



# JOURNAL OF ACCOUNTING, FINANCE AND AUDITING STUDIES

<http://www.jafas.org>

## Financial Factors in Ukraine's Machine-Building Industry Development

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### **Keywords**

Economic Margin, Capital Cost, Machine-Building, Industry Development, Capital Structure.

### **Jel Classification**

G30.

### **Abstract**

Despite numerous government interventions, machine-building industry in Ukraine slowly declines since 2008. Many researchers claim it to be a result of high cost of capital within Ukraine. This article purposes to answer the question, how cost of capital influences development of Ukrainian machine-building enterprises. Twenty Ukrainian enterprises were selected and their data analyzed for the period from 2008 to 2014, using the value-oriented approach, namely, the method of Economic Margin (EM), adjusted to peculiarities of Ukrainian reporting practices. The research shows, that the cost of capital (CC) is not a determining factor for the stalled development of the machine-building enterprises in Ukraine.

## **1. Introduction**

Ukraine inherited its machine-building plants from the USSR. Those plants were mostly privatized by the end of 1990s, and such pre-history left a noteworthy mark on Ukrainian machine-building entities' management approaches and their relations with Ukrainian state. For instance, machine-building industry was considered a priority industry throughout all of the modern history of Ukraine, although actual budget financing was only allocated in late 1990s – mid 2000s through several narrow industry development programs [1]. More recent researches on the subject show that those programs were tailored to solve current problems of few major machine-building enterprises (including AvtoZAZ, the biggest automobiles manufacturer in Ukraine), and had little to no effect on their development in the long run [2]. Although the famous inefficiency of Ukraine's business support programs is an important factor, in this article we will look past this issue, since many of local researchers [3,4,5] claim that current state of machine-building industry is mostly a result of unfavorable financing conditions like high taxation, equity and debt cost. They argue that machine-building entities in Ukraine cannot afford to modernize their production facilities due to high cost of credit [4], and that state should intervene by providing some sort of state aid (namely, credits from state-owned banks, tax exemptions or direct budget subsidies) [5]. The premise of such researchers is that low profitability of Ukrainian machine-building entities is mainly the result of their mostly outdated equipment (average depreciation of industry's funds indeed was about 64% in 2014), although others [3] point out consistency of such high depreciation even throughout periods of economic rise (2000-2007) and low exports of Ukrainian machine-building industry products (approximately 17% of total exports at peak performance in 2007 and about 11% of total exports in 2014), which is most likely to be a result of sub-par management performance.

The hypothesis of this article is that the development of the machine-building enterprises in Ukraine is restrained by mostly financial factors like cost of capital, high interest rates and high taxation. To check it, we analyze dynamic of selected financial indices of a set of Ukrainian machine-building enterprises to draw out the most and least developed ones. Then we compare their capital structure and prices of financing available to them to determine is there a recurring pattern.

We define the period of development of an enterprise to be the period, when the enterprise is able to create value for its owners. As a measurement of development we use Economic Margin (EM). Cost of capital, interest rate and taxation affects EM via Weighted Average Cost of Capital (WACC). Theoretically, the higher is the level of EM, the lower is the WACC. By

comparing capital structure and terms of financing among the most and least successful enterprises, we can draw general conclusions about significance of terms of financing for development of Ukrainian machine-building enterprises.

Based on the current research it is possible to state that financial factors such as cost of debt, equity and taxation are not main factors that cause lack of development of Ukraine's machine-building enterprises, since both worst- and best-performing entities from the sample have similar level of WACC.

## **2. Materials and Methods**

### **2.1. Choice of development assessment method**

There is no unified and approved methodology for identifying and assessing development of enterprises in Ukraine. The traditional approach offers production or sales volumes as development factors. These indices tend to be used in planned economy, and they can be easily tracked. A drawback of production volume as a development index is that it does not demonstrate sales capacity, or ability to adjust to changing markets. Sales volume is a better index (it takes into account ability to sell the produced merchandise), but this does not provide comparability for enterprises of different size. Moreover, it does not allow to estimate correlation of involved resources and received results, that is, productive efficiency. Modern finance is based on the value-oriented approach, according to which, while its profit does not exceed the cost of invested capital, an enterprise does not create any value, but destroys it [6, p.65].

A much better criterion of development for an enterprise is its value, as enterprise value represents its ability to both sell and produce merchandise, and also - market evaluation of enterprise activities. However, enterprise value alone is but an income, resulted from the sale of the enterprise. To inspect development one must consider value added, created by the enterprise for its owners. Assessment of such value is carried out based on Discounted Cash Flows (DCF), Economic Value Added (EVA) and Economic Margin (EM).

