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Bankruptcy factors at different stages of the lifecycle for Russian companies

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Many aspects of bankruptcy have not yet been thoroughly studied, among such issues are the causes that lead to bankruptcy at various stages of the company's lifecycle. We hypothesize that the most significant factors influencing the probability of company bankruptcy at a particular stage of its lifecycle are those the effectiveness of which is at the lowest level at this stage. These factors include the external environment, the quality of financial, and corporate governance. The methodology of the research consists of the methods PLS-SEM (to determine the impact of factors on bankruptcy) and DEA (to evaluate the effectiveness of factors usage). The empirical database includes 376 Russian public companies. The simulation results support the hypothesis. We also revealed that the external environment exerts a more powerful effect on the probability of bankruptcy at the stage of growth. The role of financial management increases from the initial stage to the final stage of the life cycle. Corporate governance is less important than the other two factors, but its impact is significant at the stage of growth.

keywords: bankruptcy prediction, corporate governance, external environment, financial management, company life cycle.

1 Introduction

The problem of company bankruptcy prediction holds a special place among the existing theoretical and practical issues of corporate management. Assessment of the current

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financial condition and risks of bankruptcy is of great interest not only for external actors - shareholders, suppliers, creditors, assessing a firm's reliability but also for the company's management that makes financial decisions.

One of the issues that deal with bankruptcy prediction is the search for internal and external indicators influencing the insolvency of the company. Most researchers studied the indicators of the financial condition of the firm (du Jardin, 2016; Fedorova et al., 2013; Lee and Yeh, 2004; Zelenkov and Volodarskiy, 2021; Du Jardin and Séverin, 2011). Some other academic studies are devoted to the indicators of corporate governance (Liang et al., 2016; Chan et al., 2016; Salloum and Azoury, 2012), corporate social responsibility Lin and Dong (2018), indicators of the external environment (Vlamis, 2007; Tinoco and Wilson, 2013; Delas et al., 2015; Bruneau et al., 2012; Duffie et al., 2007; Alifiah, 2014; Karas and Režňáková, 2014; Ninh et al., 2018), degree of legislation development (Rowoldt and Starke, 2016), etc. The model of bankruptcy prediction commonly includes specific indicators of these sets (Liang et al., 2016; Chan et al., 2016; Tinoco and Wilson, 2013), comparative analysis of the impact of different indicators is of great interest to researches.

The goal of our study is to analyze the impact of the factors mentioned above at different stages of the company's life cycle.

In the 1960s in management theory, and then in economic theory, the concept of the company's life cycles emerged and became popular. The company's life cycle models allow us to trace the path from the birth of a business idea, the emergence of an organization, its further development to its cessation of existence. The concept of the life cycle is based on the idea that in the course of its development, organizations go through several typical stages that have their distinctive characteristics (Miller and Friesen, 1984; Hanks, 1990).

Many papers are devoted to various financial and managerial aspects at different stages of the company life cycle (Hasan et al., 2015; Liao et al., 2014; Chang and Lee, 2016; Shyu and Chen, 2009; Owen and Yawson, 2010; Coulton and Ruddock, 2011). Some researches study the impact of financial parameters on company bankruptcy (Mokhova and Zinecker, 2013; Pai et al., 2014), the importance of corporate governance indicators (O'Connor and Byrne, 2015), and impact of external factors (Cao and Chen, 2012) in company's life cycle (CLC). However, the comparative assessment of selected indicators' impact at different stages of CLC is not entirely researched. A critical issue, which is also given insufficient attention in empirical research, is the study of the reasons that lead to bankruptcy at different stages of CLC. Some authors ((Miller and Friesen, 1984; Adizes, 1979; Hanks, 1990) underline that firm faces various challenges while in operation.

Consequently, the company must vary and generate new means to address new challenges. Delay in this situation causes performance degradation and, in an extreme case – bankruptcy. So, we hypothesize that the most important factors influencing the probability of bankruptcy at a particular stage of CLC are those the effectiveness of which is at the lowest level.

Testing our hypothesis, we faced the problem of measuring the integral influence of sets of indicators (external environment, financial, and corporate governance). We solved this problem with the help of Partial Least Squares – Structural Equation Modeling

(PLS-SEM). Currently, this method is widely used for empirical tests of hypotheses in economics, management, sociology, psychology, and other sciences, the subject of which is the so-called soft systems. Besides, we use Data Envelopment Analysis (DEA) to assess the usage effectiveness of sets of indicators as resources.

