"The trajectories of companies' financial architecture in the real economy"

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BUSINESS PERSPECTIVES

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THE TRAJECTORIES OF COMPANIES' FINANCIAL ARCHITECTURE IN THE REAL ECONOMY

Abstract

The formation of an effective company's financial architecture, which includes such basic elements as the capital structure, ownership structure, and the state of corporate governance, has a significant impact on maintaining a certain market position and ensuring stable profitability of activity. This research aims at determining the state of financial architecture, changing its trajectory, and its impact on company's market position. Twenty-two (22) Ukrainian companies were selected for the study from the list of top 200 in terms of the largest volume of sales revenue received, and those that provided full financial statements for the period from 2007 till 2017. To determine the state of company's financial architecture and the relevant market position, the authors used a cluster analysis using the method of the most remote neighbors. Algorithms of Kohonen's self-organizing maps were applied. Harrington's desirability function was used to determine the integral index. The selected sample demonstrated a high level of ownership concentration in almost all companies and showed that only a few individuals controlled a significant amount of assets, thereby confirming the oligarchic structure of the Ukrainian economy. As a result, seven cluster groups were obtained, reflecting the companies in terms of the quality of their financial architecture. Only five companies in the total sample were found to have high-quality financial architecture, i.e., capital structure and ownership structure are consistent and optimal and ensure that the company maintains a leading market position.

Keywords   cluster, ownership, capital, structure, patterns, Harrington, profit

JEL Classification   G30, G32

INTRODUCTION

Questions of the company's financial architecture, its foundation, and construction, the need for a precise financial analysis of the structure, key characteristics for understanding the company's results became more and more important in the modern market economy. The application of the concept of financial architecture allows focusing on the dynamic nature of the processes that take place in a modern company. The company's financial architecture is a system design, which enables to study the company's financial organization, the methods used in it to adapt to changing conditions in the competitive environment and the capital market.

The incentive for the development of the economic system is the mechanism of financial resources formation and redistribution in the middle of the country, which is largely realized through its component as a financial market. Due to its nature, the financial sector is successfully performing the functions of securing the real sector of the economy and stimulating production by redistributing of temporarily free cash, and restructuring of the economy as a result of property relations transformation. Nowadays, there is a rethinking of the established ap-

proaches to understanding and formation of the financial activity of companies. Given the dynamic economic environment, exploring financial activities separately from the decisions made by owners and managers of the company is inappropriate.

1. LITERATURE REVIEW

The company's financial architecture determines not only the efficiency of the formed capital structure in terms of its owners and the consistency of their goals with the goals of the management of the company but also its market position. Consistency of interests between owners and managers determines the alignment of company's strategic and operational goals and the financial component of their achievement. Therefore, there is a need to find such methods of financial architecture valuation that would allow not only to evaluate the quality of the formed architecture but also to determine how the changes in its components change the company's market position. The first to theoretically substantiate and draw attention to the existence of relationships between capital structure, ownership structure, and corporate governance, and introduced the term "financial architecture of the company" was Myers (1999). According to him, "financial architecture means the entire financial design of the business, including ownership (e.g., concentrated vs. dispersed), the legal form of organization (e.g., corporation vs. limited-life partnership), incentives, financing and allocation of risk." Given that Myers did a research based on data from US and UK companies, Cassimon and Engelen (2002), based on his work analyzed the optimal financial architecture for the so-called "new economy" firms in high-income OECD countries to developing countries. Margaritis and Psillaki (2010) conducted similar research for French manufacturing firms.

The term "financial architecture of the company" itself was used earlier, in particular in Barclay and Smith (1996), but it was more concerned with financial leverage and its influence on the formation of company's maturity. Such studies also continue to be quite relevant to Mateus and Terra (2013), but they are quite narrow and do not allow systematic decisions that take into account not only the purely financial component but also the interests of owners and managers.

Taran (2019) has analyzed the relationship between local and foreign corporate ownership and capital structure of Romanian listed companies (as proxied by debt ratio, short-term debt ratio, and long-term debt ratio in total assets). It is determined that companies with foreign ownership are more likely to use a short-term indebtedness policy, while local corporate shareholders have a negative influence on the short-term debt of their affiliates.

Nyide and Zuncke (2019) explored the relationship between the choice of capital structure and the survival and growth of small, medium and micro-enterprises in the South African context and they found that the capital structure had a significant impact on the reporting of the survival of small, medium and micro-enterprises and, at the same time, debt and external equity financing were found to not have influenced the growth of the firm.

The situation in Slovenia is investigated by Črnigoj and Mramor (2009) who state that the countries where there has been a change in economic systems and in which only a culture of corporate governance is formed, compared to countries of mature market economies on the formation of company's capital structure, are affected by other factors, such as the size of company's assets and the increase in the company's profitability, and are not affected by the capital structure and the size of company's equity. The relationship between corporate governance and cost of capital, which is an indicator of the effectiveness of the capital structure, has been proved by AlHares (2019) on the example of OECD countries, Kyriazopoulos (2017) on the example of Greek companies.

Such studies are not only typical for European countries, but they are also conducted in different regions and therefore confirm its relevance, so Wang, Manry, and Rosa (2019) investigated the impact of shareholder control, including when the owner states on the capital structure of Chinese companies. Besides, they took into account the cy-

cles of economic activity, as a result, concluded that companies have more short-term debt than long-term debt. Also, a relationship was found between an increase in the concentration of property and a decrease in the share of debt in the capital structure. During economic slowdowns, firms tend to reduce their short-term debt levels, although long-term debt appears to increase. But such a situation is not typical of state-owned companies, which, in contrast, in the period of economic downturn, short-term debt increases. Similar results were obtained by Utary and Setyadi (2014) for Indonesian companies, Murtaza and Azam (2019) for Pakistan, S. Vijayakumaran and R. Vijayakumaran (2019) for Chinese listed firms.

Alawi (2019) notes that in Saudi Arabia, for example, more than 171 companies have studied the relationship between the capital structure and the ownership structure, including state-owned and foreign investors. It is established that the concentration of ownership has a positive impact on the state of the capital structure and the companies' results. The regulation of the country's capital market plays a crutial role, which has a significant impact on companies' efficiency. Similar results were obtained by E. Al-Matari, Y. Al-Matari, and Saif (2017) who conducted case studies of Omani companies; Mardones and Cuneo (2019) – Latin American companies.

