DeFi vs TradFi: Valuation Using Multiples and Discounted Cash Flows

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Abstract

As of August 2022, blockchain-based assets boast a combined market capitalisation exceeding one trillion USD, among which the most prominent are the decentralised autonomous organisation (DAO) tokens associated with decentralised finance (DeFi) protocols. In this work, we seek to value DeFi tokens using the canonical multiples and Discount Cash Flow (DCF) approaches. We examine a subset of DeFi services including decentralised exchanges (DEXs), protocol for loanable funds (PLFs), and yield aggregators. We apply the same analysis to some publicly traded firms and compare them with DeFi tokens of the analogous category. Interestingly, despite the crypto bear market lasting for more than one year as of August 2022, both approaches evidence overvaluation in DeFi.

1 Introduction

DeFi provides financial services such as loans or asset exchange leveraging Distributed Ledger Technologiest (DLTs). Towards the end of summer 2020, the total market cap of DAO tokens in DeFi grew up to 154 billion USD from 1.8 billion USD as of March 2020[32]. The Total Value Locked (TVL), i.e. the net worth of all assets locked in smart contracts, reached its peak for many DeFi protocols in that period (Figure 1).

Since that “DeFi Summer”, DAO tokens connected to decentralised financial services have enjoyed a large growth of interest both within the crypto community and beyond, despite the continuous debate surrounding whether DeFi is just a fad, or is to stay and co-exist with Traditional Finance (TradFi)[16]. This interest was mainly driven from DeFi’s permissionless, and composable nature[10].

The growth of interest has brought more users in the protocols with (i) higher on-chain transaction volume, and (ii) higher off-chain trading volume. Similarly, entrepreneurs and hedge funds have decided to invest into digital assets, such as
Grayscale and Blackrock to cite a few. However, as a myriad of DeFi projects provide similar financial services, it is hard to reason why an investor should prefer one over the other. In classical finance, investors use valuation theory\cite{3} for their decision-making process in asset selection.

On the one hand, the necessity for fundamental analysis is the fact that market prices often do not reflect the true underlying value of an asset. Fundamental analyses looks into firms’ financial statements, and estimate a fair share price based on the firm’s performance. On the other hand, comparable analysis assumes that, on average, the market prices reflect investors’ beliefs\cite{3}. Comparable analysis will still look at financial fundamentals, but instead of estimating a theoretical value, it will use firms’ fundamental value ratios, i.e. “multiples” to compare them and thus, spot comparatively undervalued/overvalued assets. Naturally, comparable analysis is only applicable to firms within a similar segment.

In this study, we apply both intrinsic and relative valuation methods to selected DAO tokens in DeFi as well as stocks in TradFi. Our contributions can be summarised as follows:

1. First, we apply empirically fundamental analysis and comparable analysis to DeFi DAO tokens. Surprisingly, although DeFi tokens are in a bear market for more than one year thus far, they remain overvalued compared to their theoretical fair value.

2. Second, we compare multiples between DeFi and TradFi. This comparison shows that DeFi tokens multiples exceed their TradFi counterparties by several times.

3. Finally, all analyses use public available data\cite{1} and the steps to reproduce the results are well-described\cite{2}. Thus, to the best of our knowledge, we are the first to provide a clear framework and steps to value DAO tokens and compare them with stocks of traditional publicly traded firms.

This paper is organised as follows. In section 2, we provide a theoretical background. section 3 provides a description of our dataset and technical details about the approaches used. Next, section 4 shows our findings. Finally, section 5 concludes.

\footnote{TokenTerminal provides a free premium account for three days upon registration.}
\footnote{The code is publicly available at \url{https://github.com/TengXu94/DeFi-value-investing}}
Table 1: DeFi DAO protocols and publicly traded companies universe examined.

| DeFi          | DEXs                        | PLFs                          | Yield aggregators          |
|---------------|-----------------------------|-------------------------------|----------------------------|
| Uniswap (UNI) | Aave (AAVE)                 | Yearn Finance (YFI)           |
| Curve (CRV)   | Compound (COMP)             | Idle Finance (IDLE)           |
| TradFi        | Exchanges                   | Banks                         | Asset managers             |
| Chicago Board Options Exchange (CBOE) | Citigroup (C)               | Berkshire Hathaway (BRK.B)    |
| Nasdaq (NDX)  | Bank of America (BAC)       | Morgan Stanley (MS)           |
| Intercontinental Exchange (ICE) | Wells Fargo & Co. (WFC)    | BlackRock (BLK)              |

2 Literature

To date, various valuation models have been developed from the literature:\textsuperscript{[3;4]}:

Intrinsic The theoretical value is a function of dividends, earnings, assets, liabilities etc.

