

# Performance Evaluation of Selected NBFCs in India - Using Tobin's Q Ratios with Fuzzy Logic Views

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**Abstract**—This study evaluates the valuation dynamics of five prominent Non-Banking Financial Companies (NBFCs) in India Bajaj Finance Ltd, Indian Railway Finance Corp Ltd (IRFC), Cholamandalam Investment & Finance Co Ltd, Shriram Finance Ltd, and Muthoot Finance Ltd from 2021 to 2025 using Tobin's Q ratio, augmented with fuzzy logic to address uncertainties in traditional binary classifications. Tobin's Q, calculated as the ratio of market value to asset replacement cost, is fuzzified through triangular and trapezoidal membership functions to assign degrees (0–1) to undervalued ( $Q < 1$ ), fair-valued ( $Q = 1$ ), and overvalued ( $Q > 1$ ) categories, providing nuanced insights into market perceptions amid economic recovery, regulatory changes, and sector-specific drivers. Key findings reveal a predominant overvaluation trend across the cohort, with fuzzy overvalued degrees often reaching 1.00, reflecting investor confidence in NBFCs' growth in retail lending, infrastructure financing, and financial inclusion. Bajaj Finance and Cholamandalam exhibited persistent overvaluation, driven by consumer credit expansion, while Muthoot Finance's Q values are fluctuated with gold prices. IRFC transitioned sharply from fair/undervalued to overvalued post-2023, fueled by rail sector optimism. Shriram Finance maintained relative balance, with evolving mixed memberships, highlighting stability in MSME/rural segments. The analysis underscores NBFCs' resilience, with projected 15–17% asset growth for FY26, but warns of risks from liquidity mismatches and premiums potentially unsustainable in volatile conditions. Fuzzy logic's granularity aids investors in identifying transitional opportunities, recommending diversified strategies for long-term value in India's evolving financial landscape.

**Index Terms**—Fuzzy logic, India Bajaj Finance Ltd, Indian Railway Finance Corp Ltd (IRFC), Cholamandalam Investment & Finance Co Ltd, Shriram Finance Ltd, Muthoot Finance Ltd, Tobin's Q

## I. INTRODUCTION

Introduction to Non-Banking Financial Companies (NBFCs) in India

Non-Banking Financial Companies (NBFCs) play a pivotal role in India's financial ecosystem, complementing traditional banks by providing diverse financial services. Unlike banks, NBFCs do not hold a banking license but engage in activities such as lending, investment, and asset financing, catering to niche markets and underserved segments. Regulated by the Reserve Bank of India (RBI) under the RBI Act, 1934, NBFCs offer services like personal loans, vehicle financing, microfinance, and housing finance, often with greater flexibility than banks.

NBFCs are critical in promoting financial inclusion, especially in rural and semi-urban areas, by extending credit to small businesses, entrepreneurs, and individuals with limited access to banking services. They bridge the gap in sectors like infrastructure financing, gold loans, and consumer durables, driving economic growth. As of 2025, the NBFC sector has grown significantly, with companies like Bajaj Finance Ltd, Cholamandalam Investment & Finance Co Ltd, and Muthoot Finance

Ltd leading the market through innovative products and digital platforms.

Despite their contributions, NBFCs face challenges such as regulatory compliance, liquidity risks, and

competition from banks and fintechs. However, their ability to adapt to evolving market needs and leverage technology ensures their continued relevance in India's dynamic financial landscape.

Role of Non-Banking Financial Companies (NBFCs) in Economic Growth in India  
Pic-1



Source: <https://www.indiatrader.com/blog/why-nbfc-are-stealing-the-show-in-india's-financial-markets/9595>

Non-Banking Financial Companies (NBFCs) are integral to India's economic growth, acting as vital conduits for credit and financial services, particularly in underserved and unbanked segments. Their role in fostering financial inclusion, supporting small businesses, and driving consumption-led growth has made them significant contributors to India's economic landscape in 2025. Below is an overview of their contributions, followed by the references used to inform this response.

#### NBFCs and Economic Growth

**Stimulating Financial Inclusion:** NBFCs extend credit to underserved populations, such as rural and semi-urban communities, gig economy workers, micro-entrepreneurs, and individuals with limited or no credit history. By offering loans to these segments, NBFCs enhance financial access, enabling greater participation in the economy. For instance, their focus on retail lending (48% of total credit in FY24 compared to 34% for banks) supports individual borrowers and small businesses, boosting local economies.

**Supporting Micro, Small, and Medium Enterprises (MSMEs):** NBFCs play a critical role in providing credit to MSMEs, which are key drivers of employment and GDP in India. Their flexible lending criteria and faster loan processing compared to banks make them a preferred choice for small businesses, fostering entrepreneurship and job creation. This is particularly evident in sectors like microfinance and SME loans, which fuel economic activity in Tier 2 and Tier 3 cities.

