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Behavior and predictive Power of the Different Financial Ratios in case of MSME Failure

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ABSTRACT

The backbone of national economies is made up of Micro, Small, and Medium Enterprises (MSMEs). MSMEs provide income, create jobs, ignite innovations and make crucial contributions to the Gross Domestic Product (GDP). However, MSMEs also face significant challenges. Such challenges include issues with financing, functioning efficiently, also with management. Financial ratio analysis is one of the most famous methods of assessing the viability of a business. Financial ratio analysis summarizes data from accounts, providing necessary information about liquidity, profitability, leverage, effectiveness, and solvency of an enterprise. Consequently, this analysis can send signals to people that something might be wrong with their businesses. This paper presents how different financial ratios function and how successful they are in forecasting the failure of MSMEs. The research is based on traditional bankruptcy predictive theories and contemporary research and studies the functioning of financial ratios several years before failure.. The study examines various types of ratios, such as liquidity, profitability, leverage, activity, cash flow, and financial distress models including Beaver's Univariate, Ohlson's O-Score, Zmijewski's model, and Altman's Z-Score. According to the study, profitability reduces first and is followed by liquidity problems; on the other hand, leverage raises the distress costs. It has also been found out that cash flow ratios and measures of interest coverage perform really well in the later stages of the crisis. Finally, research gaps have been identified as well in the context of MSMEs in developing countries, including India, where characteristics specific to financing of businesses necessitate customized prediction models.

KEYWORDS: MSMEs, Financial Ratios, Business Failure, Bankruptcy Prediction, Financial Distress, Liquidity, Profitability, Leverage, Early Warning Systems.

Introduction

Micro, small, and medium enterprises (MSMEs) are known as the backbone of economic development since they significantly contribute to job creation, technological innovation, industrial output, trade promotion, and regional development. MSMEs comprise such a large percentage of businesses that they contribute significantly to both skilled and inclusive economic growth in developed and developing economies (OECD, 2023). However, despite their serious contribution to the economy, MSMEs are more prone to financial collapses and failures compared to large businesses due to limited resources, lack of access to financial aid, poor management systems, and vulnerability to economic crises (Altman, 1968; Balcaen & Ooghe, 2006). Usually, before a business failure occurs, the financial condition of a company worsens gradually. In the financial statements of a company, it can be shown by declining profitability, reduced liquidity, increased borrowing, inefficient use of assets, and decreased cash flow (Beaver, 1966). Therefore, financial ratios have become one of the most used techniques for assessing a company's financial health and predicting its collapse.

The concept of financial ratios implies that the performance metrics are calculated based on accounting data, enabling managers, shareholders, creditors, auditors, and policymakers to

gauge operational efficiency, solvency, liquidity, profitability, and to recognize signs indicating financial troubles (Altman, 1968).

The ability of financial ratios to predict companies' failures has been studied widely, starting with Beaver's pioneering research (1966), whereby he proved that some selection of ratios can tell failed companies from non-failed ones even before their bankruptcy takes place. This idea was further developed by Altman (1968) with the introduction of the Z-Score model, which incorporates several ratios into one composite measure that can foresee bankruptcies accurately. Ohlson (1980) and Zmijewski (1984) made further progress in predicting bankruptcies based on the use of probabilistic and econometric methods.

Financial ratio analysis has particular importance for MSMEs considering they usually operate under huge financial constraints, low access to the capital market, and unstable conditions for their business. The deterioration of the financial situation usually becomes noticeable years prior to the closure of the company, which creates room for timely measures to eliminate the problems, for instance, due to debt restructuring, working capital management, bettering the efficiency of operations, and improving financial planning. Nevertheless, the characteristics of MSMEs' finance are very different from those of large companies, thus requiring the adaptation of bankruptcy prediction models. With this situation in mind, this research aims to investigate the behavior and predictive power of various financial ratios with respect to MSME failure. In particular, it analyzes the data related to the behavior of liquidity, profitability, leverage, activity, and cash flow ratios before the failure of a business and determines their efficiency as early warning signals.