The theoretical value can be estimated through different approaches: DCF, Gordon Growth Model (GGM)\textsuperscript{[8]}, or the Modigliani & Miller (MM) theorem\textsuperscript{[15]}.

Relative This technique looks into multiples\textsuperscript{[12;17]} such as the Price to Sales (P/S) ratio.

We focus on DeFi categories that have received major interest from the literature, i.e. DEXs\textsuperscript{[31]}, PLFs\textsuperscript{[9]}, and yield aggregators\textsuperscript{[2]}. As\textsuperscript{[3]} reports, the majority of valuation approaches rely on DCF and multiples.

3 Methodology

We apply both fundamental and comparable analyses to a set of DAO tokens in DeFi and stocks in TradFi. For DeFi, we focus on DEXs, PLFs, and yield aggregators, the three major DeFi classes. The three analogous TradFi sectors that we consider are exchanges, banks, and asset managers, respectively. The set of token assets and firms grouped by their respective industry/financial service is shown in Table 1.

3.1 Data

We use Token Terminal\textsuperscript{[3]} for aggregated and processed financial metrics of tokens. In particular, we collect tokens’ off-chain and on-chain \textit{daily} measures, e.g. circulating market cap, price, TVL, and protocol revenues. Protocol revenues, in this case, is defined as the amount of revenue that is distributed to token holders\textsuperscript{[21]}. We compare tokens’ fundamentals to publicly traded companies balance sheets in the same industry. For companies’ quarterly fundamental information, we use common financial data sources such as Center for Research in Security Prices (CRSP) and Compustat, well-known databases in empirical asset pricing works, such as\textsuperscript{[11;24]} to name a few. Similar to tokens’ metrics, we are interested in companies’ market cap, share price, total revenue, net assets, and pre-tax income\textsuperscript{[28]}. Note that for firm’s and bank’s total revenue, we use the Quarterly Total Revenue\textsuperscript{[29]} and Quarterly Total Current Operating Revenue\textsuperscript{[30]} respectively. Finally, we obtain the firm’s quarter net asset value

\textsuperscript{3}https://docs.tokenterminal.com/
Table 2: Variables used to compute firms’ DCF. We set MarketReturn to the average yearly market return: 10%. We use Damodaran’s industry β and TaxRate\(^7\). The cost of debt \(R_d\) was retrieved from the firms’ 10-K document. The cost of capital \(R_e\) is the product of \(β\) and MarketReturn. Finally, we compute WACC with\[^{[\text{Equation 2}]}\].

| Firm | β  | MarketReturn | \(R_d\) | \(R_e\) | TaxRate | WACC  |
|------|----|--------------|--------|--------|---------|-------|
| BAC  | 1.12 | 10% | 2.85%  | 11.30% | 14.69%  | 10.59%|
| BLK  | 1.05 | 10% | 2.10%  | 10.50% | 13.37%  | 10.46%|
| BRK.B| 1.05 | 10% | 3.30%  | 10.50% | 13.37%  | 10.47%|
| C    | 1.12 | 10% | 2.88%  | 11.20% | 14.69%  | 10.09%|
| CBOE | 1.05 | 10% | 2.63%  | 10.50% | 13.37%  | 10.47%|
| ICE  | 1.12 | 10% | 3.00%  | 10.50% | 13.37%  | 10.42%|
| MS   | 1.12 | 10% | 2.90%  | 10.50% | 13.37%  | 9.20% |
| NDAQ | 1.12 | 10% | 3.75%  | 10.50% | 13.37%  | 10.28%|
| WFC  | 1.05 | 10% | 2.37%  | 11.20% | 14.69%  | 10.97%|

by subtracting from the firm’s quarter total asset value\[^{[26]}\] the firm’s quarter total debt\[^{[27]}\].

