Endogenous and Exogenous Money

MEGHNAD DESAI

The issue of endogeneity or exogeneity of money is one that runs through the history of monetary theory, with prominent authors appearing to hold views on either side. Narrowly put, those who plug for the exogeneity view take one or all among the cluster of variables – price level, interest rate or real output – as being determined by movements in the stock of money. Those who hold the endogeneity view consider that the stock of money in circulation is determined by one or all of the variables mentioned above. This narrow definition begs several questions. The variables price level \( (P) \), interest rate \( (R) \), real output \( (Y) \) and money stock \( (M) \) are all at the macroeconomic level, i.e. in the context of a one-good economy. Some part of the continuing debate can be traced to the view held by various participants in the controversy about whether such a high level of aggregation is appropriate, e.g. is there a rate of interest? Another part of the debate refers to the choice of money stock variable. Is it commodity money (gold), fiat (paper) money, bank deposits or a larger measure of liquidity that is to stand for the money stock? The problem can be dealt with even at a one-good level either in the context of a closed economy or an open economy and either in an equilibrium or a disequilibrium context, static or dynamic, short run or long run. The basic issue is about the direction of causality-money to other variables or other variables to money. But as our understanding of the underlying statistical theory concerning causality and exogeneity has advanced in recent years, it must also be added that participants in the controversy conflate the exogeneity of a variable (especially of money) with its controllability by policy.

Strictly speaking one can have exogeneity without any presumption that the variable can be manipulated by policy, for example rainfall. Also once posed in a dynamic context, we should distinguish between weak exogeneity, which allows for feedback from the endogenous to the exogenous variables over time, and strong exogeneity, which does not allow such a feedback (Hendry, Engle and

Richard, 1983). Endogeneity or exogeneity are notions that only make sense in such a model, which has then allowed the controversy to continue.

SOME DEFINITIONS. To simplify matters, at the risk of putting off readers, let us begin by specifying a small model within whose context endogeneity and exogeneity can be defined. This macroeconomic model will consist of four variables \( P, Y, R \) and \( M \) whose exogenous/endogenous status is at debate. We subdivide them into the three non-monetary variables \( P, Y, R \) labelled \( X \) and money \( M \). There are of course other truly exogenous variables – tastes, technology, international variables – which we label \( Z \). Now we observe that the variables \( X \) and \( M \) are correlated, i.e. jointly distributed conditional upon the set of variables \( Z \). The question of endogeneity or exogeneity of money is as to whether the correlation between \( X \) and \( M \) can be written in terms of \( X \) being a function of \( M \) and \( Z \), or \( M \) being a function of \( X \) and \( Z \). In econometric terms, we can partition the joint distribution of \( X \) and \( M \) into a conditional distribution of \( X \) on \( M \), \( Z \) and a marginal distribution of \( M \) on \( Z \) (the exogenous money case) or a conditional distribution of \( M \) on \( X \) and \( Z \) and a marginal distribution of \( X \) on \( Z \).

Thus when we say money is exogenous it is exogenous with respect to \( X \) variables but it could still be determined by \( Z \) variables; symmetrically for the \( X \) variables being exogenous. If \( M \) is influenced by the past values of \( X \) as well as by \( Z \) though not by the current values of \( X \), then \( M \) is said to be weakly exogenous. Thus \( M \) may be controlled by monetary authorities but they may be reacting to past behaviour of \( X \) variables. Then \( M \) is determined by a reaction function and is only weakly exogenous. The same definition of weak exogeneity extends to the \( Z \) variables. Thus even international variables, such as capital inflow, may be determined by past values of \( X \) variables in which case they are weakly exogenous (for further detail, see Desai, 1981). The best way to consider the issue of exogeneity of money is to specify the type of money economy envisaged – commodity money, paper money, credit money and look at the variables likely to influence the supply of money and its relation with other variables.

