The Great Plunge in Oil Prices: Causes, Consequences, and Policy Responses

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WORLD BANK

“Commodity Cycles and their Implications”
Bank of Canada and International Energy Forum
Ottawa, Canada
April 25, 2016
The latest edition of the World Bank’s Commodity Markets Outlook was published on January 26, 2016. The next edition will be published tomorrow at 3:00 pm EST!

Commodity prices (“pink sheet”) are updated on the third business day of each month (the next update will be posted on May 4, 2016).

www.worldbank.org/commodities

World Bank, Commodity Markets Outlook, Various Special Focus sections (including, China’s and India’s role on commodity consumption, the nature of the four oil price plunges, Effects of El Nino on commodity prices, the effect of EMDEs growth slowdown on commodity markets, Iran’s role in energy markets).


Questions

- What kept oil prices high during 2011-14? Did OPEC play a key role?
- What are the implications of the oil price plunge for other commodity markets?
- Where are commodity prices heading?
What kept oil prices high during 2011-14? MENA disruptions and OPEC. Did OPEC play a key role? Yes
Virtually all commodity prices declined after 2011Q1, but oil

Source: World Bank
Note: Last observation is March 2016
Indeed, oil was the outlier, out of all major commodities! Why?

Source: World Bank
Oil production increases sharply but “losses elsewhere” along with OPEC’s production quotas balance the market thus keeping prices high, despite downward revisions of growth prospects.

The “oil glut”

OPEC disengages from supply management

Search for equilibrium

Source: World Bank
Global growth: Pessimist in the short term

<table>
<thead>
<tr>
<th>Percent</th>
<th>Forecast in January of previous year</th>
<th>Forecast in January of current year</th>
<th>Actual growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>6.1</td>
<td>5.4</td>
<td>5.0</td>
</tr>
<tr>
<td>2013</td>
<td>6.0</td>
<td>5.5</td>
<td>4.8</td>
</tr>
<tr>
<td>2014</td>
<td>5.7</td>
<td>5.3</td>
<td>4.3</td>
</tr>
<tr>
<td>2015</td>
<td>5.5</td>
<td>5.0</td>
<td></td>
</tr>
</tbody>
</table>


Notes: Growth refers to developing countries.
But also pessimism in the long term

Source: World Bank calculations based on Consensus data.
Note: Weighted average growth October forecasts for 46 countries for which long-term consensus forecasts are available.
Consistent upward revisions to U.S. oil production by IEA

Source: International Energy Agency and World Bank
Note: U.S. oil output includes biofuels. Last observation is December 2015.
And by EIA as well

Source: Energy Information Agency and World Bank
Note: Last observation is December 2015.
Biofuels and Canadian oil production

Global biofuel production

Canadian oil production

Surplus conditions became apparent in 2014Q2

Source: International Energy Agency and World Bank
Note: Last observation 2015Q4
Triger I: Geopolitical concerns dissipate

Iraq's oil production during 2014
Libya's oil production during 2015

Source: IEA
Triger II: The U.S. dollar begins appreciating

Source: World Bank and FRED.
Note: Oil refers to WTI and US$ is the trade weighted U.S. dollar index against major currencies, not seasonally adjusted (DTWEXM), both daily frequency
OPEC’s changing objective

- Following the East Asian financial crisis when oil dropped below $10/bbl, OPEC began setting a price target range, initially at $20-25/bbl and gradually reaching $100-110/bbl.

- In the face of weakening demand and increasingly strong supplies from unconventional sources, OPEC decided not to cut production in order to defend market share (November 27, 2014). An earlier, similar (albeit delayed) move was taken in 1985/86.

- The decision most likely reflects the realization that global commodity markets cannot be “managed” for long, regardless the nature of the commodity. Artificially maintaining high and stable prices not only attracts suppliers not bound by the agreements but also encourages development of substitute products. Examples abound:
  - **International Tin Agreement, 1954-85**: It had two implications: (i) Artificially high tin prices made non-member producers more competitive; (ii) it encouraged the use of aluminum, a substitute product.
  - **International Coffee Agreement, 1962-89**: It attracted new (non-member) producers, including Vietnam, which is now world’s second largest coffee supplier.
The four great oil plunges

OPEC changes policy to regain market share
Price drops 66% in 82 days

First Gulf war
Price drops 48% in 71 days

2008 financial crisis
Price drops 77% in 113 days

1965-2015 average price: $48.32/bbl

OPEC changes policy to defend market share
Price drops 51% in 83 days

Source: World Bank
Note: Last observation is April 2016
Two of which are similar

Two of which share three remarkable similarities: 1985/86 & 2014/15

Source: World Bank
Note: Last observation is April 2016
Both materialized after a period of high prices, in part supported by OPEC:

- **December 1978-January 1986**: $82/bbl
- **August 2004-December 2014**: $92/bbl
- **50-year average (excluding the above periods)**: $29/bbl

*Source: World Bank*

*Note: Last observation is April 2016*
In both periods, high oil prices brought new oil supplies:

- **Prior to 1985/86**: (i) Alaska, (ii) North Sea, and (iii) Gulf of Mexico (brought 5 mb/d in the 8 years prior to the collapse, 9% of world total)
- **Prior to 2014/15**: (i) Biofuels, (ii) Canadian oil sands, and (iii) U.S. shale oil (brought 7 mb/d in the decade prior to the collapse, 8% of world total)

Source: World Bank

Note: Last observation is April 2016
And in both cases OPEC responded

In both cases, OPEC disengaged from managing supplies exacerbating the price collapse--delayed response in 1985, quick action in 2014.

