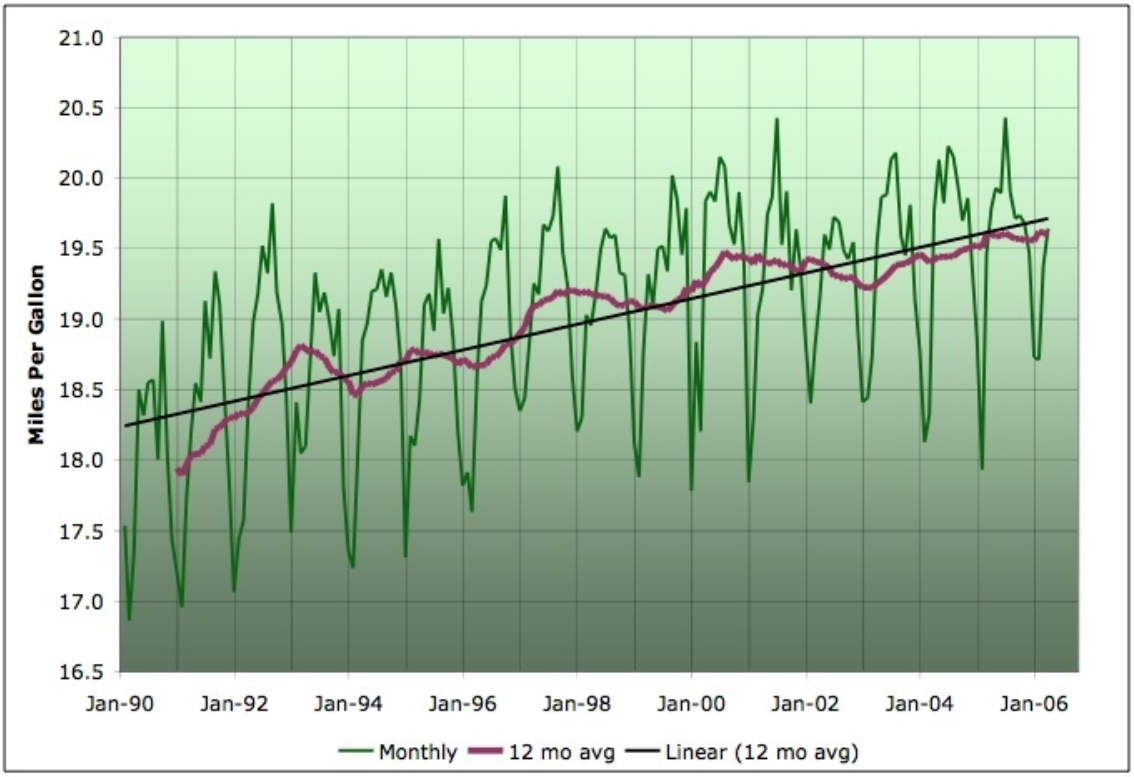
The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

Recent VMT and Fuel Economy Trends

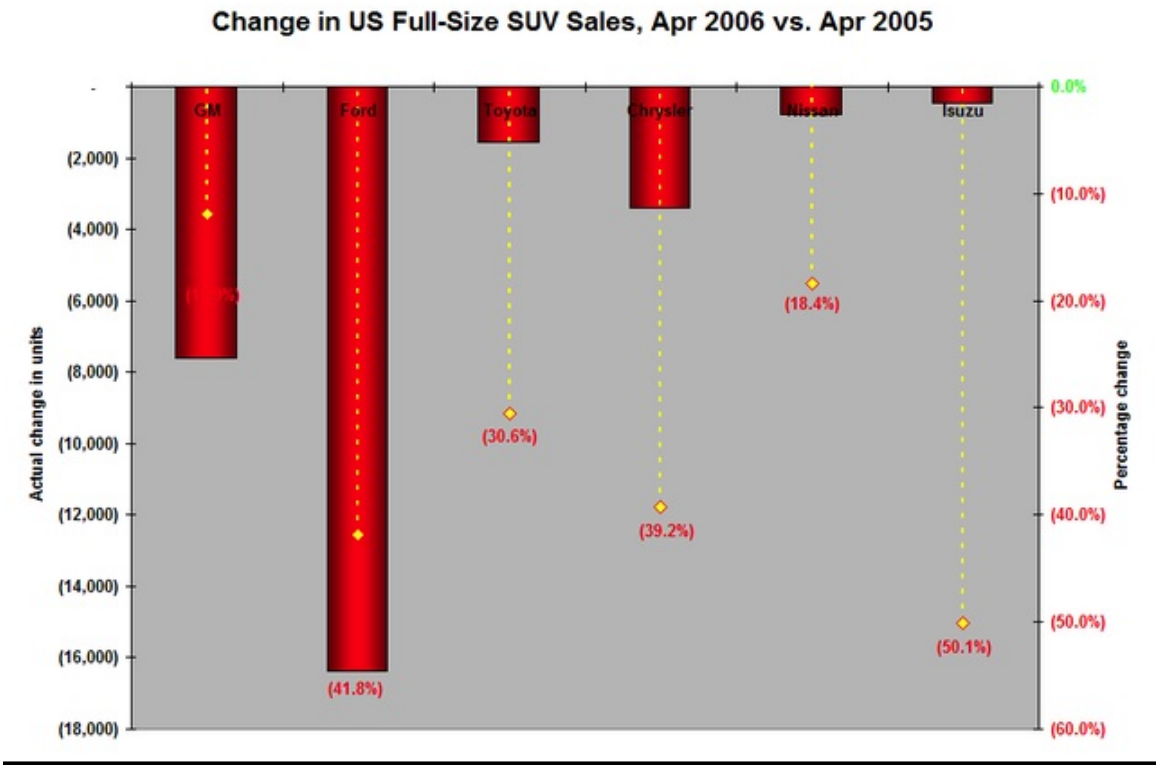
Posted by Stuart Staniford on June 12, 2006 - 3:11am
Topic: Demand/Consumption
Tags: fuel economy, peak oil, vmt [list all tags]

Also known as **Name Those Wiggles!!?**. See discussion below for some ideas.



