

The evolution of money

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Preamble

Money is a fascinating thing. It is ubiquitous to our current way of life in that everyone uses it, everyone needs it and almost everyone wants more of it. But when was it created, where does it come from, why do we need it, and who controls it? It's perhaps one of the most understudied, and underappreciated yet fascinating topics. This paper is intended to provide you with a general understand of how and why money works the way it does. It really isn't that difficult and as such this document is intentionally designed to be as brief and easy to read as possible. It is intended for all audiences in way of prior economic understanding.

We will walk through the history of a fictional population occupying a confined island and see how its people develop an economy and monetary system over time with the goal of growth and prosperity. The following simulation does not map directly to any particular country's history but instead collates the trials and tribulations of monetary systems throughout humanity in a fluid sequence of events. It represents an altruistic point of view towards how we humans have arrived at our current monetary paradigm.

Chapter 1

There is a small, isolated island economy abundant with resources but void of interactions to the world beyond its boundaries.

Originally, there are two families each with specialized skills. The Smith family is an expert at iron mining and the Jones family is excellent at farming. At this stage, during the humble beginnings of the island the goal of survival is at stake. The two families realize that their chance of survival is greatly enhanced if they "work together". As such, they give each other goods when they are needed by the counter party. At this point, it is a simple **gift economy**.

Eventually, survival is no longer a concern and well being through possessions becomes the chief interest. To that end, the two families formalize their specializations and agree on an exchange rate between each others' goods. There is no "common" currency so they resort to negotiating with each other and simply price each other's wares based on their own product to ultimately agree on a trade ratio... For example, one pound of potatoes = 1 ounce of iron. This straight forward system of direct trade of differing goods is called **bartering**. Without even realizing it, they have also introduced the concept of **ownership**, meaning that once the iron is mined and the food is harvested it leaves the **public domain** and is now **private property**.

These concepts give meaning to the people and the town starts to **grow**. The need for wood arises so a third family starts a lumber mill. This system of direct trade is getting much more complicated. For example, if the farmer needs iron and the iron smith needs lumber and the lumber mill needs food then

all three parties need to simultaneously negotiate on a price and exchange goods. This primitive system of bartering quickly hampers the town's growth as it diversifies.

After several specialized stores have been introduced, through natural processes one particular element evolves to be seen as the **medium for exchange**. The medium needs to have several key ingredients. The town needs for it to have a stable value meaning that the total quantity throughout the island should only change gradually. It also needs to be reasonable to physically carry and strong enough to stand constant exchange. Because iron meets these criteria, it becomes that medium for exchange, aka currency.

Now the different shops in town can easily exchange goods with each other because all the store owners simply price their goods in iron. Each store owner sets a price for goods based on the supply of the good and the demand for the good through a process known as **price discovery**. For example, the lumber mill tries to charge 200oz of iron per tree, but the town's people would rather just cut down trees themselves. In reaction, the store lowers the price to 50oz and immediately sells out. Finally, he finds a good compromise at 100oz. As another example if a tree is worth 100 ounces of iron and a loaf of bread is worth 1 ounce of iron then a tree is worth 100 loafs of bread. Because the money is actually made of a physical commodity, the town is operating in a **commoditized monetary system**.

Iron now represents wealth and can be stored to purchase goods at a later date. **Stored wealth** is a welcome concept to the people as it encourages over production and promotes the ability to do work now in exchange for **goods and services** later. It also provides the ability for people to enjoy a more stable quality of life all year round. For example, the lumber mill can take advantage of the long summer days and store that wealth to buy goods during the winter, effectively allowing consumption of goods to be consistent all year round despite cyclical production.

Some families choose to store their iron in greater quantities. This creates a sense of **inequality** through the town's people. This inequality gives rise to theft. In reaction to this theft, the wealthier individuals form a town police and declare codes of conduct used for **governance**. One of those laws being that each family has to contribute to this new governing body. This is known as a **tax**. Having a central government turns out to have many existential benefits including the ability to provide emergency services and take on communal projects such as building pathways connecting the families to each other.

