Working Paper:

A Monetary Supernova
A Road Map for a Self-Stabilizing Global Currency:
The Planck
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A Full-Reserve, Decentralized Credit Union Underpinned by Free Market Principles

"Throughout our history no economic problem has been more passionately discussed than the money problem. Probably none has had the distinction of suffering so much from general misunderstanding – suffering from more heat than light. As a result, not only is our monetary system now wholly inadequate and, in fact, unable to fulfill its function; but the few reforms which have been adopted during the past three decades have been patchwork, leaving the basic structure still unsound."

- *Irving Fisher et. al, A Program for Monetary Reform 1939*

Thomas J. Anderson
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www.supernova.org

Abstract

This paper outlines the process for the creation of a democratically operated non-for-profit organization managed by volunteers. The organization's specified mission is creating a market-based, self-stabilizing, neutral currency: the risk-free rate. The society leverages market participants with opposing interests, acting in their own self-interest, to create a mutually beneficial, stable financial ecosystem.

The currency is called the Planck. The framework is a distributed, transparent, open-sourced global credit union. The *Planck is a token-based project that resides on blockchain technology which enables the decentralization, community management, and voting process.*

A by-product of the creation of the platform is the ability to create a market of virtually infinite competing market based currencies, each with underlying economic value and each with limited supply. This competition will improve efficiency for borrowers, lenders, financial safety and stability and the overall market and global supply of quality currencies.

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About the Author

Tom Anderson is the founder, Chairman and CEO of Supernova Technology, a financial technology company that provides an end-to-end, cloud-based financial technology platform which empowers banks to make loans more efficiently to a broader consumer base. Supernova Technology facilitates and automates many of the mission-critical business processes of a bank including origination, servicing, risk monitoring, payment processing, and loan accounting. The company also hosts the industry's leading wealth management lending education platform. Supernova's solutions are utilized by some of the largest banks in the world.

Tom is a *New York Times* bestselling author and nationally renowned financial planning expert. His first book, *The Value of Debt*, was a *New York Times* and *USA Today* bestseller and named the #2 business book of 2013 by *WealthManagement.com*. His other books, *The Value of Debt in Retirement*, and *The Value of Debt in building Wealth* have been featured in the *New York Times*, *USA Today*, *Forbes*, the *Washington Post*, CNBC, Fox Business, and Bloomberg, among multiple additional national and international publications.

Prior to Supernova, Tom worked in investment banking and wealth management for Wells Fargo, Deutsche Bank, Bank of America/ Merrill Lynch and Morgan Stanley. While he was Executive Director of Morgan Stanley Wealth Management, Tom was recognized as one of the top 40 advisors under 40 years old by *On Wall Street Magazine.* Throughout his career he has been named multiple times by *Barron's Magazine* as one of America's Top 1,200 advisors: State by State.

Tom has his M.B.A. from the University of Chicago and a B.S.B.A. from Washington University in St. Louis, where he achieved a double major in finance and international business. During his undergraduate years, Tom studied abroad extensively, participating in programs at the London School of Economics and the Cass Business School at City University London, and he spent a year at ESCP Europe on their Madrid campus. In 2002 he attended the University of Pennsylvania Wharton School of Business, where he obtained the title of Certified Investment Management Analyst, sponsored by the Investment Management Consultants Association (IMCA).

Tom is fluent in Spanish and has lived and worked in Spain and Mexico. His extensive academic studies at some of the top schools in finance and economics, international experiences, and institutional background deliver a unique perspective on global markets and the Future of Money.

Author's Introduction

A supernova is the largest explosion known to mankind and briefly outshines an entire galaxy. It is my opinion we are about to experience a monetary Supernova, a fundamental shift in the common use and understanding of "money".

This working paper is a road map to creating a self-stabilizing global currency: the risk-free rate. Due to its intended consistency, I call it the Planck which is one of the most widely recognized physical constants in the universe. Achieving this vision is a potential path to create the best environment for all people, creating a globally peaceful and prosperous society.

Executive Summary

The paper outlines the process for the creation of an organization that is a democratically operated not-for-profit managed by volunteers with the specified mission of creating a market-based, self-stabilizing, neutral currency: the risk-free rate. The society leverages market participants with opposing interests, acting in their own self-interest, through a perpetual, decentralized, open sourced, mathematically driven, transparent network to create a mutually beneficial stable financial ecosystem. Market participants, acting in their own self-interest, make a market, the organization and ultimately its currency, more efficient.

The organization's purpose is to promote thrift among society by affording an opportunity to accumulate and store savings and create a source of credit for provident or productive purposes. The organization will also be a system, platform and society that optimizes user outcomes, eliminates market inefficiencies, and enables better decision making. Profits made are returned in the form of reduced fees, higher savings rates and potentially an appreciation in the value of currency relative to other forms of currency and money.

Vision: The Future of Money is a Credit Based Society

Bitcoin engendered the creation of blockchain, which created the ability to create an infinite number of items of limited supply. Similarly, the Planck brings the ability to create an infinite number of competing market based currencies.

The creation of a Planck not only changes currency but changes all forms of debt, credit and lending as they are known today via a complete standardization and commoditization of lending. As a result, while the Planck represents a standard, a currency and a potential store of value, its creation actually creates a market of virtually infinite competing market based currencies.

Money always has been and always will be credit or a claim on an asset. In the future, there will be no "money". There will be a separation of the roles money plays with respect to income (earnings) and as an asset, a store of value. It will be a credit-based society or the complete Denationalization of Money, as Hayek foresaw. Each person and entity is a unique issuer of currency. Each currency has infinite sub units, each with its own value, creating ***a world with infinite currencies, with one core constant.***

One Page Understanding: Past, Present Future

There is no longer a gold standard. Governments have the ability to print and borrow virtually infinite sums of money, as witnessed over the past decades. Today, digital currencies are capturing the headlines, with bitcoin receiving much of the attention.

There are two types of digital currencies: coins and tokens. Coins are generally distinguished by their defined quantity which is typically made possible via blockchain technology. Bitcoin, for example, has a defined number of 21 million units. A potential concern with bitcoin is that it has no economic value, other than the value that people ascribe to it. There is no intrinsic value. It is simply a unit of limited supply, which is why it is valuable.

Ethereum is a platform inspired by bitcoin and its underlying technology, blockchain. A movement toward "blockchain 2.0", ethereum enables smart contracts or applications that run exactly as programmed without any chance of fraud, censorship or third-party interference.

The Planck is a token-based project that builds on these foundations. Like other token-based currencies, it resides on blockchain technology. The tokens enable votes and rights to different constituents. These constituents are encouraged to pursue their own self-interest and to conspire together and against other constituents to create desired outcomes. This push-pull may sound jarring, but it intentionally creates tension. This tension creates balance. Bad conspiracies are constitutionally governed with guard rails, enforced via the blockchain.

