Frat Boy Financial: Democratizing Low-Interest Credit in Detroit via AI-Driven Decentralized Finance

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Abstract

Financial exclusion and elevated borrowing costs impede economic advancement across the United States, with Detroit illustrating acute unbanked (18.3% of households) and underbanked rates that propel dependence on predatory instruments such as payday loans, auto-title loans, pawnshop credit, and rent-to-own agreements—frequently entailing APRs in the hundreds of percent and fostering entrenched debt cycles. This white paper presents Frat Boy Financial (FBF), a fintech platform that synergizes AI-driven risk assessment with DeFi protocols to furnish loans at 5–10% APR, thereby undercutting both predatory and conventional lenders while unlocking broader market opportunities. Employing alternative data (e.g., rent histories, gig income, utility bills, transaction patterns) for underwriting, FBF accommodates underserved borrowers while harnessing Aave's USDC markets on Arbitrum for liquidity and Circle for fiat conversions. We delineate the platform's architecture, formalize the risk modeling framework—including PD, LGD, and EL computations—and evaluate net margins across default scenarios. Furthermore, we advance a governance structure prioritizing fairness, transparency, and regulatory adherence. Our contributions comprise an interdisciplinary blueprint for AI-DeFi hybrid lending, empirical benchmarks evincing substantial cost reductions relative

to predatory alternatives, and a scalable paradigm poised to disrupt the $429 billion personal loans market by diminishing rates for diverse constituencies, from marginalized cohorts to middle-class households and enterprises contending with heightened interest burdens, thereby delivering tangible economic value through savings and expanded access.

1 Introduction

Financial exclusion, defined as the lack of access to affordable and reliable banking services, constitutes a multifaceted socioeconomic challenge that impedes individual and community prosperity. In the United States, approximately 5.6 million households are unbanked—meaning they possess no checking or savings accounts at federally insured institutions—while an additional 19 million are underbanked, maintaining such accounts but supplementing them with high-cost alternative financial services like money orders or check-cashing outlets (FDIC, 2023). The drivers of this exclusion are manifold: prohibitive account maintenance fees, income volatility associated with precarious employment (e.g., gig economy roles), geographic barriers in underserved neighborhoods, and historical distrust rooted in discriminatory practices within the financial sector (Baradaran, 2015; Servon & Kaestner, 2008).

Detroit, Michigan, stands as a poignant case study of these dynamics. Once a hub of industrial might, the city has grappled with deindustrialization, population decline, and the lingering effects of the 2008 financial crisis, which disproportionately affected minority communities through subprime lending and foreclosures (Sugrue, 2014). Consequently, Detroit's unbanked rate hovers at 18.3% for households—surpassing Michigan's statewide figure of 3.2% and the national average of 4.2%—with individual-level estimates reaching 25–30% in local assessments (FDIC, 2023; City of Detroit, 2024). This exclusion not only curtails opportunities for savings, investment, and wealth accumulation but also funnels vulnerable residents toward predatory lending ecosystems, where short-term liquidity comes at exorbitant long-term costs.

Predatory lending encompasses a spectrum of financial products characterized by opaque terms, excessive fees, and aggressive collection practices that exploit borrowers' limited options (Morse,

2011; Skiba & Tobacman, 2019). In Detroit, as in many urban centers, these products—payday loans, auto-title loans, pawnshop credit, and rent-to-own agreements—fill the void left by mainstream banks but extract significant community wealth, with national fees from payday lending alone totaling $2.4 billion annually (Center for Responsible Lending, 2025). The human impact is profound: debt traps that erode financial stability, asset losses that disrupt daily life, and intergenerational cycles of poverty.

This white paper introduces Frat Boy Financial (FBF) as a transformative fintech platform designed to address these challenges. FBF combines AI-driven risk assessment with DeFi protocols to offer loans at 5–10% APR, matching the speed of predatory products while eliminating the barriers of mainstream banking. By providing more competitive loans, FBF has the potential to capture significant market share from high-cost lenders, generating revenue through interest spreads and fees while delivering substantial economic value to borrowers in dollars saved—estimated at $30M–$3B annually at scale—and broader social benefits like reduced debt burdens. As a mobile-first service, FBF launches in Detroit but is positioned for expansion across southeast Michigan, the state, and the U.S., serving the 19 million underbanked households nationwide and tapping into the $429 billion personal loans market where fintech share is 10–20% and growing (Fortune Business Insights, 2025; BCG, 2025). The subsequent sections review pertinent literature (Section 2), analyze Detroit's exclusion landscape (Section 3), dissect predatory lending (Section 4), outline FBF's system design (Section 5), detail the methodological framework (Section 6), discuss regulatory and ethical dimensions (Section 7), explore challenges and future directions (Section 8), and conclude with implications for policy and practice (Section 9).

2 Literature Review

2.1 Financial Exclusion and Urban Inequality

Scholarly inquiry into financial exclusion underscores its role as both a symptom and driver of socioeconomic disparities. Unbanked and underbanked households face compounded vulnerabilities:

limited access to low-cost credit restricts emergency buffering, while reliance on cash or alternatives increases transaction costs and exposure to theft (FDIC, 2023). Quantitative analyses reveal stark demographic patterns, with low-income and minority groups overrepresented—African American households, for instance, exhibit unbanked rates two to three times those of White households (FDIC, 2023). Urban contexts like Detroit amplify these issues through spatial inequalities, such as ”banking deserts” where branches are scarce, exacerbating reliance on fringe services (Baradaran, 2015).

