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COMPARISON OF ALTMAN'S Z - SCORE MODEL AND ALTMAN'S Z''- SCORE MODEL ON THE SAMPLE OF COMPANIES WHOSE SHARES ARE INCLUDED IN THE REPUBLIC OF SRPSKA STOCK EXCHANGE INDEX

ПОРЕЂЕЊЕ АЛТМАНОВОГ *Z - SCORE* МОДЕЛА И АЛТМАНОВОГ *Z" –SCORE* МОДЕЛА НА ПРИМЈЕРУ КОМПАНИЈА ЧИЈЕ АКЦИЈЕ УЛАЗЕ У САСТАВ БЕРЗАНСКОГ ИНДЕКСА РЕПУБЛИКЕ СРПСКЕ

Summary: *In this paper, we analysed companies whose shares are included in the Republic of Srpska Stock Exchange Index (BIRS), using Altman's Z-Score model and Altman's Z"-Score model, in order to determine their insolvency risk. Altman's Z-Score is a combination of five weighted financial ratios used to estimate the likelihood of financial distress, and possible bankruptcy of the observed companies. It is used widely by auditors, accountants, commercial banks, and other organizations to assess the financial health of their clients. Altman also developed revised versions of the model to assess the financial health of privately-held firms and non-manufacturing companies, as well as companies in emerging markets - Altman's Z'-Score model and Altman's Z" - Score model. The results of our research on a sample of 14 companies whose shares are included in BIRS show that, although it is an emerging market, Altman's Z-Score model gives better results that indicate much-needed caution when drawing conclusions about the observed companies.*

Keywords: *Altman's Z-Score model, insolvency risk, financial analysis, Banja Luka Stock Exchange, emerging market*

JEL classification*: G15, G32, G33*

Резиме: *У овом раду извршена је анализа компанија чије акције улазе у састав берзанског индекса Републике Српске (БИРС) примјеном Алтмановог Z – Score модела и Алтмановог Z" – Score modela, са циљем утврђивања ризика инсолвентности. Алтманов Z-Score је комбинација пет пондерисаних коефицијената рачунатих на бази података презентованих у финансијским извјештајима, са циљем процјене ризика могућих финансијских проблема, а у крајњем случају и стечаја посматраних компанија. Овај модел користе ревизори, рачуновође, пословне банке и друге организације како би процијениле финансијско здравље својих клијената. Алтман је развио и ревидиране верзије овог модела за процјену финансијског здравља у приватним компанијама и непроизводним компанијама, као и компанијама које послују на тржиштима у развоју - Алтманов Z'-Score модел и Алтманов Z"-Score модел. Резултати истраживања на узорку 14 компанија чије акције улазе у састав БИРС-а показују да, иако је ријеч о тржишту у развоју, Алтманов Z-Score модел даје квалитетније резултате који упућују на пријеко потребни опрез приликом доношења закључака о посматраним компанијама.*

Кључне ријечи: *Алтманов Z Score модел, ризик инсолвентности, финансијска анализа, Бањалучка берза, тржиште у развоју*

ЈЕЛ класификација: *G15, G32, G33*

1. INTRODUCTION

Altman's Z-Score model is used in financial analysis to assess the risk of possible financial distress and bankruptcy of the observed companies. This model is widely used, especially by auditors and credit analysts in commercial banks and other financial institutions to assess the financial health of their clients.

The original Z-score model was developed for manufacturing companies whose shares are traded on the stock exchange and which have assets stated in the balance sheet over USD 1 million. By testing this model through the application, it was concluded that it is not universal and not recommended for assessing the financial health of banks and other financial companies. As a result, Altman developed revised versions of the financial health assessment model in private and non-manufacturing companies, as well as companies operating in emerging markets.

In this paper, the authors' attention is focused on assessing the insolvency risk of companies whose shares are part of BIRS using the Altman Z - Score model and the Altman Z"- Score model. This paper aims to determine which of the above two models provides a better basis for making objective conclusions about the observed issuers if other available information related to their business is taken into account. Research on this topic is rare and is mainly based on comparing Altman's Z-Score model with other models for predicting financial difficulties, such as the Springate or Ohlson O-score model. For this research, the financial data for 2019 presented in the financial statements of companies whose shares are part of BIRS were used. The necessary indicators were calculated using the original Altman Z-Score model and Altman Z" - Score model, the obtained results were compared and certain conclusions were made.

