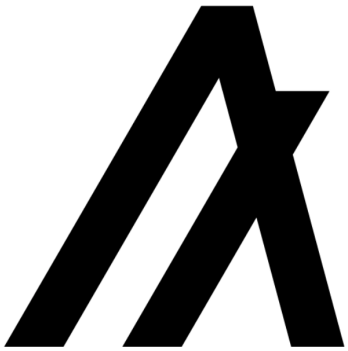
arrington
XRP CAPITAL

The Monetary Experiment: Algorand

A Thesis For Algo Currency Markets



June 17, 2019

Author: Ninos Mansor
Contributions From: Michael Arrington, Ninor Mansor

Disclosure

UPDATE: The prior version of this document was published using a standard disclosure template; The disclosure has been updated to more accurately reflect the nature of Arrington XRP Capital's intended interests in the Algorand network.

Arrington XRP Capital and/or its affiliates (collectively "Arrington XRP Capital") has a financial interest in the success of Algo and are supporters of Algorand. Beginning with the auction settlement which will be held on June 19, 2019, Arrington XRP Capital will own Algos, the native token of the Algorand network.

As of the publication date of this report, Arrington XRP Capital, others that contributed to this report, and those that we have directly shared our research with, are supporters of Algorand and stand to realize the gains upon MainNet launch through various manners of participation. All content in this report represent the opinions of Arrington XRP Capital. Arrington XRP Capital has obtained all information herein from sources they believe to be accurate and reliable. However, such information is presented "as is," without warranty of any kind – whether express or implied.

This document is for informational purposes only and is not intended as an official confirmation of any transaction. All market prices, data and other information are not warranted as to completeness or accuracy, are based upon selected public market data, and reflect prevailing conditions and Arrington XRP Capital's views as of this date, all of which are accordingly subject to change without notice. Arrington XRP Capital has no obligation to continue offering reports regarding the project. Reports are prepared as of the date(s) indicated and may become unreliable because of subsequent market or economic circumstances.

Any investment involves substantial risks, including, but not limited to, pricing volatility, inadequate liquidity, and the potential complete loss of principal. This report's estimated fundamental value only represents a best efforts estimate of the potential fundamental valuation of a specific token, and is not expressed as, or implied as, assessments of the quality of a token, a summary of past performance, or an actionable investment strategy for an investor.

This document does not in any way constitute an offer or solicitation of an offer to buy or sell any investment or token discussed herein.

The information contained in this document may include, or incorporate by reference, forward-looking statements, which would include any statements that are not statements of historical fact. These forward-looking statements may turn out to be wrong and can be affected by inaccurate assumptions or by known or unknown risks, uncertainties and other factors, most of which are beyond Arrington XRP Capital's control. Investors should conduct independent due diligence, with assistance from professional financial, legal and tax experts, on all tokens discussed in this document and develop a stand-alone judgment of the relevant markets prior to making any investment decision.

Executive Summary

We explore the monetary experiment of Algorand, a new cryptocurrency invented by Turing Award winner Silvio Micali. Arrington XRP Capital will be participating in the Algorand economy by running a relay node and bidding in the Algorand Foundation's dutch auctions.

Algorand brings together bleeding edge cryptography with a clever economic model that bootstraps Algo currency markets. This is a novel development that ties the token and technology to economic incentives that encourage efficient market pricing.

The Algorand Foundation will distribute 30% of Algos through downside-protected dutch auctions. In this world, auctions are akin to monetary policy catalysts, not only circulating tokens, but guiding price discovery both today and in the future. The clever part of this story is that any purchaser can refund their Algos one year after purchase, giving them up to 90% downside protection. This has wide implications for Algo market dynamics.

Algorand's monetary experiment marries Silvio Micali's solution to a three decade challenge in distributed systems with lessons from Foreign Currency (FX) trading, options pricing theory and traditional asset management. As these markets mature, we predict that Algo will behave unlike any other cryptocurrency today. Not a stablecoin; but a cryptocurrency whose economic model motivates financial markets to form rational expectations and seek out self-fulfilling equilibrium.

The downside-protection clause also opens up a new world for institutional investors such as family offices or endowments who have not yet ventured into cryptocurrency because of its drawdowns. The simple question for these investors as well as others who hold cash in their cryptocurrency portfolios is thus: Why hold cash when you can hold downside-protected Algos, gaining cryptocurrency exposure without significant downside risk?

Algorand's economic experiment is unprecedented. It is where macroeconomics meets cryptocurrency; and we believe that it will have wide-ranging implications for cryptocurrency portfolio management, hedging and broader market dynamics.