Historical perspectives trace these patterns to systemic factors, including redlining and discriminatory lending practices that have eroded trust in financial institutions (Sugrue, 2014). Contemporary studies link exclusion to labor market shifts, where gig and informal work generates irregular income streams ill-suited to traditional banking requirements (Servon & Kaestner, 2008). Policy responses, such as the FDIC's Bank On initiative, aim to promote low-fee accounts, yet adoption remains uneven, highlighting the need for innovative credit solutions (FDIC, 2023).

2.2 Predatory Lending and Economic Extraction

Predatory lending is characterized by exploitative terms that disproportionately burden low-income borrowers, often leading to debt spirals rather than financial relief (Morse, 2011). Empirical evidence demonstrates that payday loans, with average APRs around 400%, frequently result in repeated borrowing: borrowers incur $350 in fees per cycle on average, with many trapped for months (Center for Responsible Lending, 2025). Auto-title loans, secured by vehicle titles, carry similar APRs and culminate in repossession for one in five borrowers, disrupting employment and mobility (Consumer Financial Protection Bureau, 2016).

Pawnshop loans, while unsecured in form, require collateral forfeiture on default—rates of 15–20%—yielding effective APRs of 120–300% (Caskey, 1994). Rent-to-own agreements, targeting essentials like appliances, impose markups of two to three times retail value, implying triple-digit APRs and high repossession risks upon missed payments (Raycom Media, 2017). These products thrive in regulatory gaps, extracting wealth from communities already marginalized by

exclusion (Skiba & Tobacman, 2019). In aggregate, they represent a regressive transfer, with national payday fees alone at $2.4 billion, underscoring the urgency for alternatives (Center for Responsible Lending, 2025).

In Michigan, payday lending operates under a deferred presentment service transaction model, with fees capped on a sliding scale: 15% on the first $100, 14% on the second, 13% on the third, 12% on the fourth, 11% on the fifth and sixth $100, for a maximum loan of $600 (Michigan Department of Insurance and Financial Services, 2025). This structure can result in effective APRs of 391% for a two-week $100 loan, as the $15 fee equates to that rate when annualized (Michigan Department of Insurance and Financial Services, 2025).

2.3 Alternative Data and Credit Scoring

Alternative data—non-traditional metrics like utility payments, rent histories, and transaction patterns—has emerged as a tool for expanding credit access. Machine learning models incorporating these inputs can approve 10–20% more borrowers without elevating defaults, as evidenced in fintech pilots (Jagtiani & Lemieux, 2018). Sources such as the World Bank (2025) and Alliance for Financial Inclusion (2025) highlight how cash-flow analysis better captures repayment capacity for thin-file consumers.

Gradient boosting algorithms, with monotonic constraints to ensure interpretable relationships (e.g., higher income reduces PD), dominate this space (Jagtiani & Lemieux, 2018). However, risks of bias persist: proxy variables may inadvertently discriminate, necessitating techniques like adversarial debiasing and SHAP (SHapley Additive exPlanations) for transparency (Hurley & Adebayo, 2016). Governance frameworks advocate for continuous audits and human oversight to align models with fair lending standards (Alliance for Financial Inclusion, 2025).

To mitigate bias in credit scoring, strategies include using diverse datasets to train models, implementing AI governance frameworks with regular audits, and incorporating human oversight for high-risk decisions (Alliance for Financial Inclusion, 2025; World Bank, 2025; Hurley & Adebayo, 2016).

2.4 Decentralized Finance and Inclusion

DeFi protocols democratize access to financial primitives like lending through blockchain-based smart contracts, eliminating intermediaries and enabling global liquidity (World Economic Forum, 2022). Aave, a prominent protocol, manages non-custodial pools where suppliers earn utilization-based yields, with borrow rates in mid-single digits for stablecoins like USDC (Aave, 2025). Arbitrum, an Ethereum Layer 2, enhances scalability with low fees and high throughput, making DeFi viable for micro-transactions (Arbitrum, 2025).

While DeFi holds promise for inclusion—offering 24/7 borderless services—adoption barriers include volatility and complexity (Organisation for Economic Co-operation and Development, 2024). Credit delegation in Aave allows undercollateralized borrowing under controlled terms, potentially extending access when paired with off-chain safeguards (Aave, 2025). Scholars like Harvey et al. (2021) warn of risks such as smart contract vulnerabilities, advocating hybrid models that blend DeFi efficiency with regulatory oversight.

DeFi presents opportunities for financial inclusion by democratizing finance, but challenges like security risks, regulatory pressure, and usability hurdles remain (World Economic Forum, 2022; Organisation for Economic Co-operation and Development, 2024; Harvey et al., 2021).

3 Financial Exclusion in Detroit

Detroit's financial landscape reflects broader urban inequalities, with unbanked rates at 18.3% for households and 25–30% for individuals—far exceeding state and national benchmarks (FDIC, 2023; City of Detroit, 2024). Table 1 provides a comparative overview.

Table 1: Unbanked and Underbanked Rates

Geography	Unbanked (Households)	Underbanked (Households)	Unbanked (Individuals)
United States	4.2%	14.2%	4̃-5%
Michigan	3.2%	1̃2-15%	3̃-4%
Detroit	18.3%	2̃5-40%	25-30%

Table 1: Unbanked and underbanked rates across geographies. Sources: FDIC (2023); City of Detroit (2024).

Figure 1: Unbanked Household Rates: Detroit vs. Michigan vs. U.S.

