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BANKRUPTCY AND CREDITWORTHINESS MODELS FOR KAZAKHSTAN

Measuring competitiveness in central Asian post-socialist countries is problematic as many well-known metrics systems fail to warn about bankruptcy risks sufficiently early or at all. This article aims to present options for analyzing bankruptcy and creditworthiness models developed and used frequently in the Czech Republic. Bankruptcy likelihood is frequently measured by two famous models, the Altman z-score model, and Taffler z-score model. But there are other models which can be considered as more useful for companies in Kazakhstan such as IN99, IN01, IN05, and a creditworthiness model. The IN models were developed in an environment of Czech economy developing from socialistic to market oriented during the 1990s. During this period the IN models were developed so they are newer than the other two more famous models mentioned. Since the Czech Republic uses IFRS accounting standard which is also frequently used in Kazakhstan that is another reason why the IN models should be considered for wider use by companies in Kazakhstan.

Key words: bankruptcy models, performance evaluation, competitiveness, score models.

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Қазақстанда қолдануға ұсынылатын банкроттық және төлемқабілеттілік модельдері

Орталық Азиядағы социалистік елдердегі бәсекеге қабілеттілікті өлшеу қиындық тудырады, өйткені көптеген танымал метрикалық жүйелер банкроттыққа қатысты тәуекелдерді ертерек немесе мүлдем ескермейді. Осы мақаланың мақсаты – Чехияда дамыған және жиі қолданылатын банкроттық және несие қабілеттілігінің үлгілерін талдау нұсқаларын ұсыну. Банкроттық ықтималдығы жиі екі белгілі модельдер Altman z-score моделі және Taffler's z-score моделі арқылы өлшенеді. Бірақ қазақстандық компаниялар үшін IN99, IN01, IN05 және несие қабілеттілігі моделі сияқты пайдалы болуы мүмкін басқа да модельдер бар. IN модельдері 1990 жылдарға бағытталған социалистік нарыққа бағытталған, чех экономикасында дамыды. Осы кезеңде IN модельдері әзірленді, сондықтан олар басқа екі белгілі модельге қарағанда жаңа. Чехияда Қазақстанда жиі қолданылатын ҚЕХС стандарттары қолданылғандықтан, бұл Қазақстандағы компаниялардың кеңінен пайдалануы үшін ИН-модельді қолданудың тағы бір себебі.

Түйін сөздер: банкроттық модельдері, өнімділікті бағалау, бәсекеге қабілеттілік, бағалау модельдері.

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Модели банкротства и кредитоспособности для Казахстана

Измерение конкурентоспособности в постсоциалистических странах Центральной Азии проблематично, так как многие известные системы метрик не предупреждают о рисках банкротства достаточно рано или вообще. Цель данной статьи – представить варианты

анализа моделей банкротства и кредитоспособности, разработанных и часто используемых в Чешской Республике. Вероятность банкротства часто измеряется двумя известными моделями – моделью z-счета Альтмана и моделью z-счета Таффлера. Но есть и другие модели, которые можно считать более полезными для казахстанских компаний, такие как IN99, IN01, IN05 и модель кредитоспособности. Модели IN были разработаны в условиях чешской экономики, развивающейся от социалистической к рыночной, ориентированной на 1990-е годы. В течение этого периода были разработаны модели IN, поэтому они являются более новыми, чем две другие известные модели. Поскольку Чешская Республика использует стандарт учета по МСФО, который также часто используется в Казахстане, это является еще одной причиной, по которой модели IN следует рассматривать для более широкого использования компаниями в Казахстане.

Ключевые слова: модели банкротства, оценка эффективности, конкурентоспособность, модели оценки.

Introduction

Publicly accessible analyses of Kazakhstan companies' financial situation are not commonly available as they are in the Czech Republic where all companies are obliged to annually report its financial information at publicly accessible website of Ministry of Justice. Only joint-stock companies publicly traded in Kazakhstan have to report their statements and annual reports at Kazakh Stock Exchange website.