In Ukraine, studies of financial architecture are at an early stage. Among the works of Ukrainian scientists, it is worth mentioning Zhytar and Nemsadze (2018) who analyzed the theoretical foundations of the companies' financial architecture. Laktionova and Lukyanenko (2014) propose aggregated types of financial architecture for companies based on a 12-quadrant matrix, each demonstrating different variations of combining financial architecture components using the most informative quantitative parameters. The analysis was carried out on the example of 100 Ukrainian companies representing the metallurgical, chemical, mining, and machine-building industries. In particular, the level of ownership concentration (low or high), which is defined as a quantitative indicator of the ownership structure, financial leverage (low or high), an indicator characterizing the capital structure, and the level of corporate governance (effective or ineffective) were taken into account.

Malysh (2019) explores the main areas of the financial sector influence on the state of companies' financial security by determining the interaction between the banking, stock, and insurance sectors, and the companies' financial architecture, which, unlike the existing ones, takes into account both quantitative (capital structure) and qualitative (ownership structure and corporate governance) financial indicators.

Nakonechna and Laktionova (2017) present a study on the properties of business financial architecture adaptation in a cyclical development of the economy. The importance of the ability to regulate both individual components and the architecture as a whole following the stages of the business cycle in terms of reducing business and financial constraints and reducing capital costs is emphasized. The adaptation of the financial architecture of large metallurgical companies for the period of the business cycle in Ukraine is considered. The speed of the dynamic adjustment of architecture based on key industrial enterprises in Ukraine, as well as the acceleration for models of adaptive changes, is estimated.

According to the results of the calculations (Shkolnyk, Pisula, Loboda, & Nebaba, 2019), three categories of enterprises were defined according to the level of financial crisis probability at the enterprise, taking into account using all the models, as well as calculating the integral indicator based on the taxonomic analysis. An integral index was determined, which allowed predicting financial performance dynamics. For each enterprise, ten indicators were used to characterize their financial state for the period 2014–2018. It is substantiated that the selected models differ from each other by the set of initial data and the number of coefficients from four to seven.

Prudnikov (2016) proposes a scheme for implementing a financial architecture mechanism, highlighting its various levels and proposing a financial management information flow model, a neural network model of a balanced scorecard, a fuzzy logic model for balancing metrics, and a simulation model of alternative decision-making. At the same time, his proposals are purely theoretical without the proper application of these models in practice. Kokoreva and Stepanova (2013) in-

vestigated not only theoretical principles, based on the theory of capital structure and corporate governance theory, but also using the regression analysis of panel data. Calculations were made for banks and non-financial companies for developed countries on the example of Kazakhstan and Russia. The analysis concludes that there are significant differences in the drivers of strategic performance in developed and developing countries. Besides, they point out that the negative effect of the property concentration manifested in developed countries is not characteristic of developing countries.

Most of the studies that identify the relationships between elements of financial architecture are based on regression models. At the same time, to understand how the existing financial architecture can determine the companies' market position, it is necessary to use the cluster analysis method.

2. AIMS

The article aims to establish, based on cluster analysis, the existence of dependencies between the market position of the company and the formed capital structure and ownership structure, which are the main elements of the financial architecture of the company.

3. DATA AND METHODS

The selection of companies for cluster analysis based on the top 200 top revenues companies of Ukraine in 2017 (Table 1) with open financial statements presented on the website of the Stock Market Infrastructure Development Agency of Ukraine (smida.gov.ua). Given the changes in the legislation regarding the definition of corporate legal forms of company's activity and the new requirements for the type of public joint-stock company, and the fact that 2018 was defined as a transitional one, the data for this year were not taken into account for the calculations.

Thus, the companies have a wide range of activities and are engaged in the production of steel and rolled metal, the extraction and enrichment of ore, the provision of mobile communications and the Internet services, the production of aircraft engines, the production, distribution, and supply of electricity, the production of nitrogen fertilizers, the production of confectionery, and others.

Among the surveyed companies, 18 had a profit in 2017 (the most profitable was JSC "Northern Iron Ore Enrichment Works" with a net profit of UAH 7,792 million), and 5 were unprofitable namely PJSC "Azovstal Iron and Steel Works," PJSC "Ilyich Iron and Steel Works," JSC "Zaporizhzhiaoblenerho," PJSC "Lvivoblenerho," and PJSC "Sukha Balka."

The selected companies belong to the following industries of the real economy in Ukraine: manufacture of aircraft engines, mining and metallurgical complex (ore extraction and processing), agro-industrial complex (manufacture of confectionery products), chemical industry (manufacture of medicines, production of nitrogen fertilizers), energy (electricity production) and information and telecommunications (providing mobile communication and Internet services). That is why more attention will be paid to these areas in the future. Besides, these industries are the most important for the Ukrainian economy, as the companies of these industries are listed on Ukrainian stock exchanges, as well as are the leaders of the domestic economy.

To build the trajectories of the companies' financial architecture in the real economy, modern statistical analysis systems, including the cluster analysis module, are used. It allows splitting the entire analyzed set of objects into a small number of homogeneous groups or classes. This reduces the dimensions of the investigated features to interpret the analyzed multidimensional data. The general statement of the classification problem is to divide the analyzed features into several disjoint areas. Cluster analysis includes a set of different classification algorithms that allow organizing the observed data into visual structures and deploy the taxonomy and interpret them in a meaningful way. The results of cluster analysis can also be useful to the owner in making management decisions.

According to the results of cluster analysis, seven clusters were obtained using Viscovery SOMine software (Figure 1).

