Oil Price and Its Impact on Insurance

Casualty Actuarial Society Annual Meeting, November 7-9, 2011

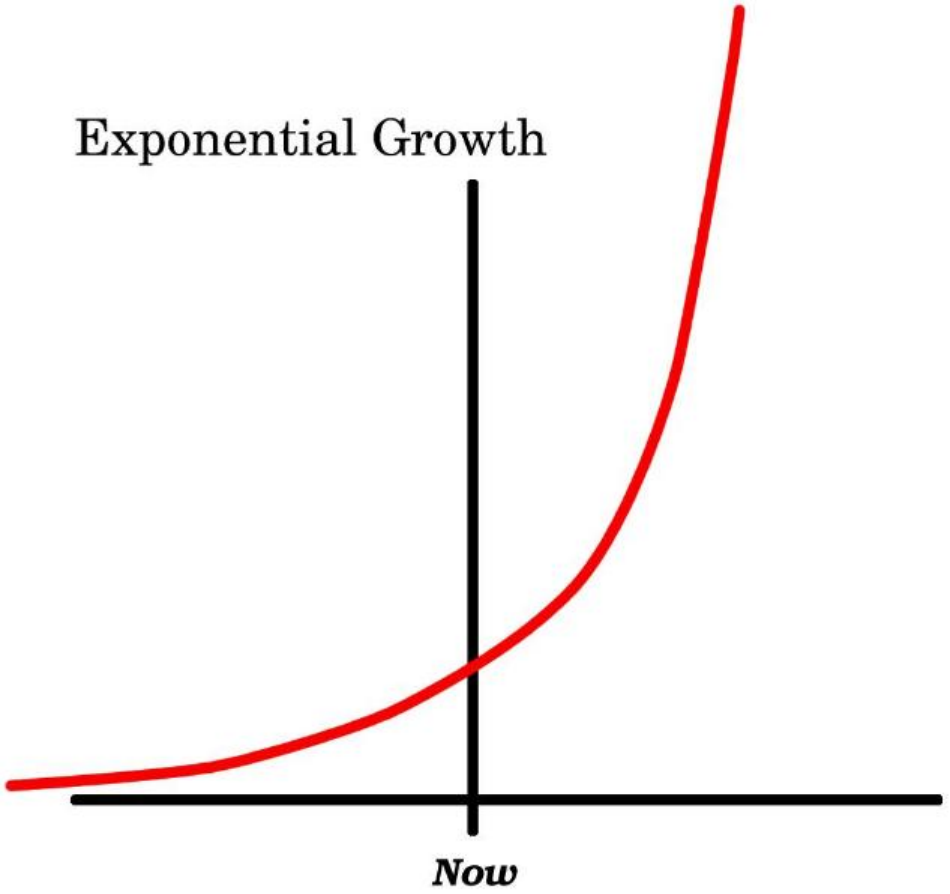
Reaching Oil Limits in a Finite World

Gail Tverberg, FCAS, MAAA

Casualty Actuarial Society Annual Meeting, November 7-9, 2011

We take growth for granted

- But perhaps we shouldn't



Our Energy/Exponential growth problem

- Exponential growth is fundamental to our current economic system
- Current monetary system is debt-based
  - Money is loaned into existence
  - Pay back borrowed money with interest
  - To finance this, exponential growth is needed

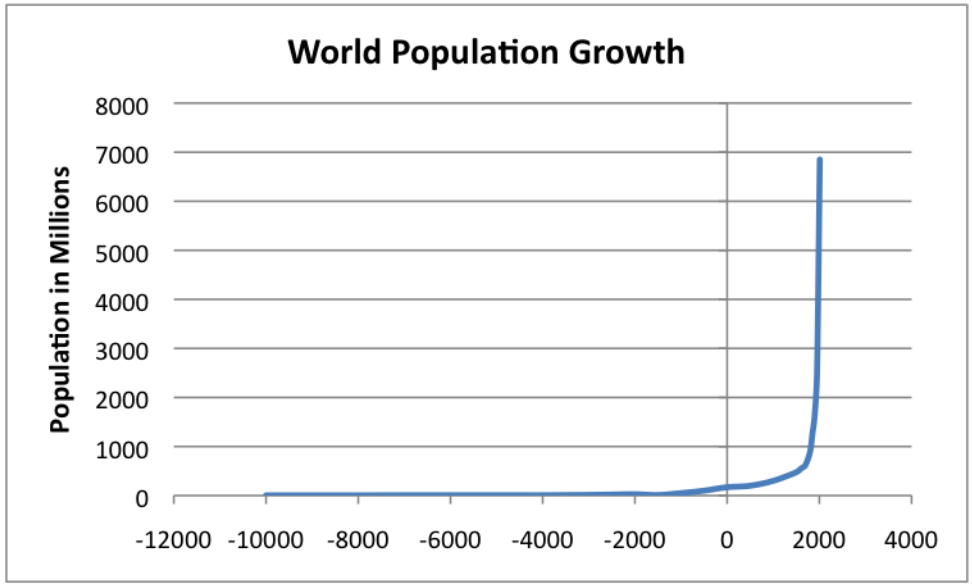
World financial system depends on growth

Repaying loans is easy in a growing economy

Repaying loans is much more difficult in a shrinking – or flat - economy

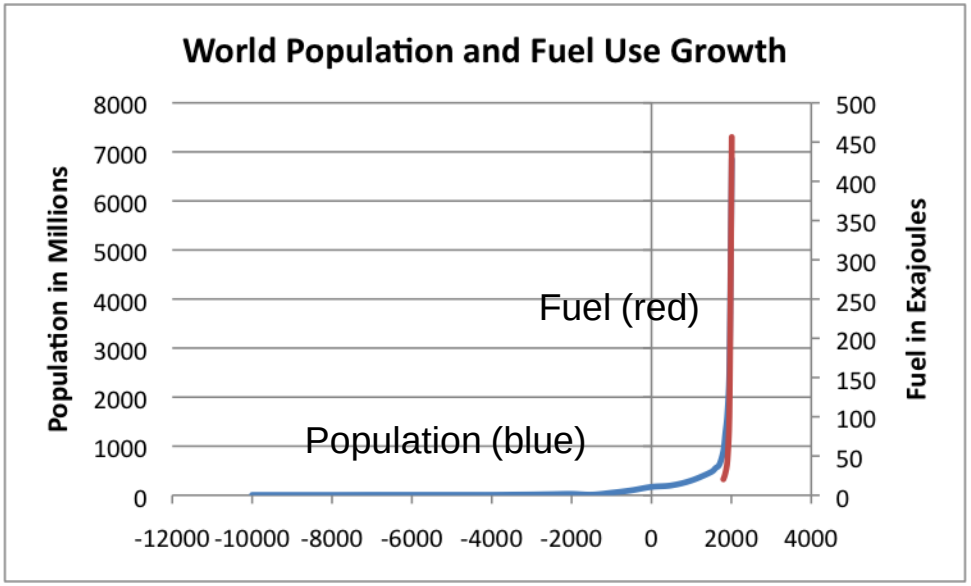
Exponential Growth

- Also where population is trending
- Fossil fuels enabled greater food production
- Fossil fuels also enabled better medicine



