Don’t Count on Rising Energy Prices

Gail Tverberg, October 17, 2019, SSP IEEE WiSEE 2019
What happens when oil reaches diminishing returns?

- Cost of oil *production* rises
  - Big question: Does the *selling price* also rise?

- Standard view
  - Of course, the price of oil will rise
  - Oil is a necessity; people will cut back on other goods
  - Eventually, the economy will run out of oil and need to substitute something else
    - Even if higher-priced

- Standard view is not really correct
  - Networked economy behaves strangely
  - Really a *two-sided problem*
    - Consumers need low prices; producers need high prices
    - System can be brought down in *either* direction
1. One overlooked item: Economy operates under the laws of physics
Unrecognized Truth: Economy operates under the laws of physics

- Energy is essential for the economy, just as food is essential for humans

- Economy requires adequate energy “dissipation” to grow
  - “Dissipative structures” include hurricanes, ecosystems, plants and animals
  - Adequate energy requirement is more of a total energy problem, than an oil problem
    - Includes coal, natural gas, electricity, burned biomass, animals used for labor

- Physics sets market prices
  - Consumers need to be earning high enough wages to afford the output of the system
  - Doesn’t work if only robots and owners of robots
Unrecognized Truth: Economy operates under the laws of physics (continued)

- Economy tends to “make a smaller batch,” if there isn’t enough inexpensive energy of the right kind
  - Like a baker needing to make a smaller cake, if not enough flour
  - If only the flavoring is missing, a different flavoring can be substituted
  - Energy acts differently from non-essential parts of the economy

- “Smaller batch” can play out in many ways
  - Major recession, like 2008-2009
  - Collapse of governments
  - Wars
  - Epidemics that lead to many deaths
2. Another overlooked item: Customers buy mostly finished goods and services
Prices of energy products tend to fluctuate together; people buy goods made with a mix of energy products.
Two different issues: Short-term and longer-term price fluctuations of commodities

- **Short-term fluctuations do indeed reflect scarcity issues**
  - Price will rise, briefly, if oil supply is temporarily reduced
  - Refineries will bid for the supply that is available

- **Longer-term fluctuations reflect different issues**
  - How many buyers are there for finished goods and services?
    - Examples: Homes, cars, smart phones
  - Are goods and services becoming relatively more affordable for these workers?
  - Is the world’s workforce rapidly expanding?
  - Is wage disparity disappearing?
    - High-wage workers don’t buy much more, even if they are richer
    - Need low-wage workers to be earning enough to start new families, buy homes and autos
Affordability of finished products is key to raising the prices of energy products.

Things that add to affordable demand:

1. Reducing the cost of the overall mix of energy products
   - For example, if coal is cheap, manufacture using lots of coal and not much expensive oil

2. Relatively even wages
   - Not too much skimmed off the top by highly trained workers, managers

3. Technology or inventions that make the system more efficient
   - Such as adding railroads to replace pony express and horse and buggy

4. Falling interest rates
   - Make monthly payments for new homes, cars, factories lower

5. Increasing debt
   - Can be used to hire workers, build factories, or wage war
Now, we seem to be running out of ways to make finished goods and services more affordable

- Diminishing returns lead to lower profits for oil producers, if oil prices stay low
  - This is today’s problem

- New technology seems to be reaching diminishing benefits
  - First new road in an area is much more important than later roads
  - First computers are more important than upgrades
  - New drugs target diseases affecting only a few individuals

- Interest rates are nearly as low as they can go
  - Debt levels are as high as are tolerable
3. Another overlooked item: A spike in oil prices doesn’t last for long
Spiking energy prices lead to recession quickly because wages don’t rise

Theory says oil price can increase—
but our pocketbooks disagree
When oil prices rise, recession sets in. The recession leads to layoffs and lower *average* wages.
Governments of oil *importing* countries get into the act as well

- Officials know that high oil prices adversely affect the economy
  - Politicians will be voted out of office if recession takes place
- Eliminate high oil and energy prices by *raising interest rates*
  - Fewer new new buildings and roads constructed
  - Vehicles less affordable
  - Lower demand lowers oil prices
    - Pushes the problem back to oil exporters
    - Oil exporters can hang on for a few years by borrowing more
4. Demand isn’t what most people think it is
What is demand?
What is demand?

