Journal of Islamic Economics and Philanthropy (JIEP). E-ISSN : 2655-335X, VOL. 04, No. 02, Agustus, 2021

COMPARATIVE ANALYSIS OF FULMER, SPRINGATE AND GROVER MODELS IN PREDICTING BANKRUPTCY

Rahma Yudi Astuti[1], Agnes Anggela[2]

(Rahmayudi67@unida.gontor.ac.id, agnesanggela@gmail.com)

Abstract

This study aims to determine the difference in scores between the Fulmer, Springate and Grover models in predicting bankruptcy and to determine the model with the highest level of accuracy in the property and real estate industry listed on the Indonesian Sharia Stock Index (ISSI). Bankruptcy prediction needs to be done because an analysis is very important for companies in determining decisions. This study uses secondary data obtained from financial statements listed on the Indonesia Stock Exchange (IDX). The sampling technique uses purposive sampling so that 40 companies are sampled. The analytical technique used in this research is Kruskall Wallis non-parametric analysis and test the accuracy of the prediction model. The results of this study indicate that there are significant differences between the Fulmer, Springate and Grover models in predicting the bankruptcy of the property and real estate industries. The Fulmer model is the most accurate model with an accuracy rate of 80%, a type I error rate of 70% and an error II type 3%.

Keywords: *Comparative Analysis, Fulmer, Springate dan Grover, Bankruptcy*

INTRODUCTION

The property and real estate sectoral index is an overview to show whether there is an increase or decrease in the role of the property and real estate sectors in the Indonesian economy today. The property sector has a high enough role in economic growth in a country. The property sector contributed 2.30% to economic growth in 2020. This sector is considered important in Indonesia because it is an indicator to analyze the economic health of a country and is the first industry to signal a fall or the rise of a country's economy.[1]

[1] Putu Fenta Premudya, I. W. (2015*). Pengaruh Nilai Tukar Rupiah dan Inflasi Tehadap Indeks Harga Saham Sektor Properti dan Real Estate yang tercatat di BEI*. e-Journal Bisma Universitas Pendidikan Ganesha, Vol. 3, 2.https://ejournal.undiksha.ac.id/index.php/JMI/article/view/4821

The low purchasing power of the public is reflected in a survey conducted by Bank Indonesia (BI) related to the Consumer Confidence Index/ I*ndeks Keyakinan Konsumen (IKK)* in June 2017 of122.4, which is down 3.5 points when compared to the IKK in the previous month. In 2016, several factors influenced the growth of the property industry, including declining commodity prices and a global economic slowdown. Most of the property products experienced lower demand than industrial land demand. In 2009-2013, the property sector experienced significant growth and led to uncontrolled and indicationsof expensive. Even the national property industry is feel the impact of the global economic slowdown. So in 2017 developers cannot raise high prices because sales are experiencing bottlenecks. As a result, the performance of property companies decreased in obtain is profit, or profits.[2]

Table 1. Share Prices, High, Year on Year, and Volume Data

Year	Share Price	High	Year On Year	Volume
Des-16	517.81	520.9540	5.5%	1.600.921.545,36
Des-17	495.51	495.5100	-4,3%	972.743.649.101
Des-18	447.75	447.7520	-9,6%	806.324.366.660
Des-19	487.72	503.8790	12.5%	640.657.562.704

Data Source: Processed data, www.idx.co.id,www.duniainvestasi.com, 2020

From the table above, it is known that the property stock price Index has decreased from 2016 to 2018 by 517.81, 495.51, and 447.75, while in the middle of 2019 it has increased to 487.72. For the highest stock price also decreased from 2016 to 2018, namely 520.9540, 495.5100, and 447.7520. Stocks are relatively bearish if the current high is now lower than yesterday's high, which is a situation where the stock market is trending down or weakening, as a result, the company's profit will grow negatively. In 2019, the high of 503.8790 making the industry's shares improve.

The property and real estate industry's Year on Year in 2016 was at 5.5%, however, in 2017 it fell to -4.3% as 2018 slowed to -9.6% but in the 2019 year on year experienced a positive increase to the level of 12.5%. In terms of volume, in 2016 the volume of shares reached 1,600,921,545.36 but in 2017-2019 it decreased

[2] Wulandari, F. &. (2017). Kinerja Keuangan Perusahaan Property dan Real Estate di BEI selama Periode 2012-2016 yang Termasuk Indeks LQ45. *Jurnal Manajemen dan Bisnis Sriwijaya, Vol. 15, No. 1*,3.https://pdfs.semanticscholar.org/8bb0/3d293a0a78125d9a66c2441edbd1196f25f6.pdf

by 972.743.649.101, 806.324.366.660, 640.657.562.704 if the volume in stock trading is getting bigger indicates that the stock is getting more liquid, otherwise, if the volume is getting smaller, then the stock becomes less liquid.