MSMEs: Definition, Importance and Failure

Micro, Small, and Medium Enterprises are often regarded as the backbone of economic development as they play an important role in generating employment, industrial output, innovation, and inclusive growth. Although, the definition of Micro, Small, and Medium

Enterprises varies across nations because of different socio-economic statuses, the classification of these enterprises is based on certain criteria, such as investment in plant and machinery, annual turnover, or the number of employees (OECD, 2023). In India, the Ministry of Micro, Small, and Medium Enterprises revised the classification under the Micro, Small and Medium Enterprises Development (MSMED) Act, 2006 through a notification on 1 July 2020 according to which enterprises are classified based on a composite criteria of investment and turnover. According to the new classification micro enterprise means an investment of maximum of ₹1 crore and turnover of maximum of ₹5 crore, small enterprise means an investment of maximum of ₹10 crore and turnover of maximum of ₹50 crores and medium enterprise means an investment of maximum of ₹50 crore and turnover of maximum of ₹250 crore (Government of India, 2020).

MSMEs are vital in ensuring regional balance and development, reducing poverty, and stabilizing the economy. It is estimated that over 90% of all firms in the world are MSMEs, which play an important part in creating jobs and ensuring economic benefits for various nations, especially emerging markets (OECD, 2023). MSMEs are known for their flexibility and ability to innovate fast and thus take advantage of changing demands, promoting economic development in industry and achieving diversification (Ayyagari, Beck, & Demirgüç-Kunt, 2007). Moreover, MSMEs strengthen the supply chain as they provide services or goods to the big companies.

MSMEs are economically important, however, they suffer a higher risk of business failure than big companies because of their financial and structural limitations. Business failure can be defined as a situation where a business is unable to generate enough revenue to fulfill its financial obligations and operations, which leads to its bankruptcy, liquidation, or eventual closure (Beaver, 1966). Financial distress may develop as a gradual process through decreasing profitability, reduced liquidity, increased leverage, and the declining efficiency of the company's operations before it finally results in business failure (Altman, 1968). The reasoning for the failure of MSMEs can be limited access to institutional finance, insufficient working capital, inefficient financial management, technological obsolescence, instability of the market, and a lack of managerial experience (Balcaen & Ooghe, 2006). Given that financial weaknesses are manifested through accounting data, the analysis of financial ratios becomes a good way of revealing the signs of upcoming business failure. Therefore, it is necessary to understand the reasons and factors of MSME failure in order to estimate how the financial ratios can help foresee the situation for sustainability of a given enterprise.

Financial Ratio Analysis: Concept and Classification

Financial ratio analysis is a widely accepted method for assessing a company's financial health and forecasting financial difficulties. It involves an in-depth analysis of all financial statements to assess the company's liquidity, profitability, and solvency. Financial ratios play a key role by converting the absolute numbers in financial statements into standardized figures and making comparisons possible across different industries, companies and time periods, regardless of the size of a company. Since an enterprise's financial troubles almost always show up in its financial reports prior to its actual failure, financial ratios have become an invaluable tool for managers, investors, creditors, auditors, and others.

The significance of financial ratio analysis in bankruptcy prediction was first established by Beaver (1966), whose groundbreaking study indicated that particular accounting ratios may be

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used to distinguish between bankrupt and non-bankrupt companies up to many years before bankruptcy. Beaver demonstrated that decreasing cash flow, falling profitability, and increasing levels of debt are consistent precursors of business failure. Building upon Beaver's findings, Altman (1968) developed the Z-score method, which employs the method of Multiple Discriminant Analysis (MDA) and incorporates various financial ratios into a single statistic making it a potent mean of bankruptcy prediction. Subsequent works of Ohlson (1980), Zmijewski (1984), and Balcaen and Ooghe (2006) confirmed the reliability of financial ratios in recognizing bankruptcy.

The importance of financial ratios in studies of Micro, Small, and Medium Enterprises (MSMEs) is primarily related to the circumstances facing these enterprises, which have limited financial resources, access to traditional bank credit, and unstable cash flows. Unlike big corporations, MSMEs can't assume great risks, and thus are more sensitive to possible financial stresses. As a result, even a slight deterioration in liquidity, profitability, or leverage levels can dramatically increase the chance of business failure. Thus, financial ratios serve as efficient and cheap tools of warning signal, allowing to act before the issuance abuses become fatal (Balcaen & Ooghe, 2006).

