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MASTER THESIS

MOBILUMO PAKETO ĮTAKA LIETUVOS TRANSPORTO SEKTORIAUS ĮMONIŲ BANKROTO RIZIKOS VERTINIMUI	IMPACT OF MOBILITY PACKAGE FOR BANKRUPTCY RISK ASSESSMENT IN TRANSPORTATION SECTOR IN LITHUANIA

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Introduction

Relevance of the study. After so many years of wars, strict regulations and fragmentation in the end of 20th century and in the beginning of 21st century countries opened their walls, globalization started and free market was entrenching around the globe. Political decisions became democratic, citizens and businesses oriented. Looked like everything in the world was becoming liberal and nothing bad can happen when people were free to make their own decisions and act as they wish. However, this happiness of freedom led to absolutely unexpected as in 2007-2008 the world faced the global financial crisis. This crisis was the most serious since the Great Depression. Many companies over the world went bankrupt. It involved the collapse or near-collapse of large commercial banks, hugely expensive interventions by governments to guarantee deposits and buy bank assets, a steep decline in bank lending to individuals and businesses, significant falls in consumer activity both domestic and international, and a resulting reduction in trade. Even today, ten years after crisis, it is still unknown whose responsibility it actually was.

It was only 18 years passed when Lithuania declared its independency and was developing new economy, entering new markets when the financial crisis hit the country. Unemployment grew rapidly from 80 000 to 320 000.[1] To avoid bankruptcy Lithuania had to borrow money and the debt in few years from 2008 to 2010 got two times bigger. In Lithuania about 2800 company's filed for bankruptcy during 2008-2009[2]. The biggest numbers of bankrupting companies were in construction and retailing sectors. However, period of crisis was the longest in transportation sector, because the number of companies who went bankrupt were growing even in 2013[3], while the financial bottom in Lithuania was reached in 2010 and after that the economy started to grow again. This fact should not surprise as transportation sector is strongly dependent on production and trade to other countries. During crisis both of these sectors reduced its activities rapidly and even after crisis manufacturing and trade starts to grow domestically and only later, when there are enough capital it goes to foreign countries, so that is why the crisis last longest in transportation sector and many companies in this sector in Lithuania usually do not have so many reserves to be able to wait for better times.

Today, ten years after crisis, some countries in the world face some economic challenges. For example, Germany is balancing on the line of recession, China and United States of America is fighting in trade war, also president of the United States Donal Trump imposed customs

[1] Department of Statistics <https://osp.stat.gov.lt/statistiniu-rodikliu-analize?theme=all#/> [2018-11-07]
[2] Department of Statistics <https://osp.stat.gov.lt/statistiniu-rodikliu-analize?indicator=S8R031#/> [2018-11-07]
[3] Department of Statistics <https://osp.stat.gov.lt/statistiniu-rodikliu-analize?theme=all#/> [2018-11-07

duties for EU items, Brexit etc. So, there are analysts who say that today economy is in its peak of economic cycle and there are signs that economic decline is coming. It might not be the crisis as it was ten years ago, because people and institutions learned the lesson and are much more protective in lending and borrowing money, but it could be economic stagnation or recession. As international disagreement started to grow, many companies are worried about export and import. It would not only have impact for production and trade, but also for transportation. However, the latter sector is not usually talked about in international overviews as its importance to countries economics is not so significant. Meanwhile, ten years in a row economy in Lithuania is still growing and GDP growth even exceeds forecast. Some of the foreign analysts are a bit overwhelmed of this fast growth, but so far there are no signs of crisis in Lithuania. What is more, Lithuania is one of the leaders in Europe in transportation sector and also has one of the biggest transportation companies in Europe. Transportation sector in Lithuania generates 13% of GDP, so it is even called indicator of economic status and for today leaders of this sector in Lithuania are still very optimistic.

However, even though the mood in business is quite positive and we belong to European Union which declares solidarity and cooperation between member countries, the law that is very unfavourable to Lithuania was approved in EU in July 2020 – it is Mobility Package which might cause huge transformations in transportation sector and would reduce revenue from this sector in our country, because one of the possibilities to save the business is to register companies in Western European countries and some of the biggest players started to do so already. Due to political challenges which cause uncertainty and sanctions export might decrease. As a result, banks started to lower finance for transportation companies, because the risk of business got higher. This is also a difficulty for transportation business, because it is harder not only expand the business, but even to renew the fleet. The worries of financial institutions can be understandable because the impact of politics to transportation sector can be seen also in the light of 2014 events – when Russia occupied Crimea and the western world put sanctions to Russia, it blocked its walls and stopped import to its country which led to increased numbers of bankrupted companies, especially in transportation sector.[4]

Many transportation companies in Lithuania are very sensitive to external changes, as some of them are family owned businesses and they usually don ‘t have strict business plan and are tend to make more profit than seek sustainability. As revenue our country gets from this sector is significant, challenges for this sector would mean challenges for Lithuania.

Study problem. Financial market is one of the hardest things to predict. There are so many factors that can have impact on economic situation that sometimes it is even almost impossible

[4] Creditinfo analysis made by data from Registry Center, 2014, September

to understand which factor was the primal and most important in essential changes in economy. There can be internal and external factors which can cause the whole avalanche of the events. So, it is very important to follow events and changes in economy and firstly in separate companies or sectors, so this could be one of the ways to protect from unexpected events, bankruptcy or crisis.

Even though Lithuania is a country of free market it is highly regulated not only domestically but as it is member of many associations and unions – also internationally. There are many regulations and laws companies have to meet and adjust if they want to continue their work. In the free market companies usually seek to make more profit and mostly those who are new in business world. They tend to grow fast and establish in market as soon as possible and while they are trying to make more profit, sometimes they forget to look around and check if there are any red flags in their financials, sector they are working in or global economy and one of those times are when new regulations are presented where companies have to invest to changes and costs got higher and that is when they come to this point where there is no other possibility, but apply for bankruptcy. So, the question is - what impact does the international politics have to company's probability to go bankrupt and its credit risk assessment? Or in other words does the changes in international politics increase the credit risk and probability of bankruptcy?

The level of investigation. Bankruptcy itself and prediction of it is quite highly investigated. There could be made several groups of scientists who: (i) created new models (Platt, 2002; Grigaravičius, 2003); (ii) analysed models of bankruptcy (Pompe, Bilderbeek, 2005; Garškaitė 2008); (iii) modified and combined old models (Stundžienė, Boguslauskas, 2006; Wu, 2010); (iv) applied bankruptcy prediction models in various sectors of business to see if it is really possible to predict bankruptcy of business and how early it is possible to foresee it (Staňková, Hampel 2018; Sahin, Altey 2011; Jurevičienė, Bercevič 2012, Kanapickienė, Marcinkevičius 2014). Applying different models to different sectors or even different countries give different results. So, the field for investigation is still very wide. What is more, the transportation sector is almost quite unexplored, in world literature of science only few researchers in these times investigated sector of transportation (Chava, Jarrow 2004; Ishutkina 2009). Only one research by scientist in Lithuania has been done in 2012 by Jurevičienė and Bercevič. 10 companies (5 bankrupted and 5 that were working at the time) were investigated and compared. So, the field of prediction of bankruptcy in transportation sector still has a lot of space for investigation.

The object of study is bankruptcy risk assessment of companies during changes in international politics – one specific event will be investigated; it is Mobility Package. Lithuanian limited liability transportation companies will be investigated.

The aim of the study is to investigate and evaluate the impact of Mobility Package to the risk of bankruptcy in Lithuanian transportation sector companies using Altman's and logistic regression bankruptcy prediction models. As there are many bankruptcy prediction models that are suitable for bankruptcy prediction and they all are different it is important to investigate what results they give for different companies while this sector has significant impact in economy of Lithuania and there are events that may cause essential changes in this sector and there might be companies that will have to go bankrupt if they could not cope with the global challenges. Altman's model will be used to evaluate if there were changes in probability of default during the investigated period and logistic regression model was selected to evaluate sensitivity to external factors and obtain better results of bankruptcy risk evaluation.

Objectives of study. 1) Reveal the concept of bankruptcy based on the scientific literature; 2) analyse causes, signs, consequences, influence of market bankruptcy on market participants and to determine the importance of bankruptcy forecasting models, distinguishing their advantages and disadvantages; 3) apply prediction models for selected Lithuanian transportation companies; 4) form mobility package impact for corporate bankruptcy risk establishment relevance.

Methodology. In this thesis classical bankruptcy prediction model will be overviewed using theoretical methods of abstraction and analogy. In empirical part of the study the linear discriminant analytical model and regression analysis model will be used to evaluate if changes in geopolitical situation increases the threat of bankruptcy for companies in Lithuanian transportation sector.

Structure of thesis. Firstly, there will be submitted theoretical overview and evaluated degree of subject analysis in scientific literature - the conception of bankruptcy, overview of bankruptcy prediction models, investigation of bankruptcy prediction in Lithuania and transportation sector. Secondly, research methodology will be defined; after that the results of analysis will be presented and in the final part there will be a discussion of research.

