



Augur (\$REP) Analysis and Valuation

Myles Snider, Tushar Jain, and Kyle Samani
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Intro

For this analysis, we will examine the REP token, which powers the Augur decentralized application (DApp). We define REP as a cryptoasset and examine the properties that make it unique, while also analyzing the functionality of the DApp, the ecosystem in which it exists, its potential market, and its unique risks. In doing so, we will form an investment thesis that allows us to set a price target for REP tokens. We'll offer bear, base, and bull cases. We hope to accomplish a few things. First, we hope to create a succinct and accessible overview of Augur and REP for curious individuals and investors. Secondly, we hope to establish terminology that we think will be helpful in distinguishing between many different types of cryptoassets. Finally, we hope to provide an honest assessment of REP tokens from an investor's perspective and to estimate the future value of this token.

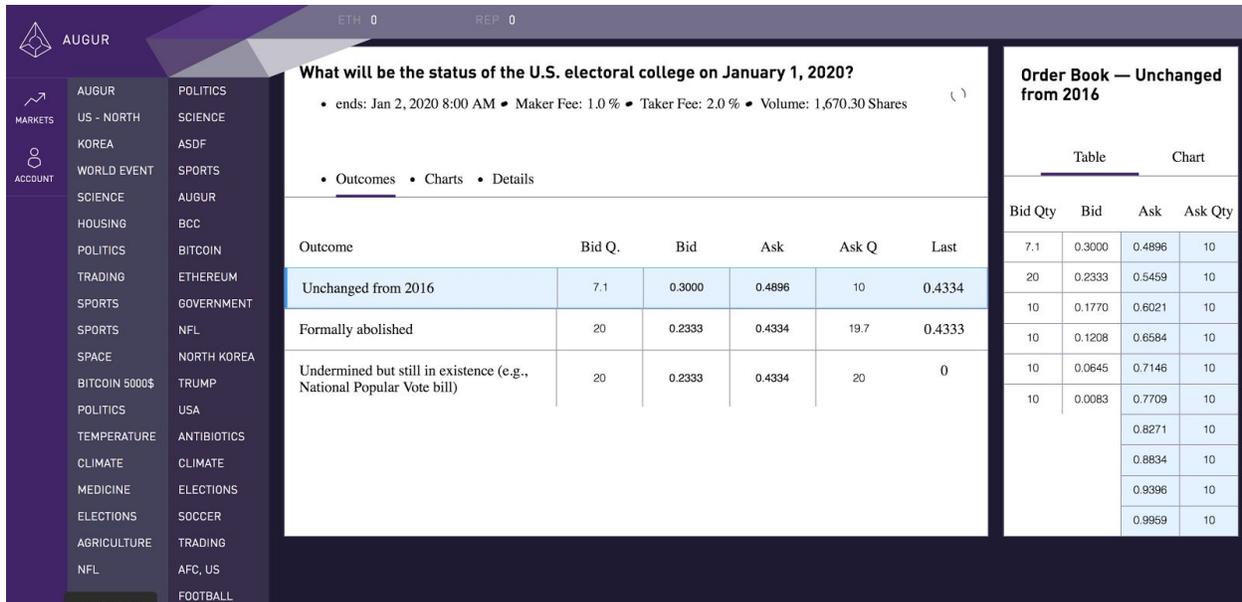
Summary

Background

Augur is a decentralized prediction market built on top of the Ethereum blockchain. REP is the native token of Augur that powers the Augur application. REP is an [ERC20](#) token issued on Ethereum.

A prediction market is a market that allows individuals to trade on the outcomes of events. Those who accurately predict outcomes are rewarded for their predictions, while those who predict inaccurately lose staked bets. As a result, there is a financial incentive to accurately forecast outcomes. This makes for more accurate predictions, as poor forecasting costs the user. Furthermore, users with good information have a financial incentive to trade in those markets. As they do, the market absorbs their information (in the form of price and volume), and this increases the accuracy of the market's predictions. In prediction markets, outcomes are valued from 0% to 100%, and the prices of shares for various outcomes reflect the probability forecast for each.

