■ quantity theory of money

The classical equation of exchange as it is applied today equates the money supply multiplied by the velocity of circulation (the number of times the average currency unit changes hands in a given year) with the economy's gross domestic product (the quantity of output produced multiplied by the price level). Although the American economist Irving Fisher originally included transactions of previously produced goods and assets as part of the output measure, only newly produced goods are included in present-day calculations of gross domestic product. If the velocity of circulation and output are both constant, there is a one-to-one relationship between a change in the money supply and a change in prices. This yields a "quantity theory of money" under which a doubling of the money supply must be accompanied by a doubling of the price level (or, when the rate of money supply growth doubles, the rate of inflation also doubles). The Nobel Prize–winning economist Milton Friedman (1956) restated this quantity theory of money by modifying the assumption of constant velocity, allowing velocity to adjust in response to changes in expected inflation and the returns available on other assets such as bonds and equities.

The tendency for velocity to rise as expected inflation rises reflects people's incentive to unload a depreciating currency before its purchasing power erodes. This reinforces the effects of faster money supply growth on inflation because, at the same time that more money is being printed, people want to hold even less of it than they did before the inflationary process began. There is, in fact, an exact inverse relationship between the proportion of income held as money and the velocity of circulation with, say, a halving of average money holdings requiring that the currency circulate at double the old rate in order to buy the same goods as before. In the extreme case of "hyperinflation" (broadly defined as inflation exceeding 50 percent per month), money holdings plunge and the inflation rate significantly outstrips the rate of money supply growth. Conversely, under deflation, velocity is likely to fall: people hold onto their money longer as they recognize that the same funds will buy more goods and services over time if prices continue to decline. Thus money demand rises as money supply falls, again exaggerating the effects of the money supply change on the aggregate price level.

The demand for money is also influenced by the economy's output level. If output rises, money demand should rise too, as increased production generates more income and spending power. This would put downward pressure on prices. Just as sustained inflation is possible only when the rate of money growth rises above the rate of growth of output (and money demand), so too does sustained deflation occur under conditions of insufficient money growth. According to the monetarist school, which emphasizes the importance of the money supply as a long-run determinant of prices and gross domestic product, stable prices could be achieved by simply tying the rate of money supply growth to the

long-run rate of growth of output. This would keep money demand and money supply in balance so long as velocity is stable.

Critics, such as those of the Keynesian school, which views the effects of monetary policy as unreliable and uncertain in practice, argue that such a policy rule would have undesirable consequences because velocity historically has been subject to fluctuations that require offsetting movements in the money supply. On the other hand, Friedman (1960) argued that velocity has been unstable only because policy has been unstable and that adoption of a constant growth rate rule for the money supply would keep inflation expectations, along with velocity, steady.

Friedman's restatement of the quantity theory of money tempers the classical prediction that money supply increases exert one-to-one effects on prices even in the short run. Under the restatement, velocity is allowed to adjust to a new level if the inflation environment changes. However, once real money holdings have adjusted to their new lower equilibrium level following a rise in inflation, the rise in velocity should end with a one-to-one relationship between money growth and inflation. Such a pattern is typically observed over extended periods. Moreover Friedman's (1992) famous proposition that inflation is always and everywhere a monetary phenomenon receives support from the fact that it is hard, if not impossible, to find any episodes of significant inflation that have not been accompanied by accelerating rates of monetary expansion. The importance of this link is further illustrated by the fact that, while a one-third money supply reduction in the eastern Confederate States in April 1864 dramatically reduced inflation there, inflation continued to run rampant in the western portion where the monetary cutback was postponed.

