Chapter 8: Money and Credit

Most forms of money that are exchanged today never touch the hands of those who are supposed to possess it. Think about it. Every week you probably exchange your labor for money. That money is deposited directly into your bank account. Or maybe you receive a check that you take to the bank where the teller credits your account for the value identified on the check. Unless you choose to withdraw currency from the bank, you never actually see the money that you've earned. When you decide to spend the money that you've earned, you probably use a credit or a debit card or maybe you write a check yourself that will provide funds to those who sell the goods that you purchase. Maybe you purchase goods online using a service like PayPal to transfer money from your account to another account.

Modern monetary systems are comprised largely of credit, meaning claims to money that operate as money itself or that at least provide some of the functions of money. In this chapter, we will consider the development of a system of credit, introduce the concept of financial intermediation between savers and borrowers, and develop the equation of exchange to accommodate our understanding of financial markets in relation to goods markets.

The Evolution of Credit

Intermediation and the Costs of Holding Money

No matter the commodity that the market selects as money, the holding of money comes at a cost. Large sums of money must be hidden and securely held. Transportation of large sums of money is difficult to accomplish at low cost without economies of scale. Further, the money could be invested in productive activities expected to create wealth.

Individuals with large hoards may benefit by leaving this money with a party that specializes in the storage of money. In early economies, this often happened to be a money changer, someone who held different types of money and facilitated the exchange of these currencies. Some customers of money changers developed a preference for leaving funds in their custody. If two parties conducting business both held accounts with the same money changer, they could facilitate a sale by the transfer of funds from the account of the buyer to the account of the seller. This allowed them to avoid the burdensome and risky act of transporting money for the purpose of transaction. In some areas and times, a similar phenomenon occurred among goldsmiths.

The development of the practice of clearing accounts was followed by the development of tangible financial instruments. Some terminology is required to describe this. So far, what we have referred to as money is actually base money. Base money is created *outside* of the financial system. Thus, in reference to the banking sector, base money is referred to as outside money. Money created within the financial system is referred to as inside money.

An early form of inside money was the deposit slip. In the modern environment, it is easy to miss the fact that banks create money when they accept deposits as deposit slips are not commonly created and circulated today. (They are created and traded, for example, in Hong Kong.) A deposit slip may be a claim to money that can be withdrawn on demand or it may be a claim to payment in the future, such as for time-deposit accounts. An individual who holds deposit slips in lieu of outside money can use these slips in exchange for other goods. This has the effect of allowing banks to employ reserves, comprised of outside money, for lending. These funds tend to be redeposited at other banks where the depositor of the borrowed funds exchanges them for inside money. It is by this process that credit money serves to adjust the quantity of the total stock of money while alleviating demand for outside money.

Lending in an Economy Without Money

In chapter 5, we considered the evolution that enabled a move from a barter economy to a moneyed economy. We noted that adoption of a commonly accepted medium of exchange enables the good chosen as money to serve as a standard of deferred payment. Before money is innovated in the market, lending would necessarily entail the temporary transfer of real goods. Ownership of a good entails the generation of value by that good for its owner. To lend a good is to temporarily relinquish this value. If economic activity is guided by value creation, then a person who lends an asset to a party expects to compensated for the temporary loss of value by payment of interest.

In a world where money does not exist, it is difficult to evaluate the terms of compensation for lending. Suppose that a farmer borrows equipment for planting and harvesting wheat from another farmer for the season. At the end of the season, the borrowing farmer can return the equipment and also offer a portion of the harvest as compensation to the lending farmer who presumably loses value by not employing the device for his own production. To maintain these gains earned, the farmer who loaned the equipment would need to sell the stock of wheat he receives, exchanging the good for an asset that depreciates slowly, or transforming it for preservation. Without money prices, it is difficult to determine the exact value of losses or gains incurred through lending. Further, without money prices the lender would be unable to compare revenues and costs to ensure that his lending of the equipment led to a profitable outcome.

The adoption of a commonly accepted medium of exchange alters this scenario. Instead of borrowing physical goods directly, individuals can borrow money and use this money to purchase a good that they would like. Although it is possible to lend non-money goods directly, a practice not uncommon in modern financial markets, most borrowing and lending employs money. Even in the case that goods are lent directly, money prices allow borrower and lender to evaluate the profitability of the terms of lending. When lending occurs using money, the value of the loan and its repayment are clear. For example, you borrow $1000 for one year and promise to pay back this principal with interest, the value paid by the borrower and received by the lender is well defined in terms of currency. Revenue earned from lending money is clearly defined. Whether or not a lender has earned a profit can by quickly surmised, even in the case where money has lost value as reflected by inflation.

