Global Economies & Markets: Appreciating Phase Transitions

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Global Economies in Transition

- Global growth improving, especially in emerging markets
- Phase Transitions can be Challenging
- Demographics constrains potential growth in US, Europe, and Japan
- Central banking experiments
- US tax cuts and economic growth
- Rising debt load matter
- Technology & Commodities
- Thoughts on crypto-currencies
- Weather
World Real GDP Growth Inching Higher

Annual Percent Change from Previous Year

<table>
<thead>
<tr>
<th>Year</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>3%</td>
<td>2%</td>
<td>3%</td>
<td>3%</td>
<td>3%</td>
<td>2%</td>
<td>1%</td>
<td>5%</td>
</tr>
</tbody>
</table>

NYMEX WTI Crude Oil Nearby Futures Price

Source: CME Group DataMine "End of Day" (EOD) as of 1 December 2017.
Phase Transitions in Physics: Example

In physics, a change from a liquid to a gas is a classic example of a phase transition. There is seriously chaotic behavior at the boundary between two different states.

Royalty Free Stock Images: Boiling water in an ovenproof dish
ID 32502199 © Roae | Dreamstime.com
Demographics are a major phase transition:

Aging mature countries vs Young emerging economies.

They have very different potential growth rates.

Source: US Census Bureau, International Database.
https://www.census.gov/population/international/data/idb/informationGateway.php
Japan and China Demographics: 2017

Source: US Census Bureau, International Database.
https://www.census.gov/population/international/data/idb/informationGateway.php
India and Brazil Demographics: 2017

Source: US Census Bureau, International Database.
https://www.census.gov/population/international/data/idb/informationGateway.php
US Economic Expansions -- Average Annual GDP Growth (Recessions Omitted)

- 1962-1970 / Johnson-Nixon: 5.0%
- 1976-1979 / Carter: 4.7%
- 1983-1988 / Reagan: 4.5%
- 1992-1999 / Clinton: 3.9%
- 2003-2007 / Bush: 2.8%
- 2010-2017 / Obama: 2.1%

Source: St. Louis Federal Reserve Bank FRED Database (GDPC1)
Slower than desired growth?
Let’s try unconventional monetary policy
Federal Reserve Balance Sheet as Percent of US Nominal GDP

Source: Federal Reserve Bank of St. Louis FRED Database.
European Central Bank Assets (% of GDP)

Source: European Central Bank via Bloomberg Professional.
Bank of Japan Assets (% of GDP)

Source: Bank of Japan (www.boj.or.jp)
Central Bank Balance Sheet Size

Percent of Country's GDP

Government 10-Year Bond Yields: US, Germany, and Japan

Source: Bloomberg Professional (USG10YR, GJGB10, GDBR10)
Slower than desired growth?

So, monetary policy did not work to raise economic growth.

Let’s try fiscal policy.
Laffer Curve -- Stylized
Top Marginal Tax Rate vs Tax Revenue as Percent of GDP

Peak Tax Revenue after which higher tax rates lead to Lower Tax Revenues.

Source: Created as an Illustration by CME Group Chief Economist.
“Tax cuts: Fuel share prices, not necessarily a catalyst for economic growth”

by Blu Putnam & Erik Norland


Top US Marginal Tax Rate for Personal Income

Note: Top tax rate was applied to different income levels. Higher rates applied to only very few wealthy individuals. Lower tax rates typically broadened the tax base and applied to more people.

Source: Tax Policy Center
US Federal Corporate Taxes & Profits as Percent of GDP

Corporate Profits Before Taxes as Percent of GDP

Corporate Taxes as Percent of GDP

Corporate profits and taxes are net of Federal Reserve Bank profits and taxes.

Source: St. Louis Federal Reserve Bank FRED Database.

Corporate Profits = A053RC1Q027SBEA, Federal Reserve Profits = B397RC1Q027SBEA, Federal Corporate Taxes = B075RC1Q027SBEA, F
US Federal Government Receipts and Expenditures as Percent of GDP

Federal Government Expenses as % of GDP
- 22.1%

Federal Government Receipts as % of GDP
- 18.6%

Source: St. Louis Federal Reserve Bank FRED Database (FGEXPND, FGRECPT, GDP)
US National Debt as Percent of GDP

Source: St. Louis Federal Reserve Bank FRED Database (GFDEGDQ188S, FYGFGDQ188S)
Phase Transitions are active in Commodity Markets due to Technological Change.
NYMEX WTI Crude Oil Nearby Futures Price

Source: CME Group DataMine "End of Day" (EOD) as of 1 December 2017.
US Crude Oil Production

Source: US Energy Information Administration
(Weekly US Field Production of Crude Oil)
Petroleum Used by Transportation Sector in the US

Peak year was 2006

Source: US Energy Information Administration, "August 2016 Monthly Energy Review", Table 2.5.
US Electrical Generation Energy Sources: Coal versus Natural Gas

Source: US Energy Information Administration
(Table 7.2b Electricity Net Generation: Electric Power Sector)
2016 Estimated by CME Group Economics

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And, what about crypto-currencies?
Gold and Bitcoin

Number of Dollars per Troy Ounce of Gold or per Bitcoin
Log Scale

Source: Bloomberg Professional (GOLDS and XBT)
Gold and Bitcoin Risk

Source: Bloomberg Professional (GOLDS and XBT), CME Economic Research Calculations
Bitcoin Money Supply Growth

Source: https://en.bitcoin.it/wiki/Controlled_supply
Finally, let’s not forget phase transitions in the weather.

Say hello to La Niña!
El Niño peaked back in August 2015

Source: National Oceanographic and Atmospheric Administration – http://www.ospo.noaa.gov/Products/ocean/sst/anomaly/
La Niña – 30 November 2017 – is here now

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 11/30/2017
(white regions indicate sea-ice)

Source: National Oceanographic and Atmospheric Administration – http://www.ospo.noaa.gov/Products/ocean/sst/anomaly/
Thank You.

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