



EVALUATION OF COMPANY BANKRUPTCY LEVEL USING THE ALTMAN Z-SCORE MODEL: A LITERATURE REVIEW IN VARIOUS INDUSTRIAL SECTORS

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ABSTRACT

This research aims to evaluate the application of the Altman Z-Score model in assessing potential corporate bankruptcy across various industrial sectors in Indonesia and to assess its effectiveness as an early warning system. The research method employed is a literature review, examining 14 prior studies covering sectors such as manufacturing, food and beverages, pharmaceuticals, textiles, automotive, construction, banking, and insurance. The results indicate variations in bankruptcy risk levels between sectors, influenced by differences in financial characteristics, capital structure, and leverage levels. The manufacturing and food-beverage sectors tend to be more stable, while the construction and textile sectors show a higher vulnerability to distress conditions. The majority of companies in Indonesia are identified as being in the grey zone, confirming that the Altman Z-Score functions effectively as an early warning indicator rather than an absolute bankruptcy determinant. This model has proven accurate for manufacturing and non-financial sectors, but requires modification or alternative models when applied to the financial sector due to differences in financial statement structures.

1. INTRODUCTION

The increasingly competitive business world and unstable economic conditions have increased the risk of companies being unable to maintain their business continuity. Various external pressures, such as economic slowdowns, changing market conditions, and the impact of the global crisis, can significantly impact a company's financial performance. These conditions put companies at risk of financial distress, which, if not properly managed, can lead to bankruptcy. Therefore, the issue of corporate bankruptcy is a significant concern for various parties, including management, investors, creditors, and other stakeholders, as bankruptcy impacts not only the company itself but also broader economic stability (Anggia et al., 2025).

Bankruptcy generally doesn't occur suddenly, but rather is preceded by a decline in financial performance over a period of time (Sunaryo et al., 2021). Therefore, an analytical tool is needed to identify potential bankruptcy early so companies can take anticipatory action. Information about a company's financial condition is also a crucial consideration for investors and creditors when making investment and credit decisions. Bankruptcy prediction analysis provides various parties with an overview of a company's financial health and the risks it may face in the future (Ermawati et al., 2025).

One widely used model for predicting corporate bankruptcy is the Altman Z-Score. Developed by Edward I. Altman, this model combines several financial ratios reflecting a company's liquidity, profitability, and solvency (Br Sitepu & Maulana, 2021). The Altman Z-Score is widely recognized for its ease of application and its ability to provide an initial overview of a company's financial health. As research has progressed, this model has undergone several adjustments to allow for use in various types of companies and industry sectors (Febriyandi & Amalia, 2020).

Various previous studies have applied the Altman Z-Score model to assess the potential for bankruptcy of companies in specific industrial sectors, such as construction, manufacturing, banking, and services and trade (Ilham et al., 2022). These studies indicate that the Altman Z-Score model can provide an initial overview of a company's financial distress. However, most studies focus on a single sector or type of

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company, resulting in partial results (Moeljono, 2020). Differences in characteristics between industrial sectors allow for variations in bankruptcy risk levels and the effectiveness of the Altman Z-Score model (Melissa & Banjarnahor, 2020). Therefore, a study that can summarize and compare the results of previous studies is needed to obtain a more comprehensive picture of the application of the Altman Z-Score model across various industrial sectors (Izmi et al., 2023).

Based on the above description, this study aims to evaluate the application of the Altman Z-Score model in assessing corporate bankruptcy levels based on previous research (Arfah & Patimbangi, 2024). This research was conducted through a literature review method, examining various studies discussing the use of the Altman Z-Score in various industrial sectors (Aisyah, 2022). It is hoped that this study will provide an overview of the differences in bankruptcy evaluation results between sectors and assess the effectiveness of the Altman Z-Score model as an early warning tool for corporate bankruptcy risk (Munandar et al., 2020).