The balance it strives to create is zero: the risk-free rate. While this may not sound like a big deal or an ambitious goal, it doesn't exist today. A risk-free holding preserves purchasing power over time, otherwise it would not be risk-free. For example, people in the United States used to be able to by a car for $3,000 or a house for $50,000. Today those numbers have increased 10x. Holding a dollar was not risk-free.

The way we conceptualize "money" is typically categorized into earnings, i.e. income from a job, and a store of value, like cash or money in the bank, so that one can purchase goods and services. The Planck creates a decentralized platform that separates these two roles: income and store of value. Its focus is to be a store of value and medium of exchange.

Income does not necessarily change, for example the means by which one is paid. Today one can be paid in dollars, yen, or any other currency. One can choose to hold this income in-kind or they could convert their earnings to any other currency. Typically, one keeps a portion (or majority) of their earnings in the currency in which they earn to facilitate day to day consumption but this does not have to be the case. They could convert it to another currency as a store of value and convert it back when they desire to save or consume. This process can, and does, take place take less than a second.

The most remarkable feature of the Planck is that through its creation, the platform creates a blockchain of virtually infinite competing currencies and stores of value, each with underlying value and each with limited supply. Some are likely to be "better", some likely to be "worse" (relative terms that depend on perspective), with the Planck as the constant in the middle.

The Planck can provide society a stable reference point and can create many competing stores of value. Society will benefit through stability, transparency, more and better options for saving money (at higher rates) and more and better options for borrowing money (at lower rates).

Background

"All money is a matter of belief."

-Adam Smith

Unlimited supply and no economic value has generally been proven to be lacking in societal value as a form of money. For thousands of years society centered on money of limited supply, such as bartering and commodity money, primarily a gold standard. We then moved to full-faith and credit currencies or an unlimited supply of money backed by government's ability to repay it with future taxation. The value that is derived or perceived from these currencies is primarily tied to beliefs related to the underlying economic value of the issuer of the currency.

Bitcoin brought us blockchain. The blockchain technology brings with it the ability for the world to create items of limited supply. We are now witnessing the creation of a virtually infinite number of currencies based not on economic value, but on the fact that they are in limited supply.

If the world can create an infinite number of items with limited supply, then limited supply by itself is no longer valuable. Similarly, if those with economic value have unlimited supply, they too are worthless in the long run. The goal for society is to have both limited supply and economic value: this is the objective of the Planck, a new global currency.

How It Works

"It is technically possible to control the quantity of any kind of token money so that its value will behave in a desired manner, and that it will for this reason retain its acceptability and its value."
-F. A. Hayek, The Denationalization of Money

The problem in this world is to avoid concentration of power - we must have a dispersion of power.
-Milton Friedman, Big Business, Big Government

Credit unions are "Not-for-profit organizations that exist to serve their members. Like banks, credit unions accept deposits, make loans and provide a wide array of other financial services. But as member-owned and cooperative institutions, credit unions provide a safe place to save and borrow at reasonable rates."[i]

As the society's framework is a global decentralized credit union, understanding the mechanics and differences will be important. There are a total of five different constituents, each represented by a unique token. Each token has different role, purpose and feature. There are:

- Lenders ("L")
- Borrowers ("B")
- Founders ("F")
- Debt Holders ("D") and
- An Administrator ("A").

Each has a different role and responsibility in the organization.

Borrowers are those who borrow money through the system. Their primary goal is to get the lowest rate. They have other goals such as platform stability and sustainability, however since they receive funds, it is of little importance to them if the organization succeeds or fails. More importantly, they would want the minimum infrastructure, minimum process and minimum risk to them as individuals. At one extreme, if credit is extended and the organization fails, they could benefit by having a windfall: relief from their

debt, or the equivalent to free money. Their best outcome would be receiving the largest loan imaginable, at the lowest rate conceivable, and a systemic default that results in forgiveness of that loan.

Lenders are those who extend credit through the system. Their primary goal is safety and stability which is measured by a return of their capital. Their second goal is a return on their capital. At the aforementioned extreme, they would like all of their money back instantly, on demand, at the highest rate imaginable.

Founders are those responsible for the creation, operation and long-term sustainability of the platform and organization. While there are material differences that will later be discussed, for now they can be thought of as equity holders. As equity holders, their goal would be to have the most users, to charge the highest rate possible and to operate at the highest margin possible. At the aforementioned extreme, and in the for-profit world, they would want a monopoly on the global extension and servicing of credit. They would then leverage this position to charge the highest rates and capture an outsized profit. In order to maximize the value of their equity they would take on the most debt possible. Taking on the most debt possible would entail a capital structure combined of senior, subordinated and preferred capital, and lead to the highest return on equity.

The Administrator oversees the creation, operation and long-term sustainability of the platform and organization. Their incentive is directly aligned with the Founders. Their primary role is to maximize the long-term sustainability, number of users, speed to market, adoption, sales, marketing and distribution. They also reduce, mitigate and ideally eliminate "the Dao effect" where a series of rules can be exploited in its early stages by a community. Initially many actions are centralized with the administrator, while remaining transparent. Long-term, the role of the Administrator diminishes to that of being on par with any other founder. This process is triggered by a combination of size, scale, and time.

Debt Holders are those that are seeking a safe store of value. Like holders of checking accounts and physical cash and currency around the world (M1 money supply), they desire one thing: protection of purchasing power, which includes protection on the ability to transact, liquidity and the ability to quickly and easily convert currency.

Lenders', Borrowers' and Debt Holders' tokens are coded to platform utilization and may not be exchanged, traded, purchased or sold, similar to a citizen's right to vote. Founder tokens may be freely traded but voting rights are subject to certain lock up provisions that reset upon exchange and mature over time. Administrator tokens may not be traded except as specifically outlined in the constitution and are subject to lock up provisions.

Assumptions

> *"A money deliberately controlled in supply by an agency whose self-interest forced it to satisfy the wishes of the users might be the best."*
>
> *- F. A. Hayek, The Denationalization of Money*

Important initial assumptions that will later be tested and explained:

- Token holders act 100% in their own self-interest;
- Token holders are encouraged to conspire together within and across branches to create outcomes that are of mutual interest, i.e. Lenders and Borrowers conspiring together against the interests of Founders, or Founders and debt holders conspiring against Borrowers and Lenders;
- Token interests across Lenders and Borrowers are netted against each other and votes occur in one branch or the other;
- Founders vote in their branch and in their respective net position, if any;

- It is a competitive market and Lenders, Borrowers, Founders and Debt Holders all have options outside the platform; the administrator does not have other options and their outcome is win / lose;
- Votes are distributed 50% based on count or number of users, and 50% size or participation in the system;
- Votes are factored on a weighted average basis of length of time of participation and re-set upon transfer;
- Upon sale, transfer or an exit from the system, one no longer maintains a vote.

These assumptions create a series of natural opposing forces. These forces need to be looked at in isolation and then collectively. For example, all things equal, Lenders would like the lowest servicing rate, Borrowers would like the lowest servicing rate, and Founders would like the highest servicing rate. Therefore, Borrowers and Lenders should conspire together to push down servicing rates to the lowest level, ideally zero. However, all things are not equal. Like nature, many forces have a counter force. Lenders want the highest quality service, measured in terms of defaults and/or recovery. This force counteracts their desire for the lowest cost.