Bankruptcy experienced by a company has negative impacts, such as rising unemployment and criminality and reduced state revenues. Financial difficulties and early signs of bankruptcy can be seen from the company's financial statements. By analyzing financial statements, the company is expected to be able to see more clearly how the company is doing as well as financial developments, so that the company can take appropriate action to correct the company's shortcomings. Bankruptcy prediction is the most important thing to do because the analysis is important for creditors as a consideration in deciding to withdraw receivables, increase receivables or make other policies related to receivables[3]. Every bankruptcy prediction model needs to be tested for accuracy. Accuracy is the precision of the results obtained with actual circumstances and used to see how precisel the model is used to predict the state of the company.[4]

The research conducted by Hernadianto et al, who analyzed financial distress in service companies using the *Altman Z-Score*, *Springate* and *Fulmer* models. The results of this study showed that the *Altman Z-Score* model and the *Fulmer* model had a significant influence on financial distress while the *Springate* model had no significant effect on financial distress. The most accurate prediction model is the *Fulmer* model. This is indicated by the Nagelkerke R Square value of 65.5%.[5] Meiliawati conducted researched on the comparison of the *Springate* model and Altman Z-Score model to financial distress potential. The results showed that there were significant differences between the two models. In this study, the *Springate* model was the most accurate with an accuracy rate of 91.66% while Altman is only 0.41%.[6] The research was conducted by Sudrajat et al, who analyzed the predictions of the bankruptcy of Basic Industrial and Chemical Sector Manufacturing companies

[3] Prasetyo, R. P. (2018). Analisis Potensi Kebangkrutan Bank Umum Syariah di Indonesia pada Period 2012-2016 Dengan Metode Discriminant Analysis. *Jurnal Ekonomi Syariah Teori dan Terapan, Vol. 5, No. 11*, 943.https://e-journal.unair.ac.id/JESTT/article/download/13777/7727

[4] Novita, D. (2018). Analisis Tingkat Akurasi Model Altman Z-Score, Indeks Kepailitan dan Indeks IN05 Sebagai Prediktor Kebangkrutan Pada Perusahaan Manufaktur Yang Terdaftar di Bursa Efek Indonesia Tahun 2011-2015. *EcoGen, Vol.1 No.1*, 198.http://dx.doi.org/10.24036/jmpe.v1i1.4739

[5] Hernadianto. (2020). Analisis Financial Distress Pada Perusahaan Jasa Subsektor Property dan Real Estate yang Terdaftar di Bursa Efek Indonesia. *JSMBI, Vol. 10, No. 1*98.https://doi.org/10.32528/jsmbi.v10i1.3391

[6] Meiliawati, A. (2016). Analisis Perbandingan Model Springate, dan Altman Z-Score Terhadap Potensi Financial Distress. *Jurnal Akuntansi dan Pendidikan, Vol.5, No. 1*, 15.http://doi.org/10.25273/jap.v5i1.1183

listed on the Indonesia Stock Exchange (IDX). The results stated that Grover's model became the most accurate prediction model with an accuracy rate of 85.14%. Altman has an accuracy rate of 77.70% and the *Zmijewski* model at 79.73% .[7]

The bankruptcy prediction model needs to be developed because by knowing the state of the company as quickly as possible will be able to take measures in anticipation of undesirable conditions. Therefore the author tries to compare theanalysis of Fulmer, Grover and Springate models in predicting the bankruptcy for Property and Real Estate Industry listed in Indonesia Sharia Stock Index (ISSI) for the period 2017-2019.

Research question: (1) Are there differences in scores between *Fulmer, Grover*, and *Springate* models in predicting the bankruptcy of the property and real estate industries for the period 2017-2019? (2) Is the *Grover* model the most accurate model in predicting the bankruptcy of the property and real estate industry listed on the ISSI for the period 2017-2019?

Research Objective: (1) to analyze the score difference between *Fulmer* models, *Grover* and *Springate* in predicting bankruptcy of the property and real estate industriesfor the period 2017-2019. (2) Toanalyze that the *Grover* model is the most accurate model in predicting the bankruptcy of the property and real estate industry listed on the ISSI for the period 2017-2019.

LITERATURE REVIEW AND HYPOTHESIS

Financial statements is an important part of a company. According to the Indonesian Institute of Accountants, financial statements are part of the financial reporting process.A financial statement are a records of a company's financial information during an accounting period that can be used to describe the company's performance. The financial condition of a company will be known from the financial statements, which of the company concerned, consisting of balance sheets, income statements and other financial statements.[8]

The analysis of financial statements consists of two parts of the word, "analysis" and "financial statements". An Analysis is the decomposition of a

[7] Sidabalok, E. L. (2019). Rasio Keuangan Dalam Memprediksi Kebangkrutan Perusahaan Pertambangan Batubara.*EQUITY,Vol.20,No.22*,33.https://pdfs.semanticscholar.org/100e/56b8d5aa80e86d1c85f70271cc37d628fc6a.pdf

[8] Kesuma, R. &. (2014). Analisis Laporan Keuangan Sebagai Dasar Dalam Penilaian Kinerja Keuangan PT. BudiSatriaWahanaMotor.*JurnalAkuntansidanKeuangan,Vol.5,No.1*,94.http://dx.doi.org/10.36448/jak.v5i1.449

relationship problem between the parts in it to obtainanoverall understanding. While the financial statement is a structured presentation of the financial position and financial performance of an entity. The purpose of the analysis of financial statements is to affirm what is desired or obtained from the analysis carried out. By analyzing financial statements, the next analysis will be able to used and have the limits and results to be achieve.[9]

Bankruptcy is a condition where the company is no longer able to pay off its obligations. There are several factors of the company that can usually be recognized early if the financial statements are analyzed more carefully, namely financial ratio analysis to predict bankruptcy so that the company can operate appropriately in making decisions for the sustainability of the company. [10]Bankruptcy in *fiqh* terminology is called *iflas* (bankruptcy) which according to the *fiqh* experts is a judge's decision that prohibits a person from acting legally on his property. The debt of a someone who spends all of his wealth until there is nothing left to pay his debts is called *Al-taflis*. Bankruptcy has two meanings, namely bankruptcy in the hereafter and bankruptcy in the world. The bankruptcy in the Hereafter is caused when a person does not have such as rewards in the world provision doesn’tfulfill any obligation and goodness during his life.[11]