Liquidity Ratios: Liquidity ratios are a measure of the ability of an organization to fulfill its short-term financial commitments using current assets. Sufficient liquidity is necessary for the uninterrupted functioning of companies, as they need enough money or near-cash resources to pay suppliers, employees, creditors, and cover statutory obligations. Lack of liquidity is one of the first signs of financial problems, particularly in a situation of MSMEs having restricted access to external financing (Brigham & Ehrhardt, 2022).

The most widely used liquidity ratios are Current Ratio, Quick Ratio (Acid-Test Ratio), and Cash Ratio. Current Ratio shows the relationship between current assets and current liabilities demonstrating whether current assets can meet current liabilities. Quick Ratio provides a more cautious assessment as it excludes inventories. Cash Ratio checks organization's readiness to make immediate payments based on cash and cash equivalents. According to Beaver (1966), companies that approached bankruptcy showed lower liquidity years before going bankrupt. Ohlson (1980) stated that reduced working capital compared to total assets had increased bankruptcy likelihood. MSMEs with low liquidity cannot pay suppliers on time, which results in even more need of short-term finance and the increasing lack of flexibility in operations. Hence, liquidity ratios are viewed as significant indicators that can act as an early warning signal of the financial health of the company. Nevertheless, if these ratios are too high, it can indicate that current assets are not used efficiently. Hence, liquidity ratios should be analyzed together with profitability and efficiency ratios.

Profitability Ratios: Profitability ratios determine how well a company can make profits based on its resources, assets, sales, and investors' money. A firm with the ability to earn profits will operate profitably even in situations where it needs internal financing, invest in new opportunities, pay its debts, or survive unfavorable economic situations. Hence, lack of profitability is usually one of the first signs of possible business failure (Altman, 1968). Some of the most widely used profitability ratios include Gross Profit Margin, Operating Profit Margin, Net Profit Margin, Return on Assets (ROA) and Return on Equity (ROE). While gross and

operating margins help measure the efficiency of operations, ROA indicates how well a company is managed in terms of its ability to use total assets to achieve profits.

Leverage Ratios: Leverage ratios evaluate the degree of financing applied by an enterprise through borrowings when compared to funds contributed by owners or total assets i.e. equity. Although debt financing promotes growth by injecting more funds, too much debt puts the business at a greater risk of financial distress due to the requirement of fixed payments regardless of how well the business performs. Industry specific leverage ratios are Debt to equity ratio, Debt ratio, Equity ratio, and Interest coverage ratio. Debt to equity ratio defines how much financing has been provided by creditors and how much by shareholders. Interest coverage ratio explains the ability of the firm to meet interest costs using operating income.

Activity or Efficiency Ratios: Activity ratios, or efficiency ratios, assess how well a company makes use of its resources to profit from its sales revenue streams. Good utilization of resources contributes positively to the company's profitability and generation of cash flows, thus improving its financial performance. The most common activity ratios are Inventory Turnover Ratio, Receivables Turnover Ratio, Total Asset Turnover Ratio, Working Capital Turnover Ratio, and Fixed Asset Turnover Ratio. They show how well the company manages its inventory, its speed of collecting debtors, how effectively it uses all of its resources, and whether it is efficient in its operations.

Cash Flow Ratios: Cash flow ratios assess the capacity of a company to generate necessary cash from its operations to run day-to-day business, repay debts, and fund growth. Cash flow ratios measure actual liquidity generation unlike accrual accounting measures. Key cash flow ratios are Operating Cash Flow Ratio, Cash Flow to Total Debt Ratio, Cash Interest Coverage Ratio, and Operating Cash Flow to Sales Ratio. According to Beaver (1966), the cash flow to total debt ratio was one of the strongest predictors of business failure. This idea has been confirmed by numerous studies indicating that negative cash flow raises bankruptcy probability as businesses need cash rather than profits to meet their financial obligations. Cash flow analysis is especially important for MSMEs as their income may be variable and their access to loans is limited. Even when firms are profitable they may fail due to inability to generate sufficient cash funds to pay suppliers, employees, and creditors.