The market is a powerful competitive counter force. For example, Lenders and Founders could conspire against Borrowers to set the highest rates. This would enable both to have an outsized economic return. However, since the matter is lending, Borrowers are only interested in rate, not quality, and would leave the system for an alternate solution.

The list is extensive but Figure 1: Examples of Conspiracies provides some examples of parties working together against the interest of another. It is important to also think about these interests over time (short, medium and perpetual). Further, constituents may have conflicting objectives (maximum price and maximum users) which requires prioritization. Other conflicts arise for token holders from cross holdings, for example, one is a Borrower and a Founder. This prioritization may also change over time. Accordingly, the following is a simple example but there are a number of creates nuanced issues which are discussed later in the paper.

Figure 1: Examples of Conspiracies

	Constituent Desire				
Issue	**Lenders**	**Borrowers**	**Founders**	**Debt holders**	**Administrator**
Servicing rates	Lowest	Lowest	Highest	Highest	Highest
Servicing quality	Highest	Lowest	Lowest	Highest	Neutral / high
Lending rates	Highest	Lowest	Highest	Highest	Lowest
Currency value	Lowest	Lowest	Highest	Highest	Highest
Alternatives	Highest	Highest	Lowest	Highest	Lowest

Mutually Beneficial Conspiracies

In some areas, the group conspires to the same desired outcome. For example, all three groups have the incentive to have the lowest costs. This would be an example of a mutually beneficial conspiracy, working together for a good outcome for all.

Another good outcome would be that all groups desire the maximum number of users. Independently, a few bad actors could desire to collude to control outcomes, but in aggregate, if there were an infinite amount of Borrowers and an infinite amount of Lenders than Borrowers and Lenders would have

infinite choice and Founders would have infinite opportunity. Therefore, all things equal, all parties would prefer to have the highest number of participants on the platform. Figure 2: Examples of Mutually Beneficial Conspiracies illustrates these incentives.

Figure 2: Examples of Mutually Beneficial Conspiracies

	Constituent Desire				
Issue	**Lenders**	**Borrowers**	**Currency**	**Debt holders**	**Administrator**
Costs	Lowest	Lowest	Lowest	Lowest	Lowest
Number of platform users	Highest	Highest	Highest	Highest	Highest

Bad Incentives and Bad Conspiracies

However, there could be bad incentives and bad conspiracies. For example, agents acting on behalf of Founders or the Administrator could have incentives to shirk or misappropriate funds. They could also have incentives to overstate or inflate costs. Borrowers and Lenders can be incentivized to overstate or inflate their alternative options in the market. Arguably all parties have a high incentive to lie.

Another example of bad incentives is leverage. As a part of their desire to have the absolute lowest cost, borrowers, lenders and currency could all have the desire to apply the maximum leverage to the organization. This would mean borrowing as much money as possible. Figure 3: Examples of Potentially Destructive Conspiracies illustrates bad potential incentives.

Figure 3: Examples of Potentially Destructive Conspiracies

	Constituent Desire			
Issue	**Lenders**	**Borrowers**	**Currency**	**Administrator**
Incentive to lie	Highest	Highest	Highest	Highest
Unconstrained leverage	Highest	Highest	Highest	Highest

Platform Accounting

The relationship between equity and debt is another natural opposing force, as are the forces between retained earnings and contributed capital. For corporations accounting is stated: assets minus liabilities equals equity value. But what is the value of the United States, The United Nations, The Red Cross or a virtual platform? Not-for profits may state their balance sheet as follows: Assets minus Liabilities equals net assets. These can be comprised of retained earnings, member contributions, donations, but in the end, it is all a part of net assets. While these are represented in the tensions above, it is important to highlight these tensions to understand the long-term equilibrium.

Nuanced and Incomplete

There are nuances to these issues. For example, unconstrained leverage could be of extreme importance to lenders or of no importance whatsoever. If lenders feel that the servicing rights would be passed on to the creditors and maintained to the same standard, they may be perfectly indifferent to leverage. On the other hand, they may oppose leverage if they do not feel they would have a continuity of service.

Further, these lists are examples and in no way extensive. The point is that there are three primary forces: Natural Opposing, Mutually Beneficial, and Potentially Destructive. The goal is to maximize the "good" forces and constitutionally constrain the "bad" forces.

The Role of Democracy, Constitutional Process, Amendments and Evolution

Democracy, operating in its own self-interest, will overcome gamesmanship, technological and legal barriers that will arise, in many combinations and permutations, over the short, medium and perpetual time horizons. This is a key competitive advantage as without the construct of a perpetual democracy, alternate cryptocurrencies may have the risk of being dependent and contingent on near term technologies and near tern economic phenomena.

Constitutional Constraints

No long-term borrowings

All borrowing must be short term. With long-term borrowings, there are restrictions to prevent arbitrage or bad incentives across the capital structure. For example, if a consumer borrows money on a 30-year mortgage and then quits their job, and don't get another one, the bank is in a bad position. If one has a short-term loan they have an incentive to always be working. The consequence is that no credit may be extended until short term creditors demands and needs are satisfied. The incentive of short term credit is that it incentivizes the organization to make conservative near term decisions, which in turn create conservative long-term decisions.

There cannot be different classes of debt. All borrowings must be in the same class.

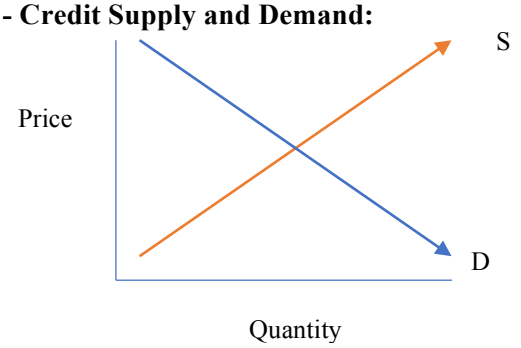
Similarly, if there are different classes of debt, there are different incentives in the insolvency of an organization. Different classes can create different incentives with respect to risk, return and desired outcomes. It is a "full faith and credit" obligation, much like the majority of obligations from organizations like the United States.

Mandated Borrowing

- The organization cannot pay interest;
- If the organization can borrow money it must borrow money, up to a level where its borrowing cost is zero or no negative interest rates.

Picture a traditional supply and demand chart for borrowing, such as Figure 4 - Credit Supply and Demand, which illustrates that from a lender's perspective, higher the rate, the greater the quantity supplied. From the borrower's perspective the higher the rate, the lower the quantity demanded.

