Monetary Theory and Policy

Chapter 19： The Demand for Money

Velocity of Money and The Equation of Exchange

$$V = \frac{P \times Y}{M}$$

M= the money supply

P = price level

Y = aggregate output (income)

$P \times Y$ = aggregate nominal income (nominal GDP)

V = velocity of money

(average number of times per year that a dollar is spent)

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

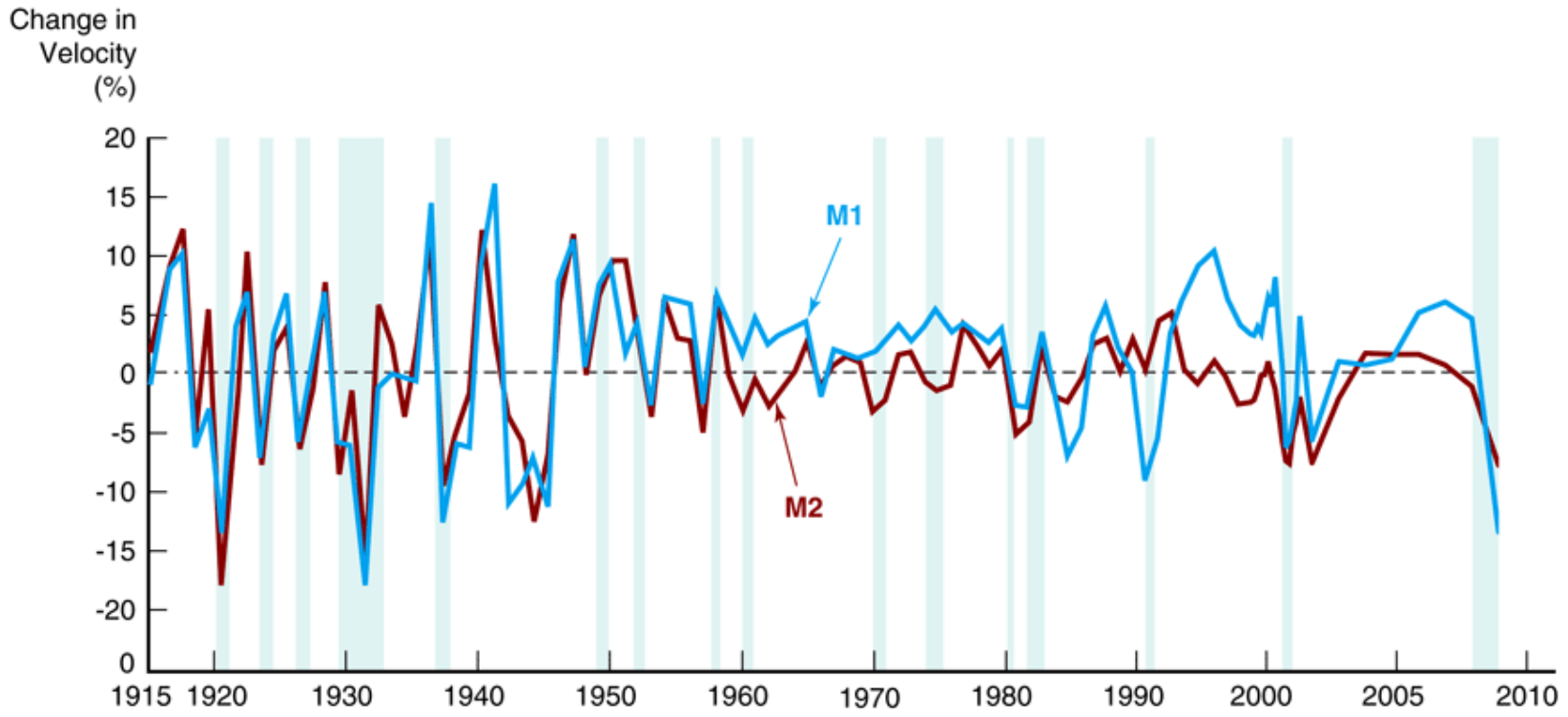
$$M^{d} = k \times PY$$

- 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

Quantity Theory of Money Demand

- Demand for money is determined by
  - The level of transactions generated by the level of nominal income *PY*
  - The institutions in the economy that affect the way people conduct transactions and thus determine velocity and hence *k*

Change in the Velocity of M1 and M2 from Year to Year, 1915–2008



Sources: Economic Report of the President; Banking and Monetary Statistics; www.federalreserve.gov/releases/h6/hist/h6hist1.txt.

