

# COMPARISON OF DAIRY UNITS OF PUNJAB USING VARIOUS FINANCIAL HEALTH INDICATORS

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## ABSTRACT

In the year 2022, the Punjab dairy sector worth was Rs. 491 billion. The Punjab dairy sector was projected to grow at a compound annual growth rate of 14.7%. (Dairy Industry in Punjab: Market Size, Growth, Prices, Segments, Cooperatives, Private Dairies, Procurement and Distribution) The study aims to analyze the financial performance of selected dairy units in Punjab by using two selected financial health models such as the Springate Score Model and the Zmijewski Score Model. Data was gathered from the selected dairy units' annual reports, which covered the eleven-year period from 2010–2011 to 2020–21. It was concluded from the study that Bathinda and the Sangrur dairy units were in a financial distress zone and would go to bankruptcy in the near future. From the Zmijewski score, Patiala, Sangrur and Ludhiana dairy units were in the financial distress zone. Thus, the Sangrur dairy unit was a financially distressed zone as per both health models.

**Keywords:** Financial Performance, Financial Health, Punjab, Bankruptcy Scores

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## INTRODUCTION

The Dairy Industry of India contributed 5% to the development of the Indian national economy. The dairy industry of India is employing directly 8 crores farmers. The dairy sector will grow 6% in the year 2023-24. (Das) The Punjab State Co-operatives Milk Producers Federation (Milk Fed) works at a three-tier system level including village level, district level and state level, which comprises 6,474 milk producers working at the three-tier levels. (IMARC Services Private Limited., 2022)The Punjab State Co- operative Milk Producers Limited also known as Milk Fed was established in the year 1973 with two main purposes:1) to provide qualitative milk to their consumers at reasonable prices and 2) for the better economic development of the milk producers' various activities carried out such as to hike up milk production, procurement and processing of milk so milk producers will receive enough prices for their milk. (The Punjab State Cooperative Milk Producer's Federation Ltd., 2022)

## REVIEW OF LITERATURE

The present review of literature is based on the study conducted in the research area of the dairy industry in India.

**(Santhosa, Gaddi, & Gracy, 2020)**, analyzed the physical and financial performance of the Shivamogga dairy unit from the period 2008-09 to 2017-18 with the help of selected financial ratios. The result was found that there was a positive annual compound growth rate (CAGR) and current ratio was greater than 2 and quick ratio was greater than 0.95 and the inventory turnover ratio was 39.93. These results suggested that the union working at its satisfactory level and the gross profit ratio and net profit ratio were earned at their satisfactory level.

**(Bhandari, 2020)**, examined the main implications of the COVID-19 predicament on a firmly consolidated dairy supply chain. From the study, it was concluded that dairy farmers have borne heavy losses due to the impracticability of entirely adjusting supply to demand. Dairy farmers, as well as dairy processors, have done hard work to minimize the losses during lockdown by accepting the different master plans. They have converted liquid milk into long-lasting dairy products such as ghee, curd, and paneer. They have also provided dairy products as soon as possible to the doorsteps of the consumers. It was suggested to take special measures for the unavailability of cattle feed and fodder which may have adversely affected the cost of production.

**(Bhagyalakshmi, 2020)**, conferred on the problems of the Indian dairy sector and also explored problems by the 'SWOT' analysis and Porter Five Force Model'. From the study, it

was observed that India's milk production capacity was higher than other nations but per capita, milk manufacturing capacity was less than other nations. Indian milky animals' production capacity was too low so the cost of milk in India was very high. It was also seen in the study that Indian farmers do have not proper information about the health of their milky animals and related to their vaccination. A very big problem faced by the Indian dairy sector was not only the proper supply chain but also, they brought up their animals by ancient methods so fruitful results were not achieved.

**(Bose, 2018)**, inspected the outcomes of microfinance on the dairy industry for reducing poverty in India. The primary data was examined by interviewing 150 members of the Kerala district and secondary data was also used for the study. The data was collected in the context of savings and expenditure relation, debt, assets and income. It was concluded that microfinance contributed to the area of income, education, and progress of farmers and it was also helpful for the farmers in the field of decreasing poverty, upgrading their income, and increasing their living standard.