DCF-based models are mostly used for assessment of individual projects. Resulting data is expressed as a sum of discounted cash flows earned from the project, thus making it hard to compare, especially when the assessed projects have different scale and length. EVA-based method, according to data of The Applied Finance Group [7, p.4-5], also has a number of shortcomings. For example, it does not take into account influence of inflation, and, provided that capital assets are not renewed (i.e. asset value drops annually), EVA tends to grow even in case, if there's no actual growth (so-called "Old Plant Trap").

Enterprise value assessment, based on the EM concept is free of the mentioned flaws. Economic margin expresses income of an enterprise, received above or below the cost of its capital, that is, the amount of new value for owners and investors of the enterprise, which is created or destroyed within the period of assessment. Moreover, the resulting data is a relative measure, making it easier to compare enterprises of different size and occupation. That is the reason why this method picked to assess development in our study.

## **2.2. Using Economic Margin method based on Ukrainian financial statements**

We will be defining the level of development of machine-building enterprises by the EM index, i.e. surplus of the cash flow, generated by enterprise as a result of its operating activities, over the invested capital. One-time assessment is of low significance, so we will assess the tendency of six periods.

Economic Margin is calculated by the following formula:

$$EM = \frac{OCF-CC}{IC_{ia}} \quad (1.1)$$

Using this method, it is necessary also to decide on the evaluation formulae for all interim indices. Experts of The Applied Finance Group [7, p.8] give the following detailed elaboration of the EM formula: Operation Based Cash Flow is subdivided into Net Income, Depreciation and Amortization, After Tax Interest Expense, Rental Expense, Research and Development Expense and Non-Recurring Items. Such formula approximately corresponds to EBITDA and, strictly saying, cannot be defined as cash flow, as there are no indices, expressing changes in current assets during the period.

Calculation of such “cash flow” by financial statements of Ukrainian enterprises requires certain changes in the formula. First, according to Ukraine’s standards of financial statements, Rental Expenses are included into expenses of the accounting period and are not singled out. R&D Expenses are also not singled out into a separate account. Starting from 2013, separate lines for Non-Recurring Items are not provided as well, and enterprises have the right not to disclose them. Thus, to calculate “Operation Based Cash Flow” according to assessment methodology of The Applied Finance Group, Ukrainian enterprises can use only Net Income, Depreciation and Amortization, and also After Tax Interest Expenses. So, it is appropriate to take the value of Net Operation Based Cash Flow, all the more, that in medium-term and in long-term outlook it approximately corresponds to “Cash Flow” by Applied Finance Group methodology (difference is in approaches to calculation, the first method is direct, and the second is indirect).

According to the Applied Finance Group methodology, Inflation-adjusted Invested Capital can be calculated as follows:

$$IC_{ia}=TA+DEP+GPIA+OR_c+R\&D_c-NDCL \quad (1.2)$$

Because of local accountancy peculiarities, the formula, used in this methodology, also cannot be applied for Ukrainian enterprises without substantial modifications. Inflation adjustment approximates revaluation of fixed assets, so if to include both indices, they are mutually compensated, so it is not expedient to use them together. Value of Capitalized Operating Rentals, as well as Capitalized R&D Expenses, are already included into the value of Total Assets, so they shouldn't be used in the formula to avoid double calculation. Accumulated Depreciation is also included into the value of Total Assets. As an exception can be regarded the situation, when an enterprise does not have sufficient financial resources to cover actual Accumulated Depreciation [4, p.332], which results in a reduction of Invested Capital. Thus, rather than take into account the value of Accumulated Depreciation, it is expedient to include into the formula a difference between Accumulated Depreciation and cash assets of an enterprise, which allows to estimate liquid assets deficit for complete renewal of fixed assets. Thus, it is expedient to calculate invested capital as a weighted average cost of Total Assets for the period, multiplied by the difference between Accumulated Depreciation and Cash Assets.

Deduction of Non Debt Current Liabilities makes sense only in the case, when Weighted Average Cost of Capital (WACC) is calculated with similar caution. In such case, we deal with Capital in its narrow sense (Equity Capital and Debt, on which interest is charged), and there is a probability of substantial distortion of resulting index, as the considerable part of the assets is financed at the expense of short-term debts and other liabilities.

Capital Charge is calculated not only for EM assessment, but also for EVA evaluation. Standard formula for Capital Charge calculation is the following:

$$\text{Capital charge} = \text{WACC} * \text{Invested Capital} \quad (1.3)$$

In the research, Capital Charge is calculated based on accounting values of WACC and Invested Capital, subject to adjustments, offered by S.Cheremushkin [8]. According to Applied Finance Group methodology, Invested Capital will be calculated as a weighted average cost of Total Assets for the period, increased by the difference between Accumulated Depreciation and Cash:

$$IC = TA + (DEP - \text{Cash}) \quad (1.4)$$

If to expand the Economic Margin formula (1.1.), taking into account detailed elaboration of mentioned indices, we obtain the following general formula, which will be used for assessment of enterprise development:

$$EM = \frac{OCF - (D * P_D * (1 - T)) + E * (R_f + MRP * \beta) * (TA + DEP - Cash)}{(TA + DEP - Cash)} \quad (1.5)$$