Recall that the Smith family is the town's expert at refining iron. When people find iron ore they bring it to the iron smith to have it refined to pure iron. The store is busy and the process of refining can be time consuming. As such, the iron smith immediately exchanges the deposited iron for a **depository note** indicating on it the amount of iron that can be claimed at a later date. For example, if a customer enters the iron smith with 10oz of iron, the smith will immediately exchange the iron for a note representing those 10oz and marked as such. Because the smith is well known and highly regarded around town people begin to realize that transferring direct iron is not necessary and they can more conveniently exchange goods using the iron smith's notes (which are backed by iron). This means that

notes must have special care taken to ensure they can't be counterfeit. The town is now operating using a **representative monetary system**.

Because the smiths have already earned the trust of the town, people begin to simply deposit their iron in exchange for iron-backed notes and before long a significant majority of the metal is simply sitting at the iron smith, while lightweight conveniently denominated notes meet the day to day work of being used for exchanging goods and services.

As the town grows new companies are constantly springing up. Historically, the town could only expand into new businesses by either borrowing capital from other companies or literally starting from scratch. But now that the smiths are so successful and sitting on piles of iron, they are seen as the logical company to approach to acquire a **loan**.

The, now extremely wealthy, smiths are happy to give out some of their personal inventory of iron to promising entrepreneurs with the understanding that they will get that money back. They do this because there is an expectation that the new business will look kindly on the smiths and perhaps garnish them with gifts at some later date. For example, the baker family requests to borrow 1000 ounces of iron so that they can exchange it with the lumber mill for wood to build a new bakery. The smiths agree and **loan** the 1000 ounces to the bakery and in turn the baker is in **debt** to the Smiths for that amount. Once the bakery is built and they earn 1000oz of iron by selling bread they will pay the Smiths back, plus out of kindness give the smiths 100 loafs of bread for free as a thank you.

After the Smiths loan iron to several small businesses with mixed success, they learn two lessons. First, they need to carefully assess the risk of the venture they are loaning money to. Second, instead of expecting gifts, they should simply include an additional fee (**interest**) on top of the original amount (**principal**). Essentially, the larger the risk, the bigger the fee they expect if it does succeed.

Another thing they quickly realize, is the longer the iron has been loaned out, the more opportunities they are missing out on to loan the iron to other people. This **opportunity cost** forces the smiths to charge interest. The interest is reoccurring as time goes by that they aren't getting paid back. This is known as **compound interest**.

At some point the town begins to grow faster than the supply of iron that is backing all of the town's notes and the smiths start turning away individuals looking to borrow iron. The smiths are pressed to solve this issue, because they could be growing their wealth substantially if they could just get more iron to loan out. They then realize that they don't actually need to have each note backed by iron because the notes are not individually tied to a particular piece of iron and hardly anyone even asks to exchange their notes for iron anymore. They calculate that they can keep loaning out notes as long as a certain fraction of the total amount of notes is still backed by their reserves of iron. This process is known as honoring a **reserve requirement**.

After this revelation, suddenly the smiths are loaning out multiples of what they were able to before, and with each loan they're earning interest. The smiths decide to charge a 5oz fee per year to borrow 100oz of iron backed notes. They also calculate that they only need to have 1oz of physical iron for

every 20oz of notes they loan out. This means that every year each 10oz piece of iron can represent 200oz worth of loans which will earn 10oz in interest. Effectively, their net worth begins to double every year!

But regardless of the massive wealth of the Smiths, others are still content because the quality of life is improving both in terms of growth and prosperity. Day after day, year after year more iron is mined effectively expanding the '**money supply**' at a rate compatible with the overall expansion of the population, economy and general need for capital.

Because iron is money and has more intrinsic value than other commodities such as wood or stones it is more heavily sought after. After several generations the entire island is stripped of its easy to access iron. As the economy continues to expand, and more and more notes are required the Smiths are forced to extend the reserve requirements to their maximum in order to print more notes. Eventually, that tactic is exhausted and there is simply not enough notes to go around.

As the economy's expansion outpaces that of the money supply the value of iron and each note representing iron begins to go up and up in value. Once this appreciation of value in the currency is recognized by the community they begin to 'hoard' notes. For example, the farmer has a note for 100 ounces of iron, which last year could buy one tree. He notices that this year he can buy 1 ½ trees, and if he simply waits, that same note will be able to buy 2 trees next year. As the community on large wakes up to this the rate of exchange of notes for goods, aka the **velocity of money**, begins to slow down. This is known as a **deflating** economy. After years and years of a deflating economy fewer new businesses are started and those that do exist suffer reduced sales.