Criticisms of Quantity Theory Critics of the quantity theory approach have questioned not only the stability of velocity and money demand but also the determination of the money supply itself. That is, a link between money and prices does not necessarily prove that money supply movements are driving price movements. The economists Sargent and Wallace (1973) argue that such "reverse" causation could arise when a government is dependent on the revenue earned by inflating away the value of its outstanding money issues. Here, higher inflation produces faster rates of monetary expansion, and not the other way around. As higher expected inflation leads individuals to reduce their real money balances, this reduces individuals' exposure to the inflation tax and reduces the government's revenue from inflation. To keep inflation tax revenue at its old level, the government must accelerate the rate of monetary expansion so as to increase the inflation tax rate and offset the decline in the inflation tax base as real money balances fall. This novel, albeit controversial, perspective could not apply in the more usual situation where governments are able to finance their expenditures through conventional taxes and bond issues.

The quantity theory's predictions have also been questioned by adherents of "backing theory." Under this view, it is the quality rather than the quantity of money that matters. Whereas unbacked paper money may well be as inflationary as the standard quantity theory assumes, this need not be true of money that is credibly backed by future taxes or other provisions for their future retirement from circulation. Pioneering analysis of the American colonies prior to the Revolutionary War by Smith (1985) suggests that even large money issues might be willingly held rather than spent—implying a fall in the velocity of circulation and an absence of the inflationary pressures predicted by the quantity theory—provided that they were properly backed. The case of Maryland stands out because that colony undertook to accumulate funds set aside for future purchases of pounds sterling that would retire the colony's paper money at a predetermined rate of exchange. Data limitations make it hard to conclusively determine the practical extent to which backing reduced the inflationary effects of the Maryland currency issues and those of other colonies, but recent work suggests that Pennsylvania enjoyed the long-run constancy of velocity, and proportional relationship between money and prices, implied by the quantity theory (Grubb 2005).

Excess Monetary Creation Whatever predictive power the quantity theory approach may have over the long term, even its strongest adherents would accept that short-run dynamics and adjustments militate against a one-for-one relation between money and prices in the short run. Excess money creation will eventually lead to inflation, but extra liquidity may well initially push down interest rates and encourage greater output and employment. Until these beneficial effects are reversed, the extra money issue may "buy" at least the illusion of greater prosperity. This, in turn, may produce a temptation to inflate. While the continued ratcheting up of the money supply will eventually lead to hyperinflation, such an extreme outcome usually occurs only when a government finds itself unable to obtain funding from any source other than the printing press. Such episodes, while unfortunate, have nevertheless provided economists with ample opportunity to observe not only the inflationary consequences of such rampant excess money growth but also the surge in the velocity of circulation as individuals become progressively less willing to hold the depreciating currency.

See also debt deflation; Federal Reserve Board; money supply; purchasing power parity; seigniorage; time inconsistency problem

FURTHER READING

Burdekin, Richard C. K., and Marc D. Weidenmier. 2001. "Inflation Is Always and Everywhere a Monetary Phenomenon: Richmond vs. Houston in 1864." *American Economic Review* 91 (5): 1621–30. Illustrates how divergent inflation performance in the eastern and western Confederacy was linked to a reform measure that reduced the money supply in the eastern Confederacy while initially leaving the money supply unchanged in the west.

Fisher, Irving. 1922. *The Purchasing Power of Money: Its Determination and Relation to Credit, Interest, and Crises.* New York: Macmillan. Fisher's original exposition of the equation of exchange and quantity theory of money.

Friedman, Milton, ed. 1956. *Studies in the Quantity Theory of Money.* Chicago: University of Chicago Press. Includes Friedman's own restatement of the quantity theory and Phillip Cagan's pioneering analysis of money demand under hyperinflation.

———. 1960. *A Program for Monetary Stability*. New York: Fordham University Press. Lays out Friedman's case for a constant growth rate rule for monetary policy.

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Sargent, Thomas J., and Neil Wallace. 1973. "Rational Expectations and the Dynamics of Hyperinflation." *International Economic Review* 14 (2): 328–50. Points to the potential dependence of money supply movements on price movements when a government must support its operations through the inflation tax.

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