Available online at http://iorajournal.org/indx.php/orics /index

Operations Research: International Conference Series

e-ISSN: 2722-0974
p-ISSN: 2723-1739

Vol. 6, No. 2, pp. 57-72, 2025

Analysis of the Effect of Cash Ratio on Corporate Bankruptcy Risk: Case Study of Manufacturing Companies

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Abstract

This study aims to explore the relationship between cash ratio and bankruptcy risk using an empirical analysis approach, and relate it to the Altman Z-score model as an indicator of financial sustainability. By analyzing the financial statement data of companies listed on the stock exchange during the period 2019-2023, this study investigates the impact of liquidity measured by cash ratio on bankruptcy potential. Regression method is used to assess the relationship, while Altman Z-score serves as a tool to measure the financial health of the company. The results show that the cash ratio contributes little to reducing the risk of bankruptcy, yet firms with higher liquidity exhibit a better Z-score. These findings highlight the importance of liquidity management as a strategy to ensure the financial sustainability of firms in the face of bankruptcy challenges.

Keywords: Cash ratio, bankruptcy risk, empirical analysis, financial sustainability, altman z-score

1. Introduction

In the era of globalization and increasingly fierce business competition, financial sustainability has become one of the main focuses for companies around the world. This sustainability is not only related to short-term profitability, but also to the company's ability to survive in the long run. One of the biggest threats that can affect a company's operational sustainability is the risk of bankruptcy. Bankruptcy not only negatively affects shareholders and employees, but can also affect the economy as a whole (Altman, 1968). Therefore, it is important for company management to have effective tools and strategies to identify and mitigate this risk.

One factor that greatly affects the risk of bankruptcy is the liquidity of the company. Liquidity refers to a company's ability to meet its short-term obligations, and cash ratio is one of the most relevant indicators in measuring liquidity. The cash ratio measures how much cash is available compared to short-term liabilities, providing a clear picture of the company's liquidity position. Companies with a high cash ratio are generally considered more able to cope with financial pressures and fulfill their urgent obligations, thereby reducing the risk of bankruptcy (Gonzalez, 2012).

In bankruptcy risk analysis, the Altman Z-score model has become one of the most widely used tools. The Z-score is an indicator that combines several financial ratios to provide an assessment of the financial health of a company. This model has proven effective in predicting the likelihood of bankruptcy, so it is widely used by academics and practitioners in finance (Altman, 2000). With linking cash ratio and Altman Z-score, this study aims to provide a more comprehensive understanding of the relationship between liquidity and bankruptcy risk.

This research will examine the financial statement data of companies listed on the stock exchange during the 2019-2023 period, using an empirical analysis approach to identify patterns and significant relationships. Using regression methods, this study will assess the impact of cash ratio on bankruptcy risk, as well as evaluate how well the Altman Z-score model can describe the financial health of companies in this context. Hopefully, the findings from this study will not only contribute academically, but also practically to company management in formulating better liquidity management strategies to ensure financial sustainability.

This study aims to conduct an empirical analysis of the effect of cash ratio on bankruptcy risk and its impact on the financial sustainability of manufacturing companies listed on the Indonesia Stock Exchange. Through this approach, this study hopes to provide deeper insights into how cash ratio affects bankruptcy risk and how it contributes to the financial sustainability of firms in the context of the Indonesian market. By using financial data of listed companies, this study is expected to provide practical guidance for financial managers and investors in formulating better liquidity management and investment strategies.

Table 1. Systematic Literature Review

Author	Variables	Method	Cash Ratio	Bankruptcy Risk	Empirical Analysis	Financial Sustainability
Xie D, Shi X, Liu J, Zhu Z	Free cash flow productivity, SOE Classification Reform	-	Yes	-	-	Yes
Mohammadi A, Abbasi A, Alimohammadlou M, Eghtesadifard M, Khalifeh M	Multi-echelon supply chain system	Mathematical modeling, integrated financial/operational approach	-	-	-	Yes
Arian AG, Sands J	Corporate carbon emissions, Corporate risk, Emission intensity, Cost of capital (COC), Market efficiency	Corporate risk, Empirical Analysis	-	-	Yes	Yes
Son H, Hyun C, Phan D, Hwang HJ	Bankruptcy prediction, Data analysis, Box-Cox transformation	Model	-	Yes	-	-
Zoričák M, Gnip P, Drotár P, Gazda V	Bankruptcy prediction, CatBoost, XGBoost	CatBoost	-	Yes	-	-
Jabeur SB, Gharib C, Mefteh-Wali S, Arfi WB	Bankingruptcy, Unbalanced learning, Anomaly detection, Annual report	Machine learning	-	Yes	-	-
Liu W, Fan H, Xia M, Pang C	Financial distress prediction, XGBoost, Interpretation ability	weighted boosted tree-based tree, Empirical Analysis	-	-	Yes	-
This Research	Cash Ratio, Bankruptcy Risk, Empirical Analysis, Financial Sustainability	Cash Ratio, Altman Z-Score	Yes	Yes	Yes	Yes

2. Literature Review

2.1. Cash Ratio

Cash Ratio is a financial ratio used to assess the company's ability to pay its short-term obligations using available cash or cash equivalents. Cash and Cash Equivalents includes cash held by the company as well as liquid assets that can be readily converted into cash, such as uncashed checks, time deposits maturing in the near future, and highly liquid short-term investments. Short-term Liabilities includes total liabilities that must be paid in the near future, usually within

one year. Short-term liabilities include accounts payable, short-term bank loans, and other liabilities that must be paid within a short period of time. Interpretation of Cash Ratio Calculation, namely, the higher the cash ratio, the better the company's liquidity position, because the company has more cash to meet its short-term obligations. However, a cash ratio that is too high can also indicate that the company may not be optimizing the use of its liquid assets for growth or investment. The interpretation of the Cash Ratio calculation, namely:

a) $Ratio > 1$: The company has more cash and cash equivalents than its short-term liabilities, indicating excellent liquidity.
b) $Ratio = 1$: Cash and cash equivalents are equal to short-term liabilities, indicating that the company can fulfill its short-term obligations entirely with only available cash.
c) $Ratio < 1$: Cash and cash equivalents are less than short-term liabilities, indicating that the company may have difficulty meeting short-term obligations with only existing cash.