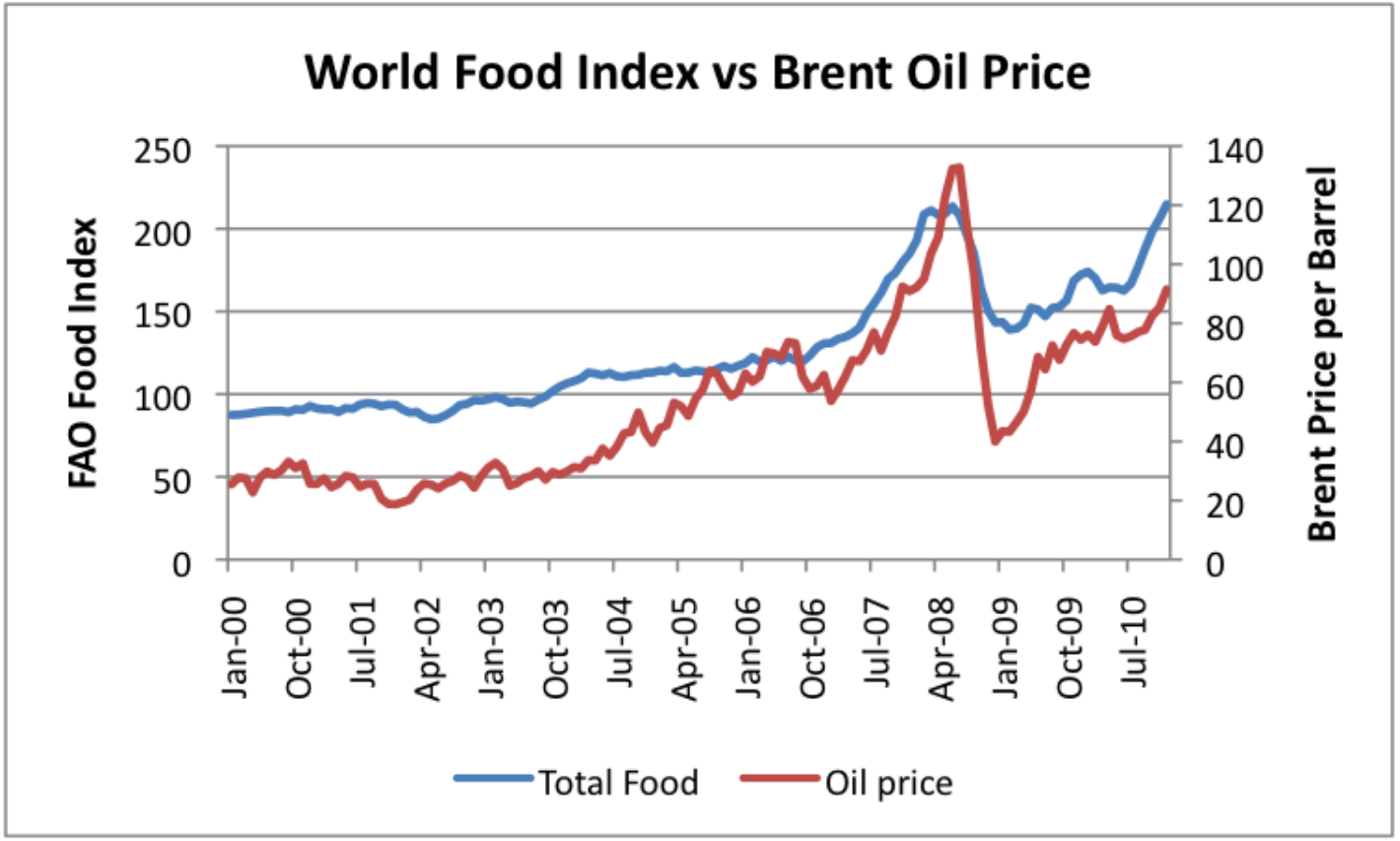
Source: Based on data from US Census Bureau website.

Population growth corresponds very closely to growth in fuel use



Note: Population from US Census Bureau website; fuel use from
Energy Transitions: History, Requirements, Prospects, Appendix A by Vaclav Smil; Praeger, 2010.

Food prices correlate closely with oil prices



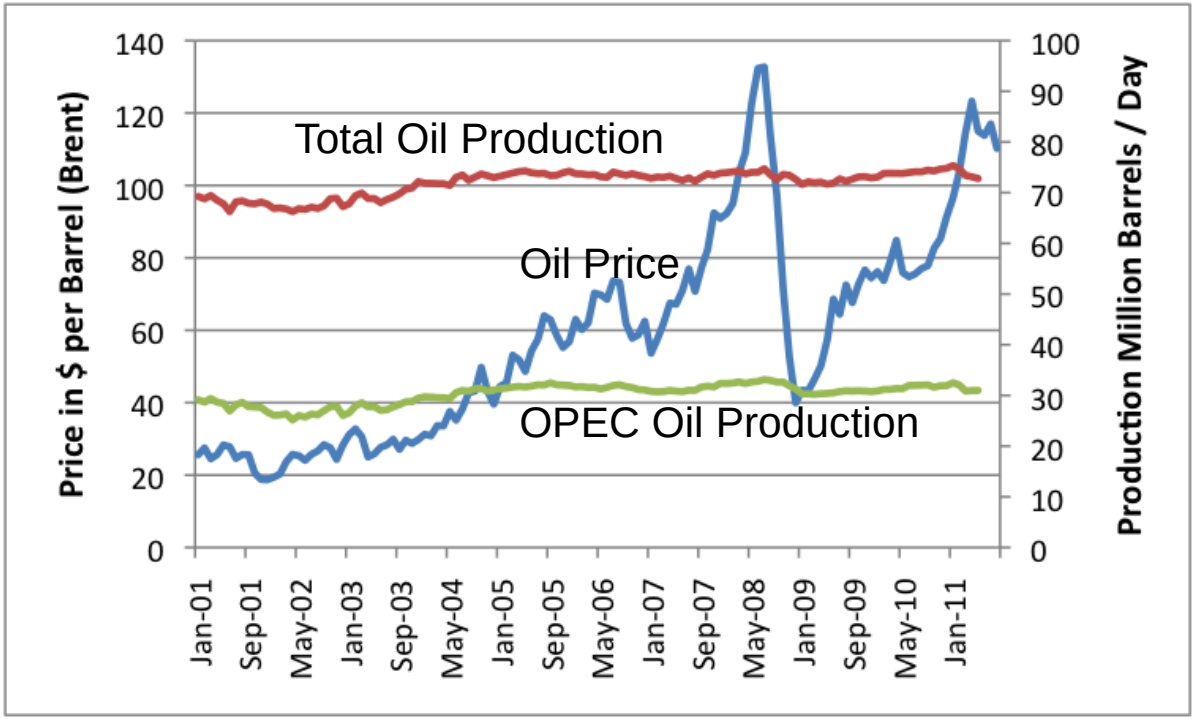
FAO Food index from http://www.fao.org/worldfoodsituation/wfs-home/foodpricesindex/en/
Brent spot oil price from US Energy Information Administration.

We are reaching limits in many areas

- Fresh water is limited
- Oil and natural gas become more expensive to extract
- Ores are at lower concentrations
- Soil is suffering depletion, erosion
- Climate is stressed by higher CO2
- Oceans are polluted, acidifying, losing fish
- Capital for solutions is limited

One of these limits is world oil production

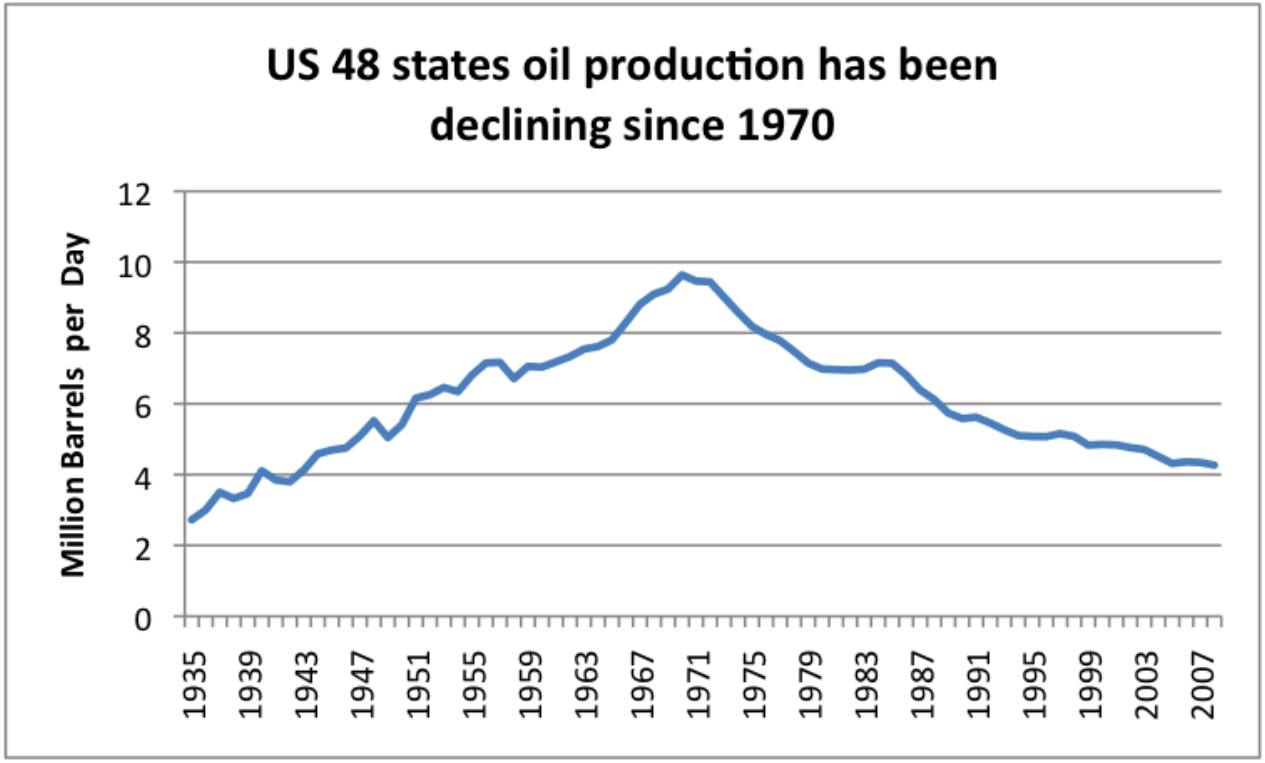
- Oil production stopped growing in late 2004
- OPEC didn't come to the rescue



