

**PROBLEM SET 5**  
**14.02 Macroeconomics**  
**April 26, 2006**  
**Due May 3, 2006**

I. Answer each as True, False, or Uncertain, and explain your choice.

1. As long as expected inflation remains roughly constant, the movements in the real interest rate are roughly equal to the movements in the nominal interest rate.

Ans:

True. The difference between the real interest rate and the nominal interest rate is expected inflation, so the two will move in tandem as long as expected inflation remains roughly constant.

2. Junk bonds are bonds nobody wants to hold.

Ans:

False. Junk bonds are named so because they carry a higher default rate than average. However, they do attract investors by offering a higher expected rate of return (aka risk premium).

3. The Dow Jones Industrial Average staged a powerful 194.99 point rally on 18 Apr 2006, despite the fact that oil prices also reached a record level – topping \$70 a barrel on the same day. This means high oil prices are good for the US stock market.

Ans:

False. What lifted the stock index were other news, in particular the publication of the minutes of the FOMC meeting, indicating that the increase in interest rates was coming to an end. On the other hand, the increase in the price of oil was perhaps not news.

4. It is quite possible for stock prices to go up in response to an increase in the federal funds rate by the Fed. All that is needed is that the market expected a larger increase than actually happened.

Ans:

True. EPDV inversely correlates with the federal funds rate, and hence stock prices should go up if the federal funds rate turns out to be lower than expected.

5. The strong performance of the U.S. stock market of the 1990s reflects the strong performance of the U.S. economy.

Ans:

Uncertain. What contributes to the stock market boom of the 1990s are both the strong performance of the US economy and possibly a bubble at the end.

6. A rational investor should never pay a positive price for a stock that will never pay dividends.

Ans:

False. A rational investor will pay a positive price for such a stock as long as she rationally expects that somebody else will be willing to purchase the stock from her at an even higher price.

## II. Short Questions:

### 1. Discount Rates and EPDV

Suppose the current one-year interest rate is 10%, and the expected one-year interest rate for next year is 8%.

- a. What is the EPDV of a bond that pays \$1,000 in one year?

Ans:

$$\frac{\$1,000}{1.1} = \$909.09$$

- b. What is the EPDV of a bond that pays \$1,000 in two years?

Ans:

$$\frac{\$1,000}{1.1 * 1.08} = \$841.75$$

- c. What is the EPDV next year of a bond that pays \$1,000 in one year from then?

Ans:

$$\frac{\$1,000}{1.08} = \$925.53$$

### 2. Saving with Uncertain Future Income

Consider a consumer who lives three periods: youth, middle age, and old age. Each period is composed of 20 years. When young, the consumer earns \$20,000 in labor income per year. Earnings during middle age are uncertain. There is a 50% chance that the consumer will earn \$40,000 per year and a 50% chance that the consumer will earn \$100,000 per year. The uncertainty is resolved when middle age starts. That is, when the consumer reaches middle age, she finds out whether she will receive \$40,000 per year for each of the 20 years, or \$100,000 per year for each of the 20 years. When old, the consumer receives no labor income. Assume that inflation, expected inflation, and the real interest rate all equal zero. Ignore taxes for this problem.

- a. What is the expected value of her earnings in the middle age? Given this number, what is the present discounted value of expected lifetime labor earnings? If the consumer wishes to maintain constant expected consumption over her lifetime, how much will she plan to consume every year? How much will she save per year when she is young?

Ans:

Expected value of earnings during middle age is

$$\frac{(\$40,000 + \$100,000)}{2} * 20 = \$1,400,000.$$

EPDV of lifetime earnings = \$20,000 \* 20 + \$1,400,000 = \$1,800,000.

The planned consumption is \$30,000 per year.

Consumer will save (-\$10,000), i.e., borrow \$10,000, per year when young.

- b. Now suppose the consumer wishes, above all else, to maintain a minimum consumption level of \$20,000 per year in each period of her life. To do so, she must consider the worst outcome. If earnings during middle age turn out

to be \$40,000 per year, how much should the consumer spend when she is young to guarantee consumption of at least \$20,000 per year in each period? How does this level of consumption compare to the level you obtained for the youth period in part (a)?

Ans:

In the worst case, EPDV of lifetime earnings =  $\$20,000 * 20 + \$40,000 * 20 = \$1,200,000$ , so the consumer should consume \$20,000 and save 0 per year when young. The planned consumption is lower than part (a), and saving is higher, for the youth period.

- c. Given your answer in part (b), suppose that her earnings during middle age turn out to be \$100,000 per year. How much will she spend in each period of life? Will consumption be constant over the consumer's lifetime? (Hint: once the consumer reaches middle age, she will try to maintain constant consumption for the last two periods of life, as long as she can consume at least \$20,000 per year in each period.)

Ans:

Actual consumption per year: young: \$20,000; middle-aged: \$50,000; old: \$50,000. Consumption is clearly not constant over the consumer's lifetime.

- d. What effect does uncertainty about future labor income have on saving (or borrowing) by young consumers?

Ans:

The uncertainty leads to higher saving by young consumers. Such saving behavior is also known as precautionary saving.

### III. Long Question: A New Federal Reserve Chairman

Suppose the Chairman of the Fed unexpectedly announces today that he will retire in one year. At the same time, the president announces his nominee to replace the retiring Fed Chair. Financial market participants expect the nominee to be confirmed by Congress. They also believe that the nominee will conduct a more contractionary monetary policy than the current chairman.

HINT: For all questions below, no need to use math. Words will do.

1. When the new Chairman starts his mandate a year from now and implements the more contractionary monetary policy, what will happen to the real interest rate and output from then on?

Ans:

A monetary contraction will lead to a higher real interest rate and a lower output in the short run. Both the real interest rate and output will eventually return to their medium-run equilibrium levels.

2. What will happen to the stock market today? What do you expect will happen to the stock market a year from now, on the day the new Chairman starts his mandate?

Ans:

Investors immediately adjust their expectations of future interest rates and future output upon the nomination. Recall the new IS curve that incorporates

expectations:

$$Y = A \left( Y, T, G, r, Y'^e, T'^e, G'^e, r'^e \right).$$

Both increase in expected real interest rate and decrease in expected output shift the IS curve to the left, so current output and the current real interest rate fall. Stock prices today are likely to go down. Lower current output and expected future output both depress prices, while higher future discount rate and lower current discount rate induce offsetting effects on the stock market. As a result, the overall effect of the news on the stock market today tends to be negative. The stock market in a year from now will not move again with regard to this event (which will not be news then).

3. Now suppose that instead of making an unexpected announcement, the Fed Chair is required by law to retire in one year, and financial market participants have been aware of this for some time. Suppose that the market had expected the nominee to be someone who favored an even more contractionary policy than the actual nominee. Under these circumstances, what is likely to happen to stock prices in response to the announcement of the nominee?

Ans:

The analysis is similar to that in parts (1) and (2), except that the signs should be just reversed. Stock prices are likely to react positively to the announcement.

4. On 24 Oct 2005 the US president appointed one of his top economic advisers, Ben Bernanke, to succeed Alan Greenspan as head of the Federal Reserve. On the day of the announcement, the Dow Jones Industrial Average and the Nasdaq composite both jumped more than 1.5 percent. Why do you think this was?

Ans:

The financial market participants were at least partially surprised by the choice, otherwise, there wouldn't have been any significant movement in prices around the announcement. The positive reaction of the stock market reflects investors' confidence in Bernanke as a qualified successor to Greenspan.