

## **Boulding's Balloons: A Contribution to Monetary Theory**

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I think it is safe to say that although Professor Kenneth Boulding is known for his research into many areas, monetary theory is not one of these. In this article, I will argue that he actually does have a well-developed monetary theory. In fact, I will argue that his monetary theory anticipated the endogenous money approach now enjoying a revival at the hands of the post Keynesians. However, I will argue that Boulding's interest rate theory is more appealing than the exogenous approach to interest rates adopted by post Keynesians such as Basil Moore. That is, Boulding provides the basis for an endogenously determined money supply in conjunction with an endogenously determined interest rate.

Boulding has said that his 1944 article, "A Liquidity Preference Theory of Market Prices," is probably his most important article and that his *Economic Analysis* is "in some ways . . . the most important thing I ever wrote in economics" [Boulding 1978, p. 536; Silk 1978]. The 1944 article seems to have anticipated recent post Keynesian research, such as that of J.A. Kregel [1988], which attempts to demonstrate that J.M. Keynes's liquidity preference theory is a theory of the determination of asset prices. Boulding's balance sheet approach in *Economic Analysis* further develops this analysis and appears to be consistent with the endogenous approach to money.

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I will focus on these two strands of Boulding's analysis, which have been incorporated within much of his writing over the past half-century. I will argue that Boulding's work provides the basis for a reconciliation of endogenous money and liquidity preference theory. This article, however, is not primarily an exegesis of Boulding's writings, but rather a reinterpretation. It is not clear that Boulding actually adopted an endogenous money approach, nor is it clear that Boulding or any previous reader has recognized the applicability of his approach to the endogenous money view.

Before proceeding, I will briefly define what is meant by the endogenous money approach. In this approach, the "real" and "monetary" sectors and values cannot be dichotomized and separately analyzed. Rising expenditures necessarily require deficits, and deficits require expansion of balance sheets. As balance sheets expand, private assets and liabilities are created, some of which are counted as "money." Thus, money is privately created to finance rising expenditures. Privately created money is simply a liability created to transfer purchasing power across time from the future to the present. These liabilities can later be retired through income flows—at which point money is destroyed. According to those who adopt the endogenous money approach, private institutions can create money essentially on demand so that borrowers can deficit spend. While the central bank may be able to influence interest rates, its control over the quantity of money is only indirect and partial. Thus, the orthodox story in which the central bank controls the money supply through control over reserves is rejected, as is the orthodox "deposit multiplier" [Wray 1990].

#### *Money and Spending*

The income and outgo concepts, which are essentially value aggregates of additions to and subtractions from the total stock of assets, must be distinguished clearly from the receipts and expenditure concepts. Receipts consist of the additions to liquid assets or money. Expenditures consist of the subtractions from liquid assets or money. It is hardly any exaggeration to say that the failure to distinguish clearly between receipts and income on the one hand, and between expenditures and consumption on the other, has been the source of most of the confusion in economics, and, especially in macroeconomics, in the past generation [Boulding 1950, p. 140].

At first brush, Boulding's early work on the relation between money and spending appears to the modern reader to quaintly confuse money and spending. All of us who have been trained in the mechanics of the IS-LM analysis know that spending has to do with the IS curve, while

money matters have to do with the LM curve. Goods markets and money markets are dichotomized so that we can analyze, for example, an increase of spending while holding the money supply constant. Alternatively, we can analyze the effects of an increase in money while initially holding spending constant.

There is no such dichotomy in Boulding's work: money, spending, and receipts appear to be closely connected. On closer examination, the reader finds that Boulding even claims the correct dichotomy is that between spending and income. Furthermore, in Boulding's model, consumption and income are not closely related, while saving is unrelated to money hoards [Boulding 1950, p. 140]. Boulding appears to be hopelessly entangled in semantic difficulties.

However, the careful reader finds that Boulding's seemingly strange terminology is quite useful. Output is the aggregate level of production and generates an equivalent flow of income, which can be defined as the gross growth of assets. At the end of any period, some of the produced output will have been consumed—that is, destroyed. The portion of output not consumed is equal to saving, which can be defined as the net addition to total assets. This might also be called real investment, while nominal investment equals saving plus capital gains [Boulding 1966, p. 123].

A receipt is defined as the exchange of an illiquid balance sheet item for a liquid asset, while an expenditure is defined as the exchange of a liquid asset for an illiquid asset [Boulding 1950, p. 140]. For example, when a firm sells a portion of its inventory of finished goods, its total assets remain unchanged, but illiquid assets are replaced by liquid claims. Therefore, while its income is not affected by this sale, its receipts increase. On the other hand, the consumer exchanges liquid assets for illiquid assets, and so records an expenditure. Thus, receipts and expenditures always involve money, broadly defined, because they always entail the exchange of a liquid asset for an illiquid one. On the other hand, production, consumption, saving, and income need not directly involve money since these include the creation, accumulation, or destruction of assets—which need not be monetary assets. (However, as will be emphasized below, production of real assets almost always involves money in an economy in which production is not for own use.)