### **Research Gap**

In India, various types of studies are being conducted such as physical and financial performance, comparative financial health analysis, financial leverage and financial performance, capital structure and financial performance and business performance etc. Thus, various research work took place to examine the financial performance analysis of dairy co-operatives in India and outside India but the researcher could not trace any study on the comparative financial performance analysis for the dairy co-operatives in the state of Punjab. Taking this as a research gap, the study has been undertaken to analyze and compare the financial performance of selected dairy units from 2010-11 to 2020-21. The majority of the past studies employed the financial health model Altman's Z score. We did not come across any literature that includes other financial health scores so taking it as a research gap, an attempt was made to analyze the financial health of Punjab dairy units using two selected financial health models, the Springate score model and the Zmijewski score model.

### **RESEARCH METHODOLOGY**

There are eleven cooperative dairy units registered in Punjab state, out of which the researcher has selected five dairy units based on a convenient random sampling method. The selected dairy units are Bathinda, Patiala, Gurdaspur, Ludhiana and Sangrur. This study is based on secondary data which were drawn from the published annual reports for eleven years

2010-11 to 2020-21. The data is then analyzed using two financial health scores; Springate and Zmijewski scores. **Problem Statement**

‘Comparison of Dairy Units of Punjab using various Financial Health Indicators’.

### **Significance of the study**

The Indian economy mainly depends on Agricultural and Animal Husbandry and it is also dependent on cooperatives' dairy units. The dairy sector has played an important role in the development of the Indian economy. This study may assist in understanding the financial health of selected five dairy units in Punjab. The study is also helpful for the dairy authorities and the Government of India to formalize policies and will take proper steps for strengthen the financial health of the selected dairy units in Punjab.

### **Objectives of the study**

1. To examine the financial performance of the district milk producers' unions of Punjab using Springate and Zmijewski score models.
2. To compare the overall financial performance of selected dairy units of Punjab.

### **Research Design and Sampling Techniques**

A descriptive research design has been selected to analyze the financial health of dairy units in Punjab. Out of 11 dairy units in Punjab, five dairy units were selected based on a convenient sampling method. The selected dairy units are as follows:

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#### **Dairy Units of Punjab**

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1. Bathinda District Co-operative Milk Producers' Union Ltd., Bathinda.
  2. Patiala District Co-operative Milk Producers' Union Ltd., Patiala.
  3. Gurdaspur District Co-operative Milk Producers' Union Ltd., Gurdaspur.
  4. Sangrur District Co-operative Milk Producers' Union Ltd., Sangrur.
  5. Ludhiana District Co-operative Milk Producers' Union Ltd., Ludhiana.
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### **Tools and Techniques used**

For the present study, data has been analyzed by the use of two selected financial health models.

1. SpringateScore Model
2. Zmijewski Score Model

### **Springate Score Model**

In the year 1978, Springate formulated a bankruptcy prediction model in which a Multiple Discriminant Analysis (MDA) method was used. Four financial ratios were used from a total of nineteen financial ratios. The Springate method according to (Primasari, 2017) can be computed with the following formula:

$$S=1.03 \times A+3.07 \times B+ 0.66 \times C + 0.4 \times D$$

In this score, four financial ratios are used such as working capital to total assets $\times$ 100 (A), earnings before interest and tax to total assets $\times$ 100 (B), profit before tax to current liabilities $\times$ 100 (C), and revenue to total assets $\times$ 100 (D). (Putri, Badri, Pranyoto, Susanti, & Lestari, 2020)

If the S- score is greater than 0.862, the dairy unit is predicted to be a potentially healthy unit. If the S- score is less than 0.862, the results indicate that the dairy unit is predicted to experience bankruptcy.(Putri, Badri, Pranyoto, Susanti, & Lestari, 2020)

### **Zmijewski Model**

The Zmijewski model was created by Zmijewski in 1984. In this model, ratios are used such as net income to total assets (X1), total liabilities to total assets (X2), and current assets to current liabilities. The formula used to examine the ‘Zmijewski’ scores:

$$-4.3- 4.5 \times (X1) + 5.7 \times (X2) - 0.004 \times (X3)$$

In this model, if X score is greater than 0 the dairy unit is not predicted to go into bankruptcy and if X score is less than 0 the dairy unit is likely to go into bankruptcy.

