Integrated Oil Companies

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Zhou Fang       Artur Shikhaleev
Suvayan Roy     Yang Zeng
Key Questions

- HOW DO WE TURN OIL RESERVES INTO END PRODUCTS?
- WHAT DRIVES CRUDE OIL SUPPLY AND DEMAND?
- WHAT ARE THE FACTORS THAT DRIVE STOCK PRICE INTEGRATED OIL COMPANIES?
THE OIL SUPPLY CHAIN
The Oil Supply Chain

**Upstream**
- Explore for hydrocarbons
- Production – take hydrocarbons from the ground and selling them
- Examples: Devon Energy, Anadrako Petroleum, Apache

**Midstream**
- Process, transport, and store via ships, pipes and other ways
- Examples: TransCanada, Williams Companies, Enbridge

**Downstream**
- Refining oil and natural gas into petroleum products for sale
- Examples: Valero Energy, Sunoco, Tesoro
Upstream Activities

**Conventional Oil Source:**
- Oil between sedimentary layers
- Least costly to obtain
- 1.3 tn barrels oil world wide
- 6,182 tn cubic feet of natural gas

**Unconventional Source:**
- Oil within rocks
- Examples are shale or sand
- North America estimate reserves 2.6tn barrels
- Costly to extract
Six steps of Upstream process:

1. Acquire rights to explore and develop from reserve holder
2. Conduct geological, geophysical, and seismic surveys to find deposits
3. Perform exploration drilling to test for deposits
4. Conduct appraisal to determine if field contain commercially viable deposits
5. Begin oil and gas production
6. Pay reserve holders via royalties or production sharing arrangements (PSAs)
Midstream Activities

The middlemen between producers and users

1. Run pipelines and crude tankers
2. Run storage terminals to hold oil
   • Oil is easily stored in tankers, pipes, trucks or planes
   • Natural gas need pipes, or need to turned into Liquefied Natural Gas to go on ships and require special terminals
3. Small part of the sector and not well publicized
**Refine crude into petroleum products & retail**

1. Produce gas, diesel, heating oil, propane, jet fuel for transportation and industry
2. Refinery produce products on local demand
   - Texas & Cali mostly gas, diesel b/c cars
   - Hawaii produces mostly jet fuel
3. Differences in Crude Oil
   - **Light v Heavy crude**: density set by American Petroleum Institute gravity
     ex: Light 38º & heavy 22º
   - **Sweet v Sour**: sulfur content of oil
     ex: sweet contains less sulfur
Downstream Activities

Upstream ▸ Midstream ▸ Downstream

What’s in a Barrel?

Oil doesn’t just fuel your car. Though 75 percent of a typical barrel of oil in the US is used for gasoline, diesel, and jet fuel, oil is refined into many different products.

Figure 1.1 Products Made from a Barrel of Crude Oil
Source: Energy Information Administration.

Figure 1.2 What We Pay For in a Gallon of Regular Gasoline
Source: Energy Information Administration.
Other Players

Oil & Gas Drilling

- Transocean
- Noble
- Diamond Offshore

Equipment & Services

- Schlumberger
- Halliburton
- Baker Hughes
Oil & Gas Drilling

- **Rent oil rigs** to other firms under short or long term contracts – charging by day
- Producers find it cost effective to contract rigs than own them due to cyclicality of rig demand
- May types of rigs:
  - Commodity: oil or gas
  - Trajectory: vertical, horizontal, directional
  - Type of well: exploration, development, infill
Oil & Gas Drilling

Equipment, services, expertise
for
Exploration, development, production:
• Drilling equipment: drill bits, fluids, pumps, pipes, wellhead
• Pressure pumping: cementing or enhancing wells
• Wire line services: record electronic data on wells
• Directional drilling tools & advice
• Seismic imaging and analysis
• Engineering & design infrastructure
• Helicopters and boats
Commodity Prices, Production Growth, F&D costs, E&P capital expenditures, Refining margins, M&A, Sentiment, Regulation

KEY DRIVERS OF THE ENERGY SECTOR
Oil Demand Drivers

- Global Economic Growth
- Contributions to Demand
- Breakdown of Oil Use
  - Transportation (69%)
  - Industrial (24%)
  - Residential (4%)
  - Electricity Generation (2%)
  - Commercial (1%)

Figure 2.1 World GDP Growth vs. Oil Demand
Source: International Monetary Fund, Energy Information Administration.

Figure 2.6 OECD Oil Consumption
Source: Energy Information Administration.

Figure 2.7 Non-OECD Oil Consumption
Source: Energy Information Administration.
Oil Supply Drivers

• **World Oil Production**
  – OPEC
  – Non-OPEC

• **Crude Oil Reserves**

• **Spare Capacity**

• **Oil Inventories**

• **Geopolitics**
World Oil Production

Figure 2.8 World Oil Production
Source: Energy Information Administration.