The contribution of this paper is reflected in the fact that the application of Altman's models is very rare in the Republic of Srpska capital market and that it brings new conclusions that give a more detailed picture of the quality of issuers from the Banja Luka Stock Exchange. At the same time, the paper tests the efficiency of the recommended Altman Z" - Score model in one emerging market. On the other hand, it should be borne in mind that this analysis is based on the financial statements for 2019 and that the situation after the coronavirus pandemic could look somewhat different.

2. INSOLVENCY RISK

Risk can be viewed in the context of a particular future event whose outcome can be quantified by an appropriate probability (5%, 10%, etc.). In contrast to that, uncertainty implies a situation in which the probability that an event will occur is completely unknown, and it is not possible to quantify it by the probability distribution. Gallati (2003) defines risk as a condition in which there is a potential danger for an investor, entrepreneur or other entity that the result of his/her economic activity will deviate from what he/she expects or hopes for. Uncertainty can be defined as the state of the system in which there is lack of adequate, reliable and timely information about its previous behaviour and final state during decision-making.

There are also approaches that do not differentiate between risk and uncertainty (Esch et al. 2005), so they suggest that the risk of financial operations consists of two basic components:

• A risk component that cannot be quantified in advance (Ex ante non-quantifiable risk) and
• A risk component that can be quantified in advance (Ex ante quantifiable risk).

Legal theory and bankruptcy legislation take various criteria and bases as a reason for initiating bankruptcy proceedings against the debtor, such as insolvency, over-indebtedness, suspension of payment, permanent insolvency, etc. (Radivojac & Kester, 2015). All mentioned institutes are reduced to the same thing - that the debtor is in a difficult financial situation and is not able to fulfil its obligations towards creditors.

Insolvency is a general, basic and regular reason for bankruptcy. It is a general bankruptcy reason, because it applies to all types of bankruptcy debtors and to all bankruptcy proceedings. It is the basic reason for bankruptcy, because the entire bankruptcy system is based on it. The insolvency of the debtor is also a regular bankruptcy reason, because the bankruptcy procedure is initiated and conducted precisely because of that. Insolvency is not the same thing as illiquidity. Illiquidity can be defined as the current state of payment inability of the debtor, which, in principle, does not last long.

When it comes to *illiquidity*, the attention is primarily focused on the debtor's assets, seeking an answer to the question of which funds can be used to pay due current liabilities. The answer is in the available cash, which is obtained either through the conversion of payment instruments into cash or by selling part of the supplies. Ultimately, an illiquid debtor can be solvent.

On the other hand, the degree of *indebtedness* is determined by analysing the structure of the debtor's liabilities. Defining the optimal ratio of equity and borrowed capital requires knowledge of the dynamics of each company's business and does not imply the existence of a universal solution.

Finally, *insolvency* can be defined as the inability of a debtor to pay due obligations, whereby the total value of the debtor's assets is not sufficient to settle all obligations to creditors.

3. LITERATURE REVIEW

The Z-Score model was defined by Edward Altman (1968). Altman designed his model based on empirical research on a sample of companies that were on the verge of bankruptcy and companies that were not threatened with bankruptcy.

The survey was based on data on 66 companies, half of which have filed for bankruptcy. Within the framework of his model, Altman calculated 22 most commonly used financial indicators for each company, then, using multiple discriminant analysis, identified a smaller number of indicators that separate financially sound companies from those that meet the conditions for opening bankruptcy proceedings.

In this way, Altman singled out five ratio numbers that best predict insolvency risk. The above Altman Z-Score is calculated as follows (Altman 1968):

$$Z = 1.2 * X1 + 1.4 * X2 + 3.3 * X3 + 0.6 * X4 + 0.999 * X5$$

X1 = (Current Assets - Current Liabilities) / Total Assets. This ratio is a measure of a company's liquidity. Companies in financial distress usually show declining liquidity.

X2 = Retained Earnings / Total Assets. This ratio is a measure of a company's cumulative profitability; a decline can be a warning signal.

X3 = Operating Profit / Total Assets. This ratio measures the profitability of a company in relation to its size.

X4 = Market Value of Capital / Book Value of Total Liabilities.

X5 = Sales Revenue / Total Assets. This relationship shows how productively a company uses its assets to generate sales revenue.

The results of the Z-score model can be positioned within the following "zones" (Altman 1968):
● Z > 2.99 - "safe zone". The possibility that the company will enter bankruptcy is negligible.
● 1.80 < Z < 2.99 - "grey zone". The possibility that the company will enter bankruptcy is present and cannot be ignored when making business decisions.
● Z < 1.80 - "unsafe zone". The possibility that the company will enter bankruptcy is very high and that fact should be seriously considered when making business decisions.

Altman found empirically that his Z-Score model was accurate in 72% of cases when predicting bankruptcy over the next two years.

