Business failure Prediction Models: A Review and Analysis of Literature of Listed Firms in Ghana

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Abstract
This paper examines the phenomenon of corporate insolvency from a developing economy perspective using data from Ghana to test the applicability of the Altman Z-score model. Drawing sample data from 16 non distress and distressed companies listed on the Ghana Stock Exchange is tested for the Z-score to predict possible failure or insolvency. The study replicates Appiah's (2011) model to investigate different companies' results with datasets within the 2018 and 2019 financial years. The sample data revealed that 18.75% were financially distressed, 37.50% were in the grey zone making their survival uncertain, and 43.75% were safe for investment. This study contributes significantly to the literature on business failure prediction from an increasingly globalized perspective while seeking to assist investors to be cautious in the cause of making investment decisions.

Keywords: Business failure, Corporate Governance, Financial Distress, Z-Score

1. Introduction

According to the definition of Altman (1996), bankruptcy occurs when companies are not capable of paying off their debts and therefore, they cannot keep on with their operational activities. Platt and Platt (2002) and Altman & Narayanan, (1997) define financial distress as several years of negative net operating income, leading to the suspension of dividend payments and significant restructuring that accounts for the layoff of staff and shutdown of operational activities by regulatory bodies due to inability to meet requirements standard as expected and demanded. The primary objective of the regulatory body at this point in the company's life is to protect and save the general public and investors from other financial crises, as observed by Appiah's (2011) research.

Appiah (2011) study admonished how several companies in Ghana have gone into corporate insolvency due to a breach of one or more of the governance principles and procedures. This paper criticized his work because many live companies have breached one or more of these corporate governance guidelines that, resulted in their current financial condition being successful or otherwise. To put it in simplicity, how many of these factors could put a company's going concern into uncertainty or doubt? The study under review has more to say with questions than answers.

Distress starts at the very top because of several mistakes management makes that exist in the company's governance profile. A typical example pointed out is when the chief executive is also the chairman in the company. One of the significant responsibilities of the company's board chair is to dismiss an incompetent chief executive. Pure common sense with reservation commands that someone who is both is unlikely to exhibit that dual behaviour. A third failure observed is a passive board, in other words, a non-contributing board coupled with an autocratic chief executive.

In addition, Appiah (2011) noted that the next failure is unbalanced skill and knowledge on board composition. Thus a lack of all-around skills such as human relations, finances, and legal skill is likely to be absent from the board of an engineering firm. He emphasizes that the fifth failure encountered by business entities is the presence of an ineffective finance director. The finance director is said to be ineffective if he only exercises financial skills today but fails to forecast the company's actual economic and financial situation. Finally, a lack of professional managers with board membership experience could undermine the business's future success. To this end, these imbalances can also trigger failure in business organizations, as observed by (Appiah, 2011; Argenti, 1968; Veganzones & Severin, 2020; Titshabona, 2014; Wang and Campbell, 2010; Dimitras, et al, 1996 Du Jardin, 2017; Tian et al., 2015).

In addition to the above, management failure, which is morally non-financial information, could also cause distress. Argenti also identified the accounting system failures which are common to failed companies. The Accounting system failure is mainly due to poor budgetary control, ineffective cash flow plans, lack of cost accounting systems, and operational inefficiency. Typically, a firm should continue and consistently respond to its products, processes, markets, employment practices, and many other changes to survive in an increasingly competitive environment. This study contributes significantly to the global talks on business distress prediction in an increasingly globalized economy while admonishing investors and the general public to be mindful of their investment portfolios.

Ghana, as a developing country, has had "her share" of corporate failure as evidenced by the collapse of UT bank Ghana, Royal bank, Co-operative bank, Bank of Housing and Constructions, Unibank, Capital bank, GN bank, Biegle bank and many microfinance institutions were collapsed due to inadequate capital requirement and operational inefficiencies among other deficiency. This demonstrates the urgent need for a reliable model that accurately predicts corporate health and success in Ghana (Appiah, 2014; Appiah, 2011).

2. Literature review
This section examines the pertinent literature on the subject. First, we will start with the theoretical aspect underpinning bankruptcy prediction. Then, the empirical literature on the variables influencing the relationship of interest is discussed.