3.2 Fundamental analysis

We apply the DCF approach for the fundamental analysis. The following\[^{[\text{Equation 1}]}\] shows how DCF values firms according to their future cash flows discounted by a discount factor:

\[
NPV = \sum_{t=0}^{n} \frac{CASH_t}{(1 + r)^t} + \frac{TerminalValue}{(1 + r)^{t+1}},
\]

where the discount factor \(r\) is usually identified as the Weighted Average Cost of Capital (WACC). For tokens, \(CASH\) is equivalent to the yearly protocol revenue, while for public traded firms, it corresponds to the pre-tax income. In this work, we will estimate a fair revenue growth of 5% for the next five years. The WACC is defined as:

\[
WACC = \left( \frac{E}{E + D} \times R_e \right) + \left( \frac{D}{E + D} \times R_d \times (1 - \text{TaxRate}) \right),
\]

where \(E\) is total equities, \(D\) liabilities, \(R_e\) the cost of capital, and \(R_d\) the cost of debt.

For publicly traded firms, we estimate the cost of capital by multiplying the industry average \(β\)—retrieved from\[^{[1]}\]—with the historical market returns set to 10%. The historical market return is coherent with the last twenty years S&P 500 average annual return (9.87%)\[^{[5]}\]. The cost of debt—the interest rate that companies have to pay on their debt—is retrieved directly from the firm’s 10-K filing from the Security and Exchange Commission (SEC) Edgar database\[^{[4]}\]. Specifically, we use the companies’ debt interest rate for senior structured notes stated in the “Financial Statements and Supplementary Data” section. Finally, the average corporate tax rate by industry is used\[^{[6]}\]. By plugging these numbers into\[^{[\text{Equation 2}]}\] we obtain the firm’s WACC. By contrary, we cannot use the same analysis to estimate WACC for DeFi tokens, as

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\(^{4}\)https://www.sec.gov/edgar/searchedgar/companysearch.html
they achieve greater economy of scale and do not face corporate taxes. However, DeFi tokens face higher risk, therefore, we discount their value by a higher factor—a value typically used in the literature: 25% \cite{13}. Next, TerminalValue is simply defined as:

$$\text{TerminalValue} = \sum_{i=1}^{\infty} \frac{CASH(1+g)^n}{(1+r)^n} = \frac{CASH(1+g)}{(r-g)}.$$ \(3\)

where \(g\) is the perpetual growth rate, i.e. the constant rate that a company is expected to grow at indefinitely. Commonly, \(g\) should be in line with the nominal Gross Domestic Product (GDP) growth rate \cite{20}. We thus take the average yearly GDP from 1990-2021 to proxy the perpetual growth rate: 2.39\% \cite{19}. To conclude our assumptions, we estimate a workforce expenses of 20\% and 30\% of the total income for DeFi DAO tokens and publicly traded firms respectively. In section 4, we show our estimations of growth for the next five years together with historical balance sheets. In these historical balance sheets, we report also the Compound Quarter Growth Rate (CQGR), defined as:

$$CQGR = \left( \frac{V_{\text{end}}}{V_{\text{start}}} \right)^{\frac{1}{q}} - 1,$$ \(4\)

where \(q\) denotes the number of quarters between \textit{start} and \textit{end}. As the data for DeFi is limited due to its short history, the analysis starts from the last quarter of 2020 for both DeFi and TradFi.

3.3 Comparable Analysis

We use multiples to compare valuation between DeFi and TradFi. Specifically, the DeFi protocol/company’s value is proxied by the token/stock’ market cap. A firm’s value is usually a function of the capacity of generating cash flow and risk, as reported in \cite{3}. Therefore, we identify:

for DeFi

- \textit{revenue protocol}, as the protocol’s total revenue. Since, TokenTerminal provides \textit{daily} observations, we simply sum up the daily revenue values within a quarter.
- \textit{treasury}, as the net asset owned by the underlying protocol, which in turn is collectively owned by protocol token holders.

for TradFi

- \textit{revtq}, as \cite{29} reports, this value is the firm’s quarterly total revenue.
- \textit{atq} and \textit{dlcq}, respectively, the firm’s quarterly total assets and total liabilities \cite{26, 27}. Therefore, the net assets owned by the firm is the difference of the two numbers.

