

L40: Lab - Testnet Lending

Module E: DeFi Ecosystem

Blockchain & Cryptocurrency

December 2025

In this lab, you will:

- Supply assets to Aave testnet as a lender
- Borrow assets using collateral
- Monitor health factor and liquidation risk
- Simulate price volatility and observe position changes
- Calculate interest accrual (supply and borrow APY)
- Experience liquidation mechanisms safely (testnet)

Network: Sepolia Testnet (Ethereum)

Platform: Aave V3

Time: 90 minutes

Before Starting:

- MetaMask installed with Sepolia testnet configured
- Testnet ETH in wallet (from faucet)
- Understanding of health factor, LTV, liquidation threshold

Safety Reminders:

- This is testnet - funds have NO real value
- Experiment freely (liquidations are educational, not costly)
- Keep testnet and mainnet wallets separate

Learning Goal: Understand lending mechanics before risking real capital.

Step 1: Access Aave Testnet

URL: <https://app.aave.com>

Actions:

- 1 Connect MetaMask wallet
- 2 Switch to Sepolia testnet (click network selector)
- 3 Verify you're on Aave V3 Sepolia

Interface Overview:

- **Dashboard:** Your supply/borrow positions
- **Markets:** Available assets to supply/borrow
- **Governance:** AAVE token voting (not relevant for lab)

Troubleshooting:

- If markets don't load: Refresh page, reconnect wallet
- If wrong network: Switch to Sepolia in MetaMask

Step 2: Supply Assets (Become a Lender)

Goal: Deposit ETH to earn interest.

Process:

- ➊ Click "Supply" on Dashboard
- ➋ Select ETH from asset list
- ➌ Enter amount: 0.5 ETH (keep some for gas)
- ➍ Review details:
 - Current Supply APY: ____%
 - Collateral enabled: Yes (allows borrowing)
- ➎ Click "Supply ETH"
- ➏ Confirm transaction in MetaMask
- ➐ Wait for confirmation (30-60 seconds)

Record:

- ETH supplied: ____
- Supply APY: ____%
- aToken received: ____ aWETH

Step 3: Understanding aTokens

What are aTokens?

- Interest-bearing tokens (aWETH, aUSDC, etc.)
- 1:1 with supplied asset
- Balance increases over time (accrues interest)
- Can be transferred, used in other DeFi protocols

Example:

- Supply 1 ETH, receive 1 aWETH
- After 1 year at 3% APY: aWETH balance = 1.03
- Withdraw 1.03 ETH (original + interest)

Check Your Balance:

- Add aWETH token to MetaMask (custom token, contract address on Aave docs)
- Observe balance increase over time (very slowly on testnet)

Step 4: Check Your Borrowing Power

After supplying collateral:

Dashboard Shows:

- **Total Collateral:** ____ USD
- **Available to Borrow:** ____ USD
- **Health Factor:** ∞ (no debt yet)

Calculation:

- ETH LTV: 80% (can borrow up to 80% of collateral value)
- Example: 0.5 ETH at \$2,000 = \$1,000 collateral
- Max borrow: $\$1,000 \times 0.80 = \800

Record:

- Total collateral: ____
- Available to borrow: ____
- LTV ratio: ____%

Step 5: Borrow Assets

Goal: Borrow USDC or DAI against your ETH collateral.

Process:

- ➊ Click “Borrow” on Dashboard
- ➋ Select asset: USDC (or DAI if USDC unavailable)
- ➌ Enter amount: 50% of max (e.g., \$400 if max is \$800)
- ➍ Choose interest rate type:
 - Variable: Changes with utilization
 - Stable: Fixed for duration (if available)
- ➎ Review borrow details:
 - Borrow APY: ____%
 - New health factor: ____
- ➏ Click “Borrow”
- ➐ Confirm transaction

Verify: USDC appears in your wallet.