Boulding provides the following example. When a worker works producing physical goods, assets are created and income is generated. The assets represent accumulation, or gross saving, of the firm, while the wage claim on the firm represents income to the worker. When the firm sells the accumulated goods, its income is not affected, but it receives

a monetary receipt. When the firm pays wages to the worker, this merely represents a substitution of the illiquid wage claims for monetary receipts. When the worker subsequently uses money wages to buy goods, he substitutes liquid assets for illiquid assets, which is defined as a monetary expenditure. Finally, as the purchased goods gradually wear out, the worker's assets are destroyed through consumption.

#### *Balance Sheet Discipline*

Every action has two facets;  
Public debt is private assets,  
My receipt is your expense,  
Your aggression, my defense  
[Boulding 1958, p. 183].

While the "hydraulic" Keynesians concentrate their analysis on flows, Boulding disciplines his analysis with balance sheets. This allows him to avoid errors and leads naturally to an endogenous money approach. Production of real assets normally involves two balance sheets: the firm's assets rise by the increase of inventory, while its liabilities increase by the wage bill; the worker's assets increase by the wage claim, which is offset by a rise of net worth. Of course, production for own use need not involve two balance sheets. However, in a developed capitalist economy, most production is undertaken for sale—that is, to be exchanged for monetary receipts.

Financial assets are created to give purchasing power to their creator [Boulding and Wilson 1978, p. vi]. When a bank makes a loan, it purchases a financial claim on the borrower by issuing its own liability. The borrower's liability will be offset by the asset the bank loan enabled him or her to purchase. Whenever money is privately created, it must involve at least two balance sheets. However, governments can obtain purchasing power by issuing money, which will show up on private balance sheets, but does not represent a true liability of the government [Boulding 1958, p. 213]. Clearly, each private liability is offset by a private asset so that if we were to aggregate all balance sheets, net private financial wealth would sum to zero and leave only real assets and claims on the government as net worth of the private sector [Boulding 1950, p. 276].

This does not mean, however, that private financial assets and liabilities can be ignored. Bank liabilities (which are money, broadly defined) are more liquid than the assets held by banks. When banks

expand their balance sheets by exchanging liquid bank liabilities for the illiquid IOUs of their customers, the liquidity of the nonbank public increases [Boulding 1950, p. 271]. Banks allow the public to realize income in liquid form. For example, a firm might anticipate future receipts from the sale of inventory by borrowing. In this case, income that has already accrued (goods accumulated as inventory) is converted from an illiquid to a liquid asset. Alternatively, firms may use short-term credit to finance the wage bill so that workers can receive accumulated income (wage claims) in money form.

Because of uncertainty, all economic agents do care about the form in which accumulated income is held. Workers are not indifferent to the form in which income is accumulated—they prefer money receipts over wage claims on firms. Indeed, Boulding argues that the ratio of liquid assets to illiquid claims in a balance sheet is a fundamental determinant of economic behavior.<sup>1</sup> Each economic agent has a preferred liquidity ratio, and deviations from that ratio set off an adjustment process to restore homeostasis [Boulding 1950, p. 27]. The liquidity ratio may be defined as the ratio of money to total assets held. Liquidity preference can then be related to the preference for a high liquidity ratio. Liquidity preference can, of course, vary among individuals and will likely fluctuate over the course of the business cycle.

When the preferred liquidity ratio rises, agents attempt to increase monetary receipts and to reduce monetary expenditures [Boulding 1966, p. 75]. Unless the actual quantity of money is increased, the only way that agents in the aggregate can achieve higher liquidity ratios is by decreasing the value of accumulated nonmonetary assets [Boulding 1950, p. 213]. Quantities of nonmonetary assets can be reduced by reducing production below the level that would be required to replace those assets destroyed through consumption. Alternatively, the value of nonmonetary assets can be reduced by a fall of their price. In summary, a rise in the preferred liquidity ratio is likely to lead to falling prices of nonmonetary assets and to falling levels of production of those assets [Boulding 1966, p. 80].

On the other hand, a general fall of liquidity preference will be associated with attempts to reduce liquidity ratios. Monetary expenditures will rise as agents attempt to reduce money hoards. Of course, every money expenditure leads to a money receipt so that aggregate hoards cannot be reduced in this manner. Instead, the value of nonmonetary assets must rise until desired liquidity ratios are reached. This is accomplished by a combination of increased production and increased prices of these assets [Boulding 1950, pp. 99, 162].