Hence, we end up with two multiples:

1. The \textit{Market Cap / Revenue} multiple, this ratio shows us how the underlying value changes with respect to its own income.
Table 3: DAOs’ historical balance sheets.

|       | 2020  | 2021  | 2022  | CQGR |
|-------|-------|-------|-------|------|
|       | Q4    | Q1    | Q2    | Q3    | Q4    | Q1 | Q2 | %   |
| **Earnings ($M)** |       |       |       |       |       |    |    |     |
| **Uniswap** | NA    | 25.7  | 46.9  | 30.8  | 46.8  | 31.1| 23.2| -0.02% |
| **% growth** | NA    | 82.33%| -34.33%| 52.13%| -33.5%| -25.4%|
| **Curve** | NA    | NA    | 6.34  | 19.8  | 18.5  | 12.2| 0.24%|
| **% growth** | NA    | NA    | NA    | NA    | 21.04%| -6.78%| -34.31%|
| **Compound** | NA    | 10.6  | 10.9  | 9.0   | 10.0  | 4.8 | 1.8 | -0.30% |
| **% growth** | NA    | 2.50% | -16.91%| 11.14%| -51.89%| -62.69%|
| **AAVE** | NA    | 1.2   | 5.5   | 9.3   | 12.7  | 6.5 | 6.0  | 0.37% |
| **% growth** | NA    | 355.22%| 68.66%| 33.94%| -48.84%| -8.68%|
| **Yearn Finance** | NA    | 22.3  | 23.1  | 26.2  | 14.0  | 6.9 | 0.25%|
| **% growth** | NA    | 2.66% | 12.98%| -46.55%| -50.39%|
| **Idle Finance** | NA    | 0.3   | 0.2   | 0.2   | 0.1   | 0.05| 0.37%|
| **% growth** | NA    | NA    | -36.96%| -24.12%| -59.15%| -50.77%|

2. The Market Cap / Net Assets multiple, similarly, this ratio shows us the change of value with respect to the net assets owned by the underlying firm/protocol.

We show and discuss the results in the next Section.

4 Results

4.1 Fundamental Analysis: Historical Balance Sheets

In this section, we show the historical earnings for both DAO tokens and publicly traded firms. Due to DAO tokens’ fairly recent phenomena, the historical data tables shown in Table 3 and Table 4 start from Q4 2020. The tables show the underlying earnings from Q4 2020 to Q2 2022. In the last column, we compute and show the CQGR defined in Equation 4. The earnings, shown in USD millions, were steadily increasing for most DeFi tokens until 2021’s last quarter. However, with the recent bearish period within the crypto ecosystem, the slope has turned negative. Fears for inflation within risk markets, regulatory uncertainty, numerous attacks and hacks caused increasing diffidence and uncertainty in cryptoassets, see [15] and [10]. This has caused investors to re-evaluate expectations and reprice the risk of DAO tokens. We can see that moving from 2022’s first quarter to the second quarter, the growth is negative for all cryptoassets. By contrary, publicly traded companies have experienced mixed results. In fact, even though the COVID-19 crisis has increased volatility in the stock market, the 2022 decline seen for DeFi tokens is less steep for publicly traded firms. Unfortunately, the CQGR numbers do not tell us much as we are considering different periods for DeFi and TradFi assets.
Table 4: Firms’ historical earnings.

|          | 2020   | 2021   | 2022   | CQGR |
|----------|--------|--------|--------|------|
|          | Q4     | Q1     | Q2     | Q3   | Q4    | Q1     | Q2     | %     |
| ICE      | 583.0  | 674.0  | 833.0  | 1932.0 | 824.0  | 2109.0 | 832.0  | 6.11% |
| % growth | NA     | 15.61% | 23.59% | 131.93% | -57.35% | 155.95% | -60.55% |       |
| NASDAQ   | 356.0  | 267.0  | 395.0  | 454.0  | 371.0  | 314.0  | 374.0  | 0.83% |
| % growth | NA     | -25.0% | 47.94% | 14.94% | -18.28% | -15.36% | 19.11% |       |
| CBOE     | 163.4  | 122.9  | 192.9  | 179.2  | 173.8  | 210.2  | 224.9  | 5.47% |
| % growth | NA     | -24.79% | 56.96% | -7.1%  | -3.01%  | 20.94%  | 6.99%  |       |
| C        | 5,441.0 | 10,309.0 | 7,348.0 | 5,862.0 | 3,950.0 | 5,266.0 | 5,971.0 | 6.07% |
| % growth | 37.61% | 89.47% | -28.72% | -20.22% | -32.62% | 33.32% | 19.39% |       |
| BAC      | 4,546.0 | 6,119.0 | 9,166.0 | 8,042.0 | 8,950.0 | 7,818.0 | 7,879.0 | 9.6%  |
| % growth | NA     | 34.6%  | 49.8%  | -12.26% | 11.29%  | -12.65% | 0.78%  |       |
| WFC      | 3,866.0 | 5,591.0 | 8,189.0 | 6,926.0 | 8,110.0 | 4,509.0 | 3,565.0 | 1.03% |
| % growth | 16.53% | 44.62% | 46.17% | -15.42% | 17.1%   | -44.4%  | -26.94% |       |
| BRK.B    | 37,930.0 | 45,403.0 | 14,528.0 | 35,721.0 | 12,484.0 | 48,953.0 | 6,812.0 | -24.89% |
| % growth | NA     | 19.7%  | -68.0% | 145.88% | -65.65% | 299.13% | -86.08% |       |
| MS       | 4,430.0 | 5,344.0 | 4,366.0 | 4,874.0 | 4,884.0 | 4,588.0 | 3,319.0 | -0.7% |
| % growth | 27.01% | 20.63% | -14.58% | 6.75%  | 0.21%   | -6.06%  | -27.66% |       |
| BLK      | 2,107.0 | 1,591.0 | 2,201.0 | 2,271.0 | 2,110.0 | 1,626.0 | 1,321.0 | -5.62% |
| % growth | 9.39%  | -36.58% | 38.34% | 3.18%  | -7.09%  | -22.94% | -18.76% |       |
### 4.2 Fundamental Analysis: DCF Estimation