Estimate of US deployed gasoline fuel economy by month, Jan 1990-Mar 2006, with 12 month trailing average and linear trend. Graph is not zero-scaled. Click to enlarge. Source: FHWA for VMT stats, EIA for gasoline supplied, and Transportation Energy Data Book for diesel vehicle correction. See text for details.

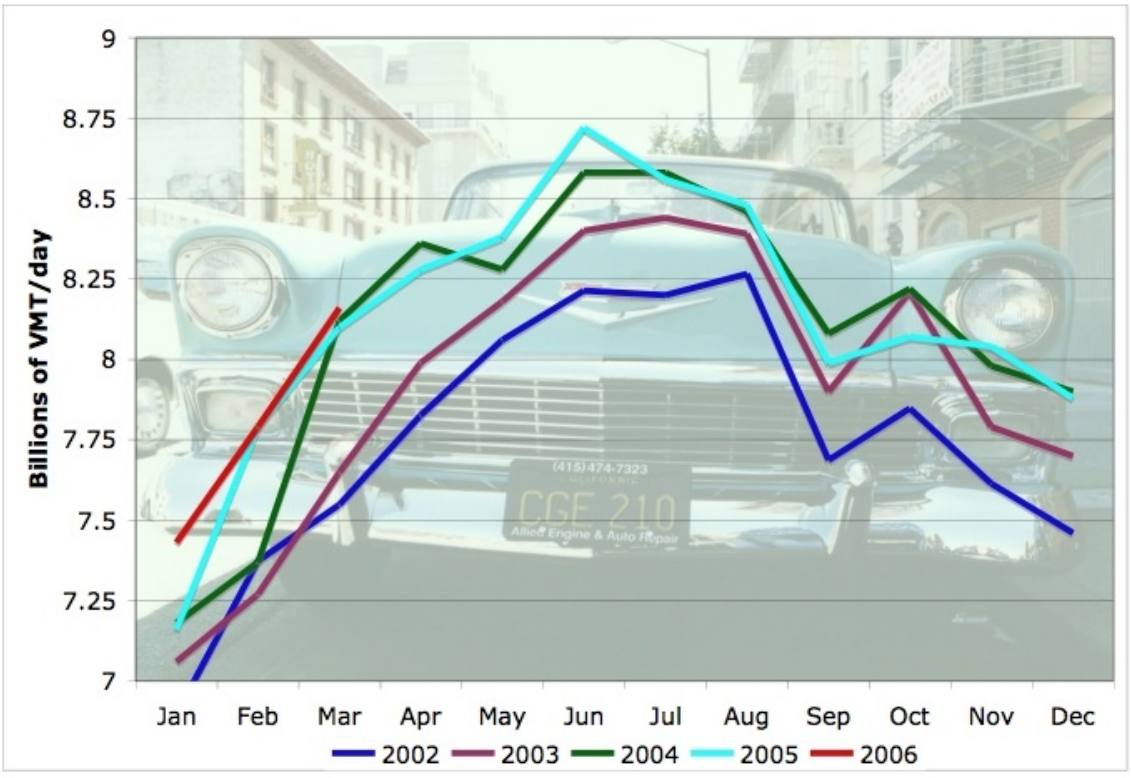
The March FHWA Travel Volume Trends is out, and I wanted to dig in and see how high gas prices have been affecting things. We know that we are now starting to see noticeable effects in the vehicle sales mix. For example, sales of full-size SUVs have started to seriously hurt:



Change in full sized SUV sales for various manufacturors from April 2005 to April 2006. Graph is not zero-scaled. Click to enlarge. Source: [Green Car Congress](#).

Can we see much other change?