2.1 Theoretical Framework
Startups and small enterprises are particularly vulnerable to the type one form of business failure. Their failure implies that their performance was never better than average before plunging. Many of these companies collapse within five years of their inception. Because there may be only one manager, the organization is identified mainly by its lack of managerial expertise. It may have a restricted financial system that includes a budget, cost, and financial reporting capabilities. This deficiency may lead to the agency problem due to the fact that the owner is overestimating revenue or underestimating expenses, resulting in additional financial mistrust (Naumzik, Feuerriegel and Weinmann, 2022).

The type two corporate failure impacts young organizations that have been in operation for longer than type one businesses. The performance of this type of company rises until it reaches it maximum and fail. These businesses face the same administrative challenges as type one businesses but diversify their operations, increasing revenue. To increase sales provide new capital resources that are easily traded. Here the company adopts the stakeholder theory because it is well-known and in the public eye, it will deploy a range of practical approaches. As a result, their sales are fast increasing, but their earnings are not. This prevents banks from lending to the company for future operations. This will have a negative impact on the firms, prompting them to close down as demonstrated by (Naumzik, Feuerriegel and Weinmann, 2022).

The third type of failure affects mature organizations that have existed for a long time before their insolvency. These companies had a slow start, a fast expansion, and an endless period of "good to great" performance stability. They have a high turnover rate, good profit margins, and low gearing rates. However, these companies have more complicated operational challenges. This failure accounts for 20% to 30% of all business failures as observed by (Arfaoui and Goaied, 2019).

2.2 Empirical Literature
Management of corporate entities has been cautious about the risk, financial sustainability, and liability that may move a company into insolvency. There have been several reviews of literature on envisaging corporate failure prediction in the 21st century but those studies are now irrelevant or out-of-date (Scott, 1981; Zavgren, 1983; Altman, 1984; Jones, 1987). All the above mentioned researchers focused exclusively on statistical models while others like Jones (1987) and Dimitras, Zanakis and Zopounidis (1996) do not give full coverage of theoretical models. Zhang, Hu, Patuwo and Indro (1999) restricted their review to empirical applications of neutral network models while Crouhy, Galai and Mark (2000) cover only the important theoretic current credit risk models. Veganzones and Severin, (2019) and Appiah et al, (2014) all focus on a systematic literature review of methodological issues on corporate failure.

Wang and Campbell (2010) observed data from listed companies in China to test the accuracy of Altman's Z-score model in predicting business failure among Chinese firms. The study was found to have significant positive effect. Their study concluded that the Z-score model is useful in predicting business failure. Unegbu and Onojah (2013) investigated the usefulness of Z-score in corporate indebtedness prediction model among selected firms in Nigeria. The study results show that Z-score is essential for predicting corporate failures in emerging economies.

Gordon (1971) concluded that insolvency comes about due to the company's running losses, where its success is jeopardized in the near future. Appiah et al. (2014) and Lee and Choi (2013), all observed that in a situation where the rate of return of a company is less than the rate of capital is a sign of insolvency. Their studies indicated that in some cases, a fin cycle in a trading unit during a relatively short period would hide bankruptcy from the eyes of the accountant. Adverse conditions of companies can cause losses for different people in society, especially investors. Prior research by Iturriaga and Sanz (2015) and Ciampi (2015) outlined that not only investors who are interested in the financial health of the company but also senior managers and accountants are more concerned in predicting the financial conditions of companies.

There have been significant contributions to the theoretical developments of the topic since Morris (1998). Patrick (1932), Durand (1941), and Beaver (1966) applied accounting ratios, the ca-scoring model and Univariate Analysis to predict a firm's financial health, respectively. The methods above create inconsistent signals since different variables could give conflicting results (Altman, 1968; Zavgren, 1983, Keasey and Watson, 1991, Ani & Ugwunta, 2012; Titshabona, 2014)

The above studies have done their part to provide solutions to the problem of the model choice in empirical applications but did not provide the stage in which a firm can be found and classified in the cause of determining its financial health. This study seeks to fill that literature gap by using the Multiple Discriminate Analysis and Pair Sample approach to provide the stage in classification in which the business life could be identified as successful or otherwise. In response to the above on the use of Altman's model, this study seeks to employ Altman's Z-score model for performing and non-performing firms, specifically publicly listed companies on the Ghana Stock Exchange, to predict failure and non-failure companies using data for the period 2018 and 2019 financial years. This has set the fertile ground for this study to use Multiple Discriminate Analysis and Pair Sample approach, which is the focus of analysis.