Lending Market

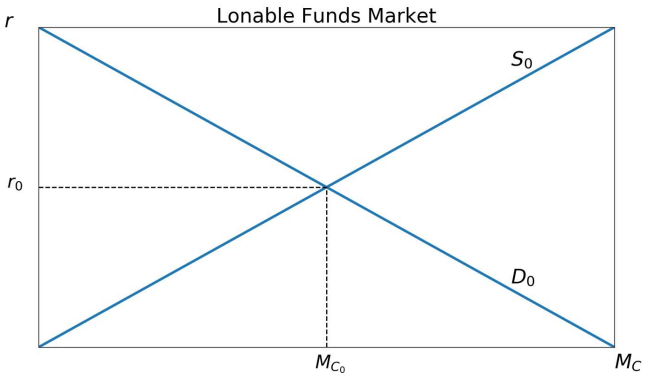
The development of money opened an opportunity for entrepreneurs to hold funds and facilitate their temporary transfer from saver to borrowers. Parties such as the money changers who held funds for safe keeping eventually realized that they did not need to hold on to all of the funds charged to them to keep. They could lend some of the money out, keeping only a fraction of deposits on reserve. This practice is known as fractional-reserve banking. Particularly for lending that supports improvements in productivity, this facilitates the improvement of real income in aggregate. This improvement is shared between the saver, the borrower, and the bank that serves as intermediary.

Lending may also occur directly between saver and borrowers. This can be accomplished through the purchase of a bond. The purchaser is offered a security that is a promise to repay by the borrower. The owner of the security can quickly sell the security if he or she wishes to regain the funds or he may even borrower against the expected return offered by the security. Another form intermediation include the sale stock by a corporation that offer a share of ownership to the purchaser. Many other types of financial instruments exist. the market for lending, often described as the loanable funds market, includes all of these forms.

Loanable Funds

The loanable funds market is the market for lending real resources. For the sake of simplicity, one may imagine that all lending is occurring through the transfer of currency and therefore leading to money creation. In reality, even cases where non-money assets are lent directly are offset by the creation of claims to future repayment. These claims themselves are attributed a value denominated according to the unit of account. These claims can quickly be exchanged for money. This makes more reasonable the assumption that the loanable funds market entails the creation of *inside money* and, therefore, of some value of credit money. This has significant implication for the application of the equation of exchange, which will be discussed in the next section.

In equilibrium, the rate of return for all assets tends to equality. This is a manifestation of the equimarginal principle. If a relatively high rate of return can be earned by investment in a particular class of assets, investment will increase in that class of asset until it's risk-adjusted expected rate of return falls to match the market rate of return. Thus, we define the interest rate, r, as the market rate of return in a perfectly competitive market.



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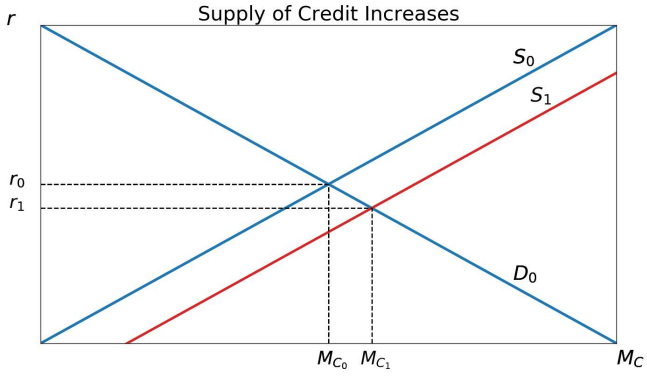
Traditionally the market for lending is represented by the loanable funds market. Taken literally, the loanable funds market describes the value of resources made available for lending at different interest rates. The willingness of asset owners to relinquish ownership temporarily is represented by the supply of loanable funds. As with all supply curves, this one is upward sloping. As the interest rate rises, owners of assets relinquish these assets to be used by parties who believe that they can create value sufficient to repay the lender with interest. Thus, value received by owners of goods is improved by the intertemporal exchange.

The supply of savings may shift for several reasons. As one's wealth grows, the proportion of it that one uses for necessities, and even for recreation, typically shrinks. Thus, as an individual's income increases, so too does the supply of savings. An individual's preference for present gain over future gain may increase or decrease. This is referred to as time preference. An general increase in the time preference of individuals results in an increase in the interest rate that these individuals will demand as compensation for deferring consumption. This is represented by a leftward shift in the supply of loanable funds. Finally, it is possible that the efficiency of intermediation increases. This would increase the supply of loanable funds made available at a given interest rate.



