# Analysis of Bankruptcy Prediction of Regional Development Banks (BPD) using the Altman Z-Score Method

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**Abstract:** The purpose of this study is to predict the level of bankruptcy of BPD using the Altman Z score method. The data used is the BPD Audited Financial Statements in Sumatera region since 2014-2018. The sample of this research is BPD Aceh, North Sumatra, South Sumatra Babel, Bengkulu, West Sumatra, Lampung, Jambi, Kepulauan Riau. The analysis techniques in this research is the Altman Z-score modification method using 4 ratio, that working capital to total assets ratio (X1), retained earnings to total assets ratio (X2), earnings before interest and taxes to total assets ratio (X3), book value of equity to total debt ratio (X4). The formula of Altman Z-score method to calculate the level of health for the company, that Z-score = 6.56 X1 + 3.26 X2 + 6.72 X3 + 1.05 X4. Z-Score indicator to determine the bankruptcy of companies grouped into the healthy category (Z-score> 2.60), gray area (Z-scores between 1.1 and 2.60) and bankrupt (Z-score <1.1). The calculation results show that there are no BPDs in the healthy category, all of them are in the bankrupt and gray area categories.

**Keywords:** Altman Z-score modification · Bankruptcy · Healthy · Bankrupt and gray area

## 1 Introduction

Collecting funds from the public and channeling them back to the community is the main function of bank financial institutions. In carrying out this function, bank collects funds in the form of customers' deposits in the form of savings, current accounts and deposits. The funds will be channeled back to the community in the form of credit. The banking activities are carried out based on government regulations, including Bank Indonesia Regulations, Financial Services Authority Regulations (POJK), and other related regulations.

The monetary crisis occurred in Indonesia in 2008, which began with the weakening of the Rupiah since mid-2017. The sudden withdrawal of large amounts of funds by foreign investors was driven by the pessimism of regional economic prospects and immediately weakened the rupiah currency drastically. (*Bulletin of Monetary, Economics and Banking*, September 1998). In that year, the value of the Rupiah weakened compared to the value of the dollar, to reach the lowest value of IDR 12,400 on November 25th, 2008. (*Reuters* data quoted by **detikFinance**, Wednesday (08/21/2013)). The weakening of the value of the rupiah impacts on the Indonesian

government is having difficulty to meet the state budget target, difficulties in paying foreign debt soaring.

The weakening of the value of the rupiah has become a big shot in the banking world. Since the enactment of banking regulation in 1988, banks in Indonesia have begun to emerge. Banks may be established on condition that quite easily, with funds only IDR 1 billion. The establishment of this bank is not accompanied by good banking managerial. Banks run with the concept of seeking profit for a moment without considering the principle of prudence, and the healthiness level of the bank. In addition, bank supervision conducted by Bank Indonesia was very weak, so that when the monetary crisis occurred in 1997 and 1998, these banks were unable to survive.

Banks that obtain loans in foreign currencies must repay loans that are due with a weakening Rupiah. The public distrust towards the banking world began to fall, and it impacts the withdrawing public funds. The decline in the Indonesian economy also caused people to be unable to finance credit obligations, resulting in a lot of bad credits. These factors are one of them, which makes many banks in Indonesia unable to survive. In 1997, Bank Indonesia liquidated 16 banks deemed unable to carry out their operational activities anymore. The monetary crisis has proven that Indonesian banking is not healthy. The healthy level of banks is very important for banks to be able to survive.

The World Bank recommends restoring confidence in the rupiah with four main policies: restructuring the private debt burden, reforming and strengthening the banking system, improving "governance", and maintaining fiscal and monetary stability during the transition period (World Bank, 1998, p.2.2). One of these policies has been noted as strengthening of the banking system. The Indonesian government began to reform them by establishing the Financial Services Authority (OJK) to improve banking supervision through issuing relevant regulations to assess the healthiness of banks so that banks could improving to meet the principles of *prudential banking*.