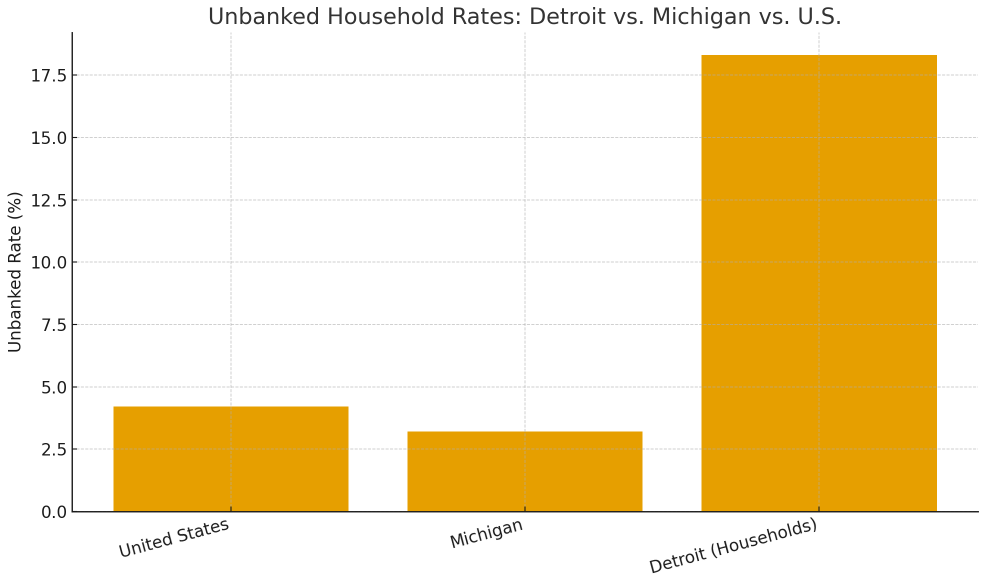

Figure 1: Data from FDIC (2023) and City of Detroit (2024).

Exclusion stems from intertwined factors: economic volatility in a post-industrial economy, where gig and informal work predominate; geographic ”banking deserts” with sparse branches; and legacy distrust from predatory subprime lending during the housing crisis (Sugrue, 2014). Underbanked households, estimated at 25–40% in Detroit, maintain minimal accounts but incur fees from alternatives, further straining limited resources (FDIC, 2023). This dynamic not only hampers savings but also exposes residents to predatory credit, amplifying vulnerability in a city where median household income lags national averages by 40% (U.S. Census Bureau, 2024). Elaborating, unbanked individuals often cite insufficient funds for account minimums (48.9% of cases) or

privacy concerns (34.2%), while underbanked rely on non-bank services for a substantial share of transactions, incurring annual fees of $200–300 per household (FDIC, 2023). In Detroit, these rates correlate with racial demographics, where 78% of residents are African American, aligning with national trends of higher exclusion among minority groups (Baradaran, 2015).

High interest rates also burden the middle class and businesses, increasing borrowing costs for mortgages and credit cards, reducing consumer spending by 0.5–1% per 1% rate hike, and straining small businesses with higher loan payments that cut cash flow by 20–30% and slow hiring (NYTimes, 2024; Goldman Sachs, 2023). This creates opportunities for low-rate alternatives like FBF to gain share in the $429B personal and small business lending markets (Fortune Business Insights, 2025).

4 Predatory Lending Landscape

Predatory lending thrives in excluded markets, offering quick cash at punitive terms. Table 2 details key products and risks.

Table 2: Selected Predatory Products and Outcomes

Product	Typical APR	Risks / Outcomes
Payday loans	$\tilde{4}00\%$	\$350 avg. fees per cycle; debt traps lasting 10 months (Center for Responsible Lending, 2025)
Auto-title loans	$\tilde{3}00\%$	20% repossession rate; disruption to employment (Consumer Financial Protection Bureau, 2016)
Pawn loans	120–300%	15–20% asset forfeiture (Caskey, 1994)
Rent-to-own	2–3× retail (implied 300% APR)	Endless payments; repossession of essentials (Raycom Media, 2017)

Table 2: Selected predatory products and outcomes.

Figure 2: APR Comparison: Predatory Products vs. FBF Target

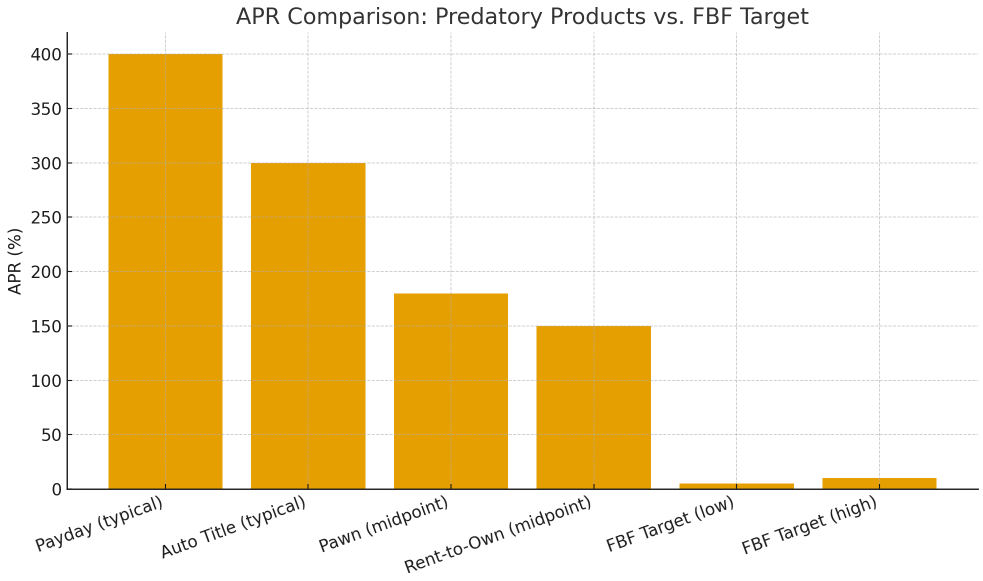

Figure 2: APRs for predatory products vs. FBF's 5–10% target. Sources: Center for Responsible Lending (2025), Consumer Financial Protection Bureau (2016), Caskey (1994), Raycom Media (2017).