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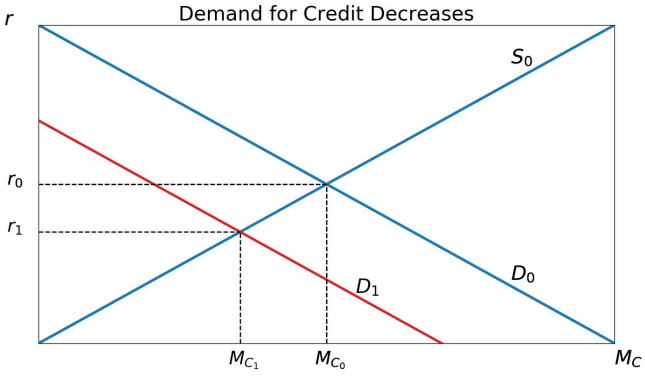


[3]

The willingness of borrowers to take on debt is also determined by the interest rate. The demand for loanable funds represents the perception of potential for value creation available in the economy. These are investment opportunities. As the rate rises, the number of profitable investment opportunities in the economy shrinks. Investment opportunities that were once profitable but whose rates of return are lower than the rate of interest are no longer profitable. Thus, the demand curve for loanable funds is downward sloping. On average, the expected incomes of investors rise and fall as economic conditions change. If borrowers expect that economic conditions will be poor in the near future, they will be less willing to borrow as they expect that their ability to repay the loan will be stunted by a diminished flow of income. Thus, shifts in the demand for loanable funds are positively correlated with changes in the expectation of economic growth. Improvement in growth prospects will lead to a greater demand for loanable funds and a greater quantity of credit extended for investment at a given rate of interest, just as degrading economic conditions lead to a contraction of credit.

Present Value Equation

You can think of the lending market as a rental market. In the case that money is lent, some rental fee is paid for each period that an asset borrowed. Typically this value is stated in terms of an interest rate. Even if the value to be paid is not stated in terms of an interest rate, it can be stated as an interest rate.

Lending markets consist of many borrower and many lenders. It makes sense first consider the structure of an individual loan. This is described by the present value equation:

$$PV = \frac{FV}{(1+\frac{r}{n})^{tn}}$$ [1]

The present value of an asset is equal to its future value discounted by the interest rate. In this form, a party borrows money or an asset whose value is equal to PV. The amount that the borrowing party must repay is equal to the future value. The future value computes interest compounded at some annual rate n for some number of years t. Notice that we could rewrite the equation:

$$PV(1 + \frac{r}{n})^{tn} = FV$$

The amount borrowed, compounded by the interest rate, yields some value that must be repaid in the future. By definition, savers who make a loan expect compensation defined by the future value, which is the value of repayment for the asset lent.

There are many ways to provide a loan. Whether the loan occurs in the form of real assets or currency that will enable the purchase of real assets does not affect the structure of the present value equation. The present value equation is most often applied to the value of financial instruments. Suppose that a saver provide a loan of $1000, PV, to a borrower. The borrower promises to repay the loan, offering a security indicating that the loan is subject to an interest rate of 5%, r, 2 years, t, from the day that the loan is created. He agrees that the interest will be compounded quarterly (n) and that no payments need to be made until the final day that the loan is due. What is the value that will be repaid the day that the loan is due.

$$PV = \$1000$$
$$r = .05$$
$$n = 4$$

Using the values representing the term of the loan, we calculate the future value of repayment:

$$FV = \$1000(1 + \frac{.05}{4})^{2*4}$$
$$FV = \$1000(1.0125)^{8}$$
$$FV = \$1000(1.1045)$$
$$FV = \$1104.50$$

The borrower will need to pay the lender $1104.50. Of this value, $104.50 is interest that collected on the principle of $1000.

Interest rates are naturally occurring in the economy. Even if there exists no lending in an economy, one can surmise an interest rate that reflects the willingness of savers to defer present consumption in light of wealth constraints. The present value equation can be used to imply this interest rate by considering the difference between the cost of inputs and the price of goods that take time to create using those inputs . Suppose that a bottle of wine is created by fermenting one pound of grapes for one year. If we know the price of a pound of grapes and the price of a bottle of wine, then we can imply the interest rate.[2] We rewrite the equation for the specific asset using simple annual compounding :

$$p_g = \frac{p_w}{(1+r)^t}$$

The price of grapes, p_g, at period t is equal to the price of wine, p_w, discounted by the interest rate. Suppose that the price of one pound of grapes is \$5.00 and that the price of a bottle of wine is \$5.50. We can calculate the interest rate:

$$\$5.00 = \frac{\$5.50}{(1+r)^1}$$

$$1 + r = \frac{\$5.50}{\$5.00}$$

$$1 + r = 1.1$$

$$r = 1.1 - 1$$

$$r = 10\%$$

Judging by current prices, the interest rate for grapes is 10% as calculated using annual compounding.