The Smiths start to notice that because people aren't transferring the notes around as much, they are more and more inclined to 'cash in' on the notes for the physical iron. Unfortunately, the Smiths are over leveraging their notes on a 20 to 1 basis meaning if just one twentieth of the notes are cashed in they will be completely out of iron. Once word of this spreads, everyone at once tries to cash in their notes and long lines of people form outside the Smith's establishment. This is known as a '**run on the bank**'.

This is a true economic collapse. One day people had a certain expectation of self-wealth and the next day 95% of that wealth disappeared. They now hold notes only worth the paper they're printed on.

Chapter 2

Despite the following depression the community has learned several things including how effective paper notes can be for exchange of goods and that backing notes by a single limited commodity places unnecessary constraints on an otherwise expanding economy. They have also felt what a deflationary economy is like.

As a band aid solution, further currencies evolve based on baskets of goods instead of just one commodity in an effort to better increase the money supply. The ever expanding population, enhanced technology and mechanization of production still outpace even these currencies' supply over time.

Eventually, the people concede that no commodity backed currency can keep up with an exponentially growing economy.

The government, which was put in place to provide security and decide / enforce policies at the community level, is about to embark on its' most important role yet. People already trusted the government for building roads and providing emergency services. As such, the government leverages that trust and issues its own currency. The currency is really pieces of paper only backed only by people's faith in the government to control it. This form of currency is known as a **fiat currency**.

This transition is seen as a saving grace to the devastated society. For example, the Baker family had accumulated pieces of paper representing a total of 10,000oz worth of iron. Because the Bakers were late to the run on the bank, by the time they got in line there wasn't any physical iron left and as such they were turned down. Rejected and devastated, the bakers didn't know what to do. They then catch news that the government (the biggest institution in town) is willing to exchange the seemingly worthless notes for new notes that represent 'a piece' of the government. Wow, the bakers are very excited they can exchange the 10,000 notes (which they thought were worthless) for some "units" of the government. As long as there's a government, these new notes have value. It's relatively unimportant to people how many units there are... They're just excited to be an active participant and own a piece of their government.

Regardless of the excitement, several measures are taken by the government to help ensure its adoption. First they name these units 'irons', which helps make the medicine go down. Second, all taxes must be paid in 'irons'. Third, people who work for the government are paid in irons. Fourth, old currency notes can be exchanged for irons only during an established adoption period.

The big question to the people at the government who are responsible for printing these irons is: How many should they make? In total, they estimate that there is a total of 1,000,000 oz worth of notes printed by the smiths throughout the town. Everyone wants to change them in immediately but the government doesn't have the capability to print that many notes that fast so instead they decide to print 10,000 notes and exchange 100 oz of old smith notes for one government 'iron'. So in the mind of the people: if my old 100 ounce note could buy 1 tree then a single 'iron' can buy that same tree now. After some time the population grows and there is more 'stuff' for sale. Because there is more stuff and more people the government prints more money. What the iron printers realize is that the number doesn't have anything to do with the size of the government, it's really about the amount of stuff being sold and the number of people. So, the 'irons' are really a currency backed by everything put together.

The money printers, still grasping to understand how much money they need to print find the need to gauge the health of the economy. They look at the number of people (**population**) as one metric, but they also need to know how much stuff there is. The government has always charged a tax each time someone buys anything and they realize by adding up and studying all the tax receipts they can determine the total amount of stuff sold, known as the **Gross Domestic Product (GDP)**. The governments' logic is: a bigger GDP means more stuff, and more stuff means more happiness. People like being happy, so how do we increase the GDP?

