Financial distress in Industries under Manufacturing and Services: Empirical Analysis

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1.0 Introduction

Since the 1990s, a great deal of study has been conducted on financial distress prediction, which is an important field of accounting and finance. Beaver (1966) established the foundation for bankruptcy prediction, and (E. I. Altman, 1968) expanded on it by using financial measures and multivariate discriminant methods to predict which businesses will experience financial hardship. Since it gives stakeholders and investors insight into how viable the business is as an investment, the ability to predict its financial issues is essential. Determining the likelihood of business bankruptcy has taken on even more importance in the wake of the global financial crisis that led to the recession of 2009. The formal process by which a business meets financial difficulties is captured by a number of definitions of a failing business enterprise. Failure, insolvency, default, and bankruptcy are four general terms commonly used in the literature to characterise economic concerns (Outecheva, 2007; Rajasekar et al., 2014). According to finance regulations, failure happens when the real return on investment which takes risk into account is consistently and noticeably less than the going rates on similar assets (E. I. Altman & Hotchkiss, 2005). The entity's continuance or discontinuation is not indicated by these economic conditions. The organization's ability to recover its variable costs and expected profits serve as the foundation for the normative decision to stop operations. Due to the absence of legally enforceable debt, a company that has been in economic failure for a long time may nevertheless be able to pay its current debts (Abdullah et al., 2023; Giannetti et al., 2014; Wu et al., 2022). A legal failure occurs when a business is unable to satisfy the legally enforceable commitments owed to its creditors. According to Altman and Hotchkiss, (2005), Dun and Bradstreet (D&B) defines company failures as enterprises that shut down because of insolvency or debt assignment, loss to creditors as a result of these actions, foreclosure or attachment, or voluntary departure with outstanding debts. Additionally, companies that voluntarily struck a compromise with creditors and went through legal processes such as receivership, bankruptcy reorganisation, or arrangement were labelled as business failures (E. Altman & Hotchkiss, 2010; E. I. Altman, 1984; Branch, 2002). Insolvency is another, more technical term that refers to subpar business performance. Following to the theory that underpins technical insolvency measurement, the primary criterion for determining technical

bankruptcy should be net cash flows relative to current liabilities. Default is another corporate phrase that is intrinsically tied with hardship. Default always includes a relationship between a creditor class and the debtor firm, which can be legal, technical, or both (Aney & Banerji, 2022; Wanke et al., 2015; Wruck, 1990). Recently, distressed corporations such as Jet Airways, which went bankrupt, reported a net loss of Rs 5539 crore and a negative net worth of Rs 12,695 crore in the fiscal year 2019 (Saxena, 2020). In 2017, Jaypee Infratech Ltd failed to repay a debt of ₹9,800 crore to 13 banks, leading to insolvency (NCLAT, 2019). Another example of a large loan defaulter is Essar Steel Ltd. In 2019, it declared an outstanding debt of Rs 42,000 crore to several Indian banks (The Economics Times, 2019). Reliance Communications owes around Rs 26,000 crore to banks and financial organisations (Business Standard, 2024).

2.0 Literature Review

The term "financial distress" refers to a wide variety of concerns, from a minor liquidity crisis to a grave situation such as bankruptcy, which is likely to grow as financial leverage rises (Brealey et al., 2012). From a capital structure standpoint, this is when the costs associated with financial stress offset the tax benefits of increasing debt. A corporation thus strives to strike a balance between risk and reward while using debt (Brealey et al., 2012). To present a comprehensive picture of financial distress, researchers characterised it from multiple perspectives and classified it into three categories: event, process, and technical. Beaver (1966) was one of the first researchers to look carefully into the many symptoms of financial distress. He proposed that financial crisis, default, bankruptcy, and failure correlate to distinct operational forms. The second component of event-based financial distress is reorganising one's finances to avoid default (Andrade & Kaplan, 1998; Brown et al., 1994). Gordon (1971) was a pioneer in the process-oriented classification of financial crisis. As he emphasized, financial distress is only one component of a larger sequence that encompasses insolvency, default, and performance deterioration; consequently, it is governed by capital structure and security valuation. Similarly, Gilbert et al. (1990) defined financial distress as a situation in which a company must choose between liquidation, merger with another corporation, or debt restructuring in order to achieve a certain degree of solvency. Purnanandam (2008) identified the onset of financial crisis as a transitional phase between solvency and insolvency, depending on relevant studies. He created a company risk management model that takes into account the cost of financial turmoil. Previous research has extensively employed agency theory and stakeholder theory to explore the relationship between CSR, financial distress, and ownership structure (Farooq & Noor, 2021; Khan et al., 2021; Lin & Dong, 2018; Oware & Appiah, 2021;

