



MARIGOLD

INTRODUCTION TO DEFI

A high level introduction to decentralized finance



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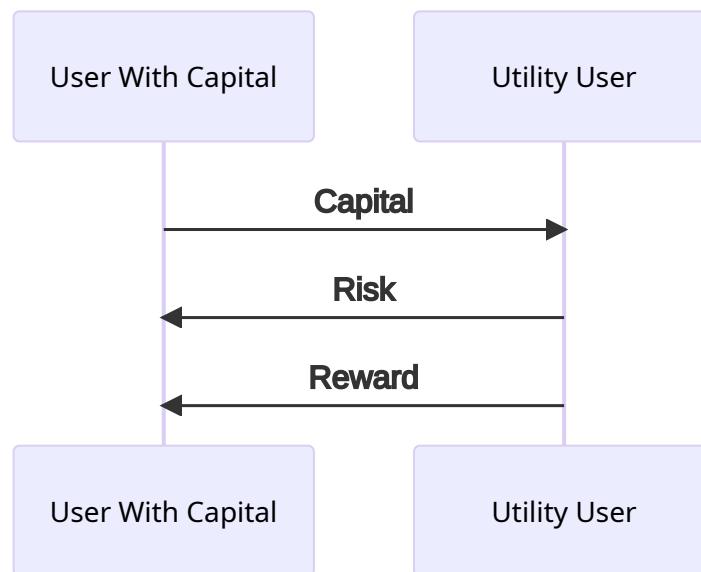
TRADITIONAL FINANCE



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TRANSACTIONS

Most, if not all financial transactions / investments can be thought of as a balance between Capital and Risk/Reward

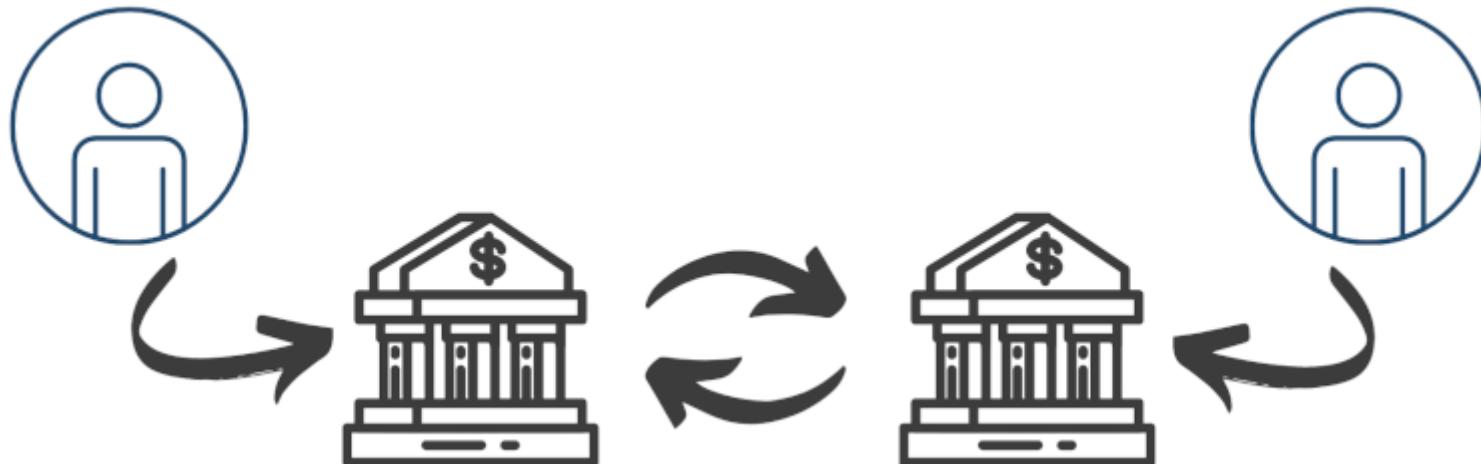




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TRADITIONAL FINANCE

Trusted third-parties required to facilitate services.





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TRADITIONAL FINANCIAL SERVICES

- Value transfer



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TRADITIONAL FINANCIAL SERVICES

- Value transfer
 - Deposit



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TRADITIONAL FINANCIAL SERVICES

- Value transfer
 - Deposit
 - Withdrawal



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TRADITIONAL FINANCIAL SERVICES

- Value transfer
 - Deposit
 - Withdrawal
 - Transfer



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TRADITIONAL FINANCIAL SERVICES

- Value transfer
 - Deposit
 - Withdrawal
 - Transfer
- Credit



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TRADITIONAL FINANCIAL SERVICES

- Value transfer
 - Deposit
 - Withdrawal
 - Transfer
- Credit
 - Loans



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TRADITIONAL FINANCIAL SERVICES

- Value transfer
 - Deposit
 - Withdrawal
 - Transfer
- Credit
 - Loans
- Conversion



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TRADITIONAL FINANCIAL SERVICES

- Value transfer
 - Deposit
 - Withdrawal
 - Transfer
- Credit
 - Loans
- Conversion
 - FX Markets



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TRADITIONAL FINANCIAL SERVICES

- Value transfer
 - Deposit
 - Withdrawal
 - Transfer
- Credit
 - Loans
- Conversion
 - FX Markets
- Investing



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TRADITIONAL FINANCIAL SERVICES

- Value transfer
 - Deposit
 - Withdrawal
 - Transfer
- Credit
 - Loans
- Conversion
 - FX Markets
- Investing
 - Equities



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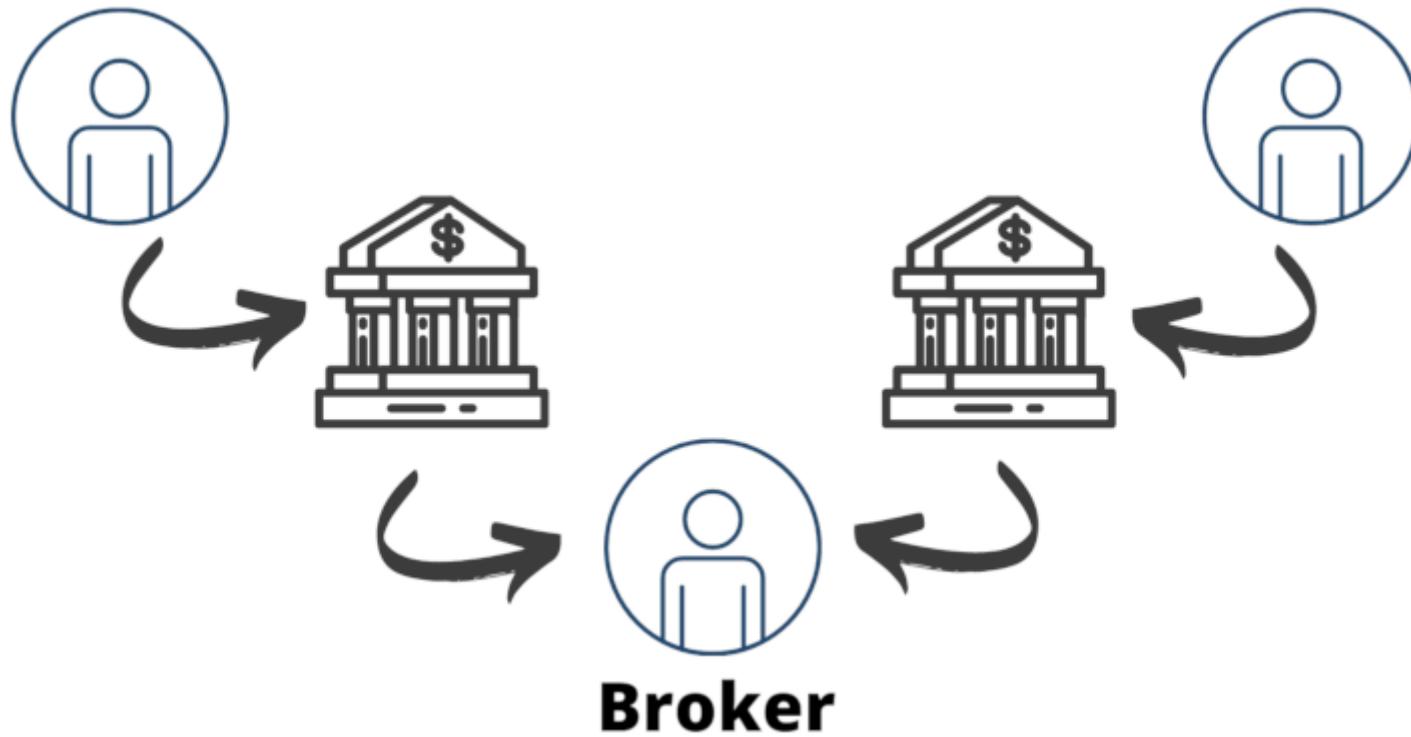
TRADITIONAL FINANCIAL SERVICES

