Quantity Theory, Inflation, and the Demand for Money

This lecture examines the link between the quantity theory of money and the demand for money with special emphasis placed on how much the quantity of money demanded is affected by changes in the interest rate.

The Classical Quantity Theory of Money

A. Velocity of money and the equation of exchange

  1. The <u>velocity of money</u> (V) is the average number of times per year that a dollar is spent buying goods and services in the economy

$$V = \frac{P \times Y}{M^S}, \tag{1}$$

   where $P \times Y$ is nominal GDP and M^S is the nominal money supply.

2. Example: Suppose nominal GDP is $15 trillion and the nominal money supply is $3 trillion, then velocity is

$$V = \frac{\$\,15\ \text{trillion}}{\$\,3\ \text{trillion}} = 5. \qquad (2)$$

Thus, money turns over an average of five times a year.

3. The equation of exchange relates nominal GDP to the nominal money supply and the velocity of money

$$M^S \times V = P \times Y. \qquad (3)$$

4. The relationship in (3) is nothing more than an identity between money and nominal GDP because it does not tell us whether money or money velocity changes when nominal GDP changes.

5. Determinants of money velocity

   a. Institutional and technological features of the economy affect money velocity slowly over time.

   b. Money velocity is reasonably constant in the short run.

6. Money demand (M^D)

   a. Lets divide both sides of (3) by V

   $$M^S = (1/V) \times P \times Y. \tag{4}$$

   b. In the money market, $M^S = M^D$ in equilibrium. If we set $k = (1/V)$, then (4) can be rewritten as a money demand equation

   $$M^D = k \times P \times Y. \tag{5}$$

   c. Thus, (5) states that money demand depends on the level of nominal income since money velocity (1/k) is constant in the short run.

B. A constant money velocity ($\overline{V}$) transforms the equation of exchange into the classical quantity theory of money

$$M^S \times \overline{V} = P \times Y. \tag{6}$$

1. Example 1: Suppose velocity equals 5. If the money supply is $3 trillion, then nominal GDP (P×Y) will be $15 trillion.

2. Example 2: If the money supply doubles to $6 trillion, then nominal GDP (P×Y) will also double to $30 trillion.

C. The Classical Quantity Theory and Inflation

1. Let %Δ represent the percentage change. Recall, from high school math that

$$\%\Delta(x \times y) = \%\Delta x + \%\Delta y. \tag{7}$$

2. Let's apply the math rule in (7) to the classical equation of exchange (6)

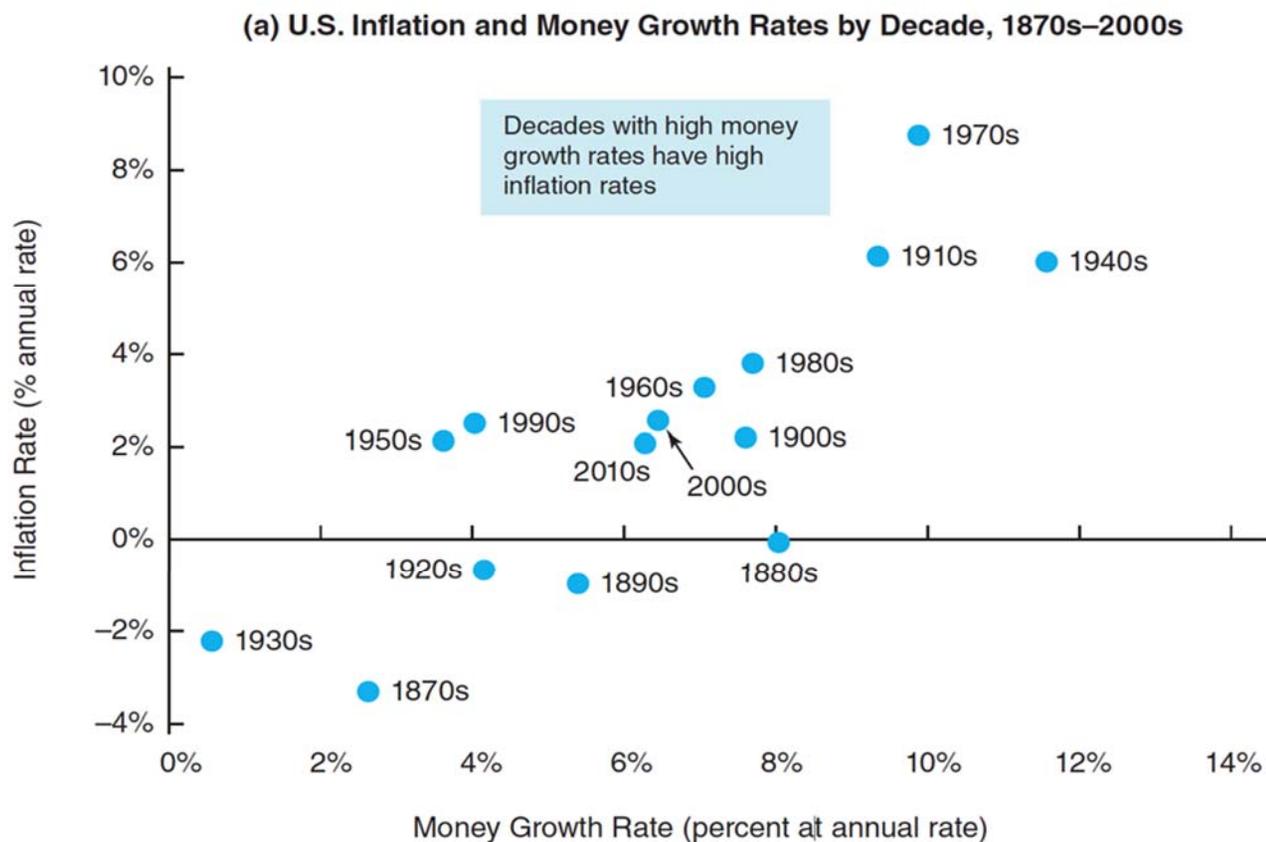$$\%\Delta M^S + \%\Delta \overline{V} = \%\Delta P + \%\Delta Y. \tag{8}$$