Bank assessment can be done in several ways, including by using Bank Indonesia Regulation and Regulation of the Financial Services Authority, the assessment by the CAMEL (Capital, Asset Quality, Management, Earnings, Liquidity and Sensitivity to Market Risk) and Risk-based Banking Rate (Risk Profile, Good Corporate Governance, Earnings, and Capital). The assessment of the health status of bank has also been raised by several experts based on the results of their research were noted as predicting the level of bankruptcy of the company, including the Altman Z-Score Model, Springate Analysis Model (S-Score), and the Zmijewski Analysis Model (X-Score). The Altman model is the first bankruptcy prediction model developed in 1969 by using discriminant analysis statistical techniques. The Springate model was developed in 1978 using discriminant analysis with several steps to identify 4 financial ratios from 19 existing financial ratios. The Zmijewski method was developed in 1983 by expanding studies to increase the validity of financial ratios as a means of detecting corporate failures.

This study uses the Altman Z-Score method to predict bankruptcy of banks, because this method is the first method developed related to bankruptcy predictions. This method also experienced developments, including in 1984 the Altman Z-Score formula for manufacturing companies that did not go-public and the formula for companies other than manufacturing companies that go-public or non-public. This formula can also be used for banking companies.

Based on Indonesian Banking Statistics data-Vol. 17 No. 9 August 2019, the number of Commercial Banks and Bank Perkreditan Rakyat has decreased, with the following details:

| Category of Bank | 2015 | 2016 | 2017 | 2018 | August 2019 |
|---|---|---|---|---|---|
| **Commercial Bank** | 118 | 116 | 115 | 115 | 111 |
| **Bank Perkreditan Rakyat** | 1636 | 1633 | 1619 | 1579 | 1579 |

The movement of the number of commercial banks in Indonesia from 1988 to January 2019 has decreased, based on OJK's database for March 2019, seen in the figure below:
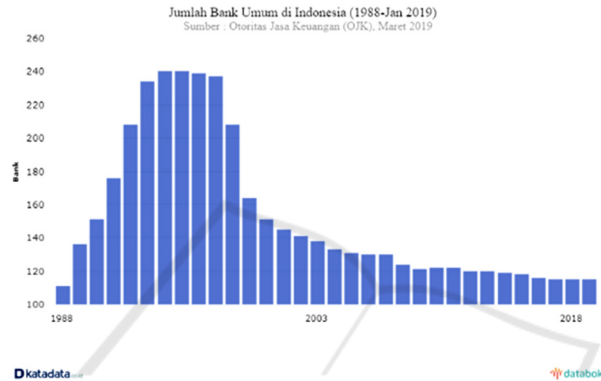


**Fig. 1.**

The number of commercial banks in August 2019 was 111 banks, with the following details:

| Group of Bank | Amount | Asset >IDR 50 Trillion (August 2019) | % |
|---|---|---|---|
| **Company Bank** | 4 | 4 | 100.00 |
| **Foreign Exchange BUSN** | 41 | 16 | 39.02 |
| **Non-Foreign Exchange BUSN** | 20 | 0 | - |
| **BPD** | 27 | 3 | 11.11 |
| **Mixed Bank** | 11 | 2 | 18.18 |
| **Foreign Bank** | 8 | 3 | 37.50 |
| **Amount** | 111 | 28 | |

The highest number of commercial banks in the BUSN (National Private Commercial Bank) group is 41 banks, and the least is Foreign Banks. From this group of banks, the development of banks viewed from the value of assets shows that the percentage of banks that have assets above IDR 50 trillion is Bank Persero, and the low level is Non-Foreign Exchange BUSN. The banks which are owned by the government in this case are the Persero Bank and the Bank Pembangunan Daerah (BPD). Based on the table, it is seen that the level of development of BPD assets falls into the 3 lowest groups. With this condition, many parties often worry about the continuity of BPD business activities if their funds are no longer fully supported by the APBD. The number of BPD is 27 BPD, spread throughout Indonesia, with the following amounts:

| No | Area | Amount |
|----|------|--------|
| 1 | Sumatera | 8 |
| 2 | Java & Southeast Nusa | 9 |
| 3 | Kalimantan | 4 |
| 4 | Sulawesi Island | 5 |
| 5 | Papua | 1 |
| | **Amount** | 27 |

This study will analyze bankruptcy predictions using the Altman Z-Score method for BPD in the Sumatra Region, totaling 8 BPDs.

