



Lecture 22. Inflation, real and nominal dollars, and price indices

FOR 2022. Financial Analysis for Natural Resources.



School of Forest Resources



What are “nominal” dollars?

- These are the funds we actually see and use every day.
- It's the money in your wallet, your bank account, and retirement account.
- It is money that actually expresses its VALUE when you trade it for something you need or want.



Price changes and inflation

- The price of any good or service can change over time.
- We know that supply and demand can cause prices to increase or decrease.
- Technology advances can cause prices to change:
 - Increases occur when new technology is required to meet some new human need or goal (BMPs for water quality)
 - Computer technology can cause prices to decrease through improved efficiency and production cost reductions



Price changes and inflation

- Inflation is a rise of costs of goods and services in the economy.
- Causes of inflation:
 - Increases in income that occur faster than the production of goods and services in the economy – more money chasing fewer goods.
- Deflation can occur when the production of goods and services rises faster than income.

Some examples of price changes

- A new automobile (in Morris County, NJ)
 - 1962: \$2,645 (Ford Galaxy, new)
 - 2002: \$13,658 (Ford Taurus LX, new)
- A gallon of gasoline (national average)
 - 1955 average price of gasoline was \$0.29/gallon
 - Feb. 22, 1999: \$0.885 / gallon
 - March 29, 2004: \$1.716 / gallon
 - April 9, 2007: \$2.802 / gallon
- Salaries for an accountant (in Morris County, NJ)
 - 1962: \$6,000 / year 2002: \$55,000 / year
- A thousand board feet of oak sawtimber stumpage in Arkansas (state average)
 - 1981: \$55 / MBF (Doyle)
 - 2006: \$252 / MBF (Doyle)
- A ton of pine sawtimber stumpage in Louisiana
 - 1955 \$3.92/ton
 - 1969 \$6.27/ton
 - 1984 \$19.85/ton
 - 2004 \$43.06/ton



Real dollars

- Perhaps an oxymoron as real dollars do not exist!
- Real dollars are inflation-adjusted dollars.
 - Expressed in terms of a base year
 - Have constant buying power for that base year
- \$100 (nominal) will buy a certain amount of goods and services today, but probably fewer goods in 10 years.
- \$100 real 2007 dollars will buy the same set of goods today, and in 2017, and 2107!



Why use real dollars?

- In forestry, we have long planning horizons
- Difficult to predict price changes:
 - Silvicultural activities
 - Stumpage prices
- By using real dollars, we can at least ignore one factor we cannot predict well – inflation.
- This is particularly valuable as forestry, due to the time factors involved, is very sensitive to interest rates.
 - Analyses in nominal dollars put forestry at a disadvantage to other, shorter-term investments.



About real dollars

- Disadvantages:
 - Conceptually confusing
 - Cannot use for real-world budgeting
 - Cannot determine tax liability
- Advantages
 - Simpler to use than nominal dollars
 - Can compare projects based on pre-tax basis
 - Eliminates inflation as a concern for long-term financial analyses.



Part 2: Price indices?

- Track the cost of goods and services over time
- Can be specific to:
 - A particular “set” of goods and services
 - A particular region or city
 - A particular consumer group
- Price indices can be for consumers and producers
 - Consumer Price Index (CPI)
 - Producer Price Index (PPI)
- Indices can be found at U.S. Department of Labor Bureau of Labor Statistics web page:
 - www.bls.gov
- We will also look at a price series from *Forest Landowner* that tracks the costs of silvicultural activities in the South and can be used as a price index.




Consumer price index – All Urban Consumers

Year	CPI-U	Year	CPI-U
1980	82.4	1994	148.2
1981	90.9	1995	152.4
1982	96.5	1996	156.9
1983	99.6	1997	160.5
1984	103.9	1998	163.0
1985	107.6	1999	166.6
1986	109.6	2000	172.2
1987	113.6	2001	177.1
1988	118.3	2002	179.9
1989	124.0	2003	184.0
1990	130.7	2004	190.2
1991	136.2	2005	197.4
1992	140.3	2006	202.6
1993	144.5	2007	203.5 (Feb)



What do the CPI numbers mean?

