of GDP per capita per kWt of the consumed electricity
5	X_5	Inflation rate	Change of the inflation rate
6	X_6	National Bank interest rate	Change of the National Bank interest rate
7	X_7	Corporate tax	Rate of the corporate tax for shareholders
8	X_8	Income tax	Established rate of the income tax
9	X_9	Level of competitiveness	Herfindahl-Hirschman Index
10	X_{10}	Size	Logarithm natural of the total assets
11	X_{11}	Liquidity	Current liquidity ratio as current assets to current liabilities
12	X_{12}	Tangible assets	Tangible assets to total assets ratio
13	X_{13}	DFL	Degree of financial leverage
14	X_{14}	Profitability	Return on assets ratio
15	X_{15}	Risk	Standard deviation of the sum of total assets
16	X_{16}	Effective tax rate	Total tax paid to EBIT
17	X_{17}	Non-debt tax shield	Depreciation and amortization to total assets
18	X_{18}	Corporate governance	Percentage of shares in government ownership
19	X_{19}	Market share	Gross sales income to total market sales
20	γ	EVAMod	Economic value-added modified

Source: developed by the author based on the analysis of scientific sources: Myers, S., 1977; Syed Zulfiqar Ali Shah, Jam-e-Kausar, 2012; Rasa Norvaisiene, 2012; Jean J. Chen, 2004; Ghazouani T., 2013; Myers, S.C., 1984; Watson D., Head A., 2007 etc.

Main factors influencing the Economic Value Added in accordance to correlation matrix analysis of the listed power-producing companies in Ukraine

Independent variable	Correlation pair	Pearson Corr.	Sig. (2-tailed)	Dependent variable
Profitability	$X_{14}Y$	0.842	<0.0001	Effectiveness of capital structure management calculated as Economic Value Added (EVAMod)
Liquidity	$X_{11}Y$	0.286	0.037	
Tangible assets	$X_{12}Y$	-0.274	0.001	
Inflation rate	X_5Y	-0.539	<0.0001	
Degree of financial leverage	$X_{13}Y$	-0.056	<0.0001	
Corporate governance	$X_{18}Y$	-0.089	0.002	
Riskiness	$X_{15}Y$	-0.002	0.011	
National Bank interest rate	X_6Y	-0.429	0.002	
Level of market competitiveness	X_9Y	-0.268	0.030	
Market share	$X_{19}Y$	0.087	0.010	
Corporate tax rate	X_7Y	-0.189	0.026	
Energy consumption	X_3Y	0.023	0.028	

Source: developed by the author.

and availability of five cross-sectional units drive us to apply Panel Data Model with fixed effects. According to Verbeek (2008), this model is the most suitable for datasets with small amount of cross-sectional units and relatively short time span (Tbl. 4). Moreover, Wahba (2014) at investigating capital structure and company's performance applied Generalized OLS Panel Data Model to examine the effect of debt and managerial ownership on various financial performance indicators, which supports the feasibility of the provided model usage. Salim and Yadav (2012) applied Pooled OLS Panel Data Procedure for investigation of the capital structure and its performance at 237 Malaysian listed companies. In addition, Babalola (2016) introduced a research of 31 selected listed companies directed towards the analysis of the capital structure and its effectiveness, which applied Panel Data Model with fixed effects and random effects, and Mugoša (2015), analyzing large Western European companies for the period from 2003 to 2010, applied Fixed-Effects, Random-Effects Panel Data Models and Pooled OLS. Such researches provide confidence in the model chosen for our paper.

Table 4 provides us the next results:

- 1) Fixed-Effects Panel Data Model identified five independent variables and a constant, which are statistically significant in accordance with *p-values*.
- 2) The greatest negative impact on Economic Value Added is made by tangible assets with the value equal to $-1.37911e + 06$.
- 3) The greatest positive impact on EVA is made by profitability of the power-producing companies with the value equal to $5.4392e + 06$.
- 4) R-squared ratio of the model equals to 0.780482, while within R-square equals to 0.774437. Moreover, *P-value* (*F*) for the model equals to $4.16e - 15$ approaching zero, which means that the model is statistically significant and valid.

Nevertheless, we are going to avoid the provided model because of the obtained result. The reason for it is that the test for differing group intercepts for Fixed-Effects Panel Data Model with H_0 – the groups have a common in-

tercept – gives us the result of *p-value* equal to 0.769814. It means that we cannot reject the null hypothesis and, therefore, for final investigation we will use Pooled Ordinary Least Square Model.

Proceeding to Step 3 of our research, where the step-wise elimination of statistically irrelevant determinants was performed, we would like to introduce the final investigation model of the factors influencing the effectiveness of capital structure management.