Contents

1 Cryptocurrencies Are Monetary Experiments

Bitcoin will be remembered as one of the greatest monetary experiments in human history. In the ashes of a financial crisis – a crisis marked by the collapse of a century-old bank – a pseudonym gave the world a global currency. This currency would soon inspire millions to rethink central banking and gold, not only riding the parabolic asset, but embracing its economic worldview; a worldview with answers to questions about savings, inflation and debt.

Bitcoin is as much a monetary experiment as it is a speculative wealth transfer. Some day, economists will study Bitcoin's origins alongside pearls and the Greenback. They will dissect Bitcoin from cycle to catastrophe, from Tether panics to hard-coded catalysts like the Halvings. They will model an elegant supply curve and its tightening impact on investor time preference. They won't see a speculative bubble, but a deep macroeconomic experiment.

The world could not be more primed for this experiment. Eleven years into Bitcoin, we are also eleven years into a global economic cycle, edging to a new era of monetary uncertainty. Whether the costume is QE, asset inflation or wars over trade and currency, economic angst will soon hang over the minds of central bankers and citizens alike.

Which cryptocurrencies will shine in this macroeconomic story? Thousands have launched over the last several years, but how many are built on real economic foundations? While investors often discuss cryptoeconomics, these ideas haven't addressed cryptocurrency pricing and market dynamics. They are more like alchemy than monetary economics. Even the most mature and liquid smart contract protocols like Ethereum have struggled to articulate an economic vision, and thus markets can barely understand let alone price these assets efficiently.

Bitcoin is simple: it is a fixed-supply asset whose scarcity is reinforced every four years. It is disinflationary today and at some point will become deflationary. Its market cycles center on this underlying economic policy (or lack thereof). While the asset's price is speculative, it is ultimately grounded by immutable monetary characteristics which steer its long term economic trajectory.

It's hard to say the same for most other cryptocurrencies including mature projects like Ethereum. The 2016-18 market cycle inspired a new wave of narratives, from Web3 to Data Privacy, and fuelled an exciting rush of new technologies. But how many of these stories and projects have a real economic foundation? Most narratives borrow Silicon Valley wisdom, but unfortunately don't establish an economic foundation for cryptocurrency markets; a foundation to price assets, form expectations and navigate monetary policy events.

2 Can Cryptocurrencies Behave Like Rational Markets?

Consider that most cryptocurrencies are highly correlated assets. Even the most liquid coins like Ethereum are at the whim of Bitcoin's cycles. Most altcoins trade on the elusive flavor of the month. Why? Because finding and exploiting inefficiency is the lifeblood of any "rational" market. This happens in crypto, but is based on order-flow and sentiment which are largely speculative. There are no models to price these assets with real economic data, and thus it becomes very difficult for traders to find and exploit fundamental inefficiencies.

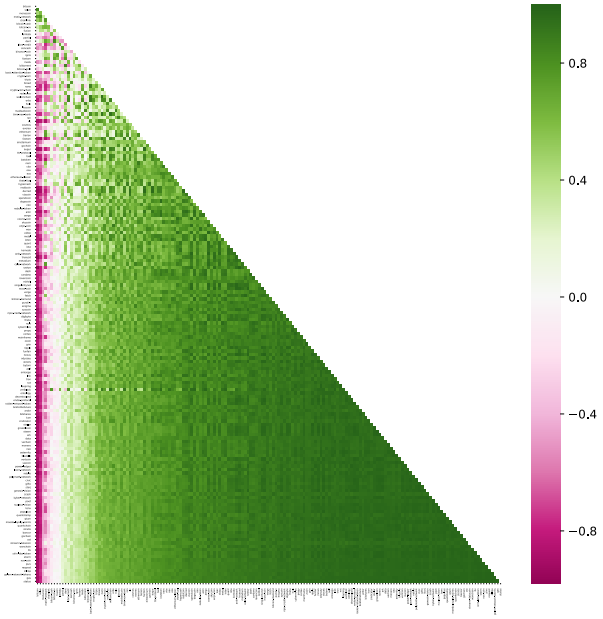


Figure 1: 90 day correlation matrix of 250+ leading cryptocurrencies.

Compare this to the FX markets. Markets trade expectations about real economic variables like interest rates and inflation. There are rules to the game, even if it's very hard to predict the outcome. Inefficiency exists when expectations diverge from reality. However, in the short run, traders will hunt these opportunities down and milk them for every penny, keeping markets efficient. These markets are not perfect but they do a pretty good job at maintaining economic stability.

For years, cryptocurrency investors have discussed theories to model protocol value. For better or for worse, these theories are not reliable in modelling real market dynamics both in the short and long run. While these ideas fuel new narratives, these narratives are ultimately fleeting and don't help the markets price underlying assets efficiently.

