SYSLABS

Pachira Fund

Can Money Grow on Trees?

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Outline

1. Introduction

2. What are we Solving?

3. Liquidity Trees

4. Simulation Results

5. Our Objective Question

Introduction

Objectives

Define our problem

- Stagnant Pool Problem
- Implicitly addressed by Uniswap v3

Present our Solution

- Liquidity Trees
- Simulation Results

Objective Question Revisted

- Can Money Grow on Trees?

What are we Solving?

Stagnant Pool Problem

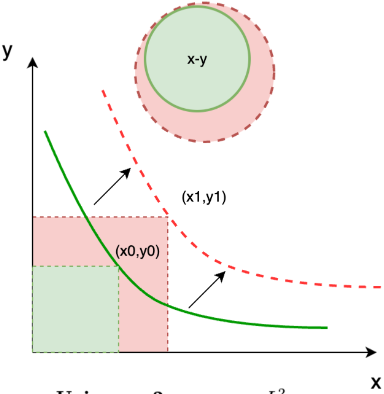
Lay Definition:

- How do we increase ΔV on stagnated liquidity in pool over some time interval t?

Uniswap v3 has implicitly addressed this problem:

- Increasing the depth of order book (virtually)
- Makes large trades more efficient
- Hence increasing the *possibility* of more ΔV
- However, does nothing to induce more trading volume

Uniswap v3



$$\textbf{Uniswap v2:}\quad x_0 * y_0 = L_0^2$$
$$\textbf{Uniswap v3:}\quad x_1 * x_1 = L_1^2$$

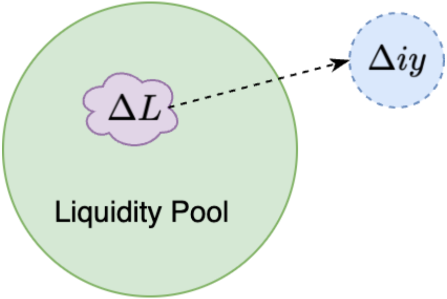
$$L_1 > L_0$$

Figure 1: Graphical illustration on how depth is virtually increased using Uniswap v3

Indexing Problem: Posed

CPT Indexing Problem

- Given a position ΔL, what is the indexed value in only one of the two pairing assets (x,y)



Indexing Problem: Solution

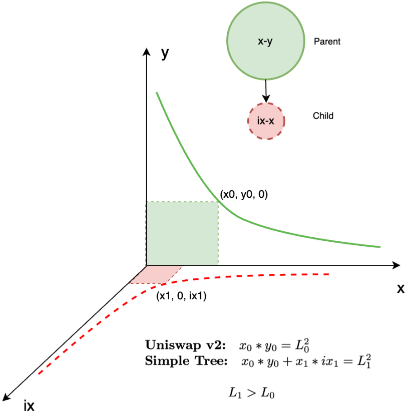
This system describes the mathematical operations that are effectively being done in the contract code when performing an *efficient* two-step withdrawal (ie, withdrawal both assets + swap one for the remaining) operation:

$$\Delta x = \frac{\Delta L x}{L} \tag{1}$$

$$\Delta y = \frac{\Delta L y}{L} \tag{2}$$

$$\Delta i y = \Delta y + \frac{\gamma \Delta x (y - \Delta y)}{(x - \Delta x) + \gamma \Delta x} \tag{3}$$

Let's Include a new Dimension ...



Uniswap v2: $x_0 * y_0 = L_0^2$
Simple Tree: $x_0 * y_0 + x_1 * ix_1 = L_1^2$

$L_1 > L_0$

Figure 2: Include a new dimension (ix); liquidity ΔL gets indexed to Δix, and new market is formed on ix-x plane

How does this Work?