Following the historical balance sheets, we show the results of the DCF estimation with assumptions that are described in subsection 3.2. Surprisingly, the projections show that a number of DeFi tokens are relatively hyped. In particular, Uniswap (UNI), Aave (AAVE), and Compound (COMP) exhibit overvaluation with prices at least five-fold of their theoretical level. By contrast, PLF protocol tokens and Curve (CRV) are relatively “fairly” priced. Moreover, we find that yield aggregators are undervalued relative to their fundamentals. Yield aggregators use smart contracts that implement algorithmic investment strategies with their earnings mostly coming from performance fees of their vaults. In this context, a vault is another name for a smart contract which allocates locked assets and algorithmically takes portfolio management decisions. It is interesting to see how both DeFi and TradFi asset management protocols and firms are undervalued compared to their theoretical valuations. For valuation of public firms shown in Table 8, Table 9, Table 10, apparently overpriced relative to their fundamentals, NDAQ and BLK have experienced a recent downwards correction from the market. It’s interesting to point out that albeit tokens’ overvaluation, hedge funds, such as BlackRock or Grayscale, and banks, JP Morgan or Citigroup for example, are investing in cryptoassets.

### 4.3 Comparable Analysis

In this section, we discuss the results of our comparable analysis. In the comparable analysis, we define multiples and compare different assets of the same kind: exchanges, banking, and asset managers. Due to their nascency, DeFi protocols have fewer data points than their TradFi counterparties. We show that the multiples change over time.
Table 6: PLFs’ Net Project Value estimation using DCF.

| Compound | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|----------|------|------|------|------|------|------|
| Revenue ($M) | 13.25 | 13.91 | 14.6 | 15.33 | 16.1 | 16.91 |
| Workforce expenses ($M) | 2.65 | 2.78 | 2.92 | 3.07 | 3.22 | 3.38 |
| Net income ($M) | 10.6 | 11.13 | 11.68 | 12.27 | 12.88 | 13.52 |
| PV cashflows ($M) | 10.6 | 8.9 | 7.48 | 6.28 | 5.28 | 4.43 |
| PV terminal value ($M) | | | | | | 18.14 |
| Total PV ($M) | 61.11 |
| COMP market price ($) | 8.89 |
| Total PV / COMP supply ($) | 6.11 |

Table 7: Yield aggregators’ Net Project Value evaluation using DCF.

| Yearn Finance | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---------------|------|------|------|------|------|------|
| Revenue ($M) | 41.87 | 43.96 | 46.16 | 48.47 | 50.9 | 53.44 |
| Workforce expenses ($M) | 8.37 | 8.79 | 9.23 | 9.69 | 10.18 | 10.69 |
| Net income ($M) | 33.5 | 35.17 | 36.93 | 38.78 | 40.72 | 42.75 |
| PV cashflows ($M) | 33.5 | 28.14 | 23.64 | 19.85 | 16.68 | 14.01 |
| PV terminal value ($M) | | | | | | 57.37 |
| Total PV ($M) | 193.18 |
| YFI market price ($) | 6.111.76 |
| Total PV / YFI supply ($) | | | | | | |