From this exercise we observe that the present value of an asset is simply its price. The price adjusts according to the value that it is expected to accumulate in the market. This value is implied by the interest rate. This carries the implication that as interest rates change, so too do asset prices. If interest rates rise, for example, this tends to have a depressing effect on asset prices. It is not uncommon for interest rates to spike upward shortly before a depression, typically accompanied by falling prices, occurs.

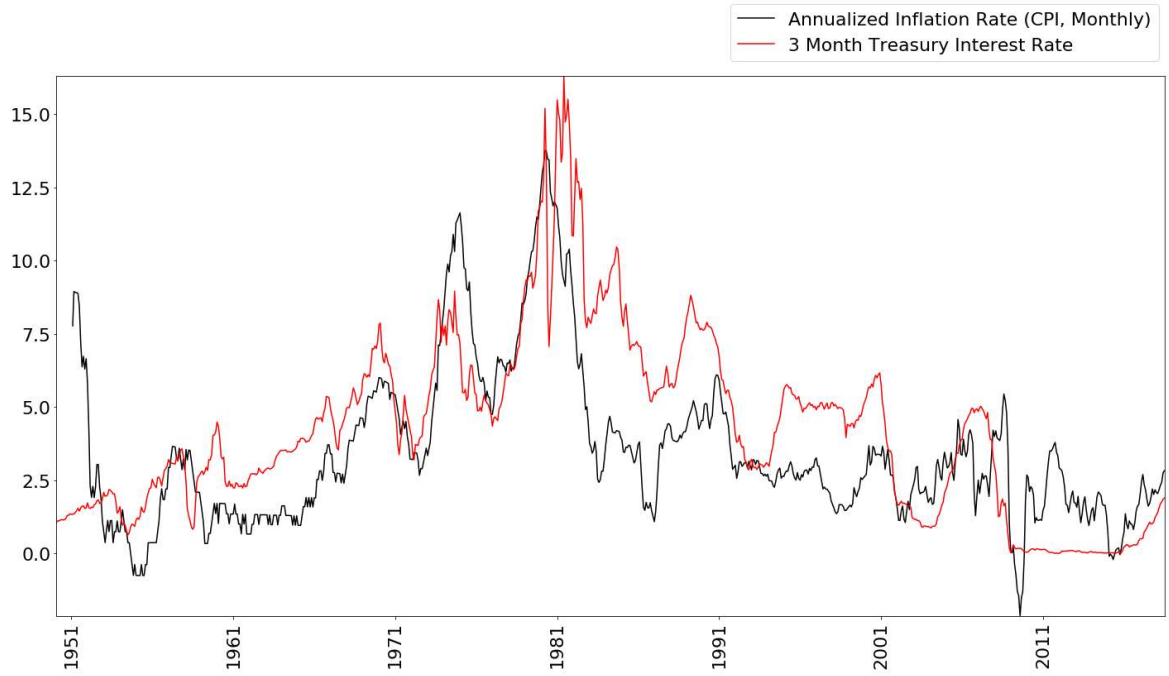
A change in a price or prices has no innate meaning without consideration of circumstance. The ultimate effect of changes in the interest rate depends upon whether change is due to a change in the supply of or a change in demand for loanable funds. In one case, the rise is a sign of growing scarcity of resources, in the other the rise is a sign of growing opportunity for value creation.

Interest Rates and Inflation

In the most basic analysis of lending, we assume that inflation, π, is adjusted for in the market place. An increase in the money stock has the long-run effect of increasing the nominal interest rate. The Fisher Equation formalizes this relationship:

$$i = r + \pi_e$$

The nominal, or observed, rate of interest includes the real rate of interest and the expected rate of inflation. If the expected rate of inflation rises, so too will the rate of return.



[4]

This can be verified empirically by a comparison of inflation rates and be best approximation of a risk-free interest rate. The risk-free rate is approximated using the rate paid on short-term government treasuries. Movements in the inflation rate do not perfectly match movements in the interest rate as there is irreducible risk, such as variance in the real rate, to which even assets of short-term maturity subject. Nominal rate integrate changes in the real interest rate, which approximates the expected rate of return in the market. If the rate of growth of real income grows, so too will nominal interest rates.

The Fisher equation describes a long-run relationship between interest rates and expected inflation. It is possible that this long-run relationship is obscured by short-run effects. It is often upon these short-run effects that monetary policy depends, particularly in cases where the central bank attempts to improve liquidity in lending markets. We will return to this topic in the discussion of monetary policy.

Monetary Aggregates and Credit Money

With the integration of credit markets into analysis, we have expanded our understanding of the money stock. There is not only one type of money. We can divide money between base money and credit money, which correspond to outside money and inside money respectively. Together these make up the total money stock:

$$M_T = M_B + M_C$$

While it is convenient to refer to M_C as credit money, it is actually the monetary value added by credit due to the creation of a highly liquid asset that offsets the liability of the money lent. Not every promise to repayment has the same liquidity. This distinction between value added to the total stock of money by credit money and the unweighted value added by claims to repayment of credit has created much confusion concerning monetary aggregates and their role in influencing the price level (P) and the value of nominal income (Py). These nuances deserve consideration.

