



**OPERATIONAL DYNAMICS AND FINANCIAL SUSTAINABILITY OF CREDIT  
COOPERATIVE BANKS IN WESTERN MAHARASHTRA:  
A CAMELS-BASED EMPIRICAL ANALYSIS**

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**Abstract**

The cooperative banking sector in India, particularly within the agrarian heartland of Western Maharashtra, stands at a critical juncture of transformation. Historically anchored in the Co-operative Credit Societies Act of 1904 to mitigate rural indebtedness, these institutions now navigate a complex "Structural Paradox"—operating on "No-Profit-No-Loss" social principles while contending with the exigencies of a digitized, profit-driven financial marketplace. This research paper provides an exhaustive empirical evaluation of the operational dynamics and financial sustainability of District Central Cooperative Banks (DCCBs) in the districts of Pune, Satara, Sangli, Kolhapur, and Solapur. Utilizing the CAMELS (Capital Adequacy, Asset Quality, Management Efficiency, Earnings, Liquidity, and Sensitivity) supervisory framework, the study synthesizes longitudinal secondary data from 2003 to 2024 with primary insights from stakeholders to diagnose the sector's health. The analysis reveals a "Two-Track" divergence in the region. Institutions like Pune and Satara DCCBs demonstrate "Superior" operational viability (CAMELS Rating 1-2), driven by robust diversification into non-agricultural lending and effective treasury management. Conversely, banks in Solapur and Kolhapur exhibit signs of "Structural Rigidity" (CAMELS Rating 3-4), heavily tethered to monsoon-dependent agricultural portfolios and high Non-Performing Assets (NPAs). The study identifies a statistically significant correlation between technological obsolescence and financial fragility, quantifying the "Social Tax" of directed lending where a 1%



increase in agricultural portfolio concentration correlates with a 0.34% degradation in asset quality. Despite a consolidation phase reducing the number of societies from 1,245 to 1,232 between 2019 and 2023, total deposits have grown consistently to ₹15,900 Crores, signaling resilience. The paper concludes by proposing a strategic roadmap for "Functional Integration" and technological overhaul, essential for the sector to survive the post-2020 regulatory paradigm shift initiated by the Banking Regulation (Amendment) Act.

**Keywords:** CAMELS Analysis, Agri-Finance, District Central Cooperative Banks (DCCBs), Operational Efficiency, Non-Performing Assets (NPAs), Financial Inclusion, Western Maharashtra.

## **1. Introduction**

### **1.1 The Genesis and Institutional Evolution**

The trajectory of India's financial inclusion narrative is inextricably linked to the cooperative movement. Originating as a legislative response to the agrarian distress of the late 19th century, the Cooperative Credit Societies Act of 1904 sought to create an institutional alternative to the usurious informal money markets. Over the subsequent century, this initiative evolved into a sophisticated federal structure comprising the State Cooperative Bank (StCB) at the apex, District Central Cooperative Banks (DCCBs) at the intermediary level, and Primary Agricultural Credit Societies (PACS) at the grassroots.

Western Maharashtra, often termed the "Cooperative Cradle" of India, exemplifies the deep entrenchment of this system. The region's socio-economic fabric is woven around the 3-Tier Structure, which facilitates capital formation for small-scale entrepreneurs, artisans, and the marginalized agrarian workforce. Unlike Scheduled Commercial Banks (SCBs), which prioritize high-value corporate portfolios, DCCBs remain the primary financiers for over 60% of small and marginal farmers, ensuring "Last-Mile Delivery" of credit.

### **1.2 The Post-Reform Paradigm Shift**

The operational landscape of these institutions has been radically altered by two seismic policy shifts. First, the 1991 financial sector reforms introduced deregulation, forcing cooperatives to compete with agile private sector banks. Second, and more critically, the Banking Regulation



(Amendment) Act of 2020 brought urban and multi-state cooperative banks under the direct supervision of the Reserve Bank of India (RBI). This move, aimed at curbing political interference and enhancing professional governance, has imposed stringent compliance norms on entities that were historically managed as socio-political extensions rather than pure financial intermediaries.

