Tokenizing Total Cryptocurrency Market Capitalization For Real-Time Trade

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Abstract—**Next to the underlying price of Bitcoin itself, Total Cryptocurrency Market Capitalization is the most widely quoted and well-known cryptocurrency data metric in the world.**

While referenced and quoted every day as one of the key metrics measuring the expansions and declines transpiring in the space, Total Cryptocurrency Market Capitalization has no means or ability to be minted in real-time form. This paper will provide insight into how Cryptex has successfully tokenized this key metric, in our DAO's commitment to providing innovative, open sourced decentralized solutions for the global crypto community.

Index Terms—**Total Market Capitalization, TCAP, Ethereum.**

I. INTRODUCTION

TCAP is an ERC-20 compatible smart contract that tokenizes real-time Total Market Capitalization from all cryptocurrencies and tokens listed on the largest crypto data providers in the world.

The Trillion Dollar Opportunity

Combining blockchain technology with the process of data aggregation, approximately $2 trillion of raw market capitalization data can be brought to market via cross-collateralized, asset nominal tokenization. Asset nominal tokenization starts with the process of taking a data metric, such as Total Market Capitalization. This metric is then set to a divisor of 10,000,000,000. The new,

nominal asset token value now trades in lockstep with the underlying data metric it tracks.

Collateralizing the new smart contract against assets like ETH or DAI provides the security that this new tokenized asset is backed by a set of rules and collateral enforced by an Ethereum smart contract, thereby tokenizing total market capitalization.

II. TCAP PRICE METHODOLOGY

A. Total Market Capitalization Data

Derived/aggregated by the largest crypto data providers in the world, inserted on chain by a suite of blockchain oracles. The table I is an example of data pulled from real world providers.

Provider	Total Market Price
Coingecko	$366,945,648,560.09560
Coin Market Cap	$358,488,544,442.52606
Nomics	$366,149,586,385.00000
Coin Paprika	$365,122,527,908.00000
Coin Lore	$355,322,396,052.01650

TABLE I

PRICES CAPTURED ON OCTOBER 12, 2020

The formula to calculate the median of the finite number of data set is different for even and odd numbers of observations. Therefore, it is necessary to recognise

first if we have odd number of values or even number of values in a given data set.

B. Odd Number of Observations

$$Median = (\frac{n+1}{2})^{th} term \qquad (1)$$

Example: Where n is the number of observations I:

$$MedianTotalMarket = \$365,122,527,908.00000$$

C. Even Number of Observations

$$Median = \frac{(n/2)^{th} term + ((n/2)+1)^{th}}{2} \qquad (2)$$

D. Injecting Real World Data on Ethereum

The median value of the Total Crypto Market Price is added to a Chainlink Aggregator Smart Contract which allows TCAP contracts to access this information on-chain. The suite of Chainklink oracles updates this data on-chain with each 1% price movement.

E. Calculating TCAP Token Price

With the median total market price, this price is nominalized with a simple divisor of 10 billion. This process is similar to S&P 500 or any major financial index.

$$TCAP_{Price} = \frac{MedianTotalMarket}{Divisor} \qquad (3)$$

Example: Using the example data from table I and the TCAP divisor of \$10B:

$$TCAP_{Price} = \frac{\$362,405,740,669.52}{\$10,000,000,000} \approx \$36.2406$$

F. Collateralization

TCAP is a synthetic asset that tracks, in real-time, an external and ever-moving metric, Total Market Capitalization. To do so without any underlying collateral would have created a model where, while an aggregated Oracle Price and divisor tracks the referenced metric correctly,

there is no inherent value to a simple price mechanism and thus, no guarantee that TCAP would be traded at the quoted price or maintain its peg to the real-world total market capitalization of all cryptocurrencies. We claim that there *must* be backing collateral behind the TCAP system in order to maintain its price. Therefore, for any TCAP token to be minted, there must be at least 100% collateral value staked in a secure smart contract on the Ethereum network. These collateralized smart contracts for TCAP are referred to as Vaults. While 100% collateralization could be the minimum backing for TCAP, it is inherently too risky as even the slightest price movement would cause the system to have insufficient collateral. As such, the TCAP system will require a minimum value of $Ratio$ between 150% and 200% backing collateral.

The TCAP system could use any type of backing collateral that has value and conforms to an ERC-20 standard interface. Initially, TCAP Vaults will only accept a select few types of backing collateral. When determining the collateralization ratio for a given Vault, the underlying assets are translated to their USD value via on-chain DeFi price oracles.

$$Collateral = \frac{TCAP_{price} \times Vault_{Debt} \times Ratio}{Collateral_{price} \times 100} \qquad (4)$$

All Vaults are required to maintain at least the Vault *Collateral* backing collateral or be subjected to a liquidation event. The amount of the Vault *Collateral* changes as the $TCAP_{Price}$ moves with current market conditions and the amount will ensure that the Vault maintains a $Ratio$ well above 100% relative to the TCAP that has been minted by the Vault (*Debt*).

