Nominal vs. Real Interest Rates: The Effect of Inflation

The nominal interest rate is the rate that you see in the market.

The real interest rate is the rate that would be found if there were no inflation.

What is the relationship between nominal and real interest rates?
Suppose there is no inflation and the interest rate is 10%.

I am willing to give up $100 today in return for $110 next year.

Now, suppose that the inflation rates jumps to 5%.

My $110 is going to be worth 5% less in terms of purchasing power.

Therefore I require 10% to compensate me for the time value of money,

and also an additional 5% to compensate me for the loss in purchasing power.

In this example, the real interest rate is 10%, while the nominal interest rate, with 5% inflation is

\[(1 + .1)(1 + .05) - 1 =
\]

\[.1 + .05 + .05(.1) = .155 = 15.5\%\]
In general, if
\[ r_r = \text{real interest rate} \]
\[ r_n = \text{nominal interest rate} \]
\[ E(i) = \text{expected inflation rate} \]

Then
\[ r_n = (1 + r_r)(1 + E(i)) - 1 \]

The point here is that market or nominal interest rates take into account inflationary expectations and therefore the loss in value of the dollar in the future.

*How does this explain the statement:*

“The bond market rallied on news of lower-than-expected inflation”

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**Example: Inflation and Future Value**

You want to put away enough money today to guarantee yourself $100,000 in 30 years. You want this $100,000 to be in terms of today’s purchasing power.

The nominal (market) interest rate is 8%. The inflation rate is known to be 5%.

1. Find out how much $100,000 in today’s purchasing power will be in actual (nominal) dollars in 30 years:
   \[ 100,000 \times F/P(5\%, 30) = 432,194 \]

2. Find out how much we need to put away today in order to achieve $432,194 in 30 years:
   \[ 432,194 \times P/F(8\%, 30) = 42,950 \]
An alternative way to look at this problem is to consider what would happen if there were no inflation.

(Verify that this is true: redo the previous problem using the exact real interest rate and make sure that you get the same result in the last step)

This case is an example of an …

**Important General Rule:**
- Always discount nominal cashflows at a nominal interest rate, and real cashflows at a real interest rate.