Source: World Bank
Note: Last observation is April 2016
A VAR model with sign restrictions

- The reduced-form VAR model is:
  \[ y_t = a_0 + A_1y_{t-1} + A_2y_{t-2} + \cdots + A_ly_{t-l} + u_t \]

- The variables included in the model are: oil prices, equity prices, and U.S. exchange rates.
- Supply and demand shocks are identified using sign restrictions.
- Two orthogonal shocks with impulse responses that satisfy certain signs are estimated using the model.
- **Adverse demand shock:** Oil and equity prices decline reflecting a weak economy.
- **Favorable supply shock:** Oil prices decline but equity prices increase.
- The differing movement of equity prices allows one to discriminate between supply and demand shocks.
Is it demand or supply?

Source: Baffes, Kose, Ohnsorge, Stocker (2015).

Note: Based on estimates from a VAR model, identifying the demand and supply shocks using sign restrictions. All shocks except the shock of interest are shut off by setting them to zeros and the model is used to trace out the counterfactual oil price. This exercise is performed separately for supply and demand shocks. The red (yellow) counterfactual shows how much oil prices would have declined since the second half of 2014 only with the estimated supply (demand) shocks. The solid line is the actual cumulative growth rate in oil price since July 2014. The last observation is January 8, 2016.
What are the implications of the oil price plunge for other commodity markets? Lower agricultural prices.
The oil price plunge brought energy prices closer together

Source: World Bank
Note: Last observation is March 2016
Natural gas prices follow suit

Source: World Bank
Note: Last observation is March 2016
The complex interaction between energy & agricultural prices

A: Crude oil
B/C: Natural gas
D/F: Policy-driven Biofuels

G1: Profitable biofuels (they may render A, B, and D/F irrelevant; oil price sets a floor to agricultural prices)

G2: Innovation in biofuels (agricultural prices fully linked to oil at lower level)

Source: Baffes (2013)
Energy intensities

- Source: Author’s calculations based on the GTAP database
Food commodity prices respond strongly to energy prices

Transmission elasticity estimates

Source: Baffes (2007)
Notes: based on OLS regression of nominal prices on oil price, deflator, time trend, annual data, 1960-2005.
Oil’s impact on other commodities

Reduced-form econometric model

\[
\log \left( \frac{P_t^i}{P_t^M} \right) = \beta_0^i + \beta_1^i \log(Y_t) + \beta_2^i R_t + \beta_3^i \log(X_t) + \beta_4^i \log(S_{t-1}^i) + \beta_5^i \log(P_t^E) + \epsilon_t^i
\]

- \( P_t^i \): Nominal price of commodity \( i \) (\( i = \) maize, soybeans, wheat, rice, palm oil, cotton)
- \( P_t^M \): Price index of manufacturing goods,
- \( Y_t \): Income (proxied by various measures of GDP),
- \( R_t \): Interest rate (3-month T-bill),
- \( X_t \): US$ exchange rate (broad index of currencies),
- \( S_t^i \): Stock-to-use ratio of commodity \( i \),
- \( P_t^E \): Price of crude oil,

Data: Annual frequency, 1960-2015

Estimation: OLS and Panel (next slide) as well as ARDL (not shown here)
## The role of energy in agricultural prices

<table>
<thead>
<tr>
<th></th>
<th>Maize</th>
<th>Soybeans</th>
<th>Wheat</th>
<th>Rice</th>
<th>Palm oil</th>
<th>Cotton</th>
<th>Panel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S/U ratio (-1)</strong></td>
<td>-0.48***</td>
<td>-0.21***</td>
<td>-0.46***</td>
<td>-0.49***</td>
<td>-0.42***</td>
<td>0.40***</td>
<td>-0.37***</td>
</tr>
<tr>
<td><strong>Oil price</strong></td>
<td>0.15***</td>
<td>0.13**</td>
<td>0.11*</td>
<td>0.15***</td>
<td>0.30***</td>
<td>0.10</td>
<td>0.15***</td>
</tr>
<tr>
<td><strong>Exchange rate</strong></td>
<td>-0.41</td>
<td>-0.21</td>
<td>-0.05</td>
<td>-1.44***</td>
<td>-0.13</td>
<td>-0.16</td>
<td>-0.46**</td>
</tr>
<tr>
<td><strong>Interest rate</strong></td>
<td>0.02</td>
<td>-0.06**</td>
<td>-0.06**</td>
<td>-0.04**</td>
<td>-0.06***</td>
<td>-0.05***</td>
<td>-0.01</td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td>-0.60***</td>
<td>-0.44***</td>
<td>-0.49***</td>
<td>-0.71***</td>
<td>-0.71***</td>
<td>-0.71***</td>
<td>-0.48***</td>
</tr>
<tr>
<td><strong>Adjusted-R²</strong></td>
<td>0.67</td>
<td>0.50</td>
<td>0.50</td>
<td>0.70</td>
<td>0.53</td>
<td>0.60</td>
<td>0.59</td>
</tr>
<tr>
<td><strong>No of obs</strong></td>
<td>55</td>
<td>50</td>
<td>55</td>
<td>55</td>
<td>50</td>
<td>55</td>
<td>310</td>
</tr>
</tbody>
</table>