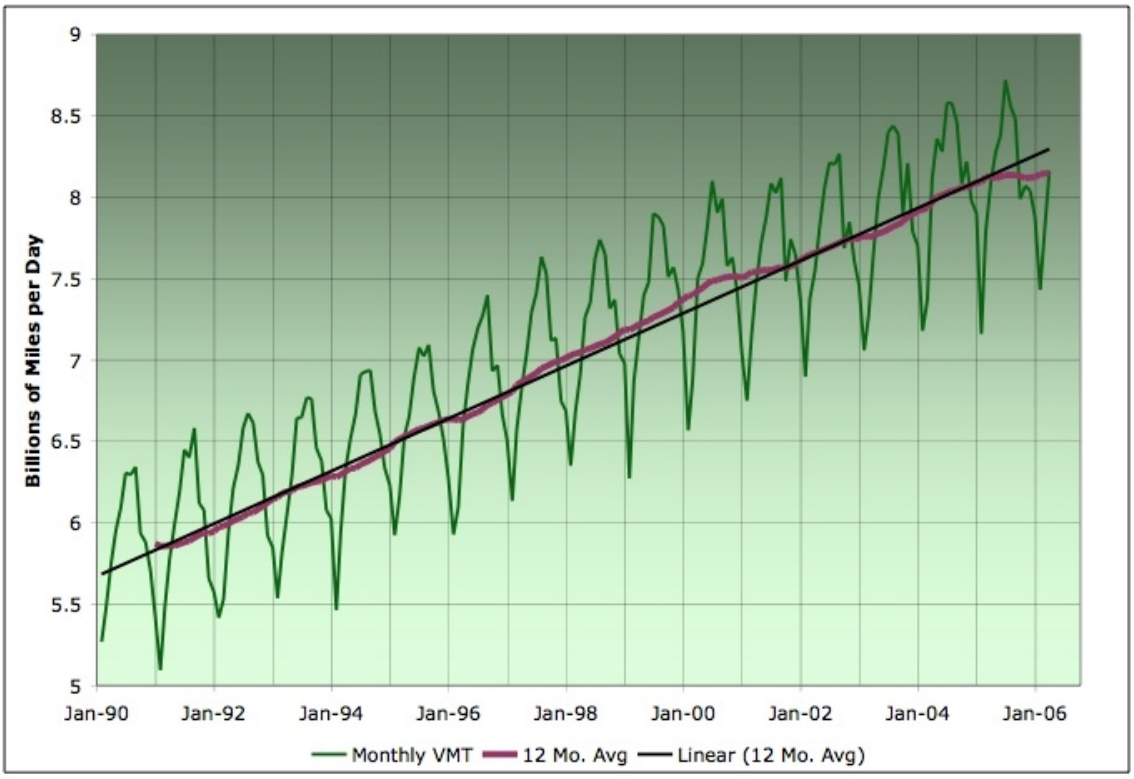
Well, I started with my customary graph of monthly vehicle miles traveled (VMT - an estimate of total daily volume of vehicle travel by all vehicle types on US roads). That graph looks like this:



Monthly US vehicle miles traveled 2002-2006. Graph is not zero-scaled. Click to enlarge. Source FHWA.

(Note that I added 2002, so the timescale now included the same period as my plateau graphs). The pattern of being roughly flat over the prior year continues.

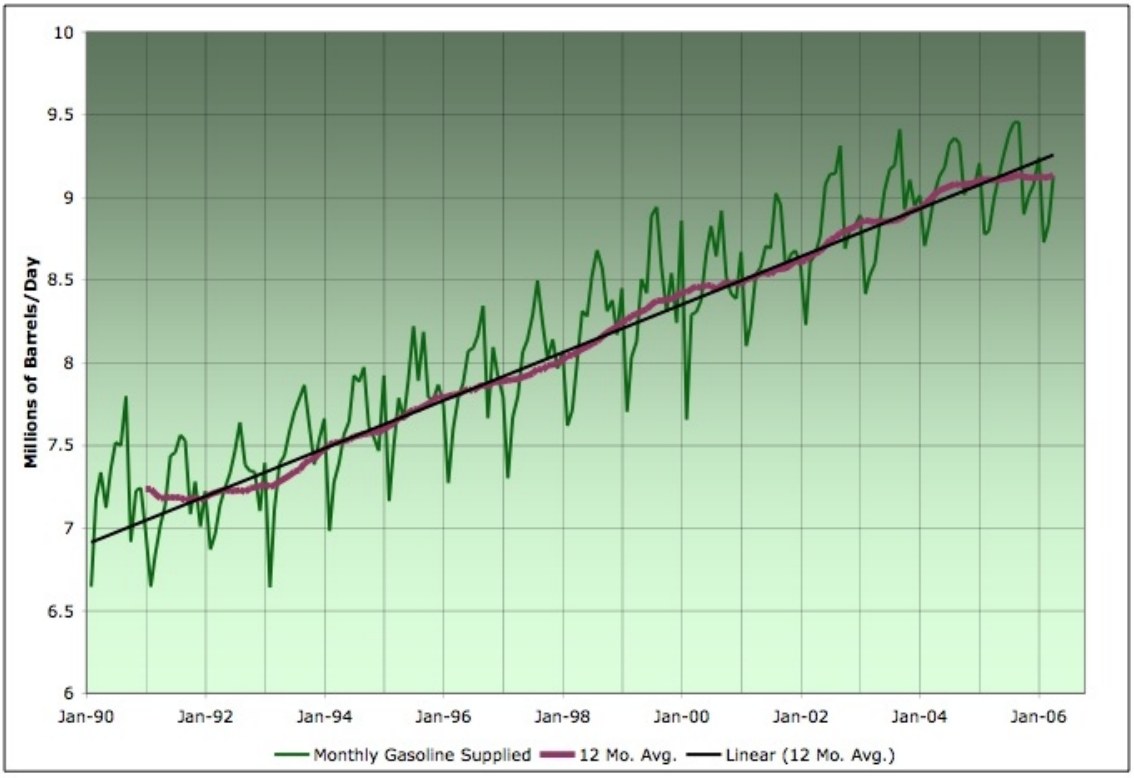
Last time we talked about VMT stats, Halfin suggested that the monthly data might, because of its noisiness, conceal trends worth exploring. This seemed a fair point, and I decided to compile a monthly series going back as far as the Travel Volume Trends go (which is the beginning of 1990). That series looks like this:



Monthly US vehicle miles traveled 1990-2006, together with 12 month trailing average and linear trend. Graph is not zero-scaled. Click to enlarge. Source FHWA.

This seems fairly as expected based on my past analysis of VMT statistics. There's a linear trend, there's seasonal fluctuations as people drive more in the summer and less in the winter, and then there's wiggles in the 12 month average due to the 2001 recession, and more recently due to the recent run up in prices associated with the oil supply plateau. You can see that VMT has gone roughly flat in the last year, versus its usual rise of around 160 million miles/day with each passing year.