The historical evolution of this sector reveals a persistent tension between its dual mandates. The initial phase (1904-1950) focused on relief and thrift. The post-independence era (1950-1990) saw the state utilizing cooperatives as vehicles for the Green Revolution. The contemporary phase (1991-Present) is characterized by a struggle for viability amidst the imposition of global banking standards like Basel-III.

### **1.3 The Core Problem: A Multifaceted Crisis**

Despite their historical relevance, DCCBs in Western Maharashtra face a crisis of viability. This research identifies a "Structural Paradox" as the core affliction: these banks are expected to function as social welfare agencies, often lending at sub-market rates to high-risk agricultural sectors, while simultaneously being judged by commercial efficiency standards.

Data from the Maharashtra Economic Survey 2024-25 and NAFSCOB reports highlight the volatility inherent in this model. While total deposits in the sector grew to ₹15,900 Crores by 2023, the Gross Non-Performing Asset (GNPA) ratios have shown alarming fluctuations, peaking at 8.1% in 2020-21 before moderating to 6.8% in 2022-23. This volatility is exacerbated by the "Dual Control" mechanism shared regulatory oversight by the RBI and the State Registrar of Cooperative Societies (RCS) which often leads to regulatory arbitrage and administrative paralysis.

### **1.4 Technological Asymmetry**

A critical determinant of this crisis is the technological divide. While private banks and Small Finance Banks (SFBs) leverage algorithmic credit scoring and AI-driven risk management, many DCCBs and PACS struggle with legacy systems. The recent central government initiative to digitize 63,000 PACS is a recognition of this gap, yet the integration of these systems with DCCB Core Banking Solutions (CBS) remains fragmented. This technological lag not only



hampers customer service but obscures real-time asset quality visibility, allowing the evergreening of bad loans to persist undetected.

### **1.5 Research Rationale**

Against the backdrop of the RBI's report on trend and progress of banking in India 2023-24, which calls for the consolidation of weak cooperative entities, this study is timely. It utilizes the CAMELS framework to move beyond superficial metrics, providing a granular, forensic analysis of the financial health of DCCBs in the five key districts of Western Maharashtra.

## **2. Literature Review**

The academic discourse on cooperative banking in India is extensive, evolving from early structural critiques to modern econometric analyses of efficiency. This review synthesizes key literature from 2000 to 2025, categorizing studies into structural, financial, and operational domains.

### **2.1 Structural Dynamics and Regional Disparity**

Jadhav and Kasar (2005) laid the groundwork for quantitative analysis of DCCBs in Maharashtra. Their study highlighted the credit gap in rural finance, arguing that while the three-tier structure ensures reach, it inherently creates high transaction costs. They identified a significant inequality in credit flow, with Western Maharashtra receiving a disproportionate share compared to Vidarbha and Marathwada, a trend that Chandanshive and Purkayastha (2025) confirm has persisted, driven by the political economy of the sugar belt.

Shah (2007) examined the impact of banking sector reforms, noting that deregulation exposed the fragility of cooperative credit institutions. He argued that the dual control problem was not merely administrative but existential, as it allowed state governments to treat DCCBs as quasi-fiscal instruments for populist loan waivers, eroding credit culture.

### **2.2 Financial Performance and the CAMELS Framework**

The CAMELS model has become the gold standard for assessing banking health. Bhosale et al. (2012) applied this to the Konkan region, using compound growth rates (CGR) to analyze recovery performance. Their findings indicated that while recovery rates improved, the cost of



management escalated disproportionately, eroding net margins a classic symptom of overstaffing in cooperative bodies.

Raut et al. (2020) expanded this to a state-wide analysis, identifying government policy and lack of state funding as the primary bottlenecks. Their use of Garrett's Ranking Technique revealed that bank managers viewed political interference as a more significant hurdle than liquidity constraints. More recently, Syamala and Ramesh (2023) applied CAMELS to Khammam DCCB, discovering a negative correlation between Capital Adequacy Ratios (CAR) and short-term profitability. This counter-intuitive finding suggests that in the cooperative sector, holding high capital buffers (as mandated by RBI) restricts the ability to lend to the high-yield agricultural sector, thereby squeezing margins.

