



**SULEYMAN DEMIREL  
UNIVERSITY**

MINISTRY OF EDUCATION AND SCIENCE OF  
THE REPUBLIC OF KAZAKHSTAN

SULEYMAN DEMIREL UNIVERSITY  
FACULTY «SDU BUSINESS SCHOOL»

UDK 005(574)



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2019

THESIS WORK

Theme: «Assessment of company bankruptcy»

Specialty «6M050700-Management»

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1-st course, group  
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Kaskelen 2019

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## Андатпа

Банкроттық әлеуетін барынша тез әрі дәл анықтау - кез келген ұйым үшін маңызды мәселе. Шетелде ұйымда банкроттық әлеуетінің деңгейін табу үшін түрлі әдістер мен тәсілдер жүзеге асырылуда. Алайда, бұл Қазақстандағы жағдай емес, себебі Қазақстанда банкроттық батыс елдеріндегідей зерттелмеген. Интеграцияланған әдіснама - экономиканың кейбір ерекшеліктерімен қай модельдің экономиканың кейбір ерекшеліктерімен ең жақсы қолданатындығын дәл анықтауға көмектесетін тәсілдердің бірі. Бұл зерттеуде әртүрлі банкроттық модельдеріне салыстырмалы көзқарас қолданылды. Қазақстандық ұйымдар мысалында Altman, Springate, Zavgren және Chesser модельдері қарастырылған. Салыстырмалы көзқарас басқа дамушы елдерде банкроттық модельдерін зерттеуге негізделген. Бұл зерттеу қазақстандық ұйымдарының банкроттық әлеуетін барынша дәл бағалау үшін үлгілердің қайсысы аса маңызды екенін анықтауға арналған. Берілген зерттеудегі талдау нәтижелері Қазақстандағы компаниялардың нақты мысалдарына негізделген.

## Аннотация

Как можно скорее и точнее определить потенциал банкротства является серьезным вопросом для любой организации. За рубежом внедряются различные методы и подходы, позволяющие найти уровень потенциала банкротства в организации. Однако об этом нельзя сказать в Казахстане, поскольку банкротство изучено не так, как в западных странах. Интегрированная методология — это один из способов, который помогает более точно определить, какая модель лучше применяется с некоторыми спецификациями экономики. В этом исследовании применен сравнительный подход различных моделей банкротства. Модели Альтмана, Спрингейта, Завгрена и Чессера рассматриваются на примере казахстанских организаций. Сравнительный подход основан на предыдущих исследованиях моделей оценки банкротства в других развивающихся странах. Данное исследование посвящено выяснению того, какая из моделей наиболее актуальна для максимально точной оценки потенциала банкротства в казахстанских организациях. Результаты анализа в данном исследовании основаны на реальных примерах компаний в Казахстане.

## Abstract

The indication of bankruptcy potential as soon and accurate as possible is a significant issue for any organization. Different methods and approaches are implemented abroad that can find the level of bankruptcy potential in the organization. However, it cannot be said in Kazakhstan, since the bankruptcy is not as studied as it is in western countries. An integrated methodology is one of the ways that help more accurately determine which model is better applied with some specifications of the economy. In this study the comparative approach of different bankruptcy models is implemented. The model of Altman, Springate model, Zavgren and Chesser are reviewed on the sample of Kazakhstani organizations. The comparative approach is based on previous studies of bankruptcy assessment models in other developing countries. This research is dedicated to find which of models are the most relevant to assess bankruptcy potential in Kazakhstani organizations as accurate as possible. The results of analysis in this study are based on real cases of companies in Kazakhstan.

# 1. INTRODUCTION

## 1.1. Research Background

Number of researches was provided on studying an aspect of enterprise bankruptcy in developing countries. Enshassi, Al - Hallaq and Mohamed (2006) studied causes in business failures of developing countries. Araujo, Ferreira & Funchal (2012) researched Brazilian case on the legal issues affecting the enterprise bankruptcy in developing countries. Anicshenko (2009) has studied Kazakhstani case of the impact of the financial crisis on banking system in Kazakhstan. In her article, influenced banking system has significant impact on bankruptcy of business in Kazakhstan. Altman & Hotchkiss (2005) provided a study on using Z-score as an indicator of company's bankruptcy potential. That model of bankruptcy assessment spread in different organizations around the world. Nowadays it is one of the most effective indication methods with scientific excellence.

## 1.2. Problem statement

Different studies were dedicated to bankruptcy in Kazakhstan, its nature and how it is conducted in modern economy of developing country such as Kazakhstan (Anicshenko, 2009), (Alimbetova, unknown year). However, the most common practice of managerial finance in company is to find out bankruptcy potential in different companies of Kazakhstan using typical model of Altman (1968). Since that there are different concepts that are scientifically protected there is no evidence that Altman's model is the most accurate working in the case of Kazakhstani companies.

### Research objective

The main goal of this study is to indicate which model of bankruptcy assessment is the most relevant for Kazakhstani companies to more accurate predict the bankruptcy. This is possible through comparative description of financial analyses practiced by previous researches. The scope of activities is directed to compare different models of insolvency assessment using cases of same stack of

companies. Comparative approach will be helpful to understand what model of assessment is more applicable for financial managers in Kazakhstan to provide a picture of bankruptcy potential in Kazakhstan, since it requires as accurate figuration as possible.