### 2.3. Data and measurement issues.

Structure of machine-building industry in Ukraine is defined by classifier of types of economic activities, which was revised within the period from 1994 to 2010 for five times. Before 1994, "All-Union Classifier of Sectors of the National Economy" was used, from 1994 to 2000, - "General Classifier of Branches of the National Economy" (KVED), and starting from 2001 until now - "Classification of Economic Activities", which was revised and amended in 2006 and 2010. The main classification principle, on which current KVED is based, consists in grouping the enterprises subject to similarity of and services, produced by them, as well as likeness of their production in terms of raw materials, production process, methods and technology. Changes to structure of groups and subsections are considerable enough to make data, calculated on the basis of KVED 2005 and KVED 2010, incomparable. Thankfully, after 2010, there were two transition years, when statistics were published, based on both data patterns, - of 2005 and of 2010. The codes of KVED that describe machine-building industry are CI (26), CJ (27), CK (28) and CL (29-30); these are loosely comparable to ISIC rev.4 codes C26-C30.

Information on machine-building enterprises, as well as their financial statements, is provided on the site of Stock market infrastructure development agency of Ukraine (SMIDA), <http://smida.gov.ua>. There is no charge required to access the data, although a free registration process is required to use the site. Unlike other European economic databases, SMIDA does not provide any systematization or data extraction options: one has to seek out each enterprise individually using its ID code (EDRPOU), open corresponding data sheets for each year and copy numbers manually. To see Motor Sich PJSC financial statement for 2014, for instance, one would have to enter its ID, follow the link to general data hub on the company, then choose "yearly information XML -> 2014 -> financial statements", effectively making it a 6-stage operation. Currently there is no English version of this website, making it nigh impossible to use for someone who does not know Ukrainian. Each PJSC must submit their financial statement to this site, although the timing is not very accurate. For instance, information on 2014 was only published mid-year in 2015. Financial statements are available for the period from 2008 to 2014 (information before 2008 is mainly incomplete, showing just empty tables).

According to the law, enterprises are obliged to publish their financial statements on their own sites, but in practice, not all enterprises support their own sites; only those, who aspire to participate in foreign stock markets, disclose their financial information completely and timely. Besides, reports published on the company's website often differ from the reports submitted to Stock market infrastructure development agency of Ukraine.

The enterprises selected for this research paper, include about 30% of the industry assets and about 30% of the industry revenues (Table A1). Number of successful enterprises in the industry is relatively small, and we can state that the concentration of machine-building enterprises in Ukraine is rather high. For example, by 2013, Motor Sich PJSC claims 7,3% of the industry assets and 7,9% of proceeds, Zaporizhtransformator PJSC – 2% and 2,5%, Kryukov Railway Car Building Works PJSC – 2,4% and 3,5% respectively. All enterprises, included in the selection, consisted in the registry of major taxpayers in different periods of their existence, and 15 of them are included into such registry in 2015, which means that either their revenues over the last four consecutive accounting (tax) quarter periods exceed UAH 500 million, or total amount of taxes, paid to State budget of Ukraine within the same period, exceeds UAH 12 million, and their financial statements are subject to special tax control [9, cl.14.1.24]. The selection includes:

- a) automobile production – Automobile Company Bogdan Motors PJSC, KRAZ PJSC, ZAZ PJSC;
- b) electrical engineering – Zaporozhtransformator PJSC and KVAZAR PJSC;
- c) production of household appliances – NORD PJSC;
- d) aircraft production - Antonov Company; FED PJSC;
- e) railway engineering – PoltavKhimMash PJSC, Kryukov Railway Car Building Works PJSC, DniproVagonMash PJSC, Diesel Plant PJSC;
- f) power engineering – Frunze Sumy NPO PJSC, Motor Sich PJSC; NasosEnergoMash PJSC, TurboAtom PJSC;
- g) mining equipment production – Poltava TurboEngineering Works PJSC (PTMZ PJSC), Azovmash PJSC, DniproVazhMash PJSC, Druzhkivka Engineering Works PJSC (DRMZ PJSC).

It should be noted, that subdivision by branches is rather conditional because of diversified activities of the selected enterprises. Most of enterprises in the selection are included into the registry of major taxpayers in 2015 (except for Azovmash PJSC, Kvazar PJSC, Diesel Plant PJSC,; Bogdan PJSC and ZAZ PJSC, which were included in the registry in 2013). A number of other big enterprises (for example, Hartron PJSC or PivdenMash Public Company) were not included to the selection because of insufficient data in open sources. Shipbuilding

enterprises and some of major heavy engineering enterprises were not included into the selection because of their proximity to temporarily occupied territories.