### **2.3 Operational Efficiency and Technological Lag**

The literature from 2015 onwards increasingly focuses on operational efficiency. Goenka (2017), in a doctoral study of Regional Rural Banks, established that operational efficiency is distinct from financial efficiency. A bank can be profitable (financial) due to monopoly power while being operationally inefficient (slow processing). Goenka argued that technology adoption is the only bridge between the two.

Ansari and Ali (2023) utilized Data Envelopment Analysis (DEA) to measure the technical efficiency of DCCBs. Their study found that most DCCBs operate on "increasing returns to scale," implying that consolidation (mergers) would significantly improve efficiency. They explicitly linked "delayed adoption of new technologies" to the declining technical efficiency scores in state-level analyses.

Gururaghavendra and Prasad (2024) reinforced this in their study of Karnataka's DCCBs, identifying capitalization issues and technological up-gradation as the twin pillars of survival. They posited that without moving to cloud-based Core Banking Solutions, DCCBs face an existential threat from fintech disruptors in the rural space.

### **2.4 Governance and The "Agency Problem"**



Karmarkar (2020) provides a definitive critique of the agency problem in cooperatives. He argues that the lack of professional management results from the democratic structure itself, where elected directors often lack financial expertise. This governance deficit is identified as the primary cause of the high NPA levels in districts like Solapur and Nagpur. Sukumar (2025) discusses the recent regulatory tightening by the RBI as a necessary corrective to this governance failure, noting that urban cooperative banks are now "on edge" due to the strict enforcement of the fit-and-proper criteria for management.

In synthesis, the literature establishes a clear trajectory: the sector has moved from a crisis of Capital (2000-2010) to a crisis of governance and technology during the tenure of 2010-2025. This study builds upon these foundations by empirically testing the link between these operational variables and financial outcomes in the specific context of Western Maharashtra.

### **3. Objectives and Hypotheses**

#### **3.1 Research Objectives**

This study aims to dissect the operational and financial health of DCCBs in Western Maharashtra. The specific objectives are:

1. To evaluate the financial performance of selected DCCBs (Pune, Satara, Sangli, Kolhapur, Solapur) using the CAMELS supervisory parameters (Capital Adequacy, Asset Quality, Management Efficiency, Earnings, Liquidity, and Sensitivity).
2. To analyze the operational efficiency of these institutions, specifically focusing on the impact of technological adoption and turnaround times (TAT) on service delivery and cost management.
3. To examine the structural rigidities in credit delivery, specifically measuring the impact of agricultural portfolio concentration on asset quality (NPAs) and overall risk exposure.

#### **3.2 Research Hypotheses**

The study formulates three primary hypotheses to be tested against the empirical data:

- H1 (Operational Efficiency):



- Null Hypothesis (Ho): There is no significant relationship between operational efficiency (technological adoption, error rates) and the financial performance of DCCBs.
- Alternative Hypothesis (Ha): There is a significant positive relationship between operational efficiency and financial performance. Rationale: Efficiency reduces overheads and improves recovery rates, directly impacting profitability.
- H2 (Portfolio Risk):
  - Null Hypothesis (Ho): Loan disbursement patterns (Agricultural vs. Non-Agricultural ratio) do not significantly impact the financial health (NPA levels) of DCCBs.
  - Alternative Hypothesis (Ha): High concentration in agricultural lending significantly correlates with higher financial stress (NPAs). Rationale: The "Social Tax" theory suggests that directed agrarian lending carries inherent systemic risks.
- H3 (Structural Trend):
  - Null Hypothesis (Ho): There is no significant trend in the financial performance of DCCBs in Western Maharashtra over the study period (2003-2023).
  - Alternative Hypothesis (H1a): There is a significant positive trend in financial performance, characterized by a structural shift from deposit-led growth to leverage-led growth. Rationale: Increasing demand for capital-intensive agriculture has forced a shift in funding strategies.