It is essential to mention that traditionally in papers devoted to the prediction of company bankruptcy, the sample is divided into two groups: bankrupts and successful companies (Fedorova et al., 2013). However, we use another group, "semi-bankrupts." In essence, these are firms that undergo stages of arbitration proceedings for claims of creditors. Still, it is impossible to find out authentically either arbitration award about the adjudication of the bankruptcy of the debtor was rendered or not. Our research shows that adding "semi-bankrupts" increases the quality of the model.

The rest of the paper is structured as follows. In Section 2, the literature review is provided, including the lifecycle theory and relationships between the life cycle stage and bankruptcy. Section 3 presents the research methodology, and a description of the empirical data is given in Section 4. Section 5 contains the simulation results, and a discussion is given in Section 6, followed by a conclusion.

2 Literature Review and background

2.1 Company's Lifecycle Theory

The majority of theoretical and empirical studies of this theme are based on the biological concept of the organization, in which the passage of stages is a consistent and iterative process (Lewis and Churchill, 1983; Quinn and Cameron, 1983; Adizes, 1979). All studies on the concept of organizational life cycle differ one from another due to the number of life cycle stages, vital organizational structures, and main drivers of organizational effectiveness triggering change of life cycle stage.

For half a century of the existence of the CLC theory, the authors have developed more than a hundred models (Levie and Lichtenstein, 2008). The first papers on the theory of life cycles were managerial and did not offer an explicit algorithm suitable for empirical research. However, they served as a reasonable basis for further analysis and model development. Currently, there are several well-known models (Grabowski and Mueller, 1975; Miller and Friesen, 1984; Dickinson, 2006), allowing to determine the stage of the organization's life cycle, highlight the main difficulties the company goes through, and design its future. It is worth noting that most of the work in this area is devoted to the organizational structure and management, and they do not take into account or underestimate the impact of financial performance; the same applies to the external environment. Thus, in our study, we will take into account not only corporate governance factors but also financial indicators and environmental factors.

2.2 Life cycle and bankruptcy

Also, there are not so many studies devoted to the analysis of factors influencing company bankruptcy at different stages of CLC. Mokhova and Zinecker (2013) studied the impact

of financial condition (liquidity) on bankruptcy. The authors found a strong negative relation between profitability and liquidity at the stage of growth and maturity. In the research by Pai et al. (2014), the priority of financial indicators at different stages of CLC was established. Koh et al. (2015) found that the influence of lifecycle is most pronounced in the choice of financial restructuring strategies.

The analysis of corporate governance indicators and life cycle was in the center of O'Connor and Byrne (2015) research. The authors found that as corporation matures the sensitivity of CEO turnover to poor performance will decrease the results. Al-Hadi et al. (2019) show that corporate social responsibility significantly reduces financial distress, and this negative association is more pronounced for firms in mature life cycle stages.

Cao and Chen (2012) studied the impact of external factors. The research by Bruneau et al. (2012) shows that not only external environment factors affect the bankruptcy, but also stages of the business cycle. Tinoco and Wilson (2013) demonstrate the utility of combining accounting, market, and macro-economic data in financial distress prediction models.

It should be noted that in most studies a limited number of factors affecting the bankruptcy of companies at different stages of the life cycle are considered. In our work, we examine all the main factors (corporate governance, financial management, and external environment) and determine the most important for each stage of the organization's life cycle.

Let us consider in more detail each stage of the company's life cycle, which we conditionally divided into a stage of growth, maturity, and decline.

The central management task at the initial stage is to prove the viability of a business idea Adizes (1979), which largely depends on entrepreneurial energy; therefore, at this stage, a significant role is given to corporate governance. The main objective of financial management is to generate sustainable cash flows using its own or borrowed funds. It also affects the company's liquidity. Therefore, at this stage, corporate governance is essential. However, the company does not work autonomously. If the company does not respond appropriately to changes in the environment, adapting its management, then the company does not move to the next stage of the life cycle and becomes bankrupt.

For example, if the dollar rate increases, the purchasing capability may fall, and the company may seek additional borrowed financial resources. However, the situation may change for the worse (a further decline in purchasing capability, the onset of a general crisis, an increase in interest rates, etc.). The company could not have foreseen this when making commitments, so a change in the market could trigger a liquidity crisis, and then bankruptcy.

