



# Loans vs. Credit Cards in Indian Banking: A Game Theory Perspective Financial Study

Mr. Franshu Mahipal, Dr. Anita Rani Kamboj

Research Scholar, Assistant Professor

Department of Mathematics, Tanta University Sri Ganganagar.

**Abstract:** This study presents a comparative financial analysis of loans and credit cards within the Indian banking sector. By examining their structure, interest mechanisms, repayment patterns, and risk factors, the research highlights how these two credit products serve different financial needs and customer segments. The paper explores data from both public and private banks to understand how lending strategies vary between institutions such as the State Bank of India (SBI) and Housing Development Finance Corporation (HDFC) Bank. Key indicators like interest rates, default rates, and customer usage trends are explored to assess the financial impact of each product on both banks and borrowers. The findings reveal that while loans offer stability and are suited for long-term needs, credit cards provide flexibility but carry higher financial risk. This study aims to guide consumers in choosing the right credit product and help banks optimize their credit strategies for sustainable financial growth.

**Keywords:** Game Theory, Indian Banking, Loan & Credit Cards.

## I. Introduction:

The Indian banking sector has witnessed significant transformation over the past decade, marked by digitization, financial inclusion policies, and an increase in consumer credit access. Two of the most commonly utilized credit instruments in this environment are **loans** and **credit cards**, each offering distinct financial structures, risk profiles, and consumer benefits. Loans are generally associated with long-term financial goals such as purchasing homes, vehicles, or funding education. They offer structured repayment terms, lower interest rates, and often involve collateral or detailed documentation (Mohan & Prasad, 2020). In contrast, credit cards provide short-term liquidity, convenience, and rewards-based incentives for everyday purchases. However, they are also associated with higher interest rates, increased default risk, and greater reliance on unsecured lending (Kaur, 2018; Mehta & Reddy, 2020). Public and private sector banks in India approach these credit tools differently. **State Bank of India**, representing the public sector, often aligns its lending policies with broader socio-economic goals, emphasizing financial inclusion and rural credit expansion. Its credit strategy tends to prioritize secured, long-term lending with policy backing (Mohan & Prasad, 2020; RBI, 2023). In contrast, **HDFC Bank**, a leading private bank, has been at the forefront of deploying digital banking infrastructure, AI-based credit scoring, and customer-focused credit card campaigns. Its approach emphasizes speed, flexibility, and profitability through unsecured products like credit cards and personal loans (Sharma & Das, 2021; PwC, 2023).

Research indicates that while loans offer stable and predictable revenue streams for banks, credit cards—though lucrative in terms of interest and fee income—introduce higher risks due to the unsecured nature of lending and evolving consumer behavior. Agarwal and Chatterjee (2022) found that credit card portfolios, especially in urban markets, provide superior short-term returns but come with heightened exposure to delinquencies. The **RBI Financial Stability Report (2023)** supports this view, noting a post-pandemic surge in unsecured credit lending, particularly in the form of credit cards, raising concerns over systemic risk if not properly managed.

While individual product studies are abundant, there exists a lack of comparative financial analysis between loans and credit cards within the frameworks of public and private sector banks. This study fills that gap by analyzing key financial indicators—Net Interest Margin (NIM), Non-Performing Assets (NPAs), and Return on Assets (ROA)—from FY2019 to FY2024 for **SBI** and **HDFC Bank**. These indicators reflect profitability, risk exposure, and operational efficiency, offering a holistic view of how these products contribute to each bank's overall performance.

By drawing a side-by-side comparison of the financial structures, customer usage patterns, and strategic positioning of loans and credit cards, this research provides meaningful insights for stakeholders. The findings aim to support improved lending strategies for banks and more informed credit choices for consumers. As India progresses toward a digital-first economy with deeper credit penetration, understanding the trade-offs between loan-based and card-based credit models is critical for promoting responsible borrowing and maintaining financial system stability.

**2. Methods:** This study follows a **comparative financial analysis approach**, integrating **game theory models** to explore strategic decision-making in the use of **loans and credit cards** by two leading Indian banks—**SBI** (public sector) and **HDFC Bank** (private sector). The research is **descriptive, analytical, and model-based**, using **secondary data** from 2019 to 2024.

### 2.1 Data Sources:

Annual reports of SBI and HDFC Bank.