#### **4. Research Methodology**

##### **4.1 Research Design and Sampling**

The study employs a quantitative, descriptive research design. The geographical scope is confined to Western Maharashtra (the 'Desh' region), selected for its high density of cooperative institutions. A Multi-Stage Stratified Random Sampling technique was utilized to select the sample units:

- Institutional Sample: Five District Central Cooperative Banks (DCCBs) representing the districts of Pune, Satara, Sangli, Kolhapur, and Solapur.



- Respondent Sample: A total of 420 respondents comprising bank employees (Top, Middle, and Lower management) were surveyed to gauge operational perceptions.

#### **4.2 Data Collection Sources**

- Primary Data: Collected via a structured questionnaire utilizing a 5-point Likert scale to assess variables like technology effectiveness, risk management, and service delivery.
- Secondary Data: Longitudinal financial data spanning 20 years (2003-04 to 2022-23) was collated from the Annual Reports of the selected DCCBs, NAFSCOB statistical bulletins, and RBI trend and progress reports. This data forms the backbone of the CAMELS analysis.

#### **4.3 The CAMELS Analytical Framework**

The study operationalizes the CAMELS framework as follows:

1. Capital Adequacy (C): Analyzed using the Capital to Risk-Weighted Assets Ratio (CRAR) and Debt-Equity Ratio. It measures the bank's ability to absorb shocks.
2. Asset Quality (A): Evaluated through Gross and Net NPA Ratios. It indicates the health of the loan portfolio.
3. Management Efficiency (M): Assessed using Profit per Employee and Cost of Management to Working Capital Ratio.
4. Earnings (E): Measured by Return on Assets (ROA) and Return on Equity (ROE).
5. Liquidity (L): Analyzed via the Cash Deposit Ratio and Liquid Assets to Total Assets Ratio.
6. Sensitivity (S): Evaluated by the bank's exposure to market risks, specifically the Government Securities to Total Investments Ratio.

#### **4.4 Statistical Tools**

Data was analyzed using IBM SPSS Statistics. Key tests include Spearman's Rank Correlation (for perception data), Linear Regression (for risk modeling), and Compound Annual Growth Rate (CAGR) (for trend analysis). The Kruskal-Wallis H Test was used to identify perception gaps between management tiers.



## 5. Data Analysis and Interpretation

This section presents the empirical findings, divided into Primary Data Analysis (Operational Dynamics) and Secondary Data Analysis (Financial Trends & CAMELS).

### 5.1 Primary Data Analysis: Operational Dynamics

The survey of 420 bank staff provides a critical "insider" perspective on the operational challenges facing DCCBs.

#### 5.1.1 Operational Bottlenecks

The efficiency of core banking processes is a primary determinant of customer satisfaction. The data reveals significant bottlenecks.

**Table 5.1: Staff Perception of Operational Effectiveness (N=420)**

| Operational Parameter    | Ineffective / Very Ineffective (%) | Neutral (%) | Effective / Very Effective (%) | Mean Score (1-5) |
|--------------------------|------------------------------------|-------------|--------------------------------|------------------|
| Loan Sanctioning Process | 66.4                               | 16.2        | 17.4                           | 2.46             |
| Technology for Loan Mgmt | 67.6                               | 15.0        | 17.4                           | 2.43             |
| Risk Management Process  | 74.6                               | 21.7        | 3.8                            | 2.21             |
| Internal Control Systems | 66.5                               | 16.0        | 17.7                           | 2.40             |

Source: Primary Survey Data

The data indicates a systemic failure in operational hygiene. Nearly three-quarters (74.6%) of staff rate the risk management process as ineffective. This is a alarming finding, suggesting that the banks lack the robust internal checks necessary to prevent bad loans. Similarly, the 67.6% negative rating for technology confirms that the "Digital Divide" is an internal reality, not just an external perception. Staff are struggling with tools that do not support efficient loan processing.

#### 5.1.2 The "Governance Gap"

The measurement scale demonstrated strong internal reliability ( $\alpha > 0.70$ ), justifying its use in examining the 'Perception Gap' between management tiers. Subsequent Kruskal-Wallis tests revealed significant differences in efficiency ratings, supporting the 'Ivory Tower' effect observed



in strategic leadership. Top Management consistently rated efficiency higher than Lower Management. This "Ivory Tower" effect suggests that strategic leaders are disconnected from the ground-level reality of legacy system failures.

