Client Newsletter

SKBA Capital Management, LLC

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Rethinking Energy Prices

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Report Summary – We are all worried about the impact of high oil prices on the U.S. and world economy. Will prices rise to $100 per barrel? Will high oil prices kill off our economic recovery? Our answers to both are emphatically **No**.

Our analysis examines the likely shifts in the supply and demand curves for oil and natural gas since 2001, the end of the last period in which normal oil prices still resided at $22 per barrel (in SKBA's estimation). The rising cost of supplying the marginal barrel of oil (representing a backward shift in the supply curve) combined with a large outward shift in the demand curve (mostly driven by the growth expectations of China and India) and with the impact of the terrorist risk premium on demand, the short-term equilibrium for oil prices appears to have risen to $55-57 per barrel and $7.25 per MCF for natural gas. Recent prices near $70 per barrel and $11 per MCF for natural gas should be viewed as extreme, not sustainable prices, created by very short-run near vertical supply curves (implying there is a completely fixed amount of supply). There appears to be very little risk that $100 per barrel could be achieved anytime soon.

Although it won't happen overnight, it appears hard to us to see how the normal price of oil (to which the market clearing price will mean revert) is much above $40 per barrel and $5.75-6.00 per MCF for natural gas. This does not, however, mean the U.S. economy cannot adjust; after all, many other nations have lived with far higher energy prices for decades. Longer-term supply and demand curves are not nearly as inelastic as the short-term picture suggests. Yet $40 is still well above the $18-$22 per barrel price range SKBA held as normal for over 25 years. From a macro economic perspective, the result will be far higher normal earning power for the producers of energy, an inflation rate that rises above 4% (pre-Katrina's effects), a massive new capital expenditure boom for energy capital goods and energy-efficient capital goods, and a slowdown in consumer expenditures as U.S. consumers lose discretionary purchasing power.

For those who want the detailed analysis, read on.

It's always dangerous to say, "It's different this time." For nearly 25 years, dating back to the late 1970s, we believed that the "normal" price of oil (the level to which the market place would mean revert) was roughly $20 per barrel (WTI). In the early 1980s when forecasters last expected that oil could stay near $40 or hit $50 or even $100 per barrel due to the perceived shortages and the power of OPEC, we held fast to the belief that the combination of new discovery, conservation and substitution effects would cause then existing price levels to fall back toward a range of $18-$22 per barrel.

Indeed, the application of vastly improved seismic evaluation techniques and drilling technology (such as horizontal drilling) kept finding and development (F&D) costs low (actually falling in the 1980s). According to the EIA (Energy Information Administration), the F&D costs of the U.S. major companies fell to near $5 per barrel of reserve additions in the ten years from 1986-95. Also, a 41% increase in the fuel economy of the U.S. auto fleet (and in all aspects of energy consumption across the economy) reduced demand such that trend-line economic growth consumed less energy and created less demand for growth in output.

Our perspectives changed, however, two years ago, and we raised the expectation of this normal range in oil prices to $24-$26. Yet this rise has proven to be far too low as spot oil prices for West Texas Intermediate recently hit $70. Most forecasts focus on either the perceived shortfall in the supply of oil and natural gas (reserves, production and inventories) or on the growth in demand (from places like China); yet the price that clears the market will always be the intersection point of the

supply and demand curves. The effects cannot be viewed in isolation, and the ex-ante price elasticities of supply and demand cannot be simply derived (ex-post) from the historical changes in price and volume. The object of this review is to offer hopefully intelligent and intellectually consistent perspectives on how these curves are shifting.

A Bit of Historical Perspective

Worldwide oil consumption grew rapidly in much of the post-WWII period. In round numbers, consumption grew 8% annually from 1945-55, 7% from 1955-65, and a bit less than 6% from 1965-75. Then after the OPEC cartel dramatically boosted prices, and for the next 20 years (1975-1995), consumption grew only about 1.5% per year (and even less than 1% from 1985 to 1995) as high prices during the early part of this period spurred energy exploration and production as well as conservation and substitution. With the 15-year cycle of massive investment in energy efficiency and alternative energy sources, this rate of growth in oil consumption was sufficient to fuel nearly two to three times that growth rate in world GDP.

