Inflation Matters

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Popular newspapers and magazines devote a great deal of ink to inflation. Whether it's up or down, the business community cares about inflation a lot. That's because it affects interest rates, consumer behavior, and business planning. Unfortunately, those same publications will often present data in graphs and tables without correcting for that very important factor, and in the process they distort the meaning of those data.

When the U.S. Postal Service announced in May 1998 that it would be granted an increase in the price of a first-class stamp in 1999, The *San Francisco Chronicle* presented a summary of the new rates and printed a graph of first-class postal rates since 1885. This graph showed a huge increase in prices, from 2¢ in 1885 to 33¢ in 1999. An uninformed observer might easily have concluded from this graph that the price of first-class mail had skyrocketed, particularly since the 1970s. The problem, of course, is that the graph was not corrected for inflation, and nowhere did the *Chronicle* article mention this omission. The *Oakland Tribune* story on the same topic correctly reproduced two graphs, one in current dollars and one in inflation-adjusted dollars. The *Tribune* graph showed that the 33¢ price of first class mail in 1999 actually represented a decline in constant dollars from 35¢ in 1885.

A more recent example appeared in the investor newspaper *Barron's* in September 2007. Figure 1 is my version of the *Barron's* graph, plotted using the acquisition price for crude oil imported to U.S. refineries.

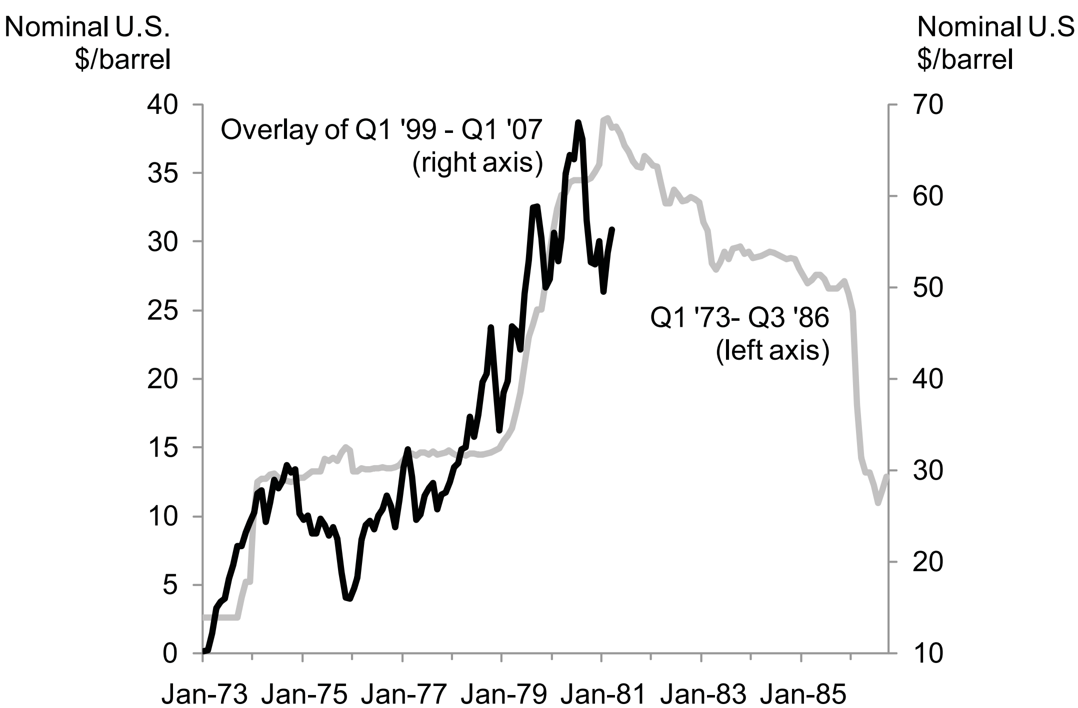

Figure 1: Nominal refinery acquisition cost for imported crude oil to the U.S. Price data taken from the U.S. Energy Information Administration <http://www.eia.doe.gov/emeu/cabs/AOMC/Overview.html>.

The reader was asked to compare two segments of the time series of oil prices and marvel at how similar they looked. “I’ve seen this movie before,” said the person being interviewed about his predictions about future oil prices, implying that the similarity in the two graphs made a subsequent drop in oil prices likely. Regardless of the merits of that argument (and there are some) it is in this case based on false premises: It is simply incorrect to compare nominal prices from two different time periods without correcting for inflation. Even a normally excellent business publication like *Barron’s* can fall into this trap, but you need not be misled.

There are some other problems with this graph as well. First notice that the scales don’t even cover the same ranges. The right hand scale, which applies to the data from the second period, goes from $10 to $70 per barrel. The left hand scale, which applies to the first data series, ranges from $0 to $40 per barrel. So not only are the data in nominal dollars, which are not comparable, but they are scaled to different axes, compounding the confusion.