## 2 Literature Review

### 2.1 Definition of Bank

Based on Banking Law Number 10 in the year of 2008, Banking is defined as everything related to banks, including institutions, business activities, as well as ways and processes in carrying out their business activities; whereas the term "Bank" is a business entity that collects funds from the public in the form of deposits and distributes them to the community in the form of credit and or other forms in order to improve the lives of many people.

### 2.2 Definition of Bank Healthiness

Based on the Financial Services Authority Regulation, the healthiness of a bank is the result of an assessment of the condition of a bank conducted on risk and bank performance. According to Kasmir (2008: 41) "The healthiness of a bank can be interpreted as the ability of a bank to be interpreted as the ability of a bank to carry out banking operations normally and be able to fulfill all its obligations properly in ways that are in accordance with applicable banking regulations."

Understanding bank healthiness according to Veithzal Rivai (2007: 118) "The healthiness of a bank is a bank that can carry out its functions properly, which can maintain public trust, can carry out the intermediary function of the government in implementing various policies, especially monetary policy".

Healthiness can be interpreted as the ability of a bank to carry out banking operations normally and as well as to fulfill all its obligations properly in accordance with applicable regulations. (Susilo et al, 2000: 22-23).

### 2.3 Rating of Bank Healthiness based on Bank Indonesia Regulations and Financial Services Authority Regulations

An assessment of the healthiness of a bank can be done in several ways. Several regulations have been issued by Bank Indonesia and the Financial Services Authority

(OJK) related to the assessment. The following are a number of regulations relating to assessing the healthiness level of banks, including:

1. Based on the Financial Services Authority Regulation Number 4 / POJK.03 / 2016 concerning Rating of Healthiness of Commercial Banks
Article 6
Banks are required to conduct individual bank healthiness assessments using a *risk-based Bank Rating* approach as referred to in Article 2 paragraph (3), with the scope of the assessment of factors: (a) *risk profile*; (b) *Good Corporate Governance* (GCG); (c) earnings (earnings); and (d) capital *(capital)*.

2. Based on Bank Indonesia Regulation Number 13/1 / PBI / 2011 dated January 5, 2011 concerning Rating of Healthiness of Commercial Banks; Article 6 Banks are required to conduct an assessment of the Bank on an individual basis using risk approach *(Risk-based Bank Rating)* as referred to in Article 2 paragraph (3), the scope of an assessment of the factors as follows: (a) The risk profile *(risk profile)*; (b) *Good Corporate Governance* (GCG); (c) Profitability (*earnings*); and (d) Capital *(capital)*.

3. Based on Bank Indonesia Regulation Number 6/10/PBI/2004 concerning Rating System for Commercial Banks, in article 3, it is stated that the assessment of bank healthiness includes an assessment of the following factors: (a) capital (capital); (b) asset quality; (c) management (management); (d) earnings (*earnings*); (e) liquidity *(liquidity);* and (f) sensitivity to market risk (*sensitivity to market risk*). This healthiness rating is usually abbreviated as CAMEL.

## 2.4 Bank Risk Assessment using the Bankruptcy Risk Altman Z-Score Method

Some researchers have conducted research to assess the risk of companies including banking. One of them is the Altman Z-Score. Altman has conducted research and has introduced 3 (three) formula models that can be used to see the level of bankruptcy of a company. The formula is:

1. The first Z-Score formula was produced by Altman in 1968.This formula is produced from research on various manufacturing companies in the United States that sell their shares on the stock exchange. Therefore, the formula is more suitable to predict the business continuity of manufacturing companies that *go public*. The first formula is as follows:

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

2. In 1983, Altman conducted research in various countries. This research uses a variety of manufacturing companies that do not *go public*. Therefore, the formula of the results of the study is more appropriate for manufacturing companies that do not sell their shares on the stock exchange. The results of these studies produce the second Z-Score formula for manufacturing companies that do not *go public*, as follows:

$$Z = 0,717 \, X_1 + 0,847X_2 + 3,107X_3 + 0,420X_4 + 0,998X_5$$

3. Altman (2000) conducted more research on the potential bankruptcy of companies other than manufacturing companies, both those that *went public* or not. The last Z-Score formula is a very flexible formula because it can be used for various types of business fields of the company, both those that *go public* or not, and is suitable for use in developing countries like Indonesia. This model is also suitable for use by service companies such as banking companies. The formula is:

$$Z = 6,56 \, X_1 + 3,26X_2 + 6,72X_3 + 1,05X_4$$

The formula for obtaining X1, X2, X3, and X4, is as follows:

1. *Working capital to total asset ratio* ($X_1$). The value of *working capital* is obtained from the difference between the current assets and the bank's current debt.