- Demand seems to equate to “affordable quantity of finished goods and services”

- Commodities are used to make finished goods and services
  - Quantity of commodities produced tends to be fixed in the short term
  - If demand for finished goods (like cars, homes, roads, pipelines) increases, the price of commodities used to make these goods will increase

- Demand is greatly affected by “evenness of wages”
  - Because high-wage people already have enough money to buy homes and cars
  - It is wages of the less educated workers, without management positions, that matters

- Demand is also affected by *how many* are earning adequate wages
  - Adding new groups to the workforce (women 50 years ago; Chinese in the early 2000s)
Now, US income disparity is at the level of the Depression of the 1930s; 1970s were a time of low income disparity.
Growing use of technology works against affordability

- Improved technology requires that some people have special training
  - Highly skilled get more pay
  - Less left for other workers
- Robots replace some workers
- Highly paid employees often own the factories, machines
  - Leads to wealth disparity, besides wage disparity

- Adding 5G internet may work against affordability, if it raises internet prices for the ordinary user
Globalization works against affordability

- Some jobs move to China or India
- Wages for some jobs fall because of competition from low wage countries
- Acts to increase wage disparity; reduce demand
Since mid-2008, oil prices have been behaving as if demand is too low
5. Reducing interest rates is one way of fixing low demand problems; raising debt is another
Governments adjust interest rates to make economy grow faster or slower

- **Option 1: Lower interest rates and more debt**
  - Stimulates the economy
  - Cheaper to buy homes and cars
  - Also cheaper to create new factories
  - Tends to raise energy prices, including oil
  - Tends to raise asset prices, such as home prices and stock prices

- **Option 2: Higher interest rates; debt less affordable**
  - Adds to the recessionary effect
  - Brings down oil prices that are too high
    - Pushes the problem over to oil producers
    - Prices are too low for producers instead
History shows a very strange pattern. Interest rates increased until 1981; have decreased since.
Huge turnaround took place in 1981

- Prior to 1981, economy tended to grow too quickly
  - Federal Reserve raised interest rates, to keep wages in line

- Subsequent to 1981, economy has mostly needed to be speeded up
  - But now it is running out of room to speed the economy up
  - Interest rates are already very low
  - Without lower interest rates, energy prices can’t increase!
Economy can’t slow down because there are a huge number of promises that must be repaid.
Can lead to a problem mentioned a year ago

We Have a Multi-Dimensional Problem

- Complexity
- Default
- Collapse
- Growing Debt Bubble
- Growing Use of Resources of Many Kinds

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6. Economic models are misleading for energy
Standard economic models are for materials that are *not essential*; energy is *essential* based on the laws of physics.

- Energy consumption affects both demand (wages) and supply (goods and services produced).
Economists usually miss the important point that energy as a share of GDP must shrink if the rest is to grow.

Energy services cost reflects the impact of efficiency gains.

Source: Roger Fouquet, *Divergences in Long Run Trends in the Prices of Energy and Energy Services*
The only way non-essential portions of the economy can grow is if essential parts take up less of the total.

Figure 2. World GDP sector added value shares

Source: UNEP
Very similar to the food situation for humans

- Humans cannot spend all of their income on food

- Food share (as well as other necessities) must drop as % of total
  - If new uses, like recreational activities, are to be added

- Big increase in food cost forces cutbacks in other expenditures for humans

- Big increase in energy costs forces cutbacks for economy as well
  - This is the major reason energy prices cannot rise
  - Leads to debt collapses; governmental collapses
7. A look at how oil prices have behaved in the past
Possible to see historical oil price spikes back to 1861, using BP data
We can overlay these patterns with some price-related issues.
1861 – 1865 was time of US Civil War oil price spike

- Growing war-related debt led to increased “demand” for oil products
- Prices dropped as soon as the war was over
- Prices had little to do with the cost of production
1870s to 1920s Time of Inventions and New Technology

- **Examples of new technologies added**
  - Train service made transportation much easier
  - Better buildings available with structural steel and elevators
  - First automobiles, trucks available
  - Much improved farm machinery available

- **Led to booms and busts**
  - Some were winners, but many more saw their incomes fall
  - For example, food became much lower-cost to produce for those with new farm machinery
    - City dwellers could afford to buy more goods and services, other than food
    - But farmers who could not afford the new technology could not make enough money
      - Bought fewer goods of all kinds
1870s to 1920s Time of Inventions and New Technology (continued)

- Oil prices rose and fell
- Pattern is of ever-lower peaks and ever-lower valleys
- By the early 1930s, prices were clearly way too low
  - Situation was one of too little demand

- Low energy prices/demand were in place for World War I, Great Depression and World War II
World War I and WWII: Peak Coal in UK and Germany. Coal prices didn’t rise high enough!

