Energy and the Economy
Bumping against the Growth Ceiling

Gail Tverberg, August 31, 2011
We have all been taught that economic growth can continue forever

- What if economic growth really can’t continue forever?
- What if we really are hitting growth limits now?
- Where do we go from here, if we are hitting limits now?
Brief statement of problem:

1) We have an economy that needs growth

2) We have limited oil supply that constricts growth
Our Economy Needs Growth
World has used fossil fuels for 450 years

- Helped create economic growth
- Helped create belief that economic growth will always continue
Our 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
Reinhart and Rogoff looked at 800 years of repayment of sovereign debt

- They report --
- “It is notable that the non-defaulters, by and large, are all hugely successful growth stories.”
- Countries that were growing could repay debt!
Growth provides many benefits

- Rising home prices
- Rising employment
- Rising stock prices
- Rising taxes;
  Rising sales for businesses
Use of fossil fuels allowed population to expand greatly

# A few of oil’s many uses

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<th>Food Uses</th>
<th>Other Uses</th>
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<td>Fertilizer</td>
<td>Medicines</td>
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<td>Pesticides</td>
<td>Plastics</td>
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<td>Herbicides</td>
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<td>Diesel for tractors</td>
<td>Synthetic cloth</td>
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<td>Fast transport to market</td>
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<td>Diesel for irrigation</td>
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<tr>
<td>Fuel for refrigeration</td>
<td>Diesel for earth movers</td>
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<td>Asphalt for roads</td>
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Economic decline leads to many bad outcomes

- Many debt defaults
- Declining home prices
- Fewer people employed
- Declining tax revenue; rising unemployment claims
- Declining stock market
- Declining church and other charity contributions
Limited oil supply is constricting economic growth
Oil production is no longer responsive to rising price

Note: “Crude and Condensate” oil amounts. Based on EIA data.
How can this happen?

A huge amount of oil is available

- Onshore, easy to extract liquid oil
- Shallow water liquid oil
- Onshore heavy oil; oil sands
- Ultra deep water oil
- Polar oil
- Oil shale

More expensive

Slower to extract
But in practice there are huge obstacles

- Cheap oil is mostly gone
- Expensive oil seems to cause recession
  - James Hamilton: 10 out of 11 most recent recessions followed oil price spikes
- 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
Leveling of world oil supply is not entirely unexpected

- Oil production in many countries has started to decline
European crude oil stayed on a plateau from 1996 to 2001, before it began to decline.

Mexican oil production has declined since 2004.
Part of our problem is that China, India, etc. are consuming more of the oil
An economy without enough oil stops growing
Food prices tend to rise with oil prices
History shows a close tie between world economic growth and oil growth

If oil shortage

- Food and oil prices rise
- People’s incomes don’t rise
- People cut back on discretionary goods
- Debt defaults rise
- Result: Recession
Shrinkage of economy is like making a smaller recipe batch
What happens after an economy hits the ceiling?
For one thing, oil prices keep spiking up

- Recession hits and continues on the down slope
- Looks like we are heading into a recession again
For another, non-government debt starts to decline, and governmental debt soars!
We don’t know for sure how this all ends

- Some views are that this will end badly
- Not too different from throwing a ball up and hitting the ceiling
Alternate energy sources are too little, too late

- Biofuels amounted to 4.4% of US petroleum consumption in 2009
- Most mitigations are electric
  - Don’t directly help oil problem – also small in total
Where do we go from here?
Take one day at a time

- What to expect
  - Another recession, probably severe
  - More layoffs
  - Huge governmental problems
  - Possible cutback in government programs
    - More hungry people
    - Possibly even nearby riots
  - Job prospects for recent graduates may be poor
A few thoughts

- Do what we can today
  - Count our blessings!
- No real solutions
  - Keep some water and food on hand
  - Don’t count on always having electricity
  - Gardening is somewhat helpful
- Don’t count on paper investments
- High population is an issue – smaller families?
- Need to work together to find partial solutions