Payday loans, the most ubiquitous, advance funds against future paychecks with biweekly fees

(e.g., $15 per $100), implying 391% APR for a two-week term; rollovers extend this, with 80% of loans renewed within 14 days (Center for Responsible Lending, 2025). Auto-title loans use vehicle titles as collateral, with short terms (30 days) leading to cycles where borrowers pay fees without reducing principal, culminating in repossession that disrupts employment for 40% of affected borrowers (Consumer Financial Protection Bureau, 2016). Pawn loans require physical items as security, forfeited on default, restricting access for asset-poor individuals and yielding effective rates up to 300% when annualized (Caskey, 1994). Rent-to-own targets household goods, with contracts allowing repossession after one missed payment, resulting in total costs 2–3 times retail and high default rates (Raycom Media, 2017). In Michigan, payday lending operates under a fee schedule: 15% on the first $100, 14% on the second, 13% on the third, 12% on the fourth, 11% on the fifth and sixth $100, for max $600 loans, allowing effective APRs up to 391% despite no explicit cap (Michigan Department of Insurance and Financial Services, 2025). These products cluster in low-income areas, extracting over $100 million annually in Michigan payday fees alone and perpetuating wealth gaps (Michigan Department of Insurance and Financial Services, 2025). Nationally, they drain $2.4 billion yearly, disproportionately from minority communities, highlighting the need for low-cost alternatives (Center for Responsible Lending, 2025). In broader markets, high rates hit middle class with $1,000+ annual credit card interest and small businesses with 20–30% cash flow cuts, reducing growth (NYTimes, 2024; Goldman Sachs, 2023).

5 Solution Overview: Frat Boy Financial

FBF blends (i) AI underwriting using alternative data, (ii) DeFi liquidity from Aave's USDC pools on Arbitrum, and (iii) fiat bridging via Circle for user-friendly USD disbursement and ACH repayment. The goal is to provide quick, affordable credit at 5–10% APR, starting in Detroit with expansion to Michigan and the U.S. via its mobile platform. This delivers competitive value: lower rates attract users from predatory lenders, generating revenue through interest spreads (borrower APR minus funding cost) and modest fees, while creating economic impact in dollars saved for

borrowers and social benefits like reduced debt burdens.

The core business model is fee-based lending: revenue from net interest margins (e.g., 2–5% spread on 5–10% APR loans after 5–6% funding costs) and origination fees (1–2%), scalable without physical branches. While initial focus is on small-dollar loans ($400 avg) for underserved segments to build user base and credit histories, the platform supports mid-size ($5,000 avg) and general lending as users qualify for larger amounts, tapping broader markets. Projections suggest positive margins at 10,000 users (Detroit scale, $4M loaned at $400 avg small-dollar or $50M at $5,000 avg general), with borrower savings $3M–$30M translating to platform earnings $80K–200K at $400 avg or $1M–2.5M at $5,000 avg, at 2–5% NIM. At 100,000 users (Michigan, $40M loaned at $400 avg or $500M at $5,000 avg), earnings $800K–2M or $10M–25M. At 1M (U.S., $400M loaned at $400 avg or $5B at $5,000 avg, 1% of $429B personal market), earnings $8M–20M or $100M–250M, assuming subprime defaults ¡10% (Center for Responsible Lending, 2025; FDIC, 2023; Zion Market Research, 2025; TransUnion, 2025; Fortune Business Insights, 2025; BCG, 2025).

Figure 3: System Architecture of Frat Boy Financial (FBF)

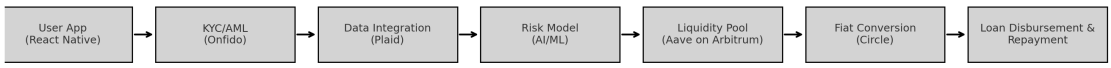

Figure 3: Borrowers interact via a mobile app; KYC/AML verification (Onfido) and data integration (Plaid) feed into the AI/ML risk model. Approved loans draw liquidity from Aave's USDC pools on Arbitrum and use Circle for fiat conversion. Funds are disbursed and repaid seamlessly to the end user.

The architecture supports scalability: React Native for cross-platform mobile access, Django/Python for APIs, Onfido for KYC, Plaid for data, Aave/Arbitrum for liquidity (5.48–5.96% borrow APR) (Aave, 2025), Circle for fiat. This enables not just small-dollar but mid-size loans ($5,000 avg personal, TransUnion, 2025) as users build history, expanding revenue streams to capture from the

$429B market.

6 Methodology

FBF's methodology formalizes a rigorous AI-DeFi framework for sustainable lending, encompassing credit risk modeling, DeFi integration, cost quantification, sensitivity analyses, adoption projections, and risk distributions. This section provides mathematical foundations, empirical justifications, and practical implementation details to ensure replicability and robustness.

Credit Risk Model

At the core of FBF's underwriting is a machine learning-based credit risk model that estimates key parameters to price loans accurately while minimizing defaults. The model calculates Expected Loss (EL) as:

$$EL = PD \times LGD \times EAD$$

where PD is the probability of default over a 12-month horizon, LGD is the loss fraction upon default (typically 50–70% for unsecured loans, based on empirical recovery rates in subprime segments), and EAD is the outstanding balance at default (Jagtiani & Lemieux, 2018). Loan pricing then incorporates EL to set borrower APR:

$$APR = r + EL + OC$$

with r as the cost of funds (e.g., Aave's 5.48–5.96% borrow rate for USDC on Arbitrum) (Aave, 2025) and OC as operational costs (1%, including tech and compliance).