Source: Graph based on US Energy Information Administration data

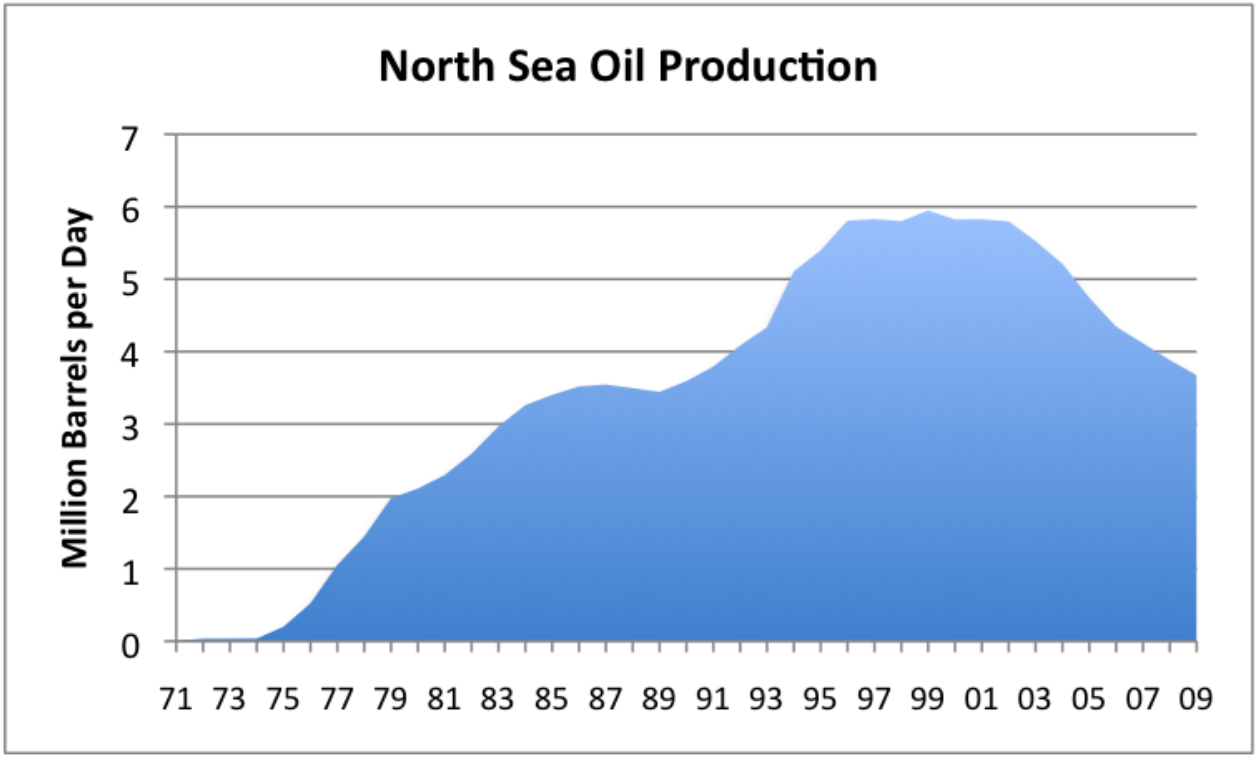
Leveling of oil production not entirely unexpected

- Oil production in many countries has reached a peak and started declining



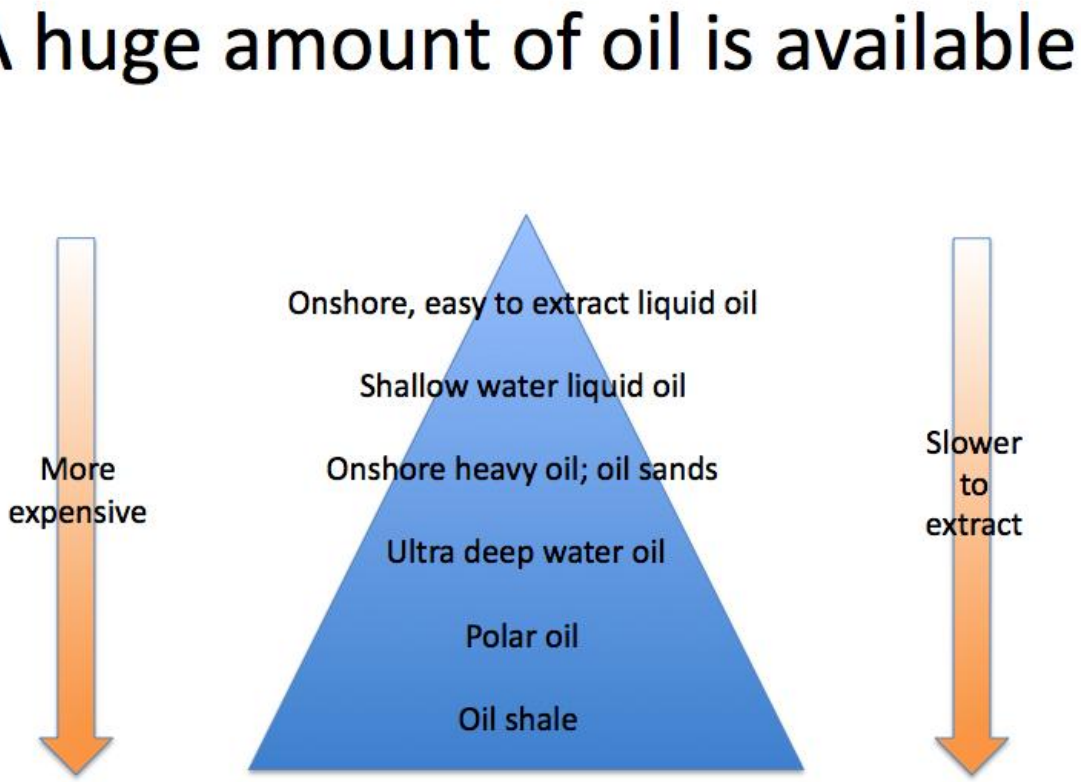
Source: Based on data of US Energy Information Administration.

Oil production in other areas also tends to rise and decline



Note: Based on data of US Energy Information Administration.

How could this happen?



But in practice there are huge obstacles

- Cheap oil is mostly gone
- Expensive oil seems to cause recession
- Major investment needs to be made, well in advance of when oil is needed
- Prices haven't been high enough, long enough, to support huge investment needed
- Low-hanging fruit picked to solve 1970s crisis

Respected authorities are talking about a possible future problem

- But are missing the issue that we already have a current problem.

