



# Preparation for FE Examination

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## INFLATION

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## Topics to be discussed

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- ✓ Definition of Inflation
- ✓ Need to Study Inflation
- ✓ What Causes Inflation?
- ✓ How to Measure Inflation
- ✓ Types of Price or Cost Indices
- ✓ Problems with Price Indices Approach
- ✓ How to Calculate Inflation Rate
- ✓ Relationship between Inflation, Opportunity Cost, and Overall Interest Rate

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Reasons for charging interest:

- Inflation
- Opportunity Cost (Sacrifice made by not spending the money initially)

This lecture deals only with the Inflation part

## What is Inflation?

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- The general increase in the price of goods and services

e.g.1 vending price of coke in 1970 = 5 cents  
vending price of coke in 2000 = 50 cents

e.g.2 Price of labor in 1970 = \$2 approx  
Price of labor in 2001 = \$6 approx

## Need to study Inflation

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To adjust prices and costs of goods and services from one time period to another.

But isn't interest rate OK for that?

Not always. Not every price change is subject to opportunity cost so it is sometimes necessary to isolate price changes due to inflation only.

## What causes inflation?

- When too much money chases too few goods. (i.e., when demand for a commodity exceeds the supply of that commodity).

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So what happens in the reverse case (too little money chases too many goods)?

- This leads to deflation (general decrease in prices of a commodity).

E.g., Price of car fuel (gasoline) deflates occasionally (was 99 cents in Lafayette only 2 weeks ago).

Note: If we all (entire U.S.) decided not to buy any gas tomorrow (Wednesday), it is estimated that the price of gas would fall to less than 20 cents per gallon by Thursday.

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## How to Measure Inflation

e.g. price of 1-ton of steel

<b>YEAR</b>	<b>1975</b>	<b>1980</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>
<b>PRICE</b>	<b>\$940</b>	<b>\$1,000</b>	<b>\$1,180</b>	<b>\$1,252</b>	<b>\$1,316</b>	<b>\$1,530</b>

Choose a base year

(Inflation should always be measured with reference to a base year!)

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YEAR	1975	1980	1985	1990	1995	2000
PRICE	\$940	\$1,000	\$1,180	\$1,252	\$1,316	\$1,530

say the base year is 1980.

Inflation can be measured as :

- the difference from the base year price, or
- the ratio to the base year price, or
- % change from the base year price.



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YEAR	1975	1980	1985	1990	1995	2000
PRICE	\$940	\$1,000	\$1,180	\$1,252	\$1,316	\$1,530

### Difference Approach:

If base year is 1980

Inflation in , say, 1990 =  $1252 - 1000 = 252$

### Interpretation:

In 1990, a ton of steel cost \$252 more than it did in 1980

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YEAR	1975	1980	1985	1990	1995	2000
PRICE	\$940	\$1,000	\$1,180	\$1,252	\$1,316	\$1,530

### Ratio Approach:

If base year is 1980

Inflation in, say, 1990 =  $1252/1000 = 1.252$

### Interpretation:

In 1990, a ton of steel cost 1.252 times more than it did in 1980

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YEAR	1975	1980	1985	1990	1995	2000
PRICE	\$940	\$1,000	\$1,180	\$1,252	\$1,316	\$1,530

### % Change Approach:

If base year is 1980

Inflation in, say, 1990

$$= (1252 - 1000) / 1000 = 25.2\%$$

### Interpretation:

Between 1980 and 1990, the price of a ton of steel increased by 25.2%

Please note the following:

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- \* How much more does it cost now compared to the base year - use the difference approach
  
  - \* How many times more does it cost now compared to the base year - use the ratio approach
  
  - \* What is the relative (or percentage) change between the base year and now?  
- use the % Change approach

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Of these three, which is the most commonly-used measure of inflation?

- The Ratio Approach!

## The Ratio Approach

YEAR	1975	1980	1985	1990	1995	2000
PRICE	\$940	\$1,000	\$1,180	\$1,252	\$1,316	\$1,530

Using 1980 as a base year, the ratio at each year is found as follows:

YEAR	1975	1980	1985	1990	1995	2000
RATIO	0.94	1	1.18	1.25	1.32	1.53

These ratios are called PRICE INDICES, e.g., the price index of a ton of steel in 1995 is 1.316, relative to 1980.

## How Are Price Indices Calculated?

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- To calculate the price index for each commodity or service would be too cumbersome (Far too many!)

