May, 2020

Decentral Park Capital

Exchange token valuation

Introducing the Price-to-Assets ratio

Powered by glassnode

“Everything that can be counted does not necessarily count; everything that counts cannot necessarily be counted.”

- Albert Einstein

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Key Takeaways

- In this paper we propose a novel relative valuation approach for tokens issued by cryptoasset exchanges, based on their Price-to-Assets ratio (PA hereon).

- The PA ratio seeks to compare an exchange token's market price, to its total Assets Under Custody (AUC hereon). Given that the vast majority of these assets live on-chain, they are relatively easy to track. The paper discusses the methodology that goes into calculating AUC, in detail.

- A PA ratio average of ~1, implies that over the long term, the token is trading at the value of AUC.

- The exchange tokens examined in this paper are those issued by Binance (BNB), Huobi (HT), Bitfinex (LEO) and OKex (OKB). All the on-chain data relating to the AUC calculation was provided by Glassnode.

- The paper finds that among the assets explored, the PA ratio has historically been a good litmus test in uncovering whether a token is over- or under- valued, as outlined by forward returns for varying states over- or under- valuation.

- By the methodology, we conclude that Huobi Token (HT) is currently strongly undervalued (PA: 0.35), Binance Token (BNB) trades closer to fair value (PA: 0.82), while OKex's token (OKB) is strongly overvalued (PA: 2.15). No clear signal was derived for Bitfinex's LEO.

- Further, we make the case for the use of the PA ratio, in forecasting the future "fair value" of an exchange token, based on a future value of AUC.

- In the Discussion section, we make the case for how an exchange's AUC value is linked to token price and propose various possible future directions for enhancing the PA ratio's signal.

- We believe that the PA ratio approach is extensible to all assets and protocols that require AUC in order to create value, and subsequently distribute it to token holders (e.g. DeFi lending facilities).

About Decentral Park

Decentral Park is a family of funds that offers a diversified approach to digital asset and blockchain investing. We research, identify, evaluate and support teams, products and market opportunities within the blockchain world.

Decentral Park's founder-led team brings multi-dimensional experience, expertise, capital and network and industry relationships to blockchain technology projects. We believe blockchain technology and cryptoassets have the potential to make a hugely positive impact in many areas of the global economy.

Decentral Park Capital's Principals have a long track record of founding, funding, developing, managing, advising, scaling and exiting successful businesses in blockchain, consumer technology, consumer brands, real estate, brick and mortar businesses, venture capital, investment banking and private equity - with a specialty in emerging markets and emergent industries.

To qualify this report, the Decentral Park family of funds is long Huobi (HT), long Binance (BNB) and short OKex (OKB).

Acknowledgements

Rafael Schultze-Kraft - Co-founder at Glassnode
Joel John - Analyst at Outlier Ventures
Ryan Yi - Analyst at Coinfund
Tara Tan - Venture Lead at IDEOVC
Mika Hokansalo - Co-founder at Token Terminal
John Quinn – CIO at Decentral Park Capital
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For their invaluable feedback.

Exchange token valuation: Price to Assets ratio

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- Albert Einstein

Introduction

Exchanges are central nodes in the blockchain ecosystem. These are the venues where buyers of cryptoassets meet sellers, where liquidity lives, and ultimately where the price of a cryptoasset gets decided. In recent years we have observed their influence in the ecosystem grow, as a progressively larger percentage of the total cryptoasset float has migrated under their custody. At the time of writing ~11% of the total supply of Bitcoin [1] and ~18% of the total supply of Ethereum [2] sit in exchange wallets.

At the same time, most of the prominent exchanges have issued tokens that broadly represent a vehicle that allows their stakeholders to participate in the value that they create. The levers through which exchanges relay value back to token holders are primarily (i) discounts on trading fees and (ii) periodic burns - distant cousins of equity buybacks - that are tied to an exchange's revenues. Presently, these tokens represent a total of more than 2% of the total market capitalization of cryptoassets [3].

While value accrual to these tokens is still a largely open question, we believe it is fair to assume that while the relationship between value and instrument is not as direct as it is in the world of equities, but that the value of an exchange token should not be entirely divorced from the exchange's fundamentals. Which raises the question: what exactly are an exchange's fundamentals?

