What is Inflation

• Up until now, we have largely been assuming that prices remain relatively constant throughout the course of the analysis
Price of Gasoline in US

![Graph showing the price of gasoline in the US from 1940 to 2020. The graph compares nominal dollars and real dollars.](image)

- Nominal Dollars
- Real Dollars

Massachusetts Institute of Technology
Department of Materials Science & Engineering

3.080 Econ & Enviro Issues In Materials Selection
Randolph Kirchain
Engineering Economic Analysis: Slide 108
CPI & PPI

- General price inflation
  - Increase in the average price paid for goods and services → reduced purchasing power of money

- Consumer Price Index (CPI)
  - Average change in the price of a basket of consumer goods
    - Food, shelter, medicine, transport, apparel, etc.
    - Formally tracked by federal government since 1967

- Producer Price Index
  - Average change in price of basket of industrial goods
  - Tracked by Standard Industrial Classification (SIC) code

- Both indices are measured against a base period (Originally, 1967, now a weighting of 1982-1984) = 100
Historic Statistics on Inflation

![Historic Inflation Chart]

- CPI
- Inflation Rate

Terminology

- **Actual dollars**
  - Number of dollars associated with a cash flow when it occurs
  - Synonyms: Nominal, current, inflated dollars

- **Real dollars**
  - Dollars adjusted to a common purchasing power
  - Synonym: Constant

- **Market interest rate**
  - Money paid for the use of capital that includes a market adjustment for anticipated inflation

- **Inflation free (Real) Interest Rate**
  - Money paid for the use of capital that does NOT include an adjustment for anticipated inflation
Mapping Actual and Real Dollars

• Actual dollars in year $k$ can be converted to real dollars of constant purchasing power of any base period $b$
Choosing the correct interest rate for your analysis

Also known as:

Now What Do I Do?
Correct Interest Rate: 3 Possible Cases

1) Cash flows known in Constant Dollars
2) Cash flows known in Actual Dollars
3) Cash flows known in mixed basis

# 3 is easy → Either convert all to Constant Dollars or convert all to Actual Dollars and see appropriate method as follows
Choosing the Correct Interest Rate

• Cash flows in constant dollars →

Use the inflation-free rate
Choosing the Correct Interest Rate

- Cash flows in Actual dollars
  - Deflation Method
    - Convert cash flows into constant dollars and use inflation-free rate
  - Adjusted Discount Method
    - Compute Market based rate from inflation free and general inflation
    - Compute Equivalent Worth using Market Based Rate
Finding the Market Based Rate

• Consider the two step Deflated Method
  - Adjust cash flows based on inflation = \( \frac{1}{(1+f)^n} \)
  - Discount cash flows using inflation free = \( \frac{1}{(1+i')^n} \)