

Theory Handout: Core Concepts in FinTech & Payment Systems

This handout consolidates the six foundational economic concepts that underpin the entire FinTech Fundamentals lecture. Work through the three activities individually, then check your answers in the Solutions section on the final page.

Activity 1: Define the Friction

Six theoretical concepts from the lecture each name a specific economic friction that financial intermediaries must manage—and that FinTechs attempt to reduce or eliminate.

For each concept below, write **one sentence** that completes the prompt: *“This concept names the friction that...”*

1. Information asymmetry

This concept names the friction that...

2. Transaction cost

This concept names the friction that...

3. Adverse selection

This concept names the friction that...

4. Moral hazard

This concept names the friction that...

5. Intermediation

This concept names the friction that...

6. Network effect

This concept names the friction that...

Activity 2: Metcalfe's Law Calibration

Metcalfe's Law states that the value of a network of n users scales with the number of possible pairwise connections:

$$C(n) = \frac{n(n-1)}{2}$$

Answer the four calibration prompts below.

Q1: If a payment network grows from N to $2N$ users, the number of possible connections grows by a factor of approximately _____. (Hint: compute $C(2N)/C(N)$ for large N .)

Q2: Which type of FinTech business benefits *most* from Metcalfe's Law, and why?

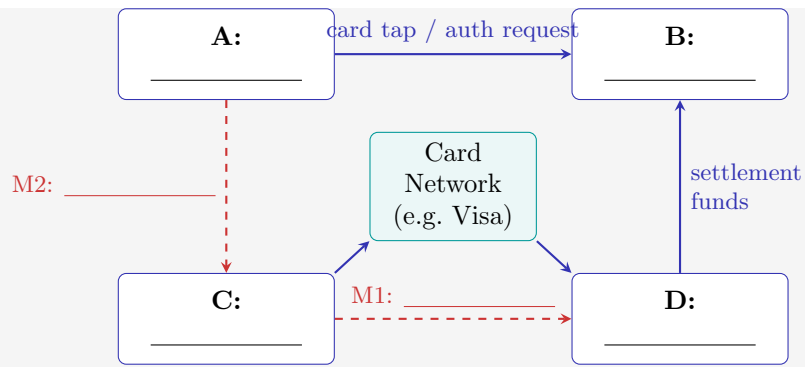
Q3: A challenger bank launches with 10 000 users. A year later it reaches 100 000 users. By what factor did its network *connections* increase?

$$C(10,000) = \underline{\hspace{2cm}} \quad C(100,000) = \underline{\hspace{2cm}} \quad \text{Factor} = \underline{\hspace{2cm}}$$

Q4: Name one real-world FinTech that dominates its market primarily because of network-effect lock-in, and identify one strategy a new entrant could use to overcome this barrier.

Activity 3: Four-Party Payment Scheme

The diagram below shows the four-party card payment scheme. Fill in the blank labels (A–D) and the two money-flow descriptions (M1, M2).



Q1: Identify parties A, B, C, D.

Q2: What is money flow M1 called, and who receives it?

Q3: What is money flow M2, and why is the interest rate on it relevant to FinTech?