- Value transfer
 - Deposit
 - Withdrawal
 - Transfer
- Credit
 - Loans
- Conversion
 - FX Markets
- Investing
 - Equities
 - Fixed Income



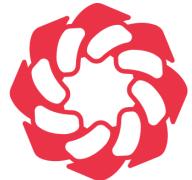
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OTC (*over the counter*) trades, are effectively any trades between two parties (normally banks) that does not go through an exchange.



The global market value of OTC derivatives is in the region of **\$15.8tn**

TRADITIONAL MARKETS - EXCHANGES



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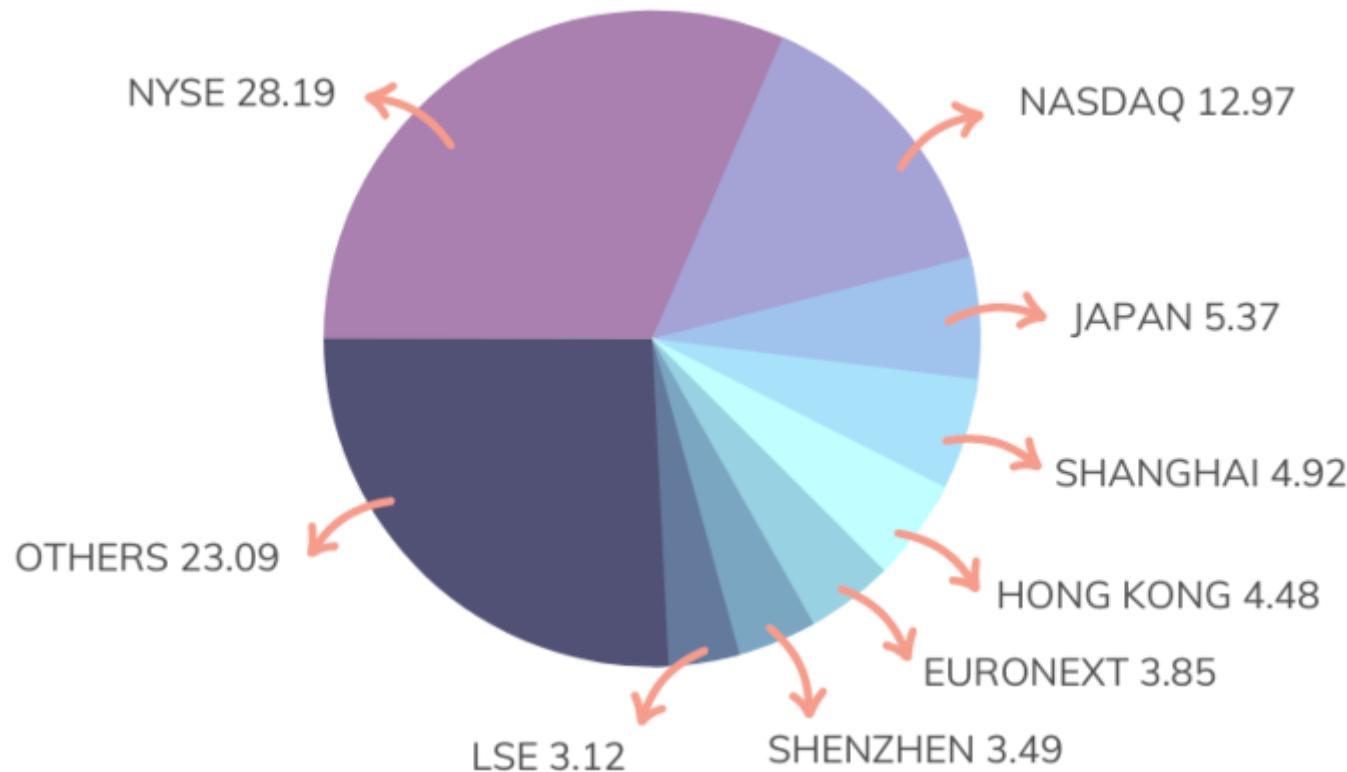
Exchange trades are those transactions that are performed on a centralised exchange; most often these trades are between banks and/or brokers. There are 60 major exchanges globally, totalling a value of **\$69tn**



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TRADITIONAL MARKETS - EXCHANGE SIZE

The total market capitalizations globally amounts to \$89.5tn





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TRADITIONAL MARKETS - MARKET MAKERS

Traditional market makers role is to provide liquidity to markets.





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CENTRALISED FINANCE

CENTRALISED FINANCE



Centralised Finance is characterized by centralised exchanges which predominately provide on/off ramps for fiat / crypto conversions and trading of currency / token pairs.

All transactions are controlled by a centralised entity.

RISKS

- Custody
 - Hacks
 - Restrictions
 - KYC

Exchange	24h Volume (Normalized)	# Coins	# Pairs
 Binance Centralized	\$9,254,208,757	365	1461
 Coinbase Exchange Centralized	\$1,470,152,752	174	469
 Huobi Global Centralized	\$1,348,243,066	553	995
 FTX Centralized	\$1,295,430,542	330	512
 KuCoin Centralized	\$1,221,662,739	696	1256
 Gate.io Centralized	\$1,214,285,469	1400	2616
 Bitget Centralized	\$892,476,400	251	293
 OKX Centralized	\$876,309,305	355	539
 Crypto.com Exchange Centralized	\$579,476,658	212	367
 Kraken Centralized	\$371,980,131	167	556



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DECENTRALISED FINANCE



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DECENTRALISED FINANCE

The best description of decentralised finance is a comparison with traditional finance.

	Defi	TradFi
Custody	Self Custody	Companies (banks) hold your money
Control	Full Control over where your money goes	Trust in companies is required not to mismanage or restrict your funds
Transfers	Transfers happen in minutes	Transfers can take days
Activity	Activity is pseudonymous	Activity is tightly coupled with your identity
Access	Open to anyone	Restrictions and barriers to entry
Market Hours	Always open	Specific times
Transparency	Fully transparent	Closed access



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Bank

MARKET COMPARISON – VALUE

	Country	Tier 1 Capital (`\$bn)	Protocol	Market Cap (`\$bn)
ICBC	China	440	Bitcoin (BTC)	605
China Construction Bank	China	362	Ethereum (ETH)	239
Agricultural Bank of China	China	336	Tether (USDT)	72
Bank of China	China	305	USD Coin (USDC)	53
JP Morgan Chase	US	235	BNB (BNB)	52
Bank of America	US	200	Cardano (ADA)	22
Citigroup	US	167	Ripple (XRP)	20
HSBC Holdings	UK	160	Binance USD (BUSD)	17
Wells Fargo	US	158	Solana (SOL)	15
Mitsubishi UFJ Financial Group	Japan	144	Dogecoin (DOGE)	11



MARKET COMPARISON - LOSSES

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	Pre-tax loss (`\$mn)	Protocol	Hack Loss (\$`mn)
BFA Tenedora de Acciones	6452	Ronin	615
Commerzbank	3206	PolyNetwork	613
UniCredit	3009	Wormhole	326
Banco Santander	2563	Beanstalk	182
Banco Monte dei Paschi di Siena	1668	Compound	150
Novo Banco	1653	Vulcan Forged	140
Umpqua Holdings Corp	1456	Cream Finance	130
Pacwest Bancorp	1162	Badger DAO	120
Allied Irish Banks	1149	bZx	55
Saudi British Bank	1147	Pancake Bunny	45



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PAYMENTS



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PAYMENTS – TRANSACTION TIMES

Payment Type	Transaction Time (s)
Visa Payment	2–5 seconds
Bank transfer	1–2 minutes
International transfer	3–5 days

Additionally there could be delays due to the size of a given transaction.



