Appendix and Supplement for
Asian Nations Driving World Oil Prices

Data Appendix:

Oil Consumption Growth Calculations:

World Consumption was 82.459 mbd in 2001 (British Petroleum, 2006).
World Consumption was estimated to be 85.1 mbd in 2006 (Energy Information Agency, 2007 – Table 3).
World Consumption Growth ((85.1)/82.459)-1)*100 = 11.42%
Per Annum Growth: 11.42/5 = 2.28%

US Consumption was 19.649 mbd in 2001 (British Petroleum, 2006).
US Consumption was estimated to be 20.62 mbd in 2006 (Energy Information Agency, 2007 – Table A.1).
US Consumption Growth ((20.62)/ 19.649)-1)*100 = 4.94%
Per Annum Growth: 4.94/5 = 0.99%

Indian Consumption was 2.284 mbd in 2001 (British Petroleum, 2006).
Indian Consumption was 2.485 mbd in 2005 (British Petroleum, 2006).
We estimate Indian Consumption at 2.557 mbd in 2006
(We assume a 2.9% annual growth rate (International Energy Agency, 2004)).
Indian Consumption Growth ((2.557)/2.284)-1)*100 = 11.94%
Percentage of World total ((2.557/85.1)*100) = 3%

Price Calculations Appendix:

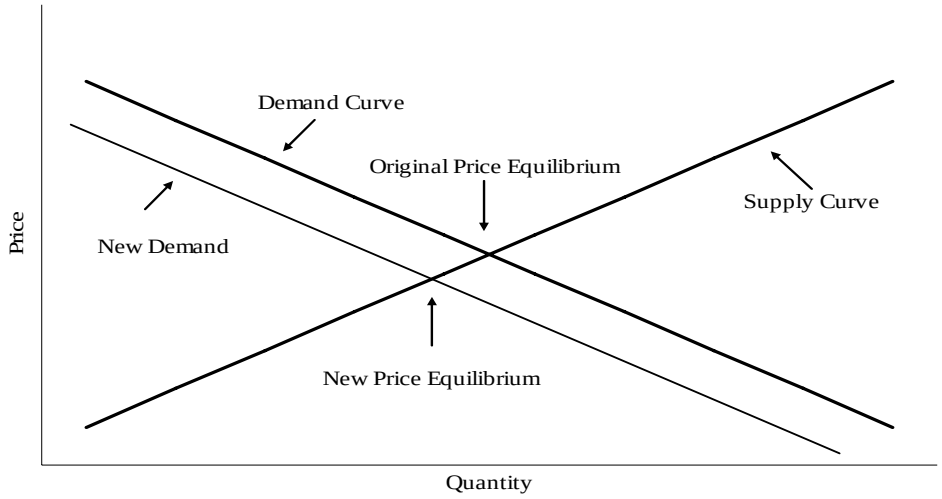
Elasticity of demand (supply) measures the responsiveness of the quantity of a good demanded (supplied) to a change in its price. Elasticities can be used, along with initial prices and quantities, to calculate supply and demand curves from the following relationship:

$$E_D = \frac{\Delta Q}{\Delta P}\frac{P_0}{Q_0};\ E_S = \frac{\Delta Q}{\Delta P}\frac{P_0}{Q_0}$$

where E is the elasticity of demand (supply), Q is the quantity demanded (supplied) and P is the price. Zero subscripts denote initial observations.

Studies have estimated the long-run elasticity of demand (E_D) as -0.05, and the long-run elasticity of supply (E_S) as 0.08 (Krichene (2006)). In 2006, world oil consumption was approximately 85.1 mbd (Energy Information Agency, 2007) and the January 25, 2007 price for West Texas Intermediate crude was $53.59 (Wall Street Journal).

Supply and Demand Curves



Supply Curve:

The slope $\left(\frac{\Delta P}{\Delta Q}\right)$ of the Supply curve can be calculated as follows:

$$E_S = \frac{\Delta Q}{\Delta P}\frac{P_1}{Q_1} \rightarrow \frac{\Delta P}{\Delta Q} = \frac{P_1}{Q_1 * E_S} = \frac{53.59}{85.1 * 0.08} = 7.872$$

The intercept (*b*) of the Supply curve—price at a zero quantity—is:

$$P = \frac{\Delta P}{\Delta Q} * Q + b \rightarrow b = P - \frac{\Delta P}{\Delta Q} * Q = 53.59 - (7.872) * 85.1 = -616.3$$

And therefore the quantity supplied (Q_S) for a given price is:

$$P = \frac{\Delta P}{\Delta Q} * Q_S + b \rightarrow Q_S = (P / \frac{\Delta P}{\Delta Q}) - (b / \frac{\Delta P}{\Delta Q}) = 0.127P - 78.29$$

Demand Curve:

The slope $\left(\frac{\Delta P}{\Delta Q}\right)$ of the Demand curve can be calculated as follows:

$$E_D = \frac{\Delta Q}{\Delta P}\frac{P_1}{Q_1} \rightarrow \frac{\Delta P}{\Delta Q} = \frac{P_1}{Q_1 * E_D} = \frac{53.59}{85.1 * -0.05} = -12.595$$

The intercept (*b*) of the Demand curve—price at a zero quantity—is:

$$P = \frac{\Delta P}{\Delta Q} * Q + b \rightarrow b = P - \frac{\Delta P}{\Delta Q} * Q = 53.59 - (-12.596) * 85.1 = 1125.39$$

And therefore the quantity demanded (Q_D) for a given price is:

$$P = \frac{\Delta P}{\Delta Q} * Q_D + b \rightarrow Q_D = (P / \frac{\Delta P}{\Delta Q}) - (b / \frac{\Delta P}{\Delta Q}) = -0.0794P + 89.355$$

Solving for New Prices:

If demand from China was 1.15mbd less than it is today, then the demand curve would shift to the left, lowering the intercept on the demand curve to 88.205 (89.355-1.15=88.205). Setting the quantity supplied equal to the quantity demanded, we find the new long-run equilibrium price:

$$-0.0794 \cdot P + 88.205 = 0.127 \cdot P + 78.29 \rightarrow P = \frac{88.205 - 78.29}{0.2064} \approx \$48.02$$

If demand from India was 0.14 mbd less than it is today, then the new price of oil would be:

$$-0.0794 \cdot P + 89.215 = 0.127 \cdot P + 78.29 \rightarrow P = \frac{89.215 - 78.29}{0.2064} \approx \$52.91$$

If demand from China, India and the United States was 1.78 mbd less than it is today, then the new price of oil would be:

$$-0.0794 \cdot P + 87.575 = 0.127 \cdot P + 78.29 \rightarrow P = \frac{87.575 - 78.29}{0.2064} \approx \$44.97$$

References:

Krichene, Noureddine. “World Crude Oil Markets: Monetary Policy and the Recent Oil Shock.” Working Paper WP/06/62, International Monetary Fund, March 2006.