- An index of equal buying power
 - CPI-U for 1983 is 99.6
 - CPI-U for 2003 is 184.0
- That means that the amount of goods that \$99.60 would buy in 1983 would cost \$184.00 in the year 2003!
- Since this is CPI-U, it is a composite based on typical goods that are consumed by people in urban areas across the United States.



Using CPI to determine annual inflation rates

- The formula for calculating inflation is based on the earning rate formula:
 - Where:
 - i = annual compound rate of inflation between years y and x .
 - CPI_y is consumer price index for year y
 - CPI_x is consumer price index for year x

$$i = \left[\sqrt[y-x]{\frac{CPI_y}{CPI_x}} - 1 \right] 100$$



Calculating annual inflation rates...

- Inflation between 1980 and 2003 was:

$$i = \left[\sqrt[23]{\frac{184}{82.4}} - 1 \right] 100 = 3.55\%$$

- Inflation between 1980 and 1982 was:

$$i = \left[\sqrt[2]{\frac{96.5}{82.4}} - 1 \right] 100 = 8.22\%$$

- Inflation between 2002 and 2003 was:

$$i = \left[\sqrt[1]{\frac{184.0}{179.9}} - 1 \right] 100 = 2.28\%$$



Inflation from 1913 to 2003...

$$i = \left[\sqrt[90]{\frac{184.0}{9.9}} - 1 \right] 100 = 3.3\%$$



Adjusting prices for inflation

- Remember that gasoline, in 1993, cost \$1.106 per gallon (national average).
- What would the price of gasoline be in 2003 if gasoline prices had risen like all other prices in the economy?

$$P_t = P_b \frac{CPI_t}{CPI_b}$$

where:

P_t = price in target year

P_b = price in base year

CPI_t = consumer price index in target year

CPI_b = consumer price index in base year

$$P_{2003} = \$1.106 \frac{184.0}{144.5} = \$1.408$$



Adjusting prices, backwards in time...

- What would a 2002 Ford Taurus cost in 1962 dollars?

$$P_t = P_b \frac{CPI_t}{CPI_b}$$

- Cost in 2002: \$13,658


- $CPI_{2002} = 179.9$

- $CPI_{1962} = 30.2$

$$P_{1962} = 13,658 \frac{30.2}{179.9} = \$2293$$

➤ So, for \$2293 1962 dollars we could buy a 2002 Ford Taurus. This is less than the cost of the 1962 Ford Galaxy in 1962 (\$2,645).


➤ Conclusion: The price of a new car did not increase as fast as other goods and services in the overall economy!



Producer price index for lumber and wood products

- The index of costs of all inputs (labor, raw materials, machinery) necessary to produce solid wood products

Year	PPI		Year	PPI		Year	PPI
1980	104.9		1989	125.7		1998	179.5
1981	104.6		1990	124.6		1999	188.2
1982	100.0		1991	124.9		2000	178.8
1983	113.5		1992	144.7		2001	171.6
1984	112.5		1993	183.4		2002	170.6
1985	109.6		1994	188.4		2003	174.8
1986	110.5		1995	173.4		2004	203.6
1987	118.2		1996	179.8		2005	198.6
1988	122.1		1997	194.5		2006	188.3



What's going on with PPI for lumber?

- Rapid inflation
 - 1991: PPI = 124.9
 - 1993: PPI = 183.4
 - 21.2% annual inflation!
 - Inflation rate in lumber producer prices averaged 7.7% from 1991 to 1997!
- Periods of deflation
 - 1997: 194.5
 - 2002: 170.6
 - Deflation of 2.6% per year (-2.6% inflation)
- Causes?
 - Timber price changes (record increases)
 - Costs of energy and labor and transportation

Another price index: costs of forestry practices in the South

- Taken from *Forest Landowner*, Volume 62(2):3-9
- Costs of Southern Forestry practices measured periodically from 1952 to 2002.
- Categories:
 - Prescribed burning, chemically removing undesirable trees, timber cruising, marking trees for harvest, mechanical site preparation, planting by hand and machine, precommercial thinning, fertilization

