Measuring the Risk of Bankruptcy in the Romanian Economy. Developments and Perspectives

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Abstract. *The paper presents the dynamics of a series of indicators considered by the supervisory authorities in Romania to analyse the risk of bankruptcy, but also the financial risk for the Romanian economy, aiming to indicate a perspective on the future evolution of these risks, taking into account the economic context, the situation generated by the Covid-19 Pandemic, but also the inflationary environment of the last year. We considered it important to start with the indicator for financial health, an indicator calculated at an aggregate level for all companies in Romania from the non-financial area, but also divided into subcategories that can provide important information regarding the health of companies and the risk of becoming insolvent. Also, the liquidity area has a considerable weight in the results obtained by these companies in the financial health score, and these aspects represent, in turn, indicators that can provide information about the bankruptcy risk of companies within an economy. To analyze the financial health, we followed the evolution of a series of other indicators, such as* return on equity *(ROE), the degree of long-term debt and the degree of short-term debt, indicators that provide additional information regarding the risk of bankruptcy, the financial risks of the companies, meaning the financial health of companies. The analysis of the dynamics and structure of the stock of loans for which rates have been suspended represents, at present, an important way to assess the risk of bankruptcy among non-financial companies in Romania, offering a better perspective regarding the bankruptcy risk of companies and the area where this type of risk is more concentrated. The last part of the paper was dedicated to a specific problem of the local economy and companies in our country, that of commercial credit, but also the level of insolvencies. Given that the banking level of the Romanian economy is a low one, a good part of the companies relies on commercial credits, and the chain of dependence built over time is extremely important for the smooth functioning of the economy. Therefore, the bankruptcy risk at the aggregate level and the financial risks were also analyzed from the perspective of insolvencies and commercial credit, these being two aspects that weigh extremely heavily, especially in an economy like Romania's.*

Keywords: bankruptcy risk, sector of activity, liquidity, comparative analysis

JEL Classification: D81, E32, G32, G33

1. Introduction

In today's civilization, the issue of risk is an important one and considered at most levels. It can be said that human history has been marked by risks and uncertainties, but only in the last decades or the last century have we become more aware and decided to measure the risks taken by different methodologies and look at risk from a scientific perspective. Assessing, modeling and measuring risk is a very complex activity, often requiring multidisciplinary approaches and the application of knowledge from different fields, such as economic, sociological, political, but especially from a technical, mathematical point of view and IT. The success we have in

measuring risk has a direct impact on how various activities are carried out and decisions are made at the macro level, but also at the micro level.

Financial risks and the risk of bankruptcy are extremely important aspects for the health of an economy and maintaining its stability. In this sense, a careful and thorough supervision of these risks is necessary, and it is required to calculate and develop a series of indicators to monitor and establish certain tolerance thresholds. Considering all these elements, I decided that in this paper I will present a series of theoretical, but also empirical aspects regarding the risk of bankruptcy and financial risks for the case of Romania, starting from the way in which these risks can be tracked, highlighting their dynamics in recent years.

In order to achieve this approach, we considered a series of reports and analyzes published by the National Bank of Romania, but also by the ASF (Financial Supervision Authority), these being the main institutions with a determining role in the area of financial risk supervision and of bankruptcy. At the same time, I also aimed to highlight what could be the directions that different lending institutions could follow when it comes to managing bankruptcy risk or financial risk, for the exposures they have and for their own portfolio, using articles scientists who have carried out research in this area, proposing models and indicators that can capture the two types of comprehensive risks considered.

2. Scientific literature

A number of more recent scientific papers and articles address the issue of bankruptcy risk. One of the extremely important works is the one published by Armeanu et al. (2012) or by Moraru and Brăila (2007), through which they analyzed and discussed techniques regarding the identification and assessment of bankruptcy risk at the level of corporations. They tried to combine the classical methods of analysis with the latest and more complex methodologies, those based more on probabilistic models. These works are joined by the research published by Grigorescu (2018) or Brîndescu-Olariu (2017) who sought to further develop the methodologies that could be the basis of not only the prediction, but also of the analysis of the bankruptcy risk for different companies.

Recently, there were papers published that brought the idea of bankruptcy risk research in the context of the latest crises that appeared in the European economies, but also in the global economy. The work written by Lupascu and Baciu (2021) can be brought into discussion, which addresses the problem for the case of the Republic of Moldova. On the other hand, the paper of Stanciu (2020) can be mentioned, through which performance optimization and risk management methods are addressed.