Market Ratios: Market ratios are important measures of how the market perceives a company's financial situation and future potential in terms of growth. Except for rare instances, market ratios are only used for public organizations as they require data based on market information. The most common types of market ratios include the Price-to-Earnings ratio (P/E ratio), Market-to-Book ratio, earnings per share (EPS), dividend yield, and Price-to-Book ratio. Strong economies have higher market ratios since investors expect higher returns. On the other hand, falling market ratios indicate lack of investor confidence in the organization's ability to generate future profits. Market ratios are helpful in predicting the likelihood of the failure of publicly held companies but do not work so well in case of MSMEs as most of them are privately owned companies and there are no publicly available stocks.

Nonetheless, for quoted SMEs and medium-sized companies that operate on financial markets, decreasing market valuation often occurs before accounting-related financial decline, thus giving additional information for early warning in case of financial troubles. As a whole, every type of financial ratio gives different information about the performance of the company. Liquidity ratios indicate short-term financial solvency, profitability ratios show the level of earning generation, leverage ratios show the degree of financial risk, activity ratios give information about the efficiency of operations, cash flows ratios demonstrate the effectiveness of cash liquidity generation, and market ratios reflect expectations of investors. The combination of these complementary indicators offers an effective basis for the prediction of micro and small businesses' failures and is the basis for modern financial failure prediction models.

Theoretical Foundations

The prediction of business failure has become one of the most extensively researched areas in accounting, finance, and corporate management. Theoretical and empirical studies consistently demonstrate that financial deterioration occurs gradually and is reflected in accounting information well before legal bankruptcy or business closure. Consequently, financial ratio analysis has emerged as a fundamental approach for identifying financially distressed firms and developing early warning systems. The theoretical foundations underlying financial distress prediction integrate accounting-based models with economic theories that explain how financial information reflects organizational performance and influences stakeholder decision-making. Among the most influential frameworks are Beaver's Failure Prediction Theory, Altman's Z-Score Model, Ohlson's O-Score Model, Agency Theory, and Signalling Theory. Collectively, these theories provide the conceptual basis for understanding the behavior and predictive power of financial ratios in the context of MSME failure.

Beaver's Failure Prediction Theory

The modern studies concerning bankruptcy prediction began with Beaver's (1966) innovative work where he pioneered the first systematic research which focused on the prediction of the bankruptcies due to the accounting ratios. Prior to Beaver's research, scientists only used descriptive analysis of the bankrupt entities. Beaver's work revolutionized the process of bankruptcy prediction by demonstrating that financial ratios were able to differentiate the bankrupt companies from those which avoided bankruptcy long before the bankruptcy takes place.

Using matched samples of firms (bankrupts and those who were avoided bankruptcy), Beaver (1966) applied a univariate analytical method in order to investigate the effectiveness of each financial ratio. The obtained results demonstrated some specific patterns of the financial ratios' decline before the business failure which proved that the financial distress is a process which takes some time to occur.

Among all the variables which Beaver used, the cash flow to total debt ratio turned out to be the most significant predictor of bankruptcy. The firms which are near bankruptcy have lower index of the operating cash flow in comparison to their debt obligations indicating lower capacity of generating the funds for debt servicing on their behalf.

According to Beaver, financial failure occurs due to gradual deterioration of the financial and

operational performance of firms. In the beginning, profitability of the company decreases due to decline in revenues or growing operating costs, and as a consequence, liquidity is affected, which leads to greater reliance on borrowed funds. With increased debts, financial obligations are creating pressure on cash flows causing the company to become bankrupt over time.

Beaver's theory is of utmost importance for MSMEs, as small firms do not have enough finances and limited opportunities to access finance. Even minor downturns of cash flows can have negative effects on the ability to pay debts and hence monitoring liquidity, profitability, and cash flow ratios can be very useful in detecting financial problems in MSMEs. Beaver used univariate approach, studying ratios separately and not looking for relationships between financial factors in that way which did lay the basis for later multivariate bankruptcy prediction techniques. What is more important is that he also showed that financial ratios include meaningful prediction information long before the actual bankruptcy happens.