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PAYMENTS - TIME TO FINALITY

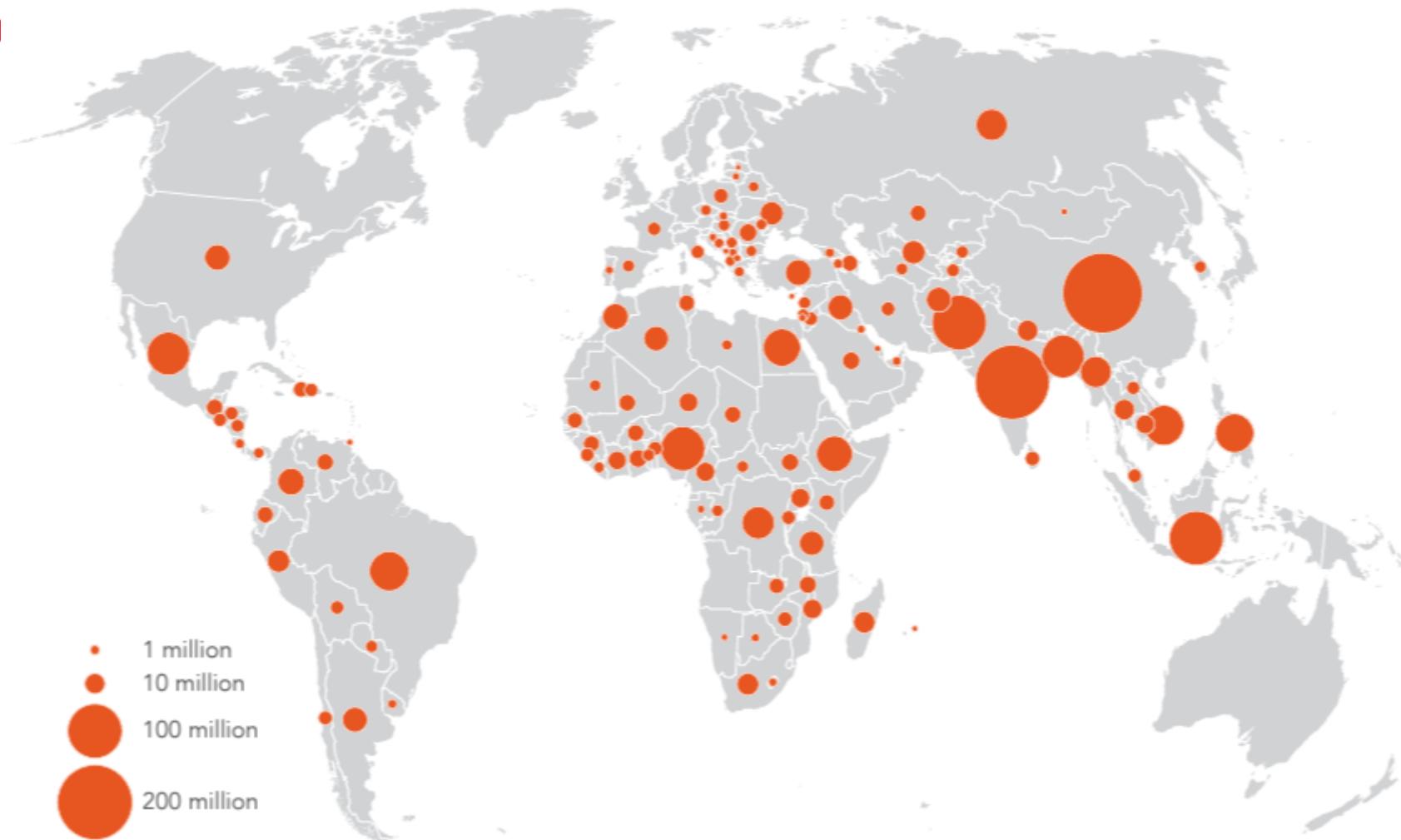
Protocol	TTF (s)
Bitcoin	~3600
Cardano	~180
Tezos	~60
Polkadot	~60
Solana	~12
Avalanche	~10
Cosmos	~6
Algorand	~5
Fantom	~1

PAYMENTS – BANKING THE UNBANKED



Globally, 1.7 billion adults lack an account
Adults without an account, 2017

M,



Source: Global Findex database.

Note: Data are not displayed for economies where the share of adults without an account is 5 percent or less.



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PAYMENTS - BANKING THE UNBANKED

Country	% unbanked
China	13
India	11
US	6
Indonesia	6
Pakistan	6
Nigeria	4
Mexico	3
Bangladesh	3



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STAKING



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STAKING - YIELDS

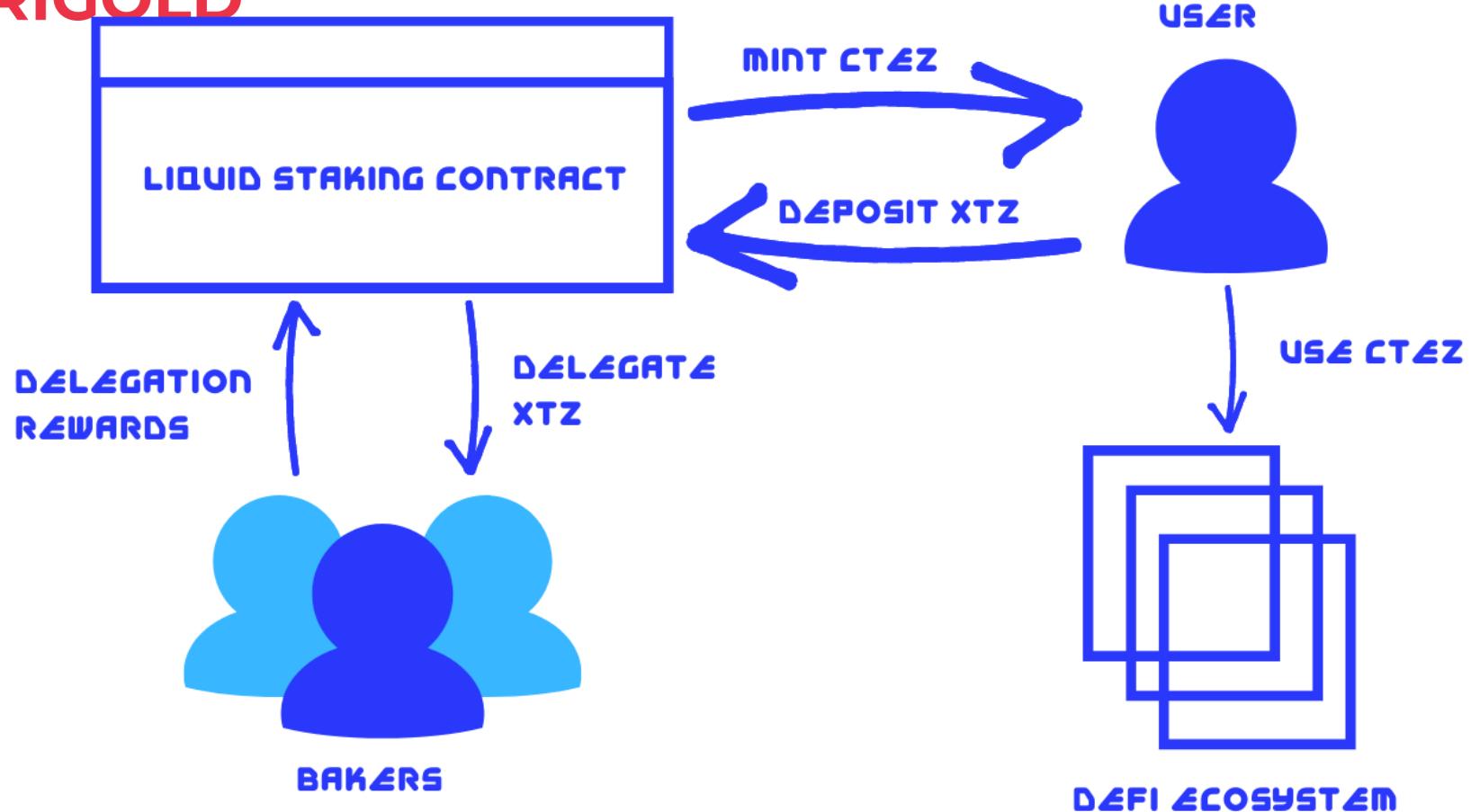
The average savings account yield is 0.35%.