Primarily before implementing the modelling process by means of Pooled OLS Model, we would like to provide information from a descriptive statistics analysis in Tbl. 5. Here we can see that EVA (*Y*) as the effectiveness indicator varies from $-3.169e + 008$ to $1.88e + 099$ with its mean equal to -21484 and the median -30077.3 . It helps us to conclude that within the chosen time span enterprises tend to have negative EVA and, hence, a low level of effectiveness of capital structure management.

Moreover, we would like to make an emphasis on such variables as size (X_{10}) and corporate governance (X_{18}). The size of the chosen enterprises during the last 14 years was not changing greatly, as the minimum value of the variable is 14.5986 and the maximum one is 16.4944, with its mean equal to 15.225 and the median equal to 15.1464, which leads to the conclusion that the enterprises did not evolve during this period. From the descriptive statistics of the corporate governance variable we see that the enterprises are strongly dependent on the government, which might have a negative influence.

The mean value of profitability ratio (X_{14}) calculated using ROA is negative for the chosen enterprises within the defined time span and equals -0.00017 , and the median value equals 0.003699. This helps to sum up that the power-producing companies perform ineffectively, which influences the EVA.

As it is mentioned in the previous part, to identify the most relevant factor influencing EVA, we applied Pooled OLS Model with five cross-sectional units (five chosen en-

Table 4

Results of Step 2 in the modelling of factors influencing the effectiveness of capital structure management at the listed power-producing companies

Model 6: Fixed-Effects, using 70 observations					
Included 5 cross-sectional units					
Time-series length = 14					
Dependent variable: EVAMod					
	Coefficient	Std. Error	t-ratio	p-value	
Const	6.60772e+06	2.95167e+06	2.2386	0.0292	**
Size	-356158	174283	-2.0436	0.0458	**
Tangible_assets	-1.37911e+06	521293	-2.6456	0.0106	**
DFL	932.248	497.643	1.8733	0.0663	*
Profitability	5.4392e+06	454760	11.9606	<0.0001	***
Corporate governance	-677373	363232	-1.8648	0.0675	*
Mean dependent var.	-21483.80		S.D. dependent var.	601272.3	
Sum squared resid.	5.08e+12		S.E. of regression	303888.8	
LSDV R-squared	0.780482		Within R-squared	0.774437	
LSDV F(9, 55)	21.72769		P-value(F)	4.16e-15	
Log-likelihood	-907.3889		Akaike criterion	1834.778	
Schwarz criterion	1856.522		Hannan-Quinn	1843.357	
rho	-0.442423		Durbin-Watson	2.213944	
Joint test on named regressors – Test statistic: $F(5, 55) = 37.7668$ with $p\text{-value} = P(F(5, 55) > 37.7668) = 1.31604e-016$					
Test for differing group intercepts – Null hypothesis: The groups have a common intercept Test statistic: $F(4, 55) = 0.452936$ with $p\text{-value} = P(F(4, 55) > 0.452936) = 0.769814$					

Source: developed by author.

Table 5

Results of the descriptive statistics on the determinants of the effectiveness of capital structure management at the listed power-producing companies

Summary Statistics, using the observations 1 : 1 – 14 : 5 (missing values were skipped)								
Var.	Mean	Median	Minimum	Maximum	Std. Dev.	C. V.	Skew.	Ex. kurtosis
X_5	0.1458	0.132775	-0.000775	0.49625	0.1263	0.866	1.481	2.0852
X_6	0.09692	0.08000	0.0600	0.2200	0.0419	0.432	1.945	3.1066
X_9	0.2182	0.216763	0.205763	0.244939	0.00964	0.044	1.530	2.1659
X_{10}	15.225	15.1464	14.5986	16.4944	0.46983	0.031	0.839	-0.0732
X_{12}	0.58631	0.589961	0.359074	0.837729	0.09833	0.168	0.168	-0.1072
X_{13}	14.1424	0.806147	0.001143	684.739	84.8601	6.000	7.769	58.886
X_{14}	-0.00017	0.003699	-0.28883	0.338222	0.09029	521.1	-0.303	4.5631
X_{18}	0.60577	0.701	0.2500	0.8577	0.22914	0.378	-0.617	-1.1924
Y	-21484	-30377.3	-3.169e+008	1.88e+009	601272.	27.99	-1.775	11.715

Source: developed by the author.

terprises) and the length of time series equal to 13 years. The results of the modelling are introduced in the *Tbl. 6*.

In the table above we can observe the following results:

1) The modelling process with Pooled OLS Method identified eight independent statistically significant variables that influence the effectiveness of the capital struc-

ture (EVA) of the chosen Ukrainian listed power-producing companies.

