

# Inflation and Real Rates

(Welch, Chapter 05)

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# 1: Maintained Assumptions

## **Perfect Markets**

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

## **Perfect Certainty**

## 2: 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.

### 3: 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*.

## 4: 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.

## 5: 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.
  - ▶ Nerddnote: with conditional contracts, it can even allow for unexpected inflation.

## 6: 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?

## 7: 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  $\$2.88/\$50 \approx 5.77\%$ .



## 8: Inflation-Adjustment Formula

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

## 9: 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:

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

# 10: 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.

# 11: “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.

## 12: Present Value Example

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

# 13: 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?

# 14: Real Cost of Capital

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

# 15: Real Present Value

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



## 16: 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!**

# 17: What is Today's Interest Rate?

## 18: What is Today's Inflation Rate?

# 19: 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?