2.2. Corporate Bankruptcy Risk

Corporate bankruptcy is a condition in which a company is unable to fulfill its financial obligations to creditors and potentially leads to liquidation of assets. Bankruptcy risk analysis is important to predict this possibility and take preventive measures. Bankruptcy can be viewed from various perspectives, including legal, economic, and accounting. Altman (1968) was a pioneer in the development of models to predict bankruptcy, where he developed the Z-Score model that uses financial ratios as indicators to detect potential bankruptcy.

Bankruptcy is a condition in which a company is no longer able to pay its financial obligations, both debt and operating costs, which can ultimately result in liquidation or reorganization of the company. According to Beaver (1966), bankruptcy is the result of an imbalance between cash inflows and outflows, which is influenced by managerial decisions and external conditions of the company. Beaver also emphasizes the importance of cash flow analysis to detect the risk of bankruptcy early.

Altman (1968) developed a bankruptcy prediction model known as the Altman Z-Score, which combines several financial ratios such as liquidity, profitability, leverage, and activity. This model has become a commonly used tool in financial literature and practice to predict potential corporate bankruptcy. Financial ratios such as liquidity ratio, debt ratio, and profitability ratio are often used to assess bankruptcy risk. Some studies show that low liquidity ratios and high debt ratios can increase the risk of bankruptcy (Beaver, 1966).

2.3. Company

The main characteristics of manufacturing companies include the production process, inventory of goods (raw materials, semi-finished products, and finished products), and production costs which include labor, raw materials, and production overhead. The companies we use in this research are listed on the Indonesia Stock Exchange, namely:

a) PT Semen Indonesia (Persero) Tbk
b) PT Indocement Tunggal Prakarsa Tbk
c) PT Chandra Asri Petrochemical Tbk
d) PT Pabrik Kertas Tjiwi Kimia Tbk
e) PT Barito Pacific Tbk
f) PT Unilever Indonesia Tbk
g) PT Indofood Sukses Makmur Tbk
h) PT Gudang Garam Tbk
i) PT HM Sampoerna Tbk
j) PT Mayora Indah Tbk
k) PT Indomobil Sukses Internasional Tbk
l) PT Selamat Sempurna Tbk
m) PT Sri Rejeki Isman Tbk
n) PT Pan Brothers Tbk
o) PT Trisula International Tbk
p) PT Indo-Rama Synthetics Tbk

q) PT Krakatau Steel (Persero) Tbk
r) PT Timah Tbk
s) PT Aneka Tambang Tbk
t) PT Vale Indonesia Tbk

Companies are classified based on their sectors to facilitate analysis and understanding of their performance and role in the economy. In this literature, companies engaged in various industrial sectors in Indonesia are divided into several categories, including:

- Basic Industry and Chemicals
  Companies included in this sector are engaged in the production of raw materials and chemicals that become raw materials for other industries. Examples of companies in this sector are PT Semen Indonesia (Persero) Tbk (SMGR) which is engaged in the cement industry, PT Indocement Tunggal Prakarsa Tbk (INTP), and PT Chandra Asri Petrochemical Tbk (TPIA) which produces petrochemicals. These companies play an important role in infrastructure development and the provision of basic materials.
- Consumer Goods
  This sector includes companies that produce daily consumer goods, including food, beverages, household products, and tobacco products. Some of the major companies in this sector are PT Unilever Indonesia Tbk (UNVR) which produces household products, PT Indofood Sukses Makmur Tbk (INDF) which focuses on the food industry, and PT HM Sampoerna Tbk (HMSP) and PT Gudang Garam Tbk (GGRM) which produce tobacco products.
- Automotive and Components Industry
  Companies in this sector are engaged in the production of motor vehicles and their supporting components. PT Indomobil Sukses Internasional Tbk (IMAS) is one of the companies engaged in the automotive sector, while PT Selamat Sempurna Tbk (SMSM) produces automotive components such as filters and radiators.
- Textile and Garment Industry
  This sector includes companies engaged in the production of textiles and apparel. PT Sri Rejeki Isman Tbk (SRIL) and PT Pan Brothers Tbk (PBRX) are examples of companies that produce textiles and apparel for both domestic and export markets.
- Metal Goods and Products
  Companies in this sector focus on the production of metals and their derivative products, such as steel and metallic minerals. PT Krakatau Steel (Persero) Tbk (KRAS) is one of the largest steel producers in Indonesia, while PT Timah Tbk (TINS) and PT Aneka Tambang Tbk (ANTM) are engaged in the production of tin and other mining minerals.

The division will illustrate how companies in various industrial sectors play a vital role in supporting economic growth through producing goods, processing raw materials, and providing products needed by consumers and other industries.

3. Materials and Methods

3.1. Materials

The materials used in this study include:

- Company Financial Statements: Annual financial report data from 20 manufacturing companies listed on the Indonesia Stock Exchange (IDX) during the 2019-2023 period. These reports include balance sheets, income statements, cash flows, and financial statement notes.
- Financial Ratio Data: Data related to *cash ratio* and other financial ratios needed to calculate bankruptcy risk, such as the ratio of working capital to assets, retained earnings to assets, operating profit, and others.
- Altman Z-Score: Data to calculate Altman Z-score which is used as a proxy for corporate bankruptcy risk.

The data is taken from the official IDX website, financial data provider platforms, and annual reports published by each company.

3.2. Methods

This study uses a quantitative approach with multiple linear regression methods to analyze the effect of *cash ratio* on the risk of corporate bankruptcy. The research process consists of several stages:

a) Data Collection
   Annual financial report data of manufacturing companies was collected and verified for completeness, specifically for the period 2019-2023.
b) Calculation of Cash Ratio and Altman Z-Score.
c) Classical Assumption Test
   Before regression analysis is performed, the data is tested to fulfill classical assumptions, which include: Normality test, multicollinearity test, heteroscedasticity test and autocorrelation test.
d) Multiple Linear Regression Analysis
   After all classical assumptions were met, multiple linear regression analysis was performed to see the effect of *cash ratio* on Z-score as an indicator of bankruptcy risk.
e) Hypothesis Testing
   Tests were carried out with the t test (partial) and F test (simultaneous) to test the significance of the relationship between the independent and dependent variables at the 5% significance level.