2) According to the results of the test for omission of variables, we exclude the variable “Energy consumption” due to insignificance of its influence ($p\text{-value} = 0.1289$).

3) The *R*-squared ratio for the model equals 0.822197, while adjusted *R*-squared equals 0.793101 with *P*-value (*F*)

**Results of modelling the factors influencing the effectiveness of capital structure management
at the listed power-producing companies**

Model 9: Pooled OLS, using 70 observations					
Included 5 cross-sectional units					
Time-series length = 14					
Dependent variable: EVAMod					
	Coefficient	Std. Error	t-ratio	p-value	
Const.	7.56013e + 06	1.99568e + 06	3.7882	0.0004	***
Size	-244525	120689	-2.0261	0.0476	**
Tangible assets	-951072	368098	-2.5837	0.0125	**
DFL	1308.26	455.237	2.8738	0.0058	***
Profitability	5.32966e + 06	478656	11.1346	<0.0001	***
Corporate governance	-427092	214926	-1.9872	0.0519	*
Energy consumption	-157.42	102.107	-1.5417	0.1289	
Inflation rate	-2.87303e+06	825879	-3.4788	0.0010	***
NB interest rate	9.84282e+06	2.99776e+06	3.2834	0.0018	***
Level of competitiveness	-1.40371e+07	6.05554e + 06	-2.3181	0.0242	**
Mean dependent var.	-21483.80		S. D. dependent var.	601272.3	
Sum squared residuals	4.11e + 12		S. E. of regression	273495.3	
R-squared	0.822197		Adjusted R-squared	0.793101	
F(9, 55)	28.25893		P-value (F)	1.51e-17	
Log-likelihood	-900.5393		Akaike criterion	1821.079	
Schwarz criterion	1842.823		Hannan – Quinn	1829.658	
rho	-0.339022		Durbin – Watson	1.924406	
White's test for heteroscedasticity – Null hypothesis: heteroscedasticity not present Test statistic: $LM = 62.4573$ with $p\text{-value} = P(\text{Chi-square}(52) > 62.4573) = 0.151935$					
Test for omission of variables – Null hypothesis: parameters are zero for the variables Energy consumption Test statistic: $F(1, 55) = 2.37687$ with $p\text{-value} = P(F(1, 55) > 2.37687) = 0.128878$					

Source: developed by the author.

for the model equal to $1.51e - 17$ verging towards zero. It helps us to conclude that the model is valid and feasible for using in the research.

4) White's test for heteroscedasticity, with H_0 – *Heteroscedasticity not present*, gives us the result of $p\text{-value} = 0.151935$. Thus, we do not reject the null hypothesis and can state that the data set is homoscedastic.

5) Comparing Table 3 and Table 6, we state that our assumption about the variables is valid. According to the model and the results of the correlation matrix analysis, such variables as National Bank interest rate, level of market competitiveness, corporate governance, inflation rate, profitability and degree of financial leverage are statistically significant and appear at all steps of the research.

The Variance Inflation Factors test in *Tbl. 7* indicates that the variables do not have the collinearity problems. Therefore, the variables defined with Pooled OLS Panel Data Model are acceptable and considered to be a valuable result. The National Bank interest rate and inflation rate have the highest values of the multiple correlation

coefficient: 7.782 and 9.502 respectively. Nevertheless, they do not exceed the maximum acceptable value, which leads to the conclusion that they are acceptable for the model.

Considering the results of Pooled OLS Model introduced in Table 6, we would like to define the regression equation of the determinants influence on the effectiveness of capital structure management. Using the provided by the model coefficients and indexes of variables, we obtain the following regression equation:

$$Y = \text{const} - \beta_5 \cdot X_5 + \beta_6 \cdot X_6 - \beta_9 \cdot X_9 - \beta_{10} \cdot X_{10} - \beta_{12} \cdot X_{12} + \beta_{13} \cdot X_{13} + \beta_{14} \cdot X_{14} - \beta_{18} \cdot X_{18}. \quad (1)$$

Therefore, substituting β with the coefficients determined with the help of the model in Table 6, we have the following equation:

$$Y = (7.56013e + 06) - (2.87303e + 06) \cdot X_5 + (9.84282e + 06) \cdot X_6 - (1.40371e + 07) \cdot X_9 - 244525 \cdot X_{10} - 951072 \cdot X_{12} + 1308.26 \cdot X_{13} + (5.4392e + 06) \cdot X_{14} - 427092 \cdot X_{18}. \quad (2)$$

Table 7

Results of the test for multicollinearity of the variables using Variance Inflation Factors Method

Variance Inflation Factors	
Minimum possible value = 1.0	
Values > 10.0 may indicate a collinearity problem	
Size (X_{10})	2.751
Tangible assets (X_{12})	1.121
DFL (X_{13})	1.277
Profitability (X_{14})	1.598
Corporate governance (X_{18})	2.075
Inflation rate (X_5)	7.782
NB interest rate (X_6)	9.502
Level of competitiveness (X_9)	2.913
$VIF(j) = 1/(1 - R(j)^2)$, where $R(j)$ is the multiple correlation coefficient between the variable j and the other independent variables	

Source: developed by the author.