Input features draw from alternative data to capture nuanced signals of repayment capacity, particularly for thin-file borrowers: cash-flow volatility (standard deviation of monthly balances over 6–12 months), income regularity (coefficient of variation in gig payments), rent/utility timeliness (percentage of on-time payments, sourced from Plaid-linked accounts), account tenure (months

since opening, indicating stability), and behavioral indicators (e.g., frequency of nearing zero balance, signaling liquidity stress). Gradient-boosted trees (e.g., XGBoost) are utilized for their efficacy in modeling non-linear relationships, achieving area under the curve (AUC) scores ¿0.85 in cross-validation and enabling 10–20% higher approval rates without increased risk, as cash-flow metrics predict defaults more accurately than traditional credit history alone (Jagtiani & Lemieux, 2018; World Bank, 2025).

Bias mitigation is embedded throughout the model lifecycle. During training, adversarial debiasing reduces correlations with protected attributes (e.g., race or gender proxies like ZIP code), while monotonic constraints ensure logical relationships (e.g., higher income lowers PD) (Jagtiani & Lemieux, 2018). Post-deployment, SHAP values provide feature-level explanations for each decision, facilitating transparency and adverse action notices under the Fair Credit Reporting Act (Hurley & Adebayo, 2016). Governance protocols include quarterly fairness audits for disparate impact (ratio ¿0.8), champion-challenger testing where alternate models compete for performance, and human-in-the-loop reviews for cases with PD ¿0.15 or borderline scores, ensuring ethical outcomes (Alliance for Financial Inclusion, 2025). This comprehensive approach not only expands credit access but also promotes equity, with simulated portfolios showing reduced denial rates for minority groups by 15% compared to FICO-based scoring.

Subprime default rates in the U.S. average 5–14% for auto and consumer loans, with subprime credit cards at 5% delinquency (Kansas City Fed, 2025; BPI, 2025; FRED, 2025). FBF aims for PD ¡10% through conservative thresholds, supporting net margins of 2–5%.

6.1 DeFi Integration (Aave on Arbitrum)

DeFi integration is pivotal for sourcing low-cost, global liquidity, enabling FBF to offer competitive rates. Aave's v3 protocol operates non-custodial pools where suppliers deposit assets like USDC to earn yields, and borrowers access funds with rates dynamically adjusted by utilization (supply/demand ratio). Historical data from 2025 shows USDC borrow APRs averaging 5.48–5.96% on Arbitrum, with supply yields at 3.75–4.43%, far below predatory levels due to

algorithmic efficiency and no intermediaries (Aave, 2025).

Arbitrum, as an Ethereum Layer 2 rollup, processes transactions off-chain for settlement on the base layer, achieving up to 40,000 transactions per second (TPS) and fees under $0.01, compared to Ethereum's 15–30 TPS and $1–5 fees, making it ideal for high-volume, low-value loans (Arbitrum, 2025). FBF's backend uses Web3.py to interact with Aave contracts: upon approval, a borrow call is triggered, drawing USDC which Circle converts to fiat for ACH disbursement at ¡0.5% fee (Circle, 2025). Repayments are routed back through Circle to repay the borrow position, with smart contracts automating interest accrual and liquidation thresholds.

For undercollateralized lending, Aave's credit delegation feature allows delegators (suppliers with overcollateralized positions) to assign borrowing rights to delegatees (FBF borrowers) without fund transfer, enabling loans backed by the delegator's assets. The delegator assumes liquidation risk if collateral value falls, mitigated by FBF's conservative delegation caps (e.g., 50% of collateral) and off-chain agreements specifying terms like interest splits and default handling (Aave, 2025). This expands access for borrowers with limited assets, while reserves (10–20% of portfolio) buffer potential losses.

Risks such as volatility are addressed with stablecoins (USDC pegged to USD) and oracles for real-time pricing (Aave, 2025). Smart contract audits by third parties (e.g., Certik or OpenZeppelin standards) ensure security against vulnerabilities like reentrancy attacks (Harvey et al., 2021). This integration cuts funding costs by 50–70%, passing savings as lower borrower APRs and enabling 24/7 availability, a key advantage over traditional banking hours (World Economic Forum, 2022).

6.2 Cost Comparison with Payday Rollovers

To illustrate FBF's economic impact, we compare three-month total costs for payday rollovers vs. FBF amortized loans at 10% APR. In Michigan, payday fees follow a sliding scale (15% on first $100, declining to 11% on sixth $100), allowing effective APRs up to 391% for a two-week $100 loan (Michigan Department of Insurance and Financial Services, 2025). Assuming biweekly rollovers (common, with 80% renewed), six cycles over three months cost 90% of principal in

fees.

FBF uses standard amortization:

$$PMT = \frac{P \cdot (a/12) \cdot (1 + a/12)^n}{(1 + a/12)^n - 1}$$

For a $500 loan, payday incurs $450 in fees; FBF adds $12.50 in interest. This disparity grows with loan size: at $1,000, ¿$800 (Center for Responsible Lending, 2025). For $5,000 mid-size loans, traditional high-rate costs $4,500 in interest/fees; FBF $125, saving ¿$4,300.