- A better method is as follows:

Group standard quantities of a few commodities commonly used in an industry, and then calculate their combined price index (this is called "packaging", or "bundling")

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A price index calculated using the packaging approach is termed as follows:

- Combined Price Index, or
- Composite Price Index, or
- Aggregate Price Index

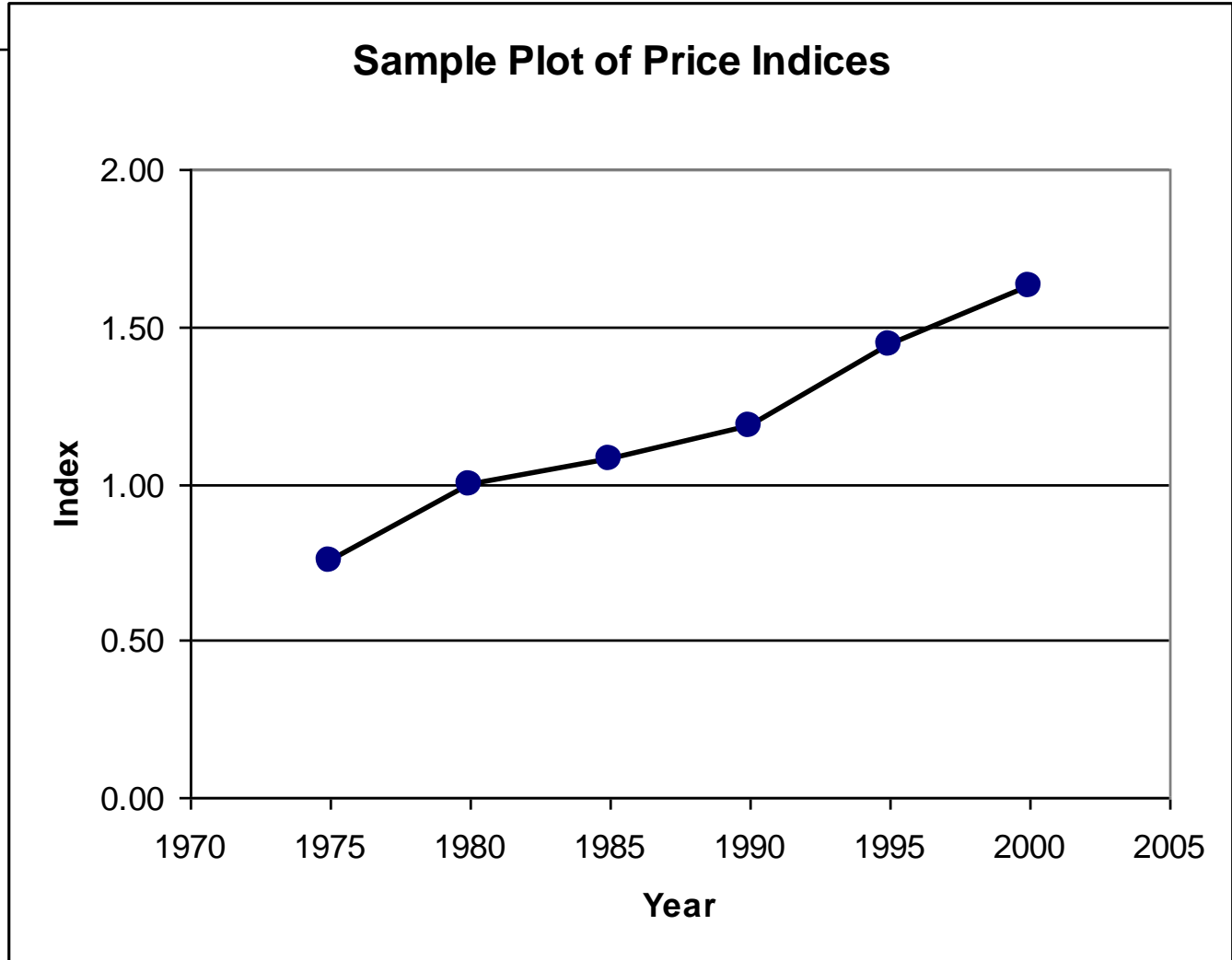


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**Prices of Standard Quantities of Primary Construction Resource**

	<b>1975</b>	<b>1980</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>
<b>Steel</b>	<b>940</b>	<b>1000</b>	<b>1180</b>	<b>1252</b>	<b>1316</b>	<b>1530</b>
<b>Lumber</b>	<b>137</b>	<b>172</b>	<b>186</b>	<b>191</b>	<b>214</b>	<b>258</b>
<b>Cement</b>	<b>780</b>	<b>914</b>	<b>953</b>	<b>1021</b>	<b>1215</b>	<b>1336</b>
<b>Labor</b>	<b>612</b>	<b>721</b>	<b>830</b>	<b>412</b>	<b>516</b>	<b>590</b>
<b>TOTAL</b>	<b>2469</b>	<b>2807</b>	<b>3149</b>	<b>2876</b>	<b>3261</b>	<b>3714</b>