Bankruptcy Prediction:

a. Fulmer Model: *Fulmer's* bankruptcy analysis on 1984 using stepwise multiple discriminant analysis to evaluate 40 financial ratios were applied to a sample of 60 companies, 30 failed and 30 successful with an average company asset size of $455,000. Fulmer reported 98% accurate at the company one month before it failed and 81% accuracy more than a year before bankruptcy.[12] Equations for measuring *Fulmer* Score variables as follows:

   H-Sore=

   $5.528X_1$+0.0212X_2+0.073X_3+1.270$X_4$0.120X_5+2.335X_6+0.575X_7+1.083X_8+0.894X_9-6.075

[9] Maith, H. A. (2013). Analisis Laporan Keuangan Dengan Mengukur Kinerja Keuangan Pada PT. Hanjaya Mandala Samporna Tbk. *Jurnal EMBA, Vol. 1, No. 3*, 621.https://doi.org/10.35794/emba.v1i3.2130

[10] Susanti, N. (2016). Analisis Kebangkrutan dengan Menggunakan Metode Altman Z-Score, Springate dan Zmijewski pada Perusahaan Semen yang Terdaftar di BEI Periode 2011-2015. *Jurnal Aplikasi Manajemen, Vol.14, No. 4*, 803.https://www.jurnaljam.ub.ac.id/index.php/jam/article/view/984

[11] Fauzia, I. Y. (2015). Mendeteksi Kebangkrutan Secara Dini Perspektif Ekonomi Islam. *Jurnal Ekonomi dan Keuangan, Vol. 19, No. 1*, 96.https://doi.org/10.24034/j25485024.y2015.v19.i1.92

[12] Masdiantini, P. R. (2020). Laporan Keuangan dan Prediksi Kebangkrutan Perusahaan. *Jurnal Ilmiah Akuntansi, Vol. 5, No. 1*, 209.http://dx.doi.org/10.23887/jia.v5i1.25119

Description :

X_1 = *Average Retained Earnings / Total Assets*
X_2 = *Revenues / Avarage Total Assets*
X_3 = *Earning Before Taxes / Total Equity*
X_4 = *Cash Flow from Operation / Average Total Debt*
X_5 = *Average Total Debt / Total Equity*
X_6 = *Total Current Liability / Average Total Assets*
X_7 = *Log (Average Fix Assets)*
X_8 = *Average Working Capital / Average Total Debt*
X_9 = *Log (Earning Before Interest and Taxes) / Interst Expenses*

The criteria for predicting bankruptcy on *Fulmer* score is if H-Score < 0, then the company is classified as a financial distress company, whereas if the value of H-Score > 0, then the company is categorized as a non-financial distress company.

b. Springate Model: This model was developed by Springate on 1978 using discriminant analysis to select 19 popular financial ratios to distinguish companies that are in bankruptcy or safe zones. Springate models can be formulated as follows: S = 1.03A + 3.07B + 0.66C + 0.4D

Description:

A = *Working Capital/Total Assets*
B =*Earning Before Interest and Taxes/Total Assets*
C = *Earning Before Taxes/Current Liabilities*
D = *Sales/Total Assets*

If Springate's score is greater than 0.82, the company is included in the healthy category, which is an area where the company is safe and not bankrupt. If Springate's score is less than 0.862, the company is included in the bankruptcy category, which is the area where the company is bankrupt.

c. Grover Model: The Grover model was created by redesigning and reassessing the Altman Z-Score model. Jeffrey S. Grover used a sample following the Altman Z-Score model in 1968, by adding thirteen new financial ratios. Samples used were 70 companies with 35 bankrupt companies and 35 companies that did not go bankrupt from 1982 to 1996.[13] Jeffrey S. Grover generates the following functions: G = 1.6 X_1 + 3.4X_2 – 0,016 ROA + 0,057

Description:

G = *Overall Index*
$\boldsymbol{X_1}$ = *Working Capital/ Total Assets*
$\boldsymbol{X_2}$ = *Earnings Before Interest and Taxes/ Total Assets*
ROA = *Net Income/ Total Assets*

[13] Septiani, I. G. (2016). Analisis Perbandingan Model Zmijewski dan Grover pada Perusahaan Semen di BEI 2008-2014. *Jurnal Riset Akuntansi, Vol. 4, No.3*, 1146

Grover's model categorizes a company in bankruptcy with a score of less than or equal to -0.02. While the value for a company categorized as not going bankrupt is more or equal to 0.01.

Hypothesis

a. H_1= There is a difference in the score between *Fulmer*, *Springate*, and *Grover* models in predicting bankruptcy in 2017-2019.
b. H_2= Grover's model is the most accurate model in predicting the bankruptcy of the property and real estate industry in 2017-2019.

DATA AND METHOD

This research is categorized as quantitative research that research is based on the philosophy of positivism to examine specific populations or samples, the aim is to describe and test established hypotheses.Sampling in this study uses a purposive sampling method, namely tectonic sampling taking into account certain considerations.The method limits sample selection based on certain criteria. From the previous explanation, it can be concluded that the criteria that can be used in selecting of samples are:

a. Companies listed on the Indonesia Stock Exchange and included in the Indonesia Sharia Stock Index 2017-2019
b. Have a complete financial report for 2017-2019

From some of criteria above, it can be concluded that there are 40 property and real estate sector companies included in the research sample.

