

# **The Institutional Structure of the Monetary System**

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## **Abstract**

In this paper we establish a very simple theoretical framework to discuss what the main factors are in determining the institutional structure of the monetary system. We see this problem through different angles. We also compare our model with various monetary systems proposed by economists such as Smith, Friedman, Keynes, Hayek, and Mundell. In all cases we found that transaction costs are the key to understanding the institutional structure of the monetary system. Much more empirical studies are needed to see if transaction costs are as important as they are in our theoretical model.

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## **I. Introduction**

Money is a measuring rod. It measures the exchangeable value of almost all goods and services transacted in the market. Money is also a human device or an institution created by human beings to facilitate transactions. Without it the cost of transactions would be much higher and the operation of the market would certainly be very costly. Because by using money transaction costs of the market could be reduced, the stability of money is therefore essential for the stability of the price of various goods and services.

But the value of the measuring rod itself is not always stable. After all it is a human device. Its value naturally depends on the institutional structure of a society which created it. By institutional structure we mean the economic, political, and legal framework or infrastructure on which both money supply and money demand are based. The monetary system a country adopts is closely related to the institutional structure it faced. Similarly, the international monetary system is regulated by the institutional structure created by countries involved in the system. The study of monetary stability is largely a study of the monetary system, and the latter is actually a study of the relevant institutional structure.

In this paper we propose a simple model of money to study the institutional structure of the monetary system. Money acts as the medium of exchange because households and firms use money to buy commodities. Money also acts as the store of value because people use it to invest in financial products, such as stocks and bonds. These two motives of holding money are actually Keynes' (1936) transaction and speculative motives of the demand for money. The liquidity preference theory of Keynes later became the foundation of the models of Baumol (1952), Tobin (1956), and Lucas (2013). Both Baumol-Tobin and Lucas had introduced some kind of transaction cost into their models.

Following their works and those in the literature of the new institutional economics, such as Coase (1988), we use the idea of transaction cost to construct both the functions of money demand and money supply. We will find that this transaction-cost based monetary model would be useful in discussing both the monetary policy and the monetary system. Different monetary systems therefore reflect different behavior of money demand and money supply. Different behavior in consumers, producers, banking systems, monetary policies, and legislation would result in different degree of monetary stability and economic performance.

Monetary theory has traditionally been dominated by Hume's (1752) *quantity theory of money*.<sup>1</sup> It is indeed a theory of the demand for money. Friedman (1969) had given it a modern interpretation. By assuming a stable money demand, the quantity theory traces out the demand for money by altering the exogenously given money supply. On the contrary, a minor group of economists adhere to the *real-bills doctrine* of Smith (1776). This is the "...classical version of the objection...to the quantity theory...that changes in the demand for money call forth corresponding changes in supply and that supply cannot change otherwise, or at least cannot do so under specified institutional arrangements." (Friedman (1969, p. 63)) Thus, in the sense of Friedman, the real-bills doctrine is mainly a theory of money supply, which traces out a stable supply of money by shifting the money demand curves.

In our framework the equilibrium quantity of money and the corresponding equilibrium interest rates and prices are determined by both money demand and money supply. The quantity theory of money and the real-bills doctrine, though usually considered to be opposite to each other, are actually the two sides of the same coin. The real problem rests on the distinction between outside money and inside money, between narrowing banking and free banking, and between commodity money (such as silver and gold) and fiat money. These distinctions are closely related to the transaction cost of operating the market of money. And the supply and demand of the money market consist of the institutional structure of the monetary system, which is the focus of the present paper.

Section II establishes a simple monetary model with transaction costs. Section III compares this model with some monetary systems proposed by various economists, such as Friedman, Hayek, Keynes, Mundell, and Smith. Section IV summarizes.