We will consider the traditional monetary aggregates M_1, M_2, and Divisia aggregates which we will refer to broadly as $M_{Divisia}$. The different aggregates include different types of financial instruments. We will also consider recent changes that have altered the structure of the monetary base, M_B.

Base money, M_B, serves as reserve currency for the creation of credit. It is outside money as it does not originate within the financial system. For most of history, the monetary base has been comprised of commodity money. Most monetary systems converged upon gold, silver,and, copper, though other standards have existed.

In the modern era, central banks issue notes that serve as outside money. These notes are not redeemable for any physical good, but they are accepted for the payment of taxes. In the United States, the Federal Reserve has begun to pay interest on excess reserves left on account at the Federal Reserve. Before this practice, it was custom for the central bank to pay interest on required reserves held on account at the Federal Reserve.

The new custom removes money from circulation that otherwise would affect the value of nominal income. This requires consideration of an alternate measure of the base: the effective stock of base money, M_{EB}. The effective stock of base money subtracts the portion of base money stock that is sterilized - removed from circulation - as a result of their collecting interest on account at the Federal Reserve.

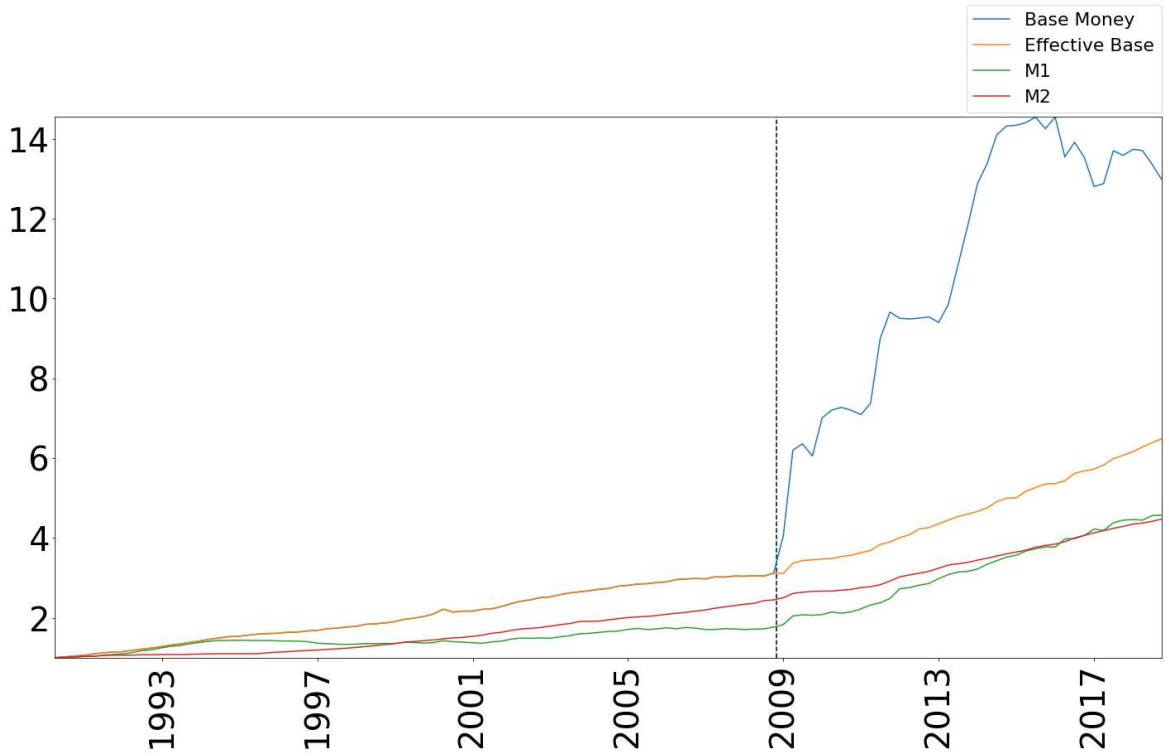
Before the crisis in 2008, the base money and the effective base were essentially the same. After the crisis, the quantity of base money in circulation increased by a factor of more than 4. Aware that this increase in the quantity of base money could lead to tremendous inflation, much of this money was removed from circulation by a policy of paying interest on excess reserves.

If financial instruments support the existing level of expenditures, then they should be counted as part of the money stock. A good measure of inside money should attempt to calculate the monetary value of all relatively liquid financial assets. There exist several different estimates of monetary aggregates. Most commonly, these estimations simply sum up the nominal value of different money-like assets without weighting the ability of the asset to serve as a means to the commonly accepted medium of exchange.