**4. Results.**

To be able to create value, enterprise must have return on invested capital (ROIC) that exceeds its weighted cost of capital [10, p.143-144]. ROIC is calculated using a standard formula, by dividing net operating profit less adjusted taxes by invested capital. On the basis of this pre-condition, it is possible to analyze activities of selected enterprises within the period from 2008 to 2014 for their capacity to create value. Among the enterprises of the sample during the 2008-2014 only around half of them could create value (see table 1):

**Table 1: Number of enterprises that create and destroy value, 2008-2014**

Condition	2008	2009	2010	2011	2012	2013	2014	Average
WACC>ROIC	11	6	8	11	11	13	9	9.86
WACC<ROIC	8	14	11	9	8	7	11	9.71
No data	1	0	1	0	0	0	0	-

For a more detailed overview see table A2. There are no newly-created enterprises in the selection, that is why surplus values of WACC over ROIC can be regarded only as an indication of negative development. Among the sample, 7 enterprises from the selection were destroying value during the whole period. They are Kvazar PJSC, KRAZ PJSC, Azovmash PJSC, Bogdan Corporation PJSC, ZAZ PJSC, DniproVazhMash PJSC, and Poltava TurboEngineering Works PJSC. Only Motor Sich PJSC and ZaporizhTransformator PJSC were creating value within the regarded period of time. Others show no clear trend. Also it should be noted, that there were considerable fluctuations of this ratio, which resulted from irregular profitability of selected enterprises, which defines ROIC.

Significant portion of figures in table A2 are exceeding range of admissible values. It is not a miscalculation, but a result of poorly or non-audited financial statements that are published in open sources. For instance, an astoundingly low ROIC/WACC ratio for Druzhkivka Engineering Works PJSC in 2010 is a result of high financial losses during that year and a near 0 WACC, since judging from their financial report that year they had over 90% of debt capital, and no bank credits on the balance sheet. It is rather usual for Ukraine’s enterprises to have up to 60% of debt capital to be accounts payable which are often considered to be “free”, but in this case its almost certainly a mistake in the financial statement.



As indications of development, we can regard positive values of EM in maximal number of examined periods, and rising tendencies for EM in course of time [10]. Economic Margin expresses Excessive Return to enterprise owners above expected return on invested capital. Negative numbers mean that the enterprise was losing its value during the corresponding period of time, in other words, it was not developing. In the 2008-2014 period, economic margin of the sample's enterprises could be summarized as follows (see table 2):

**Table 2: Distribution of positive and negative EM among the sample**

Condition	2008	2009	2010	2011	2012	2013	2014	Average
EM>0	5	3	6	7	10	8	7	6,57
EM<0	14	17	12	13	9	12	13	12,86
No data	1	0	2	0	1	0	0	-

Judging from the calculations is possible to claim that most of machine-building enterprises in Ukraine are not developing, but stagnating. Development is shown only by most successful enterprises, like Motor Sich PJSC, ZaporizhTransformator PJSC or Kryukov Railway Car Building Works PJSC, and none of them managed to maintain positive EM during the whole period. The year 2009 was the aftermath of 2008 crisis, and somehow only the railway engineering companies managed to maintain profits at a time. It could be because some of their sales are dependent on state orders. If to examine mentioned indices in dynamics, it is obvious that rising tendencies of EM are shown only by 10 enterprises out of selected 20, and 4 enterprises (KRAZ PJSC, ZAZ PJSC, Diesel Plant PJSC, DniproVazhMash PJSC) demonstrate neither rising nor declining tendencies of EM (they are gradually losing their value, as for all of them this index, calculated to four-five decimal places, is less than zero). Here it is appropriate to mention, that all selected enterprises are included or were included into the registry of major taxpayers, that is, they are considered above average in terms of profitability.

As we can see in Table A3, the highest EM indices during the period from 2008 to 2014 had DniproVagonMash PJSC, ZaporizhTransformator PJSC and PoltavKhimMash PJSC. Structure of their assets is not single-type, as it might be expected (see table 3)

Table 3: Capital structure of best and worst sample's entities

		Best			Worst		
		ZTF <sup>1</sup>	DVM <sup>2</sup>	PKM <sup>3</sup>	AzovMash	Kvazar	Diesel Plant
2008	Equity	0,25	0,66	0,26	0,76	0,65	0,61
	Debts	0,75	0,34	0,74	0,24	0,35	0,39
2009	Equity	0,22	0,41	0,31	0,71	0,56	0,28
	Debts	0,78	0,59	0,69	0,29	0,44	0,72
2010	Equity	0,41	0,26	0,08	0,74	0,54	0,16
	Debts	0,59	0,74	0,92	0,26	0,46	0,84
2011	Equity	0,14	0,46	-0,01	0,64	0,51	0,11
	Debts	0,86	0,54	1,01	0,36	0,49	0,89
2012	Equity	0,25	0,58	0,60	0,91	0,51	0,11
	Debts	0,75	0,42	0,40	0,09	0,49	0,89
2013	Equity	0,25	0,82	0,68	0,96	0,47	0,13
	Debts	0,75	0,18	0,32	0,04	0,53	0,87
2014	Equity	0,10	0,92	0,89	0,94	0,44	-0,04
	Debts	0,90	0,08	0,11	0,06	0,56	1,04
AVG	Equity	0,23	0,59	0,40	0,81	0,53	0,19
	Debts	0,77	0,41	0,60	0,19	0,47	0,81

