Problem set 3: due Jan 30
• Chapter 12, exercises 2, 6, and 12, pages 336-338
• Copies of questions can be obtained from course web page at http://econweb.ucsd.edu/~jhamilto/Econ110B.html

Chapter 12
Monetary policy and the Phillips Curve

Outline of Chapter 12 lectures
12.1. The MP curve
12.2. Using the IS-MP model
12.3. Term structure of interest rates
12.4. Phillips Curve and the IS-MP model
12.5. The end of the Great Inflation
12.6. The start of the Great Inflation
12.7. Reconciling short- and long-run model
12.8. Details of implementing monetary policy

12.1. The MP curve
• The central bank can control the short-term lending rate between banks
• In the United States, the central bank is called the Federal Reserve or Fed
• Goal of monetary policy is to use this power to influence output and inflation

How does monetary policy influence real GDP?

\[ i_t = \text{nominal interest rate} \] (controlled by central bank)
\[ \pi_t^e = \text{expected inflation} \]
\[ R_t = i_t - \pi_t^e = \text{real interest rate} \] (matters for investment demand in IS curve)

(1) Simple model of \( \pi_t^e \)

Adaptive expectations:
\[ \pi_t^e = \pi_{t-1} \]

People expect inflation this year to be whatever it was last year
(2) More general model of $\pi_i$
Sticky inflation assumption
People take some time to change their expectations of future inflation.

Under either model of inflation expectations, when Fed raises $i$, result is $R = i - \pi_i$ goes up at least in short run.

In our short-run model, the Fed chooses the real interest rate $R$, through monetary policy.

- We will summarize monetary policy with the MP curve
- This is just a horizontal line at the real interest rate chosen by the Fed

12.2. Using the IS-MP model
Example 1:
Suppose the economy starts out at both long-run and short-run equilibrium and then the Fed raises the interest rate.
(1) Fed raises nominal interest rate $i_t$ as policy decision.
(2) Inflation and inflation expectations do not respond immediately so $R_t = i_t - \pi_t$ goes up.
(3) This lowers investment demand $I_t$, which makes GDP fall below potential.

Example 2:
Suppose the economy starts out at both long-run and short-run equilibrium and collapse of the housing bubble puts the economy into a recession.
How could the Fed respond?

We’re told that economy started out at short-run and long-run equilibrium.
(1) IS passed through $\tilde{Y}_t = 0, R_t = \tilde{r}$.
(2) MP was horizontal line at $R_t = \tilde{r}$. 
Then there was a collapse of house prices, which would mean $\bar{a}$ goes down. So IS now passes through a point to the left of $\bar{Y}_t = 0$ when $R_t = \bar{r}$. Economy may now be in recession.

Fed could respond by lowering interest rate to restore economy to full employment

At original interest rates, consumers were spending less. But with lower interest rates, investment spending may pick up slack.

12.3. The term structure of interest rates

- We said the central bank can control the overnight interest rate on loans between banks as a choice of policy.
- This rate is called the federal funds rate (or fed funds rate) in the U.S.
- What is the relation between the fed funds rate and other interest rates?
- To answer let’s first look at interest rates on different Treasury securities (U.S. federal government debt).
• Current yield on 3-month U.S. Treasury security (called Tbill) is 0.53% at an annual rate
• This means that if you bought $100 of these bills today, reinvested the proceeds at the same rate after 3 months, and so on until the end of the year, by the end of the year you would have $100.53
• Yield on 3-month Tbill is very small but had been 0.03% (almost zero) two years ago

• Current yield on 1-year U.S. government bond is 0.82% at annual rate
• If lend $100 today, at end of year would have $100.82
• This is also very low but higher than the 3-month yield

• Current yield on 5-year government bond is 1.93% at an annual rate
• Current yield on 10-year government bond is 2.42% at an annual rate

• What is relation between fed funds rate (the instrument of monetary policy) and these other rates?

Fed funds rate and yields on 3-month, 1-year, 5-year, and 10-year Treasury bonds, 1953-2016

• Fed funds, 3-month Tbill, and 1-year yield are usually very similar
• All rates tend to move up and down together
• But at some times they differ more than others
• Yield curve: at a given point in time plots the interest rate (quoted at an annual rate) on Treasury securities of different maturities as a function of maturity.

Example: the yield curve in Jan 1996 would compare the yields at that date.

- January 1996 was a fairly typical month, in which longer-term Treasuries had a higher yield than shorter-term.
- In other words, the yield curve usually slopes up.
- At other times, such as January 2004, the yield curve slopes up more steeply.

When Fed lowered rates from 2000-2004, long rates did not fall as much as short.

Yield curve was steeper in Jan 2004 than in Jan 1996.
Why was yield curve steep in Jan 2004?

- In Jan 2004
  – yield on 1-year bond was 1.3%
  – yield on 2-year bond was 1.9%
  – doesn’t this mean 2-year was much better deal?

Suppose in Jan 2004 you thought the Fed was about to start hiking the short-term rate and that by Jan 2005 the 1-year rate would be up to 2.8%  
- As events turned out you would have been exactly right

Shortly after Jan 2004, the Fed starting raising the fed funds rate

- If in Jan 2004 bought 1-year bond yielding 1.3% and reinvested in Jan 2005 for 2.8%, would have average annual return of \((1.3 + 2.8)/2 = 2.05\%\)
- If in Jan 2004 bought 2-year bond would have average annual return of 1.9%
- Despite steeper yield curve, 1-year bond was better investment than 2-year because short-term rates were headed up

In Jan 2004, most investors had a pretty good guess that the Fed was about to start raising rates  
- This is why they required a much higher premium on 2-year bond over 1-year compared to normal  
- Expectations hypothesis: when market expects the Fed to be raising the short-term rate, the yield curve is steeper than normal

Yield curve was steeper in Jan 2004 because market expected rate hikes
When the Fed is lowering short rates, the long rates don’t fall as much because market expects the short rate drop to be temporary.

Yield curve was inverted in Oct 2000 because market anticipated (correctly) that Fed was about to start lowering rates.

Implications of short-term model

- Fed can lower rate below MPK, but only temporarily
  - When this happens, market expects short rate will go back up and yield curve steepens
- Fed can raise rate above MPK, but only temporarily
  - When this happens, market expects short rate will go back down and yield curve flattens or inverts

Yield curve two years ago was steeper than usual, reflecting market belief that Fed would start raising rates by end of 2015.

Yield curve today is still steeper than usual, reflecting market belief that Fed will continue to raise interest rates.
• Yield curve: summarizes how bonds with different maturities (e.g., 1-year versus 2-year) have different yields
• Risk premium: if two bonds have the same maturity but one is riskier, the higher-risk bond has a higher yield as compensation for the risk
• Example: compare the return on 10-year Treasury bonds (risk-free) with Baa-rated corporate bonds

Observations
• Long-term government and Baa yields usually move together
• During financial turmoil of Great Recession, Baa yields rose even as Treasury yields fell

Summary
• In our theoretical model we talk about “the” interest rate
• We interpret this as the short-term rate controlled by the central bank
• All interest rates move with the short rate, but by how much depends on other factors such as how long before we return to a long-run equilibrium and financial frictions
• Investment demand depends on risky rate which rose during Great Recession even though Fed lowered the fed funds rate