'Peak Oil' and the German Government

Military Study Warns of a Potentially Drastic Oil Crisis

This post is a contribution to Honda's "Racing Against Time" thought leadership series. The Oil Drum was selected to provide a unique perspective on how we should approach the discussion of oil as a finite energy source. During the first week of

WHITE PAPER

SUSTAINABLE ENERGY SECURITY

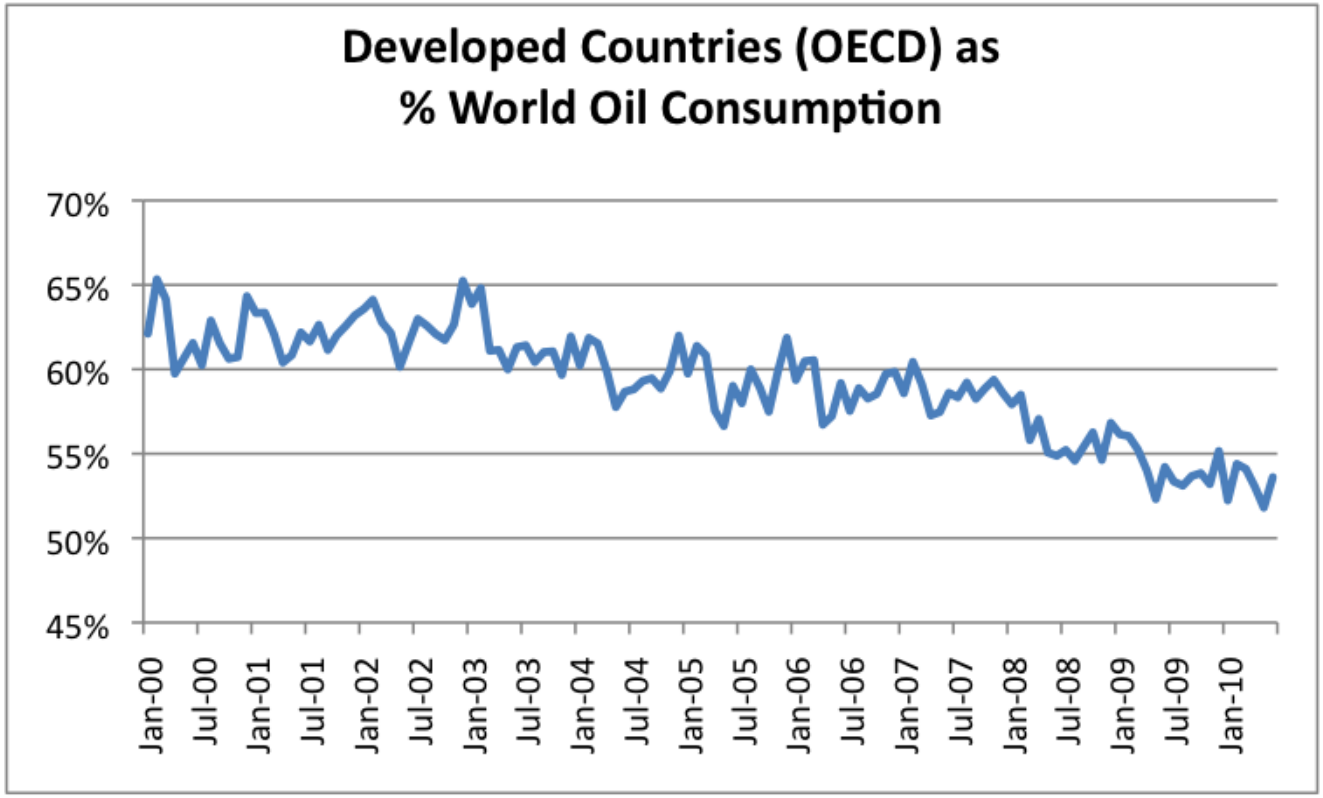
Strategic risks and opportunities for business

guardian.co.uk

US military warns oil output may dip causing massive shortages by 2015

- Shortfall could reach 10m barrels a day, report says
- Cost of crude oil is predicted to top $100 a barrel

To make matters worse, China, India, and OPEC are taking more of the oil



Source: Based on International Energy Statistics shown on EIA website

Oil has many uses

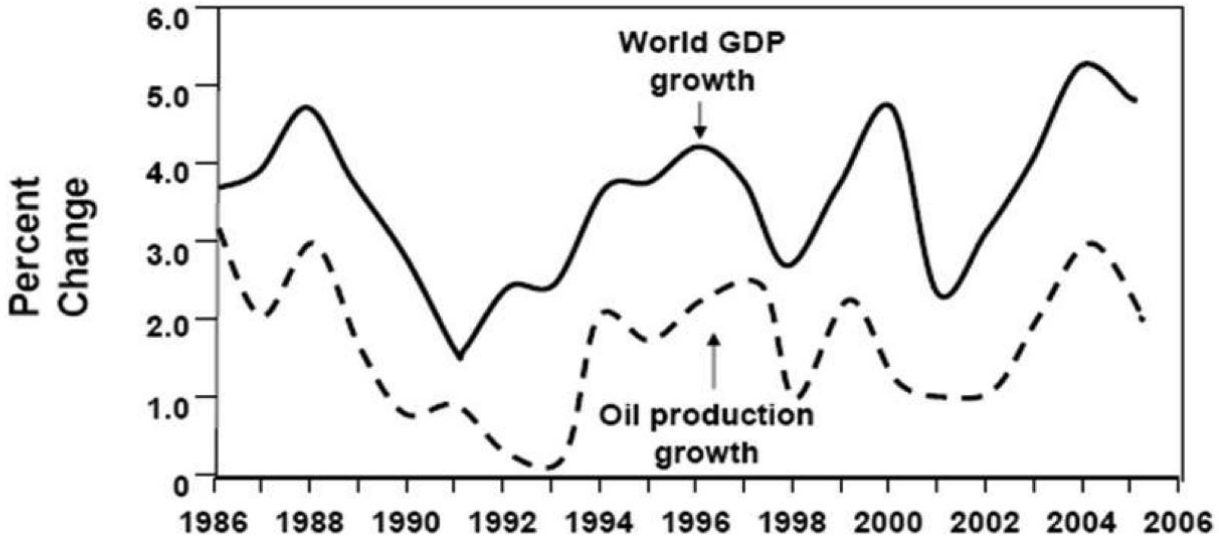
Food Uses

- Fertilizer
- Pesticides
- Herbicides
- Diesel for tractors
- Fast transport to market
- Diesel for irrigation
- Fuel for refrigeration
- Asphalt for roads

Other Uses

- Medicines
- Plastics
- Gasoline
- Synthetic cloth
- Building materials
- Easier metal extraction and working
- Diesel for earth movers

World GDP Growth & World Oil Production Growth Have Tracked For Decades.



For 1995-2006, Deutsche Bank calculated:

$$\frac{\%\ \text{Change in World GDP}}{\%\ \text{Change in Oil Supply}} \sim 2.5 \Rightarrow \text{Order of magnitude of 1}$$

