

Understanding Money

ray.do White Paper No. 1

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Table of Contents

1. Introduction	3
2. What is Money?	4
The five characteristics of a stable currency.	4
The three general functions of money.	5
3. Origin of Money and our Monetary System	6
How did we get to the present fiat monetary system?	7
4. Modern Money and Its Manipulation	9
How does the monetary authority measure modern money?	10
How does the monetary authority manipulate the broad money supply or M2?	10
5. Non-Conventional Monetary Policy	13
6. Conclusion: A Niche for ray.do?	14
References	16
Bibliography	16

1. Introduction

Money has a long and interesting history. The money we use today is very different from historical money.

This paper goes back in history to observe the origins of money as well as give the reader a high level overview of the global monetary and exchange rate systems. This historical review presents the context for developing a new currency backed by creative output and online influence.

The outline below shows that money has historically been a tangible commodity or something which we can feel or touch. Modern money is mainly comprised of electronic credits to a bank account plus paper currencies. ray.do is proposing a service-based money allowing people to leverage their online content, clout, and overall credibility.

The paper is organized as follows

Section 2 looks at the functions and characteristics of money. It also underscores the two types of historical money, fiat and commodity money.

Section 3 briefly discusses the history of money and the roots of the present fiat standard.

Section 4 discusses how modern money can be manipulated in normal economic times.

Section 5 explains money control or manipulation in crisis.

Section 6 concludes by making several observations of desirable properties of ray.do and what it should aim to be using the background of the history of money.

The conclusion notes that a successful new currency has to smartly sequence all of the various functions of money.

2. What is Money?

The item used as money is a matter of convention and convenience. For example, in 1715 North Carolina declared 17 commodities as legal tender for use as money [Miles et al. 2012].

Historically, various societies utilized different commodities as money. Eventually fiat money was adopted and became dominant after 1971 because of the ease in which it was produced and exchanged at scale, as well as the gradual decline of the Gold Standard.

The paper version of fiat money has a much longer history dating back to 960AD under the Song dynasty in China [Selgin 2003, Miles et al. 2012]. At the time, China's fiat currency was backed by some commodity of value, but the backing was dissolved and excessive amounts were printed to fund government expenses. By 1455 excessive printing resulted in hyperinflation and paper money was abandoned by the Ming dynasty.

What this shows us is that fiat money can be manipulated quite easily, and that the flaws inherent in the nature of paper currencies have been well documented throughout history. You can almost always expect that putting people in charge of the mechanism by which we conduct commerce will always lead to a flawed system. However, the item selected to be used as money is more likely to withstand the test of time if it possesses these five characteristics.

The five characteristics of a stable currency.

1. **The commodity or item must be durable.** In ancient times various grains and leaves were used as money, but these were not very durable.
2. **The commodity or item must be generally acceptable.** This second feature is intuitive and is the basis for a successful currency. The currency becomes more valuable as more people accept it for payments and other uses.
3. **The commodity or item must be divisible or easily divided into various units.** For example, modern America fiat money is broken up into \$1, \$5, \$10, \$50 notes and so on. In ancient times certain animals were used as money. A living animal cannot be divided to buy a pair of shoes, a pound of cheese, etc., if the seller's objective is to have a living cow or goat.
4. **The commodity or item must be portable or easy to move around.** This is not a problem when it comes to modern notes, but gold and silver coins could become heavy. Animals are not very portable and some creatures may escape from their owners. Here money literally runs away!
5. **The commodity or item must not be easily counterfeited or debased.** Fiat money could be counterfeited, although it is becoming increasingly difficult to counterfeit the currency. Gold and silver coins were easy to debase by clipping coins and grinding them down to shave off some gold dust that was melted to make more gold coins.

In addition to these 5 characteristics, money has several higher functions.

The three general functions of money.

First: Money is used as a medium of exchange.

When money becomes generally accepted and forms a strong psychological bond with people, sellers are willing to accept the chosen currency as payment.

Second: Money serves as a unit of account.

