ECON 3510 - Intermediate Macroeconomic Theory

Fall 2015

Mankiw, *Macroeconomics, 8th ed.*, Chapter 5

Chapter 5: Inflation

Key points:

- Quantity theory
- Money demand
- Costs and benefits of inflation
- Why inflation?
- Classical dichotomy

The Quantity Theory of Money:

- Key equation:
  - $MV = PY$
  - M = money supply
  - V = velocity of money = # of times money changes hands
  - P = the price level
  - Y = real GDP (so PY = nominal GDP)
  - $\Rightarrow$ \$ value of all stuff bought (PY) = # of times each dollar trades hands times the number of dollars
  - e.g., bread economy:
    - 20 loaves of bread (Y=20)
    - \$1.00 per loaf (P=1)
    - \$5 in the economy (M=5)
    - $\Rightarrow$ each dollar bill must trade hands 4 times: $M \times V = 20 \times 1 \Rightarrow 5 \times V = 20 \Rightarrow V = \frac{20}{5} = 4$
- Money demand:
  - M/P = real money balances
    - e.g., how many loaves of bread the stock of money can purchase
  - $(M/P)^d$ = demand for real money balances
  - For now, we'll assume that people want to hold money equal to some fraction of their income:
    - $(M/P)^d = kY$
    - $0 < k < 1$
- Equilibrium: Supply = Demand
  - $(M/P)^d = M/P$
  - $\Rightarrow M/P = kY$
  - $\Rightarrow M(1/k) = PY \rightarrow$ rewrite as $MV = PY$ where $V = 1/k$

- Interpretation:
  - If people want to hold lots of money:
  - $\rightarrow \Rightarrow k$ large $\Rightarrow V = 1/k$ is small
  - $\rightarrow$ Money doesn't change hands very often
  - If people don't want to hold much money:
  - $\rightarrow \Rightarrow k$ small $\Rightarrow V = 1/k$ is large
  - $\rightarrow$ Money changes hands a lot

Money and Inflation:

- Let's assume, for now, that V is constant $\rightarrow V = \bar{V}$
- $\Rightarrow M\bar{V} = PY$
- Write out the quantity equation ($MV = PY$) as percent changes:
  - $\%\Delta M + \%\Delta V = \%\Delta P + \%\Delta Y$
- Inflation is the $\%\Delta P$:
  - $\%\Delta P = \%\Delta M + \underbrace{\%\Delta V}_{=0 \text{ b/c} V=\bar{V}} - \%\Delta Y$
  - $\Rightarrow \%\Delta P = \%\Delta M - \underbrace{\%\Delta Y}_{\text{exogenous for now: take } K \text{ \& } L \text{ as given}}$
  - Here we are assuming K and L are fixed as we have been doing in these long run models.
  - $\Rightarrow \%\Delta P = \%\Delta M$
    - Inflation is directly related to the money supply
    - Key result of the QTM
    - Milton Friedman famous for: "Inflation is always and everywhere a monetary phenomena."
    - Central bank has ultimate control over inflation
    - SHOW graphs of money vs. inflation

Inflation and Interest Rates:

- Fisher equation: $r = i - \pi \Rightarrow i = r + \pi$
- Fisher Effect $\rightarrow$ a 1% $\uparrow$ in the inflation rate $\uparrow$ the nominal interest rate (i) by 1%
- SHOW graphs of inflation and interest rates
- 2 real rates:
  - ex ante: $\rightarrow r = i - \underbrace{\pi^e}_{\text{expect. infl.}}$
  - ex post: $\rightarrow r = i - \pi$
  - These two differ if actual inflation is not what is expected

Interest Rates and Money Demand:

- Opportunity cost of holding money is that you give up the ability to lend it and earn r

