

# EARLY WARNING ASSESSMENT OF BANK FAILURE RISK: A SPRINGATE MODEL APPLICATION TO HDFC BANK

K.Sathya<sup>#1</sup>, Dr A.Latha<sup>#2</sup>

Research Scholar, Department of Commerce, Government Arts College, Coimbatore, Tamil Nadu, India.  
Associate Professor, Department of Commerce, Government Arts College, Coimbatore, Tamil Nadu, India.

<sup>1</sup> [Sathyaks007.sk@gmail.com](mailto:Sathyaks007.sk@gmail.com) <sup>2</sup> [lathakarthiskeyan03@gmail.com](mailto:lathakarthiskeyan03@gmail.com)

**Abstract**—This study examines the failure risk of HDFC Bank by applying the Springate bankruptcy prediction model as an early warning assessment tool. In the context of increasing financial complexity and regulatory scrutiny in the Indian banking sector, early detection of financial distress has become crucial for ensuring banking stability and depositor confidence. Using secondary financial data derived from audited annual reports over a multi-year period, the study computes Springate scores based on key profitability, liquidity, efficiency, and solvency ratios. The results indicate that HDFC Bank consistently maintains Springate scores above the critical cut-off value, suggesting a low probability of financial failure during the study period. Trend analysis further reveals stable financial performance and resilience against short-term shocks, reflecting strong internal controls and risk management practices. The findings validate the applicability of the Springate model as an effective early warning mechanism for bank-level failure risk assessment in emerging economies. The study contributes to the existing literature by extending the application of corporate bankruptcy prediction models to the banking sector, offering practical insights for regulators, investors, and policymakers concerned with financial stability.

**Keywords**—Bank Failure Risk, Early Warning System, Springate Model, Indian Banking Sector

## I. INTRODUCTION

In India, banking institutions in the private sector have experienced rapid growth in terms of asset size, digital reach, and lending activity. Even though the Reserve Bank of India's stringent regulations, current pressure in certain financial regulatory oversight may not be sufficient to predict the initial phase. As a result, models that quantitatively forecast failure using financial indicators have become increasingly important in banking studies.

Against this backdrop, the current study applies the Springate model for predicting bankruptcy on HDFC Bank, which is one of the largest private sector banks in India, to evaluate its failure risk over a multiple year. By examining the trend and consistency of Springate scores, the study aims to suggest the suitability of the model as an early warning mechanism in the Indian banking context. The findings are expected to provide insights for regulators, investors, and policymakers concerned about how stable banks are and the risk they pose to the system

## II REVIEW OF LITERATURE:

Hermanto (2025) conducts a comparative analysis of Springate alongside Grover and Zmijewski models on banks listed on the Indonesia Stock Exchange (2023–2024) and finds varying predictive accuracy across models, suggesting practical considerations for model selection in banking distress prediction.

Polynesian research (2025) analysing delisted companies finds that Springate provides more consistent bankruptcy classification than Altman Z-Score and Interest Coverage Ratio, demonstrating the continued

relevance of Springate across industries and validating its usability in distress classification.

Sari & Seran (2025) provide an extensive literature analysis of financial distress prediction methods in the banking sector, noting that traditional models like Springate remain in use while artificial intelligence and machine learning models gain traction due to higher predictive accuracy.

Rejimon, Sinosh & Krishnaveni (2025) adopt the Springate model combined with logit probability approaches for manufacturing firms, highlighting mixed outcomes where Springate shows sound financial indicators but different models may signal risk, suggesting triangulation in failure prediction research.

Rane & Kanetkar (2024) examine the relevance of bankruptcy prediction models (including Springate) for NBFCs and propose novel indices that improve prediction accuracy, highlighting the need for model adaptation to financial institutions' unique risk profiles.

Agustina and Hilaludin (2024) compare Springate S-Score with Altman Z-Score using a mixed-method approach, showing the relative performance of both bankruptcy prediction models on corporate firms. This provides context for evaluating the comparative strengths and weaknesses of Springate in early warning systems.

Al-abbasi & Mohammed (2024) apply the Springate model to predict financial failure in private Iraqi banks from 2013–2022, concluding that while results vary, the model can be employed to assess financial stability and recommend early intervention.

