Inflation and Real Rates

(Welch, Chapter 05)

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Maintained Assumptions

Perfect Markets

1. No differences in opinion.
2. No taxes.
3. No transaction costs.
4. No big sellers/buyers—infinitely many clones that can buy or sell.

Perfect Certainty

Annualization

Almost all interest rates are quoted in annualized terms. So are many RoRs.

- *Annualized* interest rates are a little lower than *average* interest rates,
- because they take (away/into account) the interest on interest.

Inflation: Real and Nominal Rates

- **Nominal cash flows**: nominal amount of dollars.
- **Real cash flows**: adjusted for inflation.
- Real dollars have the same *purchasing power*.

Instant Anticipated Inflation

- What if the U.S decreed that 1 cent today will be called 1 dollar tomorrow?
- Instant inflation would be 9,099%.
- But it would be irrelevant under certainty
  - Without surprises,
  - all contracts today would be written in real units,
  - contracts would just note cent becomes dollar tomorrow,
  - and there would be no disagreements about them.

Inflation is not an Imperfection!

- Agents just contract in terms of real dollars!
- ...and all issues caused by inflation go away.

- PCM: Inflation is not a hindrance to arbitrage
  - PCM allows for known inflation.
  - Nerdnote: with conditional contracts, it can even allow for unexpected inflation.

Inflation-Adjusting Cash Flows

- Nominal Interest Rate: 10% per year.
- Invest $100 for 1 year.
- Bread sells for $2/Loaf today.
- $100 purchases 50 loaves today.
- *Bread Inflation* over the next year will be 4%.
  - One Loaf will cost .....
  - How is inflation (the CPI) defined?

Next Year's Real RoR

- The bank will pay you \$110 *nominal* dollars.
- Each loaf of bread will cost \$2.08.
- Eat $\$110/\$2.08 \approx 52.88$ loaves of bread.
- Started with 50 loaves of bread, you earned 2.88 extra bread loaves.
- The real RoR is $\$2.88/\$50 \approx 5.77\%$.

Inflation-Adjustment Formula

- What is the formula that relates the nominal rate, the real rate, and the inflation rate?

Inflation-Adjustment Formula

- More generally:

$$(1 + 0.0577) \cdot (1 + 0.04) \approx (1 + 0.10)$$

- **The formula is important:**

$$(1 + \text{real rate}) \cdot (1 + \text{inflation rate}) = (1 + \text{nominal rate}).$$

- Good approximation when rates are small:

$$\text{real rate} + \text{inflation rate} \approx \text{nominal rate}$$

Formula Intuition

- **Intuition:** Why is this a "one-plus" type formula?
  - Sorry, my intuition is not that good.
  - I convince myself with examples here.

- Yes, approximation is reasonable when inflation is about 2-3% per year.
- But not if it's much, much higher.

“Real” Dollars

- Define CPI as 1.0 today.
- 1 real dollar today = $1.
  - also *inflation-adjusted* or *in today’s dollars.*
  - unfortunately rarely clear. Ask!
- 1 real dollar tomorrow: $\$1/(1+\pi_t)$.
  - $\pi_t = CPI_t/CPI_0$.
  - So, $110 next year is $\$110/1.04 \approx \$105.77$ today in inflation-adjusted dollars.
  - $100 next year is $96.15 real dollars now.

Present Value Example

- A project returns $110 in cash next year.
- The cost of capital is 10%.
- What is the PV?

Purchasing Power of Investment

- The inflation rate is 4%.
- A project will return $110 in cash next year,
- What is the purchasing power of this future $110 in today's *real* dollars?

Real Cost of Capital

- The inflation rate is 4%.
- The cost of capital is 10%.
- What is the *real* cost of capital?

Real Present Value

- What is the project's *real* dollar value discounted by the *real* cost of capital?

Ashes to Ashes, Oranges to Oranges

- Either
  Discount nominal dollars with nominal rates,
- or
  Discount real dollars with real rates.

Never mix nominal cash flows with real rates!
Never mix real cash flows with nominal rates!

What is Today's Interest Rate?

What is Today's Inflation Rate?

Taxes and Inflation

- What are today's short-term interest rates?
- How do they compare to the inflation rate?
- How much does *a taxed* retail investor earn in real terms on short-term Treasury bonds today?