

1 Introduction

Money

Before developing a theory of money, we need to define what we mean by the term. Most economists are likely to be satisfied with the following definition: **money is an asset that circulates widely as a medium of exchange.**

Implicit in this definition is that money is a means of payment. But almost any good can in principle be used as a means of payment. When you go to a restaurant and order a meal, you are typically expected to settle your debt at the end of your meal with money. If you do not have the money to do so, you may find yourself temporarily employed as a dishwasher. Labor (or any other good) can also serve as a means of payment. It is clear, however, that perishable goods and services cannot circulate—so that these objects cannot, by definition, constitute money. On the other hand, durable commodities—like gold or silver—can potentially circulate and have, in the past, served as media of exchange.

The contemporaneous swap of one good for another (like food for labor) is called a **barter** exchange. While barter exchange was a common phenomenon historically (and even today, in lesser developed economies), it in no way exhausts all possibilities—even in an economy without money. I'll scratch your back, if you'll scratch mine, is an example of a barter exchange. I'll scratch your back today, if you'll scratch my back tomorrow, is an example of a **credit** arrangement that does not involve money. Even the operation of an **insurance** market does not require money; e.g., let's agree to scratch each other's back whenever we feel an itch.

Credit and insurance transactions are distinct from barter in that they involve the exchange of **promises**. The promise-maker issues a **liability**; and the promise-taker acquires an **asset**. But as the examples above demonstrate, there is nothing inherent in these financial market transactions that obviously necessitates the use of money. In fact, privately-issued liabilities representing specific claims to certain commodities have themselves frequently emerged as circulating media of exchange. The paper notes is-

sued by private banks during the so-called U.S. free-banking era (1836-63) constitute a primary example of this phenomenon.¹

In principle, any financial instrument might serve as a medium of exchange; but in practice, most do not. Financial instruments that do end up as media of exchange appear to possess a common set of characteristics.

First, their contractual terms are not exclusively bilateral in nature; as is the case for registered bonds, or insurance policies—which are typically tailored to specific individuals. Instead, successful monies typically have the characteristic of **bearer debt**; so that the transfer of ownership occurs automatically in any act of exchange.

Second, for the debt instrument to circulate widely as a means of payment, it must be **easily recognizable** by the general population. In particular, the identity (balance sheet or reputation) of the issuer must be known, and the asset itself—whether it takes a physical or virtual form—must be difficult to counterfeit.

To summarize, money is almost always in the form of an easily-recognizable bearer debt instrument, issued by a reputable person or agency. These properties render the monetary instrument **liquid** in the sense that it is widely accepted as a form of payment in exchange for goods or services.

Subtleties

At this point, I would like to mention the subtle (but important) distinction to be made between a **form** of payment and a **method** of payment. A monetary asset may take different forms. Money may take a physical or **tangible** form—like gold coins or paper notes. But it may also take a metaphysical or **intangible** form—like book-entry items or electronic digits recorded in an account.

In contrast, a method of payment describes *how* a monetary form is transferred across individual balance sheets. A common method of payment involves the transfer of tangible money from one hand to another (the purchaser's balance sheet is debited and the vendor's is credited). Until recently, checks were a common method of payment. Note that checks are not money—they constitute instructions regarding the transfer of intangible money from one account to another. These days, debit and credit cards are popular methods of payment. Debit and credit cards too are not money; they are simply a way of transferring intangible money from one account to another.

¹ These notes were made redeemable in specie—gold and silver coins—and constituted senior claims against the bank's other assets (in the event of bankruptcy). See also Champ (2007) for many other examples.

I find it useful to classify different methods of payments into two broad categories, depending on whether an intermediary is involved. Payment for goods with tangible money requires no intermediary; balance sheets are debited and credited bilaterally between the seller and buyer. Payment for goods with intangible money, on the other hand, requires an intermediary to execute the actual transfer of money from one account to another. In economies with well-developed banking systems, this latter method typically makes use of the credits that exist in what are called **checking** or **demand-deposit** accounts. For this reason, the demand-deposit liabilities of chartered banks are commonly included in measures of the money supply. But a demand-deposit liability itself is not money; it is a debt contract between you and your bank. It is the electronic credits themselves that exist in these accounts that constitute the monetary form.