Table 2. Samples of Companies in the Property and Real Estate Sub-Sector
List of Sample Companies Category I

No	Company	Stock Code
1	Bumi Citra PermaiTbk.	BCIP
2	Bhuwanatala Indah PermaiTbk.	BIPP
3	Bukit Darmo Property Tbk.	BKDP
4	BumiSerpongDamaiTbk.	BSDE
5	CahayasaktiInvestindoSuksesTbk.	CSIS
6	Nusa KonstrukiEnjiniringTbk.	DGIK
7	Fortune Mate Indonesia Tbk.	FMII
8	MNC Land Tbk	KPIG
9	Metro Realty Tbk.	MTSM
10	Indonesia Prima Property Tbk.	OMRE

Source: www.idx.co.id

List of Sample Companies Category II

No	Company	Stock Code
11	AcsetIndonusaTbk.	ACST
12	AdhiKaryaTbk.	ADHI
13	AgungPodomoro Land Tbk.	APLN
14	AlamSutera Realty Tbk.	ASRI
15	BekasiAsriPemulaTbk.	BAPA
16	BekasiFajarIndutrial Estate Tbk.	BEST
17	Sentul City Tbk.	BKSL
18	Ciputra Development Tbk.	CTRA
19	Intiland Development Tbk.	DILD
20	Duta Pertiwi Tbk.	DUTI
21	Gading Development Tbk.	GAMA
22	Gowa Makassar Tourism Development Tbk.	GMTD
23	PerdanaGapuraprimaTbk.	GPRA
24	Jaya Real Property Tbk.	JRPT
25	KawasanIndustriJababekaTbk.	KIJA
26	LippoCikarangTbk.	LPCK
27	LippoKarawaciTbk.	LPKR
28	Modernland Realty Tbk.	MDLN
29	Metropolitan KentjanaTbk.	MKPI
30	Metropolitan Land Tbk.	MTLA
31	Nusa Raya CiptaTbk.	NRCA
32	PP Property Tbk.	PPRO
33	PP (Persero) Tbk.	PTPP
34	PakuwonJatiTbk.	PWON
35	Pikko Land Development Tbk.	RODA
36	SummareconAgungTbk.	SMRA
37	Surya SemestaInternusaTbk.	SSIA
38	SitaraPropertindoTbk.	TARA
39	Total BangunPersadaTbk.	TOTL
40	WijayaKaryaPerseroTbk.	WIKA

Source: www.idx.co.id

Data Analysis Techniques

a. Calculation of Prediction Models, after knowing the values of the financial ratio, further calculation of bankruptcy predictions were carried out using the Fulmer Springate and Grover models.

b. Statistic Deskriptive, Descriptive statistics provide an overview of how the data is distributed in this study. Descriptive analysis is used to determine the minimum value, a maximum, mean, and standard deviation that aims to know the distribution of data that became a sample of research.[14]
c. Normality Test, the data normality test uses Kolmogorov-Smirnov test using a significant level of 0.05. If the variable value is greater than the level of a significant 5% (> 0.05) then the variable is normally distributed. Conversely, if the value of a variable is smaller than the level of significant 5% (< 0.05) then it is not normally distributed.[15]
d. Hypothesis Test
    a. Homogeneity test
    b. One Way ANOVA test, the One Way ANOVA test is used if normality test reuslt indicate data that is distributed normally.
    c. Kruskal Wallis test, the Kruskall-Wallis test is used if normality test results indicate data that is not distributed normally.
    d. Predictive Model Accuracy Test

$$Accuracy\ Level = \frac{Correct\ Number\ of\ Predictions}{Total\ Sample}\ X\ 100\%$$

In addition to the accuracy of each model, error rates are also a consideration. There are two types of errors, namely, Type I and Type II. Type I error is a sample error of a company that are predicted not to go bankrupt but are bankrupt infact. While Type II error is a sample error the company that are predicted to go bankrupt but not bankrupt in fact.[16]

$$Type\ I\ Error = \frac{Wrong\ Number\ of\ Predictions\ I}{Total\ Sample}\ X\ 100\%$$

$$Type\ II\ Error = \frac{Wrong\ Number\ of\ Predictions\ II}{Total\ Sample}\ X\ 100\%$$

RESULTS

Predictive Model Calculation Result

[14] Nation, L. M. (2017). Statistik Deskriptif. *Jurnal Hikmah, Vol. 14, No. 1*, 49.http://jurnalhikmah.staisumatera-medan.ac.id/index.php/hikmah/article/view/16

[15] Sari, A. Q. (2017). Batasan Persyaratan Uji Normalitas Homogenitas pada Model Regresi Linear. *Unnes Journal of Mathematics, Vol. 6, No. 2*, 49.

[16] Wijayanti, A. u. (2019). Analisis Prediksi Kebangkrutan (Financial Distress) Dengan Perbandingan Model Altman,ZmijewskidanGrover.*JurnalAkuntansi,Vol.3,No.2*,123.http://doi.org/10.25273/inventory.v3i2.5240

a *Fulmer* Model

In 2017, there were three companies experiencing financial difficulties, namely PT. Bhuwanatala Indah Permai Tbk. (BIPP), PT. Bukit Darmo Property Tbk. (BKDP), PT. Sitara Propertindo Tbk. (TARA). While the remaining 37 companies in 2017 were included in the healthy category. In 2018, there were 4 companies experiencing financial difficulties, namely PT. Bukit Darmo Property Tbk. (BKDP), PT. Cahayasakti Investindo Sukses Tbk. (CSIS), PT. Metro Realty Tbk. (MTSM), PT. Sitara Propertindo Tbk. (TARA). While 36 other companies are categories as healthy companies (not bankrupt). In 2019, there were 5 companies experienced financial difficulties, namely PT. Bukit Darmo Property Tbk. (BKDP), PT. Cahayasakti Investindo Sukses Tbk. (CSIS), PT. Nusa Konstruksi Enjiniring Tbk. (DGIK), PT. Metro Realty Tbk. (MTSM), PT. Sitara Propertindo Tbk. (TARA). While the remaining 35 companies in 2017 fall into the healthy category.