| Idle Finance | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---------------|------|------|------|------|------|------|
| Revenue ($M) | 0.25 | 0.26 | 0.27 | 0.28 | 0.3 | 0.31 |
| Workforce expenses ($M) | 0.05 | 0.05 | 0.05 | 0.06 | 0.06 | 0.06 |
| Net income ($M) | 0.2 | 0.21 | 0.22 | 0.23 | 0.24 | 0.25 |
| PV cashflows ($M) | 0.2 | 0.16 | 0.14 | 0.12 | 0.1 | 0.08 |
| PV terminal value ($M) | | | | | | 0.33 |
| Total PV ($M) | 1.13 |
| IDLE market price ($) | 5.419.10 |
| Total PV / IDLE supply ($) | | | | | | |

Note: market prices are retrieved on 30 June 2022. The annual growth rate for revenue and workforce expenses equals 5% and 20% respectively.
### Table 8: Centralized Exchanges’ Net Project Value evaluation using DCF.

| Exchange                | 2022  | 2023  | 2024  | 2025  | 2026  | 2027  |
|-------------------------|-------|-------|-------|-------|-------|-------|
| **Intercontinental Exchange** |       |       |       |       |       |       |
| Revenue ($M)            | 5,882.0 | 6,176.1 | 6,484.9 | 6,809.15 | 7,149.61 | 7,507.09 |
| Workforce expenses ($M) | 1,764.6 | 1,852.83 | 1,945.47 | 2,042.74 | 2,144.88 | 2,252.13 |
| Net income ($M)         | 4,117.4 | 4,323.27 | 4,539.43 | 4,766.4 | 5,004.73 | 5,254.96 |
| PV cashflows ($M)       | 4,117.4 | 3,915.12 | 3,722.77 | 3,539.88 | 3,365.97 | 3,200.61 |
| PV terminal value ($M)  |       |       |       |       |       | 40,667.48 |
| **Total PV ($M)**       | 62,529.23 |       |       |       |       |       |
| **ICE market price ($)**| 111.86 |       |       |       |       |       |
| **Nasdaq**              |       |       |       |       |       |       |
| Revenue ($M)            | 1,376.0 | 1,444.8 | 1,517.04 | 1,592.89 | 1,672.54 | 1,756.16 |
| Workforce expenses ($M) | 412.8 | 433.44 | 455.11 | 477.87 | 501.76 | 526.85 |
| Net income ($M)         | 963.2 | 1,011.36 | 1,061.93 | 1,115.02 | 1,170.78 | 1,229.31 |
| PV cashflows ($M)       | 963.2 | 917.06 | 873.14 | 831.32 | 791.5 | 753.59 |
| PV terminal value ($M)  |       |       |       |       |       | 9,729.70 |
| **Total PV ($M)**       | 14,850.51 |       |       |       |       |       |
| **NDAQ market price ($)** | 90.28 |       |       |       |       |       |
| **Chicago Board of Trade** |       |       |       |       |       |       |
| Revenue ($M)            | 870.2 | 913.71 | 959.4 | 1,007.36 | 1,057.73 | 1,110.62 |
| Workforce expenses ($M) | 261.06 | 274.11 | 287.82 | 302.21 | 317.32 | 333.19 |
| Net income ($M)         | 609.14 | 639.6 | 671.58 | 705.16 | 740.41 | 777.43 |
| PV cashflows ($M)       | 609.14 | 578.98 | 550.32 | 523.67 | 497.17 | 472.56 |
| PV terminal value ($M)  |       |       |       |       |       | 5,976.65 |
| **Total PV ($M)**       | 9,207.89 |       |       |       |       |       |
| **CBOE market price ($)** | 113.19 |       |       |       |       |       |

Note: market prices are retrieved on 30 June 2022. The annual growth rate for revenue and workforce expenses equals 5% and 30% respectively.
Table 9: Banks’ Net Project Value evaluation using DCF.