2. RESEARCH METHODS

This research uses a literature review approach. A literature review is a written synthesis sourced from various scientific literature such as journal articles, books, and other official documents that serves to present theories and factual information, both historical and current (Maddepunggeng et al., 2017). This process involves organizing the literature into specific topics relevant to the needs of the research proposal. In the context of educational research, although journal articles are the main priority, researchers also need to integrate information from other sources such as conference proceedings, book literature, and government policy documents (Nurjani & Resnawaty, 2023). In line with Purwono's (2010) view, a literature review is seen as a systematic effort by researchers to collect information that aligns with the research object (Mashudi et al., 2020). This data can be extracted from various scientific references, ranging from research reports, theses, dissertations, to regulatory documents and other credible electronic references (Widiarsa, 2019). The data used in this study is secondary data obtained from scientific articles, national journals, and academic works discussing corporate bankruptcy prediction using the Altman Z-Score model. Literature searches were conducted through online journal portals such as Open Journal Systems (OJS), Google Scholar, and university institutional repositories (Nofitasari & Nurulrahmatia, 2021).

Data collection techniques were carried out by identifying relevant articles using keywords including Altman Z-Score, corporate bankruptcy, and financial distress. The obtained articles were then selected based on predetermined inclusion and exclusion criteria (Rizal et al., 2020).

3. RESULTS AND DISCUSSION

To provide a more systematic overview of the literature review results, this study presents a grouping of previous studies that discuss the application of the Altman Z-Score model to various industrial sectors. This grouping is done to facilitate analysis of differences in sectors, company types, and variations in the Z-Score model used to evaluate corporate bankruptcy rates (Rizkiah & Nafisa, 2023). The tabular presentation of the results is intended to summarize the main characteristics of each study, including the industrial sector studied, company type, the Altman Z-Score model used, and the categories of bankruptcy evaluation results (Rofinus Leki, 2021). Therefore, this table serves as a basis for further analysis of the patterns and differences in the research results in the discussion section.

Table 1. Summary of Grouping of Previous Research Using the Altman Z-Score Model

No	Writer	Research Title	Industrial Sector	Period	Z-Score Model	Key Findings
1.	Suwardi & Rohmawati	Bankruptcy Prediction Analysis Using the Altman Z-Score Model for Food and Beverage Sub-Sector Companies Listed on the Indonesia Stock Exchange from 2019 to 2021	Food & Beverages	2019–2021	Classic Z-Score	PT Mayora Indah Tbk remains in the safe zone, while PT FKS Food Sejahtera Tbk is predominantly in distress due to negative

								WCTA and RETA. (Rohmawati, n.d.)
2.	Ermawati, Rudelvo & Purwanto	Altman Z Score Analysis to Predict Financial Distress in Pulp and Paper Industry Companies Listed on the Indonesia Stock Exchange in 2020-2023	Pulp & Paper	2020-2023	Classic Score	Z-		
3.	Nofitasari	Altman Z-Score Analysis to Predict Bankruptcy	Pharmacy	2015-2019	Classic Score	Z-	The majority of companies are in the grey and distress zones (Ermawati et al., 2025)	
4.	Febriyandi & Amalia	Financial Distress Analysis Using the Altman Z-Score Model in Manufacturing Companies Listed on the Indonesia Stock Exchange for the 2018-2020 Period	Manufacturing	2018-2020	Classic Score	Z-		
5.	Nugroho, Murni & Untu	Analysis of Potential Bankruptcy of Companies Using the Altman Z-Score Method in Food and Beverage Companies Listed on the IDX in the 2018-2020 Period	Food & Beverage	2018-2020	Classic Score	Z-	The average company is in the grey to safe zone (Nofitasari & Nurulrahmatia, 2021)	
6.	Hasanah & Maqsudi	Bankruptcy Prediction Analysis Using the Altman Z-Score Method in Automotive Sub-Sector Companies Listed on the Indonesia Stock Exchange in 2019-2021	Automotive	2019-2021	Classic Score	Z-		
7.	Fitri et al.	Bankruptcy Prediction Analysis Using the Altman Z-Score Method in Food and Beverage Companies Listed on the Indonesia Stock Exchange	Food & Beverages	2017-2021	Modified Score	Z-	safe zone companies decreased during the pandemic (Febriyandi & Amalia, n.d.)	
8.	Anggia et al.	Bankruptcy Prediction Analysis Using Altman Z-Score at PT Sri Rejeki	Textiles	2013-2024	Classic Score	Z-		
9.	Melissa & Banjarnahor	Bankruptcy Prediction Analysis Using Altman Z-Score, Springate, and Zmijewski Models Listed on the Indonesia Stock Exchange	Manufacturing	2014-2018	Model Comparison		Three companies are in distress, four are safe, the rest are in the grey zone	