Table 2.4 Top 10 Oil Producers

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Production (mill bbls/day)</th>
<th>% of Total Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Saudi Arabia</td>
<td>10.7</td>
<td>12.6%</td>
</tr>
<tr>
<td>2</td>
<td>Russia</td>
<td>9.7</td>
<td>11.4%</td>
</tr>
<tr>
<td>3</td>
<td>US</td>
<td>8.3</td>
<td>9.8%</td>
</tr>
<tr>
<td>4</td>
<td>Iran</td>
<td>4.1</td>
<td>4.9%</td>
</tr>
<tr>
<td>5</td>
<td>China</td>
<td>3.8</td>
<td>4.5%</td>
</tr>
<tr>
<td>6</td>
<td>Mexico</td>
<td>3.7</td>
<td>4.4%</td>
</tr>
<tr>
<td>7</td>
<td>Canada</td>
<td>3.3</td>
<td>3.9%</td>
</tr>
<tr>
<td>8</td>
<td>United Arab Emirates</td>
<td>2.9</td>
<td>3.5%</td>
</tr>
<tr>
<td>9</td>
<td>Venezuela</td>
<td>2.8</td>
<td>3.3%</td>
</tr>
<tr>
<td>10</td>
<td>Norway</td>
<td>2.8</td>
<td>3.3%</td>
</tr>
<tr>
<td></td>
<td>Rest of the world</td>
<td>32.4</td>
<td>38.3%</td>
</tr>
<tr>
<td></td>
<td>World total</td>
<td>84.6</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Source: Energy Information Administration, as of 12/31/06.
Table 2.3  OPEC Members and Production

<table>
<thead>
<tr>
<th>Country</th>
<th>Location</th>
<th>Production (Mill bbls/day)</th>
<th>% of Total Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saudi Arabia*</td>
<td>Middle East</td>
<td>10.7</td>
<td>12.6%</td>
</tr>
<tr>
<td>Iran*</td>
<td>Middle East</td>
<td>4.1</td>
<td>4.9%</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>Middle East</td>
<td>2.9</td>
<td>3.5%</td>
</tr>
<tr>
<td>Venezuela*</td>
<td>South America</td>
<td>2.8</td>
<td>3.3%</td>
</tr>
<tr>
<td>Kuwait*</td>
<td>Middle East</td>
<td>2.7</td>
<td>3.2%</td>
</tr>
<tr>
<td>Nigeria</td>
<td>Africa</td>
<td>2.4</td>
<td>2.9%</td>
</tr>
<tr>
<td>Algeria</td>
<td>Africa</td>
<td>2.1</td>
<td>2.5%</td>
</tr>
<tr>
<td>Iraq*</td>
<td>Middle East</td>
<td>2.0</td>
<td>2.4%</td>
</tr>
<tr>
<td>Libya</td>
<td>Africa</td>
<td>1.8</td>
<td>2.1%</td>
</tr>
<tr>
<td>Angola</td>
<td>Africa</td>
<td>1.4</td>
<td>1.7%</td>
</tr>
<tr>
<td>Qatar</td>
<td>Middle East</td>
<td>1.1</td>
<td>1.3%</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Asia</td>
<td>1.1</td>
<td>1.3%</td>
</tr>
<tr>
<td>Ecuador</td>
<td>South America</td>
<td>0.5</td>
<td>0.6%</td>
</tr>
<tr>
<td>Total OPEC supply</td>
<td></td>
<td>35.8</td>
<td>42.4%</td>
</tr>
<tr>
<td>Total non-OPEC supply</td>
<td></td>
<td>48.8</td>
<td>57.6%</td>
</tr>
<tr>
<td><strong>Total world production</strong></td>
<td></td>
<td><strong>84.6</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

Source: Energy Information Administration, as of 12/31/06.

*Founding Members
Crude Oil Reserves:
  • Conventional
    • Easy to extract
  • Unconventional
    • Difficult to extract

Table 2.5  Top 10 Oil Exporters

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Net Exports (mill bbls/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Saudi Arabia</td>
<td>8.5</td>
</tr>
<tr>
<td>2</td>
<td>Russia</td>
<td>6.9</td>
</tr>
<tr>
<td>3</td>
<td>United Arab Emirates</td>
<td>2.6</td>
</tr>
<tr>
<td>4</td>
<td>Norway</td>
<td>2.6</td>
</tr>
<tr>
<td>5</td>
<td>Iran</td>
<td>2.5</td>
</tr>
<tr>
<td>6</td>
<td>Kuwait</td>
<td>2.3</td>
</tr>
<tr>
<td>7</td>
<td>Venezuela</td>
<td>2.2</td>
</tr>
<tr>
<td>8</td>
<td>Nigeria</td>
<td>2.1</td>
</tr>
<tr>
<td>9</td>
<td>Algeria</td>
<td>1.8</td>
</tr>
<tr>
<td>10</td>
<td>Mexico</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Source: Energy Information Administration, as of 12/31/07.

