

Module 2 Summary: The Access Problem

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Digital Finance — BSc Course

L1: Financial Exclusion

- 1.4 billion adults lack formal identity documents
- Mobile money (M-Pesa) as leapfrog technology
- KYC requirements as barrier to inclusion

L2: Credit Scoring & Alternative Data

- Traditional scoring excludes "credit invisibles"
- Alternative data: mobile usage, utility payments, social graphs
- Trade-off: inclusion vs. privacy and bias risk

L3: Democratizing Investment

- Fractional shares lower minimum investment to \$1
- Robo-advisors: algorithm-driven portfolio management
- Gamification risks: overtrading, herd behavior

L4: Algorithmic Fairness

- Disparate impact vs. disparate treatment
- Fairness metrics: demographic parity, equalized odds
- Impossibility theorem: cannot satisfy all fairness criteria simultaneously

Module 2 answers: Who is excluded from finance, why, and how can technology close the gap without creating new harms?

Financial Exclusion

Unbanked: No account at a formal financial institution. **Underbanked:** Has an account but relies on alternative financial services (payday lenders, check cashers).

Credit Scoring

Default Probability = $f(\text{payment history, utilization, length, mix, inquiries})$

Alternative data extends this: $f(\dots, \text{mobile top-ups, rent payments, utility bills})$

Fairness Metrics

Demographic Parity: $P(\hat{Y} = 1 | A = 0) = P(\hat{Y} = 1 | A = 1)$

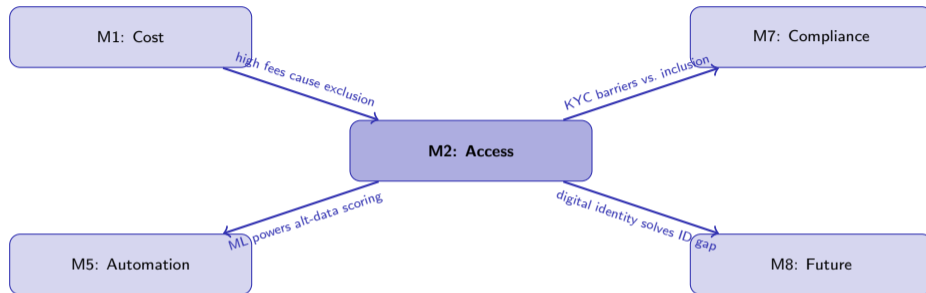
Equalized Odds: $P(\hat{Y} = 1 | Y = y, A = 0) = P(\hat{Y} = 1 | Y = y, A = 1) \forall y$

Impossibility Theorem (Chouldechova, 2017)

When base rates differ across groups ($P(Y = 1|A = 0) \neq P(Y = 1|A = 1)$), it is **mathematically impossible** to simultaneously achieve equal false positive rates, equal false negative rates, and equal predictive values.

Fairness in lending is a mathematical constraint problem, not just an ethical aspiration.

Connections to Other Modules



- **Cost** → **Access (M1)**: High MDR and account fees are direct drivers of financial exclusion
- **Access** → **Automation (M5)**: ML models enable alternative credit scoring but introduce bias-variance trade-offs
- **Access** → **Compliance (M7)**: KYC/AML requirements designed to prevent crime also exclude legitimate users without documents
- **Access** → **Future (M8)**: Self-sovereign identity (SSI) could give the unbanked verifiable credentials without centralized gatekeepers

Access is the human consequence of cost, technology, and regulation decisions made across every other module.