Zaid et al., 2020). Jensen and Meckling (1976) define agency theory as "a theory of ownership structure of the enterprise" (p. 67) from a theoretical standpoint. However, agency theory states that when ownership and control are separated, there is a potential conflict between managers and shareholders called as 'agency conflict' (Zaid et al., 2020). Stakeholder theory identifies different groups as stockholders, including investors, regulators, environmental activists, creditors, and so on (Freeman, 1994). With the abundance of auditing companies' assurance services, stakeholders and investors have high levels of confidence, which may lower the FD (Ballou et al., 2018). Several high-profile business failures in the United States, Europe, and Asia over the last decade, including Enron, Parmalat, Satyam, and WorldCom, have alarmed investors worldwide and demonstrated that not only small and medium-sized businesses, but also large corporations, are vulnerable to default. The empirical investigation of distress risk features is restricted to risk assessment at the point of financial hardship immediately before default. The risk characteristics of the various stages of value impairment, as well as the makeup of distressed enterprises in each phase, have yet to be empirically investigated. A proactive approach to disaster prevention benefits all parties involved, including investors, managers, workers, lenders, suppliers, customers, community members, and authorities. The wealthy nations are principally responsible for the global rise in default rates. In 2016, there were 165 defaults worldwide, an increase from 113 in 2015. As in previous years, the majority of defaults occurred in the United States, accounting for an incredible 64.8% of all defaults, the highest rate since 2011. Furthermore, sustained strain in global energy markets, such as low commodity and oil prices, contributed significantly to the increase in default rates. Notably, more than half of all defaults in 2016 were in the energy and natural resource sectors. According to a recent research by Vazza and Kraemer (2017), 63 of the 95 defaults in 2017 occurred in the United States region, which included Bermuda and the Cayman Islands. Furthermore, the retail and consumer service sectors had a substantial impact on the overall number of defaults in 2017. However, there were fewer defaults overall in 2017, with 95 versus 163 in 2016.

2.1 Altman’s Z-Score (1968)

Altman (1968) questioned the appropriateness of univariate analysis (Beaver, 1966) for failure prediction purposes. Using multiple discriminant analysis (MDA), he defined explicit group classifications based on a linear combination of ratios, such as financially distressed and solvent. The person examined the twenty-year prediction potential of the selected ratios using a sample of 33 insolvent and 33 matched non-insolvent manufacturing enterprises (1946-1965). Twenty-two ratios were selected based on their potential significance and occurrence in the

literature. These ratios were then classified into five standard ratios based on their statistical significance, analyst judgement, inter-correlations among the variables, profitability, liquidity, leverage, solvency, and activity. The discriminant function was used to calculate the Z-score. The classification zones for assigning enterprises to one of two categories, sound or distressed, are also detailed.

$Z = 0.012\ X_1 + 0.014\ X_2 + 0.033\ X_3 + 0.006X_4 + .999\ X_5$

X1 = Working Capital/Total Assets;

X2 = Retained Earnings/ Total Assets;

X3 = Earnings before Interest and Taxes/Total Assets;

X4 = Market Value of Equity/ Total Liabilities;

X5 = Sales/Total Assets; Z = Overall Index.