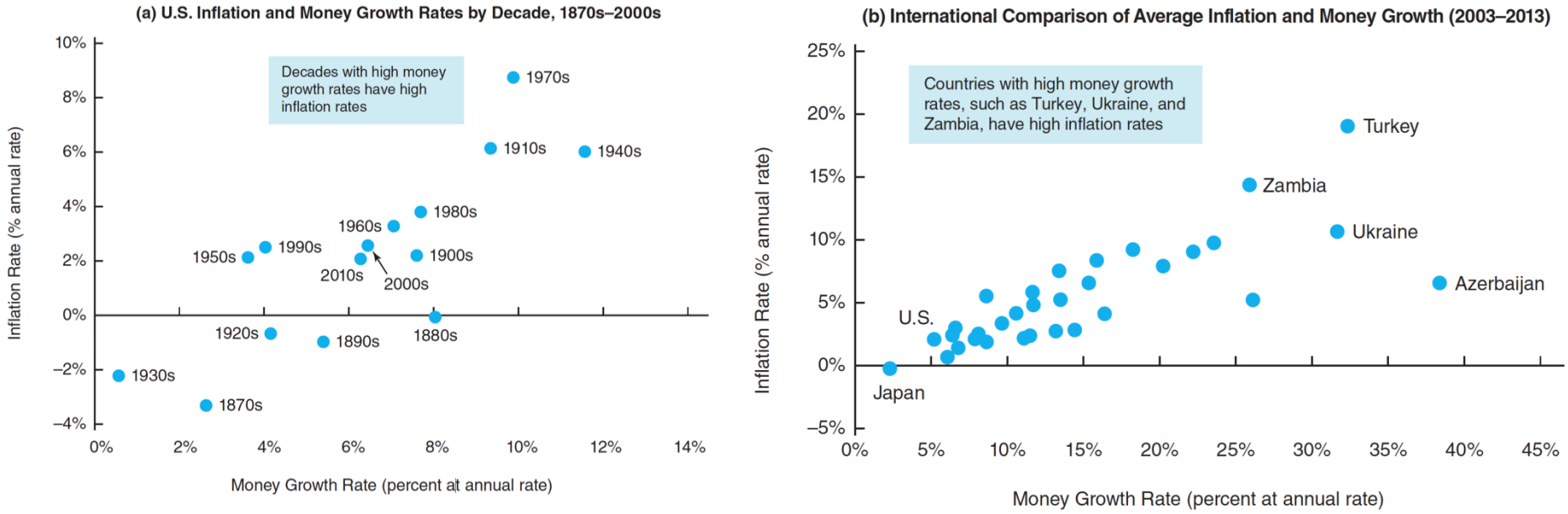
Quantity Theory and Inflation

- Percentage Change in ($x \times y$) = (Percentage Change in x) + (Percentage change in y)
- Using this mathematical fact, we can rewrite the equation of exchange as follows:

$$\%\Delta M + \%\Delta V = \%\Delta P + \%\Delta Y$$

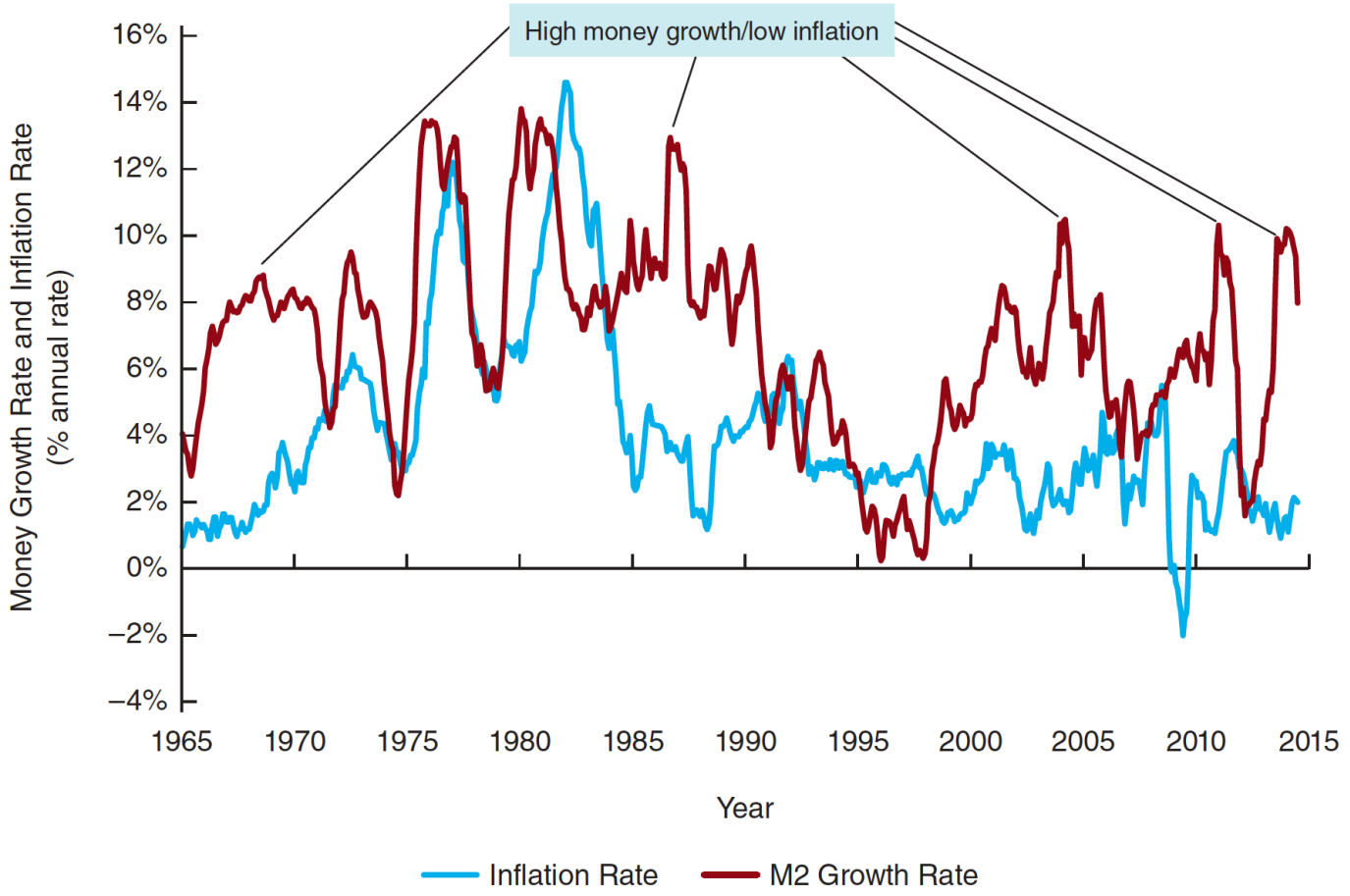
- Since we assume velocity is constant and output stays at the natural level, the net growth rate is zero, so the quantity theory of money is also a theory of inflation

Figure 1 Relationship Between Inflation and Money Growth



Sources: For panel (a), Milton Friedman and Anna Schwartz, *Monetary Trends in the United States and the United Kingdom: Their Relation to Income, Prices, and Interest Rates, 1867–1975;* Federal Reserve Bank of St. Louis, FRED database: http://research.stlouisfed.org/fred2/. For panel (b), International Financial Statistics. International Monetary Fund, http://www.imfstatistics.org/imf/.

Figure 2 Annual U.S. Inflation and Money Growth Rates, 1965–2015



Sources: Federal Reserve Bank of St. Louis, FRED database: http://research.stlouisfed.org/fred2/.

Keynes's Liquidity Preference Theory

- Why do individuals hold money?
  - Transactions motive
  - Precautionary motive
  - Speculative motive
- Distinguishes between real and nominal quantities of money