10.	Wahyuningsih et al.	Study of Insurance Industry Bankruptcy Predictions in Indonesia 2019-2021	Insurance	2019-2021	Modified Z-Score	(Nugroho et al., 2022)
11.	Rofianus Leki	Application of the Altman Z-Score Model in Measuring Bankruptcy Potential (Case Study of State-Owned Banking Companies Listed on the Indonesia Stock Exchange in 2018 & 2019)	Banking	2018-2019	Non-Manufacturing Z-Score	Fluctuating financial conditions; some companies recover from distress (Rohmatul Hasanah & Achmad Maqsudi, 2023)
12.	Anggraeny & Suryana	The Effect of Altman Z-Score Bankruptcy Analysis on Stock Prices of Manufacturing Companies on the Indonesia Stock Exchange Before and During the Covid-19 Pandemic (Case Study 2019-2020)	Manufacturing	2019-2020	Classic Z-Score	
13.	Munandar et al.	Bankruptcy Assessment of Companies in the Construction & Building Sub-Sector for the 2019-2021 Period Using the Altman Z-Score Method	Construction	2019-2021	Classic Z-Score	All companies are in the distress zone (Izmi et al., 2023)
14.	Wahyuni	Predicting Financial Difficulties Using the Modified Altman Z-Score Model	Textiles	2020-2022	Modified Z-Score	

Table 1 shows that the Altman Z-Score model has been applied to various industrial sectors, yielding varying bankruptcy evaluation results. This variation indicates differences in financial characteristics between sectors, which influence the resulting Z-Score values.

Evaluation of the Implementation of the Altman Z-Score

The Altman Z-Score model is a method used to predict bankruptcy risk based on a combination of several key financial ratios. This model was originally developed as a bankruptcy prediction tool for manufacturing companies but has been modified and applied to various other sectors in numerous Indonesian studies. The Altman Z-Score uses working capital ratios, retained earnings, EBIT, and equity structure to measure a company's financial health (Hasanah & Maqsudi, 2023).

The purpose of this study is to evaluate the application of the Altman Z-Score model in assessing the level of corporate bankruptcy based on the results of previous studies, as well as assess its differences between industrial sectors and its effectiveness as an early warning tool. The results of the literature grouping that has been conducted indicate that the Altman Z-Score model has been widely used in various industrial sectors in Indonesia, including manufacturing, food and beverage, automotive, pulp and paper, textiles, construction, insurance, and banking.

In general, the Altman Z-Score classification classifies a company's financial condition into three main categories: the safe zone, the gray zone, and the distress zone, each indicating a different level of bankruptcy risk (Rohmawati, 2020). These variations in results reflect differences in financial structure characteristics, leverage levels, and profitability across industry sectors.

Differences in Bankruptcy Evaluation Results Between Industrial Sectors

The synthesis of previous research indicates that the manufacturing and food and beverage sectors tend to have more stable results than other sectors. Most companies in these sectors fall into the safe or gray zone, particularly those with strong operating cash flow and consistent profitability. This suggests that the manufacturing sector's asset structure and revenue patterns are relatively more in line with the basic assumptions of the Altman Z-Score model, originally developed for manufacturing companies (Suryana & Anggraeny, 2023). In contrast, the construction and textile sectors tend to fall into the distress zone, particularly following periods of economic pressure or declining demand. Companies in these sectors generally have high levels of leverage, reliance on external financing, and slow working capital turnover, negatively impacting the Z-Score. This indicates that the construction and textile sectors are more vulnerable to bankruptcy than other sectors. In the pulp and paper and automotive sectors, bankruptcy evaluations show fluctuating conditions, with many companies in the gray zone. This indicates that companies in these sectors are in a vulnerable state, where small improvements in financial performance can lead to health, but external pressures can also quickly push them into distress.

Meanwhile, the financial and insurance sectors demonstrate limitations in the application of the Altman Z-Score. Most banking and insurance companies fall into the gray zone, despite still operating effectively. This is because the financial reporting structure of the financial sector differs significantly from that of non-financial companies, making the use of the Altman Z-Score model without modifications likely to produce bias (Wahyuni, 2024).