b *Springate* Model

Springate model calculation results in 2017, there were 28 companies that experienced financial difficulties. While the remaining 11 companies are included in the category of not bankrupt namely PT. Bumi Serpong Damai Tbk. (BSDE), PT. MNC Land Tbk. (KPIG), PT. Bekasi Fajar Industrial Estate Tbk. (BEST), PT. Duta Pertiwi Tbk. (DUTI), PT. Perdana Gapuraprima Tbk. (GPRA), PT. Jababeka Industrial Estate Tbk. (KIJA), PT. Lippo Cikarang Tbk. (LPCK), PT. Lippo Karawaci Tbk. (LPKR), PT. Metropolitan Kentjana Tbk. (MKPI), PT. Metropolitan Land Tbk. (MTLA), PT. Nusa Raya Cipta Tbk. (NRCA), PT. Surya Semesta Internusa Tbk. (SSIA).

In 2018, 28 companies fell into the category of financial difficulties. While the remaining 11 companies are included in the category of not bankrupt namely PT. Metro Realty Tbk. (MTSM), PT. Bekasi Fajar Industrial Estate Tbk. (BEST), PT. Duta Pertiwi Tbk. (DUTI), PT. Goa Makassar Tourism Tbk. (GMTD), PT. Perdana Gapuraprima Tbk. (GPRA), PT. Lippo Cikarang Tbk. (LPCK), PT. Lippo Karawaci Tbk. (LPKR), PT. Metropolitan Kentjana Tbk. (MKPI), PT. Metropolitan Land Tbk. (MTLA), PT. Nusa Raya Cipta Tbk. (NRCA), PT. Pakuwon Jati Tbk. (PWON).

In 2019, 28 companies fell into the category of bankrupt and 11 other companies are included in the category of not bankrupt, namely PT. Bumi Serpong Damai Tbk. (BSDE), PT. Bekasi Asri Pemula Tbk. (BAPA), PT. Bekasi Fajar Industrial Estate Tbk. (BEST), PT. Duta Pertiwi Tbk. (DUTI), PT. Perdana

Gapuraprima Tbk. (GPRA), PT. Lippo Cikarang Tbk. (LPCK), PT. Lippo Karawaci Tbk. (LPKR), PT. Metropolitan Land Tbk. (MTLA), PT. Nusa Raya Cipta Tbk. (NRCA), PT. Pakuwon Jati Tbk. (PWON), PT. Pikko Land Development Tbk. (RODA).

c Grover Model

The results of the calculation of the *Grover* model prediction in 2017, 2 companies fell into the category of bankrupt, namely PT. Bukit Darmo Property Tbk. (BKDP) and PT. Cahayasakti Investindo Sukses Tbk. (CSIS). While the remaining 38 companies are included in the category of not bankrupt. In 2018, 3 companies fell into the category of bankruptcy, namely PT. Bukit Darmo Property Tbk. (BKDP) and PT. Cahayasakti Investindo Sukses Tbk. (CSIS) and PT. Nusa Konstruksi Enjiniring Tbk. (DGIK). While the other 37 are included in the category of healthy or not bankrupt. In 2019, 3 companies fell into the category of bankruptcy, namely PT. Bukit Darmo Property Tbk. (BKDP) and PT. Cahayasakti Investindo Sukses Tbk. (CSIS) and Acset Indonusa Tbk. (ACST). While the other 37 fall into the category of not bankrupt.

Descriptive Statistic

Table 3. Descriptive Statistical Test

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
FULMER	120	-14,3	14,96	3,4162	3,09622
SPRINGATE	120	-0,49	2,78	0,6644	0,52024
GROVER	120	-0,36	1,74	0,5761	0,40805
Valid N (listwise)	120				

Source: SPSS.24, 2021

Fulmer's score model has a minimum value of -14.30 in DGIK companies in 2019. The maximum value of the *Fulmer* model is 14.96 in BAPA company in 2019. The mean value of the *Fulmer* model is 3.4162. While the standard deviation value of the *Fulmer* model is 3,09622, it interprets the difference from the sample value in this model to an average of 2.96583.

The *Springate* score model gets a minimum value of -0.49 which is found in BKDP company in 2017. The maximum value of the Springate model is 2.78 in LPCK in 2018. The mean value of the *Springate* model is 0.6644 which interprets that the average of the entire property industry and real estate sampled from 2017-2019 is classified as bankrupt. The standard deviation value of the *Springate* model is

0.52024, this concludes a large difference from the sample value to the average of 0.52024.

Grover's score model has a minimum value of -0.36 which is found in the BKDP company in 2017. The maximum value contained in the *Grover* model is 1.74 namely the LPCK company in 2018. The mean value of this model is 0.5761 which interprets that the average of the entire property and real estate industry. The standard deviation value of the *Grover* model is 0.40805, this shows a large difference from the sample value to the average of 0.40805.