## **II. A Simple Monetary Model with Transaction Costs**

Suppose that there are four representative groups of agents in our economy: households, banks, firms, and the government. The government, or central bank, issues fiat money which households use to buy goods and services produced by the

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<sup>1</sup> For example, in his essay *Of Interest*, Hume (1752) said that "Were all the gold in ENGLAND annihilated at once, and one and twenty shillings substituted in the place of every guinea, would money be more plentiful, or interest lower? No, surely: we should only use silver, instead of gold...No other difference would ever be observed; no alteration on commerce, manufactures, navigation, or interest; unless we imagine that the colour of the metal is of any consequence." (2008, p. 178)

firm. For simplicity, assume that firms earn zero profits because the market for goods and services are perfectly competitive. The bank gets fiat money by taking deposits from households, and pays them interest at the rate of  $R^d$ . In a fractional reserve system the bank could lend part of the deposits to the firm as a loan and earn an interest at the rate of  $R^l$ . The firm uses the loan or financial capital  $k$  to produce final goods and services  $y$ , where  $y = f(k)$  is the associated production function.

In reality the operation of both the bank and the government would have costs. The fiat money is actually a social contract between the central bank and the people who would use it. For example, the Federal Reserve Bank is the legal tender of the Federal notes or U.S. dollars. In the era of silver standard or gold standard the bank, which issued what Smith (1776) called the bank money, had the responsibility to pay equal value of silver or gold to the depositors on their demand. There are costs in enforcing this social contract. In the commodity standard era the cost might be in digging, producing, and transporting the species from the mines to the market. But even in an era of fiat money there are still costs in issuing the irredeemable paper money. After all the main difficulty of maintaining a fiat money system is how to restraint the inappropriate over-supply of the paper money by the central bank, or how to make the long-run price level more predictable.

As noted by Friedman (1986) that “...the real resource cost of producing irredeemable paper money was negligible...such an assumption...is false for society as a whole and is likely to remain so unless and until a monetary structure...provides a high degree of long-run price level predictability.” (p. 643), the resource cost or prime cost of producing fiat money is near zero, but what is important is the cost of maintaining the credibility of this paper money and of keeping the price to be predictable and the inflation or deflation to be under control. These costs might be considered as the transaction cost of the money supply, which was unfortunately ignored by most monetary economists, including Friedman himself in his 1969 monograph on the optimum quantity of money.<sup>2</sup>

On the contrary, the transaction cost was not ignored in the demand theory for money, at least not by such authors as Baumol (1952), Tobin (1956), and Lucas (2013). They had adopted a similar setting where there are costs in either replenishing households’ cash balances such as in the Baumol-Tobin model, or in managing cash

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<sup>2</sup> Keynes (1923) might be the first economist who noticed the importance of the transaction cost in issuing the paper money. This is probably one of the reasons he would have in mind when he was proposing to the British monetary authority (mainly Bank of England) with *A Tract on Monetary Reform* about the arrangement of the international monetary system after the 1922 Genoa Conference.

transactions such as in the model of Lucas. We follow their settings in assuming that there are transaction costs when using cash as a medium of exchange without specifying the particular structure of the demand for money, so one can interpret our model in either the sense of Baumol-Tobin or that of Lucas. We will discuss the transaction cost of money demand and that of money supply in the following two subsections respectively.

## 1. Transaction Costs and Money Demand

The representative firm wishes to maximize its profit:  $py - R^l k$ , subject to the production technology:  $y = f(k)$ , where  $p$  is commodity price. Suppose that there is not depreciation in financial capital and the price of capital is normalized to unity, so there is no possibility for the firm to have either capital gain or capital loss. The representative bank also wishes to maximize profit:  $R^l k - R^d k - C^b k$ , given  $C^b > 0$ , the (marginal) transaction cost incurred by the bank when participating in the money market. It could also be interpreted either as Baumol-Tobin's cost for shopping trips, or as Lucas's cash management cost. The bank collects deposits from households and then distributes them to the firm to produce final goods.