General Patterns of Bankruptcy Zones (Safe, Grey, and Distress)

Altman's research on bankrupt and non-bankrupt companies revealed certain values. The criteria used to predict corporate bankruptcy using the discriminant model is to look at the zone of ignorance, namely the Z-value area. This is categorized in the following table

Table 2. General Patterns of Bankruptcy Zones

Criteria	Z Value
Not bankrupt if $Z >$	2.99
Bankruptcy-prone areas (grey areas)	1.81 – 2.99
Bankrupt if $Z <$	1.81

The literature review revealed that the *grey zone* category was the most dominant finding. The dominance of *the grey zone* indicates that many companies in Indonesia are in a financial condition that is not entirely secure, but also not yet categorized as bankrupt. This condition confirms that the Altman Z-Score serves more often as an early warning indicator than as a tool for determining absolute bankruptcy.

Companies in *the safe zone* generally exhibit positive working capital, stable retained earnings, and the ability to generate adequate operating profit. Conversely, companies in *the distress zone* consistently exhibit weaknesses in their working capital-to-total assets ratio and profitability ratio, reflecting liquidity pressures and an inability to generate profits. These findings indicate that the Working Capital to Total Assets and Earnings Before Interest and Taxes to Total Assets ratios are the most sensitive components in determining shifts in the bankruptcy zone. When these ratios decrease significantly, the Z-Score tends to fall directly into the distress category.

Effectiveness of the Altman Z-Score as an Early Warning Tool

To address the research objectives, the literature review indicates that the Altman Z-Score remains relevant in Indonesia, particularly as a preliminary evaluation tool and early warning of bankruptcy risk. Several studies have shown that companies that ultimately experience financial distress or bankruptcy have shown a decline in Z-Score values several years prior.

However, the effectiveness of the Altman Z-Score is sector-specific. This model has proven more accurate in manufacturing and non-financial companies, while in the financial sector, adjustments or the use of alternative models are required. Therefore, the Altman Z-Score cannot be used uniformly without considering industry characteristics (Wahyuningsih & Ediwijoyo, 2022).

1. Synthesis of Research Findings and Implications

Overall, the results of a review of previous research indicate that the majority of companies in Indonesia are in a vulnerable condition (grey zone), while others are in a healthy or distressed state. This confirms that bankruptcy risk remains a relevant issue and needs to be addressed by company management (Nugroho et al., 2022). The implication of this research is that the Altman Z-Score can be used as a decision-making tool by management, investors, and creditors to identify potential financial problems early. However, its use must be accompanied by an understanding of the characteristics of the industrial sector and supported by other financial analyses (Widiarsa, 2019). Thus, this study answers the introduction by showing that there are differences in bankruptcy evaluation results between industrial sectors and that the Altman Z-Score model is still effective as an early warning tool, although it has limitations in certain sectors.

4. CONCLUSION

Based on the results of the literature review analysis that has been carried out, several main conclusions can be drawn as follows:

- a. The Altman Z-Score model has been proven to be able to be used to evaluate the level of company bankruptcy and provide an initial picture of the company's financial health as an early warning tool.
- b. Based on the results of the literature review, the Altman Z-Score model has been proven to be able to be used to evaluate the level of company bankruptcy and provide an initial picture of the company's financial health as an early warning tool.
- c. The results of the bankruptcy rate evaluation using the Altman Z-Score model show differences between industrial sectors, which are influenced by the financial characteristics and asset structure of each sector.
- d. Overall, the Altman Z-Score model is still effective and relevant for use in assessing the risk of corporate bankruptcy, but caution is needed in its application by considering the characteristics of the industrial sector being analyzed.

Suggestion

- a. For further researchers, it is recommended to combine the Altman Z-Score model with other bankruptcy prediction models, such as Zmijewski or Springate, to obtain more comprehensive bankruptcy risk evaluation results.
- b. Further research is expected to consider the characteristics of the industrial sector more specifically, especially in the financial sector, by using a modified Altman Z-Score model or a more appropriate alternative model.
- c. For company management, the results of this study can be used as a consideration in monitoring the company's financial health condition periodically as an effort to prevent the risk of bankruptcy.
- d. For investors and creditors, the Altman Z-Score model can be used as an initial tool in assessing a company's level of financial risk before making investment or credit decisions.

