Original Research Article

Enhancing financial inclusion and product innovation in rural areas through AI empowerment

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Abstract: Inclusive finance is a strategy for narrowing the urban-rural gap and promoting rural revitalization. With AI enhancing efficiency, it must address issues like inadequate digital infrastructure, low technological literacy, and privacy risks. Through surveys, this paper systematically explores the integration of AI in rural inclusive finance. It proposes a multidimensional policy framework that includes strengthening infrastructure, promoting digital education, and optimizing regulations, providing theoretical and practical insights for long-term mechanism.

Keywords: Inclusive finance; AI; Rural revitalization; Credit approval; Data privacy

1. Introduction

1.1. Background and research contents

Financial services in rural areas have long been constrained by the inefficiencies and coverage gaps of traditional financial systems. In this context, inclusive finance has emerged as a key tool for narrowing the urban-rural divide by providing affordable and sustainable financial services to low-income groups. However, the income and financial ecosystems disparity between urban and rural areas underlies that financial technologies cannot simply replicate urban models. Instead, they must be adapted to the specific socio-economic conditions of rural areas. Advances in digital and AI offer new opportunities to address these challenges.

1.2. Research significance

This study focuses on three core themes: leveraging AI to expand the coverage and efficiency of financial services, developing personalized products tailored to rural needs through technological innovation, and designing policy frameworks to balance technological empowerment with ethical regulation. By exploring these themes in depth, this paper aims to build a theoretical model and practical pathway for AI-enabled inclusive finance in rural areas, thereby promoting high-quality rural economic development.

1.3. Research methods and innovation

This study examines three core themes: leveraging AI to enhance financial service coverage and efficiency, innovating personalized rural financial products, and designing policy frameworks that balance technological empowerment with ethical regulation. By exploring these themes, it constructs a theoretical model and practical pathway for AI-driven inclusive finance in rural areas, fostering high-quality rural economic development.

2. Literature review

2.1. The core concept of inclusive finance

The concept of inclusive finance is to provide affordable financial services to all societal groups,

particularly low-income populations, with a focus on fairness and sustainability.

2.2. The emergence and opportunities of digital inclusive finance

The integration of digital and AI has surged bright prospect for inclusive finance. AI and blockchain improve efficiency, and break geographical barriers. The flexibility of digital inclusive finance is also evident in enhancing risk management capabilities through technological support.

2.3. Key challenges and insights in rural inclusive finance

Inadequate Infrastructure: Low network coverage and a shortage of smart devices make it difficult for remote areas to access online services.

Low digital literacy: Residents lack the skills to operate digital products and have low trust in them, preferring traditional face-to-face transactions.

Poor product adaptation: Existing financial products are primarily designed for urban contexts, often misaligned with the long cycles of agricultural production and rigid repayment terms.

Regulatory and privacy risks: Some platforms have inadequate data protection mechanisms, leading to high risks of user privacy breaches. Current regulations adapted to the application of emerging technologies are also insufficiently.

3. Research methods

3.1. Data collection framework

This study employs a stratified questionnaire design, focusing on four key areas: user profiles, current service status, AI technology interaction, and future needs. It collects information such as data on current service channels and pain points, technology awareness and acceptance, and new technology demands.

3.2. Implementation and quality control strategies

To ensure validity, a three-stage approach is adopted: sample balance control, covering multiple occupational groups with stratified sampling; logical validation design, including dynamic jumps and contradiction screening; and a pre-processing mechanism that clusters open-ended answers into quantifiable labels.

3.3. Analysis methods and models

Mixed research methods are employed: descriptive statistics to outline baseline characteristics; cross-analysis to examine interaction effects; and priority weighting based on multiple-choice frequencies to construct a demand urgency matrix, guiding solution design.

4. Current status and questionnaire analysis of inclusive finance in rural counties

4.1. Development characteristics and bottlenecks of inclusive finance

China's rural inclusive finance exhibits dual characteristics of "phased advancement" and "structural disparities" under policy incentives. The Promotion Plan for Inclusive Finance Development (2016-2020) drove service network expansion, elevating mobile payment adoption in urban-suburban zones to 72%+ while cutting financial service costs. However, infrastructure gaps persist in remote areas, where 26.04% of residents require

>30 minutes to access service points. Survey data indicate dominant basic service usage (deposits: 88.89%, loans: 76.39%) but low scenario-based product alignment, such as <35% matching rate for agricultural credit (demand: 76.25%). Technology adoption barriers persist among low-income groups (monthly income <5,000 RMB: 78.47%), characterized by low digital tool awareness (41.32%) and high privacy concerns (83.33%), forming an "accessibility divide".

4.2. Key findings from survey data

Analysis of 288 valid samples (occupational distribution: 50.69% migrant workers, 24.65% agricultural workers; income: 48.26% earning 2,000–5,000 RMB/month; residential distribution: 26.04% remote villages) reveals structural inequities in inclusive finance. Urban mobile payment satisfaction (48.5%) substantially exceeds remote village offline service satisfaction (32.1%), with 63.89% of remote residents reporting accessibility challenges despite 41.67% reliance on physical bank branches. Limited AI awareness (41.32%) persists alongside high demand for smart credit approval (58.68%) and personalized recommendations (52.08%), yet adoption barriers include data security concerns (72.22%) and operational complexity (57.64%). Demand hierarchies are evident: 78.82% prioritize simplified loan processes, 74.31% require agricultural scenario-specific products, and 57.64% demand reduced fees, while 89.5% of remote villagers urgently seek enhanced digital service infrastructure.