Researchers who study the problems of bankruptcy prediction often use external parameters; mostly these are indicators of economic conditions such as GDP and its derivatives, different market indices, etc. (Vlamis, 2007; Alifiah, 2014; Karas and Režňáková, 2014). Vlamis (2007) analyzed British insurance companies and used the combination of financial and macroeconomic variables (rate of GDP growth, inflation rate, 3-month Treasury Bill rate) for building probit-model. The author proved that macroeconomic factors, as well as financial indicators equally, influence the probability of company bankruptcy. Zelenkov et al. (2017) proposed a model for bankruptcy prediction tak-

ing into account the factors of the external environment (stock indexes, oil price, GDP, etc.). The authors identified18 factors of the firm financial condition and 13 factors of the external environment as most important in the prediction problem.

The stage of maturity replaces the stage of growth. The company already has a well-established organizational structure and corporate governance (Flamholtz, 1986), shared visions, and values (Adizes, 1979). Therefore, the company's financial condition is particularly important.

The stage of maturity is replaced by the stage of decline, which is characterized as (Miller and Friesen, 1984): inertia in management; decrease in the level of innovation activity; reduced profitability; conservative decision-making style. Instead of focusing on the possibility of increasing revenues, management is looking for ways to reduce costs. A company in decline may have a sufficiently high borrowed capital and, therefore, problems with the capital structure. The decrease in investment leads to the fact that the product lines "die," the customer base is shrinking, financial results are falling. And there comes a time when the company again faces a liquidity or bankruptcy crisis, and yet, financial indicators are given particular importance.

So, based on the discussion above, we can formulate the following hypothesis:

Different factors determine the risk of company bankruptcy to varying stages of the life cycle. The most important factors influencing the probability of bankruptcy at a certain stage of company life cycle are those the effectiveness of which is at the lowest level.

We will use PLS-SEM to estimate the influence of the factors mentioned above (external environment, financial management, corporate governance) on company bankruptcy at different stages of the life cycle. These factors cannot be measured directly, but only through some manifest variables, so they are often called latent variables or constructs. PLS-SEM allows checking the relationships between latent variables.

To assess the efficiency of the use of factors, we will apply the DEA method. According to our hypothesis, if the efficiency of the factor is low, it should affect the company's bankruptcy. Knowledge, experience, and other intellectual assets within the resource theory of the firm are considered as its resources (Grant (1996); Massingham (2014)). Thus, we believe that the quality of both financial and corporate management is also the resource of the company. The external environment can also be considered as a resource, which is a source of extra opportunities, as it is given in Dynamic Capabilities Theory (Teece and Pisano, 1994).

3 Methodology

3.1 Partial Least Squares - Structural Equation Modeling (PLS-SEM)

A PLS-SEM model consists of two elements (Fig. 1). First, there is a structural model (also called the inner model) that represents the constructs (ellipses) and the relationships between them. These relationships determine the research hypotheses that are examined when PLS-SEM is applied. The path coefficients indicate the strength of

these relationships. Second, there are the measurement models (also referred to as the outer models) of the constructs that display the relationships between the constructs and the observed data or manifest variables (rectangles). The relationship between the manifest variables and a latent variable is estimated with the help of factor loading. The values of latent variables are computed by using the measurement and structural model in alternating steps. The measurement model predicts each latent variable as a weighted sum of the connected manifest variables (so-called formative way) or as a source of variation of observed variables (reflective way). In the latter case, each manifest variable is viewed as a linear function of the construct. The structural model estimates the latent variables using the linear regression between the constructs.