A simple example is a presidential election. If shares for the Republican candidate are trading at \$0.65, shares for the Democratic candidate are trading at \$0.34, and shares for the independent candidate are trading at \$0.01, then the market is forecasting a 65% chance that the Republican candidate will win, a 34% chance that the Democrat will win, and a 1% chance that the independent will win. Once election results are known, shares for the winning candidate will be worth \$1.00, and shares for all losing candidates will be worth \$0. Although a given market may have multiple potential outcomes, the outcome for an individual bet is binary. An investor will either lose all of their staked bet, or win the difference between the staked bet and \$1.00.



Augur’s purpose is to democratize and decentralize finance. Augur is doing this by creating a global, frictionless, and highly liquid prediction market. While the idea of prediction markets is not new, past models have largely been ineffective for a variety of reasons. They have traditionally drawn heavy scrutiny from regulators because of their association with gambling, and they must operate within the laws of the jurisdictions in which they are located. This makes for high barriers to entry, limiting the pool of potential capital and knowledge, resulting in inefficient markets.

Augur aims to ameliorate these concerns by building a new type of prediction market that is entirely decentralized. This accomplishes several things:

- It means that governments [cannot effectively regulate the market](#) because it’s decentralized and doesn’t have a single point of failure.
- It means that the market will be globally accessible and has fewer barriers to entry. This will allow for a significantly larger user base with more information, which in turn will allow for more accurate predictions.
- It allows for a design that provides a critical security measure (decentralized resolution, to be discussed later).

Centralized prediction markets can potentially be manipulated, since there is a single authority reporting on the outcomes of events. If the company running the prediction market does not report the correct outcome, then even those who predicted accurately will not be able to capitalize on their forecast. Augur decentralizes this reporting responsibility, making the market resistant to manipulation. Finally, because the Ethereum blockchain is global and immutable, the information from these markets is fully open and accessible to anyone around the world, and this information can't be censored or manipulated.

The major challenge for Augur is to create a system for reporting on events in an accurate, timely, cost effective, and decentralized way. That's where the REP token becomes relevant. REP are the native token of the Augur protocol, and they are paramount to the functionality of the platform.

Each REP token entitles and encourages the REP holder to report on the outcomes of events, or face a small financial penalty for failing to do so. Those who report accurately are paid a percentage of the network fees, while those that report inaccurately will lose some REP. REP holders who report against the consensus can lose up to 20% of their REP in each reporting period. Consensus on event outcomes is determined by the majority outcome that is reported. Rational REP holders will assume that almost all other reporters will report the outcome that actually occurred in reality, so there strong incentive to report accurately.

If the Republican candidate actually wins the election, each REP holder expects that other REP holders will report that the Republican candidate won. If an individual REP holder reports that the Democrat won, then they are guaranteed to lose some of their REP unless the majority of REP holders also report that the Democrat won. This would require widespread global collusion among 51+% of the REP holders voting on that market. That is extremely unlikely.

Even if that were to mistakenly occur, Augur has several built-in backstops that allow for conflict resolution. See [this post from Augur](#) for more information about backup resolution processes.

Augur has also released a detailed FAQ for anyone interested in the system mechanics and dispute resolution. That information can be found [here](#). The core development team continues to experiment with the specifics of this system. The most up-to-date information can be found on the [Augur Stack Exchange](#).

Vision

Augur is the most well-developed project that is building a decentralized prediction market. Several different studies ([Link 1](#), [Link 2](#), [Link 3](#)) have demonstrated the superiority of prediction markets over traditional means of forecasting event outcomes. By combining the concept of the "[wisdom of the crowd](#)" with a financial incentive that encourages accurate predictions and discourages false forecasting or signaling, prediction markets are able to elicit more accurate information about future events. The long-term implications of this are far-reaching. Global, decentralized prediction markets

could not only offer society’s best information about the likelihood of any future event, but also the ability for nearly anyone to participate in these financial markets. This widened pool of global brain power increases the accuracy of predictions, creating a self-fulfilling virtuous cycle.