Z'- Score for private companies

The usefulness of the original Z-Score model has certain limitations. If the company's shares are not traded on the stock exchange, its capital has no market value. To solve this problem, Altman (2000) developed a revised Z'-Score model for private companies, in which he took into account the book value of capital in relation to total liabilities in the form that calculates the factor X4, instead of the market value of capital.

The above Altman's Z'-Score is calculated as follows (Altman 2000):

$$Z' = 0.717 * X1 + 0.847 * X2 + 3.107 * X3 + 0.420 * X4 + 0.998 * X5$$
● Z' > 2.9 - "safe zone"
● 1.23 < Z' < 2.9 - "grey zone"
● Z' < 1.23 - "unsafe zone"

In practice, this model is often used by commercial banks as a measure of risk exposure when assessing the creditworthiness of unlisted business clients.

Z'' - Score for non-manufacturing companies

In order to reduce the potential effects of the industry, Altman (2000) proposed a general model, without the factor X5 = Sales / Total Assets, to assess the financial health of non-manufacturing companies.

The specified Altman's Z"-Score is calculated as follows Altman (2000):

$$Z'' = 6.56 * X1 + 3.26 * X2 + 6.72 * X3 + 1.05 * X4$$
- Z" > 2.6 - "safe zone"
- < Z" < 2.6 - "grey zone"
- Z" < 1.1 - "unsafe zone"

As in the previous case, this model uses the book value of capital to calculate the factor X4.

Altman suggests using the Z" - Score model to assess insolvency risk in non - financial companies in emerging and volatile markets.

Numerous studies deal with the application of Altman's Z - Score model to companies from different sectors. Celli (2015) observed a sample of 102 industrial companies whose shares are listed on the Italian Stock Exchange, half of which was delisted due to the impossibility of settling liabilities. Altman's Z - Score model was applied to this sample and a significant level of reliability was found in predicting the bankruptcy of Italian companies.

Unegbu and Onojah (2013) tested the Z-Score model in selected sectors in developing countries. The research results showed that this model is an important tool for predicting the bankruptcy of corporations from developing countries. Another important conclusion of the research was that the accuracy of predictions of this model varies significantly depending on the sector: the best results were achieved in the agriculture sector, oil and manufacturing, while the worst results were in the general services sector, transport and aviation, and trade.

Sajjan (2016) conducted research on a sample of three manufacturing and three non-manufacturing companies based in India, and proved that none of the observed companies was in the "safe zone" for a long period of time. Most of the companies were in the "insecure zone", so the danger of bankruptcy was predicted for them in the near future.

Alkhatib & Al Bzour (2011) conducted research on companies from the Jordanian Stock Exchange, and came to the conclusion that Altman's model is the most acceptable and most accurate model in predicting the bankruptcy of the analysed companies.

4. INSOLVENCY RISK ANALYSIS OF ISSUERS WHOSE SHARES ARE PART OF THE REPUBLIC OF SRPSKA STOCK EXCHANGE INDEX USING ALTMAN'S Z - SCORE MODEL

Trading in shares, bonds and short-term financial instruments is organized on the Banja Luka Stock Exchange. The market consists of the official stock market and the free stock market. Securities can be listed on the official stock market if, in addition to general conditions, they meet special conditions regarding the amount of capital, ownership dispersion, business performance and objectivity of financial reporting.

During 2019, the total turnover on the Banja Luka Stock Exchange amounted to KM 472,133,341, with the largest share in the structure of total turnover having public offerings of securities (75.6%), followed by regular turnover (18.3%) and block transactions (5.9%) (Banja Luka Stock Exchange 2020).

The basic stock exchange index of domestic capital market is the Republic of Srpska Stock Exchange Index (BIRS). BIRS consists of shares of 5 to 30 issuers that meet the general conditions and criteria for inclusion in the index, except for shares of investment funds.

BIRS is a weighted index, which means that the weight of individual shares is determined by the market capitalization of their issuers. The market capitalization includes ordinary shares that are publicly owned (free float), i.e. those that are not owned by shareholders with over 10%, not counting investment funds and custody accounts. The maximum weight of an individual issuer in BIRS is 25% and it is calculated as the ratio of the free float market capitalization of the issuer and the total free float market capitalization of the stock exchange index.

Whether shares will be included in BIRS depends on the fulfilment of general conditions, which refer to the fact that the shares must be listed on the stock exchange for at least six months, and that the shareholder with the largest number of shares (and its related persons) cannot own more than 90% of the total issued shares. After fulfilling the general conditions for listing, shares must also meet the criteria related to market capitalization and liquidity represented by average daily turnover of shares, average number of transactions and the number of traded shares in relation to the total number of shares of the issuer.