**Influencing Consumption and Retail Credit Growth:** NBFCs have capitalized on rising consumer demand by offering personal loans, vehicle financing, consumer durables, and housing loans. In FY25, India's retail credit market reached US\$ 937 billion, with NBFCs leading the charge due to low credit penetration and high demand. This surge in retail credit stimulates consumption, contributing to GDP growth.

**Infrastructure and Green Financing:** NBFCs, such as Indian Railway Finance Corporation (IRFC), support large-scale infrastructure projects, which are critical for economic development. Additionally, their increasing focus on green financing aligns with

India's sustainability goals, such as achieving net-zero emissions by 2070, fostering inclusive and low-carbon growth.

**Technological Innovation and Efficiency:** By partnering with fintech platforms and leveraging digital tools like mobile-based loan origination and data analytics, NBFCs have reduced costs and improved turnaround times. Innovations like Buy Now Pay Later (BNPL) apps (e.g., Lazypay) increase liquidity and consumer spending, further stimulating economic growth.

**Economic Resilience and Post-Pandemic Recovery:** NBFCs have been instrumental in the post-COVID economic revival by quickly disbursing loans to support consumption and business recovery. Their ability to cater to diverse sectors, from retail to infrastructure, has helped sustain economic momentum, with NBFC credit growth outpacing India's GDP growth at a CAGR of 12% from FY19 to FY24.

#### Challenges and Outlook

Despite their contributions, NBFCs face challenges such as regulatory scrutiny, asset-liability mismatches, and dependence on market borrowings, which could impact growth in FY25 and FY26. However, their projected asset growth of 15-17% year-on-year remains above the decadal average, driven by core segments like home and vehicle loans. Supportive government policies and technological advancements position NBFCs for continued growth, particularly in MSME and green finance sectors.

#### Strategies and Milestones

The following is a detailed overview of the strategies and key milestones for selected Non-Banking Financial Companies (NBFCs). This information is compiled from recent financial reports, investor presentations, and market analyses, focusing on their growth trajectories, innovations, and achievements.

##### Bajaj Finance Ltd

Bajaj Finance Ltd, a leading consumer finance NBFC, emphasizes digital transformation and diversified lending to drive sustainable growth. The company's strategies include:

- **BFL 3.0: AI-Powered Fintech Innovation:** Focus on AI for customer engagement, revenue growth, productivity enhancement, and cost reduction,

with significant customer acquisition through digital platforms.

- **Green Finance and Tech Innovations:** Enter new growth cycles with macroeconomic improvements, reviving demand, and tech-driven products like partnerships with platforms.
- **Expansion in Gold Loans and Diversification:** Scale gold loan business to 1,209 branches, targeting underserved segments with flexible lending.
- The company has achieved several milestones, including:
- **Customer Franchise Growth:** Crossed 100 million customers, reaching 101.82 million as of March 31, 2025.
- **Network Expansion:** Added 118 new locations in FY25, enhancing rural and semi-urban reach.
- **Gold Loan AUM Surge:** Achieved 81% YoY growth to Rs 8,307 crore by March 31, 2025.

##### Indian Railway Finance Corp Ltd (IRFC)

IRFC, a Navratna PSU under the Ministry of Railways, focuses on funding railway infrastructure while diversifying into adjacent sectors for resilience. The company's strategies include:

- **Financing Railway Innovations:** Mobilize funds for locomotives, coaches, train operations, and passenger amenities to align with Indian Railways' vision for operational efficiency.
- **Diversification Beyond Railways:** Pivot to ports, logistics, and renewables amid declining railway borrowings.
- **Sustainable Funding Models:** Maintain strong credit ratings and explore budgetary resources to support long-term rail projects.

The company has achieved several milestones, including:

- **Record Q1 FY25-26 Performance:** Achieved strongest quarterly results with total income of Rs 6,918.24 crore.
- **Dividend Announcements:** Declared interim dividend of Rs 0.80 per share in March 2025.

##### Cholamandalam Investment & Finance Co Ltd

Cholamandalam, part of the Murugappa Group, prioritizes diversified lending and customer-centric financial solutions. The company's strategies include:

- Comprehensive Loan Portfolio Expansion: Offer vehicle, home, personal, and SME loans, including supply chain financing and term loans for capex.
- Secured Business Loans for Growth: Focus on fast approvals and flexible options to support business expansion.

The company has achieved several milestones, including:

- Incorporation and Legacy: Established in 1978 as the financial arm of Murugappa Group, evolving into a diversified NBFC.
- Employee Welfare Achievements: Recognized under EPFO's Prayaas Yojana, providing pensions to employees in 2025.

#### Shriram Finance Ltd

Shriram Finance targets underserved segments with a focus on inclusive growth and asset diversification. The company's strategies include:

- Diversification and Stable Investments: Emphasize asset class diversification, fixed deposits for returns, and investments in growth sectors like MSMEs and EVs.
- Customer-Centric Product Development: Create cost-effective products tailored to customer needs.