Having said this, it should be clear that the book-entry items that exist in bank accounts are **intrinsically useless** objects. Economists describe such objects as **fiat money**. A demand-deposit liability itself is not a fiat object; it is a contract entitling the holder to some intrinsically valuable rights (including the right to claim a part of the bank's physical assets in the event of bankruptcy).

In contrast, commodity money (like gold) is not a fiat object; as commodities possess intrinsic value. Paper money may or may not constitute fiat money. Although paper notes are by themselves without intrinsic value, they may in some cases constitute contracts that are of intrinsic value. A banknote representing a claim against gold, for example, is not a fiat money instrument. On the other hand, modern-day government notes are fiat in nature—as they do not represent a claim against anything of intrinsic value.

Why Money?

Having described some of the key characteristics of money, it remains to ask why it is necessary. Why might we expect a monetary economy to function more efficiently relative to an economy without money? To put it another way: what is it that prevents people from acquiring the things they want directly in exchange for the things they have? Why is it frequently more efficient to first sell what you have for money (a debt instrument issued by some third party) and then use money to purchase what you want?

A second question concerns the method of payment. That is, given that monetary exchange is desirable, how what is the optimal method of payment? Should payments be organized via hand-to-hand transfers of tangible money, or should the payment system involve a centralized book-keeping agency that executes transfers of money from account-to-account?

Lack of Double-Coincidence

People generally differ in terms of the types of goods they have (or are good at producing) and the types of goods they want (and are not so good at producing). These differences imply that people can potentially make themselves better off by trading what they have for what they want. The welfare benefits associated with voluntary exchange are called the **gains to trade**.

When two people meet, there are potential **bilateral** gains to trade. If these gains are transitory, they can be exploited by way of barter. If these gains are long-lasting, a relationship is likely to form. In personal relationships, these gains appear to be exploited well enough without the use of money (think of a marriage).

In a society consisting of more than two people, the gains to trade may take a more complicated form; in particular, they may be **multilateral** in nature. Multilateral gains refer to the benefits that exist beyond what can be achieved through bilateral trading relationships. In fact, it is possible for multilateral gains to exist even in the absence of any bilateral gains. To see this, consider the following example.

Imagine an economy consisting of three people; let's call them Adam, Bob, and Cathy. They all have (can produce) food and they all want (to consume) food. However, Adam likes food in the morning, Bob likes food in the afternoon, and Cathy likes food at night. Moreover, Adam can only produce food at night, Bob can only produce food in the morning, and Cathy can only produce food in the afternoon. Assume that food is not storable (it must be eaten immediately after it is produced, or else it spoils).²

One interesting property of this example is that there are *no* bilateral gains to trade. Economists describe this situation as a (complete) **lack of double-coincidence** (of wants). Despite this lack of double-coincidence, there clearly exist (multilateral) gains to trade. The efficient trading arrangement involves: [1] Bob producing food in the morning for Adam; [2] Cathy producing food in the afternoon for Bob; and [3] Adam producing food at night for Cathy.

A Rationale for Money?

In most introductory macroeconomics textbooks, the lack of double-coincidence “problem” is presented as *the* reason for why money is necessary. Why should Bob produce food in the morning for Adam? Adam possesses nothing that Bob values. This would appear to pose a bit of problem. But what if Adam offers to pay Bob with money? Bob

² This setup is commonly referred to as *Wicksell's Triangle*; named after the Swedish economist, Knut Wicksell (1851-1926).

does not value money either, but he may accept it as payment if he expects to be able to use it to purchase food from Cathy in the afternoon. Such an expectation is not entirely unreasonable. After all, Cathy can then use the money acquired in this manner to buy her food from Adam at night. Problem solved.

Well sure. But is the monetary mechanism described above really *necessary*? Are there not other mechanisms that might not work equally well here? Let's think about this.

