Velocity of Money and Equation of Exchange

\[ M = \text{the money supply} \]
\[ P = \text{price level} \]
\[ Y = \text{aggregate output (income)} \]
\[ P \times Y = \text{aggregate nominal income (nominal GDP)} \]
\[ V = \text{velocity of money (average number of times per year that a dollar is spent)} \]
\[ V = \frac{P \times Y}{M} \]

Equation of Exchange
\[ M \times V = P \times Y \]
Quantity Theory

• Velocity fairly constant in short run
• Aggregate output at full-employment level
• Changes in money supply affect only the price level
• Movement in the price level results solely from change in the quantity of money
Quantity Theory of Money Demand

Divide both sides by $V$

$$M = \frac{1}{V} \times PY$$

When the money market is in equilibrium

$$M = M^d$$

Let $k = \frac{1}{V}$

$$M^d = k \times PY$$

Because $k$ is constant, the level of transactions generated by a fixed level of $PY$ determines the quantity of $M^d$

The demand for money is not affected by interest rates
FIGURE 1  Change in the Velocity of M1 and M2 from Year to Year, 1915–2005

Sources: Economic Report of the President; Banking and Monetary Statistics; www.federalreserve.gov/releases/h6/.
Keynes’s Liquidity Preference Theory

- Transactions Motive
- Precautionary Motive
- Speculative Motive
- Distinguishes between real and nominal quantities of money
The Three Motives

\[ \frac{M^d}{P} = f(i, Y) \] where the demand for real money balances is negatively related to the interest rate \( i \), and positively related to real income \( Y \).

Rewriting

\[ \frac{P}{M^d} = \frac{1}{f(i, Y)} \]

Multiply both sides by \( Y \) and replacing \( M^d \) with \( M \)

\[ V = \frac{PY}{M} = \frac{Y}{f(i, Y)} \]
The procyclical movement of interest rates should induce procyclical movements in velocity. Velocity will change as expectations about future normal levels of interest rates change.
• There is an opportunity cost and benefit to holding money

• The transaction component of the demand for money is negatively related to the level of interest rates
Precautionary Demand

- Similar to transactions demand
- As interest rates rise, the opportunity cost of holding precautionary balances rises
- The precautionary demand for money is negatively related to interest rates
Speculative Demand

- Implication of no diversification
- Only partial explanations developed further
  - Risk averse people will diversify
  - Did not explain why money is held as a store of wealth
Friedman’s
Modern Quantity Theory of Money

\[
\frac{M^d}{P} = f(Y_p, r_b - r_m, r_e - r_m, \pi^e - r_m)
\]

\[
\frac{M^d}{P} = \text{demand for real money balances}
\]

\[Y_p = \text{measure of wealth (permanent income)}\]

\[r_m = \text{expected return on money}\]

\[r_b = \text{expected return on bonds}\]

\[r_e = \text{expected return on equity}\]

\[\pi^e = \text{expected inflation rate}\]
Variables in the Money Demand Function

- Permanent income (average long-run income) is stable, the demand for money will not fluctuate much with business cycle movements.

- Wealth can be held in bonds, equity and goods; incentives for holding these are represented by the expected return on each of these assets relative to the expected return on money.

- The expected return on money is influenced by:
  - The services provided by banks on deposits.
  - The interest payment on money balances.
Differences between Keynes’s and Friedman’s Model

- Friedman
  - Includes alternative assets to money
  - Viewed money and goods as substitutes
  - The expected return on money is not constant; however, \( r_b - r_m \) does stay constant as interest rates rise
  - Interest rates have little effect on the demand for money
Differences between Keynes’s and Friedman’s Model (cont’d)

• Friedman (cont’d)
  ⇢ The demand for money is stable ⇒ velocity is predictable
  ⇢ Money is the primary determinant of aggregate spending
Empirical Evidence

• Interest rates and money demand
  - Consistent evidence of the interest sensitivity of the demand for money
  - Little evidence of liquidity trap

• Stability of money demand
  - Prior to 1970, evidence strongly supported stability of the money demand function
  - Since 1973, instability of the money demand function has caused velocity to be harder to predict

• Implications for how monetary policy should be conducted