

## PERCENT INCREASES AND DECREASES: WHAT DO THEY MEAN?

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Consider the following problem:

The value of each share of HiTech stock, when issued in 1993, was \$20. During 1993 the stock increased 20% in value. In 1994 the stock's annual performance showed a decrease of 10%. In 1995, each share showed an annual gain of 40%. What is the current value of the stock?

Students' who have little or no experience with or understanding of the stock market and changes in stock value might easily come up with two interpretations for this problem.

### Interpretation #1

		<u>Value</u>
Initial value of stock when issued in 1993		\$20.00
20% increase in 1993	(.20 x \$20 = \$4)	\$24.00
10% decrease in 1994	(.10 x \$24 = \$2.40)	\$21.60
40% increase in 1995	(.40 x \$21.60 = \$8.64)	\$30.24

The percentage increase in the stock from its initial date of issue in 1993 to the end of 1995 can be calculated as  $\frac{\text{Final Value} - \text{Initial Value}}{\text{Initial Value}}$ .

Using Interpretation #1 this would be  $\frac{30.24 - 20.00}{20.00} = \frac{10.24}{20.00} = .512$  or 51.2%.

### Interpretation #2

		<u>Value</u>
Initial value of stock when issued in 1993		\$20.00
20% increase in 1993	(.20 x \$20) = \$4	\$24.00
10% decrease in 1994	(.10 x \$20) = \$2	\$22.00
40% increase in 1995	(.40 x \$20) = \$8	\$30.00

This interpretation assumes that the percentage increase is always figured on the initial value. The percentage increase in the stock from its initial date of issue in 1993 to the end of 1995 according to Interpretation #2 would be  $\frac{30 - 20}{20} = \frac{10}{20} = 50\%$ .

Question: What was the "average" annual increase for 1993, 1994, and 1995?

Is it approximately 16.7% which might be calculated from  $50\% \div 3 = 16.7\%$  or the average of the annual percentages

$\frac{20\% - 10\% + 40\%}{3} = 16.7\%$ ? Or is it  $51.2\% \div 3 = 17.1\%$ ?

When dealing with stocks, interpretation #1 is the more common way of viewing the percent changes in the value. That is, percentage gain is "benchmarked" against the previous year's closing price.

Interpretation #2 is a common way of interpreting the change in purchasing power for a fixed amount of money in a given year. Thus, a 5% increase in inflation is often interpreted to mean a 5% decrease in purchasing power as indexed to a fixed year.

An understanding of the different interpretations is important for all citizens since data is often reported to consumers without explicitly clarifying which method is being used for calculations. The table below describes the audited performance record of Wall Street expert John Dessauer's recommended portfolio for stocks. It leaves room for multiple investment interpretation.

	<u>Annual Performance</u>	<u>Cumulative Gain</u>
1982	20.1%	20.1%
1983	21%	45.3%
1984	0.0%	45.3%
1985	41.8%	106.1%
1986	20.2%	147.7%
1987	-10.9%	120.7%
1988	27.7%	181.8%
1989	21.1%	241.3%
1990	-16.5%	185.0%
1991	36.8%	289.8%
1992	11.8%	335.8%
1993	23.1%	436.5%
1994	-5.8%	405.4%

(A hypothetical investment of \$150,000 in 1982 would have been worth \$758,100 in 1994.)

Look at this table carefully.

- How is it possible for an annual gain in 1988 of 27.7% to translate into a cumulative gain of 61.1%?
- How is it possible for an annual gain in 1993 of 23.1% to translate into a cumulative gain of 100.7%?
- How can an annual gain which is less in 1993 than in 1988 can produce a larger percent cumulative gain in 1993 than in 1988?
- If the average annual rate of inflation during this time period was 4%, what gain in *purchasing power* does this investment represent?

The preceding illustrates how data can give a distorted impression depending upon the interpretations and assumptions given to the data. Being aware of such interpretations and assumptions empowers each of us to have a greater understanding of the "real world" and to be more intelligent consumers in this "Information Age". 📖