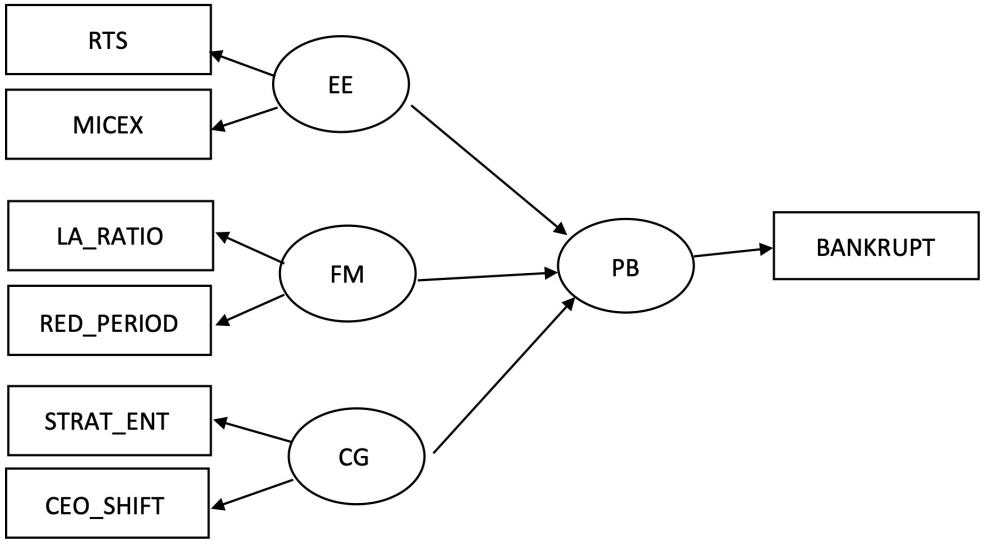

Figure 1: Research model. The ellipses present the latent variables, and rectangles display the corresponding manifest variables. Arrows correspond to the hypothesized relations between variables.

Several parameters allow us to estimate the PLS-SEM model quality that will be illustrated below.

In our case, latent variables are a set of factors (external environment *EE*, financial management *FM*, and corporate governance *CG*) and bankruptcy probability *BP*. Manifest variables should be selected from indicators discussed in the previous section.

Nowadays, PLS-SEM is widely used to empirically test hypotheses in economics, management, and other sciences that study the so-called soft systems (Ciavolino et al., 2021; Cheah et al., 2021). In financial applications, Serrano-Cinca et al. (2014) studied the bankruptcy of US banks. Sharif and Lai (2015) examined the effects of disclosure in corporate governance practices on firm performance, bankruptcy risk, leverage, and dividend policy in public listed companies.

3.2 Data Envelopment Analysis (DEA)

DEA is used to estimate a production frontier converting inputs into outputs in a given set of firms and to empirically measure the efficiency of each of them as a distance to this frontier. DEA models for bankruptcy prediction were used by Mousavi et al. (2015), Premachandra et al. (2011), Sueyoshi and Goto (2009), and others.

In this paper, as input parameters, we use the indicator from the sets mentioned above (external environment, corporate governance, financial management), which turned out to be significant during PLS-SEM modeling. As output parameters, we use revenues, net profit, and ROA. Analyzing the efficiency of conversion of inputs into outputs at various stages of the life cycle, we can conclude how the impact of these indicators changes.

There are several modifications of DEA which differ in the way of describing the return to scale. For our analysis, we use the Variable Return on Scale (VRS) model as the empirical data include companies with different volumes of business. This model also allows taking into consideration local effects of other kinds of return to scale (constant (CRS), increasing (IRS) and decreasing (DRS) return to scale).

4 Empirical Data

The empirical database presented in this paper is based on the data concerning 376 Russian public companies of 2010-2015, 46 of which are bankrupt and 16 – semi-bankrupt. The data was collected from various databases (Bloomberg Professional, Ruslana-Bureau van Dijk, SPARK-Interfax, SKRIN). The total volume of capitalization of these companies in December 2015 is 87.6% of the market.

We chose this period because the results of a severe economic crisis due to sanctions from Western countries began to appear in Russia in 2015 and later. In particular, in 2016, the bankruptcy rate in some industries reached 30%. Such external shocks could affect our results, so we limited ourselves to a period of reasonably stable economic development.

In modern studies on bankruptcy forecasting, two approaches to select financial indicators are used. The first approach is to use the classical models of bankruptcy by Altman, Taffler, etc. (Heo and Yang, 2014; Boratyńska and Grzegorzewska, 2018; Oz et al., 2018), the second one is to consider individual financial ratios, e.g., profit rate, business activity, liquidity. In our work, we follow the latter approach and take 20 factors based on Anthony and Ramesh (1992), Jabeur (2017), du Jardin (2016), Nyitrai and Virág (2019), that include working capital to current assets ratio, liquidity ratio, debt period days, financial debt to cash flow ratio, working capital to turnover days ratio, operating profit margin, redemption period, added valued margin, return on capital employed, EBIT margin, current ratio, total assets turnover, net profit margin, return on total assets, EBITDA margin, equity to total assets ratio, operating assets to short term debts ratio, sales receivables to total sales ratio, total liabilities to total assets ratio, total debt to total assets ratio.