2. *Retained earnings to total asset ratio* ($X_2$).

3. *Earnings before Interest and taxes to total asset ratio* ($X_3$),

4. *Book value of equity to total debt ratio* ($X_4$)

The results of calculations using the Z-Score formula will produce a different score between one company and another company. The score must be compared with the following assessment standards to assess the viability of the company:

1. If Z value> 2.60          = Safe Zone (HEALTHY)

2. If the value is 1.10 <Z <2.60    = Gray Zone (RISKY)

3. If Z value <1.10          = Dangerous Zone (BANKRUPT)

## 2.5 Prior Research

Several previous studies have been conducted to look at the level of bank health by assessing bankruptcy predictions using the Altman Z-Score method, including:

1. Analysis of Camel and Altman's Z-Score Models in Predicting Bankruptcy in Commercial Banks in Indonesia (Studies in Commercial Banks Listed on the Indonesia Stock Exchange in 2007-2011); (2014, Kusdiana)
2. Analysis of the Altman Z-Score Model for Predicting Financial Distress in Banks Listed on the Indonesia Stock Exchange in 2010 - 2013; (2015, Ariesco).
3. Analysis of Altman Method Prediction Accuracy Against Liquidation in Banking Institutions (Case of Bank Liquidation in Indonesia); (2001; Adnan & Taufik).

## 3 Research Methodology

### 3.1 Population and Research Samples

The population in this study is all Regional Development Banks (BPD) in the Sumatra Region, which are 8 (eight) BPDs, namely: (1) Aceh BPD; (2) BPD North Sumatra; (3) South Sumatra BPD and Bangka Belitung; (4) BPD Bengkulu; (5) West Sumatra BPD; (6) BPD Lampung; (7) Jambi BPD; and (8) BPD Riau Kepri.

The sampling method used is saturated samples, i.e. the entire population will be sampled. The year of observation was 2014-2018, so the number of observations were 40 (forty).

### 3.2 Data Sources and Data Collection Techniques

The data used in this study are secondary data in the form of audited bank financial statements for the 2014-2018 period. Data is collected from bank annual reports which are published annually.

### 3.3 Data Analysis Tool

To analyze this research data, the steps that will be carried out are:

1.  Bank financial report data for 2014-2018 was obtained from each bank's website. The financial statements used are the audited financial statements.

2.  Data from the financial statements will be processed using the Altman Z-Score formula. The Altman formula used is the modified Altman Z-Score.

3.  Altman conducted more research on the potential bankruptcy of companies other than manufacturing companies, both those that *went public* or not. The last Z-Score formula is a very flexible formula because it can be used for various types of business fields of the company, both those that *go public* or not, and is suitable for use in developing countries like Indonesia. The formula is:

$$Z = 6{,}56\,X_1 + 3{,}26X_2 + 6{,}72X_3 + 1{,}05X_4$$

The score must be compared with the following assessment standards to assess the viability of the company:

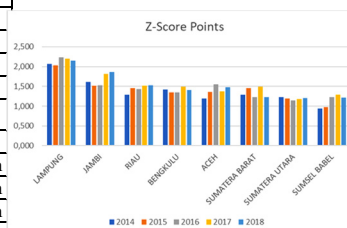1.  If Z value> 2.60                    = Safe Zone (HEALTHY)