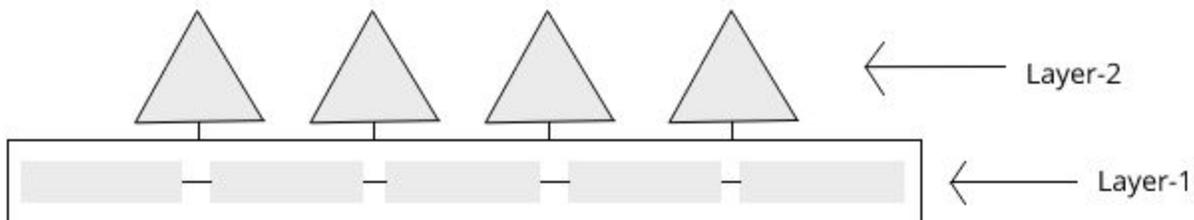
We believe that prediction markets are one of the most compelling types of decentralized applications. Not only does decentralization mitigate some of the inherent issues with existing prediction market models, it actually makes prediction markets truly viable for the first time by enabling global liquidity pools with low barriers to entry.

While current prediction markets mostly function as betting platforms for political and sporting events, we envision platforms like Augur enabling entirely new possibilities. For example, a person could create a market to predict the probability of a hurricane striking a certain area within a given time frame. This information could be used to determine prices on home insurance premiums in that area. Furthermore, people living in that area could then use this information to invest in ways that hedge against that risk. Not only do prediction markets offer superior information about the future, they also allow users to leverage this information to hedge *against* predicted outcomes. We believe that these are just a few of the entirely new possibilities that decentralized prediction markets will enable. We predict that Augur will greatly surpass the current market size of existing prediction markets, as the creation of a decentralized prediction market will itself expand the total addressable market.

Defining REP as a Cryptoasset

Because “cryptoassets” as an asset class are so diverse in nature, it’s important to attempt to define each asset specifically. There are many different cryptographic protocols with underlying tokens. Each specific cryptoasset has unique properties that must be examined on a case-by-case basis to attempt to determine valuation.

REP is a *Layer-2 cryptoasset*. This refers to the fact that the REP tokens are issued *on top of* the Ethereum blockchain, rather than on their own blockchain. This distinction is important. Another way to phrase this is as follows: Layer-1 cryptoassets are *protocol-level* tokens like Ethereum and Bitcoin. Layer-2 cryptoassets like REP are *application-level* tokens built on top of a given protocol. This distinction is important, as the success of Augur as a user-facing application is directly tied to the success of Ethereum. This will be explored further in a later section.



Another important distinction is that REP is what we like to call a “Cryptolicense,” similar to other licenses that give you the right to perform work in exchange for compensation (eg: beauty school license, medical license, etc.) There are several different types of cryptolicenss, and each one has unique permission and compensation profiles. These assets are specifically designed to incentivize people to perform the tasks necessary to make the network function, and thus are not optimal as a passive investment.

Unique Attributes of REP

Like all cryptoassets, REP is designed to incentivize specific behaviors particular to an individual network (in this case, the Augur prediction market). As such, it has unique characteristics that other cryptoassets may not share. We’ve identified the following:

1. There are exactly 11,000,000 REP. They are fungible, divisible, and transferable on the Ethereum blockchain.
2. REP holders who report on market outcomes are entitled to reporting fees, shared pro rata among active REP holders.
3. REP holders must actively opt in to report on markets in a given time window. If they opt in, they must report on outcomes and will earn fees for their work. If they do not opt in, they do not receive any of the fees generated in that time window.
4. The REP protocol entitles REP holders to a vote on future software changes proportional to their stake (which implies a control premium).

Of these attributes, the most relevant to valuation is the ability to earn fees. REP has a direct cash-flow incentive built into it. This will be the focus of our price analysis. However, two other attributes are worth noting:

Because REP holders can decide when they want to work for the system (by opting in to work during a specific time window), the number of REP holders to which fees are distributed will change over time. The fewer reporters that choose to work during a given window, the more fees each active reporter will earn, since fees are split pro rata among active reporters.