### 1.3. Research question

What is the most applicable bankruptcy assessment model for Kazakhstani companies?

### 1.4. Research Gap

Sahin & Altey (2011) used Z-score model of Altman to study the case of bankruptcy of different companies in Kazakhstan. Using the model, they could find an empirical valuation of solvency of different joint-stock companies in Kazakhstan with different field of activities. In their study all companies were local Joint-Stock Companies, however there are no implementation of comparative analysis on Limited Liability Partnership companies and Joint Stock Companies.

### 1.5. Contribution

The main contribution of this research is the practical appliance of the most accurate bankruptcy assessment methodology in bankruptcy assessment. The comparative approach in this research will be useful for financial managers to make forecasting a financial situation of a company in more accurate way especially in Kazakhstani companies. This study will foster the methodological knowledge of financial and risk management. It also can be a basis for further research in the field of bankruptcy assessment, financial management and risk management in Kazakhstan.

## 2. LITERATURE REVIEW

### 2.1. The concept and essence of bankruptcy

Bankruptcy is one of the main results of the firm's activity in a market economy and market relations. Bankruptcy also serves as a powerful engine for a company in a highly competitive environment. This phenomenon serves as an incentive for lenders to protect the interests of the company and promote their strengthening. The phenomenon of bankruptcy is deeply studied by theorists and practitioners in the field of financial activities.

The goal of bankruptcy is to liquidate low-performing and unstable enterprises. The main activities in bankruptcy are creditors, entrepreneurs and financial and legal bodies (Zhurova & Shehtman, 2011).

In economic and financial practice, there are 4 types of bankruptcy:

- Real bankruptcy is characterized by the fact that the company is unable to restore its solvency due to losses of organizational and borrowed capital.
- Temporary bankruptcy or conditional bankruptcy caused by the overdue payables in large quantities, but the amount of the assets of the organization exceeds the amount of the company's debts.
- Deliberate bankruptcy - the deliberate creation of insolvency, committed by the owner of the enterprise in the personal interests or interests of other stakeholders.
- False bankruptcy - an advance false announcement by the organization about the state of bankruptcy in order to obtain a deferment from creditors or to obtain a company exemption from the payment of accounts payable.

The main indicator and determining factor of bankruptcy is the inability of the organization to be in a competitive market. A successful company must have enough financial resources, from the initial processes of selling goods in the market to profit. This allows the company to go through the stages of conditional crisis affecting the organization. The objectives of the institution of bankruptcy can be present at 3 levels: macro level, micro level and meso-level. At the macro level, the goal of the institution of bankruptcy is to create a favorable development and competitiveness of

the economy. The goal at the meso-level is the development of regional, sectoral sectors in order to protect the interests of various territories. The objectives of the micro level are aimed at protecting the interests of creditors, business owners and other stakeholders. In Kazakhstan, there are phenomena of industrial decline, the economic crisis, the devaluation of the national currency, the tightening of credit conditions, which subsequently leads to financial instability of organizations in various sectors (Alimbetova, unknown year).

To date, there are several models for calculating risks and predicting crisis situations that predict a state of bankruptcy. It is inherent for companies to meet different crises at different levels, respectively, there are differences in the assessment of crisis situations in different methods. However, any type of crisis can lead a company to absolute liquidation (Afonichkin & Zhurova, 2006). Taking measures to get out of the bankruptcy state of the organization are divided into 2 types according to the deadline:

- Operational - short-term measures for the immediate exit of the organization from the state of insolvency.
- Strategic - long-term measures aimed at implementing the general concept of financial recovery and enterprise development in the long term.

Regarding on the type of operational activities, the goals of different levels of management and relevance of the risk is also differentiated, so in regard of types bankruptcy can be real, technical, intentional and dummy. Real bankruptcy is published in the organization that has no ability anymore to conform its obligations, is not able to pay their loans, further its financial stability cannot be guaranteed and doesn't have an ability to perform its economic activities, so it is stated that it is a bankrupt. Real bankruptcy can be prevented after some specific actions directed to raise company's financial situation if these actions are done in relevant time. The technical type of bankruptcy occurs when a company's insolvent position happens due to the inability to pay money of debtor for a long period of time which amount is more than the number of total debts. Technical bankruptcy can be figured out when

the bankruptcy is transmitted to any institution of crisis issues or crisis management departments, but it still can potentially be saved from bankruptcy condition. Fictitious or deliberate bankruptcy – occurred when a company currently has no ability to pay debts, so they announce bankruptcy in order to delay its obligations. So intentional fictitious bankruptcy is a conscious management performance for any specific objectives of a company's management

The full mechanism of procedures aimed at reducing the crisis situation of the company can be attributed to the bankruptcy system. The system of bankruptcy is a certain system of control, diagnostics and the adoption of measures for the possible protection of the financial fall of companies experiencing difficulties in paying debts to creditors (Iskakov & Seitova, 2016).