The company has achieved several milestones, including:

- AUM Growth: Assets under management reached Rs 2,72,249 crore, up 16.6% YoY as of June 2025.
- Future AUM Target: Aims to exceed Rs 3 lakh crore in FY26 with 15% loan growth.

#### Muthoot Finance Ltd

Muthoot Finance, the largest gold loan NBFC, leverages gold collateral for stable growth while diversifying. The company's strategies include:

- Effective Business Finance Management: Focus on debt reduction, work-life balance, and ethical investing via ESG mutual funds.
- Diversification into Gold Loans: Stabilize operations through gold loan expansion.

The company has achieved several milestones, including:

- Gold Loan AUM Milestone: Crossed Rs 1 lakh crore in March 2025.
- Q4 FY25 Results: Net profit surged 43% to Rs 1,508 crore, revenue up 35% to Rs 5,622 crore.

## II. REVIEW OF LITERATURE

This study develops an expert system that uses fuzzy membership functions to rank financial securities and form portfolios. The approach considers 22 financial market and fundamental variables, simplifying decision-making while evaluating numerous factors. The results show that portfolios formed using this method can outperform the market, with one portfolio (P5) achieving a 3.39% higher return than the market. A portfolio strategy of shorting the lowest-performing portfolio (P1) and taking a long position in P5 would have resulted in a 3.68% higher return than the market. The risk-adjusted performance of four out of five portfolios and the net portfolio compare favorably to the market, indicating that fuzzy logic can be a useful tool in stock portfolio formation. (Andrew J. Jacob, Amit K. Sinha, 2018)

This systematic review examines the application of neural networks, fuzzy logic-based models, and genetic algorithms in brain tumor classification, analyzing 53 studies published in the last decade. The review highlights the significance of these techniques in medical image processing, particularly in brain tumor detection using magnetic resonance imaging (MRI). Convolutional neural networks (CNNs) and machine learning (ML) models are widely used, with neural networks demonstrating strong learning ability and accuracy but requiring large datasets. Fuzzy logic offers interpretability and handles uncertainty well but may lack precision in complex patterns, while genetic algorithms are effective in feature selection and optimization but are computationally intensive. Despite their potential, these techniques face challenges, including long training times and insufficient dataset sizes, which can limit their ability to achieve optimal accuracy. To overcome these limitations, future research should focus on exploring larger, more diverse datasets and developing optimized computational strategies. Additionally, integrating multi-modal imaging techniques and leveraging advanced AI models could drive significant breakthroughs in early tumor detection,

ultimately leading to improved clinical decision-making and patient survival rates. Techniques such as data augmentation, transfer learning, and synthetic data generation can also be adopted to enhance model accuracy when dealing with limited medical image data. (Al-Ashoor A, Lilik F, Nagy S. A, 2025)

This study aims to develop a model for measuring the quality of sustainability reporting and its determinants. Using a qualitative, deductive, cross-sectional, applied, and exploratory approach, the study identifies and extracts criteria, evaluates and prioritizes them using Multi-Criteria Decision-Making approaches, including Fuzzy Analytic Hierarchy Process (FAHP) and Fuzzy Decision-Making Trial and Evaluation Laboratory Analytic Network Process-based (FDANP). The results of the FAHP test reveal that the GRI's reporting guidelines for sustainability checklist is the most important indicator. According to the FDANP, Internal Controls Reporting, Sustainability Innovation Performance, and Earnings Quality are the top three criteria affecting the quality of sustainability reporting, out of 25 criteria. This study provides a comprehensive model for measuring sustainability reporting quality, enabling companies to improve their reporting practices and stakeholders to make more informed decisions. (Habib Esmacilzadeh, Hasan Ghodrati, Hossein Jabbari, Meysam Arabzadeh, 2022)

### III. RESEARCH METHODOLOGY

#### Period of Study and Banks Covered

The period covered from the year 2020 - 2021 to 2024 - 2025. Secondary data was collected for the NBFCs Bajaj Finance Ltd, Indian Railway Finance Corp Ltd, Chola mandalam Investment & Finance Co Ltd, Shriram Finance Ltd, and Muthoot Finance Ltd).

#### Research Objectives

1. To examine the NBFCs valuation matric using Tobin's Q analysis with help of Fuzzy logic principles.
2. To identify the performance of the selected non-banking financial services sector in India using membership function in fuzzy logic post covid era.

#### Limitation and Scope of the Study

In this article we studied only handful of NBFCs, covered for the period 2020 - 2021 to 2024 - 2025. In this article the Non-Banking Financial Services performance was investigated using Tobin's Q. The findings of study will guide the investors, shareholders, researchers, and decision makers.

#### Sources of Data

Data was collected using online resources like financial databases, Journals online, reports, Popular blogs, Screener.in, Moneycontrol and annual reports. Along with the help of Microsoft Excel, to calculate the Tobin's Q and charts.