A rise of liquidity preference need not generate changes in the value of nonmonetary assets if the quantity of money is increased sufficiently to increase liquidity ratios. For example, if some institution were to stand ready to buy illiquid assets in sufficient quantity by issuing liquid liabilities, the demand for liquidity could be met. However, no private institution is likely to do this, for it would require that the preferences of the institution move in the opposite direction from those of the general public.<sup>2</sup> For example, the liquidity preference of banks is unlikely to fall just as the rest of the public attempts to increase hoards. The quantity of privately issued money would rise only if banks bucked the trend and bought all the illiquid assets the public was trying to sell.

On the other hand, a fall of liquidity preference is very likely to lead to an increase in the quantity of privately issued money. If banks attempt to revise liquidity ratios downward just as the public tries to reduce hoards, the money supply will increase because bank purchases of illiquid assets are financed by bank liabilities—which are money [Boulding 1958, p. 217]. When the public borrows to finance accumulation of nonmonetary assets, the money supply will increase as banks issue liabilities to purchase the IOUs of customers.

Boulding argues that the effect of an increase of the money supply depends upon who receives the money [Boulding 1950, p. 240]. If consumers receive more money, the demand for consumer goods is likely to rise. This will increase the price and quantity of consumer goods accumulated until desired liquidity ratios are restored. On the other hand, if the new money is received by firms, it is likely to increase production and accumulation of investment goods. Finally, if it is received by speculators in the stock market, the price of stocks is likely to increase. It is therefore quite impossible to predict whether an increase of the money supply is likely to be associated with inflation—unless one knows who will receive the money—where it will be spent, and what the reactions of those receiving the money are likely to be.

It can be seen that privately issued money can never be “excessive,” in the sense of the quantity supplied exceeding the quantity demanded. Banks rarely, if ever, force customers to borrow. If banks supply more money, it must be due to a rise in the demand for money. It may seem somewhat paradoxical that a fall of liquidity preference is likely to lead to an increase in the money supply, and that the rise of the money supply comes at a time when the nonbank public is trying to reduce money hoards. However, if one remembers that borrowers borrow in order to spend and that money is privately issued to enable banks to spend, then the paradox is solved: a fall of liquidity preference means that desired spending has risen and desired money balances have fallen.

Monetarists have trained most of us to conceive of money as something that is dropped by helicopters, and that therefore might well be excessive. By focusing on balance sheets, Boulding shows how the money supply is increased as spending rises, but he also shows why the money supply might not increase as liquidity preference rises. Because hydraulic Keynesians have confused money demand with liquidity preference and because they have focused on flows to the detriment of an understanding of balance sheets, they have fallen into the helicopter money trap.

#### *Fiscal and Monetary Policy*

It's just as true as it is funny,  
That Deficits increase our money;  
In understanding this there lies  
The power of States to Stabilize  
[Boulding 1958, p. 183].

An objection will immediately be raised: some part of the money supply is provided by governments, and therefore can be excessive or might be supplied to satisfy increased demands for hoards. Thus, hydraulic Keynesian fine-tuners would advocate easy money policy to meet rising liquidity preference, while monetarists would argue that inflation is caused by excessively easy money. Characteristically, Boulding's view on this matter is quite different. According to him, monetary policy has to do with the regulation of financial markets, while fiscal policy has to do with regulation of the quantity of money [Boulding 1958, p. 210].

In addition to direct regulation of financial institutions (reserve requirement ratios, capital requirements, Regulation Q), monetary policy affects the structure and price of debts. For example, following World War II, the Fed attempted to peg the interest rate on government bonds by standing ready to purchase them as needed to maintain their price. The Fed also provides notes as needed to meet the currency demands of the public. This helps to ensure that bank liabilities trade at par with currency. Open market operations and discount window policies influence the price of a wide variety of bonds and other debts. Open market operations directly influence the price of government bonds and indirectly influence the price of substitute assets. Furthermore, open market operations can indirectly influence the price and quantity of privately issued debts by influencing liquidity positions of bond dealers and their bankers. The discount rate might also indirectly affect the

prices of a variety of assets, and will directly affect the price of those assets the central bank is willing to discount.

This way of thinking must appear quite strange to those who have been trained in the sport of the deposit multiplier. According to the orthodox money and banking texts, the central bank injects reserves into the system and banks passively increase the money supply through the deposit multiplier. Interest rates might then be indirectly affected as excess money balances are run down. In Boulding's analysis, prices of assets are directly affected, which might affect interest rates and even the quantity of money indirectly. I will return to Boulding's theory of interest rates below.

