

# Content Reference: DeFi Lending

Digital Finance – BSc Course

## 1. Key Definitions

- **DeFi lending** — Smart-contract-based lending pools where anyone deposits assets to earn interest or borrows by posting collateral; no bank, credit check, or human approval required.
- **Overcollateralisation** — Posting collateral worth *more* than the loan (typically 120–200%). Replaces credit-worthiness checks with mathematical guarantees.
- **Liquidation** — Automatic seizure and sale of collateral when its value falls below the required threshold. Third-party bots execute this and earn a *liquidation bonus* (typically 5%).
- **Flash loan** — Uncollateralised loan borrowed and repaid within a single blockchain transaction. If repayment fails, the entire transaction reverts atomically.
- **Oracle** — External data feed that tells the smart contract the current market price of an asset. Manipulation of oracles is a primary attack vector.
- **TVL (Total Value Locked)** — Total crypto deposited in a protocol; the DeFi equivalent of assets under management.
- **Health factor** — A numeric score ( $> 1 = \text{safe}$ ,  $< 1 = \text{liquidated}$ ) measuring how close a position is to forced liquidation.
- **Utilisation rate** — Fraction of a lending pool currently borrowed out. Drives the algorithmic interest rate: higher utilisation  $\Rightarrow$  higher rates.
- **Liquidation bonus** — The discount (e.g. 5%) at which liquidator bots purchase seized collateral, incentivising them to act quickly.

## 2. Core Formulas

### Formulas & Worked Example

#### Collateral Ratio:

$$\text{Collateral Ratio} = \frac{\text{Collateral Value}}{\text{Borrowed Amount}}$$

#### Health Factor:

$$\text{Health Factor} = \frac{\text{Collateral Value} \times \text{Liquidation Threshold}}{\text{Debt}} \quad (\text{liquidation if } < 1)$$

#### Liquidation Price:

$$\text{Liquidation Price} = \frac{\text{Debt}}{\text{Quantity} \times \text{LTV}}$$

**Worked Example** — Priya deposits 10 ETH at \$3,000 and borrows \$20,000 USDC on Aave (ETH LTV = 82.5%, liquidation threshold = 82.5%):

Collateral value	$10 \times \$3,000 = \$30,000$
Collateral Ratio	$\$30,000 / \$20,000 = 150\%$
Health Factor	$(30,000 \times 0.825) / 20,000 = 1.24$ (safe)
Liquidation Price	$\$20,000 / (10 \times 0.825) = \$2,424$ per ETH

**A 19.2% drop in ETH (from \$3,000 to \$2,424) triggers automatic liquidation.**

## 3. Protocol Comparison

	<b>Aave</b>	<b>Compound</b>	<b>Sky (ex-MakerDAO)</b>
Founded	2020 (pool model)	2018	2017
Model	Pooled lending	Pooled lending	CDP + stablecoin
TVL	~\$12B	~\$3B	~\$8B
Token	AAVE	COMP	MKR
Key innovation	Flash loans, multi-chain	cTokens, governance pioneer	DAI stablecoin

#### 4. Traditional Banking vs. DeFi

<b>Aspect</b>	<b>Traditional Banking</b>	<b>DeFi</b>
Interest rate	0.5% saver / 7% borrower	Market-driven, typically 2–5%
Access	Requires ID, credit check	Permissionless (wallet only)
Speed	Days for approval	Instant (smart contract)
Collateral	Undercollateralised (80%)	Overcollateralised (150%+)
Insurance	FDIC / deposit insurance	None (protocol risk)
Transparency	Opaque	Fully on-chain

#### 5. Key Facts & Figures

- DeFi TVL peaked at **\$180B** (November 2021); currently ~\$50B following the Terra/Luna crash.
- Aave holds **\$12B+** in deposits across 7 blockchains and 150+ assets, with a protocol fee of just 0.09%.
- Flash loans: borrow **millions with zero collateral** — repay within the same 12-second transaction or it never happened.
- **Black Thursday (12 March 2020)**: ETH dropped 55% in 24 hours. Network congestion let one bidder claim **\$8.3M in collateral for \$0 DAI**.
- **Euler Finance hack (March 2023)**: \$197M stolen via a flash-loan-enabled exploit; \$176M later returned.
- Cross-border remittances: **6–8% fees** via banks vs. **<0.1%** via DeFi protocols.

#### 6. Five Things DeFi Does *Not* Solve

1. **Smart contract bugs** — code can be exploited; audits reduce but do not eliminate risk.
2. **Oracle manipulation** — flash loans can move prices briefly, corrupting on-chain price feeds.
3. **No deposit insurance** — there is no FDIC equivalent; a protocol exploit means permanent loss.
4. **Regulatory uncertainty** — DeFi operates in a legal grey zone; MiCA (EU, 2024) is a first step.
5. **UI/UX complexity** — wallet setup, gas fees, and liquidation monitoring exclude most retail users.

#### 7. Further Reading

- Schär, F. (2021). “Decentralized Finance: On Blockchain- and Smart Contract-Based Financial Markets.” *Federal Reserve Bank of St. Louis Review*, 103(2), 153–174.
- DeFiLlama.com — real-time TVL and protocol-level data across all major chains.
- docs.aave.com — Aave V3 technical documentation including collateral parameters.
- Rekt.news — curated database of DeFi exploits with post-mortems.