We also considered quite common indicators of corporate governance, namely,

- the duality of CEO (one person combines the position of CEO and Chairman of the board) (Daily and Dalton, 1994),

- frequency of CEO succession (Parker et al., 2002; Lee and Yeh, 2004; Deng and Wang, 2006),

- CEO occupies the same positions in other companies (Platt and Platt, 2012), size of the board of directors (Mak and Kusnadi, 2005; Larmou and Vafeas, 2010; Kiel and Nicholson, 2003; Cheng et al., 2008),

- the share of women in the board of directors (Shrader et al., 1997; Pelled et al., 1999; Carter et al., 2003; Erhardt et al., 2003; Rose, 2007).

We also included indicators reflecting the specifics of Russian companies: the company is under government control, is it included in the list of strategic enterprises. It can contribute to preferences from the government and thus mitigate the shortcomings of corporate and financial management.

We also reviewed ten external indicators: GDP, stock market indexes (RTS and MICEX annual average indexes), central bank rate, US dollar rate, consumer price index, euro rate, unemployment rate, Brent oil price, industrial goods price index.

For each indicator, we obtained public data according to the respective dates of annual company reports.

To analyze the life cycle, we used the method proposed by Anthony and Ramesh (1992) and modified for developing markets. As a result, the stage of the company life cycle is characterized by three parameters: sustainable growth rate (SGR), the share of retained earnings in total assets (RETA), the share of capital expenditure in total assets (CapexTA). The method implies calculation of the parameters mentioned above; their ranking with the help of the 33rd and 66th percentile and their grouping according to the level – low, average, high, giving the score for each parameter in the same group. For instance, a flat sustainable growth rate and a small share of capital expenditure in total assets are ranked as three. It means that a company is at a more mature stage of its life cycle. A small share of retained earnings in total assets is ranked as one (stage of growth). Then we calculated an overall score (sum of ranks): the higher the score is, the more mature the stage is. Using this method, we got the following results (Table 1).

In total, we considered 37 parameters characterizing the activity of the company (20 financial, 10 of the external environment, and 7 of corporate governance). As a target, we used an indicative variable, the value of which is 0 for successful companies, 1 for semi-bankrupts (companies for which start of bankruptcy procedure are reported), and 2 for companies that are officially declared bankrupt.

A chi-squared test was performed to select the most significant manifest variables for each construct. The results are presented in Table 2.

Table 1: The number of companies at each stage of the life cycle

Stage	Total observations	Bankrupt and semi-bankrupt companies	Percent of unsuccessful companies (%)
Growth	116	14	12
Maturity	114	21	18
Decline	146	27	18
Total	376	62	16

5 Results and Discussion

5.1 The results of PLS-SEM modelling

Fig. 1 shows the research model. It is constructed according to the formulated hypothesis and includes four latent variables and seven significant manifest variables. It is a standard model for all stages of the company's lifecycle; it was tested separately for each phase to identify the difference of the impact of the constructs on the bankruptcy.

According to the framework for accessing reflective and formative models (Coltman et al., 2008), we use a reflective measurement model for all exogenous latent variables *EE*, *FM*, and *CG*. For these constructs, the following assertions are true:

- latent construct exists independent of the measures;
- variation in the construct causes variation in the measures;
- adding or dropping the measure does not change the conceptual domain of the construct;
- measures of one latent variable have high positive intercorrelations. If we remove the measure, the correlation of the remaining measures with the latent variable and the correlation between the remaining measures do not change.

A measurement model for latent variable *PB* consists of only one observed indicator because additional data are not necessary to describe the state of the company according to the researched problem.

For PLS-SEM modeling, we used a software package SmartPLS 3.0 (Ringle et al., 2014). First, the PLS-SEM model was tested for convergent validity. It was assessed through factor loadings, composite reliability (CR), and average variance extracted (AVE) (Hair Jr et al., 2016). All reflective factor loadings should exceed the recommended value of 0.7. CR values, which depict the degree to which the construct measurements indicate the latent construct, should exceed the recommended value of 0.7. AVE, which reflects the overall amount of variance in the indicators accounted for by