3. Research Methodology

This article uses the Altman Z-score model to look at business failure prediction from a developing economy perspective like Ghana. Using empirical data from a sample of 16 companies listed on the Ghana Stock Exchange, the study tests Altman's (1968) model via a cross-section of firms with the dataset from 2018 to 2019. Distress and non-distress companies were matched by nature, size and industry and selected on a stratified random approach. According to Appiah (2011) Altman's Z-score is applicable for predicting business failures in Ghana depending on the nature and size of the company. The study examines the usefulness of Altman's Z-score using an investigational case study setting. The author initially computed and tailed out the Z-score for two listed companies in Ghana for the fiscal years ending December 31, 2018, and 2019 based on their annual financial statement reports presented at the Ghana Stock exchange. The Paired Sample approach and Multiple Discriminate Analyses (MDA) was adopted for the study due to the accessibility of data from the listed firms and the researcher's familiarity with previous empirical works and arguments (Altman, 196; Taffler, 1995, Appiah, 2011).

3.1 Multiple Discriminate Analyses
Altman's Z-score
Following Beaver, Altman (1968) proposed 'multiple discriminant analysis' (MDA).This methodological approach dominated the literature on corporate failure prediction models until the 1980s and is commonly used as the reference point for comparative studies (Altman, 1986). The model takes the following form.

$$Z = 0.012 X_1 + 0.014 X_2 + 0.033 X_3 + 0.006 X_4 + 0.999 X_5$$

Where:
X_1= Working capital / total assets;	(%)
X_2=Retained earnings/ total assets;	(%)
X_3=Earnings before interest and taxes/total assets;	(%)
X_4=Market value of equity/book value of total liabilities;	(%)
X_5=Sales/total assets.	(%)

Table 1   Multiple Discriminate Analysis Zone

No.	Position	Range	Company's Grouping	Percentage
1	Safe Zone	Z > 2.99	7	43.78
2	Grey Zone	1.8 < Z < 2.99	6	37.50
3	Distress Zone	< 1.80	3	18.75
Total			16	100

The above is the zones of discrimination for the Z-Score model as presented by Altman (1968).

The above table classification is based the Z scores recorded by each company from table 2 and 3 below. By standard, the model reiterates that, companies with Z-score less than 1.81 were likely to become distress from the table above 3 companies were in this zone representing 18.75%. The results from table further indicate that 7 out of 16 companies had a Z-scored greater than 2.99 were unlikely to become distress or safe representing 43.75%. He identified the range between 1.8 and 2.99 as "middle ground "or grey zone in which the company's failure was uncertain and from the results, 6 companies had 37.50% demonstrated by their middle ground of performance. Altman's style was related to that of Beaver (1968), but for the concurrent use of multiple financial ratios in a given year, to predict an imminent collapse of companies. The pictorial diagram below depicts distress and non-distress financial institutions in Ghana.
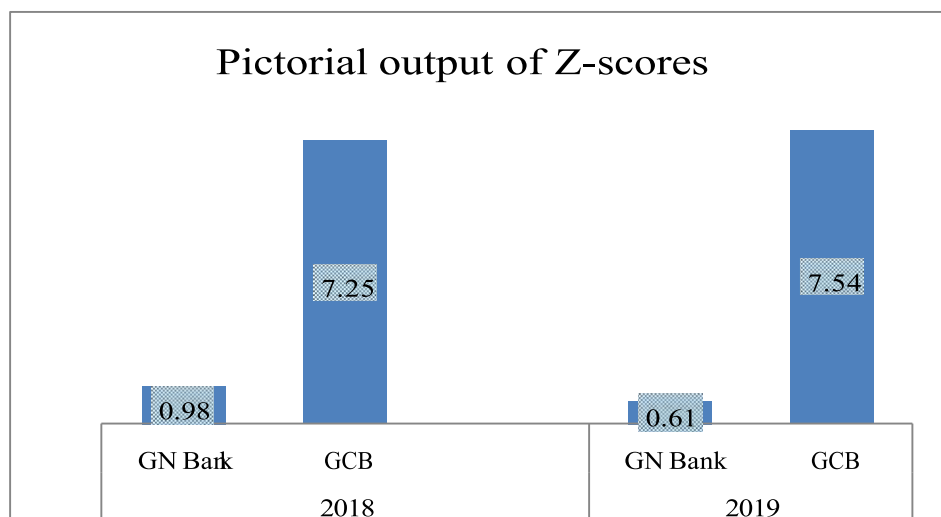