Table 1. Companies in the top 200 largest revenue-producing companies of Ukraine in 2017

| Ranking/Company	Revenues, UAH billion	Profit/loss, UAH million	Business type	Property type
5. PJSC "Azovstal Iron and Steel Works"	68.97	−131	Manufacture of steel and rolled metal products	Private (Metinvest Group, R. Akhmetov, V. Novinskyi)
7. PJSC "ArcelorMittal Kryvyi Rih"	66.19	5,062	Manufacture of steel and rolled metal products	Private (ArcelorMittal Group, L. Mittal)
8. PJSC "Ilyich Iron and Steel Works"	56.64	−828	Manufacture of steel and rolled metal products	Private (Metinvest Group, R. Akhmetov, V. Novinskyi)
28. JSC "Northern Iron Ore Enrichment Works"	23.28	7,792	Ore extraction and processing	Private (Metinvest Group, R. Akhmetov, V. Novinskyi)
35. PJSC "Poltava Iron Ore Enrichment Works"	20.59	4,872	Ore extraction and processing	Private (Ferrexpo AG, K. Zhevaho)
44. PJSC "Kyivstar"	17.08	6,169	Providing mobile and internet services	Private (VimpelCom Ltd, M. Fridman)
46. PJSC "Dnipro Metallurgical Plant"	5.78	2,380	Manufacture of steel and rolled metal products	Private (O. Yaroslavskyi)
47. PJSC "Ingulets Iron Ore Enrichment Works"	15.71	5,711	Ore extraction and processing	Private (Metinvest Group, R. Akhmetov, V. Novinskyi)
52. JSC "Motor Sich"	14.92	3,078	Manufacture of aircraft engines	Private (V. Bohuslaiev)
60. PJSC "MTS"	11.75	2,206	Providing mobile and internet services	Private (V. Yevtushenkov, Russia)
66. JSC "Centrenergo"	10.92	1,891	Electricity production	State property
67. PJSC "Central Iron Ore Enrichment Works"	0.73	2,709	Ore extraction and processing	Private (Metinvest Group, R. Akhmetov, V. Novinskyi)
99. JSC "Zaporizhzhiaoblenerho"	8.05	−14	Electricity distribution and supply	State property + Private (I. Surkis, H. Surkis, K. Hryhoryshyn, I. Kolomoiskyi)
100. PJSC "Kyivoblenerho"	8.03	218	Electricity distribution and supply	Private (VS Energy, M. Spektor, O. Babakov, Ye. Hiner)
103. PJSC "Kharkivoblenerho"	7.95	31	Electricity distribution and supply	State property + private (K. Hryhoryshyn)
114. JSC "Dniproazot"	7.30	533	Production of nitrogen fertilizers	Private (Privat Group, I. Kolomoiskyi)
121. JSC "Poltavaoblenerho"	6.69	130	Electricity distribution and supply	Private (Privat Group, I. Kolomoiskyi)
134. JSC "Ukrtelecom"	6.12	867	Providing mobile and internet services	Private (R. Akhmetov)
149. JSC "Farmak"	6.08	839	Manufacture of medicines	Private (F. Zhebrovska)
158. PJSC "Lvivoblenerho"	5.36	−63	Electricity distribution and supply	Private (I. Surkis, H. Surkis)
178. PJSC "Mondelis Ukraine"	4.79	276	Manufacture of confectionery products	Private (Kraft Foods Group (Netherlands)
197. PJSC "Sukha Balka"	4.38	−1,174	Ore extraction and processing	Private (O. Yaroslavskyi)
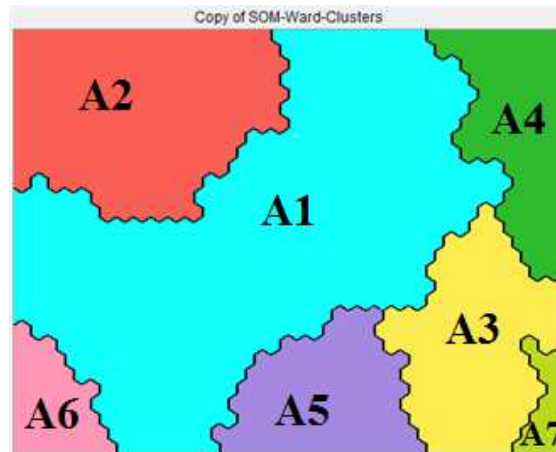
Figure 1. Cluster map

Table 2 shows the quantitative characteristics of the clusters obtained (group profile).

Table 2. Description of quantitative characteristics of clusters

Cluster	Share	H_1	H_2	H_3
A1	41.74%	0.5409	0.5494	0.5876
A2	23.97%	0.6363	0.6105	0.6329
A3	8.26%	0.4752	0.3953	0.1651
A4	6.61%	0.0414	0.5236	0.4287
A5	10.33%	0.5280	0.5752	0.0513
A6	7.02%	0.6030	0.4035	0.6361
A7	2.07%	0.5182	0.0187	0.0000

Thus, the largest by volume is cluster A1, which includes 41.74% of observations, and the smallest A7, which includes 2.07% of observations.

Highly rated companies have been identified – those that are in the clusters of 2, 1, and 6 and highly attractive for the investor. The companies that have low rates are in clusters 4 and 7 (Table 3).

When using the Viscovery SOMine software, the profile, *p*-value, and *t*-test columns and histograms are calculated against the reference group. By changing the reference group, one can compare the properties of different groups of nodes. For example, to analyze how a cluster differs from other clusters, the cluster can be defined as a reference group, and then alternately examine the values of the other clusters.

Figure 2 shows a graphical representation of the reference group of the surveyed companies.

The main purpose of group profile is to help find the attributes for which the currently specified group range is significantly different from the reference group. This is achieved by performing a two-sided *t*-test of the statistical contrast of the three averages.

Table 3. Characteristics of companies based on cluster assessment

| Cluster	The value of the desirability function	Rating	Group companies
A2	0.6266	5	Companies with high-quality financial architecture
A1	0.5593	4	Companies with the above-average quality of financial architecture
A6	0.5475		
A5	0.3848	3	Companies with the middle quality of financial architecture
A3	0.3452		
A4	0.3312	2	Companies with the below-average quality of financial architecture
A7	0.1790	1	Companies with low-quality financial architecture
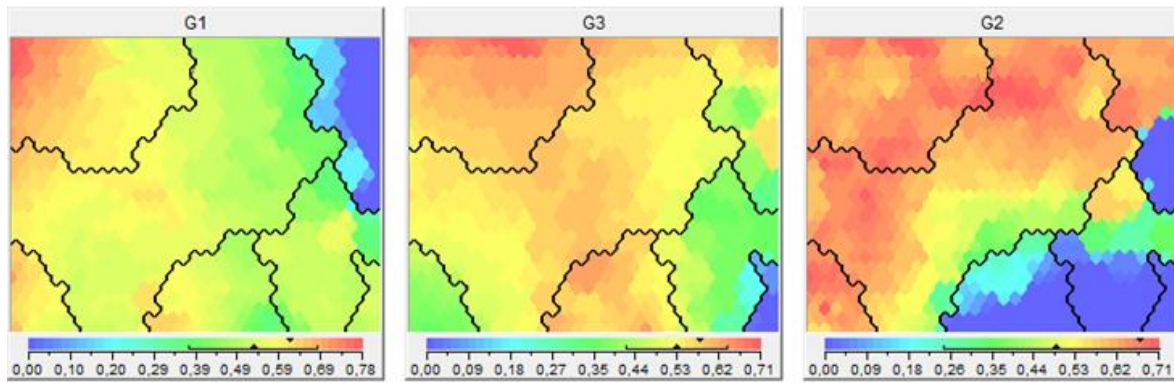
Figure 2. Cluster analysis reference groups

