

## Lesson 1.3: Real-Time Payments and Cost Compression Practice Exercises

Digital Finance

## Exercise 1: RTGS Liquidity Buffer Calculation

A bank participates in an RTGS system and processes the following outgoing payments on a single day:

Time	Outgoing (€)	Incoming (€)	Net Position (€)
09:00	5,000,000	0	?
10:00	3,000,000	2,000,000	?
11:00	0	8,000,000	?
12:00	7,000,000	1,000,000	?
14:00	2,000,000	4,000,000	?
16:00	0	6,000,000	?

Calculate:

- 1 The cumulative net position after each time slot
- 2 The **maximum intraday liquidity need** (peak negative cumulative position)
- 3 If the bank uses a **deferred net settlement** (DNS) system instead, what single end-of-day net amount settles?
- 4 What is the liquidity saving of DNS vs. RTGS (maximum intraday buffer vs. DNS amount)?

## Exercise 2: Instant Payment Cost Savings

### An online retailer currently processes all payments via card networks.

#### Current state (card-only):

- Monthly transactions: 50,000
- Average transaction value: €65
- Blended card MDR: 1.85%

#### Proposed state (hybrid):

- 30% of transactions migrate to instant payment (A2A via open banking)
- Instant payment cost: €0.08 per transaction (flat fee)
- Card MDR remains 1.85% for remaining 70%
- Integration cost for open banking: €15,000 one-time

#### Calculate:

- 1 Monthly card fees under current state
- 2 Monthly fees under proposed hybrid state (cards + instant payments)
- 3 Monthly net savings
- 4 Payback period for the integration investment (in months)
- 5 At what migration percentage does the payback period drop below 3 months?

## Exercise 3: BNPL Provider Unit Economics

### A BNPL provider offers 4-installment, interest-free financing.

#### Given per-transaction data:

- Average order value (AOV): **\$180**
- Merchant Discount Rate (MDR): 5.5%
- Cost of capital (annualized): 6% (provider borrows to fund advances)
- Average repayment period: 6 weeks
- Default rate: 3.2% of transaction value (total loss on defaulted portion)
- Operational cost per transaction: **\$1.20** (underwriting, servicing, collections)
- Late fee revenue: averages **\$0.80** per transaction (across all transactions)

#### Calculate:

- 1 MDR revenue per transaction
- 2 Cost of capital per transaction (hint: annualized rate  $\times$  fraction of year)
- 3 Credit loss per transaction
- 4 Net contribution per transaction (revenue  $-$  all costs  $+$  late fee revenue)
- 5 Contribution margin (% of AOV)
- 6 If the default rate rises to 5%, what is the new contribution per transaction?

## Exercise 4: Stablecoin Corridor vs. Correspondent Banking

**Compare two routes for a \$10,000 cross-border remittance from the US to the Philippines.**

### Route A: Correspondent Banking

- Sending bank fee: **\$25** flat
- Intermediary bank fee: **\$15** flat
- FX markup: 2.5% over mid-market rate
- Receiving bank fee: **\$10** flat
- Settlement time: 3–5 business days

### Route B: Stablecoin Corridor

- On-ramp fee: 0.25% of value
- Blockchain network fee: **\$0.10**
- Off-ramp fee: 0.40% of value
- FX markup at off-ramp: 0.8% over mid-market rate
- Settlement time: approximately 5 minutes

### Calculate:

- ① Total cost of Route A (in USD)
- ② Total cost of Route B (in USD)
- ③ Percentage cost saving of Route B over Route A
- ④ If the sender sends \$10,000 monthly for a year, what is the annual saving?

## Exercise 5: Payment Orchestration ROI

### A merchant evaluates adding a payment orchestration layer.

#### Current state (single acquirer):

- Monthly transactions: 200,000
- Average transaction value: \$80
- Current authorization rate: 88%
- Current blended fee: 2.30%

#### Projected state (orchestrated, 3 acquirers):

- Authorization rate improves to 93% (smart routing + retry logic)
- Blended fee drops to 2.05% (least-cost routing)
- Orchestration platform fee: \$0.03 per transaction
- Monthly platform subscription: \$2,000

#### Calculate:

- 1 Current monthly revenue lost due to declines (failed auth  $\times$  avg. txn value)
- 2 Revenue recovered by improving auth rate from 88% to 93%
- 3 Monthly fee savings from lower blended rate (on successful transactions only)
- 4 Total monthly cost of the orchestration platform
- 5 Net monthly benefit (recovered revenue + fee savings – platform cost)
- 6 Annual ROI of the orchestration investment

### A bank's cross-border payment operations before and after ISO 20022 migration.

#### Before migration (legacy MT messages):

- Monthly cross-border payments: 12,000
- Exception rate (requires manual repair): 8%
- Average cost per exception: €45 (staff time + delays)
- Average STP (Straight-Through Processing) rate: 92%

#### After migration (ISO 20022):

- Exception rate drops to 1.5%
- Average cost per exception: €30 (simpler to diagnose with structured data)
- STP rate improves to 98.5%
- Migration cost (one-time): €800,000
- Ongoing annual maintenance: €50,000

#### Calculate:

- 1 Monthly exception-handling cost before migration
- 2 Monthly exception-handling cost after migration
- 3 Monthly net savings from reduced exceptions
- 4 Payback period for the migration investment (months)
- 5 3-year net present value (NPV) of savings at an 8% annual discount rate, net of migration and maintenance costs

## Exercise 7: Open Banking A2A vs. Card Payment Comparison

### A subscription service evaluates switching recurring payments from card pull to open banking A2A.

#### Current state (card recurring):

- Monthly subscribers: 25,000
- Subscription fee: €12.99/month
- Card MDR: 1.65% + €0.10 per transaction
- Card failure rate (expired cards, insufficient funds): 4.5%
- Recovery rate on failed card payments (retry + dunning): 60%

#### Proposed A2A (open banking direct debit via PISP):

- Cost: €0.05 per transaction
- Failure rate: 1.8% (bank account more stable than card-on-file)
- Recovery rate on failures: 80%
- Integration cost: €20,000 one-time

#### Calculate:

- 1 Monthly payment processing cost under card (on successful charges)
- 2 Monthly revenue lost to card failures net of recovery
- 3 Monthly payment cost and lost revenue under A2A
- 4 Monthly net savings of A2A over card
- 5 Payback period for the integration cost

## Exercise 8: Multi-Rail Payment Strategy Design

Design a payment strategy for an EU marketplace with the following transaction profile:

Segment	Monthly Volume	Avg. Value	Customer Type
Low-value domestic	40,000	€22	EU consumer
Mid-value domestic	15,000	€85	EU consumer
High-value domestic	3,000	€350	EU consumer
Cross-border EU	8,000	€60	EU consumer
Cross-border non-EU	2,000	€95	Non-EU consumer

Available rails and costs:

- Card (Visa/MC): 1.8% + €0.12
- Open Banking A2A (PISP): €0.06 flat
- SEPA Instant: €0.04 flat
- BNPL (high-value only): 5.2% (increases conversion by 22% for orders >€200)

Tasks:

- 1 Assign the optimal rail to each segment (justify)
- 2 Calculate total monthly processing cost under your strategy
- 3 Calculate what the cost would be if all segments used cards only
- 4 What is the percentage saving of your multi-rail strategy vs. card-only?