Anyway, the popularity of this research field is recently on the increase (Janshanlo, Noyanov, & Andybayeva, 2016) use catastrophe theory on chosen companies from various sectors concluding the «approach is able to predict on time a developing mismatch in a company's structure and define the moment of entering a critical zone.» Another group of authors (Alimbekova, Baidildina, & Dzhakishva, 2017) created a formula for calculation of efficiency of financial recovery. Hájek et al. (2017) analyzed the confectionery sector in Kazakhstan during 2007-16. This field is gaining popularity.

Objective of this paper is to present options and models how financial situation of a company may be checked. Czech and Kazakh companies operate in different countries while do not face too different accounting environments as all use IFRS. Kazakhstan based companies are obliged to follow IFRS since 2007 (KZ Law 234/III, 2007). Therefore, using Czech INFA system utilizing Czech IFRS data allow greater relative comparability than US-based systems or systems developed using data from other than post-communist countries.

Materials and methods

To analyze financial trends and health in order to analyze financial performance and competitiveness of individual companies, the following bankruptcy and creditworthiness models that do not work with

market value of a company, and thus are more suitable for analysis of companies operating on markets where its value can be quantified only with difficulty: Altman z-score model, Taffler z-score model, IN99, IN01, IN05, and Creditworthiness model.

These bankruptcy models belong to the group of indicator systems, which are supposed to assess the financial situation of the company. The values of these indicators are very important for banking institutions when deciding about granting or rejecting a credit. Their purpose is to eliminate limitations and potentially missing information discovered by the ratios. (Kislingerová, 2008)

Creditworthiness models examine the financial health of a company based on macroeconomic and microeconomic principles and also on experience and knowledge of the financial analyst. These assess the financial health of the company in comparison with other companies, or they use a point system, in which the companies are classified according to their financial situation. (Grünwald, 2007)

Bankruptcy index: Altman Z-score

According to (Vochozka, 2011) the Altman Z-score belongs to the group of bankruptcy models. Edward Altman on the grounds of several ratios and statistical analysis managed to evaluate the bankruptcy likelihood of the company or the probability of decline two years in advance and with up to 70% success rate five years in advance. According to (CRF, 2017), the z-score is known to be about 90% accurate in forecasting business failure one year into the future and about 80% accurate in forecasting it two years into the future.

Altman (Altman, 1968) constructed it by using discriminant analysis with five ratios used in the equation (5), according to which is possible to identify a bankrupting company. That model requires the companies to be publicly traded. Altman later developed a different version of the z-score model suitable for analyzing not publicly traded companies (6) (Credit Guru Inc., 2018). The original z-

score employs market value of debt (see equation 5) compared to book value of debt used in equation 6. Due to unavailability of 'market value of equity' data we used 'book value of debt' (e.i. equation 5

uses 'book value of debt' instead of unavailable 'market value of debt'). The models' results thus differ only due to the different coefficients used in the equations.

$$Z = 1.2 * X(1) + 1.4 * X(2) + 3.3 * X(3) + 0.6 * X(4) + 1.0 * X(5) \quad (1)$$

$$Z = 0.717 * X(1) + 0.847 * X(2) + 3.107 * X(3) + 0.42 * X(4) + 0.998 * X(5) \quad (2)$$

where:

$X(1)$ = (working capital [current assets – short-term liabilities] / total assets

$X(2)$ = retained earnings / total assets

$X(3)$ = EBIT / total assets

$X(4)$ (eq.5) = market value of equity / book value of debt

$X(4)$ (eq.6) = book value of equity / book value of debt

$X(5)$ = sales / total assets

$Z > 2.99$ (5); $Z > 2.9$ (6) the business is in a good position, financially healthy (green)

$1.81 < Z < 2.99$ (5); $1.23 < Z < 2.9$ (6); on alert / gray zone of unmatched results (white)

$Z < 1.81$ (5); $Z < 1.81$ (6) bankruptcy has significant probability

The higher values of the Z- score, the financially healthier the company (red)

Bankruptcy index: Taffler's model (Růčková modification)