Distressed firms (Z<1.81) Firms in Grey zone (1.81<Z>2.99) Healthy firms (Z>2.99)

2.2 Modified Z”-Score Model

The Z-Score model will go through one more modification in which the features and accuracy of a model without X5 (sales/total assets) will be assessed. We do this to decrease the potential impact on the sector, which is more likely when an industry-sensitive variable, such as asset turnover, is included in the research. In this case, the book value of equity was used to determine X4.

The new Z″-Score model is:

$Z'' = 6.56\ (X1) + 3.26\ (X2) + 6.72\ (X3) + 1.05\ (X4)$

Where X1, X2, X3, and X4 are

X1 = Working Capital/Total Assets;

X2 = Retained Earnings/ Total Assets;

X3 = Earnings before Interest and Taxes/Total Assets;

X4 = Book value of equity/ Total Liabilities;

3.0 Research Methodology

Following an examination of various studies on financial distress and related prediction models, the prior chapter provided a literature overview. This chapter describes the research methodologies used in the study to analyse data and answer research questions. The sampling criteria for this study are then described, followed by the methodology. Finally, the Panel-data Regression Technique and model selection are described in detail.

3.1 Research Gap

Although significant study has been undertaken on financial distress in industrialised economies, there is a distinct lack of comprehensive empirical studies that focus solely on the Indian context. India's economic and financial environments differ from those of the West, and there may be significant variances in the reasons of financial hardship among Indian listed firms. As a result, research particular to the Indian setting is required. This is research is specifically carried out in Industries under manufacturing and services.

3.2 Research objective

- To examine the financial distress in various industries under manufacturing using Altman’s Z-score
- To examine the financial distress in various industries under services using Modified Altman’s Z”-score.

3.3 Sampling Method

This research used data from companies listed on the National Stock Exchange (NSE)'s NIFTY 200 index. Information is obtained over an 11-year period, from 2012 to 2022. The index contains the 200 largest corporations in the pool of qualifying companies, as measured by total market capitalisation. 200 financial firms were omitted from the sample due to their diverse business structures and nature. Furthermore, banks are regulated entities, making them difficult to analyse (Berger & Bonaccorsi di Patti, 2006). The final sample is created by excluding financial enterprises and firms with insufficient data. After subtracting 74 financial industry firms and enterprises with incomplete data were identified and dropped. Thus, 126 firms make up the final sample. Data is collected from prowess IQ data base.

3.4 Shows the division of firms based on manufacturing and services.

Nature of Business	Number of firms
Manufacturing	85
Services	41

Table 1

Table 2 demonstrates the numerous industries under manufacturing and services. Services are classified into three industries: Retail, Communication, and Energy. Construction, Automobiles, Chemicals, Steel, FMCG, and Pharmaceuticals are the industries that fall under manufacturing.

Industries	Number of firms	Year	Observations
Retail	10	11	110
Communication	19	11	209
Energy	12	11	132
Construction	8	11	88
Automobiles	24	11	264
Chemicals	14	11	154
Steel	9	11	99
FMCG	16	11	176
Pharmaceuticals	14	11	154
Total	126	11	1386

Table 2

4.0 Analysis and Interpretation

4.1 Results of manufacturing industries during 2012

Table 3 represent industries in terms of the total number of businesses and the degree of hardship in 2012. Eight of the 14 companies in the pharmaceutical sector are in crisis, two are in the grey area, and four are in good health. Ten of the 16 companies in the FMCG industry are in crisis, two are in the grey area, and four are healthy with a Z-Score greater than 2.99. Five of the nine companies in steel are healthy, two are in the grey zone, and two are in difficulty. Six of the 14 companies in the chemical industry are in crisis, four are in the grey area, and four are doing well. Ten of the 24 companies in the automobile sector are in the grey zone, seven are in the healthy zone, and seven are in trouble. Out of eight companies in the construction industry, two are in crisis, three are in the grey area, and three are in good standing.