Table 1: Criteria for inclusion of shares in BIRS

Label	Criterion	Weight
M1	Market capitalization on the day of BIRS formation/revision	55%
M2	Liquidity ratio in turnover value - average daily turnover of shares	15%
M3	Liquidity ratio in number of concluded transactions - average number of concluded transactions	15%
M4	Turnover ratio - the number of traded shares in relation to the total number of shares of the issuer	15%

Source: The Rules of the Banja Luka Stock Exchange 2020

As can be seen from the previous table, each of these criteria has a certain weight, i.e. the share in the calculation of BIRS, which for M1, M2, M3 and M4 is 55%, 15%, 15% and 15%, respectively. Based on the presented criteria, the shares are ranked from 1 to n. The rank of the share is higher if the value of the criterion is higher. By multiplying the rank of shares according to each of the criteria with their weight in the formation of the index, and summing these products, we get the average rank on the basis of which the shares that will be part of BIRS are selected (Banja Luka Stock Exchange 2011):

$$AM_i = M1_i *0{,}55 + M2_i *0{,}15 + M3_i *0{,}15 + M4_i *0{,}15$$

where: M1,...,M4 = rang based on criteria 1,2,3,4;

 i = 1,...,n;

 n = number of issuers whose shares were traded in the observed period.

For the purpose of this research, we observed the shares that were included in BIRS at the end of 2019. The audit of BIRS from November 15, 2019 determined that as of this day, the stock exchange index includes the following shares:

Table 2: Shares that were part of BIRS at the end of 2019

No.	Sec. code	Issuer
1.	BOKS-R-A	Boksit a.d. Milići
2.	BVRU-R-A	ZTC Banja Vrućica a.d. Teslić
3.	CMEG-R-A	Čajavec Mega a.d. Banja Luka
4.	DEST-R-A	Hemijska industrija Destilacija a.d. Teslić
5.	EKBL-R-A	Elektrokrajina a.d. Banja Luka
6.	ELDO-R-A	Elektro Doboj a.d. Doboj
7.	HEDR-R-A	Hidroelektrane na Drini a.d. Višegrad
8.	HELV-R-A	Hidroelektrane na Vrbasu a.d. Mrkonjić Grad
9.	HETR-R-A	Hidroelektrane na Trebišnjici a.d. Trebinje
10.	KRPT-R-A	Krajinapetrol a.d. Banja Luka
11.	MRDN-R-A	Meridian a.d. Banja Luka
12.	NOVB-R-E	Nova banka a.d. Banja Luka
13.	RITE-R-A	RiTE Gacko a.d. Gacko
14.	RTEU-R-A	RiTE Ugljevik a.d. Ugljevik
15.	TLKM-R-A	Telekom Srpske a.d. Banja Luka

Source: Banja Luka Stock Exchange 2020

All issuers from the previous table were included in the analysis, except for Nova Banka a.d. Banja Luka to which Altman's Z - Score model cannot be applied since it is a financial institution. Insolvency risk was calculated for these companies using the original Altman Z-Score model, as well as Altman's Z " - Score model. The obtained results are shown in the following table.

Table 3: Insolvency risk calculation using Altman's Z-Score model and Altman's Z '' - Score model for issuers whose shares were part of BIRS at the end of 2019