Normaity Test Result

Table 4. Normality Test

One-Sample Kolmogorov-Smirnov Test

		FULMER	SPRINGATE	GROVER
N		120	120	120
Normal Parameters[a,b]	Mean	3,4162	0,6644	0,5761
	Std. Deviation	3,09622	0,52024	0,40805
Most Extreme Differences	Absolute	0,147	0,081	0,071
	Positive	0,119	0,081	0,071
	Negative	-0,147	-0,07	-0,068
Test Statistic		0,147	0,081	0,071
Asymp. Sig. (2-tailed)		,000[c]	,051[c]	,200[c,d]

Source: SPSS.24

Based on the test results Kolmogorov Smirnov obtained a significant value of the Fulmer model of 0.000. Thus it is known that Fulmer is significant <0.05, it means that data are not normally distributed. While the Springate Model obtained a significant value of 0.051. Thus it is known that the significant Springate >0.05 means that the data is normally distributed. the significant value of the Grover model gets a result of 0.200, it can be interpreted that the data is normally distributed because the significant value is >0.05. Because there is abnormal data, the H1 difference test uses a Kruskal Wallis non-parametric test.

Hypothesis Test Result

- **Kruskal Wallis Test**

Table 5. Kruskal Wallis Test Result

Test Statistics[a,b]

	Bankruptcy

Chi-Square	150,255
df	2
Asymp. Sig.	0

Source: SPSS.24

Based on Kruskal Wallis test output value above can be seen that asymp value. Sig. less than 0.05 i.e. 0.00 (Asymp. Sig. <0.05). So H1 is accepted that there are differences in predictions between the Fulmer, Grover, and Springate models in predicting bankruptcy. So it can be concluded that there are prediction differences between the Fulmer model, Grover model, and Springate model in predicting the bankruptcy of the property and real estate industry listed on the Indonesia Stock Exchange for the period 2017-2019.

- **Prediction Model Accuracy Test**

Table 6. Predictive Model Accuracy Result

Prediction Models	Accuracy Level	Type I Error	Type II Error
Fulmer	80%	70%	3%
Springate	47%	13%	67%
Grover	80%	77%	1%

Source: Data Processing Result

Based on the table above, the *Fulmer* and *Grover* models have the same level of accuracy at a score of 80%, this interprets both models to have the same high level of accuracy in predicting companies that are in bankruptcy and do not go bankrupt in the Property and Real Estate industry in 2017-2019, while the *Springate* model has a smaller accuracy rate of 47%.

When viewed in type I error, the *Springate* model has the lowest error rate of 13% compared to Fulmer 70% and Grover 77%. This is interpreted even though the accuracy levels of both models are the same, but may different at that model's error level. Whereas when viewed from Type II error, *Grover* model has the lowest error rate of 1% when compared to Fulmer 3% and *Springate* 67%. This suggests that *Grover's* model tends to have a small error rate in predicting companies that go bankrupt and not bankrupt. If sorted by accuracy and Type I error and Type II error then the most accura model in this study is the *Fulme*r model. This indicates that H2 was rejected, where H2 stated that the Grover model is the most accurate predictive model in predicting the bankruptcy of the property and real estate industry in 2017-2019.

DISCUSSION

Score Differece in Predicting the Bankruptcy Models

The *Springate* model has 4 ratios including the Ratio of working capital to total assets, the ratio of profit before interest and tax to total assets, the ratio of profit before tax to current liabilities, and the ratio of total sales to total assets. *Grover's* model has a ratio similar to the *Springate* model which uses the ratio of working capital to total assets and the ratio of profit before interest and tax to total assets, but the *Grover* model uses a return on assets ratio where this ratio measures the company's ability to generate profit from the total assets used. The greater the value of ROA, the better the company is using its assets to earn a profit.[17] The ratio used in the Fulmer model is very different from the ratio used by the *Springate* and *Grover* models. The *Springate*and *Grover* models both emphasize how much the asset is capable of making a profit, while the *Fulmer* model focuses on the company's ability to meet the company's obligations as well as the company's capital ability to make a profit.

This research is supported by TriesieAprilia Fanny's research which aims to find out the differences in *Altman*, *Springate*, and *Zmijewski* prediction models in predicting financial distress conditions in plantation companies 2012-2014. The results show that there are differences in the prediction models of *Altman*, *Springate*, and *Zmijewski* in predicting financial distress. The ratio differencesare because Altman and *Springate* models have similarities in predicting financial distress conditions using Multi Discriminant (MDA) technique. Meanwhile, Zmijewski model prediction results use ratio analysis in measuring the company's performance, leverage, and liquidity.[18] The results of a study conducted by AnggiMeiliawati that examined the difference in scores between the *Springate* model and the *Altman* model in predicting financial distress also mentioned that there were differences between the two prediction models. This is due to the different ratios used in calculating the level of financial difficulty.

The Most Accurate Models in Predicting the Bankruptcy

Table7. Differences and Similarities in the Ratio of Bankruptcy Models

Components	F	S	G
Retained Earnings to Total Assets	✓	-	-
Revenues to Total Assets	✓	-	-
Earning Before Taxes to Total Equity	✓	-	-
Cash Flow From Operation to Total Debt	✓	-	-

[17] Almira, N. P. (2020). Return On Assets, Return On Equity dan Earning Per Share Berpengaruh Terhadap Return Saham. *E-Junal Manajemen, Vol. 9, No. 3,* 1070.https://doi.org/10.24843/EJMUNUD.2020.v09.i03.p13

[18] Fanny, T. A. (2017). Analisis Perbandingan Model Prediksi Financial Distress Pada Sub Sektor Perkebunan. *Jurnal Ilmu dan Riset Akuntansi, Vo. 6, No. 6,* 1.http://jurnalmahasiswa.stiesia.ac.id/index.php/jira/article/download/1209/1227