Table 2: Selected significant manifest variables

Manifest variable	Chi-squared	p-value	Description
Construct: External Environment (EE)			
RTS	69.210	0.000	RTS index average annual value
MICEX	48.906	0.000	MICEX index average annual value
Construct: Financial Management (FM)			
LA_ RATIO	8.333	0.016	The ratio of total liabilities to total assets
RED_ PERIOD	6.521	0.038	Redemption Period
Construct: Corporate Governance (CG)			
STRAT_ENT	5.064	0.049	Indicative variable: 0 if organization is in the list of strategic enterprises, 1 otherwise.
CEO_ SHIFT	2.039	0.051	The number of shifts of the CEO for the last 6 years
Construct: Probability of Bankruptcy (PB) - target variable			
BANKRUPT			0 for successful companies, 1 for semi-bankrupts and 2 for officially declared bankrupt.

the latent construct, should exceed the recommended value of 0.5. Table 3 presents all mentioned values for different stages of a company's life cycle and confirms that the given model is consistent with convergent validity requirements excluding measurements of CG construct on the second and third stages of the life cycle. It will be discussed later.

Next, discriminant validity was assessed. Table 4 shows that the square root of each AVE (shown on the diagonal) is higher than the related inter latent variable correlations, indicating adequate discriminant validity for all the reflective constructs (Fornell and Larcker, 1981).

Also, Table 5 also presents the heterotrait–monotrait (HTMT) ratio of correlations (Henseler et al., 2015) as a better means to assess the discriminant validity. If the HTMT value is greater than 0.85, there is a problem of discriminant validity. As shown in Table 5, all the values satisfy this condition, indicating that discriminant validity is not an issue. The single exception is the HTMT ratio between CG and FM constructs on the

third stage; this artifact will be discussed below.

To assess the quality of the structural model (i.e., the hypothesis regarding relations between latent variables), Henseler et al. (2015) recommend applying the standardized root mean square residual (SRMR) as the only approximate model fit criterion. A value of 0 for SRMR would indicate a perfect fit, and generally, an SRMR value less than 0.08 is recommended to be adequate for PLS path models. For this study, the SRMR ≤ 0.08 was observed (Table 6), indicating a proper model fit. Table 6 also lists adjusted R^2 for sole endogenous variable PB. According to Chin et al. (2008), this variable can be described as substantial on the base of values presented.

The complete results of the structural model and hypotheses testing are presented in Table 7. Displayed data indicates that corporate governance (CG) does not impact the probability of bankruptcy (PB) on later stages of the company life cycle (maturity and decline). It explains problems with convergent validity and the HTMT ratio on these stages fixed above. All other factors significantly relate with PB, and we can compare their impact on the base of path coefficients.

5.2 PLS-SEM modelling results discussion

We suggest that the external environment in developing countries is one of the most important factors influencing the company. However, this factor is rarely taken into account by the researchers who create models for bankruptcy prediction in developed markets (Korol, 2013; Salehi et al., 2016), though the importance of macroeconomic indicators is proved in case of developed national economies (Vlamis, 2007; Tinoco and Wilson, 2013). According to Table 7, the external environment is the most significant factor at the stage of growth (the value of the path coefficient is 0.508). This factor is also the second significant after financial management at the stages of maturity and decline. It confirms that at the stage of growth the company raising capital is financially vulnerable to external environment shocks (Pai et al., 2014).

The external environment, which is measured by market indices, has a positive relationship with the probability of bankruptcy, i.e., the higher the impact of competition is, the more difficult for the company to survive in the developing market. This result is consistent with Tian and Twite (2011) and Chou et al. (2011), which have argued that competition is a substitution of corporate governance. High competition induces managers to show high performance. Otherwise, they might lose their jobs or experience company takeover (Ghofar et al., 2015). Table 7 shows that the more strong the influence of the external environment is, the more significant the impact of corporate governance is. For instance, at the stage of growth external environment is the most valuable factor and quality of corporate governance is essential in comparison with the phases of maturity and decline.

At the stage of maturity, the indicator of the external environment is less critical rather the factor of financial management. Corporate governance at this stage is not essential. This finding is consistent with O'Connor and Byrne (2015) conclusion that mature firms tend to practice better overall corporate governance. The absence of the impact of corporate governance on the probability of bankruptcy at the stage of maturity supports

this conclusion. It is going to be discussed in detail below. At the stage of decline, the role of financial management becomes most important. Financial management at this stage is the most crucial factor that is consistent with Cao and Chen (2012) findings.