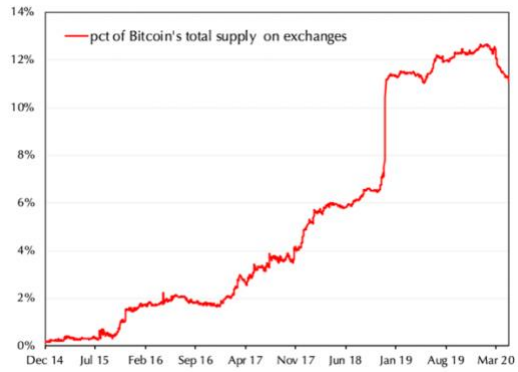


Figure 1: Total share of BTC supply on exchanges

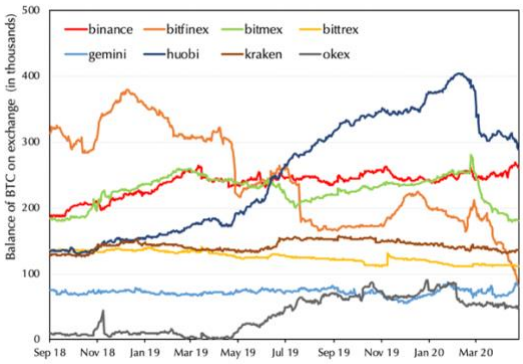


Figure 2: BTC exchange balances over time

From a "bare bones" perspective, an exchange is a marketplace that creates value by pooling liquidity - therefore collapsing the search and counterparty costs involved in a pure P2P exchange and extracts a fraction of the value it creates by charging fees on transactions.

The types of transactions facilitated by an exchange are - by and large - discerned between the (i) exchange of assets on spot markets, (ii) transactions involving derivative products and (iii) lending markets.

In that context then, there are two distinct ways to approach valuing the exchange itself and its attached token thereafter, that represent the two sides of the same coin; (i) market surface (off-chain) transaction volumes and (ii) assets under custody.

While transaction volumes are what is more directly linked to the value of the token, there are several problems with the metric itself - of which the primary is the fact that several exchanges have been found to misreport the volumes that are recorded on their market surface (see research from : Whalepool, Bitwise, TIE).

Assets under custody (AUC thereafter) on the other hand, is an interesting, and often overlooked metric that should exhibit a strong relationship to the value of the exchange. Here are some reasons why:

- Volume is a function of AUC; the majority of the assets that live on an exchange's blockchain wallets are liabilities to its stakeholders; traders deposit assets in the exchange. These assets get turned over multiple times in interactions with the exchange's order book. The total turnover amount gets recorded as volume.

- AUC represents a terminal value of an exchange's value generating liabilities at any given moment in time - e.g. in the extreme event that an exchange abruptly winds down and disappears with their customers' deposits.

- AUC are on-chain datasets that can be independently verified and are therefore harder to overstate or manipulate.

- While volume only captures the transaction value executed, AUC (as an abstraction) might capture all the value creative activities that take place in an exchange, including those in the funding markets.

In the following sections we introduce a novel approach to the relative valuation of exchange tokens, based on the total assets that an exchange has under custody, akin to how a price-to-book ratio is deployed on the relative valuation of legacy financial institutions.

Methodology

Estimating AUC

In order to estimate the USD amount of assets under custody for each exchange, we are using a feed provided by Glassnode - one of the leading on-chain data and analytics providers in the industry.

Glassnode employs a combination of methodologies for obtaining address labels associated with exchanges. These methodologies comprise a wide range of approaches, from collecting verified labels from publicly available sources, the application of industry-standard heuristics (e.g. multi-input heuristic), as well as advanced clustering and pattern recognition techniques (e.g. peeling chain detection). As exchanges often reshuffle their funds into new addresses, Glassnode's labels are constantly being updated and undergo frequent QA.

For the purposes of the exercise we are considering the feeds that apply to the Huobi, Binance, Bitfinex and OKex.

In order to cross-reference for the validity of the reported balances, we overlay the balances reported by Glassnode to those reported by the Token Analyst.

