Energy Macroeconomics

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In the recent modern industrial age, there are three interesting historic periods that give some indication about what can happen to the world's macro economy if a peak in world oil production were to occur: First, there is the era of the fall of the Soviet Empire which occurred after Soviet peak-oil in 1988. Second, there is the stagflationary era during the 1970s, when the U.S. reached its peak in conventional oil production in 1970 and how that affected the "West" including the U.S., Western Europe and Japan. And third, there is the era after the plateau of the world's conventional oil production that occurred starting in 2005 and which affected the entire world.

Note that since 2009, the world has relied on U.S. shale-oil at the margin for its liquid petroleum needs, and where U.S. shale-oil is about three times the real, inflation-adjusted price that conventional oil was during much of the 20th century, even at today's roughly $50 per barrel petroleum price. Non-U.S. shale-oil, though, may encounter higher costs to produce than U.S. shale-oil considering how easy it is in the U.S. to deal with the shale-gas compliments to shale-oil. That means that once U.S. shale-oil reaches its peak, then there will be a fourth peak-oil situation with a substantial increase in oil prices and a new macro-economic convulsion, upon which an appropriate speculation can be made.

Therefore, along the lines of Hamilton (1983, 2009, 2013) where oil prices are shown to cause macroeconomic events, maybe it is possible to take one step back in causation and look for oil supply levels, i.e., peaks in supply, to see if there are macroeconomic parallels or not.

Churrency Changes and Bankruptcies

Two observed macro-economic effects of a peak-oil event are currency changes and banking problems. First, consider the Soviet collapse. The way the macro-shock started at that time was with the sudden rubble shock-devaluation, where the Soviet rubble jolted down by an order of magnitude on October of 1989 one year after Soviet peak–oil. After the rubble shock, there was a continual rapid inflationary period, and eventually Russia, Ukraine, Kazakhstan and the other Soviet republics all created national currencies, and where the currencies continued to inflate.

Luckily, the new countries and their banks could still rely on having a reserve currency to use, such as the dollar, to help stabilize things. In the post-Soviet days, then, the banks kept two accounts: one for dollar loans and transactions and one for local currency loans and transactions. While this is not unusual in many banks around the world, it was more obvious in those days, but even then most common people kept their money in cash, i.e., dollars, rather than with the banks. Still, even with dollar reserves available to banks, and with government oversight, one could never tell when a bank might go bankrupt which happened from time to time during the post-Soviet transition.

In the West in the 1970s, a remarkably equivalent parallel to the Soviets occurred, where such an improbable parallel suggests that the macro-economies of East and West were more similar to each other than not. The Western shock started on August of 1971, only one year after the U.S. oil peaked in 1970, when U.S. President Richard M. Nixon took the dollar off of the Breton Woods gold standard system. That was the so called "Nixon-shock," which included a short lived wage and price freeze, but where the dollar and other currencies began floating. Troubles with the banks and the banking system took longer to mature, but came about with problems in the U.S. condominium markets, debt crises of several emerging market countries and the U.S.'s own Savings and Loan problems. And there was, in a similar manner as the post-Soviet situation, high inflation rates in the 1970s and into the early 1980s throughout the Western World.

The world's 21st century "Global Free-Trade Empire" had a little more subtle currency change after the 2005 conventional oil plateau. The post-2005 oil-plateau currency change started when the worlds' central banks carried out Quantitative Easing. And while most economists see the financial crisis as the cause of the Quantitative Easing, nevertheless, the increasing price of oil from 2005 onward had to have played a role in these macroeconomic events. After all, the high price of oil degraded economic vibrancy pushing people to lean on housing ever more forcefully as a way to continue spending.

The signal that the world's currencies had changed after 2005 came about in 2008 when many of the central banks started Quantitative Easing on a massive scale which included buying poorly rated mortgage backed bonds and other securities. The monetary base of the U.S., as measured by the Federal Reserve's assets, doubled in 2008 and doubled again in around 2014 such that it is now six times higher than it was in 2005. The ECB's assets also started increasing rapidly after 2008 and are now about 5 times higher than they were in 2005 and similarly with Japan. The world's currencies have different characteristics because the backing of the currencies has changed, and indeed the price of gold tripled. Another indication of the post-2005 currency change could be the invention of

Bit-Coin itself, as the idea behind crypto-currencies is the lack of trust in the central banks. Again, this third currency change somewhat parallels the Nixon-Shock and the Rubble-Shock.