This is what makes Algo a fundamentally novel monetary experiment. The Algorand Foundation will distribute 30% of the Algo currency through downside-protected dutch auctions. Auctions inject three billion Algos onto the market over five years, allowing participants to buy Algos and have an option to refund them one year from purchase. The extent of this downside protection depends on the clearing price as per figure 2: Above $1 and buyers can refund their Algos at 90% their cost basis. Below $1 and buyers can refund their Algos at the clearing price minus ten cents ($0.5 if $0.6, $0.3 if $0.4, and so on)[1].

[1] URL: `https://algorand.foundation/algo-auctions/`.

Figure 2: Algorand Foundation refund policy governing the Algo dutch auctions.

One thing is clear about these auctions: They are not simply a naive way to distribute tokens. Algo auctions are the first token distribution where the distribution actually informs current *and* future price discovery. An exercise of financial engineering, these auctions are the first attempt to bootstrap a rational cryptocurrency market; run not by speculative winds, but self-fulfilling economic incentives.

3 The Team And Technology

3.1 A Life's Work

In this article, we mainly focus on Algorand's economic model, but there is an obvious aside to this entire discussion. Economics don't matter without deep conviction in the project. The fate of the Algo auction depends on the market's faith not just in its incentives, but in the project's technical credibility and long term vision. This is why, even in a pure discussion of monetary policy, we will first unpack the project's origin story and technological contributions.

Algorand is the brainchild of Silvio Micali, an Italian computer scientist and MIT cryptographer of over three decades. Silvio won the Turing Award in 2012[2], the highest prize in all of computer science. Among his inventions is the Verifiable Random Function (VRF) in 1999, which is today a cornerstone piece of cryptography for Algorand's competitors like Dfinity. He also co-invented zero-knowledge proofs[3], an important cryptographic primitive in the privacy space.

Silvio invented Algorand as a solution to the Byzantine Generals Problem[4]. This is a challenge facing any distributed system: How does the system achieve consensus in the presence of unknown adversaries? Before Algorand, there were two broad answers, two families of consensus. The first was born in the 1970s and the second in the aftermath of Lehman Brothers collapsing: classical Byzantine Fault Tolerance (BFT) and Nakamoto Consensus (NC).

Each solution solves the Byzantine dilemma, but comes with a tradeoff[5]. BFT algorithms have high throughput, deterministic finality and low latency, but they sacrifice decentralization. NC encourages decentralization, but at the cost of throughput and probabilistic finality. These tradeoffs ultimately imply a "blockchain trilemma", where a blockchain can be fast and secure, but not decentralized; secure and decentralized, but not fast.

Algorand overturns this idea entirely, capturing the best of both worlds through a consensus algorithm marrying properties from both BFT and NC. The protocol is an extremely intuitive application of VRFs:

1. *Through the application of VRFs, 1000 network participants randomly self-select into a subcommittee of nodes to vote on the next block. This is known as "Cryptographic Sortition"*
2. *These selected nodes agree on the next block via Byzantine Agreement, a very fast iteration of classical BFT.*

The idea is simple but the results are groundbreaking. Consensus happens quickly as in BFT algorithms, while the randomised node selection scales validator count to numbers only seen in networks employing NC, such as Bitcoin. The verifiable randomness at the heart of the protocol ensures voters can never be predicted ahead of time. This produces a very powerful result: PoW-like security without the costly arms-race, thus capturing both sides of the distributed systems divide. Algorand thus solves the trilemma and produces a network that has fast finality, high throughput, low latency *and* decentralization. Comparing

[2] URL: `https://amturing.acm.org/award_winners/micali_0557920.cfm`.

[3] URL: `https://en.wikipedia.org/wiki/Zero-knowledge_proof`.

[4] Leslie Lamport, Robert Shostak, and Marshall Pease. *The Byzantine Generals Problem.* SRI International, 1982. URL: `https://people.eecs.berkeley.edu/~luca/cs174/byzantine.pdf`.

[5] Marko Vukolic. *The Quest for Scalable Blockchain Fabric: Proof-of-Work vs. BFT Replication.* IBM Research, 2015. URL: `https://allquantor.at/blockchainbib/pdf/vukolic2015quest.pdf`.

BFT and NC with Algorand, Table 1 illustrates this technological breakthrough[6].

Table 1: Comparison of Classical BFT, Nakamoto Consensus and Algorand.