No.	Sec.code	Issuer	X1	X2	X3	X4	X5	X4"	Z	Z"
1.	BOKS-R-A	Boksit a.d. Milići	-0,0872	0,2060	0,0138	0,2918	0,5941	1,3845	0,9980	1,6461
2.	BVRU-R-A	ZTC Banja Vrućica a.d. Teslić	0,1353	0,1039	0,0509	15,5080	0,3679	18,4670	10,1482	20,9588
3.	CMEG-R-A	Čajavec Mega a.d. Banja Luka	0,2285	0,2024	-0,0243	13,0064	0,0002	46,2517	8,2813	50,5595
4.	DEST-R-A	Hemijska industrija Destilacija a.d. Teslić	0,2984	0,0325	0,0036	1,3366	0,4919	7,0970	1,7089	9,5396
5.	EKBL-R-A	Elektrokrajina a.d. Banja Luka	-0,0973	0,0335	0,0062	0,0477	0,3948	1,1613	0,3736	0,7320
6.	ELDO-R-A	Elektro Doboj a.d. Doboj	0,0884	0,2890	0,0022	0,4263	0,2111	7,5962	0,9847	9,5131
7.	HEDR-R-A	Hidroelektrane na Drini a.d. Višegrad	0,1710	0,0267	0,0013	2,1134	0,0447	11,6279	1,5596	13,4269
8.	HELV-R-A	Hidroelektrane na Vrbasu a.d. Mrkonjić Grad	0,0575	0,0941	0,0198	1,3680	0,0732	8,8541	1,1600	10,1138
9.	HETR-R-A	Hidroelektrane na Trebišnjici a.d. Trebinje	-0,0096	0,0558	-0,0103	1,4145	0,0382	16,7491	0,9195	17,6364
10.	KRPT-R-A	Krajinapetrol a.d. Banja Luka	0,2013	0,0985	0,0627	6,6361	2,2462	12,4907	6,8121	15,1787
11.	MRDN-R-A	Meridian a.d. Banja Luka	0,2340	0,1386	0,0568	0,7123	0,6789	1,5963	1,7677	4,0444
12.	NOVB-R-E	Nova banka a.d. Banja Luka								
13.	RITE-R-A	RiTE Gacko a.d. Gacko	-0,0437	0,0077	-0,0231	0,1023	0,1962	3,4889	0,1394	3,2463
14.	RTEU-R-A	RiTE Ugljevik a.d. Ugljevik	-0,0077	0,0637	-0,0051	0,0426	0,1926	1,3964	0,2809	1,5887
15.	TLKM-R-A	Telekom Srpske a.d. Banja Luka	-0,0656	0,0349	0,0589	0,8678	0,3322	1,2067	1,0170	1,3460

Source: Authors' calculation

It can be seen from Table 3 that the coefficients Z and Z" are significantly different, and that this difference mostly originates from the coefficients X4 and X4". If the book value of capital is used to calculate X4" instead of its market value, it can be expected that there will be a change in the end result. For example, in the case of the issuer Čajavec Mega ad Banja Luka, the coefficient X4 is 15.5080, and X4" is 46.2517, given that the market price of shares was 0.291 KM, and the book value per share 1,1596 KM. Furthermore, in the case of the issuer Hidroelektrane na Trebišnjici ad Trebinje, the value of the coefficient X4 was 1.4145, and the value of the coefficient X4" was 16.7491 (the market price of shares was 0.201 KM, and the book value per share was 2.38 KM).

By applying the criteria from Altman's Z-Score model and Altman's Z"-Score model, the observed companies can be classified into following groups, i.e. zones:

Table 4: Evaluation of issuers based on Altman Z-Score model and Altman Z" - Score model

No.	Sec.code	Issuer	Z"	Criterion	Z	Criterion
1.	CMEG-R-A	Čajavec Mega a.d. Banja Luka	50,5595	sigurna zona	8,2813	sigurna zona
2.	BVRU-R-A	ZTC Banja Vrućica a.d. Teslić	20,9588	sigurna zona	10,1482	sigurna zona
3.	HETR-R-A	Hidroelektrane na Trebišnjici a.d. Trebinje	17,6364	sigurna zona	0,9195	nesigurna zona
4.	KRPT-R-A	Krajinapetrol a.d. Banja Luka	15,1787	sigurna zona	6,8121	sigurna zona
5.	HEDR-R-A	Hidroelektrane na Drini a.d. Višegrad	13,4269	sigurna zona	1,5596	nesigurna zona
6.	HELV-R-A	Hidroelektrane na Vrbasu a.d. Mrkonjić Grad	10,1138	sigurna zona	1,1600	nesigurna zona
7.	DEST-R-A	Hemijska industrija Destilacija a.d. Teslić	9,5396	sigurna zona	1,7089	nesigurna zona
8.	ELDO-R-A	Elektro Doboj a.d. Doboj	9,5131	sigurna zona	0,9847	nesigurna zona
9.	MRDN-R-A	Meridian a.d. Banja Luka	4,0444	sigurna zona	1,7677	nesigurna zona
10.	RITE-R-A	RiTE Gacko a.d. Gacko	3,2463	sigurna zona	0,1394	nesigurna zona
11.	BOKS-R-A	Boksit a.d. Milići	1,6461	siva zona	0,9980	nesigurna zona
12.	RTEU-R-A	RiTE Ugljevik a.d. Ugljevik	1,5887	siva zona	0,2809	nesigurna zona
13.	TLKM-R-A	Telekom Srpske a.d. Banja Luka	1,3460	siva zona	1,0170	nesigurna zona
14.	EKBL-R-A	Elektrokrajina a.d. Banja Luka	0,7320	nesigurna zona	0,3736	nesigurna zona