The more obvious change after 2005 was the too-big to fail bankruptcies and potential bankruptcies of the world's largest banks that required all the quantitative easing in the first place. Then there were the banking stress-tests, the mortgage inversions and the housing abandonments that occurred. The inflation in the post-2005 plateau period was also more subtle in that housing and other asset prices rose substantially including that of stock prices, which have attained the highest price to earnings ratios since the late 1920s or the Dotcom Bubble. Thus all three modern "Empires" changed their base currency value, endured at least some inflation and had banking problems.

If we were to speculate on what may happen when peak U.S. shale-oil occurs, which may become the world's ultimate peak oil event, we can project similar circumstances. Probably currencies will become unstable. There may be a shock in gold prices and countries will be forced to devalue their money. It is also possible that European countries will separate each into their own national currencies similarly to how the Soviet Union's rubble broke up and national currencies were issued.

However, without a strong reserve currency, it will be hard to have banking. Therefore gold-backed banks may emerge to take care of banking needs and, like the Middle Ages, each bank will issue gold valued checks, or what might be called a bank issued currency, in order to help the economy work properly. It is also possible that gold and silver coin kiosks will be ubiquitous throughout the world, where people will have to trade in their currencies for gold, or something that is a hard asset, in order to hedge against their inflating currencies. One can only speculate on the relevance of crypto-currencies in such an environment.

So, the banks will transition to these new circumstances but one will never be able to tell which banks may go bankrupt or which ones will stay solvent. And without a single strong reserve currency, or a strong central bank, banks will have to revert to having one side of the bank for gold loans and transactions and one side of the bank used for local currency loans and transactions. But one may not know the gold reserves of any given bank and any bank could suddenly go bankrupt.

Then, countries, such as the U.S. with its gold reserves at Fort Knox, may try to resurrect a stable gold based currency, similar to Ancient Rome's famous Diocletian currency reform. But, it will be difficult not to be tempted to start printing and devaluing that new currency just to pay for government services. In the end, there may be less trust of the banks and less banking and that in turn will cause less economic activity in general. More people will save money under their mattresses than at banks, further reducing lending and economic activity. Fin-techs such as internet peer-to-peer lending will still have the same "trust" issues as conventional banking.

Deregulation and Breakdowns

In new institutional economics, such as Banerjee (2002) and shown in Gleaser and Shleifer (2002) and Umbeck (1977), institutions are as much caused by the macroeconomy as cause changes to it. During the post-Soviet economic change, for example, there was rapid de-regulation of the economy after Soviet peak-oil such as the relaxing of Soviet planned prices and people being allowed to sell things on street corners. The post-Soviet electric utilities were relatively stable, but as more people didn't pay bills and as people learned how to steal electricity from power lines, and because utilities were government owned and not allowed to raise prices severely, utilities often had brown-outs to survive. People would have available a certain time of day for power like for example a 2 hour window from 10 pm to midnight (22:00 to 24:00) and if that was your time, you had to use every electrical thing you needed at that time such as using the clothes washer or baking cookies.

Many post-Soviet stores, usually large ones, went out of business even as smaller mobile retail outlets and bazaars became more popular. There was a lot of trade in food with farmers' markets and trade in other items such as automotive parts, bicycles, chain saws and anything useful usually done on street corners or at bazaars. The mail services, the phone services and other services became inefficient and intermittent, and while you could ascribe that to the fact that they had always been relatively inefficient, nevertheless they had no ability to rapidly improve.

During the 1970's Western post conventional peak-oil, there was also an environment of de-regulation including the de-regulation of natural gas pipelines, airlines and trucking. One of the more interesting break-downs in the U.S. was with regulated gasoline (petrol) prices that created long gasoline lines (queues) with multiple cars waiting for a turn to fill-up with petrol. Other regulations such as the price of "new" oil and "old" oil created black markets of sorts for certifications of oil fields, which in turn reduced the ability to initiate enhanced oil recovery (EOR). Also there were some large retailers that had to re-structure in the 1970s such as Montgomery-Wards, which was sold to Mobile Oil Company, although Exxon was not allowed to purchase Sears. In both the Western and the Soviet situations, there were suddenly unemployed workers in all types of fields even in such fields as accounting, engineering and technical work as suddenly some types of work were less valuable while other types of work became more valuable. In the Post-Soviet States, there were even workers standing on street corners waiting for employers to hire them for the day.

In the 1970s in the West, utilities had to scramble to change away from oil generated power for peaking

demands and in some cases could not change to natural gas since natural gas supplies to many locations were constrained by pipeline and shipping capacities. This induced a backing of nuclear power generation as an alternative form of power production and indeed after 2005 there was also a renewed backing of nuclear power that only slowed down and went into reverse after the 2011 Fukushima disaster.