Peak coal in UK occurred at time of World War I, and Peak Coal in Germany at time of World War II. Led to Wars?

Source: http://www.davidstrahan.com/blog/?p=116

Texas Railroad Commission began fixing oil prices in early 1930s, and continued until around 1970

- TRC prices started out higher than market-based price in 1930s
  - Prices stayed close to flat (less than $20 per barrel) for 40 years
    - In later years, prices likely were far below market based prices
  - Only time that prices were not at physics-based prices!

- Low prices were very beneficial for buyers of oil
  - Europe, Japan, United States and Soviet Union were all able to grow their economies in this period

- Low prices discouraged Middle Eastern producers who wanted higher prices

- Removal of artificially low TRC price, together with high demand, led to price spikes of 1970s
  - US employers raised wages to compensate for higher oil prices, helping keep prices high
High prices of 1973 to 1981 reflected many issues at once

- Huge amount of oil demand that had built up in US, Europe, and Japan, as result of long period of low prices
  - Many people bought cars for the first time
- Peak in US oil production in 1970, indirectly related to TRC cap on prices
- Arabs’ frustration with TRC pricing
  - New prices were really physics-based market prices
  - OPEC did not have the same power over prices that TRC did
- US employers in 1970s gave cost-of-living raises to their employees
  - Inadvertently fed the high oil prices
- Total world energy supply was still growing (next slide)
  - Allowed world economy to grow; little wage disparity
World energy consumption (not just oil) grew rapidly between World War II and 1980.

- Rapid growth helped by low oil prices and women entering the labor force
In 1981 to 2001, oil prices held down by

1. **Adverse impact of interest rate spike of 1981**
   - High price of oil discouraged building projects of all kinds

2. **Impact of crash of government of Soviet Union in 1991**
   - This seems to have been a follow-on impact of the fall in oil prices after 1981
   - Soviet Union was an oil exporter
     - Needed higher prices to develop other fields
     - Also, communism was not an efficient form of government
Soviet Union collapse affected wide area and many types of resources for 10+ years.
Impact of Soviet Union collapse seems to have pushed prices lower than interest rate impacts alone.
Temporary escape from low oil prices came when China joined the World Trade Organization in 2001

- Suddenly, China added both energy supply and energy demand
  - China added huge amount of cheap-to-produce coal
  - Demand related to building huge quantity of factories, roads, goods in China

- China’s cost of finished goods and services was lower
  - Used cheap coal and cheap labor
  - More affordable for customers in US, Europe, Japan
  - But China’s higher oil demand led to a spike in oil prices

- Moving production to China adversely affected job opportunities in US, Europe, and Japan
  - Higher oil prices also made cost of commuting higher in US and elsewhere
  - Together with US housing debt bubble, led to Great Recession of 2008-2009
China’s energy consumption grew greatly, to support its new role. But its coal production has lagged since 2013.
Now China is no longer helping the world economy as much as in the past

- Oil prices have generally been falling since 2008, despite QE and OPEC cuts.

![Inflation-Adjusted Oil Price Chart](chart.png)

- Price Trend
- OPEC Cutback

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Wholesale electricity prices are plunging, even beyond those of the underlying fossil fuels
Subsidies for wind and ground solar lead to the need for subsidies for other fuels

- When one type of provider gets a subsidy, all need subsidies
  - Even “going first” is a huge subsidy
- Nuclear and coal get subsidies, in order to remain open
- Playing field becomes more and more unlevel
  - No producer can compete without subsidies
  - Cannot end well
8. Are any fixes available?
Difficult to see a way to get energy prices, including wholesale electricity prices, to increase.

- Moving *income* from the rich to the poor might help demand
  - Moving *assets* from the rich to the poor might also help
  - This is why some proposals by Democratic candidates for president are popular

- Getting rid of subsidies and mandates for wind and ground solar might be helpful
  - Would tend to raise wholesale electricity prices; commodity prices
  - Also help keep transmission costs from escalating further
  - These ideas are likely to be favored by Republican office-seekers
Update on renewables: A few charts
Wind, solar, and hydroelectric provide only about 10% of the world’s energy supply today.
Hydroelectric is nearly flat as share of energy supply; wind and solar are growing, thanks to mandates and subsidies.
Electricity will likely not be 100% of energy consumption for 150 years, at current rate of change
Electricity is less than half of energy consumption. Demand is highest in winter for all energy products combined.
Timing by month of solar is ill-suited to matching total energy demand – too low in winter!