Altman's Z-Score Model

Capitalizing on Beaver's ground-breaking research, Altman (1968) brought forth the Z-Score Model, which has emerged as one of the most notable advancements in bankruptcy forecasting literature. Unlike Beaver's single variable approach, Altman applies the Multiple Discriminant Analysis (MDA), which integrates several financial ratios into a collective measure being able to categorize firms in terms of their bankruptcy likelihood.

Altman's original model incorporated five financial ratios representing different dimensions of corporate financial performance:

- Working Capital to Total Assets
- Retained Earnings to Total Assets
- Earnings Before Interest and Taxes (EBIT) to Total Assets
- Market Value of Equity to Total Liabilities
- Sales to Total Assets

The combination of these variables enables the measurement of liquidity, profitability, operational performance, leverage, and efficiency.

The most significant contribution of the Z-Score formula is the assertion that no single financial ratio can account for the business's bankruptcy. In fact, bankruptcy is caused by the simultaneous decline in many aspects of financial performance. Consequently, by combining liquidity, profitability, leverage, and efficiency into a single discriminant, Altman made it possible for the model to have higher predictive accuracy than earlier univariate models.

Multiple studies have shown that the original Z-Score has approximately the 95% level of accuracy when it comes to classification of bankrupt companies one year before the bankruptcy occurrence, maintaining accuracy even the second year before bankruptcy (Altman, 1968). The subsequent modifications, such as Z'-Score for private manufacturing companies and Z''-Score for non-manufacturing companies allowed for an expansion of the scope of practical usability of the model to privately held companies and market transitions (Altman, 1983; Altman, Iwanicz-Drozowska, Laitinen, & Suvas, 2017).

The Z-Score model demonstrates the interrelatedness of financial decline with MSMEs. Lowering of the profitability leads to a drop in retained earnings thus weakening the firm's internal financing capability. Decrease in the working capital reduces liquidity whereas increase

in debt heightens financial risk. At the same time, lack of efficiency in the asset utilization reduces revenue generation per every invested dollar thus causing financial trouble before any other factor. Even though the first Z-Score was created for a sample of publicly traded manufacturing corporations in the USA, the similarity of results obtained by numerous research studies conducted in other countries proves the utility of the Z-Score for small and medium-sized enterprises.

Behaviour of Financial Ratios Prior to MSME Failure

The financial decline of Micro, Small, and Medium Enterprises (MSMEs) happens over time instead of suddenly, which makes financial ratio analysis an effective tool for the early identification of business failure. Since Beaver's (1966) first experiments, researchers have shown that accounting-based financial ratios identify symptoms of financial distress even before the occurrence of bankruptcy. Thus, financial ratios have turned into an inexorable part of bankruptcy forecasting and the analysis of credit risks.

Liquidity ratios, among other categories, give the earliest warning. Decreasing current ratio, quick ratio, and working capital indicate that an enterprise is facing problems with short-term liabilities (Ohlson, 1980; Tinoco & Wilson, 2013). Profitability ratios, that is, Return on Assets (ROA), Return on Equity (ROE), and profit margins also decrease along with sales and returns. Altman (1968) pointed out that profitability was the strongest indicator of business failure. With the decline in profitability levels, MSMEs become more dependent on borrowing, which leads to higher leverage ratios. A high level of debt can significantly increase bankruptcy risk (Zmijewski, 1984; Balcaen & Ooghe, 2006). In addition to this, activity or efficiency ratios such as inventory turnover and receivables turnover are becoming worse, indicating ineffective use of resources and low operating efficiency.

In the sense of the cash flow ratios, they are among the most reliable indicators of financial distress, as they provide information about the ability of the company to generate cash and fulfill financial obligations. According to Beaver (1966), the Cash Flow/Total Debt ratio is one of the best predictors of bankruptcy. For the publicly traded companies, decreasing figures of the market indicators such as EPS and Market-to-Book Ratio represent a sign of bad financial health (Tinoco & Wilson, 2013). Financial distress exhibits a sequential process whereby adverse conditions impact one another. For instance, research conducted by Altman et al. (2017) has indicated that the prediction of bankruptcy would be more precise if various financial ratios are employed instead of evaluating just one indicator. As a result, periodic monitoring of financial ratios helps managers, lenders, investors, and state administrators detect potential troubles beforehand and take preventive actions in time.