M_1 is the most narrow monetary aggregate that includes inside money. It is defined:

$$M_1 = M_B + demand\ deposits,\ traveler's\ checks,\\ and\ other\ checkable\ deposits$$

You can think of M_1 as consisting of account whose funds can be withdrawn on demand. These are typically referred to as checking accounts, although debit cards are a means to the same function. The ease of access to funds held in a checking account make them practically the equivalent of money. However, banks can limit the withdraw or even the transfer of funds in the case of an economic crisis. This limitation can prevent the bank from becoming insolvent as a shrinking level of reserves can limit the ability of a bank service withdraw of base money.



[5]

M_2 is much like M_1, with the exception that the cost of withdrawing funds from some accounts included in M_2 are somewhat higher. It is defined:

$$M_2 = M_1 \ + \ retail\ money\ market\ mutual\ fund\ balances,\\ savings\ deposits\ (including\ money\ market\ deposit\ accounts,\\ and\ small\ time\ deposit\ accounts$$

Funds held in these account typically take more time to retrieve than from accounts whose deposits are available on demand. In particular, funds held in time deposit accounts are essentially a loan to a bank where the depositor agrees not to withdraw the funds deposited. The withdraw of these funds is penalized. There exists a measure of M_2 that disregards accounts whose funds are subject to penalty if withdrawn early. This is called MZM, a measure of the money stock comprised of instruments that require zero time to reach maturity.

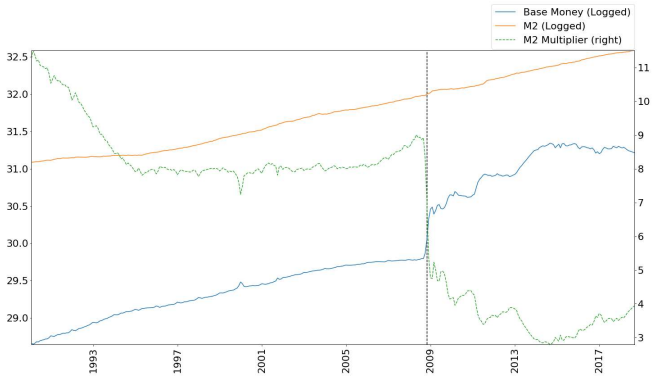
The measures of the money stock that most closely correspond to M_T are the Divisia aggregates, named after François Divisia. These measures of the money stock attempt to measure the value added by financial instrument to nominal GDP and do so using a cost basis. The actual values used to represent the quantity of money are actually index numbers. These can be used to estimate relative changes in velocity, though technically the aggregates cannot be represented by a particular measure of velocity since they are index numbers.

The Money Multiplier and Velocity of the Base

By comparing the value of monetary aggregates with the base we can estimate the extent to which the stock of base money has been augmented. This value is the money multiplier. It is calculated as $MM_i = \frac{M_i}{M_B}$ where i refers to a

particular monetary aggregate. Thus the M_1 multiplier is represented as $MM_1 = \frac{M_1}{M_B}$ and the M_2 multiplier as $MM_2 = \frac{M_2}{M_B}$.

A multiplier falls or rises depending on changes in the aggregate under consideration or the monetary base. The multiplier increases if the aggregate increases or the quantity of base money falls. Likewise, it falls if the aggregate falls or the quantity of base money rises. Thus, starting in 2008 the multipliers collapsed as the quantity of base money increased by a multiple of 4 over the course of only a few years. The size of the increase in the quantity of base money was rather unusual, as was the collapse of the multipliers. This expansion of the quantity of base money us referred to as "quantitative easing" and will be considered in detail in the chapter on central banking.



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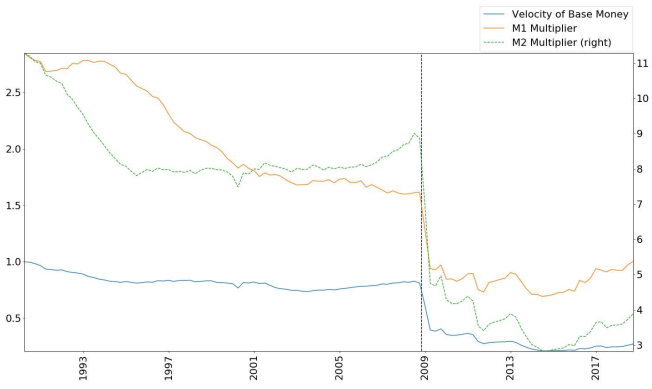