This function allows goods and services to be priced or valued in terms of money. For example, a textbook is worth \$120 or a Toyota Camry is priced at \$24,000. This function of money makes it very convenient for a society and allows for overcoming the inefficiencies of barter. Given the advantage of having a unit of account, money sometimes develops without a central bank. For example, during World War II, prisoners of war used cigarettes as money – hence the unit of account is cigarettes. So, for instance, 1 bar of soap = 2 cigarettes, 1 candy bar = 4 cigarettes, 1 razor blade = 6 cigarettes, etc. [Colander 2013]

Third: Money serves as a store of wealth.

The money we work for over time can be stored or saved in the form of real estate, stocks, bonds, gold, or other commodities. Often all the other assets are transferrable into money. The final function of money is to serve as a means of deferred payments. This indicates we can borrow and repay in money. In other words, this function allows us to settle our debt in terms of money.

As observed earlier, there are two kinds of money:

1. Commodity money
2. Fiat money

For most of human history money was a commodity such as bronze, gold, silver, grains, whale teeth, cowry shells, animals and others.

Commodity money has both face value and intrinsic value. For example, a gold coin has a value stamped on its face, but it could also be melted down and used for another purpose. Whale teeth were used in Polynesia not only to make payments, but also for ornaments and jewelry.

On the other hand, fiat money has face value but no intrinsic value. It cost just about an average of 10 cents to produce a currency note, according to the Federal Reserve. In spite of not having another intrinsic use, fiat money can buy goods and services because the society generally accepts it. Its perceived value stems from the faith we place in paper money. Exactly why we tend to have faith in paper money will be explored in the next section.

3. Origin of Money and our Monetary System

Economic historians frequently debate the origin of money. Previously it was thought that money was invented to overcome the problems of the barter system.

One problem of bartering is the double coincidence of wants. For example, person A specializes in making shoes and would like to have a bicycle. Person A not only has to find an individual with a bicycle, but also needs to find a person who wants to trade that bicycle for a pair of shoes.

This is the problem of double coincidence of wants, a problem furthermore that results in significant inefficiencies, transaction costs and search costs. If there is a single unit of account Person A will just need to sell his shoes and use the money to buy a bicycle. There is no need to search for the ideal bicycle seller who also wants a pair of shoes.

This perspective of money's origin is known as the Metallist view of money [Goodhart 1998, Wray 2014].

But as it turns out, money did not come into existence because of people's desire to overcome the problems of barter.

Goodhart [1998] argues that money was created by the emperor (government) to tax the subjects. For the emperor to buy goods and services from his subjects, he would need to raise taxes. The emperor declared a money unit and demanded that the citizens use it to pay taxes. This is known as the *Chartalist origin of money*. Afterward citizens discovered that the emperor's money can be used to make general payments and store personal wealth. According to this perspective, money developed because of the coercive power of the King, Queen or State.

Understanding the history of money in terms of the Metallist and Chartalist perspectives provides insight for understanding the stability of a monetary union such as the European Monetary Union.

Goodhart argues that Chartalist perspective requires the establishment of a fiscal and political union to make the Euro Zone more stable. This fact came to the forefront during the Greek financial crisis when there was no joint European spending and taxing authority. The establishment of the European Central Bank and common currency before political and fiscal union is premised on the Metallist viewpoint.

In a modern democracy one cannot compel the citizens like the emperors of old, but the Chartalist idea says that modern money is a creature of the State. On the other hand, ray.do proposes a private money whose success will depend on approximating as close as possible the classic functions of money.

How did we get to the present fiat monetary system?

In a fiat system money is not backed by gold. The value of money under the fiat standard stems from the fact that people have faith in the government's ability to accept tax payments in the fiat currency. Moreover, a fiat currency requires a central bank implementing credible monetary policy. As we mentioned earlier, when governments and central banks abuse the power to create money, it most often sparks instability in the monetary system.