Parameter	**Classical BFT**	**Nakamoto Consensus**	**Algorand**
Network Setting	Permissioned	Permissionless	Permissionless
Finality	Deterministic (<1m)	Probabilistic (>50m)	Probabilistic (5s)
Scalability (Nodes)	Low (<100)	High (thousands)	High (thousands)
Scalability (Clients)	High (thousands)	High (thousands)	High (thousands)
Performance (Transactions)	High (1000+ TPS)	Low (3-10 TPS)	High (1000+ TPS)
Performance (Latency)	Low	High	Low
Power Consumption	Low	High	Low
Tolerated Adversarial Voting Power	33%	51%	33%
Network Synchrony Assumptions	Synchronous	Asynchronous	Partially synchronous

In the end, this discussion spells out a simple idea about the origins of Algorand. We think of this project not just as a Turing Award winner's life's work, but as the culmination of three decades of research into a very hard computer science problem.

3.2 The Leadership Team

One of the most unique aspects of Algorand is the team's diversity, complementing its computer science origins with economic and commercial expertise. Silvio and his team of scientists are joined by economists who specialize in macroeconomics and exchange rate theory, as well as pragmatic and seasoned executives who have built large technology companies. It sounds too good to be true, but in reality these are the initial ingredients any cryptocurrency needs to have a real shot: technology, economics and business.

The economics team is lead by Chief Economist Pablo Azar, also an academic from MIT. Azar's background is a rare cross-section in both academia as well as crypto: he holds a double PhD in Macroeconomics and Computer Science. His work blends market dynamics, software engineering and monetary systems. Azar's most-cited paper is titled *Momentum, Mean-Reversion and Social Media: Evidence from StockTwits and Twitter*[7], examining the relationship between social media and monetary shocks.

Complementing Pablo's leadership, Algorand has a number of economic advisors specializing in macroeconomics, central banking and institutional finance. One of Algorand's economic advisors is Kenneth Rogoff, a world leading macroeconomist that served as IMF Chief Economist between 2001 and 2003[8]. Rogoff is famed for his highly-cited contributions to exchange rate theory and central bank independence.

[6] Vukolic, *The Quest for Scalable Blockchain Fabric: Proof-of-Work vs. BFT Replication.*

[7] Pablo Azar et al. *Momentum, Mean-Reversion, and Social Media: Evidence from StockTwits and Twitter.* The Journal of Portfolio Management, 2018. URL: `https://jpm.iijournals.com/content/44/7/85`.

[8] URL: `https://www.imf.org/external/np/bio/eng/kr.htm`.

Accompanying Rogoff are several other high-profile economic advisors including Andrew Lo and Joseph Naggar. Lo is a professor at the MIT Sloan School of Business and founder of a Boston-based quant firm called AlphaSimplex Group[9]. He also holds a PhD in Economics from Harvard University and previously served as a Roundtable Member at the New York Fed.

Naggar complements Rogoff and Lo's accolades with a focus on institutional finance. He is a partner at a multi-billion dollar asset management firm called GoldenTree[10]. Naggar is also an MIT alumni who spent over twenty years of his career in fixed income risk management at firms including Merryl Lynch and Morgan Stanley.

Algorand's research roots across both computer science and economics are brought together by a strong commercial team. It is equally impressive, lead by senior technology entrepreneurs with trophies to their name long before blockchain. After announcing its $62m equity round lead by Union Square Ventures[11], Algorand welcomed Steve Kokinos as CEO. Steve was the founder and CEO of Fuze, an enterprise-level cloud communications company backed by venture capital firms like Bessemer Partners[12]. Steve grew the company to over five hundred employees.

Joining Steve to lead Algorand's operating strategy is also Sean Ford[13], COO. Sean is also a seasoned technology executive and has held a long list of C-level operating roles, including as the CMO at LogMeIn, one of the world's top 10 publicly-listed SaaS companies.

[9] URL: https://www.alphasimplex.com.

[10] URL: https://www.goldentree.com.

[11] URL: https://www.businesswire.com/news/home/20181024005053/en/Algorand-Secures-62M-Funding-Announces-Appointment-Executive.

[12] URL: https://www.fuze.com/media-center/Fuze-Announces-Additional-150M-in-Funding-Following-New-5.0-Platform-Launch.

[13] URL: https://venturefizz.com/blog/sean-ford-chief-marketing-officer-logmein-venturefizz-podcast.

4 Algo Market Dynamics

In this section, we unpack the market dynamics behind the auctions, centering our analysis on the financial instrument sitting inside this process. We first unpack one auction in a vacuum and then apply this logic over several. Finally, we analyze the dance between auction buyers and other secondary participants like speculators and relay nodes.

4.1 The Option Within

The downside protection clause is effectively a put option to sell Algos back to the Foundation one year after buying them. It is a carefully crafted economic instrument sitting inside the auction. Having this ability to refund Algos and cap downside risk means the auctions are not just a way to *LONG* Algos, but an avenue for risk management, hedging and market making. In the medium term, these incentives guide price discovery and help secondary markets find the efficient price.