3.2.1. Formula / Equation

The formulations used in this study are Cash Ratio and also Altman Z-score. There are two main variables that will be used, namely: Cash Ratio as the independent variable, and Altman Z-Score as the dependent variable with the following formula calculation:

$$Cash\ Ratio\ = \frac{CashandCashEquivalents}{CurrentLiabilities}$$

Altman Z-score to measure bankruptcy in Manufacturing Companies

$$Z\ =\ 0.717\ \times X_1\ +\ 0.874\ \times X_2\ +\ 3.107\ \times X_3\ +\ 0.420\ \times X_4\ +\ 0.99\ \times X_5$$

Where:

$$X_1\ = \frac{NetWorkingCapital}{TotalAssets}$$
$$X_2 = \frac{RetainedEarnings}{TotalAssets}$$
$$X_3\ = \frac{OperatingProfit}{TotalAssets}$$
$$X_4\ = \frac{MarketValueofEquity}{BookValueofLiabilities}$$
$$X_5 = \frac{Sales}{TotalAssets}$$

In the calculation and analysis, the following steps are carried out:

a) Data Collection: Financial data of manufacturing companies were collected for several periods, including information on cash ratio and the components required to calculate Altman Z-Score.
b) Calculation and Analysis of Cash Ratio and Altman Z-Score: Each company will have its Cash Ratio calculated based on the available financial statements, and then the Z-Score is calculated using the Altman formula.
c) Classical Assumption Test: Before conducting regression analysis, the data was tested to ensure the regression assumptions were met, such as tests for normality, heteroscedasticity, autocorrelation, and multicollinearity.
d) Regression Analysis: Simple linear regression was conducted to determine if there is a significant relationship between Cash Ratio and Altman Z-Score. The regression results will provide information regarding:
   - Does Cash Ratio have a significant effect on Altman Z-Score.
   - How much influence does Cash Ratio have in explaining variations in Altman Z-Score.
e) Interpretation of Results:
   - The Regression Coefficient will show whether an increase in cash ratio has a positive or negative impact on Z-Score.
   - Statistical significance is tested with the t-test (for coefficient significance) and F-test (for the whole

model).

- R-squared will show how much percentage of Z-Score variation can be explained by Cash Ratio.

3.2.2. Tables

Table 2: Cash Ratio Calculation Results of each company

No	Perusahaan	2019	2020	2021	2022	2023
1	SMGR	0.23714264	0.25469811	0.17383956	0.45994339	0.43073408
2	INTP	1.95853596	1.82590133	1.32149774	0.93861468	0.51864517
3	TPIA	0.84207908	1.06379159	1.69470884	2.3103707	1.76160314
4	TKIM	1.25389088	1.38236402	1.18857813	1.22534156	1.23538216
5	BRPT	0.67309917	1.03253554	0.97597652	2.10379012	1.58262483
6	UNVR	0.0481159	0.063191	0.02613042	0.04041738	0.09093023
7	INDF	0.55677866	0.61971109	0.72959511	0.84443029	0.86818771
8	GGRM	0.14141196	0.28067456	0.1469808	0.12734849	0.12223707
9	HMSP	1.47872204	0.9438883	0.81239508	0.1337559	0.11565874
10	MYOR	0.80283151	1.08703296	1.17295628	0.57872813	1.03576651
11	IMAS	0.06522939	0.12089917	0.11091926	0.15053307	0.1230648
12	SMSM	0.5291332	1.73902839	0.595131	1.39273	1.75890413
13	SRIL	0.92230778	0.29322739	0.00553632	0.16376027	0.02183772
14	PBRX	1.09825337	0.19547403	0.09075901	2.13443388	0.14454651
15	TRIS	0.20040844	0.29499763	0.26673113	0.25055361	0.28775441
16	INDR	0.07415056	0.14166251	0.15860998	0.11275822	0.04064155
17	KRAS	0.03735971	0.03714282	0.02614547	0.00932583	0.02598338
18	TINS	0.13374689	0.13764319	0.31344797	0.47473446	0.38335214
19	ANTM	0.30147548	0.31397698	0.421321	0.45102225	0.78804405
20	INCO	0.44543165	0.85406939	0.78942541	2.09022998	1.9332461

Table 2: Altman Z-Score Calculation Results of each company in 2019

X1	X2	X3	X4	X5	Z-Score
0.05536200196	0.3699038959	0.04004375953	0.7717593906	-0.03864453508	0.7772917515
0.3220038553	0.6547187215	0.08208631455	4.98764362	0.5752667963	3.730676186
0.2581943856	0.3044747533	0.007939762646	1.426480716	0.1816042708	1.255609256
0.1106046342	0.2174399175	0.06031287931	0.826068212	0.3419349509	1.148233665
0.1005923479	0.02512309544	0.03852022329	0.6225522	0.3344918541	0.8102355145
-0.2196180213	0.2467049481	0.4795193035	0.3437031987	2.078637795	3.79817917
0.06981999595	0.2771870938	0.09095143515	1.290656166	0.7961964898	1.914313824
0.341046862	0.6325500614	0.1842115469	1.837559887	1.405310234	3.551178068
0.5691108463	0.2737563033	0.3587115217	2.343792411	2.083483885	4.844745195
0.4653377487	0.4784333767	0.03725120774	1.077780248	0.3456409255	1.666114781
-0.1073149589	0.03546230594	0.008968269249	0.2665910362	0.4164583148	0.5070724362
0.5397947397	0.5999946572	0.2645790238	3.674415281	1.266763781	4.55728365
0.4567702013	0.2548929438	0.06512668251	0.6131586018	0.7579495602	1.767038615

0.6792921463	0.1537412136	0.03701596308	0.6699588301	1.01010816	2.021522271
0.2971239479	0.07404961675	0.02093947007	1.357520166	0.3040115945	1.216040065
0.01370836923	0.2894212667	0.0565764609	0.9719983753	1.018832285	1.861107078
0.01850380729	0.03416692495	-0.04914523351	0.6017616755	0.2450404277	0.3808502855
0.01713399326	0.2726702125	-0.0354797965	0.3481724967	0.9480066526	1.221574166
0.07855632109	0.2461395411	0.02275330858	1.503414698	1.083578165	2.048597258
32.59646023	0.6749651773	0.04010279445	6.910062457	0.3518316561	27.34073078