It is a bankruptcy model that indicates the probability of bankruptcy of the company. The

model was published in 1977. (Atlantis, 2017) Taffler's z-score model discrimination function has the form of modification of (Růčková, 2011) with four ratios.

$$TZ = 0.53 * R1 + 0.13 * R2 + 0.18 * R3 + 0.16 * R4 \quad (3)$$

where:

$R1$ = Earnings before taxes / short-term liabilities

$R2$ = current assets / liabilities

$R3$ = short-term liabilities / total assets

$R4$ = sales / total assets

$TZ > 0.3$ low probability of bankruptcy of the company (green)

$0.2 < TZ < 0.3$ gray zone of unmatched results (white)

$TZ < 0.2$ increased probability of bankruptcy of the company (red)

The original version of Taffler's model uses the share of financial assets net of current liabilities to operating costs instead of sales to total assets and does not use gray zone. When evaluating the original Taffler's Model, the gray zone is not used. Enterprises are classified according to the index outcome only on bankruptcy and credibility; zero is the critical value for the determining the category. A positive index corresponds with credit business and vice versa. (Vochozka, 2011)

Růčková (2011) uses the same breakdown of enterprises according to the established value of the Taffler's Model. Rather than evaluating enterprises as creditworthy, she states that the company has a small probability of bankruptcy and instead of bankruptcy enterprises says that the company has a high probability of bankruptcy.

«The [Taffler] model is shown to have the clear predictive ability over time period [of 25 years] and dominates more naïve prediction approaches. [This] study also illustrates the economic value to

a bank of using such methodologies for default risk assessment purposes.» (Agarwal & Taffler, 2007). These authors also note «As such, it is totally wrong and potentially dangerous to seek to apply the very accessible Altman [z-score US] model in market environments such as the UK. It would be similarly inappropriate to draw any inferences from seeking to apply the listed firm z-score model described in this paper to UK privately-owned firms which have very different financial characteristics».

IN Models – creditworthiness¹ and bankruptcy indexes

The success rates of the models are according to their authors (Neumaierová & Neumaier, 2005) as follows: the IN95 model has a success rate of

¹ By „creditworthiness«, it is understood that the business owner can be satisfied with the financial performance of the enterprise because the business creates value for its owner. This means that the index is able to take into account corporate profitability and risk in its statement. (Neumaier & Neumaierová, 2002)

75%. The IN99 success rate is 85%. The IN01 success rate 74% and the IN05 success rate is 83% for creation value prediction and 77% for bankruptcy prediction. The bigger the company, the higher the success rate. When a business falls below the bottom of the index, it can be said that with 97% probability files for bankruptcy

and in 76% of cases will not generate value. The enterprise in the gray zone will have a practically 50% probability of bankruptcy, and 70% will generate value. Undertakings above the upper limit will have a 92% probability of non-bankruptcy and a 95% probability of value creation.

IN99 Index

$$IN99 = -0.017 * A + 4.573 * C + 0.481 * D + 0.015 * E \quad (4)$$

where:

$A = \text{assets} / \text{liabilities}$

$C = \text{EBIT} / \text{total assets}$

$D = \text{sales} / \text{total assets}$

$E = \text{current assets} / \text{short-term liabilities}$

$IN99 > 2.07$ The company creates a new value for the owner (dark green)

$1.42 \leq IN99 < 2.07$ Rather it creates value for the owner (green)

$1.089 \leq IN99 < 1.42$ It is not possible to determine whether or not a company creates value for the owner (light blue)

$0.684 \leq IN99 < 1.089$ Rather does not create value for the owner (red)

$IN99 < 0.684$ Enterprise does not create value for the owner (dark red)

The IN index may be an appropriate indicator of value creation, especially if it is not possible to work with market prices for a company's shares due to their low ability to provide information or if no equity cost can be determined. With the success rate of 86.4%, the index proves the value creation

and with an even higher rate of success 98.9% has been able to identify that there is no value creation. (Atlantis, 2017)

IN01 Index

The IN01 merges creditworthiness and bankruptcy models.