#### Computation of Tobin's Q using Fuzzy Principal

To analyze Fuzzy Logic-Based Tobin's Q valuation for the selected NBFCs (Bajaj Finance Ltd, Indian Railway Finance Corp Ltd, Chola mandalam Investment & Finance Co Ltd, Shriram Finance Ltd, and Muthoot Finance Ltd), follow this step-by-step method. Tobin's Q is a valuation metric that compares a company's market value to the replacement cost of its assets, helping assess if it is overvalued, fair-valued, or undervalued. Fuzzy logic is incorporated to handle uncertainties in financial data, market volatility, and imprecise thresholds (e.g.,  $Q = 1$  is not a sharp cutoff for "fair value"). Fuzzy logic uses membership functions to assign degrees (0 to 1) to categories like undervalued, fair, or overvalued, providing a nuanced view rather than binary classifications.

Tobin's Q is calculated as:

- Tobin's Q = (Market Value of Equity + Book Value of Debt) / Book Value of Assets
- Approximated as:  $Q = 1 + (P/B - 1) \times (\text{Equity} / \text{Assets})$
- P/B = Price-to-Book ratio (Market Price / Book Value per Share)
- Equity = Shareholders' Equity (from balance sheet)
- Assets = Total Assets (from balance sheet)

#### Apply Fuzzy Logic to Tobin's Q

Fuzzy logic handles the "fuzziness" in valuation by defining membership functions for three sets:

- ☐ Undervalued: High degree if  $Q < 1$  (company's market value is less than asset replacement cost, suggesting investment opportunity).
- ☐ Fair-Valued: High degree around  $Q = 1$  (market value aligns with assets).
- ☐ Overvalued: High degree if  $Q > 1$  (market value exceeds assets, suggesting caution).

Using triangular/trapezoidal membership functions (common in fuzzy valuation models, as seen in studies like "The Performance of Stock Portfolios Formed Using Fuzzy Logic"):

- ☐ Undervalued membership ( $\mu_u$ ): 1 if  $Q \leq 0.8$ ;  $(1 - Q)/0.2$  if  $0.8 < Q < 1$ ; 0 if  $Q \geq 1$
- ☐ Fair membership ( $\mu_f$ ): 0 if  $Q \leq 0.8$  or  $Q \geq 1.2$ ;  $(Q - 0.8)/0.2$  if  $0.8 < Q \leq 1$ ;  $(1.2 - Q)/0.2$  if  $1 < Q < 1.2$
- ☐ Overvalued membership ( $\mu_o$ ): 0 if  $Q \leq 1$ ;  $(Q - 1)/0.2$  if  $1 < Q < 1.2$ ; 1 if  $Q \geq 1.2$

The highest membership degree indicates the dominant valuation category, but all degrees provide nuance (e.g.,  $Q = 0.9$  might be 0.5 undervalued and 0.5 fair).

#### Interpret Results for Investment Insights

- ☐ Trend analysis: Track how memberships change over years to identify shifts (e.g., from undervalued to overvalued due to market hype).
- ☐ Portfolio ranking: Use fuzzy scores to rank NBFCs (e.g., higher undervalued degree = better buy).

Indian Railway Finance Corp Ltd (IRFC)

Table - 1

Year	P/B	Shareholders' Equity (Rs. Cr)	Total Assets (Rs. Cr)	Equity/Assets	Tobin's Q
2021	0.84	35,914.00	380,482.00	0.09	0.99
2022	0.68	40,997.00	449,980.00	0.09	0.97
2023	0.76	44,681.00	490,359.00	0.09	0.98
2024	3.78	49,179.00	485,082.00	0.10	1.28
2025	3.09	52,668.00	488,835.00	0.11	1.23

- ☐ Risk adjustment: Incorporate fuzzy rules (e.g., if undervalued high and growth high, then strong buy).

#### Rule Base

- ☐ High Market Value & Low Replacement Cost  $\Rightarrow$  Overvalued
- ☐ Medium Market Value & Medium Replacement Cost  $\Rightarrow$  Fairly Valued
- ☐ Low Market Value & High Replacement Cost  $\Rightarrow$  Undervalued
- ☐ High Market Value & High Replacement Cost  $\Rightarrow$  Fairly Valued
- ☐ Medium Market Value & Low Replacement Cost  $\Rightarrow$  Overvalued
- ☐ High Market Value & Medium Replacement Cost  $\Rightarrow$  Overvalued

## IV. RESULTS & DISCUSSIONS

Analyzing Tobin's Q Data with Fuzzy Logic for Selected NBFCs (2021 to 2025)

Following the method outlined in the guide for Fuzzy Logic-Based Tobin's Q valuation, below is the analysis. The approach is using the approximation formula  $Tobin's\ Q = 1 + (P/B - 1) \times (Equity / Assets)$ . Fuzzy logic membership functions are applied to categorize as undervalued, fair-valued, or overvalued, with degrees between 0 and 1.