Chain	Staking Yields (% apy)
Tezos	2.72
Ethereum	4.14
Cardano	4.98
Solana	4.78
Avalanche	8.82
Polkadot	13.98
Algorand	7.8



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LIQUID STAKING



LIQUID STAKING - EXAMPLE - LIDO

The screenshot shows the Lido liquid staking interface. At the top, there are navigation tabs: LIDO (selected), STAKE (highlighted with a blue lightning bolt icon), WRAP, and REWARDS.

Stake Ether

Stake ETH and receive stETH while staking.

Available to stake
0.0 ETH

Staked amount
0.0 stETH +

Lido APR ⓘ
4%

Amount MAX

Submit

You will receive
0 stETH

Exchange rate
1 ETH = 1 stETH

Transaction cost
\$6.79

Reward fee ⓘ
10%

Lido statistics

[View on Etherscan](#)

Annual percentage rate ⓘ

4%

Total staked with Lido

4,216,588.083 ETH

Stakers

79779

stETH market cap

\$7,239,389,182



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LIQUID STAKING - EXAMPLE - CTEZ

The screenshot shows the Marigold platform interface for liquid staking CTEZ. The left sidebar has a dark blue background with white icons and text:

- ctez** (selected)
- + Create Oven**
- All Ovens**
- My Ovens**
- Trade**
- Stats**

Below the sidebar, the main area has a light gray background with a header bar containing:

- All Ovens**
- Sort By: **Value**
- Search Oven Owner
- Track Oven →**
- + Create Oven**

The main content area displays the **Oven Summary** for a specific oven:

Total Balance	Outstanding	Mintable	Withdrawable
580998.213434 tez	452725.030843 ctez	54062.753719 ctez	0 tez

Below the summary, detailed information for the oven is shown:

Oven address	Owner	Oven balance	Outstanding	Mintable	Collateral Utilization
KT1W...AgLM	tz1V...s6c9	60277.057442 tez	51550 ctez	52577.917979 ctez	98.04%



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DECENTRALISED EXCHANGES (DEX)

DEX - ORDER BOOK DEX



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Order book based DEXs hold collect buy and sell orders at different price levels and try to match order off against each other.

Order books can be on or off-chain and in contrast to CeFi, assets are held in users wallets.

10	90000000.000
500	2.777
500	2.500
1,641	2.438
1,460	2.175
1,476	2.076
2,024	2.053
3,915	2.045
9,975	2.039
10	2.036
40,924	2.035
44,797	2.034
49,110	2.033
9,726	2.032
1,456	2.031
2,373	2.030
2,018	2.029

	2.019	2.029
Spread	0.006	
7,448	2.023	
41,691	2.022	
40,053	2.021	
44,942	2.020	
299	2.019	
21,183	2.018	
14,106	2.010	
2,024	2.001	
982	1.981	
497	1.955	
1,938	1.900	
2,462	1.625	
10	1.500	
256	1.450	
900	1.020	
30,000	0.039	
50,000	0.038	



DEX - ORDER BOOK DEX EXAMPLE - DYDX

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X Mainnet English Portfolio Trade Rewards Competitions Governance More Connect wallet

XTZ-USD All markets \$2.203 Index Price \$2.204 Oracle Price \$2.205 24h Change +\$0.173 (8.51%) Open Interest 328,467.00 xtz 1h Funding -0.002065% 24h Volume \$1,871,740 24h Trades 817 Next Funding 26:55

Connect your Ethereum wallet to deposit funds & start trading. Connect wallet

Market Limit Stop ▾

Sell Buy

Amount Set order size 0.0000 xtz USD

or

Leverage Up to 10x Slider 0.00x NONE 2x 3x 5x

Trading rewards Earn \$DYDX rewards as you trade All rewards are made available through dYdX Foundation. Learn more +

Expected Price -

Price Impact -

Fee Taker -

Total 0:00 / 0:19 Unavailable

Book Trades Price Depth Funding Details

Size	XTZ	Price	USD	Mine
500		2.777		-
500		2.500		-
1,601		2.499		-
493		2.279		-
1,005		2.262		-
1,975		2.231		-
3,959		2.227		-
9,985		2.219		-
13,633		2.218		-
32,062		2.215		-
14,630		2.213		-
1,473		2.212		-
14,615		2.211		-
42,892		2.210		-
15,214		2.208		-
40,958		2.207		-
5,895		2.206		-
1,375		2.205		-
Spread	0.005	0.23%		
621		2.200		-
646		2.199		-
801		2.198		-
11,671		2.197		-
18,434		2.196		-
36,680		2.195		-
38,894		2.193		-
17,832		2.192		-
14,620		2.190		-
10,073		2.186		-
4,017		2.183		-
2,047		2.175		-
1,023		2.150		-
2,000		2.146		-
497		2.122		-
2,259		1.771		-
10		1.500		-
256		1.450		-
900		1.210		-

XTZ-USD · 1D O 2.091 H 2.260 L 2.055 C 2.211
Volume 20 564.875K

Position Orders 0 Fills 0 Payments 0

Average Open Average Close Net Funding

Leverage Liquidation Price

Unrealized P&L Realized P&L

None

POWERED BY STARKWARE



DEX - ORDER BOOK DEX EXAMPLE - SPICYSWAP

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The screenshot shows the SpicySwap DEX interface. At the top, there is a navigation bar with links for Home, Trade, Dashboard, and Analytics. Below the navigation bar, there are tabs for Swap, Limits, Liquidity, Farm, and SVaults. Further down, there are links for Charts, Shortcuts, and Recipes.

The main area displays a swap form. The "From" section shows XTZ with a balance of 0.551819. The "To" section shows tzBTC with a balance of No Balance. A swap button at the bottom of the form is labeled "Swap".

Below the swap form, there are several input fields: "Slippage" (radio buttons for .1%, .3%, and 0%), "Expire Time" (set to 30), and "Price Impact" (radio button set to 0%).