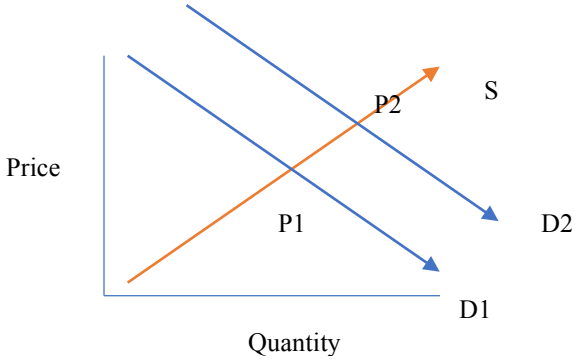
Figure 4 - Credit Supply and Demand:



By constraining or fixing the price, the market may not clear. For example, if the price is set at zero, there is a chance that there is no level of credit that the market is willing to extend to the entity, or zero quantity supplied. Put another way, due to the constraint of zero percent interest rates or price, there is a possibility that the organization will not have debt. With constraints that the only money one was able to borrow had an interest rate of zero, chances are the amount one could borrow would be near zero or a nominal sum, like a dollar from a friend for a soda.

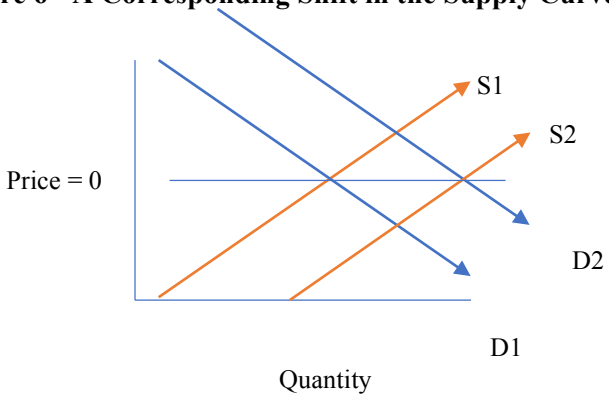
What about the other side? Imagine the market is clearing, the organization is perceived to be safe, and that there is a shock in the global supply of safe assets, a scarcity, that leads to an increase in demand for safe assets (a shift in the demand curve). Figure 5 - A Shift in the Demand Curve of Credit illustrates this shift.

Figure 5 - A Shift in the Demand Curve of Credit



All things equal a shift in the demand curve would lead to an increase in the equilibrium price. However, the organization is required to borrow. Accordingly, the organization must increase the supply to match the shift in demand. This leads to a shift in the quantity supplied as illustrated in Figure 6 - A Corresponding Shift in the Supply Curve of Credit.

Figure 6 - A Corresponding Shift in the Supply Curve of Credit



By holding these constraints, price stays constant at zero but supply shifts, or expands. The same is true in reverse. A small shift in demand leads to a dramatic shift in supply. Note that as a result of this policy this can create no swings in price and wide swings in quantity. The severity of this swing is important to understand in relation to short term volatility and the long-term equilibrium.

A Flat Supply Curve of Credit

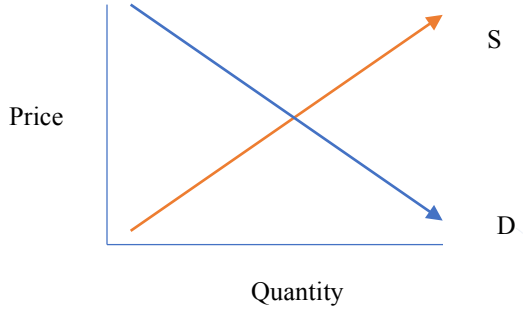
Another way to look at this is that the supply curve is flat. The organization is willing to supply between zero and an infinite amount of credit at zero percent and is constrained from borrowing below zero percent. The organization must borrow up to a point where their weighted average cost (which is their total cost since it is all one class) is equal to zero.

Quantity of Founders' Stake

If Founders tokens are thought of as equity of the organization, an asset with infinite supply, we can say that the higher the price, the more that the organization is willing to supply. Inversely, the higher the price, the lower the demand from investors. This is illustrated in Figure 7 - Supply and Demand of

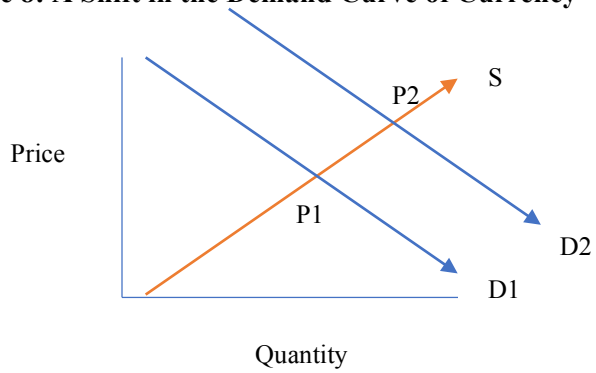
"Equity" / Founders' Tokens. Again, we will decidedly see why Founder's position is not equity, however it is helpful to frame supply and demand and an understanding of the long-term equilibrium.

Figure 7 - Supply and Demand of "Equity"/ Founders' Tokens



Imagine that due to a shift in the belief of the quality of the asset there is a shift in aggregate demand. In this case, equity holders may choose to issue more equity, to increase quantity supplied. Figure 8: A Shift in the Demand Curve of Currency illustrates this movement.

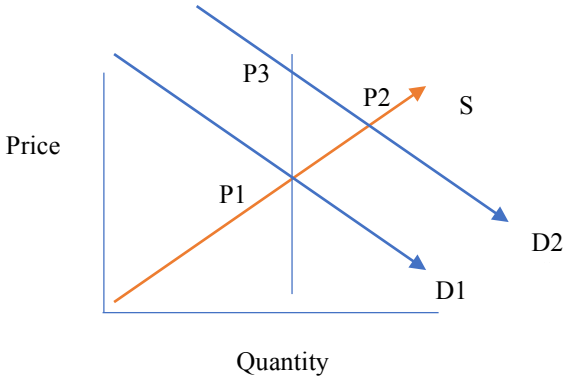
Figure 8: A Shift in the Demand Curve of Currency



This happens, for example, with gold. If there is an increase in demand, or a shift of the curve, miners have more incentive to mine. This phenomenon also occurs in the digital world with Bitcoin. As the price of Bitcoin increases, miners direct more resources to creating more coins, until they hit the end state, a defined 21 million bitcoins.

Through smart contracts the organization can create a finite supply upon launch. By constraining supply, price moves more dramatically. As Figure 9 - Impact on Price with Quantity Constrained illustrates that while price should move from P1 to P2, it increases to P3.

Figure 9: Impact on Price with Quantity Constrained



This scenario is advantageous to the Founders. However, because the quantity is fixed, the opposite is true as well. A small shift in the demand curve leads to a big downward correction in price, for example from P3 to P1.

Retained Earnings

There is an additional constraint that occurs by fixing quantity. The primary source of growth has to be from retained earnings which means that the organization has to make decisions to profitably grow earnings. Optimization includes reinvestment to retain users and investment to grow the number of users. Borrowers, Lenders and Founders and the Administrator all are equally incentivized to make sure that the organization makes wise spending and investment decisions and that the organization retains a proper amount of liquidity and reserves.

