

General Equilibrium Approaches to the Study of Monetary Economies: Comments on Recent Developments

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1. Introduction

Several points raised in the papers and discussions of this conference have been active research topics in the general equilibrium literature of recent years. Questions treated include positivity of the price of fiat money (that is, a bounded determinate price level in a fiat money economy), the role of money in allocation over time, and the usefulness of money as a medium of exchange. I would like briefly to sketch the framework and results for some of this research.

2. Positivity of the Price of Money

A fiat money is essentially valueless in itself; hence, if not exogenously prevented, its equilibrium price may be zero (the price level in money terms may be indefinitely high). This is inevitable in a finite-horizon model where the lack of backing for the currency is expected actually to be experienced. In contrast, the infinite-horizon models of Wallace and Cass, Okuno, and Zilcha in their conference papers can admit positive price equilibria.

A few technical points are worth noting. There will typically be discontinuities in opportunity sets and resulting individual behavior in the neighborhood of the null price of money (Hahn 1965).[†] This arises because the economy is effectively demonetized when the price of money is zero so that monetary transactions—available at any positive price—are discontinuously unavailable at a null price. The result is that proofs of existence of equilibrium relying on continuity are not directly applicable. Further, a transaction demand for money is of little help in preventing the null price equilibrium. When the price of money is zero, money can serve no transaction function; it becomes useless in transactions, and hence the transaction demand is zero as well. Thus the null price equilibrium is sustained.

In order to prevent the existence of a null price of money equilibrium, an excess demand for money must be created whenever the price is too low. Two independent means have been developed in the literature to do this:

*I gratefully acknowledge the support of a John Simon Guggenheim Fellowship and the assistance of the Group for the Applications of Mathematics and Statistics to Economics, University of California, Berkeley.

[†]Author names and years refer to the works listed at the end of this book.

expectations and taxes. Money appears in temporary equilibrium models as an intertemporal asset (sometimes the sole such asset or one of the few). Demand for goods and money in the present depends in part on expectations, particularly price expectations, about the future. In order to ensure positivity of the price of money in the present, it requires only that agents always attach positive probability to positivity of its price in the future (Grandmont 1977). Money is accepted because it is expected to be accepted. A government that extracts taxes payable in money can similarly ensure positivity of its equilibrium price. Nominal taxes can be structured so that whenever the price of money is low the demand for money to pay taxes creates an excess demand for money. Thus taxes can be used to place a floor beneath the price, bounding it away from zero (Kaulla 1920, Lerner 1947, Starr 1974). Money is then accepted because the government, its issuer, accepts it.

3. Intertemporal Monetary Economies

Sequence economies, formal models quite different from the overlapping generations sort, have been used to portray the store-of-value function of money. The market is thought of as reopening at a sequence of dates, usually without the use of futures markets. The missing futures markets may be conceived of as performing, when present, two distinct functions: price formation and intertemporal reallocation of purchasing power. The former function is formally replaced simply by the assumption of perfect foresight on prices. Money and related financial institutions are developed to replace the latter.

In a sequence economy agents face a budget constraint in each period. The value of goods delivered to the market in that period must equal the value extracted. Since agents' desired time pattern of sales may not coincide with their desired stream of purchases, a difficulty arises. It could be relieved by the use of futures markets, but these are supposed to be prohibitively costly to operate or for some other reason unavailable. The result is an intertemporally inefficient allocation (Hahn 1971b, 1973b). The solution (Starrett 1973) is to introduce a financial asset that allows a costless transfer of purchasing power between periods. This asset, to be thought of as money, allows equilibria to be efficient and efficient allocations to be supported as equilibria. Though it lacks a generational structure and will typically be applied to models with finite horizon, this approach seems to give an adequate account of the intertemporal (that is, store-of-value) role of money.

4. Bilateral Trade: Money as a Medium of Exchange

Consider trade between pairs of agents in an economy at equilibrium prices. Jevons (1875) argues that the difficulty of trade in this situation is that the commodities which the suppliers of a good may wish to purchase will not typically be those which its demanders wish to supply. In the apparently unlikely event that goods are reciprocally desired (that is, suppliers of A are demanders of B , and vice versa), a "double coincidence of wants" is said to occur, and trade can proceed directly. When this is lacking, Jevons suggests the use of money as an intermediate good in exchange.

A formalization of this problem focuses on the informational requirements of trade. It can be shown that monetary trade provides an informationally decentralized means of moving in restricted time from an arbitrary initial allocation to the equilibrium allocation. Other trading procedures require either greater information and coordination among traders or significantly

more time (Ostroy 1973, Ostroy and Starr 1974, Starr 1972, 1976). Thus the use of money as a medium of exchange in bilateral trade is a device for economizing on time, information, and coordination.

By *monetary trade* I mean trade in which a single good plays a distinctive asymmetric role as one side of virtually all transactions. This differs from Wallace's treatment in his conference paper; he takes the distinguishing quality of a monetary economy to be the presence of an intrinsically useless financial asset with positive equilibrium price. Nevertheless, there is a useful relationship between the concepts. In order for monetary trade successfully to take place in the models of Ostroy (1973) and Ostroy and Starr (1974), each individual's holdings of the monetary commodity should be sufficiently large to finance all of that person's desired trades. It appears unlikely that any single real commodity should have this property, but a costlessly produced financial asset with an artificially maintained positive price could certainly have it. Hence, in seeking to put into effect monetary trading procedures it is peculiarly useful to have ample fiat money on hand. Alternative approaches to bilateral trading processes include those of Feldman (1973), Jones (1976), Madden (1975), and Townsend (1978a).