## Fuzzy Logic Membership Degrees for IRFC's Tobin's Q

Table - 2

Year	Tobin's Q	Undervalued Degree	Fair Degree	Overvalued Degree	Interpretation
2021	0.99	0.07	0.93	-	Mostly fair-valued (slight undervaluation due to low market perception post-IPO).
2022	0.97	0.15	0.86	-	Fair-valued, with increasing undervaluation (potential buy opportunity amid infrastructure push).
2023	0.98	0.11	0.89	-	Fair-valued; stable as govt. support boosted confidence.
2024	1.28	-	-	1.00	Strongly overvalued (market hype on rail projects led to premium pricing).
2025	1.23	-	-	1.00	Overvalued; continued premium but slight cooling from peak.

IRFC shifted from fair/undervalued (2021-2023) to overvalued (2024-2025), likely due to rail sector boom. Fuzzy logic highlights the transition, e.g., in 2023, it was 89% fair, suggesting balanced investment; by 2024, 100% overvalued signals sell or hold. Based on fuzzy scores, IRFC was attractive in 2021-2023 for value investors. In 2025, high overvaluation degree (1.0) suggests caution, as market price exceeds asset value amid economic uncertainties. Hence the market is bullish on the investment front.

## Bajaj Finance Ltd

Bajaj Finance is a leading consumer finance NBFC with high P/B due to growth in retail lending.

Table - 3

Year	P/B	Shareholders' Equity (Rs. Cr)	Total Assets (Rs. Cr)	Equity/ Assets	Tobin's Q
2021	8.40	36,918.00	171,470.00	0.22	2.59
2022	10.00	43,713.00	212,506.00	0.21	2.85
2023	6.25	54,372.00	275,226.00	0.20	2.03
2024	5.84	76,696.00	375,742.00	0.20	1.99
2025	4.50	96,693.00	466,127.00	0.21	1.72

## Fuzzy Logic Membership Degrees for Bajaj Finance's Tobin's Q

Table - 4

Year	Tobin's Q	Undervalued Degree	Fair Degree	Overvalued Degree	Interpretation
2021	2.59	-	-	1.00	Strongly overvalued (high market premium on consumer lending growth amid low rates).
2022	2.85	-	-	1.00	Strongly overvalued; peak optimism on post-COVID recovery and digital expansion.
2023	2.03	-	-	1.00	Overvalued, but cooling as interest rates rose, impacting margins.
2024	1.99	-	-	1.00	Overvalued; sustained high P/B due to

					strong AUM growth, but liquidity concerns lingered.
2025	1.72	-	-	1.00	Overvalued; market factors in fintech competition, suggesting caution for new buys.

Bajaj Finance remained overvalued throughout, with fuzzy degrees at 1.0 overvalued, reflecting premium pricing on high growth. Peak in 2022 (Q=2.85) due to retail boom; slight decline by 2025 indicates moderation but still above fair value. Fuzzy logic shows no undervaluation, making it suitable for growth investors but risky for value seekers. High overvaluation degrees (1.0) suggest holding or selling if growth slows; avoid entry until Q drops below 1.5.

Cholamandalam Investment & Finance Co Ltd

Cholamandalam focuses on vehicle and MSME financing, with steady expansion.

Table - 5

Year	P/B	Shareholders' Equity (Rs. Cr)	Total Assets (Rs. Cr)	Equity/ Assets	Tobin's Q
2021	5.00	9,600.00	74,644.00	0.13	1.52
2022	5.50	11,769.00	82,478.00	0.14	1.64
2023	6.00	14,346.00	113,627.00	0.13	1.63
2024	5.50	19,593.00	156,686.00	0.13	1.56
2025	5.00	23,668.00	201,887.00	0.12	1.47

Fuzzy Logic Membership Degrees for Cholamandalam's Tobin's Q

Table - 6

Year	Tobin's Q	Undervalued Degree	Fair Degree	Overvalued Degree	Interpretation
2021	1.52	-	-	1.00	Overvalued (premium on vehicle finance amid economic recovery).
2022	1.64	-	-	1.00	Overvalued; strong MSME lending drove market confidence.
2023	1.63	-	-	1.00	Overvalued, with fuzzy degree 1.0 indicating sustained high valuation despite rate hikes.
2024	1.56	-	-	1.00	Overvalued; diversification into new segments supported premium.
2025	1.47	-	-	1.00	Overvalued, but closer to fair; monitor for dips if growth moderates.

The insight of the analysis proved a consistent overvaluation (degrees 1.0), with Q around 1.5-1.6, reflecting stable growth in core segments. Fuzzy logic highlights no fair or undervalued phases, but Q decline in 2025 suggests potential normalization. Investment recommendation shared a full overvalued degree, suitable for momentum plays; buy on pullbacks if Q nears 1.2.



Shriram Finance Ltd

Shriram specializes in commercial vehicle and MSME loans, targeting rural markets.