If participant A buys 1,000 Algos at a clearing price of $2, they are now hedged for 90% of their exposure. They have a right to sell 1,000 Algos back to the Foundation at $1.80 in 365 days, no matter what happens to price in the interim. This downside-protection is fungible: participants don't need to refund the "same" Algos. They can trade in and out and claim the refund as long as they have the Algos at the refund date 365 days after auction.

So with all this in mind, what does an auction participant do after they buy these coins? This obviously depends on why they bought them in the first place—the scalping high frequency trader (HFT) might hunt for the low-risk trade, while the downside-sensitive endowment gets crypto exposure without the infamous 85% drawdown. All else equal, whatever the motivation, let's call participant A Bob and think through his incentives after his successful bid:

1. ***Algos rise above his clearing price:*** *If price trades above $2 after Bob's bid, he can either sell his Algos and book in these "low-risk" gains or continue to hold them. If he decides to sell, he still holds the right to the refund at Day 365, but will need to buy back his Algos if he wants to claim it.*
2. ***Algos rise above his clearing price and then fall below his clearing price:*** *If Bob sold at Day 30 at $3 but Algos subsequently trade below $1.80 on Day 300 – say to 90c – Bob is incentivized to re-buy his Algos and exercise his put 65 days later by selling the Algos to the Foundation at $1.80. He conducts a "risk-free" trade. In this world, Bob is now a market maker, with a mental algorithm that guides his decision making. The urge to re-buy Algos grows as he gets closer to Day 365.*
3. ***Algos fall below his clearing price:*** *If Bob never sold his Algos and price falls below $1.80, he can't lose anymore money beyond a 10% drawdown. Since he already revealed his preference for downside-protection as he bid in the auction, Bob is likely to hold.*

To summarise:

1. Bob may or may not sell above $2 depending on his strategy
2. Bob is incentivised to re-buy Algos below $1.80 and this incentive strengthens as we approach Day 365
3. Bob will likely hold if his Algos trade below $1.80.

4.2 Everyone Has Their Price

One way to imagine these auctions is that every participant has their own "base" price, below which they act as holders or as reservation demand with an urge to re-buy. Everyone has their price, and everyone is a liquidity provider. In effect, each auction is a game inviting participants to form their own price floor regardless of subsequent secondary market activity. Each of these auctions creates a layer of buyers with incentives to participate in the Algo markets (either by re-buying or holding) from Day 1 all the way to Day 365.

This is the game played in one auction. So if auctions are ongoing for five years, then you could imagine that the actual auction price floor is each auction's price floor summed cumulatively. As the next auction clears, we add it to the model. Auctions will need to be weighted by the quantity of Algos sold, since an auction which sells more will have more influence over the market price. For simplicity's sake, let's assume that price clears above $1.

$$P_{average} = 90\% \times \frac{A_1P_1 + A_2P_2 + ... + A_nP_n}{A_1 + A_2 + ... + A_n}$$

$$\begin{aligned} \text{where } A_n &= \text{Number of Algos sold in Auction } n \\ P_n &= \text{Clearing price of Algos in Auction } n \\ P_{average} &= \text{Average base price of Algos up until Auction } n \end{aligned}$$

Let's walk through an example. Auction 1 clears 25 million Algos at $4, Auction 2 clears 50 million Algos at $3 and Auction 3 clears 50 million Algos at $3.50. What's the *actual* auction-based price floor market participants will think about when modelling out the three auctions?

$$\begin{aligned} P_{average} &= 90\% \times \frac{(\$4 \times 25M) + (\$3 \times 50M) + (\$3.50 \times 50M)}{25M + 50M + 50M} \\ &= \$3.06 \end{aligned}$$

Assuming the auction price is the market price, the efficient reserve price for Algos is $3.06.

As economists would say, this is *ceteris paribus*; all else equal. Like most things in economics, all else is not equal. We have so far assumed that the only tokens in circulation are auction tokens. We've also assumed that re-buyers face no opportunity cost. These are both more complicated considerations that will play a role in the *actual market price* of Algos.

This all becomes very interesting very quickly when we think about the next piece of the puzzle: the speculators.

4.3 Who Will They Side With?

So the auction buyers play a game, and these games sum over time to theoretically create a floor price on total auctioned tokens. These participants have their own reference prices to determine if Algos are over or underpriced. Everyone is a market maker in the Algo currency universe.

This is where it gets interesting: speculators should now enter the market by trying to piece together this information and beat the auction participants to the front of the line. This is where real liquidity

providers see an opportunity; where expectations begin to churn the wheels of an efficient market and Algos trade more like an FX pair than a smart contract protocol like ETH or EOS.