G. Liquidation

The price of TCAP moves according to the crypto market and therefore the minimum amount of required collateral for each Vault changes accordingly.

The $Vault_{Ratio}$ must always be greater that the system minimum $Ratio$.

$$Ratio = \frac{Collateral_{Price} \times Vault_{Collateral} \times 100}{Vault_{Debt} \times TCAP_{Price}} \tag{5}$$

When any Vault $Ratio$ is less than $Ratio$, any user can trigger a liquidation event. A liquidation event allows the caller to pay some of the outstanding debt, TCAP, in exchange for an appropriate amount of the underlying collateral. Such an event is incentivized by offering the underlying collateral at a discount relative to the value of TCAP paid to the Vault $Debt$.

The amount of TCAP required to resolve an under-collateralized Vault can be determined as follows where $cTCAP$ represents the collateral value in TCAP tokens:

$$Liq_{TCAP} = \frac{Vault_{Debt} \times Ratio - 100 \times cTCAP}{Ratio - (Liq_{Penalty} + 100)} \tag{6}$$

$$cTCAP = \frac{Vault_{Collateral} \times Collateral_{Price}}{TCAP_{Price}} \tag{7}$$

The liquidation reward can be computed with the following formula:

$$Liq_{Reward} = \frac{TCAP_{Value} \times (Liq_{Penality} + 100)}{100 \times Collateral_{Price}} \tag{8}$$

$$TCAP_{Value} = Liq_{TCAP} \times TCAP_{Price} \tag{9}$$

III. COMPETITION AND MARKET

Currently, several firms are rolling out traditional finance structured vehicles, such as OTC ETP's. These products purchase a small underlying per share equivalent of Bitcoin or other Cryptocurrency. Then, the ETP share typically trades at a substantial premium to the underlying cryptocurrency asset, given the limited listed publicly traded solutions.

The Grayscale Bitcoin trust, GBTC, currently with $38.8 billion assets under management, can trade at a premium to the underlying bitcoin a customer can simply purchase with a Coinbase account. Their recently launched Ethereum Trust, ETHE, traded as high as 2,000% premium to the underlying spot ETH equivalent. These types of products often charge annual fees of 2-2.5% and, in our opinion, provide nothing but the application of a structure available for decades to a new and exciting asset class.

In terms of bundled Crypto products, the choices are only to purchase a bundle of coins, weighted by market cap, that trade solely on that specific exchange, for a fee. Again, another option lacking innovation as nothing stops the buying those coins or assets outright themselves.

Companies like Bitwise offer similar options. In the case of Bitwise, for a bundle of the top 10 coins, annual expenses average 2.5% in management fees, 3% early withdrawal fees, and offers WEEKLY redemptions after the first 12 months.

The Decentralized Finance (DeFi) movement in Ethereum allows for new kinds of tokens to be born. The Base Protocol is creating BASE, a syntethic elastic crypto-asset whose price is pegged to the total market cap of all cryptocurrencies at a ratio of 1:1 trillion. The problem with elastic rebase is that it takes time for the price to be pegged with the target price and rebases are generally completed on a infrequent basis. Given that large price swings in a short time frame are not uncommon in the cryptocurrency sector, a daily rebase or even hourly rebase is insufficient for such a token to maintain its peg.

sDEFI from Synthetix is a synthetic token that tracks a basket value of 9 DeFi tokens. Conversely, Synethix offers iDEFI which tracks the inverse value of their DeFi index sDEFI. The PieDAO is an asset allocation

decentralized autonomous organization that has DEFI++, DEFI+S, and DEFI+L, which are baskets of tokens. Additionally, DeFi Pulse has a similar offer with their DeFi Pulse Index (DPI), an index basket of tokens. The problem with these baskets is that they only reflect the movement of a small piece of the market.

TCAP is not a fixed basket of tokens, not an ICO, nor a rebased elastic token. It's a new, crypto-collateral backed, and decentralized asset that's both audited and an accurate representation of the entire cryptocurrency complex by total market capitalization. TCAP achieves this goal by aggregating data from major reputable exchanges and data providers tracking thousands of cryptocurrency pairs in one simple solution. TCAP provides an alternative to having true exposure to the entire crypto space via one asset.

Total Market Capitalization (TCAP) tokens offer instantaneous settlement and carry no annual fees, other than a simple burning fee when TCAP is destroyed in the Vault Debt repayment process. There is also NO outlier detection included in the Cryptex Total Market Capitalization. Cryptocurrency markets are young, notoriously volatile, are subject to various flash crashes, low volume events, price swings, etc. Our goal is to capture the movement of the space, in its entirety, as close as possible.