Figure 1 Pictorial output of Z-score

4. **Analysis**

The researcher randomly selected 16 firms from the Ghana Stock Exchange Fact Book 2018 and 2019. The relevant accounting data for 2018 and 2019 was extracted and exported to Microsoft excels for computation of Z-score as shown in Figure 1 below. This resulted in Altman's Z-score crucially misclassifying 7 out of the 12 companies as failed as evidenced by a Z-score's ranging from 0.41 to 0.82, 1.60, 1.38 and many more up to 2.7 as depicted on Figure 1 below. This empirical finding supports Moyer's (1977) view that distress prediction models are fundamentally unstable in that, the coefficients of a model will vary according to the underlying health of the economy. Interestingly, only 5 companies representing 41% were correctly classified, resulting in a type II error of 58.33%.
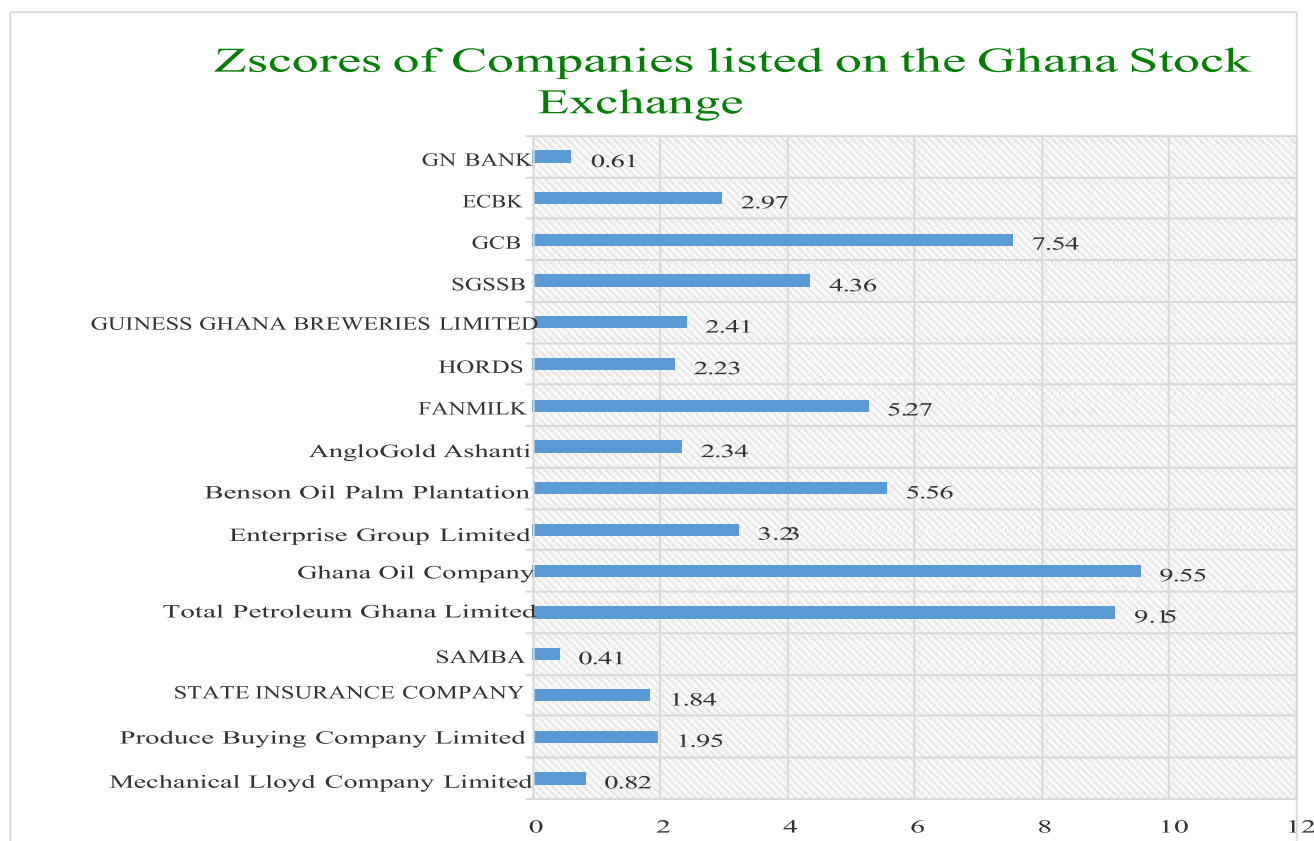
Figure 2