COMMODOITY MONEY. Historically the argument about exogeneity is constructed around the Quantity Theory of Money, which stated that the amount of money in circulation at any time determined the volume of trade and if the amount went on increasing it would lead sooner or later to an increase in price. In the context of commodity money, the proposition concerned attempts by coinage authorities to debase coinage by clipping or alloying it with inferior metal. These were ways in which the amount of money could be altered by policy manipulation and then exogenously act upon prices. But in a commodity money regime, the stock of money could also be altered by influx of precious metal through gold discoveries and greater influx. These were exogenous variations not susceptible to policy manipulation but presumed an open economy. The first statement of the quantity theory of money by David Hume starts with an illustration of an influx of gold from outside and traces its effects first on real economic activity and eventually on prices. In Hume’s quantity theory, money is exogenous but
Endogenous and Exogenous Money

not subject to policy manipulation. The opposite view (argued by James Steuart for instance) was that it was the volume of activity that elicited the matching supply of money. This could be done partly by dis-hoarding on the parts of those who now expected a better yield on their stock. It could also be altered if banks were willing to 'accommodate' a larger volume of bills (see Desai, 1981). Dis-hoarding implies that a portion of the money supply in circulation is endogenously determined in a commodity money economy. It could be argued that even the influx of gold could have been caused by the discrepancy between the domestic and the world gold price, which in the 18th century before a world gold market existed could be substantial. In the latter case would be weakly exogenous as long as there were lags between the appearance of discrepancy and the inflow of gold.

INSIDE MONEY. Once however one introduces banks into the scheme of things, the issue of exogeneity becomes complex. Till very recently we have lacked a theory of banking behaviour of any degree of sophistication, although in terms of institutional description we have much knowledge. If banks are willing to 'accommodate' a greater volume of trade, this can only be because they find it profitable to do so. This increased profitability may be actual or perceived but it must be a result of an increase in differential between the interest (discount) rate borrowers are willing to pay and the rate at which banks can acquire liquidity. Banks can then choose to expand the ratio of credit to the cash base and sustain a higher volume. Banks create inside money and inside money can only be regarded as endogenous. But the extent to which a single bank can create money will depend on the behaviour of the banking system. The banking system can by the cloakroom mechanism choose any ratio of credit to cash base. It is conceivable though not likely that in such a system of inside money, banks could arbitrarily, i.e. exogenously, increase money supply. They must however base such an action on considerations of expected profitability. We can envisage a situation in which banks guided by 'false' expectations can sustain a credit boom by a bootstrap mechanism. This is the way in which a Wicksellian cumulative process could sustain itself. An arbitrary, exogenous increase in inside money by the banking system though possible is not very likely. It runs into the problems caused by the leakage of cash either internally (finite limits to the velocity of circulation of cash) or abroad. It was the international leakage that was normally regarded as the most likely constraint since it caused outflow of gold – the International Gold Standard which provided the context for 19th-century theories in this imposed exogenous constraints on money supply by imposing a uniform gold price in all countries. In such a case, money is exogenous and not subject to policy manipulation. In as much as gold movements are triggered by internal variables, it is weakly exogenous.

OUTSIDE FIAT MONEY. It is the case of fiat money printed as the state's liability, i.e. as outside money, that provides the best illustration of exogenous money not subject to any constraint. In a world where only paper currency was used and it was printed by the monetary authorities, the stock of money could be exogenously determined. This would be additionally so even if there was inside money as long as the monetary authorities could insist that banks obeyed a strict cash to deposit ratio and there were no substitutes for cash available beyond the control of the monetary authorities. It is this view of money that most closely corresponds to Keynes's assumption in the General Theory and it is also in the monetarist theory of Milton Friedman. The banking system is a passive agent in this view and given the cash base is always fully loaned up. Thus given the amount of high powered money in the system provable only by the monetary authorities, the supply of money is determined. Even if the stock of money were exogenous, its impact on the non-monetary variables X can be variable. This is because the velocity of circulation which translates the stock of money into money in circulation need not be constant but variable. If the velocity of circulation were not only a variable but also a function of the X variables, then although the monetary authorities can determine the stock of money the influence of money on real variables is not as predicted by the Quantity Theory. Thus it is not the exogeneity of money issue that divides monetarists and Keynesians but the determinants of the velocity of circulation. For the monetarist, the velocity of circulation (M/PY) has to be independent of P, Y, R and M. For Keynesians, the demand for money depends on the rate of interest crucially and the interest elasticity of demand for money is a variable tending to infinity in a liquidity trap.