DniproVagonMash PJSC has higher equity, which increases from 66% in 2008 to 92% in 2014; PoltavKhimMash PJSC and ZaporizhTransformator PJSC had only 25% of equity in 2008 and by 2014, PoltavKhimMash PJSC increased its equity up to 89%, and ZaporizhTransformator PJSC – decreased to 10%. The lowest EM values have Kvazar PJSC, AzovMash PJSC and Diesel Plant PJSC. Equity of Kvazar PJSC decreases from 65% in 2008 to 44% in 2014, and equity of Diesel Plant PJSC - from 61% in 2008 to -0.04% in 2014. Negative equity value means that the enterprise has an unallocated loss greater than its capital value during the said period. This happens eventually for Ukrainian machine-building enterprises due to their low profitability, and means that their losses are transferred to their creditors. The normal procedure here is bankruptcy, although the fact that some of those enterprises

<sup>1</sup> ZaporizhTransformator

<sup>2</sup> DniproVagonMash

<sup>3</sup> PoltavKhimMash

survive (see PoltavKhimMash, 2010 in table 3) means that at least some creditors would rather restructure their debts than go to court.

So, we can state that among the 3 best-performing entities 2 rely mostly on debt capital, and among the 3 worst-performing – 2 rely mostly on equity. This could be a result of generally low credit worthiness of low-performing entities.

According to formula 1.4, the main parameters, which theoretically should influence the EM value, are WACC, value of invested capital and value of total assets. Influence of the choice of capital structure could be tracked via WACC.

The lower is weighted average cost of capital, the higher should be EM value. In practice, such ratio is not fulfilled: for three enterprises with the best EM, the mean for WACC amounts to 10% (ZaporizhTransformator PJSC), 13% (PoltavKhimMash PJSC) and 18 % (DniproVagonMash PJSC). Enterprises with worst EM value have very similar WACC during the period: 9% for Diesel Plant PJSC, 18% for AzovMash PJSC and 18% for Kvazar PJSC (see table 4). The more enterprise relies on equity, the higher is its WACC, thus the cost of equity is higher than cost of debt.

**Table 4: WACC values for best and worst performing entities**

	2008	2009	2010	2011	2012	2013	2014	AVG
ZTF	0,10	0,09	0,09	0,07	0,09	0,12	0,12	0,10
DVM	0,16	0,17	0,12	0,13	0,08	0,14	0,43	0,18
PKM	0,07	0,15	0,10	0,08	0,09	0,10	0,33	0,13
AzovMash	0,06	0,11	0,10	0,09	0,20	0,23	0,49	0,18
Kvazar	0,15	0,17	0,20	0,16	0,15	0,21	0,19	0,18
Diesel Plant	0,10	0,17	0,08	0,05	0,06	0,09	0,05	0,09
AVG(sample)	0,10	0,13	0,08	0,08	0,09	0,10	0,15	0,18

Relatively low cost of debt is a result of low share of actual loans in enterprises' debt. On average, only around 28% of debts were loans in 2008-2014. The rest of debt consisted of accounts payable (20%), liabilities for obtained advances (26%), other short-term liabilities (13%) and non-loan long-time liabilities (13%). This is why effective cost of debt is that much lower than nominal credit rate (see table 5). Thus, Ukrainian machine-building enterprises tend to rely on short-term financing, most of which is considered interest-free. Scarce use of loans is a result of generally low creditworthiness of machine-building enterprises of Ukraine. As we can see, both best- and worst-performing enterprises have

above-average expenditures on loan capital, excluding Azovmash that does not use loans at all.