3. Since money velocity is constant ($\%\Delta \overline{V} = 0$), and inflation ($\pi$) is the percentage change in the price level ($\%\Delta P$), (8) shows us that inflation equals the growth rate of the money supply ($\%\Delta M^S$) minus the growth rate of output ($\%\Delta Y$)

$$\pi = \%\Delta M^S - \%\Delta Y. \tag{9}$$

D. Testing the Classical Quantity Theory of Money

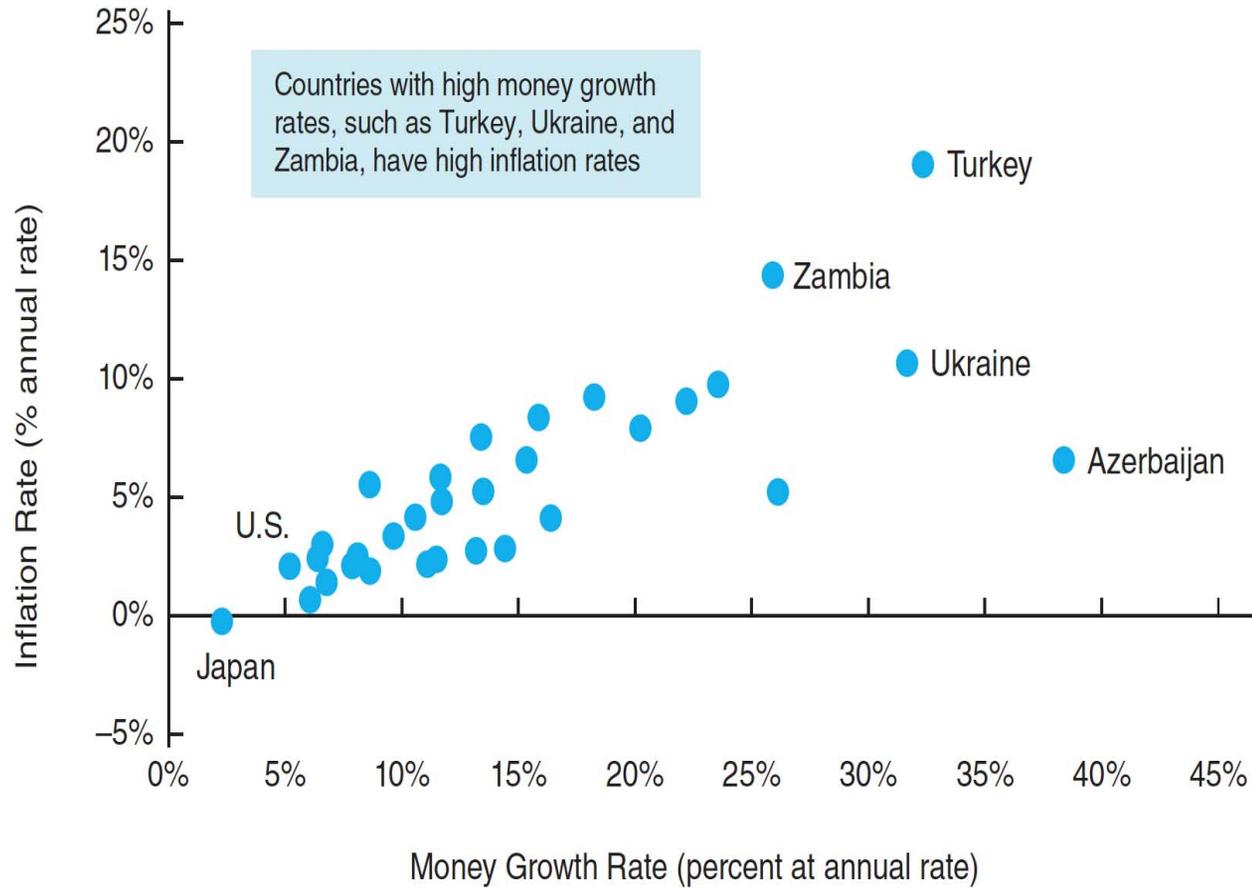1. In the long run, empirical evidence supports the classical quantity theory of money both in the U.S. and across countries.