Total Debt to Total Equity	✓	-	-
Total Current Liability to Total Assets	✓	-	-
Tangible Assets	✓	-	-
Working Capital to Total Debt	✓	-	-
EBIT to Interest Expenses	✓	-	-
Working Capital to Total Assets	-	✓	✓
EBIT to Total Assets	-	✓	✓
EBT to Total Assets	-	✓	-
Return On Assets	-	-	✓

Souce: Processing by Author

The table above shows some similarities and differences of the *Fulmer*, *Springate,* and *Grover* models. The *Springate* and *Grover* models have almost the same components while the *Fulmer* models have different components than *Springate* and *Grover*. The *Fulmer* model is superior because it uses 9 ratios. The more components used, the better at predicting financial difficulties.[19] *Fulmer's* model components are composed of profitability, liquidity, and solvency ratios. While the *Springate* and *Grover* models consist only of profitability and liquidity ratios. Solvency ratios are used to measure the level of management of the company's resources and demonstrate the company's ability to meet long-term obligations.

The results of this study are in line with research conducted by Sudarman et al, which mentions that the *Fulmer* model is the most accurate in predicting the bankruptcy of non-financial sector companies listed in IDX with an accuracy rate of 68.89%.[20] Research conducted by Manurung et al, which aims to find out the difference in scores between the *Springate* model and *Fulmer* model for bankruptcy prediction on property companies listed on Indonesia Stock Exchange. The results of this study showed that there is a significant difference between the *Springate* and *Fulmer* models in predicting bankruptcy and the highest accuracy rate is achieved by the Fulmer model with an accuracy rate of 99.3%.[21]

CONCLUSION

[19] Permana, R. K. (2017). Prediksi Financial Distress Pada Perusahaan Manufaktur di Bursa Efek Indonesia. *JunalBisnis dan Manajemen, Vo. 7, No. 2*, 163.http://journal.uinjkt.ac.id/index.php/esensi/article/view/4797

[20] Sudarman. (2020). Perbandingan Analisis Prediksi Kebangkrutan Model Springate, Fulmer, Foster dan Altman Z-Score pada Perusahaan Sektor Non Keuangan yang Terdaftar di Bursa Efek Indonesia. *Jurnal Ekonomi KIAT, Vol. 1, No. 31*, 15.https://doi.org/10.25299/kiat.2020.vol31(1).2705

[21] Manurung, F. (2019). Model Springate, Model Fulmer dan Kebangkrutan Perusahaan. *SENSASI*, 65.https://www.prosiding.seminar-id.com/index.php/sensasi/article/view/269

a. There is a score difference between the *Fulmer, Springate*, and *Grover* models in the property and real estate industries listed on the Indonesia Sharia Stock Index (ISSI). This is supported by the Kruskal-Wallis test results between the *Fulmer, Springate*, and *Grover* models which produce Sig values. (2 tailed) of 0.000 indicates a probability <0.05 which means there is a score differences in predicting bankruptcy between the *Fulmer, Springate*, and *Grover* models.
b. *Grover* model is not the best prediction model in predicting the bankruptcy of the property and real estate industry in 2017-2019. This is because *Grover* model have higher error rates than *Fulmer* models. The accuracy of the prediction model is determined by looking at the accuracy and error rate of a model. So it can be concluded that the *Fulmer* model is the most accurate model in predicting the bankruptcy of the property and real estate industry in 2017-2019 with an accuracy rate of 80% and a Type I Error rate 70% and a Type II Error rate 3%.

Limitations and Avenue for Future Research

By considering the limitations of this research, it is expected that future researches can eliminate the limitations above and can provide better research for future research by following the existing advice, among others:

a. Adding prediction model used to more than three and use other prediction models that have been found such as *Altman, Zmijewski, Foster, IN05*, or so on.
b. Trying to apply research in other sectors such as manufacturing, Food and Beverages, Consumer Good Industry, Agriculture, and so on.
c. Further research may use different bankruptcy criteria.
d. Further research should no longer a comparison between models but could be directed to create a new bankruptcy prediction model that can be applied in Indonesia.

Acknowledgement

Thanks to all parties who have provided motivation, direction, guidance, and advice.The author realizes that in scientific work is not an easy job, but a tireless struggle that demands seriousness, cleverness of mind, and takes a considerable amount of time and can not be separated from the help of various parties.

REFERENCES

Almira, N. P. (2020). Return On Assets, Return On Equity dan Earning Per Share Berpengaruh Terhadap Return Saham. *E-Junal Manajemen, Vol. 9, No. 3*, 1070.https://doi.org/10.24843/EJMUNUD.2020.v09.i03.p13

Fanny, T. A. (2017). Analisis Perbandingan Model Prediksi Financial Distress Pada Sub Sektor Perkebunan. *Jurnal Ilmu dan Riset Akuntansi, Vo. 6, No. 6*,

1.http://jurnalmahasiswa.stiesia.ac.id/index.php/jira/article/download/1209/1227

Fauzia, I. Y. (2015). Mendeteksi Kebangkrutan Secara Dini Perspektif Ekonomi Islam. *Jurnal Ekonomi dan Keuangan, Vol. 19, No. 1*, 96.https://doi.org/10.24034/j25485024.y2015.v19.i1.92

Hernadianto. (2020). Analisis Financial Distress Pada Perusahaan Jasa Subsektor Property dan Real Estate yang Terdaftar di Bursa Efek Indonesia. *JSMBI, Vol. 10, No. 1*, 98.https://doi.org/10.32528/jsmbi.v10i1.3391