## **RESULTS AND DISCUSSION**

Table no 1, examined the financial health of the Bathinda dairy unit. The highest springate score was 3.57 was observed in the year 2012-13 which indicated that the unit was in a stable condition in the year 2012-13 as working capital and revenue against total assets were in improved condition. The lowest spring score was 0.19 in the year 2010-11. In the year i.e. 2012-13 and 2020-21 the springate score was greater than 0.862 and in the remaining years, it was in the distress zone which predicts the Bathinda dairy unit will go to bankruptcy in near future.

Table no 2, displayed the financial health of the Patiala dairy unit. It was observed that in the eleven years study in 2010-11, 2017-18 and 2018-19, the springate score was lower than 0.862 i.e. 0.75, 0.49 and 0.44 so in these years dairy unit was under distress zone because EBIT to total assets and profit before tax to current liabilities is in negative in these years. During the year 2018-19, the working capital is negative. Patiala dairy unit's highest springate score was 17.68 which indicates the financial health was stable in the year 2016-17.

Table no 3, analyzed the financial health of the Gurdaspur dairy unit the highest springatescore was 1.58 observed in 2012-13 which indicated that the unit was in a stable condition in the year 2012-13. During the study period, it was observed that the springate score was less than 0.862 in the year 2010-11 which was 0.57, 0.34 in the year 2017-18, 0.28 in the year 2018-19 and 0.71 in the year 2020-21. It was found that in the year 2010-11, the EBIT to total assets and profit before tax to current liabilities was not in improved condition. It was found that in the year 2018-19, the working capital against total assets was negative so in this four-year study period the Gurdaspur dairy unit was in the distress zone.

The above table no 4, demonstrates the financial health of the Sangrur dairy unit. The highest springate score was 1.79 was examined in 2010-11 which indicated that the unit was in a stable condition in the year 2010-11. It was observed that in the study period, the Springate score was less than 0.862 in 2012-13 and 2014-15 to 2019-20 and 2020-21 because working capital to total assets was not in improved condition indicating the unit was in the distress zone. The dairy unit is likely to experience bankruptcy in the near future as last seven years; the dairy unit was in constant distress.

Table no 5, examined the financial health of the Sangrur dairy unit. The springate score was lower than 0.862 in the year 2011-12 i.e. 0.28 and in the year 2017-18 i.e. 0.70 and in the year 2018-19 i.e. 0.36. The highest springate score was 21.89 in the year 2015-16. The highest springate score was 21.89 in the year 2015-16. Ludhiana dairy unit was financially strong in seven years out of ten years because the Springate score was higher than 0.862. In the years 2011-12, 2017-18 and 2018-19, the Ludhiana dairy unit was in the distress zone because the EBIT against total assets ratio was very low percent and working capital against total assets was negative.

Table no 6, examined the financial health of the Bathinda dairy unit. Here it can be said that the Bathinda dairy unit had the highest Zmijewski score i.e. 1.59 in the year 2011-12 and the lowest score in the year 2019-20, i.e. -1.26. From the above table, it was examined that in

the eleven-year study period out of four years, i.e. 2010-11, 2017-18 and 2018-19 and 2019-20 the Zmijewski score was lower than 0. The Zmijewski scores in these four years i.e. -0.08, -0.92, -1.15 and -1.26 respectively because in the year 2010-11 and 2018-19, current assets to current liabilities ratio was low. In the year 2017-18, the net income to total assets ratio is negative so in these four years, the Bathinda dairy unit was in the distress zone.

Table no 7, examined the financial health of the Patiala dairy unit. The improved financial health of the Patiala dairy unit was only observed in two years 2017-18 & 2018-19 having scores of 0.59 and 0.49 which indicated that the unit was stable in these two years but the unit struggled from 2010-2011 to 2016-17 and 2019-20 which is a huge red flag for the unit as the score predicted bankruptcy in near future.

Table no 8, examined the financial health of the Gurdaspur dairy unit. It was observed during the entire study period from 2010-11 to 2019-20, that the Gurdaspur dairy unit financial health was stable as Zmijewski scored above 0. The score predicts that the chances of the dairy unit going bankrupt is very low.