Boulding emphasizes that reserves do not normally act as a constraint on the quantity of money that is privately issued [Boulding 1966, p. 112]. First, he points out that banks engage in a variety of reserve-economizing behaviors to reduce legal requirements. This has been recently investigated by post Keynesians and others, who have shown how banks induce customers to hold certificates of deposit or repurchase agreements rather than demand deposits in order to economize on reserves. The development of the fed funds market also allowed a given quantity of aggregate reserves to support more demand deposits.<sup>3</sup> Thus, it has since been confirmed that banks can expand their liabilities without necessarily increasing reserve requirements [Moore 1988; Wray 1990].

In the orthodox presentation, however, a bank that loans more than its excess reserves will quickly run into trouble when reserves are lost through a clearing drain. Boulding realized that this analysis is faulty because it applies only to a system in which a single bank is expanding while all others are not.

A many-bank system is rather like a number of balloons tied together with a string; if one balloon tries to get away from the others the strings will bring it back, but all the balloons can rise together without difficulty. The "string" in the case of a banking system is the loss of cash reserves. One bank expanding loans disproportionately will lose reserves to the other banks, but if all banks expand together they will all lose reserves to each other, which means of course that no bank loses reserves on balance except to the public [Boulding 1966, p. 107].

Thus, as long as each bank only attempts to expand at approximately the same rate as others, none will lose reserves. A bank that expands faster than average will be forced to recapture lost reserves by turning to the fed funds market or to other wholesale sources of funds. As these



sources may be more expensive than retail sources of deposits, banks must weigh the higher costs against higher profit rates that might result from a high rate of asset growth. Banks may pay particular attention to their relative rate of growth when wholesale interest rates are rising.

In conclusion, control over the quantity of reserves does not give the central bank direct control over the money supply. Banks can individually create money and recapture lost reserves by turning to wholesale sources of funds. The banking system can get around reserve constraints by economizing on reserves or by turning to international sources of funds. If there is any impact of monetary policy on the quantity of money it must be indirect and operate primarily through price effects or by changing bank behavior. This is consistent with the endogenous money approach.

In contrast, fiscal policy is likely to directly influence the quantity of money. When the government purchases assets such as goods and services from the public, private liquidity ratios rise as illiquid assets are replaced by money. This may then lead to changes in the quantity of assets privately produced or to changes in their prices until desired liquidity ratios are restored.

Of course, if the government taxes away the money received by the public from government purchases, there would not be any net increase in the quantity of money privately held. However, since it is rather unlikely that an individual's tax expenditures are exactly offset by receipts from government spending, even a balanced budget is very likely to cause a redistribution of money among the public. This will then set off an adjustment process until each individual achieves his or her desired liquidity ratio. Thus, fiscal policy is likely to affect the prices and quantities of nonmonetary assets even if the government's budget is balanced.<sup>4</sup>

If the government runs deficits, however, the quantity of money is likely to rise [Boulding 1950, p. 270; 1958, p. 185]. As even orthodox theory holds, the sale of government bonds to the central bank will increase the money supply. However, Boulding argues that most government bonds are sold to the banking system. Since banks buy assets by issuing liabilities, and since their liabilities are money, sales of government bonds to banks will also increase the money supply.<sup>5</sup> Finally, sales of government bonds to the nonbank public will not increase the money supply (unless the public borrows from banks to finance such purchases) but are likely to redistribute money from some households to others, and so will likely affect asset prices and quantities, in general.

The banking system takes up those government bonds that the non-

bank public does not wish to hold, and in this way the money supply is increased<sup>6</sup> [Boulding 1979, p. 616]. Private banks would be able to purchase only a finite quantity of government bonds if the aggregate quantity of reserves remained fixed. However, a primary function of the central bank is to purchase government bonds in sufficient quantity so that bank reserves rise. This prevents reserves from acting as an operative constraint on the ability of banks to create money to provide the government with purchasing power.

Thus, fiscal policy will redistribute money and will increase the money supply to the extent that government spending is financed by selling bonds to banks or to the central bank. Fiscal policy will indirectly influence the prices and quantities of nonmonetary assets as the public and banks attempt to restore desired liquidity ratios. Through its impact on prices of assets, fiscal policy might also indirectly affect interest rates. However, appropriate monetary policy can mitigate any undesired effects on interest rates.

### *Liquidity Preference and the Determination of Interest Rates*

The rate of growth of assets is the “average efficiency of capital,” in the Keynesian phrase; the rate of growth of liabilities is the rate of interest. Clearly the individual’s willingness to increase his liabilities depends on the expectations which he has of being able to increase his assets [Boulding 1950, p. 281].

