Supply of Money

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Abstract: This short paper is the encyclopedia entry on Supply of Money to appear in the second edition of the *International Encyclopedia of the Social Sciences*. The encyclopedia is edited by William A. Darity and forthcoming from Macmillan Reference USA (Thomson Gale).

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1. Introduction

Central bank policy influences the supply of monetary services. The transmission mechanism is not the same in all countries, but commonly the procedure operates through open market operations, by which the central bank buys or sells domestic Treasury securities. Such purchases and sales alter the central bank's balance sheet and thereby "high powered money," also called the monetary base, defined to be the sum of currency and bank reserves. The resulting changes in interest rates and in bank balance sheets alter "inside money," defined to be monetary services produced by banks and other financial intermediaries. How to measure the resulting change in the supplied monetary-service flow in the economy is a complicated matter that has been the subject of much debate. The entry on "Divisia monetary aggregates" in this encyclopedia deals with demand-side financial-services aggregation, while this Supply of Money entry deals with the supply side.

The conventional measurement procedure is to add up the nominal balances of monetary assets. The resulting sum is called the "money supply." Subtracting the monetary base from that sum produces what is commonly treated as inside money. Much of the modern literature on business cycles revolves around empirical work on the relative effects of inside money and outside money. But the usual measurement of inside money is unrelated to the theory of production and the ways in which that theory determines the output services produced by financial intermediaries.

2. High Powered Money

During the depression of the 1930s, the monetary base continued to rise in a normal manner as the supply of money in the economy collapsed. Why did this happen? Currency is

dollar-for-dollar pure money. But reserves back demand deposits with a multiplier, k. For every dollar removed from demand deposits as the banking system crashed, currency increased by one dollar, while reserves declined by 1/k dollars, so that the monetary base changed by 1 - 1/k, which is positive. Hence runs on banks increased the monetary base at the same time that demand deposits were declining and banks were failing. As an instrument or indicator of policy, the monetary base is defective, since it adds together currency and reserves, which have very different effects on the economy.

3. Inside Money

According to the theory of production, there are two ways to measure the output of a firm. One way is to measure the gross value of the output "aggregator function, g." The other way is to measure the net "value added" by the firm's production. By the most conventional and simplest accounting convention, called "double deflation," value added subtracts from aggregate output the aggregate over intermediate factor inputs. Value added then depends only upon primary inputs, such as capital, land, and labor. In the obsolete labor theory of value, only the one labor factor was needed, since inputs were assumed to be employed in fixed proportions.

Consider the case of a bank that produces a vector of n monetary-asset balances, $\mathbf{m}_t = (m_{1t}, m_{2t}, \ldots, m_{nt})'$, during period t and pays on those assets the nominal interest rates $\mathbf{r}_t = (r_{1t}, r_{2t}, \ldots, r_{nt})'$, by employing the vectors of primary inputs, $\mathbf{x}_{1t}$, and intermediate inputs, $\mathbf{x}_{2t}$. If the bank's technology is described by the production function, f, with outputs separable from inputs, we can write $g(\mathbf{m}_t) = f(\mathbf{x}_{1t}, \mathbf{x}_{2t})$, where the value of the output aggregator function is $M_t = g(\mathbf{m}_t)$. For the most general procedure to measure value added in banking, see Barnett (2000, pp. 92 - 93).

The special case of double deflation accounting requires two further assumptions. The first is the existence of aggregator functions, f_1 and f_2, over primary and intermediate inputs, so that $M_t = g(\mathbf{m}_t) = f(f_1(\mathbf{x}_{1t}), f_2(\mathbf{x}_{2t}))$. The second is strong separability between primary and intermediary inputs, so that $M_t = g(\mathbf{m}_t) = f_1(\mathbf{x}_{1t}) + f_2(\mathbf{x}_{2t})$. Value added then becomes $f_1(\mathbf{x}_{1t}) = g(\mathbf{m}_t) - f_2(\mathbf{x}_{2t})$.

Under those assumptions, production theory tells us that the supply of inside money produced by a bank can be measured by, $M_t = g(\mathbf{m}_t)$, while value added in banking is $f_1(\mathbf{x}_{1t}) = g(\mathbf{m}_t) - f_2(\mathbf{x}_{2t})$. Neither theoretical concept has any known relationship with the simple sum monetary aggregate, $\sum_{i=1}^{n} m_{it}$, provided by most central banks, or with inside money, as measured by the simple sum monetary aggregate minus the monetary base. In contrast, it has been shown in Barnett (2000) that total inside money services, $M_t = g(\mathbf{m}_t)$, can be measured from the Divisia index over $\mathbf{m}_t$, and that value added in banking, $g(\mathbf{m}_t) - f_2(\mathbf{x}_{2t})$, can be measured by subtracting from M_t the Divisia index over $\mathbf{x}_{2t}$.

4. The Divisia Index

The Divisia index is defined in this encyclopedia in its entry for "Divisia Monetary Index." As explained there, user-cost prices must be used within the formula, since monetary assets are durable. So long as required reserves do not exist, the formula for the user-cost price of a monetary-asset supplied is the same as the formula for the user-cost price of a monetary-asset demanded. That formula is

$$\pi_{it} = \frac{R_t - r_{it}}{1 + R_t},$$

where the benchmark asset rate of return, R_t, on the supply side of money markets, is the rate of

return on loans by the financial intermediary. But if noninterest-bearing required reserves exist, there is a regulatory wedge, requiring subtraction of the implicit tax on banks out of the formula. As shown in (2000, p. 57), the corrected user cost price becomes

$$\pi_{it} = \frac{(1 - k_i)R_t - r_{it}}{1 + R_t},$$

where k_i is the required reserve ratio on monetary asset i.

5. The Economic Stock of Money

The Divisia demand-side index and the Divisia supply-side index both measure flows. Since the transmission mechanism of money is sometimes viewed as operating through a wealth effect, it is useful to know how to discount the present value of the service flow to find the economic capital stock of money. Because of the dependency of that capital stock on future expectations, measurement of that capital stock is one of the most challenging areas of this field of research. Since money is now a joint product producing both monetary services and investment yield, wealth effects must untangle the discounted present value of the monetary services flow from the discounted present value of the investment yield. See, e.g., Barnett, Keating, and Chae (2006).

6. Conclusion

There is reason to be concerned about conclusions regarding policy reached using conventional monetary aggregates and conventional measures of inside versus outside money. The data provided by many central banks is unrelated to the relevant economic theory, unless all financial assets are perfect substitutes. With different interest rates being paid on different

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monetary assets, that implied assumption has been unreasonable for over a half century.

Although little research has been done using the relevant theory to measure aggregate money on the supply side, a few such empirical studies have been published and reprinted in Barnett and Binner (2004, chapters 15 and 16, pp. 351-434). Also see Barnett, Hinich, and Weber (1986).

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