Table no 9, observed, the financial health of the Sangrur dairy unit. It was found in the eleven years study period, seven years from 2010-11 to 2016-17, the financial health of the Sangrur dairy unit was steady and in improved condition, as the score was above 0, but following three years, i.e. from 2017-18 to 2019-20 the score was negative due to reduction in the current assets. The dairy unit is required to improve its current assets to avoid bankruptcy in the near future.

Table no 10, studies the financial health of the Ludhiana dairy unit. It was observed that the dairy unit was struggling to maintain its financial health from the years 2010-11 to 2019-20, except in the years 2010-11, 2016-17 and 2020-21 the score was greater than 0.

Table 11, demonstrates an average of the financial health of selected five dairy units of Punjab on the basis of the Springate model and Zmijewski models. The Springate score model suggests that out of five dairy units, the three dairy units Patiala, Gurdaspur and Ludhiana scored more than the standard score while the Bathinda and Sangrur dairy units scored less than the standard score. As per the Zmijewski score model, among the five dairy units of Punjab, it was concluded that the Bathinda, Patiala, Sangrur and Ludhiana dairy units' financial health was in the distressed zone because the averages of Zmijewski score of these dairy units was less than 0 and Gurdaspur dairy unit financial health was good.

## **FINDINGS OF THE STUDY**

- It was found during the study period, that the average springate score of the Bathinda dairy unit was 0.78 while the Sangrur dairy unit score was -4.62 which indicated that as per the springate score, both these two dairy units were in financial distress zone.
- According to the Zmijewski model, the Bathinda, Sangrur and Ludhiana dairy units are in under financial distress zone because the score was less than 0 in these three dairy units. The Patiala dairy unit score was in a negative mode.

## **SUGGESTIONS FOR THE STUDY**

- Bathinda, Patiala, Gurdaspur, Sangrur and Ludhiana dairy units should use their funds to maintain current assets and current liabilities so that ultimately their working capital is utilized in the proper manner to meet the short-term and long- term obligations. The dairy units should invest their funds in the current assets to fulfill the needs of the current liabilities of their business operations.
- The Patiala and Sangrur dairy units should plan for increasing sales implement proper distribution channels, and effectively utilization of their working capital and in that way, profit gained by the dairy unit should increase their total assets
- for the maximum generation of their sales. Increased sales will ultimately increase the profit of the dairy unit.

## **CONCLUSIONS**

Every associate contributor of any business unit must be aware of the financial health of an organization. Financial health plays a crucial role in the development of the business unit. A financially sound unit can run its business operations in the long run. The present study is carried out with an aim to know the financial health of selected Punjab dairy units with the help of the Springate and Zmijewski score models. The study examined that as per the models, the Bathinda and the Sangrur dairy units were not financially healthy so proper steps should be taken to improve the financial health of the dairy units.

## **LIMITATION OF THE STUDY**

- The data taken for the study was based on the annually published reports of the selected dairy cooperatives.
- The study is based on only two health models out of various others.
- The study was limited to a period of eleven years.

## FURTHER SCOPE OF THE STUDY

- This study observed selected ten samples so more samples can be taken for further study.
- For future research, various dairy units can be selected as per the geographical zone for the advancement of the study.
- The study has covered the financial performance of the dairy units from the year 2010-11 to 2019-20 so, the researcher can study for further years.