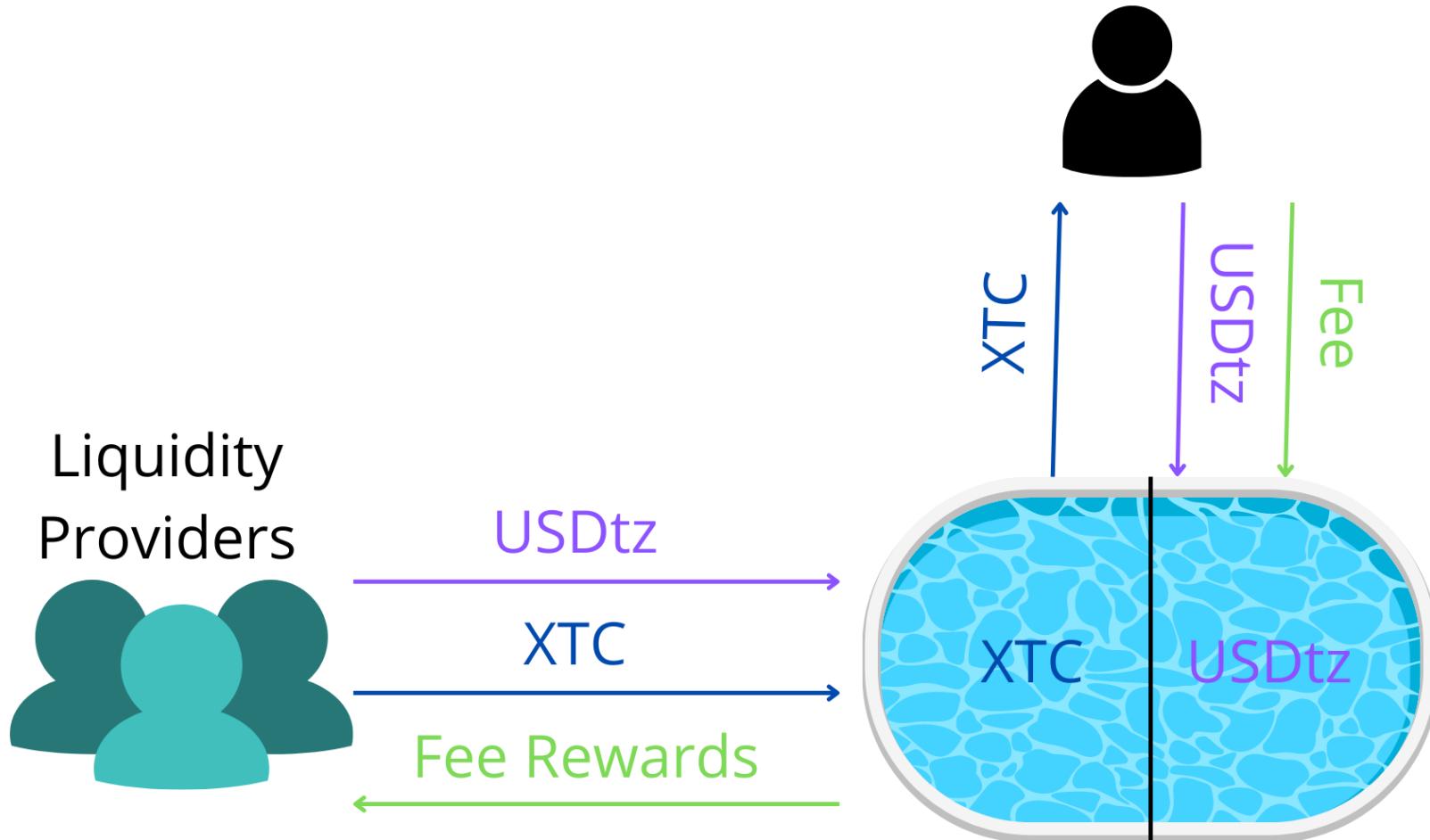
At the bottom of the screen, there is a video player showing a progress bar from 0:00 to 0:30 and a volume control icon.

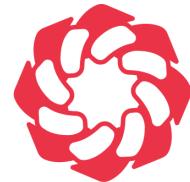


DEX - LIQUIDITY POOL

In contrast, liquidity pools hold reserve amounts of tokens that can be used to swap.

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DEX - LIQUIDITY POOL - EXAMPLES

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▶ 0:00 / 3:11





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DEX - AUTOMATED MARKET MAKERS

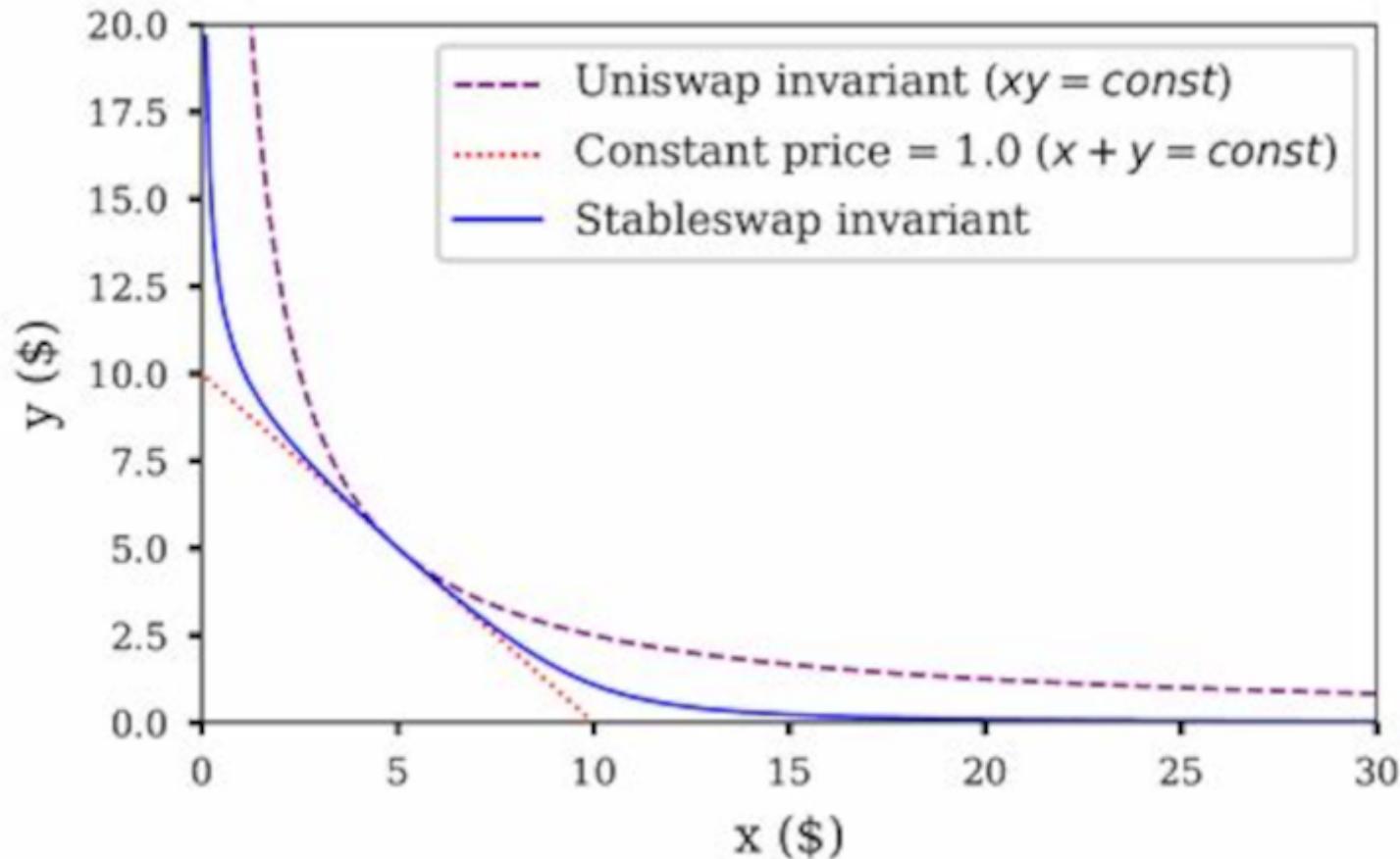
AMMs are the contracts that keep the pool balances according to a given pool curve (rule).