Firstly, smart traders will be all over this process. If the auctions provide real economic data that tells us about the efficient price of Algo, any deviation is now a trade. You could imagine the market "mispricing" Algos in the same way that USDT markets often lapse away from 1:1 for brief periods. While the market panics and retail traders read article upon article about the coming USDT liquidity crunch, smart money realises the world is likely not ending and takes advantage of the false panic, bidding up all the USDT they can get their hands on below $1.

In an equally interesting way, you could imagine HFTs building economic models to price Algos, creating a timeline of "catalysts" to track refund dates and associated price floors. These models will calculate the rational price of Algos based purely on the math. As the Algos markets mature, so will these models, pricing out inefficiencies and smoothing volatility over time. For instance, since demand should grow leading into Day 365, the closer we get to a refund date, the more likely these models will price in auction participants re-buying, thus driving the markets toward equilibrium.

You can see how this all becomes a self-fulfilling prophecy, thanks to these speculators. The market can find the rational price for Algos regardless of the behavior of actual auction participants. There's even some added reflexivity thrown into the auction participants' incentives; they now have a heightened incentive to pace toward equilibrium, since they face direct competition from speculators who are watching and frontrunning their every move.

4.4 Relay Nodes And Rewards

The above two sections describes how the market prices Algos and forms expectations based purely on auction data. However, this analysis considers these auctions and speculators in a vacuum – the reality is that price discovery will be a dance between the auctions and secondary markets. The latter is informed not just by auctions, but also by Algos entering circulation through relay nodes and rewards. Relay nodes will amount to 2.5 billion Algos vested over two to five years[14], as illustrated in figure 3.

The short answer is that nobody can predict how this will play out. Note that the relay nodes don't have access to the put option which creates the psychological price floor and incentives for liquidity. Will relay node inflation undermine the auction game theory? Or will the auctions provide speculators with firm expectations, especially as the number of auctioned tokens begins to exceed relay tokens in circulation?

The behaviour of relay nodes is harder to predict than the behavior of the auction participants. They have other incentives that we can't model. Some of them might want to hold their Algos for five years; others might want to liquidate them regularly.

Understanding who they are or what they are trying to achieve is practically, for all intents and purposes, impossible. For this reason, it's possible that speculators temper their strategy based on the real world behavior of these participants over time, getting more or less aggressive as they get a feel for how relay nodes are participating in this dance.

[14] URL: `https://algorand.foundation/token-dynamics`.

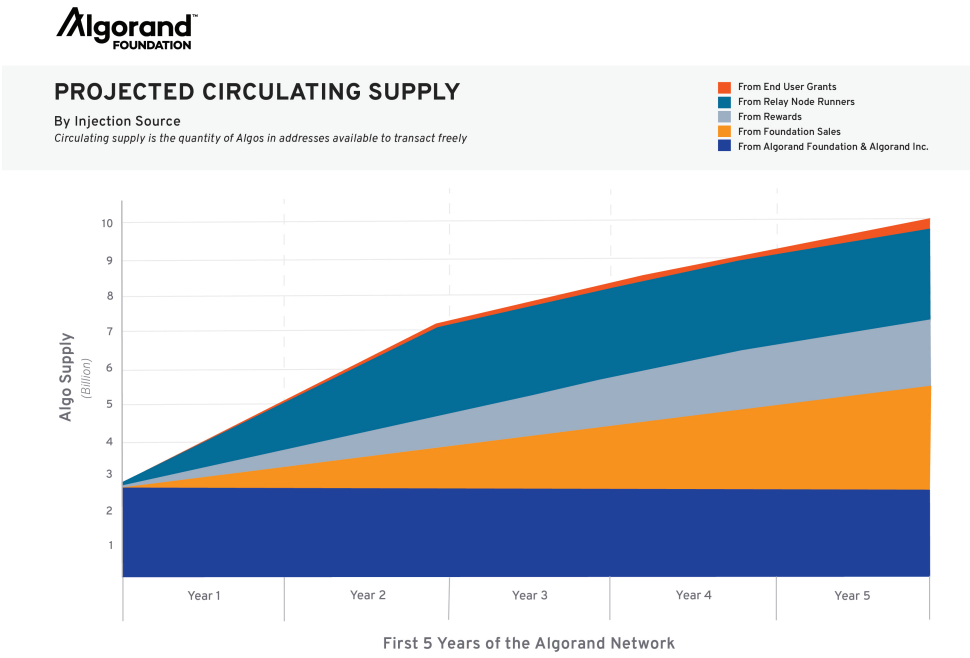


Figure 3: Projected circulating supply of Algos.