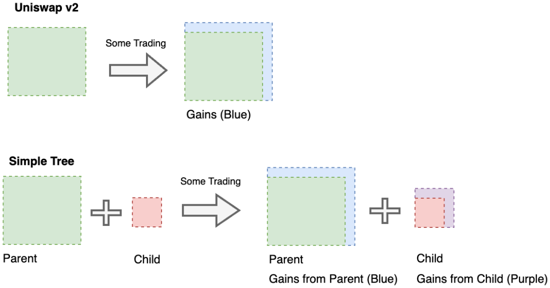


Figure 3: Boxes represent liquidity under CPT curve; creating a new market out of indexed liquidity indexed liquidity is a way to address the stagnant pool problem; in short we've leveraged some of the green, got red and made some extra purple

Liquidity Trees

Full Tree

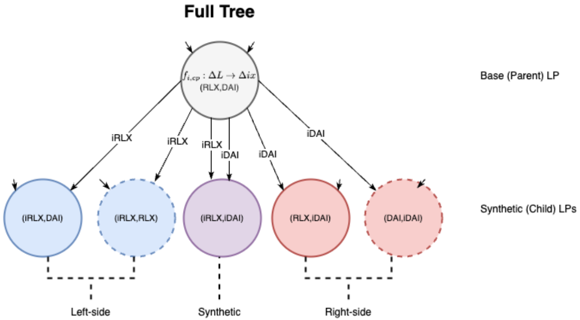
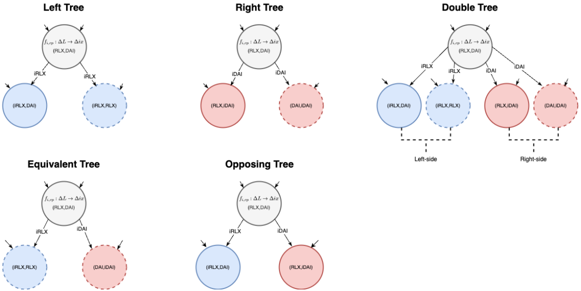


Figure 4: Full CPT liquidity tree represented as a computational tree structure comprised of left-sided, right-sided and synthetic pools

Liquidity Trees can be represented as computational graphs where nodes are denoted as DEX operations and arcs are denoted as indexed capital transitioning between the parent node and the child

Sub Trees



Left Tree

Right Tree

Double Tree

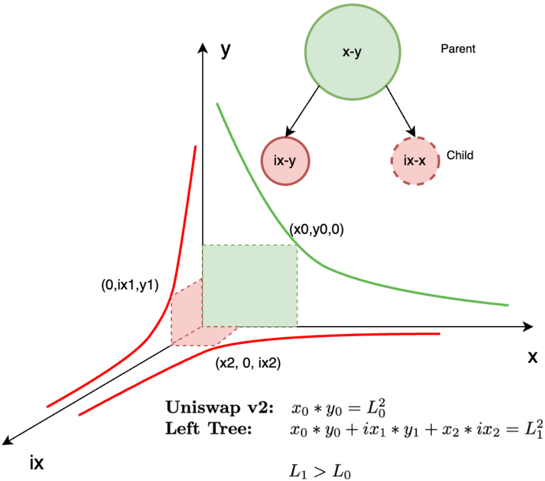
Equivalent Tree

Opposing Tree

Figure 5: Sub-trees comprised of: (TOP LEFT) left tree; (TOP CENTER) right tree; (TOP RIGHT) double tree; (BOTTOM LEFT) equivalent tree; (BOTTOM CENTER) opposing Tree

Simulation Results

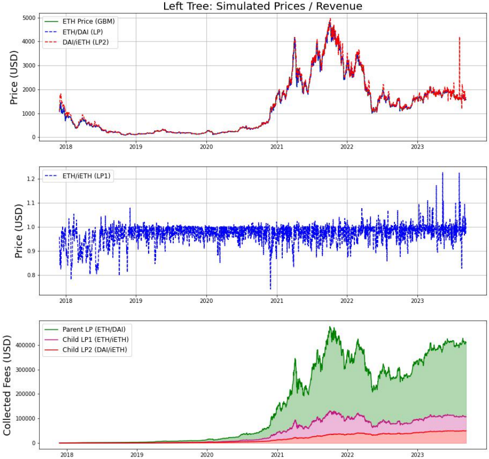
Left Tree



Uniswap v2: $x_0 * y_0 = L_0^2$
Left Tree: $x_0 * y_0 + ix_1 * y_1 + x_2 * ix_2 = L_1^2$

$$L_1 > L_0$$

Left Tree: Simulated Price / Revenue (1)



LEFT TREE: SIMULATED PRICE / REVENUE (2)

Metric	Totals
Revenue (LP) / LP Liquidity	19.4%
Revenue (LP+LP1+LP2) / LP Liquidity	26.3%
Revenue Boost (Indexed Liquidity)	35.61%
Percentage Indexed	7.51%

