An Oil Market Looking for Some Direction

Dr Bassam Fattouh
Oxford Institute for Energy Studies
21 October 2008
The Sharp Rise in Oil Price

Price index, 2005 = 100: Simple average of Dated Brent, WTI, Dubai Fateh
Oil Shock Large despite fall in share of oil expenditure

Global: Oil intensity

Source: Oxford Economics

Petroleum expenditure as share of GDP, %

- World
- OECD
- US
- EU15

Source: Oxford Economics
Is the Conventional Framework Still Relevant?

• Demand
  – High oil prices will have an adverse impact on demand and economic growth
  – High oil prices induce inflationary pressures that require tightening of monetary policy
  – High oil prices will induce efficiency and conservation policies
    • Feedback: Reduced global oil demand or slowdown in oil demand growth

• Supply and Investment
  – Non-OPEC supply
    • Feedback: High oil prices induces greater investment and supply response from non-OPEC countries
  – Entry of substitutes
    • Feedback: High oil prices will encourage substitution at the margin
  – OPEC response
    • Feedback: OPEC imposes a price ceiling on the oil price
    • Avoid demand destruction for its oil in the long term and limit entry of substitutes

• Spare capacity
  – Feedback: Cushion against adverse supply/geopolitical shocks

• Implications
  – High degree of determinacy in the future oil price based on supply/demand ‘fundamentals’
  – Back end of crude oil futures curve very rarely strayed outside $20-$22 range and governments and financial market thought in terms of that range
  – Relationship between current price of oil and expected change in prices
Global Oil Balances

Growth in Global Demand is a non-OECD Phenomenon

Most of demand met by OPEC Supply

Source: IEA
Less than Full Pass-Through to Retail Prices

Retail Gasoline and Diesel Prices Vary Greatly Across Countries

Note: * denotes countries belonging to the Organization for Economic Cooperation and Development.

Non-OPEC Oil Production

Non-OPEC Oil Production Growth
(Change from Previous Year)

Source: EIA
Sources of US Production Growth

Corn Ethanol Component Main Contributor to Production Growth

<table>
<thead>
<tr>
<th></th>
<th>Crude</th>
<th>NGLs</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>5,178</td>
<td>1,717</td>
<td>440</td>
<td>7,335</td>
</tr>
<tr>
<td>2006</td>
<td>5,102</td>
<td>1,739</td>
<td>498</td>
<td>7,339</td>
</tr>
<tr>
<td>07Q2</td>
<td>5,161</td>
<td>1,776</td>
<td>603</td>
<td>7,540</td>
</tr>
<tr>
<td>07Q3</td>
<td>4,941</td>
<td>1,782</td>
<td>631</td>
<td>7,355</td>
</tr>
<tr>
<td>Dec</td>
<td>5,056</td>
<td>1,828</td>
<td>682</td>
<td>7,566</td>
</tr>
<tr>
<td>07Q4</td>
<td>5,039</td>
<td>1,851</td>
<td>659</td>
<td>7,549</td>
</tr>
<tr>
<td>2007</td>
<td>5,064</td>
<td>1,783</td>
<td>615</td>
<td>7,462</td>
</tr>
<tr>
<td>Jan</td>
<td>5,093</td>
<td>1,783</td>
<td>692</td>
<td>7,568</td>
</tr>
<tr>
<td>Feb</td>
<td>5,113</td>
<td>1,830</td>
<td>718</td>
<td>7,661</td>
</tr>
<tr>
<td>Mar</td>
<td>5,139</td>
<td>1,847</td>
<td>747</td>
<td>7,734</td>
</tr>
<tr>
<td>08Q1</td>
<td>5,115</td>
<td>1,820</td>
<td>719</td>
<td>7,654</td>
</tr>
<tr>
<td>Apr</td>
<td>5,162</td>
<td>1,880</td>
<td>745</td>
<td>7,787</td>
</tr>
<tr>
<td>May</td>
<td>5,166</td>
<td>1,908</td>
<td>794</td>
<td>7,868</td>
</tr>
<tr>
<td>Jun</td>
<td>5,109</td>
<td>1,810</td>
<td>764</td>
<td>7,683</td>
</tr>
<tr>
<td>y/y</td>
<td>13</td>
<td>30</td>
<td>158</td>
<td>201</td>
</tr>
<tr>
<td>08Q2</td>
<td>5,146</td>
<td>1,866</td>
<td>768</td>
<td>7,780</td>
</tr>
<tr>
<td>2008 to date</td>
<td>5,131</td>
<td>1,843</td>
<td>743</td>
<td>7,717</td>
</tr>
<tr>
<td>y/y change</td>
<td>-9</td>
<td>94</td>
<td>160</td>
<td>245</td>
</tr>
</tbody>
</table>