With this agenda, the money printers dabble with an interesting idea... If the amount of stuff and amount of money are tied together, then simply print lots more money, and then people will have way more stuff! There are 100,000 total irons and the government decides to double that by quickly adding another 100,000 irons. To get the money into the economy they give huge raises to all of the government employees. The employees start buying a lot more of everything and people like the bakers see sales go way up! At first the bakers are really excited, but then they can't make the bread as fast as people are buying it, so they discover they need to raise the price a little. The government employees have so much money that the bakers need to double their price in order to be able to keep up with demand. The baker's income has now doubled, but all the businesses are being forced to double their prices at the same time. In effect, everyone has twice the money, but everything costs twice as much so people still can still only buy the same amount of things. Now each iron is effectively 'worth' half as much. Looks like the idea didn't work, but in the process the money printers learned a valuable lesson. Changing the quantity of irons doesn't change quantity of 'stuff' but it does change the value of each iron. This is a good consolation prize, because the ability to subtly control the value of money will turn out to be profound.

With that failed idea behind them, they simply print money at the same rate of expected population and GDP growth. The economy resumes its exponential growth and the money printers can easily cope. Even as new energy sources and technologies are introduced allowing the population to grow at unimaginable rates they simply print more irons in reaction.

By closely watching the GDP they can keep the irons' value in balance. If they see the value of each iron going up, they print more (**inflation**). If they see the value going too low they take some out using taxes (**deflation**).

The printers expect that the amount of irons (hence the amount of stuff) should directly match the GDP. But, they notice that it isn't. They decide to track how money is spent. They monitor the irons paid to two government employees both earning 100 irons. Both employees pay 10 in taxes. The first employee, Tracy, saves the 90 irons under her bed for a year and the other employee, Steve, immediately buys 90 worth of bread for his family. Afterwards, the baker pays 9 in sales tax and a few days later takes the remaining 81 irons and buys some shoes. The Shoe smith pays 8 in taxes and buys some more food with the remaining 72 irons. At the end of the year, the 100 irons paid to Tracy generated 10 in taxes but the irons paid to Steve generated 34 in taxes. More tax revenue indicates higher GDP, hence more economic activity. A curious thing is noticed... The faster people spend money the higher the GDP goes. They found their answer: increase the GDP by increasing the velocity of money. But how do they increase the velocity of money?

They encourage spending and discourage people from hoarding by predictably decreasing the value of irons overtime. This inflationary tactic has several subtle implications. For example, Tracy notices that her \$90 could have bought one chair last year, but this year she needs \$100 to buy that same chair and it's likely that next year she will need about \$103. If she has \$100 now and wants to buy that chair, she

has only two options: Buy it now or **invest** the \$100 in some other business that will return her at least \$103 next year so she can buy it then. The one thing she won't do is hoard the capital because she can predict that it will reduce in **real value** over time.

The printers ensure that there is always a steady, predictable loss in value by simply increasing the money supply slightly faster than the growth of the economy. This is known as a **healthy inflation**. It's important that the rate is slow enough that prices don't change dramatically which would force retailers like the bakers to need to re-price their menu every month. But it also needs to be fast enough that people notice it. They decide that an annual 3% decrease in the value of notes is enough to keep people from hoarding money for long periods of time.

In general, at this point people are highly encouraged to keep their money in motion, otherwise it will lose value. People who want to save money know they can't hoard it, so they find themselves spending a lot of time trying to figure out which companies to invest in. Assessing small companies and lending are skills that the Smith family had acquired over time so they decide to make a new business out of it. The Smiths are still regarded as intelligent investors so people are happy to deposit money with the Smiths under the expectation that they will earn interest at a rate higher than the rate of inflation. This is an easy guarantee for the Smiths to make because they know how to invest wisely. Trust is critical to the Smith's line of work so they name their new business the 'Island Bank' and build a large, government-style building for show. This type of company is known as a **commercial lending and investment bank**.

Tracy sees that the Island Bank is guaranteeing 5% interest per year so she decides to save her \$100 for the next year and buy the chair then with the likelihood of having some money left over because she will earn 5% and have \$105 to buy a chair that only costs \$103. The Smith bank understands that at any moment she or any other customer could ask for their money back. For example, Tracy might decide she needs the money in an emergency a few weeks later and ask the bank for her \$100 back. In order to guarantee that they can meet the demand of having readily available money they decide to hold onto a percentage of all the money they are given in a safe vault. They decide that 10% is a good **reserve requirement**, meaning that they can loan out \$90 of Tracy's deposit. They think 10% is good because on average only 1 in 10 people will want to actually take their money out.

