



Course III:

DeFi Deep Dive

1. Credit and Lending

(ii) Compound

(b) Supply and Borrow Rates

Credit/Lending: Compound

Supply and borrow rates

- The supply and borrow interest rates are compounded every block (approximately 15 seconds on Ethereum producing approximately continuous compounding) and are determined by the utilization percentage in the market.
- Utilization is calculated as total borrow/total supply.
- The utilization rate is used as an input parameter to a formula that determines the interest rates.
- The remaining parameters are set by *Compound Governance*.

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Borrow rate formula

- The formula for the borrow rate generally is an increasing linear function with a y-intercept known as the *base rate* that represents the borrow rate at 0% borrow demand and a *slope* representing the rate of change of the rates.
- These parameters are different for each ERC-20 asset supported by the platforms.

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Borrow rate formula

- Some markets have more advanced formulas that include a *kink*. A kink is a utilization ratio beyond which the slope steepens.
- These formulas can be used to reduce the cost of borrowing up to the kink and then increase the cost of borrowing after the kink to incentivize a minimum level of liquidity.

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Supply interest rate formula

- Supply interest rate = (borrow interest rate x utilization ratio)
so borrow payments can fully cover the supplier rates.
- The reserve factor is a percentage of the borrow payments not given to the suppliers and instead set aside in a reserve pool that acts as insurance in that case a borrower defaults.
- In an extreme price movement, many positions may become undercollateralized in that they have insufficient funds to repay the suppliers. In the event of such a scenario, the suppliers would be repaid using the assets in the reserve pool.

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Example

- In the DAI market, 100 million is supplied and 50 million is borrowed.
- Suppose the base rate is 1% and the slope is 10%.
- At 50 million borrowed, utilization is 50%.
- The borrow interest rate is then calculated to be $0.5 * 0.1 + 0.01 = 0.06$ or 6%.
- The maximum supply rate (assuming a reserve factor of zero) would simply be $0.5 * 0.06 = 0.03$ or 3%.

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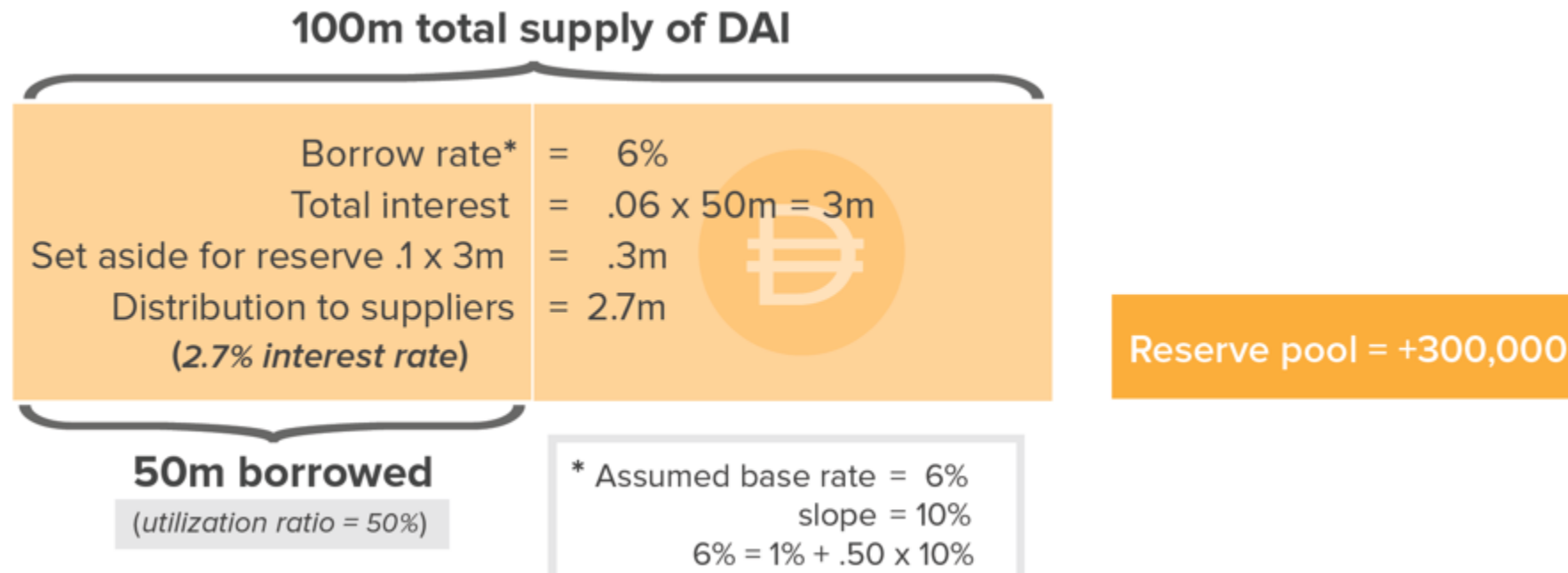
Example

- The borrow rate is not a marginal rate – it is a rate for all borrowers.
- For example, suppose an initial borrower does \$25 million. The rate would be $.25 * 0.1 + 0.01 = 3.5\%$.
- Then suppose another borrower enters the market with another \$25 million loan.
- The rate increases to 6% for all borrowers.

Credit/Lending: Compound

Example

- If the reserve factor is set to 10, then 10% of the borrow interest is diverted to a DAI reserve pool, lowering the supply interest rate to 2.7%. $0.5 * 0.06 * (1 - 0.10) = 0.027$ or 2.7%.



Credit/Lending: Compound

Example

- Another way to think about the supply interest rate is that the 6% borrow interest of 50 million is equal to 3 million of borrow payments.
- Distributing 3 million of payments to 100 million of suppliers implies a 3% interest rate to all suppliers. With 10% diverted (300,000), then there is on 2.7 million of payments

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Example with kink

- Suppose 100 million DAI is supplied and 90 million DAI is borrowed, a 90% utilization.
- The kink is at 80% utilization, before which the slope is 10% and after which the slope is 40%, which implies the borrow rate will be much higher if the 80% utilization is exceeded.

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Example with kink

- The base rate remains at 1%.
- The borrow interest rate = 0.01 (base) + $0.8 * 0.1$ (pre-kink) + $0.1 * 0.4$ (post-kink) = 13%.
- The supply rate (assuming a reserve factor of zero) is $0.9 * 0.13 = 11.7\%$.

Credit/Lending: Compound

Advantages of Compound

- Unlock value of asset without selling it – like a HELOC
- Easily engineer levered long or short positions
- Suppose you are bearish on price of ETH
 - Deposit stablecoin like USDC or DAI
 - Borrow ETH
 - Sell ETH for stablecoin
 - If price of ETH falls, you can use your stablecoin to buy (cheap) ETH to pay off debt

Credit/Lending: Compound

Advantages of Compound

- Levered positions are possible too
- Suppose you are bearish on price of ETH
 - Deposit stablecoin like USDC or DAI
 - Borrow ETH
 - Sell ETH for stablecoin
 - Deposit additional stablecoin from your sale
 - Borrow more ETH
 - Sell additional ETH for stablecoin
 - If price of ETH falls, you can use your stablecoin to buy (cheap) ETH to pay off debt