Money Growth and Inflation

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Outline: Unit III, Section MP3

I. Classical Theory of Inflation
II. Quantity Equation and the Velocity of Money
III. Fisher Effect
IV. Costs of Inflation

I. Classical Theory of Inflation

- LR Determinants of Prices (P) and Inflation (π)
- Recall: $\pi \quad = \%\Delta P$

- Overview: If you double the M^S in the economy, what happens to the price level?

Price Level (P) and the Value of Money$\left(\frac{1}{P}\right)$

Different perspectives on the price level:

- View 1: P = Price of a basket of G&S (CPI)
- View 2: $\frac{1}{P}$ = Value of Money
  - $\frac{1}{P} = \#\ of\ Units\ of\ G\&S\ \$1\ buys$
    - If P = 1 =>
    - If P = 2 =>

M^S, M^D, & Monetary Equilibrium

- Assume that the Fed controls M^S

  => M^S exogenously determined

- M^D(**P**, i, Y,…)
  - If P increases => People need more M1 to buy the same amount of G&S => M^D increases
  - LR: P adjusts until M^S=M^D
  - SR: i adjusts until M^S=M^D => future classes

LR Money Market: Effects of a Monetary Injection

Summary of Effects

"Too much money chasing too few goods"

- Point A to point B
  - Excess Money => [SR: C, I, increases]=> LR: Y is determined by real variables => LR: P increases
  - SR: Many effects studied in future lectures
- Quantity Theory of Money [Monetarists]
  - The money supply determines prices
  - "Inflation is always and everywhere a monetary phenomenon…" Milton Friedman (1970)

Classical Dichotomy and Money Neutrality

- Real variables = Variables measured in physical units
- Monetary Neutrality = Changes in the money supply do not affect real variables

- Nominal variables = Variables measured in monetary units

- Classify the following variables as nominal or real:
  - L, μ, hourly $ wage, (Y/L), K, P_{car}
- Classical dichotomy = Theoretical separation of nominal and real variables

II. Quantity Equation and the Velocity of Money

- V = Velocity of Money = Average rate at which money changes hands (in a given time period).

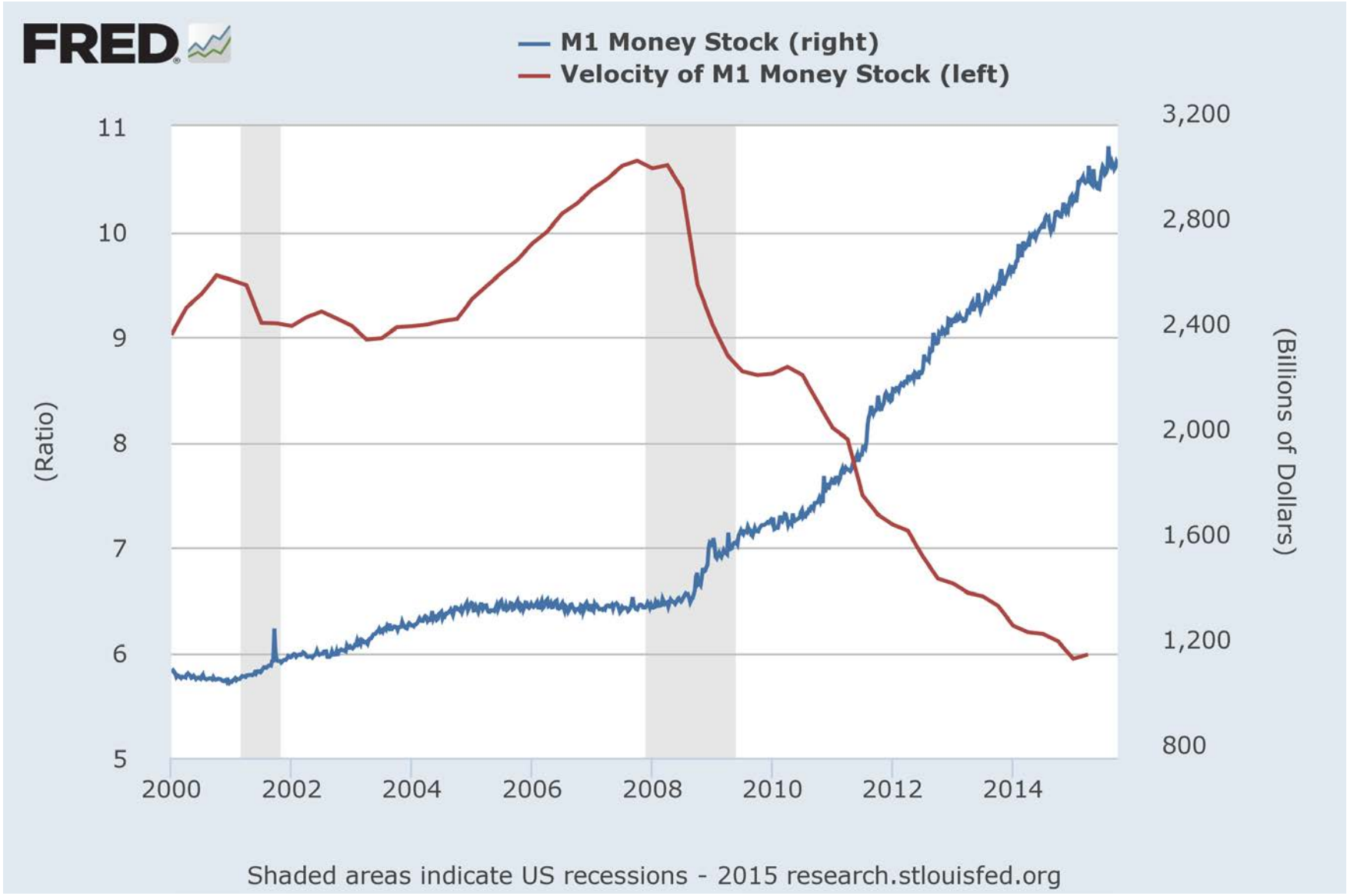
$$V = \frac{nom\ GDP}{M} = \frac{P \times Y}{M}$$