	Sub-totals		
	LP (ETH-DAI)	**LP1 (iETH-ETH)**	**LP2 (iETH-DAI)**
Liquidity	$1,559,145	$71,961	$162,118
Revenue	$302,140	$57,927	$49,673
Revenue / Liquidity	19.4%	80.5%	30.64%

Table 1: Metrics harvested from Left-tree simulation using ETH & DAI (Jan 2018 to Oct 2023)

Our Objective Question

In Summary

Stagnant Pool Problem

- Defined stagnant pool problem and how it can be addressed

Liquidity Trees: A new DeFi Primitive

- New DeFi primitive, which we call Liquidity Trees
- Utilizes fully collateralized liquidity, and can be represented as undirected graphs or algebraically in $\mathbb{R}^n$
- Simulations support our reasoning

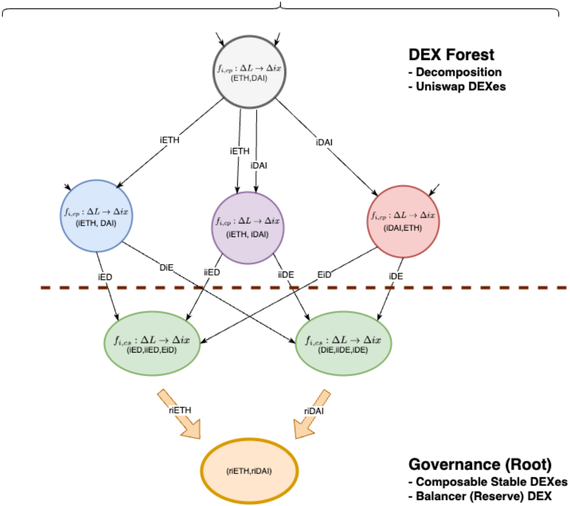
Pachira Token Launch

- Combining Liquidity Trees with a governance system for Pachira Fund token launch

Thank you!

Appendix 1: Pachira Token Launch

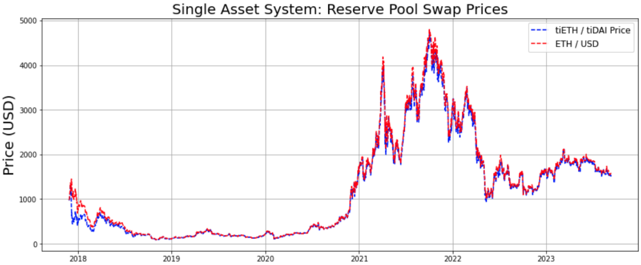
Launch DEX Tree


$f_{i,cp} : \Delta L \to \Delta ix$
(ETH,DAI)
iETH
iETH
iDAI
iDAI
$f_{i,cp} : \Delta L \to \Delta ix$
(iETH, DAI)
$f_{i,cp} : \Delta L \to \Delta ix$
(iETH, iDAI)
$f_{i,cp} : \Delta L \to \Delta ix$
(iDAI,ETH)
iED
DiE
iiED
iiDE
EiD
iDE
$f_{i,cs} : \Delta L \to \Delta ix$
(iED,iiED,EiD)
$f_{i,cs} : \Delta L \to \Delta ix$
(DiE,iiDE,iDE)
riETH
riDAI
(riETH,riDAI)

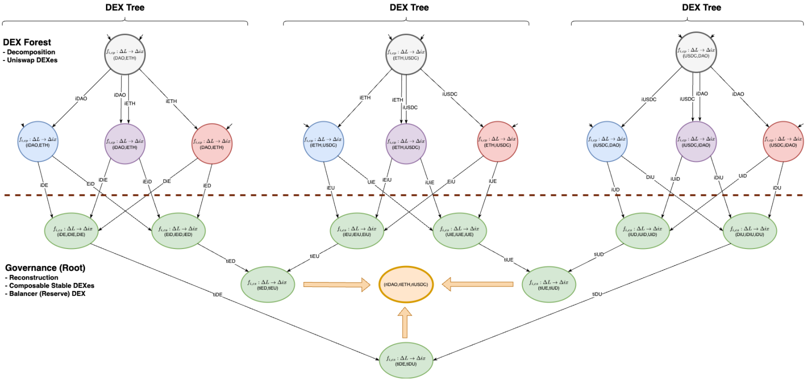
DEX Forest
- **Decomposition**
- **Uniswap DEXes**