1. The research of bankruptcy and its prediction models

Mobility package was brought in the light of attention only few years ago. The topic itself is quite specific from one point of view as it affects directly only certain field and mostly in those countries who are small players in European Union as they usually are import oriented countries. However, if we look to the wider picture, we can see that not only transportation sector will be affected by these changes as transport of goods have major importance in all types of business affecting the growth of socio-economic well-being (Engström, 2016). Road transport is an industry that currently dominates in the commodities transport structure in the whole European Union.

However, even though European Union declares solidarity, this Mobility package brought controversy between member states. Poland is one of the most works on Mobility package written countries as it will also feel negative effects of new order even though Lithuanians as one of the options for costs management are setting up transportation companies in Poland what means additional income from taxes to Poland. In 2016 Lewandowski examined how member states are trying to protect their own interests by internal regulations, pointing out that the regulations to the minimum wage applied by the German administration have hurt Polish transport companies. However, Paprocki in 2015 pointed out that the minimum wage regulations made in Germany violate the basic principles of the European Union. Therefore, as mentioned, this topic is very controversial, so there are researchers such as Sternberg and Hofmann, 2018, who note also negative consequences of existing order for the transport industry, which of course mostly affect companies in Western European countries.

Even though this topic is quite fresh and the real impact of the Mobility package will be seen in few years, companies are setting their budget and making plans now as some major changes will have to be made and if comapnies won ‘t do their homeworks early enough thei might face excessive costs which might lead to the risk of bankruptcy.

1.1. The concept of bankruptcy

Bankruptcy appeared as country ‘s interest to protect creditors (Biscotti, 2010). In Lithuania the concept of bankruptcy was first presented in corporate bankruptcy law (2001) – „it is state of insolvency when there is case of bankruptcy in court or creditors are proceeding bankruptcy procedures not a court-material in company “. This law states that insolvency of company is inability to pay commitments to creditors more than 3 months and overdue payments compose more than a half of company’s assets in balance sheet. Therefore, it is important to mention that in 2020 January

1st The new Law on Insolvency of Legal Entities entered into force, the main purpose is to create conditions for an effective insolvency process of legal entities, ensuring a balance of interests of creditors and legal entities. Main changes are that Bankruptcy and Restructuring Laws have been merged into one Insolvency Law. It resulted that the concept of company insolvency has changed. The previously used formula as mentioned before, when a company became insolvent, was if the company's overdue liabilities exceeded half of the assets. According to the current wording of the law, insolvency of a legal person is the state of a legal person when the legal person is unable to perform its property obligations in time or the obligations of the legal person exceed the value of its property.

Due to company's insolvency and bankruptcy suffer all parties that are involved in financial relations with this company (Silvanavičiūtė 2008). According to Stundžienė and Bogulauskas (2006) it is very important to perform deep analyzes of company that the expectations and plans would be controlled properly. However, bankruptcy could also mean a return of financial stability, because when the bankruptcy of the company is declared, there is possibility to establish a new company. According to A. Sakalas ir R. Virbickaitė (2003, p.107) it is not always that the bankruptcy only have negative impact, because usually only companies that does not have "know-how" go bankrupt and if bankruptcy is stated in time the assets sold can still cover the debts for creditors and other lenders; company can change the managers or profile and continue its work.

Every manager is trying to do everything he can that company would be profitable, so they always need to evaluate and manage business and financial risks. There are lots of techniques available for measuring the financial soundness of a business. Various approaches have been adopted to measure company's financial performance and one of the most important and simplest way to do this is financial analysis of the company. The aim of the analysis according to many autohrs (Brigham, Daves 2004; Buškevičiūtė, Mačerinskienė 2004; Mackevičius 2007) is to evaluate financial condition and how it changes during analysed period, set the most important factors that have impact on company's financial rates and determine how to improve financial ratios as well as what economic factors do have impact on company's financial results. However, financial ratios can be used not only to analyse company's financial soundness, but also to predict its bankruptcy. R. Wilson and G. McHugh (1993) provided analysis of connection between solvency and profitability where the bankruptcy threat can be determined. Profitable and solvent company is every manager's target, but there is very thin line when company can still be profitable but to be insolvent or to be unprofitable, but still be solvent. Company's profitability depends on its income and costs. When the income decreases or costs increases company can become unprofitable. In the long run company's loss depends on inappropriate management of costs. Solvency of company is divided in to long-term and

short-term. Short-term insolvency can arise from inappropriate usage of current assets and short-term liabilities. Short-term insolvency also has direct relation with size of working capital – bigger working capital means smaller risk of short-term insolvency. (J. Mackevičius, 2007, p.159) Long-term company's solvency shows company's ability to implement financial liabilities in the future. Long-term solvency depends on company's equity and long-term liabilities. Also, it has indirect relation with company's profitability, because company's net profit in the balance sheet is in retained earning which is assigned to company's equity. Long-term insolvency is related with short-term insolvency, because when there are short-term insolvency problems, usually long-term insolvency problems comes right after.

In the market economy fluctuations are inevitable or in other words economy is cyclical. It contains four cycles: rise, recession, crisis and recovery. Companies that work in market economy has to adapt to these cycles. According to A. Sakalas and R. Virbickaitė (2003, p.107) there are 13 stages of company's development:

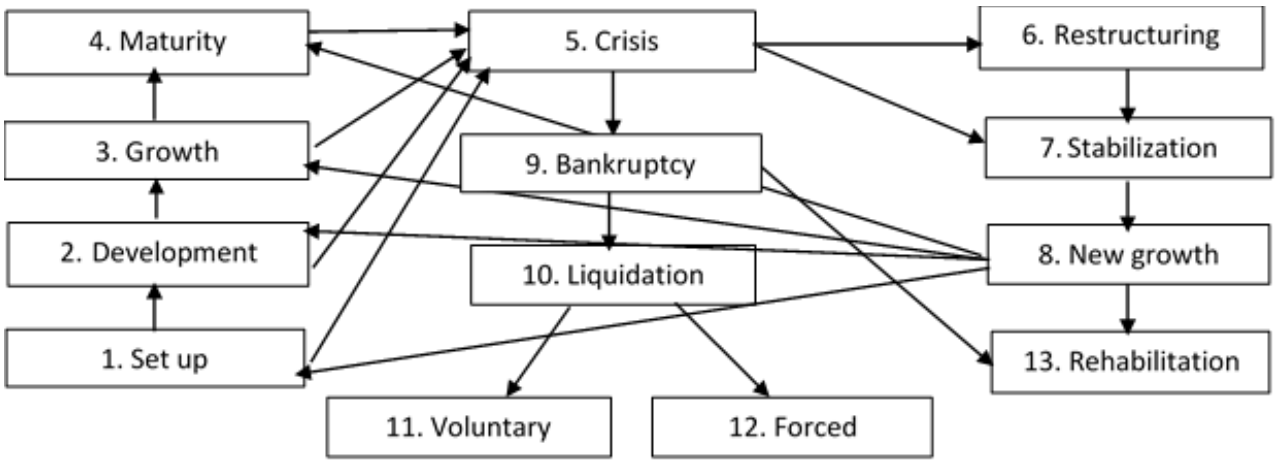

Figure 1. Company's cycle

Source: SAKALAS, A., VIRBICKAITĖ, R. Bankroto teorija ir praktika, 2003, p. 107

This scheme is very detailed, but in other words there can be said that when the company faces crisis there are few outcomes: it can restructure and stabilize its activity and renew its cycle or it can go bankrupt.

Crisis is unusual situation where the threat to company arises. Risk of threat increases because of rapid integration, globalization and competition (Cibulskienė, Grigaliūnienė, 2006, p.21). As mentioned before, there are two outcomes – bankruptcy or recovery. Trying to get out of crisis successfully it is very important to identify the problems which led company to the threat.

There are various risk factors that can cause a threat of bankruptcy: internal, which depends on company's mistakes and management failures and external which do not depend on company's

actions (Brigham, Daves 2004). In the countries with stable economic situation bankruptcy usually depends on exetrnal factors by one third and by two thirds on internal factors. Internal factors are classified as follows (Dauble, Meskens 2002; Brigham, Daves 2004):

- Material – technological are related to technology development, science adaptation in business;
- Organizational, human resources are divided into three subsets: 1) organization of activities (organization of transport flows, production realization; organization of quality control) 2) organization of work (distribution of work, cooperation, work place maintenance, instalment of new ways of working) 3) organization of management (building of organizational structure, coordination of company's activities and employees);
- Financial – structure of financing, assets, spending and investments, management of financial risk.

However, when country have unstable economy companies more often go bankrupt because of external factors. These factors are classified as follows (Dauble, Meskens 2002; Brigham, Daves 2004):

- Economical – solvency of business partner, market situation, domestic and global market conjuncture, country 's tax and credit policy, inflation, technology and science;
- Social – political situation, competition, moral principles, religion, demographic situation;
- Legal – business laws, forms of accountability, opportunities to invest, protection of property consumers protection;
- Climate and ecology – natural resources, geographical situation, climate;
- Other.