Solutions

Solutions — Activity 1: Define the Friction

1. **Information asymmetry:** This concept names the friction that arises when one party in a financial transaction (typically the borrower or insured) holds private information the other party (the lender or insurer) cannot observe, creating misallocation of capital and pricing errors. *Takeaway: FinTech reduces this friction by harvesting alternative data—digital footprints, transaction histories—to close the information gap.*
2. **Transaction cost:** This concept names the friction that captures all costs—search, negotiation, monitoring, and enforcement—incurred to complete an economic exchange beyond the face-value price, explaining why intermediaries historically existed. *Takeaway: Coase (1937) showed firms and markets both arise to minimize transaction costs; FinTech lowers them below the threshold where intermediaries are necessary.*
3. **Adverse selection:** This concept names the friction that occurs *before* a contract is signed when information asymmetry causes the riskier counterparties to be disproportionately attracted to a product (e.g. high-risk borrowers seeking loans, sicker patients buying insurance), pushing out safer counterparties and potentially collapsing the market. *Takeaway: Akerlof’s “market for lemons” shows adverse selection can destroy markets; credit-scoring FinTechs directly attack this problem.*
4. **Moral hazard:** This concept names the friction that occurs *after* a contract is signed when the insured or funded party takes on more risk than disclosed because they do not bear the full cost of losses (the classic problem of insured drivers driving recklessly). *Takeaway: Smart contracts and telematics-based insurance reduce moral hazard by making behavior directly observable and contractible.*
5. **Intermediation:** This concept names the friction that the cost and delay of routing transactions through third parties (banks, exchanges, correspondents) imposes on economic activity—visible most acutely in cross-border remittance fees (avg. 6–7%) and the “3-to-5 business days” problem. *Takeaway: DeFi and instant payment rails directly attack intermediation cost; the Philippon puzzle notes US intermediation cost has barely changed despite decades of technology.*
6. **Network effect:** This concept names the friction that incumbent payment networks are so valuable precisely *because* they are large, making it nearly impossible for a new entrant to provide equivalent utility with fewer participants—a positive feedback loop that locks in the leader. *Takeaway: Metcalfe’s Law ($C = n(n-1)/2$) quantifies this; winner-take-most outcomes in payments, messaging, and lending marketplaces all trace back to network effects.*

Solutions — Activity 2: Metcalfe’s Law Calibration

- A1:** For large N : $C(2N)/C(N) = \frac{2N(2N-1)}{N(N-1)} \approx 4$. Doubling users roughly **quadruples** connections. *Takeaway: Value scales as $\sim n^2$ while costs scale roughly linearly—explaining explosive winner-take-most dynamics.*
- A2: Multi-sided payment networks** (e.g. card schemes, P2P transfers, marketplace lending) benefit most. Each new user on one side adds value to all users on the other side; the marginal cost of adding a user is near zero while the marginal benefit is high. Messaging-

based payment apps (WeChat Pay, Venmo) illustrate this: once your friend group is on one platform, switching costs become prohibitive. *Takeaway: B2B SaaS FinTechs benefit less; network effects are strongest where both sides must participate.*

A3: $C(10,000) = \frac{10,000 \times 9,999}{2} = 49,995,000$. $C(100,000) = \frac{100,000 \times 99,999}{2} = 4,999,950,000$. Factor ≈ 100 . A $10\times$ growth in users produces $100\times$ growth in connections. *Takeaway: Super-linear scaling is why early user acquisition is economically worth subsidizing.*

A4: Visa / Mastercard dominate through network lock-in: 50+ million merchant acceptance points globally make defection nearly impossible. A new entrant could use **subsidy arbitrage**—pay merchants zero fees and offer consumers high cashback (as Square and Stripe did)—to cross the minimum viable network threshold before turning profitable. *Takeaway: Crossing the critical mass threshold, not technology superiority, is the primary barrier in payment networks.*

Solutions — Activity 3: Four-Party Payment Scheme

A1: A = Cardholder (the consumer who initiates the payment); **B = Merchant** (the seller who accepts the card); **C = Issuer** (the cardholder’s bank, which issues the card and extends credit); **D = Acquirer** (the merchant’s bank, which processes card payments on the merchant’s behalf). *Takeaway: “Four-party” means four distinct roles; in practice one bank can act as both issuer and acquirer for different transactions.*

A2: M1 = Interchange fee. It flows from the Acquirer to the Issuer as compensation for the credit risk the Issuer bears on the cardholder. EU regulation caps interchange at 0.2% (debit) and 0.3% (credit); US interchange averages 1.5–2.0%. *Takeaway: Interchange is the largest single component of the merchant discount rate; it is invisible to consumers but determines who can afford to issue rewards cards.*

A3: M2 = Cardholder repayment (credit card bill or debit account debit). The interest rate is relevant to FinTech because: (i) credit card APRs (15–30%) represent the primary profit pool incumbents protect; (ii) BNPL FinTechs (Klarna, Affirm) offer zero-interest instalment terms to capture this pool; (iii) digital banks reduce overdraft and credit rates to attract customers away from traditional issuers. *Takeaway: The cardholder-to-issuer money flow is the largest FinTech disruption target—more valuable than the interchange component.*