Year	Industry	Total firms	Distressed firms (Z<1.81)	Firms in Grey zone (1.81<Z>2.99)	Healthy firms (Z>2.99)
2012	Pharmaceuticals	14	8	2	4
2012	FMCG	16	10	2	4
2012	Steel	9	2	2	5
2012	Chemicals	14	6	4	4
2012	Automobiles	24	7	10	7
2012	Constructions	8	2	3	3

Table 3

4.2 Results of manufacturing industries during 2013

Table 4 represent industries in terms of the overall number of businesses and the degree of hardship in 2013. Of the 14 companies in the pharmaceutical sector, five are in crisis, five are in the grey area, and four are doing well. Six of the 16 FMCG companies have a Z-Score of greater than 2.99, three are in the grey zone, and seven are in trouble. Out of nine companies in the steel industry, four are in crisis, two are in the grey area, and three are doing well. Eight of the 14 companies in the chemical industry are healthy, three are in crisis, and three are in the grey zone. Eight of the 24 companies in the automotive sector are in difficulty, nine are in the grey zone, and seven are in the healthy zone. Out of eight companies in the construction sector, one is in crisis, three are in the grey area, and four are in good standing.

Year	Industry	Total firms	Distressed firms (Z<1.81)	Firms in Grey zone (1.81<Z>2.99)	Healthy firms (Z>2.99)
2013	Pharmaceuticals	14	5	5	4
2013	FMCG	16	7	3	6
2013	Steel	9	4	2	3
2013	Chemicals	14	3	3	8
2013	Automobiles	24	8	9	7
2013	Constructions	8	1	3	4

Table 4

4.3 Results of manufacturing industries during 2014

Table 5 distressed industries in 2014, including the overall number of businesses and the degree of distress. Of the 14 companies in the pharmaceutical sector, 3 are in crisis, 0 are in the grey area, and 11 are doing well. Four of the 16 companies in the FMCG industry are in crisis, five are in the grey area, and seven are healthy, with a Z-Score of greater than 2.99. Out of nine companies in the steel industry, four are in crisis, two are in the grey area, and three are doing well. Eight of the 14 companies in the chemical industry are healthy, four are in the grey zone,

and two are in difficulty. Out of 24 companies in the automotive sector, nine are in difficulty, five are in the grey zone, and ten are in the healthy zone. Out of eight companies in the construction industry, two are in crisis, four are in the grey area, and two are in good standing.

Year	Industry	Total firms	Distressed firms (Z<1.81)	Firms in Grey zone (1.81<Z>2.99)	Healthy firms (Z>2.99)
2014	Pharmaceuticals	14	3	0	11
2014	FMCG	16	4	5	7
2014	Steel	9	4	2	3
2014	Chemicals	14	2	4	8
2014	Automobiles	24	9	5	10
2014	Constructions	8	2	4	2

Table 5

4.4 Results of manufacturing industries during 2015

Table 6 represent industries in terms of the overall number of businesses and the degree of hardship in 2015. Five of the 14 companies in the pharmaceutical sector are healthy, two are in the grey area, and seven are in crisis. Nine of the 16 FMCG companies have a Z-Score of greater than 2.99, two are in the grey zone, and five are in trouble. Out of nine companies in the steel industry, two are in the grey zone, two are healthy, and five are in difficulty. Nine of the 14 companies in the chemical industry are healthy, five are in crisis, and none are in the grey zone. Nine of the 24 companies in the automotive sector are in crisis, six are in the grey zone, and nine are in the healthy zone. Out of eight companies in the construction industry, three are in crisis, one is in the grey area, and four are in good standing.

Year	Industry	Total firms	Distressed firms (Z<1.81)	Firms in Grey zone (1.81<Z>2.99)	Healthy firms (Z>2.99)
2015	Pharmaceuticals	14	7	2	5
2015	FMCG	16	5	2	9
2015	Steel	9	5	2	2
2015	Chemicals	14	5	0	9
2015	Automobiles	24	9	6	9
2015	Constructions	8	3	1	4

Table 6

4.5 Results of manufacturing industries during 2016

Table 7 represent industries in terms of the overall number of businesses and the degree of distress in 2016. Five of the 14 companies in the pharmaceutical sector are in crisis, four are in the grey area, and five are in good health. Nine of the 16 FMCG companies have a Z-Score of

greater than 2.99, three are in the grey zone, and four are in trouble. Of the nine companies in steel, three are in crisis, two are in the grey area, and four are doing well. Six of the 14 companies in the chemical industry are in crisis, one is in the grey zone, and seven are doing well. Nine of the 24 companies in the automotive sector are in crisis, six are in the grey zone, and nine are in the healthy zone. Out of eight companies in the construction industry, four are in crisis, one is in the grey area, and three are in good standing.

