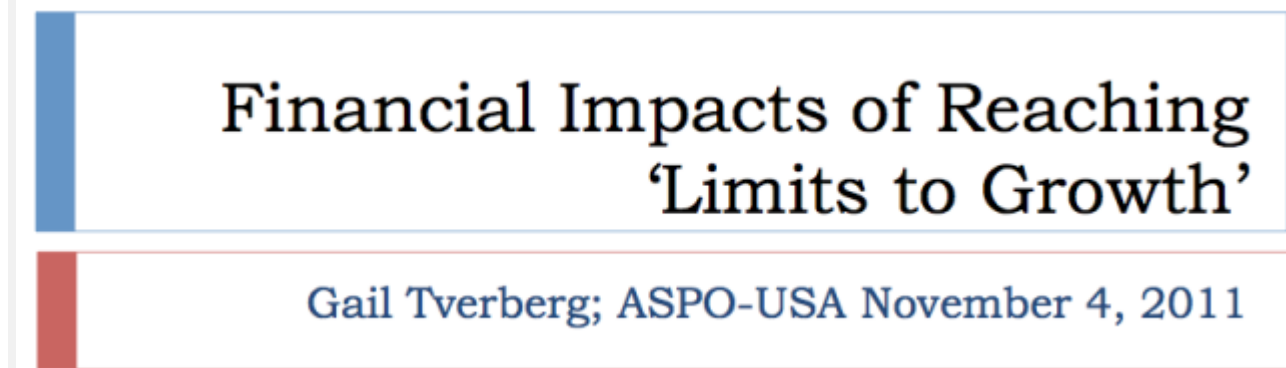


Financial Impacts of Reaching ‘Limits to Growth’

I gave a talk on expected financial implications of the oil limits that we are now reaching at a recent meeting of the Association for the Study of Peak Oil-USA. My talk consisted of two parts:

1. Why the impact of oil supply limits is expected to be more severe than simply a reduction in oil supply would imply. I believe we are really reaching a more general “limits to growth” because of the impact of high oil prices, interconnectedness of all of the systems, and the short-term inability to substitute one fuel for another. (Slides 2–11)
2. What the short-term financial impacts might be (Slides 12–17).



Slide 1

I have written about Limits to Growth previously. See [this post](#) for a longer version of why I believe we are reaching limits to growth. A PDF version of the slides can be found at this link: [Financial Impacts of Reaching Limits to Growth](#).

Why reaching oil supply limits is more of a “Limits to Growth” issue, rather than simply a “depleting oil supply,” issue

It seems to me that we may be reaching limits to growth:

- 1) We have an economy that needs growth



- 2) We have limited oil supply that constricts growth



Slide 2

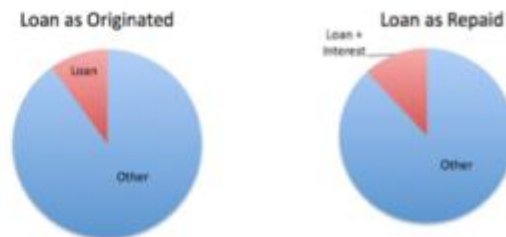
Slide 2 - High oil prices lead to people to cut back on their demand for discretionary goods and employers to lay off unnecessary workers. These actions lead to constriction on economic growth. This issue seems to me to be the first stage of "Limits to Growth" as foretold by the 1972 book by that name. People who are looking for oil limit problems to start when oil supply actually starts declining may miss this connection.

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



Slide 3

Slide 3 – In a growing economy, when it comes time to pay back debt with interest, borrowers, on average, have more resources than when they took out the loans. They can use these extra funds to help handle interest payments, and still have sufficient funds for their other obligations. The reverse happens in a declining economy.