4. RESULTS AND DISCUSSION

The next step in building a company financial architecture model will be the practical application of a pattern analysis method, based on which clusters will be formed. Given information about the quantitative values of indicators of the surveyed companies, measured in successive times, it is possible to construct trajectories of their development, as well as to detect implicit relationships between the output indicators. It is proposed to build trajectories of companies' patterns using trend forecasting.

Table 4 shows the information on the companies that are included in each of the described clusters.

Thus, one can present the dynamics of the patterns of the analyzed companies for the period 2011–2017 (Table 5).

Thus, out of 22 studied objects, five companies were the most stable (Figure 3):

- PJSC "Azovstal iron & steel works".

- PJSC "ArcelorMittal Kryvyi Rih".

- PJSC "Ilyich iron and steel works".

- JSC "Motor Sich".

- JSC "Northern Iron Ore Enrichment Works".

- JSC "Centrenergo".

These companies were within the clusters A2 (companies with high-quality financial architecture) and A1, A6 (companies with the above-average quality of financial architecture) throughout the analyzed period. Based on trend forecasting, it can be argued that there is no change in the performance of these companies over the next two years within the relevant range.

It should be noted that in PJSC "Azovstal Iron and Steel Works," PJSC "ArcelorMittal Kryvyi Rih," PJSC "Mondelis Ukraine," JSC "Motor Sich," and JSC "Centrenerho" financial architecture can be defined as established and high-quality level.

The companies with the above-average quality of financial architecture are the companies that had problems with financial stability but could recover the previous years. As of the beginning of 2018, they are within clusters with "above-average quality" or "high-quality" companies and have a positive outlook for future periods (Figure 4):

- JSC "Dniproazot" (the company had problems with financial stability in 2011–2012).

- PJSC "Sukha Balka" (the company had problems with financial stability in 2017).

- PJSC "Ingulets Iron Ore Enrichment Works" (the company had problems with financial stability in 2016–2017).

- PJSC "Mondelis Ukraine" (the company had problems with financial stability in 2010 and 2016).

Table 4. General characteristics of clusters

Cluster	Number of objects	Company
A1	101	PJSC "Azovstal Iron and Steel Works" 2009–2017
		PJSC "ArcelorMittal Kryvyi Rih" 2009, 2012–2017
		JSC "Dniproazot" 2008, 2012–2016
		PJSC "Sukha Balka" 2010, 2013, 2015, 2017
		JSC "Zaporizhzhiaoblenerho" 2009–2011, 2014–2015, 2017
		PJSC "Ingulets Iron Ore Enrichment Works" 2009, 2012–2014, 2017
		PJSC "Kyivoblenerho" 2013–2014, 2016–2017
		PJSC "Lvivoblenergo" 2008, 2010, 2012–2013
		PJSC "Ilyich Iron and Steel Works" 2009–2017
		PJSC "Mondelis Ukraine" 2017
		JSC "Motor Sich" 2008
		JSC "Northern Iron Ore Enrichment Works" 2009–2010, 2012, 2014–2017
		JSC "Poltavaoblenerho" 2009–2016
		PJSC "Poltava Iron Ore Enrichment Works" 2009–2010, 2013–2014
		JSC "Ukrtelecom" 2010–2011
		JSC "Farmak" 2008–2010
		PJSC "Kharkivoblenerho" 2008, 2010, 2012, 2014–2017
		PJSC "Central Iron Ore Enrichment Works" 2009–2011, 2014, 2016–2017
		JSC "Centrenergo" 2008–2017
A2	58	PJSC "Azovstal Iron and Steel Works" 2008
		PJSC "ArcelorMittal Kryvyi Rih" 2008, 2010–2011
		JSC "Dniproazot" 2017
		PJSC "Sukha Balka" 2008, 2011–2012, 2014
		JSC "Zaporizhzhiaoblenerho" 2012–2013
		PJSC "Ingulets Iron Ore Enrichment Works" 2008, 2010–2011
		PJSC "Kyivoblenerho" 2010–2012
		PJSC "Kyivstar" 2008, 2010, 2012, 2016–2017
		PJSC "Lvivoblenerho" 2011
		PJSC "Ilyich Iron and Steel Works" 2008
		PJSC "Mondelis Ukraine" 2008, 2010–2016
		JSC "Motor Sich" 2009–2017
		PJSC "MTS" 2010, 2013–2014
		JSC "Northern Iron Ore Enrichment Works" 2008, 2011, 2013
		PJSC "Poltava Iron Ore Enrichment Works" 2011–2012
		JSC "Farmak" 2011–2015, 2017
		PJSC "Kharkivoblenerho" 2013
		PJSC "Central Iron Ore Enrichment Works" 2008, 2013, 2015
A3	20	JSC "Dniproazot" 2011
		PJSC "Dnipro Metallurgical Plant" 2009–2011, 2014, 2016
		PJSC "Sukha Balka" 2016
		JSC "Zaporizhzhiaoblenerho" 2007–2008
		PJSC "Ingulets Iron Ore Enrichment Works" 2015–2016
		PJSC "Kyivoblenerho" 2007, 2009
		PJSC "Kyivstar" 2009
		PJSC "Lvivoblenerho" 2007, 2014
		PJSC "Mondelis Ukraine" 2009
		PJSC "MTS" 2007, 2009
		PJSC "Kharkivoblenerho" 2007
A4	16	PJSC "Dnipro Metallurgical Plant" 2008, 2015
		PJSC "Kyivoblenerho" 2008
		PJSC "Kyivstar" 2007, 2011, 2013
		PJSC "MTS" 2011–2012
		JSC "Ukrtelecom" 2007–2013, 2015
		JSC "Kharkivoblenerho" 2009, 2011