Loadings for the measurements of latent variables at different stages of the company life cycle are presented in Table 3. This parameter shows the strength of the relationship between the latent variable and its indicator. Adizes (1979) argues that after the company completes the growing stages and enters a maturity stage, it's capacity for self-control increases. However, later it starts reducing that causes the aging process. The company loses its flexibility, growing companies are more adaptive; at the stage of growth the organizations achieve a balance of self-control and flexibility. At the stage of decline, both these characteristics decrease. These findings are consistent with our results. Our study of the relationship between corporate governance and probability of bankruptcy shows that on growth stage bankruptcy risk increases when CEO changes more frequent and reduces when the company is included in the list of strategic enterprises that means preferences and support from the government.

5.3 DEA results

We constructed 9 VRS models for three sets of indicators (external environment, corporate governance, financial management). As input, we used all the factors which were significant in PLS-SEM analysis (see Figure 1). As output, we used ROA, revenues and net profit (Table 8).

6 Discussion

Comparison of the results presented in Table 7 and Table 8 shows that the less effectively the factor is converted into output, the more important it is for the company success. This finding is true for the models in which revenues, net profit and ROA are used as outputs. Thus, the results support our research hypothesis (the most important factors influencing the probability of bankruptcy at a certain stage of company life cycle are those the effectiveness of which is at the lowest level).

As for the external environment, it impacts all the companies in the same way. That is why all the companies are very close to the production possibility frontier, and their effectiveness is close to 1. However, although the external environment is one of the significant factors, its influence decreases at the stages of maturity and decline (Table 7) as financial management becomes more critical.

The effectiveness of corporate governance increases during the first two stages but later decreases. Consistent with our hypothesis, the effectiveness of corporate governance is the lowest at the stage of growth (0.144, see Table 8) and thus this factor is important in its influence on the company bankruptcy. This result can be seen in Table 7: at the stage of growth path coefficient of CG is statistically significant, but on the following stages when the efficiency of corporate governance exceeds some level this factor becomes insignificant.

These results are partially consistent with some studies (Cao and Chen (2012); Ooghe and De Prijcker (2008)). At the growth stage, the most critical problem is the management's overconfidence, who may overestimate the level of real sales and underestimate the costs. At the decline stage, the main problem is the lack of financial resources. As a result, liquidity drops, and the threat of bankruptcy increases.

Table 8 shows that the effectiveness of financial management decreases within the company's life cycle. At the stage of the growth, company profitability has a significant influence on the probability of bankruptcy (Pai et al., 2014) since, at this stage, companies raise capital, and their financial stability is at a low level. Profitability is the primary resource for such companies; it allows them to compete in case of financial shocks. At the stages of maturity and decline, the quality of financial management becomes more critical in impact on bankruptcy risk as at these stages managers are inclined to maximize their benefits by spending the capital on perquisites, inefficient diversification, and acquisition activities (Pai et al., 2014). This argument was supported by agency theory (Saravia, 2013; Nikolov and Whited, 2014). According to these conclusions, there should be an increase in the influence of this factor on the bankruptcy, and it is proved by our results. As shown in Table 7, the importance of financial management grows, i.e., the absolute value of the path coefficient increases from 0.311 at the stage of growth to 0.594 at the stage of decline. The significance of this indicator is almost two times more important, and at the stages of maturity and decline it plays a more significant role than the external environment.

7 Conclusion and Future Works

Financial stability is an integral characteristic of a business. To assess this parameter and predict the possibility of bankruptcy, various sets of factors (SoF) are used, which include financial ratios, indicators of the quality of corporate governance, and indicators of the external environment. The particular interest is the impact of these factors on company performance at different stages of its life cycle, since the company meets different challenges while developing and growing.

The goal of our study is to analyze the impact of the mentioned SoF at different stages of the company's life cycle.

The originality of our work is that we combine two quantitative metrics: one to estimate the impact of a set of factors on bankruptcy (PLS-SEM) and second to assess the efficiency of transformation of this SoF to the company's result (DEA).

The main contribution of our work is the empirical proof that the less effectively the company transforms the set of factors into economic benefits, the more these factors impact the probability of company bankruptcy. The main findings are the following. The external environment more effects on the probability of bankruptcy at the stage of growth. The importance of financial management increases during the life cycle from the initial to the final stage. Corporate governance is less important than the other two SoF, but its impact is more significant at the stage of growth.

In sum, evidence from this study is essential for theory since it explains the reason

which causes bankruptcy. In practice, the obtained models can be used to develop crisis management for virtually any type of company.