Table 2.6  Top 10 World Oil Reserves by Country

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Reserves (Billion Barrels)</th>
<th>% of Total Reserves</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Saudi Arabia</td>
<td>262.3</td>
<td>19.9%</td>
</tr>
<tr>
<td>2</td>
<td>Canada</td>
<td>179.2</td>
<td>13.6%</td>
</tr>
<tr>
<td>3</td>
<td>Iran</td>
<td>136.3</td>
<td>10.3%</td>
</tr>
<tr>
<td>4</td>
<td>Iraq</td>
<td>115.0</td>
<td>8.7%</td>
</tr>
<tr>
<td>5</td>
<td>Kuwait</td>
<td>101.5</td>
<td>7.7%</td>
</tr>
<tr>
<td>6</td>
<td>United Arab Emirates</td>
<td>97.8</td>
<td>7.4%</td>
</tr>
<tr>
<td>7</td>
<td>Venezuela</td>
<td>80.0</td>
<td>6.1%</td>
</tr>
<tr>
<td>8</td>
<td>Russia</td>
<td>60.0</td>
<td>4.6%</td>
</tr>
<tr>
<td>9</td>
<td>Libya</td>
<td>41.5</td>
<td>3.1%</td>
</tr>
<tr>
<td>10</td>
<td>Nigeria, Rest of the world</td>
<td>207.7</td>
<td>15.8%</td>
</tr>
</tbody>
</table>

World total: 1317.4, 100.0%
Spare Capacity

- **Definition:** “the amount of oil currently not being produced, but could be produced if needed”
- **OPEC** – largest spare capacity
  - Quotas
  - To keep oil prices high
A change in oil inventories indicates how oil supply balances with oil demand
- Growing inventories => Excess supply => Falling prices
- Shrinking inventories => Higher Prices
Geopolitics

- Political conflicts
  - Arab Oil Embargo (1973)
- Labor Strikes
- Weather
- Civil Unrest
- Terrorism
- Wars
  - Iraq invasion of Kuwait (1990)
  - Iran-Iraq War (1980)
  - Iran production nearly halt

United States Announces New Iran Sanctions

Islamists take foreign hostages in attack on Algerian oil field
Margin Determinants

• Most net margins determined in upstream. Very small section of net margin from distribution.
• Crude oil prices the main factor
• Refining capacity and capability (volatility between firms)
• Regulatory environment (nationalized companies and OPEC)
• Average Industry Net Profit Margin: 7.3%
## Margin Determinants

### Oil and Gas Economics

<table>
<thead>
<tr>
<th>Operation</th>
<th>Costs</th>
<th>Value</th>
<th>Gross Margin</th>
<th>Net Margin</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploration</td>
<td>2.97</td>
<td>16.33</td>
<td>16.33</td>
<td>13.36</td>
<td>36%</td>
</tr>
<tr>
<td>Production</td>
<td>17.78</td>
<td>49.00</td>
<td>32.67</td>
<td>14.89</td>
<td>41%</td>
</tr>
<tr>
<td>Transportation</td>
<td>1.00</td>
<td>51.96</td>
<td>2.96</td>
<td>1.96</td>
<td>5%</td>
</tr>
<tr>
<td>Refining</td>
<td>3.70</td>
<td>60.46</td>
<td>8.50</td>
<td>4.80</td>
<td>13%</td>
</tr>
<tr>
<td>Distribution</td>
<td>1.90</td>
<td>63.69</td>
<td>3.23</td>
<td>1.33</td>
<td>4%</td>
</tr>
<tr>
<td>Marketing</td>
<td>0.80</td>
<td>64.85</td>
<td>1.16</td>
<td>0.36</td>
<td>1%</td>
</tr>
<tr>
<td>Pump Taxes</td>
<td>19.15</td>
<td>84.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>36.70</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Gasoline Cost Components