Z-score of firms listed in Ghana. Source: Excel pictorial output from Z-scores computation

The figure above shows the distribution of Z-scores for companies listed on Ghana Stock Exchange. From figure 2 and by all standard it quite clear that 5 companies are insolvent taking the Z scores to be 0.42 for Samba Ltd, 0.82 for Mechanical Lioyed ltd, 1.38 for state insurance 1.84, produce buying company 1.95,Hords 2.23, AngloGold Ashanti 2.34 and many more to 2.7 . The rest of the companies are depicting variability for the fact that their z- scores are more than 2.7 score as indicated by Altman, (1968) research model.

Table 2 Companies Correctly Classified (Non-Distress firm Classified as Non-Distress)

NO.	Company	Z-scores	Turnover (GH¢)	Total Assets (GH¢)	Nature of Company
1	Total Petroleum Ghana Limited	9.15	1,793,752,000.00	500,704,000.00	DISTRIBUTION
2	Ghana Oil Company	9.55	3,630,998,000.00	585,372,000.00	DISTRIBUTION
3	Enterprise Group Limited	3.23	58,077,000.00	65,389,000.00	INSURANCE
4	Benso Oil Palm Plantation	5.56	58,077,000.00	65,389,000.00	AGRICULTURE
5	Anglogold Ashanti	2.34	4,174,000.00	7,284,000.00	MINING & PETROLEUM
6	FANMILK	5.27	315,409.00	214,214.00	FOOD & BEVERAGE
7	HORDS	2.23	2,569,789.00	4,450,707.00	FOOD & BEVERAGE
8	GUINNESS GHANA LIMITED	2.41	437,348.00	480,654.00	FOOD & BEVERAGE
9	SGSSB	4.36	1,216,553,205	131,936,515	FINANCE
10	GCB	7.54	4,259,102,000	690,708,000	FINANCE
11	ECBK	2.97	4,694,261,000	473,557,000	FINANCE
	MEAN SCORE		15,718,316,751.00	2,525,485,090.00	

From Table 2 above it is obvious that the average turnover and total assets for the type II error group of companies and the correctly classified companies were GH¢15,718,316,751.00 and GH¢2,525,485,090.00 respectively. This results in terms of total assets and turnover is in contrast with (Altman et al. 1977; Hill and Perry, (2011),) argument that the size of a firm has some influence on probability of bankruptcy. By their findings larger companies stand tall to be successful as compare to smaller companies. Smaller companies lack the ability to mobilized sufficient resources in terms of financial and human capital to boost-up production to meet customers' demands of the firm product. It must be appreciated that the sustainability of companies largely depends on its turnover or profitability which guarantee success.

Table 3 Assessment of Type II Error Companies (Non-Distress firm Classified as Distress)

NO.	Company	Zscores	Turnover (GH¢)	Total Assets (GH¢)	Nature of Company
1	Mechanical lloyd company limited	0.82	46,838,893.00	70,300,839.00	DISTRIBUTION
2	Produce buying company limited	1.95	993,095,216.00	1,208,263,130.00	DISTRIBUTION
3	State insurance company	1.84	154,725,323.00	213,384,119.00	INSURANCE
4	SAMBA	0.41	124,417.00	4,802,987.00	FOOD & BEVERAGE
5	GN Bank	0.61	1,336,336,000	226,346,000	FINANCE
	MEAN SCORE		2,531,119,849.00	1,723,097,075.00	

From Table 2 above it is obvious that the average turnover and total assets for the type I error group of companies and the correctly classified as failed companies were GH¢2,531,119,849.00and GH¢1,723,097,075.00 respectively. . This finding in terms of total assets and turnover is in contrast with Altman et al. (1977) argument that the size of a firm has some influence on probability of bankruptcy.