In his 1875 *Critique of the Gotha Program*, Karl Marx wrote a phrase that is considered by many to be a defining principle of a communist system: *From each according to his ability, to each according to his needs*. One has to admit that Marx had a way with words (and it probably sounds even better in the original German). And indeed, why should this communal (or **gift-giving**) system not work here? Adam, Bob and Cathy must surely understand what is in the best interest of their community (and by extension, themselves). If Marx (or his doctrine) ruled this community, then the efficient trading arrangement would involve: [1] Bob making a gift of food in the morning to Adam; [2] Cathy making a gift of food to Bob in the afternoon; and [3] Adam making a gift of food to Cathy at night. Problem solved—without money.

What is it that prevents the world from operating in the manner described above? If money is a solution, then there must be some problem it is solving. What is the problem? Evidently, the problem cannot simply be a lack of double-coincidence, as is commonly asserted.

Opportunism

According to Marx, man's nature is shaped—at least, to some extent—by the institutions that govern his behavior. If man has a tendency to behave opportunistically, it is largely because capitalism encourages such behavior. If we could somehow reshape social institutions in a manner that encourages cooperative behavior, then man's nature will adapt accordingly.

Whatever the merits (or shortcomings) of this view, even Marx appears to have understood that—for the time-being, at least—man is predisposed to opportunistic behavior and that institutions will have to accommodate this fact. Prior to any transition to a communist system, he foresaw the need for a socialist system—a defining principle of which may be stated as: *From each according to his ability, to each according to his deeds*.³

To an economist, this prescription sounds roughly correct, since it recognizes the need

³ Or, to each according to his *contribution*.

for any trading mechanism to embed within it the proper **incentives**. Apart from those who have little or no ability (the likely recipients of charity), people should be rewarded on the basis of their contributions to society—their *deeds*; and not on the basis of their stated needs, claims, or promises. Of course, as not all deeds are good deeds, it may also be desirable to punish bad behavior. The question then becomes one of constructing an optimal system of **rewards** and **punishments**.

Understanding the fact that humans are naturally opportunistic is in itself not very helpful in terms of understanding the economic rationale for money. In particular, opportunism may take many forms; and surely money is not the answer to all of these problems. Exactly what type of opportunistic behavior should we be focussing on?

Limited Commitment

With the exception of direct barter, transactions in either bilateral or multilateral relationships typically involve an exchange of promises. Whether these promises are made implicit or explicit (i.e., stipulated contractually), they will only have value to the extent that they are expected to be honored (or enforced).

Self-interest suggests that contributions to society (e.g., working or extending credit) must ultimately be rewarded. Simple arithmetic suggests that these rewards must ultimately be made by the recipients of these contributions (e.g., debtors). Opportunism suggests that debtors may desire to escape an obligation if they can do so at little or no cost. To prevent (or at least, mitigate) this type of opportunistic behavior, there must be some credible punishment attached to any act of noncompliance.

If punishments can be made sufficiently large and certain (and credible), then even opportunistic debtors will behave *as if* they have honor.⁴ But if the ability (or willingness) to punish is limited, the commitment to repay debt may be similarly limited. What is it that determines the ability to punish bad deeds?

One of the crudest form of punishments is the threat of violence (whether this involves physical harm or the seizure of property). But engaging in violent behavior is costly and may invite retaliation. Perhaps the biggest threat facing a would-be transgressor is that the person harmed will choose to terminate the relationship. If the relationship is a mutually beneficial one, its termination will impose a cost on both parties (the foregone gains from trade). For the would-be transgressor, the immediate gain from not fulfilling an obligation must be weighed against this cost.⁵ Depending on the parameters of

⁴ This is the implicit assumption made by models that assume full commitment.

⁵ And the party slighted in the relationship must weigh the net benefit associated with a policy of

the trading relationship, this cost may not be sufficient to induce the efficient level of compliance.

The punishment for noncompliance may be greatly enhanced in a society consisting of many people. A common form of punishment levied on bad deeds involves being ostracized from a trading network (including possibly all of society). To a would-be transgressor, the cost of having one relationship terminated may be relatively small; but the exclusion from all social interaction may be significantly greater.