- Constant Product
 - $x * y = k$
- Constant Sum
 - $x + y = k$
- Constant Mean
 - $v = \prod_t B_t^{w_t}$
- Stable swap
 - $An^n \sum X_i + D = ADn^n + \frac{D^{n+1}}{n^n \prod x_i}$
 - $U(x, y) = (x + y)^8 - (x - y)^8$



DEX - AMM CURVE COMPARISON

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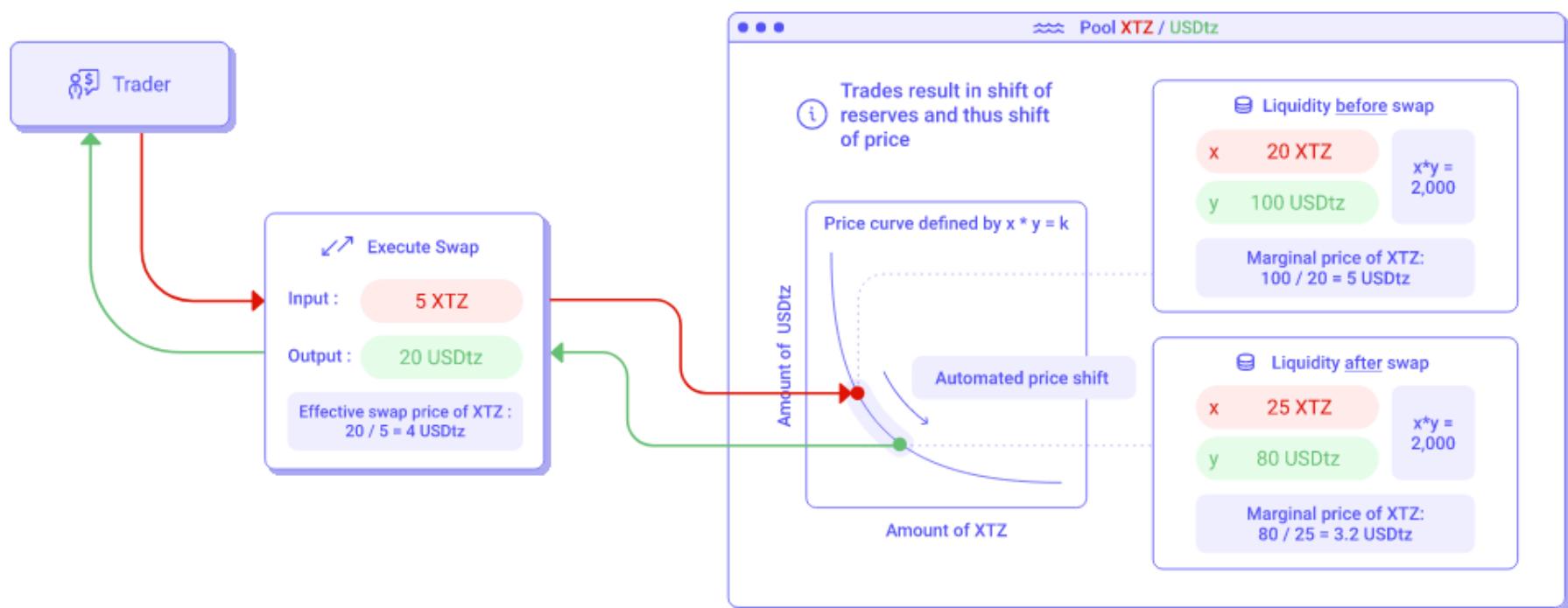




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DEX - RISKS - SLIPPAGE

Slippage is the difference between the quoted swap price and the actual price at the point of trade execution.





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DEX - RISKS - IMPERMANENT LOSS

Impermanent Loss is the movement in value of LP tokens due to the change in balance of the underlying pool tokens.

Initial Pool	
# XTZ	50
# USDTZ	250 USDtz
LP	\$500
HODL	\$500
Exchange Rate	5 XTZ/UDStz
IL (\$)	0



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DEX - RISKS - IMPERMANENT LOSS

Impermanent Loss is the movement in value of LP tokens due to the change in balance of the underlying pool tokens.

	Initial Pool	After ARB
# XTZ	50	45
# USDTZ	250 USDTz	275 USDTz
LP	`\$500	\$`550
HODL	`\$500	\$`555
Exchange Rate	5 XTZ/UDStz	6.11 XTZ/USDTz
IL (\$)	0	-5

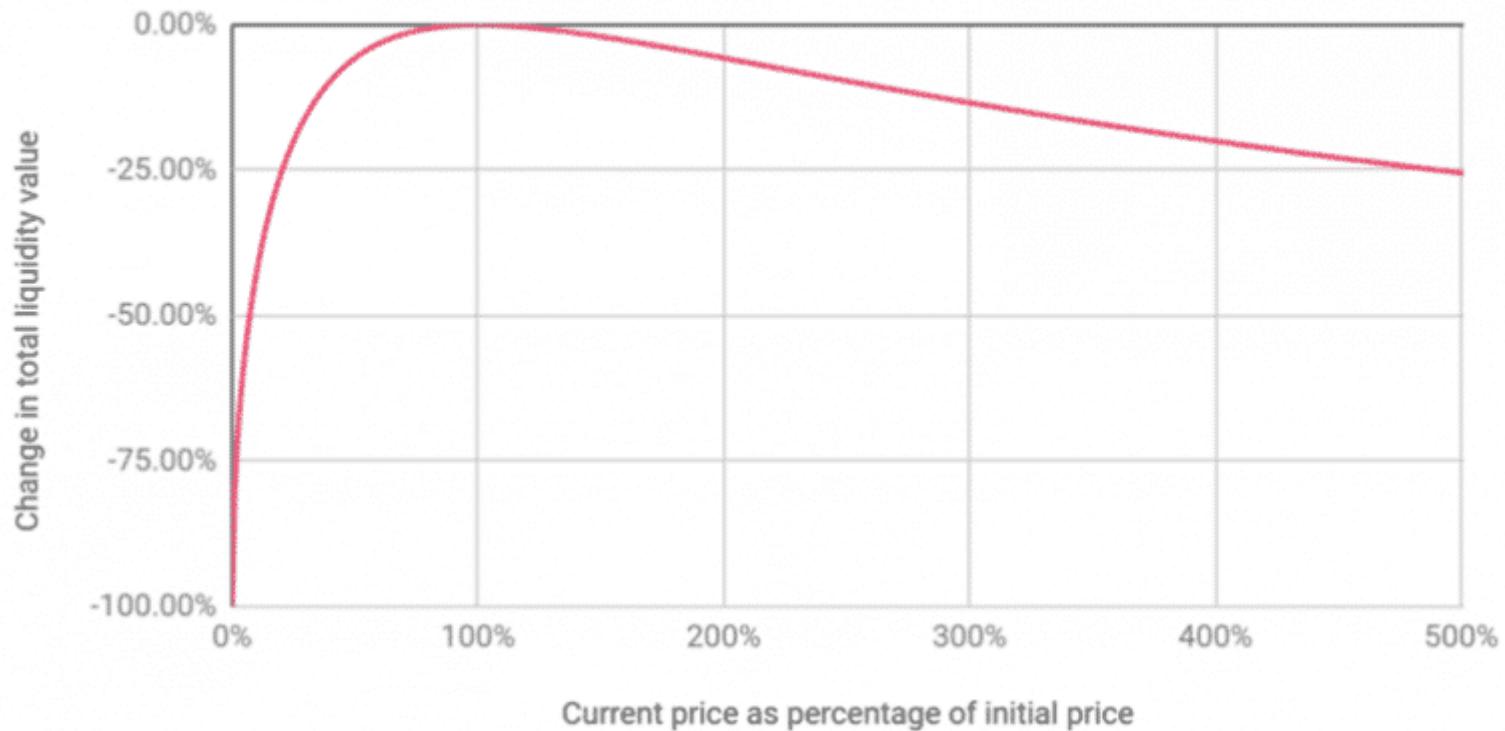


DEX - RISKS - IMPERMANENT LOSS CURVE

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Losses to liquidity providers due to price variation