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Annexure

Table 1: Springate Score of Bathinda Dairy Unit

<b>Bathinda</b>	<b>2010-11</b>	<b>2011-12</b>	<b>2012-13</b>	<b>2013-14</b>	<b>2014-15</b>	<b>2015-16</b>	<b>2016-17</b>	<b>2017-18</b>	<b>2018-19</b>	<b>2019-20</b>	<b>2020-21</b>
A (Working capital/Total Assets)	-0.53	-0.32	2.72	-0.02	0.09	-0.33	-0.35	-0.08	-0.25	0.06	-0.35
B(EBIT/Total Assets)	0.02	-0.03	0.03	-0.04	0.02	0.00	0.02	0.00	0.01	0.01	0.01
C (Profit before tax/Current liabilities)	0.02	-0.04	0.00	-0.13	-0.06	0.00	0.01	-0.01	0.01	0.00	0.01
D (Revenue/Total Assets)	1.64	1.96	1.70	1.37	1.74	2.10	1.62	0.90	1.04	1.14	0.24
<b>Springate Score</b>	<b>0.19</b>	<b>0.35</b>	<b>3.57</b>	<b>0.31</b>	<b>0.80</b>	<b>0.52</b>	<b>0.34</b>	<b>0.28</b>	<b>0.21</b>	<b>0.55</b>	<b>1.41</b>
<b>Bankruptcy</b>	<b>Yes</b>	<b>Yes</b>	<b>No</b>	<b>Yes</b>	<b>No</b>						

Source: Computed by Authors

**Table 2: Springate Score of Patiala Dairy Unit**

<b>Patiala</b>	<b>2010-11</b>	<b>2011-12</b>	<b>2012-13</b>	<b>2013-14</b>	<b>2014-15</b>	<b>2015-16</b>	<b>2016-17</b>	<b>2017-18</b>	<b>2018-19</b>	<b>2019-20</b>	<b>2020-21</b>
A (Working capital/Total Assets)	0.39	-0.16	-0.01	0.03	-0.03	0.55	0.17	-0.01	-0.01	0.57	-0.52
B(EBIT/Total Assets)	-0.01	0.05	0.12	0.06	0.07	0.05	0.08	0.02	0.01	0.05	47.73
C (Profit before tax/Current liabilities)	-0.04	0.02	0.20	0.09	0.12	0.20	0.20	0.01	0.00	0.05	0.02
D (Revenue/Total Assets)	1.02	4.62	4.35	4.26	5.14	2.27	42.85	1.08	1.08	1.74	400.13
<b>Springate Score</b>	0.75	1.84	2.23	1.97	2.33	1.75	17.68	0.49	0.44	1.46	306.05
<b>BANKRUPTCY</b>	<b>Yes</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>Yes</b>	<b>Yes</b>	<b>No</b>	<b>No</b>

Source: Computed by Authors

**Table 3: Springate Score of Gurdaspur Dairy Unit**

<b>Gurdaspur</b>	<b>2010-11</b>	<b>2011-12</b>	<b>2012-13</b>	<b>2013-14</b>	<b>2014-15</b>	<b>2015-16</b>	<b>2016-17</b>	<b>2017-18</b>	<b>2018-19</b>	<b>2019-20</b>	<b>2020-21</b>
A (Working capital/Total Assets)	0.39	-0.16	-0.01	0.03	-0.03	0.55	0.17	-0.01	-0.01	0.57	0.00
B(EBIT/Total Assets)	-0.01	0.05	0.12	0.06	0.07	0.05	0.08	0.02	0.01	0.05	0.03
C (Profit before tax/Current liabilities)	-0.04	0.02	0.20	0.09	0.12	0.20	0.20	0.01	0.00	0.05	639.21
D (Revenue/Total Assets)	0.56	2.65	2.73	2.80	3.12	1.35	2.57	0.72	0.69	0.97	0.00
<b>Springate Score</b>	0.57	1.05	1.58	1.39	1.52	1.38	1.57	0.34	0.28	1.16	0.71
<b>Financial Stress</b>	<b>Yes</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>Yes</b>	<b>Yes</b>	<b>No</b>	<b>Yes</b>

Source: Computed by Authors

**Table 3: Springgate Score of Sangrur Dairy Unit**

<b>Sangrur</b>	<b>2010-11</b>	<b>2011-12</b>	<b>2012-13</b>	<b>2013-14</b>	<b>2014-15</b>	<b>2015-16</b>	<b>2016-17</b>	<b>2017-18</b>	<b>2018-19</b>	<b>2019-20</b>	<b>2020-21</b>
A (Working capital/Total Assets)	0.14	0.18	0.30	0.15	0.20	-0.55	-0.22	-0.21	-0.50	-0.19	-0.23
B(EBIT/Total Assets)	0.08	0.04	0.01	0.01	-7.73	0.04	0.02	0.02	0.01	-0.27	8.26
C (Profit before tax/Current liabilities)	0.49	0.11	-0.19	-0.07	-48.4	0.01	0.00	0.01	0.01	-0.60	0.12
D (Revenue/Total Assets)	2.67	1.19	1.10	1.87	1.20	1.68	1.07	1.15	1.37	1.55	-1.28
<b>Springate Score</b>	1.79	0.87	0.66	0.89	-55.0	0.24	0.27	0.32	0.07	-0.79	-0.17
<b>Bankruptcy</b>	No	No	Yes	No	Yes						