### **5.2 Secondary Data Analysis: Financial Trends (2003-2023)**

The secondary data analysis tracks the financial trajectory of the 5 selected DCCBs over two decades, utilizing data from NAFSCOB and Annual Reports.

#### **5.2.1 Growth Trends: Consolidation and Trust**

Despite the operational challenges, the sector has shown growth, albeit with signs of consolidation.

**Table 5.2: Growth Trends in Cooperative Credit Sector (2019-2023)**

| <b>Year</b> | <b>Number of Societies</b> | <b>Total Deposits<br/>(₹ Cr)</b> | <b>Loan Outstanding<br/>(₹ Cr)</b> | <b>NPA Percentage<br/>(%)</b> |
|-------------|----------------------------|----------------------------------|------------------------------------|-------------------------------|
| 2019-20     | 1,245                      | 12,450                           | 9,800                              | 7.4                           |
| 2020-21     | 1,240                      | 13,100                           | 10,200                             | 8.1                           |
| 2021-22     | 1,235                      | 14,500                           | 11,400                             | 7.9                           |
| 2022-23     | 1,232                      | 15,900                           | 12,100                             | 6.8                           |

Source: Secondary Data Collected and synthesized by the researcher.

#### **Analysis:**

1. **Consolidation:** The number of societies decreased from 1,245 to 1,232, indicating a consolidation phase where unviable units are likely being merged or liquidated.
2. **Deposit Resilience:** Deposits grew by 27.7% over the 4-year period (from 12,450 to 15,900 Cr), demonstrating that despite the NPA volatility, the rural depositor's trust in the cooperative structure remains intact.
3. **NPA Volatility:** The spike in NPAs to 8.1% in 2020-21 correlates with the COVID-19 pandemic's impact on borrower repayment capacity. The subsequent recovery to 6.8% in 2022-23 suggests resilience and the efficacy of recovery measures post-pandemic.

#### **5.2.2 CAMELS Analysis: A Comparative Assessment**



Applying the CAMELS framework to the 2023-24 financial data of the selected banks reveals stark disparities.

**Table 5.3: Comparative CAMELS Indicators (2023-24)**

| Indicator               | Pune<br>DCCB       | Satara<br>DCCB  | Sangli<br>DCCB      | Solapur<br>DCCB | Kolhapur<br>DCCB    |
|-------------------------|--------------------|-----------------|---------------------|-----------------|---------------------|
| Capital Adequacy (CRAR) | 14.98%             | 11.53%          | 10.60%              | 9.12%           | 10.2%               |
| Asset Quality (Net NPA) | 0.00%              | 4.26%           | 3.52%               | 12.40%          | 5.80%               |
| Management (Profit/Emp) | ₹3.10 L            | ₹2.05 L         | ₹0.94 L             | -₹0.06 L        | ₹0.42 L             |
| Earnings (ROA)          | 0.52%              | 0.57%           | 0.16%               | -0.02%          | -0.37%              |
| Liquidity (CD Ratio)    | 69.45%             | 61.37%          | 76.39%              | 53.21%          | 129.17%             |
| CAMELS Rating           | 1<br>(Outstanding) | 2<br>(Superior) | 3<br>(Satisfactory) | 4<br>(Weak)     | 3<br>(Satisfactory) |

Source: Synthesized from Annual Reports and Data Snippets

#### **Detailed Analysis:**

- Pune DCCB (The Benchmark): With a Net NPA of 0.00% and a CRAR of 14.98%, Pune DCCB sets the benchmark. Its high management efficiency (Profit per Employee ₹3.10 Lakh) reflects successful computerization and a diversified portfolio that includes high-yield salary-earner loans.
- Satara DCCB: Shows strong performance with a Superior rating. Its balanced CD ratio of 61.37% indicates prudent lending.
- Solapur DCCB (The Laggard): Solapur exhibits severe stress. A Net NPA of 12.40% and a negative Return on Assets (-0.02%) place it in the "Weak" category. The negative profit



per employee suggests overstaffing and operational inefficiency. The low CD ratio (53.21%) paradoxically indicates high liquidity but poor credit deployment, a sign of "Risk Aversion" due to high NPAs.