### 3. OBJECTIVES OF THE STUDY

- To analyse the Springate scores of HDFC Bank over the selected study period.
- To evaluate whether HDFC Bank's springate scores remain above the critical cut-off point, indicating financial soundness.

### 4. RESEARCH METHODOLOGY

The current study was conducted using secondary data for the period of 10 financial years from 2015-16 to 2024-25. The required data for the analysis has been obtained from published sources like annual reports of HDFC Bank and many other websites. The Springate model was used as a statistical tool to analyse the early warning Assessment of bank failure risk.

#### SPRINGATE MODEL

$$S\text{-Score} = (1.03X1) + (3.07X2) + (0.66X3)$$

Where,

X1 = WORKING CAPITAL/TOTAL ASSETS

X2 = EARNINGS BEFORE INTEREST

& TAX /TOTAL ASSETS

X3 = EARNINGS BEFORE INTEREST

& TAX/CURRENT LIABILITIES

As per S Score Model, if

Springate Score	Failure Risk Status
$S < 0.862$	Distress Zone
$S \geq 0.862$	Safe Zone

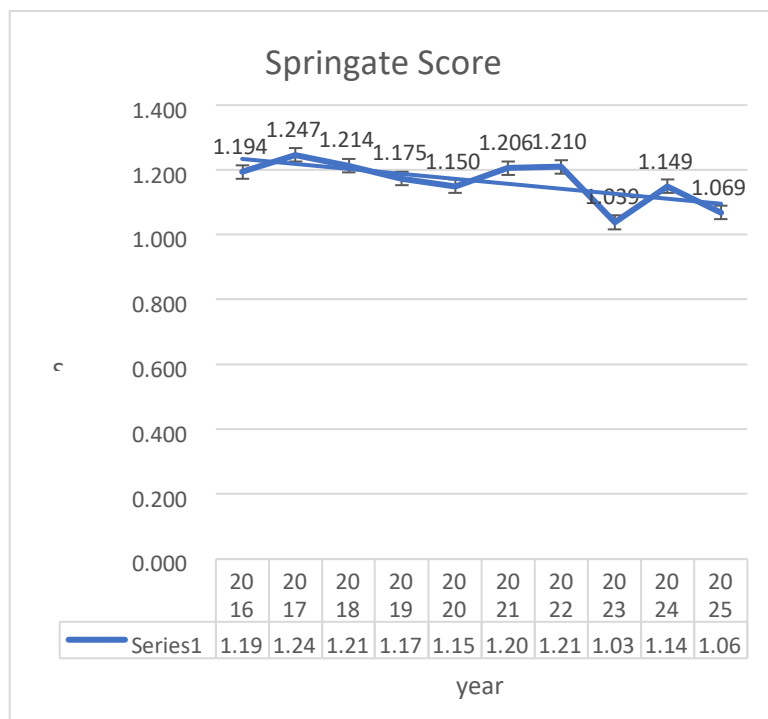
Table 1 – S-Score of HDFC Bank from 201516 to 2024-25

S-SCORE				
YEAR	S1	S2	S3	S-SCORE
2016	0.765	0.020	0.523	1.194
2017	0.748	0.024	0.611	1.247
2018	0.736	0.024	0.581	1.214
2019	0.702	0.024	0.574	1.175
2020	0.697	0.024	0.543	1.150
2021	0.719	0.026	0.584	1.206
2022	0.726	0.025	0.583	1.210
2023	0.682	0.026	0.390	1.039

2024	0.712	0.026	0.507	1.149
2025	0.658	0.026	0.472	1.069

Source: Calculated from Annual Reports of HDFC Bank from 2016-2025

Chart:1 S-Score Analysis of HDFC Bank



### 6. FINDINGS:

By analysing the S-Score of HDFC Banks in the last 10 years, the S-Score remained consistently above the critical cutoff value of 0.862 throughout the study period, indicating that HDFC Bank falls within the safe zone.

### 7. CONCLUSION

The present study applied the springate bankruptcy prediction model to assess the failure risk of HDFC Bank from an early warning perspective. The empirical findings reveal that HDFC Bank is within the financial safe zone throughout the period of analysis. The stability and persistence of springate scores indicate strong fiscal fundamentals and suggest a low probability of financial failure during the study period.

### 8. REFERENCES

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