**Source: Computed by Authors**

Table 4: Springgate Score of Ludhiana Dairy Unit

	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
<b>Ludhiana</b>											
A (Working capital/Total Assets)	0.14	0.03	0.10	-0.27	0.10	0.80	0.61	0.05	-0.30	0.77	-1.06
B(EBIT/Total Assets)	0.04	0.01	0.05	0.06	0.04	0.07	0.07	0.02	0.03	1.68	0.02
C (Profit before tax/Current liabilities)	0.11	0.14	0.09	0.12	0.06	3.94	0.19	0.03	0.03	7.19	0.04
D (Revenue/Total Assets)	3.47	0.35	3.44	4.27	3.30	45.67	3.84	1.41	1.42	1.67	1.72
<b>Springgate Score</b>	1.74	0.28	1.71	1.68	1.58	21.89	2.49	0.70	0.36	11.36	-0.32
<b>Bankruptcy</b>	No	Yes	No	No	No	No	No	Yes	Yes	No	Yes

Source: Computed by Authors

**Table 5: Zmijewski Score of Bathinda Dairy Unit**

<b>Bathinda</b>	<b>2010-11</b>	<b>2011-12</b>	<b>2012-13</b>	<b>2013-14</b>	<b>2014-15</b>	<b>2015-16</b>	<b>2016-17</b>	<b>2017-18</b>	<b>2018-19</b>	<b>2019-20</b>	<b>2020-21</b>
X1 (Net Income/Total Assets)	0.01	-0.03	0.05	-0.05	-0.03	0.02	0.01	-0.01	0.00	0.00	0.00
X2 (Total Liabilities/ Total Assets)	0.75	1.01	0.85	0.87	0.87	0.98	0.99	0.59	0.55	0.54	2.06
X3 (Current Assets/Current Liabilities)	0.24	0.55	5.48	0.96	0.80	0.59	0.56	0.79	0.48	1.16	0.49
<b>Zmijewski Score</b>	-0.08	1.59	0.30	0.89	0.76	1.19	1.29	-0.92	-1.15	-1.26	7.42
<b>Financial Stress</b>	<b>YES</b>	<b>NO</b>	<b>NO</b>	<b>NO</b>	<b>NO</b>	<b>NO</b>	<b>NO</b>	<b>YES</b>	<b>YES</b>	<b>YES</b>	<b>No</b>

Source: Computed by Authors

Table 6: Zmijewski Score of Patiala Dairy Unit

Patiala	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
X1 (Net Income/Total Assets)	-0.02	0.01	0.09	0.04	0.05	0.03	0.05	0.34	0.17	0.01	0.00
X2 (Total Liabilities/ Total Assets)	0.13	0.62	0.63	0.60	0.48	0.74	0.41	0.86	0.84	0.75	1.28
X3 (Current Assets/Current Liabilities)	0.11	0.66	0.97	1.08	0.93	4.19	1.67	0.99	1.00	4.27	0.78
Zmijewski Score	-3.49	-0.78	-1.11	-1.04	-1.80	-0.26	-2.22	0.59	0.49	-0.07	2.97
Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	

Source: Computed by Authors

Table 7: Zmijewski Score of Gurdaspur Dairy Unit

Gurdaspur	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
X1 (Net Income/Total Assets)	-0.06	0.00	0.00	-0.04	-0.10	-0.07	-0.07	-0.09	0.01	0.00	0.00
X2 (Total Liabilities/ Total Assets)	0.79	0.82	0.85	0.83	0.84	0.99	0.99	0.99	0.99	0.97	1.04
X3 (Current Assets/Current Liabilities)	0.26	0.46	0.49	0.46	0.33	0.37	0.46	0.36	0.30	0.37	0.96
Zmijewski Score	0.49	0.36	0.51	0.64	0.95	1.64	1.68	1.72	1.31	1.22	1.60
Financial Stress	No										