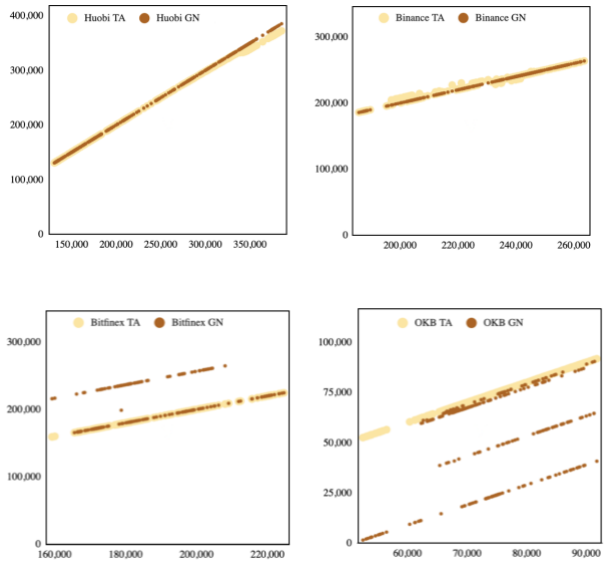
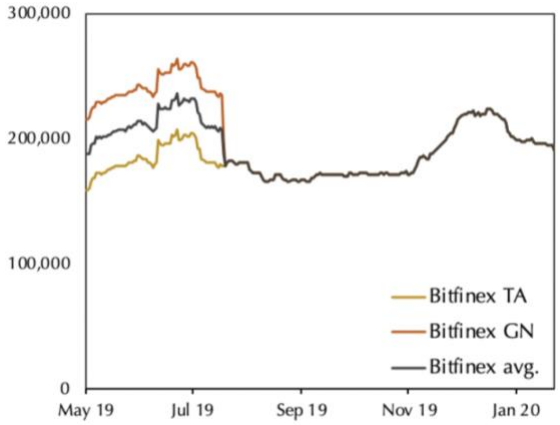


Figure 2: Exchange balances reported by Glassnode vs Token Analyst

What we have found, is that while the Binance and Huobi datasets are almost in perfect agreement, the Bitfinex and OKex feeds exhibit discrepancies earlier in the sample - though agree in the relative changes in the time-series. In order to reconcile for these discrepancies, we are opting for an average between the two feeds where there are disagreements.



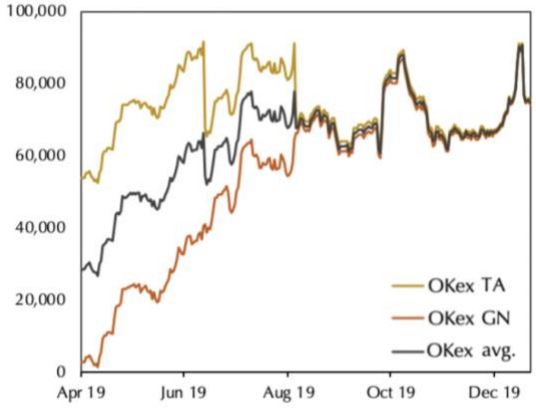


Figure 3: Bitfinex and OKex BTC reported balances from Glassnode (GN) and Token Analyst (TA)

In addition to the historical balance of BTC on exchange, Glassnode also tracks the equivalent balances for ETH and USDT - which ultimately provides us with additional information about the state of AUC for each exchange. For simplicity, we propose 2 approaches in reaching an estimate for the state of Total AUC, based on (v1) the balance of Bitcoin alone and (v2) the joint balance of BTC, ETH and USDT - all translated in USD terms, given the closing market price (23:59 GMT) of each asset. The formulas for calculating the total AUC estimates are presented below.

v1.

$$AUC = \frac{BTCbalance}{BTCmarketshare}$$

where:

$$BTCmarketshare = \frac{BTCmarketcap}{Totalcryptoassetcap}$$

v2.

$$AUC = \frac{balance(BTC + ETH + USDT)}{marketshare(BTC + ETH + USDT)}$$

To illustrate the above methodology more clearly, consider the following example: if $200M BTC's worth on exchange, and BTC dominance at 32%, the total value of assets on exchange should be close to $625M (200M/0.32). We perform a similar calculation for the extension that considers the balance of ETH and USDT.

Further, for the base approach (v1), we assume that some exchanges will be overweight or underweight BTC. Over/underweight BTC is a heuristic that moderates the % of the total AUC of an exchange we expect BTC represents. When 1, this is market rate (BTC dominance). Values larger or smaller than 1, reflect the assumption that BTC represents a larger or smaller part of AUC than the market rate.

In the iteration we present here, Huobi is marked at 1.2 overweight and Bitfinex is marked at 1.3 overweight. The reasoning is that Huobi runs their own BTC mining pool, which ranks in the top-5 by hashrate distribution and is favorably positioned among the greater Chinese mining community - as the only regulated exchange in mainland China [4], while Bitfinex has approximately 1/3 of the number of the listed assets that other exchanges do [5]. For the joint approach (v2), we do not include an overweight factor. We should note that for v2 we only have data available post Q2 2019 - which will reflect on the analysis below.

Finally, in the following table we present some of the key variables that describe each exchange's current state. The purpose of the table is to provide some context with respect to the degree to which the exchange tokens in question are comparable.