In addition to these articles that address methods, both classical and more recent, of bankruptcy risk analysis, we also mention the article published by Baciu, Petre and Simion (2020), in which they applied Z-Score (Altman) for risk analysis of insolvency in the auto components industry in Romania. The three authors chose this industry because it is an extremely important one for Romania, contributing to a good part of our country's GDP and being a sector through which our country's economy is strongly correlated with Germany and the Eurozone. Thus, the assessment of the risk of bankruptcy for this area is an extremely important aspect, it may even be a problem of stability at the level of the Romanian economy, there is a risk of destabilization at the macroeconomic level if a strong shock occurs in this sector.

Bankruptcy risk was analyzed from a more advanced and deeper perspective by Dincă et al. (2017). They used a model based on logit and probit regressions to make predictions regarding the insolvency risk of some Romanian companies. The models were successfully applied and gave a certain dimension to the insolvency risk that occurs at the level of companies in Romania. However, there could be some

shortcomings to the study and the approach the authors took. From my point of view, the methodology used is a very suitable one and has brought good results countless times in other researches, but I believe that it would have been better to focus on a certain sector or several sectors of interest for our country, as Baciu, Petre and Simion (2020) did. In this way, the results could have been compared with each other for sectors of interest for our country and could have led to conclusions to be integrated at the level of a country policy regarding the support of a certain activity sector. Morever, this approach can be integrated by commercial banks or central banks considering the lending strategy.

An analysis in the sense of the one we proposed as an improvement for the research of the authors Dincă et al. (2017), is that of Popa (2019), who focused on the sector of energy companies, within the limits of those listed on the Stock Exchange Bucharest. This sector, successively, is essential for Romania's economy and one on which the proper functioning of the other sectors in the economy depends. In the situation where a number of companies in the energy sector would encounter problems, I believe that there is a risk that these problems will spread to other economic sectors and, finally, destabilize the Romanian economy. Thus, the importance of analyzing this sector is demonstrated from the point of view of stability, the risk of insolvency, but also from the point of view of performance, considering that many of the companies are listed on the Bucharest Stock Exchange (BVB), and the shareholders have expectations that these companies will perform and bring good returns, both through the perspective of the market price evolution and through the perspective of the dividend yield that these companies grant each year.

I believe that Popa's research (2019) could have been improved by a comparison of the results obtained for the energy sector in Romania with other energy sectors in other countries. Thus, by comparing the results we could form a better picture in terms of performance and stability, considering the specifics of the industry. It is difficult to compare the results for companies in the energy sector in Romania with other companies in Romania in other sectors of activity, given that there is an important difference in terms of the specifics of each industry, and this can be transposed to a different level of risk assumed or performance. Also, the fact that the Romanian state is the majority shareholder of many companies in the energy sector would lead to a significantly lower risk of insolvency and bankruptcy compared to other companies that do not have the Romanian state as a majority shareholder, and this could lead to the distortion the results obtained.

A research that partially developed the work in the direction of the observation I made for Popa's article (2019) is that of the authors Bărbuță-Mișu and Madaleno (2020). The two authors made a comparison regarding the risk of bankruptcy for a number of companies in the European Union, being analyzed in detail and the evolution over time, in order to be able to draw conclusions regarding the impact of certain events on the way in which those companies were administered in turbulent times.

Another important direction in which researches have been directed recently is the application of a series of artificial intelligence algorithms (machine learning) for modeling different risks or for making classifications or predictions. In this sense, works have appeared that aimed to use machine learning algorithms to identify the risk of bankruptcy or to classify companies from the point of view of this risk. The paper published by Prodan-Palade (2017) is an important one that can be used in the context of machine learning algortihms applied for analysing bankruptcy.

An important article that caught my attention is that of the authors Voda, Dobrotă, Tîrcă, Dumitrașcu and Dobrotă (2021). They tried to develop, based on artificial intelligence algorithms, a prediction model for the risk of insolvency or

bankruptcy using machine learning algorithms and the results were put in an economic context.

Also, the same direction of complex prediction models based on classifiers is represented by the article of authors Arinichev and Bogdashev (2017) by applying these algorithms at the level of small companies. The two authors tried to identify the risk factors, the factors that could increase the risk of going bankrupt, especially for small companies, which generally have the lowest level of risk management, not having developed complex administration systems, from different rationales, and the most important one is that of low resources. Another article that developed exactly the same type of analysis was that of Clement (2020), this one using several methods based on machine learning algorithms to make predictions regarding the bankruptcy of some companies. This problem is one of classic classification, and machine learning algorithms are very suitable to find a solution of this kind, which is the reason why more and more research has been developed in this direction for the case of corporate finance.

3. Developments regarding the risk of bankruptcy for non-financial companies in Romania

It is known that many of the companies in Romania are undercapitalized, and access to financing is made difficult because this. On the other hand, financing costs can often be prohibitive for different fields of activity, where profit margins are lower, and the interest rate cover a good part of these margins. These aspects have been analyzed and presented by many economists over time, including by the National Bank of Romania in various reports on financial stability.