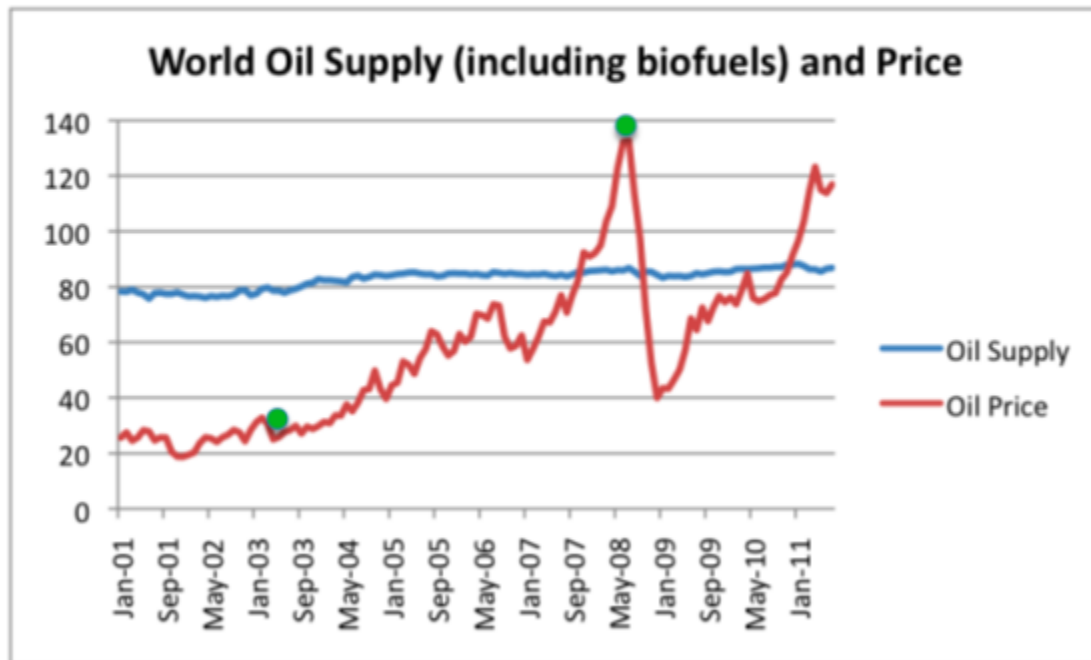
Reinhart and Rogoff looked at 800 years of repayment of sovereign debt

- ▶ 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!

Slide 4

Slide 4 - Reinhart and Rogoff are well-known researchers with respect to defaults on sovereign debt. In a paper they wrote, they made the observation above, saying that it was only the countries that were growing that did not default on their debt. They did not seem to understand why this connection would hold, but the connection I pointed out in Slide 3 is the reason we would expect this situation to hold.

With peak oil approaching, it becomes virtually impossible to invest enough in oil



Slide 5

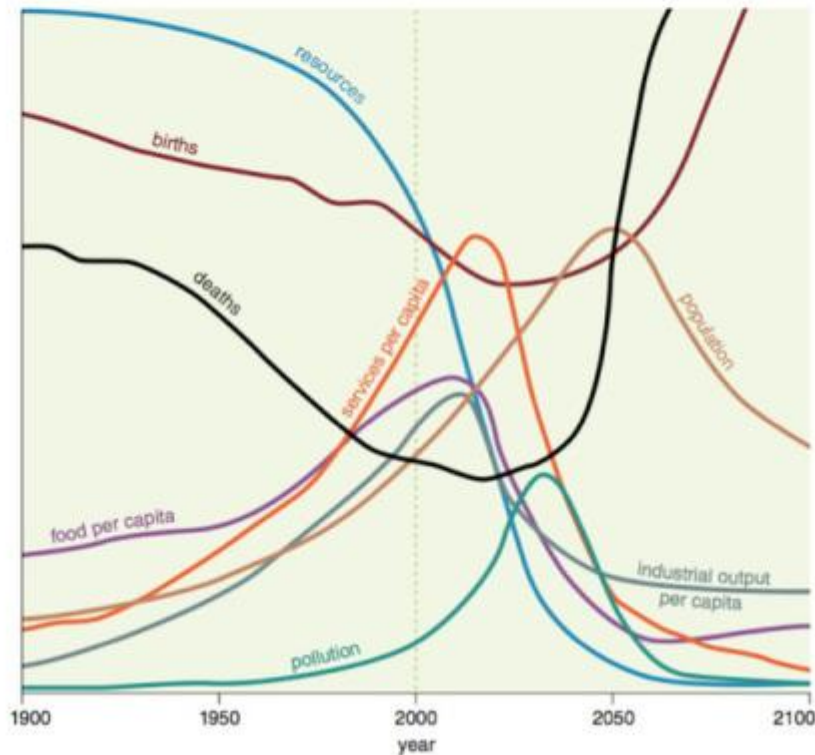
Slide 5 - World oil supply has remained relatively flat for the last few years, despite wild gyrations in prices. Theoretically, if investment had ramped up high enough, fast enough, oil production might have kept rising fast enough to keep price relatively level.