Sam comes to the Island Bank and requests to borrow \$90 in order to start a small shoe smith. The bank agrees to lend him \$90 of the money that Tracy deposited. Sam takes the \$90 and exchanges it with the lumber mill in order to build the shop. The lumber mill owner decides to deposit the \$90 he just earned into the Island Bank in order to 'keep his money working'. The Island bank then loans out 90% of that \$90, or \$81 to another individual who is looking to borrow money. That \$81 is used to also buy lumber and once again makes its way back to the bank. Then, \$72 of that is loaned out again to another customer who also buys lumber, and for a third time the lumber smith deposits the money. Without even realizing it, the Smiths have loaned out the same money again and again. The lumber mill has deposited $90+81+72 = \$143$ into the bank, which he expects to be able to withdraw at any point. Recall that this is based on an initial deposit of just \$90. And in fact, the money could be re-lent out many more times. By adjusting the reserve requirement just slightly the Smiths are able to greatly

influence the money supply. Even if there are many banks that people can choose to deposit and lend from, the island is a closed system so the net effect is still the same. This re-re-re-loaning of money is known as **fractional reserve banking**. Effectively, it gives people the false impression that there is a lot more money than there really is.

The government and economists struggle to understand why the money supply is so much higher than the amount of irons they printed. Despite only increasing the money supply by 3% year over year, they see the amount of available cash, based on tax receipts, is going up by magnitudes of that. It turns out that the Island Bank through its process of re-re-re-loaning money has more control over the money supply than even the government. The more money the Island bank loans out the more interest they earn so they are heavily incentivized to loan as much as possible. Because the Smiths are so successful a handful of other similar banks open up all loaning to their maximum. This inadvertently causes out of control growth in the money supply (**hyperinflation**). Just like before when the money printers tried doubling the money supply the value of notes dropped accordingly. Suddenly, that chair that Tracy wanted to buy is selling for \$5000. She and others realize this and quickly decide to withdraw their deposits from the banks in an effort to convert their irons into hard assets such as shoes and food because they have lost faith in the 'iron'.

Once again, a seemingly solid paradigm came to a quick collapse with a run on the bank.

Chapter 3

After another depression, the people have learned a few more lessons. It's apparent that banks are critical to the lifecycle of investment but it's also understood that governments are required to keep civil order. Money doesn't need to be backed by a physical commodity and modest inflation promotes growth. Most importantly they learned that the money supply is not just about the money printed, but also the number of times that it is re-re-re-loaned.

With these lessons in mind they decide to set up a central consortium independent of the government and instead controlled by all the largest banks such as the Island Bank (**primary dealers**). It will decide how much money is printed and the number of time the money can be re-loaned out by deciding how much must be kept in reserve. For example, lets they decide to print a total of \$100,000 irons and require that banks keep 10% in reserve. Immediately, the banks will collectively hold onto \$10,000 in their vaults and make loans of \$90,000. Virtually all of the \$90,000 will make its way back to the banks. Of the \$90,000 another \$9,000 will be held in the vault and the remaining 90% or \$81,000 will be loaned out again. This process will repeat and in total, the amount of money lent out will be \$90,000 + \$81,000 + \$72,000 + \$63,000 ... = approximately \$900,000. So, by controlling the reserve rate and the amount printed the group of banks can control the total money supply. This unified body collectively making these decisions is known as a **central bank**.

In the prior system inflation was the key driving factor that kept people spending or investing money but there weren't any drivers to keep people working. Economists noticed that small businesses in debt were highly motivated to work at full capacity when their debt had interest. For example, when Sam borrowed \$900 to open his new business he understood very well that he must at least make minimum

payments to cover the interest on the debt in order to avoid serious consequences such as **bankruptcy**. As such, his wife also contributed to the business, in net increasing overall work performed by the community.

After recalling the effectiveness of debt as a driver for maximum employment, the mechanism for how money is introduced into the system changes. Unlike before when money was spent into existence through government pay role, this time it will be loaned into existence. Just like before, debt will have interest associated with it. Also like before, riskier loans will have higher interest rates. The central bank, which is really just a collaboration of all the largest individual banks, establishes a single entity for creating money which they call the Federal Island Bank (**Federal Reserve Bank**). The federal Island Bank creates special loans (**high power money**) with relatively low interest rates tied to them. Because the Island Bank and other member banks are considered to be the safest companies, they are the only ones privileged to have direct access to these low interest loans (**via discount window**). These banks then re-loan this money out to the people, businesses and government.