Step 6: Calculate Health Factor

Formula:

$$\text{Health Factor} = \frac{\text{Collateral} \times \text{Liquidation Threshold}}{\text{Borrowed Amount}}$$

Example:

- Collateral: \$1,000 (0.5 ETH at \$2,000)
- Borrowed: \$400 USDC
- ETH Liquidation Threshold: 82.5%

$$\text{HF} = \frac{1,000 \times 0.825}{400} = 2.06$$

Interpretation:

- $\text{HF} > 1$: Safe (no liquidation)
- $\text{HF} = 1$: At liquidation threshold
- $\text{HF} < 1$: Liquidation occurs

Your Calculation:

- Health Factor: ____ (check dashboard vs. manual calculation)

Step 7: Monitor Interest Accrual

Track Over Time (15-30 minutes):

Supply Side:

- Initial aWETH balance: ____
- Balance after 30 min: ____
- Interest earned: ____ (minimal on testnet)

Borrow Side:

- Initial USDC debt: ____
- Debt after 30 min: ____
- Interest accrued: ____

Net Position:

- Supply APY: ____%
- Borrow APY: ____%
- Net cost: $\text{Borrow APY} - \text{Supply APY} = \text{____\%}$

Note: Interest accrues per block, compounded continuously.

Step 8: Simulate Price Volatility

Goal: Understand how price changes affect health factor.

Scenario 1: ETH Price Drops 10%

Current State:

- Collateral: \$1,000 (0.5 ETH at \$2,000)
- Borrowed: \$400
- Health Factor: 2.06

After 10% Drop (ETH = \$1,800):

- New collateral: $0.5 \times \$1,800 = \900
- Borrowed: \$400 (unchanged)
- New HF: $\frac{900 \times 0.825}{400} = 1.86$ (still safe)

Question: At what ETH price would you be liquidated?

Answer:

$$\text{Liquidation Price} = \frac{\text{Borrowed}}{\text{ETH Amount} \times \text{Liquidation Threshold}} = \frac{400}{0.5 \times 0.825} \approx \$970$$

Step 9: Add Collateral to Improve Health Factor

If health factor drops (or to test):

Process:

- 1 Go to Dashboard
- 2 Click "Supply" again
- 3 Deposit more ETH (e.g., 0.1 ETH)
- 4 Observe health factor increase

Example:

- Before: 0.5 ETH collateral, \$400 debt, $HF = 2.06$
- Add 0.1 ETH: 0.6 ETH collateral, \$400 debt
- New HF: $\frac{1,200 \times 0.825}{400} = 2.48$

Alternative: Repay debt to improve HF.

Record:

- HF before: ____
- Action taken: ____
- HF after: ____

Step 10: Repay Debt

Goal: Close your borrowing position.

Process:

- ➊ Go to Dashboard
- ➋ Click “Repay” on borrowed asset
- ➌ Select amount:
 - Partial: e.g., 50% (\$200)
 - Full: 100% (all debt + accrued interest)
- ➍ Approve USDC spending (if first time)
- ➎ Confirm repayment transaction
- ➏ Observe debt decrease, health factor increase

Record:

- Debt before repayment: ____
- Amount repaid: ____
- Remaining debt: ____
- Interest paid: ____

Step 11: Withdraw Collateral

Goal: Remove your supplied assets.

Process:

- ① Ensure all debt is repaid (health factor = ∞)
- ② Go to Dashboard
- ③ Click “Withdraw” on supplied asset (aWETH)
- ④ Enter amount (or select “Max”)
- ⑤ Confirm withdrawal
- ⑥ Observe:
 - aWETH balance decreases
 - ETH balance increases (original + interest)

Record Final Outcome:

- ETH withdrawn: ____ (should be \geq initial deposit)
- Net interest earned from supply: ____
- Interest paid on borrow: ____
- Net profit/loss: ____

Optional Experiments:

1. Multiple Collateral Types

- Supply both ETH and USDC as collateral
- Observe combined borrowing power

2. Borrow Multiple Assets

- Borrow both USDC and DAI
- Check how health factor changes

3. Rate Switching

- Switch between variable and stable borrow rates
- Compare APY differences

4. Isolation Mode

- Try supplying an isolated asset (if available)
- Understand borrowing limits

Step 13: Simulate Liquidation (Optional)

Warning: This will result in penalty on testnet (educational loss).