Using an axis that does not extend to zero without noting it for the reader is a problem that has been well known for more than five decades (with the publication of *How to Lie with Statistics* in 1954), but people still introduce this distortion with disturbing frequency. This technique helps to hide an important feature of the data in this graph. The curves look comparable, but the ratio of the highest price in each data series to the lowest shows that the magnitude of changes they represent isn’t the same (even putting aside the error introduced by not correcting for inflation). The price increase in the first data series is about a factor of 15 in nominal terms from the first year to the year with the highest price, while it is only about a factor of seven for the second data series over a comparable time period. So what happens if I plot the graph using the same axis for both series?

Figure 2 shows the result, which makes the situation a little clearer.

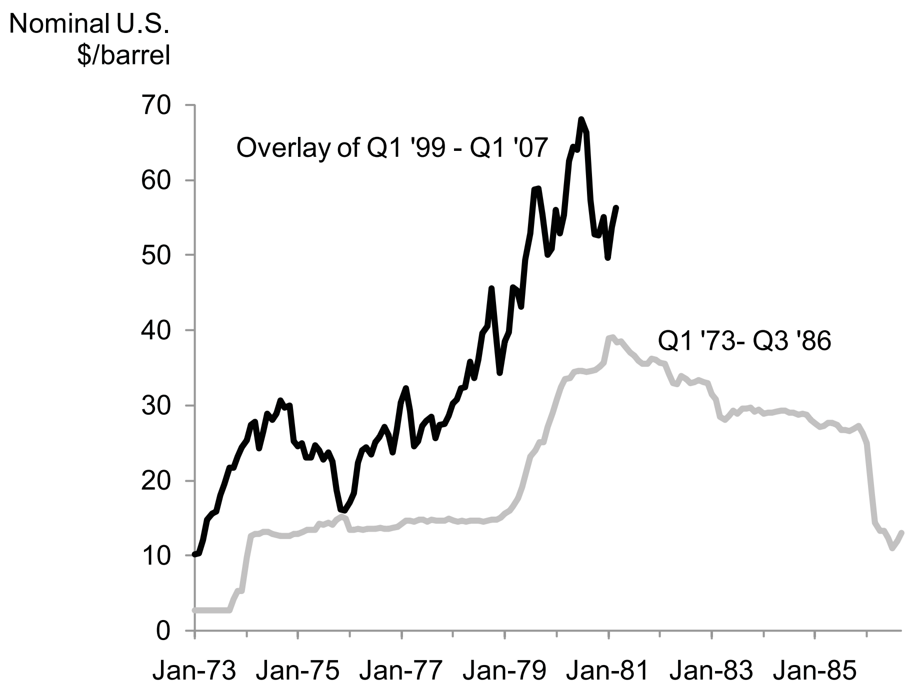

Figure 2: Nominal refinery acquisition cost for imported crude oil to the U.S.

Of course, comparing nominal dollars from different time periods doesn't make much sense, so Figure 3 shows what the graph looks like after it is corrected to constant 2006 dollars.

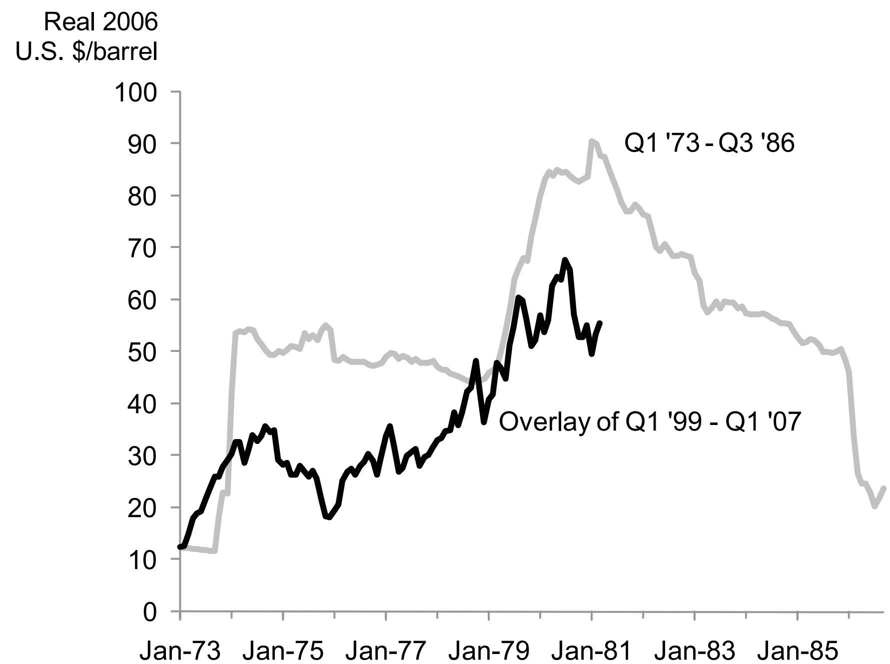

Figure 3: Real refinery acquisition cost for imported crude oil to the U.S.

A clearer way to show price trends is as an index over time, as shown in Figure 4.