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Table 4 (cont.). General characteristics of clusters

Cluster	Number of objects	Company
A5	25	JSC "Dniproazot" 2010
		JSC "Zaporizhzhiaoblenerho" 20164
		PJSC "Kyivoblenerho" 2015
		PJSC "Kyivstar" 2014–2015
		PJSC "Lvivoblenerho" 2009, 2015–2017
		PJSC "Mondelis Ukraine" 2015
		PJSC "MTS" 2008, 2015–2017
		PJSC "Poltava Iron Ore Enrichment Works" 2008, 2017
		JSC "Ukrtelecom" 2014, 2016–2017
		JSC "Farmak" 2016
		PJSC "Central Iron Ore Enrichment Works" 2012
A6	17	PJSC "Azovstal Iron and Steel Works" 2007
		PJSC "ArcelorMittal Kryvyi Rih" 2007
		JSC "Dniproazot" 2007, 2009
		PJSC "Dnipro Metallurgical Plant" 2007
		PJSC "Sukha Balka" 2007, 2009
		PJSC "Ingulets Iron Ore Enrichment Works" 2007
		PJSC "Ilyich Iron and Steel Works" 2007
		PJSC "Mondelis Ukraine" 2007
		JSC "Motor Sich" 2007
		JSC "Northern Iron Ore Enrichment Works" 2007
		JSC "Poltavaoblenerho" 2007
		PJSC "Poltava Iron Ore Enrichment Works" 2007
		JSC "Farmak" 2007
		PJSC "Central Iron Ore Enrichment Works" 2007
		JSC "Centrenergo" 2007
A7	5	PJSC "Dnipro Metallurgical Plant" 2012–2013, 2017
		PJSC "Poltava Iron Ore Enrichment Works" 2015–2016

Table 5. Dynamics of the analyzed companies' patterns for 2011–2017

| Company	Dynamics of patterns for 2011–2017
PJSC "Azovstal Iron and Steel Works"	A6→A2→A1→A1→A1→A1→A1→A1→A1→A1→A1
PJSC "ArcelorMittal Kryvyi Rih"	A6→A2→A1→A2→A2→A1→A1→A1→A1→A1→A1
JSC "Dniproazot"	A6→A1→A6→A5→A3→A1→A1→A1→A1→A1→A2
PJSC "Dnipro Metallurgical Plant"	A6→A4→A3→A3→A3→A7→A7→A3→A4→A3→A7
PJSC "Sukha Balka"	A6→A2→A6→A1→A2→A2→A1→A2→A1→A3→A1
JSC "Zaporizhzhiaoblenerho"	A3→A3→A1→A1→A1→A2→A2→A1→A1→A5→A1
PJSC "Ingulets Iron Ore Enrichment Works"	A6→A2→A1→A2→A2→A1→A1→A1→A3→A3→A1
PJSC "Kyivoblenerho"	A3→A4→A3→A2→A2→A2→A1→A1→A5→A1→A1
PJSC "Kyivstar"	A4→A2→A3→A2→A4→A2→A4→A5→A5→A2→A2
PJSC "Lvivoblenerho"	A3→A1→A5→A1→A2→A1→A1→A3→A5→A5→A5
PJSC "Ilyich Iron and Steel Works"	A6→A2→A1→A1→A1→A1→A1→A1→A1→A1→A1
PJSC "Mondelis Ukraine"	A6→A2→A3→A2→A2→A2→A2→A2→A5→A2→A1
JSC "Motor Sich"	A6→A1→A2→A2→A2→A2→A2→A2→A2→A2→A2
PJSC "MTS"	A3→A5→A3→A2→A4→A4→A2→A2→A5→A5→A5
JSC "Northern Iron Ore Enrichment Works"	A6→A2→A1→A1→A2→A1→A2→A1→A1→A1→A1
JSC "Poltavaoblenergo"	A6→A5→A1→A1→A1→A5→A5→A1→A1→A1→A5
PJSC "Poltava Iron Ore Enrichment Works"	A6→A5→A1→A1→A2→A2→A1→A1→A7→A7→A5
JSC "Ukrtelecom"	A4→A4→A4→A1→A1→A4→A4→A5→A4→A5→A5
JSC "Farmak"	A6→A1→A1→A1→A2→A2→A2→A2→A2→A5→A2
PJSC "Kharkivoblenerho"	A3→A1→A4→A1→A4→A1→A2→A1→A1→A1→A1
PJSC "Central Iron Ore Enrichment Works"	A6→A2→A1→A1→A1→A5→A2→A1→A2→A1→A1
JSC "Centrenerho"	A6→A1→A1→A1→A1→A1→A1→A1→A1→A1→A1
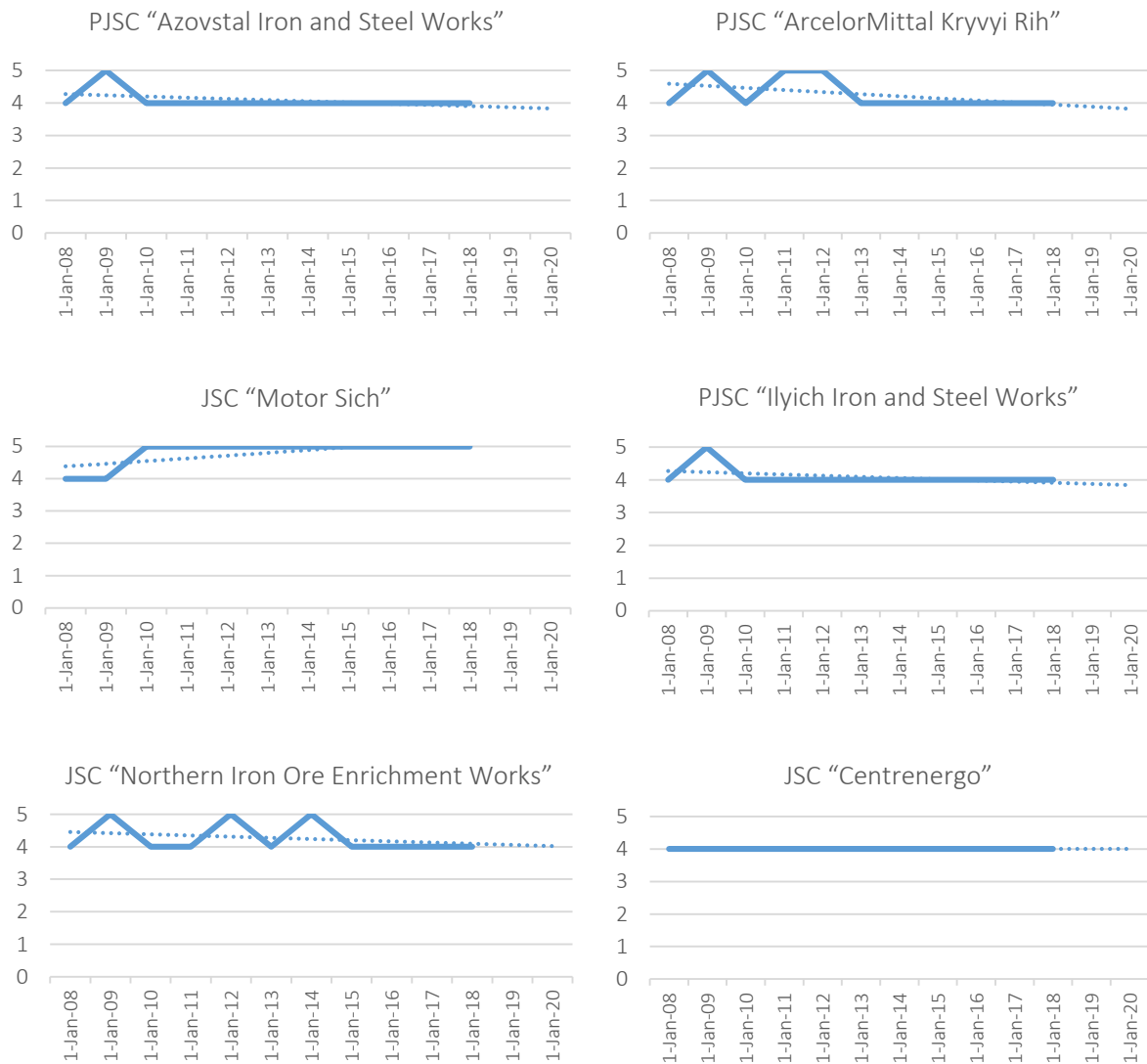
Figure 3. Group of the most Ukrainian stable companies (within the relevant range)