Small and medium businesses are considered to be the most vulnerable to bankruptcy, in the absence of a large number of liquid assets for large sales. During the first quarter of 2018, 3.7 thousand business companies were liquidated (Table 1). This indicator exceeded 2.5 times the same period of the previous year.

*Table 2.1.1 Liquidated organizations for the first quarter of 2018*

Liquidated organizations			
<i>Industry</i>	<i>2018/19</i>	<i>2017/18</i>	<i>Increase</i>
<b>legal entities</b>	<b>3 678</b>	<b>1 476</b>	<b>149,2%</b>
Business partnerships	3 049	1 153	164, 4%
State-owned enterprises	63	34	85,3%
Joint – Stock companies	48	13	269,2%
Other legal forms	518	276	87,7%
Retrieved from the data of the Committee of Ministry of National Economy of the Republic of Kazakhstan			

The result of the influence of external and internal factors, the company loses its solvency on the property of the capital, namely the lack of cash. One of the most common causes of insolvency is the illiquidity of property companies. This phenomenon occurs when there is low demand or no demand for the goods sold by the enterprise. The reason for the illiquidity of a company's property may be the high book value of long-term property, such as a building, land, equipment and other. The nature of Kazakhstani bankruptcy is the classical common bankruptcy practice according to developing countries around the world.

## 2.2. The essence of bankruptcy assessment

The estimation of the bankruptcy potential in enterprises took a particular attention to perform ratio analysis starting from the middle of 20<sup>th</sup> century (Yadav, 1986). Researches over different organizations in different countries have demonstrated the helpfulness of financial ratios in the insolvency forecasting. In the period of last decades, various of multivariate models for assessing the potential of bankruptcy have been suggested, in relation with the features and specifics of learned samples. Requirements to constantly update methods of assessment is important, as factors and its nature that influence organizations variate over time.

The implementation of bankruptcy assessment is significant function for people responsible for financial issues in an organization, but it can also be significant for groups of internal and external stakeholders. (Lifschutz and Jacobi, 2010). Forecasting in advance the statement of bankruptcy does make a sense in most times, however it is practiced that it is especially important during periods of financial difficulties and problems upcoming from economic macro factors (Diakomihalis, 2012).

Previous study of Brîndescu - Olariu (2016) provided through examples of around thousand European entities and it was found that arrangement of solvency ratio accuracy is 67%. However, this number of precisions makes a significant space when errors occurs, so it is determined as satisfactory to state that bankruptcy prediction by

ratio of solvency is still useful determination tool (Chung et al., 2008). Previous studies were based on analysis with 588 insolvent companies as sample participants and 588 companies that have problems with solvency. The ideally accurate bankruptcy esteem was not considered for the whole population representatives that they got an annual level of bankruptcy not as same as it is really represented, and the model of assessment configurations were not performed. This research is directed to provide the most relevant method for assessing the bankruptcy potential in Kazakhstan based on the statistical models relevant for studying population. There are still various tools to assess the potential of bankruptcy, however, the proposed study methodology is directed on the description of how accurate analyses of bankruptcy assessment for specific region, with minimum risk of error occurring in analysis, being at the same time relevant for all interested parties. Analysis results that have been performed by analytical estimation based on the given study method is helpful in order to clearly understand what the right performance decision for financial managers either it can be a startup for further, more specific researches.

Altman (1968) concluded three main terms to determine business failure are monetary instability, indebtedness, and insolvency. As indicated by his study, financial disappointment underlies that consequences of rate of return on investment relative and consistently under gaining profit for similar turnovers, where indebtedness is identified with a circumstance in which an organization can't perform in the way to meet current obligations, imply the absence of liquidity (Gu and Kim, 2006). However, bankruptcy is a harder position in which an organization is unable to pay its loan obligations, petitions for legal issue of court for review of its loans or liquidation of organizational assets.

The empirical study of Stanisic, Mizdrakovic & Knezevic (2013) of the developing countries case state that the level of quality of bankruptcy prediction of originally developed models usually level down over time. Begley et al. (1996) provided a study of Altman's origin Z value model on the several sample and realized

that the model was not as accurate as when it was originally developed. The results of this study showed that errors exist in both case I whereas bankrupt firms were indicated as non-bankrupt and case II where non-bankrupt companies occurred as bankrupts and errors increased over time. Further they re-estimated coefficients based on 1980's sample but by applying such a model the average of the Type I and Type II error rates was not reduced compared to original model. Grice and Ingram (2001) implemented Altman's bankruptcy prediction model and on over thousands sample provided repetitive approach to make the analysis more valid. They implemented both models to assess the bankruptcy of the sample and found that Altman's model accuracy significantly decreased, and the original model cannot be implemented in valid way without re-assessment of Z value coefficients. The significant note was that the accuracy of implementation was larger for manufacturing companies rather than to non-manufacturing companies.