I used the pointer (simulated by green dots) on Slide 5 to show three distinct time-periods:

1. Prior to the green dot in 2003 - Time when oil supply followed demand—something that the EIA assumes still happens today. In such a situation, if economies are expanding and need more oil, it will be supplied.
2. Between the green dot in 2003 and the green dot in 2008 - Time when growth in supply stopped keeping up with world demand at historical prices. Prices rose higher and higher, to choke back demand to match supply through higher prices.
3. Subsequent to the green dot in 2008 - Time when inadequate oil supply started affecting the economy in additional ways, besides leading to higher prices. Additional

impacts included recession and, as we will see on Slide 8, reduction in non-governmental debt. During this period, oil price decreased, then rose again, as demand again built.

In fact, we may be hitting “Limits to Growth” of 1972 fame



Slide 6

Slide 6 – The aim of the 1972 book *Limits to Growth* was to model the kinds of impacts that would be expected if the world attempts continue growth of resources and population within a finite world. Many scenarios were modeled. Most indicated that the world was likely to hit limits of many kinds, starting in the first half of the 21st century.

How LTG works: 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

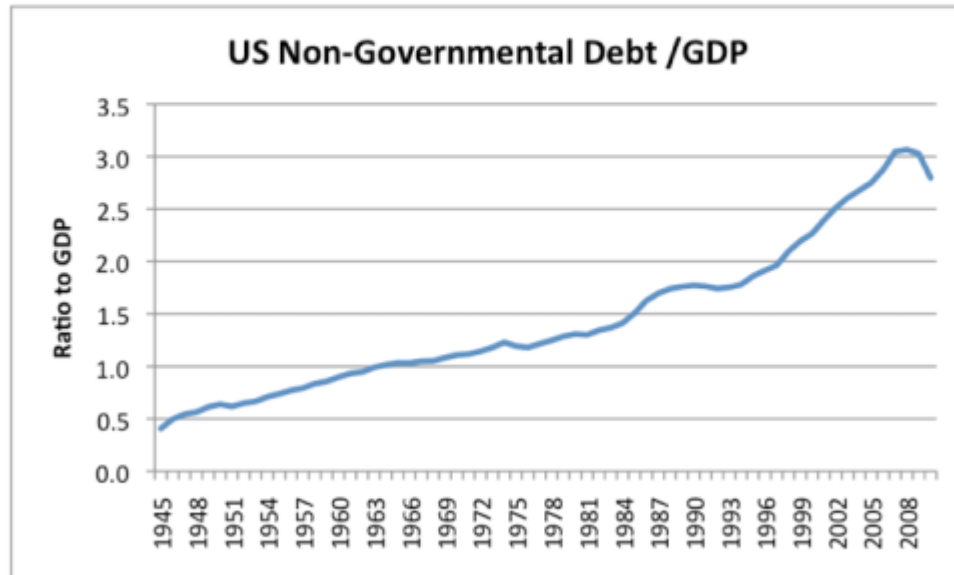
Slide 7

Slide 7 – In agricultural science, there is a principle called Liebig's Law of the Minimum that says that the growth of a crop is not governed by total nutrients. Instead, crop growth is governed by the amount of the nutrient in scarcest supply. Thus, it is not possible to substitute, say, nitrogen fertilizer for phosphorous.

A similar principle holds in chemistry experiments. If we are short of one reagent, it is not possible to substitute another reagent, and get the same reaction. Instead, we have to make a smaller batch.

It seems to me that oil and the economy follows a similar principle. Oil is needed to run our cars and trucks and construction equipment. In the short run, we cannot substitute anything else. So if oil supply (including biofuel substitutes) is limited by high price, we find that the economy as a whole shrinks. In the 2008–2009 recession, we saw that electricity use shrank as oil use shrank, and we saw that many workers were laid off. This is the effect we would expect from the application of Liebig's Law of the Minimum, if oil is an essential component of the economy.

In the private sector, debt bubble since 1945 seems to be deflating



Slide 8

Slide 8 - Here I am showing the ratio of debt other than governmental debt to GDP. Growing debt helps pump up GDP, because GDP measures what people purchase, not whether funds were saved up in advance to buy these goods. For example, a person can get a car loan, and use this to buy a car, and this will help increase GDP. As far back as I could find records—to 1945—private debt has been rising faster than GDP.