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The money multiplier is closely related to the velocity of base money. As the quantity of credit money increases, so too does the velocity of the base. In fact, the magnitude of the money multiplier and the ratio of the velocity of a monetary aggregate divide by the velocity of the base are identical. Since total expenditures is equal to nominal income whether it is defined in terms of the quantity of base money or an aggregate that includes credit money, we can derive the money multiplier from this equivalence:

$$M_i V_i = M_B V_B$$

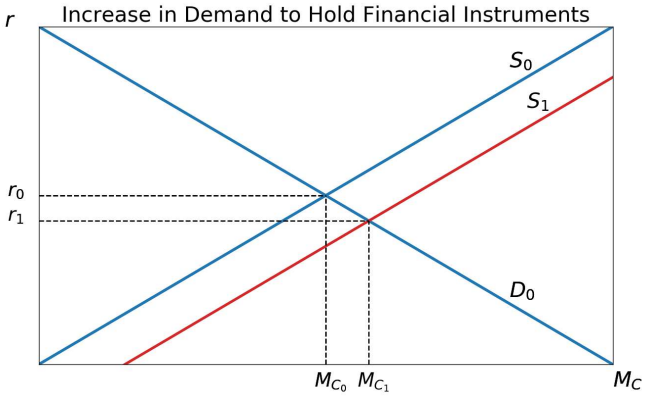
For the sake of clarity, we will reference the total money stock, M_T in deriving the money multiplier:

$$M_T V_T = M_B V_B$$
$$\frac{M_T}{M_B} = \frac{V_B}{V_T}$$

The equality does not interpret itself. However, the intuition that base money and credit money are substitutes reveals one use of the construction. An increase in the quantity of inside money is identical to an increase in the velocity of base money. This can be rewritten to show that an increase in the credit stock is identical a fall in the burden of portfolio demand for money born by the base money stock:

$$\frac{M_T}{M_B} = \frac{k_T}{k_B}$$

Creation of inside money alleviates demand that would otherwise fall upon the stock of base money. We assume that the creation of credit does not affect the overall demand for money, k_T, and that the quantity of base money, M_B, is held constant. Rather, the creation of credit is a response to an increase in demand to hold money.



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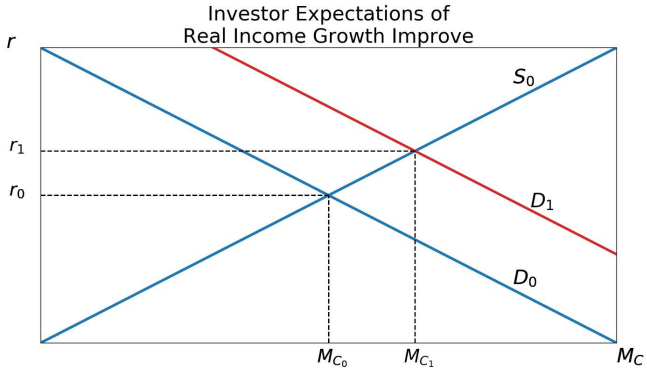
If demand for money can be sufficiently satiated by the holding of inside money, then the increase in demand for money can be offset by an increase in the stock of credit, M_C. The mechanism behind this increase in M_C, however, would be an increase in the willingness of individuals to save money, offering the funds to be lent in the financial system. An increase in demand to hold bank liabilities is exactly the same as an increase in the supply of savings that are exchanged for bank liabilities. An increase in demand for bank liabilities allows banks to lend more and at lower interest rates. Thus, an increase in k_T would be offset by an increase in M_T by virtue of an increase in M_C. If the increase in k_T is not offset by an increase in M_C, k_B must increase. If this increase is not offset by an increase in M_B, the inevitable result is a rise in the price of money, meaning a general price deflation.

Holding k_T and M_B constant, there exists an inverse relationship between the quantiy of credit and demand for base money. Imagine that the rate of growth of real income has increased. Investors are more willing to borrow for the purpose of investing since the rate of return has increased. Investors will increase borrowing until the interest rate rises to match the market rate of return. Thus, an increase in expected real income promotes an increase in M_C that alleviates deflationary pressure that would otherwise manifest through an increase in demand for M_B.



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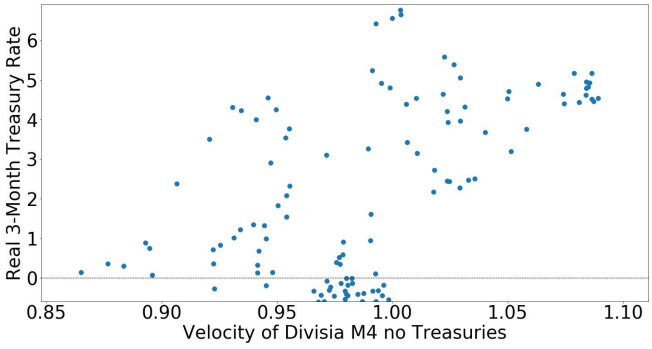
Velocity and the Interest Rate

Recall that the influence of money on the goods market depends on the relative stability of the velocity. This is a defining characteristic of the quantity theory of money. More important, the equation of exchange is actually a theory of nominal income, describing the influence of changes in either M or V.