Costs of Forestry practices in the South, 1952-2004

Forestry Practice	1952	1961	1967	1974	1976	1979	1982	1984	1986	1988
Controlled prescribed burning	0.21	0.68	1.60	2.51	3.65	2.95	4.12	7.16	4.84	6.52
Removing undesirable trees chemically	5.01	7.93	10.17	22.86	23.41	40.23	40.65	64.82	65.61	57.26
Timber cruising	0.30	0.41	0.74	1.03	1.18	1.77	2.18	2.26	3.27	2.47
Marking trees for harvest	0.60	2.10	3.09	4.96	8.05	7.14	14.02	14.63	10.57	8.58
Mechanical site preparation	5.25	14.09	23.52	48.01	73.36	93.09	114.04	90.23	94.21	92.66
Planting by hand	0.0111	0.0163	0.0228	0.0534	0.0534	0.0466	0.0484	0.0485	0.0524	0.0584
Planting by machine	0.0074	0.0120	0.0159	0.0330	0.0384	0.0409	0.0540	0.0505	0.0439	0.0492
Precommercial thinning					25.97	33.22	49.27	43.18	52.44	55.58
Fertilization							38.80	40.35	36.03	65.84
All costs are per acre basis except for planting which is by seedling (does not include cost of seedling itself)										

Forestry Practice	1990	1992	1994	1996	1998	2000	2002	2004
Controlled prescribed burning	8.10	8.14	10.57	14.65	16.58	17.70	14.41	21.08
Removing undesirable trees chemically	63.70	62.73	67.41	67.65	72.32	68.12	70.18	69.45
Timber cruising	2.02	2.49	2.09	3.06	4.10	3.45	5.40	3.32
Marking trees for harvest	8.47	12.72	14.19	12.21	15.06	25.70	65.09	14.62
Mechanical site preparation	87.45	98.42	100.74	108.05	122.14	136.03	166.50	105.23
Planting by hand	0.0597	0.0577	0.0587	0.0607	0.0670	0.0641	0.0800	0.0668
Planting by machine	0.0452	0.0519	0.0592	0.0651	0.0593	0.0770	0.1100	0.1162
Precommercial thinning	55.43	75.71	79.05	89.22	71.27	82.27	102.10	74.98
Fertilization	39.29	43.17	41.01	56.52	54.80	43.08	56.04	50.08
All costs are per acre basis except for planting which is by seedling (does not include cost of seedling itself)								

Cost of timber cruising in the South



Nominal dollars!

Adjusting for inflation

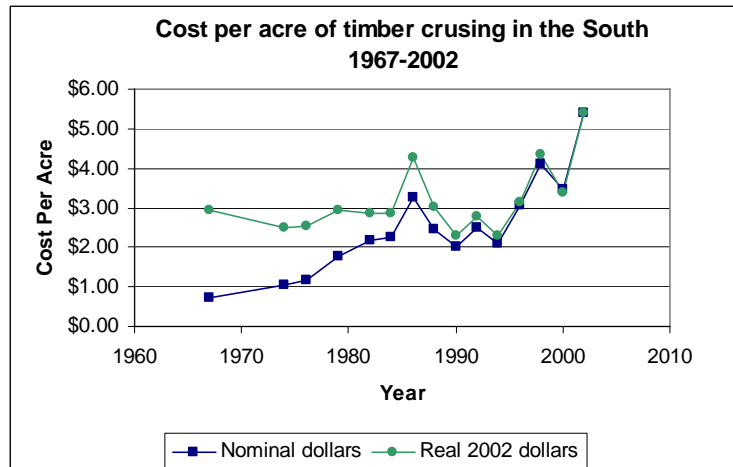
- Use producer price index for all commodities.

● 1967 = 33	1988 = 107	2002 = 131
● 1974 = 54	1990 = 116	
● 1976 = 61	1992 = 117	
● 1979 = 79	1994 = 120	
● 1982 = 100	1996 = 128	
● 1984 = 104	1998 = 124	
● 1986 = 100	2000 = 133	

$$P_t = P_b \frac{CPI_t}{CPI_b}$$

- Adjust all costs to 2002 dollars:
- So, nominal cost in 1976 is \$1.18 per acre
- Cost of cruising in 1976 is \$2.53 in 2002 dollars!

Compare real and nominal dollars



NTLS

Price indices are valuable

- Adjusting costs to a constant (real) dollar basis
 - Eliminates inflation as a price change effect
- Measuring changes in the economy and prices of inputs, cost of living, cost of production
- Predicting cost or price trends into the future



Next lecture...

Sunk and opportunity costs