IV. Burn Fee

In order for TCAP to be a self-sustaining protocol, it implements a parameterizable Burn Fee which is paid in ETH every time TCAPs are burned in the Vault Debt repayment process. The total fee is a percentage of the value of TCAP being burned and needs to be paid to the Vault contract when repaying any $Vault_{Debt}$. The Burn Fee payment can be determined as follows:

$$Fee_{ETH} = \frac{Vault_{Debt} \times TCAP_{Price} \times BurnFee}{100 \times ETH_{price}}$$

(10)

The BurnFee is a percentage value represented in the TCAP system smart contracts. This protocol fee may be adjusted at a later time. The burn fee payments are used by the Cryptex Development Team to further develop the TCAP protocol and other relevant products or tooling, Oracle compensation, and an insurance fund for TCAP.

V. Data Sources

While Cryptocurrency exchange Data API's are public, to create a central source of Total Market Capitalization Data, this data must be aggregated in a single source. Data external from the Ethereum blockchain must be written to the Ethereum blockchain by some Oracle. In the TCAP system, Chainlink's oracle suite will be leveraged to provide a trust minimized solution. The Chainlink Oracles reference multiple sources of "Total Market Capitalization" from multiple feeds, including those outlined in table I. More data sources may be added over time to increase the confidence in the aggregated data feed.
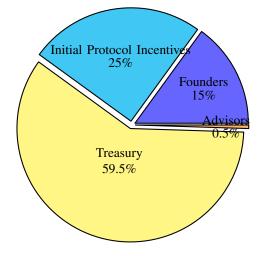
VI. Governance

The TCAP Protocol is managed as a Decentralized Autonomous Organization (DAO) governed by a ERC-20 standard interface token, CTX. CTX holders are able to make governance proposals, vote on such proposals, and delegate their votes to other CTX holders. This type of Governance allows for various parameters of the TCAP system to be modified to suit the community and projects best interest. Some aspects of the TCAP system can be upgraded or replaced entirely.

A. CTX Distribution

CTX has an initial supply of 10 million tokens, which are distributed to the Cryptex Team, Advisors, Protocol

Treasury, and Community members. Any CTX allocated to the Cryptex Team, Advisors, and Treasury are distributed via multi-year vesting contract. CTX tokens are rewarded with a value of ZERO.

As time goes on, it may be in the best interest of the project and/or community to allocate and mint new CTX tokens. The creation of new CTX tokens via governance vote will be subject to a 2% per year maximum adjustment. That is, the max supply of CTX tokens cannot increase more than 2% in a given 1 year time span. Minting new CTX tokens may be used for compensation of black swan events that leaves TCAP vaults undercollateralized, continued incentives for product development, and other solutions that further advance the protocol.

B. CTX Rewards Issuance & Vesting

CTX issuance occurs on a per block basis with rate that diminishes at the start of each month. CTX is rewarded in this manner until the hard cap is reached. The rates are as follows:

In order to minimize the volatility of CTX due to new issuance from community rewards, newly issued CTX tokens shall be subjected to a vesting period of 6 months where 30% of the reward is immediately available while the remaining 70% reward will not be accessible until 6 months vesting period has been reached.

C. Early Adopter Rewards

As an incentive for early Adopters, the TCAP protocol will reward CTX tokens to Vault owners in the first 14 days of deployment. Any Vault owner with outstanding TCAP debt will earn CTX tokens on a per-block basis. Early adopter rewards are the only type of rewards that don't need vesting as their main goal is to distribute CTX for protocol governance.

Early adopters rewards are issued over 14 days for a total of 500,000 CTX. Assuming approximately 6500 Ethereum blocks per day over 14 days (91,000 Ethereum blocks), the per block reward would be 5.4945 CTX split across the debtors at that point in time.

D. Liquidity Provider Rewards

As an incentive to provide liquidity for TCAP on certain Decentralized Exchanges, the CTX protocol will reward CTX tokens to any liquidity provider who stakes their liquidity pool position within the CTX protocol. These tokens will be rewarded on a per-block basis and be distributed to liquidity providers based on their percentage of pool ownership.

Initial liquidity provider rewards target a 6 month cycle where the per block rate is higher initially and decreases on a monthly basis. The total amount of CTX for the initial 6 month liquidity provider rewards is 20% of the protocol or 2,000,000 CTX. Assuming approximately 6500 Ethereum blocks per day over 6 months (1,170,000 blocks), this would result in 1.7094 CTX issued per block.

VII. EMERGENCY OPERATIONS

TCAP contracts use a multisign admin key as a Guardian that can immediately pause some actions in the smart contracts to protect users in case of bugs, hacks,

or other unforeseen risks. A Guardian can be used only once and does not prevent users from withdrawal of their staked collateral.

VIII. CONCLUSION

The Cryptex Finance team aims to provide an innovative opportunity to gain exposure to the entire cryptocurrency in a decentralized and trust minimized protocol. With the launch of the DAO's flagship product, Total Market Cap token (TCAP), users in the Decentralized Finance space will have true exposure to Cryptocurrencies in a way that has never been offered.

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