All these factors mentioned above and their interactions cause insolvency and even bankruptcy of companies. Most common reasons why company goes bankrupt (Brigham, Daves 2004) are ineffective marketing and use of assets, insufficient diversification, inability to adapt to market changes, lack of financial resources and knowledge.

In literature there can be find a lot of different reasons of companies' bankruptcies. But before that some warning indicators can be identified and if it is done on time, companies can solve problems before they turn to crisis. According to K. Garškaitė ir A. Garškienė (2003) every company no matter if it is healthy or facing the crisis should apply the system of bankruptcy diagnosis upon which the scheme of company's management should be built. There are two main types of bankruptcy diagnosis: express and complex.

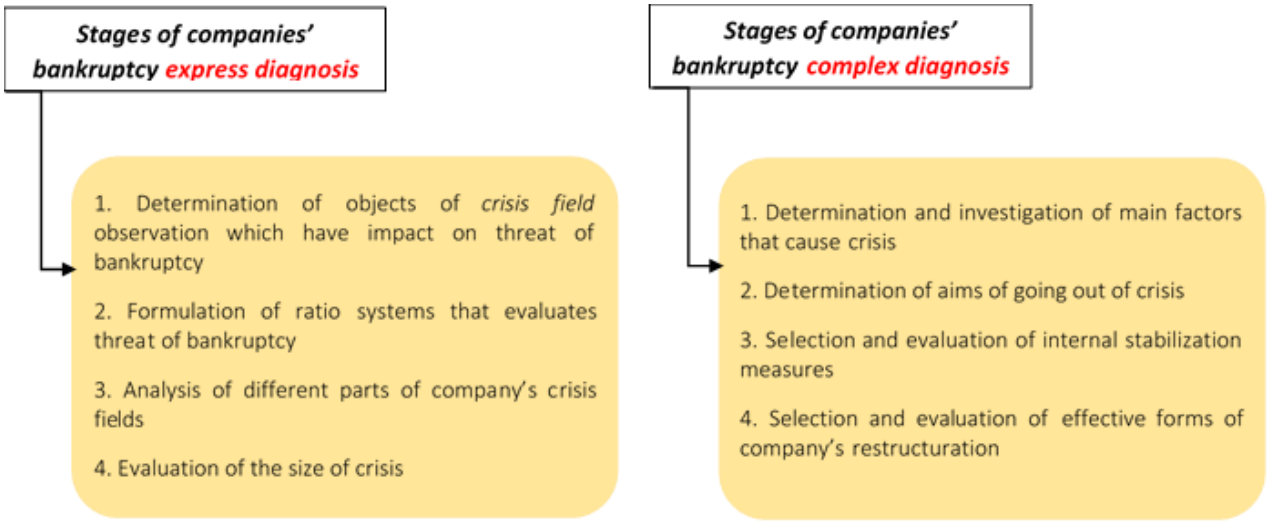

Figure 2: Stages of companies' bankruptcy diagnosis

Source: Garškaitė, K., Garškienė A. (2003) *Įmonių bankroto diagnostikos sistema.* Verslas: teorija ir praktika

Express diagnosis is applied seeking to determine what factors might cause crisis and how big it could be before it actually happens. However, the bigger the scale of crisis the lower the value of this diagnosis. So, when crisis might be huge the complex diagnosis should be applied, so all the factors could be identified and then there is possibility that company would be able to find solution and not to go bankrupt.

Unprofitable activity of company doesn't mean it has solvency issues, but it definitely could be a warning indicator of financial issues in the future. So, it is very important that company would take right actions that would help to identify the reasons of profit loss. S. Grigaravičius (2003a), divided companies to three groups taking into account their ability to continue business:

1. Profitable
2. Unprofitable – potentially bankrupting, restructuring or liquidating
3. Insolvent – bankrupting, restructuring or liquidating

However, sometimes companies not going to bankrupt on purpose, because declaring bankruptcy it would mean additional costs. What is more, when the law of companies' bankruptcy and restructuring have been adopted in Lithuania there is willing to increase insolvent companies' activities. However, for company to be restructured, it has to meet some criteria:

1. Operating profit and cash flows are sufficient to cover operating expenses;
2. The company's capital is dominated by larger shareholders or creditors;
3. Most of the financial liabilities belong to the main (largest) creditors;
4. Large market share;
5. Large number of employees.

If company meets these requirements it means company's value is bigger than liquidation and it is better to restructure this company, but if answers to requirements mentioned above are mostly no, so it is better to liquidate such company. According to bankruptcy law of Lithuania, creditors requirements are satisfied under set order:

1. claims of employees (salaries, compensations, severance pay), claims for remuneration damage to health or death as a result of an accident;
2. claims for taxes, compulsory state social and health insurance contributions;
3. all remaining claims of creditors.

Of course, in most cases company's assets are not able to cover all claims of creditors. So, bankruptcy of the company has different effect for different market participants:

Employees. As a result of company's bankruptcy, they lose their jobs and lose a source of income. In some cases, employees are not even paid salaries or other benefits to which they are entitled. Work loss causes not only financial problems but, in some cases, psychological ones. S. Silvanavičiūtė (2008, p.120) notes that the problem of unemployment is much more relevant in weak economically developed regions with high unemployment and job opportunities relatively small, often with only one person in the family who works. In this case, people become dependent on country's allowance which usually is very small, so people are forced to emigrate.

State. According to A. Sakalas and R. Virbickaitė (2003), bankrupt companies cause negative economic and social consequences. A. Valackienė (2005, p.164) also distinguishes the impact of bankruptcy on both the country's economy: loss of productive capacity, the overall economy of the country weakening of competitiveness, non-collection of taxes in the national budget, bankrupt companies economic difficulties of business partners, as well as the social situation: rising unemployment, livelihoods declining levels of education, growing dissatisfaction with the deteriorating economic situation in the country, uncertainty about the future, the need for public funds to retrain the workforce, social benefits.

Creditors and suppliers. Bankruptcy of companies has definitely a negative financial impact on this group. As mentioned before, according to the Law on Bankruptcy of Enterprises of the Republic of Lithuania (2001), creditors and suppliers are only in the third place to assets of the company. Therefore, very often the assets of a company in liquidation are not sufficient to cover all creditors and requirements of suppliers. "Creditors and suppliers who are not fully settled will undoubtedly suffer financially. Suppliers who have been dependent on a bankrupt company may even to go bankrupt"[5].

[5] SILVANAVIČIŪTĖ, Simona. (2008) *Estimating the negative impact of business failure on Lithuania.* Socialiniai tyrimai, Šiauliai: ŠU leidykla, Nr. 4 (14), p. 119

Investors. Market participants who have acquired the company's shares have the primary interest that company would be solvent. Growing up of the company's insolvency or bankruptcy threat, investors suffer losses and magnitude depends on the type and number of shares held.

Buyers. Bankruptcy of companies firstly influence this group through guarantees of goods they have bought. It means, that buyers suffer a loss if the purchased goods fail during the warranty period. Also, buyers suffer if the goods of bankrupt company were unique and this company were the only one who provided specific goods.

Competitors. This is the only group of market participants who gain from bankruptcy of other company who works in the same field, because it means that number of buyers and income will increase.

In order to avoid the consequences of bankruptcy, it is necessary to take bankruptcy prevention measures. Company insolvency, which later escalates into a bankruptcy of company can be seen through a careful analysis of changes in financial statement items, calculating and comparing individual relative financial ratios, taking into account their dynamics, but the most important tool is the application of bankruptcy prediction models.

1.2 Classification of bankruptcy prediction models

In order to calculate the most accurate probability of a company's bankruptcy, it is not enough to estimate only a few relative financial ratios, as in some cases some ratios have reached a critical level while others are entirely good (Mackevičius, Silvanavičiūtė, 2006, p.193). Therefore, it is best to apply bankruptcy prediction models that combine the most important and significant relative financials indicators revealing the threat of bankruptcy of the company. According to S. Grigaravičius (2003a, p.31), company's bankruptcy assessment is a methodology that helps diagnose the real probability of company's bankruptcy, taking into account the financial condition of company and its trends. Bankruptcy forecasting is very important for businesses as making the wrong decisions can lead to financial difficulties and various social problems for owners, shareholders, employees, lenders, suppliers, even society as a whole and the government (Tsai, 2008, p.120). According to Y. Wu (2010), bankruptcy prediction models differ in the coefficients used and applied econometric techniques. Bankruptcy prediction models found in the literature are divided into two main groups: classical statistical and artificial intelligence.