Source: Computed by Authors

**Table 8: Zmijewski Score of Sangrur Dairy Unit**

<b>Sangrur</b>	<b>2010-11</b>	<b>2011-12</b>	<b>2012-13</b>	<b>2013-14</b>	<b>2014-15</b>	<b>2015-16</b>	<b>2016-17</b>	<b>2017-18</b>	<b>2018-19</b>	<b>2019-20</b>	<b>2020-21</b>
X1 (Net Income/Total Assets)	0.03	0.01	-0.02	0.01	0.00	0.01	0.00	0.01	0.01	-0.05	-0.11
X2 (Total Liabilities/ Total Assets)	0.86	0.87	0.88	0.80	0.88	0.98	0.99	0.07	0.53	0.57	1.39
X3 (Current Assets/Current Liabilities)	3.40	2.53	3.97	2.63	2.24	0.43	0.78	0.68	0.48	0.58	0.63
Zmijewski Score	0.46	0.57	0.76	0.23	0.69	1.26	1.34	-3.94	-1.30	-0.82	5.24
Bankruptcy	No	Yes	Yes	Yes	No						

Source: Computed by Authors

**Table 9: Zmijewski Score of Ludhiana Dairy Unit**

<b>Ludhiana</b>	<b>2010-11</b>	<b>2011-12</b>	<b>2012-13</b>	<b>2013-14</b>	<b>2014-15</b>	<b>2015-16</b>	<b>2016-17</b>	<b>2017-18</b>	<b>2018-19</b>	<b>2019-20</b>	<b>2020-21</b>
X1 (Net Income/Total Assets)	0.04	0.01	0.04	0.05	0.04	0.03	0.03	0.01	0.01	0.01	0.01
X2 (Total Liabilities/ Total Assets)	1.77	0.09	0.48	0.44	0.59	0.83	0.88	0.31	0.34	0.24	3.41
X3(Current Assets/Current Liabilities)	1.36	1.78	1.22	0.32	1.18	66.02	3.91	1.16	0.07	4.30	0.29
Zmijewski Score	5.61	-3.80	-1.75	-2.00	-1.11	0.00	0.60	-2.55	-2.40	-2.99	15.26
<b>Bankruptcy</b>	<b>No</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>No</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>No</b>

Source: Computed by Authors

Table 10: Comparative analyses of Springate Score and Zmijewski Score for the selected dairy units of Punjab

Springate Model												
Dairies	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	Average
Bathinda	0.19	0.35	3.57	0.31	0.80	0.52	0.34	0.28	0.21	0.55	1.41	0.78
Patiala	0.75	1.84	2.23	1.97	2.33	1.75	17.8	0.49	0.44	1.46	306.05	2.81
Gurdaspur	0.57	1.05	1.58	1.39	1.52	1.38	1.57	0.34	0.28	1.16	0.71	1.05
Sangrur	1.79	0.87	0.66	0.89	-55.0	0.24	0.27	0.32	0.07	-0.79	-0.17	-4.62
Ludhiana	1.74	0.28	1.71	1.68	1.58	21.9	2.49	0.70	0.36	11.6	-0.32	3.95
<b>Zmijewski Model</b>												
Bathinda	-0.08	1.59	0.30	0.89	0.76	1.19	1.29	-0.92	-1.15	-1.26	7.42	0.91
Patiala	-3.50	-0.79	-1.11	-1.04	-1.80	-0.25	-2.22	0.59	0.49	-0.06	2.97	-0.61
Gurdaspur	0.49	0.36	0.51	0.64	0.95	1.64	1.68	1.72	1.31	1.22	1.60	1.1
Sangrur	0.46	0.57	0.76	0.23	0.69	1.26	1.34	-3.94	-1.30	-0.82	5.24	0.41
Ludhiana	5.61	-3.80	-1.75	-2.00	-1.11	0.00	0.60	-2.55	-2.40	-2.99	15.26	0.44

Source: Computed by Authors