Beginning from this information, I consider it important to start with the indicator for financial health, determined based on the methodology developed by Edward I. Altman (Altman, 2000), according to the calculations made by the National Bank of Romania in the Financial Stability Report for the year 2021. Its dynamics for the last three years, as well as the critical level, are presented through figure 1.
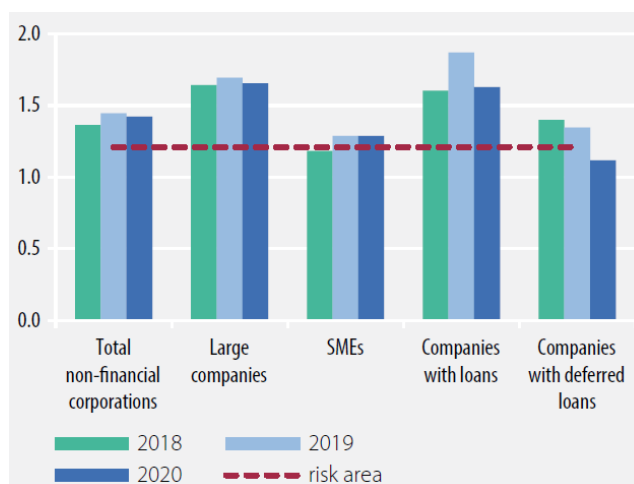

Figure 1. Aggregate indicator of financial health for non-financial companies in Romania (Z-Score) in the period 2018-2020
Source: Own processing based on the National Bank of Romania, data from the Financial Stability Report, December 2021, pg. 27

This indicator was calculated at an aggregate level for all Romanian companies in the non-financial area, but also divided into subcategories that can provide important information regarding the health of companies and the risk of becoming insolvent: corporations (large companies), SMEs, companies that have taken out loans and companies that have resorted to the suspension of installments. It was decided to include this last category because, in most cases, the companies that resorted to the suspension of installments are the ones that may have a higher risk and are the ones that can generate problems from the point of view of the ability to pay.

This indicator shows, in most of the previously presented groups, a deterioration in 2019 compared to 2018 and in 2020 compared to 2018 and 2019. However, the biggest deterioration is recorded in 2020, against the background of the crisis generated by the Covid-19 pandemic and of problems arising in production chains and in the service market. We can also observe that, at the aggregate level, the indicator is above the risk threshold, which shows that the risk of bankruptcy is still low for companies in the non-financial area in Romania. The best results are obtained for the case of large companies in our country, followed by the category of SMEs. In the area of companies that have contracted loans, it is noticeable that we meet companies with good scores, above the risk threshold. On the other hand, as expected, the score for companies that resorted to rate suspension is low and has deteriorated compared to previous years. However, it is worth noting that we are talking here about companies whose financial health was precarious even before this shock generated by the Covid-19 pandemic, being below the risk threshold even for the years 2018 and 2019.

The recent developments were mainly due to the deterioration of the companies' profitability and the efficiency of the use of assets, these effects being counterbalanced by the improvement of the level of indebtedness and pressures in this area, by lowering the costs of loans or by suspending rates. Also, the liquidity area weighs a lot in the results obtained by these companies in the financial health score, and these aspects are, in turn, indicators that can provide information about the bankruptcy risk of companies within an economy, but also about the financial risks they may encounter. In this sense, the chart made available by the National Bank of Romania through the 2021 Financial Stability Report regarding the evolution of companies' profitability by activity sector in the period 2006-2020 is relevant (figure 2). Thus we have an image regarding the profitability of companies during both the period of the financial and economic crisis of 2008-2010, but also during the period of economic lockdown, from 2020.
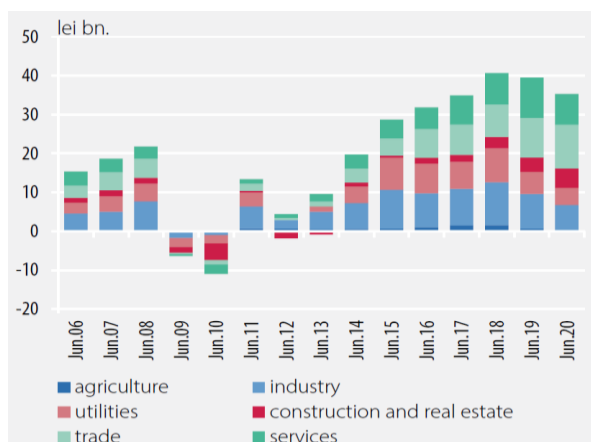

Figure 2. The evolution of the profitability of non-financial companies in Romania according to the activity sector in the period 2006 – 2020
Source: National Bank of Romania, Report on financial stability, June 2021, pg. 34

Figure 2 highlights the reduction in profitability in 2019 and 2020 for most of the sectors captured by this figure. However, it can be seen that the trade sector managed to maintain a good part of its profitability in 2019 and in 2020, despite the difficult situation in the economy, amid the lockdown. An important decrease was registered at the level of services, but also at the level of industry. On the other hand, it can be seen that all sectors managed to maintain good profitability, well beyond the economic and financial crisis of 2008-2010, but also beyond the years 2011-2013, which were, in turn, marked by difficult periods in each of the branches of the economy.