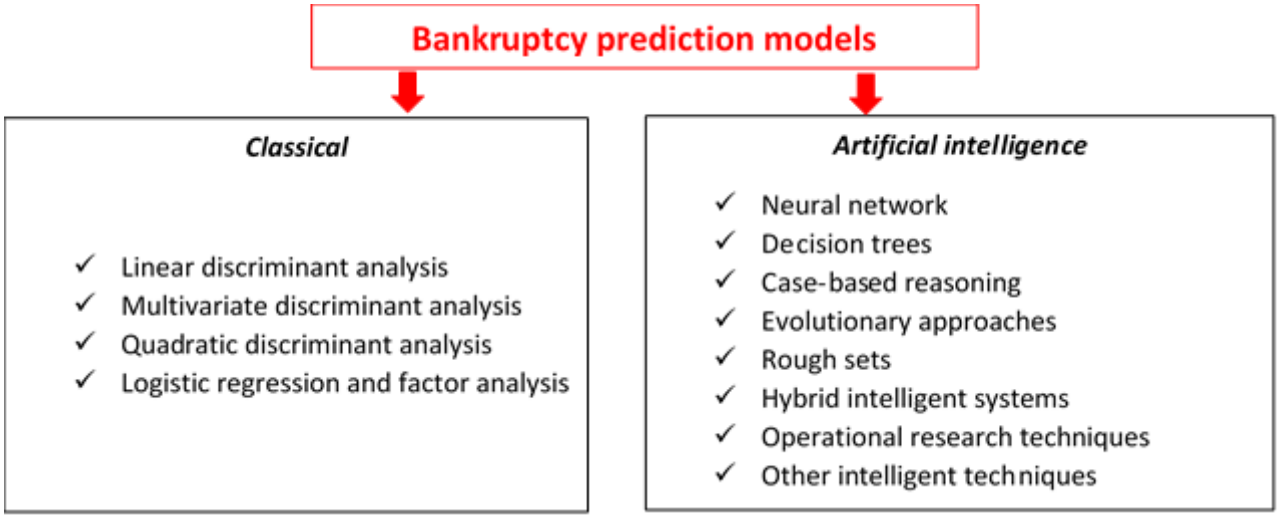

Figure 3: Models of bankruptcy prediction

Source: made by author, according GRIGALIŪNIENĖ, Ţ., CIBULSKIENĖ, D. Bankroto diagnostikos pritaikomumas Lietuvos ūkio sąlygomis, 2004, p.111; MACKEVIČIUS, J., SILVANAVIČIŪTĖ, S. Įmonių bankroto prognozavimo modelių tinkamumo nustatymas, 2006, p.3; RAVI KUMAR, P., RAVI, V. Bankruptcy prediction in banks and firms via statistical and intelligent techniques – A review, 2007, p. 3; GARŠKAITĖ, K. Įmonių bankroto prognozavimo modelių taikymas, 2008, p.284

Classical statistical models for predicting the probability of a company's bankruptcy include linear, multiplicative, quadratic discriminant analysis and logistic regression models. According Butkus (2014) statistical models for predicting the probability of bankruptcy of a company were developed the earliest and still remains one of the most popular. In practice, predicting the probability of bankruptcy discriminatory analysis is very often applied in Lithuanian and foreign companies using Beaver, Altman, Liss, Taffler and Tisshaw, Springate, Fulmer, Legault (Ca-Score) models. But the question immediately arises as to whether they are not out of date because they are were tested and most used during the period when they were developed, i.e. 1968-1990 and mainly in the United States. And can these models really identify bankruptcy In Lithuania, when business in Lithuania started to establish under market economy conditions only in 1993.

In addition to traditional statistical bankruptcy prediction models, mathematical programming has developed so-called artificial intelligence models (Mackevičius, Silvanavičiutė, 2006, p.195) Modern bankruptcy predicting models are becoming more popular, but there is a problem with that - these studies are not so often used to conduct research. Due to lack of practical application, these models can prove unreliable and most scientists face a problem - they are difficult to apply because requires additional programming knowledge or additional software, which also requires much time. The lack of time these days is very great and the application of modern models

to investigate bankruptcy takes time. Since it is necessary to select a statistical base, then write down the possible questions and their solutions and, finally, the aggregation of companies' financial data.

After reviewing the literature, it is possible to single out the advantages and disadvantages of each bankruptcy prediction group (see Table 1).

Table 1. Advantages and disadvantages of models

Name of model	Advantages	Disadvantages
Linear discriminant analysis models	+ High level of reliability; + Easy calculation methodology; + High popularity: uses scientists, financiers, analysts, creditors, etc.	- Shows the highest probability of bankruptcy only 1 year before possible bankruptcy; - Underestimated macroeconomic environment, changes in economic structures and aspects of corporate governance; - Most models are similar or even identical, mostly derived from the Altman model; - Does not take into account the industry, therefore possible errors; - Does not fully assess the company's financial condition and its evolution.
Logistic regression models	+ Takes into account rapidly changing economies and competitive conditions; + Some models can help determine major insolvency restructuring direction.	- Results obtained for some models are not accurate and does not provide any useful information; - Very similar to linear discriminatory analysis models.
Neural network models	+ Applied to modelling quite complex nonlinear dependencies who's analytical and regression expressions unknown; + High level of reliability.	- Fairly new, little researched compared to classic statistics models; - Information technology knowledge and additional computer program resources needed; - Need to rely on data from dozens of times the number of companies than their condition descriptive indicators;

		- It is difficult to set parameters related to algorithms
Decision trees models	+ Solves classifications and regressions problems; + Provides an easy-to-understand answer.	- Like neural network models, sufficiently new and little researched and use requires additional computer program resources; - Difficult modeling; - "Exploratory" tests are required, to get the most accurate answers possible.

Made by author according to: GRIGARAVIČIUS, S. Įmonių nemokumo diagnostika ir jų pertvarkymo sprendimai: mokomoji knyga, 2003a, p.31-39; PURVINIS, O., ŠUKYS, P., VIRBICKAITĖ, R. Research of possibility of bankruptcy diagnostics applying neural networks, 2005, p.17-19; MACKEVIČIUS, J., SILVANAVIČIŪTĖ, S. Įmonių bankroto prognozavimo modelių tinkamumo nustatymas, 2006, p. 195-195; RAVI KUMAR, P., RAVI, V. Bankruptcy prediction in banks and firms via statistical and intelligent techniques – A review, 2007, p. 4

All bankruptcy prediction models have both advantages and disadvantages. So, when examining different firms, the most appropriate bankruptcy prediction models can vary. In order to calculate the most accurate probability of a company going bankrupt, it would be more appropriate to use even several models at once.

1.3 Application of bankruptcy prediction models in Lithuania

For some time, bankruptcy prediction models were only used to investigate companies which were operating in the United States of America. The first study which covered businesses over ten countries on prediction model's application was also done by Altman (1984). However, study limits itself to only one type of statistical model.[6] But even today there are some areas where there is lack of research done by using bankruptcy prediction models. One of them is Indian business area of manufacturing.[7] So it can be told, that bankruptcy prediction models are more often used to investigate western world business.

Lithuania entered new markets in last decade of XX century. Private companies started to emerge, huge transformations where happening, what means that some companies succeed while others have to go bankrupt. On one hand, it was very good environment for research, on the other hand, there could be lack of data. But in 1999 Mackevičius and Poškaitė did research using Altman's

[6] Narendar V. Rao et al. *Analysis of bankruptcy prediction models and their effectiveness: an indian perspective*, Great Lakes Herald Vol 7, No 2, September 2013 <https://www.greatlakes.edu.in/pdf/ANALYSIS%20OF%20BANKRUPTCY.pdf>
[7] Ibid

model. They analyse companies whose shares are quoted in stock exchange market and using Altman's model examine the probability of bankruptcy through changes of financial statements in several years.[8] Other Lithuanian scientists usually also use Altman 's model, however they do not agree about application of this model to Lithuanian companies. Manuela Tvaronavičienė (2001) had different opinion about Altman 's model application to Lithuanian companies, because it was applied to American companies who work in 1945-1965. Purlys (2001) also say that Altman's model shouldn't be applied during economic transformation period. Buškevičiūtė and Mačerinskienė (1998) say that Altman's model can forecast Lithuanian companies' bankruptcy only approximately. They have collected data about bankrupted companies in Lithuania and made a conclusion that Altman's model can confirm the probability of bankruptcy, but conclusions should not be made only by this model application. However, all these scientists used only the first Altman's model, but in the later study made by Mackevičius and Rakštelienė (2005) it is recommended to use all Altman's models for bankruptcy prediction. Whats is more, prediction should be executed yearly as results of one year do not let to make unambiguous conclusions.