Credibility requires that the central bank sends clear expectations to markets so they can price in future interest rate and money decisions. When central banks conduct monetary policy in an ad hoc manner it often stokes the problematic form of inflation known as unexpected inflation. On the other hand, expected inflation is not such a big problem as markets and firms will adjust prices and contracts accordingly.

The present fiat standard came about from the collapse of Bretton Woods in 1971 after the United States ran up large fiscal deficits often attributed to the Vietnam War.

Bretton Woods, which came into existence in 1945, was a system of fixed exchange rate between the US dollar and the main currencies like the British pound, French franc and German mark [Eun and Resnick 2007].

The US dollar was backed by gold and all the other currencies were tied (pegged) to the dollar^[1].

This means holders of dollar could redeem their currency for gold. Since the dollar was backed by gold and all the other major currencies were pegged against the dollar, they were also indirectly convertible into gold at the fixed rate of exchange.

The fiat system was ratified at a global conference held in Kingston Jamaica in 1973, thus marking the official starting point of our present global financial architecture.

Under this system there would be multiple systems of exchange. Some economies like the United States, Canada, those in the European Monetary Union, Australia, India, Mexico, South Africa and others have flexible exchange rates where one country's currency is exchanged against another depending on the market's supply and demand.

The foreign exchange market is the largest market in the world with about \$5 trillion of trades taking place each day as of 2013, according to the last Bank for International Settlement (BIS) survey. It dwarfs the bond and stock markets.

In the other extreme several economies maintain completely fixed exchange rates. These tend to be small open economies like Barbados, Belize, Eastern Caribbean Currency Union, The Bahamas and several small economies in Africa.

There is an intermediate exchange rate regime known as a managed or dirty float. Here the exchange rate is allowed to change to some extent, but often the country's central bank intervenes actively to keep the rate trading at some target.

China, the second biggest economy by GDP, is the only large economy with a managed exchange rate. The Peoples Bank of China only allows the yuan to change within a narrow band, thus making it almost fixed over some period of time.

According to the International Monetary Fund (IMF), as of 2014, 74 economies maintained some form of a managed float or fixed exchange rate, while 65 countries follow a flexible exchange rate regime. The monetary policy system of the country is largely restricted by the nature of the exchange rate regime.

One economic idea – known as the trilemma or impossible trinity – advises that for a country to pursue independent monetary policy (meaning it has some control over its money supply and a benchmark interest rate), it must have a flexible exchange rate.

The same conventional wisdom says a country will be hard-pressed to maintain a fixed exchange rate or a dirty float and also have an independent monetary policy. The theory says that international capital flows will respond to interest rate differentials, thereby weakening the country's ability to control its money supply and interest rate.

Therefore, conventional wisdom has it that it is better to have an independent monetary policy and let market forces determine the exchange rate^[2].

1. The Bretton Woods is not the classic Gold Standard which lasted from 1871 to 1914. There was also a period known as bimetallism in which gold and silver were used together.

2. My book Money, Banking and the Foreign Exchange Market in Emerging Economies was written to explain certain conditions under which a central bank might have a fixed exchange rate or dirty float and monetary policy independence. I propose the compensation thesis as making this possible. Some of my research papers also try to develop this hypothesis further.

4. Modern Money and Its Manipulation

As noted earlier fiat money has no intrinsic value, only face value. Yet people widely use paper currency to make payments, store wealth, pay off debt and price goods and services.

This general acceptance emerge from the fact that central banks – particularly the Federal Reserve, Bank of England and other main ones – have been successful in managing the supply of money in line with the society's demand for money.

In the 1970s and 1980s many central banks in Central and South America, and most recently Zimbabwe, used their central banks to print money to finance government deficits, a recipe for instability and the bad form of inflation.

These monetary decisions were allowed because the central bank was seen as an extension of the government. Moreover, central bank heads were often the puppet of the President.