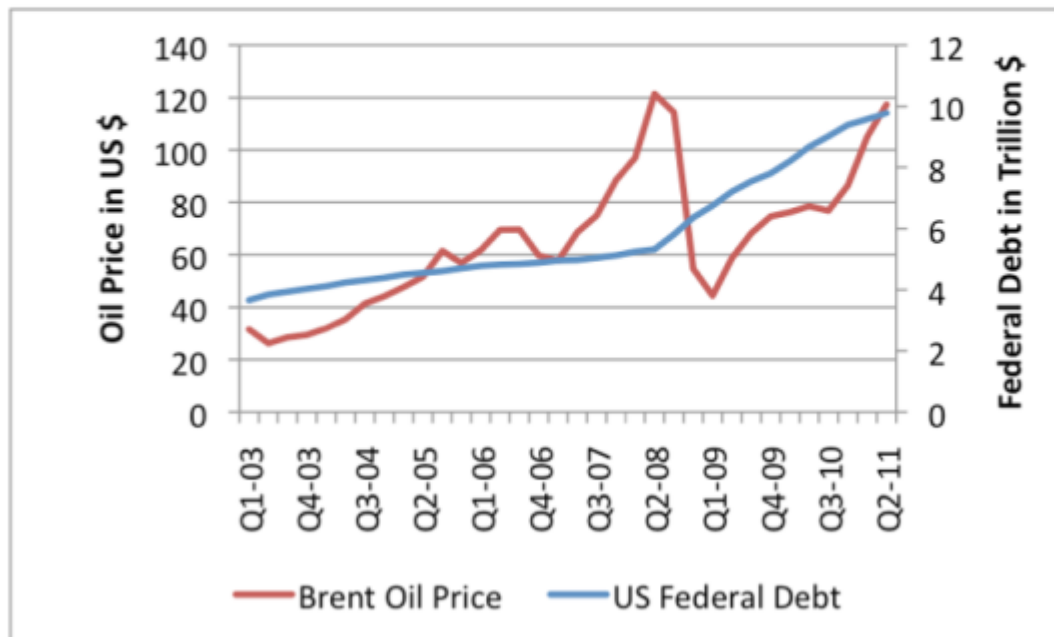
What we see in Slide 8 is a steepening of the rate of growth of non-governmental debt in the early 2000s, as the US government tried to keep economic growth rising, by keeping interest rates low and by encouraging borrowers who could not really afford to buy homes to buy them. With debt growing more rapidly, the home construction industry could be kept growing, even as oil prices would otherwise be dampening the economy.

Even as debt grew, there was a conflict with rising oil and food prices. With higher oil prices, people had less discretionary income. One area consumers cut back on was buying higher priced homes, so the prices of homes started dropping, about 2006. With lower priced homes, smaller loans were needed. Higher oil prices caused the most

vulnerable to default on their loans. Often, these were people with sub-prime loans. The Federal Reserve also raised interest rates in the 2004 to 2006 period to try to hold oil and food prices down, and this also contributed to lower demand for homes. Finally, in 2007 - 2008, non-governmental debt as a percentage of debt hit a plateau, (just as oil prices hit their peak) and started to decline in 2009, as many impacts of high oil prices were felt through the economy. The amount of non-governmental debt continued its decline in 2010, and into 2011. Such a decline, if it continues, will tend to hold down GDP growth in the future.