Lithuanian scientists apply not only Altman 's model. For example, Garškaitė (2008) used Altman's, Taffler & Tisshaw, Springate and Liss models to Lithuanian companies from the same economic sector and all models predicted bankruptcy. However, she stated that Taffler & Tisshaw model predictability was the highest. Budrikienė and Paliulytė (2012) used Altman's, Taffler & Tisshaw, Springate, Lis, Zavgren, Chesser models. Researchers revealed that Altman's and Taffler & Tisshaw models are best applicable to profitable and sufficient companies; Altman's, Taffler & Tisshaw, Lis and Zavgren are best applicable to profitable, but insolvent companies; all bankruptcy prediction models were applicable to unprofitable, but sufficient companies; when company is not only unprofitable, but also insolvent Altman's, Taffler & Tisshaw, Lis and Springate models could be applied.

As mentioned before models of bankruptcy prediction aren't applicable to every country and every sector. As in this thesis it will be investigated possibilities to apply bankruptcy prediction models in transportation sector in Lithuania it is important to overview what is already done in this research field.

However, as Lithuania is one of the leading countries in Europe in transportation, it is also hard to find scientific works made in this field in foreign countries. Chava and Jarrow (2004) investigated importance of industry effects on bankruptcy prediction and one of ten investigated industries was transportation sector. It was noted that groupings of industry significantly affect

[8] Kanapickienė, R., Marcinkevičius, R. „Possibilities to apply classical bankruptcy prediction models in the construction sector in Lithuania", *Economics and management*: 2014. 19 (4)

intercept and slope coefficients in equations prediction. In Lithuania Jurevičienė and Bercevič (2013) for Lithuanian carrier companies applied Altman, Springate, Taffler & Tisshaw, Liss, Zavgren, Chesser models and investigated 10 companies (5 which already failed and 5 which are still working). Research considered data of three years before companies' bankruptcy.

2. Companies' bankruptcy risk

Bankruptcy prediction of company is a way to evaluate company's condition, determine negative trends and its probability of bankruptcy. The sign to proceed bankruptcy prediction analysis is when company lacks working capital to execute its main activity. However, it can be complicated to compare company's condition during different period of time or compare it with another similar company during the same period of time due to huge amount of data and criteria. For example, the same probability of bankruptcy can be determined by different combinations of financial and economical ratios. It explains effort to find integrated ratio that could be able to determine bankruptcy threat. So, models of bankruptcy prediction aim to use complex ratios, that would include different company's activity fields and determine the threat of bankruptcy according established critical values.

In the third decade of 20th century it was started to look over for these complex ratios or systems of ratios that would define probability of bankruptcy.[9] According to most researches that have been done, bankruptcy prediction is the most accurate when the data of financial statements is used. What is more, to find the roots of bankruptcy it is recommended that the term of financial data analysed would not be shorter than five years what means the amount of data which needs to be analysed is quite big and because of high amount of data generated by information technology users it is usually looked for ways to make statistical analysis automatic. One of the ways is applying machine learning methods and the most popular of them is artificial neural networks.[10] However, these artificial intelligence models are still quite new and barely investigated comparing to researches done using classic bankruptcy prediction models. Meanwhile, traditional bankruptcy prediction models are also questioned by today 's scientists if they are still capable to predict companies' bankruptcies and whether can they reflect the real situation of today 's business.

Most of the researches analyse only financial ratios and investigate whether specific model is able to forecast the bankruptcy. But as mentioned before, the company's probability of default increases when it lacks working capital and even though company manages its financials very carefully, sometimes external changes such as new laws, regulations can increase costs and company can face problems managing it what increases the risk of bankruptcy.

So, the purpose of this study is to perform analysis based on post-event approach using the historical data in regression analysis and Altman 's discriminant analysis models and compare whether and how political events impact companies' risk of bankruptcy. The last international politics

[9] Garškaitė K. *Įmonių bankroto prognozavimo modelių taikymas.* Verslas: teorija ir praktika. 2008, nr. 9(4)

event who has direct impact for transportation companies in Lithuania have been selected – it is Mobility package.

2.1. Transportation sector – indicator of economic condition

Lithuanian transport and logistics sector are counting probably the best results in history. Its companies do not lack optimism for the future either - only a few such doubts arise about the requirements of the Mobility Package, Brexit and the US-China trade war. The economic slowdown is not intimidating for the sector - its leaders believe that the transport sector is the business that is recovering or even winning the most during the crisis. Statistics show that the Lithuanian transport and storage sector generates 13% of the country's GDP, half of which is accounted for by road freight transport. The sector is also important and interesting in that, like no one else, it feels changes in business early on. Therefore, the sector can be called an indicator of economy of the state.

Representatives of road haulage companies are most concerned about the Mobility Package being debated in the European Parliament: hauliers believe that if the requirement to return the truck to the country of registration once every 4 weeks is adopted, significant changes can be expected in the transport market. Some carriers are preparing for possible difficulties in advance. They started to set up companies in western European countries and register their trucks there, what means tax paid in Lithuania loss.

2.2. The main economic indicators of the country's transportation sector

In the first half of the 2019, the Lithuanian economy grew much faster than forecasted. Country’s gross domestic product grew 4.1 percent in the first half of the year. Together with it grew the added value of transportation sector. Export of transportation services was increased by 23.4 percent by export increasing to all major European Union and Eastern European countries - Germany, Russia, France, Denmark, Belarus. Development of the sector into new markets, growth in existing markets, and implementation of new activities also increased the income of companies in the sector by 11.1 percent.

Table 2. Statistics of Lithuanian transportation and storage sector

	Y2018 IH	Y2019 IIH	Change 18/19, %
GDP	18915,6	20307,9	7,4
Transport and storage, mln. EUR	2245,6	2486,0	10,7
Transport and storage contribution, %	11,9	12,2	
Transport and storage income, bln. EUR	5,280	5,865	11,1
Number of employees	121 537	135 050	11,1
Number of companies	7 706	7 950	3,2
Export of transport services, bln. EUR	2,684	3,313	23,4

Sources: Statistics Department of Lithuania, Bank of Lithuania

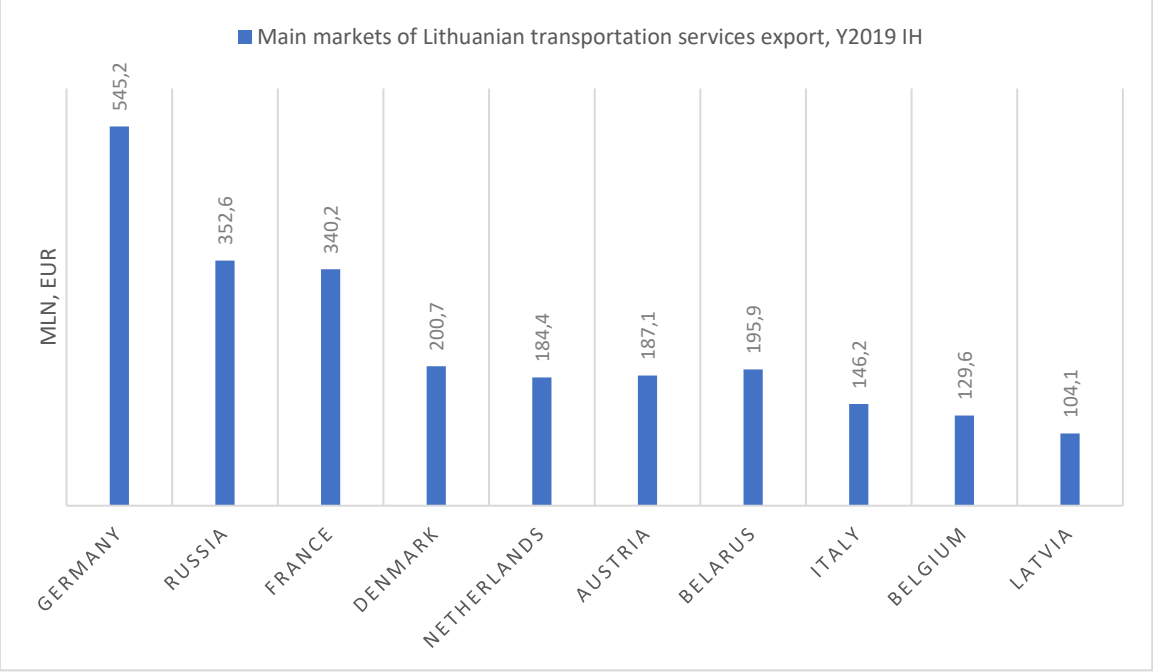

Figure 4: Main markets of Lithuanian transportation services export

Sources: Statistics Department of Lithuania, Bank of Lithuania

The importance of the transport and storage sector in the Lithuania is obvious. Lithuania is the most importing country in the Europe. The transport and storage sector is also significant in the context of tax collection. Based on the statistical data of the State Tax Inspectorate (hereinafter - STI), it was clarified that in 2014–2018 the amount of taxes collected jointly in transport and storage

economic activities showed an upward trend. During this period, the average annual growth rate was 41.33 percent. The important role of the transport and storage sector is also noticeable in 2018. In terms of total taxes collected, taxes paid by the transport and storage sector were in fourth place, ranking the sector from the highest to the lowest tax-paying legal entities (wholesale and retail trade; repair of motor vehicles and motorcycles - in the first place; in the second place – manufacturing; in the third place - real estate operations; in the fourth place - transport and storage). In other words, 6.11% from the jointly collected taxes to the account of the State Tax Inspectorate were paid by transportation and storage sector in 2018.