Newly independent nations in the 1950s and 1960s thought it was a no brainer to have their central banks print money to finance development projects. But this turned out not to be as simple as initially expected because most countries, save a privileged few, face limited foreign exchange. This means that the international demand for their country's currency is limited. This is often called a foreign exchange constraint in the economic literature. This means they must import critical machinery, fuel and technology using the US dollar or one of the other major global currencies. The US dollar is currently used as the main global reserve and vehicle currency.

By reserve currency this means that about 66% of all foreign exchange reserves held by global central banks are held in dollars. Vehicle currency means that 83% of all foreign exchange trades globally goes through the dollar.

These days most economists have figured out that central banks should be independent. The consensus holds that central banks ought to be independent of political interferences. Although this does not mean the central bank should do as it pleases. After all, the organization is still required to testify in front of Congress.

The task of the central bank is limited to declaring an inflation target and therefore determining a credible rate of growth of the money supply consistent with said target. If the monetary authority (another name for central bank) does not credibly control the money supply, markets and businesses begin to lose credibility in the central bank, which can lead to financial turmoil. Instability in a central bank can quickly lead to a rapid reduction in the value of a currency which can have long term effects on markets and other exchanges.

How does the monetary authority measure modern money?

It turns out most of money is not the actual notes and coins we have come to associate as being money.

Modern money is made up of currencies in circulation (notes and coins), checking deposits, savings deposit, small CDs and money market mutual fund.

This broad definition of money is known as M2^[3].

As at November 9, 2015 the stock of M2 in the United States is \$12.3 trillion. The amount of currencies (notes and coins) as at November 9, 2015 is \$1.3 trillion. Therefore, most of modern money is not actual fiat notes, but deposits in commercial banks and money market mutual funds. Furthermore, to put this into perspective, US nominal GDP at the end of the third quarter of 2015 is \$18.1 trillion.

How does the monetary authority manipulate the broad money supply or M2?

In general, the central bank does not possess complete control of M2. Instead it exercises some control through its balance sheet.

A balance sheet item which it has more control over is known as the monetary base (MB), which is made up of currencies in circulation + commercial bank reserves.

Commercial banks are required to maintain 10% of certain deposits as reserves. The 10% is known as the required reserve ratio that is set by mandate. This is kept at the central bank and therefore is a liability of the monetary authority and an asset of the commercial banks.

The central bank can manipulate M2 (increase or decrease the stock) by changing the monetary base (MB), providing the constant ratio M2/MB does not change too unpredictably. It changes MB by crediting or debiting the reserves of commercial banks.

An important tool the monetary authority has at its disposal is open market operations, which involves buying and selling Treasury bills and Treasury bonds in the open market. For example, if the central bank wants to increase the monetary base, it will buy securities from the open markets. This will credit their accounts at banks and increase reserves. In theory banks are expected to use the extra reserves to make loans and invest in securities, thereby increasing M2.

On the other hand, if the central bank wishes to take money out of the economy it will sell the same securities to the open markets. The buyers pay the Federal Reserve by debiting their reserves, thus reducing MB and M2.

Therefore, open market operations is a tool used to effect a change in MB that is expected to result in multiple creation of deposit money or M2. The multiple creation of money is the result of the smaller quantity of reserve money (part of MB) being used by the public multiple times. The smaller quantity of MB changes hands several times thereby resulting in a multiplied increase in broad money. This is known as a money multiplier effect. A simple equation is often used to illustrate the connection between MB and money supply (M2).

$$M2 = [(1 + c + b)/(c + rd + brt + re)]MB$$

Where c = ratio of currencies in circulation to checking deposits; b = ratio of small CDs to checking deposit; rd = the required ratio on checking deposits (set by regulation); rt = the required ratio on CDs (also set by regulation; and re = the ratio of reserves banks keep as non-remunerated excess reserves^[4].

The money multiplier (m) is given by the following expression: $m = (1 + c + b)/(c + rd + brt + re)$.

It is expected the multiplier will stay constant for some period; therefore, a change in MB will result in a change in M2 through the process of multiple deposit creation.