Problems from the 2008-2009 recession are still around

► Moved to the governmental sector

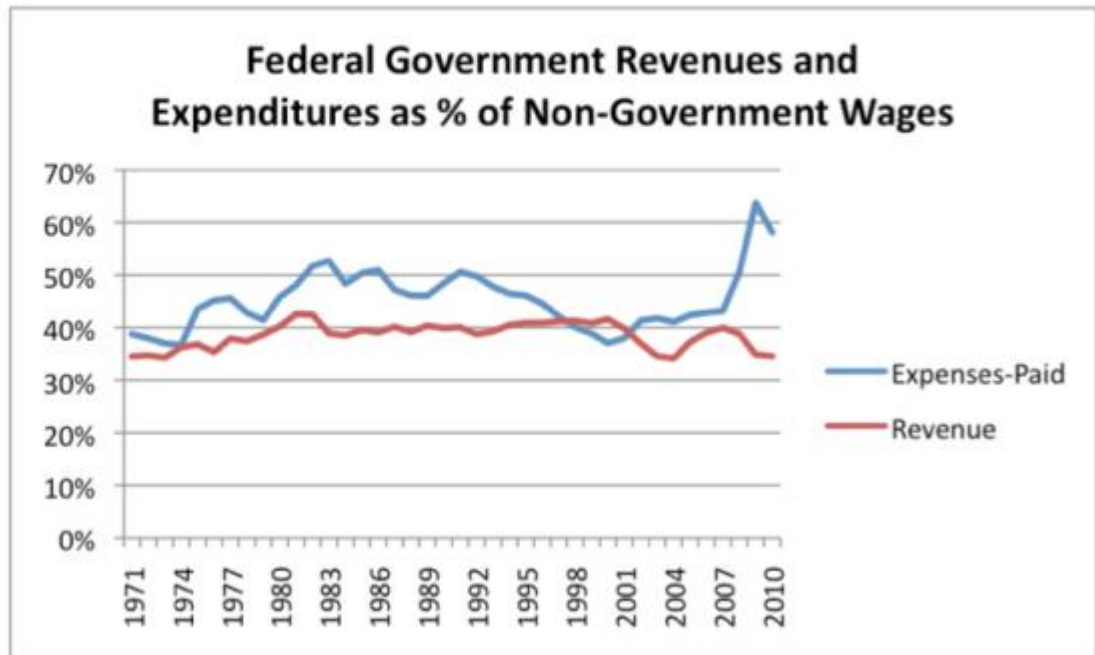


Slide 9

Slide 9 - The problems of the 2008-2009 are not gone; they have moved to the governmental sector. As non-governmental debt dropped off, the government has attempted to pick up the slack. In fact, Slide 9 shows that governmental debt suddenly started to rise at exactly the same time that oil prices hit their 2008 peak. The increase in debt occurs because the government spent more for stimulus and bailouts and unemployment coverage at the same time tax revenue was falling. While all the

government intervention prevented an even worse economic melt down, it moved problems over to the governmental sector, where they are hiding today.

Government expenditures still outpace income – US and elsewhere



Slide 10

Slide 10 - Even at this point in time, governmental expenditures are vastly outpacing revenue, so the government is finding itself deeper and deeper in debt. It is hard to see a way for this situation to get better, because of the difficulty of going back to economic growth in the future, given our limited oil supply.

Encountering many problems now

- 1) Either very high oil prices or recession
- 2) US governmental debt crisis
- 3) Euro crisis
- 4) Chinese debt problem
- 5) Debt deleveraging
- 6) Further MENA problems
- 7) Conflict between resource needs and pollution issues

Slide 11

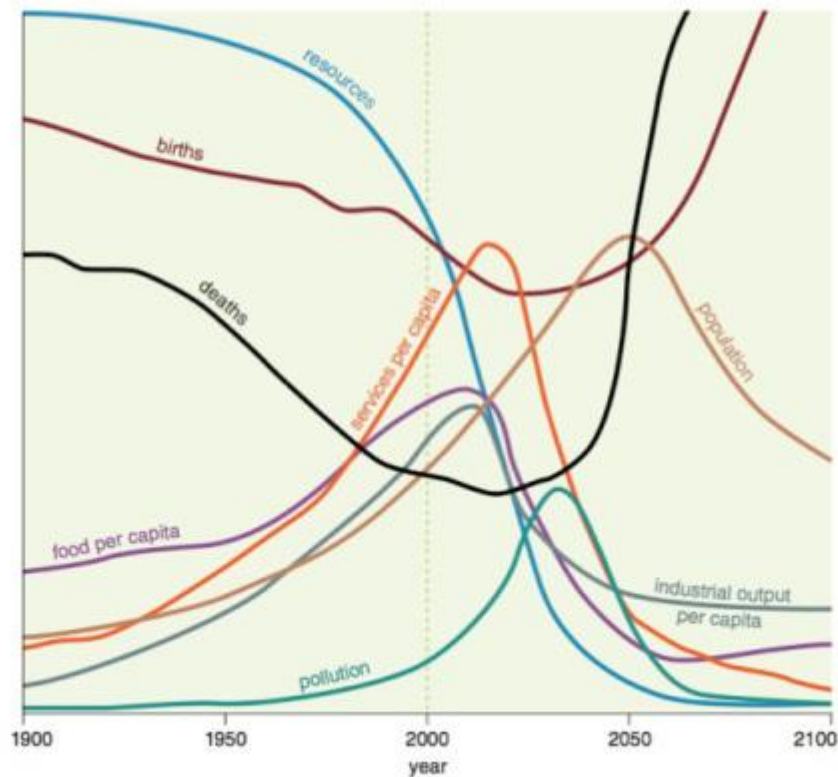
Slide 11 - At this point, the world is hitting many problems, more or less simultaneously. It seems to me that the reason we are hitting so many at the same time is because oil limits are causing problems of different types in many parts of the world.