Moreover, we would like to summarize all the identified determinants of the effectiveness of capital structure management with highlighting the level of each factor and the way of its influence. *Tbl. 8* summarizes the modelling process.

From *Tbl. 8* we can see eight factors influencing the effectiveness of capital structure management: two of them represent the impact of the macro-level; one – the market-level and the rest five factors represent the micro-level. National Bank interest rate, degree of financial leverage and profitability of the power-producing enterprises have a positive impact on the effectiveness of capital structure management (EVA). On the contrary, inflation rate, level of market competitiveness, size of the enterprise, tangible assets ratio, and corporate governance decrease the effectiveness of the capital structure.

CONCLUSIONS

The conducted research of the determinants of the effectiveness of capital structure management at the listed

power-producing companies of Ukraine gave us very important and interesting results. Considering the previous researches provided by Chen (2004), Norvaisiene (2012), Ali Shah and Jam-e-Kausar (2012), Al Ani and Al Amri (2015), Babalola (2016), Amjed and Amir Shah (2016) etc., we conclude that our investigation confirms the influence of such determinants as profitability, size of the enterprise and tangible assets ratio. The mentioned authors included these factors in their researches. Having agreed with their position, we admit that these factors are statistically significant, and have impact not only on capital structure but on its effectiveness as well. Moreover, we support the idea of inclusion into investigation the factor of inflation rate, which was done by Ali Shah and Jam-e-Kausar (2012), Babalola (2016), and Amjed and Amir Shah (2016) in their investigation. In spite of the aim of the present research, which is directed towards investigating the determinants of the effectiveness of capital structure management, we note that four of the eight identified factors are the same as in the mentioned researches. In addition, we support the implication of Panel Data Fixed-Effects Model and Pooled OLS Model for the investigation of the factors influencing the effectiveness of capital structure management, as these models are considered viable, feasible and acceptable by scholars in this field.

The empirical investigation of the determinants, besides, gives us a clear understanding of an external environment influence, which is reflected in two macroeconomic factors (inflation rate and National Bank interest rate) and one market-level factor (level of market competitiveness). Therefore, National Bank interest rate and profitability show us the strongest positive influence on the effectiveness of capital structure management (EVA), whereas, level of competitiveness and inflation rate have the strongest negative influence on EVA. Tangible assets, company's size, and corporate governance have average but negative effect on the effectiveness of capital structure management at the listed power-producing companies in Ukraine. DFL has statistically significant but not strong positive influence on EVA of the chosen companies.

Table 8

Empirically determined factors influencing the effectiveness of capital structure management (EVA) of the listed power-producing companies in Ukraine

Factors	Description	Factors change	Influence on EVA	Level of factor
Inflation rate	Change of inflation rate	X_5	Decrease	Macro-
National Bank interest rate	Change of National Bank interest rate	X_6	Increase	
Level of competitiveness	Herfindahl-Hirschman Index	X_9	Decrease	Market-
Size	Logarithm natural of total assets	X_{10}	Decrease	Micro-
Tangible assets	Tangible assets to total assets ratio	X_{12}	Decrease	
DFL	Degree of financial leverage	X_{13}	Increase	
Profitability	Return on assets ratio	X_{14}	Increase	
Corporate governance	Percentage of shares in government ownership	X_{18}	Decrease	

Source: developed by the author.

Not paying attention to such influence in a very unstable and volatile economy can lead to significant decrease in the effectiveness of capital structure management and, eventually, in overall enterprise's performance. Therefore, by the given research we recommend the chosen Ukrainian enterprises to adapt their financial strategies for such influence, which can help to prepare for extreme changes. Besides, we would like to make an accent at the level of corporate governance. According to the results of the model, the increasing of percentage in shares owned by the government decrease the effectiveness of capital structure management. Thus, in the current environment, the Ukrainian listed power-producing companies should stepwise decrease the level of government ownership in order to increase the capital performance. This research paper provides us with scientific basis for further research of capital structure and its performance, development of financial strategies and adaptation of the financial management system to influence of different kinds of environment.

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