Notes for Tuesday, January 27, 2004

Announcements

By today you should have finished reading Chapter 3.
  - Read Chapter 4 for Thursday.
  - Send in answers to Chapter 4, Study Questions 6, 11 and 12.
Comments on homeworks.
  - Units, Names.
You should have determined who will be in your group by this week.
  - Groups should be finalized by next week’s lab; problem set 3 must be done with your permanent group.
  - Starting with problem set 3, I only want one homework assignment per group.

Review Inflation
  Review Real and Nominal Values
    - PV-FV:RV-NV chart.
    - Example of accounting for inflation when discounting

Changing Real Prices
  Nominal future price
  Real future price
  Nominal rate of price change
  Real rate of price change

Converting Nominal to Real Rates of Price Change

\[(1 + k_p) = (1 + k)(1 + r_p)\]

Projecting Nominal and Real Future Prices

\[P_{p,n}^* = (1 + k_p)^n P_{p,0}\]

\[P_{p,n} = (1 + r_p)^n P_{p,0}\]
Accounting for Inflation When Discounting

Discount real future values with a real interest rate, and discount nominal future values with a nominal interest rate.

Example

A bond that you buy today matures in 10 years, at which time you will receive $1,000. This $1,000 is an actual amount that you will get paid; therefore it is a nominal amount, and the 7% you will earn on the bond is a nominal rate.

a. How much should you pay for the bond today if it is to earn 7%?

b. If you expect inflation to average 3% during the 10-year period until the bond matures, what real rate of return will you earn on the bond?

c. What will be the real future value of the bond?
Real Changes in Prices and Costs

- The *nominal future price* of a product is the expected price that will be paid for the product at a future date, expressed in future dollars – i.e., dollars with the purchasing power that dollars will have at that future date.

- The *real future price* of a product is the expected price that will be paid for the product at a future date, expressed in current dollars.

- The *nominal rate of price change* for a product is the expected or historical rate of change in the nominal price of the product over a particular period.

- The *real rate of price change* is the expected or historical rate of change in the real price of a product. In other words, it is the rate at which the price for that product has changed, or is expected to change, relative to the general rate of inflation.
Converting Nominal to Real Rates of Price Change

Recall that:

\( r = \) real discount rate,

\( i = \) the nominal discount rate, and

\( k = \) the actual or expected (general) inflation rate.

Now, let:

\( k_p = \) the actual or expected nominal rate of price change for the price of a particular product (product \( p \)), and

\( r_p = \) the actual or expected real rate of price change for the price of a particular product (product \( p \)).

Then,

\[(1-k_p) - (1-k)(1+r_p)\]

or, rearranging:

\[k_p = (1-k)(1+r_p) - 1\]

or:

\[r_p = \frac{(1+k_p)}{(1+k)} - 1\]
Converting Nominal to Real Rates of Price Change
Example:

If the price of a McDonald’s hamburger went up at an average rate of 2% per year during a period of time when the inflation rate was 4% per year, what was the real rate of price change for a McDonald’s hamburger during this time?
Projecting Nominal and Real Future Prices

Now, let

\[ P_{p,0} = \text{the current price of product } p, \]
\[ P^*_{p,n} = \text{the (projected) nominal future price of product } p \text{ in period } n, \text{ and} \]
\[ P_{p,n} = \text{the (projected) real future price of product } p \text{ in period } n, \text{ and} \]

The basic formula for projecting \( P^*_{p,n} \) from \( P_{p,0} \):

Given a projected nominal rate of price change \( k_p \):

\[ P^*_{p,n} = (1 + k_p)^n P_{p,0} \]

The basic formula for projecting \( P_{p,n} \) and \( P_{p,0} \):

Given a projected real rate of price change \( r_p \):

\[ P_{p,n} = (1 + r_p)^n P_{p,0} \]

Note: These last two equations can be rearranged to calculate the nominal and real rates of price change, respectively, given a projected or actual prices at two points in time.
Example:

In the first quarter of 1992, hard maple stumpage in northwestern Pennsylvania sold for an average price of $104/mbf. In the first quarter of 2001, the average hard maple stumpage price in the region was $380/mbf. The PPI for the first quarter of 1992 was 115.9, and in the first quarter of 2001 it was 137.8.

a. What were the real and nominal rates of change in hard maple prices in the region over this 9-year period?

b. What will the real and nominal hard maple stumpage prices be in 2015 if these trends continue?