Boulding’s definitions of saving and hoarding help to clarify why saving cannot go directly into the determination of interest rates. Saving is defined as income minus outgo, or production less consumption, and so is equal to net accumulation of total assets.<sup>7</sup> Saving can rise because production increases or because consumption decreases. On the other hand, hoarding is equal to total money receipts less money expenditures, or to the net increase in liquid assets [Boulding 1950, p. 143]. Clearly, saving and hoarding are different concepts. In fact, hoarding and saving may well move in opposite directions [Boulding 1966, p. 124]. An individual might increase money hoards by selling accumulated nonmonetary assets and might reduce saving by decreasing production. Society can increase hoards only by creating more money and can increase saving only by producing more assets or by reducing the rate of destruction of assets (that is, consumption).

As discussed above, a fall of liquidity preference is likely to increase the money supply as purchasing power is increased. In this case, the

aggregate levels of hoards and the flow of saving will increase if the newly created money is used to finance production in excess of consumption. Rising liquidity preference, however, may actually reduce saving as attempts to increase hoards lead to lower levels of production and as assets are sold, forcing down their prices. Thus, as preferences for hoards rise, saving, real investment, and nominal investment may all fall. In extreme cases, the aggregate money supply may actually decline when liquidity preference rises, since banks might call in loans or refuse to renew them.

Saving and real investment are necessarily identical in Boulding's presentation, so clearly cannot determine the interest rate. It might be objected that Boulding has merely defined the terms differently from their normal use. However, Keynes appeared to have something similar in mind when he argued that saving cannot be any more of a source of loanable funds than consumption, and when he argued that saving and investment are merely different names for the same variable [Keynes 1973a, p. 551; 1973b, p. 233]. Boulding eliminates the possibility of confusing saving with money when he defines saving as the accumulation of assets rather than as the nonconsumption of income. This makes it clear that abstinence from spending on consumption goods need not increase aggregate saving since it may well cause production to fall.

Keynes defined the interest rate as a reward for not hoarding money or as the premium required to equate the demand for hoards with the supply of hoards [Keynes 1973b, p. 214]. However, Keynes's presentation has subsequently led to difficulty for those who adopt an endogenous money supply since Keynes seems to have taken the supply of hoards as fixed.<sup>8</sup> Boulding points the way toward a liquidity preference theory that is consistent with an endogenously determined money supply. If liquidity preference is distinguished from money demand, and if money is distinguished from hoards, then liquidity preference theory can be easily reconciled with the endogenous money approach.

The price of a bond or other asset can be determined through Boulding's desired liquidity ratios. That is,

$$(1) P_b = (M/B)(R_b/R_m)$$

where  $P_b$  is the price of the bond,  $M/B$  is the ratio of the quantity of money to the quantity of the bond, and  $R_b$  is the percent of the total value of assets individuals wish to hold in the form of bonds, while  $R_m$  is the percent of the total value of assets individuals wish to hold in the form of money [Boulding 1950, p. 279; 1966, p. 80].

Boulding argues that Keynes assumed the quantity of money and bonds, as well as the desired ratio of bonds to total assets, were all fixed (so that liquidity preference alone would determine asset prices) [Boulding 1966, p. 136]. In contrast, Boulding argues that all of these are variable. For example, an increase in the price of bonds is likely to increase the quantity of bonds issued, or an increase in the price of bonds might increase the percent of assets individuals want to hold in the form of bonds [Boulding 1966, p. 138]. Alternatively, a fall in liquidity preference will likely reduce the portion of assets individuals wish to hold in the form of money, so will increase the price of bonds. This effect would be enhanced if a fall of liquidity preference also causes the quantity of money to increase and raises the percent of assets to be held in the form of bonds. However, upward pressure on the price of bonds will be offset to the extent that more bonds are issued.

Boulding explicitly laid out a liquidity preference theory of the determination of market prices [Boulding 1971a]. This can be used to distinguish those factors that determine the price of bonds from those that determine the quantity of bonds that will be supplied in equilibrium. I will first examine the determination of the quantity of bonds.

The supply of bonds comes from those willing to borrow, while the demand for bonds comes from those who are willing to lend. If lenders are banks, then the quantity of money will increase as bonds are purchased, while the quantity of money will not be changed if buyers are nonbanks. As a first approximation, we can assume that each individual agent can be either a supplier or demander of bonds, depending upon the price of the bond. At a low price, an agent may be a demander, but when the price reaches a certain level, the individual becomes a supplier. Obviously, exchange can take place only if preferences vary so that at a given price there are both suppliers and demanders. We can call the price at which excess demand is zero the "null price." For each individual, the null price is that price at which no further changes in the quantity of bonds held are desired. As the divergence of preferences increases, the equilibrium quantity of bonds will rise [Boulding 1971a, p. 137]. That is, a large equilibrium quantity of bonds will be associated with a wide diversity of null prices among individuals.