Long Run Equilibrium

> *"We know today that it is possible to control the quantity of a currency so as to prevent significant fluctuations in its purchasing power."*
>
> *- F. A. Hayek, The Denationalization of Money*

The long run stable equilibrium of the organization is that the expected return on Founder's tokens and Debt tokens is zero. They converge to collectively form the risk-free rate.

According to the Capital Asset Pricing Model[ii]:

$$E(r) = rfr + \beta \times MRP + \alpha$$

E(r) = required return on security
rfr = risk-free rate
β = systematic risk or the sensitivity of the expected excess asset returns to the expected excess market returns
MRP = market or equity risk premium
α = asset-specific risk factors

At equilibrium the risk free rate is zero (it is the debt of the organization), asset specific risk factors are zero, and Beta is zero, there is no systemic risk. Accordingly, the equilibrium Capital Asset Pricing Model expected return on the security is zero. This can be expressed mathematically as: $\beta i = \sigma i\text{M} / \sigma\text{MM}$; $\sigma i\text{M} = \text{cov}\{Ri, R\text{M}\}$; and $\sigma\text{MM} = \text{var}\{R\text{M}\}$, since the covariance is zero the numerator is zero and therefore

Beta is zero. This is because at equilibrium, if there was a change in market forces, there would be an offsetting change in the quantity supplied of credit, holding the covariance constant (at zero) and holding the expected return constant (also at zero).

Understanding Achieving Equilibrium

There can be no debt, particularly zero percent debt, until there are assets or certainty of income. Therefore, on day 0, assets = 0, liabilities equal zero. On day 1 through infinity, assets, including those related to future income, must be greater than liabilities. Therefore, the organization then needs to start out with assets.

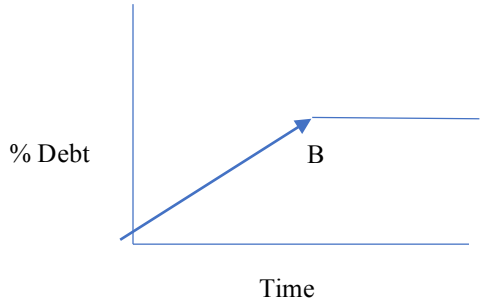
Assets – Liabilities = Net Assets. This is illustrated another way in Figure 10: Liabilities + Net Assets = Total Assets.

Figure 10: Liabilities + Net Assets = Total Assets.

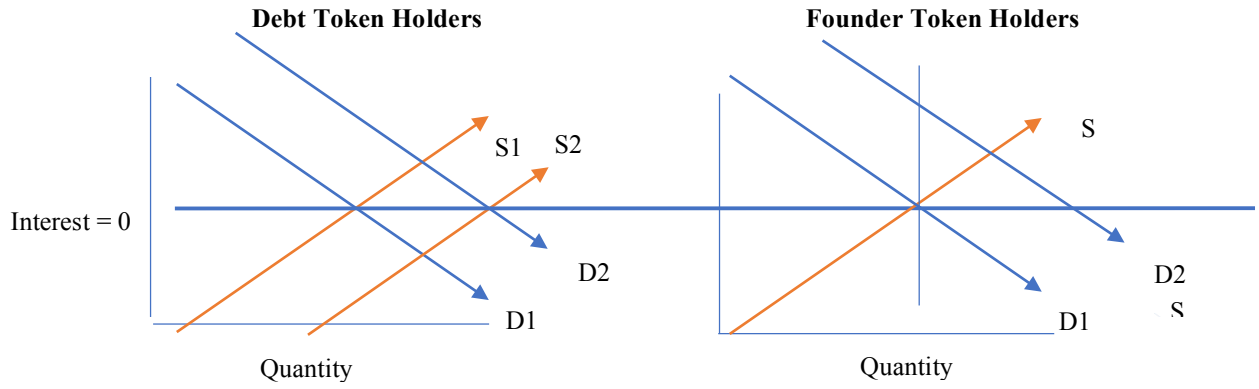
<table>
<tr><td rowspan="2">Total Assets</td><td>Liabilities</td></tr>
<tr><td>Net Assets</td></tr>
</table>

In the long run, it would be optimal for the entity would be to have infinite funding at zero percent. However, no rational creditor would be willing to provide these terms. Therefore, the token holders must conspire together to obtain the maximum possible at 0%. They are incentivized to create an organization with maximum political and economic certainty. Initially, this certainty is low. As time progresses, confidence in economic and political stability increases, there is, overall, more certainty, the entity will issue more debt. This debt, always at zero percent, will continue to grow as a percentage of assets, until it hits an equilibrium point or the point at which the market is no longer willing to extend credit at zero percent. This is the balance point, B.

Figure 11: Debt as a Percentage of Assets



Balance point "B" is not static. The percentage can, will and is likely to change over time, and more so initially, less so as time progresses. Think of a body of water, where there are waves at the surface. The larger and deeper the body of water, however, the smaller the percentage change at the surface is as a percentage of the overall depth.



Composition of Assets

The composition of assets is likely to change over time. Initially the composition is likely to primarily be tangible assets, technology and liquidity related. Long term, the composition is likely to primarily be intangible assets, such as the value of servicing the underlying portfolio.

In the United States, people primarily value to the full faith and credit due to the ability of the government to tax its people and its corporations, not due to the value of underlying tangible assets. Generally, with respect to currency there is little value to "tangible assets" of a government, or at least less so than the value of the intangibles which are largely tied to the political economic stability and growth of the country. The same principal applies here. While there can be tangible assets, the long-term value is much more associated with the servicing rights of the underlying loans. This can be thought of as the ability to "tax" users of the platform.

Balance, Money Supply & the K-Percent Rule

> *Inflation is always and everywhere a monetary phenomenon in the sense that it is and can be produced only by a more rapid increase in the quantity of money than in output. … A steady rate of monetary growth at a moderate level can provide a framework under which a country can have little inflation and much growth. It will not produce perfect stability; it will not produce heaven on earth; but it can make an important contribution to a stable economic society.*
>
> *-Milton Friedman, The Counter-Revolution in Monetary Theory (1970)*

The federal reserve has two mandates: maximum employment and price stability. These forces are many times at odds with each other. While there are sometimes they may be aligned, there are other times that they are counter forces which could require different policy responses. The organization only has one objective: price stability.

Additionally, a country's monetary policy traditionally has incentive conflicts with respect to currency appreciation and the impact on importers and exporters. For example, a strong currency can be detrimental to exporters but beneficial to importers. A weak currency can benefit exporters and serve as a detriment to importers. The organization has no conflict with respect to a balance of payments. There are no disadvantages to price stability and currency appreciation.

So, what governs the money supply? In the previous example, the Founder tokens represent the floor of the ocean. The balance point, triggered by the issuance of debt up to zero percent, is the surface level of the water. If the economy or the economic value of the platform grows at a consistent and steady state, one would anticipate the supply of credit to grow at a similar consistent steady state. However, if there are concerns with the future prospects of the economy or the economic value of the platform, the supply would naturally correct and/or reduce.