Table 1. Behaviour of Financial Ratios Prior to MSME Failure

Financial Ratio Category	Typical Behaviour Before Failure	Interpretation	Predictive Power
Liquidity Ratios	Current ratio and quick ratio decline	Inability to meet short-term obligations	High

Profitability Ratios	ROA, ROE, and profit margins continuously decline	Weak earnings and reduced financial sustainability	Very High
Leverage Ratios	Debt-to-equity and debt ratio increase	Greater dependence on borrowed funds	High
Activity/Efficiency Ratios	Inventory turnover and asset turnover decrease	Poor utilization of business resources	Moderate–High
Cash Flow Ratios	Operating cash flow to debt declines sharply	Reduced capacity to service debt	Very High
Market Ratios*	EPS and market value decline	Lower investor confidence	Moderate

*Applicable primarily to publicly listed SMEs.

Predictive Power of Different Financial Ratios

The ability to foresee financial difficulties using financial ratios has been the subject of intense study for over five decades, as financial challenges can be detected through financial data long before bankruptcy occurs. Financial ratios provide a means to convert accounting data into standardized indicators that can be utilized by managers and investors for financial evaluations. The foundation of research in bankruptcy prediction was laid by Beaver (1966) who showed that financial ratios can be utilized to effectively predict bankruptcy years before it happens.

Profitability ratios consistently demonstrate the strongest predicting ability of all financial ratios. Measured such as Return on Assets (ROA), Return on Equity (ROE), Net Income Margin, and EBIT/Total Assets significantly decrease as the business earns less and has less internal finance available. Altman (1968) pointed out that profitability is one of the integral parts of the Z-Score model, while Altman et al. (2017) proved that profitability indicators are reliable forecasting tools in any country and economic situation.

Liquidity ratios serve as an early warning mechanism for potential financial difficulties. Various liquidity ratios, including Current Ratio, Quick Ratio, and Working Capital to Total Assets ratio, help to assess the company's ability to fulfill its immediate obligations. According to Ohlson (1980), the reduction of working capital increases the bankruptcy probability, while various studies after that confirm the increased importance of liquidity problems for MSMEs, owing to their scarce financial resources and limited access to financing. Leverage ratios gain more significance with the drop of profitability and dependence on debt financing. Hence, ratios such as Debt-to-Equity and Total Debt-to-Assets help calculate long-term solvency and financial risk. Zmijewski (1984) has noted that companies, relying heavily on debt finance, encounter significantly higher bankruptcy risk, whereas Balcaen and Ooghe (2006) point out the centrality of leverage ratios in bankruptcy forecast models. Cash flow ratios are among the most reliable means of predicting the capability of a company to generate cash for settling obligations. Beaver (1966) classified Cash Flow to Total Debt as one of the most accurate predictors, while Tinoco

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and Wilson (2013) revealed that the combination of cash flow ratios with accounting and market data improves prediction accuracy considerably.

While efficiency ratios like Inventory Turnover Ratio, Receivables Turnover Ratio, and Total Asset turnover Ratio are not formidable in terms of their predictive ability by themselves, they do contribute to multivariate prediction models based on the identification of prior operational failures (Balcaen & Ooghe, 2006). In brief, empirical studies show that there is no financial ratio which can successfully predict business failure itself. An alternative is a combination of profitability, liquidity, leverage, efficiency, and cash flow indicators, which provides the greatest predictive power. This method is especially important for MSMEs, who can benefit from prompt decision-making and, as a result, better outcomes.

