

**Finance 30220**  
**Solutions to Problem Set #1**

1) When Father Theodore Hesburgh became president of Notre Dame in 1952, the endowment was \$7M. Over the past 56 years, it has grown to its current value of \$6.5B (this ranks Notre Dame as the 17th largest endowment in the country - Harvard is #1 with \$35B).

- Calculate the total return on the endowment from 1952 to 2005. Calculate the annualized return.

This is tricky...we could calculate this using the usual percentage change formula

1952: \$7M

2008: \$6,500M

$$\left(\frac{6,500 - 7}{7}\right) * 100 = 92,757\% \text{ (Wow! That's a BIG number).}$$

Suppose that we divide by the ending value rather than the starting value...

$$\left(\frac{6,500 - 7}{6,500}\right) * 100 = 99.9\% \text{ (This can't be right!)}$$

What if we split the difference and divide by the average of the starting and ending value (3,254)

$$\left(\frac{6,500 - 7}{3,254}\right) * 100 = 200\%$$

Or, we could take the difference in natural logs

$$[\ln(6,500) - \ln(7)] * 100 = 683\%$$

This is a big difference!

$$\left[ \left( \frac{6500}{7} \right)^{\frac{1}{56}} - 1 \right] * 100 = 13\%$$

Or,

$$\frac{[\ln(6,500) - \ln(7)] * 100}{56} = 12.2\%$$

- What is the difference between a nominal variable and a real variable?

Nominal variables are in terms of current dollars. Real variables are in terms of constant dollars.

- The CPI in 1952 was 26.5 while the CPI in 2008 was 211 (1983 = 100). Convert both the 1952 endowment value and the 2008 endowment value to 1983 dollars.

First, scale up the 1969 endowment to 1983 dollars:

$$E_{1969} = (\$7M) \frac{100}{26.5} = \$26.4M$$

Now, scale back the 2008 endowment from 2008 dollars to 1983 dollars.

$$E_{2005} = (\$6,500M) \frac{100}{211} = \$3,080M$$

- Now, calculate the annualized real return the Notre Dame endowment.

Now, repeat part (b)

$$\left[ \left( \frac{3,080}{26.4} \right)^{\frac{1}{56}} - 1 \right] * 100 = 8.9\%$$

Or,

$$\frac{[\ln(3080) - \ln(26.4)] * 100}{56} = 8.5\%$$

- 2) Suppose that the US and Germany produce two goods: Hot Dogs and Hamburgers. We have the following local prices and production levels in Germany and the US (US prices are in dollars, German prices are in Euro).

	US Production	German Production	US Price	German Price
Hot Dogs	3M	2.5M	\$3.50	E 2.25
Hamburgers	6M	3M	\$4.25	E 3.50

Suppose that the current exchange rate is \$1.30 per Euro. Calculate GDP in the US and Germany using the PPP approach and the market exchange rate approach.

The PPP approach calculates GDP in both countries using prevailing prices in the US.

$$\text{US: } (3\text{M})(3.50) + (6\text{M})(4.25) = \$36\text{M}$$

$$\text{Germany: } (2.5\text{M})(3.50) + (3\text{M})(4.25) = \$21.5\text{M}$$

The market exchange rate approach calculates German GDP in Euro and then converts it to dollars with the current exchange rate.

$$\text{Germany: } (2.5\text{M})(2.25) + (3\text{M})(3.50) = \text{E } 16.13\text{M (in Euros)}$$

$$\text{Now, to convert to dollars, multiply by the exchange rate: } \text{E } 16.13\text{M} * 1.30 = \$20.97\text{M}$$

- 3) What is the Gini coefficient? If the Gini coefficient is increasing, what does this tell you about an economy? How might you explain the change in the Gini coefficient in the US over the past 50 years?

The Gini coefficient is a measure of income inequality. An increase in the Gini coefficient indicates that the distribution of income is becoming more uneven.

- 4) In 1980, the price level was 76.7 while today it is 208.6. Calculate the average annual inflation rate in the US over the past 27 years.

$$\left[ \left( \frac{208.6}{76.7} \right)^{\frac{1}{27}} - 1 \right] * 100 = 3.77\%$$

Or,

$$\frac{[\ln(208.6) - \ln 76.7] * 100}{27} = 3.70\%$$

- 5) Currently, the 3 month yield on a 90 day T-Bill is .46% while the cumulative 5 year yield on a 5 year T-Note is 17.5%. Calculate the annualized yields on these securities.

90 Day T-Bill:  $(1.0046)^4 = 1.0185 \Rightarrow 1.85\%$

5 Year T-Note:  $(1.175)^{\frac{1}{5}} = 1.0328 \Rightarrow 3.28\%$