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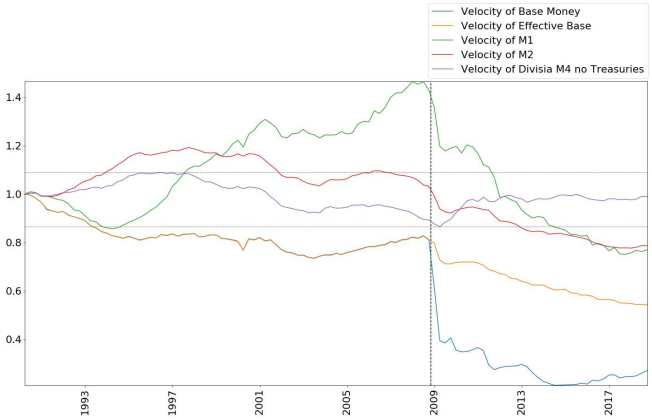
As a theory of nominal income, the equation of exchange suggests that the velocity of money should be relatively stable. This should definitely be true for money broadly conceived: M_T. In fact, the ability of an observed aggregate to maintain stable velocity is evidence that the aggregate actually represents M_T. Under a regime of market created money, the monetary base should also reflect a stable velocity. This is not the case, however, for a fiat currency whose quantity is determined by the monetary authority. We consider these features below.

While in the short-run, the value of V can fluctuate, fluctuations tend to stay within a tight range where the value of V is determined largely by the value of interest rates. A rise in interest rates is associated with a rise in velocity of money, as reflected by Divisia aggregates which weight the liquidity of financial instruments in identifying their impact on the money stock. This means demand to hold money on reserve falls as interest rates rise. In the case of rising real interest rates, the holding of currency is associated with relatively greater opportunity cost then before. Rational agents will invest a greater portion of their money holdings in productive ventures. The velocity of money is predictable and stable after controlling for changes in the interest rate.

The difficulty arises that the velocity of the monetary base and of most monetary aggregates show little stability. This has especially been the case since the financial crisis in 2008 when the velocity of the base collapsed. This is not a natural occurrence, but the result of manipulation by policymakers. The massive increase in the base has been intentionally kept from circulation as it collects interest safely sequestered at the Federal Reserve. Also starting in 2008, capital ratios began to increase as a result of Basil III (***see Chapter 1X***).



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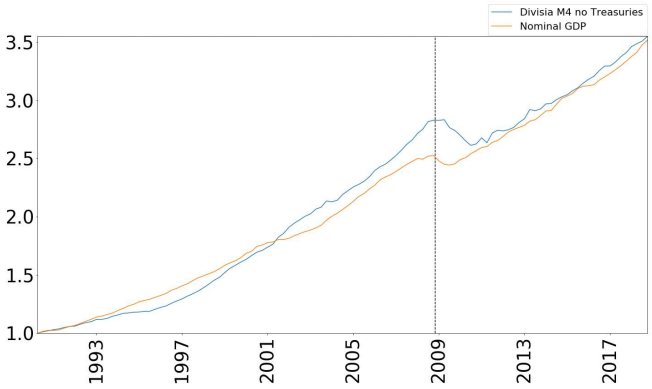
If, as has been suggested by the theory presented in this text, the stock of money adjusts to offset changes in velocity and to accommodate the growth of nominal income, then we should expect that the growth of the money stock should match growth of nominal income. This would be true for the monetary base if it was subject to market forces. The quantity of base money is the object of policy. The total money stock, represented by the Divisia aggregates, shows precisely this feature.



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Conclusion

Credit markets are a fundamental part of a monetary economy. Just as with base money produced by the market, credit markets respond to changes in demand for money. Changes in the size of the stock of credit money impact the overall size of the base and adjust the size of the burden placed upon base money.

This relationship between credit and base money is well reflected by the money multiplier. The multiplier not only shows the magnitude of increase of the money stock enabled by credit, it also implies the magnitude of the change in velocity of base money supported by a change in the size of the stock of credit money. It is by this mechanism that financial markets promote long-run stability of nominal income growth. This fact is obscured by the difficulties entailed in estimating a representative monetary aggregate. The velocities of traditional monetary aggregates are erratic,

whereas the Divisia estimates are highly stable, fluctuating in the short-run according to the value of the real rate of interest.

Endnotes

[1] For continuous compounding, use: $PV = FV(e^{-rt})$

[2] For the sake of simplicity, we assume that no other costs are involved.