For example, a wide diversity of null prices of bonds might occur where the profit expectations of borrowers (those who supply bonds) are high, but the liquidity preference of lenders (those who demand bonds) is low. In this case, the demand price of lenders will greatly exceed the supply price of borrowers, so that a large quantity of bonds may be created and floated. This can also be stated in Keynesian ter-

minology. Each asset has a return that consists of  $q-c+1$ , where  $q$  stands for the profits expected over the life of the asset,  $c$  is the carrying cost (or wastage), and  $1$  is liquidity [Keynes 1964, p. 226]. The return from physical assets consists almost entirely of the  $q$ 's, while the return from money consists almost entirely of liquidity. When the expectation of potential borrowers is high and liquidity preference of potential lenders is low, the  $q$ 's will be estimated very optimistically, while little value will be placed on liquidity. In this case, the "marginal efficiency of capital" will exceed the interest rate required to induce wealth holders to release hoards. Thus, many investment projects can obtain finance at a cost lower than the marginal efficiency of capital, which is based on the expected  $q$ 's. The greater the divergence of the  $q$ 's from the  $1$ 's, the greater the equilibrium quantity of bonds that can be issued.

On the other hand, the equilibrium price of bonds will be influenced by the general willingness to buy bonds. If the willingness to buy bonds uniformly increases (the null price of each agent rises), the price of bonds will rise. However, given a diversity of null prices, a uniform increase of null prices will not affect the quantity of bonds, but will only raise their prices. Returning to the equation above, the general willingness to buy bonds will likely rise and push up bond prices if liquidity preference falls or if the money supply rises [Boulding 1971a, p. 139]. Thus, bond prices can fall if liquidity preferences generally rise so that all agents require higher prices to induce them to hold bonds rather than money.

These results can be generalized to all assets: the degree of divergence of preferences determines the equilibrium quantity of each asset, while the general willingness to buy each asset determines its price. In this way, the desired liquidity ratio (or liquidity preference) goes into the determination of the price of an asset. An increase in the quantity of money or a decline of liquidity preference will tend to increase the price of all assets. The degree to which the price of any particular asset will be affected depends upon the effect of a change in liquidity preference or in the money supply on the preferred ratio of that particular asset and on the ratio of money to bonds.

R. F. Kahn has argued that the stock of money privately supplied is determined by the quantity of bonds (broadly defined) taken up by the banking system [Kahn 1954]. Thus, the quantity of bonds issued is determined by the divergence of individual null prices, while the quantity of money is determined by the divergence of null prices of bonds between banks and borrowers. An increase in the divergence of these null prices will increase the quantity of bonds as well as the quantity of

money. While the factors that determine the quantity of an asset can normally be separated from those factors that determine the price of an asset, this is not true for those assets purchased by banks. This is because the determination of the equilibrium quantity of assets banks buy, such as bonds, necessarily affects the quantity of money, which goes directly into the determination of asset prices.<sup>9</sup>

Since the purchase of bonds by the banking system normally increases the money supply, diversity of null prices for bonds will normally increase the money supply and affect the prices of bonds, which may inversely affect the interest rate. Returning to the equation above, if both the money supply and the quantity of bonds are doubled, the price of bonds need not be affected, but if the percentage increase in money is greater than the percentage increase in bonds, then the price of bonds will rise and the interest rate will fall. Even if the growth of the money supply is only equal to the growth of the quantity of bonds, interest rates will fall if the quantity of money is smaller than the quantity of bonds<sup>10</sup> [Boulding 1966, p. 141].

Investment and saving (that is, accumulation of assets) are possible only if liquidity preference falls or if the money supply increases. Given a degree of liquidity preference, the rate of investment will be equal to the rate of growth of the money supply. Given a quantity of money, investment can grow only if liquidity preference falls so that velocity rises as the public tries to decrease hoards. Normally, however, falling liquidity preference is not consistent with a fixed money supply, since banks will almost certainly supply more money as liquidity preference falls and banks buy more bonds.

If we define the short run as a period so short that the quantity of bonds, money, and other assets can be taken as fixed, then only the price-determining factors are relevant. In this case, desired liquidity ratios (or the general willingness to buy) will determine the price of bonds and the interest rate. In this case, liquidity preference determines the interest rate and the prices of assets. A rise of liquidity preference will lower the price of assets and raise the interest rate [Boulding 1966 pp. 139–41]. This seems to be Keynes's world: holding the supply of money and bonds fixed, liquidity preference completely determines the price of bonds.

If, however, the period is extended to allow the quantity-determining factors to come into play, then liquidity preference theory alone cannot determine the interest rate. A divergence of null prices of bonds will increase the quantity of bonds, the money stock, and the price of bonds, and will lower the interest rate. As mentioned above, a change in the

price of bonds might cause further changes in the quantity of bonds and in the degree of liquidity preference. As bond prices rise, the quantity of bonds issued will increase—some of which may be taken up by the banking system, and thereby increase the money supply—and desired liquidity ratios might fall. In this case, the equilibrium quantity of loans and the interest rate may be indeterminate.