**Source:** Baffes and Haniotis (2016)

**Notes:** Asterisks denote levels of significance.
Where are commodity prices heading? The cycle is over. Down this year (from 2015), slightly up next year. Oil at $41 in 2016 and $50 in 2017.
The U.S. rig count responds to the price collapse

Source: Baker Hughes, Bloomberg, and World Bank
Note: Weekly data, last observation April 22, 2016
U.S. oil production turned out to be resilient, ... until recently

Source: International Energy Agency
Notes: Last actual is January 2016. February 2016 to December 2017 is forecast.
Prices are still higher than the 1985-2004 average

Changes (%) in real prices to 2015 from:

<table>
<thead>
<tr>
<th>Category</th>
<th>1986-2004</th>
<th>1998</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>+22</td>
<td>+20</td>
</tr>
<tr>
<td>Energy</td>
<td>+73</td>
<td>+158</td>
</tr>
<tr>
<td>Metals</td>
<td>+31</td>
<td>+54</td>
</tr>
</tbody>
</table>

Source: World Bank
The ultimate question: 1985-2004 Déjà vu?

Index, real (2010 = 100)

- Agriculture
- Metals
- Energy

Source: World Bank
Note: The period 2016-25 refers to forecasts, as of April 2016
Crude oil price for 2016

| Notes: World Bank forecast (made available on April 26), average of Brent, WTI, Dubai. Average Brent futures closing for the week of April 18, including actuals to date. Consensus, median [39.55] and range [33.59-46.09] for Brent as of April 22. Historical average 12-month recovery, median [57.95] and range [55.85-69.11] since the lows of 07/86, 12/98, and 12/08 applied to 01/16 average of $29.78/bbl. |
Supporting material
Oil continues its search for equilibrium after November 2015

➢ DEMAND
  - Forecast growth of emerging economies, notably China’s, are revised downwards.
  - The Northern Hemisphere experienced milder-than-usual winter linked to El Niño by some.

➢ SUPPLY
  - OECD stocks reached record high levels.
  - OPEC production surged, led by Iraq and Saudi Arabia.
  - The US shale oil industry turned out to be more resilient-than-expected, but the first monthly year-on-year decline took place in December 2015.

➢ MACRO
  - US$ (against major currencies) appreciated further, but weakened recently (down almost 7 percent since mid-January).

➢ POLICY
  - OPEC reaffirmed retaining market share in its December 2015 meeting.
  - OPEC & non-OPEC producers failed to agree on freezing production during their April 17 meeting in Doha. Politics appears to have played a key role.
  - Sanctions on Iran were removed earlier-than-expected (it already increased exports).
  - US lifted the effective ban on crude oil exports (no material changes, US is still a net oil importer).
OECD stocks and OPEC crude production surged.

OECD crude and product stocks

OPEC crude oil production

Source: International Energy Agency
Iran’s history

Source: BP Statistical Review.

Note: Production includes crude oil and liquids.
Iran’s potential

**Proved oil reserves**

- Venezuela
- Saudi Arabia
- Canada
- Iran, Islamic Rep.
- Iraq
- Russian Federation
- Kuwait
- United Arab Emirates
- United States
- Libya
- Nigeria
- Kazakhstan
- Qatar
- China
- Brazil

9.3% of world total

**Proved natural gas reserves**

- Iran, Islamic Rep.
- Russian Federation
- Qatar
- Turkmenistan
- United States
- Saudi Arabia
- United Arab Emirates
- Venezuela
- Nigeria
- Algeria
- Australia
- Iraq
- China
- Indonesia
- Canada

18.2% of world total

Source: BP Statistical Review and World Bank
Global metal consumption

Million metric tons

Country: World, excluding China

Country: China

Source: World Bank and World Bureau of Metal Statistics
Agricultural prices decline despite El Niño


Note: The numbers denote percent changes of the six-month average price index leading to the episode compared to the previous six-month period (bold) and the corresponding six-month period of the previous year (italic). The last observation is February 2016.
Thank you!