Source: Robert Hirsch

Research suggests that oil prices over $80 - $85 barrel cause US recessions

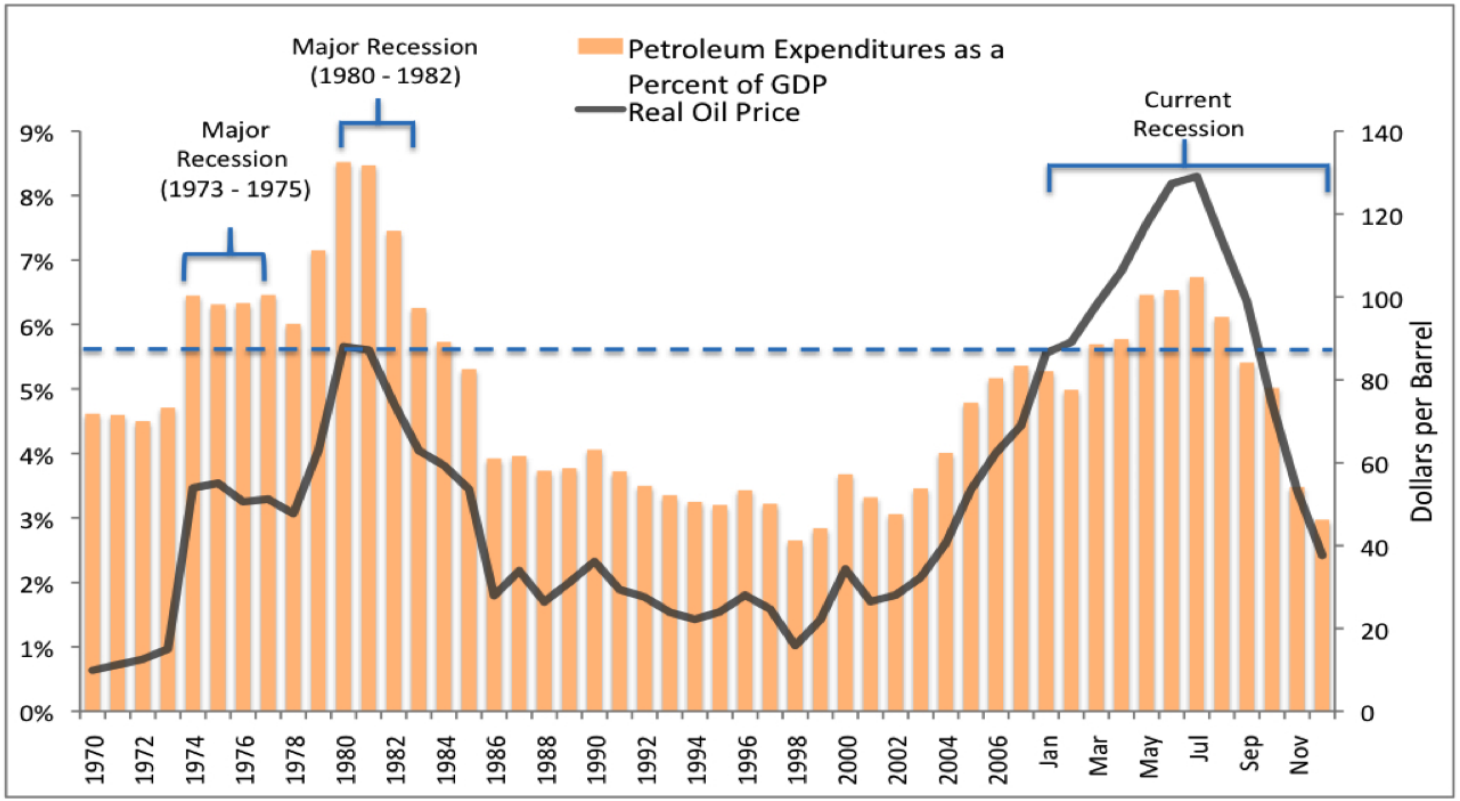


Figure 1. Petroleum expenditures as a percent of GDP in the U.S. and real oil price.

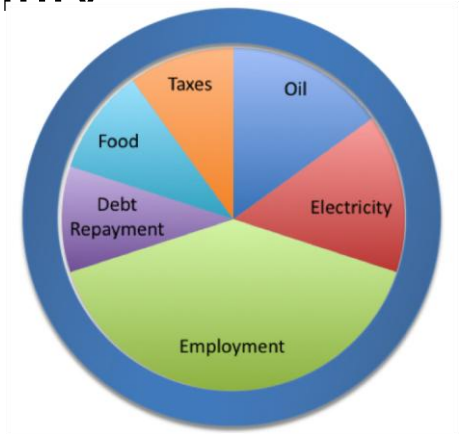
Source: David Murphy http://netenergy.theoildrum.com/node/5304

Some oil problems are hidden

- Everyone expects very high prices and inadequate supply
- Real problem: Economy cannot afford even moderately high oil prices
  - Result looks like excessive oil supply
  - People cannot afford the oil that is available
  - Oil prices don't keep going higher
  - Related to energy needed to produce the oil
    - Can't spend more than one barrel of oil to get a barrel of oil
- If oil prices kept going higher, substitutes and more oil would be found
- Recession, debt defaults can also be symptoms of oil problems.

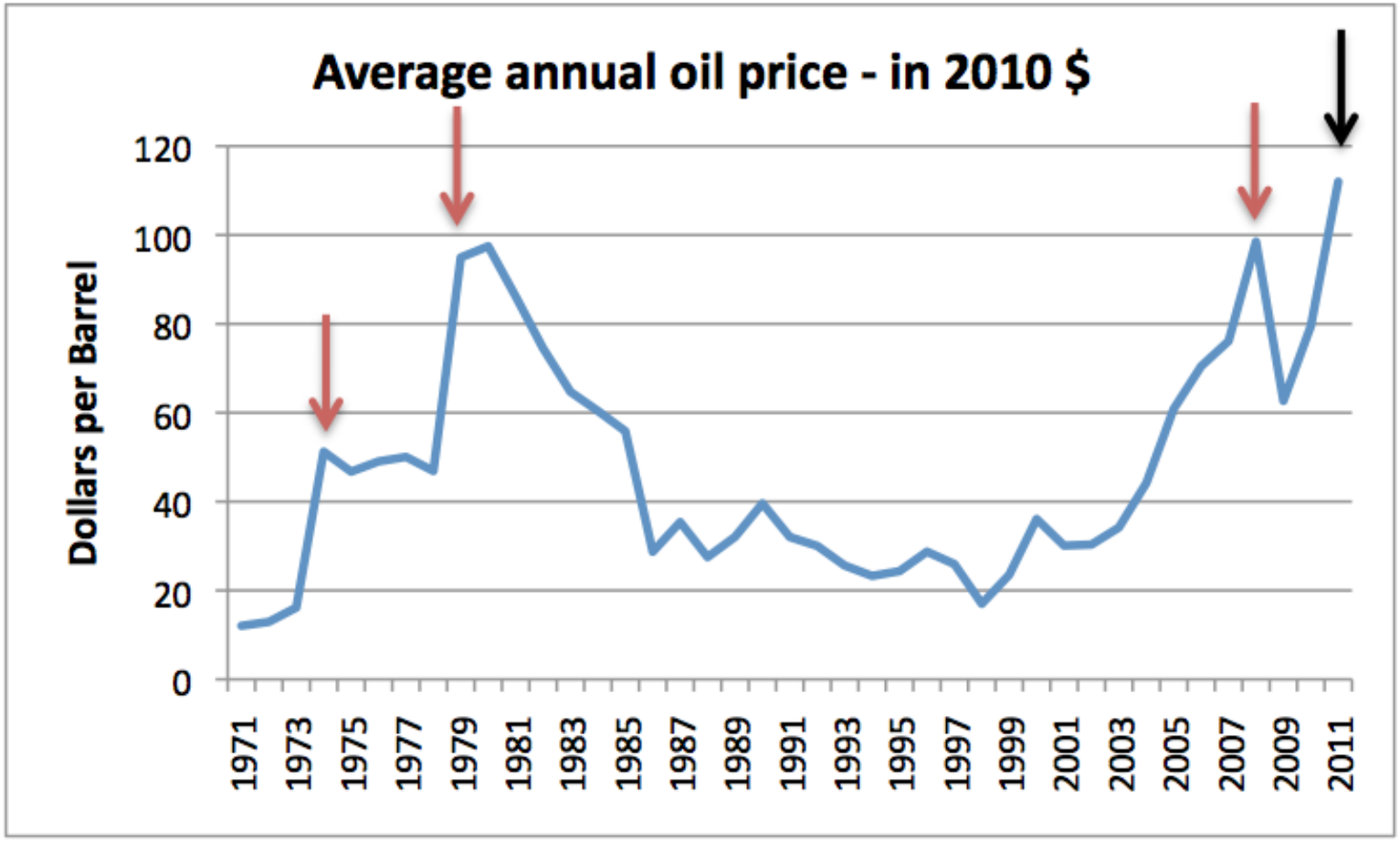
Liebig's Law of the Minimum

- Agricultural yield is proportional to the amount of the most limiting nutrient
- Chemical reactions – output limited by the reagent with smallest quantity



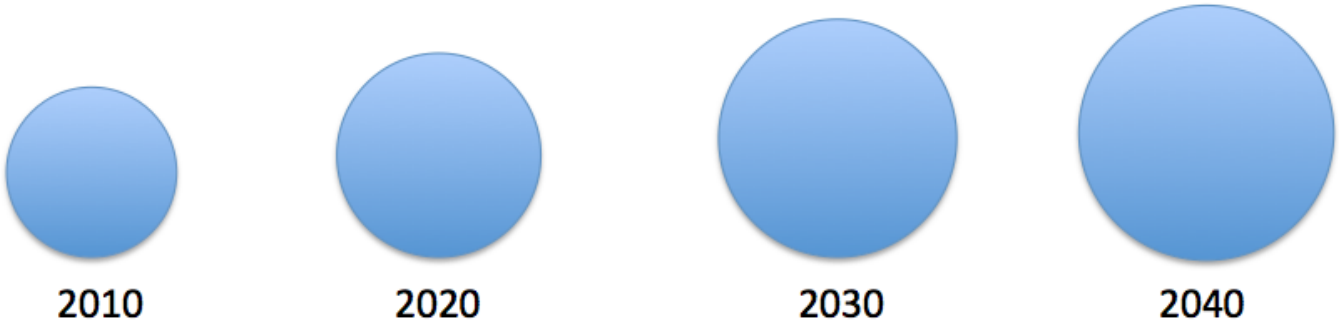
- Does limited oil supply constrict economic output?
  - High price restricts consumer's ability to purchase oil