Source: Barclay’s Capital
The Top Decliners: Mexico

Figure 42: Oil output and 12 month average (mb/d)

Figure 43: y/y change in oil output (thousand b/d)

Figure 44: Crude oil exports (mb/d)
The Top Decliners: UK
The Top Decliners: Norway

Figure 84: Output and 12-month average (mb/d)

Figure 86: y/y change in oil output (thousand b/d)
Russian Crude Oil Supply

Russian crude supply
Source: IEA

[Graph showing the supply of Russian crude oil from January to December with data for 2005, 2006, 2007, and 2008.]
## International Oil Companies

### Year-to-Year Change in Oil Output, Thousands b/d

<table>
<thead>
<tr>
<th></th>
<th>Q107</th>
<th>Q207</th>
<th>Q307</th>
<th>Q407</th>
<th>2007</th>
<th>Q108</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP</td>
<td>-87</td>
<td>-82</td>
<td>-130</td>
<td>53</td>
<td>-61</td>
<td>7</td>
</tr>
<tr>
<td>Chevron</td>
<td>-8</td>
<td>-31</td>
<td>-112</td>
<td>-81</td>
<td>-58</td>
<td>-118</td>
</tr>
<tr>
<td>Exxon</td>
<td>48</td>
<td>-34</td>
<td>-110</td>
<td>-161</td>
<td>-65</td>
<td>-272</td>
</tr>
<tr>
<td>Shell</td>
<td>-5</td>
<td>11</td>
<td>-180</td>
<td>-348</td>
<td>-131</td>
<td>-121</td>
</tr>
<tr>
<td>Total</td>
<td>-9</td>
<td>9</td>
<td>-4</td>
<td>17</td>
<td>3</td>
<td>-41</td>
</tr>
<tr>
<td>ConocoPhillips</td>
<td>117</td>
<td>-162</td>
<td>-198</td>
<td>-143</td>
<td>-97</td>
<td>-156</td>
</tr>
</tbody>
</table>

### 6 companies

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>2007</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>56</td>
<td>-289</td>
<td>-734</td>
<td>-663</td>
<td>-409</td>
<td>-701</td>
</tr>
</tbody>
</table>

Part of this due to harsher fiscal terms
Decline in Oil Production Within OPEC

Figure 11: Estimates of Venezuelan output (m/d)

Figure 14: Estimates of Nigerian output (mb/d)

Figure 19: Estimates of Iraqi output (mb/d)
Entry of Substitutes

2006

- Conventional Crude Oil: 71.5%
- Natural Gas Plant Liquid: 8%
- Refinery Gain: 1.8%
- Unconventional Crude Oil: 0.2%
- CTL and GTL: 2.4%
- Biofuels: 0.3%

2030 High Price Case

- Conventional Crude Oil: 60.3%
- Natural Gas Plant Liquid: 9%
- Refinery Gain: 6.6%
- Unconventional Crude Oil: 13.7%
- CTL and GTL: 6.1%
- Biofuels: 2.1%

Conventional Crude = Crude oil and lease condensate
Unconventional Crude Oil = Oil sand production, extra-heavy crude oil, and shale oil

Source: STATEMENT OF GUY CARUSO before the SELECT COMMITTEE ON ENERGY INDEPENDENCE AND GLOBAL WARMING, June 2008
OPEC and Market

- **Conventional wisdom**
  - OPEC puts a floor on oil price
  - OPEC puts a ceiling on oil price
    - Avoid demand destruction for its oil in long term
    - Limit entry of substitutes, technical change, etc.
- **Reinforced by OPEC price band**
  - Production adjustments if OPEC basket prices above $28 or below $22
- **Implication**
  - From 1986 to 2002 back end of crude oil futures curve very rarely strayed outside the $20 range
  - Governments and financial market thought in terms of that range
- **Objective to defend oil prices from falling below some level**
  - Policy tool to achieve objective is simple
  - Degree of success depends on market perception
- **OPEC’s role is passive when oil prices rise**
- **Learning process**
  - Increasing oil prices did not affect growth in oil demand
- **OPEC’s position:**
  - Will increase output but in response to customers' requests (at current prices)
Different Cycles

• Active in controlling inventories
  – Rapid accumulation of crude oil stocks not desired by OPEC
  – Fears sharp oil price declines if physical traders decide to unwind their position and flood the market with supplies
  – OPEC adjusted its supplies and in the process absorb part of the rise in inventories, cause spot prices to increase and change the shape of the futures curve

• Passive when oil prices were rising
  – OPEC resumed a passive role supplying the market upon demand at current international oil prices
  – No attempt to bring down prices by auctioning its spare capacity or offer discounts for refineries to lift its heavy sour crude.