2.  If the value is 1.10 <Z <2.60    = Gray Zone (RISKY)

3.  If Z value <1.10                    = Dangerous Zone (BANKRUPT)

## 4 Results and Discussion

### 4.1 Z-Score Value of the Regional Development Bank of Sumatera Region

Based on the Sumatra Regional BPD financial report data obtained from each annual report, the Z-Score values for these banks were obtained from 2014-2018, as follows:

| Name of BPD | 2014 | 2015 | 2016 | 2017 | 2018 | AVG |
|---|---|---|---|---|---|---|
| ACEH | 1,197 | 1,361 | 1,551 | 1,368 | 1,476 | **1,391** |
| SUMATERA URATA | 2,278 | 2,241 | 2,191 | 1,174 | 1,209 | **1,818** |
| SUMSEL BABEL | 0,939 | 0,974 | 1,226 | 1,287 | 1,221 | **1,129** |
| BENGKULU | 1,418 | 1,345 | 1,344 | 1,491 | 1,409 | **1,401** |
| SUMATERA BARAT | 1,288 | 1,450 | 1,230 | 1,495 | 1,223 | **1,337** |
| LAMPUNG | 2,064 | 2,035 | 2,230 | 2,200 | 2,145 | **2,135** |
| JAMBI | 1,616 | 1,514 | 1,525 | 1,810 | 1,866 | **1,666** |
| RIAU | 1,288 | 1,450 | 1,426 | 1,519 | 1,528 | **1,442** |
| **AVERAGE** | **1,511** | **1,546** | **1,590** | **1,543** | **1,510** | **1,540** |

| Name of BPD | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| ACEH | Rawan | Rawan | Rawan | Rawan | Rawan |
| SUMATERA URATA | Bankrupt | Bankrupt | Rawan | Rawan | Rawan |
| SUMSEL BABEL | Rawan | Rawan | Rawan | Rawan | Rawan |
| BENGKULU | Rawan | Rawan | Rawan | Rawan | Rawan |
| SUMATERA BARAT | Rawan | Rawan | Rawan | Rawan | Rawan |
| LAMPUNG | Rawan | Rawan | Rawan | Rawan | Rawan |
| JAMBI | Rawan | Rawan | Rawan | Rawan | Rawan |
| RIAU | Rawan | Rawan | Rawan | Rawan | Rawan |



The calculation results show that the Z-Score for BPD in Sumatra Region is more grouped in the value of 1.1 - 2.6 and included in the category of gray areas, or vulnerable conditions. In 2014 and 2015, there was 1 (one) BPD which was included in the bankrupt category with a Z-Score <1.1, namely Bank Sumsel Babel. There is no BPD in the healthy category, which is a Z-Score greater than 2.6. Based on the average Z-Score for each bank, the banks that have the highest average Z-Score from 2014-2018 are Bank Lampung with a value of 2.135; which was followed by the North Sumatra Bank and the Jambi Bank, while the bank with the lowest average Z-Score was the Sumsel Babel Bank with a value of 1,129.

If seen the value of Z-Score for each year, then the highest Z-Score value in 2014 is the Bank of North Sumatra and the lowest Bank of South Sumatra Babel. The highest Z-Score in 2015 was the North Sumatra Bank and the lowest was the South Sumatra Babel Bank. For the highest Z-Score value from 2016 to 2018 is the Lampung Bank, and the lowest since 2016-2018 is the Sumsel Babel Bank. BPDs that achieved a Z-Score 2 score were only the Lampung Bank and the North Sumatra Bank. The Z-Score value which reached 2 in 2014 and 2018 was only Bank Lampung, and the value was quite stable.

Bank Sumsel Babel entered the category of bankruptcy based on the Z-Score assessment in 2014 with a value of 0.939. In 2015, the Z-Score increased to 0.974, but it still entered the bankrupt category. In 2016, the Bank Sumsel Babel began to rise and is able to reach a value of Z-Score of 1.226 and included in the gray category or categories of vulnerable bankruptcy. In 2017, the Z-Score increased again to 1,287, and again declined in 2018 to 1,221. However, this value is still included in the

vulnerable category. With the increase in the value of the Z-Score each year, it shows that Altman's bankruptcy prediction did not occur at the South Sumatra Bank of Babel. The bank actually experienced an increase in Z-Score and began to enter the vulnerable category for the next 5 years.