REFERENCES

- Aisyah, S. (2022). Analisis Peranan Auditor Internal Terhadap Fungsi Pemasaran(Promosi) Pada Hotel Transit Syariah Medan. *Accumulated Journal (Accounting And Management Research Edition)*, 3(2), 198. <https://doi.org/10.22303/Accumulated.3.2.2021.198-206>
- Anggia, R. D., Tristan, J., Nurkharisa, N., & Yanathan, A. (2025). *Analisis Prediksi Kebangkrutan Menggunakan Altman Z-Score Pada Pt Sri Rejeki Isman Tbk Tahun 2013-2024*. 02(01).
- Arfah, D. M. S., & Patimbangi, A. (2024). Analisis Pengendalian Persediaan Bahan Baku Dalam Perencanaan Produksi Dengan Menggunakan Metode Mrp (Material Requirement Planning). *Jurnal Akuntansi Dan Keuangan Syariah (Jurnal Akunsyah)*, 3(2), 12–24. <https://doi.org/10.30863/Akunsyah.V3i2.5486>
- Br Sitepu, P. A., & Maulana, R. Y. (2021). Tata Kelola Program Corporate Social Responsibility (Csr) Melalui Konsep Collaborative Governance Dalam Menunjang Program Pembangunan Daerah. *Jurnal Ilmu Pemerintahan Widya Praja*, 47(1), 80–90. <https://doi.org/10.33701/jipwp.V47i1.1438>

- Ermawati, E., Rudelvo, A., & Purwanto, K. (2025). Analisis Altman Z Score Untuk Memprediksi Financial Distress Pada Perusahaan Industri Pulp And Paper Yang Terdaftar Di Bursa Efek Indonesia Tahun 2020-2023. 9(2).
- Febriyandi, A., & Amalia, H. S. (2020). Analisis Financial Distress Menggunakan Model Altman Z-Score Pada Perusahaan Manufaktur Yang Tercatat Di Bursa Efek Indonesia Periode 2018-2020.
- Hasanah, R., & Maqsudi, A. (2023). Analisis Prediksi Kebangkrutan Dengan Menggunakan Metode Altman Z-Score Pada Perusahaan Sub Sektor Otomotif Yang Terdaftar Di Bursa Efek Indonesia Pada Tahun 2019-2021. *Journal Of Creative Student Research*, 1(3), 375-387. <https://doi.org/10.55606/jcsrpolitama.V1i3.1799>
- Ilham, M., Norisanti, N., & Z, F. M. (2022). Altman Z-Score Is A Method Of Analyzing Bankruptcy. *Almana : Jurnal Manajemen Dan Bisnis*, 6(3), 421-432. <https://doi.org/10.36555/Almana.V6i3.1795>
- Izmi, D. E. F., Natsir, U. D., Nurman, Tawe, A., & Anwar. (2023). Analisis Prediksi Kebangkrutan Dengan Metode Altman Z-Score Pada Perusahaan Makanan Dan Minuman Yang Terdaftar Di Bursa Efek Indonesia. *Sibatik Journal: Jurnal Ilmiah Bidang Sosial, Ekonomi, Budaya, Teknologi, Dan Pendidikan*, 2(3), 981-992. <https://doi.org/10.54443/Sibatik.V2i3.699>
- Maddepungeng, A., Abdullah, R., & T.F, M. (2017). Pengaruh Pengalaman Kerja Dan Gaya Kepemimpinan Terhadap Kinerja Sumber Daya Manusia (Sdm) Konstruksi. *Konstruksia*, 8(1), 99. <https://doi.org/10.24853/jk.8.1.99-108>
- Mashudi, I., Wijiyanti, R., & Effendi, B. (2020). Pengaruh Motivasi Kerja Kedisiplinan Kerja Dan Lingkungan Kerja Terhadap Kinerja (Studi Kasus Pada Karyawan Pt. Bank Bri Tbk. Kantor Cabang Kabupaten Wonosobo). *Journal Of Economic, Business And Engineering (Jebe)*, 1(2), 319-325. <https://doi.org/10.32500/Jebe.V1i2.1227>
- Melissa, P., & Banjarnahor, H. (2020). Analisis Prediksi Kebangkrutan Menggunakan Model Altman Z-Score, Springate Dan Zmijewski Yang Terdaftar Di Bursa Efek Indonesia.
- Moeljono, M. (2020). Faktor-Faktor Yang Mempengaruhi Penghindaran Pajak. *Jurnal Penelitian Ekonomi Dan Bisnis*, 5(1), 103-121. <https://doi.org/10.33633/jpeb.V5i1.2645>
- Munandar, A., Rahmatiah, N. N., & Darmawan, I. (2020). Penilaian Kebangkrutan Perusahaan Sub Sektor Konstruksi & Bangunan Periode 2019-2021 Dengan Menggunakan Metode Altman Z-Score.
- Nofitasari, H., & Nurulrahmatia, N. (2021). Analisis Altman Z-Score Untuk Memprediksi Kebangkrutan. *Balance : Jurnal Akuntansi Dan Bisnis*, 6(2), 168. <https://doi.org/10.32502/jab.V6i2.3875>
- Nugroho, T., Murni, S., & Untu, V. N. (2022). Analisis Potensi Kebangkrutan Perusahaan Menggunakan Metode Altman Z-Score Pada Perusahaan Food And Beverage Yang Terdaftar Di Bei Pada Periode 2018-2020. *Jurnal Emba: Jurnal Riset Ekonomi, Manajemen, Bisnis Dan Akuntansi*, 10(1), 1431-1437. <https://doi.org/10.35794/Emba.V10i1.39424>
- Nurjani, M., & Resnawaty, R. (2023). Implementasi Corporate Social Responsibility (Csr) Pt Pertamina Melalui Program Pertamina Cerdas. *Share : Social Work Journal*, 13(1), 74. <https://doi.org/10.24198/Share.V13i1.46499>
- Rizal, R., Ridwan, R. P. A., Lukitawati, L. J., & Nugroho, M. F. (2020). Prediksi Kebangkrutan Perusahaan Berdasarkan Analisis Model Altman Z-Score Studi Kasus Pada Pt. Garuda Indonesia Tahun 2017-2020.
- Rizkiah, E., & Nafisa, A. (2023). Bankruptcy Prediction Using The Altman Z-Score Method For Companies Listed On The Indonesian Stock Exchange. *Journal Islamic Business And Entrepreneurship*, 2(1), 43-56. <https://doi.org/10.33379/jibe.V2i1.1895>
- Rofinus Leki, R. L. (2021). Penerapan Model Altman Z-Score Dalam Mengukur Potensi Kebangkrutan (Studi Kasus Pada Perusahaan Perbankan Bumn Yang Terdaftar Di Bursa Efek Indonesia Tahun 2018 & 2019). *Jurnal Ilmiah Ekonomi Bisnis*, 7(1), 148-158. <https://doi.org/10.35972/jieb.V7i1.448>
- Rohmawati, A. (2020). Analisa Prediksi Kebangkrutan Dengan Model Altman Z-Score Pada Perusahaan Sub-Sektor Makanan Dan Minuman Yang Terdaftar Di Bursa Efek Indonesia Tahun 2019 Sampai Dengan 2021.
- Sunaryo, D., Kurnia, D., Adiyanto, Y., & Quraysin, I. (2021). Pengaruh Risiko Kredit, Risiko Likuiditas Dan Risiko Operasional Terhadap Profitabilitas Perbankan Pada Bank Umum Di Asia Tenggara Periode 2012-2018. *Jurnal Ilmu Keuangan Dan Perbankan (Jika)*, 11(1), 62-79.