• Active when oil prices reached above $145
  – Jeddah Meeting

• Active again?
Saudi Arabia Output

Estimates of Saudi Arabia Output (mb/d)
Change in OPEC Supply in 2007

Change 2007

Mb/d
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5

Growth
Decline

FSU
Other
OPEC
ROW

OECD
OPEC-10
The First Cycle: Shift from Contango to Backwardation

WTI forward curve $/b

- range since 1 April 2007
- 31 Aug 2007
- one month ago
- three months ago

Source: Barclays Capital

Change in shape of the curve with the back end of the future curve remaining fixed
3. US Demand Dynamics and Market Sentiment

- US demand weakened in last 3 years
  - 2008 weakest year for oil demand since 1982 (see Figure)
- Fall in US oil demand not cause for recent decline in oil price
  - US oil demand fallen year on year in every month since August 2007 (see Figure)
    - Recent reversal in oil price does not correspond to fall in US oil demand
- But once market reached turning point US demand intensified and maintained the negative sentiment
  - Main factor driving the market
Largest US Fall in Oil Demand Since the Early 1980s

Annual Percentage Year on Year Change in Total US Oil Demand, 1965-1998

Source: Barclays Capital
The Turning Point in Demand Does Not Correspond to the Turning Point in Oil Price

Year on Year Change in total US Oil Demand, Jan 2007-June 2008

Jan-07  Feb-07  Mar-07  Apr-07  May-07  Jun-07  Jul-07  Aug-07  Sep-07  Oct-07  Nov-07  Dec-07  Jan-08  Feb-08  Mar-08  Apr-08  May-08  Jun-08
## US Demand by Product