5. **Discussions**

From the analysis above, the present author believes that business failure cannot be predicted in Ghana using Altman's model due to the high percentage of type II error documented. However, failed companies can be distinguished from non-failed companies depending on the nature and size of the business. Specifically, the model distinctively predicted all companies in the distribution sector correctly, whilst that of large-sized firms based on turnover in the trading sector was also rightly classified.

Though professor Altman's model used dataset from publicly quoted manufacturing companies, all the four manufacturing non-failed companies were wrongly classified. Given the inconsistent results using the financial data, which is subject to creative accounting, future researchers must consider external and internal non-financial data such as over-trading, inappropriate financial policies, lack of marketing efforts, acquisition, poor management, organization inertia and confusion, operational inefficient and strong competition leading to changes in market demand among others forces.

The 9 companies listed on Ghana Stock Exchange been observed with Z-score less than 2.7 as indicated in the above table were classified as failure companies taking into account company like Guinness Ghana Breweries Limited and AngloGold Ashanti classified as failure. This in consistence with Appiah, (2011) which clearly stated that Altman, (1996) model cannot be used to predict the success and failure of companies in Ghana because of type one (I) and two (II) errors. However, failed companies can be distinguished from non-failed companies depending on the nature and size of the business. Specifically, the model distinctively predicted Guinness Ghana Breweries Limited and AngloGold Ashanti as failure companies, whilst that of large-sized firms based on turnover in the trading sector was also rightly classified. From the analysis it stands to reason that business failure in Ghana could be emanated from number of factors as indicated below.

(i) Financial crises which the company management may not be aware of: This sub-stage is mostly in the short run and/or typical of public sector organization in Ghana where decisions are politically motivated. As case in point, GN bank liquidated with an accumulated load of hundred and sixty million Ghana cedi's in debt.

(ii) Company management lost control of the business: Companies finally moved to liquidation and considered the company as a failed company. Unibank bank liquidation was attributed to government regulatory institutions, like the Central Bank of Ghana requirements for universal banking institutions to meet the minimum capital requirement of 400 million Ghana cedis and rural and community banks 300 thousand Ghana cedis.

(iii) Technological Advancement leading to innovation where existing companies are not able to produce new products to meet the current demand of society. This situation could lead companies recording low sales resulting to concurrent losses.

6. **Conclusion and Recommendation**

This study replicate Appiah, (2011) research and adopted the style of Moyer (1977) and Argenti (1983) in testing Altman's (1968) Z-score using dataset from the Ghana Stock Exchange Market between the periods 2018 and 2019. The findings showed that few companies were in severe distress i.e. 18.75%, whilst only 37.50% of the listed companies are in the grey zone. 7 out of 16 companies are in the safe zone of 43.75% representing their attractiveness to investment. The study further observed that, Altman's Z-score was wrongly classified as it is depicted in the outcome of the findings. Though, it correctly classified some of companies as they were so to be for the few years. This study has enough grounds to advance the argument that, the nature of business to some extent influences the applicability of Altman's model in Ghana. I am tempted to believe that, the larger the size of the companies, the higher the probability of the company's Z-score under scrutiny.

This current study contributes to the field of accounting and finance, specifically on bankruptcy prediction literature from the perspective of developing countries, while seeking to assist the general public and investors on the financial health of listed companies in Ghana. The study is, however, limited to the extent that it relies on data from only sixteen (16) quoted firms in Ghana. In addition, Altman's model was based on US GAAP whilst the data for this study were based on Ghana Stock Exchange report of listed firms. Furthermore, given the relatively high type II error using Altman's model in Ghana and no type I error recorded, critics of this paper may argue that the research was biased taking into account the sample for 5 failed companies as against 11 non-failed companies and many other limitation of Altman's model. The study also concentrated on only quantitative method of predicting business failure, leaving out the other qualitative methods that could assist in business failure prediction. One, therefore, needs to be cautious in generalizing the findings.

From the above criticisms, it would be useful to consider the following questions for future research: To what extent can we predict business failure in Ghana using new set of variables and/or different statistical tools to predict business failure? This would further improve our understanding on predicting business failure in Ghana. In short, we argue that these approaches could further answer the grey question of when and why business entities fail particularly in Ghana and other parts of world. The study recommends to investors and the general public to investigate the financial wellbeing of a companies and not necessarily considering the size, nature and human resources component to judge the success and future prosperous of it.

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