$$IN01 = 0.13 * A + 0.04 * B + 3.92 * C + 0.21 * D + 0.09 * E \quad (5)$$

where: $A = \text{assets} / \text{liabilities}$

$B = \text{EBIT} / \text{interest expenses}$

$C = \text{EBIT} / \text{total assets}$

$D = \text{sales} / \text{total assets}$

$E = \text{current assets} / \text{short-term liabilities}$

$IN01 > 1.77$ Enterprise creates a value (green)

$0.75 \leq IN01 \leq 1.77$ Creditworthy business not creating value (grey)

$IN01 < 0.75$ Enterprise is on the way to bankruptcy (red)

Together with IN05, the IN01 uses interest expenses. To be able to run the analysis with comparable results we limit the ceiling of the ratio EBIT / Interest expenses to 9 if the result was to be higher (in absolute value as well) to limit distortion of the z-score result. In fact (Neumaier & Neumaierová, 2002) note that in cases when the ratio would skyrocket up to infinity – including cases of zero interest expenses or serious problems

with credit repayments, the nine is maximum value to be used. This ceiling we implement affects results of IN01 and IN05 for all the companies in almost all years.

IN05 Index

IN05 is the latest known index of Inka and Ivan Neumaier. This index is an update of the IN01 index of the Industrial Data Tests of 2004. The ratios are same with IN01. The index formula IN05 is:

$$IN05 = 0.13 * A + 0.04 * B + 3.97 * C + 0.21 * D + 0.09 * E \quad (6)$$

where: $A = \text{assets} / \text{liabilities}$

$B = \text{EBIT} / \text{interest expenses}$

$C = \text{EBIT} / \text{total assets}$

$D = \text{sales} / \text{total assets}$

$E = \text{current assets} / \text{short-term liabilities}$

$IN05 > 1.6$ The enterprise creates a value (green)

$0.9 \leq IN05 \leq 1.6$ Gray zone of unmatched results (grey)

$IN05 < 0.9$ The enterprise destroys value, threat of bankruptcy (red) (Neumaierová & Neumaier, 2005)

Creditworthiness index

The creditworthiness index, also referred to as the creditworthiness indicator, is based on a multivariate discriminatory analysis based on a

simplified method. It is mainly used in German-speaking countries. (Atlantis, 2017) The credit index (index) is calculated according to the formula:

$$CI = 1.5 * x1 + 0.08 * x2 + 10 * x3 + 5 * x4 + 0.3 * x5 + 0.1 * x6 \quad (7)$$

We use the following ratios:

$x1$ = cash flow / liabilities

$x2$ = total assets / liabilities

$x3$ = earnings before taxes / total assets

$x4$ = earnings before taxes / sales

$x5$ = stocks / sales

$x6$ = sales / total assets

Evaluation:

$-3 < CI < -2$ extremely bad (dark red)

$-2 < CI < -1$ very bad (red)

$-1 < CI < 0$ bad (light red)

$0 < CI < 1$ certain problems (dark grey)

$1 < CI < 2$ good (light blue)

$2 < CI < 3$ very good (light green)

$3 < CI$ extremely good (dark green)

Literature Review

As (Kislingerová, 2008) points out: the purpose of the bankruptcy models is to predict a threat to the financial health of the analyzed company and the likelihood of bankruptcy. The term financial distress represents a state of the company in which it is not capable of settling its debts, or the value of its debts exceeds the value of its assets. In other words when a company becomes illiquid or insolvent.

According to (Neumaier & Neumaierová, 2002) the IN models belong to the group of bankruptcy models made for the conditions of the Czech restructuring market during the 1990s. The authors using discriminant analysis, ratios and weighted mean values created a function for identification of bankrupting companies. IN models has gone through several phases of evolution, the first being the IN95 index, which focuses on the company from the creditor's point of view and includes Past due liabilities, an indicator not being published by companies in Kazakhstan (so we cannot use it in our analysis). IN95 also takes into account what sector an enterprise belongs. Then the IN99 index followed, which assesses the company from the perspective of the owner. It is a creditworthiness model where the weights of the individual indicators are set concerning their importance for achieving positive economic profit. The model is thus able to identify whether an enterprise is creating new value for the owners. This model can, therefore, indicate the sustainability of the company's competitiveness. The IN99 index may be a suitable indicator of value creation, especially if it is not possible to work with market prices of the company's shares due to their low ability to report and/or the cost of equity.