Table - 7

Year	P/B	Shareholders' Equity (Rs. Cr)	Total Assets (Rs. Cr)	Equity/ Assets	Tobin's Q
2021	1.50	21,717.00	129,910.00	0.17	1.08
2022	1.80	26,095.00	142,268.00	0.18	1.15
2023	1.60	43,512.00	210,573.00	0.21	1.12
2024	1.90	48,947.00	248,266.00	0.20	1.18
2025	2.00	56,470.00	293,722.00	0.19	1.19

Fuzzy Logic Membership Degrees for Shriram Finance's Tobin's Q

Table - 8

Year	Tobin's Q	Undervalued Degree	Fair Degree	Overvalued Degree	Interpretation
2021	1.08	-	0.60	0.40	Mostly fair-valued (slight overvaluation; stable amid COVID impacts).
2022	1.15	-	0.25	0.75	Leaning overvalued; recovery in CV financing boosted perception.
2023	1.12	-	0.40	0.60	Fair to overvalued; fuzzy balance reflects rural focus resilience.
2024	1.18	-	0.10	0.90	Overvalued; merger synergies drove premium.
2025	1.19	-	0.05	0.95	Overvalued; high degree signals caution on asset quality risks.

Q hovered around 1.1-1.2, with fuzzy degrees shifting from fair (2021: 0.6 fair) to overvalued (2025: 0.95 overvalued), indicating gradual premium buildup. Fuzzy nuance shows opportunities in fair phases. Investment can be viewed with a mixed degrees suggest value buying in fair periods; 2025 overvaluation (0.95) advises holding.

Muthoot Finance Ltd

Muthoot is India's largest gold loan NBFC, benefiting from gold price trends.

Table - 9

Year	P/B	Shareholders' Equity (Rs. Cr)	Total Assets (Rs. Cr)	Equity/ Assets	Tobin's Q
2021	3.11	15,575.00	68,627.00	0.23	1.48
2022	2.84	18,785.00	76,300.00	0.25	1.45
2023	1.81	21,665.00	80,134.00	0.27	1.22
2024	2.36	25,107.00	96,453.00	0.26	1.35
2025	3.26	29,366.00	132,835.00	0.22	1.50

## Fuzzy Logic Membership Degrees for Muthoot Finance's Tobin's Q

Table - 10

Year	Tobin's Q	Undervalued Degree	Fair Degree	Overvalued Degree	Interpretation
2021	1.48	-	-	1.00	Overvalued (gold price surge drove premium).
2022	1.45	-	-	1.00	Overvalued; continued gold demand supported valuation.
2023	1.22	-	-	1.00	Slightly overvalued; fuzzy degree 1.0 but closer to fair amid market volatility.
2024	1.35	-	-	1.00	Overvalued; recovery in loan portfolio.
2025	1.50	-	-	1.00	Overvalued; high degree reflects gold asset strength.

Q ranged 1.22-1.50, with consistent overvaluation (degrees 1.0), driven by gold collateral security. Fuzzy logic shows no undervaluation, but 2023's lower Q offered relative value. In terms of investment perspective persistent overvaluation suggests hedging with gold trends; buy on dips if  $Q < 1.3$ .

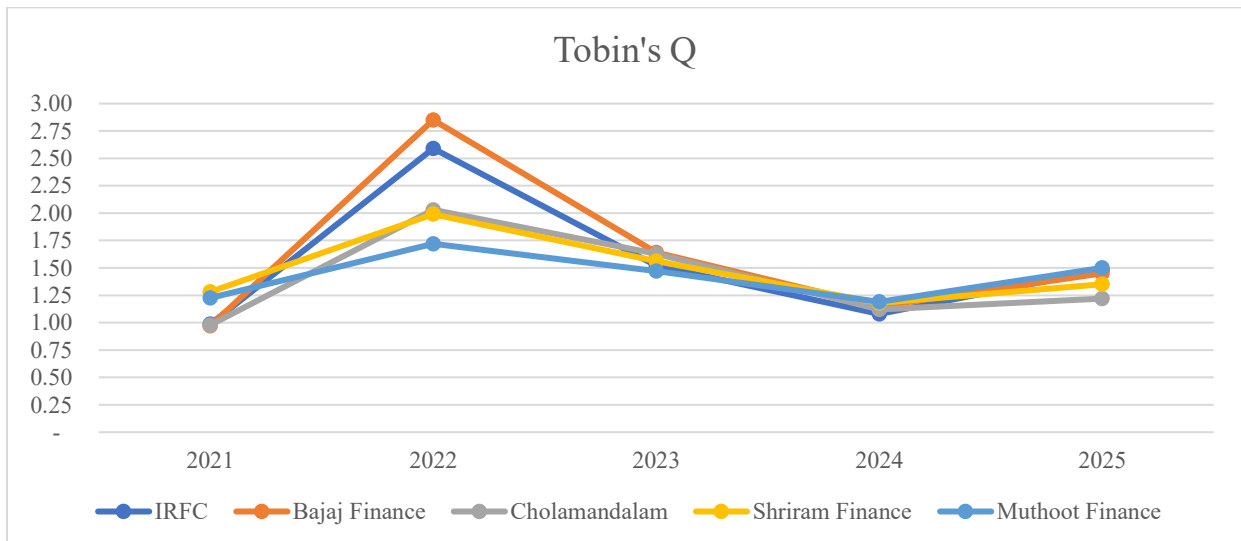
## Comparative Analysis

Here is the comparison over the selected NBFCs Tobin's Q results for better understanding