Considering the profitability dynamics of companies by sector compared to not only the previous years, but also to the years during the crisis, it can be stated that these developments did not significantly affect the bankruptcy risk of the companies considered for analysis. Thus, profitability as an indicator regarding the change in the risk of bankruptcy did not provide concerning information in the direction of the worsening of this risk for the case of companies operating on the Romanian market.

At the same time, for the analysis of financial health, we followed the evolution of a series of other indicators, such as return on equity (ROE), the degree of long-term debt and the degree of short-term debt. These indicators provide additional information regarding the risk of bankruptcy, the financial risks of the companies, meaning the financial health of the companies. For this purpose, we created figure 3, based on the data made available by the National Bank of Romania.

Figures on financial health indicators show that in 2019 and 2020 we have seen a slight increase in medium and long-term debt at the expense of short-term debt. This change is only beneficial for companies, as they manage to obtain more solid and predictable financing, given that the general degree of indebtedness has remained relatively constant for the last four years for which we used aggregated data, made available by the National Bank of Romania.

On the other hand, as we also observed in figure 2 regarding the performance of companies by activity sector, the performance measured by ROE also decreased in 2019 and the most in 2020, against the background of the Covid-19 pandemic and the closure or reduction of a series of activities. However, the reduction was not significant, being below 2 percentage points in terms of ROE, as can be seen in figure 3.
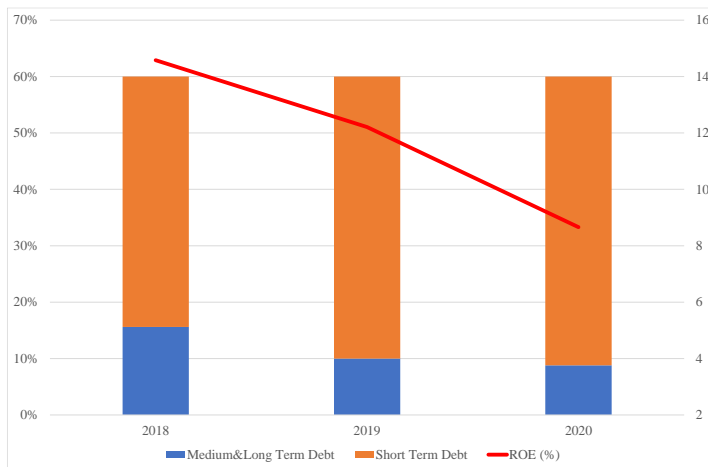

Figure 3. Financial health main indicators at the level of non -financial companies in Romania during 2018-2020
Source: authors' owm computation based on NBR's data published on the website: www.bnr.ro

For a complete analysis, it is necessary to take into account the liquidity rates calculated for companies in our country. These indicators provide information about the health of the company and the risk of bankruptcy, and three important such indicators emerge in the literature: general liquidity, immediate liquidity and demand liquidity. Based on the aggregated data published by the National Bank of Romania, we created figure 4 to illustrate the trend and level in 2018, 2019 and 2020.

The liquidity analysis revealed a good dynamic for Romanian companies in the three years analyzed, even during the period affected by the closure of the economy due to the Covid-19 pandemic. Thus, it can be observed that all three indicators presented for the liquidity of companies have registered an increase from year to year in the period 2018-2020. This dynamic highlights a good trend and a reduction in the bankruptcy risk of these companies, the liquidity issue being a very important one in the analysis of the financial health of companies operating not only in Romania, but also in any other economy.
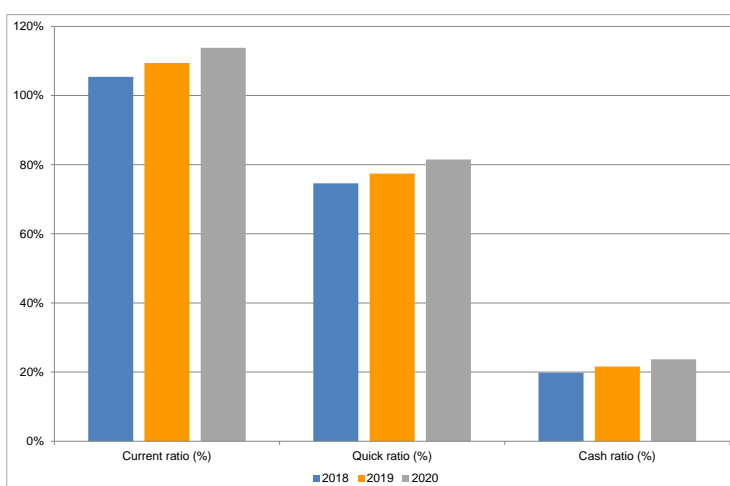