An alternative way to assess bankruptcy of a company is to use market models. Even though market models are extremely often used by financial institutions, there is an absence of empirical studies that analyzes their accuracy compared to financial indicator-based models (Stanisic, Mizdrakovic & Knezevic, 2013). Agarwal & Taffler (2008) empirically examined the Z-value in the UK against the market model for usage of credit risk estimates and realized that traditional bankruptcy assessment models based on financial esteems even dominate market patterns in the considering potential bank profitability. Stanisic, Mizdrakovic & Knezevic (2013) did not use market models, due to specific interest in small and medium-sized enterprisés, which make up about 99% of companies in Serbia and whose participation in the capital market is extremely rare.

The foreign markets already have the special bankruptcy institutions that study problems of companies that meet insolvency. Kazakhstan has no similar entities that can work with local bankruptcy issues (Sahin & Altey, 2011). However, different industries meet increase in bankruptcy percentage (see table 1). At the same time,

most of Kazakhstani organizations understand the tendency of economic macro factors shifting microenvironment of a company. That is why it can be relevant to keep the tendency on the different world markets that have practiced their own risk determining departments. If we consider the theoretical basis of bankruptcy issues of western practice, currently it looks like more relevant than ever to develop caution systems in advance, that can be helpful to prevent or avert corporate fall, and which filter the selection of firms to collaborate with or invest in.

The main parts of bankruptcy assessment models are based on the analysis of a stack of companies, taken from different industries, which stimulate a question of comparability of damp financial ratios of such companies and ways that they implement the assessment of insolvency (Garškaitė, 2008). If industry turbulence factors are not considered, models of bankruptcy assessment do not perform well enough as variate industries are not similar in respect to fluctuations of the environment of businesses, product life cycles length, capital tenseness and profitability (Ooghe & Spaenjers, 2009).

Unstable financial data over time limit the ability of prediction of the models when implemented for different financial periods and business cycle phases. It happens due to the variate context of organizational behavior, performance and rates of success under different lifecycle periods. Considering the nature of bankruptcy, that is mentioned above companies meet failed, false and not accurate corporate bankruptcy prediction models (Stundžienė & Boguslauskas, 2006).

In some cases, failed bankruptcy models are formed due to fluctuating macro factors like economic failure in the country, natural disaster, etc. Fail in organizational bankruptcy assessment models is associated with not competent financial management in organizational activities that ignore its prediction in time where it can be prevented (Mackevičius, Rakštelienė, 2005). However, the responsibility spreads, when an organization goes bankrupt because of high-risk

activities, deficient objectives, the absence of assessment in the changing financial circumstance, the careless corporate bankruptcy assessment (Rukinov, 2006).

### 2.3. Bankruptcy assessment models

A statistical model, like multiple discriminant analysis (MDA<sup>1</sup>), can be a more modern step up compared to an original analysis of coefficients for assessing bankruptcy in a singular industry (Gu, 2002). MDA that has been presented by Altman, was subsequently implemented to assess potential of the bankruptcy of companies by several researchers, including Begley et al. (1996), Beynon and Peel (2001) and others.

Mackeviius and Silvanaviit (2006) provided a study of the implementation of five classic empirical statistic models: Altman's which is directed on evaluating enterprises whose shares are listed on the stock exchange, Springate, Zavgren, Chesser and Taffler & Tisshaw. They formulated in their study the scientific statements regarding the bankruptcy prediction in the of linear discriminant analysis models (Altman, Springate, Taffler & Tisshaare) are relevant; bankruptcy assessment model calculated by the Chesser model was not accurate in overall entities; the Zavgren model is totally not relevant and has no excellence to predict bankruptcy in the sample

Garškait (2008) studied the Altman, Liso, Taffler and Springate models in Lithuanian companies from a similar industry and found that the results of the models' implementation match the real situation in the case of bankruptcy assessment. On the other hand, the research is not as accurate as to the excellence of the models; it is stated in her work that it is not recommendable to blindly apply each of the models and claim for their ability to assess bankruptcy in Lithuanian companies because the specification of both the country's economy and the company's field of activity must be taken into consideration. However, it is a relevant case, because

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<sup>1</sup> MDA Multi-factor discriminant analysis is a technique in statistics of multivariate discrimination between groups

economics of Lithuania and Kazakhstan has similarities in the enterprise system even if other different factors are playing their roles.

Kanapickien, Rudžionien, and Griauslyt (2008) provided a study of the application of six bankruptcy assessment models in Lithuanian organizations of different sizes. The list of models consists of: Altman, Taffler & Tisshaw, Springate, Zavgren, and the ones which were studied by Marcinkevicius & Kanapickiene(2014). The conclusion was that the analyzed bankruptcy assessment models do not always accurately indicate the potential of bankruptcy. The most suitable models to assess bankruptcy is determined that one of Marcinkevicius & Kanapickiene among the group of medium and small organization and Altman's model among the group of large enterprises.