Z-Score value each year for each bank has increased and decreased varies. From this value, there is no BPD that has an increase in the Z-Score every year and a decreasing Z-Score every year. All banks show increases and decreases in different years. For the value of Z-Score each year, shows that the average value of the Z-Score for all BPD in the Sumatra Region each year is at 1.5. The lowest value is 1,510 in 2018 and the highest value is 1,590 in 2016.

The Z-Score rating can be seen in the table below:

| Name of BPD | The average of Z-Score | Rangking |
|---|---|---|
| LAMPUNG | 2,135 | **1** |
| JAMBI | 1,666 | **2** |
| RIAU | 1,442 | **3** |
| BENGKULU | 1,401 | **4** |
| ACEH | 1,391 | **5** |
| SUMATERA BARAT | 1,337 | **6** |
| SUMATERA UTARA | 1,188 | **7** |
| SUMSEL BABEL | 1,129 | **8** |
| **AVERAGE** | **1,461** | |

Based on the table above, the average value of Z-Score since 2014-2018, the highest is Bank Lampung, Bank Jambi and Bank Riau. While the lowest Z-Score is Bank Sumsel Babel.

### 4.2 Comparison of Z-Score Value with Bank Capital

Commercial Banks based on Business Activities, hereinafter referred to as BUKU *(Commercial Banks Business Groups)*, are groupings of Banks based on Business Activities that are adjusted to their Core Capital. Based on its Core Capital, Banks are grouped into 4 (four) BOOKS, namely:

1.  BUKU 1 is a Bank with a Core Capital of less than Rp1,000,000,000,000.00 (one trillion Rupiahs);

2.  BUKU 2 is a Bank with Core Capital of no less than Rp1,000,000,000,000.00 (one trillion Rupiahs) up to less than Rp5,000,000,000,000.00 (five trillion Rupiahs);

3.  BUKU 3 is a Bank with a Core Capital of at least Rp5,000,000,000,000.00 (five trillion Rupiahs) to less than Rp30,000,000,000,000.00 (thirty trillion Rupiahs); and

4.  BUKU 4 is a Bank with a Core Capital of at least IDR 30,000,000,000,000.00 (thirty trillion Rupiahs).

5.  BUKU Grouping for Syariah Business Units is based on the Core Capital of Conventional Commercial Banks that are the parent.

Based on bank capital, BPDs in the Sumatra region are in the following capital groups:

| The Capital of The Bank | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| ACEH | 1,810,489,653,203 | 1,952,844,970,594 | 2,073,577,807,208 | 2,169,482,198,756 | 2,217,946,337,147 |
| SUMATERA URATA | 1,995,720,290,879 | 1,992,416,897,528 | 2,719,148,719,086 | 2,994,537,223,528 | 3,173,605,799,781 |
| SUMSEL BABEL | 1,801,584,523,019 | 2,073,759,380,591 | 2,829,832,670,059 | 2,977,056,034,301 | 3,270,043,930,878 |
| BENGKULU | 457,729,210,000 | 530,998,414,000 | 618,557,359,000 | 713,181,819,000 | 769,333,081,210 |
| SUMATERA BARAT | 1,789,199,254,658 | 2,139,599,910,099 | 2,474,316,465,533 | 2,683,687,060,316 | 2,900,346,936,365 |
| LAMPUNG | 545,753,917,455 | 663,296,230,888 | 727,207,507,390 | 809,353,897,606 | 821,843,994,664 |
| JAMBI | 913,960,515,028 | 985,124,808,438 | 1,104,992,007,462 | 1,284,133,787,372 | 1,460,751,529,921 |
| RIAU | 2,387,137,839,421 | 2,393,670,063,449 | 2,674,459,553,784 | 2,866,704,041,783 | 2,942,807,090,336 |