- E.g.: Cookies: P_{box} = \$5/box, Y = 10 boxes,
  => Nom GDP = \$50
  - If M = \$5 => V = 10
  - If M = \$10 => V = 5

$$M \times V = P \times Y$$

Empirical Data

Year	Money Supply	Nominal GDP	Velocity
2008	M1 = \$1.46 T	\$13.9 T	$V_{M1} \approx 9$
2014	M1 = \$2.80 T	\$17.4 T	$V_{M1} \approx 6$
2008	M2 = \$7.85 T	\$13.9 T	$V_{M2} \approx 2$
2014	M2 = \$11.4 T	\$17.4 T	$V_{M2} \approx 1.6$


FRED
M1 Money Stock (right)
Velocity of M1 Money Stock (left)
11
10
9
8
7
6
5
(Ratio)
3,200
2,800
2,400
2,000
1,600
1,200
800
(Billions of Dollars)
2000
2002
2004
2006
2008
2010
2012
2014
Shaded areas indicate US recessions - 2015 research.stlouisfed.org

Quantity Equation: Growth Rate Form

- LR Assumptions
  - M doesn't affect Y
  - V is stable (Not true in the SR)

- Quantity Equation: Growth Rate Form

$$M \times V = P \times Y$$

$$\ln(M \times V) = \ln(P \times Y)$$

$$\ln M + \ln V = \ln \mathrm{P} + \ln \mathrm{Y}$$

$$\frac{d}{dt}\left[\ln M + \ln V = \ln \mathrm{P} + \ln \mathrm{Y}\right]$$

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

Quantity Equation: Growth Rate Form

$$\%\Delta M + \%\Delta V = \%\Delta P + \%\Delta Y$$
$$\%\Delta P = \%\Delta M + \%\Delta V - \%\Delta Y$$
$$\%\Delta P = \%\Delta M + 0 - \%\Delta Y$$
$$\pi = \%\Delta M - \%\Delta Y$$

- If $\%\Delta M \gg 0 \Rightarrow \pi \gg 0$
- Past half century in the US:

