

Quantity Theory of Money (2/8/2011)

Econ 310-008

Equations

- $M^S V = Py$ equation of exchange
- $V \equiv Py/M^S$ definition of velocity
- $M^S = kPy$ Cambridge equation
- $M^D = Py/V$ money demand for graphical model
- $M^S = C$ money supply for graphical model
- $\bar{V}M^S = \bar{y}P$ quantity theory of money: bar means constant
- $M^D/P = f(i, y)$ liquidity preference theory: $f_i < 0$, $f_y > 0$
- $M^D/P = f(y_p, r_b - r_m, r_e - r_m, \pi^e - r_m)$ Friedman's quantity theory of money: $f_{y_p} > 0$, others < 0
- $M^D/P = f(y_p)$ Friedman's quantity theory of money approximated
- $V = y/f(i, y)$ velocity under liquidity preference theory
- $V = y/f(y_p)$ velocity under Friedman's quantity theory of money

Definitions

- **purchasing power of money** – the basket of goods and services that a single dollar can buy
- **price level** – weighted average of prices in the economy
- **inflation** – a rise in the price level (fall in PPM)
- **deflation** – a fall in the price level (rise in PPM)
- **relative prices** – implicit barter ratios between goods
- **real variables** – “constant” dollars
- **nominal variables** – “current” dollars
- **aggregate output** – total production of final goods and services in the economy
- **aggregate income** – Total income of factors of production (land, labor, capital) in the economy
- **real money balance** – quantity of money in real terms
- **velocity of money** – average number of times a unit of money turns over in a given period
- **transactions motive** – money is a medium of exchange that can be used to carry out transactions
- **precautionary motive** – people hold money as a cushion against an unexpected purchase need
- **speculative motive** – people hold money as an alternative store of wealth to bonds
- **transactions demand** – money demand for transactions
- **portfolio demand** – money demand as a store of value (captures precautionary and speculative)
- **permanent income** – present discounted value of all future earnings

Variable definitions

- PPM \equiv purchasing power of money
- PPM $\equiv 1/P$
- $P \equiv$ price level
- $V \equiv$ velocity
- $y \equiv$ aggregate output = aggregate income
- $Y \equiv$ nominal output
- $y \equiv$ real output
- $M^D \equiv$ money demand
- $M^S \equiv$ money supply
- $M^S/P \equiv$ real money stock
- $y_p \equiv$ permanent income
- $M^D/P \equiv$ demand for real money balances
- $\pi^e \equiv$ expected inflation rate

Notable Figures

- **Irving Fisher** – equation of exchange, quantity theory of money (*The Purchasing Power of Money*)
- **John Maynard Keynes** – liquidity preference theory (*General Theory of Employment, Interest, & Money*)
- **Milton Friedman** – modern quantity theory of money (*A Monetary History of the U.S., 1867-1960*)
- **William Baumol & James Tobin** – transactions & precautionary are also sensitive to the interest rate

Principles

- Price level is stated in terms of price indexes.
- Price levels move independently of relative prices.
- Capital letter variables are nominal. Lowercase letter variables are real. (nominal/P = real, e.g.: $Y/P = y$)
- The money supply can be in terms of any of the monetary aggregates: M1, M2, M3, MB, MZM.
- Equation of exchange is an identity, not a theory ($V \equiv Py/M^S$)
- Right side of equation of exchange is nominal output ($Y = Py$)
- Quantity theory of money: $\bar{V}M^S = \bar{y}P$, P is flexible & y is sticky: $\Delta M^S \rightarrow \Delta P$ (doubling M^S will double P)
- Keynes: interest rates should be in a narrow band: when interest high, people expect it to fall.
- Keynes: If interest rates rise, then the price of a bond falls. So if $i^e \uparrow$, expect a capital loss from bonds.
- Baumol & Tobin showed transactions and precautionary demand are also sensitive to the interest rate because people will vary how frequently they visit the bank.
- The permanent income hypothesis is that people spend money based on perceived average life income.
- Under Friedman's theory, changes in interest rates have little effect on the demand for money.
- Friedman's velocity isn't constant, but it is stable: relationship between y_p and y is predictable.
- If something doesn't affect M^S or M^D , then it can't effect the price level.

Government price indexes

- consumer price index (CPI)
- producer price index (PPI)
- GDP deflator

Keynes' reasons individuals hold money

- transactions motive (+ related to y)
- precautionary motive (+ related to y)
- speculative motive (– related to i)

Transactions demand vectors

- population: $N \uparrow \rightarrow y \uparrow \rightarrow M^D \uparrow$
- output/person: $y/N \uparrow \rightarrow y \uparrow \rightarrow M^D \uparrow$
- vertical integration: $\text{merge} \uparrow \rightarrow M^D \downarrow$
- clearing system efficiency: $\text{eff.} \uparrow \rightarrow M^D \downarrow$

Transaction demand causes

- population: e.g., black death, baby boom
- output/person: e.g., Internet revolution
- vertical integration: e.g., oil company buys gas stations
- clearing system efficiency: e.g., credit cards

Quantity theory assumptions

- velocity is constant
- wages and prices are completely flexible

Empirical evidence on velocity

- Declines during recessions.
- Fluctuates in the short run(not constant).
- Sensitive to interest rates, but not ultra-sensitive when interest rates are non-zero (i.e., there is no liquidity trap).

Portfolio demand vectors

- wealth: $W \uparrow \rightarrow M^D \uparrow$
- uncertainty: $\text{uncertainty} \uparrow \rightarrow M^D \uparrow$
- interest differential: $i \uparrow \rightarrow M^D \downarrow$
- anticipations about inflation: $\pi_e \downarrow \rightarrow M^D \uparrow$

Portfolio demand causes

- wealth: e.g., win the lottery
- uncertainty: e.g., travel to a foreign country
- interest differential: i.e., interest rate soars
- anticipations about inflation: e.g., print money non-stop