Since we have assumed that the firm will earn zero profit in the competitive equilibrium, this means that the marginal product of capital (MPK) would be equal to the loan rate of interest, or  $MPK = \partial y / \partial k = R^l / p$  in equilibrium. What the bank earns in per dollar lent is the spread, or the difference between the loan rate  $R^l$  and the deposit rate  $R^d$ . The first-order condition for the profit maximization problem of the bank requires that  $R^l - R^d - C^b = 0$ . This implies that  $R^l - R^d = C^b$  in equilibrium. Since  $C^b > 0$ , the bank would earn a positive spread or profit in our model.<sup>3</sup>

We might take another look at the equilibrium condition of the bank optimization problem. Since  $MPK = R^l / p$ , this means that  $MPK = (R^d + C^b) / p$ . The economic implication of this equation is that the representative individual would have two

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<sup>3</sup> For simplicity we assume that there are not transaction costs in using the final-good market. But in reality there are transaction costs and the real firm earns positive profits on average. The firm in our model could also earn a positive profit in equilibrium if we would instead assume that there are transaction costs in using the market of goods and services. That the emergence of the firm is due to the fact that there are costs in using the market is one of the great ideas proposed by Coase (1988). In the real world banks are also firms and would like to maximize profits. A positive spread means that there are at least two interest rates in equilibrium, that is, deposit and loan rates. Unfortunately, mainstream macroeconomic models usually have only one equilibrium interest rate. This embarrassing situation has been changing. Woodford (2010) was one such example. And I believe there will be more.

options: the first is to deposit her money in the bank to earn the deposit rate of interest. The second is to become an entrepreneur, borrow money from the bank to establish a firm, and earn the marginal product of this loanable fund. In standard macroeconomic models these two options are equivalent because it is assumed that  $MPK = R^d / p$ . But in our model the firm would on average earn an extra profit above the deposit rate of interest. Of course this does not mean that every firm would have positive profits. When the transaction cost is too large to be covered by the spread, or  $C^b > R^l - R^d$ , the bank would be bankrupt such that the firm could not get a loan to produce goods. The firm would therefore go bankrupt sooner or later. This is what happened in the financial crisis, when the default risk of the bank is high and households would rush to the bank to get their deposits back as soon as possible. The no-bank-run condition of our model, if there is one, is naturally to require that  $R^l - R^d \geq C^b$  in equilibrium.

Though the above model is simple enough, it has almost all the properties inherent in traditional models of money demand, such as those of Baumol (1952), Tobin (1956), Friedman (1969), and Lucas (2013).<sup>4</sup> For example, the loanable fund  $k$  is positively related to the income  $y$  and negatively related to the loan rate  $R^l$ . The novelty here is the transaction cost in the operation of the bank and the money market. When this cost is higher, the bank's profit becomes lower, and the loanable funds created by the banking system would decrease. This is the typical phenomenon of a recession. On the other hand, when transaction cost is lower, the credit or inside money created by the bank would increase, and this is probably a situation of prosperity. But an over-heated economy needs more fuel from outside the banking system, and a great contraction is usually the result of a liquidity crisis. Thus, we have to consider the behavior of the government or the central bank because they are responsible for the creation of public debts and the outside money, which are very probably roots of financial booms and busts.

## 2. Transaction Costs and Money Supply

Assume that there are no taxes and public debts in our economy. All government spending is financed by issuing fiat money. This outside money plus the inside money created by the banking system as a whole consist of the total amount of money circulated in the economy. Call this sum total  $M1$ , which is equal to currency plus loanable funds, or  $M1 = C + k$ , where  $C$  is the currency held by the public. The

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<sup>4</sup> As is obvious, we focus here on the demand for money of the firm rather than that of the household. This is only for simplicity. Households' demand for money could be considered in the similar way as done by Baumol-Tobin or Lucas, which is omitted here.

outside (or high-powered) money created by the central bank is denoted by  $M0$ , which is the sum of currency and the required reserves of the bank, or  $M0 = C + R$ , where  $R$  is the required reserve. In a fractional reserve system the required reserve ratio can be defined as  $rr = R/k$ . Let  $cr = C/k$  be the currency ratio. The money multiplier could be derived as  $m_G = \Delta M1 / \Delta M0 = (cr + 1) / (cr + rr)$ .