| BPD | 2014 | | 2015 | | 2016 | | 2017 | | 2018 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Group of Capital | Z-Score | Group of Capital | Z-Score | Group of Capital | Z-Score | Group of Capital | Z-Score | Group of Capital | Z-Score |
| Aceh | BUKU II | 1,197 | BUKU II | 1,361 | BUKU II | 1,551 | BUKU II | 1,368 | BUKU II | 1,476 |
| Sumatera Utara | BUKU II | 1,227 | BUKU II | 1,191 | BUKU II | 1,141 | BUKU II | 1,174 | BUKU II | 1,209 |
| Sumsel Babel | BUKU II | 0,939 | BUKU II | 0,974 | BUKU II | 1,226 | BUKU II | 1,287 | BUKU II | 1,221 |
| Bengkulu | BUKU I | 1,418 | BUKU I | 1,345 | BUKU I | 1,344 | BUKU I | 1,491 | BUKU I | 1,409 |
| Sumatera Barat | BUKU II | 1,288 | BUKU II | 1,450 | BUKU II | 1,230 | BUKU II | 1,495 | BUKU II | 1,223 |
| Lampung | BUKU I | 2,064 | BUKU I | 2,035 | BUKU I | 2,230 | BUKU I | 2,200 | BUKU I | 2,145 |
| Jambi | BUKU I | 1,616 | BUKU I | 1,514 | BUKU II | 1,525 | BUKU II | 1,810 | BUKU II | 1,866 |
| Riau | BUKU II | 1,288 | BUKU II | 1,450 | BUKU II | 1,426 | BUKU II | 1,519 | BUKU II | 1,528 |

Based on the above table, it appears that BPD in the Sumatra Region is in the BUKU I and II groups. The highest Z-Score was obtained by Lampung BPD, and based on the BUKU group, Bank Lampung was still in the BUKU I's position. Other banks that are also in BUKU I are Bengkulu Bank and Jambi Bank, and in that position each bank is included in the Risky category according to the Altman Z-Score method .The lowest Z-Score is obtained by the South Sumatra Bank of Babel, and for capital positions, the bank is included in the category of BUKU II. With this result, it can be concluded that high bank capital does not directly affect the Altman Z-Score category.

### 4.3 Comparison between Z-Score and Bank Assets

Assets are assets owned by companies to be used to carry out operational activities. According to IAI, the definition of assets is the resources controlled by the company as a result of events that occurred in the past and bring economic benefits in the future for the company. With assets owned, the bank can use it to improve business continuity to avoid bankruptcy. Here is a comparison of the Z-Score value with the assets owned by the bank:

| BPD | Type | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|
| Aceh | Total Asset | 16,375,138,309,571 | 18,590,014,442,084 | 18,759,190,948,558 | 22,612,006,926,978 | 23,095,158,779,296 |
| | Z-Score | 1,197 | 1,361 | 1,551 | 1,368 | 1,476 |
| Sumatera Utara | Total Asset | 23,389,209,268,233 | 24,130,113,107,232 | 26,170,043,788,235 | 28,931,823,934,130 | 28,121,107,028,840 |
| | Z-Score | 1,227 | 1,191 | 1,141 | 1,174 | 1,209 |
| Sumsel Babel | Total Asset | 16,072,595,700,887 | 16,515,086,293,124 | 18,911,353,525,089 | 22,145,410,143,202 | 25,672,239,733,320 |
| | Z-Score | 0,939 | 0,974 | 1,226 | 1,287 | 1,221 |
| Bengkulu | Total Asset | 3,920,719,978,000 | 4,607,038,828,000 | 5,136,647,584,000 | 5,865,005,396,000 | 5,893,387,816,082 |
| | Z-Score | 1,418 | 1,345 | 1,344 | 1,491 | 1,409 |
| Sumatera Barat | Total Asset | 18,017,897,548,922 | 19,448,300,127,447 | 20,616,860,447,266 | 21,371,463,635,573 | 23,190,691,424,930 |
| | Z-Score | 1,288 | 1,450 | 1,230 | 1,495 | 1,223 |
| Lampung | Total Asset | 4,987,459,199,385 | 5,835,227,784,316 | 5,367,473,702,955 | 5,979,450,593,305 | 7,348,167,382,969 |
| | Z-Score | 2,064 | 2,035 | 2,230 | 2,200 | 2,145 |
| Jambi | Total Asset | 5,779,858,202,959 | 6,580,730,164,473 | 7,591,715,071,059 | 9,526,848,629,322 | 10,895,786,868,743 |
| | Z-Score | 1,616 | 1,514 | 1,525 | 1,810 | 1,866 |
| Riau | Total Asset | 18,017,897,548,922 | 19,448,300,127,447 | 21,220,939,642,979 | 25,492,549,495,353 | 27,414,272,407,258 |
| | Z-Score | 1,288 | 1,450 | 1,426 | 1,519 | 1,528 |