Table 3: Altman Z-Score Calculation Results of each company in 2020

X1	X2	X3	X4	X5	Z-Score
0.05202713003	0.4074864443	0.04472270194	0.9549551985	0.4663549369	1.399644881
0.2956096895	0.6303520115	0.07856477489	4.290717635	0.5187234281	3.330474639
0.1776229657	0.2633599416	0.008024771916	1.016332093	0.5026630979	1.307763645
0.07533799042	0.2588992973	0.04977898999	0.9691097574	0.2819416731	1.1260849
0.1245764926	0.02790232507	0.03181920353	0.623592039	0.3038034225	0.7784262077
-0.2205628034	0.2313071888	0.4483581201	0.3165534673	2.092682937	3.686612008
0.06400996697	0.1899991538	0.07617138275	0.9421367093	0.5010004566	1.347923901
0.4160039756	0.7333291948	0.1235830525	2.975374627	1.464065074	4.034617183
0.4901515742	0.1706851045	0.2246941913	1.556220978	1.86063442	3.716852618
0.4691893765	0.5321389281	0.13570422	1.325114629	1.237616135	3.018489757
-0.1208625929	0.01704596488	-0.009150070132	0.3562760931	0.3146216692	0.360006831
0.5618632474	0.5984759116	0.2027144806	3.642987224	0.957981956	4.054486005
0.4064293125	0.2589276531	0.05491423372	0.531902437	0.692536238	1.602832433
0.4941805881	0.1767942084	0.03743234132	0.6785157499	0.9881241578	1.89211067
0.3011198801	0.06674757958	0.01111788573	1.519635443	1.067664245	2.005129887
0.03099103327	0.2890754429	0.008935504419	0.9718599306	0.7711431201	1.47514153
0.002250491847	0.04211683913	0.002342565245	0.1477216089	0.3882735205	0.4923701879
0.04767277186	0.3824237999	-0.01858145574	0.5158029745	1.048098528	1.563083842
0.05033966327	0.2617578467	0.0517240211	1.500343024	0.8626814096	1.914947498
0.2312484177	0.6821405149	0.04520970269	6.865762735	0.3303917901	4.117691663

Table 4: Altman Z-Score Calculation Results of each company in 2021

X1	X2	X3	X4	X5	Z-Score
0.01385634313	0.4273063689	0.04535875397	1.13860172	0.4569403081	1.459449916
0.2559763475	0.66073893	0.08547567553	3.738967027	0.565191367	3.165046962
0.1296457483	0.199082126	0.04049921291	1.417484307	0.5168023216	1.503812463
0.03604132935	0.2910574357	2.611077012	1.252852564	0.2889723512	9.466230513
0.2631139513	0.03386877376	0.05208216673	1.85959085	0.341463895	1.504358933
-0.2518780156	0.2167817114	0.3931394404	0.2930217628	2.073885866	3.445885012
0.07683032724	0.2047905756	0.08059986532	0.9343000128	0.5539012416	1.43332631

0.3439505589	0.6458761802	0.08099702228	1.932719077	1.388119179	3.256845782
-0.07761480092	0.1389014231	0.1723882505	1.221447723	1.862384383	2.975367734
0.3714800287	0.5339442763	0.07780276803	1.327475269	1.40099629	2.927057895
-0.1480411577	0.01066992362	0.0001109094441	0.3364875562	0.3758063326	0.4169087326
0.5494098782	0.5864486766	0.2383563952	3.041730871	1.076009173	4.013668032
-0.7959325019	-0.4795391062	-0.2403005039	-0.2399166732	0.6869100693	-1.181168533
0.2779132939	0.1989756536	0.03027099004	0.7183053051	0.9896924585	1.75173138
0.3413598954	0.07059215285	0.03162212588	1.637989109	1.035456382	2.120921988
0.08654276485	0.337251897	0.1114072114	1.050285951	0.9763710928	2.121819728
-0.1361264189	0.03891007071	0.02101319774	0.1605679337	0.5713447577	0.6368639269
0.1183075557	0.3779128825	0.1176711112	0.7525640409	0.9942831623	2.092910858
0.1569369253	0.2974494529	0.09246247299	1.725060137	1.167985634	2.549852783
0.2701950965	0.6927271124	0.0892277991	6.767221477	0.3854590776	4.309164439

Table 5: Altman Z-Score Calculation Results of each company in 2022

X1	X2	X3	X4	X5	Z-Score
0.07012959448	0.4100436485	0.01620654298	1.419850744	0.2013124709	1.25627211
0.2135650007	0.6757208746	0.08905679411	3.187175073	0.6351890863	2.996762015
0.3395344422	0.1693953047	-0.03579708272	1.324572029	0.4837025147	1.311882189
0.04948289276	0.4680358148	0.1487273153	1.672517512	0.3616882049	1.982039714
0.2270150668	0.0317529125	0.01680565867	1.673481102	0.3202260665	1.264303464
-0.2661002656	0.2079742489	0.3817971108	0.2791212649	2.250170569	3.560298732
0.1338484969	0.2281627671	0.06827323449	1.078478925	0.6142451089	1.5753997
0.2971921776	0.6399261214	0.04117449465	1.884150961	1.407847873	3.089541624
-0.3880935095	0.1162761226	0.1510040924	1.05835948	2.029885506	2.761730042
0.4101243836	0.54479823	0.1124995259	1.359396228	1.376781501	3.064958918
-0.1310639758	0.01691945077	0.01656116066	0.32735813	0.4453285528	0.5522920535
0.5520090182	0.5995738858	0.2676062095	3.129553201	1.117496964	4.198765495
0.2268001407	-1.291250138	-0.3877924129	-0.5053270067	0.686108027	-1.742577584
0.8126798799	0.1962715669	0.00944453776	0.888933009	0.9522506217	2.100601435
0.3455884869	0.08786757337	0.07785673536	1.528658535	1.271864626	2.475452319
0.1162527281	0.3523288077	0.05976670624	1.14954679	1.076271729	2.131279074
-0.4196451214	0.04643069231	0.03291926409	0.2117311046	0.5828248115	0.5111905803
0.2362920082	0.4896872084	0.1076475536	1.16876642	0.956938851	2.380885053
0.1701421319	0.01428816862	0.1550295504	2.389073643	1.365460236	2.9868761
0.2582528377	0.7198007912	0.103764847	7.762942743	0.4437172795	4.846763099

Table 6: Altman Z-Score Calculation Results of each company in 2023

X1	X2	X3	X4	X5	Z-Score
0.02722306123	0.4182574313	0.01641623936	1.502723763	0.2143867665	1.281109689
0.06272742895	0.6331542924	0.08082214812	2.415804986	0.6053953091	2.471528497