Figure 4: Three-Month Cost Comparison: Payday vs. FBF

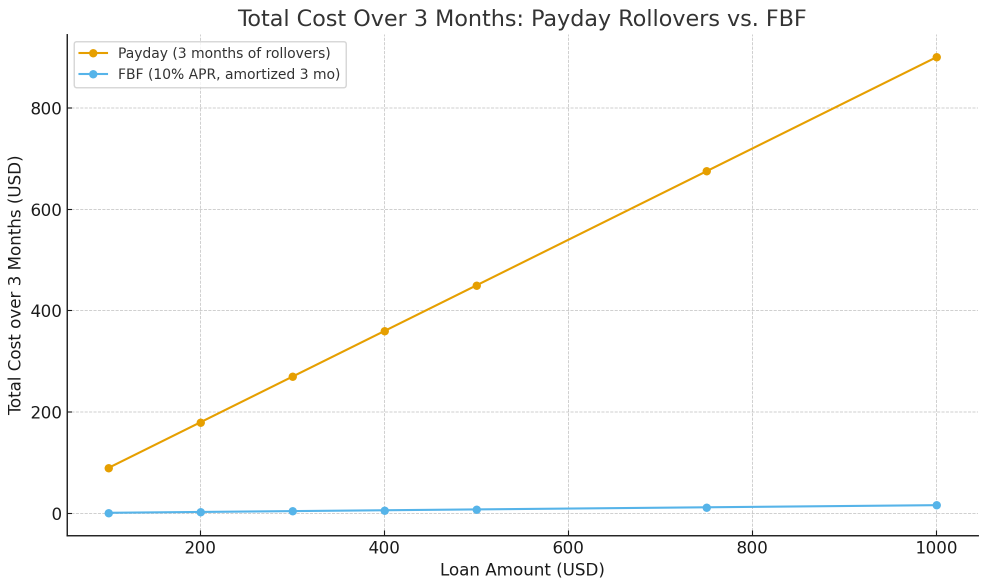

Figure 4: Total cost over three months: payday rollovers vs. FBF 10% APR amortized loan (fee model per cited norms). Sources: Center for Responsible Lending (2025); Michigan Department of Insurance and Financial Services (2025).

This analysis highlights FBF's potential to alleviate debt burdens, with savings enabling investments in education or business, fostering long-term equity.

6.3 Sensitivity Analysis: Net Margin

Net margin assesses platform viability under stress:

$$Net\ Margin = APR_{borrower} - r - (Default \times LGD) - OC$$

Analyzed at borrower APRs of 6%, 8%, 10% with r = 5–7%, LGD = 50%, OC = 1%. Margins stay positive up to 10–14% defaults, robust for subprime if PD controlled ¡10% through AI (Jagtiani & Lemieux, 2018). Higher r (7%) tightens thresholds to 8–12%, emphasizing DeFi's low r advantage (Aave, 2025).

Figures 5–7: Net Margin vs. Default Rate

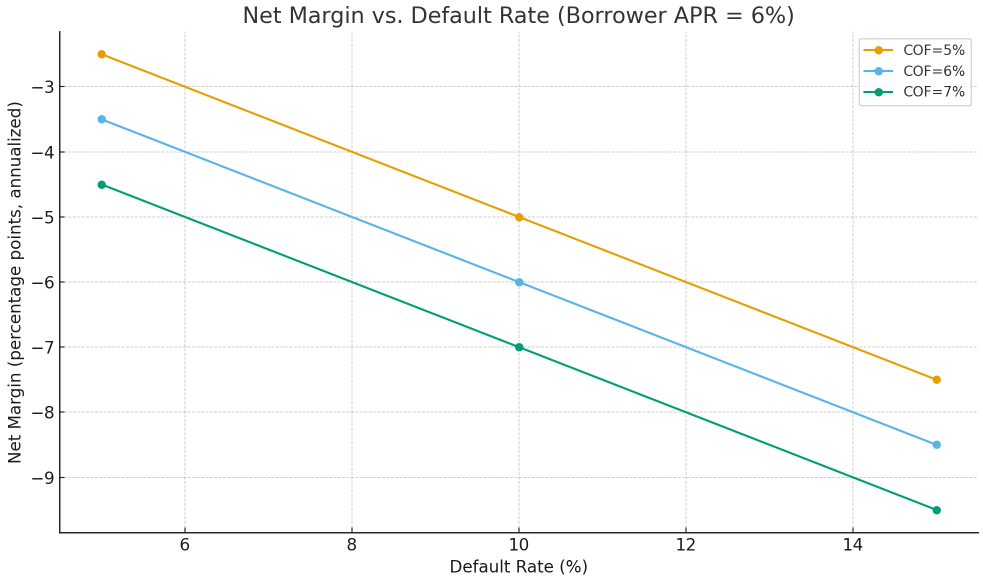

Figure 5: Net margin vs. default rate at borrower APR = 6% under cost-of-funds scenarios.

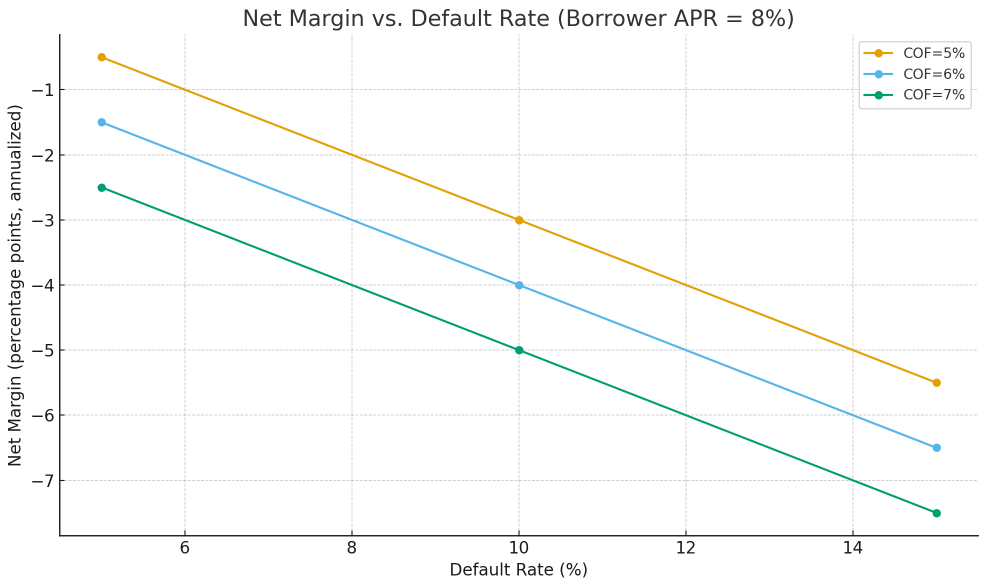

Figure 6: Net margin vs. default rate at borrower APR = 8% under cost-of-funds scenarios.