**Table 5: Cost of debt for best and worst performing enterprises of the sample**

	2008	2009	2010	2011	2012	2013	2014	AVG
ZTF	0,10	0,06	0,05	0,07	0,06	0,07	0,09	0,07
DVM	0,13	0,15	0,09	0,06	0,00	0,00	0,00	0,06
PKM	0,06	0,12	0,09	0,08	0,00	0,00	0,00	0,05
AzovMash	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Kvazar	0,11	0,13	0,14	0,10	0,08	0,14	0,11	0,12
Diesel Plant	0,05	0,13	0,07	0,03	0,05	0,07	0,06	0,07
AVG(sample)	0,06	0,07	0,04	0,04	0,04	0,04	0,04	
Nominal Credit Rate	0,17	0,21	0,14	0,14	0,17	0,14	0,16	

Assessing cost of equity is rather difficult task, since Ukraine's stock market provides little to none data due to low level of activity. Shares are mainly used to distribute property among existing shareholders, and dividends are often not paid. That is why calculation mainly requires use of capital asset pricing model. As we can see from table 6, a surge in cost of capital in 2014 is mostly attributed to rising equity cost due to high market risk. Risk premium in Ukraine steadily grew from 10,04 in 2008 to 16,25 in 2014 as a consequence to lowering of its sovereign credit rating, due to semi-permanent crisis, political instability and, eventually, beginning of Russian invasion. Risk-free rate is also relatively high, changing from 14,4% in 2008 to 13,2% in 2014. Both best- and worst-performing enterprises from the sample show slightly higher than average cost of equity, although worse-performing ones (namely, Kvazar and Diesel plant) actually have better capital cost than the best-performing ones.

**Table 6: Cost of equity for best- and worst-performing entities**

	2008	2009	2010	2011	2012	2013	2014	AVG
ZTF	0,10	0,16	0,14	0,15	0,15	0,16	0,26	0,16
DVM	0,10	0,14	0,11	0,12	0,14	0,16	0,46	0,18
PKM	0,12	0,14	0,11	0,11	0,15	0,16	0,37	0,17
AzovMash	0,08	0,16	0,14	0,14	0,22	0,24	0,52	0,21
Kvazar	0,10	0,15	0,12	0,13	0,14	0,15	0,18	0,14
Diesel Plant	0,10	0,14	0,11	0,11	0,13	0,15	0,16	0,13
AVG(sample)	0,11	0,14	0,12	0,12	0,14	0,15	0,22	-

The last of the factors we will examine is profit tax. Nominal tax rate declined during the 2008-2014 period due to tax reform, although real tax rate (calculated as tax expenses to net profits ratio) often remained the same or even grew (see table 7). As we can see, two of three worst-performing enterprises had no profit during most of the 2008-2014 period, except for AzovMash, which formally is state-owned, meaning that it is obliged to give all of its leftover (not reinvested) profits to the budget.

**Table 7: Profit tax rate for the best- and worst-performing enterprises of the sample**

	2008	2009	2010	2011	2012	2013	2014	AVG
ZTF	0,21	0,17	0,23	0,18	0,23	0,18	0,00	0,17
DVM	0,25	0,27	0,00	0,26	0,24	0,21	0,15	0,20
PKM	0,26	0,14	0,00	0,00	0,21	0,22	0,33	0,17
AzovMash	0,93	0,66	0,46	0,47	0,96	0,90	0,04	0,63
Kvazar	0,26	0,29	0,00	0,00	0,00	0,00	0,00	0,08
Diesel Plant	0,22	0,00	0,00	0,00	0,23	0,00	0,00	0,06
AVG(sample)	0,28	0,17	0,20	0,23	0,24	0,17	0,09	0,20
Nominal rate	0,25	0,25	0,25	0,23	0,21	0,19	0,18	-

## 5. Conclusions

Assessing Ukrainian machine-building enterprises using value-oriented approach instead of more commonly used “production volume” method reveals that most of the enterprises that were included in the sample are degrading over time. Sample covers around 30% of general assets and revenues of the entire industry, and most of the enterprises picked are

considered above average in terms of profitability. That makes possible to state that Ukraine's machine-building industry is in deep state of stagnation.

It is possible to conclude that best-performing enterprises rely on loan capital, which makes their cost of capital slightly lower. Cost of capital in Ukraine mostly depends on equity cost, which is rather high. Thus, it is advisable for Ukrainian entities to use more loan capital. Also, it is highly possible that financial factors are not among the main ones that affect enterprises' level of development, but to check this statement one should use method of development that does not include WACC in its calculation.

## **6. References**

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## 7. Appendix

Table A1: Shares of selected enterprises in general assets value and sales revenues of the industry