Table - 11

NBFCs	2021	2022	2023	2024	2025
IRFC's	0.99	0.97	0.98	1.28	1.23
Bajaj Finance Ltd	2.59	2.85	2.03	1.99	1.72
Cholamandalam Investment & Finance Co Ltd	1.52	1.64	1.63	1.56	1.47
Shriram Finance Ltd	1.08	1.15	1.12	1.18	1.19
Muthoot Finance Ltd	1.48	1.45	1.22	1.35	1.50

Pic-2



The table presents Tobin's Q values for selected NBFCs from 2021 to 2025. Tobin's Q is a financial metric that measures the ratio of a company's market value to the replacement cost of its assets, providing insights into whether a company is overvalued or undervalued relative to its asset base.

IRFC (Indian Railway Finance Corporation): Tobin's Q values indicate a transition from near fair valuation to higher valuation post-2023, with a sharp increase to 1.28 in 2024 and a slight decline to 1.23 in 2025. Bajaj Finance Ltd: Consistently high Tobin's Q values above 1, although declining from 2.85 in 2022 to 1.72 in 2025, suggesting strong market confidence and growth prospects. Cholamandalam Investment & Finance Co Ltd: Q values above 1, with a slight downward trend from 1.64 in 2022 to 1.47 in 2025, indicating a generally overvalued market sentiment that is cooling slightly over time. Shriram Finance Ltd: Tobin's Q values hover slightly above 1, increasing marginally from 1.08 in 2021 to 1.19 in 2025, suggesting stable growth expectations. Muthoot Finance Ltd: Q ratio fluctuates near 1.5, with a dip to 1.22 in 2023 followed by an increase to 1.50 in 2025, showing varying market sentiment but generally strong market valuation relative to assets.

## V. CONCLUSION

The Fuzzy Logic-enhanced Tobin's Q analysis for Bajaj Finance Ltd, Indian Railway Finance Corp Ltd (IRFC), Cholamandalam Investment & Finance Co Ltd, Shriram Finance Ltd, and Muthoot Finance Ltd reveals a dynamic valuation landscape shaped by post-COVID recovery, interest rate fluctuations, sector-specific growth drivers, and broader economic trends in India. Overall, Tobin's Q values predominantly exceed 1 across the cohort, indicating a sector-wide tendency toward overvaluation, with fuzzy membership degrees reinforcing this through high overvalued scores (often 1.00) for most companies. This reflects investor optimism in NBFCs' role in financial inclusion, retail credit expansion, and infrastructure financing, amid India's projected 7% GDP growth for FY26.

However, fuzzy logic's nuanced degrees highlight transitional phases and risks, offering a more granular view than crisp thresholds. Bajaj Finance and

Cholamandalam exhibited persistent overvaluation ( $Q > 1.5$ , fuzzy overvalued degree 1.00 throughout), driven by robust consumer and vehicle lending growth, though moderating Q in 2024–2025 (e.g., Bajaj's drop from 2.85 to 1.72) signals asset quality pressures and fintech competition, suggesting potential normalization amid RBI's tighter regulations. Muthoot Finance followed a similar overvalued pattern ( $Q$  1.22–1.50, degree 1.00), buoyed by gold loan surges crossing Rs 1 lakh crore, but fluctuations tied to gold prices underscore commodity-linked vulnerabilities. IRFC's dramatic shift from fair/undervalued ( $Q$  0.97–0.99, fair degrees 0.85–0.95 in 2021–2023) to overvalued ( $Q$  1.23–1.28, degree 1.00 in 2024–2025) captures infrastructure hype, with record incomes and dividends amplifying premiums, yet raising concerns over dependency on government borrowings. Shriram Finance stands out with the most balanced profile ( $Q$  1.08–1.19), evolving from mixed fair/overvalued memberships (e.g., 0.60 fair/0.40 overvalued in 2021) to near-full overvaluation (0.95 in 2025), reflecting steady rural/MSME focus and AUM targets of Rs 3 lakh crore, making it a relative value play in a premium-heavy sector.