$$\%\Delta M = 8\%, \%\Delta Y = 3\% \Rightarrow \pi = 5\%$$

Nominal vs Real Interest Rates

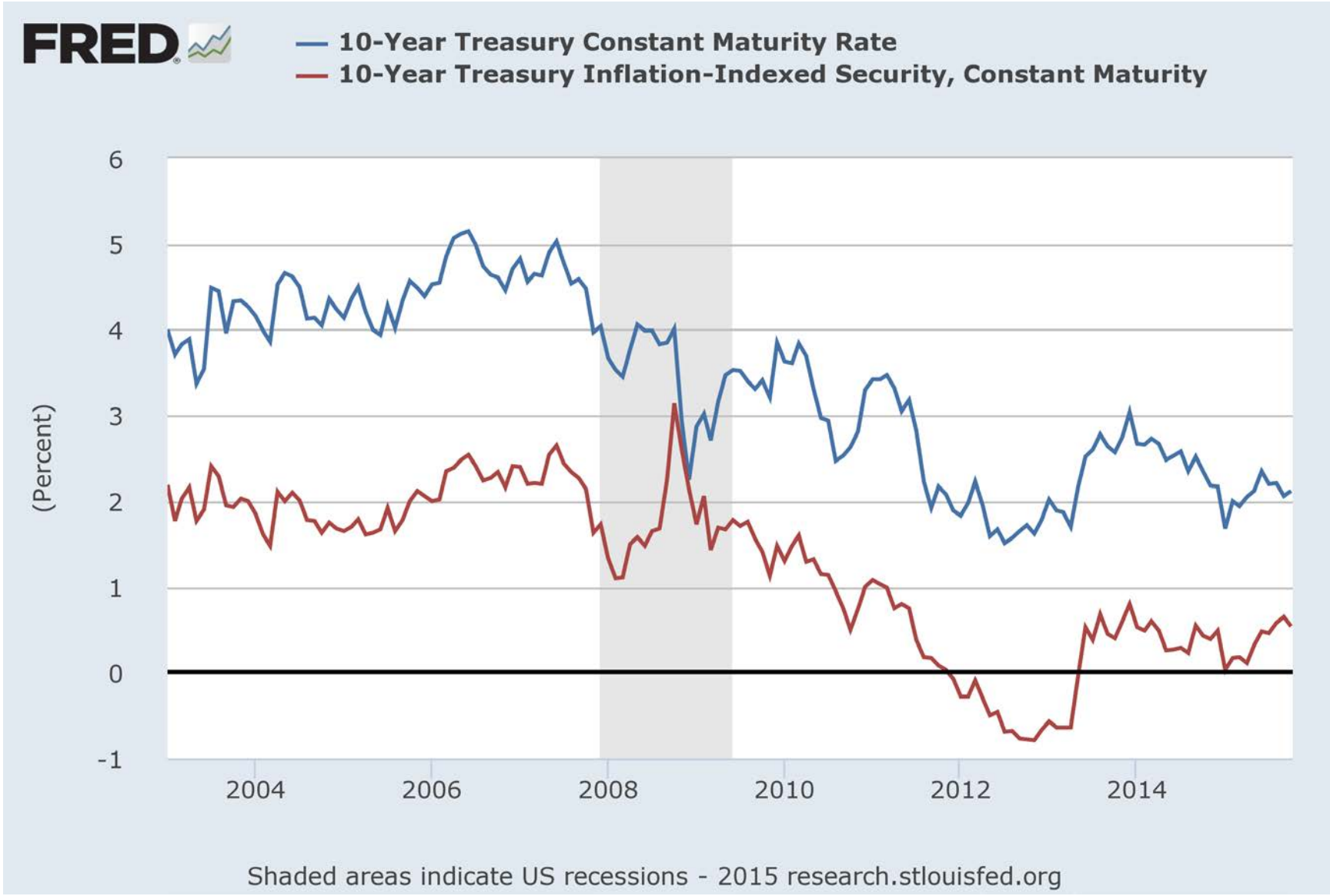
Fisher Equation

$$i = r + \pi$$

nominal = real + inflation

- Inflation Effects (Ch 11, pp. 227-228):
  - E.g.: You purchase a bond with 12% yield
    - i = 12%, π = 4% => r = 8%
    - i = 12%, π = 6% => r = 6%
  - If π increases, then there is a redistribution of wealth from lenders to borrowers

- Fisher Effect:
  - Assume r is exogenous
  - one-for-one adjustment of *i* and π
- r determined in the long run by???


FRED
10-Year Treasury Constant Maturity Rate
10-Year Treasury Inflation-Indexed Security, Constant Maturity
(Percent)
6
5
4
3
2
1
0
-1
2004
2006
2008
2010
2012
2014
Shaded areas indicate US recessions - 2015 research.stlouisfed.org

IV. Cost of Inflation

- Inflation Tax
  - Seniorage = Revenue raised by government by printing money. E.g., Zimbabwe
- Shoeleather Costs
  - Germany after WWI
- Menu Costs
  - Firms change menu prices more
- [Relative Price Variability]
  - [MRS between goods x and y varies => Misallocated resources]
- Confusion and Inconvenience
- Inflation-Induced Tax Distortions

Current Event

"Hanging On to Dollars in Zimbabwe," 03-26-12

- Hyperinflation
  - Central bank prints $ => Lends $1.5 billion to government for president pet projects
  - Chikotsa withdraw 1 trillion Zimbabwe dollars = 1 loaf of bread
    - Distrust of currency and banks
    - Destroyed the value of her modest income
- 2009 Dollarization
  - Stable prices
  - Distrust of Banks => Hoard USD at home => Breakdown of financial system=> no deposits and no loans

Inflation-Induced Tax Distortions

Capital gains tax rate = 25%

	Low Inflation	High inflation
Real interest rate (r)	4%	4%
Inflation rate (π)	0%	8%
Nominal interest rate ($i = r + \pi$)	4%	12%
After-tax nominal interest rate		
After-tax real interest rate ($r_{at} = i_{at} - \pi$)		