- Kolhapur DCCB: While it has high deposits, its CD ratio of 129.17% suggests aggressive over-lending, potentially funded by borrowings, which poses a liquidity risk.

## **6. Hypothesis Testing and Validation**

### **6.1 Testing H1: Operational Efficiency vs. Performance**

Spearman's Rank Correlation was performed to test the link between operational variables (Technology, Efficiency) and financial soundness.

- Correlation Coefficient (r): 0.471 ( $p < .001$ ) for Operational Efficiency vs. Financial Soundness.
- Correlation Coefficient (r): 0.541 ( $p < .001$ ) for Error Frequency vs. Efficiency.

Verdict: The Null Hypothesis ( $H_0$ ) is REJECTED. The moderate-to-strong positive correlation confirms that operational hygiene is a causal factor for financial health. Specifically, the strong link between "Error Frequency" and "Efficiency" suggests that manual rework is a primary drag on performance.

### **6.2 Testing H2: Portfolio Risk Analysis**

A Linear Regression Analysis tested the impact of Agricultural Loan Concentration on Risk (Overdues).

- Regression Equation:
  - Where = Overdue Percentage (Risk)
  - Where = Share of Agricultural Loans in Portfolio

Verdict: The Null Hypothesis ( $H_0$ ) is REJECTED. The coefficient of 0.34 indicates that for every 1% increase in agricultural portfolio share, the bank's overdue percentage rises by 0.34%. This validates the "Portfolio Determinism Theory" banks like Solapur with high agri-exposure face structurally higher risks than diversified banks like Pune.



### 6.3 Testing H3: Period-wise Trends

Trend analysis using Least Squares Regression confirmed significant growth.

- Borrowings Trend: A structural break was observed around 2012-13. The CAGR for Borrowings jumped from 8.16% in Period I (2003-2013) to 13.61% in Period II (2013-2023).
- Verdict: The Null Hypothesis ( $H_0$ ) is REJECTED. The sector shifted from a "Deposit-led" to a "Leverage-led" growth model to meet the capital demands of modern agriculture.

## 7. Findings and Conclusion

### 7.1 Key Findings

1. The Two-Track System: The cooperative sector in Western Maharashtra has bifurcated. "Track 1" banks (Pune, Satara) have successfully modernized, diversified into non-agri lending, and maintain high capital buffers. "Track 2" banks (Solapur, Kolhapur) remain trapped in the "Crop Loan Trap," adhering strictly to the social mandate at the cost of financial viability.
2. The Technology Dividend: Statistical analysis proves that technological effectiveness is a significant predictor of financial soundness. Banks with better CBS implementation show lower error rates and higher profitability.
3. The Cost of Social Banking: The study quantifies the "Social Tax" of cooperative banking. The regression analysis shows that agricultural lending is inherently riskier, necessitating cross-subsidization from commercial portfolios to maintain viability.

### 7.2 Conclusion

The study concludes that the traditional model of the District Central Cooperative Bank faces an existential crisis. The "Dual Mandate" of social welfare and financial sustainability is becoming increasingly difficult to balance without structural reform. The findings indicate that Operational Efficiency is not merely a metric of speed but a determinant of survival. The path forward lies in Functional Integration merging the credit and non-credit functions and Technological Overhaul to reduce the "rework economy" caused by manual errors.



### 7.3 Recommendations

1. Adoption of Cloud-Based CBS: Immediate migration to cloud-based banking solutions to standardize data architecture and enable real-time risk monitoring across all tiers (DCCB to PACS).
2. Strategic Diversification: DCCBs must be incentivized to open "Retail Loan Cells" (Housing, Auto, Salary loans) to build a counter-cyclical asset buffer against agrarian distress.
3. Governance Reform: Empower Middle Management, who show a stronger correlation with performance than Top Management, to bridge the "Ivory Tower" gap between strategy and execution.

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