Parameters	Binance	Huobi	OKex	Bitfinex
Token	BNB	HT	OKB	LEO
Issued total supply	200M	500M	300M	1B
Current total supply (after burns)	185.5M	297M	282.8M	982M
AUC (1 year average between v1 and v2) [1]	$ 3.6B	$ 4.2B	$ 800M	$ 2.4B
Total volume (May 19 to May 20) [2]	$1.05T	$ 1.67T	$ 1.2T	$ 66B
AUC turnover multiple (1 year)	291x	397x	1500x	27.5x
Trading fees	Maker: 0.1% Taker: 0.1%	Maker: 0.2% Taker: 0.2%	Maker: 0.1% Taker: 0.15%	Maker: 0.1% Taker: 0.2%
Buyback and burn from	Treasury	Market	Market	Market
Burn proportionate to	20% of net profit	20% of revenue	30% of spot tx fees	27% of revenue

Table 1: Key business model variables for the 4 exchange tokens in question

We also introduce an additional metric, in AUC turnover multiple (AUCTM), as a crude way to capture how many times an exchange has managed to turn its AUC over in an annual volume print. As such this is simply calculated as:

$$AUCTM = \frac{Volume}{AUC}$$

AUCTM is not factored in the analysis presented in the sections to follow but should provide a good basis for a "sanity check".

Introducing APT: Assets under custody value per token

Here we introduce APT, or *assets under custody value per token*. This is a metric of relative value for an exchange token, described by the following equation:

$$APT = \frac{AUC(inUSD)}{TokenSupply}$$

In the APT calculation, AUC is calculated as described above, while Token Supply represents the total token supply net of token burns - information that is publicly available through each exchange. For clarity, though a token burn, an exchange either removes a certain number of tokens in circulation from the markets and destroys them - by sending them to an address from which they are irrecoverable, or "burns" the token directly from reserves that are not yet

in circulation. That amount is normally a function of the exchange's revenues.

Here is how the total token supplies of the four tokens in question have adjusted over time:

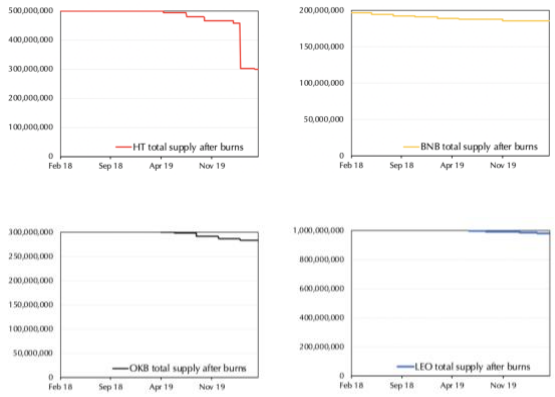


Figure 4: Total supply of the 4 exchange tokens examined, over time

While we fully acknowledge that the relationship between AUC and token value is fundamentally weak in isolation, we maintain that in a valuation exercise it is still a very useful gauge of relative value of an exchange token, in comparison to its counterparts.

Price to APT (PA) ratio and the Under/Over valuation index (U/O)

In order to delineate the comparison across the asset universe, we introduce the Price to APT ratio (Price to Assets or PA ratio) and the Under/Over valuation index (U/O). Simply, the PA ratio looks at the market price of an exchange token, in relation to APT, such that:

$$PA = \frac{MarketPrice}{APT}$$

It follows that a PA ratio of 1 would imply that the exchange token is trading at the relative value of AUC. A PA ratio greater than 1, would imply that the token is relatively overvalued and conversely, a PA ratio less than 1 would imply that the token is relatively undervalued. In order to make the results more easily digestible, we propose a further modification; the Under/Over (U/O) valuation index, such that:

$$U/O = PA - 1$$

As such, values below 0 imply that the token might be relatively undervalued, while the opposite might be true for values above 0.

Having put the foundations in place, we now move on to putting the exchange tokens of Huobi (HT), Binance (BNB), Bitfinex (LEO) and OKex (OKB) to the test.

Results

The first asset we examine is Binance's token (BNB). Interestingly, it appears that the APT approach to valuing BNB, has been relatively coincident with both the price trend[1], but perhaps even more interestingly, the actual price levels.

The correlation of APT v1 with Binance's price stands at 65%, while the mean of the distribution of U/O v1 (larger sample) is at 0.01 - which implies that when zooming out enough, BNB has been trading at the value of Binance's AUC for most of its life in liquid markets.

The results are similar when looking at v2, although they exhibit a deviation to the upside post-March 2020 – attributable to the ~$800M increase in the balance of USDT in Binance associated addresses [6].