Recession seems likely in the near term



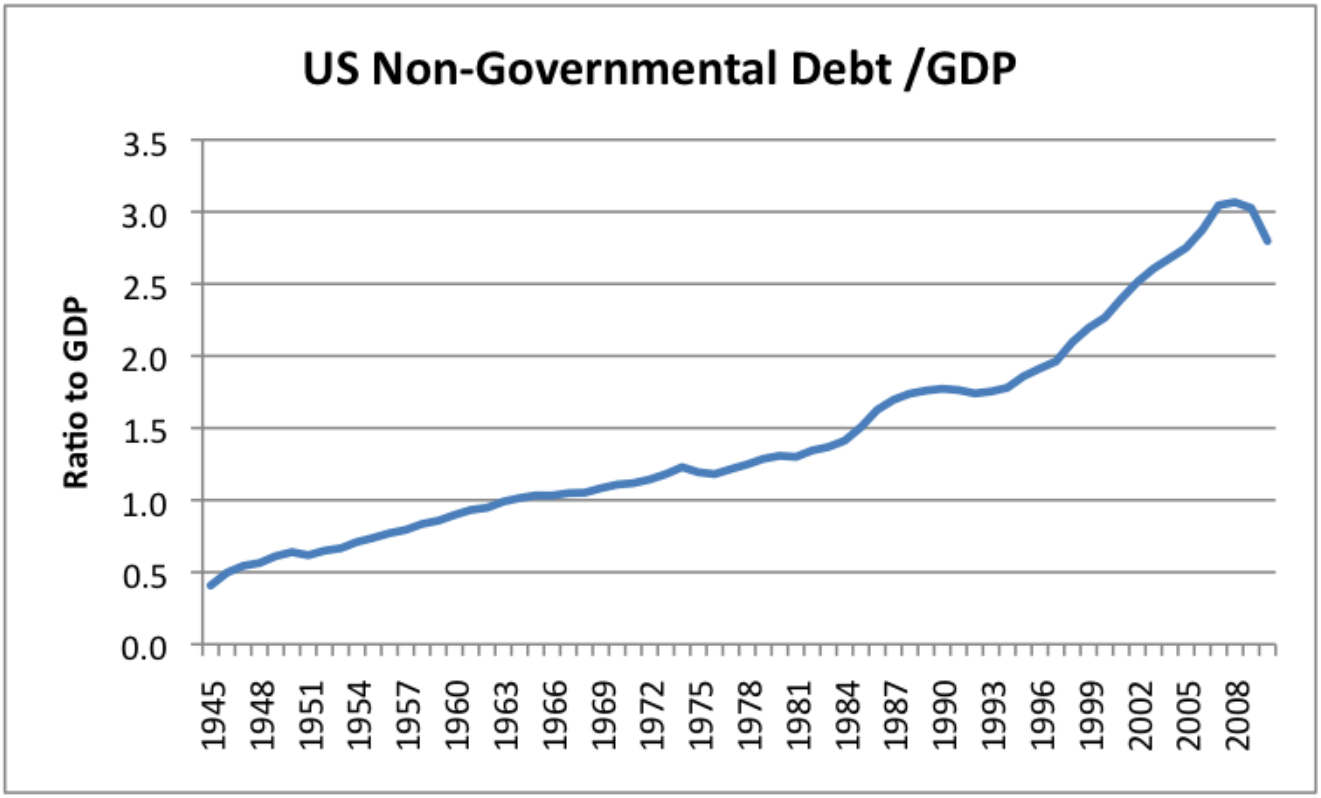
Longer term, growth may turn to contraction

Scenario 1: What most assume will happen

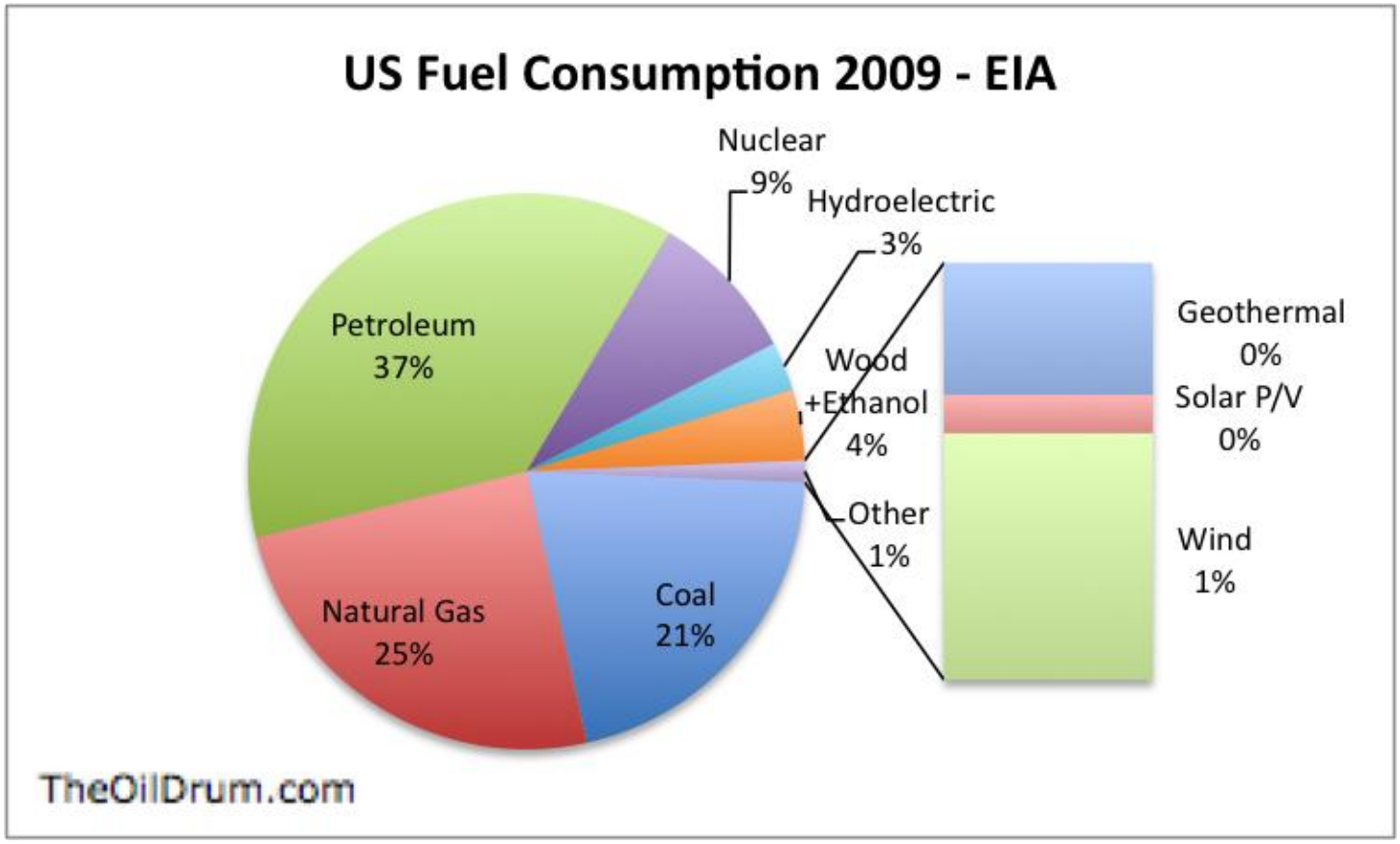


Scenario 2: Alternative that should also be considered

Non-government debt is already falling

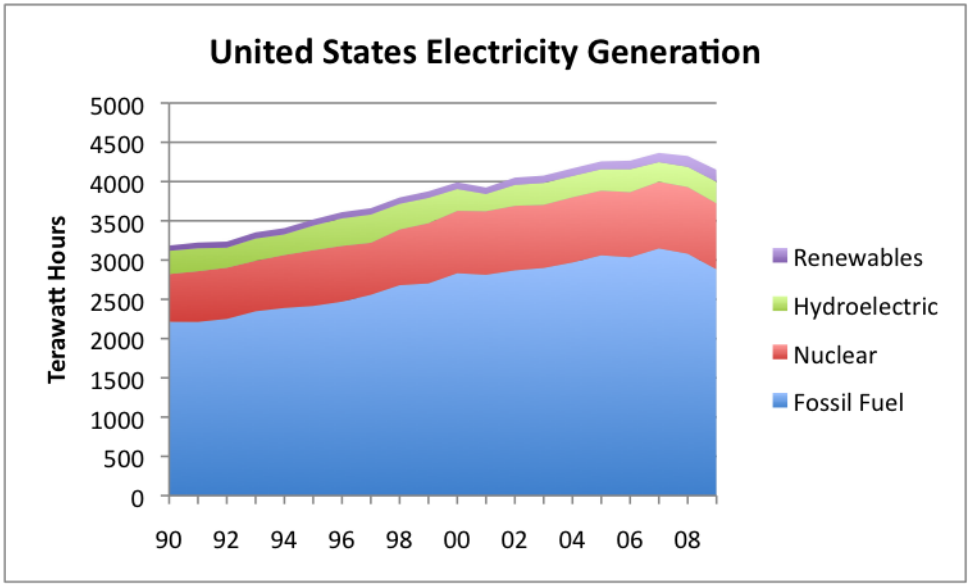


Mitigation has had little impact



Mitigation Issues

- Oil is our single largest energy source
- There are no good substitutes for oil
  - Wind, solar, natural gas, coal won't run today's cars
  - Ethanol is only 2% of current energy supply
- Even within electricity, renewables are a small share