In this netherworld between the short period and the long period, the quantity of loans and the interest rate are established through rationing, conventions of behavior, and central bank policy. As liquidity preference falls, expansion of the money stock may be limited by credit rationing. This, in turn, will place a ceiling on bond prices even as it limits the quantity of bonds that can be sold. Credit rationing may be optimal behavior in a world of uncertainty where unpredictable loan default would destroy bank capital [Boulding 1966, p. 140]. Thus, where rationing prevails, interest rates need not be set to clear the market. In this case, banks may follow rules of thumb in their pricing schemes. In an imperfect market, banks may well charge higher interest rates as the quantity of loans increases (to compensate for greater perceived risk) [Boulding 1950, p. 131]. Finally, central bank policies can influence the interest rate by affecting conditions in financial markets, as discussed above.

In this medium run (in which we actually live), liquidity preference affects both the quantity of money and interest rates. A decline in liquidity preference will tend to increase the money supply as borrowers willingly supply bonds and go into debt and as banks willingly take up the bonds. Up to some point, determined by conventions regarding acceptable balance sheets, banks will increase the money supply without raising interest rates on loans. This does not mean, of course, that banks will meet all loan demand—many potential borrowers will not obtain loans even if they are willing to pay the market interest rate, since banks ration credit based on rules of thumb, risk assessment, established relations with customers, and other conventions of behavior. Beyond some point, banks will require higher interest rates, even for established customers, to compensate for greater perceived risk associated with further expansion of balance sheets [Wray 1990; Minsky 1957].

If liquidity preference rises, banks will increase interest rates on the loans they do make, and will decrease the quantity of loans actually made. The supply of credit will be cut off to all but established customers. As the money supply stops growing, asset prices will begin to fall and interest rates will rise.

It is essential to distinguish between money demand and liquidity

preference: an increase in money demand can be characterized as a rise in the diversity of null prices, while an increase in liquidity preference is equivalent to a decline in the general willingness to buy. As money demand rises, more bonds are offered for sale as borrowers take out loans to buy goods, services, and assets. This rise of money demand will normally be met to a great extent by an increase in the supply of money, as long as banks share in the optimism so that their null price rises as they willingly become buyers of bonds. However, a rise of liquidity preference is unlikely to be met by an increase in the supply of money. An increase in liquidity preference is an attempt to increase hoards, which is certainly not equivalent to an attempt to issue new bonds and to go into debt. Thus, rather than generating an increase in the money supply, rising liquidity preference causes asset prices to fall and interest rates to rise. This effect is enhanced where the liquidity preference of banks also increases so that they cut off the supply of loans.

In the long run, the willingness to issue bonds and to go into debt must be primarily a function of the expected profits to be generated over the life of the asset to be purchased. Thus, in the long run, the rate of growth of the money supply, as well as the interest rate, must be governed by the rate of profit or the state of long-term expectations [Boulding 1966, p. 139]. In the absence of uncertainty, the interest rate would be pushed up to the point where it just equaled the rate of profit if markets were perfectly competitive. Each borrower would issue bonds to purchase assets up to the point where the expected rate of growth of the value of the assets just covered the rate of growth of the liabilities entailed in the bonds issued (which is the interest rate). Credit rationing by oligopolists, however, could maintain a differential between the expected profit rate and the interest rate. In the presence of uncertainty, borrowers might limit the quantity of bonds issued to reduce the risk of destroying net worth.<sup>11</sup> In other words, a differential between the expected profit rate and the interest rate might be maintained even in the long run [Boulding 1950, p. 280].

It can be seen that Boulding provides the basis for a synthesis of Keynes's liquidity preference theory and the post Keynesian endogenous money approach. Boulding's foundation leads to an approach in which both the interest rate and the money supply are endogenously determined by behavioral patterns that are consistent with those of a capitalist economy. In contrast, Basil Moore combines an endogenous money supply with an exogenously determined interest rate. The central bank sets the discount rate, and banks merely add a markup to ob-



tain market interest rates. Banks then meet all loan demand at the markup rate of interest. There is no room in Moore's model for liquidity preference or for desired balance sheet positions. Banks passively allow their balance sheets to expand or contract according to the whims of borrowers. Borrowers never demand liquidity, but only demand more or less money to finance spending. Because he has not distinguished liquidity preference from money demand and liquidity from credit, Moore is forced to abandon many of the Keynesian insights into the functioning of capitalist economies.

#### *Conclusions*

The essential difference between Milton Friedman's helicopter money and Boulding's balloon money is the absence of balance sheet discipline in Friedman's analysis. Monetarist theory and policy might apply to a world in which money is exogenously supplied as an asset with no offsetting liability. However, in a world in which most money is supplied as banks purchase assets, money must be analyzed through its effects on balance sheets. Boulding's approach is clearly superior in such a world to the helicopter money approach.