To exploit the multilateral gains from trade when people are opportunistic, society must be called upon to administer a system of punishments and rewards. The ability on the part of society to administer any such system will depend on its **record-keeping technology**. That is, the ability to administer individual punishments or rewards presumes that individual identities can somehow be known; where a person's **identity** is defined here by the recorded history of his past deeds (whether good or bad). For individual identities to be known, it is necessary that this **information be communicated** in some reliable manner to other members of society.

You are no doubt wondering what any of this has to do with the theory of money. To give you a flavor of where we are heading, it may be helpful to note the following. The information embedded in personal identities (histories) must be easily communicated to (recognized by) society; and such information—let's call it **memory**—must be durable. Moreover, it seems clear enough that memory is intrinsically useless—one cannot eat a credit history or digest a reputation. In short, this memory object appears to share at least some of the properties that economists frequently attach to money.

False Claims of Past Deeds

Not all relevant information concerning the economic attributes of any particular individual may be readily apparent to society. The reason for this may be technological; there may be physical limitations that prevent such information from being communicated to a readily-accessible databank. Or the reason may be strategic; opportunistic individuals may be motivated to misreport pertinent information.

There is a large literature that studies the problem of resource allocation under certain forms of **private information**; typically, information relating to individual preferences or abilities. But the type of private information that concerns me here is that which relates to an individual's personal history (identity). This line of enquiry was initiated

forgiveness.

by Joseph Ostroy (1973) who—in the context of our three-person economy described above—asked the following question:

What is to prevent Adam from asking Bob for a little more food, justifying his claim by saying that he will supply Cathy with a little extra as well? And what is to prevent Adam from then supplying Cathy with a little less food, telling her that he too took a little less from Bob?

Indeed, what is to prevent any person from making **false** and **mutually inconsistent** claims?

When commitment is limited, it is essential that people be rewarded (and punished) on the basis of their deeds. In turn, this relies on the idea that society can somehow monitor and record individual deeds. The record-keeping function itself may be a daunting task, especially in an economy consisting of many people—each of whom will have performed an array of different deeds over their entire life. But even if this is technologically feasible, how might the record-keeping system be expected to **observe** the individual actions of all members of society?

In principle, the record-keeping system might rely on **individual reports** of deeds. But for these reports to serve any useful role, they must constitute accurate information. How can opportunistic individuals be expected not to misreport their deeds (or the actions of others)? It is not uncommon for a beggar in the street to claim that he is a war veteran; the implication being that society (i.e., you) owes him something. His claim may be true or false; but how are we to know? If society was to naively reward all stated claims, a rapid proliferation of false claims might quickly bankrupt society.

Hence the need of **evidence** in support of stated claims. Ideally, this evidence should take the form of a **non-falsifiable record** of a person's past contributions. If falsification cannot be ruled out, then an efficient trading mechanism should at the very least be designed to induce **truthful revelation** (i.e., made **incentive-compatible**). The basic problem to be solved then involves the question of how this **information** might best be monitored or solicited, recorded, and communicated—all subject to the available technology and given opportunistic behavior.

Note that the problem of registering a false claim over a past deed is not likely to be severe in an economy where all the gains to trade are exhausted through bilateral trading relationships. For example, in an economy consisting of two people, it will be difficult to register a false claim over an action (or a report of an action) taken in the past—unless people have very poor memories (in which case, personal diaries will prove useful).

The problem of falsifying personal histories becomes pertinent when the gains to trade

are multilateral in nature. It is a problem here because the reward for good behavior toward one person (Adam) by a second person (Bob) must be made by some third member of society (Cathy); and it is therefore essential that this information be communicated in some credible manner to society. Precisely how this can and should be achieved is likely to depend on the nature of the communication and record-keeping technologies available to society; among other properties of the physical environment.

What does any of this have to do with the theory of money? I have already described the need for memory (personal trading histories) when commitment is limited. This memory must be durable and made easily accessible to (recognized by) members of society. When components of this memory constitute private information, it is subject to falsification. When this is the case, the relevant information must be provided in the form of evidence that is difficult to counterfeit. In short, there will be a need for an easily-recognizable, durable, and difficult-to-counterfeit object to serve as a record-keeping (communication) device.