- JSC "Farmak" (the company had problems with financial stability in 2017).

- PJSC "Central Iron Ore Enrichment Works" (the company had problems with financial stability in 2013).

The group of companies with the below-average quality of financial architecture (within the relevant range) was formed from companies that had significant financial sustainability problems during the study period but had the potential and demonstrated the ability to overcome the crisis (Figure 5):

- JSC "Zaporizhzhiaoblenerho" (the company was in the clusters of "problem companies" in

2008–2009 and 2017, restored financial stability at the beginning of 2018, and has a positive outlook for further activities).

- PJSC "Kyivoblenergo" (the company was in the cluster of "problem companies" in 2008, 2010, and 2016. In 2009, it was in the cluster of companies in crisis, but restored financial stability for 2017–2018, has a positive outlook on further activities).

- PJSC "Kyivstar" (the company was in the clusters of "problem companies" in 2010 and 2015–2016. However, in 2008, 2012 and 2014, it was in the cluster of companies in crisis, restored financial stability for 2017–2018, and has a positive outlook on for further activities).
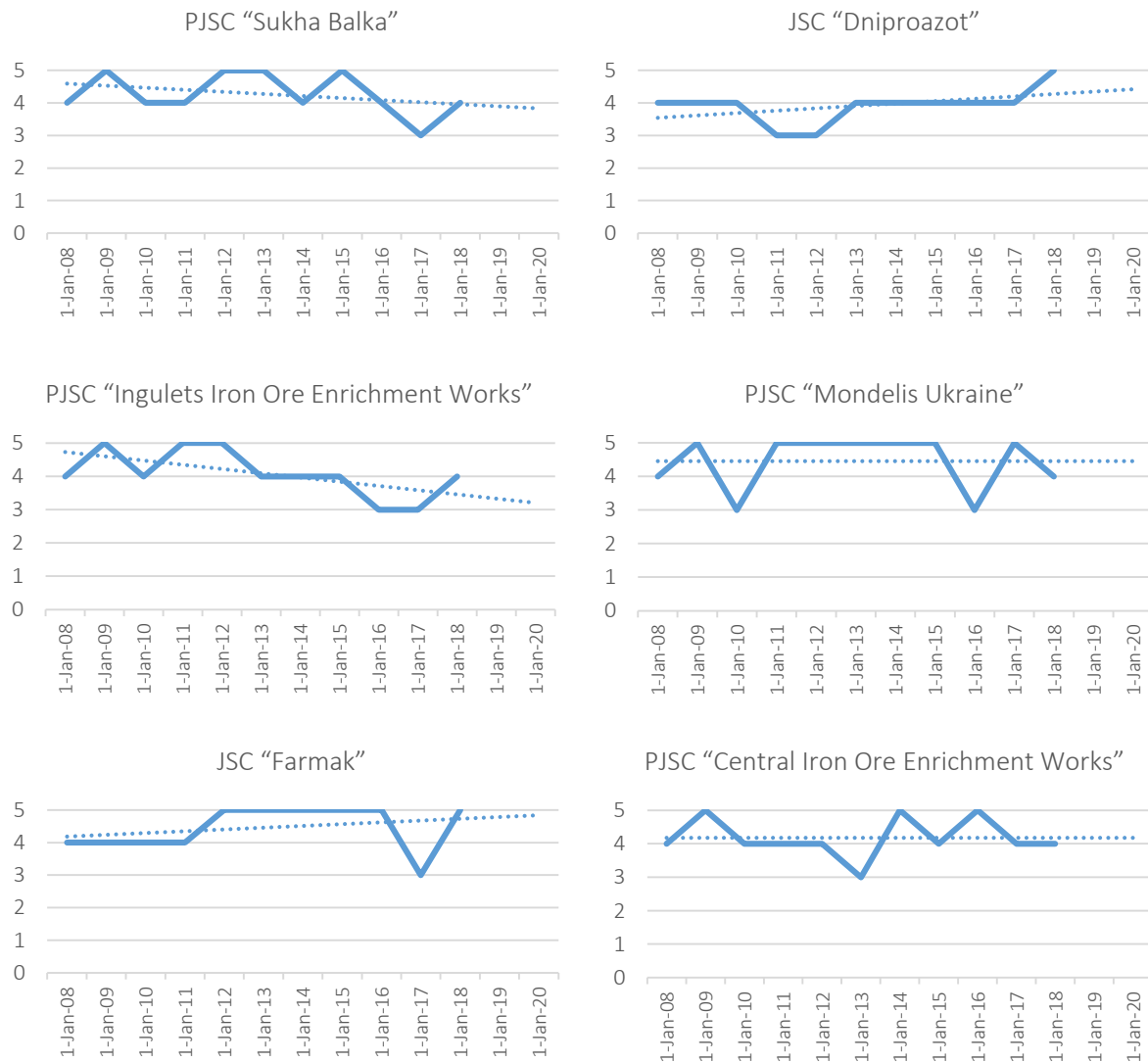
Figure 4. Group of conditionally stable Ukrainian companies (within the relevant range)