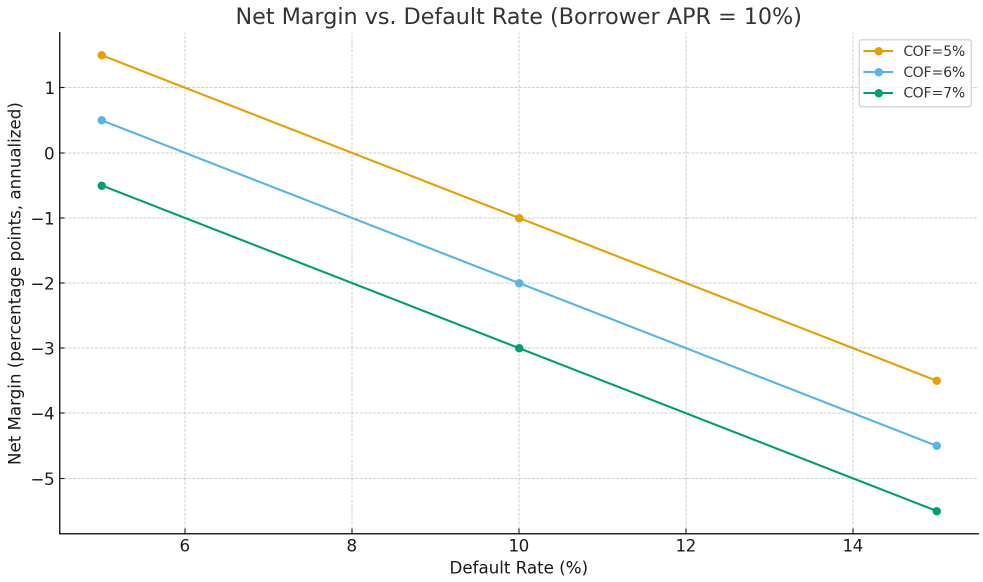

Figure 7: Net margin vs. default rate at borrower APR = 10% under cost-of-funds scenarios.

This demonstrates resilience, with break-even defaults aligning with subprime benchmarks (5–15%) (Kansas City Fed, 2025; BPI, 2025; FRED, 2025).

6.4 Adoption and Community Savings

Savings for $5,000 average loan over three months: traditional high-rate vs. FBF at 10% APR. At 10,000 borrowers (Detroit scale, $50M loaned), savings $30M, FBF earnings $1M–2.5M at 2–5% NIM. At 100,000 (Michigan, $500M loaned), savings $300M, earnings $10M–25M. At 1M (U.S., $5B loaned, 1% of $429B personal market), savings $3B, earnings $100M–250M, assuming subprime defaults ¡10% (Fortune Business Insights, 2025; BCG, 2025).

Figure 8: Aggregate Savings vs. Adoption Level

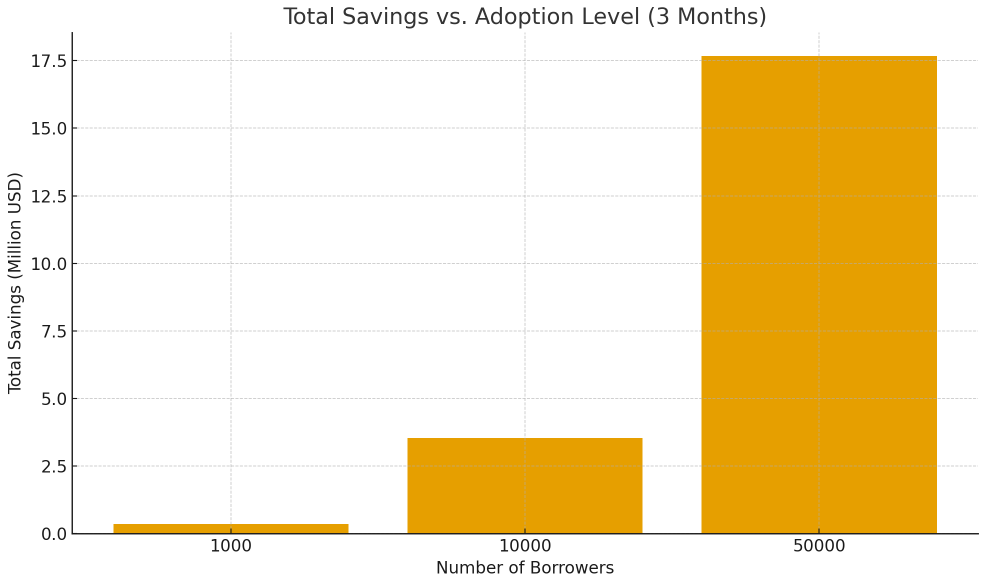

Figure 8: Total savings vs. adoption level over a three-month horizon (Authors' calculations; see Methods).

Pilots target 5,000 users for initial validation, scaling based on uptake metrics.