In the post-2005 economy, de-regulations were more subtle. They included how Uber and Lyft among others created de-facto de-regulated taxi services around the world, and how Airbnb deregulated hotels around the world. Electronic information and shopping also changed and forced such retail outlets as Sears into decline. Alternatively, as in Post-Soviet days and in the 1970s West, there have also been counter-deregulations, examples of which include airline, retail store and banking mergers, ostensibly allowed to make businesses stronger in the face of economic volatility. In the U.S. due to the Supreme Court, labor unions have been de-facto de-regulated.

Another interesting parallel between eras is migration. In the post-Soviet world a number of people migrated often to ethnically centered homelands: Russians migrated to Russia, Uzbeks migrated to Uzbekistan and a number of ethnic Germans migrated to Germany. After the 1970s oil price shocks, many in the U.S. who had been living on the outskirts of cities tried to move closer to city centers even as interest in mass-transit accelerated. Job related migrations also occurred. The migrations of the post-2005 era have been more obvious than other eras in that they included the refugee crises around the world not just from Syria, but much of Northern Africa, Latin America and Myanmar among others and often as a result of lower worldwide economic activity.

Similar to the breakdown of utilities in the post-Soviet days, the long petrol queues in the 1970s' U.S. and the banking institutional problems in the post-2005 time frame, it is possible when the next peak in oil production hits to expect that regional utilities may have problems. For example, the current idealized deregulated utilities force regional grids to deal with multiple entities including buyers and generators, and where the grid operators have to mesh the power system differences together to smooth out the lumpiness of power loads and line frequency variances. Once economies and businesses break down, many of these grid entities may pull at each other and at least some of the regional electrical grids may fail, not to mention the possible break downs of water, internet and other utilities, and breakdowns of liquid natural gas (LNG) shipment logistics. Micro-grids might have to be instituted with high cost power and using storable fuels. Indeed, with oil, LNG and nuclear power constrained, as they could be, coal could re-emerge as a powerful energy back-up.

If internet, cell phones and national mail services break down, then private small carriers may become more important. Deregulation or counter-deregulation (consolidations) may happen in medicine, in regional zoning, in inner-city travel, in education, in fin-techs and in other areas. There may also be migrations within countries, between countries and across regions.

Conclusion

According to Reinhart and Roghoff (2009), each financial crisis is both different and the same, or as Tolstoy said, "Happy families are all alike; every unhappy family is unhappy in its own way." And so, too, would a careful analysis of peak-oil situations reveal parallels and differences, kind of along the lines of Diamond (2005), or Tainter and Patzek (2012). The parallels and differences considered here may look to be merely anecdotal. The point is not to prove the parallels, but to simply try to understand what could happen during severe energy circumstances forced on a modern industrial society. After all, global climate scientists consider a single planet's trend, rather than a thousand plants' trends, in order to discern potential futures. Past climate change events are also considered. Here, past macro-economic events are considered. These three past peak-oil situations in the modern industrial era may at least provide an impression of what could happen in the future.

References:

Banerjee, Abhijit (2002). "The Uses of Economic Theory: Against a purely positive interpretation of theoretical results," *BREAD working paper no 7*, MIT, Bureau for Research in Economic Analysis of Development: Cambridge, MA.

Diamond, Jared, (2005). *Collapse: How Societies Choose to Fail or Succeed*, Viking, New York.

Gleaser, E., and A. Shleifer (2002). "Legal Origins," *Quarterly Journal of Economics*, November, volume 117, number 4, pp. 1193 – 1229.

Hamilton, James D. 1983. "Oil and the Macroeconomy since World War II." *Journal of Political Economy*, 91 (2): 228–48.

Hamilton, James D. 2009. "Causes and Consequences of the Oil Shock of 2007–08." *Brookings Papers on Economic Activity* (Spring): 215–61.

Hamilton, James D. 2013. "Oil Prices, Exhaustible Resources, and Economic Growth." In *Handbook on Energy and Climate Change*, edited by Roger Fouquet, 29–63. Cheltenham, UK: Edward Elgar Publishing.

Reinhart, Carmen M. and Kenneth S. Rogoff (2009). *This Time is Different: Eight Centuries of Folly*, Princeton University Press, New Jersey.

Tainter, Joseph A. and Tadeusz W. Patzek (2012). *Drilling Down: The Gulf Oil Debacle and Our Energy Dilemma*, Springer Science, New York.

Umbeck, John, (1977). "The California Gold Rush: A Study of Emerging Property Rights," *Exploration in Economic History*, Volume 14, July, #3, pp. 197-226.