RBI Financial Stability Reports.

PwC, Deloitte, and NASSCOM banking reports.

Published journals, academic papers, and bank websites.

### 2.2 Analytical Tools and Financial Techniques:

Ratio analysis (e.g., NIM, NPAs, ROA).

Trend analysis (loan/credit growth, default rates).

SWOT analysis for credit strategy.

Comparative tables and graphs.

### 2.3 Game Theory Methods Used:

**Nash Equilibrium:** To analyze borrower-bank interactions where both aim to maximize benefit.

**Stackelberg Model:** Applied to understand how one bank (leader) sets strategies.

**Signaling Games:** Used to study how banks signal creditworthiness through product features, interest rates.

**Prisoner's Dilemma:** To model risk in credit expansion—banks may lend aggressively to gain market share.

## 3. Results & Discussion:

In This section presents a comprehensive analysis of the financial and strategic performance of SBI and HDFC Bank over the six-year period from FY (Final Year) 2019 to FY2024.

Metric	Bank	FY2019	FY2020	FY2021	FY2022	FY2023	FY2024
Net Interest Margin (NIM)	SBI	2.95%	3.02%	3.05%	3.12%	3.37%	3.28%
	HDFC	4.30%	4.20%	4.10%	4.00%	3.90%	3.41%
Gross NPA	SBI	7.53%	6.15%	4.98%	3.97%	2.78%	2.24%
	HDFC	1.36%	1.26%	1.20%	1.18%	1.24%	1.24%
Net NPA	SBI	3.01%	2.23%	1.50%	1.02%	0.67%	0.57%
	HDFC	0.39%	0.36%	0.34%	0.33%	0.33%	0.33%
Return on Assets (ROA)	SBI	0.38%	0.49%	0.61%	0.76%	0.96%	1.04%
	HDFC	1.88%	1.90%	1.95%	1.96%	1.99%	1.74%

**Table 1:** Summary Ratio Analysis of NIM,NPA,ROA

### 3.1 NIM(Net Interest Margin):

NIM is vital for understanding the bank's core earnings from lending activities. It reflects the success of interest rate spread management and the institution's ability to optimize its asset-liability portfolio. **SBI** demonstrated a consistent upward trend in NIM, improving from **2.95% in FY2019 to 3.28% in FY2024**. This suggests a progressive enhancement in interest income generation relative to interest expenditure, possibly due to better lending rates and improved asset quality. **HDFC Bank**, while historically maintaining a **higher NIM** (4.30% in FY2019), experienced a gradual decline to **3.41% in FY2024**. This fall may be attributed to increased funding costs, competitive loan pricing, or structural changes post-merger.

### 3.2 Gross & Net NPAs:

NPAs signify credit risk and impact the bank's profitability, capital adequacy, and investor confidence. Lower NPAs reflect efficient credit appraisal and robust recovery mechanisms. **SBI** has significantly improved its asset quality, with **Gross NPA decreasing from 7.53% in FY2019 to 2.24% in FY2024**, and **Net NPA dropping from 3.01% to 0.57%** over the same period. These figures underscore better loan performance, successful resolution strategies, and aggressive provisioning. **HDFC Bank**, on the other hand, maintained **exceptionally low NPAs** throughout the period. Gross NPA remained around **1.2%**, and Net NPA hovered at **0.33%**, indicating strong credit risk controls and superior portfolio quality.

### 3.3 ROA(Return on Assets):

A higher ROA signifies better asset utilization and managerial efficiency. It is a crucial indicator of the overall performance and profitability of the bank. **SBI** recorded substantial growth in ROA, increasing from **0.38% in FY2019 to 1.04% in FY2024**, reflecting improved profitability, enhanced operational efficiency, and better asset quality. **HDFC Bank** consistently posted **high ROA values**, ranging from **1.88% to 1.99%** in earlier years, though it slightly dipped to **1.74% in FY2024**, potentially due to structural adjustments following its merger and a broader asset base.