Type	Name	ID Code (EDRPOU)	2007		2008		2009		2010		2011		2012		2013		2014	
			% Assets	% Revenues	% Assets	% Revenues	% Assets	% Revenues	% Assets	% Revenues	% Assets	% Revenues	% Assets	% Revenues	% Assets	% Revenues	% Assets	% Revenues
PJSC	Poltava TurboEngineering Works	00110792	0,15	0,2	0,3	0,2	0,2	0,3	0,1	0,2	0,1	0,2	0,2	0,2	0,2	0,4	0,15	0,27
PJSC	M.Frunze Sumy NPO	05747991	1,85	1,7	2,4	2,1	2,5	3,9	3,0	1,9	2,1	2,1	2,3	2,3	2,4	2,1	2,29	0,77
PJSC	Motor Sich	14307794	2,52	1,8	2,3	1,7	2,8	4,5	3,9	4,4	4,8	4,4	6,6	5,6	7,3	7,9	7,06	5,16
PJSC	NasosEnergoMash	05785448	0,14	0,2	0,1	0,2	0,2	0,4	0,7	0,3	0,6	0,7	0,6	0,7	0,7	0,9	0,68	0,79
PJSC	TurboAtom	05762269	0,93	0,4	0,9	0,5	1,0	0,8	1,1	0,9	1,4	1,0	1,8	1,0	2,0	1,6	1,99	1,24
PJSC	AzovMash	30832888	0,35	0,3	0,3	0,4	0,3	0,3	0,3	1,6	0,3	0,4	0,2	0,0	0,2	0,1	0,18	0,01
PJSC	PoltavKhimMash	00217449	0,13	0,3	0,1	0,2	0,1	0,1	0,1	0,4	0,1	0,7	0,2	0,9	0,2	0,5	0,22	0,41
PJSC	ZAZ	25480917	4,72	13,5	3,6	12,1	0,0	0,0	2,8	2,9	2,4	3,2	5,6	2,9	2,2	1,6	2,12	1,24
PJSC	Bogdan Motors	05808592	5,68	4,7	7,1	6,8	3,3	1,8	3,1	1,7	0,0	0,0	2,5	2,3	2,3	1,0	2,25	0,75
PJSC	DniproVagonMash	05669819	0,28	0,8	0,4	1,4	0,4	0,4	0,6	2,3	0,0	0,0	1,0	2,7	0,9	1,2	0,89	0,94
PJSC	Kryukov Railway Car Building Works	05763814	0,85	2,2	1,0	2,9	1,1	1,7	1,3	4,0	1,7	4,8	2,2	5,0	2,4	3,5	2,33	2,68
PJSC	Diesel Plant	00190957	0,08	0,1	0,1	0,3	0,1	0,0	0,1	0,4	0,2	0,9	0,1	0,8	0,1	0,2	0,11	0,72
PC	Antonov	14307529	0,00	0,0	3,3	1,3	4,0	2,7	3,9	2,0	3,7	2,4	3,8	2,3	3,5	3,0	3,42	2,32
PJSC	Nord	13533086	0,45	1,5	0,3	0,9	0,3	1,1	0,3	0,9	0,3	0,8	0,3	0,6	0,3	0,8	0,28	0,69
PJSC	FED	14315552	0,05	0,1	0,1	0,1	0,1	0,3	0,1	0,3	0,2	0,3	0,2	0,3	0,2	0,3	0,20	0,36
PJSC	KRAZ	05808735	3,05	1,1	3,1	1,0	3,8	0,4	3,8	0,5	3,0	0,0	2,7	0,5	2,6	0,7	2,52	1,24
PJSC	Druzhkivka Engineering Works	00165669	0,65	0,9	0,5	0,7	0,6	0,9	0,9	1,2	1,5	0,9	1,8	0,6	1,7	0,3	1,68	0,23
PJSC	DniproVazhMash	00168076	0,24	0,4	0,2	0,4	0,2	0,4	0,2	0,4	0,3	0,5	0,3	0,6	0,4	0,7	0,35	0,56
PJSC	ZaporizhTransformer	00213428	2,13	2,2	2,4	2,8	2,7	4,6	2,3	2,0	2,2	0,0	2,3	2,9	2,0	2,5	1,91	0,97
PJSC	Kvazar	14314038	0,22	0,2	0,2	0,2	0,2	0,3	0,2	0,3	0,1	0,1	0,1	0,1	0,1	0,1	0,10	0,06
Total:			24,48	32,65	28,81	36,24	23,83	25,08	28,92	28,33	24,94	23,53	34,74	32,32	31,62	29,22	30,73	21,40

Source: composed by author, based on source [11,12]