2.3. Mobility Package

Mobility package was created by European Union and Parliament of European Union declares that the Mobility Package aims to improve the situation of long-distance drivers. The main changes in the Mobility Package:

1. Obligation on the haulier to organize the work of the fleet in such a way that they can return to the haulier's control centre in the Member State of establishment for at least 8 weeks in the period after departure;
2. Revision of cabotage rules - 4 days "cooling down" period after cabotage operations.
3. Obligation on the employer to organize the work in such a way that the driver can return every 4 weeks before the start of the relevant weekly rest to the haulier's control centre in the Member State of establishment or to the driver's place of residence;
4. Tightening of roadside inspections to + 56 days (provision of data to inspection officers)

The mobility package is mainly supported by old EU members from western Europe, such as Germany and France. Meanwhile, Lithuania, Latvia, Poland, Hungary, Bulgaria called on the EU institutions to postpone the adoption of the provisions of the Mobility Package until the end of the coronavirus pandemic and the assessment of its impact on the transport sector.

If the Mobility package will be implemented without any significant changes it will have huge impact for Lithuanian transportation sector as many bigger and stronger companies are ready to register their businesses in Western European countries while the smaller ones would not be able to drive in Western countries at all due to negligible requirements and too high costs. It will be more difficult for Lithuanian carriers to compete with companies from western and central EU Member States. Due to Lithuania's geographical location, the country's transport companies find themselves in a less favourable position in implementing the requirements of cabotage, returning drivers and tugs to the centre of activity. LINAVA (Lithuanian National Association of Road

Carriers) estimates that the challenges for the country's economy in the freight transport sector due to the implementation of the Mobility Package for Lithuania will be about 1.6 percent. GDP losses. It is also projected that almost 35 thousand will lose their jobs. persons working in the sector.

2.4. Impact of Mobility Package to bankruptcy risk

The empirical part of this study consists of two substantial sections – discriminant analysis and regression analysis. An analysis of the event of interest is performed, i.e., announcement of Mobility package general approach by the Council of the European Parliament in December of 2018. The period preceding this event is considered as normal performance according to the level of bankruptcy risk. Then the analysis of the development of credit risk levels connected to Mobility package is made. It allows to make appropriate inferences. The regression analysis aims to find out whether the effects of Mobility package can explain the variation in probability of default (PD).

Discriminant analysis

The multivariate statistical technique known as discriminant analysis is by far the most widely used method for bankruptcy risk analysis. Models of linear discriminatory analysis were developed earliest and they still are the most popular (Mackevičius, Silvanavičiūtė, 2006, p. 94). These models are expressed in linear function that determines dependency between dependant variable – probability of bankruptcy (Z) and independent variables – financial ratios (X_i). The most common linear discriminant analysis model can be expressed like this:

$$Z=a+b_1X_1+b_2X_2+....+b_nX_n$$

However, as mentioned before, in this work the Altman‘s linear discriminant analysis for companies whose shares are not traded on stock exchange will be used and this formula is expressed:

$$Z = 0.717 \cdot \frac{\text{working capital}}{\text{total assets}} + 0.847 \cdot \frac{\text{retained earnings}}{\text{total assets}} + 3.107 \cdot \frac{\text{earnings before interest and taxes}}{\text{total assets}} + 0.420 \cdot \frac{\text{market value of equity}}{\text{total debt}} + 0.995 \cdot \frac{\text{sales}}{\text{total assets}}$$

Z means probability of bankruptcy: if Z < 1,23 – very high, (1,23; 2,90) – possibility of bankruptcy, >2,90 – very low;

Regression analysis

After assessment of the probability of default changes during investigated time period for selected companies using Altman's model, panel regression will be made to study the relationship between PD and selected main variables of research interest. According to this that dataset has both cross-sectional and time-series properties (i.e. variation over cross-sectional units and over time), panel data analysis is considered to be the most appropriate econometric approach.[11] Moreover, according to Baltagi (2005), panel regressions offer many advantages. Selecting this approach (as opposed to estimating individual regressions) is not only less time-consuming, but it also allows to observe more variation in the data, gives more freedom (improved explanatory power) and helps to get rid of some collinearity problems. Assuming that heterogeneity is present in the dataset, it is needed to make some decisions regarding the choice of error component models (i.e. fixed or random effects model) and the choice of dimension in which the respective models should be applied.[12] The regression analysis will be made using EViews program.

2.4.1. Variables in bankruptcy prediction models

As it can be seen, a very wide range of bankruptcy prediction models can be detected in the scientific literature. P. D. Jardin (2009) examined 190 studies related to bankruptcy prediction model development, singled out the most frequently recurring variables in the models, among which financial indicators are the most popular due to their economic importance:

Table 3. Variables frequency in bankruptcy prediction models

Variable	Financial ratios	Statistical variables	Change variables	Non-financial variables	Market variables	Financial market variables
Frequency	93%	28%	14%	13%	6%	5%

Source: Jardin P. D. Focus on bankruptcy prediction models: how to choose the most relevant variables, 2009

[11] Wooldridge, J.M. (2013). *Introductory Econometrics: A Modern Approach*. 5th ed. Mason, OH: South-Western CENGAGE Learning.
[12] Brooks, C. (2014). *Introductory Econometrics for Finance*. 3rd ed. Cambridge University Press.

Ever since bankruptcy prediction models have been created the most used variables were financial ratios because of their economic character. They are easy to collect, count, check and to compare. However, their predictability is not absolute. But non-accounting data is even harder to collect – for example financial markets data can be collected only for companies whose stocks are listed. Back et al. (1994) showed that a model built with financial ratios alone might give better results than a model where common financial variables (assets, debt, income) were used. Keasey and Watson (1987) compared results obtained with three different models to determine whether a model including non-financial variables, either alone or in conjunction with financial ratios, would make better predictions than a model based solely on ratios. The model using financial and non-financial indicators led to better results than the two others and the ratio-based model was a bit more accurate than the model based on non-financial variables.

However, many researches proved that even though some variables were indicated as significant in forecasting bankruptcy in some circumstances, they might not be so effective in others. When confronted with other samples, not with those who were used to design them, all studies that attempt to test the behaviour of models such as Altman's (1968) or Ohlson's (1980) come to the same conclusion: original models always achieve poor results, and even when their coefficients are re-estimated, the results are weaker than those who were obtained using original values (Grice and Dugan, 2003). So, not even prediction of bankruptcy is hard itself, but firstly it is not so easy to find the right variables and the right model that can be applied to specific company, sector, country or region. This might be the reason why there is no global theory explaining the phenomenon of failure.

Dependent variable

Dependent variable: the probability of default of a company;

Independent variables *(Table 4)*

Variable	Expected impact	Representation of	Explanation
ROA	+	Company's profitability	Higher profitability means lower PD
DEBT_TO_EQUITY	-	Company's leverage	Higher leverage means higher PD

QUICK_RATIO	+	Company's liquidity	Higher liquidity means lower PD
COSTS_TO_SALES	-	Company's Expenses	Increasing expense mean worse compensation for risk; PD increases (higher default risk)
WORKING_CAPITAL_TO_ASSETS	-	Company's financial strength	ability to finance short term obligations; PD increases when ratio decreases
NEW_VEHICLES_REGISTRATION	-	Overall strategy of transportation companies	Stable or increased registration of new vehicles means that companies feel good about upcoming changes and feel safe what means lower PD
MOBILITY PACKAGE_DUMMY	+	Mobility package announcement event	Mobility package uncertainty means higher PD

2.4.2. Data of companies of transportation sector

Historical data was chosen to derive better results. In the research 5 biggest SME Lithuanian transportation companies who worked during years 2016-2019 will be investigated. Only five companies were chosen as all transportation companies in Lithuania are private limited liability companies and do not publish their financial statements publicly and it can only be bought from Register Centre.

It is important to mention that the aim of this research is to see the general trend if there is any increase in probability of default after the general approach of the Mobility package was announced.

3. Assessment of Mobility Package impact to bankruptcy risk

The research hypothesis is formulated in the following way:

H0: The probability of default of transportation companies in Lithuania has not increased after the announcement of general approach of mobility package.

H1: The probability of default of transportation companies in Lithuania has increased after the announcement of general approach of mobility package.

3.1. Probability of default

Using the above-mentioned Altman's formula, the change in probability of default during period of 2016-2019 for each investigated company was assessed. As shown in the graph below, the average probability of default estimated for the Lithuanian transportation companies increased in 2018 - the year when the general approach of mobility package was made.