Now the question for the money printers at the central bank is: What interest rate should they charge? If interest rates are too high people will be afraid to borrow because it will be impossible to make interest payments. Alternatively, if interest rates are too low, people will borrow all the money they can. What the central bank realizes is that they don't need to control the supply of money printed directly... Instead they can control interest rates. If they increase rates then people will borrow less effectively decreasing the money supply. Alternatively, when they lower interest rates people will be incentivized to borrow more hence increasing the money supply.

Like the last revamping of the currency, old notes will be exchangeable for the new central bank issued 'irons'. Also like before, taxes must be paid in the new irons effectively making its adoption mandatory.

The government is no longer tied to the creation of money so it is now participating in the system much like businesses in the private sector. The government will now have its own balance (**treasury**) and must rely solely on tax receipts and loans for money that it can spend (**liquidity**). The loans come from the private sector and banks in exchange for promissory notes issued by the government (**treasury bills**).

So now everything is in place: A fiat currency allowing for a flexible based money supply, a healthy inflation encouraging money velocity and a debt based dollar encouraging people to work.

It's worth highlighting that in the new system all money is fundamentally debt owed to the banks and all debt has interest tied to it. This means that on average the general public, including its people, businesses, and even the government, have no choice but to, in aggregate, take on debt.

So the new currency is established and the desired effect is quickly achieved: A higher percentage of people are working (husbands and wives), people are working longer hours, the velocity of money is high and growth is once again exponential. Despite everyone being in debt, the quality of life is continuing to improve so once again the community is complacent. The unified financial system is closely monitoring inflation and deflation in order to adjust interest rates to control the money supply accordingly.

The Island Bank's job is virtually guaranteed because the only way for governments, businesses and people to get 'irons' is through banks like there's. For example, the central bank decides to loan \$20,000 at 3% interest and lend its largest dealer, the Island Bank. Sam and 3 other businesses are all looking to expand and as such would each like to borrow \$2,500. They all reach agreements with the Island Bank to borrow the \$2,500 at 5% interest. At the end of the year, despite the varying levels of success amongst the 4 companies, in total they owe back the \$10,000 plus \$500 in interest for a grand total of \$10,500. Recall that only a total of \$10,000 dollars has been loaned into existence. As such, it is impossible for all 4 businesses to pay back the principle of \$10,000 plus the accumulated interest of \$500. Fortunately, the community is growing and the following year a newcomer Steve decides to open a fishery and borrows an additional \$1000 from the Island bank. He takes some of that money and buys shoes and other goods from the prior 4 businesses. This newly loaned \$1000 which is added to the system makes it possible for the four original businesses to pay their interest. But now Steve has debt he needs to repay, so in fact the total debt has only increased.

This unstoppable self-perpetuating debt is highly motivating. It not only keeps those in debt indentured to work but it promotes the expansion of business and government in order to keep paying down existing debt.

There are some consequences to this debt based system however. New debt must constantly be created and the velocity of money must not stop. For example, if the central bank decided not to loan the money to Steve or anyone else after the 4 initial businesses then eventually at least one them would not be able to pay the interest rate and would be forced into bankruptcy, followed by another until all of them went bankrupt. In fact, even if the central bank did loan to Steve, but Steve simply hoarded the money then that would also result in the original 4 companies going bankrupt. Note that the cause of bankruptcy has transitioned from mismanagement of one's money on a personal level to the mismanagement of money at a system level.

With the pervasive risk of bankruptcy and the necessity to loan, comes the need for credit ratings and insurance. The banking system devises a rating system to rate the credit worthiness of people, businesses and even the government. Another interesting side effect of this debt based system is that the balance sheet of the central bank is constantly expanding because all debt eventually ends up being owed to the central bank.

For the time being though, the resources required to support an exponentially growing economy are available so bankruptcy is generally an anomaly. Because the uninhibited growth rate is 5% annually the size of the economy is doubling about every 12 years. As the GDP continues to double, debt is transitioned from generation to generation and old businesses to new businesses, where each generation's debt is predicated on future growth.