MODERN CREDIT ECONOMY. In a world with inside and outside money with a sophisticated banking system as well as a non-banking financial sector, the question of exogeneity is the most complex. In the previous case of outside fiat money, we assumed that the cash ratio was fixed and adhered to by banks. It is when the banks' reserve base contains government debt instruments – treasury bills, bonds, etc. – that the profit-maximizing behaviour of the banks renders a greater part of the money stock endogenous. Thus while the narrow money base - currency in circulation and in central bank reserves – can be regulated by the monetary authority, the connection between money base and total liquidity in the economy becomes highly variable. Banks will expand their loan portfolio as long as the cost of replenishing their liquidity does not exceed the interest rate they can earn on loans. The relation between broad money (M) and narrow money (M) becomes a function of the funding policy concerning the budget deficit and the structure of interest rates. Thus the stock of narrow money can be exogenous and policy determined. But the stock of broad money is endogenous. A crucial recent element has been the financial revolution of the last decade (De Cecco, 1987). A variety of financial instruments – credit cards, charge cards, money market funds, interest-bearing demand deposits, electronic cash transfer – has made the ratio of cash to volume of financial transactions variable though with a steep downward trend. It has also increased the number of money substitutes and made the cost of liquidity lower. The non-banking financial system thus can create liquidity by 'accommodating' a larger volume of business,
advancing trade credit, allowing consumer debt to increase etc. The velocity of circulation of cash increases very sharply in such a world and liquidity, a broader concept that even broad money, becomes endogenous. Here again profitability of liquidity creation becomes the determining variable. But the financial revolution has also integrated world financial markets and economies are increasingly open. Thus capital flows are rapid and respond to minute discrepancies in the covered interest parity. In such a world money is at best weakly exogenous but more usually endogenous. The issue of exogeneity or endogeneity of money thus crucially depends on the type of money economy that one is considering — commodity money, paper money, credit (mobile) money. It also depends on the sophistication of the banking and financial system within which such money is issued. Debates over the last two hundred years have used the word money to cover a variety of situations. It has also not been clarified whether the issue is exogeneity of money or its controllability and whether it is merely the stock of money or its velocity as well which is being considered. Once these issues have been clarified, the notion of exogeneity needs to be defined in the modern econometric fashion, relative to a model in order to decide whether money can be exogenous. It seems likely that the narrower the definition of money stock, the more likely it is to fulfill the requirement of (weak) exogeneity. Such exogeneity is necessary but not sufficient to demonstrate that money determines the price level or the real economy.

BIBLIOGRAPHY

Equation of Exchange

MICHAEL D. BORDO

The equation of exchange (often referred to as the quantity equation) is one of the oldest formal relationships in economics, early versions of both verbal and algebraic forms appearing at least in the 17th century. Perhaps the best known variant of the equation of exchange is that expressed by Irving Fisher (1922):

\[ MV = PT \]  \hspace{1cm} (1)

Equation (1) represents a simple accounting identity for a money economy. It relates the circular flow of money in a given economy over a specified period of time to the circular flow of goods. The left-hand side of equation (1) stands for money exchanged, the right-hand side represents the goods, services and securities exchanged for money during a specified period of time. \( M \) is defined as the total quantity of money in the economy, \( T \) as the total physical volume of transactions, where a transaction is defined as any exchange of goods, including physical capital, services and securities for money, \( P \) is an appropriate price index representing a weighted average of the prices of all transactions in the economy. Finally, to make the stock of money comparable with the flow of the value of transactions \( (PT) \), and to make the two sides of the equation balance, it is multiplied by \( V \), the transactions velocity of circulation, defined as the average number of times a unit of currency turns over (or changes hands) in the course of effecting a given year's transactions.

An alternative variant of the Equation of Exchange is the income version by Pigou (1927). Empirical difficulties in measuring an index of transactions, and the special price index related to it, led, with the development of national income accounting, to the formulation of equation (2):

\[ MV = PY \] \hspace{1cm} (2)

where \( Y \) represents national income expressed in constant dollars, \( P \) the implicit price deflator and \( V \) the income velocity of circulation defined as the average