Karaleviciene and Bužinskiene (2012) examined contemporary bankruptcy assessment models. From the empirical examination of several companies, the research results state that models that has been examined apart from models that has been performed for European organizations, are appropriate for the assessment of a company's financial situation and bankruptcy potential. The real picture appears, that the capability of the corporate liquidation to decide isn't sufficient to ascertain distinctive money related indicators (Mackevičius and Silvanavičiūtė, 2006). To evaluate it as precisely as could be allowed and in increasingly target way, the money related exchanges of an association and monetary occasions, to consider the elements, giving the most critical effect to the organization's budgetary circumstance and execution, it is important to utilize a coordinated technique of chapter 11 appraisal. In previous studies (Ooghe and De Prijcker, 2007; Rugenytė et al., 2010) it is proposed that all assessment of bankruptcy models can be arranged into two noteworthy gatherings: old style measurable and man-made reasoning.

Traditional factual models comprise of linear discriminant analysis and logistic regression models. Linear discriminant analysis models suggest with the premise of linear function in significant relationship between likelihood of liquidation, as the reliant variable, and budgetary markers of the association as the autonomous factors. Linear discriminant examination models incorporate Altman, Taffler and Tisshaw, Springate models. Calculated relapse models are spoken to by Zavgren and Chesser chapter 11 evaluation models. Man-made consciousness models depend on the choice tree and the neural systems administration frameworks (Mackevičius and Silvanavičiūtė 2006).

In the modern period of advanced technologies, some machine learning methods have been proposed for assessment of enterprise bankruptcy. Some of them are k-nearest neighbor, neural network and support vector machine. These methods have their positive and negative sides. Between several issues, the neural network and support vector machine outperform some other methods. (Arieshanti, et al., 2013).

The most significant theoretical and practical contribution for the bankruptcy assessment are represented in E. Altman's works. According to Kuruppu et al. (2003), implementation of these models can help as accurately as possible estimate the status of continuity of an organization. The nature of this bankruptcy assessment model (Chuvakhin & Wayne Gertmenian 2002; Mackevičius 2005; Stoškus et al., 2007; Mavlutova & Leshinskis 2007; Nedzveckas et al., 2003), is relies on evaluation of organizational performance by several financial indicators from which the comprehensive Z coefficient is calculated. Regarding on the coefficient of Z value it is proposed that the potential of bankruptcy can have the following results according to estimations: as the coefficient of Z value is less, as the bankruptcy potential is higher. There is a statement that most of classical statistical models for the assessment of bankruptcy are the most accurate, for instance, Altman's model predictionary. Nowadays, this model is mostly experienced by scientific workers,

financiers, investors, creditors and other participants of market who implement the prediction of further bankruptcy (Stundziene & Boguslauskas, 2006).

Armeanu & Cioaca (2014) provided an empirical study of Romanian capital market using Altman's original discriminant analysis model. Nevertheless, it is noted in their work that they strongly believe that this model can make errors in conclusion, because it was based on historical data, the likelihood that financial data may be the subject of financial fraud and creativity. Furthermore, the classification of the binary type for companies (as solvent or insolvent) does not take into account the occurrence of some temporary difficulties that can affect it in debt servicing, what does not actually mean that the company is insolvent.

Linear discriminant analysis models are represented by Springate model, that includes four major financial indicators as variables (Mackevičius & Silvanavičiūtė, 2006). If coefficient of Z value in Springate model is less than 0,862 – it can be stated that an organization has a risk of becoming a bankrupt. Nedzveckas (2003) applied the model for 40 entities acting in the similar industry (financially, by activity with considering of macro factor influences) and identified that bankruptcy could be determined with 92% excellently. However, later researchers provided an empirical evaluation that the accuracy of the model is only 83%.

### 3. METODOLOGY

#### 3.1. Research framework

The methodology of this study is based on educated literature. The literature was selected by relevance, so it was as actual as possible. Kiyak & Labanuskaite (2012) compared bankruptcy assessment models for Lithuanian organizations comparing models of 1) Altman's; 2) Springate model; 3) Zavgren model; 4) Chesser model. The same examination will be implemented with companies of Kazakhstan. The validity of the research will be in the case that economies of different countries have its impact on microeconomics, so it is relevant to find out what will be the most applicable model for Kazakhstani organizations. Different models will be implemented with the same stack of Kazakhstani companies. The analysis will be implemented using Microsoft Excel software.

In order to compare bankruptcy prediction models, it is necessary to install the estimation indicator that will show if the company is in the case of risk or not. Using Altman's and Springate models, the indicator will be Z value that will be found according to performance of Kazakhstani companies. However, the way how Z value will be found is different according to implemented model.

According to Altman's model if Z value is less than 1,81 - very high potential of bankruptcy, when Z value ranges between 1,82 and 2,79 - high potential of bankruptcy, and when the 2,80 and 2,99 - bankruptcy is possible but can be prevented (safe zone). Z coefficient value exceeded 3,00, states that the bankruptcy probability is very low. Z value in Altman's model will be found using the following information:

- $X_1$  = Operating capital/total assets
- $X_2$  = Retained earnings/total assets
- $X_3$  = Earnings before interest and taxes/total assets
- $X_4$  = Market value equity/total liabilities
- $X_5$  = Net sales/total assets

Whereas  $Z = 1,2X_1 + 1,4X_2 + 3,3X_3 + 0,6X_4 + X_5$ .