Several doublings take place until the population has expanded to cover the entire island. For the first time in the island's history, the monetary system is outpacing the resources that back it. As expansion becomes impossible due to resource constraints growth levels off and the GDP slows to the rate of inflation, meaning that the inflation-adjusted rate of GDP is flat. People have a difficult time expanding

their business due to physical constraints, and as such stop borrowing money. The central bank makes every effort to increase the money supply and get velocity moving again by continuously lowering interest rates until eventually the rate is zero. Unfortunately, all the past issued money was pegged at substantially higher interest rates and the debt continues to mount, which makes even zero interest rate money unattractive other than to pay off existing interest. In an effort to stave off systemic Bankruptcy the central bank attempts to lend money to indebted individuals, businesses and the government at extremely low interest rates. Despite the efforts of the unified banking system to perpetuate the monetary paradigm people become overwhelmed with debt and the impossibility to repay the loans rapidly becomes a reality.

For the third time the system has collapsed.

Chapter 4

It seems that without growth the existing system can't sustain itself. If new businesses were started then new loans could be made, and the money for those loans would make their way to existing businesses allowing them to cover their debt. So let's rewind and pretend they didn't collapse.

Having exploited the island of all of its land and resources how can they expand? The people have been forced to search beyond the convenient confines of their island. Eventually, the population finds a new island of equal size! With an existing financial system in place, new massive loans are made and remaining resources are directed towards investing in new businesses on the new island. A significant percentage of the population quickly transport onto the new island to take advantage of this new exciting endeavor. Even better, this isn't just good news for the people that venture to the new island, but because the money loaned to the new enterprises find their way into the pockets of the existing businesses the pre-existing debt obligations for those businesses are paid back. So the original island's economic system can continue because it is now servicing the needs of the second island.

It took many generations for the original island to reach maximum capacity, and because the new island is of equal size people expect that this new island will allow for growth and prosperity for many generations as well. Surprisingly, it turns out that the extents of the second island are reached within just a generation or two. Much like before when the original island was saturated, businesses on both islands are hesitant to take on new loans and the existing debt becomes problematic. Once again they take to the seas. But unlike last time when they went in search for new land, this time there are two islands in financial trouble and as such they need to find two island islands of equal size in order to cover the debts of both existing islands.

Two more islands are found allowing growth to continue for a few more generations. When the resources of all four islands are exhausted they go on to search again. Just like before, they find an additional two islands of equal size. Even though they found just as many islands as last time, it turns out the loans made to new enterprises occupying the two newest islands is not enough to cover the loans of the existing four islands. Two of the existing four islands are forced into bankruptcy. Note that all of the islands had interwoven debt and loans with each other. Once two of the islands defaulted, this systemically forced the other islands into bankruptcy as well.

Once again the system collapses...

Conclusion

The driving force behind each of the refinements to the monetary system up to this point has been focused on the promotion of growth. Despite having found another two islands, that simply wasn't enough to supply the debt obligations of the existing four islands. It turns out, not only does this final monetary system require perpetual growth but it required perpetually exponential growth. In other words, even if they found four islands, which would have allowed the population to grow to eight in total, very shortly after they would need to then find another eight.

As such, the significance in these final collapses is that it's not due to the inadequacy of the monetary system to handle growth of society, but instead for the growth of society to handle the need of the monetary system. Consider the state of the economy at the end of the final collapse and you will note that it is begging for growth... Add more islands and it can continue. If this exercise were carried out on an infinitely large domain instead of being confined to an island then the results would be spectacular. But unfortunately, the compounding growth paradigm will reach the extents of any limited resource no matter how big that resource is.

What is most devastating is that in a compound growth debt based paradigm, all stored value in fiat currency is really just someone else's debt. Think about the lumber mill in chapter 2. He received payments of \$90, \$81, and \$72 which he responsibly saved in the bank. But really, all of that money was just someone else's debt. And the only way that debt can be paid off is by creating more debt. Effectively, when the system did finally collapse the savers were the real losers because the only thing they had really saved was someone else's debt.

Ironically, the more equipped the system is to promote growth the faster it will reach and even overshoot the resource limits. During the following unwind of the overshoot a momentary paradigm will be needed to accommodate a shrinking population and economy. Following that, an entirely new monetary paradigm will be needed, one that promotes balance between the economy and the resources that it relies on.