0.3598032364	0.1374169732	-0.009718490781	1.14246922	0.384709318	1.207613452
0.0395587933	0.4533573893	0.05115379352	1.948436313	0.2974676987	1.701484502
0.2450673746	0.03051873825	0.02199264488	3.614892171	0.2719655011	2.060417655
-0.3019744977	0.1916503551	0.3721701868	0.2545567035	2.317042831	3.545322703
0.1617858595	0.2520477943	0.08368913113	1.168640362	0.5986646341	1.688188217
0.2658575468	0.6455367845	0.07421043726	1.926772241	1.286662391	3.075851991
-0.3725400725	0.1459232315	0.1864047435	1.17383363	2.096732057	3.027000546
0.4493313751	0.6096267673	0.1714975443	1.779404669	1.318997656	3.458134655
-0.06020187458	0.02475729555	0.01757036429	0.3261135033	0.4592458106	0.6264423144
0.1060959479	0.649381513	0.2840644375	3.842280579	1.114885854	4.272119727
0.1294352936	-1.471252727	-0.2326859796	-0.0005953466349	0.5009054381	-1.443647376

Table 7: Calculation Results of the Effect of Cash Ratio on Company Bankruptcy Risk

Variable	Coefficient	Standard Error	t-statistic	P-value	Confidence Interval [0.025 - 0.975]
Constant	1.6753	1.172	1.43	170	[-0.786, 4.137]
Y	2.31E-07	3.24E-10	712	486	[-4.5e-10, 9.12e-10]

4. Results and Discussion

4.1. Cash Ratio result analysis

In general, each company shows different trends regarding its liquidity, where companies that have experienced a sharp decline need to immediately improve their financial condition to be better able to cover short- term obligations. Companies whose liquidity continues to increase or stabilize are in better condition to face financial challenges. For the results of cash ratio calculations from 2019-2023 divided into 5 company sectors with the following results:

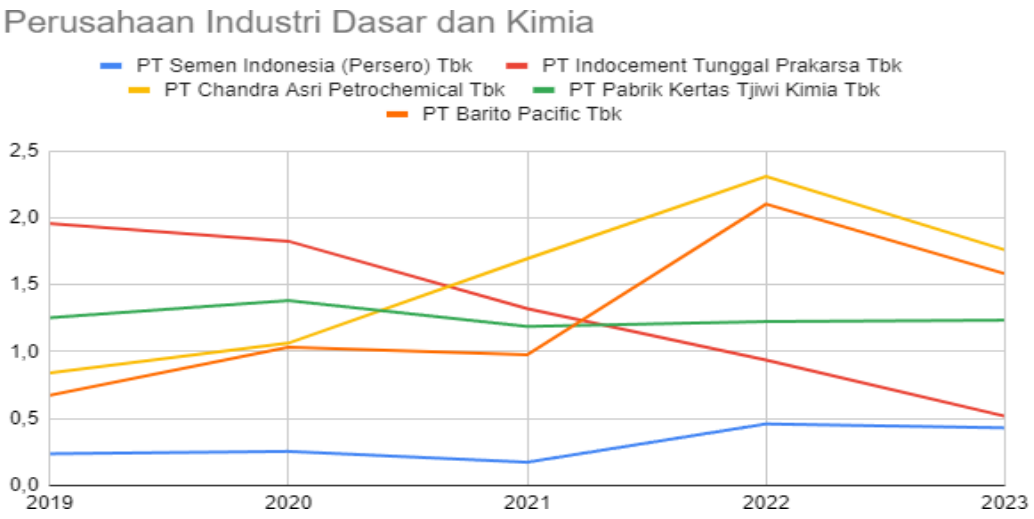

Figure 1: Results of Cash Ratio analysis in the Basic Industry and Chemical sector

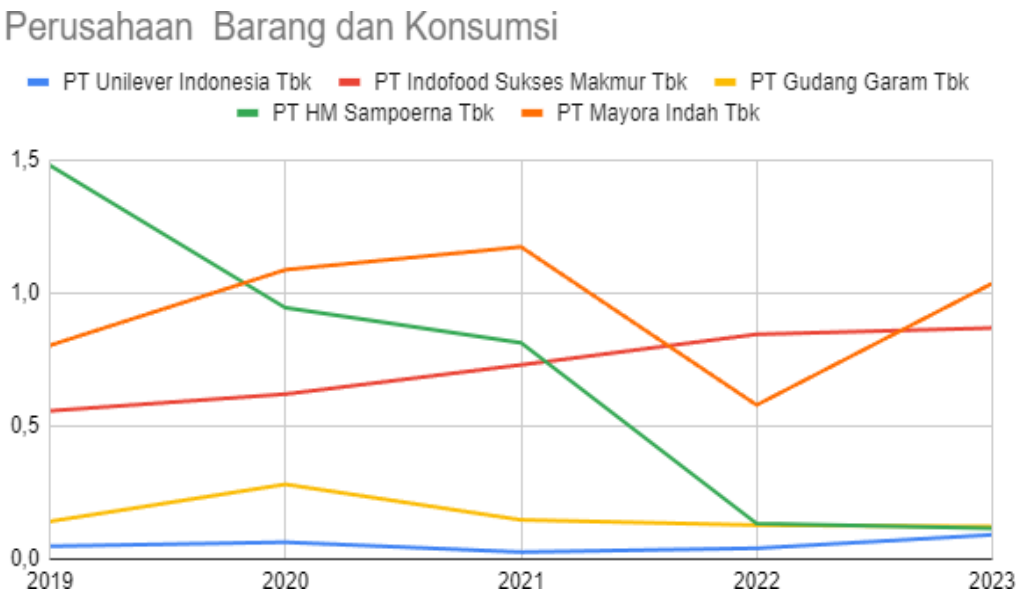

Figure 2: Cash Ratio analysis results of Consumer Goods sector

Figure 3: Cash Ratio analysis results for the Automotive and Component sectors

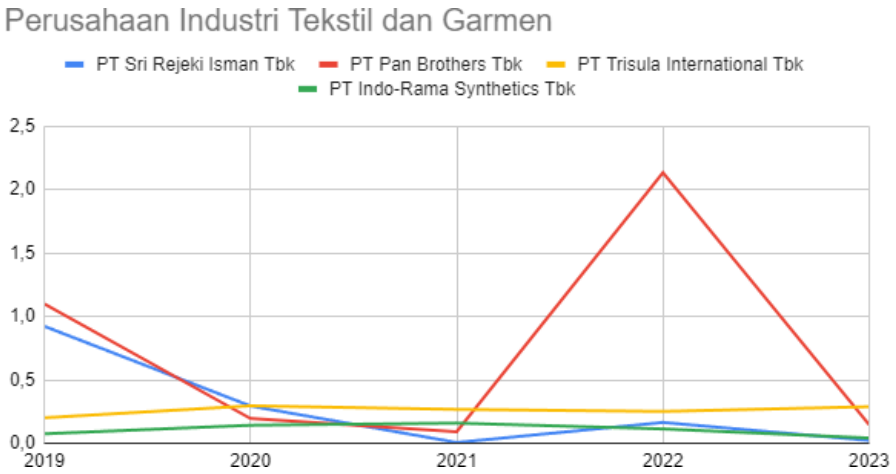

Figure 4: Results of the Cash Ratio analysis of the Textile and Garment Industry sector