Now let there be costs in implementing the monetary policy. If the central bank's goal is to pursue full employment and price stability, then it needs to stay focused with the targeted interest rate and unemployment rate. The recent announcement of the Fed to target the expected inflation rate at 2% and unemployment rate at 6.5% was an example. The efforts the Fed pays for implementing these monetary policies could be considered as costs of enforcing the mandates authorized by the Federal Reserve Act of 1913. These costs of enforcing legal contracts are what Coase (1988) called transaction costs.

The purpose of the government or the central banker is assumed to maximize the welfare of the household, which is represented by the rent households obtain by using the fiat money. Again the household has two options in using money. First, she could use it to buy goods. In this case the fiat money provides her with liquidity services. Otherwise she could lend the money to someone else who needs it to consume goods or invest in bonds and stocks. In this second case she abandons the right to use the money in exchange for some interest returns. With competitive uses from numerous households the rent would be equal to the interest income in equilibrium. The government therefore wishes to maximize the rent, or equivalently the interest income, net of the transaction cost of implementing the mandates:  $(R^d - C^g)M0$ , where  $C^g > 0$  is the relevant (marginal) transaction cost. We are assuming that the central bank would follow the advice of Friedman (1969) to choose the quantity of money ( $M0$  here) instead of interest rates as the instrument to conduct monetary policies.

The solution to the government maximization problem is simply  $R^d = C^g$ , that is in equilibrium the transaction cost is just equal to the opportunity cost of forgoing the right to use the money to other people. The novelty here is that this result could help us explain the optimum quantity of money proposed by Friedman (1969). In his famous statement Friedman had claimed that “...the optimum quantity of money is that it will be attained by a rate of price deflation that makes the nominal rate of interest equal to zero.” (p. 34, italics original) Although the process of deriving the optimum quantity of money is without error, the assumption Friedman used is not. Assuming zero nominal interest rate is equivalent to assuming that there is no right to

use the money, or that the right to use money cannot be transferred to someone else. This amounts to saying that only the person who originally owns the money can use it. Nobody can use the medium of exchange except the owner of the money. This is a world with zero velocity of money. And in the end the money is useless because it has lost its role as medium of exchange and as store of value.

To have a meaningful monetary equilibrium, be it optimum or not, a positive nominal interest rate would be necessary. And it seems that if there were no transaction cost of supplying money, there would probably be no nominal interest rate, at least in the sense of Friedman's optimum quantity of money. The equilibrium nominal interest rate in our model is  $R^d = C^g > 0$ ,<sup>5</sup> but we would not discuss the optimum property of this equilibrium, and would leave it to the future research.

### **III. A Comparison between Different Monetary Systems**

The arrangement of the monetary system is actually the rearrangement of the right of using money and the liability of issuing money. Consumers and producers have the right to use money and the central bank has the liability for the money they issued. Every market transaction involves the transfer of the right to use money from one person to the other, and at the same time involves the exchange of the right to use money with the liability the central bank committed. Monetary rearrangements of rights and liabilities would occur when foreigners use our money in international market transactions, when exchange rates become more flexible or more rigid, when there is inflation or deflation, when countries use quantitative easing (QE) policies to buy huge amount of public debts to lower interest rates and to induce higher expected inflation, and so on.

These monetary rearrangements of rights and liabilities are the essence of what we have called the institutional structure of the monetary system. And they depend on the magnitudes of the relevant transaction costs. Many seminal economists have discussed the arrangement of the monetary system, or the international monetary system in particular, though very few of them have dealt with the institutional

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<sup>5</sup> This is the equilibrium nominal deposit rate. The equilibrium nominal loan rate would in general be higher than the deposit rate. In any case the equilibrium nominal interest rates in our model are positive. If there are no transaction costs, then both the nominal deposit rate and the nominal loan rate would be zero in our equilibrium, which is consistent with Friedman's optimum quantity of money. Friedman's theory is therefore a special case of ours.



structure and transaction costs. Nevertheless we would like to compare monetary systems suggested by some well-known economists with the theoretical model we have thus far proposed. These economists have seen the monetary system from different angles. It is therefore convenient for us to compare different monetary systems from different angles.

