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)
  - ⇒ $\$ value of all stuff bought ($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$)
      * ⇒ 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
  - $(M/P)^d = M/P$
  - ⇒ $M/P = kY$
  - ⇒ $M(1/k) = PY$ → rewrite as $MV = PY$ where $V = 1/k$
- Interpretation:
  - If people want to hold lots of money:
  - $k$ large $\Rightarrow V = 1/k$ is small
  - Money doesn’t change hands very often
  - If people don’t want to hold much money:
  - $k$ small $\Rightarrow V = 1/k$ is large
  - Money changes hands a lot

Money and Inflation:
- Let’s assume, for now, that $V$ is constant $\Rightarrow V = \bar{V}$
- $\Rightarrow MV = PY$
- Write out the quantity equation ($MV = PY$) as percent changes:
- $\%\Delta M + \%\Delta V = \%\Delta P + \%\Delta Y$
- Inflation is the $\%\Delta P$:
  - $\%\Delta P = \%\Delta M + \%\Delta V - \%\Delta Y$
- $\Rightarrow \%\Delta P = \%\Delta M - \%\Delta Y$
  - 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% ↑ in the inflation rate ↑ the nominal interest rate ($i$) by 1%
- SHOW graphs of inflation and interest rates
- 2 real rates:
  - ex ante: $\Rightarrow r = i - \pi$
  - 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’n, 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 supply $\rightarrow$ 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 $\pi$)

Costs of Inflation:

• 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 seignorage
  - 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 seignorage
    * 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