1 Presumably, this is the case as both values are moderated by the market value of BTC/USD.

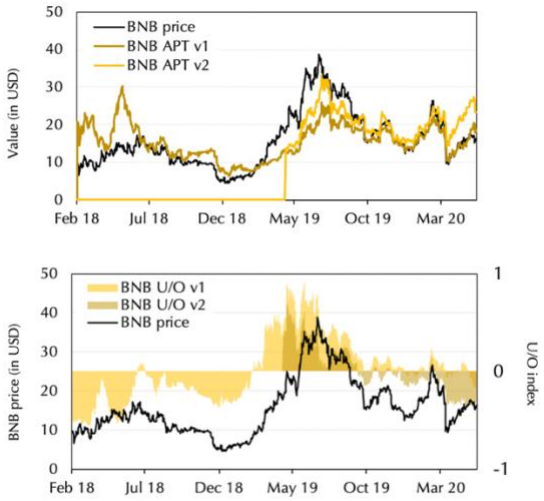


Figure 5: BNB's price, APT v1 & v2 and U/O index over time

Applying the same methodology to HT (Huobi Token), yields equally interesting results. The correlation of APT v1 with HT's price stands at 75%, however, the mean of the distribution of U/O v1 (larger sample) stands at 0.39. If we take the assumptions made above as true, then this could signal either (i) that the market is discounting HT, or (ii) a possible mispricing. The results for v2 of the PA ratio are similar.

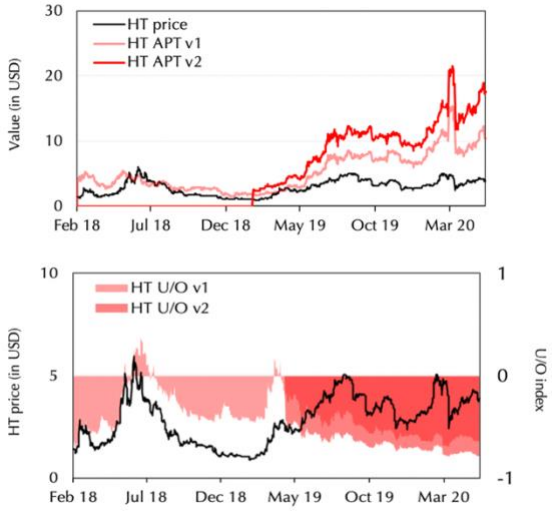


Figure 6: HT's price, APT v1 & v2 and U/O index over time

Equivalently for OKex's token (OKB - for which we have a smaller sample), the correlation of price and APT v1 stands at 29%, while U/O v1's mean is 0.23. However, when excluding dates from March 10th 2020 onwards, the same figures become 75% and -0.01 - not much unlike the behavior that BNB has exhibited over its trading history. There are three possible explanations for the state of things post-March 2020; (i) the market is assigning a premium to OKB - potentially related to its growth prospects, (ii) this reflects the higher AUCTM OKex has exhibited over the past year (1500x), or that (iii) this is a mispricing - an indication that OKB might be overvalued. The results for v2, are similar.

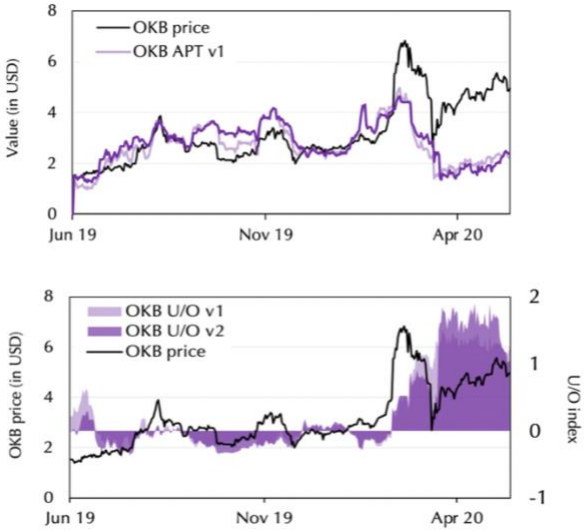


Figure 7: OKB's price, APT v1 & v2 and U/O index over time

The final token we look into is Bitfinex's LEO. LEO's APT (v1) exhibits a 75% correlation with the token's market price, the U/O (v1) average stands at -0.17, while the U/O (v2) average stands at - 0.45. By the above, while there seems to be a strong trend relationship between APT and price, the levels don't agree - for most of the token's trading history. As previously, the reasons we might ascribe to this could range

between (i) the market discounting the asset for a reason - possibly related to the lawsuit on charges of market manipulation Bitfinex is involved in [7], (ii) the market pricing in Bitfinex's lower AUCTM (26.5x), and (iii) LEO being undervalued for most of its trading history.