| Bank of America | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|-----------------|------|------|------|------|------|------|
| Revenue ($M)    | 522.4740 | 23,597.7 | 24,777.58 | 26,016.46 | 27,317.29 | 28,683.15 |
| Workforce expenses ($M) | 16,742.2 | 7,079.31 | 7,433.28 | 7,804.94 | 8,195.19 | 8,604.95 |
| Net income ($M) | 15,731.8 | 16,518.39 | 17,344.31 | 18,211.53 | 19,122.1 | 20,078.21 |
| PV cashflows ($M) | 15,731.8 | 15,006.1 | 14,313.88 | 13,653.59 | 13,023.76 | 12,422.99 |
| PV terminal value ($M) | 15,006.1 | 14,313.88 | 13,653.59 | 13,023.76 | 12,422.99 | 11,842.43 |
| Total PV ($M)   | 247,954.28 | | | | | |
| Total PV / C supply ($) | 128.02 | | | | | |
| C market price ($) | 46.02 | | | | | |

| Bank of America | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|-----------------|------|------|------|------|------|------|
| Revenue ($M)    | 31,394.0 | 32,963.7 | 34,611.88 | 36,342.48 | 38,159.6 | 40,067.58 |
| Workforce expenses ($M) | 9,418.2 | 9,889.11 | 10,383.56 | 10,902.74 | 11,447.88 | 12,020.28 |
| Net income ($M) | 21,975.8 | 23,074.59 | 24,228.32 | 25,439.74 | 26,711.72 | 28,047.31 |
| PV cashflows ($M) | 20,864.52 | 19,809.44 | 18,807.71 | 17,856.64 | 16,953.66 | 16,053.66 |
| PV terminal value ($M) | 211,690.06 | | | | | |
| Total PV ($M)   | 327,957.84 | | | | | |
| Total PV / BAC supply ($) | 40.68 | | | | | |
| BAC market price ($) | 31.15 | | | | | |

| Bank of America | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|-----------------|------|------|------|------|------|------|
| Revenue ($M)    | 16,148.0 | 16,955.4 | 17,803.17 | 18,603.33 | 19,628.0 | 20,669.4 |
| Workforce expenses ($M) | 4,844.4 | 5,086.62 | 5,340.95 | 5,608.0 | 5,888.4 | 6,182.82 |
| Net income ($M) | 11,303.6 | 11,868.78 | 12,462.22 | 13,085.33 | 13,739.6 | 14,426.58 |
| PV cashflows ($M) | 10,695.06 | 10,119.27 | 9,574.49 | 9,059.03 | 8,571.33 | 8,094.03 |
| PV terminal value ($M) | 102,944.03 | | | | | |
| Total PV ($M)   | 162,266.81 | | | | | |
| Total PV / WFC supply ($) | 42.78 | | | | | |
| WFC market price ($) | 39.17 | | | | | |

Note: market prices are retrieved on 30 June 2022. The annual growth rate for revenue and workforce expenses equals 5% and 30% respectively.
|                      | 2022       | 2023       | 2024       | 2025       | 2026       | 2027       |
|----------------------|------------|------------|------------|------------|------------|------------|
| **Berkshire Hathaway** |            |            |            |            |            |            |
| Revenue (M)          | 111,530.0  | 117,106.5  | 122,961.82 | 129,109.92 | 135,565.41 | 142,343.68 |
| Workforce expenses (M)| 31,459.0   | 35,131.95  | 36,888.55  | 38,742.98  | 40,669.62  | 42,703.1   |
| Net income (M)       | 78,071.0   | 81,974.55  | 86,073.28  | 90,376.94  | 94,895.79  | 99,640.58  |
| PV cashflows (M)     | 78,071.0   | 74,205.71  | 70,541.78  | 67,039.76  | 63,720.62  | 60,565.82  |
| PV terminal value (M)|            |            |            |            |            |            |
| **Total PV (M)**     |            |            |            |            |            | 1,180,130.30 |
| Total PV / BRK.B supply ($) |      |            |            |            |            | 535.06         |
| BRK.B market price ($) |            |            |            |            |            | 273.02          |
| **Morgan Stanley**   |            |            |            |            |            |            |
| Revenue (M)          | 15,814.0   | 16,694.7   | 17,434.94  | 18,306.68  | 19,222.02  | 20,183.12  |
| Workforce expenses (M)| 4,744.2   | 4,981.41   | 5,230.48   | 5,492.0    | 5,766.6    | 6,054.94   |
| Net income (M)       | 11,069.8   | 11,623.29  | 12,204.45  | 12,814.68  | 13,455.41  | 14,128.18  |
| PV cashflows (M)     | 11,069.8   | 10,644.02  | 10,234.61  | 9,840.96   | 9,462.44   | 9,098.48   |
| PV terminal value (M)|            |            |            |            |            | 132,466.85  |
| **Total PV (M)**     | 192,817.15 |            |            |            |            | 111.91       |
| Total PV / MS supply ($) |      |            |            |            |            | 76.10        |
| MS market price ($)  |            |            |            |            |            | 609.04       |
| **BlackRock**        |            |            |            |            |            |            |
| Revenue (M)          | 5,894.0    | 6,188.7    | 6,498.14   | 6,823.04   | 7,164.19   | 7,522.4     |
| Workforce expenses (M)| 41,768.2  | 1,856.61   | 1,949.44   | 2,046.91   | 2,149.26   | 2,256.72    |
| Net income (M)       | 4,125.8    | 4,332.09   | 4,534.37   | 4,776.13   | 5,014.94   | 5,265.68    |
| PV cashflows (M)     | 4,125.8    | 3,921.81   | 3,727.91   | 3,543.59   | 3,368.39   | 3,201.84    |
| PV terminal value (M)|            |            |            |            |            | 40,528.04   |
| **Total PV (M)**     | 62,417.382 |            |            |            |            | 413.45       |
| Total PV / BLK supply ($) |      |            |            |            |            | 609.04       |