<table>
<thead>
<tr>
<th>Component</th>
<th>$/B</th>
<th>Cents/Gallon</th>
<th>Percent of Pump Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Oil</td>
<td>49.00</td>
<td>116.67</td>
<td>58%</td>
</tr>
<tr>
<td>Operating Costs</td>
<td>4.90</td>
<td>11.67</td>
<td>6%</td>
</tr>
<tr>
<td>Taxes</td>
<td>21.65</td>
<td>51.55</td>
<td>26%</td>
</tr>
<tr>
<td>Company Net Margins</td>
<td>8.45</td>
<td>20.11</td>
<td>10%</td>
</tr>
<tr>
<td>Total</td>
<td>84.00</td>
<td>200.00</td>
<td>100%</td>
</tr>
</tbody>
</table>
Marginal Analysis

Historical Operating Margins

- PBR: US Equity
- XOM: US Equity
- RDSA: LN Equity
- BP: LN Equity
- CVX: US Equity
- ENI: IM Equity
- FP: FP Equity
- IMO: CN Equity
- HSE: CN Equity
- 386: HK Equity
- ROSN: RM Equity
- 883: HK Equity
- STL: NO Equity
- SU: CN Equity
- 857: HK Equity
- TNBP: RU Equity
- Transformed Oil Prices

Year: 2002 to 2013
Operating Margin: -10 to 60
Refining Margins

Figure 5.17  US Refining Margins vs. Crude Oil Prices
Foreign Exchange Risk

• Euro-dominated oil shares were penalized due to:
  – Currency volatility
  – Stocks traded in crisis-heavy French and Italian markets

• Pricing gap between European and US oil companies:
  – All else equal, i.e. ROE, leverage, etc.
  – Traded at a discount to US rivals since 2009.
Oil Market is Regional

The Gulf
Premium/discount of euro-zone oil majors to U.S. oil majors based on average 12-month forward price/earnings multiples

Sources: FactSet; Total E&P UK/Bloomberg News (photo)

Total SA’s Elgin platform in the North Sea
Major European oil stocks vs EUR/USD for past 5 years
Earnings per share

Chart showing earnings per share for various companies over time.
Debt Levels

- ADRs dropped 2.3% on February 11, sixth day in a row
- Warning government that debt ratios may rise - projected to increase from 2.8 to 3.5
- Selling products at a loss because of Brazilian price ceiling, high interest rates, complicated tax structure
  - Eight year low for 2012 profits – 36.6% drop
Growth

• Doubled gas output at Argentina project
• Overconsumption rather than undersupply
• Importing 190,000 barrels of diesel and 110,000 barrels of gasoline daily
• Continuing expansion with production of rigs and refineries
• Expects to increase its production by 27% by 2016, growing 6% annually
### Base Costs

<table>
<thead>
<tr>
<th></th>
<th>Lifting Costs</th>
<th>Finding Costs</th>
<th>Total Upstream Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>United States – Average</strong></td>
<td>$12.18</td>
<td>$21.58</td>
<td>$33.76</td>
</tr>
<tr>
<td><strong>On-shore</strong></td>
<td>$12.73</td>
<td>$18.65</td>
<td>$31.38</td>
</tr>
<tr>
<td><strong>Off-shore</strong></td>
<td>$10.09</td>
<td>$41.51</td>
<td>$51.60</td>
</tr>
<tr>
<td><strong>All Other Countries – Average</strong></td>
<td>$9.95</td>
<td>$15.13</td>
<td>$25.08</td>
</tr>
<tr>
<td><strong>Canada</strong></td>
<td>$12.69</td>
<td>$12.07</td>
<td>$24.76</td>
</tr>
<tr>
<td><strong>Africa</strong></td>
<td>$10.31</td>
<td>$35.01</td>
<td>$45.32</td>
</tr>
<tr>
<td><strong>Middle East</strong></td>
<td>$9.89</td>
<td>$6.99</td>
<td>$16.88</td>
</tr>
<tr>
<td><strong>Central &amp; South America</strong></td>
<td>$6.21</td>
<td>$20.43</td>
<td>$26.64</td>
</tr>
</tbody>
</table>
Constraints

• In times of economic growth, IOCs in the US can’t produce enough oil to meet demand, so they make a high profit on the oil they produce, and take some of that to buy more oil and refine it and take only the refining profits.

• Periods of high oil prices are also tempered by alternative energy sources and unconventional drilling, making a “cap” on oil prices.
Peak Oil Myth

• People are trying to predict “Peak Oil” or the time when we are going to extract the most oil, after which production will fall
• This would mark the end of “cheap” oil as we know it
• However, this still hasn’t happened, mainly because as the price of oil increases, more and more oil become economically viable to extract, even through unconventional methods, making our theoretical reserves greater and greater.
Conclusion

• IOCs are tied to the price of oil through both volume and price
• IOCs, on average, make about 7.9 cents on every dollar of business.
• Extraction, transportation, and
• Additionally, they benefit from the time lag from drilling → customer, because during periods of oil price increases, this means the oil becomes more valuable