The traditional objections to Milton Friedman's K-Percent rule is that as initially proposed it may have led to arbitrary expansions of the money supply. The benefit of the organization is that money supply is directly correlated to the underlying GDP or the economic value of the platform, and a function of demand. Importantly, one would expect a negative correlation with demand. In times of global economic expansion, a rate of return of zero is likely to be less attractive than the perceived risk/return trade off of alternatives. In times of global economic contractions, as a store of value with a mandate more conservative than any government, corporation or individual today, it is likely that demand would rise for safe assets. It is important to think of this self-correction process in phases. In the short term one would anticipate high levels of volatility and at scale, and in the long term, less volatility.

Mechanism For a Reduction in the Supply of Credit

Since credit is extended short term, no additional Debt tokens may be extended if the price is above zero, as the firm cannot pay above zero. Should there be a sudden drop in the demand for Debt tokens, their votes trump those of Founder's and they may remedy redemption of tokens via multiple methods including a redemption of assets or a diversion or claim on future income.

Impact of Zero Expected Return on the Expected Value of the Currency

Using traditional models, the long term expected value of the currency ranges between zero and infinity. It depends on which model is used and where "zero" is inserted into formulas. This framework likely is not helpful. Traditionally the long-term qualities of a valuable currency are economic and political stability, growth, low inflation and high interest rates. Blockchain technology and tokens create political and economic stability, and the organization has a high potential for growth and is designed for low inflation. This gate on leverage and zero-bound on interest rates is both a hindrance and a support to traditional fundamentals of currency valuation.

The platform is likely to roll out in phases and accordingly valuation should also be approached in phases.

Phase 1

At the beginning, there are no Borrowers, no Lenders and no Debt Holders. There are only Founders and the Administrator. These parties must believe there is long term value to the creation of the risk-free rate. It is possible that the platform could be founded through governments. It is also possible that it could be funded from private donations. This is not inconceivable, it happens for example in healthcare, but unlikely and lengthy. If Founders believe in the potential appreciation of the currency, they are the most likely to fund the project.

Phase 2

Once the organization can break even, future funds can enable it to reinvest. Imagine a future state where the organization facilitates the origination and servicing of $500 billion in credit. This would imply the entity would be somewhere in size between the top 100 banks in the world today. Large, but reasonable. Imagine the servicing fees are 20 bps, the organization would have $1 billion in annual recurring revenue.

At this level the organization is able to:

- Cover direct expenses;
- Invest in research in development;
- Invest in sales marketing and distribution;
- Cover general and administrative expenses;
- Have a healthy level of retained earnings;
- Borrow some level of money.

As a result, the value of the currency would likely be greater than zero and less than infinity. As the organization grows, the value of the currency would continue to grow.

Phase 3

As the platform scales, the marginal costs will continue to fall. Similar to the process witnessed with fee compression in Exchange Traded Funds, one can imagine prices falling from 75bps (0.75%) to 50 bps (0.50%)to 25 bps (0.25%) to 5 bps (0.05%). Theoretically, at the outer bound the platform fees can fall to zero with activity based fees covering marginal costs, if any. At this level, the platform has a size, scale and scope where it would not actually need to tax users, but because it retains the ability to do so, credit is extended and it maintains its role as the risk-free rate.

Understanding the Platform Value Proposition

> *The term money has two very different meanings in popular discourse. We often speak of someone "making money," when we really mean that he or she is receiving an income. We do not mean that he or she has a printing press in the basement churning out greenbacked pieces of paper. In this use, money is a synonym for income or receipts; it refers to a flow, to income or receipts per week or per year. We also speak of someone's having money in his or her pocket or in a safe-deposit box or on deposit at a bank. In that use, money refers to an asset, a component of one's total wealth. Put differently, the first use refers to an item on a profit-and-loss statement, the second to an item on a balance sheet*
>
> *-Milton Friedman, The Mystery of Money*

In order to exist or compete, the platform must attract users. In the matter of borrowing, consumers are highly price elastic. If a consumer seeks a loan, what matters is the best price. A strategy of offering car loans, home loans, boat loans etc. is unlikely to credibly gain market share, nor is it likely to leverage the power of a decentralized platform and blockchain technology.

In "The Case for Flexible Exchange Rates," economist Milton Friedman said, "Isn't it absurd to change the clock in summer when exactly the same result could be achieved by having each individual change his habits? All that is required is that everyone decide to come to his office an hour earlier, have lunch an hour earlier, etc. But obviously it is much simpler to change the clock that guides all than to have each individual separately change his pattern of reaction to the clock, even though all want to do so. The situation is exactly the same in the exchange market. It is far simpler to allow one price to change, namely, the price of foreign exchange, than to rely upon changes in the multitude of prices that together constitute the internal price structure."[iii] Foreign exchange markets changed the financial system's clock. One lever, instead of many, enables billions of people to instantly convert their purchasing power to any market on earth.

The lever for change is changing leverage. Today consumer debt is atomistic. When one wants to buy a home; they get a home loan. When they want to buy a car; they get a car loan. When they want to invest in a restaurant, they get a small business loan. The commoditization of lending is the world transparently transacting in a full reserve system at the risk level, not the loan level.

The platform approach is to deconstruct the extension of credit to its core, separating the roles of origination and servicing from funding. It must segment funding into tranches to achieve the lowest possible cost. The decentralization and commoditization of the creation of credit becomes the basis of currency: one facility, infinitely broken down into units of risk, dynamically market priced and sold to the market.

This process operates much the same way as a grain elevator. The grain elevator sorts and stores grains of various qualities and makes the market more efficient for the small farmer and the institutional gain buyer. Borrowers create a good, credit, of various levels of quality. These goods are sorted by quality, bundled and positioned in bulk. Today there is no efficient way for a small producer of a high-quality market to distribute it to the market. Similarly, for those who want to purchase a certain quality, there is no effective way for them to operate at scale, in bulk. The platform can sort, group and sell risk, fulfilling the needs of both parties.

Utilizing blockchain technology, all assets, income and liabilities are cataloged to an individual. These are the inputs. The individual or entity is either a Borrower or Lender, not both. These inputs combine with the individual or entity objectives and drives outputs.

"Income" does not necessarily change (for example how one is paid). Today one can be paid in dollars, yen, euro, etc. One can choose to hold this income in kind or one could convert their earnings to any other currency. Typically, one keeps a portion in the currency in which they earn to facilitate day to day consumption, but this does not have to be the case. One could convert it to another currency as a store of value and convert it back when they desire to save or consume. This process can take place in milliseconds. What does change is the "asset" component of money, or the balance sheet component.

Borrowers, by definition, require capital, a loan. Rather than the extension of many loans, borrowers receive a single loan. Borrowers produce a good of a certain quality, as some level of borrowing has less risk than others. For example, it is less risky to lend $1 than to lend $1 million. A borrowers' need for credit is sorted by quality and priced into infinite categories of risk and sold to the market in ascending order, lowest cost to highest cost. The result is transparent information, risk and pricing to all parties (Borrowers and Lenders) and as a result, always offers the lowest price to borrowers and the highest price to lenders.