Source: Authors' calculation

If the Z coefficient is observed, it can be concluded that only three issuers are in the "safe zone", i.e. that they have a coefficient value greater than 2.99. These are ZTC Banja Vrućica a.d. Teslić (10.1482), Čajavec Mega a.d. Banja Luka (8.2813) and Krajinapetrol a.d. Banja Luka (6.8121). All other issuers are in the "unsafe zone", while in the "grey zone" there are no issuers from the analysed sample. One of the companies in the "unsafe zone" is Telekom Srpske a.d. Banja Luka, which is often considered one of the best issuers on the Banja Luka Stock Exchange. The data from the financial statements of this company show that in 2019 there was a significant increase in liabilities (short-term liabilities increased by 123,269,672 KM, and long-term liabilities by 150,274,544 KM). Short-term liabilities were higher than current assets, so the liquidity ratio was 0.67, which may indicate future difficulties with liquidity and servicing obligations.

Also, in the "unsafe zone" there are companies included in the Mixed Holding Power Utility of the Republic of Srpska (Hidroelektrane na Trebišnjici a.d. Trebinje, Hidroelektrane na Drini a.d. Višegrad, Hidroelektrane na Vrbasu a.d. Mrkonjić Grad, Elektro Doboj a.d. Doboj, RiTE Gacko a.d. Gacko, RiTE Ugljevik a.d. Ugljevik i Elektrokrajina a.d. Banja Luka). Three of the mentioned companies had a negative business result in 2019 (Hidroelektrane na Trebišnjici a.d. Trebinje, RiTE Gacko a.d. Gacko and RiTE Ugljevik a.d. Ugljevik).

Table 5: Number of issuers by position based on Altman Z-Score model and Altman Z'' - Score model

Criterion	Z	Z''
safe zone	3	10
grey area	-	3
insecure zone	11	1
In total	*14*	*14*

Source: Authors' calculations

On the other hand, observing the coefficient Z'', significantly different results are obtained. Namely, the application of this model shows that a total of 10 issuers are in the "safe zone", three in the "grey zone" and one in the "unsafe zone". The highest coefficient has Čajavec Mega a.d. Banja Luka (50.5595), which is a consequence of the very high coefficient X4'' (46.2517). Namely, the capital of this issuer amounts to 12,876,652 KM, and liabilities only 278,404 KM. The liquidity ratio is 25.94, which indicates significant liquidity.

The issuer Hidroelektrane na Trebišnjici a.d. Trebinje also has a high Z'' coefficient (17.6364). In this case, too, the high coefficient comes from X4'' (16.7491) which is a consequence of the high value of capital (916,700,496 KM) in relation to liabilities (54,731,204 KM). The liquidity ratio is 0.37, which may indicate future problems in servicing liabilities.

When assessing the overall quality of the analysed issuers, it is necessary to take into account other financial indicators and publicly available information. For example, in the case of the issuer Čajavec Mega a.d. Banja Luka, significant part of the assets was sold, there was reduction of capital and income, and a loss in business activities was incurred. Share liquidity was very low (a total of seven days of trading in 2019). According to the data from the 2019 financial reports, the company is liquid and solvent, but the question of further direction of its business remains open because the 2019 business report states that all construction facilities, part of the equipment and construction land have been sold. Also, the issuer Hidroelektrane na Trebišnjici a.d. Trebinje has a high Z'' coefficient, and it is a company that made a loss of -13,067,475 KM in the reporting period. For the purpose of comparison, a net profit of 5,531,004 KM was realized in 2018. The main reason for such a significant decline lies in the fact that operating revenues in 2019 were reduced from 66,457,177 KM to 37,063,989 KM (a decrease of 29,393,188 KM).

When interpreting the obtained results, it should be borne in mind that the Altman Z-Score model and the Altman Z'' - Score model differ in the fact that in the Altman Z'' - Score model there is no factor X5 = Sales / Total Assets, in order to eliminate cyclical impacts in small and underdeveloped economies, and that the Altman Z'' - Score model uses the book value of capital to calculate the factor X4, thus eliminating its market valorisation.

Based on the sample observed in this paper, it can be concluded that the Altman Z-Score model and the Altman Z'' - Score model provide significantly different results that can have a decisive influence on investment decisions. According to the Altman Z''- Score model, there are some companies in the "safe zone" that are there solely because of the value of their capital, while the other financial indicators are

relatively poor. In this way, capital becomes a key factor in the application of this model. The mentioned situation leaves room for making insufficiently objective conclusions regarding the overall quality of the observed companies. In addition, since the Altman Z" - Score model is intended for emerging markets where there is a greater possibility of manipulation in financial reporting (primarily due to insufficiently liquid market and a large number of estimates used in valuation of certain balance sheet items), it should be taken into account the widest possible range of information related to the overall business of the analysed companies.