Governance (Root)
- **Composable Stable DEXes**
- **Balancer (Reserve) DEX**

Appendix 2: Reserve Swap Prices



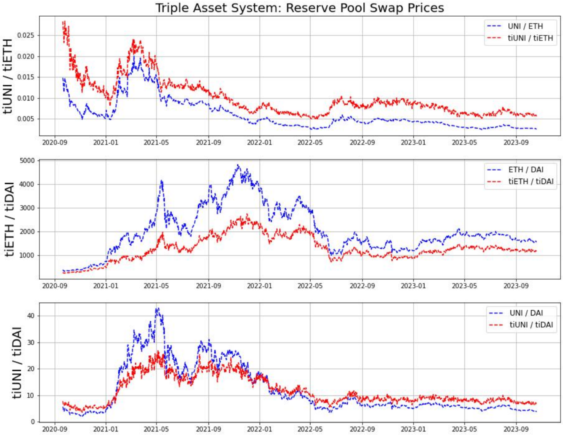
Appendix 3: Pachira Token Launch


DEX Tree
DEX Tree
DEX Tree
$f_{i,cp} : \Delta L \rightarrow \Delta ix$ (DAO,ETH)
iDAO
iDAO
iETH
iETH
$f_{i,cp} : \Delta L \rightarrow \Delta ix$ (iDAO,ETH)
$f_{i,cp} : \Delta L \rightarrow \Delta ix$ (iDAO,iETH)
$f_{i,cp} : \Delta L \rightarrow \Delta ix$ (DAO,iETH)
iDE
EiD
iDiE
iEiD
DiE
iED
$f_{i,cs} : \Delta L \rightarrow \Delta ix$ (iDE,iDiE,DiE)
$f_{i,cs} : \Delta L \rightarrow \Delta ix$ (EiD,iEiD,iED)
$f_{i,cp} : \Delta L \rightarrow \Delta ix$ (ETH,USDC)
iETH
iETH
iUSDC
iUSDC
$f_{i,cp} : \Delta L \rightarrow \Delta ix$ (iETH,USDC)
$f_{i,cp} : \Delta L \rightarrow \Delta ix$ (iETH,iUSDC)
$f_{i,cp} : \Delta L \rightarrow \Delta ix$ (ETH,iUSDC)
iEU
UiE
iEiU
iUiE
EiU
iUE
$f_{i,cs} : \Delta L \rightarrow \Delta ix$ (iEU,iEiU,EiU)
$f_{i,cs} : \Delta L \rightarrow \Delta ix$ (UiE,iUiE,iUE)
$f_{i,cp} : \Delta L \rightarrow \Delta ix$ (USDC,DAO)
iUSDC
iUSDC
iDAO
iDAO
$f_{i,cp} : \Delta L \rightarrow \Delta ix$ (iUSDC,DAO)
$f_{i,cp} : \Delta L \rightarrow \Delta ix$ (iUSDC,iDAO)
$f_{i,cp} : \Delta L \rightarrow \Delta ix$ (USDC,iDAO)
iUD
DiU
iUiD
iDiU
UiD
iDU
$f_{i,cs} : \Delta L \rightarrow \Delta ix$ (iUD,iUiD,UiD)
$f_{i,cs} : \Delta L \rightarrow \Delta ix$ (DiU,iDiU,iDU)
tiED
tiEU
tiUE
tiUD
$f_{i,cs} : \Delta L \rightarrow \Delta ix$ (tiED,tiEU)
(riDAO,riETH,riUSDC)
$f_{i,cs} : \Delta L \rightarrow \Delta ix$ (tiUE,tiUD)
tiDE
tiDU
$f_{i,cs} : \Delta L \rightarrow \Delta ix$ (tiDE,tiDU)

DEX Forest
- Decomposition
- Uniswap DEXes

Governance (Root)
- Reconstruction
- Composable Stable DEXes
- Balancer (Reserve) DEX

Appendix 4: Reserve Swap Prices


Triple Asset System: Reserve Pool Swap Prices
tiUNI / tiETH
UNI / ETH
tiUNI / tiETH
tiETH / tiDAI
ETH / DAI
tiETH / tiDAI
tiUNI / tiDAI
UNI / DAI
tiUNI / tiDAI