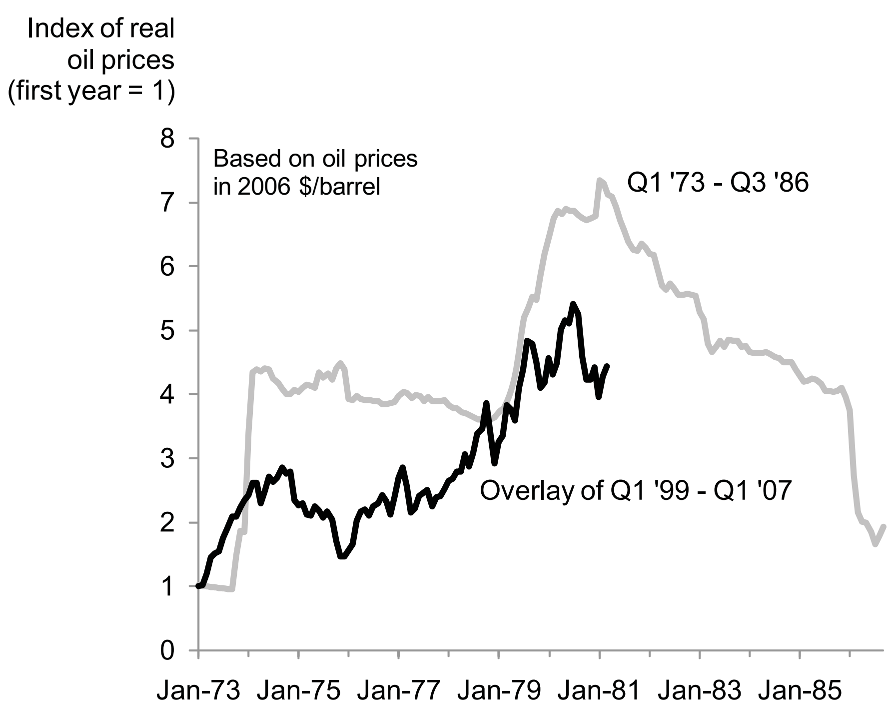

Figure 4: Real refinery acquisition cost for imported crude oil to the U.S.
(First year of time series = 1.0)

Admittedly this graph looks pretty similar to Figure 3, but it is a more straightforward way to make such comparisons (and if the starting points for each data series were at a different price, Figure 4 would be much more informative).

These last two graphs tell a very different story. First, they show clearly that the magnitude of the price increase in real terms from the beginning to the highest price point for the two eight year periods is different (a factor of 7.4 for the earlier period and a factor of 5.4 for the later period). They also show that the shape of the price trajectories aren't nearly as similar as Figure 1 implied. In the first period, the real price of oil increased by a factor of more than four over a one-year period, then dropped only slightly over the next six years. After that period of modest price changes, the real price almost doubled over a two-year period. The graph representing the second period shows an increase in real terms of about a factor of three over a two year period, then a drop over one year that brought the price almost back to initial year levels. Prices then increased steadily over the next five years.

Determining that the same causal forces are at work in different time periods requires a level of statistical analysis and sophistication that few people can muster I would be hard pressed to argue that Figure 4 shows anything other than two independent and unrelated price paths during periods of rising prices. It is only the distortions introduced by the use of nominal dollars and inconsistent axis scales that allowed the subject of the *Barron's* interview to argue that comparison of these two time series could yield insight into the course of future oil prices. You should not let such distortions color your judgment, your investment decisions, or your analysis.

Over time, inflation makes each dollar worth less, so a dollar spent in 1997 is not the same as a dollar spent in 1990. Any time you present tables or figures that include dollars, you must therefore specify "current dollars" or "constant dollars in some year." Current (also known as nominal) dollars imply that if the money is spent in 1990 it is in 1990 dollars and if spent in 1997 it is in 1997 dollars.

Alternatively (and more accurately in my view), you can correct for inflation using an inflation index from the *Statistical Abstract of the U.S*. to calculate all expenditures in constant dollars. The most common indices for this purpose are the Consumer Price Index and the implicit Gross Domestic Product (GDP) deflator (sometimes called the "chain-type price index for GDP"), but sometimes a more specialized index for a particular material or industrial sector comes in handy. The expenditures in current dollars in 1990 would then be converted to 1997 dollars by multiplying them by the following factor:

$$\frac{\text{Inflation index in 1997}}{\text{Inflation index in 1990}}$$

If the inflation index in 1997 is 1.5, and the inflation index in 1990 is 1.2, then expenditures in 1990 must be multiplied by 1.5/1.2 or 1.25 to convert them to 1997 dollars. All other years would be treated similarly using the appropriate inflation index (of course, 1997 expenditures are already in 1997 dollars). The correction is a simple one, which makes it all the more puzzling why newspapers and magazines don't normally make that correction by default. You need not fall into that trap.

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About the Article

This article was adapted from Chapters 33 and 35 of the revised and updated 2nd edition of *Turning Numbers into Knowledge: Mastering the Art of Problem Solving*, by Jonathan Koomey, which will be released on April 28, 2008 <http://www.analyticspress.com>.

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