Year	Industry	Total firms	Distressed firms (Z<1.81)	Firms in Grey zone (1.81<Z>2.99)	Healthy firms (Z>2.99)
2016	Pharmaceuticals	14	5	4	5
2016	FMCG	16	4	3	9
2016	Steel	9	3	2	4
2016	Chemicals	14	6	1	7
2016	Automobiles	24	9	6	9
2016	Constructions	8	4	1	3

Table 7

4.6 Results of manufacturing industries during 2017

Table 8 represent industries in terms of the overall number of businesses and the degree of hardship in 2017. Three troubled enterprises, six grey zone firms, and five healthy firms make up the pharmaceutical industry's total of fourteen firms. Nine of the 16 FMCG companies have a Z-Score of greater than 2.99, four are in the grey zone, and three are in trouble. Three of the nine companies in the steel industry are in crisis, three are in the grey area, and three are doing well. Three of the fourteen companies in the chemical industry are in crisis, four are in the grey area, and seven are in good health. Eight of the 24 companies in the automotive sector are in difficulty, six are in the grey zone, and ten are in the healthy zone. Out of eight companies in the construction industry, two are in crisis, three are in the grey area, and three are in good standing.

Year	Industry	Total firms	Distressed firms (Z<1.81)	Firms in Grey zone (1.81<Z>2.99)	Healthy firms (Z>2.99)
2017	Pharmaceuticals	14	3	6	5
2017	FMCG	16	3	4	9

2017	Steel	9	3	3	3
2017	Chemicals	14	3	4	7
2017	Automobiles	24	8	6	10
2017	Constructions	8	2	3	3

Table 8

4.7 Results of manufacturing industries during 2018

Table 9 reflect industries in terms of the overall number of businesses and the degree of hardship in 2018. Six of the 14 companies in the pharmaceutical sector are healthy, three are in the grey area, and five are in crisis. Five of the 16 FMCG companies are in crisis, four are in the grey area, and seven are in good health with a Z-Score of greater than 2.99. Out of nine companies in the steel industry, four are in crisis, one is in the grey zone, and four are doing well. Five of the 14 companies in the chemical industry are in crisis, four are in the grey area, and five are doing well. Ten of the 24 companies in the automotive sector are in the healthy zone, seven are in the grey zone, and seven are in difficulty. Out of eight companies in the construction industry, two are in crisis, four are in the grey area, and two are in good standing.

Year	Industry	Total firms	Distressed firms (Z<1.81)	Firms in Grey zone (1.81<Z>2.99)	Healthy firms (Z>2.99)
2018	Pharmaceuticals	14	5	3	6
2018	FMCG	16	5	4	7
2018	Steel	9	4	1	4
2018	Chemicals	14	5	4	5
2018	Automobiles	24	7	7	10
2018	Constructions	8	2	4	2

Table 9

4.8 Results of manufacturing industries during 2019

Table 10 represent industries in terms of the overall number of businesses and the degree of hardship in 2019. Five of the fourteen companies in the pharmaceutical sector are in trouble, two are in the grey area, and seven are in good health. Five of the 16 FMCG companies are in crisis, four are in the grey area, and seven are in good health with a Z-Score of greater than 2.99. Of the nine companies in steel, three are in crisis, two are in the grey area, and four are

doing well. Five of the 14 companies in the chemical industry are in crisis, four are in the grey area, and five are doing well. Nine of the 24 companies in the automotive sector are in difficulty, four are in the grey zone, and eleven are in the healthy zone. Out of eight companies in the construction industry, one is in crisis, two are in the grey area, and five are in good standing.