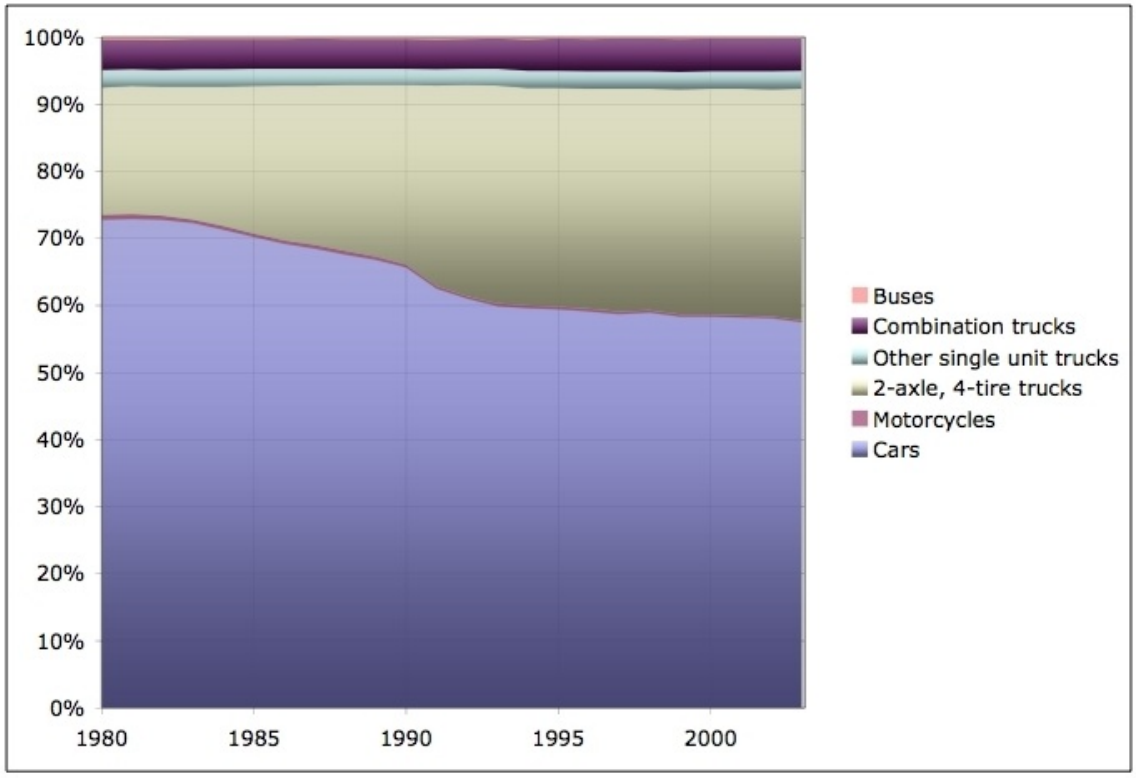
But much more intriguing are the fuel economy stats. Last time, I started to construct a deployed fuel economy series by taking the finished gasoline supplied stats from the EIA, and dividing them into the VMT. The gasoline stats look like this:



US Finished Motor Gasoline Supplied, daily average by month, Jan 1990-Mar 2006, with 12 month trailing average and linear trend. Graph is not zero-scaled. Click to enlarge. Source: EIA.

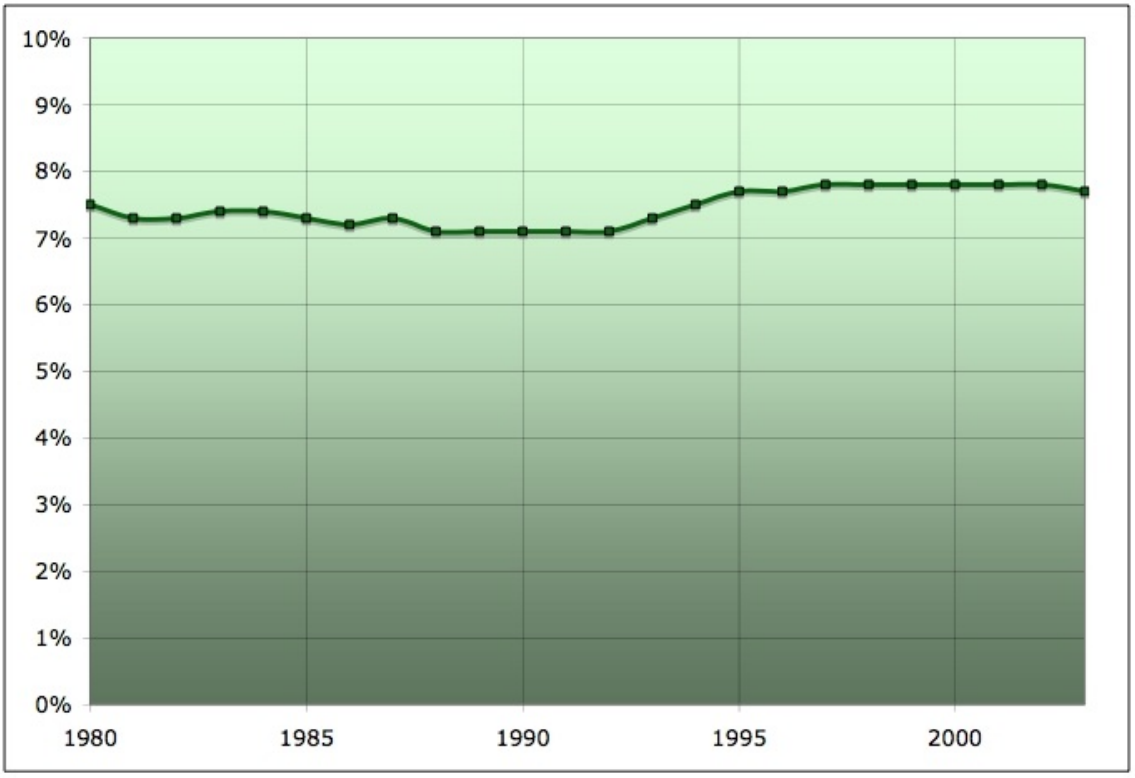
However, I wanted to do a little better than just dividing all miles by all gasoline, since some miles are fueled by diesel. Unfortunately, I can't figure out a very precise way of doing this, since EIA doesn't seem to distinguish between diesel for transportation and heating oil in the product supplied statistics. Instead, I looked at vehicle types and made a correction based on that.