Compared to holding the original funds supplied





DEX - RISKS - IL PROTECTED POOLS

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▶ 0:00 / 0:48





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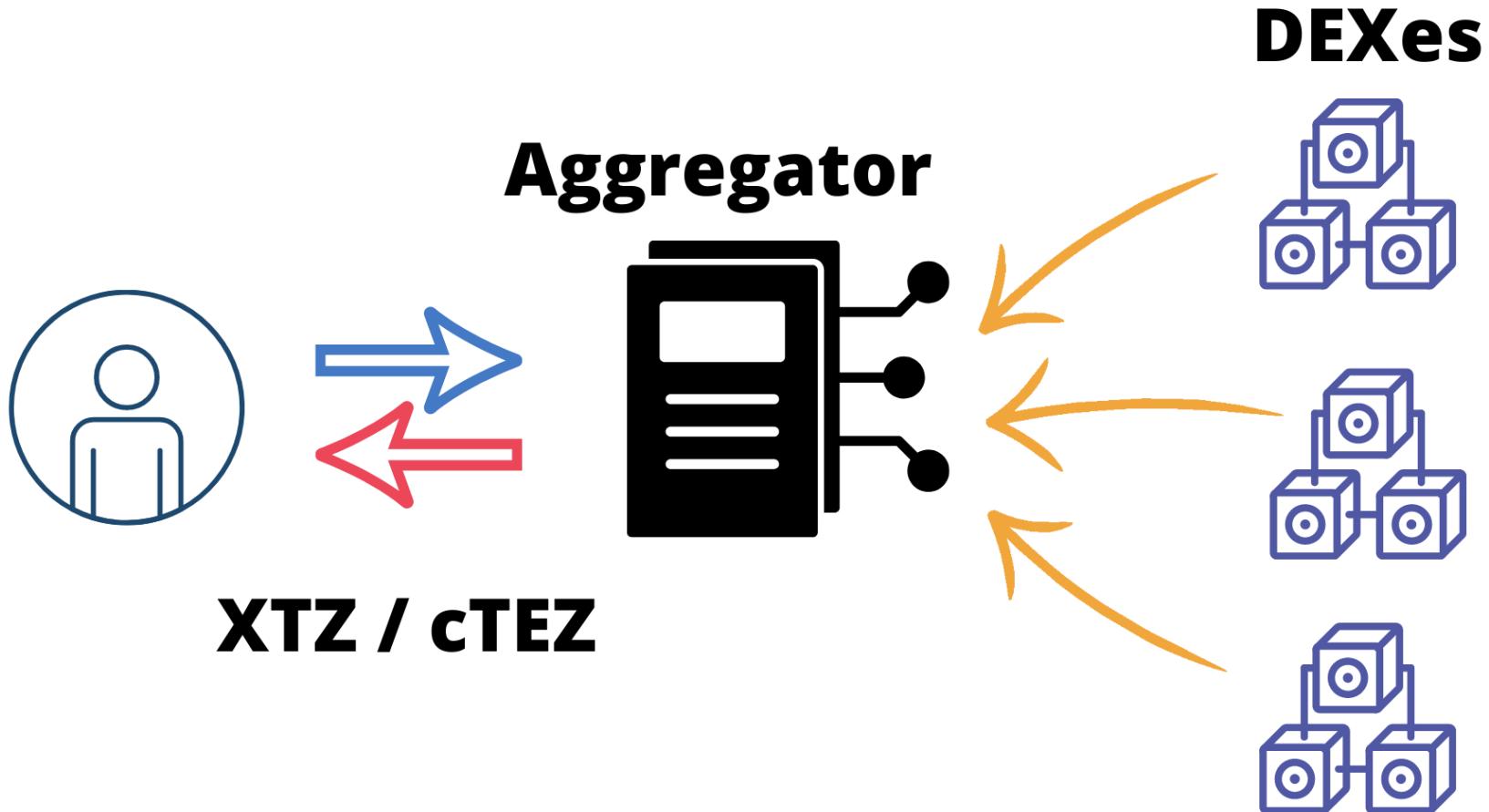
DEX (SWAP) AGGREGATORS



DEX (SWAP) AGGREGATORS

DEX aggregators are portals that look for the best price when initiating a swap.

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DEX (SWAP) AGGREGATORS - EXAMPLE - JUP.AG

The screenshot shows the Jupiter DEX Swap interface. At the top, there is a navigation bar with links for Trade, Infra, Docs, Stats, More, and a user account section showing a balance of 0.08 SOL. Below the navigation bar is a search bar with placeholder text "You can try '10 GST to USDC'". The main area displays a swap transaction between ORCA and SOL.

You pay: ORCA (0.00)

You receive: SOL (0.080870076 SOL)

Swap

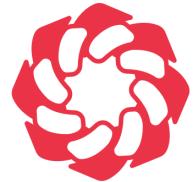
A cursor is hovering over the "Swap" button. At the bottom of the screen, there is a dark overlay with a video player interface showing a progress bar at 0:00 / 0:10 and control icons for volume, full screen, and more.



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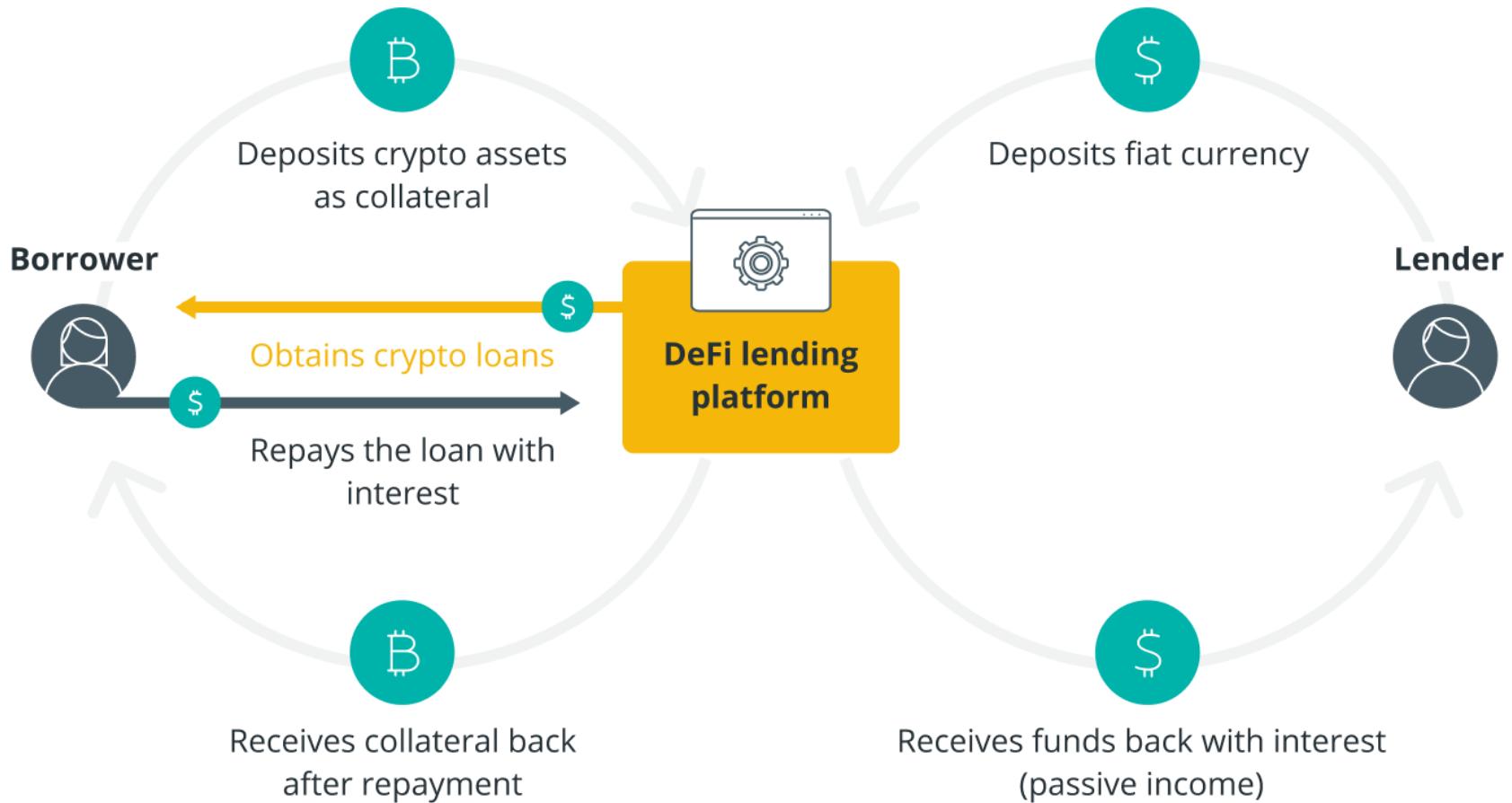
LENDING / BORROWING