Year	Industry	Total firms	Distressed firms (Z<1.81)	Firms in Grey zone (1.81<Z>2.99)	Healthy firms (Z>2.99)
2019	Pharmaceuticals	14	5	2	7
2019	FMCG	16	5	4	7
2019	Steel	9	3	2	4
2019	Chemicals	14	5	4	5
2019	Automobiles	24	9	4	11
2019	Constructions	8	1	2	5

Table 10

4.9 Results of manufacturing industries during 2020

Table 11 represent industries in 2020, including the total number of businesses and the degree of suffering. Three troubled enterprises, six grey zone firms, and five healthy firms make up the pharmaceutical industry's total of fourteen firms. Nine of the 16 FMCG companies have a Z-Score of greater than 2.99, four are in the grey zone, and three are in trouble. Of the nine companies in steel, two are in crisis, three are in the grey area, and four are doing well. Out of 14 companies in the chemical business, five are in crisis, five are in the grey zone, and four are doing well. Six of the 24 companies in the automotive sector are in difficulty, eight are in the grey zone, and ten are in the healthy zone. Out of eight companies in the construction sector, three are healthy, 0 are in the grey zone, and 5 are in difficulty.

Year	Industry	Total firms	Distressed firms (Z<1.81)	Firms in Grey zone (1.81<Z>2.99)	Healthy firms (Z>2.99)
2020	Pharmaceuticals	14	3	6	5

2020	FMCG	16	3	4	9
2020	Steel	9	2	3	4
2020	Chemicals	14	5	5	4
2020	Automobiles	24	6	8	10
2020	Constructions	8	5	0	3

Table 11

4.10 Results of manufacturing industries during 2021

Table 12 represent industries in terms of the overall number of businesses and the degree of hardship in 2021. Of the 14 companies in the pharmaceutical sector, two are in crisis, six are in the grey area, and six are doing well. Out of 16 FMCG companies, 4 are in crisis, 1 is in the grey area, and 11 are in good health with a Z-Score greater than 2.99. Of the nine companies in steel, one is in crisis, three are in the grey area, and four are doing well. Out of 14 companies in the chemical business, five are in crisis, one is in the grey zone, and seven are doing well. Ten of the 24 companies in the automotive sector are in the healthy zone, seven are in the grey zone, and seven are in difficulty. Six of the eight companies in the construction sector are healthy, one is in the grey zone, and one is in crisis.

Year	Industry	Total firms	Distressed firms (Z<1.81)	Firms in Grey zone (1.81<Z>2.99)	Healthy firms (Z>2.99)
2021	Pharmaceuticals	14	2	6	6
2021	FMCG	16	4	1	11
2021	Steel	9	1	1	7
2021	Chemicals	14	1	1	12
2021	Automobiles	24	7	7	10
2021	Constructions	8	1	1	6

Table 12

4.11 Results of manufacturing industries during 2022

Table 13 represent industries in terms of the overall number of businesses and the degree of hardship in 2022. Ten of the fourteen companies in the pharmaceutical sector are in crisis, three are in the grey area, and one is a robust company. Ten of the sixteen FMCG companies are in crisis, four are in the grey area, and two are in good condition with a Z-Score of greater than

2.99. Six of the nine steel companies are in crisis, three are in the grey area, and none are doing well. Twelve of the fourteen companies in the chemical industry are in crisis, two are in the grey zone, and none are healthy. Thirteen of the twenty-four companies in the automobile sector are in crisis, seven are in the grey zone, and four are in the healthy zone. Six of the eight companies in the construction sector are in crisis, two are in the grey zone, and none are in the healthy zone.

