## Heating Oil Price History

The first chart is taken directly from the Energy Information Administration website at (http://www.eia.doe.gov/emeu/steo/pub/fsheets/real_prices.html). (the chart is on the lower right of that page). The "Nominal Price" shows the actual price that was paid at any time; the "Real Price" adjusts that price to account for inflation. At the same webpage the Excel sheet that generated this chart can be downloaded (this gives the actual data as opposed to "eyeballing" the chart). Data from the Excel sheet was taken and the following summary data calculated:

	1980	2008	Total Change
Nominal Price*	$0.98	$3.75	282 %
Real Price*	$2.61	$3.79	45 %

note - these values are based on the annual averages. The average for 2008 includes four projected months (Oct – Dec). Similar values would be obtained using different methods such as include only actual data for 2008 (i.e., January - September 2008), or use Quarterly averages, or use monthly data without averaging
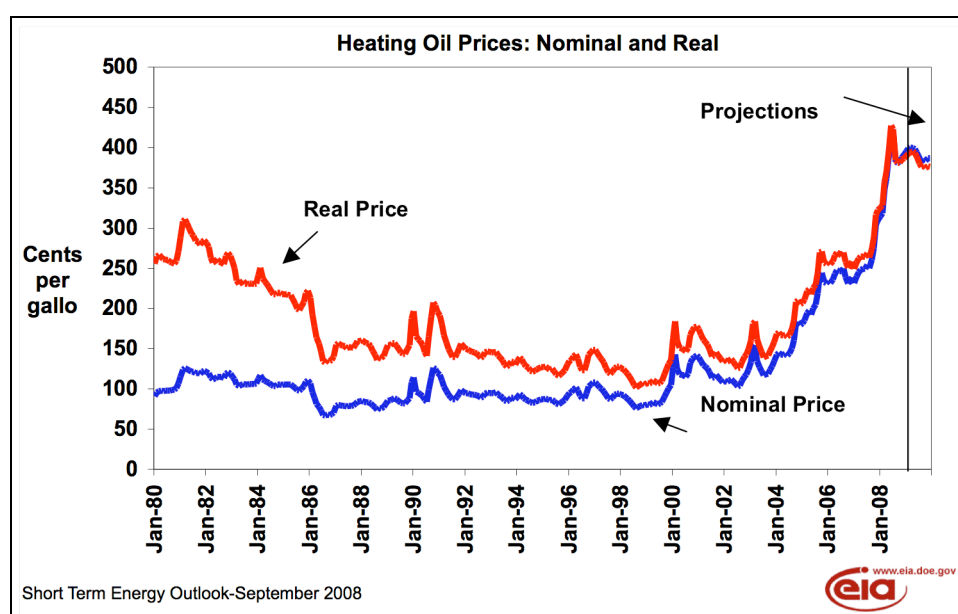

Historic Price Analysis

The next chart shows the calculation of averages. This is not particularly meaningful in that it shows only what would have happened if there had been no volatility throughout the entire period but the starting (1980) and ending (2008) points were maintained. **It is, however, the only way to check the veracity of a statement such as, "the average price increase has been xx% per year.** These exponential curves are calculated and drawn to start/stop at the 1980 Average/2008 Average price. To calculate history look at the start points (Nominal = $0.98 and Real = $2.61) and determine the constant percentage increase needed each year to hit the endpoint (Nominal = $3.75 and Real = $3.79). There are 29 years in this analysis (the start year, 1980, and 28 additional years). The calculations to hit the endpoint are Real $= (\$2.55) * 1.0134^{28}$ and Nominal $= (\$0.98) * 1.049^{28}$. This shows that on average:

- **the Real price has increased by an average of 1.34% per year since 1980 , and**

- **the Nominal price has increased by an average of 4.9% per year since 1980** *(this shows that a 280% price increase over 28 years is not 10% per year - it is 4.9% per year compounded)*

A comment on inflation. Total inflation since 1980 can be calculated as a ratio of the 1980 Real and Nominal prices (if there was zero inflation the prices would be identical). The ratio is $2.61÷$0.98 or 2.66. Therefore it takes $2.66 in 2008 to buy what $1.00 would have bought in 1980 (at least to the accuracy of the "official" rate of inflation). Most people that have a quarrel with the official inflation rate (the CPI) say that it understates inflation; if true that would mean that the <u>Real</u> growth in oil price has been less than the calculated 1.34% per year.