5 Algo Auctions Are Monetary Policy Events

Once a month, the Federal Reserve announces changes to interest rate policy. A group of economists called the Federal Open Market Committee (FOMC)[15] decides if they should change interest rates. In anticipation, markets form expectations for easing or tightening; pundits debate if the Fed is hawkish or dovish and traders price-in perceived flow-on effects. This process takes place on a global stage, with dozens of central banks tinkering monetary policy simultaneously and global currency markets responding in kind.

Each Algo dutch auction is a monetary policy catalyst. The economic data revealed in the auctions steers the currency markets. Each auction is like an FOMC meeting, except it isn't run by a closed group of PhDs, but an open network of participants expressing demand for downside-protected Algos.

The Algo put *is* the monetary policy of Algorand; it's the Greenspan put for decentralized money. As Algo markets mature, you could even imagine that the market will price in the next auction's expected clearing price, with speculators betting on future demand based on their view of Algorand's technology, community and perception within the market.

When speculators are optimistic, they anticipate a higher future clearing price. When pessimistic, they anticipate a lower future clearing price. When the auction clears and the real bids roll in, we find out if the market got it right or wrong. Investors are notoriously bad at predicting the Fed's next move – we suspect this won't change, even if the Central Bank is decentralized.

Ultimately, these speculators are betting on Algos just as they would bet on ETH, but this speculation is tied to the protocol's underlying economic policy. There's a way for the market to prove them right or wrong, as the real data comes out.

Algo currency markets are tied to real, regularly-staged monetary catalysts. The market price is an amalgamation of expectations about future clearing prices, the summed price floor determined by cumulative auctions, as well as other sources of supply and demand such as relay nodes and speculators. Over time, as the market matures, this will come together to form a fluid but reliable process to price the Algo currency.

[15] URL: `https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm`.

6 Algo's Killer DAPP: Smoothing Volatility

Algo is not a stablecoin. Especially in the early days, it will likely trade with a lot of volatility, like most cryptocurrencies. However, as the monetary experiment unfolds, the market will finetune the process we described above. Over time, the dance gets cleaner; markets form consensus. They form consensus not on what the price of Algo should be – short term inefficiencies will always exist – but on how the game between the auctions, relay nodes and speculators is played. As speculators better understand this process over time the market will continue to mature.

If the market can find consensus, then Algos will end up trading in a very different way to any other other cryptocurrency. This won't eliminate volatility; but the Algo economic experiment will smooth price swings significantly, in the same way that a free-floating exchange rate[16] helps a national currency absorb economic shocks.

This is where Algo currency markets end up looking more like an FX pair than a protocol token. A national currency like the Australian dollar will always have price swings in both the short and long term. Nonetheless, the AUD's volatility curve is relatively smooth. Market forces know how to price in expectations through tangible economic information. Speculators smooth volatility. Until there's a black swan wiping out the AUD overnight, there are not many days where we wake up to the Aussie down 10% intraday or even intra-month.

Algorand will thus become the first native cryptocurrency, vying for the world's DAPP-building developers just like Ethereum, with a smooth volatility curve. This opens the gates to a whole new world of applications that are otherwise unfeasible.

A calmer ebb and flow could give the Algorand platform an edge over its competitors, whose economies are held back by their wild swings. Algo might look like the CAD while ETH behaves like the PESO, up and down. If these pricing mechanisms work, Algo could also slowly become an uncorrelated asset whose market price is swayed by these internal monetary catalysts, rather than market-wide movements. This is the killer DAPP of Algorand.

[16] URL: http://www.economicsdiscussion.net/international-trade/finance/floating-exchange-rates-advantages-and-disadvantages-currencies/26267.

7 Hedging Downside, Music To Their Ears

These Algo puts also have very interesting implications for cryptocurrency asset management and institutional investment. An asset manager can now gain *LONG* cryptocurrency exposure through Algos, while remaining hedged against infamous cryptocurrency drawdowns.

This might not be so interesting to retail investors or long-only crypto funds, who are more sensitive to the potential opportunity cost of holding Algos. On the other hand, these dutch auctions are music to the ears of large institutional investors who think carefully about risk management and hedging.

If you're a new endowment, hedge fund or family office looking for cryptocurrency exposure—why hold cash when you could *LONG Algo*, getting your bleeding edge exposure, while hedging the downside?

You could imagine that Algos become a staple for portfolio and risk management, particularly as institutional AUM grows. This is the first time a native cryptocurrency is also a native hedging tool. More sophisticated investors will enter the space, viewing the Algo currency as a very convenient way to gain upside exposure to an innovative project while limiting their downside.