Here's the mix of vehicles contributing to US miles driven.



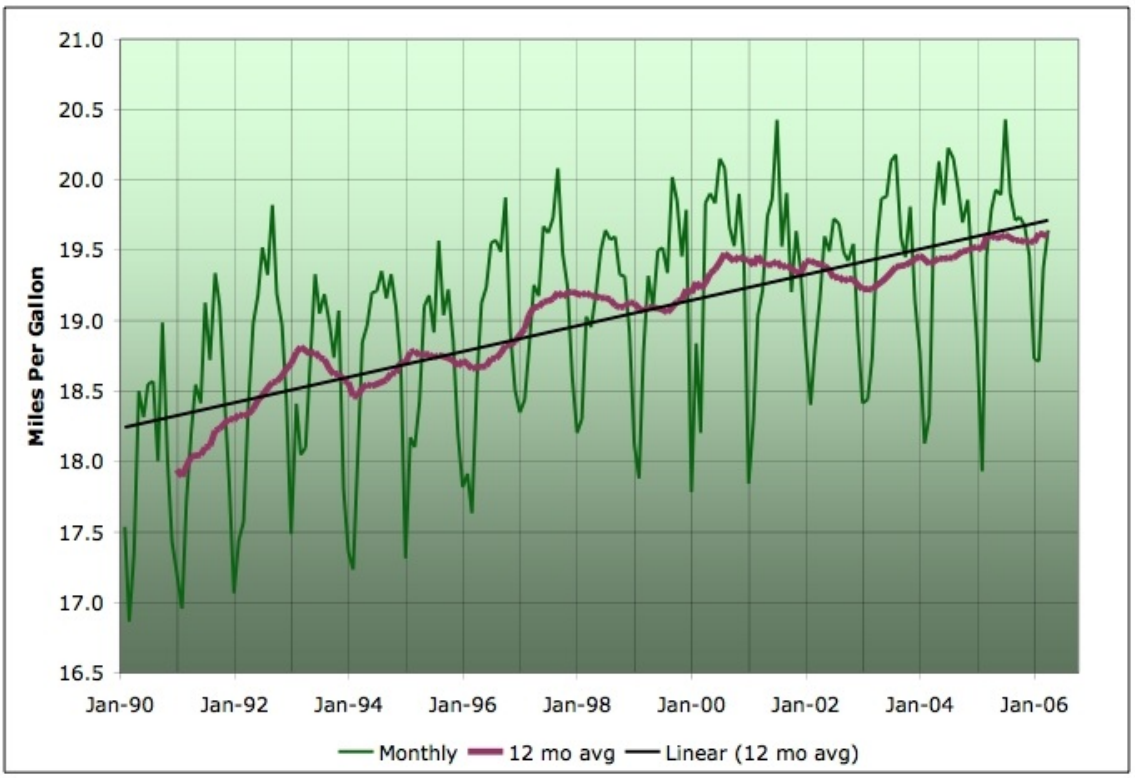
Proportion of VMT from vehicles in various classes 1980-2003. Click to enlarge. Source: Table 3.4 of the 2006 Transportation Energy Data Book.

You can see that the big trend is that away from cars and towards light trucks. The proportion of everything else hasn't changed much. What I did was to assume that everything else (trucks with more than 4 tires, big trucks, and buses) runs on diesel, and light trucks, cars, and motorcycles run on gasoline. Obviously, this isn't altogether correct. Some cars and four tire pickups run on diesel, and some larger trucks run on gasoline. However, there isn't an obvious way to do better. Hopefully these distortions are at least fairly consistent from year to year. At any rate, here's the proportion of miles that are assumed due to diesel under this method:



Proportion of miles assumed due to diesel 1980-2003. Click to enlarge. Source: Table 3.4 of the 2006 Transportation Energy Data Book.

So in constructing my fuel economy series, I subtracted these miles out in an attempt to estimate miles per gallon only for the gasoline powered fleet. That results in this estimate (only from 1990 on, because that's all I have monthly VMT for):