The Three Motives

$$\frac{M^d}{P} = f(i, Y)$$

- When 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

$$V = \frac{PY}{M} = \frac{Y}{f(i, Y)}$$

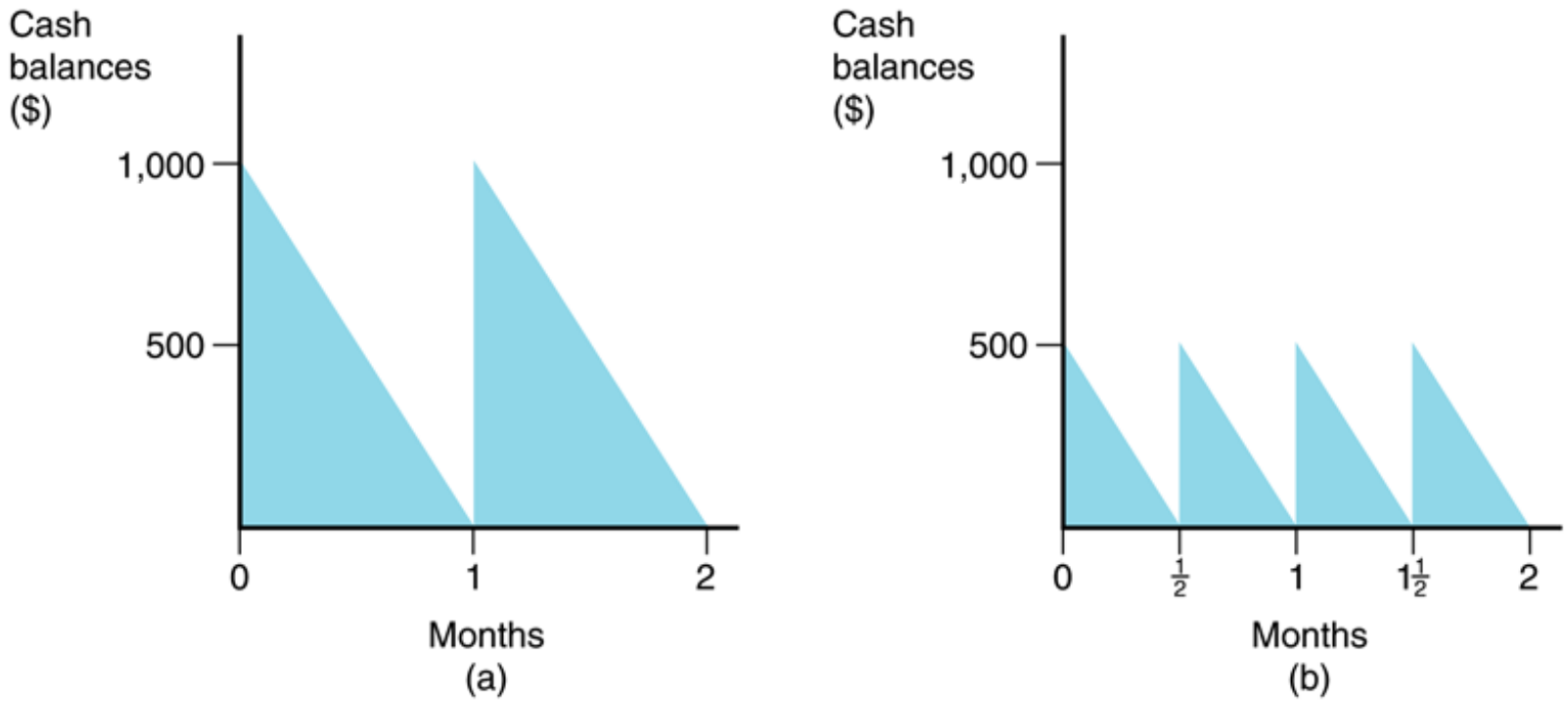
The Three Motives (cont'd)

- Velocity is not constant:
  - 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

Further Developments in the Keynesian Approach

- Transactions demand
  - Baumol - Tobin model
  - 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

FIGURE 2 Cash Balances in the Baumol-Tobin Model



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 (Tobin)
  - Risk averse people will diversify its portfolio and hold some money as a store of wealth
  - Do not provide a definite answer as to why people hold money as a store of wealth

Friedman's Modern Quantity Theory of Money

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

$\frac{M^d}{P}$ = demand for real money balances

Y_p = measure of wealth (permanent income)

r_b = expected return on bonds

r_m = expected return on money

r_e = expected return on equity (common stocks)

π^e = 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

$$\frac{M^d}{P} = f\left(Y_p\right)$$

  - 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 $\Rightarrow$ velocity is predictable

$$V = \frac{PY}{M} = \frac{Y}{f\left(Y_p\right)}$$

  - If 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
  - About 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