Earn Mutual

Motivation

1. Most lending protocols only support demand deposit

2. Most lending protocols doesn’t provide fixed deposit rate, user can’t predict the future interest.

3. Existing fixed-rate protocol’s fixed rate is lower than lending protocol or vault

Introduction

1. Earn Mutual is a time deposit protocol with a fixed-rate.

2. Earn Mutual aims to provide **equal or higher interest rate** than the floating rate of lending protocol and vault.

Note: the floating rate is calculated from EMA

Proposal

1. Lending protocol: Aave, Compound, MakerDAO, dYdX
2. Vault: Yearn, Harvest
3. Fixed-rate protocol: 88mph

Proposal A: Use Qvault

Vault revenue is higher than lending protocol. So how about we create a Qvault which is a vault of vault to get higher revenue.

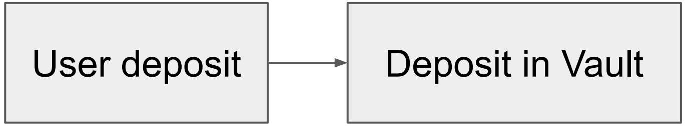
Proposal B: Buy bond

88mph is the only working fixed-rate protocol. If the market does not fluctuate sharply , people buy bond can get higher APY. We can combine 88mph with lending protocol.

Architecture A

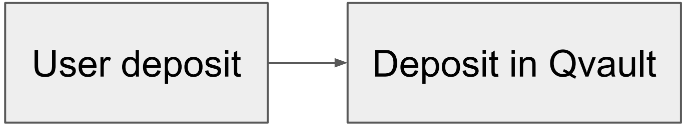
Product A (low risk)

Rate > lending protocol



Product B (high risk)

Rate > vault



Hedge Risk

The interest rate is variable for every protocol, it may lower than the fixed-rate of our product. So we need another group of people with high risk tolerance to take the risk. If there is a loss, they will be deducted, but if there is a profit, they will get more.

88mph: If there is a loss, 88mph will sell bond. However, if no one buy it, the system will lock user's money until the next deposit people coming ❌

Hegic: We can take the ideal of **liquidity pool** to solve the above problem. All of those people create a pool and only there is liquidity we can sell the product.

Suppose user's amount : lp's amount = 1 : 1, 10% float-rate => 12.5% APY

Suppose user's amount : lp's amount = 1 : 0.1, 10% float-rate => 35% APY

Risk Factor

The risk factor idea is generated from **Nexus Mutual**.

Review Nexus Mutual: the lower risk, the lower premium, the more people buy cover.

We can use the availability to determine how our fixed-rate is higher than the lending protocol interest rate.

LP funds: unpurchased + purchased(user 1, user 2, …)

$$\text{Availability} = (\text{unpurchased} / \text{high\_availability\_amount})^{(1/7)}$$

$$APY_{year} = (\text{Availability} * \Delta) + \text{Base\_line}, \text{ if } (\text{Availability} * \Delta) < 1$$

Availability in range of [0, 98%]

The higher availability, the more people provides liquidity, the more user can purchase

Fixed Rate - Part 1

The base line of each product is the floating rate of the lending protocol.

$$APY_{year} = (\text{Availability} * \Delta) + \text{Base\_line}, \text{ if } (\text{Availability} * \Delta) < 1$$

$$\Delta = \text{Vault\_rate} - \text{Base\_line}$$

E.g. if base_line = 3%, vault = 6%, then Δ = 3%, if availability = 0.5, then APY_{year} = 4.5%

Compound Interest

If an amount of $5,000 is deposited into a savings account at an annual interest rate of 5%, **compounded monthly**, the value of the investment after 10 years can be calculated as follows...

$$A = P(1 + \frac{r}{n})^{nt}$$

A = final amount

P = initial principal balance

r = interest rate

n = number of times interest applied per time period

t = number of time periods elapsed

P = 5000.
r = 5/100 = 0.05 (decimal).
n = 12.
t = 10.

A = 5000 (1 + 0.05 / 12) $^{\mathbf{(12 * 10)}}$ = 8235.05.

So, the investment balance after 10 years is **$8,235.05.**

Fixed Rate - Part 2

In order to make interest rate be related to time: the short term with a low APY, the long term with a high APY. We can use compound interest calculation formulas in reverse to calculate monthly interest rates and even daily interest rates through APY_{year}.

monthly interest rate (mr) = $(APY_{year} + 1)^{(1/12)} - 1$

daily interest rate (dr) = $(APY_{year} + 1)^{(1/365)} - 1$

$APY_{month} = ((1+mr)^t - 1) * (12 / t)$

$APY_{day} = ((1+dr)^t - 1) * (365 / t)$

APY analysis

Suppose APY_{year} = 3.1%, base_line = 3%, the following picture shows that the shorter term, the lower APY, the longer term, the higher APY

```
Using monthly interest rate, 12 month, apy:  3.100000000000014
Using monthly interest rate, 6 month, apy:  3.076340325504212
Using monthly interest rate, 1 month, apy:  3.0568072670559054

Using daily interest rate, 365 days, apy:  3.100000000029893
Using daily interest rate, 180 days, apy:  3.076017891979231
Using daily interest rate, 30 days, apy:  3.0567539791701717
```