Limitations that should be taken into consideration when generalizing the result are following. Firstly, the presented findings are obtained on data of Russian companies that operate on an emerging market with the significant impact of government. Despite the results are consistent with theory, they should be confirmed of data of other countries. Secondly, the model can be expanded to include more factors when the detailed information at firm level becomes available. It is the goal of our future works.

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Table 3: Convergent validity and reliability of the constructs. Factor loadings and Convergent Validity (CR) should exceed 0.7. Average Variance Extracted (AVE) should exceed 0.5

Construct	Measurement variable	Loading	AVE	CR
Life cycle stage 1: Growth				
PB	BANKRUPT	*single-item measure*		
CG	CEO_ SHIFT	0.733	0.578	0.728
	STRAT_ ENT	0.877		
EE	RTS	0.994	0.988	0.994
	MICEX	0.994		
FM	LA_ RATIO	0.786	0.595	0.746
	RED_ PERIOD	0.757		
Life cycle stage 2: Maturity				
PB	BANKRUPT	*single-item measure*		
CG	CEO_ SHIFT	0.703	0.529	0.691
	STRAT_ ENT	0.750		
EE	RTS	0.993	0.986	0.993
	MICEX	0.993		
FM	LA_ RATIO	0.845	0.619	0.764
	RED_ PERIOD	0.724		
Life cycle stage 3: Decline				
PB	BANKRUPT	*single-item measure*		
CG	CEO_ SHIFT	0.991	0.500	0.560
	STRAT_ ENT	0.137		
EE	RTS	0.992	0.986	0.993
	MICEX	0.993		
FM	LA_ RATIO	0.859	0.619	0.764
	RED_ PERIOD	0.627		

Table 4: Discriminant validity. The square root of AVE (shown on the diagonal) should be higher than the inter latent variable correlations.

Construct	CG	EE	FM	PB
Life cycle stage 1: Growth				
CG	*0.762*			
EE	0.074	*0.994*		
FM	0.162	0.048	*0.771*	
PB	0.228	0.533	0.358	*N/A*
Life cycle stage 2: Maturity				
CG	*0.727*			
EE	0.498	*0.993*		
FM	0.018	-0.075	*0.787*	
PB	0.535	0.468	0.126	*N/A*
Life cycle stage 3: Decline				
CG	*0.707*			
EE	0.166	*0.992*		
FM	0.181	0.302	*0.771*	
PB	0.281	0.491	0.704	*N/A*

Table 5: Heterotrait–Monotrait (HTMT) ratio. It should be less than 0.85.

Construct	CG	EE	FM
Life cycle stage 1: Growth			
EE	0.158		
FM	0.668	0.121	
PB	0.412	0.537	0.632
Life cycle stage 2: Maturity			
EE	0.842		
FM	0.090	0.329	
PB	0.846	0.471	0.382
Life cycle stage 3: Decline			
EE	0.398		
FM	1.096	0.553	
PB	0.642	0.494	0.848

Table 6: Standardized Root Mean Square Residual (SRMR).

Life cycle stage	SRMR	Adjusted R^2 for PB
Growth	0.07	0.396
Maturity	0.08	0.339
Decline	0.06	0.581

Table 7: Structural model and hypotheses testing, t-statistics that exceeds the critical value marks the supported hypotheses.

Hypotheses	Path coefficient	t-statistics	DEcision
Life cycle stage 1: Growth			
CG impacts on PB	0.139	2.350	Supported
EE impacts on PB	0.508	4.724	Supported
FM impacts on PB	0.311	3.364	Supported
Life cycle stage 2: Maturity			
CG impacts on PB	0.140	1.523	Not supported
EE impacts on PB	0.283	2.408	Supported
FM impacts on PB	0.391	3.323	Supported
Life cycle stage 3: Decline			
CG impacts on PB	0.126	1.484	Not supported
EE impacts on PB	0.290	3.250	Supported
FM impacts on PB	0.594	7.813	Supported

Critical t-value is 1.984 ($p = 0.05$)

Table 8: Average effectiveness (DEA VRS) at different stages of life cycle according to ROA, revenues, net profit

	External Environment	Corporate Governance	Financial Management
		Revenue	
Growth	0.999	0.147	0.308
Maturity	0.999	0.183	0.271
Decline	1.000	0.165	0.217
		Net profit	
Growth	0.999	0.149	0.296
Maturity	0.999	0.171	0.289
Decline	1.000	0.160	0.222
		ROA	
Growth	0.999	0.144	0.337
Maturity	0.999	0.174	0.327
Decline	1.000	0.160	0.252