Based on the above table, it appears that the decreasing asset bank the assets the Bank of Sumatra Utara in 2017 to 2018, while the value of the Z-Score even increase. Another bank that experienced a decline was Bank Lampung in 2015 to 2016. In the same year, the bank's Z-Score also increased. In addition to the decline, there were BPDs that experienced an increase in total assets, namely Bank Aceh in 2014 to 2015, this increase was also followed by an increase in the Z-Score. The increase in assets also occurred at the North Sumatra BPD in 2014 to 2015, but the Z-Score value actually declined. This also happened to other BPDs as seen in the table above. With this result, it can be concluded that the increase in assets does not directly increase the Z-Score value.

## 5 Conclusion

The conclusions of this study are:

1. Of the 8 (eight) Regional Development Banks in the Sumatra Region, none of the BPD is included in the Healthy category, all are in the Risky and Bankrupt categories.
2. Altman Z-Score values starting from the highest are Lampung Bank, Jambi Bank, Riau Bank, Bengkulu Bank, Aceh Bank, West Sumatra Bank, North Sumatra Bank, and Sumsel Babel Bank.
3. The bank that got the Z-Score in the category of Bankrupt was the Bank of South Sumatra Babel in 2014 and 2015.Until 2018, the value of the Z-Score able to enter the Vulnerable category. Thus, it can be concluded that the Altman Z-Score bankruptcy prediction has not been proven for banking companies, especially Regional Development Banks, for 5 (five) years.
4. BPD grouping based on capital value shows that BPD in Sumatra region is still in BUKU I and BUKU II.
5. Comparison of the Z-Score value with bank capital, is not able to show the relationship between the two hectares.
6. The increase in assets does not directly increase the Z-Score value.

## References

Adnan dan Taufik. 2001. Analisis Ketepatan Prediksi Metode Altman Terhadap Terjadinya Likuidasi Pada Lembaga Perbankan [ Kasus Likuidasi Perbankan Di Indonesia ].

Altman, Edward I. (1968): Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. In: The Journal of Finance, 22(4), 589-609.

Altman, Edward I. (1983), Corporate Financial Distress: A Complete Guide to Predicting, Avoiding, and Dealing With Bankruptcy, USA: John Willey & Sons.

Altman, Edward I. (2000), Predicting financial distress of companies: Revisiting the Z-score and ZETA® models

Ariesco . 2015. Analisis Model Altman Z-Score Untuk Memprediksi Financial Distress Pada Bank Yang Listing Di Bei Tahun 2010 – 2013.

Buletin Ekonomi Moneter dan Perbankan, September 1998

Data *Reuters* yang dikutip detikFinance, Rabu (21/8/2013

Kasmir. 2014. Bank dan Lembaga Keuangan Lainnya. Edisi Revisi 2014.Jakarta: Raja Grafindo Persada.

Kusdiana. 2014. Analisis Model Camel Dan Altman's Z-Score Dalam Memprediksi Kebangkrutan Bank Umum Di Indonesia (Studi Pada  Bank Umum Yang Tercatat Di Bursa Efek Indonesia Tahun 2007-2011).

Undang-undang Perbankan No. 10 tahun 2008 tentang Perubahan Atas Undang-Undang Nomor 7 Tahun 1992 Tentang Perbankan

Peraturan Otoritas Jasa Keuangan Nomor 4/POJK.03/2016 tentang Penilaian Tingkat Kesehatan Bank Umum

Peraturan Bank Indonesia Nomor 13/1/PBI/2011 tanggal 5 Januari 2011 tentang Penilaian Tingkat Kesehatan Bank Umum

Peraturan Bank Indonesia Nomor 6/10/PBI/2004 tentang Sistem Penilaian Tingkat Kesehatan Bank Umum

Statistik Perbankan Indonesia-Vol. 17 No. 9 Agustus 2019. Otoritas Jasa Keuangan

World Bank. 1998. The World Bank annual report 1998 (English). Washington DC; World Bank.