- PJSC "Lvivoblenerho" (the company was in the clusters of "problem companies" in 2008, 2010, and since 2015 and at the time of the survey. In 2011–2014, the company demonstrated the ability to restore financial soundness. According to the forecast of further activity, the company will continue to be in the cluster of "problem companies").

- JSC "Poltavaoblenerho" (the company was in the cluster of "problem companies" in 2008–2009 and 2013–2014 and as of the beginning of 2018, it is projected to remain in the cluster of "problem companies").

- PJSC "Kharkivoblenerho" (the company was in the clusters of "problem companies" in

2008. In 2010 and 2012, it was in the cluster of companies in crisis but restored financial stability since 2013, and as of the beginning of 2018 is in the cluster of "stable companies," and has a positive outlook for further activity).

It is worth noting that within the framework of the research, five companies providing electricity distribution and supply services were included in the group of companies with low-quality financial architecture (JSC "Zaporizhzhsaoblenerho," PJSC "Kyivoblenerho," PJSC "Lvivoblenerho," JSC "Poltavaoblenerho" and PJSC "Kharkivoblenerho"), which can testify to the crisis of the entire industry. However, according to the forecast of further activity, there is no significant deterioration of the financial status of the studied companies.
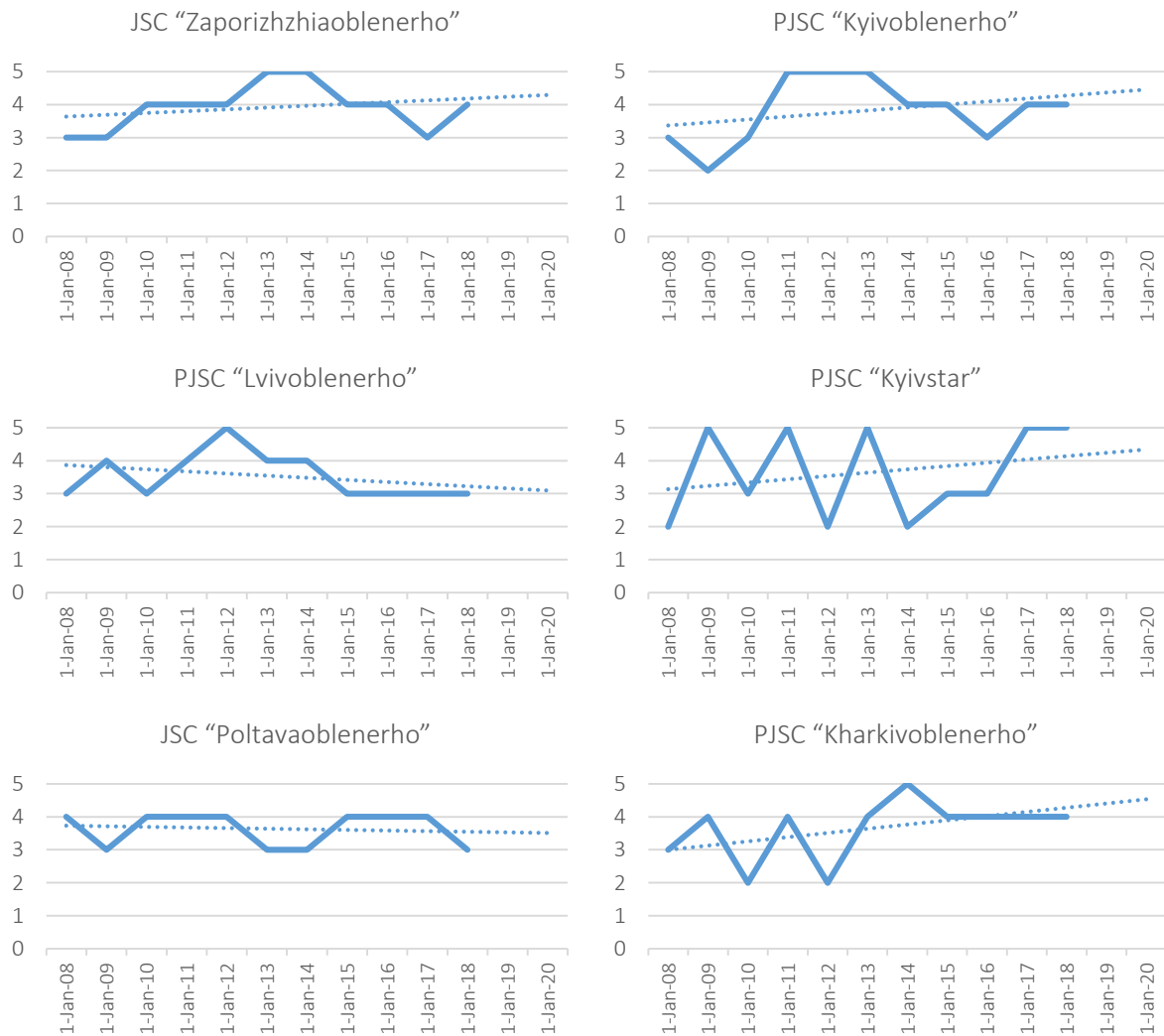
Figure 5. Group of Ukrainian unstable companies (within the relevant range)