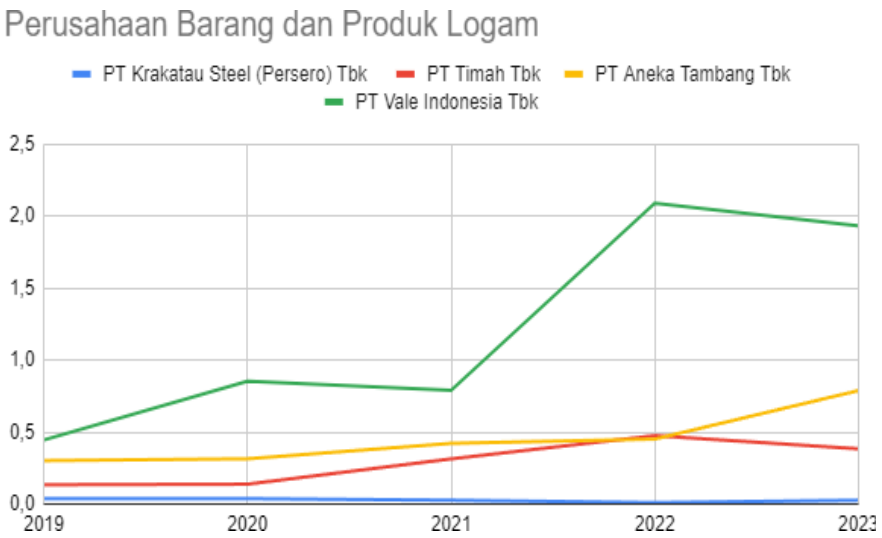

Figure 5: Cash Ratio analysis results for the Metal Goods and Products sector

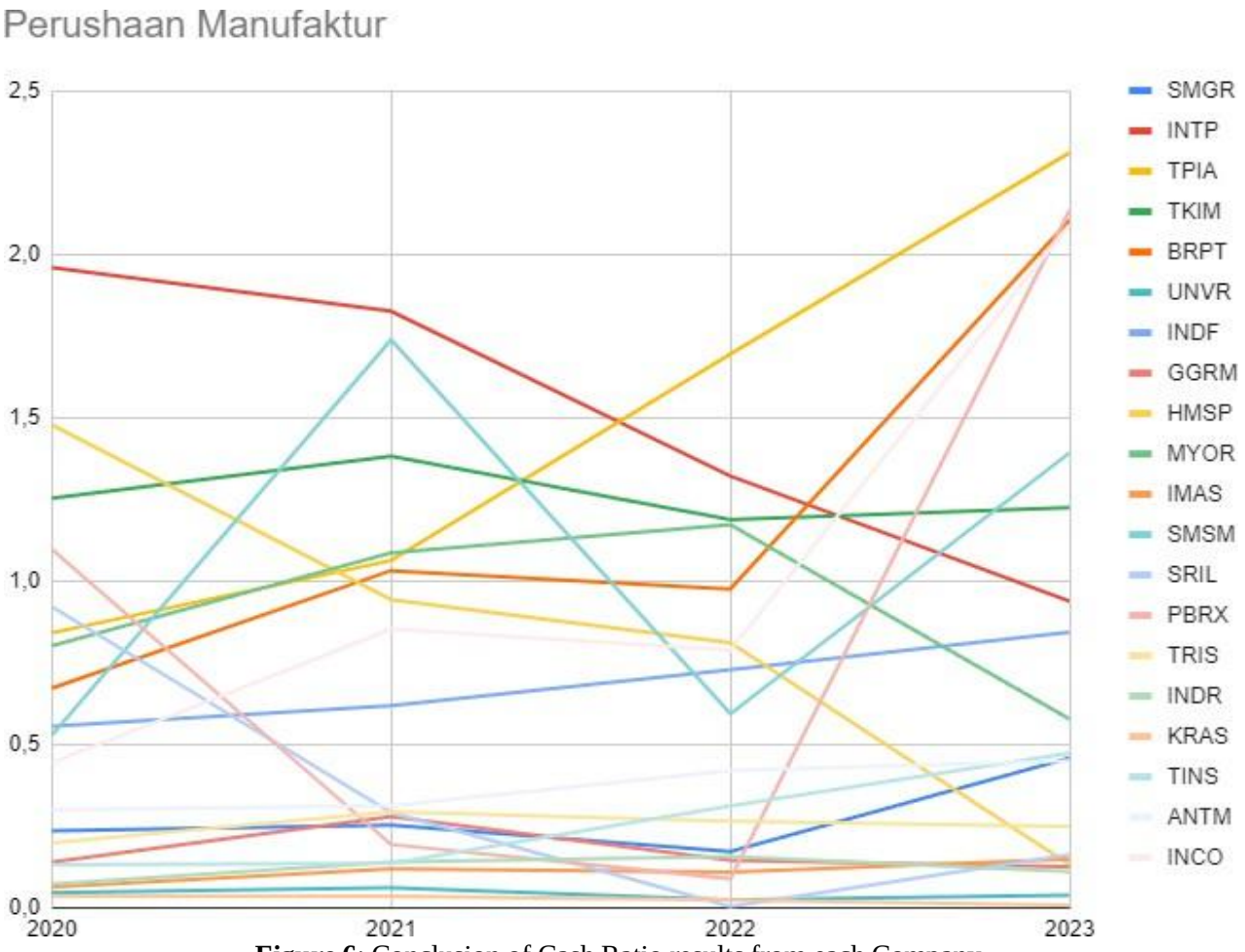

Figure 6: Conclusion of Cash Ratio results from each Company

Based on the company's cash ratio graph from 2019 to 2023 contained in Figure 6. it can be concluded that the liquidity analysis of companies in the 2019-2023 period shows dynamics influenced by various internal and external factors. Some companies such as TPIA, BRPT, and TKIM managed to maintain healthy liquidity due to good financial management and operational stability despite external challenges such as the COVID-19 pandemic in 2020-2021. On the other hand, companies such as SMGR and INTP experienced a significant decline in liquidity especially in 2021 which was likely due to a decrease in revenue due to reduced economic activity during the pandemic but started to recover in the following years. In addition, global economic fluctuations and government policy changes.