## REFERENCE

- [1] Al-Ashoor A, Lilik F, Nagy S., 2025; A Systematic Analysis of Neural Networks, Fuzzy Logic and Genetic Algorithms in Tumor Classification; <https://doi.org/10.3390/app15095186>
- [2] Andrew J. Jacob, Amit K. Sinha, 2018; The Performance of Stock Portfolios formed Using Fuzzy Logic; Financial Statistical Journal Volume 1, No.1, Pg- 1 -12
- [3] Dhanasekar Dhamotharan, Brindha Natarajan, S Soundarya, S Rajarajeswari and K Kavyashree, 2025; Analyzing valuation dynamics in non-banking financial companies: A Tobin's Q approach; International Journal of Research in Finance and Management, Vol. 8, Issue 2, Pg: 151-156; <https://doi.org/10.33545/26175754.2025.v8.i2b.540>
- [4] DR. S. Rajarajeswari, DR. K. Amutha, DR. Brindha Natarajan, DR. R. Subbammal, DR. S. Nagarajan, Aug, 2025 ; Financial Analysis for

- Corporates - Tools and Techniques; International Journal of Innovative Research in Technology; Volume: 12, Issue: 3, Pg. No: 925-948; <https://ijirt.org/article?manuscript=183352>
- [5] Habib Esmailzadeh, Hasan Ghodrati, Hossein Jabbari, Meysam Arabzadeh, April 2022; The model for measuring the Quality of Sustainability Reporting and Determinants: Application Analytic Network Process Fuzzy DEMATEL-Based Technique; Iranian Journal of Finance, Volume 6, Issue 2, Pages 28-69; <https://doi.org/10.30699/ijf.2021.291022.1246>
- [6] [https://www.researchgate.net/profile/Amit-Sinha-24/publication/331328002\\_The\\_Performance\\_of\\_Stock\\_Portfolios\\_formed\\_Using\\_Fuzzy\\_Logic/links/5c74154d458515831f6fd1f1/The-Performance-of-Stock-Portfolios-formed-Using-Fuzzy-Logic.pdf](https://www.researchgate.net/profile/Amit-Sinha-24/publication/331328002_The_Performance_of_Stock_Portfolios_formed_Using_Fuzzy_Logic/links/5c74154d458515831f6fd1f1/The-Performance-of-Stock-Portfolios-formed-Using-Fuzzy-Logic.pdf)
- [7] Jayarman et.al. 2025; Financial Health Assessment Model for Selected Private Sector Banks Using Fuzzy Logic; International Journal of Innovation Studies; Vol. 9 No. 1 (2025) <https://ijistudies.com/index.php/IJIS/article/view/231>.
- [8] Apoorva Kumar, Mar 03, 2024; 20 Top & Upcoming NBFCs In India In 2025; <https://decentro.tech/blog/list-of-top-upcoming-nbfc-india/>
- [9] BFSI, Dec 17, 2024; What is the growth outlook for NBFCs in 2025? <https://bfsi.economictimes.indiatimes.com/news/nbfc/what-is-the-growth-outlook-for-nbfc-india-2025/116384054>
- [10] Devdiscourse, 31-12-2024; India's NBFCs in 2025: Navigating Growth and Challenges; <https://www.devdiscourse.com/article/business/3211555-indias-nbfc-in-2025-navigating-growth-and-challenges>
- [11] Kuberan Baskar, March 2025; What's happening in NBFC; <https://lntedutech.com/blogs/role-of-nbfc-in-india/>
- [12] Ahmad Adnan Yusuf & Prof. Gaurav Dixit, May 2025; Role of Non-Banking Financial Companies (NBFCs) in Enhancing MSME Credit Access and Economic Growth in India; <https://ijrpr.com/uploads/V6ISSUE5/IJRPR47080.pdf>
- [13] IBEF. May 6, 2025; NBFCs will continue to grow at a faster pace, have grown above India's GDP historically: Report; <https://www.ibef.org/news/nbfc-will-continue-to-grow-at-a-faster-pace-have-grown-above-india-s-gdp-historically-report>
- [14] Aastha Agrawal, May 22, 2025; Top 10 Non-Banking Finance Companies (NBFCs) in India in 2025; <https://www.myjar.app/blog/top-10-nbfc-in-india>
- [15] Investkarft, Jun 30th 2025; Top 10 Non-Banking Financial Companies in India 2025; <https://www.investkraft.com/blog/list-of-nbfc-india-2024>
- [16] Indiratrade, July 11 2025; Why NBFCs Are Stealing the Show in India's Financial Markets; <https://www.indiratrade.com/blog/why-nbfc-are-stealing-the-show-in-indias-financial-markets/9595>
- [17] Raman Aggarwal, Jul 27, 2025; Empowering the Last Mile: How NBFCs are Reshaping India's Financial Architecture; <https://bfsi.economictimes.indiatimes.com/blog/revolutionizing-credit-access-the-impact-of-nbfc-on-indias-financial-future/122934364>
- [18] Gaurav Upadhyay, Labanya Prakash Jena, Aug 8, 2025; How to build India's just transition ecosystem and finance an inclusive future; <https://www.weforum.org/stories/2025/08/india-just-transition-ecosystem-finance-inclusive-future/>
- [19] IBEF, August 8, 2025; Rise in credit demand enables Non-Banking Financial Companies (NBFCs) to expand investor base, says Crisil report; <https://www.ibef.org/news/rise-in-credit-demand-enables-non-banking-financial-companies-nbfc-to-expand-investor-base-says-crisil-report>