Table 2. Selected Empirical Studies on Financial Ratio-Based Failure Prediction

Year	Country/Sample	Method	Major Finding
1966	USA	Univariate Analysis	Cash flow to debt was the strongest predictor of failure.
1968	USA	Multiple Discriminant Analysis	Developed the Z-Score using five financial ratios.
1972	USA SMEs	MDA	Adapted ratio-based prediction specifically for SMEs.
1980	USA	Logistic Regression	Working capital and leverage significantly predicted bankruptcy.
1984	USA	Probit Model	Profitability, leverage, and liquidity explained distress.
2006	Review	Literature Review	Multivariate ratio models outperform single-ratio approaches.
2013	UK	Logit Model	Accounting, market, and macroeconomic variables improved prediction.
2017	International	Comparative Analysis	Z-Score remains robust but requires country-specific calibration.
2022	SMEs	Bayesian Model	Financial ratios combined prediction.

Empirical Analysis of Financial Ratios

Since the first studies conducted by Beaver (1966) and Altman (1968), empirical research in the field of prediction of corporate failure has taken big strides. Advances in statistical techniques as

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well as machine learning methods have made them more sophisticated, financial ratios remain, nonetheless, the most accurate predictors of business failures. Recent systematic reviews reveal that financial ratios based on accounting information play a key role in MSME bankruptcy prediction models by consistently winning against alternative financial indicators.

Beaver was the first to prove that financial ratios can predict the likelihood of failure, based on the research he conducted among 79 unsuccessful and 79 successful companies. This study revealed the Cash Flow to Total Debt ratio to be the best indicator of failure, followed by such ratios as the Current Ratio and Net Income to Total Assets. Based on his research, Altman developed the Z-Score model that consists of liquidity, profitability, leverage and efficiency ratios used for prediction of the likelihood of bankruptcy. According to Deakin (1972), liquidity and profitability ratios matter most, while Edmister (1972) stated that bankruptcy prediction models should be specially tailored for small businesses.

The O-Score model was introduced by Ohlson (1980) with the help of logistic regression where working capital, leverage, profitability and size of firm were identified as the most important factors influencing bankruptcy risk. In a similar manner Zmijewski (1984) discovered that profitability, liquidity and leverage were the key variables determining financial distress in a company. Balcaen and Ooghe (2006) conducted a review of the existing literature on bankruptcy prediction for more than three decades and managed to conclude that multi-variate models are always better in bankruptcy prediction than single-ratios one.

Having noted that SMEs have their own specific financial characteristics, Altman and Sabato (2007) came up with a unique default prediction model that proved to be helpful in predicting such ratios as EBITDA to Total Assets, Cash to Total Assets and Short-term Debt to Equity.

Tinoco and Wilson (2013) achieved an even better prediction accuracy by joining the use of accounting ratios with models based on market and macroeconomic variables. Recently Altman et al. (2017) confirmed the validity of Z-Score in different countries, whereas the same information is represented by Fuertes-Callén et al. (2022), Cheraghali and Molnár (2024) and Wang and Guedes (2025) who managed to prove that profitability, liquidity, leverage, activity and cash flow ratios are still the lowest significant variables.

In general, research results show that profit ratios demonstrate the highest expository power, whereas cash flow, liquidity, and leverage ratios account for a lower level of predictive power with activity ratios yielding only supplementary information. In this connection, the application of the totality of the financial ratios mentioned above would enable a comprehensive early warning system to be developed to help managers, lenders, and policymakers to detect the signs of financial distress before MSMEs close down.

Table 3. Landmark Peer-Reviewed Studies on Financial Ratio-Based Failure Prediction

Year	Sample	Method	Most Significant Ratios
1966	158 US firms	Univariate Analysis	Cash Flow/Total Debt, Current Ratio
1968	Manufacturing firms	MDA	Working Capital, EBIT/TA, Sales/TA

1972	US firms	Discriminant Analysis	Liquidity and Profitability
1972	Small businesses	MDA	Working Capital, Debt Ratios
1980	2,163 firms	Logistic Regression	Working Capital, Leverage
1984	US firms	Probit Model	ROA, Debt Ratio, Liquidity
2006	Literature Review	Review	Profitability, Liquidity, Leverage
2007	2,000+ SMEs	Logistic Regression	EBITDA/TA, Cash/TA
2013	UK firms	Logit Model	Cash Flow, Profitability
2017	International	Comparative Study	Z-Score Validation
2022	European SMEs	Empirical	Liquidity, Profitability
2024	145 studies	Systematic Review	Financial ratios dominate SME prediction models
2025	Global SME literature	Systematic Review	Profitability, Liquidity, Leverage, Activity