For example, GGRM and HMSP face liquidity fluctuations due to pressure on the cigarette industry influenced by excise

tax hikes which have a direct impact on their profitability IMAS and KRAS which consistently have liquidity ratios below 1 indicate deeper structural issues such as, high debt burden and inefficient cash management making them vulnerable to external pressures.

Companies such as INCO and SMSM that have strong liquidity in 2022-2023 show that success in maintaining liquidity is also influenced by the increase in global demand for the commodities they produce such as, nickel and automotive components along with the post-pandemic economic recovery. However, textile companies such as SRIL. INDR. and PBRX experienced a sharp decline in liquidity in 2023 which was most likely influenced by rising production costs and declining export demand due to the global economic slowdown. In general, liquidity performance during this period is highly influenced by macroeconomic conditions, financial management strategies and industry-specific factors. Companies that are able to adapt quickly to external changes and maintain operational efficiency tend to be better at maintaining healthy liquidity.

4.2. Regression

Based on the OLS regression results, this analysis is conducted to test the effect of cash ratio on bankruptcy risk in manufacturing companies as follows:

```
 OLS Regression Results
==============================================================================
Dep. Variable:                      y   R-squared:                       0.027
Model:                            OLS   Adj. R-squared:                 -0.027
Method:                 Least Squares   F-statistic:                    0.5069

Date:                Sun, 13 Oct 2024   Prob (F-statistic):              0.486
Time:                        05:13:24   Log-Likelihood:                -40.916
No. Observations:                  20   AIC:                             85.83
Df Residuals:                      18   BIC:                             87.82
Df Model:                           1
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const          1.6753      1.172      1.430      0.170      -0.786       4.137
Y           2.308e-10   3.24e-10      0.712      0.486   -4.5e-10    9.12e-10
==============================================================================
Omnibus:                       17.067   Durbin-Watson:                   1.865
Prob(Omnibus):                  0.000   Jarque-Bera (JB):               19.089
Skew:                           1.585   Prob(JB):                     7.16e-05
Kurtosis:                       6.586   Cond. No.                     9.59e+09
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly
specified.
[2] The condition number is large, 9.59e+09. This might indicate that there are
strong multicollinearity or other numerical problems.
```

Based on the OLS regression results, it can be concluded that the results of the calculation of the effect of cash ratio on the company's bankruptcy risk using regression analysis in Table 7. Based on the OLS regression results, the analysis is carried out to test the effect of cash ratio as an independent variable on Altman Z-Score as the dependent variable. Altman Z-Score is an important indicator in measuring the risk of corporate bankruptcy, where a lower score indicates a higher risk of bankruptcy.

a. Coefficient and Significance

- Constant (Intercept): The constant value in this regression is 1.6753, which means that when the cash ratio is zero,

the predicted value of Altman Z-Score is 1.6753. This means that in the case without adequate cash reserves, the company is expected to have a relatively low Z-score, which could indicate the risk of bankruptcy. However, the p-value (0.170) shows that this constant is not statistically significant, so it can be concluded that this constant has no real influence in this model.

- Cash Ratio: The coefficient for cash ratio is $2.308\times^{-10}$, which indicates that there is a very small positive relationship between cash ratio and Al1tm0 an Z-Score. However, the high p-value (0.486) indicates that this relationship is not statistically significant. That is, changes in the cash ratio have no significant impact on the Altman Z-Score of manufacturing companies in this sample.

b. Model Fit (R-squared and Adjusted R-squared)

- The R-squared of 0.027 indicates that only 2.7% of the variation in Altman Z-Score can be explained by the cash ratio. This suggests that the model has very low predictive power and it is likely that many other factors have more influence on Altman Z-Score than just the cash ratio.
- The negative Adjusted R-squared (-0.027) indicates that adding the cash ratio variable into the model actually worsens the prediction model compared to the simple model that only uses the average. This strengthens the argument that cash ratio is not significant in predicting Altman Z-Score.

c. Diagnostic Statistics

- Omnibus and Jarque-Bera tests show that the model residuals are not normally distributed (p-value = 0.000 and 7.16e-05). This violates the assumptions of OLS regression which may affect the validity of the statistical test results.
- The Durbin-Watson value (1.865) is close to 2, which indicates that there is no significant autocorrelation in the residuals, so there is no indication that the regression errors are connected to each other.
- The high condition number (9.59e+09) indicates a potential multicollinearity or other numerical problem in the model. This could mean that the cash ratio may be correlated with other variables not included in the model or that there are other structural issues in the dataset that affect the accuracy of the estimates.

4.3. Relationship between Cash Ratio and Altman Z-Score

The regression results show that cash ratio has no significant influence on Altman Z-Score in this sample of manufacturing companies. While the Altman Z-Score is widely recognized as a predictive tool of bankruptcy risk, the cash ratio does not prove significant in influencing the score. Some reasons that may explain this include:

- Cash Ratio as a Weak Predictor: Although the cash ratio indicates the level of liquidity of the company in meeting short-term obligations, bankruptcy is a more complex phenomenon. The Altman Z-Score, which measures bankruptcy risk, integrates various financial ratios, including leverage, profitability, and operational efficiency. Therefore, using only cash ratio as a predictor of Altman Z-Score may not provide a complete picture of a company's bankruptcy risk.
- Limited Sample Size: With only 20 observations, this small sample size may reduce the statistical ability to detect significant effects. A larger sample may provide clearer results regarding the relationship between cash ratio and Altman Z-Score.
- Multicollinearity and Model Problems: A high condition number indicates the possibility of multicollinearity or numerical problems in the model. It could be that the cash ratio is correlated with other variables that also affect the Altman Z-Score, causing distortions in the estimation results.
- Manufacturing Sector Specifications: The manufacturing sector often has distinct operational characteristics, such as long production cycles, large capital investment requirements, and demand fluctuations. Therefore, liquidity ratios such as cash ratio may not fully reflect bankruptcy risk in the context of this sector. Other financial ratios, such as profitability or asset utilization efficiency, may be more relevant in influencing the Altman Z-Score.