When comparing the results of applying both models to the sample of shares that are part of BIRS, it can be concluded that, although it is an emerging market, Altman Z - Score model provides better results that indicate much-needed caution in making conclusions on the analysed issuers (according to this model only three issuers enter the "safe zone", while according to the Altman Z" - Score model a total of 10 issuers are in the "safe zone").

5. CONCLUSION

In this paper, the insolvency risk of companies whose shares are part of BIRS is assessed using the Altman Z - Score model and the Altman Z" - Score model. The research results show that, based on the observed sample, Altman's Z-Score model and Altman's Z" - Score model give significantly different results that can have a decisive influence on investment decisions. According to the Altman Z"- Score model, there are some companies in the "safe zone" that are there solely because of the value of their capital, while the other financial indicators are relatively poor. In this way, capital becomes a key factor in the application of this model. The mentioned situation leaves room for making insufficiently objective conclusions regarding the overall quality of the observed companies. In addition, since the Altman Z" - Score model is intended for emerging markets where there is a greater possibility of manipulation in financial reporting (primarily due to insufficiently liquid market and a large number of estimates used in valuation of certain balance sheet items), it should be taken into account the widest possible range of information related to the overall business of the analysed companies.

When comparing the results of applying both models to the sample of shares that are part of BIRS, it can be concluded that, although it is an emerging market, Altman Z - Score model provides better results that indicate much-needed caution in making conclusions on the analysed issuers (according to this model only three issuers enter the "safe zone", while according to the Altman Z" - Score model a total of 10 issuers are in the "safe zone"). The findings of this paper are of theoretical and practical significance, given that the application of Altman's models is very rare on the Republic of Srpska capital market and that it has reached different conclusions than expected. The main limitation of the work refers to the fact that the analysis is based on the financial statements for 2019, and that the economic consequences of the coronavirus pandemic have not been taken into account, which may be the subject of some future research in this area.

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ANNEX 1

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Calculation of Z coefficient and Z'' coefficient for issuers whose shares were part of BIRS at the end of 2019