Year	Industry	Total firms	Distressed firms (Z<1.81)	Firms in Grey zone (1.81<Z>2.99)	Healthy firms (Z>2.99)
2022	Pharmaceuticals	14	10	3	1
2022	FMCG	16	10	4	2
2022	Steel	9	6	3	0
2022	Chemicals	14	12	2	0
2022	Automobiles	24	13	7	4
2022	Constructions	8	6	2	0

Table 13

4.12 Industry wise classification of service sector firms in between 2012-2022

There are 41 service firms in the service sector, which includes the retail, energy, and communication sectors. This section shows the year-by-year financial difficulty and thriving businesses in certain industries from 2012 to 2022.

4.13 Results of service industries during 2012

Table 14 represent industries in terms of the total number of businesses and the degree of hardship in 2012. Ten of the 19 companies in the communication sector are healthy, seven are in the grey area, and two are in difficulty. Out of ten retail businesses, two are in crisis, four are in the grey area, and four are doing well. Six of the twelve companies in the energy sector are healthy, two are in the grey zone, and four are in difficulty.

Year	Industry	Total firms	Z" <1.10	1.10<Z">2.60	Z">2.60
2012	Communication	19	2	**7**	10
2012	Retail	10	2	4	4

2012	Energy	12	4	2	6

Table 14

4.14 Results of service industries during 2013

Table 15 represent industries in terms of the overall number of businesses and the degree of hardship in 2013. Of the 19 companies in the communication sector, three are in crisis, ten are in the grey area, and six are doing well. Out of ten retail businesses, one is in crisis, three are in the grey area, and six are doing well. Seven of the twelve companies in the energy sector are healthy, four are in the grey zone, and one is in difficulty.

Year	Industry	Total firms	Z" <1.10	1.10<Z">2.60	Z">2.60
2013	Communication	19	3	10	6
2013	Retail	10	1	3	6
2013	Energy	12	1	4	7

Table 15

4.15 Results of service industries during 2014

Table 16 distressed industries in 2014, including the overall number of businesses and the degree of distress. Ten of the 19 companies in the communication sector are healthy, eight are in the grey area, and one is in crisis. Out of ten retail businesses, two are in crisis, one is in the grey area, and seven are doing well. Five of the twelve companies in the energy sector are healthy, six are in the grey zone, and one is in difficulty.

Year	Industry	Total firms	Z" <1.10	1.10<Z">2.60	Z">2.60
2014	Communication	19	1	8	10
2014	Retail	10	2	1	7
2014	Energy	12	1	6	5

Table 16

4.16 Results of service industries during 2015

Table 17 represent industries in terms of the overall number of businesses and the degree of hardship in 2015. Of the 19 companies in the communication sector, six are in crisis, five are

in the grey area, and eight are doing well. Out of ten retail businesses, four are in crisis, two are in the grey area, and four are doing well. Seven of the twelve companies in the energy sector are healthy, three are in the grey zone, and two are in difficulty.

Year	Industry	Total firms	Z" <1.10	1.10<Z">2.60	Z">2.60
2015	Communication	19	6	5	8
2015	Retail	10	4	2	4
2015	Energy	12	2	3	7

Table 17

4.17 Results of service industries during 2016

Table 18 represent industries in terms of the overall number of businesses and the degree of distress in 2016. Of the 19 companies in the communication sector, one is in crisis, one is in the grey zone, and 17 are in good health. Out of ten retail businesses, four are in crisis, three are in the grey area, and three are doing well. Three of the twelve companies in the energy sector are healthy, eight are in the grey zone, and one is in difficulty.

Year	Industry	Total firms	Z" <1.10	1.10<Z">2.60	Z">2.60
2016	Communication	19	1	1	17
2016	Retail	10	4	3	3
2016	Energy	12	1	8	3

Table 18

4.18 Results of service industries during 2017

Table 19 represent industries in terms of the overall number of businesses and the degree of hardship in 2017. Of the 19 companies in the communication sector, four are in crisis, ten are in the grey area, and five are doing well. Out of ten retail businesses, one is in crisis, four are in the grey area, and five are doing well. Five of the twelve companies in the energy sector are healthy, four are in the grey zone, and three are in difficulty.