Figure 4. Indicators regarding companies' liquidity (%)
Source: own processing based on the National Bank of Romania data
published on the website: www.bnr.ro, accessed on February 10, 2022

Also, for the analysis of the impact of liquidity, we created figure 5, which allows the formation of an overall picture regarding the distribution of liquidity at the level of companies operating in Romania. At the same time, the figure highlights the share of companies with a general liquidity rate lower than 100% as a number of employees, as a number of companies or as a share of total contracted bank loans. Firms that have an overall liquidity ratio of less than 100% are the ones that may have problems in terms of bankruptcy risk and this risk may be transmitted further down the credit channel or at the level of employees.

Figure 5 highlights a decrease in importance both in terms of contracted bank loans and in terms of the number of employees of firms that have a liquidity ratio lower than the threshold of 1 (100%). At the same time, a decrease in the number of these companies was also observed. The dynamics can be explained not only by the improvement of the liquidity level, but also by the establishment of new companies with a better liquidity rate. It can also be observed that the share of companies with a general liquidity ratio higher than 150% (1.5) has increased, and this shows an increasingly high level in terms of the financial health of Romanian companies, as well as a lower level of bankruptcy risk that they can register. Thus, we highlighted another

way in which the liquidity risk can be quantified at the aggregate level of companies, a liquidity risk that can be transposed into a bankruptcy risk or a financial risk for them.
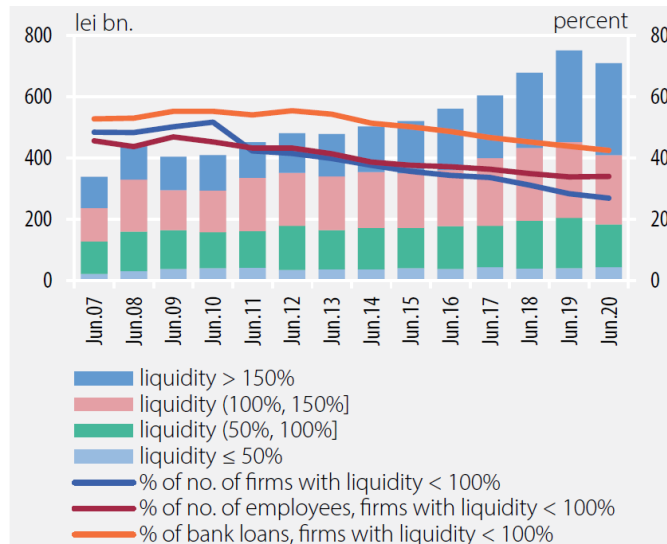

Figure 5. Distribution of companies according to the value of the general liquidity indicator in the period 2007-2020
Source: National Bank of Romania, Report on financial stability,
June 2021, pg. 37

It is known that the financial system has offered the possibility of suspending installments for contracted loans, as a result of the situation determined by the Covid-19 pandemic, and the analysis of the data on these suspensions offers a better perspective in terms of the bankruptcy risk of companies and the area where this type of risk is more concentrated. Therefore, I will graphically represent (figure 6) the breakdown of the stock of loans with suspended installments according to the activity sector of the companies.

The analysis of this type of data provides important information regarding the risk of bankruptcy and the risk of the appearance of non-performing loans at the time when the facility for suspending installments on these loans expires. There is a high probability that at least some of these loans will turn into non-performing loans, depending on how the business resumes and how these companies will recover and how they will be able to restore profitability in order to could obtain the necessary margins to cover the interest committed for the respective loans. Therefore, the analysis of the dynamics and structure of the stock of loans for which rates have been suspended is, at present, an important method for assessing the risk of bankruptcy among non-financial companies in Romania.
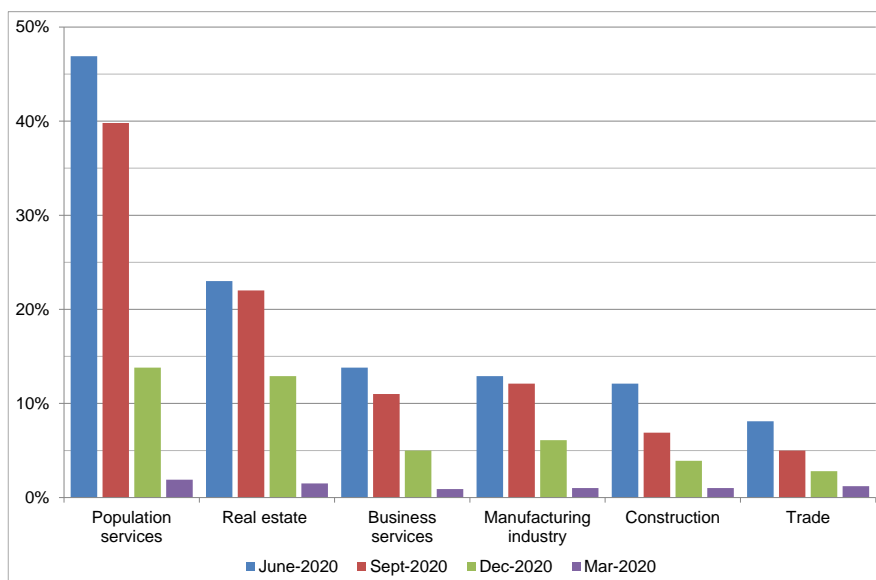
**Figure 6. Breakdown of the stock of loans with suspended installments
according to the activity sector of the companies (% of total companies)**
*Source: own processing based on the National Bank of Romania data published
on the website: www.bnr.ro, accessed on February 21, 2022*