- (Expected) Return on holding money is $-\pi^e$ b/c higher prices mean same dollar buys less
  - Since the expected return to holding money equals the negative of the inflation rate, we see that inflation imposes a cost on holding money
  - This is called the "inflation tax"
- Total cost of holding money equals:
  - the opportunity cost minus the return on holding money:
  - $r + \pi^e = i$
  - $\Rightarrow$ the nominal interest rate is the cost to holding money!
- Now, write the money demand function as a function of income and interest rates:
  - $(M/P)^d = L(i, Y)$
    - $\frac{\partial (M/P)^d}{\partial i} < 0$
    - $\frac{\partial (M/P)^d}{\partial Y} > 0$
- In eq'm, Supply = Demand
  - $\Rightarrow (M/P)^d = M/P = L(i, y)$
  - $\Rightarrow M/P = L(r + \pi^e, Y)$, by Fisher Eq'n
  - $\Rightarrow$ demand for real money balances depend on expected inflation
    - Higher expected inflation means higher i, which means lower demand for money balances
    - Holding constant M; if money demand falls, then prices rise to maintain our equilibrium (supply = demand)
- DRAW flow of monetary policy: money suppy $\rightarrow$ price level $\rightarrow$ inflation rate $\rightarrow$ nominal interest rate $\rightarrow$ nominal interest rate $\rightarrow$ money demand $\rightarrow$ price level....
- Changing money supply has direct and indirect effects on inflation rate (both saying that increase M increases π)

<u>Costs of Inflation</u>:

- Expected inflation:
  - Shoe-leather costs (more time going to ATM)
  - Menu costs (costs to changing prices)
  - Changes in relative prices lead to inefficient allocations (b/c of menu costs, prices are sticky, so not all move at once)
    - Catalog example in text is best I can think of...
  - Changes in tax liability b/c taxes are on nominal amounts
  - Makes money's role as a unit of account and store of value less valuable
- Unexpected inflation:
  - Redistributes wealth between lenders and borrowers (when lending at fixed nominal rates)
    - Higher than expected inflation benefits borrowers (they pay back in dollars worth less than those they borrowed)
    - e.g., Janet lends me money. We agree to an 8% nominal rate b/c she wants a 6% return and expects 2% inflation

    - $i = r + \pi^e = 6 + 2 = 8$
    - Turns out, inflation is 5%
    - $\rightarrow r = i - \pi = 8 - 5 = 3\%$
    - I end up paying a real interest rate of only 3% and thus Janet only gets a 3% return on her money
  - Ok, but if inflation expected, then Janet could have just charged a higher nominal interest rate to get a higher real rate of returns. BUT,...
  - High levels of inflation go hand in hand with high variability in inflation
  - This uncertainty in the inflation rate means that people less likely to write contracts, b/c they have additional risk

Benefits of Inflation:

- "Greases the wheels" of the labor market
  - There is difficulty lowering workers nominal wages (i.e., they are "sticky" - could be due to psychology or institutional features like unions)
  - Inflation lowers real wages when the nominal wage is fixed
  - DRAW labor market for blacksmiths - when lower real wage, Demand shifts out - implies higher nominal wage

Causes of Inflation:

- Revenue source
  - Printing money is a source of revenue - and if the gov't controls the printing press it have the incentive to print money to buy stuff
  - Called seinorage
  - Note talk of trillion dollar coin
  - Leads to name "inflation tax"
- Commitment problems
  - Gains to surprise inflation
    - printing money can lead to short term stimulus (e.g., employment example noted before)
  - Fiscal pressure
    - Gov't budget can be financed by:
    - $\rightarrow$ the fiscal authority
    - $\rightarrow$ the monetary authority
    - If the monetary authority is "weak" if could be forced to finance with sienorage
    - Or if spending is out of control, need to finance by printing money
  - Regional interactions
    - What if each state could print U.S. dollars?
    - That state would get all the benefits from each dollar printed, but only pay part of the inflation tax (b/c tax spread across all states using dollars)
    - $\rightarrow$ Implies inflation too high
    - $\rightarrow$ e.g., Argentina in the 1980's

    * This is the reason that EU member nations and US states have balanced budget amendments - don't want the moral hazard of a state running large deficits hoping to be bailed out by central bank

The Classical Dichotomy:

- Dfn: The idea that real and nominal variables can be analyzed separately
- Chap 3 dealt with variables measured as quantities (real variables)
  - real GDP
  - the capital stock
  - hours of work
  - the real wage
  - the real interest rate
- Chap 4 and 5 have dealt with variables measured in dollars (nominal variables)
  - the price level
  - the inflation rate
  - nominal GDP
  - the dollar wage
- Thus you'll notice that we've been studying real and nominal variables separately.
- The classical dichotomy holds in more long-run, neoclassical economic models.
  - We'll break from this when we move to models of the economy in the short run
- Implications of the classical dichotomy
  - nominal variables don't influence real variables in classical models
  - Monetary neutrality
    * The irrelevance of money for describing the movement of real variables
    * This is true of the long run models we've seen so far
    * We'll relax this later when we talk about models of the economy in the short run