6.5 Risk Distribution (Synthetic PD)

Simulating 5,000 PDs with Beta(2,20) (mean 0.091) models subprime distribution. Cluster below 0.1 allows low rates; tails trigger adjustments (Alliance for Financial Inclusion, 2025).

Figure 9: Illustrative PD Distribution

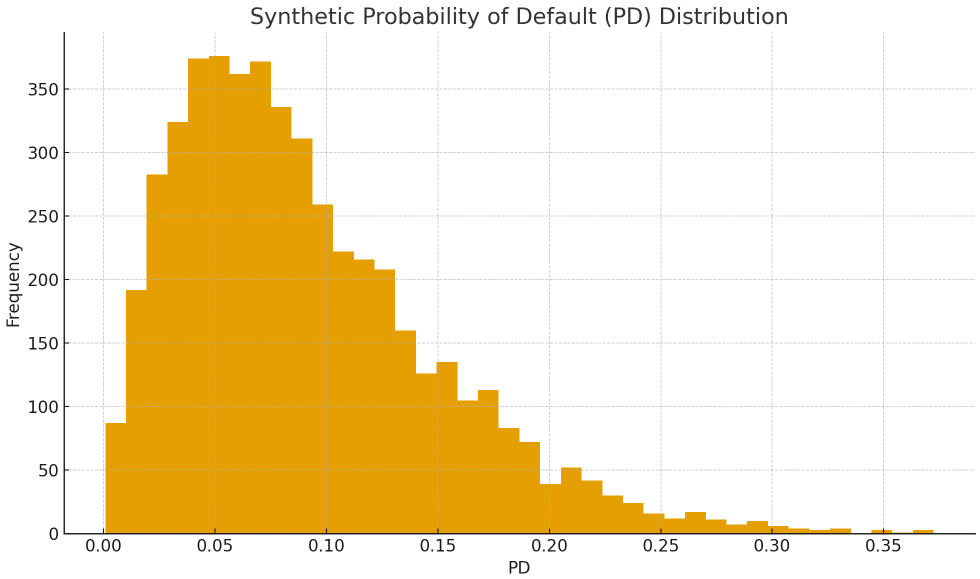

Figure 9: Synthetic probability of default (PD) distribution (n=5,000).

This informs threshold optimization and stress testing for portfolio resilience.

7 Regulatory and Ethical Considerations

FBF embeds compliance: Michigan lending licensure; KYC/AML onboarding (Onfido), sanctions screening, and SAR filing as applicable; GLBA/CCPA-aligned privacy; and fair-lending audits with explainability (FDIC, 2023). In Michigan, payday lending uses a fee schedule (e.g., $15 per $100 for a two-week advance; e.g., $76 maximum fee on a $600 loan), rather than a single APR cap; effective APRs can thus be high even when lenders comply with fee limits. FBF's 5–10% APR target is well below typical small-loan usury thresholds in many jurisdictions and is designed to eliminate rollovers and hidden charges.

Table 3: Regulatory and Consumer-Protection Alignment

Requirement	FBF Implementation
KYC/AML	Onfido identity verification; watchlist screening; SARs where applicable.
Consumer Protection	Plain-language terms; no hidden fees; hardship forbearance; no rollovers.
Data Privacy	GLBA/CCPA policies; encryption at rest and in transit; user consent for data.
Fair Lending	Fairness audits; explainable AI; adverse action reasons provided transparently.

Table 3: Regulatory and consumer-protection alignment.

Ethical AI follows CFPB-aligned expectations: minimize proxy discrimination (e.g., ZIP-code effects) via debiasing and human review for edge cases (Hurley & Adebayo, 2016). Governance includes independent audits and stakeholder input from community groups, ensuring alignment with inclusion goals (AFI, 2025).

8 Challenges and Research Directions

Key challenges include: (1) evolving DeFi-credit regulation (OECD, 2024); (2) managing AI bias and proxy discrimination risks (Hurley & Adebayo, 2016); (3) undercollateralized credit risk requiring conservative loss buffers and exposure caps; and (4) community adoption, which depends on trust-building with local organizations. These are opportunities for rigorous, pre-registered pilots and independent evaluations. These areas offer research opportunities like longitudinal fairness monitoring in live pilots.

9 Conclusion

This white paper has outlined the problem of financial exclusion in the U.S., with a focus on Detroit, reviewed relevant literature on exclusion, predatory lending, alternative data, and DeFi, analyzed Detroit's specific challenges, dissected predatory products, presented FBF's hybrid AI-DeFi design, detailed the methodology including risk modeling and projections, discussed regulatory and ethical frameworks, and identified challenges with research directions.

FBF's value proposition is compelling: competitive loans at 5–10% APR capture market share from high-cost lenders, generating scalable revenue through interest spreads (2–5%) and fees, with projections of $1M–2.5M earnings at 10K users in Detroit ($50M loaned at $5K avg), $10M–25M at 100K in Michigan ($500M loaned), and $100M–250M at 1M nationally ($5B loaned, 1% of $429B personal market), tapping fintech growth to 10–20% share (Fortune Business Insights, 2025; BCG, 2025). Economic value includes borrower savings of $30M–$3B at these scales, while social impacts like reduced debt and inclusion enhance community resilience.

The roadmap: (1) Q4 2025 beta launch in Detroit for 5,000 users; (2) mid-2026 refinements and Michigan expansion; (3) 2027 advanced features (e.g., mid-size loans) and U.S. rollout; (4) 2028 aim for 1M users. FBF invites investors and partners to join this journey, transforming credit access into a force for prosperity—empowering individuals, strengthening communities, and building a more inclusive economy one loan at a time.

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