Analysis

Proposal A: Lending protocol APY: 3%, Vault APY: 9%, Δ = 6%, low_risk_amount = 1000 eth

1. **If Total 1 LP**: 100 eth, risk_factor = (100/1000) ^ (1/7) = 0.72, fixed_rate = 0.72 * 6% + 3% = 7%

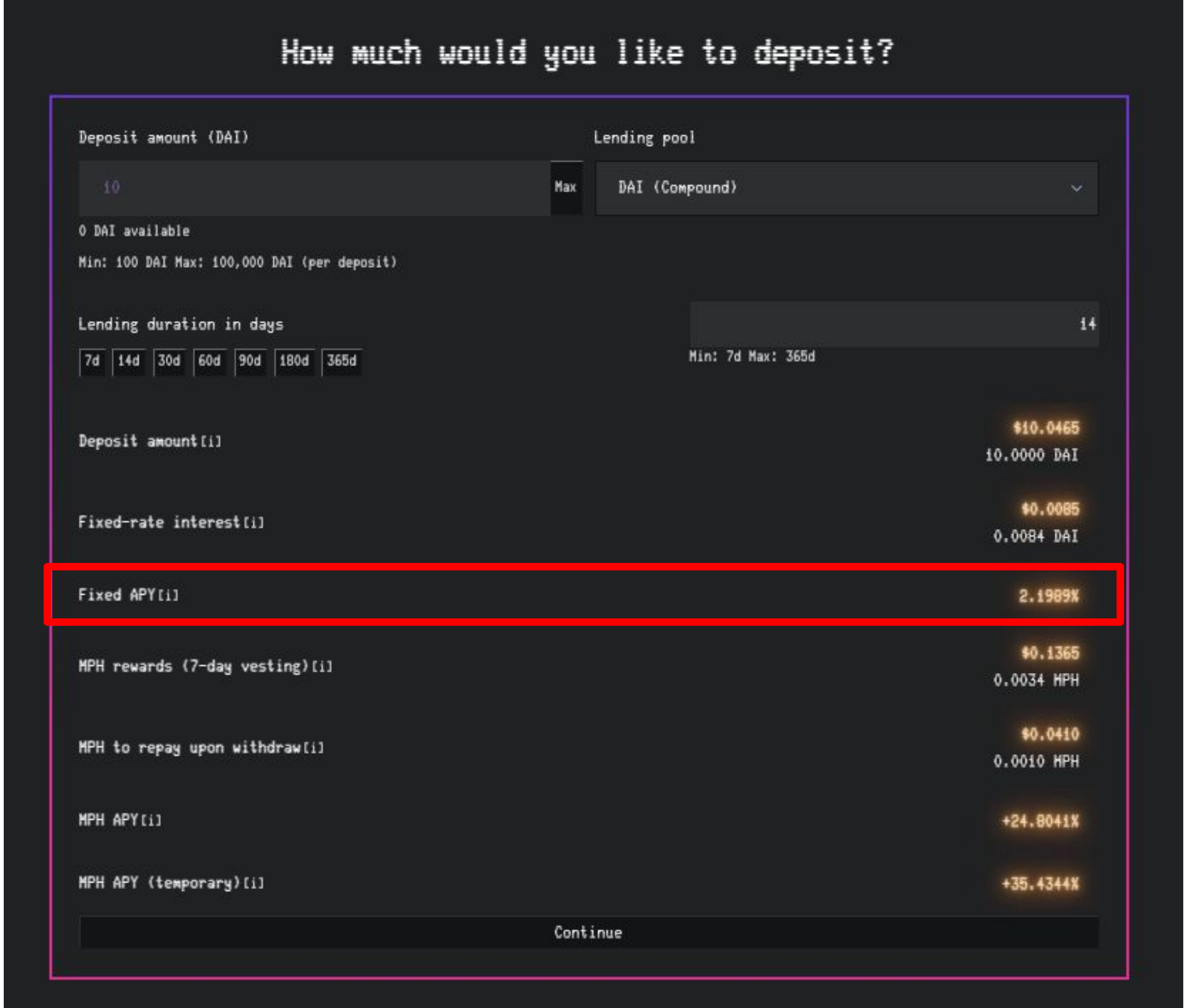
   Alice buy 100 eth 1 year, total profit = 18 eth. Alice gets 7 eth. LP gets 11 eth, APY: 11%.