<b>PI<sub>1980</sub></b>	<b>0.88</b>	<b>1.00</b>	<b>1.12</b>	<b>1.02</b>	<b>1.16</b>	<b>1.32</b>
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# Types of Price Indices Commonly Used

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- Construction Cost Index (CCI)

*(Steel, Cement, Lumber, and Common Labor)*

- Building Cost Index (BCI)

*(Steel, Cement, Lumber, and skilled labor)*

- Consumers Price Index Index (CPI)

*(Personal Housing, Transportation, Medical care, Energy, Apparel, etc).*

*This index is mentioned daily on CNN-Financial News*

Indices are also developed and used by several governmental agencies such as U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, U.S. Environmental Protection Agency.

## Cost Comparison using Indices

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$$COST_{YEAR\_i} = COST_{REF\_YEAR} * \frac{COST\_INDEX_{YEAR\_i}}{COST\_INDEX_{REF\_YEAR}}$$

Given any 3 of the variables in the above equation, the fourth can be calculated.

Note that the reference year (REF\_YEAR) may be the base year or any other year

## Example

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The Wabash Bridge on US-52 in West Lafayette/Lafayette had a construction cost of \$6,000,000 in 1987. What would this project cost if it were built in 1999?

(Use the sample plot in the previous 2 sheets).

Ans.

$$\begin{aligned} \text{COST}_{1999} &= \text{COST}_{1987} * (C_{1999} / C_{1987}) \\ &= 6,000,000 * (1.6/1.2) \\ &= \$8,000,000 \end{aligned}$$

# Problems with Price Indices

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- (1) Inconsistency with pre-defined goods at a given time:

In a strict sense, Price Indices apply to buyers who purchase exactly the types and amount of goods and services upon which the Index is calculated.

In reality, however, the purchases of most buyers deviate from the Price Index's predefined package. Therefore the Price Index may not be applicable to everyone.

## Problems with Price Indices (cont'd)

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(2) Changing buying patterns over time: Buying patterns, even for an individual buyer, changes over time, while the composition of the predefined package (upon which Price Index is calculated) remains the same.

## Problems with Price Indices (cont'd)

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### (3) Changing Quality of Goods:

The Price Index approach of measuring inflation assumes that the quality of a standard good or service stays the same over time. Therefore changes in quality of the goods are not considered in indices

In reality, however, the quality of most goods changes over time because through research and development, better products evolve every day.



## Problems with Price Indices (cont'd)

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### (3) Changing Quality of Goods (cont'd)

Examples: The quality of a steel bar in 2000 is far superior than it was in 1970

(higher tensile strengths, higher corrosion resistance, better bonding to concrete, etc).

Goods and services that typically see fast changes in quality are associated with this problem of Price Indices.

In spite of these problems...

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... Price Indices are still considered a useful indicator of price inflation, and are used to adjust your salaries, benefits, etc. so that you can cope with increasing prices.

Also they are used by infrastructure agencies to predict future costs in order that they can prepare more realistic budgets for the future.

# INFLATION RATE

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How do we measure the rate of Inflation:

- Inflation rate is denoted by  $f$
- Can be measured using either
  - \* actual prices, or
  - \* Price Indices

## Calculation of Inflation Rate

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$$f = \left( \frac{FP}{RP} \right)^{\frac{1}{n}} - 1$$

FP = price or price index at a given year

RP = price or price index at a reference year

f = inflation rate per period

n = number of periods

Note: The reference year may be the base year or any other year.

## Calculation of Inflation Rate- An Example

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<b>YEAR</b>	<b>1975</b>	<b>1980</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>
<b>RATIO</b>	<b>0.94</b>	<b>1</b>	<b>1.18</b>	<b>1.25</b>	<b>1.32</b>	<b>1.53</b>

What is the overall inflation rate between 1985 and 2000?

Ans.

$$f = (1.53/1.18)^{1/15} - 1 = 1.74\% \text{ per year}$$

## Calculation of Inflation Rate- Example II

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<b>YEAR</b>	<b>1975</b>	<b>1980</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>
<b>RATIO</b>	<b>0.94</b>	<b>1</b>	<b>1.18</b>	<b>1.25</b>	<b>1.32</b>	<b>1.53</b>

What is the overall inflation rate between 1975 and 1995?

Ans.

$$f = (1.32/0.94)^{1/20} - 1 = 1.71\% \text{ per year}$$