<table>
<thead>
<tr>
<th></th>
<th>Jan to Jun 2008</th>
<th>y/y change</th>
<th>% change</th>
<th>Jan-08</th>
<th>Feb-08</th>
<th>Mar-08</th>
<th>Apr-08</th>
<th>May-08</th>
<th>Jun-08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas Liquids and LPGs</td>
<td>2149</td>
<td>-102</td>
<td>-4.5</td>
<td>-122</td>
<td>-257</td>
<td>12</td>
<td>-251</td>
<td>59</td>
<td>-84</td>
</tr>
<tr>
<td>Pentanes Plus</td>
<td>90</td>
<td>-12</td>
<td>-11.8</td>
<td>13</td>
<td>4</td>
<td>5</td>
<td>-107</td>
<td>41</td>
<td>-32</td>
</tr>
<tr>
<td>Liquefied Petroleum Gases</td>
<td>2059</td>
<td>-90</td>
<td>-4.2</td>
<td>-135</td>
<td>-261</td>
<td>7</td>
<td>-144</td>
<td>19</td>
<td>-52</td>
</tr>
<tr>
<td>Ethane/Ethylene</td>
<td>757</td>
<td>31</td>
<td>4.2</td>
<td>7</td>
<td>45</td>
<td>104</td>
<td>47</td>
<td>94</td>
<td>-20</td>
</tr>
<tr>
<td>Propane/Propylene</td>
<td>1220</td>
<td>-76</td>
<td>-5.9</td>
<td>-75</td>
<td>-294</td>
<td>-17</td>
<td>-75</td>
<td>-50</td>
<td>30</td>
</tr>
<tr>
<td>Normal Butane/Butylene</td>
<td>80</td>
<td>-40</td>
<td>-33.4</td>
<td>-54</td>
<td>-7</td>
<td>-66</td>
<td>-37</td>
<td>-28</td>
<td>-46</td>
</tr>
<tr>
<td>Finished Petroleum Products</td>
<td>17663</td>
<td>-713</td>
<td>-3.9</td>
<td>-326</td>
<td>-1155</td>
<td>-620</td>
<td>-337</td>
<td>-770</td>
<td>-1099</td>
</tr>
<tr>
<td>Reformulated</td>
<td>3098</td>
<td>58</td>
<td>1.9</td>
<td>33</td>
<td>217</td>
<td>85</td>
<td>110</td>
<td>40</td>
<td>-132</td>
</tr>
<tr>
<td>Conventional</td>
<td>5924</td>
<td>-239</td>
<td>-3.9</td>
<td>-105</td>
<td>-382</td>
<td>-194</td>
<td>-209</td>
<td>-259</td>
<td>-289</td>
</tr>
<tr>
<td>Finished Aviation Gasoline</td>
<td>16</td>
<td>-2</td>
<td>-9.1</td>
<td>-3</td>
<td>-1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>-6</td>
</tr>
<tr>
<td>Kerosene-Type Jet Fuel</td>
<td>1560</td>
<td>-61</td>
<td>-3.7</td>
<td>-70</td>
<td>-97</td>
<td>-18</td>
<td>-54</td>
<td>-54</td>
<td>-74</td>
</tr>
<tr>
<td>Kerosene</td>
<td>35</td>
<td>3</td>
<td>10.0</td>
<td>21</td>
<td>2</td>
<td>11</td>
<td>-1</td>
<td>14</td>
<td>13</td>
</tr>
<tr>
<td>Distillate Fuel Oil</td>
<td>4061</td>
<td>-196</td>
<td>-4.6</td>
<td>-47</td>
<td>-331</td>
<td>-194</td>
<td>-106</td>
<td>-132</td>
<td>-386</td>
</tr>
<tr>
<td>15 ppm sulfur and under</td>
<td>3223</td>
<td>468</td>
<td>17.0</td>
<td>584</td>
<td>569</td>
<td>258</td>
<td>531</td>
<td>561</td>
<td>314</td>
</tr>
<tr>
<td>&gt; than 15 ppm to 500 ppm sulfur</td>
<td>243</td>
<td>-345</td>
<td>-58.6</td>
<td>-239</td>
<td>-371</td>
<td>-223</td>
<td>-351</td>
<td>-392</td>
<td>-500</td>
</tr>
<tr>
<td>&gt; than 500 ppm sulfur</td>
<td>596</td>
<td>-319</td>
<td>-34.9</td>
<td>-392</td>
<td>-529</td>
<td>-228</td>
<td>-286</td>
<td>-301</td>
<td>-201</td>
</tr>
<tr>
<td>Residual Fuel Oil</td>
<td>638</td>
<td>-115</td>
<td>-15.2</td>
<td>-87</td>
<td>-394</td>
<td>-152</td>
<td>1</td>
<td>-30</td>
<td>-45</td>
</tr>
<tr>
<td>Petrochemical Feedstocks</td>
<td>574</td>
<td>-46</td>
<td>-7.5</td>
<td>40</td>
<td>-59</td>
<td>-8</td>
<td>-11</td>
<td>-180</td>
<td>-59</td>
</tr>
<tr>
<td>Other Oils for Petro. Feed. Use</td>
<td>325</td>
<td>-7</td>
<td>-2.2</td>
<td>92</td>
<td>-17</td>
<td>-3</td>
<td>-26</td>
<td>-103</td>
<td>13</td>
</tr>
<tr>
<td>Special Naphthas</td>
<td>46</td>
<td>4</td>
<td>9.5</td>
<td>-24</td>
<td>12</td>
<td>29</td>
<td>-1</td>
<td>23</td>
<td>-16</td>
</tr>
<tr>
<td>Lubricants</td>
<td>138</td>
<td>-7</td>
<td>-4.7</td>
<td>-19</td>
<td>3</td>
<td>-8</td>
<td>0</td>
<td>-15</td>
<td>1</td>
</tr>
<tr>
<td>Waxes</td>
<td>9</td>
<td>-1</td>
<td>-13.9</td>
<td>-4</td>
<td>2</td>
<td>-7</td>
<td>0</td>
<td>3</td>
<td>-2</td>
</tr>
<tr>
<td>Petroleum Coke</td>
<td>430</td>
<td>-54</td>
<td>-11.2</td>
<td>65</td>
<td>-227</td>
<td>-87</td>
<td>45</td>
<td>-95</td>
<td>-30</td>
</tr>
<tr>
<td>Asphalt and Road Oil</td>
<td>362</td>
<td>-54</td>
<td>-12.4</td>
<td>-51</td>
<td>24</td>
<td>-75</td>
<td>-95</td>
<td>-62</td>
<td>-56</td>
</tr>
<tr>
<td>Still Gas</td>
<td>681</td>
<td>-12</td>
<td>-1.7</td>
<td>-23</td>
<td>40</td>
<td>3</td>
<td>-27</td>
<td>-37</td>
<td>-22</td>
</tr>
<tr>
<td>Miscellaneous Products</td>
<td>70</td>
<td>8</td>
<td>12.2</td>
<td>-10</td>
<td>35</td>
<td>-4</td>
<td>12</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>19781</td>
<td>-925</td>
<td>-4.5</td>
<td>-453</td>
<td>-1527</td>
<td>-803</td>
<td>-768</td>
<td>-891</td>
<td>-1170</td>
</tr>
</tbody>
</table>

Source: Energy Information Administration, Barclays Capital
4. Conclusions: Where are Oil Markets Heading?

- State of the world economy
  - How deep is the recession?
  - Will Asia decouple?

- Has the fall in US oil demand reached a bottom?
  - Not yet

- OPEC reaction
  - Is there a new oil price floor that OPEC wishes to defend?
  - Will OPEC be able to defend oil price in face of global recession?

- All other dynamics such sluggish performance of non-OPEC supply, investment constraints, geo-political situation, spare capacity still in play
  - Will any of these change dramatically in the near future?

- Don’t underestimate the shift in sentiment (either way)