Renewables tend to be expensive

IEA, Forecasted cost of electricity generation in OECD countries in 2015. All figures in **US dollar cent per kWh**	Median Costs at 5% interest rate	Cost Range at 5% interest rate	Median Costs at 10% interest rate	Cost Range at 10% interest rate
Nuclear Electricity	5.9	2.9 - 8.2	9.9	4.2 - 13.7
Coal Electricity	4.4	3.6 - 8.0	5.8	4.9 - 10.4
Natural Gas Electricity	7.6	5.9 - 9.2	8.1	6.7 - 10.7
Onshore Wind Electricity	9.7	4.8 - 16.3	13.7	7.0 -23.4
Offshore Wind Electricity	14.5	10.1 - 18.8	19.0	14.6 - 26.1
Photovoltaic Solar Electricity	21.5	n/a	33.3	n/a
Thermal Solar Electricity	13.6	n/a	24.3	n/a

Source: http://www.theoildrum.com/node/7275

To read more

- OurFiniteWorld.com – my own site
- TheOilDrum.com – a group site where I write at as "Gail the Actuary"

What's the Impact on Insurance?

Terri Dalenta, FCAS, MAAA

Casualty Actuarial Society Annual Meeting, November 7-9, 2011

The Price of Oil and Insurance

- The Economy Connection
- Impact of Scarcity of Oil

Recession (USA)

"… a significant decline in economic activity spread across the economy lasting more than a few months, normally visible in a real GDP, real income, employment, industrial production, and wholesale-retail sales."

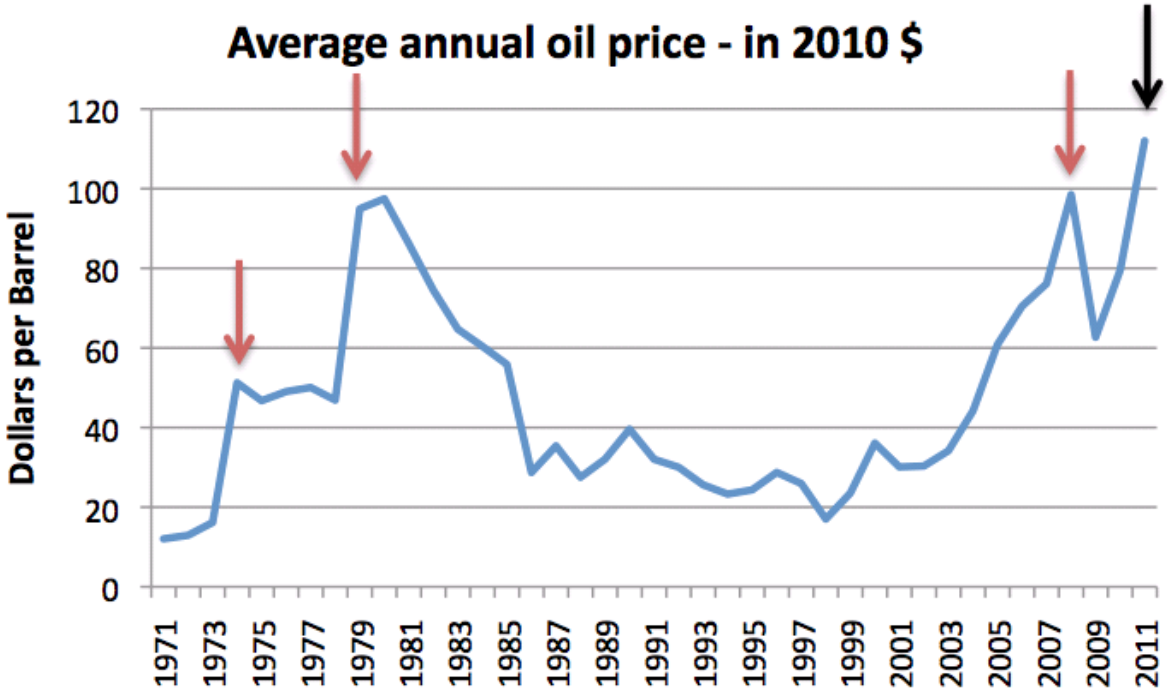
http://www.nber.org/

The Price of Oil and Recessions

Last six recessions	Price of oil 6 months prior
November 1973 – March 1975	Rising steeply
January 1980 – July 1980	Rising steeply
July 1981 – November 1982	Flat
July 1990 – March 1991	Flat
March 2001 – November 2001	Flat to Rising
December 2007 – June 2009	Rising steeply

Recessions do not require rising oil prices, but rising oil prices tend to be followed by recession

Are we due again?

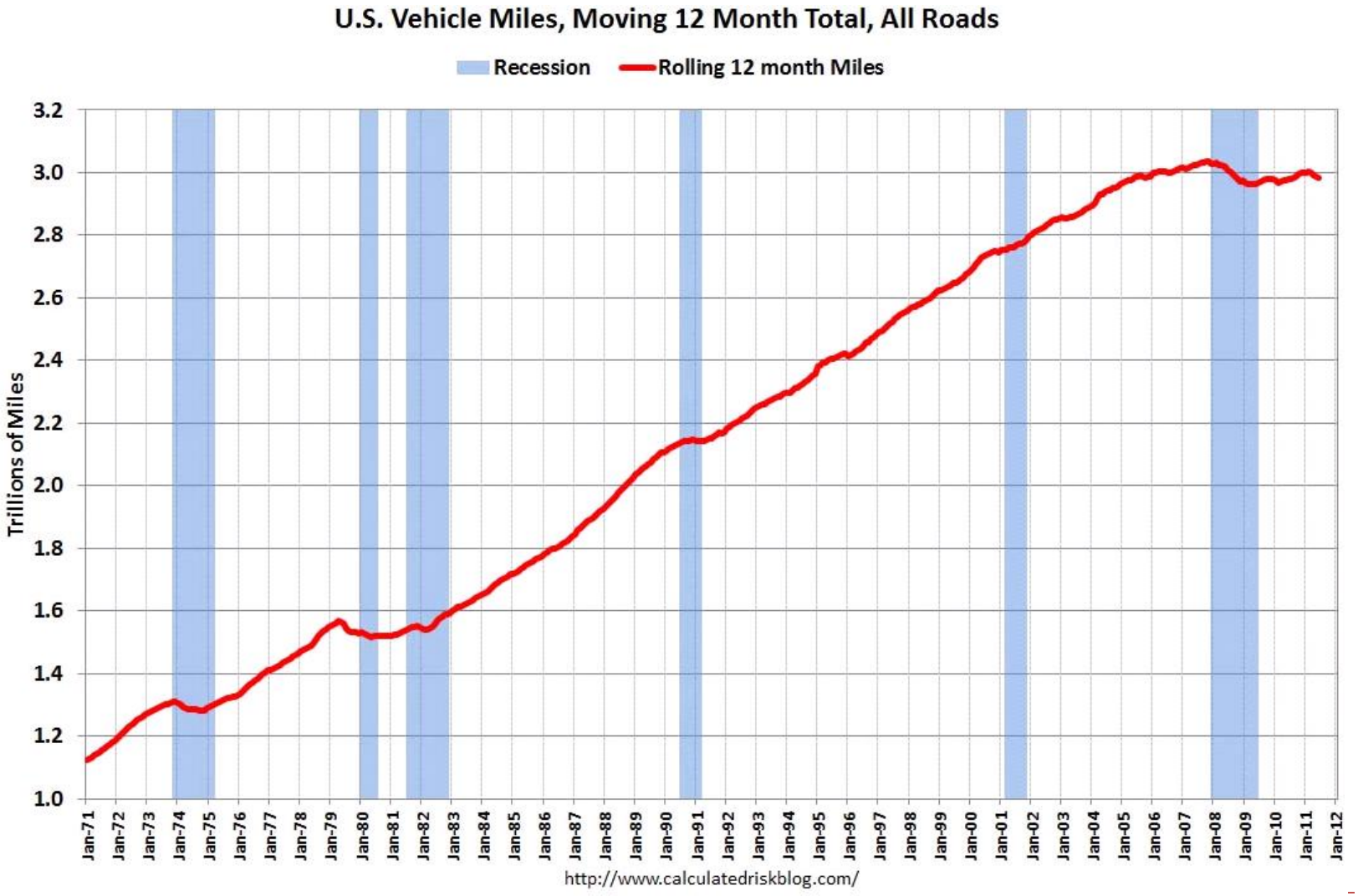


The Economy and Insurance –
Review of Research

Strong correlations

	Real GDP	Consumer Price Index	Unemployment Rate
Automobile frequency			
1st party	+/-	+/-	+
3rd party	+	-	+
Automobile severity			
1st party	+	+	N/A
3rd party	+	+	+
Homeowners frequency	-	N/A	N/A
Homeowners severity	-	+	+
Workers compensation frequency	-	+	-
Workers compensation severity	+	-	+