How to Trigger Liquidation:

- 1 Borrow maximum allowed (e.g., 75% of collateral)
- 2 Health factor will be close to 1.0
- 3 Wait for testnet price oracle to fluctuate (or cannot force on testnet)
- 4 **Alternative:** On some testnets, you can manually manipulate oracle (advanced)

Observe:

- Liquidation transaction (if triggered)
- Penalty paid (5-10%)
- Remaining collateral returned

Note: Liquidation may not occur on testnet due to stable test prices. This is a thought exercise.

Liquidation Calculation Example

Pre-Liquidation:

- Collateral: \$1,000 (0.5 ETH)
- Borrowed: \$825 (max with 82.5% threshold)
- Health Factor: 1.00 (at threshold)

Liquidation Event:

- Liquidator repays 50% of debt: \$412.50
- Liquidator receives collateral + 5% bonus: $\$412.50 \times 1.05 = \433.13
- Borrower loses: $\$433.13 - \$412.50 = \$20.63$ (penalty)

Post-Liquidation:

- Remaining collateral: $\$1,000 - \$433.13 = \$566.87$
- Remaining debt: $\$825 - \$412.50 = \$412.50$
- New Health Factor: $\frac{566.87 \times 0.825}{412.50} \approx 1.13$ (safe again)

Step 14: Analyze Utilization Rates

Check Market Statistics:

For Each Asset (e.g., USDC):

- Total supplied: ____
- Total borrowed: ____
- Utilization rate: $\frac{\text{Borrowed}}{\text{Supplied}} \times 100\% = \text{____}\%$

Observe Relationship:

- Higher utilization → Higher borrow APY
- Lower utilization → Lower borrow APY

Question:

- What happens to rates if utilization hits 95%?
- Why does Aave increase rates at high utilization?

Your submission should include:

- ➊ **Introduction** (1 paragraph)
 - Overview of activities
- ➋ **Supply Analysis** (1/2 page)
 - Assets supplied, APY, aToken balance
- ➌ **Borrow Analysis** (1 page)
 - Borrowing details, health factor calculations
 - Screenshots of dashboard showing position
- ➍ **Interest Accrual** (1/2 page)
 - Net cost of borrowing (borrow APY - supply APY)
- ➎ **Risk Analysis** (1/2 page)
 - Liquidation price calculation
 - Collateral management strategies
- ➏ **Reflections** (1/2 page)
 - UX comparison to CeFi, risks, learnings

Problem: Can't Borrow (Insufficient Collateral)

- **Solution:** Supply more assets or reduce borrow amount

Problem: Health Factor Too Close to 1

- **Solution:** Add collateral or repay debt

Problem: Transaction Fails (Gas)

- **Solution:** Ensure enough testnet ETH for gas fees

Problem: Interest Not Accruing Visibly

- **Solution:** Testnet rates are low, wait longer or calculate manually

Problem: Can't Withdraw (Collateral Locked)

- **Solution:** Repay all debt first, or reduce borrow to free some collateral

Answer in your lab report:

- 1 How does Aave's health factor system prevent cascading liquidations?
- 2 Why is overcollateralization necessary in DeFi lending?
- 3 Compare Aave's UX to traditional bank loans. Which is better and why?
- 4 What risks would you face using Aave on mainnet with real funds?
- 5 How do variable interest rates protect liquidity providers?
- 6 Would you use DeFi lending for personal finance? Under what conditions?

Before submitting, verify you have:

- ☐ Supplied assets and received aTokens
- ☐ Borrowed against collateral
- ☐ Calculated health factor manually
- ☐ Monitored interest accrual
- ☐ Repaid debt and withdrawn collateral
- ☐ Screenshots of dashboard (positions, transactions)
- ☐ Transaction hashes (Etherscan links)
- ☐ Completed all calculations (HF, liquidation price, net cost)
- ☐ Written reflection answers
- ☐ PDF format, 3-4 pages

Deadline: [Instructor to specify]

Key Takeaways:

- DeFi lending requires overcollateralization for safety
- Health factor must stay above 1.0 to avoid liquidation
- Interest rates adjust algorithmically based on utilization
- aTokens represent interest-bearing deposits
- Liquidations protect lenders but penalize borrowers
- Testnet experimentation is crucial before using real funds
- DeFi lending is powerful but requires active risk management

Course Completion: Congratulations on finishing Module E: DeFi Ecosystem!