Oil Demand, Supply, and Medium-Term Price Prospects
A Wavelet-Analysis Approach

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June 12, 2013
Outline

1. World Demand and Supply
   - Secular Business Cycle and Demand
   - Supply Responses to High & Low Prices

2. Other Supply Responses
   - Incorporating Hotelling
   - Wars and Regime Changes
IMF WEO forecast modest real GDP growth: 3.2%, 3.3%, 4.0%, 4.4% for 2012–2015.
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BP data stops in 2011. PIW data shows declining oil demand in Asia by April 2013, as growth in China and India has slowed down in recent quarters.
Real Price of Oil (Gold led in 1970s, Oil led in 2000s)

Gold Price Index (2005=100)

Oil Price Index (2005=100)
High Oil Prices and the Weak Recovery

- World GDP Growth (%)
- Mean of gold price of oil
- 1/50th Ounce of Gold per oil barrel

Expensive oil → recession
Cheap oil → recovery

Mahmoud A. El-Gamal – Medium Term Price Talk – June 12, 2013
Justification of Medium-Term (3-5 Year) Focus

- Short-term “speculative” effects (0-2 years)
- 1970s & 1990s were partially gold-led at very high frequencies
- Long-term phase alignment (business cycle)
- Near 2008 peak, oil-led at high frequencies
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Hubbert Curves and Supply Shifts

![Graph showing Hubbert curves and supply shifts]

- Technical Advance, Etc → Higher Hubbert Curve
- Well mismanagement, other disruptions → Lower Hubbert Curve
- Status quo Hubbert Curve

Production (barrels per day) vs. Time (years)

Individual Wells’ outputs
Isolating Medium-Term Cyclets: DWT Decomposition

**US Production**

**Object of Study (Smooth + Detail 5)**

**Wavelet Smooth**

**Wavelet Detail 5 (32–64 months)**

**Wavelet Detail 4 (16–32 months)**

**Wavelet Detail 3 (8–16 months)**

**Wavelet Detail 2 (4–8 months)**

**Wavelet Detail 1 (2–4 months)**
Isolating Medium-Term Cyclets Example: Venezuela

Venezuela Production

Object of Study (Smooth + Detail 5)

Wavelet Smooth

Wavelet Detail 5 (32–64 months)

Wavelet Detail 4 (16–32 months)

Wavelet Detail 3 (8–16 months)

Wavelet Detail 2 (4–8 months)

Wavelet Detail 1 (2–4 months)
Technology-Driven Supply Response to Rising Prices: UK
Technology-Driven Supply Response to Rising Prices: Mexico
Technology-Driven Supply Response to Rising Prices: Brazil
Technology-Driven Supply Response to Rising Prices: Angola
1 World Demand and Supply
   • Secular Business Cycle and Demand
   • Supply Responses to High & Low Prices

2 Other Supply Responses
   • Incorporating Hotelling
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Gold Price (Gold led in 1979)
### Saudi Production Response to Price

<table>
<thead>
<tr>
<th></th>
<th>Prod Detail 1 (2–4 months)</th>
<th>Prod Detail 2 (4–8 months)</th>
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<tbody>
<tr>
<td>DWTI D1</td>
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## Saudi Production Responses 2

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<th>Prod Detail 3 (8–16 months)</th>
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Saudi Arabia: Responding to Economics (Mexico & UK)
To Prevent Prices from Falling Too Fast
Kuwait: Responding to Economics (Mexico & UK) + War
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Unintentional Supply Disruptions?

- Can Saudi Arabia and other major producers reduce output to accommodate U.S.?
  - No, for fear of regime changes in the region. They need current production level as well as high prices to meet budgetary and populist demands.

- If prices fall, reducing revenues significantly, would regime change result in output disruption
  - As we will show, regime change by itself does not lead to jumps to lower Hubbert curve, although they may prevent jumps to higher ones

- War, on the other hand, destroys facilities and leads to supply disruptions
  - Is the status quo with threat of spreading war (i.e. Syria) the best scenario for major producers?
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The Effect of War on Iran
The Effect of Wars on Iraq
Regime Change Did Not Disrupt Venezuela’s Production
Libya: Regime Insanity and Quasi-War
Concluding Remarks: A Very Simple Story

Demand destruction will continue, somewhat similar to 1980s
  ● Sluggish recovery, in part because oil prices never fell sufficiently
  ● Commodity and asset prices have been artificially inflated by QE

Supply growing, also similar to 1980s:

No voluntary output reduction, for fear of “Arab Autumn”

Price will fall (by half?) if no war;
rise (to double?) in case of war;
stay the same only with continued QE and threat of war
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FINANCIAL TIMES

June 10, 2013 7:53 pm
World has 10 years of shale oil, reports US