Economic Theory

1.) Market participants, acting in their own self-interest, make a market more efficient;[iv]
2.) Investors are risk averse;[v]
3.) Markets reflect all available information;[vi]
4.) One can borrow and lend at the risk-free rate;[vii]
5.) Investors hold cash for investment and transaction reasons;[viii]
6.) One should be a Borrower or a Lender, not both;[ix]
7.) The relevance of capital structure is a function of exogenous events to the firm and a function of need for the individual;[x]
8.) It is far simpler to allow one price to change, namely, the price of foreign exchange, than to rely upon changes in the multitude of prices that together constitute the internal price structure;[xi]
9.) There can be a complete free market in the production, distribution and management of money.[xii]

Proofs

1.) Assets are assets: a store of value with a price;
2.) Money is a medium of exchange, yet there is no binding constraint on the potential number of currencies: it is infinite;
3.) The creator of a liability (a borrower) receives assets (money) from the purchaser (lender);
4.) The purchaser of a liability (lender) is the holder of an asset;

5.) Liabilities constitute risk to the entity that created the liability;
6.) Units of risk can be infinitely broken down into smaller and smaller units;
7.) These units can be independently valued by the market;
8.) Units with common characteristics can be aggregated and sold in bulk;
9.) Credit is money and money is credit.

Construct: The separation and creation of pure credit (money) and pure assets

The Borrower (Entity or Individual) with:

- Assets of A;
- Income of B (current and potential);
- Obligations of C (current and potential);
- Market determined credit capacity of Z .

The credit capacity ranges from negative to infinity. Negative credit capacity and infinite capacity are both corrected by market forces until an equilibrium whole positive number of Available Credit Capacity is created "Z_a".

Z_a is broken into infinite individual units with individual characteristics of risk and return. These units are Dutch auctioned, as individual units, with the lowest price being the winner. Prices are not aggregated across units and therefore when assessing Z_a, pricing is cumulative to the borrower.

When a Borrower accesses their credit capacity, or borrows, an asset with a whole positive number is created. The market determined credit capacity of Z is then divided into two categories, Accessed Capacity "Z_x" and Available Capacity Z_{a1}.

Z_x is distributed across the infinite subunits that were bid by the Lender(s) in stack order, filling the units from lowest cost (negative rates (if any)) through highest cost (positive interest rates (if any)). The sum of balances of units multiplied by the interest rate of each unit determines the weighted average cost of capital or the price of money. The weighted average cost is the cost paid by the borrower but does not represent the price received by any individual unit holder.

The Lender(s) hold an asset(s). As asset value A and income level B and obligations C change, the price of the units comprising Z_a and Z_x change. The volatility of price (interest rate) is highest for the highest priced unit of Z_a and price volatility is lowest for the lowest priced unit Z_x. This process creates a transparent distribution of risk (at the risk level) with individual units (both Accessed and Available) receiving dynamic market based prices of risk.

Units are market-grouped into common characteristics. Lenders then bid for units in bulk, across multiple categories of units to affect their desired risk / return profile in aggregate.

Structural Superiority

This process eliminates all structural inefficiencies for both borrower and lender. The Lender can optimize their exact desired risk and/or return characteristics. Idiosyncratic risk is eliminated for both the borrower and for the lender. Borrowers can hedge risks, such as a desire for a committed facility or a fixed rate, through private contracts. These private contracts are available across all individual infinite units. Borrowers know their exact costs of transacting: the direct and opportunity costs of paying down or accessing credit. Real time information creates an informed view on risk, return and access to credit. This information is optimized against a market view on risk and return where price becomes an indication of probability of success. Positive feedback loops are created that create mutually reinforcing, market-based incentives.

The result is infinite issuers of currency, or Borrowers, broken into infinite transparent categories of risk, with dynamic market based pricing on each unit, rolled up and held by society (Lenders), with no idiosyncratic risk.

Illustration

Today:

Borrower: Many loans

Loan 1 rate A	**Loan 2 rate B**	**Loan … rate …**	**Cash / Currency rate < cost of loans**

No relation between the cost of Loan 1, Loan 2 or cash and currency. Static. No optimization.

Lender:

Loan 1 (whole loan) rate A	**Investment in part of loan 2 at rate Y**	**Investment in part of loan … at rate …**	**Cash / Currency rate < rate on assets**

Opaque risk, multiple intermediaries, channel and incentive conflicts. Inefficient costs and allocations.

Future:

Borrower: One loan

Last loss……..…First loss

Unit 1 rate A	**Unit 2 rate B**	**Unit… rate…**	**Available Credit**

Lowest…….…….....Highest rate

Sum of dollars in units x rate = weighted average cost of capital

Lender (theoretical world of one lender):

Unit 1 rate A	**Unit 2 rate B**	**Unit… rate…**	**Available Purchasing Power**

Sum of dollars in units x rate = weighted average return on capital.

However, idiosyncratic risk is suboptimal for both borrower and lender. Units are rolled up into groups.

Lender (world of many lenders):

% to group of unit 1 @ rate A	% to group of unit 2 @ rate B	% to group of unit … @ rate …	Available Purchasing Power

Process:

All Assets	+	All Income (current and potential)	**Secure:**	One Loan

Structural incentives are to include as much as possible (assets, income, information) but Borrower may opt to include or exclude items and information of their choice. These choices and the perceived risks are reflected in market prices of interest.

Blockchain Facilitating Full Reserve Banking

An important obstacle to full reserve banking in the past is that banks have an essential role in matching the supply and demand of credit (borrowers and lenders). An obstacle with full reserve banking is that borrowers need to be matched in both time, quality and quantity with lenders that desire the same quality, quantity and for the same period of time. By breaking the loan into categories of risk and grouping across multiple borrowers, the blockchain enables a more efficient matching of the borrowers and lenders in bulk, something previously difficult to impossible to do at scale.

A Road Map to Implementation

There is little intellectual property in the ability to create a decentralized full reserve banking platform and there is little intellectual property to the concept of transacting at the risk level rather than the loan level. These ideas can quickly and easily be duplicated.

There is intellectual property in the ability to execute. Challenges fall in the areas of build (what is the underlying infrastructure), comply (how will the entity comply with regulatory requirements), sell (how will the organization generate enough demand) and fund (how will the initial loans be funded). Execution therefore requires the ability to:

- Create the technology platform that handles the origination and servicing of loans. All aspects of collateral monitoring, loan accounting and maintenance, payment processing – a complete bank infrastructure ("tech");
- The ability to create the legal infrastructure to create loan level securitization that feeds into the lending platform ("fin");
- The ability to originate, service and collect debt and the corresponding licenses across multiple regulatory bodies;
- The ability to generate sufficient volume for the platform to scale for both borrowers and lenders.

The extension of credit requires licenses as an originator, servicer and collector of debt. The extension of secured credit and the process of collection crosses even more regulatory bodies in the physical world. While much of the lending process can occur electronically and, over time, more and more can move to the virtual world, initially the organization needs entities and agents working on its behalf in the physical world. While the regulatory hurdles can be overcome, they should not be underestimated.