Figure 6 highlights the breakdown of loans with suspended installments by activity category and reveals that in the population services category were placed the most companies that resorted to the suspension of installments, at the level of each observation period. Thus, in June 2020 their number exceeded 45% of all companies in this activity sector, and in September 2020 the percentage decreased to 40%. At the beginning of 2021, the share of those who still had rates suspended dropped significantly to 3%. In second place was the sector of real estate activities, where approximately 23% of companies requested the suspension of installments and in third place we have the sector of companies offering business services, closely followed by the manufacturing industry. Here we are talking about a little over 13% of the total number of companies that called for the suspension of installments in 2020.

Based on these figures, we note that the health level of the companies improved in 2021 compared to 2020, but also the fact that the rate suspension program was a beneficial one, one that many companies that encountered difficulties turned to. It is quite possible that this program has had a life-saving effect on several types of businesses, bearing in mind that many of them had problems with cash flows during the lockdown period of 2020. Thus, the suspension of installments contributed significantly to reducing the risk of bankruptcy and preventing the increase in the balance of non-performing loans.

In correlation with figure 6, in order to characterize the risk of bankruptcy, its monitoring and the manner in which it manifested itself, we present, through figure 7, the breakdown of non-performing loans according to the activity sector. Thus, it can be seen where the banking sector in Romania is most exposed and where a more thorough analysis of the risk of bankruptcy and financial risks is necessary in order to reduce their impact at the aggregate level of the economy, but also at the level of financial institutions, thus so that they maintain their profitability and capital adequacy level.

Based on figure 6 and figure 7, it can be seen that, in March 2020, the largest share of non-performing loans was concentrated in the construction sector, so that

later a significant decrease in the share of this sector could be observed, being overtaken in June 2020 by the utilities and extractive industries. On the other hand, the manufacturing industry recorded the most significant growth in June 2020 compared to March 2020, continuing to remain at a high level even in March 2021. These three sectors were the ones that had the strongest dynamics and stood out through significant changes. The other sectors presented (business services, agriculture, population services and trade) maintained their shares relatively constant in the period of 2020-2021 impacted by the Covid-19 pandemic, a period in which the economy was significantly affected by a series of restrictions, the effect of which was directly seen in the profitability of the companies and in the level of the risk of bankruptcy and the financial risks they carry.
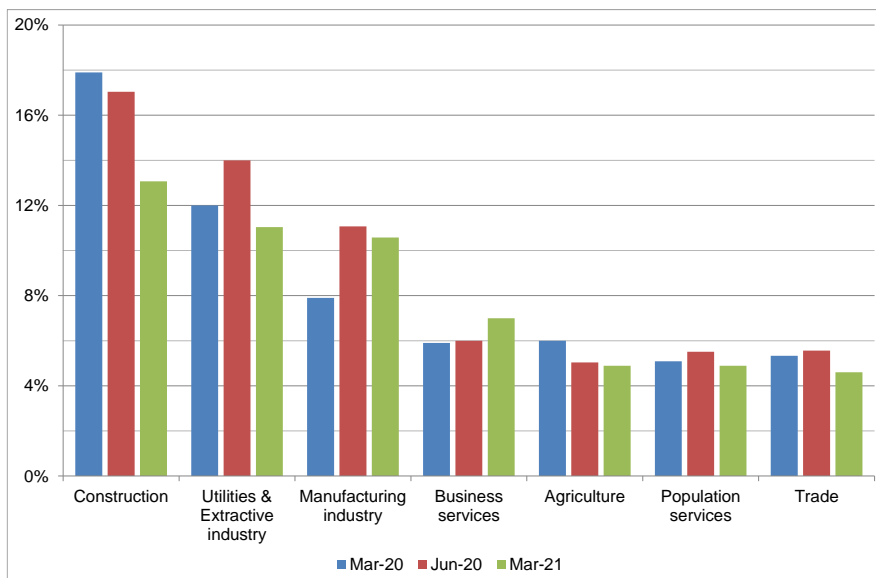