It should be noted that among the surveyed companies of Ukraine, four companies were found that are in deep crisis and have negative prospects for further activity, namely (Figure 6):

- PJSC "Dnipro Metallurgical Plant" (since 2009 it is in the clusters of A3, A5 "companies with the middle quality of financial architecture" (2010–2012, 2015 and 2017), A4 "companies with the below-average quality of financial architecture" (2009, 2016) and A7 "companies with low-quality financial architecture" (2013–2014). At the beginning of 2018, the company is within the cluster of low-quality financial architecture companies, and has a negative outlook for further activities);

- PJSC "MTS" (during 2008–2010 and 2016–2018, it was within the clusters A3, A5 "companies with the middle quality of financial architecture," and in 2012–2013, moved to cluster A4 "companies with the below-average quality of financial architecture." It is expected to continue to be in the cluster of "companies with the middle quality of financial architecture");

- PJSC "Poltava Iron Ore Enrichment Works" (in 2009 and as of early 2018, it is within the clusters of A3, A5 "companies with the middle quality of financial architecture." During 2016–2017, it moved to cluster A4, "companies with the below-average quality of financial architecture," which has a negative outlook for further activities);
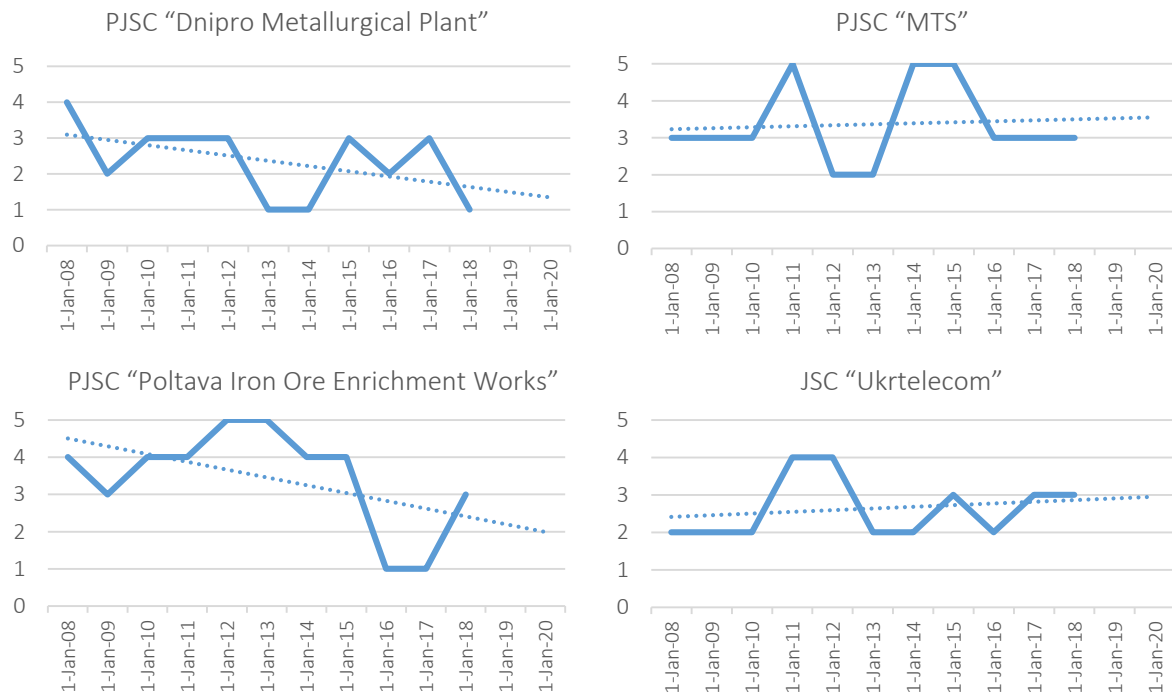
Figure 6. Group of Ukrainian companies under crisis (within the relevant range)

- JSC "Ukrtelecom" (during 2008–2010 and 2013–2014, and 2016, it was within the A4 cluster of "companies with the below-average quality of financial architecture." In 2015 and during 2017–2018, clusters A3, A5 "companies with the middle quality of financial architecture" shifted. It is expected to continue to be in the cluster of "companies with the middle quality of financial architecture").

Thus, one can conclude that providing mobile communications and Internet services companies (JSC "MTS" and JSC "Ukrtelecom"), according to the forecast calculations, can improve their financial condition.

Results of cluster analysis that proved the existence of dependencies between the company's market position and the formed capital structure and ownership structure, which are the main elements of the company's financial architecture, give us a topic for scientific discussion. First of all, we should admit that one of the formed clusters A6 (presents companies with the above-average quality of financial architecture) consists mainly of the position of Metinvest Group companies in 2007. This year, Rinat Akhmetov and Vadim Novinskyi decided to combine their mining and steel business. This situation proves large influence of non-economic factors on the company's financial architecture and confirms the need for further research.

CONCLUSION

The study enabled to draw the following conclusions. The company's financial architecture in terms of the level and quality of its structural elements is quite diverse. The analysis of the ownership structure revealed a high level of concentration not only in the context of a single company but in the sample as a whole. Among the selected from the top 200 largest companies by volume, most are controlled by Ukrainian oligarchs: 6 out of 22 are under the exclusive control of R. Akhmetov's assets, 3 – are under the control of I. Kolomoiskyi, 2 – under the control of I. Surkis and H. Surkis. Concerning these companies, the ownership structure can be noted, but their market positions are significantly different.

There is a direct relationship between the capital structure and the ownership structure, and a change in each of these elements can change the company's market position. PJSC "Azovstal Iron and Steel Works," PJSC "ArcelorMittal Kryvyi Rih," PJSC "Mondelis Ukraine," JSC "Motor Sich," and JSC "Centrenergo" are the most stable companies with high-quality financial architecture.

As a result of the use of the cluster method, 75 cluster groups have been formed based on the quality of financial architecture, and it is determined that only five companies out of the 22 analyzed have a high-quality architecture that has enabled them to hold a leading market position.

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