   a. In the U.S.

(a) U.S. Inflation and Money Growth Rates by Decade, 1870s–2000s

Decades with high money growth rates have high inflation rates

• 1970s
• 1910s   • 1940s
• 1980s
1960s •
1950s •   • 1990s   • 2000s   • 1900s
2010s •
1920s •   • 1890s   1880s •
• 1930s
• 1870s

Inflation Rate (% annual rate): 10%, 8%, 6%, 4%, 2%, 0%, −2%, −4%

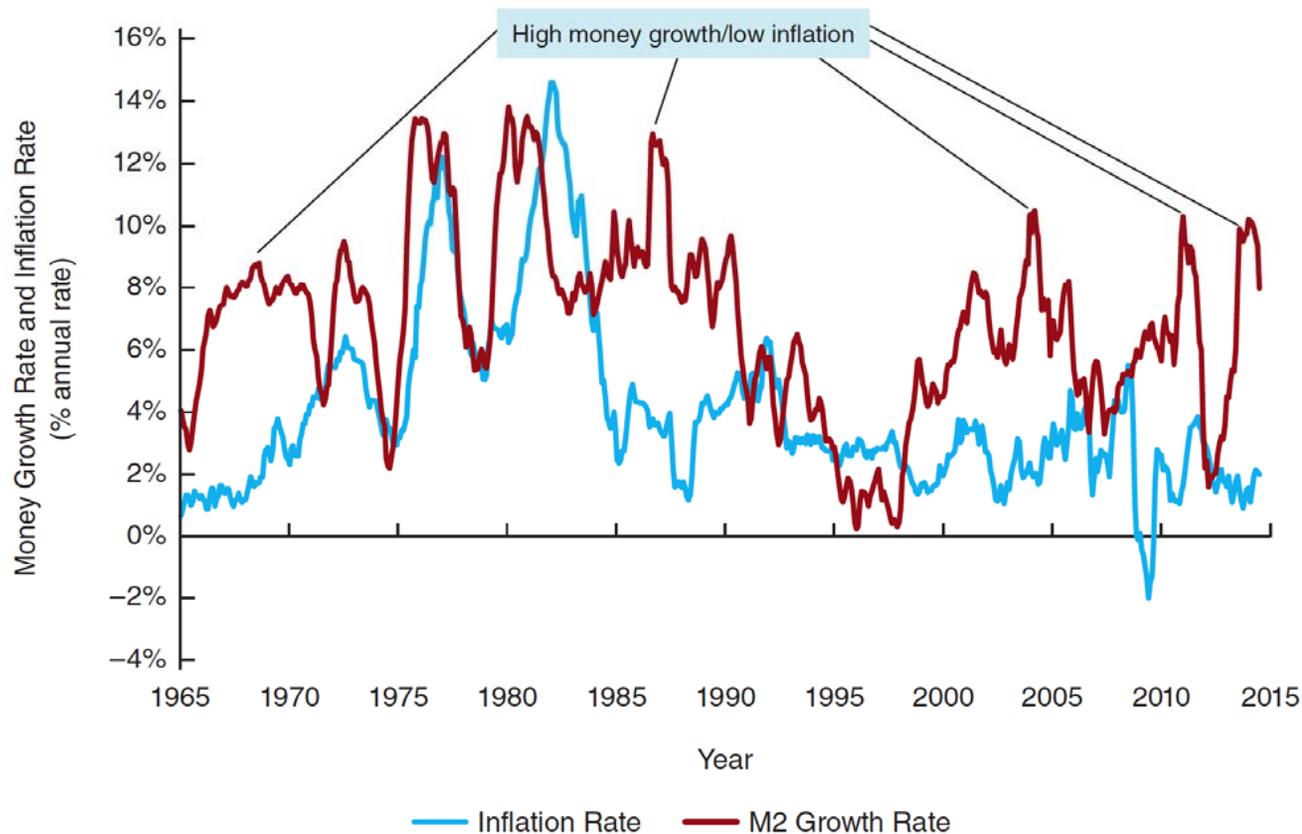Money Growth Rate (percent at annual rate): 0%, 2%, 4%, 6%, 8%, 10%, 12%, 14%

b. Across countries

(b) International Comparison of Average Inflation and Money Growth (2003–2013)

2. In the short run, empirical evidence does not support the classical quantity theory of money.

   a. In the U.S.