First Steps

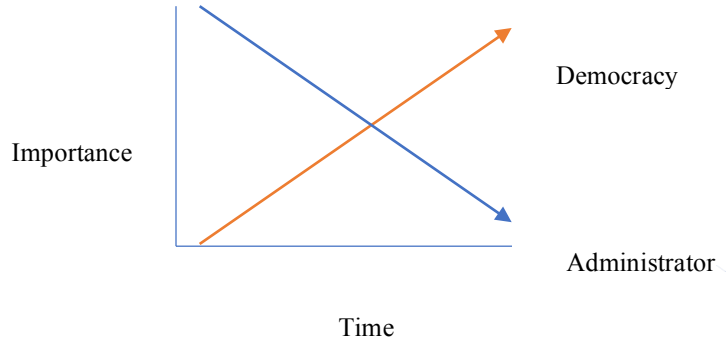
Initially there are no Borrowers, Lenders or Debt Holders, there are only Founders and the Administrator. Credible entities in the physical world are unlikely to transact with the organization unless it has critical scale. The ability of the virtual organization to engage with the physical world is a function of capital. Further, the strategic plan, dependency on partnerships, bargaining power, speed to market, rent versus build decisions, talent and team, even unit economics are all also functions of capital.

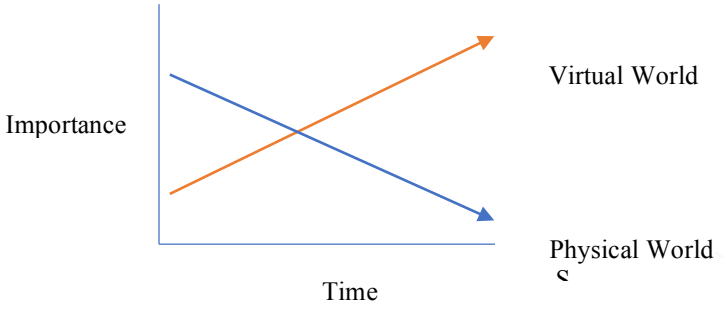
An additional obstacle is the need for scale. The broader the reach of the platform, the greater the economic activity. There is a cost to enter each additional market. For example, there is one cost to enter the United States alone and another cost to enter the United States, Europe and Japan. While there are some economies of scale, each additional market brings the challenges of build, comply, sell and fund. Each market has a fixed cost to enter and a low variable cost. Below some threshold of funding, the organization is incapable of entering any market. Above another threshold it can enter every market. The size of the total addressable market (between $1 trillion and $200+ trillion) is a function of capital.

Another important consideration is the structure of the constitution. The initial constitution should be circulated and open sourced (similar to the Articles of Confederation at the inception of the United States). After pre-set period of time, the best practices and thoughts from a global society should be adopted to form the final Constitution. Inception of a rigid constitution on day one is likely to lead to suboptimal outcomes. There are vast potential benefits to open sourcing the constitution in the long term but in the short term there is much more risk. Certainty and stability are also functions of both time and capital.

Capital then should be priced in multiple rounds as a function of the capital that is raised. Founders would be best served by controlling the release of their tokens so that capital is released to raise enough to be able to achieve a minimum level of sustainability but preserve the ability to flex higher so that they have more long-term vision into their runway, which will drive strategic decisions and the market plan.

During the initial period the Administrator will serve a critical role. In addition to being instrumental to preventing early gamesmanship and facilitating a strong constitution, they have critical incentive alignment with the Founders for a successful launch of the organization. Implementation happens in phases with a baton being passed from the Administrator to the Democracy and from the physical world to the virtual world.





Founders should move first establishing a level of funding that assures the Administrator that the organization is in a position to move forward and that will shape the strategic plan. The Administrator should respond by providing a lock up on their tokens and on the funds raised until a minimum threshold is achieved. With a critical mass achieved, the constitution should be circulated, operating plan released and the democratic process underway.

Administrator Token Lock and Anticipated Founder Token Release

Assume that there are 21 million authorized Founder and Administrator tokens. Also assume that the Administrator controls 5 million of the 21 million authorized tokens. These units should have a two-year restriction and then convert to Founders tokens, gradually over a lengthy period of time, something greater than 10 years. This provides long term incentive for the administrator with no short-term liquidity or benefit. It also facilitates the transition to a broader democracy.

Administrator tokens vote with Founders. Therefore, up to the release of 5 million tokens, the Administrator effectively has control, but no economic value. The more tokens the Founder's release, the more control they have of the organization. However, Founders are best served by releasing tokens at the highest valuation. One would anticipate that Founders would likely release their tokens in tranches. Phase one would be initial capital, likely priced as a series of rounds. Phase two would occur at some point in the future when critical milestones have been achieved. Phase three release would then be a function of if the organization is facing good, bad or moderate outcomes.

Conclusion

By removing the dual mandate inventive conflicts, the conflicts a nation can face between importers and exporters, society can combine multiple Nobel prize winning theories and work together to build a better standard. Money always has been and always will be, credit or a claim on an asset. In the future, there will be no "money": it will be a credit based society or the complete Denationalization of Money, as Hayek foresaw. Each person and entity is a unique issuer of currency. Each currency has infinite sub-units, each with its own value, creating a world with infinite currencies.

Money serves as a store of value, a medium of exchange and a unit of value. For the infinite creators and purchasers of money, these roles are best served through complete decentralization. Debt is the creation of credit, which is the creation of money. This platform and organization is positioned to not only facilitate that exchange, but also to represent the neutral equilibrium or the risk-free rate.

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- https://www.actuaries.org/lyon2013/papers/AFIR_Thomson_Sahin_Reddy.pdf
- The Reader's Guide to Optimal Monetary Policy https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2989237
- Additional Articles:
    - Money, Bank Credit, and Economic Cycles - DeSoto
    - A Program for Monetary Reform
    - The Chicago Plan Revisited

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i https://www.mycreditunion.gov/about-credit-unions/pages/how-is-a-credit-union-different-than-a-bank.aspx

ii The CAPM was introduced by Jack Treynor (1961, 1962),[4] William F. Sharpe (1964), John Lintner (1965a,b) and Jan Mossin (1966) independently, building on the earlier work of Harry Markowitzon diversification and modern portfolio theory. Sharpe, Markowitz and Merton Miller jointly received the 1990 Nobel Memorial Prize in Economics for this contribution to the field of financial economics. Additional notes inspired by the KPMG 2017 Market Risk Premium Summary.

iii *Friedman, Milton,* Essays in Positive Economics*, University of Chicago Press, 1953, p. 165*

iv Adam Smith

v Harry Markowitz

vi Eugene Fama, Kenneth French

vii ibid

viii James Tobin

ix Harry Markowitz, William Sharpe, James Tobin

x Franco Modigliani, Merton Miller, Thomas Anderson

xi Milton Friedman

xii Fredrich A. Hayek