LENDING / BORROWING



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Working of a crypto lending platform





LENDING / BORROWING - EXAMPLES

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▶ 0:00 / 2:13





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GROWING AREAS OF DEFI

- Stablecoins



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GROWING AREAS OF DEFI

- Stablecoins
 - USDT



MARIGOLD

GROWING AREAS OF DEFI

- Stablecoins
 - USDT
 - USDC



MARIGOLD

GROWING AREAS OF DEFI

- Stablecoins
 - USDT
 - USDC
 - DAI



MARIGOLD

GROWING AREAS OF DEFI

- Stablecoins
 - USDT
 - USDC
 - DAI
 - USDP (Pax Dollar)



MARIGOLD

GROWING AREAS OF DEFI

- Stablecoins
 - USDT
 - USDC
 - DAI
 - USDP (Pax Dollar)
 - kUSD (Kolibri)



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GROWING AREAS OF DEFI

- Stablecoins
 - USDT
 - USDC
 - DAI
 - USDP (Pax Dollar)
 - kUSD (Kolibri)
 - EURL (Lugh)



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GROWING AREAS OF DEFI

- Stablecoins
 - USDT
 - USDC
 - DAI
 - USDP (Pax Dollar)
 - kUSD (Kolibri)
 - EURL (Lugh)
- Derivatives



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GROWING AREAS OF DEFI

- Stablecoins
 - USDT
 - USDC
 - DAI
 - USDP (Pax Dollar)
 - kUSD (Kolibri)
 - EURL (Lugh)
- Derivatives
 - Options



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GROWING AREAS OF DEFI

- Stablecoins
 - USDT
 - USDC
 - DAI
 - USDP (Pax Dollar)
 - kUSD (Kolibri)
 - EURL (Lugh)
- Derivatives
 - Options
 - Hegic (Ethereum)



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GROWING AREAS OF DEFI

- Stablecoins
 - USDT
 - USDC
 - DAI
 - USDP (Pax Dollar)
 - kUSD (Kolibri)
 - EURL (Lugh)
- Derivatives
 - Options
 - Hegic (Ethereum)
 - Opyn (Ethereum)



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GROWING AREAS OF DEFI

- Stablecoins
 - USDT
 - USDC
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 - USDP (Pax Dollar)
 - kUSD (Kolibri)
 - EURL (Lugh)
- Derivatives
 - Options
 - Hegic (Ethereum)
 - Opyn (Ethereum)
 - Zeta Markets (Solana)



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GROWING AREAS OF DEFI

- Stablecoins
 - USDT
 - USDC
 - DAI
 - USDP (Pax Dollar)
 - kUSD (Kolibri)
 - EURL (Lugh)
- Derivatives
 - Options
 - Hegic (Ethereum)
 - Opyn (Ethereum)
 - Zeta Markets (Solana)
 - Synthetic Asset



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GROWING AREAS OF DEFI

- Stablecoins
 - USDT
 - USDC
 - DAI
 - USDP (Pax Dollar)
 - kUSD (Kolibri)
 - EURL (Lugh)
- Derivatives
 - Options
 - Hegic (Ethereum)
 - Opyn (Ethereum)
 - Zeta Markets (Solana)
 - Synthetic Asset
 - Synthetix (Ethereum)



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GROWING AREAS OF DEFI

- Stablecoins
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 - USDC
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 - USDP (Pax Dollar)
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- Derivatives
 - Options
 - Hegic (Ethereum)
 - Opyn (Ethereum)
 - Zeta Markets (Solana)
 - Synthetic Asset
 - Synthetix (Ethereum)
 - UMA Protocol



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GROWING AREAS OF DEFI

- Stablecoins
 - USDT
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 - Hegic (Ethereum)
 - Opyn (Ethereum)
 - Zeta Markets (Solana)
 - Synthetic Asset
 - Synthetix (Ethereum)
 - UMA Protocol
 - Badger Finance (Ethereum, Polygon, Fantom, Arbitrum)



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GROWING AREAS OF DEFI

- Stablecoins
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 - Synthetix (Ethereum)
 - UMA Protocol
- Badger Finance (Ethereum, Polygon, Fantom, Arbitrum)
- Harvest Finance (Ethereum, Polygon, Arbitrum, BSC)



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GROWING AREAS OF DEFI



MARIGOLD

GROWING AREAS OF DEFI

- Insurance



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GROWING AREAS OF DEFI

- Insurance
 - Armor (Ethereum)



MARIGOLD

GROWING AREAS OF DEFI

- Insurance
 - Armor (Ethereum)
- Indices



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GROWING AREAS OF DEFI

- Insurance
 - Armor (Ethereum)
- Indices
 - Index Cooperative (Ethereum)



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GROWING AREAS OF DEFI

- Insurance
 - Armor (Ethereum)
- Indices
 - Index Cooperative (Ethereum)
 - Indexed Finance (Ethereum)



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GROWING AREAS OF DEFI

- Insurance
 - Armor (Ethereum)
- Indices
 - Index Cooperative (Ethereum)
 - Indexed Finance (Ethereum)
- Prediction Markets



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GROWING AREAS OF DEFI

- Insurance
 - Armor (Ethereum)
- Indices
 - Index Cooperative (Ethereum)
 - Indexed Finance (Ethereum)
- Prediction Markets
 - Augur (Ethereum)



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GROWING AREAS OF DEFI

- Insurance
 - Armor (Ethereum)
- Indices
 - Index Cooperative (Ethereum)
 - Indexed Finance (Ethereum)
- Prediction Markets
 - Augur (Ethereum)
- Fixed Income



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GROWING AREAS OF DEFI

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 - Indexed Finance (Ethereum)
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 - Augur (Ethereum)
- Fixed Income
 - Yield Protocol (Ethereum)



MARIGOLD

GROWING AREAS OF DEFI

- Insurance
 - Armor (Ethereum)
- Indices
 - Index Cooperative (Ethereum)
 - Indexed Finance (Ethereum)
- Prediction Markets
 - Augur (Ethereum)
- Fixed Income
 - Yield Protocol (Ethereum)
 - Saffron Finance (Ethereum)



MARIGOLD

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MARIGOLD

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 - Yield Protocol (Ethereum)
 - Saffron Finance (Ethereum)
- Yield Aggregators
 - Yearn Finance (Ethereum, Fantom, Arbitrum)



MARIGOLD

FUTURE DEEP DIVES

- Liquidity Pool Designs and Risks
- Stablecoin and Stableasset designs and risks
- Prediction Markets
- Derivatives - use cases
- Cross Chain Bridges