The ability of REP tokens to serve as a governance mechanism gives it a control premium. This means that the REP token has value not just because of its cash-flow incentive, but also because of its influence on governance. Each REP token entitles its owner to one vote on upgrades, changes, and improvements to the platform.

While market creators and traders in a given market don’t need to own REP to use the Augur platform, those who utilize the Augur network will want to have influence on its future development. Since

changes to the software will affect any user’s ability to earn money creating and trading on markets, these users will be incentivized to purchase REP for its voting rights. As volume on the network increases, so too does the value of having a say in the future design of the platform. While it is difficult to assign a precise multiple to this particular utility, REP is likely to always trade at a higher multiple of its cash flow implied value due to this control premium.

Risks

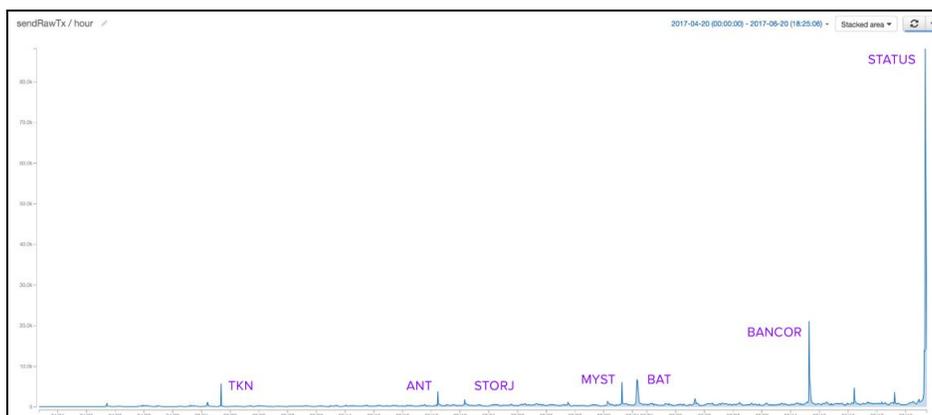
We’ve identified four primary risks:

1. Platform risk
2. Scalability
3. Need for stablecoins
4. Structural costs

Platform Risk and Scalability

As a layer-2 cryptoasset, REP is inherently tied to its layer-1 protocol, the Ethereum blockchain. Without switching blockchains, Augur can only succeed if Ethereum does too. The security and scalability of Augur depend on Ethereum solving these issues. If a critical security flaw affects Ethereum, Augur is likely at risk. Similarly, if Ethereum cannot find a way to scale its infrastructure to allow for tens or hundreds of millions of concurrent transactions, then Augur’s potential will be capped.

The scalability issue is closely related to platform risk, but it is worth detailing further. While Augur’s potential market is huge, its ability to reach such a market will require that Ethereum’s transactional capacity scale by several orders of magnitude. Currently, the Ethereum network supports about 15 transactions/second for ETH and about 7 transactions/second for ERC20 tokens. As the chart below shows, Ethereum has already experienced network-clogging levels of transactions when demand is particularly high. Now, imagine many high-level DApps all running in parallel, and you can see why the network, in its current state, simply cannot support such activity.



Need for Stablecoins

While markets and payouts in Augur will initially be denominated in ETH, these markets will eventually need to be denominated in less volatile assets. The volatility of ETH is simply too high, and large swings in the price of ETH could adversely impact prediction market performance. The ability to denominate markets and payouts in USD, EUR, or other, more stable currencies is absolutely necessary. This is needed not just to protect against price swings, but also to attract outside users that might be confused by ETH-denominated markets. The Augur core team has acknowledged this as a major bottleneck but also appears to be quite bullish on the possibility that this issue is solved by the [MakerDAO](#) project.

Structural Costs

It is possible that the use of centralized data sources (such as [Oraclize](#) or [RealityKeys](#)) for resolving prediction markets could largely negate the need for reporters on a network such as Augur. The Augur network charges fees regardless of whether a market is resolved by using an automated data source or by utilizing the decentralized oracle feature of the network. This is structurally more expensive than potential competitors which may not include a backstop.