Overall, the empirical studies confirm the theory that integrated financial ratio analysis is the most effective approach to predicting MSME failures. Modern prediction models include multiple ratios, which means that the models use different categories of ratios instead of only a single measure, such as profitability, liquidity, leverage, cash flow, and performance ratios, to enhance the prediction accuracy. The multidimensional approach allows managers, lenders, investors, and policymakers to detect financial distress signs at an early stage and take timely steps before the business fails.

Research Gaps

Even though years of study have been made on predicting financial distress, numerous crucial gaps subsist when it comes to comprehending the financial ratios' predictive power in relation to MSME going out of business. The prototype prediction model developed by Beaver in 1966, Altman in 1968, Ohlson in 1980, and Zmijewski in 1984 was built on data relating to sizeable public companies from mature economies, which makes it impossible to apply it to MSMEs directly, due to major structural differences in ownership, financing, and financial reporting (Altman & Sabato, 2007).

Another obstacle is that prediction models are based on accounting ratios which causes neglecting numerous other factors, for instance, such important factors as managerial skills, corporate governance, digital transformation, innovation, entrepreneurial experience, supply chain resilience (Balcaen & Ooghe, 2006). Additionally, most studies rely on cross-sectional indexes while financial distress must be viewed as a process that needs longitudinal analysis. Evidence from different parts of the world is primarily available in developed countries while MSME research in emerging economies is rather limited. Furthermore, although machine learning methods are helpful in making predictions more precise, the models do not provide explanations which diminishes their usefulness for managers and financial institutions. Finally, the effects of recent global shocks, such as the COVID-19 pandemic, inflation, geopolitical instability, and disruptions in supply chains on the outcome of financial ratios used for prediction

are yet to be studied.

Future Research Directions

In the future, researchers must focus on the formulation of financial distress prediction methods that relate to MSMEs and capture the financial aspects and business characteristics of small businesses. The financial distress forecasting method should be adjusted for the specifics of industries and financial indices dependent on the country. It is vital that the academic community adopts time-series databases with data about financial ratios to analyze the evolution of financial ratios during a period preceding company failure. In particular, studying the dynamics of profitability, liquidity, financial leverage, operational efficiency, and cash flow indicators would enable researchers to create a more efficient mechanism for early warning of default. Researchers should look for ways to combine financial ratios with non-financial indices, such as corporate governance, management competency, innovativeness, digitalization, environmental impact and ESG indexes. Cross-border comparison studies continue to be one of the most important research priorities. Comparative studies of emerging and developed economies will allow experts to acquire knowledge about the impact of different parameters like level of institution quality, type of financial system, accounting practices adopted, and government support approaches. Furthermore, the researchers should explore models for predicting the MSME performance by sectors since financial indicators behave differently within different groups of MSMEs related to agriculture, service, retail, and other sectors. In this regard, unique references for each sector could significantly increase the effectiveness of the forecasting model. Finally, future studies should assess how economic indicators like inflation, interest rates, exchange rates, or level of economic growth affect financial ratios. The combination of firm-level financial information and economic indicators may lead to the development of a more effective model for early detection of companies in financial distress.

Conclusion

The role of Micro, Small, and Medium Enterprises (MSMEs) is crucial to economic development, they are, however, exposed to financial difficulties due to insufficient resources and uncertain environments for their operations. The analysis of financial ratios is a recognized method of predicting MSME bankruptcies. It is confirmed in practice that profitability, liquidity, leverage, cash flows, and efficiency issues are early signals of financial distress. Profitability and cash flow ratios are the most powerful in terms of prediction ability, combining different financial ratios leads to better prediction of failures than using only one indicator. Despite the fact that substantial results have been achieved with the help of Beaver, Altman, Ohlson, and Zmijewski models, further development of MSME-specific models is necessary integrating non-financial factors and more advanced analytical instruments.

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