In Springate model the potential of bankruptcy is determined according to the break point of Z value. Here the bankruptcy is taken in more optimistic sense and is denominated as avoidable or unavoidable. So according to the Springate model if Z value is lower than 0, 862 the bankruptcy is unavoidable and accordingly vice-versa. In order to calculate Z value in Springate model, the following information is needed:

- $X_1$  = Operating capital/total assets
- $X_2$  = Earnings before interest and taxes/total assets
- $X_3$  = Earnings before interest and taxes/total assets /short - term liabilities
- $X_4$  = Net sales/total assets

Whereas  $Z = 1,03X_1 + 3,07X_2 + 0,66X_3 + 0,4X_4$

Zavgren and Chesser model is designed to calculate logistic regression from components of financial statement and balance sheet. In terms of results of logistic regression models, it will be shown if the company in the zone of risk or not. So, if Z value of logistic regression is more than 50% it will be concluded that probability of a company's bankruptcy is high.

Data required to implement Zavgren model are following:

- $X_1$  = Reserves/net sales
- $X_2$  = Short-term assets/reserves
- $X_3$  = Cash/net profit
- $X_4$  = Cash/short-term liabilities
- $X_5$  = Operating capital/ (total equity-short-term liabilities)
- $X_6$  = Long-term liabilities/ (total equity-short-term liabilities)
- $X_7$  = Net sales/net profit

Whereas  $P_B = \frac{1}{1+e^{-z}}$

And  $P_B$ - probability of bankruptcy;  $e = 2,71828$ ; Z- linear analysis of the function.

Data required to implement Chesser model of prediction are following:

- $X_1$  = Cash/net profit
- $X_2$  = Net sales/cash
- $X_3$  = EBIT/net profit

- $X_4$  = Total liabilities/net profit
- $X_5$  = Long-term assets/total equity
- $X_6$  = Operating capital/net sales

Whereas  $P_B = \frac{1}{1+e^{-z}}$

And  $P_B$ - probability of bankruptcy;  $e = 2,71828$ ;  $Z$ - linear analysis of the function.

### 3.2. Research design

This research has the descriptive nature that is directed to give a picture of what we have now in Kazakhstani financial situation. Description of concepts is helpful in order to understand actual financial regularity in Kazakhstan and more accurate predict the future of companies in Kazakhstan.

The research will have the quantitative character since the nature of the topic has financial basics. Comparative framework that is taken as methodological basis in the given research requires data collected in figures and then calculations of requirable indicator.

### 3.3. Sample design

In order to implement the research methodology, it is needed to take Kazakhstani companies as a population. The sampling method is selected as a non-random opportunity sampling. Due to limitations in time, Kazakhstani organizational mentality that is strongly associated with accessibility to data, opportunity sampling is the only appropriate method for this research.

Among 7 selected companies around Kazakhstan there will be companies that are currently in good conditions and far away from bankruptcy conditions. Also, there will be companies that have a risky situation now. Companies will be selected among LLP and public JSC from different industries what will give us know if some specifications of industries are significant or not through different bankruptcy potential models.

### 3.4. Data gathering

Required data will be collected from financial statements conducted by financial managers of Kazakhstani companies selected in the sample. The data will be retrieved from kase.kz. Information that is only requirable according to models in methodology will be taken. Since we need to check reliability of different models we need data from previous years that have replication on current financial situations of companies.

## 4. ANALYSIS

### 4.1. Altman model

The results of bankruptcy assessment analysis of financial indicators in last financial periods of selected companies by Altman Z coefficient model show that company A (Z value = 4.68) has low potential to become a bankrupt in near future. Selected failing companies D (Z value = 0.71) and company G (Z value = 1.07) have very high potential to become a bankrupt. However, Altman model also showed that Company B (Z value= 1.90), Company C (Z value = 2.09), Company E (Z value = 2.10) and Company F (Z value = 2.12) still have potential to become bankrupt. Financial situation on Kazakhstan Stock Exchange shows that the last category doesn't feel problems with bankruptcy and, they are able to pay their liabilities to shareholders. The bankruptcy assessment of selected companies that has been analyzed by the model of Altman can be rejected seems it cannot reflect the real financial situation of companies in Kazakhstan, and the results show the ineffectiveness of the Altman models to assess bankruptcy Kazakhstani companies. However, since there are some previous studies showing the relevance of Altman's model, it can be admitted that assessment of companies' bankruptcy by Altman has a relationship with acting industry and some macro factors that can shift results.