One of the items I have listed where the connection may not be obvious is “Further MENA problems”. MENA refers to Middle East and North Africa. As oil prices rise, so do food prices. MENA is a big buyer of imported grain. When food prices rise, there is a tendency for populations to become unhappy, and even riot and overthrow governments, unless their subsidies are raised, or unless wages rise. The situation has not really improved from the situation in the spring of 2011. If food prices go higher, or if governments are not able to keep up benefits, more unrest is likely.

Financial Impacts of Reaching ‘Limits to Growth’

In the context of all of these issues, what should we expect in the future?

Let's look at "Limits to Growth" graph again



Slide 12

Slide 12 - This is the base scenario from the 1972 analysis again. As we can see, changes are expected in many areas, including the amount of resources extracted, number of births, numbers of deaths, extent of pollution, and other variables. All of the declines are not simultaneous. Since this is just a model, and the model does not include the financial system as it works today, it cannot be expected to be exactly right. But it gives us an idea that we can expect to see many interrelated effects that get more severe over time.

What to expect from LTG

- ▶ **Huge financial disruptions**
 - ▶ International trade problems
- ▶ **Political disruptions**
- ▶ **Electricity ceases to work**
 - ▶ Intermittency; local outages
 - ▶ May become widespread
- ▶ **Oil supply problems**

Slide 13

Slide 13 – Limits to Growth produces different kinds of effects than would be expected simply through reduced oil supply. One of the big issues is likely to be financial disruptions, because with lower, or even declining, economic growth, it will become more and more difficult to repay debt. Governments are also likely to have more debt defaults, because they are now shouldering a disproportionate share of the issues resulting from the higher oil prices. The possible future break-up of the Euro would seem to be one such impact.

With increased debt defaults, there may be international trade problems. Countries that have recently defaulted on their debts may find the value of their currency dropping relative to the rest of the world, making the price of oil very high for them. There may also be a question of whether other countries want to trade with them, if the defaulting countries want to buy goods using still more debt. It seems to me that some imported goods from defaulting countries may become impossible to get, because of these disruptions.

There are likely to be political disruptions, of the type we have recently seen in MENA countries. Britain has also seen riots relating to reduced social benefits, at a time of high unemployment and high food costs. In some places, these political disruptions may lead to overthrown governments. In a few instances, countries may fall into pieces, as the Former Soviet Union did. New rulers may come into power, demanding a new constitution, and a new form of government.

With all of these changes, even things we take for granted like electricity may become a problem. One problem may be that funds are not available to repair electric transmission lines after storms. Or repair parts may not be available when needed.

Oil supply may also be interrupted, in unexpected ways. Governmental overthrows in oil-producing nations may lead to reduced oil imports. Unavailability of parts may cause production to be delayed, even for countries that are producing their own oil. We cannot count on the downturn in oil to be slow—indirect impacts may cause it to be quicker.

Financial Implications

- ▶ **If monetary system still works:**
 - ▶ Necessities will be expensive
 - ▶ Homes, businesses, vehicles will be cheap
 - ▶ Stocks, bonds will decline in value

- ▶ **But money may not be available:**
 - ▶ Then relationships and power will be important
 - ▶ Also goods to trade

Slide 14

Slide 14 – It seems to me that if the financial system still works, the emphasis will be on necessities, like food and water and oil. These will be relatively higher priced than discretionary goods. High priced goods that are normally bought with credit are likely to be less frequently purchased, and may even drop in relative price.

There will be more bond defaults. Stocks will tend to decline in price, because with little or no economic growth ahead, the present value of future earnings will be low.

If for some reason money is not available, then relationships, and goods to trade, would seem to be important.