Kesuma, R. &. (2014). Analisis Laporan Keuangan Sebagai Dasar Dalam Penilaian Kinerja Keuangan PT. Budi Satria Wahana Motor. *Jurnal Akuntansi dan Keuangan, Vol. 5, No. 1*, 94.http://dx.doi.org/10.36448/jak.v5i1.449

Maith, H. A. (2013). Analisis Laporan Keuangan Dengan Mengukur Kinerja Keuangan Pada PT. Hanjaya Mandala Samporna Tbk. *Jurnal EMBA, Vol. 1, No. 3*, 621.https://doi.org/10.35794/emba.v1i3.2130

Manurung, F. (2019). Model Springate, Model Fulmer dan Kebangkrutan Perusahaan. *SENSASI*, 65.https://www.prosiding.seminar-id.com/index.php/sensasi/article/view/269

Masdiantini, P. R. (2020). Laporan Keuangan dan Prediksi Kebangkrutan Perusahaan. *Jurnal Ilmiah Akuntansi, Vol. 5, No. 1*, 209.http://dx.doi.org/10.23887/jia.v5i1.25119

Meiliawati, A. (2016). Analisis Perbandingan Model Springate, dan Altman Z-Score Terhadap Potensi Financial Distress. *Jurnal Akuntansi dan Pendidikan, Vol.5, No. 1*, 15.http://doi.org/10.25273/jap.v5i1.1183

Nation, L. M. (2017). Statistik Deskriptif. *Jurnal Hikmah, Vol. 14, No. 1*, 49.http://jurnalhikmah.staisumatera-medan.ac.id/index.php/hikmah/article/view/16

Novita, D. (2018). Analisis Tingkat Akurasi Model Altman Z-Score, Indeks Kepailitan dan Indeks IN05 Sebagai Prediktor Kebangkrutan Pada Perusahaan Manufaktur Yang Terdaftar di Bursa Efek Indonesia Tahun 2011-2015. *EcoGen, Vol.1 No.1*, 198.http://dx.doi.org/10.24036/jmpe.v1i1.4739

Permana, R. K. (2017). Prediksi Financial Distress Pada Perusahaan Manufaktur di Bursa Efek Indonesia. *Junal Bisnis dan Manajemen, Vo. 7, No. 2*, 163.http://journal.uinjkt.ac.id/index.php/esensi/article/view/4797

Prasetyo, R. P. (2018). Analisis Potensi Kebangkrutan Bank Umum Syariah di Indonesia pada Periode 2012-2016 Dengan Metode Discriminant Analysis.

Jurnal Ekonomi Syariah Teori dan Terapan, Vol. 5, No. 11, 943.https://e-journal.unair.ac.id/JESTT/article/download/13777/7727

Putu Fenta Premudya, I. W. (2015). Pengaruh Nilai Tukar Rupiah dan Inflasi Tehadap Indeks Harga Saham Sektor Properti dan Real Estate yang tercatat di BEI. *e-Journal Bisma Universitas Pendidikan Ganesha, Vol. 3*, 2.https://ejournal.undiksha.ac.id/index.php/JMI/article/view/4821

Sari, A. Q. (2017). Batasan Persyaratan Uji Normalitas Homogenitas pada Model Regresi Linear. *Unnes Journal of Mathematics, Vol. 6, No. 2*, 49.

Septiani, I. G. (2016). Analisis Perbandingan Model Zmijewski dan Grover pada Perusahaan Semen di BEI 2008-2014. *Jurnal Riset Akuntansi, Vol. 4, No.3*, 1146.

Sidabalok, E. L. (2019). Rasio Keuangan Dalam Memprediksi Kebangkrutan Perusahaan Pertambangan Batubara. *EQUITY, Vol. 20, No. 22*, 33.https://pdfs.semanticscholar.org/100e/56b8d5aa80e86d1c85f70271cc37d628fc6a.pdf

Sudarman. (2020). Perbandingan Analisis Prediksi Kebangkrutan Model Springate, Fulmer, Foster dan Altman Z-Score pada Perusahaan Sektor Non Keuangan yang Terdaftar di Bursa Efek Indonesia. *Jurnal Ekonomi KIAT, Vol. 1, No. 31*, 15.https://doi.org/10.25299/kiat.2020.vol31(1).2705

Susanti, N. (2016). Analisis Kebangkrutan dengan Menggunakan Metode Altman Z-Score, Springate dan Zmijewski pada Perusahaan Semen yang Terdaftar di BEI Periode 2011-2015. *Jurnal Aplikasi Manajemen, Vol.14, No. 4*, 803.https://www.jurnaljam.ub.ac.id/index.php/jam/article/view/984

Wijayanti, A. u. (2019). Analisis Prediksi Kebangkrutan (Financial Distress) Dengan Perbandingan Model Altman, Zmijewski dan Grover. *Jurnal Akuntansi, Vol. 3, No. 2*, 123.http://doi.org/10.25273/inventory.v3i2.5240

Wulandari, F. &. (2017). Kinerja Keuangan Perusahaan Property dan Real Estate di BEI selama Periode 2012-2016 yang Termasuk Indeks LQ45. *Jurnal Manajemen dan Bisnis Sriwijaya, Vol. 15, No. 1*, 3.https://pdfs.semanticscholar.org/8bb0/3d293a0a78125d9a66c2441edbd1196f25f6.pdf

www.idx.co.id

www.duniainvestasi.co.id