## 1. Commodity Money or Fiat Money

Commodity money had prevailed for most of the time in human history. Only after the collapse of the Bretton Woods System on August 15, 1971, the world has for the first time been experiencing a global fiat-money system. The debate between commodity and fiat currencies has been a long story, but the champion of commodity money in the last century was undoubtedly Hayek. The debate about monetary systems between Hayek and Keynes in 1943 was heuristic. It had inspired the debate between Hayek and Friedman, and that between Friedman and Mundell.

The main reason for a commodity monetary system is that it could restraint the discretionary power of the central bank. In the silver standard or gold standard the central bank has almost nothing to do except issuing the bank money. Some countries even did not have a central bank in the era of silver or gold standard. The Federal Reserve System was created in December 1913 when the United States had already been with the gold standard for many years.

But the main problem of the commodity standard or a commodity-reserve currency would be on the supply side. The production of the specie, say silver or gold, is costly. The amount of the specie reserved in the mine is limited, and we always have to search for new mines to meet the market demand for species. If we adopt a commodity-reserve currency in which the specie is replaced by a basket of raw materials such as wheat, soybean, corn, etc., as recommended by Hayek (1943) among others, the same problem still applies. The supply of raw materials is still limited, and we need so many warehouses to store those commodity monies. A basket of commodities does not change the essence of the problem. This is why both Keynes (1943) and Friedman (1951) had objected this proposal. In any case, if there were not transaction costs in supplying the specie or the basket of raw materials, then the commodity-reserve money might be a good idea to solve the would-be discretion problem of the central bank.

The demerit of commodity money is the merit of fiat money. The latter has an unlimited supply. The material cost of printing paper money is near zero, at least marginally. But this does not mean that the marginal cost of its supply is negligible. The marginal transaction cost of providing the fiat money is still positive, as argued forcefully by Friedman (1986) and Friedman and Schwartz (1986). The supply of the commodity money is therefore regulated by the scarcity of the commodity or set of commodities. On the other hand, the supply of the fiat money is not regulated by the scarcity of the material producing it, say paper and ink, but by legal constraints and, much more importantly, by the supply of its nearest competitors. If the fiat money has more close substitutes, then the central bank that issues it would be forced to limit the supply of its own currency. Otherwise, people in other countries would hold other currencies instead. International competition in the use of money is the real constraint of the supply of any fiat money. And the choice between commodity money and fiat money is the choice of institutions. This in turn depends on the magnitudes of relevant transaction costs.

## 2. Fixed Exchange Rate or Flexible Exchange Rate

Exchange rates are another important angle through which various monetary systems are determined. Since the termination of the Bretton Woods System the world has been largely on a flexible-exchange-rate system. But many countries are more or less on a target-zone system. They usually pegged the U.S. dollar within a targeted zone, the range of it being implicitly determined by the central bank. China is an exception because she, under heavy capital control, announced a 0.2% daily range allowed for flexible exchange rates on July 21, 2005, and has gradually broadened the range to the current 1%. Other countries such as Taiwan and South Korea have kept the target zone as secret as possible because, unlike China, their capital markets are relatively less constrained.

The champion for flexible exchange rates has certainly been Friedman (1953), and that for fixed rates is probably Mundell (1961, 2000), the theoretical founder of the euro. Why has the monetary system anything to do with exchange rates? The answer should be found in the famous proposition of *impossible trinity*, an idea which can be traced back to Keynes (1924, Ch. IV). The main concern of Keynes was the choice between the internal price stability and the external one. These two options cannot prevail simultaneously, if there is a central bank and the country does not want to abandon the independence in determining its monetary policies. Keynes implicitly

suggested a fixed-exchange-rate system. Later on he proposed an international monetary system with an international currency called “bancor”, and a Clearing Union as the international central bank.<sup>6</sup> Mundell’s (1961) proposal for an optimum currency area was a small-scale Keynesian plan for the international monetary system. Now euro is kind of the European bancor, and the European Central Bank is the realization of the hypothetical international Clearing Union.