**Table A2: Dynamics of creation and destruction of value by selected enterprises in 2008-2014<sup>4</sup>**

	2008	2009	2010	2011	2012	2013	2014
KRAZ PJSC	-1,71	-0,42	-1,37	-0,84	нд	-0,39	2,62
M.Frunze Sumy NPO	0,07	0,80	5,15	-0,35	-0,98	1,74	2,20
AzovMash PJSC	-0,98	-0,96	-0,94	0,66	-1,00	-0,99	-0,97
Motor Sich PJSC	0,45	2,35	2,86	2,91	2,51	0,36	0,79
FED PJSC	1,17	-1,34	9,28	5,22	3,37	0,41	-0,87
Nord PJSC	-0,48	-1,64	-0,89	-3,53	-	-9,36	-
					16,70		21,93
Kryukov Railway Car Building Works PJSC	0,89	1,38	-0,28	1,55	1,86	1,10	-0,26
Zaporizh Transformator	1,82	7,74	5,24	5,28	9,77	5,83	1,76
Kvazar PJSC	-0,14	-0,77	-0,82	-1,15	-1,65	-0,96	-0,33
NasosEnergoMash PJSC	0,29	-0,42	4,09	15,70	3,85	7,35	2,60
Diesel Plant	-0,16	-1,32	-2,30	5,62	15,76	10,80	-1,00
DniproVazhMash PJSC	-0,65	-0,29	-0,57	0,11	-0,34	1,17	0,05
DniproVagonMash	2,26	2,74	-7,51	8,67	9,85	3,09	-0,81
Druzhkivka Engineering Works PJSC	3,35	-0,73	-	64,32	1,89	3,02	7,22
			840,62				
PoltavKhimMash	0,50	1,34	-28,71	-	13,48	4,92	-0,75
				73,29			
TurboAtom PJSC	-0,40	-0,26	0,04	0,41	2,05	1,37	1,61
Bogdan PJSC	2,65	-0,74	-14,68	-1,05	-0,66	-1,13	-1,25
Poltava TurboEngineering Works	-0,66	-0,94	-0,81	-0,49	0,69	1,65	1,08
Antonov Public Company	нд	-0,46	2,42	-0,12	-0,01	-0,09	-0,11
ZAZ PJSC	0,77	-1,44	нд	-0,87	-0,74	-0,99	-0,66

Source: calculated by author, based on the source [12]

<sup>4</sup> (ROIC/WACC)-1

**Table A3: Economic margin of the selected enterprises for the period of 2008-2013, %**

	2008	2009	2010	2011	2012	2013	2014
KRAZ PJSC	-0,07	-0,11	нд	-0,09	нд	-0,09	-0,09
M.Frunze NPO	-0,05	-0,10	-0,04	-0,06	-0,06	-0,15	-0,08
AzovMash PJSC	-0,05	-0,10	-0,10	-0,08	-0,19	-0,22	-0,12
Motor Sich PJSC	-0,06	-0,20	0,02	0,08	0,05	0,10	-0,01
FED PJSC	0,01	-0,03	0,15	0,05	0,09	0,07	0,04
Nord PJSC	-0,06	-0,13	-0,03	-0,02	0,00	-0,01	-0,04
Kryukov Railway Car Building Works PJSC	0,05	0,11	-0,04	0,05	0,12	0,08	0,06
Zaporizh- Transformator	0,06	0,03	0,11	-0,01	0,13	0,12	0,05
Kvazar PJSC	-0,03	-0,13	-0,17	-0,12	-0,15	-0,21	-0,13
NasosEnergoMash PJSC	-0,05	-0,08	0,08	0,02	0,04	0,01	0,02
Diesel Plant	-0,08	-0,19	-0,13	-0,08	-0,04	-0,19	-0,12
DniproVazhMash PJSC	-0,05	-0,07	-0,06	-0,06	-0,07	-0,03	-0,06
DniproVagonMash	0,08	0,03	-0,16	0,16	0,41	0,34	0,14
Druzhkivka Engineering Works PJSC	0,01	-0,01	0,01	0,07	0,00	-0,02	0,01
PoltavKhimMash	-0,04	-0,06	-0,16	-0,15	0,60	0,30	0,08
TurboAtom PJSC	-0,03	-0,02	-0,03	0,00	0,08	0,03	0,00
Bogdan PJSC	-0,01	-0,07	-0,02	-0,13	-0,17	-0,19	-0,10
Poltava TurboEngineering Works	-0,09	-0,06	-0,05	-0,10	-0,04	-0,01	-0,06
Antonov Public Company	нд	-0,08	0,05	0,02	-0,01	-0,07	-0,02
ZAZ PJSC	-0,03	-0,25	нд	-0,06	-0,14	-0,10	-0,11

Source: calculated by author, based on the source [12]

#### List of Abbreviations:

- Cash – cash and equivalents;
- CC – cost of capital;
- D – debt;
- DCF - discounted cash flows;
- DEP – accumulated depreciation;
- E – equity;
- EM – economic margin;
- EVA - economic value added;

GPIA – gross plant inflation adjustment;

IC – invested capital;

IC<sub>ia</sub> – invested capital, inflation adjusted;

KVED - General Classifier of Branches of the National Economy;

MRP – market risk premium;

NDCL – non-debt current liabilities;

OCF – operating cash flow;

OR<sub>c</sub> – capitalized operating rentals;

PD – average value of debt of an enterprise;

R&D – research and development;

R&D<sub>c</sub> – capitalized research and development;

R<sub>f</sub> – risk-free rate;

T – tax rate;

TA – total assets;

WACC - weighted average cost of capital;

$\beta$  – market risk coefficient;

EBITDA - earnings before interest, taxes, depreciation and amortization