No.	Sec.code	Issuer	Assets	Current Assets	Liabilities	Short-Term Liabilities	Retained Earnings	Operating Profit	Market Capitalization	Book Value of Capital	Sales Revenue	x1	x2	x3	x4	x5	x4''	Z	Z''
1.	BOKS-R-A	Boksit a.d. Milići	96.058.728	23.005.924	40.284.384	31.381.934	19.784.203	1.328.516	11.755.616	55.774.344	57.069.528	-0,0872	0,2060	0,0138	0,2918	0,5941	1,3845	0,9980	1,6461
2.	BVRU-R-A	ZTC Banja Vrućica a.d. Teslić	50.613.328	8.731.810	2.599.957	1.883.649	5.257.464	2.577.415	40.320.212	48.013.371	18.620.838	0,1353	0,1039	0,0509	15,5080	0,3679	18,4670	10,1482	20,9588
3.	CMEG-R-A	Čajavec Mega a.d. Banja Luka	13.155.056	3.125.799	278.404	120.509	2.662.631	-319.604	3.621.037	12.876.652	2.208	0,2285	0,2024	-0,0243	13,0064	0,0002	46,2517	8,2813	50,5595
4.	DEST-R-A	Hemijska industrija Destilacija a.d. Teslić	30.956.842	12.852.229	3.823.268	3.613.953	1.005.235	111.841	5.110.240	27.133.584	15.227.475	0,2984	0,0325	0,0036	1,3366	0,4919	7,0970	1,7089	9,5396
5.	EKBL-R-A	Elektrokrajina a.d. Banja Luka	547.660.245	86.786.684	253.390.560	140.063.200	18.319.485	3.398.147	12.088.237	294.269.685	216.199.877	-0,0973	0,0335	0,0062	0,0477	0,3948	1,1613	0,3736	0,7320
6.	ELDO-R-A	Elektro Doboj a.d. Doboj	313.775.302	31.908.950	36.501.498	4.167.214	90.685.228	696.313	15.558.981	277.273.804	66.232.759	0,0884	0,2890	0,0022	0,4263	0,2111	7,5962	0,9847	9,5131
7.	HEDR-R-A	Hidroelektrane na Drini a.d. Višegrad	633.763.576	120.679.124	50.187.762	12.280.855	16.926.073	809.785	106.069.275	583.575.814	28.331.863	0,1710	0,0267	0,0013	2,1134	0,0447	11,6279	1,5596	13,4269
8.	HELV-R-A	Hidroelektrane na Vrbasu a.d. Mrkonjić Grad	279.423.770	20.303.051	28.356.146	4.232.751	26.282.689	5.534.001	38.792.351	251.067.624	20.453.489	0,0575	0,0941	0,0198	1,3680	0,0732	8,8541	1,1600	10,1138
9.	HETR-R-A	Hidroelektrane na Trebišnjici a.d. Trebinje	971.431.700	5.543.739	54.731.204	14.896.081	54.220.026	-9.971.579	77.418.003	916.700.496	37.063.989	-0,0096	0,0558	-0,0103	1,4145	0,0382	16,7491	0,9195	17,6364
10.	KRPT-R-A	Krajinapetrol a.d. Banja Luka	24.147.342	6.610.164	1.789.924	1.748.460	2.378.274	1.515.073	11.878.174	22.357.418	54.239.173	0,2013	0,0985	0,0627	6,6361	2,2462	12,4907	6,8121	15,1787
11.	MRDN-R-A	Meridian a.d. Banja Luka	18.237.317	9.814.244	7.024.465	5.546.166	2.526.831	1.035.133	5.003.565	11.212.852	12.380.726	0,2340	0,1386	0,0568	0,7123	0,6789	1,5963	1,7677	4,0444
12.	NOVB-R-E	Nova banka a.d. Banja Luka																	
13.	RITE-R-A	RiTE Gacko a.d. Gacko	533.644.786	48.401.980	118.881.624	71.720.841	4.094.564	-12.338.427	12.158.716	414.763.162	104.689.098	-0,0437	0,0077	-0,0231	0,1023	0,1962	3,4889	0,1394	3,2463
14.	RTEU-R-A	RiTE Ugljevik a.d. Ugljevik	690.637.976	70.286.432	288.198.003	75.622.218	43.965.100	-3.535.944	12.288.632	402.439.973	132.993.064	-0,0077	0,0637	-0,0051	0,0426	0,1926	1,3964	0,2809	1,5887
15.	TLKM-R-A	Telekom Srpske a.d. Banja Luka	1.246.980.502	167.361.439	565.088.399	249.183.595	43.575.758	73.392.368	490.400.987	681.892.103	414.271.908	-0,0656	0,0349	0,0589	0,8678	0,3322	1,2067	1,0170	1,3460

Source: Authors' calculation

ANNEX 2

Market capitalization of shares that were part of BIRS on May 21, 2020

Sec.code	Issuer	Number of shares	Average Price (KM)	Last Trading Date	Market Cap. (KM)
BOKS-R-A	Boksit a.d. Milići	17.287.671	0,68	18.2.2020.	11.755.616
BVRU-R-A	ZTC Banja Vrućica a.d. Teslić	33.600.177	1,2	20.5.2020.	40.320.212
CMEG-R-A	Čajavec Mega a.d. Banja Luka	12.443.425	0,291	26.11.2019.	3.621.037
DEST-R-A	Hemijska industrija Destilacija a.d. Teslić	23.228.364	0,22	21.6.2019.	5.110.240
EKBL-R-A	Elektrokrajina a.d. Banja Luka	92.276.622	0,131	21.5.2020.	12.088.237
ELDO-R-A	Elektro Doboj a.d. Doboj	31.117.961	0,5	3.3.2020.	15.558.981
HEDR-R-A	Hidroelektrane na Drini a.d. Višegrad	441.955.312	0,24	21.5.2020.	106.069.275
HELV-R-A	Hidroelektrane na Vrbasu a.d. Mrkonjić Grad	102.354.487	0,379	24.2.2020.	38.792.351
HETR-R-A	Hidroelektrane na Trebišnjici a.d. Trebinje	385.164.196	0,201	20.5.2020.	77.418.003
KRPT-R-A	Krajinapetrol a.d. Banja Luka	13.876.371	0,856	20.2.2020.	11.878.174
MRDN-R-A	Meridian a.d. Banja Luka	7.842.578	0,638	18.5.2020.	5.003.565
NOVB-R-E	Nova banka a.d. Banja Luka				
RITE-R-A	RiTE Gacko a.d. Gacko	379.959.879	0,032	27.4.2020.	12.158.716
RTEU-R-A	RiTE Ugljevik a.d. Ugljevik	256.013.165	0,048	20.5.2020.	12.288.632
TLKM-R-A	Telekom Srpske a.d. Banja Luka	491.383.755	0,998	21.5.2020.	490.400.987

Source: Authors' calculation