Risk Assessments

Platform Risk and Scalability

For purposes of our risk assessment, these two issues can be examined in tandem. Any Layer-2 cryptoasset is going to be subject to platform risk. Since almost all of the decentralized prediction markets being built are doing so on top of smart contract platforms, this is a risk they all share. Were a prediction market to be built as its own blockchain, it would likely be far less secure than one built on a smart contract platform (due to the nature of proof-of-work and proof-of-stake consensus algorithms). Thus, being implemented as a Layer-2 asset is actually an advantage.

Currently, Ethereum is by far the largest, most mature, secure, and trusted smart contract platform. Ethereum has experienced huge momentum in recent years and is clearly the industry leader. With a Q1 2018 release, we expect Augur to be the first major decentralized prediction to launch.

Still, Augur faces the very real bottleneck of being limited by Ethereum's current scalability challenges. Augur simply can't function as a user-facing application if Ethereum's transactional capacity does not scale by five or six orders of magnitude. The core question thus becomes-- will Ethereum find a way to scale before another smart contract platform with greater scalability gains traction? The core research and development team at Ethereum has been making steady progress on this front, and we're likely less than a year out from a switch to [proof-of-stake](#), which would at least double current throughput.

Research continues to progress on further options like [sharding](#), [state channels](#), and the recently-announced [Plasma](#). While other platforms like EOS and Tezos are theoretically more scalable than Ethereum, they are far less mature and unproven.

The effects of the rise of another prominent smart contract platform are difficult to forecast. If another smart contract platform surpassed Ethereum in terms of security or scalability, the Augur core development team would likely aim to port over to the new platform. The risk would then only come from competitive prediction markets built on the new platform, particularly those that are built before Augur ports over.

Need for Stablecoins

We recognize that Augur will never reach its full potential unless markets can be denominated in stable cryptoassets, especially those pegged to fiat currencies. The search for a fully secure and fully decentralized stablecoin is something that motivates the entire crypto community, as it represents an incredibly important bridge to widespread adoption. The crypto ecosystem is investing heavily in creating such a stablecoin. We fully expect that there will be a sustainable stablecoin solution within 12 months.

The [MakerDAO](#) project has made the most progress on this front (within the Ethereum ecosystem), and the Augur lead developers have already expressed an intent to integrate Maker stablecoins as soon as they become available. We believe that some form of stablecoin will emerge in the next few years, and it likely will not matter on which platform it's created. The same mechanism will be implemented on all other platforms, leading to a robust stablecoin ecosystem across all smart contract blockchains.

While we hope that these stablecoins can be implemented in a completely decentralized way, collateralized options like [Tether](#) and [Digix](#) already exist. These options entail counterparty risk, but the transparency and governance of these companies causes them to be a trusted option for many.

Structural Costs

While paying reporters for markets that are resolved without any human input presents an added structural cost, the REP system functions like an insurance policy against compromised data feeds/oracles and also allows for dispute resolution in the case of an unclear event outcome. We believe that the value provided by this backstop will outweigh the additional structural costs it imposes. We predict that oracles will provide the information needed to resolve the vast majority of markets on Augur without human intervention. However, to rely exclusively on these would entail serious risk. We recognize the need for a decentralized backstop (in which REP holders report outcomes), and we believe Augur presents the most compelling design for this.

Valuation Drivers

There are three key variables that impact the valuation of REP:

1. Outstanding Interest
2. Network Fees
3. Number of Active Reporters

Outstanding Interest

Outstanding interest refers to the total amount of money being wagered across all markets. While volume refers to the total amount being transacted on the platform, outstanding interest simply refers to the amount that winners will receive once a market is resolved.

We've already outlined why Augur is superior to centralized alternatives (capital, liquidity, barriers to entry, security, and resistance to regulation). Because of this, Augur's potential value is much larger than that of existing prediction markets. First, the lower barriers to entry suggest that the existence of Augur itself could substantially increase the size of prediction markets the same way ride sharing expanded the market for taxis and digital cameras expanded the photography market. And because Augur can be used for nearly any type of prediction, the potential for Augur to expand into the online gambling and global derivatives markets is significant.