Year	Industry	Total firms	Z" <1.10	1.10<Z">2.60	Z">2.60

2017	Communication	19	4	10	5
2017	Retail	10	1	4	5
2017	Energy	12	3	4	5

Table 19

4.19 Results of service industries during 2018

Table 20 reflect industries in terms of the overall number of businesses and the degree of hardship in 2018. Twelve of the 19 companies in the communication sector are healthy, four are in the grey area, and three are in difficulty. Out of ten retail businesses, two are in crisis, three are in the grey area, and five are doing well. Six of the twelve companies in the energy sector are healthy, one is in the grey zone, and five are in difficulty.

Year	Industry	Total firms	Z" <1.10	1.10<Z">2.60	Z">2.60
2018	Communication	19	3	4	12
2018	Retail	10	2	3	5
2018	Energy	12	5	1	6

Table 20

4.20 Results of service industries during 2019

Table 21 represent industries in terms of the overall number of businesses and the degree of hardship in 2019. Five of the 19 companies in the communication sector are in crisis, nine are in the grey area, and five are in good health. Out of ten retail businesses, none are in crisis, three are in the grey area, and seven are doing well. Out of 12 companies in the energy sector, two are in trouble, five are in the grey zone, and five are in good health.

Year	Industry	Total firms	Z" <1.10	1.10<Z">2.60	Z">2.60
2019	Communication	19	5	9	5
2019	Retail	10	0	3	7

2019	Energy	12	2	5	5

Table 21

4.21 Results of service industries during 2020

Table 22 represent industries in 2020, including the total number of businesses and the degree of suffering. Of the 19 companies in the communication sector, five are in crisis, eight are in the grey area, and six are doing well. Out of ten retail businesses, one is in crisis, five are in the grey area, and four are doing well. Of the twelve companies in the energy sector, seven are healthy, five are in the grey zone, and none are in the troubled zone.

Year	Industry	Total firms	Z" <1.10	1.10<Z">2.60	Z">2.60
2020	Communication	19	5	8	6
2020	Retail	10	1	5	4
2020	Energy	12	0	5	7

Table 22

4.22 Results of service industries during 2021

Table 23 represent industries in terms of the overall number of businesses and the degree of hardship in 2021. Six of the 19 companies in the communication sector are in crisis, six are in the grey zone, and seven are in good health. Out of ten retail businesses, one is in crisis, four are in the grey area, and five are doing well. Four of the twelve companies in the energy sector are healthy, six are in the grey zone, and two are in the troubled zone.

Year	Industry	Total firms	Z" <1.10	1.10<Z">2.60	Z">2.60
2021	Communication	19	6	6	7
2021	Retail	10	1	4	5
2021	Energy	12	2	6	4

Table 23

4.23 Results of service industries during 2022

Table 24 represent industries in terms of the overall number of businesses and the degree of hardship in 2022. Of the 19 companies in the communication sector, 12 are healthy, 7 are in the grey zone, and 0 are in difficulty. Out of ten retail businesses, two are in crisis, four are in the grey area, and four are doing well. Of the twelve companies in the energy sector, four are in the troubled zone, one is in the grey zone, and seven are in the healthy zone.

Year	Industry	Total firms	Z" <1.10	1.10<Z">2.60	Z">2.60
2022	Communication	19	0	7	12
2022	Retail	10	2	4	4
2022	Energy	12	4	1	7

Table 24

5.0 Conclusion

Overall, in service sector, the energy sector continues to be the most financially unstable, while the communication sector shown a robust recovery by 2022. Retail, on the other hand, is positioned in the center with a reasonable level of resilience. Investors can use these data to pinpoint fragile industries and carry out focused financial or governance initiatives. The financial situation of India's manufacturing sectors exhibited erratic patterns from 2012 to 2022, with a significant decline in 2022. Industries including steel, chemicals, and autos experienced ongoing and increasing hardship. Despite showing signs of recovery in some years, sectors including FMCG and pharmaceuticals concluded 2022 with high levels of hardship. Over the course of the decade, the manufacturing sector's overall financial vulnerability increased, underscoring the need for more robust financial resilience and strategic changes.

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