From the equation above it is obvious the central bank can control MB (using open market operations), the ratio c, and set by mandate rt and rd. It however cannot control the ratios b and re. In particular, in times of increased risk, banks will tend to hoard excess reserves. In that case the multiplier will get smaller and a change in MB does not feed through to a change in M2.

Here banks are choosing to hold cash instead of lending them out at a rate of interest^[5]. The central bank, therefore, loses some control of the money supply when banks accumulate excess reserves. The phenomenon of excess reserves (which is part of excess liquidity) is widespread in developing economies. It raises interesting topics for academic research and theorizing.

It should be noted that the primary instrument of the Federal Reserve is the benchmark federal funds rate. The Fed targets this interest rate and supply bank reserves (base money) depending on the demand for this component of money.

The Fed has a broad guide for how it should change the funds rate. This is known as the Taylor rule, although unconventional monetary policy since 2008 has weakened the Taylor rule.

The rule says the Federal Reserve should raise interest rate when GDP is above its trend ($GDP > GDP_{trend}$). When GDP is above its trend unemployment is falling and wage pressures will emerge, thus the need to cool things down before inflation increases too much above its target. Typically when $GDP > GDP_{trend}$ we would have inflation exceeding its own target ($Inflation > Inflation_target$).

On the other hand, the Fed should lower interest rate when GDP is less than its trend ($GDP < GDP_{trend}$). When GDP is below trend inflation typically falls below its target, thus resulting in deflation which is as dangerous as unexpected inflation.

Moreover, to reduce the interest rate the Fed has to inject liquidity into the economy by buying securities such as Treasury bills and Treasury bonds. This is the classic liquidity effect. In the short-term the Fed can reduce interest rates by just announcing it plans to do so; however, over time the central bank will have to inject liquidity so that it can defend its lower target. It has to do the exact opposite if it wants to increase interest rate in the long-term.

Here it will need to sell securities to reduce reserves of banks, thereby making funding scarce. Banks will be forced to increase the overnight rate at which they lend reserves to each other. They will pass on the increase to higher lending rates. Financial markets will also follow increasing rates on many private securities.

3. There is also a more narrow measure of money indicated as M1. M1 = currencies in circulation + checking deposits. The monetary authority can manipulate M1 using the same tools it uses to influence M2. Since M1 is a narrower measure of money, it is usually easier to control.

4. Typically excess reserves pay no interest rate. However, in October 2008 the Federal Reserve started paying member banks a small rate of interest (0.14%) on excess reserves as a response to the subprime crisis of 2007-08. The purpose of this policy was to create an extra tool the Fed could use to stem a possible credit boom resulting from the massive expansion of the monetary base owing to quantitative easing, which will be discussed later in the paper.

5. I wrote my PhD dissertation – “Excess Liquidity, Oligopoly Banking and Monetary Policy in a Small Open Economy” – on this topic explaining why banks in many developing economies demand excess reserves that pay no interest rate instead of lending. The thesis argues that banks can still make profits by marking up their loan rate and the limited supply of foreign currencies prevent banks from investing all excess reserves in a foreign asset overseas.

5. Non-Conventional Monetary Policy

The scenario described above represents conventional monetary policy.

In conventional policy there is no ambiguity between the output gap ($GDP - GDP_{trend}$) and inflation gap ($Inflation - Inflation_{target}$). This means when there is a positive output gap ($GDP > GDP_{trend}$) we also have a positive inflation gap ($Inflation > Inflation_{target}$). And when there is a negative output gap ($GDP < GDP_{trend}$) we should also have a negative inflation gap ($Inflation < Inflation_{target}$).

The Fed faces a conundrum since the end of the subprime crisis. The US economy has a positive output gap and a negative inflation gap. In other words, inflation is below expectation persistently for the past 7 years. As noted above, expected inflation is not a problem. Deviation of inflation from expectation often is a problem as markets and investors cannot plan for the future.