4.4. Implications

From the results of this study, it can be concluded that cash ratio as a measure of liquidity is not adequate to predict

Altman Z-Score or bankruptcy risk of manufacturing companies. Therefore, companies, investors, and analysts should use a more comprehensive approach by including various other financial ratios such as leverage, profitability ratios, and activity ratios. This is important to get a fuller picture of the company's financial health and bankruptcy risk. Moreover, the specific nature of the manufacturing industry such as reliance on long-term capital and fixed assets implies that liquidity ratios alone may not provide sufficient insight into bankruptcy risk.

4.5. Limitations and Futher Research

Cash ratio separately is not a significant predictor of Altman Z-Score in this study of manufacturing companies. Further research is needed to explore a broader relationship and consider other factors that may better capture the complexity of corporate bankruptcy risk. There are limitations in this study, namely:

- Sample Size: Limitations in the sample size (20 companies) reduce the generalizability of these findings. Future research should expand the sample coverage by adding more companies or conducting the analysis over a longer period of time to improve the robustness of the results.

- Model Specification: Future studies can use more complex models incorporating more financial ratios and macroeconomic variables to capture different aspects of bankruptcy risk. In addition, using methods to address multicollinearity, such as principal component analysis (PCA), may improve the estimation results.
- Inter-Sector Comparison: Given that these findings may be specific to the manufacturing sector, further research should conduct cross-sector comparisons to understand whether or not this pattern of relationship between cash ratio and Altman Z-Score holds true in other sectors.

5. Conclusion

a) Uji Classical Assumption Test. This classic assumption test includes several tests such as:
   - Normality Test: The distribution of residuals was tested using the Omnibus statistic, which has a value of17.067 and a p-value of 0.000, which significantly indicates that the model residuals are not normally distributed. This condition is reinforced by the positive Skewness value of 1.585, which indicates that the data distribution is skewed to the right. However, this unmet assumption of residual normality may indicate that there are other factors causing distortions in the model, which may be due to unobserved variables or sampling imperfections.
   - Multicollinearity Test: A very high Condition Number value (9.59e+09) indicates the possibility of strong multicollinearity between the independent variables. High multicollinearity can affect the stability of the regression coefficients and increase the standard errors, causing the coefficients to become insignificant. This is evident from the high p-value for the coefficient of the independent variable (Y), which may reflect strong dependency between variables or high collinearity among the independent variables.
   - Heteroscedasticity Test: From the table, there is no direct indication of heteroscedasticity, but additional tests such as the Breusch-Pagan or White Test should be performed to ensure that the residual variance is constant. If heteroscedasticity occurs, it may lead to incorrect standard errors, making coefficient estimates and significance tests unreliable.
   - Autocorrelation Test: The Durbin-Watson value of 1.865 is close to 2, which indicates that there is no positive autocorrelation in the residuals. This means that the residuals from this model do not exhibit systematic patterns that are related over time, and the assumption of residual independence is met. However, in the context of financial data analysis, the presence of autocorrelation in time series is often a common problem, so this figure indicates a fairly good model in terms of residual independence.

b) Multiple Linear Regression Analysis

After classical assumption testing, multiple linear regression analysis was conducted to evaluate the effect of the independent variables on the dependent variable. In this model, the independent variable Y is used to explain its effect on the dependent variable Z. The results show a regression coefficient of Y of 2.308e-10, which is nominally very small. The p-value of 0.486 (greater than 0.05) indicates that statistically, the variable Y is insignificant in influencing Z. This indicates that there is a high probability that the independent variable Y will

influence Z. This indicates that there is a high probability that the Y variable is not the main factor contributing to the variation in Z, or there could be interactions with other variables that are not accounted for in this model.

This low coefficient value and significance can be caused by several factors, one of which is the potential for multicollinearity as indicated by the very large condition number. If the independent variables have high collinearity, then the coefficients cannot be estimated well, and this affects the reliability of the significance test. In addition, the very low R-squared value (0.027) indicates that only about 2.7% of the variation in the dependent variable Z can be explained by the independent variable Y, indicating a very weak relationship between these two variables

c) Hypothesis Testing: In this analysis, two types of hypothesis testing were conducted:
   - Test t (Partial): The t-test result for the coefficient of variable Y shows a t-value of 0.712 with a p-value of 0.486, which is far above 0.05. This indicates that partially, variable Y has no significant effect on the dependent variable Z at the 5% significance level. In other words, we cannot reject the null hypothesis that the coefficient of Y is equal to zero, which means Y does not contribute significantly in predicting Z.
   - F Test (Simultaneous): The F-test yields an F-statistic of 0.5069 with a p-value of 0.486, which indicates that simultaneously, the model is not significant at the 5% significance level. Thus, there is no strong evidence that the independent variables jointly have a significant effect on the dependent variable Z. This indicates that the regression model constructed is not good enough to explain the variation in Z, and there may be other more influential variables that have not been included in the model.

d) Relevance and Implication: Based on the results obtained, it can be concluded that the cash ratio variable (represented by Y) does not have a significant influence on Z-score as an indicator of bankruptcy risk in this model. The low coefficient value and statistical significance indicate that there is a very weak relationship between these two variables. This may be due to:
   - Multicollinearity: Apparent from the high condition number, which may affect the analysis results and cause the independent variables to appear insignificant. A potential solution is to eliminate or combine some variables that have a strong relationship with each other.
   - Analyzing other variables that are more influential: While cash ratio is often used as an indicator of liquidity, there may be other factors such as leverage, operating income, or market performance that are more relevant in explaining Z-score as an indicator of bankruptcy risk.

Acknowledgments

On this occasion, the author would like to express his deepest gratitude to all those who have provided support and contributions during the process of writing this journal. Thank you to Prof. Dr. Sukono, MM, M.Si and to Moch Panji Agung Saputra, M.Mat. as lecturers who have provided valuable guidance and direction. Also, to friends who always provide encouragement and motivation, as well as all respondents who have taken the time to participate in this study. Hopefully the results of this research can be useful for all parties.

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