3. The empirical evidence indicates the classical quantity theory of money is a good theory for inflation in the long run but not in the short run.

Budget Deficits and Inflation

A. The government budget deficit (BD) is the difference between government spending (G) and taxes (T)

$$BD = G - T. \tag{10}$$

B. The government can finance its deficit by increasing the government bonds held by the public (ΔB) and/or the monetary base (ΔMB)

$$BD = \Delta B + \Delta MB. \tag{11}$$

1. If the government deficit is financed by increased bond holdings by the public, then the monetary base and money supply are unaffected.

2. If the government deficit is not financed by increased bond holdings by the public, then both the monetary base and money supply must increase.

3. Countries that finance their budget deficits by increasing the monetary base and the money supply are said to be <u>monetizing the debt</u>.

4. The persistent financing of deficits by money creation will lead to sustained inflation.

C. <u>Hyperinflations</u> are periods of extremely high inflation rates (countries with annual inflation rates of 50% or more).

1. Many countries both poor and developed have had experiences with hyperinflation (ex., Germany in the 1920s and Zimbabwe in the 2000s).

Keynesian Theories of Money Demand

A. In 1936, John Maynard Keynes abandoned the classical quantity theory assumption that money velocity was constant and developed a money demand theory where interest rates were important.

B. According to Keynes, there are three motives behind the demand for money.

    1. Transactions motive

        a. Individuals hold money because it is a medium of exchange.

        b. The transactions component is positively related to income.

        c. New payment technologies enable individuals to demand less money.

2. Precautionary motive

   a. Individuals hold money as a cushion against unexpected wants.

   b. Precautionary balances are also positively related to income.

3. Speculative motive

   a. Individuals hold money as a store of wealth.

   b. The opportunity cost of holding money (which does not earn interest) is to hold bonds (which earns interest). Thus, as the interest rate rises, the opportunity cost of holding money rises, so people demand less money.

C. Putting the Three Motives Together

1. The real demand for money (M^D/P) is positively related to income (Y) and negatively related to the interest rate (R)

$$M^D/P = L(Y,R), \qquad (12)$$

where L() is a function that transfers output and interest rates into real money demand.

2. An important point in the Keynesian theory is that money velocity is not constant and changes with the interest rate.

3. Recall in the quantity equation (3) that

$$M^S \times V = P \times Y. \qquad (13)$$

4. Since $M^D = M^S$ in equilibrium, (12) can be substituted into (13) to get

$$M^S/P = L(Y,R) = Y/V. \qquad (14)$$

5. Rearranging (14), we get

$$V = Y/L(Y,R). \tag{15}$$

6. Therefore, an increase in the interest rate lowers money demand (L() declines), which causes money velocity to rise.

7. The Keynesian result that money velocity moves positively with the interest rate runs contrary to the classical quantity theory, which says money velocity is constant.

Portfolio Theory of Money Demand

A. People decide how much of an asset like money they want to hold as part of their overall portfolio of assets.

B. Factors that Impact the Demand for Money

1. Higher <u>income</u> leads to more transactions, which <u>raises</u> the demand for money.

2. Higher <u>interest rates</u> increase the opportunity cost of holding money, which <u>reduces</u> the demand for money.

3. Improved <u>payment technology</u> reduces the need for money, which <u>lowers</u> the demand for money.

4. An increase in the <u>riskiness of other assets</u> makes money more attractive, which <u>raises</u> the demand for money.

5. A higher <u>inflation risk</u> makes money more risky, which <u>reduces</u> the demand for money.

6. As the <u>liquidity of other assets</u> rises, money is a less attractive instrument to hold wealth, which <u>lowers</u> the demand for money.

Empirical Evidence for the Demand for Money

A. Interest Rates and Money Demand

   1. When the interest rate is above zero, the demand for money is sensitive to the interest rate as the Keynesian and portfolio theories of money demand suggest.

   2. When the interest rate falls to zero, the demand for money is completely flat because a change in the money supply has no effect on the interest rate.

B. Stability of Money Demand

   1. Prior to the early 1970s, money demand was stable.

   2. After 1973, a rapid pace of financial innovation generated instability in the money demand function.

   3. This recent instability in money demand has led central banks to focus on interest rates when setting policy.