2. **If Total 2 LP**: 200 eth, risk_factor = (200 / 1000) ^(1/7) = 0.79, fixed_rate = 0.79 * 6% + 3% = 7.7%

   Alice buy 100 eth 1 year, total profit = 18 eth. Alice gets 7.7 eth. LP gets 19.3 eth, APY: 10.3%

   Alice buy 200 eth 1 year, total profit = 36 eth. Alice gets 15.4 eth. LPs gets 20.6 eth, APY: 10.3%

Vault APY: 3% => 1. Total Profit = 6 eth, Alice gets 7 eth, LP gets -1 eth, APY: -1%


How much would you like to deposit?
Deposit amount (DAI)
Lending pool
10
Max
DAI (Compound)
0 DAI available
Min: 100 DAI Max: 100,000 DAI (per deposit)
Lending duration in days
7d
14d
30d
60d
90d
180d
365d
14
Min: 7d Max: 365d
Deposit amount[i]
$10.0465
10.0000 DAI
Fixed-rate interest[i]
$0.0085
0.0084 DAI
Fixed APY[i]
2.1989%
MPH rewards (7-day vesting)[i]
$0.1365
0.0034 MPH
MPH to repay upon withdraw[i]
$0.0410
0.0010 MPH
MPH APY[i]
+24.8041%
MPH APY (temporary)[i]
+35.4344%
Continue

Note

1. Fixed income depositor => care about fixed income rate
2. Liquidity provider: care about capital ratio => Governance control ratio
3. Single pool support different period, user can early exit.
4. LP withdraw full amount?
    a. Sell bond for LP exit
    b. User’s / LP’s < 1 / APY, LP pay user’s interest, get back their rest money,
        i. E.g. LP1: 10 eth, LP2: 990 eth, total LP: 1000 eth, LP1 takes 1%, LP2 takes 99%
        ii. Alice buy 1000 eth product 5% APY, 1 year, **ratio = 1**, LP also buy 1000 eth, then LP1 wants to exit. He needs to pay 1000*0.05*0.01 = 0.5 eth, then he can get 10 eth back.
    c. User’s / LP’s = 1 / APY, LP get their unhedged money back without paying extra.

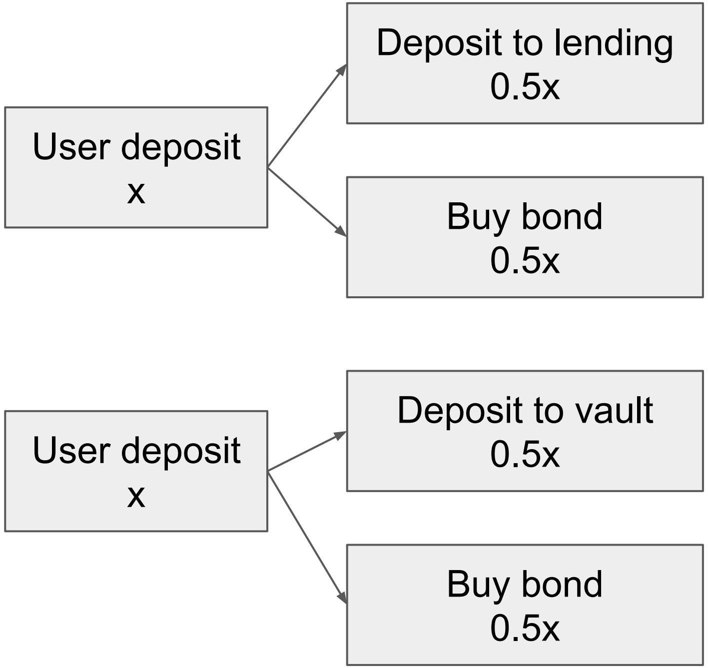
Architecture B

Product A (low risk)

Rate > lending protocol

Product B (high risk)

Rate > vault



Fixed_rate = Base_line

LP1: 100, LP2: 100, baseline 3%, vault 6%

* LP1: 2, LP2: 2

B1: 10 (1yr), fixed rate 4%
B2: 10 (2yr), fixed rate 5%

after B1: NFT, LP1 (95 + 5), LP2 (95 + 5)
after B2: NFT, LP1 (90 + 10), LP2 (90 + 10)

B1 withdraw after 1yr:
total amount: (200 + 20) * 1.06 = 233.2
B1 should get back 10.4
LP1 withdrawable =(233.2 - 10.4 - 10.6) / 2 = 106.1

LP1: 100, LP2: 100, baseline 3%, vault 6%

B1: 200 (1yr), fixed rate 4%

B1 withdraw after 1yr:
total amount: (200 + 200) * 1.06 = 424
B1 should get back 208
LP1 withdrawable =(424 - 208) / 2 = 108

Zero Coupon Bond Price

Coupon Price $P = \frac{M}{(1+r)^n}$

M = Maturity value or face value of the bond

r = required rate of interest

n = number of years until maturity

r = (M/P)^1/n - 1