After the market meltdown in the summer of 2007, the Federal Reserve implemented quantitative easing (QE) and other measures like Operation Twist. QE involves massive purchases of securities, both Federal government papers and private securities. The purpose was to add liquidity into these markets so that the yield on the securities could stay low. One such private security is the commercial paper market as there was fear the rate could spike to close to 20%. This would have been disastrous for corporations that depend on this market for short-term financing.

The Fed also bought toxic securities at the center of the crisis such as mortgage backed securities. It also purchased US federal 10-year papers so as to keep mortgage rates low. Note, just like conventional open market operations, QE also injects liquidity into the economy. However, these injections are much larger generating about \$1.4 trillion of excess reserves at one point by the middle of 2014. Thus, the excess reserves in US banks are a post-crisis phenomenon. The liquidity in the banking sector in developing economies goes back to the 1960s.

Owing to the inconsistency in the output and inflation gaps, the Fed has been reluctant to increase interest rate and it might have continued QE much longer than it should have. More recently, the Fed is facing the trilemma that small open economies and large emerging economies have faced for decades. Increasing interest rate now will make the US dollar much stronger as foreign portfolio capital flows into the US, thus further reducing American exports and the profits of American multinational corporations.

In spite of these headwinds, the Fed might not be able to wait longer and we could expect interest rate to increase as early as this month.

One of the quiet issues emerging from QE is the large amount of profits the Federal Reserve made since 2009. The Fed made and handed over almost \$500 billion to the Treasury since by law the Fed has to cede profits to the Federal government. Some observers see this as a transfer of wealth from the private sector to the government (Perry 2015). However, the million dollar question pertains to the nature of the counterfactual. What would have been the outcome if there had been no intervention by the Federal Reserve?

6. Conclusion: A Niche for ray.do?

In view of the survey above, it is important for the proposed currency to approximate the functions of money as closely as possible, and as soon as possible.

It is clear that ray.do has certain desirable characteristics.

Obviously the currency is portable, durable (this depends on the technology) and divisible. It is an easy idea to understand, thus making it democratic and transparent compared with Bitcoin. People will understand how to earn the currency and how to save using it.

It will also have several desirable functions.

In the beginning the currency will act as a store of value or wealth. It is going to be a private currency that does not require central bank intervention to regulate its quantity. However, its 'value' will likely be priced against traditional fiat currency in the beginning, especially if people choose to cash out.

The challenge will be to get into people's mind so that it becomes a unit of account and a medium of exchange, at least in the online environment.

Initially, the currency will be generated when people 'work' online. However, a truly disruptive currency will be one which makes people comfortable enough so that they demand wage payments for work outside of the online environment in the proposed currency. Nevertheless, the store of value function is enough to give ray.do a niche.

At this stage it will be complementing traditional money. My hunch is before it displaces fiat money it will take away market share from companies like PayPal, Apple Pay or Android Pay. It could even completely displace those. Its success will depend on network externality, meaning the proposed currency will become more valuable as others join the network of income receipts and payments in ray.do.

The currency also has the potential of becoming a tradable asset like gold, cash, stocks, bonds, real estate and others in a financial portfolio. Here is where there is a lot of potential for growth. I can see ray.do displacing gold and cash as an asset in portfolios. Gold, for instance, requires a cost to store and it is not very portable. Cash earns little interest rate – at least for now – while the value of the proposed currency is likely to grow over time. ray.do is potentially easy to store and globally portable like a Dropbox. The currency is an asset for individuals. We have to convince people to add the asset to their personal balance sheet.

This currency also has potential in international finance.

Foreign companies can generate incomes in ray.do. Companies have to be convinced that the new currency can be a new profit center complementing traditional revenue sources. The same can occur

for central banks around the world. If foreign central banks join the network, they will now possess a digital asset that can supplement their traditional international reserves which currently have to be held in US dollar or Euro assets.

The International Monetary Fund (IMF), World Bank and United Nations will also likely find this idea interesting. Since income earned in ray.do is production, they will have to be added to GDP of all nations. It is also not farfetched to envisage ray.do being part of the IMF's basket of currencies known as Special Drawing Rights (SDRs).

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