Insurance and Bank Accounts

- ▶ **Stick to short term insurance policies**
 - ▶ Homeowners
 - ▶ Auto
 - ▶ Term life insurance

- ▶ **Don't count on**
 - ▶ Pensions, Social Security
 - ▶ Bank accounts
 - ▶ Government guarantee helps somewhat
 - ▶ Most anything that is paper

Slide 15

Slide 15 - In such a disrupted economy, short-term insurance policies, such as auto, homeowners, and term life insurance would seem to make more sense than other insurance products.

As the world gets poorer, it will be less able to set aside funds for Social Security. Thus, cut backs seem likely. If there is a complete change of government, the program could even disappear completely.

How about gold or silver?

- ▶ **Too little gold to work well as money**
 - ▶ Gold hard to weigh, tell if real
 - ▶ Coins better in this respect
 - ▶ Won't work for small purchases
 - ▶ Certificates based on gold would be better, but . . .

- ▶ **Silver would be better**
 - ▶ Coins more plentiful
 - ▶ Still only small amount
 - ▶ Still won't work well as money, by itself

Slide 16

Slide 16 - People ask me whether gold or silver might be a good investment.

Metals, in general, seem likely to better hold their value than paper securities. Such appreciation of metals on commodity exchanges only "works" as long as the current system holds together.

The question then that arises is whether the gold or silver that has been accumulated can itself work as a currency, if the current US dollar runs into problems and no longer acts as a currency.

When I think about the situation, gold or silver metal bars don't work very well as currency, because of difficulty in determining that whether they really are what they claim to be. Silver or gold coins would be a little better in this regard, because then the amounts would be standardized, and there would be a greater chance that the metal is what it claimed to be.

Another issue is whether a person can "make change", so that it is possible to buy small things with the metal. It seems to me for this to work, there would need to be some paper currency based on the metal, which can be used for change. Gold in particular would be difficult for making change in, because coins don't come in small enough units. Silver coins would be a little better for buying small objects, but even here, we would quickly run into the issue of not enough metal coins for all the needed small transactions. So it seems to me that metal would work as a currency, only if it is used to back some type of "paper currency" that could be used for everyday transactions.

Another issue with trying to use gold and silver as alternate currencies is the fact that governments may not be happy with private citizens trying to usurp their role. Governments may try to confiscate any gold or silver used as alternate currency.

So in the end, while there is a chance that gold and silver coins may "work" for transactions, we can't count on this being the case. They may work in individual instances—say for bribes of public officials, but not for such mundane purposes as buying bread.

What are the best investments?

- ▶ Knowledge
- ▶ Relationships
- ▶ Land, tools, seed, and water
 - ▶ Also shelter near land
- ▶ Other thoughts
 - ▶ Don't be afraid to spend now
 - ▶ Don't worry about paying down debt
 - ▶ But don't add debt either
 - ▶ Appreciate what we have now

Slide 17

Slide 17 – So what are the best investments? Using money to learn a skill that you can use for the long term would seem to be a useful use of funds. It might also be useful to buy tools to use for gardening / farming, and land for that purpose.

Even these uses of money are less than certain, however. Unless we can grow enough food for everyone, there is likely to be a lot of fighting. Also, without the right skills and a lot of nutrient recycling, farming is not likely to last for long.

Life expectancies may very well be shorter in the future than today, and we may be less able to produce good and services than we are today. Thus, from a purely practical point of view, it may make sense to spend money we have saved now, rather than continue to save funds with the idea of being more able to buy goods and services in the future. If a person wants to see the world, or take advantage of other opportunities that are here today, today may really be the best opportunity a person has.

People often seem to be stressed out about the idea of needing to repay debt. While it would be nice to repay debt, I expect that those holding debt will be the ones who take most of the “haircut” relating to people’s inability to repay debt. Also, as a practical matter, most people don’t have the financial ability to repay much of their debts. So my view (even though I am not an investment advisor) is not to get too stressed out about the situation. If you have some debt, just let it be, but don’t add to it with new purchases like expensive new cars, or sending children to expensive private colleges.

At this point, our standard of living is close to as good as people have ever had it. Perhaps what we should be doing now is being thankful for what we have, and scaling back our expectations for the future. Most of us would continue to be happy, even if our standard of living drops a little in the future.

Source: <http://ourfiniteworld.com/2011/11/08/financial-impacts-of-reaching-limits-to-growth/>