All of these factors will serve to increase the outstanding interest on Augur. While it's impossible to predict the multiplier of these benefits, we expect it to be significant. The size of existing prediction markets, which are subject to significant friction relative to Augur, is already enormous:

- Global sports gambling [estimated](#) to be worth between \$1-3 trillion
- Online gambling [to approach](#) \$1 trillion by 2021
- InTrade [processed](#) \$230 million on 2012 US presidential election alone
- The global value of all betting and derivatives platforms [is likely](#) in the trillions

Network Fees

Fee structure determines the cash flow to REP holders and impacts Augur's competitiveness against alternatives. To compete effectively, Augur must offer lower fees than centralized alternatives, and be competitive with decentralized alternatives. PredictIt currently [charges](#) 10% fees on all profits, while Betfair rates are usually [between](#) 3-7%, though they are sometimes higher. We believe that Augur's fees will be far lower than those of these centralized options. Most estimates suggest that Augur fees will be on the order of 1%. Our models include fee estimates above and below this figure.

Augur's current structure involves two type of fees: market creator fees and reporting fees. Market creator fees are different across each market, as they are set by the individual that creates the market. These fees will be highly competitive, since users will choose to participate in markets that offer the lowest fees.

Reporting fees are the fees that are paid to reporters, and thus are the fees relevant for determining the REP valuation. These fees are set dynamically by the Augur network. The fee structure is designed to maintain the network value (AKA market cap) of all REP at a 5x multiple of the total amount of outstanding interest in Augur markets. If the network value of all REP is less than 5x outstanding interest, the network will increase fees. As a result, REP buyers should be willing to pay more for REP, driving up the price. This process works in both directions to target a 5x equilibrium point.

There is a fee floor of 0.1%. However, the Augur team has stated that both this lower limit, as well as the 5x multiple, are subject to change as markets evolve. These changes will be at the discretion of the development team early on, but will only be changed by a vote of REP holders later.

We recognize the need for experimentation with new, disruptive technology like Augur. Fees must be high enough to provide a cash-flow incentive for REP reporters, but low enough that Augur remains competitive.

Number of Active Reporters

As mentioned before, REP holders have the option to decide whether or not they choose to report during a given time window. The number of active reporters will affect the distribution of fees, as they are split among active reporters relative to their REP stake. If fewer reporters decide to work during a given time window, the cash flow per REP will increase.

Financial Models / Price Targets

Using this information about valuation drivers, we can create cash flow model for REP:

$$\text{Annual Return Per Rep} = (\text{Annual Outstanding Interest}) \times (\text{Average Reporting Fee}) / 11,000,000$$

The total reporting fees generated on the market are split pro rata amongst REP reporters. Thus, the return for each REP is a function of total reporting fees divided by 11,000,000.

For this valuation, we will use a cash flow multiple methodology. We project that in 2021 the Augur network will process \$25B in outstanding interest with 1% fees.

We chose 2021 because we have seen other networks take ~4 years to get to the level of maturity to apply this type of analysis. We chose \$25B based on the use cases highlighted above. Juniper Research projects that almost [\\$1,000B will be gambled online in 2021](#). We are forecasting that 2.5% of that volume will flow through the Augur network. We believe this is achievable because of Augur's structural advantages relative to centralized prediction markets (global liquidity pools, lower fees, lack of counterparty risk).

$$\text{Annual Return Per Rep} = \$25 \text{ billion} \times 1\% / 11,000,000 = \$22.73$$

We are conservatively predicting 100% active REP reporters. If we only see 75% active REP reporters, then the cash flow to active REP reporters will increase by 33%.