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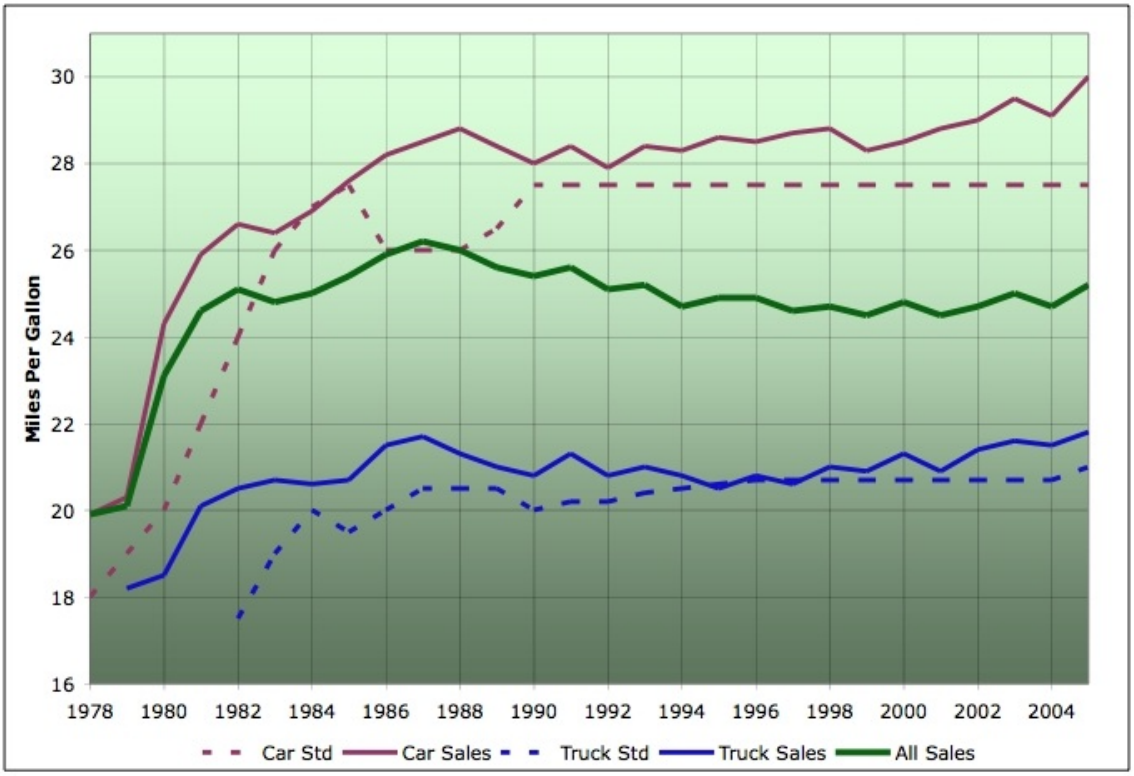
Interesting! There are a bunch of slightly puzzling things about this graph. The seasonal signal we discussed at length last time, and the general feeling is that fuel economy is poorer in the winter because cars are less efficient in the cold. It's possible that a higher mix of highway driving during the summer is also a factor. However, the generally rising trend from 1990-2006 seems a little odd. Here's a graph of fuel economy of **new** vehicles from 1978-2005:

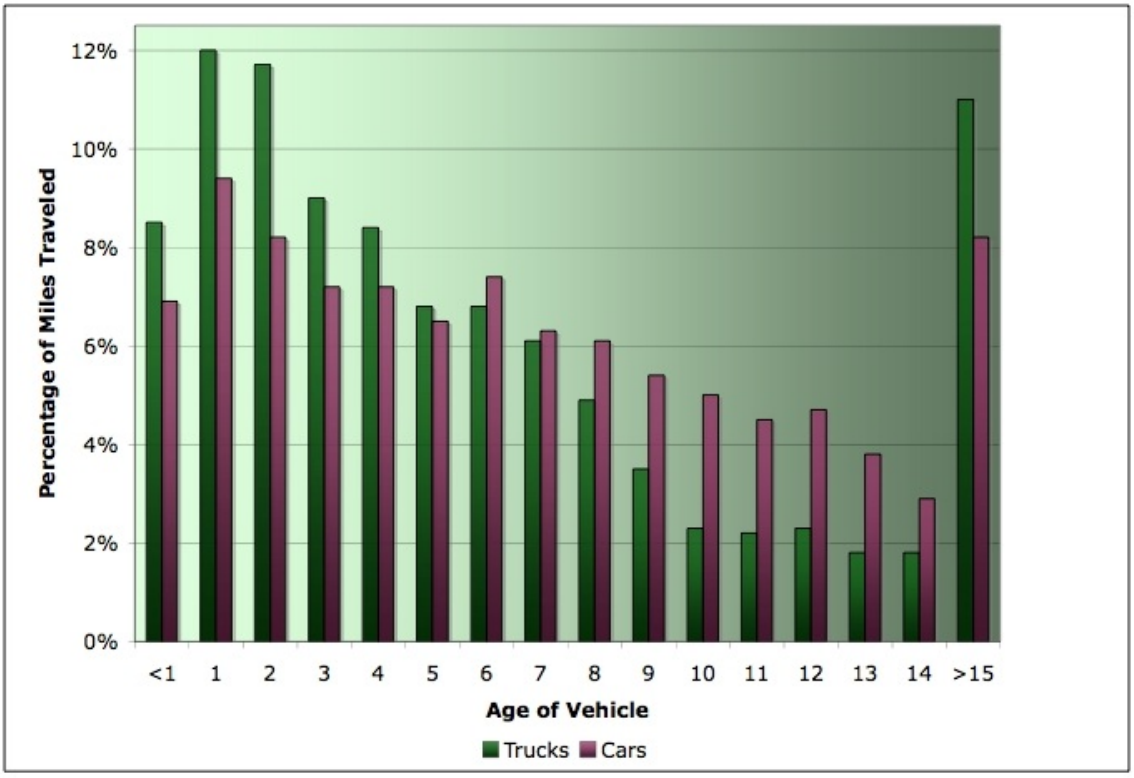


Sales weighted fuel economy of new vehicles, 1978-2005. Click to enlarge. Source: Table 4.17 and 4.18 of the 2006 Transportation Energy Data Book.