Consider what the chart shows. The area under the Real/Nominal Price curves gives a visual indication of what people actually spent in heating their house for twenty-nine years (in current and then-year dollars). The area under the historic averages is what they should have <u>expected</u> to pay if, in 1980 they believed somebody who made an uncanny prediction that, "Real heating oil prices will increase 1.34% per year between now and 2008". That prediction would have been amazingly correct even though for the first twenty-seven years they would have looked totally incorrect. In actuality the total price paid over time was about one-half of what the average annual increase would have predicted.

With the dramatic price increase of the past few years it's easy to forget that for most of the 1980's and 1990's heating oil prices were fairly steady. Year-to-year prices actually declined half of the time (Nominal) and more than half of the time in Real terms.

Heating Oil Prices: Nominal and Real

Short Term Energy Outlook-September 2008
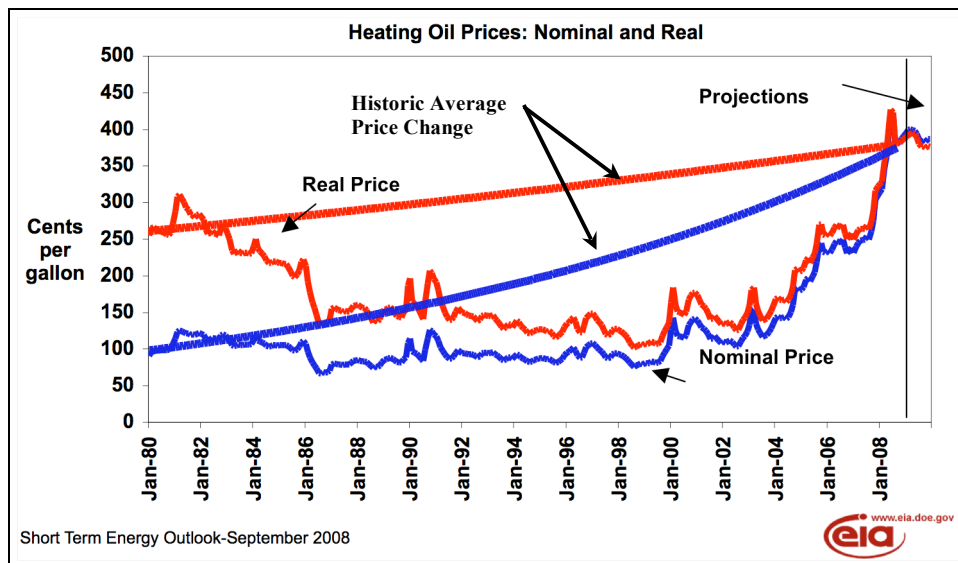
Price Projection

Averages are, again, not particularly meaningful. Looking at average change per year is a way to evaluate price history but it is not necessarily appropriate for projecting the future. The reason is that whether annualized or not the endpoints could be extremes (and in the case of heating oil, <u>are</u> extremes). If the extreme is short lived it is considered a "scatter point" with minimal statistical value. Therefore, for the third and final chart I have used Microsoft Excel to generate "Projected Prices" lines based on least squares. This is a statistical projection that forms a "best fit line" based on the entire database; both the magnitude of the price and the time-weighted value of the price factor into the projection (the best fit has essentially the same area under the curve as the Nominal or Real Price, but it attenuates the volatility). Observations:

- The best fit lines are mostly below their respective Real/Nominal Price plots for the first six years (the oil price was higher than the trend line, indicating atypically high prices)

- The best fit lines are mostly above their respective Real/Nominal Price plots for the next eighteen years (the oil price was lower than the trend line, indicating atypically low prices)

- The best fit lines are mostly below their respective Real/Nominal Price plots for the last four years (another period of high oil price overall, but the extreme divergence from the trend line has occurred only in the past year)

The Projected Real Price line shows a very moderate uptrend, from ~ $1.75 to ~ $2.05 per gallon over twenty-nine years. <u>That is about 0.5% per year</u>. This line can be extended for whatever period you want. (this shows that even the 1.34% increase in Real Price - based on averages - overstates the statistical trend because it has to "hit the endpoint"). The Nominal Price projection is approximately 4% per year – 3.5% of that is inflation.