Figure 7. The structure of the rate of non-performing loans according to the activity sector of the companies
Source: own processing based on the National Bank of Romania data published on the website: www.bnr.ro, accessed on February 21, 2022

The last part of the paper is dedicated to a specific problem of the local economy and companies in our country, that of commercial credit, but also the level of insolvencies. Given that the banking level of the Romanian economy (the share of banking assets in GDP) is low, a good part of the companies rely on commercial credits, and the chain of dependence built over time is extremely important for the smooth functioning of the economy. Therefore, the risk of bankruptcy at an aggregate level and financial risks must also be analyzed from the perspective of insolvencies and commercial credit, these being two aspects that weigh extremely heavily, especially in an economy like Romania's, where companies' dependence on credit commercial is high.

In this sense, I highlight the evolution of commercial credit, the share of this credit in total assets and the non-payment rate of commercial debts, using figure 8, based on the data presented by the National Bank of Romania in the Financial Stability Report of 2021. It can be observed that the level of commercial debts has increased slightly in recent years (2018, 2019 and 2020), and the share in total assets has remained high, over 30% for each of the years of analysis. Noticeably, in this way that the role of commercial credits is a very important one at the microeconomic level, as it

is about a chain dependence of companies on the payment of this type of credit. Also, we can observe that the default rate remains elevated at 15%, well above the NPLs ratio in the banking systems. Hence, we can say that the risk is higher.

It can be stated that, at least for the case of Romania, the non-payment rate of commercial credits and their level can represent important indicators for assessing the risk of bankruptcy at the level of our country's economy. An incident in this trade credit chain can spread further to the other firms and cause a chain reaction with stronger adverse effects than in the event of appearing a non-performing loan in the case of a bank. Considering the points presented for commercial credit, I think it is important to take into account other indicators that target commercial receivables, such as payment incidents and insolvencies at the level of non-financial companies in our country.
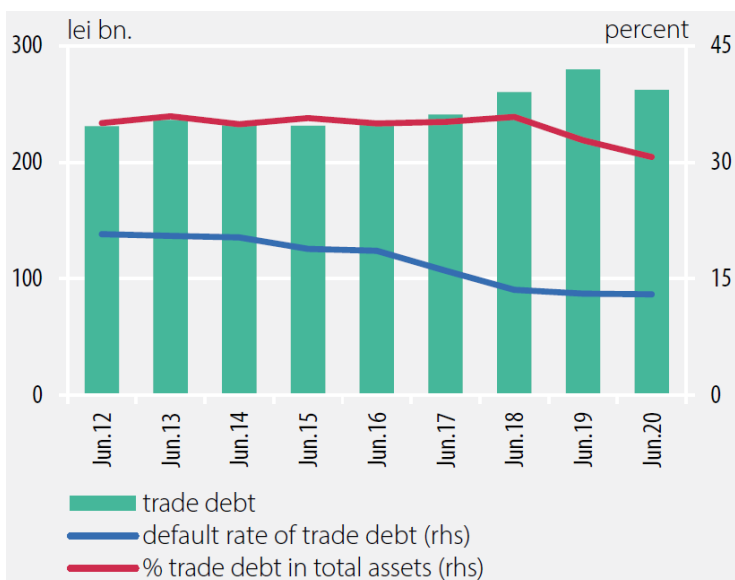

Figure 8. Evolution of the balance of commercial credits, the non-payment rate on commercial debts and the share of commercial debts in total assets
Source: National Bank of Romania, Report on financial stability,
June 2021, pg. 43

For this last part, I created figure 9, which shows the evolution of the flow of insolvencies and major payment incidents, because I believe that they represent important information for the risk of bankruptcy and the financial risks that can occur at the level of the economy and at the level of companies in Romania.
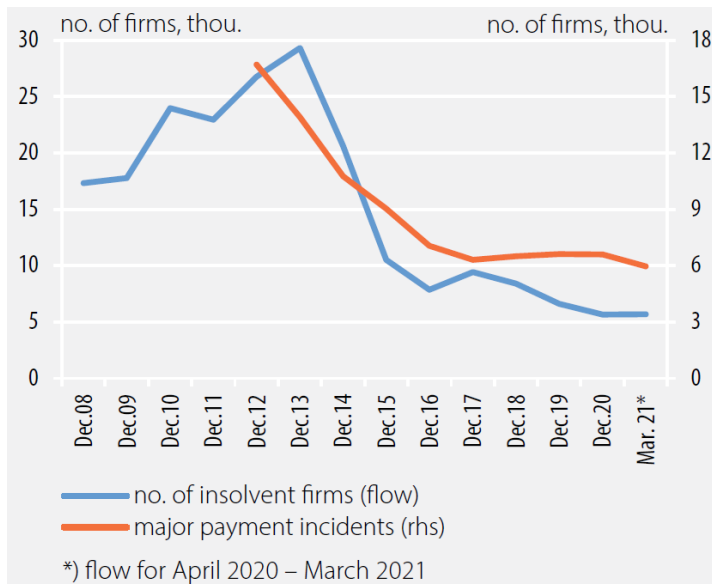
Figure 9. Evolution of insolvencies and payment incidents
Source: BNR, Report on financial stability, June 2021, page 44