<https://doi.org/10.34010/jika.v11i1.3731>

- Suryana, A., & Anggraeny, A. D. (2023). Pengaruh Analisis Kebangkrutan Model Altman Z-Score Terhadap Harga Saham Pada Perusahaan Manufaktur Di Bursa Efek Indonesia Sebelum Dan Saat Pandemi Covid-19. *Jurnal Ekonomi Dan Statistik Indonesia*, 2(3), 327–351. <https://doi.org/10.11594/jesi.02.03.09>
- Wahyuni, S. (2024). Prediksi Kesulitan Keuangan Dengan Menggunakan Model Altman Modifikasi Z-Score. *Jurnal Management Risiko Dan Keuangan*, 3(3), 216–232. <https://doi.org/10.21776/jmrk.2024.03.3.02>
- Wahyuningsih, S., & Ediwijoyo, S. P. (2022). Kajian Prediksi Kebangkrutan Industri Asuransi Di Indonesia Tahun 2019-2021. *Jurnal E-Bis*, 6(2), 555–570. <https://doi.org/10.37339/E-Bis.V6i2.1020>
- Widiarsa. (2019). Kajian Pustaka (Literature Review) Sebagai Layanan Intim Pustakawan Berdasarkan Kepakaran Dan Minat Pemustaka. *Media Informasi*, 28(1), 111–124. <https://doi.org/10.22146/mi.v28i1.3940>