*Table 4.1.1. Altman bankruptcy assessment model implementation among companies in Kazakhstan*

		(Altman) $Z = 1.2X1 - 1.4X2 + 3.3X3 + 0.6X4 + X5$ .						
The calculation model		Company A	Company B	Company C	Failing Company D	Company E	Company F	Failing Company G
Financial Ratios								
x1	Operating capital/total assets	0,29	0,42	0,46	-0,19	-0,84	0,05	-0,04
x2	Retained earnings/total assets	0,43	0,24	0,02	0,12	1,24	0,34	0,47
x3	EBIT/total assets	0,17	0,17	0,32	0,11	0,42	0,21	0,02
x4	Market value equity/total liability	5,10	0,45	0,21	0,29	0,00089	1,21	0,64
x5	Net sales/total assets	0,11	0,17	0,33	0,23	0,000176	0,16	0,02
	<b>Z value</b>	<b>4,68</b>	<b>1,90</b>	<b>2,09</b>	<b>0,71</b>	<b>2,10</b>	<b>2,12</b>	<b>1,07</b>
	The possibility of bankruptcy assessment	Very low	High potential	High potential	Very high	High potential	High potential	Very high

## 4.2. Springate model

Based on the selected Kazakhstani companies' Springate model of bankruptcy assessment it can be stated the safest financial situation has the company C, which has specifically greater coefficient than critical point ( $3.810 > 0.862$ ). Company A (Z value = 1.817), Company B (Z value = 1.986) and Company F (Z value = 2.245) have twice greater than critical point according to Springate model, thus they are far away from bankruptcy. Company E (Z value = 0.989) is closer to critical point than other companies, but still in safe zone and taken as a non-bankrupt firm. Failing company D has results (Z = 0.389) based on last year financial indicators showed that the organization for the last financial period does not operating financially sufficient, that is why the potential of the bankruptcy has a very high level. Failing company G results showed the least results according to financial indicators of last financial year the possibility go bankrupt very high (Z value = 0.244). The model reflected the real financial situation among companies in Kazakhstan. Springate bankruptcy assessment model showed the suitability and relevance to apply it for bankruptcy prediction in Kazakhstani companies.

*Table 4.2.1. Springate bankruptcy assessment model implementation among companies in Kazakhstan*

		(Springate) $Z = 1.03X1 + 3.07X2 + 0.66X3 - 0.4X4$						
		Company A	Company B	Company C	Failing Company D	Company E	Company F	Failing Company G
11	The calculation model							
12	Financial Ratios							
14	x1 Operating capital/total assets	0.259	0.478	0.461	-0.195	-0.341	0.051	-0.036
15	x2 EBIT/total assets	0.171	0.166	0.316	0.112	0.416	0.202	0.015
16	x3 EBIT/short-term liabilities	1.245	1.337	3.561	0.300	0.125	2.135	0.073
17	x4 Retained earnings/total assets	0.428	0.242	0.022	0.118	1.240	0.336	0.471
18	Z value	1.817	1.986	3.810	0.389	0.989	2.245	0.244
19	The probability of bankruptcy assessment	Low	Low	Low	Very high	Low	Low	Very high

### 4.3. Zavgren model

According to implemented Zavgren model of bankruptcy assessment whereas company is stated as bankrupt if potential ratio is more than 50%, companies A, B, C, E and F have 100% potential of bankruptcy. Failing company D has result of 0,11%, that showing that company is far away from bankruptcy. Company G has the same result with companies A, B, C, E and F and it is 100%. These results of linear regression model didn't reflect the real situation of real companies' financial situation instead of failing company G. In this sense it can be stated that model is not relevant to assess bankruptcy in Kazakhstan by Zavgren model.

*Table 4.3.1. Zavgren bankruptcy assessment model implementation among companies in Kazakhstan*

The calculation model		(Zavgren) Prediction = 1/1 - e <sup>-Z</sup> ; Z = 0.11X1 - 1.55X2 + 10.78X3 - 3.07X4 - 0.49X5 + 4.35X6 - 0.11X7 - 0.24						
Financial Ratios		Company A	Company B	Company C	Failing Company D	Company E	Company F	Failing Company G
x1	Reserves/net sales	0.05	0.02	0.03	0.00	32.57	0.02	0.02
x2	S/t assets/reserves	18.28	196.02	535.48	0.00	494.95	39.71	346.76
x3	Cash/net profit	0.02	0.38	0.32	0.02	0.26	0.97	0.01
x4	Cash/s/t liabilities	0.02	0.04	0.64	0.01	0.00003	1.62	0.00
x5	OP/(total equity-s/t liabilities)	0.42	3.21	10.44	1.32	0.252609	0.14	0.26
x6	L/t liabilities/(total equity-s/t liab)	1.05	4.03	17.59	-2.70	-0.001	1.87	-0.59
x7	Net sales/net profit	26.70	529.31	918.50	-12.53	693.25	75.92	544.88
Z value		100%	100%	100%	0.11%	100%	100%	100%
Bankruptcy probability proc.		Very high	Very high	Very high	Very low	Very high	Very high	Very high
The probability of bankruptcy assessment		Very high	Very high	Very high	Very low	Very high	Very high	Very high

### 4.4. Chesser model

Chesser model is one more linear regression model using different financial indicators than Zavgren model. Implementation of this model in Kazakhstani companies showed that company A (0.000000000000006%), company B (0.004), company C (0.1%), Company E (0,0000000001%) and company F (0.27%) have

very low potential to become a bankrupt. That is what real financial situation shows. However, results of failing company D (0.0041%) and failing company G (0,00000001%) show that these companies are also far away from bankruptcy what has no real reflection of current financial positions of companies in Kazakhstan. From this sense it can be stated that Chesser model like Zavgren model does not reflect the real financial situation and can be rejected to assess bankruptcy among Kazakhstani companies.