Firstly, it's worth noticing that the claimed efficiency of new vehicles has almost always been higher than what seems to actually happen on the road.

New vehicle mileage improved massively following the 1979-1980 oil shock (the Iranian revolution and Iraq-Iran war). Fuel economy of new vehicles peaked in the late 1980s, and then declined slightly to the mid 1990s, and then has been increasing very slighly since then. However, 1990 to the present is mostly flat, with signs of a more aggressive increase perhaps starting in 2005.

However, if we look at the age structure of the deployed vehicles, or rather the miles they travel:

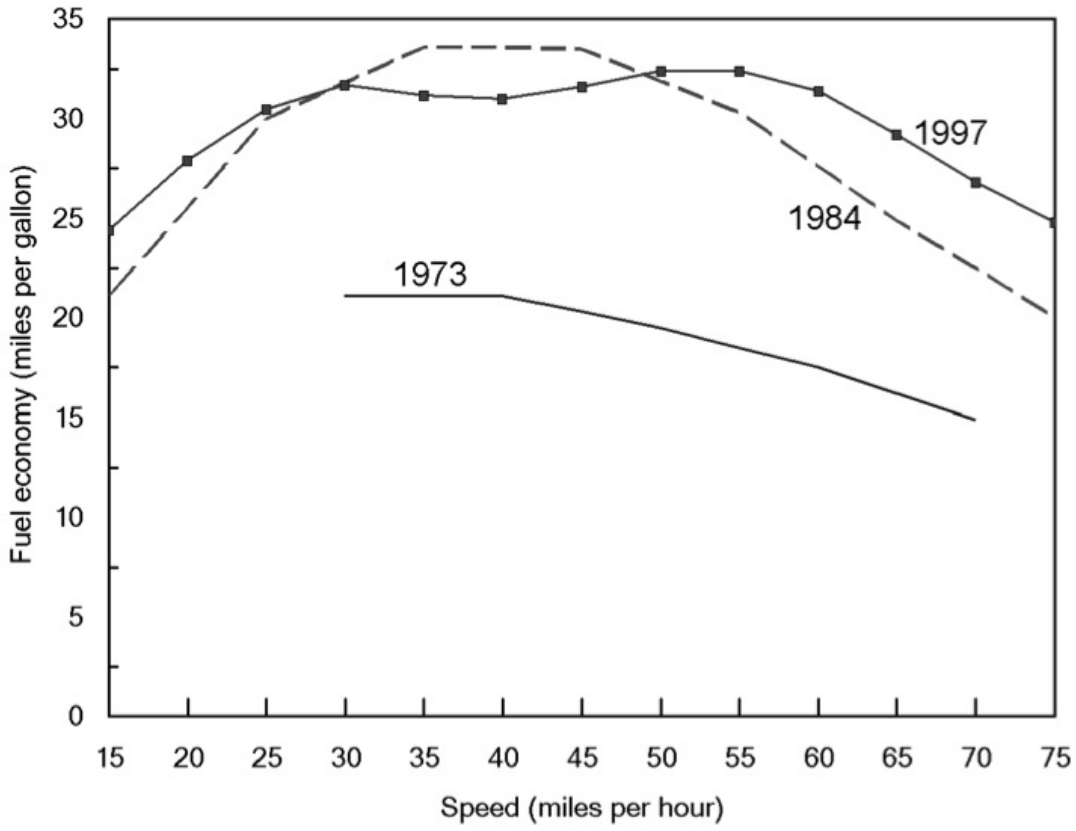


Proportion of car and truck miles travelled (separately) on the road in 2001 as a function of age of vehicle (in years). Click to enlarge. Source: Table 3.6 of the 2006 Transportation Energy Data Book.

Clearly, even quite old vehicles contribute. So probably increases in deployed fuel economy in the 1990s were coming from the retirement of 1970s and early 1980s vehicles with poor mileage. That's mostly over now, and presumably further increases are coming from the renewed though gradual trend for efficiency in the last few years.

Another possibility is hinted at by this graph:

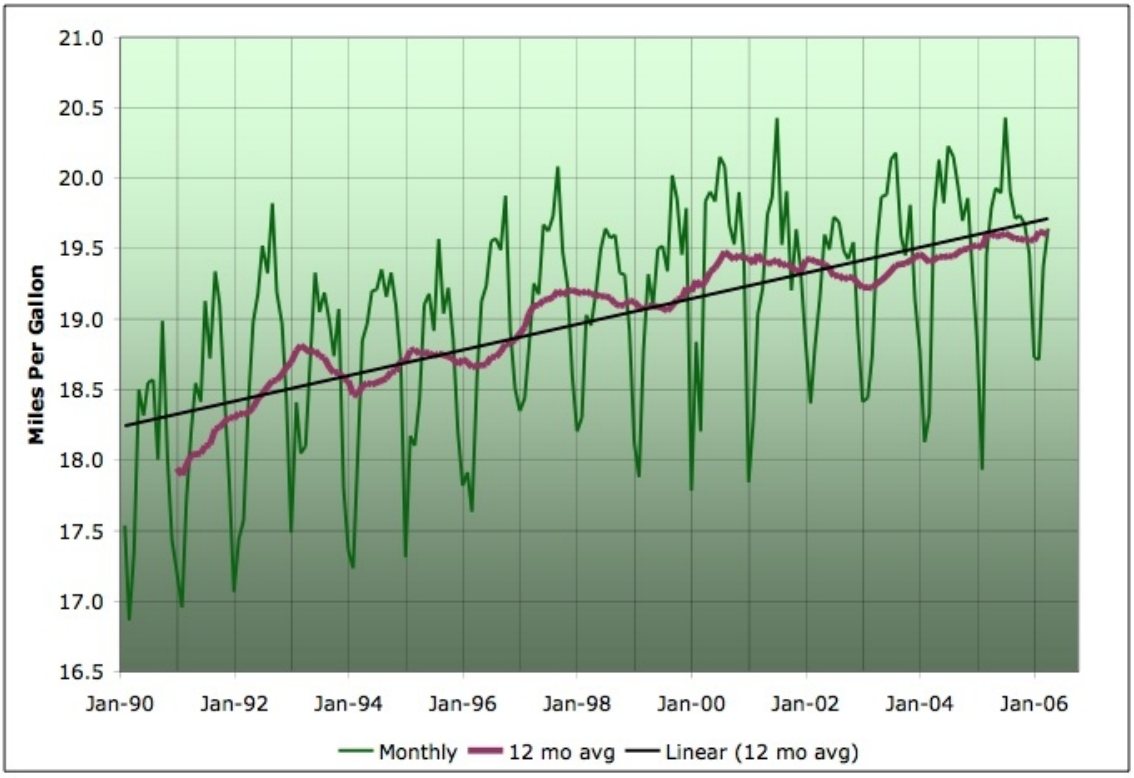
Figure 4.2. Fuel Economy by Speed, 1973, 1984, and 1997 Studies