8 Faith And Liquidity: What About Life After Auctions?

The beauty of the Algo experiment is that it bootstraps the most difficult currencies for any monetary system: faith and liquidity. Every financial system rests on the faith of its participants and on the liquidity that proves this belief. Whether fiat or Bitcoin, faith is the energy of the system; while liquidity keeps us all alive.

Algorand's economic experiment is designed to bootstrap liquidity in the early days when it's the hardest to build. Marrying token distribution with lessons from FX trading and monetary economics allows Algo markets to bootstrap the most important element for any cryptocurrency's staying power.

But there is one looming question that hangs over this model. What happens when the puts expire? If the puts create the game theory that incentivise self-fulfilling equilibrium, what happens when they disappear?

Monthly auctions mean that expiry occurs on a rolling basis. As old puts expire, new buyers have just entered the market. However at some point, the party stops or it has slowed so much that it actually begins to matter. Eventually, incentives dry up. Does the economic magic come to an end?

This is Algorand's Day 365 problem. It's a very interesting hypothetical that won't have much relevance for the next few years, but the answer is extremely important.

Ultimately, life after "the option within" boils down to network fundamentals. The Algorand team and Foundation will have five years of auctions that will fuel self-fulfilling currency markets. Can they build real economic value in this period? The question is: By the expiry of the final put, is the Algo currency actually a medium of exchange (MoE) and store of value (SoV) beyond a sophisticated network of equilibrium-hunting speculators?

With a vast economy, the downside-protection might matter less than we think. We believe that the long term success of the experiment ultimately depends on the team's ability to onboard real network value. They need to deliver on what they describe as the "borderless economy." By the end of the experiment, what is the real GDP? What applications has this network imagined and how much economic value do they represent?

We are already seeing inklings of this strategy even before the network has launched. Algorand has thus far announced four ecosystem partners. One of them is OTOY[17], an award-winning cloud graphics company planning to launch a high-end GPU rendering service on Algorand. Another publicly known partnership is Syncsort[18], an enterprise-focused Big Data company with over 800 employees. We will be watching closely to see how these partnerships progress over time and how they fit into the broader Algorand ecosystem.

One of the most important metrics to determine currency value after the puts expire is network decentralization. The early days will require economic management, but will the Algo currency and network eventually decouple from the Foundation? It needs to take a life of its own, just as we have seen with Bitcoin.

On the other hand, we might be asking the wrong question. Perhaps there is already a clever monetary solution to this problem. With a world-class team of macroeconomists, we most likely did not think of

[17] URL: https://www.algorand.com/resources/blog/otoy-and-algoranddemocratizing-holographic-computing.
[18] URL: https://www.algorand.com/resources/blog/syncsort-and-algorand-helping-data-driven-enterprises.

Algorand's 365 Day Problem. We will be watching closely to see if the Foundation releases a long term economic roadmap for Algo's monetary policy addressing economic policy after the auctions.

A final point to consider is the Foundation's cash reserve at Day 365. After years of auctions, the Foundation will have a very large cash position on its balance sheet, and thus will have the flexibility to apply new monetary pressures to support Algo markets. The fact that the Foundation is applying strict governance measures over the funds themselves, segregating bank accounts and providing quarterly audits[19], points to this possibility.

What could this evolution of monetary policy look like? One thing is clear: these auctions are not simply designed to build a war-chest. They aren't an EOS-style fundraising machine[20], but a way to enact real economic policy. Thus it would make sense that the reserves play an important role in longer term economic stabilisation. We will be watching closely for the Foundation's official position.

[19] URL: https://algorand.foundation/algo-auctions/.

[20] URL: https://www.cnbc.com/2018/05/31/a-blockchain-start-up-just-raised-4-billion-without-a-live-product.html.

9 Conclusion: A Powerful Promise

Algorand's economic experiment is the first of its kind. Lead by an impressive team of macroeconomists, the Algo auctions are the first token distribution tied to an economic model that incentivizes a rational and equilibrium-seeking market. More analogous to an FX pair than a speculative utility token, the Algo markets will behave in ways that haven't played out in any other cryptocurrency markets.

Yet an experiment of this kind will not work with just any project. These auctions are ultimately a bid to build faith and bootstrap a currency, but the market needs to believe in the underlying technology, vision and values of the project.

The Algo market dynamics could not be better fitted with such a high quality team and technology. Beyond the economics, the Algorand project represents a life's work, both for Silvio Micali as a cryptographer and Turing Award winner, and also for challenges that have plagued distributed systems for over three decades.

We are very excited to watch this experiment unfold and participate in Algorand's economy, and more importantly back a team as smart and creative as this. Moreover, we are excited to see how Algorand's ingenuity inspires new projects to rethink monetary policy and apply new creative macroeconomic ideas to their protocols.