IN01 combines the merits of both the credit and the bankruptcy models and can be used by both owners and creditors. Its construction was based on a discriminatory analysis and was based on the data of 1915 enterprises that were divided into three groups: 583 enterprises were in the value-added enterprise group, 503 enterprises in bankruptcy or just before bankruptcy and 829 other enterprises = a sample for defining the model extensively and therefore very representative. The model can identify, on the one hand, whether the firm creates economic value and at the same time to advise on the likelihood of bankruptcy.

The IN01 connects both of the previous indexes. The last version emerged in 2005 when IN01 was updated into the bankruptcy index IN05 (Neumaierová & Neumaier, 2008).

The IN05 index is an update of the IN01 index according to the Industrial Data Tests of 2004. In addition to assessing whether or not the company shortly files for the bankruptcy of IN95, the indexes IN01 and IN05 also deal with whether the company also creates value for its owners. Advantages of IN05 are that its calculation is simple, financial algorithms are transparent, works with publicly available business finance data, it can be used for both the businesses publicly traded and not publicly traded on the capital market, gives clear results, and it is appropriate to be used as a complement to the parallel indicator system. However, users must take into account that the IN05 index was created and tested above the data of predominantly medium and large industrial enterprises, so for these companies, its information capability will be the best, works with annual business performance data, so it is a performance statement of an

enterprise within an annual time horizon, is a rough indicative characteristic for the whole performance of the business, but it does not address how that performance has been achieved (Neumaierová & Neumaier, 2008).

Results and Discussion

The review presented various models on bankruptcy and creditworthiness in order to show Kazakh companies their situation can be also checked by Czech bankruptcy and creditworthiness models. When selecting the models, priority was given to those which do not work with the market value indicator, given that in the economic conditions of the Czech Republic and other post-socialist countries its value can be quantified with great difficulties. This is primarily due to the low explanatory power of capital market data, especially for companies with securities with very low liquidity levels.

It certainly needs experienced management fully aware of local market specifics. The market in Kazakhstan is due to political and economic influences in a permanent change and managements of the companies need to be able to adapt quickly. Another specific of the whole market is high-interest rates causing fluctuating and hardly predictable interest expenses of all indebted companies.

Considering changing economic environment in the Czech Republic during the 1990s, its evolution from centrally planned to a market-driven economy, the IN models results should be interpreted in respect to what companies are to be analyzed regarding country and period. For example, one of the most widely used models (the so-called Altman's Z-Score) was constructed on a much smaller (compared to IN models) sample of US companies doing business under the US accounting standards in 1968, which

makes it a half-century old model. Moreover, the Altman model does not give – in our opinion – sufficient weight to the company's liquidity. On the contrary, it emphasizes the profitability too much, which is certainly a very important indicator, but when assessing long-term financial stability, especially in the conditions of the Czech Republic and other economies of the former Eastern bloc, we consider liquidity as much more important.

The above is related, among other things, to a different perception of the risk associated with the indebtedness rate. If it is common in the US that companies have up to 80% foreign capital, then in environments analyzed by us that would be hard to accept by both the management of companies and the creditors in particular. We consider it healthy to stick to the golden rule of financing when own and foreign capital are almost balanced. Therefore, we consider IN models to be much more suitable for analyzing companies operating in post-socialist countries of Eastern Europe or Central Asia than other models.

Conclusion

The IN models can be actually very well used in Kazakhstan because they do not work with the market value of the company indicators, given that in the economic conditions of the Czech Republic and other post-socialist countries its value can be quantified only with difficulty. This is primarily due to the low explanatory power of capital market pricing data, especially for companies whose securities are traded with very low liquidity levels. This is of course also the case of Kazakhstan, for which the Czech models are more suitable than the other models that were designed for the analysis of companies operating in much more liquid, effective and advanced market environments.

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