Boulding's balance sheet approach is also superior to that of the hydraulic Keynesians, who dichotomize the real and nominal sectors. The hydraulic Keynesians try to analyze the effects of an increase in spending flows while holding stocks constant, and vice versa. The balance sheet approach makes it clear that spending and money cannot be dichotomized. Furthermore, Boulding's analysis avoids the unnecessary confusion of hoarding with saving, or of saving with "loanable funds," which is often encountered in the works of the hydraulic Keynesians.

Boulding's analysis also makes it clear that private assets and liabilities cannot be netted out—that is, inside debts matter. The individual's balance sheet affects spending decisions, which affect production and income. The decisions of banks to purchase assets, and the decisions of borrowers to offer bonds, are the primary determinants of the stock of money and go into the determination of the prices of assets. The stock of money issued by banks, in turn, affects nonbank balance sheets and sets in motion a process of homeostasis.

A decline in preferred liquidity ratios will affect spending, prices, and the quantity of money. However, an asymmetry exists with regard to rising liquidity preference: attempts to reduce spending and increase hoards may cause prices and income to fall, but are not likely to increase the money stock. Therefore, an increase in the desired liquidity

ratios must lead to deflation until the value of nonmoney assets falls sufficiently that the actual quantity of hoards stands in the desired relation to total assets. However, deflation can generate a crisis as each agent tries to sell assets and avoid purchases. The monetary authorities must enter to supply helicopter money to meet the demand for liquidity that cannot be met privately. In Boulding's analysis, primary responsibility for supplying money must fall on the Treasury, which must increase the money supply through deficit spending, rather than on the central bank—which can only affect the liquidity of bank balance sheets directly, and the money stock only very indirectly.

Finally, Boulding points the way toward a reconciliation of the endogenous money approach with liquidity preference theory. Liquidity preference theory alone explains interest rates (and bond prices) in the short run, during which the quantity of money and assets is fixed. In a longer period, however, liquidity preference theory must be extended to take account of quantity-determining factors. In this longer period, the quantity of money cannot be taken as fixed, but is influenced by the liquidity preference of the public and of banks. In this case, liquidity preference theory alone cannot determine the interest rate, which is also affected by central bank behavior and rules and conventions concerning balance sheets. In the long run, the interest rate is determined by the state of long-term expectations—that is, by expectations of profit on real assets. Boulding's approach appears to be a more fruitful starting point than the exogenous theory of interest rates that comes out of some of the post Keynesian work on endogenous money.

#### *Notes*

1. See Boulding [1971a, p. 138]; [1950, pp. 55, 253, and 270]; and [1966, p. 86].
2. This is apparently what Moore assumes: banks stand ready to buy all the assets offered by the public as liquidity preference rises so that interest rates are not affected [Moore 1988].
3. See Hyman Minsky [1957] for an analysis of the development of the fed funds market and other reserve-economizing innovations.
4. In the orthodox analysis, a balanced budget increase of government spending will increase aggregate income if the marginal propensity to consume is less than unity. In Boulding's analysis, total spending would increase if the redistribution of money generated a process of homeostasis.
5. When banks buy bonds by issuing demand deposits, they will lose reserves when the Treasury transfers these deposits to the central bank. However, the reserves are restored as soon as the Treasury spends its borrowed funds. Thus, reserves will merely be redistributed among banks, rather than per-

- manently lost. Banks that lose reserves must recapture them from those that gain reserves.
6. Kahn made a similar argument [Kahn 1954].
  7. Boulding says: "This is the proposition which in a somewhat frivolous mood I have labeled the 'bathtub theorem'—the total stock being the water in the tub; production, the flow from the faucet; consumption, the flow down the drain; the difference between production and consumption being the rate of accumulation of water in the tub. This is positive if the inflow (production) exceeds outflow (consumption)—negative if outflow exceeds inflow" [Boulding 1966, p. 122].
  8. For example, Moore argues that Keynes's exposition in the *General Theory* was fatally hampered by his use of liquidity preference theory. Moore believes that liquidity preference theory can apply only in the case of a fixed money supply. In Moore's approach, the central bank determines the short-term interest rate, while long-term interest rates are determined by expectations regarding the future value of the short-term interest rate [Moore 1988].
  9. This is not explicitly recognized by Boulding, but seems to be consistent with his model.
  10. Boulding proves that the price of bonds will rise if the derivative of money divided by the money stock is greater than the derivative of bonds over the quantity of bonds [Boulding 1966, p. 141; see his footnote 8].
  11. This, as Boulding notes, is similar to Michel Kalecki's "principle of increasing risk." See Boulding [1966, p. 140; 1950, p. 47].

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