Short Term Energy Outlook-September 2008
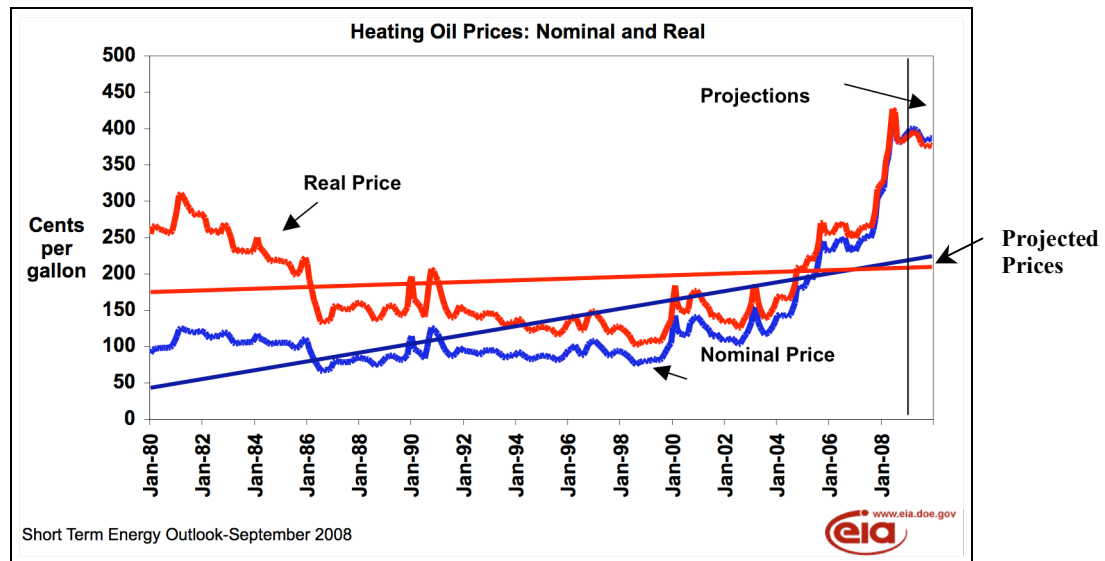
Observation/Conclusion

- For most of the 1980's and 1990's the Real Price for home heating oil declined.

- From 2003 to mid-2008 the increase has been dramatic; since mid-2008 an equally dramatic decline has occurred. It is too early to tell if this is a short-term move or the start of another period of decline (a reversion to the mean). A similar situation existed in 1981 with a price spike. Nearly twenty years of mostly decreasing prices followed.

- There has been very little Real Price increase for heating oil. <u>There is no basis to state that an 8% to 10% annual increase (or anything remotely close to that) is supported by a long-term history</u>.

- Statistically, a case for an annual increase (in Real Terms) of ~ 0.5% can be made based on history. (as stated earlier the case can also be made for 1.34%/year but that could only be done by simply using averages; averages are not a valid statistical process for projections).

- The extreme volatility of the past few years is not statistically significant (at least so far). Nor is the dramatic decline of the past few months. Statistically, duration is as important as magnitude.

- Nearly all of the historic change in heating oil price is due to inflation – most everything is more expensive with time. Wages adjust accordingly.

- The EIA data shows high volatility. Predicting an oil price trend is less certain than a trend for other items as there are too many unknowns (nobody can accurately predict wars, geopolitics, speculation or the condition of the world economy). But if someone wants to make a case based solely on history, the only legitimate way to do so is the best-fit line.

- The people that are paid to study this (the Energy Information Agency) actually predict a significant <u>decrease</u> starting next year (if interested go to http://www.eia.doe.gov/oiaf/forecasting.html and download the spreadsheet identified as "AEO=yearly projections to 2030").

- As a final note, the case was made that it is inappropriate to try to correlate crude prices to home heating oil prices. This too is incorrect and again I turn to the EIA for the facts. The following is taken directly from their site – crude oil and heating oil track with consistency; there may be a few months lead-lag but crude and heating oil move together.

Figure 2. Heating Oil Prices Follow Crude Oil

Monthly Prices

Source: EIA, Petroleum Marketing Monthly, January 1995-present