What are the merits and demerits of the idea of an international currency and an international central bank? This is definitely an empirical question. But any empirical work needs a theoretical framework. According to the theory we proposed in Section II the plan of Keynes and Mundell has been to leave the monetary rearrangement of rights and liabilities to a giant firm, the international central bank, with all liabilities being reduced to just one, the international currency. That a single firm issues a single liability and distributes it to all the people around the world is the essence of the plan of Keynes and Mundell.

A more market-oriented plan had been proposed by Friedman (1953), and also by Hayek (1978) with a much more extreme version. Friedman objected the Bretton Woods System, and favored a flexible-exchange-rate system with fiat money. The competition between different fiat monies in the international money markets and the free mobility of capital across national borders would ensure an efficient international monetary system. Nevertheless, as argued by Coase (1988), the operation of markets has costs, and if the transaction cost of using markets is greater than the benefit of using them, then the firm would emerge to save the cost. From the viewpoint of Coase, the plan of Keynes and Mundell is more firm-oriented, and that of Friedman and Hayek is more market-oriented. That which plan is more efficient depends on the magnitudes of the relevant transaction costs in implementing these proposed international monetary systems.

### 3. Quantity Theory of Money or Real-Bills Doctrine

Both Hume and Smith are excellent monetary economists. Hume originated the idea now called the quantity theory of money in two essays of his 1752 *Political Discourses*: “Of Money” and “Of Interest.” Smith initiated the idea of real-bills

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<sup>6</sup> Keynes (1943) had mentioned the Clearing Union but not bancor. The idea of bancor was prepared for the Bretton Woods conference held in July 1944. Harry Dexter White, the U.S. representative of the conference, proposed the “unitas” as the counterpart of the bancor, but these two fictitious monies have never come true.

doctrine in *Wealth of Nations* (Bk. II, Ch. II). These two theories are not contradictory to each other but their emphases are different. Hume focused on money supply side, and implicitly assumed the long-run neutrality of money. But Smith had a balanced view between money demand and money supply. His focus was on the difference between real bills and fictitious bills, and economic fluctuations are mainly due to issuance of the fictitious bills of exchange. In other words, inside money was the point of Smith, but it is outside money to which Hume had paid more attention. The implication for an efficient monetary system is obviously different under these two theories. The problem is how to draw the line between outside money (gold or paper money in Hume's case) and inside money (bank money or bills of exchange in Smith's case), as demonstrated by Sargent (2011).

An equally important problem is about the stability of money supply and demand. As mentioned above, adherents of the quantity theory would usually assume that the money demand function is stable. Though many empirical works had confirmed this, they all ignored transaction costs. It seems necessary to test the stability of money demand along the line of Friedman (1969) but with positive transaction costs. Similarly, to test the economic implication of the real-bills doctrine it is necessary to have a stable money supply function. But unlike the case for the money demand, there are hardly any empirical evidences for the case of money supply. Obviously, there will be much works to be done.

#### **IV. Summary**

Monetary system is perhaps the most important economic system. Business cycles are largely a monetary phenomenon. And the choice of the international monetary system has always been the focus of international economic affairs. From silver standard to gold standard, and from Bretton Woods System to the current fiat-money world, monetary system has played a decisive role in determining the economic performance of a country and the global world as well. The emergence and evolution of the monetary system depend on the institutional structure of the society. And the institutional structure of the monetary system is closely related to the transaction cost involved in both money demand and money supply.

In this paper we establish a very simple theoretical framework to discuss what the main factors are in determining the institutional structure of the monetary system. We

see this problem through different angles. We also compare our model with various monetary theories and monetary systems proposed by seminal economists such as Smith, Friedman, Keynes, Hayek, and Mundell. In all cases we found that transaction costs are the key to understanding the institutional structure of the monetary system. And much more empirical studies are needed to see if transaction costs are as important as they are in our theoretical model.

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