Based on figure 9, it is highlighted that the number of insolvencies is closely correlated with economic activity and with the number of major payment incidents. Thus, in the previous crisis from 2008-2010, these indicators recorded very high values, only to gradually decrease later and currently to be at the lowest levels, highlighting a low risk of bankruptcy at the aggregate level of the Romanian economy. However, this indicator seems more like an ex-post one, i.e. it is not an early warning indicator, an indicator that provides information about the possible risk of bankruptcy before it materializes, but it is an indicator that provides information about the risk of bankruptcy after its materialization.

Finally, I will present figure 10 which highlights the forecast of the probability of default (bankruptcy) for companies in Romania, depending on the activity sector, according to the calculations made by the National Bank of Romania.
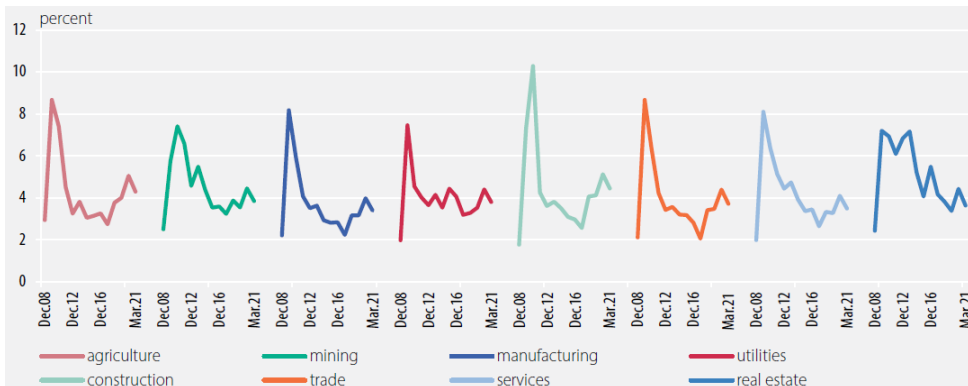

Figure 10. Evolution of the forecast regarding the probability of default on loans by companies - depending on the activity sector
Source: National Bank of Romania, Report on financial stability, June 2021, pg. 42

These results highlight that the risk of default increased generally not only during the 2008-2010 crisis period for all sectors, but also during the economic lockdown period from March-April 2020, resulting in the trend returning to normal levels later on. In the period 2008-2010, the largest movements were recorded for the construction, agriculture and extractive industry sectors. On the other hand, during the period of economic lockdown, the real estate sector registered a greater increase in default risk compared to other sectors, followed by agriculture, construction and the extractive industry. Thus, we noticed that the most vulnerable sectors are: the extractive industry, construction and real estate, these having the highest bankruptcy risks.

4. Conclusions

The paper presents the risk of bankruptcy and the methods of analysis for the case of Romania, as it is pursued by the supervisory authorities in our country. We considered various indicators adapted to the current situation in Romania, such as the rate of non-performing loans, the capitalization rate of companies, their profitability, the rate of deferred payment loans, the stock of receivables, but also their dynamics. These indicators are relevant in both a static and a dynamic analysis, providing a series of information regarding the health of companies and the financial system in Romania, while also helping managers and banks in the system to calibrate their business model and adopt measures for protection that are effective in different tense situations.

The work is descriptive and analytical, in which I tried to capture a series of indicators that can be used in the analysis of financial and bankruptcy risks, but there are also methods to improve.

The first of the directions in which this work can be extended is to introduce an econometric model VAR (autoregressive vector) or VECM (error correction model vector) through which are analyze different correlations between these indicators and real variables in the economy and, at the same time, to analyze the response of variables in the economy to different shocks to these indicators.These responses could be analyzed by using impulse response functions or by using variance decomposition, which are specific elements for VAR and VECM models.

Another direction for improvement is to include more comparisons with indicators for other countries and to identify correlations that show us how these indicators react to different market situations. Thus, the behavior of the indicators for economies with different structures can be observed.

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