Studies at different times of average fuel economy as a function of driving speed. Source: Figure 4.2 of the 2006 Transportation Energy Data Book.

It appears that with time, manufacturors have been making cars that increasingly do their best mileage at higher speeds. This might be improving the deployed fuel economy, but not be captured by the EPA's static CAFE profiling methodology.

Finally, when I stared at the fuel economy graph, the wiggles in the moving average away from the linear trend looked familiar. Sure enough, when I pulled out a chart of GDP changes, there's a pretty good visual correlation to my eye. It appears that fuel economy improves when GDP is growing strongly, and regresses when GDP growth is weak:



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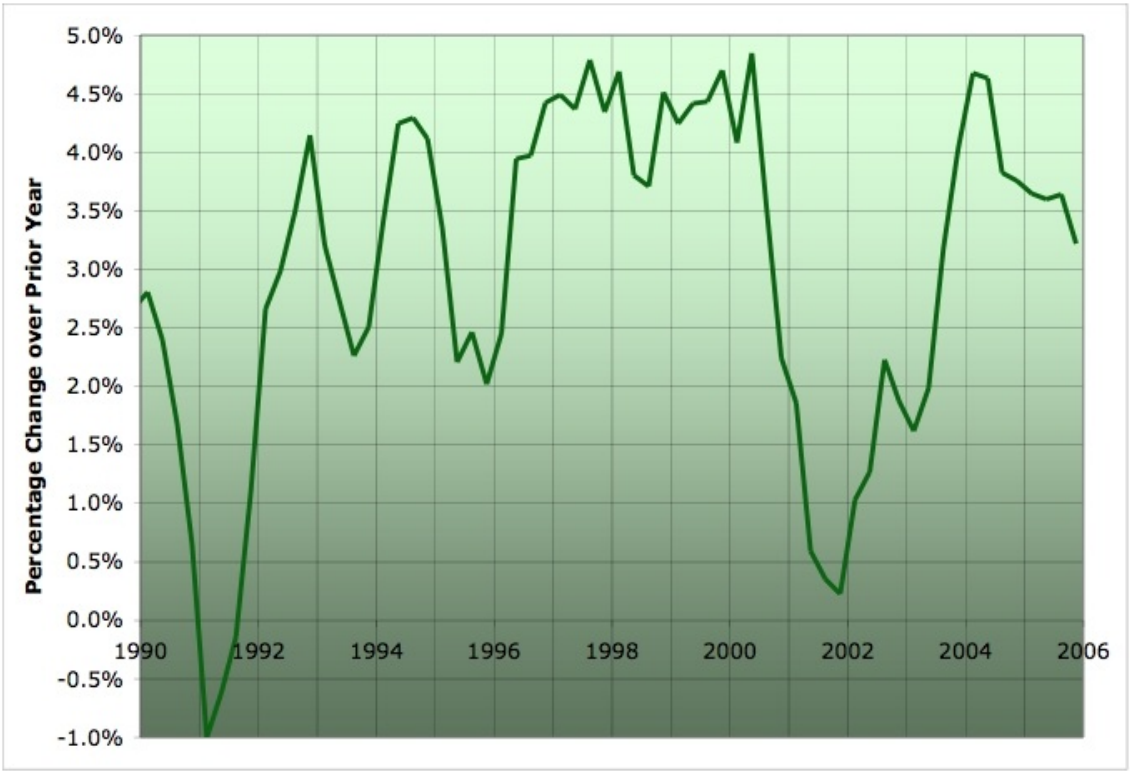

US quarterly GDP - percentage change on four quarters ago. Graph is not zero-scaled. Click to enlarge. Source: Bureau of Economic Analysis.

I haven't explored this further yet, but my guess is that during good times, people buy newer

(and on average more efficient) cars. During bad times, people hold onto old inefficient vehicles (which are presumably getting less efficient all the time).

Obviously, this effect could markedly counter the beneficial effects of increasing fuel economy on peak oil. New cars might be getting more efficient, but if there's an economic slowdown (and the Fed now seems to be getting trapped into more interest rate rises by the inflationary pressures that are due in large measure to energy prices), reduction in car sales will limit the benefits.

Your thoughts?