Metric	Bank	FY2019	FY2020	FY2021	FY2022	FY2023	FY2024
Loan Growth (YOY)	SBI	11.95%	8.58%	5.23%	10.95%	15.38%	15.24%
	HDFC	24.47%	21.23%	18.45%	19.30%	20.90%	55.20%
Default Rate (Slippage Ratio)	SBI	2.57%	2.16%	1.83%	1.12%	0.65%	0.62%
	HDFC	~1.80%	~1.75%	~1.70%	~1.65%	1.79%	1.75%

**Table 2:** Summarize About Loan Growth, Default Rate of FY-2019 to 2024

From Table-2 We can say SBI Loan growth improved from 5.23% (FY2021) to 15.24% (FY2024). Default rate (slippage) dropped significantly from 2.57% to 0.62%, showing better asset quality and lending discipline. HDFC Bank Maintained high loan growth, jumping to 55.20% in FY2024 post-merger. Slippage ratio remained stable (~1.7–1.8%), reflecting strong risk control despite rapid expansion. HDFC Bank leads in growth and consistency. SBI shows strong improvement in both lending and risk management.

Game Theory Model	Example Comparison	Better Performer	Reason
Nash Equilibrium	Loan rate vs. terms (SBI vs. HDFC)	HDFC	Balances risk and reward efficiently
Stackelberg Model	Product launch and follower response	HDFC	Leads in digital & credit innovation
Signaling Game	Eligibility signals and credit policy	HDFC	Attracts low-risk, high-value clients
Prisoner's Dilemma	Aggressive lending vs. caution	HDFC	Maintains credit quality in competition

**Table 3:** Summarize Game Theory Models Nash Equilibrium, Stackelberg Model, Signaling Game, Prisoner's Dilemma

### 3.4 Nash Equilibrium:

Nash Equilibrium is a foundational concept in game theory where each player, in a strategic setting, selects the best possible strategy after considering the choices of others.

At this point, no player can gain by changing their decision alone they are all acting optimally given the circumstances.

This equilibrium ensures stability, as everyone's current choices are their best responses to competitors' actions.

Mathematically, a set of strategies forms a Nash Equilibrium if:

$$\forall i, u_i(s^*_i, s^*_{-i}) \geq u_i(s_i, s^*_{-i}) \text{ for all possible } s_i$$

Where:

$u_i$  : payoff function of player  $i$

$s^*_i$  : optimal strategy of player  $i$

$s^*_{-i}$  : strategies of all other players

*Practical Example (SBI vs. HDFC)*

SBI and HDFC design their loan products by adjusting interest rates and repayment terms, while monitoring each other's strategies. If SBI offers low rates with strict terms and HDFC offers slightly higher rates with flexible terms, customers will weigh cost against convenience. A Nash Equilibrium occurs when neither bank can gain by changing its offer independently.

In this scenario, HDFC performs better by achieving a stable balance between customer appeal and profitability, attracting quality borrowers without increasing risk.

### 3.5 Stackelberg Model:

The Stackelberg Model is a strategic game in game theory where players move sequentially. One player acts as the leader and makes the first move, while the other (the follower) responds after observing the leader's action. This setup gives the leader a first-mover advantage, allowing it to influence market outcomes and shape the follower's behavior. The model is particularly relevant in markets where firms compete on strategies like pricing, innovation, or product launches. In this framework, the leader anticipates the follower's best response and selects a strategy that maximizes its own benefit. The follower, in turn, reacts optimally to the leader's decision, trying to maximize its own outcome based on the given situation.

*Practical Example (HDFC vs. SBI)*

In India's banking sector, HDFC Bank acts as a Stackelberg leader, especially in digital innovation and credit services. It frequently introduces new digital platforms, instant credit approvals, and AI-based lending tools ahead of its peers. These initiatives establish a strong early presence, attract tech-savvy customers, and set service benchmarks. Banks like SBI observe these innovations and often respond by adopting similar technologies or improving upon them. However, HDFC enjoys a lasting advantage due to early customer engagement, brand value, and market leadership. Thus, under the Stackelberg model, HDFC emerges as the better performer by influencing the strategic direction of its competitors.

### 3.6 SIGNALING GAME:

The Signaling Game is a game theory model that involves communication between two players where one has more information than the other. The player with more information (the sender) sends a signal to convey their type or quality, while the other (the receiver) makes a decision based on the observed signal. This model addresses issues of asymmetric information, often found in finance, labor markets, and insurance. A signal is considered credible when it is costly or difficult to fake, which helps differentiate high-quality from low-quality players. When signals successfully distinguish between types, a separating equilibrium is achieved, leading to more efficient decision-making.