*Table 4.4.1. Chesser bankruptcy assessment model implementation among companies in Kazakhstan*

		(Chesser) Prediction = $1/1 - e^{-Z}$ ; $Z = -2,0434 - 5,24X1 - 0,0055X2 + 6,5507X3 - 4,4009X4 - 0,079X5 - 0,1021X6$						
The calculation model		Company A	Company B	Company C	Falling Company D	Company E	Company F	Falling Company G
<b>Financial Ratios</b>								
x1	Cash/net profit	0,02	0,35	0,32	0,02	0,25	0,97	0,01
x2	Net sales/cash	42,41	3,10	5,87	72,42	1,62	1,04	134,19
x3	EBIT/net profit	2,63	1,20	1,78	0,70	1,01	1,27	0,58
x4	total liabilities/net profit	18,11	5,20	4,86	4,85	14,9	2,77	27,67
x5	Long-term assets/total equity	1,76	2,19	3,57	1,76	1,92	1,54	0,15
x6	Operating capital/net sales	-4,56	2,37	1,38	-0,84	-5	0,37	-1,5
<b>Z value</b>		-54,80	-18,83	-13,32	-18,65	-62,72	-10,91	-117,49
<b>Bankruptcy probability proc.</b>		0,00000000%	0,004%	0,13%	0,0041%	0,00%	0,27%	0%
The probability of bankruptcy assessment		Very low	Very low	Very low	Very low	Very low	Very low	Very low

## 5. DISCUSSION

After provision, structuring, summarizing and implementation of companies' assessment of bankruptcy and theoretical model determination, it is stated that the statistical models are the most practiced, like logistic regression or linear discriminant analysis models for prediction of bankruptcy. Assessment models by artificial intelligence are compared with generally used statistics models, and they are absolutely modern and not studied sufficiently enough, so currently these models didn't get spread scientific recognition and weren't implemented enough in practical cases to make any specific conclusions. Altman bankruptcy assessment model has received the biggest scientific recognition and acceptance; however, the assessment is still shifted. Recent researchers had its rejection, different studies claim that it's the only applicable model for assessment of bankruptcy in an organization, however it must be enveloped by adjustments of components' value. Previous researchers have studied different models of bankruptcy assessment which are interpreted in various ways by different researchers, so it is complicated to strictly approve the actual appliance of the model implementation, since it is not enough understandable which numbers in the financial ratio are relevant. However, in this work it was found that Springate model is more applicable for companies in Kazakhstan as actors in developing economy. Since the economy has its specifications, regulations and other factors then Altman model may be not relevant for Kazakhstan.

The comparative approach of the bankruptcy assessment models determined that four financial ratios which are the most significant in the prediction: working capital, assets ratio, PBIT and assets ratio, sales revenue and assets turnover and finally sales revenue and monetary turnovers. It states that in the assessment of bankruptcy, it is significant issue to estimate the efficiency of how an organization uses its assets to effectively provide sales operations and make the profit for an organization. In some cases, authors use different ratios, but in general they want to estimate the same and relative part of assets profitability and their indicators of efficiency. In general, most of bankruptcy assessment techniques use similar

components that are generally financial indicators from the statement, but implementation has non-similar calculations and assessment of current financial position of an organization in the sense of solvency.

From the provided work it can be stated that the most relevant model to predict bankruptcy among Kazakhstani companies is Springate model. However, there are some errors that can occur depended on industry actions that can fluctuate companies' financial indicators. Different hypotheses could be constructed based on provided studies and different specifications could be also studied in further researches

## 6. LIMITATIONS

The main limitation occurred in this work is a critically low time resource since the topic is spread in different way. To assess the methodology in more valid and reliable way it is better to implement repetitive comparative analysis of different methods of bankruptcy assessment.

The second critical limitation was the accessibility in collection of primary data for methodology implementation. Kazakhstani organizational behavior is kind of close and afraid of competitive benchmark, so most of companies provide information only in confidential way. In most cases financial managers in Kazakhstan are not interested in scientific contribution, so they keep the data closed.

One more important limitation was in the absence of similar studies of local scientists. Most of researches in Kazakhstan were directed on the nature of the bankruptcy and the only that is made based on Altman's model. However, the topic is well enough studied abroad to have accessibility in literature of different previous practices that supported an absence of long-time data collection.

## 7. FUTURE RESEARCH

The education of the bankruptcy case in Kazakhstan still didn't occurred on an appropriate level. As it said above in this work, all of companies in Kazakhstan have potential to be under the risk of bankruptcy, however there is no special institution that specialized on bankruptcy prevention. This research can be used as a basis for further education of the potential of creating this specified institution that will work with the case of bankruptcy regulation in Kazakhstan.

This research is also can be a basis for further detailed education of bankruptcy issue in Kazakhstan in the type of deeper education of each model presented above. There is a lack of researches dedicated to bankruptcy forecasting in Kazakhstan and especially empirical models for calculating the forecast. As most educated and scientifically excellent that issue will be as less companies will be suffering from bankruptcy in Kazakhstani economy.

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