Note: market prices are retrieved on 30 June 2022. The annual growth rate for revenue and workforce expenses equals 5% and 30% respectively.
starting from Q1 2021 to Q2 2022.

Figure 2 show the Market Cap / Revenue ratio for (a) exchanges, (b) banks, and (c) asset managers. We merge both DeFi and TradFi assets. These figures show that DeFi assets were relatively overvalued with respect to their TradFi counterparties, and have been only recently converging to a more fair price. In fact, in Q2 2022, we can see DeFi converging to TradFi multiples values. This could be explained by the slump in the crypto market where high growth expectations have been adjusted towards more realistic levels. Due to the large price increases in crypto tokens and high growth in DeFi protocol usage, aggressive (growth) expectations were priced in. The crypto market slump and sluggish recovery caused a reassessment of the aggressive growth expectations and the subsequent revaluation of DeFi tokens. As previously discussed, comparable analysis assumes that market prices reflect investors expectations on average. Therefore, by comparing similar assets’ multiples, the empirical observations can reveal undervalued and/or overvalued assets. For example, by looking at 2a, Uniswap during 2021 was overvalued compared to its TradFi counterparties and only recently its price has been converging to a “fair” price.

Similarly, Figure 3 shows the Market Cap / Net Assets ratio for the same set of financial services and assets from Figure 2. Net assets are represented by the protocol treasury value for DeFi, and equal the difference between total assets and total liabilities for TradFi. We generally observe overvaluation for DeFi tokens which is, differently from the latest multiples, not disappearing with the recent market slump. It should be noted that this behavior is mixed between different DeFi tokens. Firstly, in 3a we can see that Uniswap is “fairly” valued with respect to its TradFi equivalents. This could be explained by Uniswap retaining 430M UNI tokens in its own treasury that can be distributed to the community in the future[23]. To date, these tokens have a value of $3B, and Uniswap’s market cap is around $5B. This relatively large treasury size makes Uniswap the “richest” DeFi protocol with the highest treasury value[14]. Compared to Uniswap, other protocols’ treasury values have been driven by cryptoassets that users pay as fees for using the DeFi service[32]. Therefore, moving to 3b we can observe that—since the slopes are positive—the recent market cap crash was lower than their treasury loss. Finally, 3c shows an overpriced Yearn Finance (YFI) consistent with 2c. Interestingly, Idle Finance’s Market Cap / Net Assets ratio is comparable to TradFi Hedge Funds.
5 Conclusion

In this study, we apply conventional valuation analysis on DeFi tokens and provide a comparison with the valuation on stocks of publicly listed firms within similar categories. Specifically, we analyze DEXs, PLFs, and yield aggregators, which are also compared with exchanges, banks and asset managers, respectively.

The results show that DeFi tokens have been rather overpriced relative to the equity of financial services firms. More specifically, DeFi assets were overvalued with respect to their TradFi counterparties, and have been only recently converging to a more fair price. We believe high growth expectations in DeFi have been adjusted towards more realistic levels in line with TradFi.

Despite the large growth in DeFi tokens and cryptocurrencies in general, little research has been conducted on the valuation of these. Research on digital assets and DeFi tokens valuation is still in an early stage, and we contribute by providing a framework to think about fundamental valuation in DeFi. Future research could contribute by building upon our approach and propose DeFi native fundamental measures and frameworks.

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