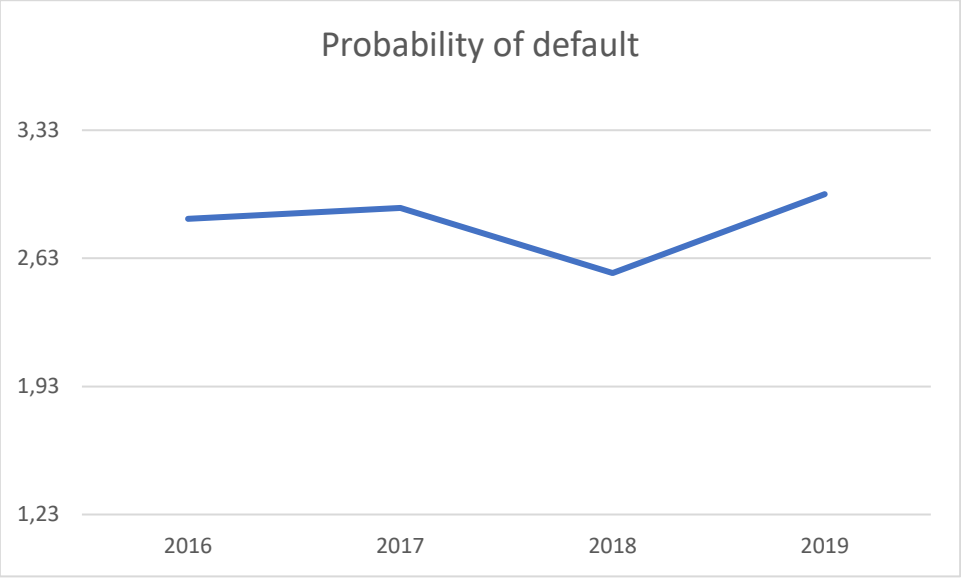

Figure 5: Changes in probability of default during investigated period of Lithuanian SME transportation companies
Source: Investigated Lithuania SME companies' financial data

Even though received results give an idea about whether hypothesis that the probability of default of transportation companies in Lithuania has increased after the announcement of general

approach of mobility package is supported by the data or not, direct conclusions cannot be made just yet because no formal hypothesis testing has been carried out. The purpose of this chart is to capture the trends and developments in the estimated probability of default values during investigated period and set the scene for the regression analysis.

The indicators used in the formula will be briefly reviewed below:

Figure 6: ratios used in Altman's Z score formula

Source: Investigated Lithuania SME companies' financial data

As seen in the graphs above most of the ratios that were investigated in discriminant analysis have changed their direction in 2018. Companies' ability to finance short term obligations got weaker as well as efficiency of usage of assets to generate income as both ratios dropped. Sales to total assets also dropped in 2018 what shows that more capital investment was required. Two ratios were growing: retained earning to total assets and market value of equity to total debt. However, it is important to mention that as companies are private limited liability companies the market value of equity can not be calculated so it is assumed that the book value is in line with the market value. Retained earnings to total assets is a ratio that measures profitability of assets of an entity and it can be seen in the graph that this ratio grew more intensively after 2018. As market value of equity to total debt grew significantly after 2018 it can be assumed that companies' debt was lowering as bank did not lend the money and the valid loans amortised as well as more trucks were redeemed before term as companies tend to registrate them in other countries.

3.2. Impact of Mobility Package to probability of default

As discriminant analysis showed that probability of default increased in 2018 it is worth to check whether the Mobility package had impact to this change. But firstly, prior to running regression analysis, the choice of error component models (i.e. fixed/random effects) is important modification which have to be implemented. Following the standard approach, it was started by estimating each model, arriving at the conclusion that heterogeneity was present in the dataset, so pooled OLS regression was not an option as this model pool all 20 observations together and run the regression model, neglecting the cross section and time series nature of data. The major problem with this model is that it does not distinguish between the various transportation companies that research investigated. In other words, by pooling all investigated companies together the individuality is being denied that may exist among investigated companies. So, then it was estimated the model with random effects and the Hausman test was performed (included in EViews by default). The results showed statistically significant P-value, which suggested that fixed effect model should be used. If the Hausman test would have been shown statistically insignificant P-value, then random effect model would have been used.

Effects Test	Statistic	d.f.	Prob.
Cross-section F	17.283389	(4,8)	0.0005
Cross-section Chi-square	45.321938	4	0.0000

Figure 7: results the Hausman test
Source: EViews

Having addressed the econometric technicalities of model, the regression specifications will be presented. The general equation is presented:

PD = COSTS_TO_SALES + DEBT_TO_EQUITY + QUICK_RATIO + ROA + WORKING_CAPITAL_TO_ASSETS + NEW_VEHICLES REGISTRATION + MOBILITY_PACKAGE

Moving on to the estimation results, it should be noted that the test variable (which is essential for the tested hypotheses) is basically only one (MOBILITY_PACKAGE), while other variables act as controls and will be commented on only briefly.

Dependent Variable: PD
Method: Panel Least Squares
Date: 11/05/20 Time: 14:52
Sample: 2016 2019
Periods included: 4
Cross-sections included: 5
Total panel (balanced) observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.132024	2.689262	-0.420942	0.6849
COSTS_TO_SALES	-6.279379	4.962972	-1.265246	0.2414
DEBT_TO_EQUITY	-0.013068	0.012082	-1.081591	0.3110
QUICK_RATIO	0.769490	0.642001	1.198582	0.2650
ROA	8.200743	1.955555	4.193564	0.0030
WORKING_CAPITAL_TO_ASS	-1.315539	1.580810	-0.832193	0.4294
NEW_VEHICLES_REGISTRAT	0.000326	0.000239	1.365485	0.2093
MOBILITY_PACKAGE	-0.795393	0.613671	-1.296123	0.2311

Effects Specification

Cross-section fixed (dummy variables)

Root MSE	0.161501	R-squared	0.974330
Mean dependent var	2.820517	Adjusted R-squared	0.939033
S.D. dependent var	1.034183	S.E. of regression	0.255356
Akaike info criterion	0.391391	Sum squared resid	0.521652
Schwarz criterion	0.988831	Log likelihood	8.086089
Hannan-Quinn criter.	0.508018	F-statistic	27.60388
Durbin-Watson stat	1.263832	Prob(F-statistic)	0.000038

Figure 8: results of panel regression

Source: EViews

Despite huge agitation in media and banks on the Mobility Package in 2018 when the general approach of Mobility package was announced, the effect on probability of default is rather low and statistically insignificant. It can be said that the attention of this event was even bigger in 2018 than in July 2020 when the Mobility package was actually approved and it became clear that by 2022 it will be fully implemented. However, the negative coefficient shows that it actually has the negative effect to the probability of default. As mentioned, Mobility package most likely will be in effect starting 2022 eliminating existing competitive advantage through lower cost base. But as it is seen changing regulation puts additional pressure for the industry even before they are fully implemented. It is good that there is enough time for companies to regain financial strength which will be damaged over the coming period having in mind COVID-19 uncertainty and higher costs preparing for new ways of working when Mobility Package starts to work.

Remaining explanatory variables on probability of default measure behave in the expected way – costs to sales, debt to equity and working capital to assets had negative effect on probability of default as they all grew in 2018 making tense in then relations between banks and businesses while other independent variables quick ratio, ROA and new vehicles registration had positive effect – these ratios and especially quick ratio is very important to observe during unfavorable changes because liquidity might the answer to many problems as it was shown also during COVID-19, Lithuanians coped with crisis quite smoothly at least until now as banks' reports showed that Lithuanians have one of the largest deposits.

So, Hypothesis H1: *The probability of default of transportation companies in Lithuania has increased after the announcement of general approach of mobility package* can be partially approved, as the research results show that probability of default has increased after the voting of general approach.

3.3. Diagnostic testing

In a regression analysis, there is a variety of potential issues related to the chosen variables which could cause bias, inefficiency or simply could give wrong results of estimations if they are left untreated. These issues are addressed by performing diagnostic tests and evaluating most important rations. Some of the issues that usually appear in basic OLS regression are, in case of panel regressions, resolved straight away – e.g. possible residual autocorrelation in one or both dimensions is handled by using fixed or random effects.

One of ratios that is important to check is Prob(F-statistics) – if it is less than 5%, it means that all independent variables together have influence to probability of default. Another ratio

is R-squared – it equals one if the regression fits perfectly, and zero if it fits no better than the simple mean of the dependent variable. In this research case R-squared is 0.97.

The remaining most relevant diagnostic test to detect other econometric issues therefore is non-normality test *(refer to Annex 1)*. Testing for non-normality is carried out by examining the distribution of residuals (histogram) and the significance of the Jarque-Bera statistic. Probability is 36% which shows that residuals are normally distributed.

Conclusions

The purpose of this study was to determine and evaluate the extent to which Mobility package affects the levels of corporate credit risk in the Lithuanian transportation sector companies. Moreover, because this specific topic has not been researched as extensively as this sector is important to country's GDP, this research study also aimed to extend the existing literature and advance the understanding of the presented phenomena. As mentioned before, it is important to note that the aim of this research was to see the general trend if there is any increase in probability of default after the general approach of the Mobility package was announced.