We can apply a range of multiples that investors would be willing to pay for that \$22.72 in cash flow in 2021. The multiple is going to be a function of how risky the cash flows are, how fast they are growing, and the macro environment. NYU finance professor Aswath Damodaran, widely considered a valuation expert, in a [study](#) of P/E ratios in different sectors, found that internet software companies, on average, traded at a P/E ratio of 221.88. We're projecting more conservative P/E ratios:

- Bear case: multiple of 10x = $22.73 \times 10 = \$227.27$
- Base case: multiple of 25x = $22.73 \times 25 = \$568.18$
- Bull case: multiple of 100x = $22.73 \times 100 = \$2,272.73$

We must then discount from 2021 to 2017. We will apply a 40% annual discount to capture the significant risks outlined above. This implies a discount factor of $(1 + .4)^4 = 3.84$:

- Bear case: discounted value of $227.27 / 3.84 = \$59.16$
- Base case: discounted value of $568.18 / 3.84 = \$147.90$
- Bull case: discounted value of $2,272.73 / 3.84 = \$591.61$

It is very important to recognize that these discounted values are adjusted for an extremely high risk investment. [40% discount rates](#) are considered appropriate for early-stage ventures.

We encourage the reader to go through this exercise with the variables of their choosing. We've created a table showing various cash flow possibilities below (dollar values have been rounded to the nearest .01 decimal places).

Annual Cash Flow Per REP

	Annual Outstanding Interest (Millions of USD)							
		100	1,000	10,000	25,000	50,000	100,000	250,000
Avg Fees	0.10%	0.01	0.09	0.91	2.27	4.55	9.09	22.73
	0.25%	0.02	0.23	2.27	5.68	11.36	22.73	56.82
	0.50%	0.05	0.45	4.55	11.36	22.73	45.45	113.64
	1.00%	0.09	0.91	9.09	22.73	45.45	90.91	227.27
	1.50%	0.14	1.36	13.64	34.09	68.18	136.36	340.91
	2.00%	0.18	1.82	18.18	45.45	90.91	181.82	454.55

Our [Excel model](#) is available for download.

Competitors

Gnosis

Augur's primary competitor among Ethereum-based prediction markets is [Gnosis](#). Gnosis has an entirely different design than Augur, using mostly centralized oracle services and resorting to decentralized arbitration (in which all ETH holders can vote) only in the event of a dispute. We will not provide an in-depth exploration of Gnosis, as the token and platform do not pass some of our baseline tests for investment eligibility. Gnosis employs an overly-complex token mechanism and dispute resolution process that relies on untested and tenuous cryptoeconomic assumptions. Furthermore, >90% of GNO tokens are held by the development team and foundation, and the release schedule is unknown. We project that protocol complexity, token distribution uncertainty, and dilution will create downward price pressure on GNO tokens.

Stox

[Stox](#) is another decentralized prediction market being built on Ethereum. Stox requires that all markets be denominated in its native token, STX. We do not see this as a viable long-term solution, among a number of other serious problems.

Centralized Alternatives (Vegas sports betting, PredictIt, etc.)

As discussed above, Augur has significant structural advantages over centralized prediction markets - global liquidity pools, lower fees, lack of counterparty risk, and minimal regulations.

Miscellaneous

[Joey Krug joins Pantera Capital](#)

Joey Krug is the lead back-end developer for Augur and the most publicly active member of the team. He recently announced that he would be joining Pantera Capital as a partner in their token fund. A major part of the plan for this fund is to use the fund's large pool of capital to provide early liquidity on the Augur platform. The importance of this cannot be understated. As with any financial market, the utility of Augur depends on high trading volume and liquidity. That can be a difficult hurdle for new networks to clear, and having a large pool of capital to provide early liquidity and market-making services provides a critical advantage.

[Ron Bernstein founds AugmentPartners Limited](#)

Ron Bernstein, former CEO of prediction markets InTrade and TradeSports, is currently on the advisory board of Augur. He has created a new company, AugmentPartners, which will be building trading software, with a focus on decentralized protocols, especially Augur. There are few details about the firm, but Bernstein's [LinkedIn](#) says that they will be creating "a portfolio of commercial market 'verticals' designed to leverage the Augur Project." AugmentPartners' team and advisors include past Augur employees and current Augur lead developers. They will likely seek to drive interest and usage of the platform and increase liquidity and markets.

Conclusion

We believe that decentralized prediction markets will democratize and reshape event forecasting. Augur presents the most compelling investment opportunity in the prediction market space. At current valuations (~\$22), we are bullish on REP.

Please email research@multicoin.capital with any comments or questions.