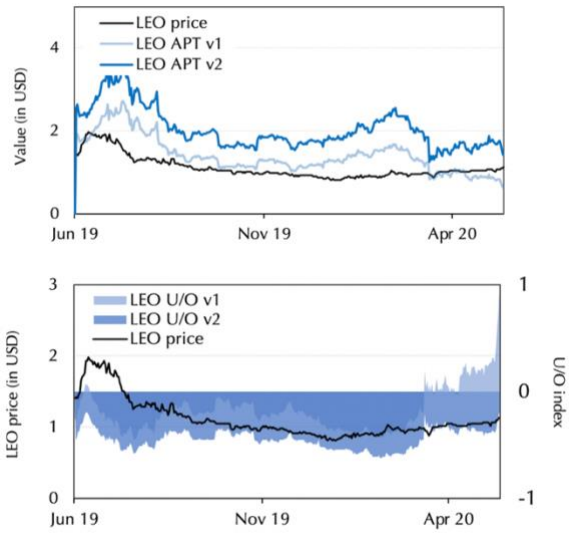


Figure 8: OKB's price, APT v1 & v2 and U/O index over time

Market performance and relative PA valuation

Given the above output, it seems that there is some level of signal in the methodology and data, that could prove to be a powerful complement in investment decisions regarding the exchange vertical.

To illustrate the point, we examine the forward return profiles of BNB and HT - the two tokens for which we have the most data (over 2 years' worth) for different levels of PA ratio (measured as U/O for clarity). The two tokens also happen to be the most comparable from the group, as they exhibit the closest AUC turnover multiples (AUCTM) from the group. The expectation here would be that the higher the PA ratio (i.e. the more overvalued a token is), the lower the forward returns of the asset and vice versa.

BNB U/O v1	14 day fwd returns	30 day fwd returns	90 day fwd returns	180 days fwd returns
u/o < -20%	3.86%	7.35%	54.41%	149.01%
-19% < u/o < -5%	4.10%	7.26%	6.83%	50.99%
-5% < u/o < 5%	6.85%	18.25%	12.05%	19.94%
6% < u/o < 20%	-6.78%	-12.29%	12.08%	3.02%
u/o > 20%	4.23%	7.13%	10.29%	-21.27%
u/o > 70%	1.15%	18.13%	-4.94%	-37.16%

Table 2: BNB's historical forward returns for different clusters of the U/O index

HT U/O v1	14 day fwd returns	30 day fwd returns	90 day fwd returns	180 days fwd returns
u/o < -20%	5.11%	12.37%	39.03%	62.52%
-19% < u/o < -5%	0.59%	-2.43%	-1.36%	-10.73%
-5% < u/o < 5%	0.12%	-20.88%	-21.38%	-38.51%
6% < u/o < 20%	-4.32%	-16.01%	-18.21%	-28.28%
u/o > 20%	-15.09%	-23.87%	-61.58%	-74.56%
u/o > 70%	-11.79%	-21.96%	-47.09%	-59.08%

Table 3: HT's historical forward returns for different clusters of the U/O index

Indeed, it appears that forward returns improve for lower PA's and worsen for higher PA's. Further, for the two tokens examined here, the relationship between PA and forward returns seems to strengthen, the longer timeframes of forward returns become. In practical terms this might imply that the market eventually corrects the possible mispricing that extreme values of PA's mark, but it takes 3 to 6 months to do so.

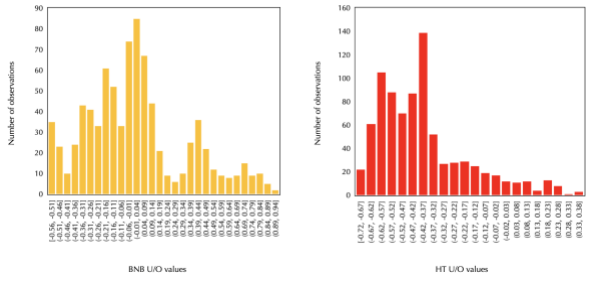


Figure 9: U/O value histograms for BNB and HT

In the chart below, we look at the performance of the two assets examined above over the past year, benchmarking off of the 15th of May 2020. At that time, BNB exhibited a U/O of 0.75 (relatively overvalued), while HT exhibited a U/O

of -0.65 (relatively undervalued). As shown by the plot below, HT has outperformed BNB for most of their trading history over the past year - yielding a positive 40% return, while BNB has yielded a negative 39% return.