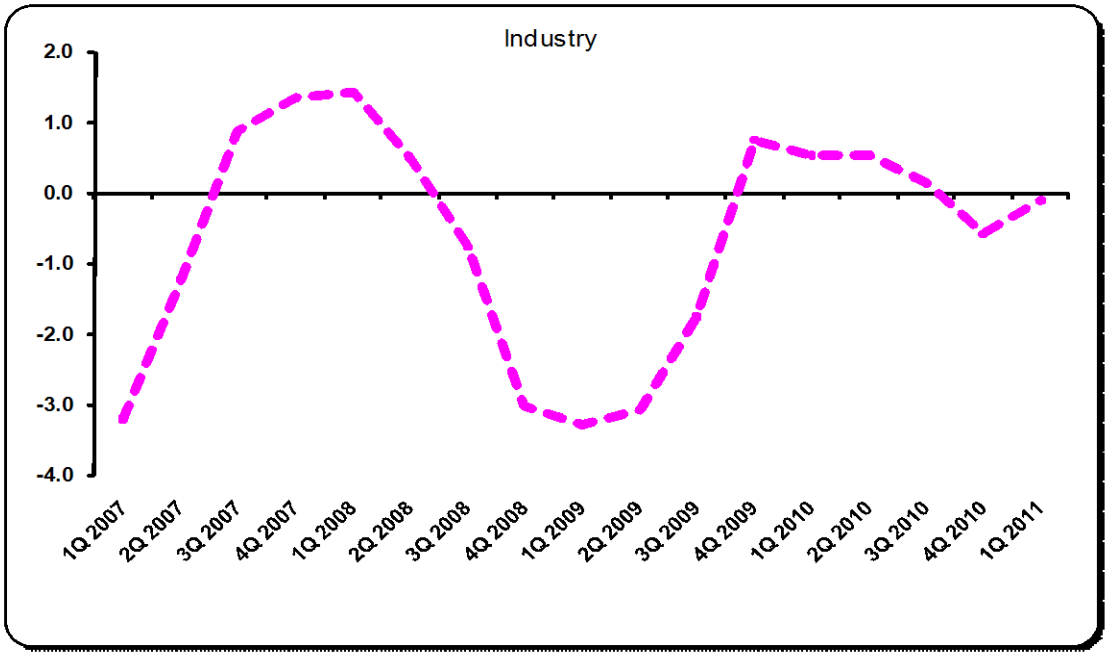
Driving Habits



Property Damage Accident Frequency

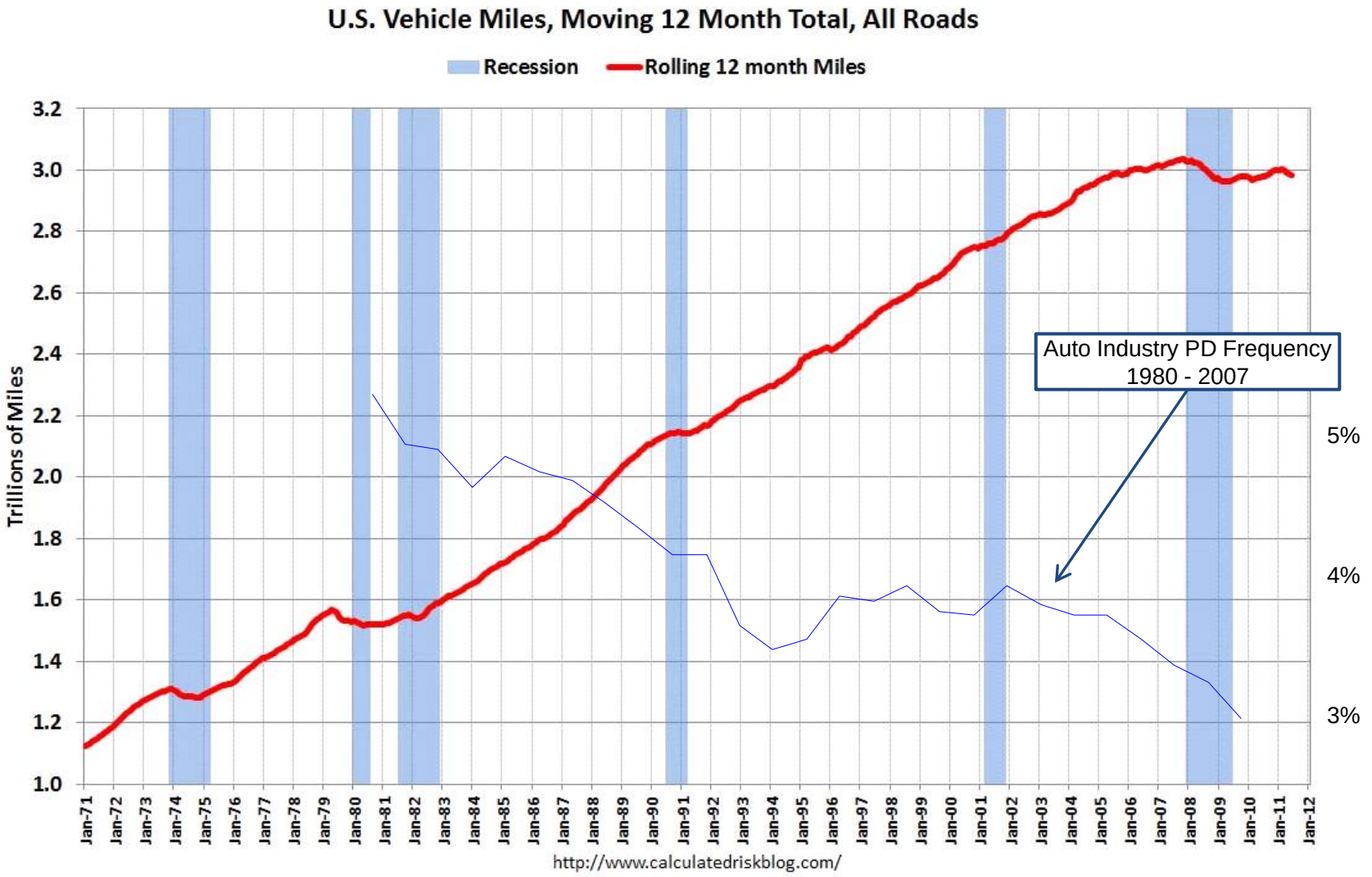
Paid Frequency

% Var to PY



REPRESENTED ON 12MM BASIS., FastTrack

Driving Habits



Consumer Spending

- Reduced disposable income
  - Insured elect higher deductibles, lower limits
  - Reduced property maintenance
- Use of disposable income

Industrial Production

- Cliff Risk: Increased corporate bankruptcies due to increased cost of goods sold and asset losses
  - Asset write downs, arguably heavier in Municipal Bonds
  - Financial guaranty, D&O losses
  - Increased insolvency fund assessments

The Pace of Change

- Environmentally conscious public
  - Solar panels, charging stations
- Technology
  - Autonomous cars, Telematics
- Reinventing Insurance
  - New methods of oil drilling
  - Protecting value versus protecting property

And just some thoughts…

- Is the price of our products fundamentally driven by the natural resource consumption of the products?
  - Asphalt, Synthetic rubber, Synthetic fibers
- How much of unexpected variation is a function of the economy or natural resources?
  - New York PIP
  - Florida sinkholes