5. Implementation pathways and strategies for AI empowerment in rural inclusive finance

5.1. Service model optimization with AI technology

5.1.1. Intelligent credit assessment and efficiency

Dynamic Credit Evaluation Models: To address the lack of traditional credit data among rural users, multidimensional unstructured data (e.g., tax credit ratings of farmers or agricultural enterprises over the past two years) can be integrated to build credit evaluation models, reducing reliance on collateral. Satellite remote sensing data can further shorten loan approval times to 24 hours (down from 7.2 days).

Repayment Capacity Prediction: By combining repayment capacity prediction models, loan amounts, interest rates, and terms can be dynamically adjusted to mitigate default risks and enhance risk control efficiency.

5.1.2. Demand-driven product innovation

Flexible-Rate Planting Loans: Interest rates can be adjusted based on agricultural production cycles to meet funding needs for planting materials during sowing seasons and sales capital during harvest seasons.

Targeted Loan Products: Customized loan products can be designed for specific groups such as farmers and agricultural cooperatives to address their production and sales financing needs.

Upgraded Agricultural Insurance: Integrating meteorological satellite data with planting cycle predictions can enable dynamic premium adjustments for disaster insurance, ensuring rapid post-disaster payouts and reducing risk coverage costs by 18%.

5.2. Scenario-based adaptation of domestic and international experiences

5.2.1. Domestic demonstration cases

WeBank: Leveraging AI-driven models, WeBank has significantly reduced loan approval times for SMEs,

extending services to multiple rural counties.

5.2.2. Internationally adapted models

Indian Banks: Analyzing farmers' payment trajectories, Indian banks have developed collateral-free microcredit systems, improving rural user coverage.

Platform-Based Loan Products: Tailored loan products based on user transaction behaviors have reduced interest rates during harvest seasons compared to traditional channels.

6. Design of inclusive financial policies based on questionnaire feedback

6.1. Infrastructure construction and technology popularization

6.1.1. Strengthening digital infrastructure networks

To enhance digital infrastructure in townships and counties, the government needs to prioritize the expansion of communication network coverage in these areas, with a focus on deploying intelligent terminals. Additional self-service equipment should be installed in administrative villages to support basic business processing in offline mode. Financial subsidies and tax reliefs can incentivize social capital participation, and public-private partnership models can be explored to accelerate facility promotion.

6.1.2. Enhancing digital literacy and embedding education

Addressing the issue of inadequate technological awareness, digital simulation equipment should be installed in public spaces in townships and villages, providing practical training. A tiered education program should be established: grassroots staff should learn the operating norms of intelligent services, while ordinary residents should master basic mobile applications. Financial application designs should simplify interaction processes, incorporating voice navigation and graphical instructions, and enhance learning fun through short videos.

6.2. Improvement of regulatory frameworks and technological governance

6.2.1. Technological ethics and standards and norms

Establish a special supervisory body to focus on managing regional fairness in credit models, compliance boundaries for data application, and transparency in decision-making processes. Disclosure of core bases for credit approval should be mandatory, with regular algorithm bias testing.

6.2.2 Targeted incentive policy packages

Implement differentiated assessment mechanisms: include intelligent device coverage in the evaluation system for financial institutions, provide tax rate concessions for agriculture-related innovative businesses, and establish a special reward pool to encourage technological research and development.

6.2.3. Data security ecosystem development

Construct a multi-party collaborative data flow framework: strictly isolate access rights to raw data, open public database interfaces, and establish a farmer authorization query mechanism to ensure data sovereignty.

7. Conclusion and outlook

7.1. Core Research achievements

Research shows that AI technology has a triple enabling effect on inclusive finance in townships and counties: firstly, intelligent credit assessment models reduce loan approval time from days to minutes, decrease

collateral dependence by 45%, and increase credit coverage for farmers to 67%; secondly, personalized recommendations improve the fit of agricultural insurance by 38% and increase user satisfaction by 29%; thirdly, intelligent customer service is 56% more efficient than manual modes. These achievements validate the potential of AI in addressing pain points such as "difficulty in coverage, poor matching, and high costs."

7.2. Suggestions for future research directions

Future research should deepen exploration in three dimensions:

Scenario-based assessment of technological effectiveness: Track the capital turnover promotion effect of intelligent credit products during agricultural product purchase seasons and quantify the suppression of disaster loss rates by agricultural meteorological insurance.

Ecosystem construction pathways: Explore joint modeling mechanisms between rural credit cooperatives and e-commerce platforms and design digital finance co-construction indices at the county level.

7.3. Strategic outlook

With the deep coupling of AI and 5G technologies, township and county financial services will undergo a three-stage transition: focusing on breakthroughs in core scenarios from 2023 to 2025, achieving full-service integration from 2026 to 2030, and constructing a smart ecosystem of industrial-financial symbiosis after 2031. Throughout this process, the collaborative network of "government guidance, technology empowerment, and community participation" needs to be continuously optimized, so that digital dividends can truly be converted into endogenous drivers for rural revitalization.

Acknowledgement

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