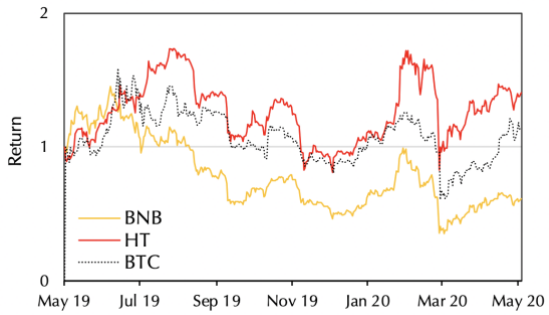


Figure 10: Comparative returns of HT, BNB and BTC, since May 15, 2020

Exploring the predictive capacity of PA

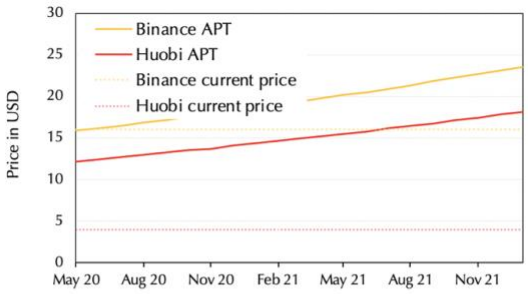
By the above empirical analysis, we can get some comfort around the strength of the relationship between APT and the market price of the token in question, as reflected in the PA ratio. Further, for those tokens that have exhibited a mean PA ratio of ~1 (U/O of ~0) for a large segment within the time-series, we can more confidently assume that the price (P) will converge to APT over time. The relationship could be true for all tokens in the vertical, though more research (and more data) is necessary here.

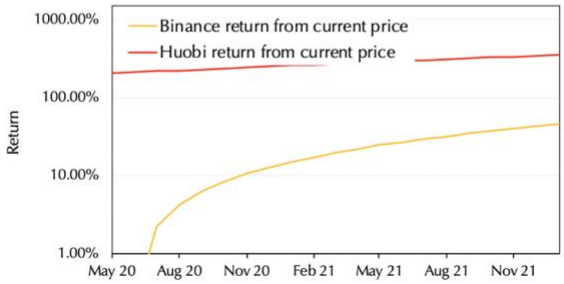
While holding that assumption true enables us to draw forecasts for the future "fair value" of an exchange token, based on expected levels of AUC. Consider the following example - extending the comparison between BNB and HT. For simplicity, and in order to leverage the largest dataset available, we presume with the analysis based on PA v1. The main assumption in this exercise is that (1) AUC will keep growing at the same average month-on-month rate it has for both exchanges considered (Binance: 1.7%, Huobi: 4.4%), since September 2018.

Parameters	Binance	Huobi
BTC UC MoM growth	1.70%	4.40%
BTC UC as of 30/04/2020	250,258	308,908
BTC dom as of 30/04/2020	64%	64%
AUCTM	291x	397x

Table 2: Binance & HT AUC key parameters

Further, in order to accommodate the APT model, we assume that (2) BTC dominance will remain stable at 65%, that (3) the price of Bitcoin will remain stable at the 2 year moving average price (~7.5k USD) and that (4) there are no more burns to be executed over the period of the projection - for simplicity. The results are presented below.





Figures 11 & 12: Projected returns benchmarked off of their respective market values as of May 15, 2020

Given the above, the end of 2021 fair value (APT) for BNB stands at $22.17 (~0.3x return), while for HT's fair value is $29.58 (~6x return). Adjusting for growth rates to be equal - at 2%, while keeping all other assumptions constant, yields a

$23.58 fair value for BNB (~0.45x return) and a $18.15 fair value for HT (~4x return).

Discussion

While we have a historical precedent from legacy financial institution valuation approaches on the Price to Book ratio, there deviations in this case are significant. For example, the AUC of an exchange represents mostly liabilities to its users - on top of its own reserves held on-chain. In effect, the APT model assumes that the value of the token economy is equal to those liabilities - which with a degree of abstraction allowed, makes some sense. The exact link, however, remains elusive.

Without those liabilities, the exchange itself is an empty shell; in other words, without AUC there is nothing to exchange and therefore no value to be created and captured. As AUC increases, so does order book depth and liquidity - and value created follows suit (e.g. users enjoy less slippage for larger orders). So, the value creation part is - at least to us - fairly self-evident.