The credit risk measure selected for the purposes of this study was the probability of default (PD). Data-collection process resulted in a set of yearly data for 5 companies over a 4-year period. Firstly, it was used Altman model to obtain the probability of default estimates and, finally, results included in panel regression as a dependent variable, together with a set of explanatory variables and Mobility package dummy variables.

The empirical results suggest the expected effects of Mobility package on credit risk in Transportation sector in Lithuania. The announcement of Mobility package general approach has had negative effect on the probability of default. However, as effect came out statistically insignificant, the possible reasons for such result are likely the sample selection. It is way harder to evaluate political decisions impact for companies whose stocks are not traded in stock exchange market, as the change in stock price is very sensitive and moves with every announcement. Nevertheless, this research shows that even private limited liability companies do feel impact and it can be evaluated from financial statements. In more general terms, the effect of Mobility package on the risk of bankruptcy, described by many as rather adverse, seem to be actually smaller in magnitude. Consequently, it may be the case that the real effects are artificially inflated by the market sentiment as well as other external factors such as media.

Apart from the more general implications of Mobility package such as the decrease of GDP, there can be pointed out very specific implications related directly to probability of default. The increase in probability of default of companies following Mobility package events essentially translates to higher credit risk – for companies, this usually means worse financing terms and generally more expensive debt[13]. In times of increased uncertainty following Mobility package, this

[13] Antunes, A., Gonçalves, H. and Prego, P. (2016). Firm default probabilities revisited. In: *IFC-ECCBSO-CBRT Conference on "Uses of Central Balance Sheet Data Offices' information".* Bank for International Settlements, pp.21-27. https://www.bis.org/ifc/publ/ifcb45i.pdf [20 November 2020].

might lead to lower investment activity as the companies could refrain from taking on new debt to finance their expansion. More and more companies are not only not expanding their fleet in Lithuania, but decreasing it. Even though the sales of trucks in Lithuania are still high, but the percentage of trucks bought in Lithuania, but registered in Poland are growing rapidly. Especially, it started to grow in 2020 and it is forecasted that in upcoming two years the real effect of mobility package will be even stronger for Lithuanian economy. Even though, as mentioned in literature review Poland also sees themselves as the ones who will experience loss from the Mobility package. While Germany and other Western European countries find the existing regulation unfavourable to them as the competetive advantge is definetly in Eastern countries side due to smaller administrative costs and simpler regulation of work relations. As the main idea of European Union is solidarity of memeber states this controversial situation can lead to questioning the whole system.

Suggestions for future research

Due to the aforementioned lack of research concerning bankruptcy risk relation to Mobility package, this particular field of investigation still has a lot of potential in terms of further research. Future studies may focus on corporate credit risk pertaining also to small cap firms in the light of Mobility package events. As bigger firms such as those used in the present study, have more resources and more international reach. Another suggestion would be to do the similar research after 2-5 years, when the mobility package will be fully implemented. And finally, the impact for the Lithuanian economy could be evaluated after 5 years of the full Mobility package implementation.

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SANTRAUKA

Laura Deikutė

MOBILUMO PAKETO ĮTAKA LIETUVOS TRANSPORTO SEKTORIAUS ĮMONIŲ BANKROTO RIZIKOS VERTINIMUI

Magistro darbas

Darbo vadovė: prof. dr. Rasa Kanapickienė

Vilniaus universitetas, Ekonomikos ir verslo administravimo fakultetas

Finansai ir bankinkystė

Vilnius, 2021

41 puslapis, 8 iliustracijos, 4 lentelės, 13 nuorodų

Pagrindinis šio magistro darbo tikslas yra įvertinti Mobilumo Paketo poveikį transporto sektoriaus įmonių bankroto rizikos vertinimui Lietuvoje.

Magistro darbą sudaro trys pagrindinės dalys: literatūros analizė, tyrimas ir jo rezultatai, išvados ir rekomendacijos.

Literatūros analizė apžvelgia bankroto sampratą, bankroto prognozavimo modelių klasifikavimą ir taikymą.

Tyrime tirtos 5 didžiausios MVĮ Lietuvos transporto įmonės. Buvo naudojami įmonių 2016–2019 m. Metiniai finansiniai duomenys. Pirma, Altmano modelis buvo naudojamas norint sužinoti, kaip pasikeitė įsipareigojimų neįvykdymo tikimybė tiriamu laikotarpiu. Po to pirmojo tyrimo rezultatai panaudoti regresinėje analizėje. Įsipareigojimų nevykdymo tikimybė, buvo naudojama kaip priklausomas kintamasis, kartu su aiškinamųjų kintamųjų rinkiniu ir mobilumo paketo fiktyviu kintamuoju.

Tyrimo rezultatai parodė, kad bendrųjų Mobilumo paketo nuostatų paskelbimas neigiamai paveikė įsipareigojimų nevykdymo tikimybę. Tačiau, kadangi poveikis pasirodė statistiškai nereikšmingas, tikėtina, kad tokio rezultato priežastys yra imties atranka. Kur kas sunkiau įvertinti politinių sprendimų poveikį įmonėms, kurių akcijomis neprekiaujama biržos rinkoje, nes akcijų kainos pokyčiai yra labai jautrūs ir juda su kiekvienu pranešimu ar įvykiu pasaulyje.

Išvadose ir rekomendacijose apibendrinamos pagrindinės literatūros analizės sampratos ir atliktų tyrimų rezultatai. Tyrimo rezultatai galėtų suteikti naudingų gairių tolesniems tyrimams ir padėti transporto sektoriuje dirbančioms įmonėms įvertinti riziką ir galimą išlaidų padidėjimą.

SUMMARY

Laura Deikutė

IMPACT OF MOBILITY PACKAGE FOR BANKRUPTCY RISK ASSESSMENT IN TRANSPORTATION SECTOR IN LITHUANIA

Master Thesis

Academic supervisor: prof. dr. Rasa Kanapickienė

Vilnius University, Faculty of Economics and business administration

Finance and banking

Vilnius, 2021

41 pages, 8 figures, 4 tables, 13 references

The main purpose of this master thesis is to evaluate the impact of the Mobility package to bankruptcy risk assessment of transportation sector companies in Lithuania.

The Master thesis consists of three main parts; the analysis of literature, the research and results of it, conclusion and recommendations.

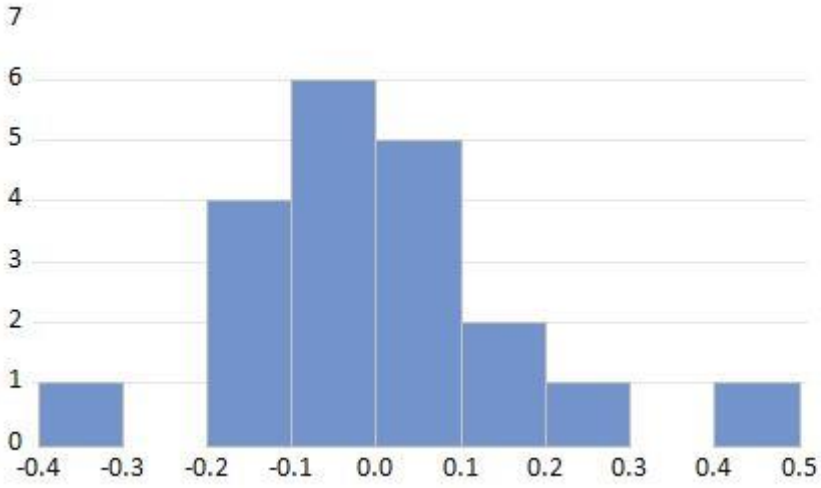
Literature analysis reviews the concept of bankruptcy, classification and application of bankruptcy prediction models.

5 biggest SME Lithuanian transportation companies were investigated. Annual financial data of 2016-2019 of companies were used. Firstly, Altman's model applied to see how probability of default changed during investigated period. After that the results of first research used in regression analysis. Probability of default used as dependent variable together with a set of explanatory variables and Mobility package dummy variables.

The research results showed that the announcement of the Mobility package general approach has had negative effect on the probability of default. However, as effect came out statistically insignificant, the possible reasons for such result are likely the sample selection. It is way harder to evaluate political decisions impact for companies whose stocks are not traded in stock exchange market, as the change in stock price is very sensitive and moves with every announcement.

The conclusions and recommendations summarise the main concepts of literature analysis as well as the results of the performed research. The results of the study could give useful guidelines for further researches and for companies that work in transportation sector to evaluate risks and possible increase in costs.

Annex 1



Series: Standardized Residuals	
Sample 2016 2019	
Observations 20	
Mean	-1.67e-17
Median	-0.011537
Maximum	0.421876
Minimum	-0.326063
Std. Dev.	0.165697
Skewness	0.663007
Kurtosis	3.798314
Jarque-Bera	1.996349
Probability	0.368552