*Practical Example (HDFC vs. SBI)*

HDFC Bank, in its lending and credit card policies, uses strict eligibility criteria as a form of signaling to potential customers. By requiring high credit scores, verifiable income, and strong repayment history, HDFC signals that it prefers to work with low-risk, high-value clients. These signals attract financially stable borrowers who are confident in their profiles and reduce the chance of defaults. Customers who meet the criteria view HDFC as a premium lender, while those who do not may approach broader-policy banks like SBI. Through this signaling mechanism, HDFC builds a strong, low-risk client base and enhances its brand reputation. As a result, HDFC performs better under the Signaling Game model by reducing asymmetric information and improving loan portfolio quality.

### 3.7 PRISONER'S DILEMMA:

The Prisoner's Dilemma is a classic game theory model illustrating how two rational players might not cooperate, even if it appears to be in their best interest. In a competitive setting, each player faces a temptation to act in self-interest, which can lead to suboptimal outcomes for both.

In the context of banking, SBI and HDFC must decide between aggressive lending to expand market share or cautious lending to preserve credit quality. If both banks lend cautiously, they maintain overall financial health. If one lends aggressively while the other stays cautious, the aggressive lender may gain market share. However, if both lend aggressively, the risk of bad debts increases, leading to lower profitability for both. This situation reflects the core structure of the Prisoner's Dilemma: cooperation (cautious lending) would yield better joint outcomes, but competitive pressure pushes both toward riskier strategies.

HDFC is considered the better performer in this scenario. It manages to maintain credit quality despite the competitive environment, suggesting a disciplined lending approach that resists short-term gains for long-term stability. This cautious strategy ensures sustainable growth and minimizes non-performing assets (NPAs). The model demonstrates that rational banks must weigh competitive behavior against systemic risk, and HDFC's consistent performance shows the advantage of long-term prudence over short-term gains.

### 4. Conclusion and Future Directions:

This study presents a comprehensive comparative analysis of the lending and credit card strategies of two leading Indian banks SBI (public sector) and HDFC Bank (private sector)—through a dual lens of financial performance and game theory models. Using data from 2019 to 2024, we examined critical metrics such as Net Interest Margin (NIM), Non-Performing Assets (NPAs), Return on Assets (ROA), and loan growth trends, supplemented by ratio and trend analyses. HDFC Bank consistently outperformed SBI in terms of profitability (higher ROA), asset quality (lower NPAs), and operational efficiency. However, SBI showed notable improvement over the years, especially in reducing NPAs and enhancing returns, indicating strengthened governance and recovery mechanisms. While HDFC led in private banking innovation and premium customer engagement, SBI leveraged its wide public sector network to improve steadily across all financial indicators.

The incorporation of **Game theory** provides a strategic dimension to this financial comparison. Through the **Nash Equilibrium**, we observed that HDFC achieved a balanced position between profitability and borrower satisfaction. In the **Stackelberg Model**, HDFC acted as the market leader, pioneering digital and credit innovations, with SBI responding in due course. The **Signaling Game** highlighted HDFC's strategy of attracting low-risk customers through stringent eligibility filters, while SBI focused on financial inclusion. Lastly, under the **Prisoner's Dilemma**, HDFC stood out by maintaining credit quality even amidst competitive lending pressures, showcasing prudence in its long-term strategy. In conclusion, while both banks have distinct operational models shaped by their sectoral affiliations, **HDFC Bank emerges as the stronger strategic performer** due to its consistent financial metrics, controlled risk exposure, and proactive market leadership. SBI's progress, however, reflects a significant institutional transformation and a strong trajectory toward operational resilience. Integrating game theory with traditional financial analysis not only reveals the dynamics behind strategic banking decisions but also offers valuable insights into competitive behavior, signaling value, and sustainable credit growth in India's evolving banking landscape.

This study can be expanded by including more banks to capture a broader competitive landscape. Future research may explore dynamic game theory models, digital lending strategies, and customer behavioral responses. The role of AI in credit assessment, regulatory impacts, and ESG-driven lending also offer rich avenues for analysis. Additionally, stress-testing strategic decisions under economic shocks could enhance understanding of bank resilience. Integrating such dimensions will deepen insights into India's evolving credit ecosystem.

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