The looming question is why the value of AUC should translate into token value. Unfortunately, the answer here is not as obvious as one might hope for. Although through the above analysis we uncovered some very interesting empirical relationships that show that APT might actually be a good gauge of fair value for an exchange token, theoretically there is no clear reason why there should be a direct relationship between the two.

Let's for a moment imagine these tokens as cloakroom tickets at a random establishment. Patrons leave their items at the till and receive a ticket in exchange, which is redeemable for the item they have deposited. Were there a secondary market for those tickets, in theory, the value of each ticket should be equal to the value of the corresponding item that the ticket can be redeemed for. However, if we were to put all these tickets in a bag and perform random draws, the expected value of an arbitrary ticket should be equal to the total value of all the items in the cloakroom, divided by the sum of cloakroom tickets. What a third party should be willing to pay for that arbitrary ticket - in theory - is at maximum that expected value, assuming information about the total value of the cloakroom deposits is known (and that the value of the items in the cloakroom is normally distributed).

When trying to translate the logic to exchange tokens, however, things break down as these tokens do not represent claims to the AUC. Remember, these are instruments that primarily provide users with discounts and exposure to revenues via token burns. Going back to the cloakroom example, this is like checking your items for free, agreeing to the fact that the establishment can use your items to generate yield, and then having the opportunity to buy a ticket that gives you access to some fraction of the yield that is generated on top of the items in the cloakroom.

If you expect that over your holding period, the amount generated on the total items in the cloakroom is *R*, where $R = AUC * r$ - with *r* being some rate of return, then the maximum price (P) you would be willing to pay for a single ticket is just under $R*y/n$ - where y is the fraction of R that gets remitted back to ticket holders, and n is the number of tickets that the establishment has floated, and. So for the total market capitalization of tickets (P*n) to equal the value of the items in the cloakroom (AUC), $r*y$ must be equal to 1 and therefore r must be equal to 1/y - which implies that over your holding period, the establishment will generate and remit returns equal to AUC.

From the crude example above, it stems that in order to arrive at a more credible fair value for an exchange token, a moderator "*r*" that represents the ability of the exchange to turn

AUC over (AUCTM) and the amount that it is able to capture off of that, needs to be introduced in the model. Given this, for empirical results where the long-term PA average has been close to 1, we can assume that the value of *r*y* is indeed close to 1 - and conversely for those exchange tokens that exhibit long term PA averages above or below 1. This, together with an introduction of a measure of risk, represent only two of many possible avenues for extensions of the model.

Limitations

While we are undoubtedly encouraged by both the fundamental base of the PA ratio approach, as well as the empirical results, to the keen eye, it becomes obvious that the model comes with certain limitations. We discuss those briefly below:

- Oracle risk; the AUC calculation is benchmarked off of Glassnode's reporting on on-chain asset balances. If that calculation is somehow corrupted, the valuation is off. However, historically, it has been more likely that a chain surveyor will "discover" new addresses rather than over-count. As such, the historical balance will be adjusted upwards - implying that the valuation was lower than the actual "fair value". Given that, we become more confident in defining undervaluation than overvaluation.

- Methodology risk; extrapolating value of AUC from BTC (or BTC, ETH and USDT) balances via BTC market share is an imperfect way to fill an information gap. The ideal approach would consider the totality of on-chain assets under custody.

- Relative valuation vs absolute valuation: The price-to-assets (PA) ratio that we are proposing in this paper, appears to be a good measure of relative valuation (when compared across exchange tokens), but a less good measure of absolute valuation. In order to make APT a better proxy to fair value, both a measure "r" that represents the ability of the exchanges to turn assets over and a measure of default risk should be incorporated in the model.

Conclusion

As the universe of cryptoassets continues to expand, generally accepted approaches to their valuation remain elusive. Yet, if this asset class is to be adopted more broadly by the global investor base, credible and generally accepted approaches to valuation are sorely needed. By going through the exercise of approaching the relative valuation of an exchange token via the PA ratio, we hope to introduce one such approach to the literature.

We think that the PA ratio in its current form can - at the very least - be a useful addition to the analysts' and builders' toolkits, in the pursuit of both uncovering investment opportunities, as well as optimizing an exchange business that runs a token programme as part of its business model.

More importantly though, we hope that this piece of work sets the stage for a wide range of valuation methodologies on protocols that are using asset custody as the main driver of creating value and distributing it to token holders. One fertile area of further research in this context is - of course - DeFi. With open back-ends, data acquisition is a much more straightforward exercise when applied to open protocols, while as a protocol replaces a company, more of the value generated is remitted back to token holders - therefore the relationship between AUC and token value becomes clearer.

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