Yet the world's appetite for oil reaccelerated after 1995, growing at nearly a 2% annual rate to today's consumption level. Anecdotally, it was easy to observe that the growth in miles driven in the U.S. accelerated, and the fuel economy of the U.S. auto fleet reached a plateau in the early 1990s. An even more important worldwide impact was the emergence of high economic growth rates in China and India, which required an increase in energy-consuming activities. Again, the easy observation was that demand growth caught up with and then surpassed supply growth.

Commodity prices are highly volatile. Among energy commodities, oil prices are now quite volatile, natural gas prices are even more volatile, and electricity prices have the greatest volatility. This wasn't the case before OPEC's oil embargo launched oil prices dramatically higher in 1973 and 1974. The discovery of "elephant" fields in Saudi Arabia and elsewhere kept oil prices low and stable for much of the 1950s, 60s and early 70s. The standard deviation of annual percentage changes in oil prices amounted to only around 3% in the late 1960s and early 70s. As low real prices encouraged consumption growth to catch up with supply growth, this volatility began to rise dramatically (as measured by the PPI for petroleum, not simply spot oil prices). Even in an era of oil price controls following the OPEC embargo, annual volatility (as measured by the standard deviation of annualized price changes) jumped to over 25% during the 1973-1982 period and stayed at 23% for the next 20 years. Thus, if one believed that the normal price of oil would mean revert back to the upper end of our estimated price range near $22 per barrel, two standard deviations of price change in a typical year covered a range from $12 to $32. This represented most of the historic experience for nearly two decades.

In the short run, a price elasticity of supply of roughly 10/1 (1% increase in output for every 10% change in price received) and of demand of 12/1 (a 1% *decrease* in demand for every 12% increase in price) were consistent with this record of volatility of output and prices. With oil producers earning acceptable returns on capital and with supply and demand growth in relative balance, the outward shift in the supply and demand curves for oil left the equilibrium price of oil relatively stable up until 2001.

So what has changed?

Shifts in the Supply Curve

The supply curves for oil and natural gas are, however, determined by more than just the costs of exploration and production or available inventory levels. These are clearly important, and at the same time, the interaction of risk preferences, return on capital hurdle rates, marginal finding and development costs, and expectations have a major impact on the willingness of producers to supply oil to the market and at what price. Three key factors were and are at play here:

- Although improvements in seismic and drilling technology reduced finding costs for a time in the 1980s and 1990s, technology enhancements also enabled the more rapid recovery of reserves (i.e. field pressurization techniques) – hence the high decline rates being seen in many mature fields today. The combination of the downward reserve estimates (e.g. Shell's revelation of its massive overstatement of reserves), the reduction in spare capacity, and the declining productivity of active drill rigs searching for new oil has made the supply curve more inelastic since 2001. In our estimation, it now takes closer to a 15-16% price rise to coax an additional 1% increase in worldwide supply. This partly represents a preference shift and partly the impact of supply disruptions (i.e. Iraq & Katrina), and we are not arguing that such a shift is permanent. The more difficult it is for oil producers to find new reserves (or the time from discovery to production is lengthened), the steeper this inelasticity becomes, particularly in the short run.

- Finding & developing costs are rising rapidly. Bernstein Research reports that 20% of U.S. producers had average costs over $25 per barrel in 2004. Simmons International Research focuses on the high decline rates of current fields and the inability of the worldwide industry to grow supply. Indeed, F&D costs were quite probably understated in the 1980s and 1990s as reserve additions were likely systemically overstated as fewer wells were drilled to verify "proven" reserves. Furthermore, the average success in terms of new barrels of reserves added per active drilling rig has progressively fallen and active rig counts are far below prior peaks. There is now a large and growing gap between the low (yet rising) production costs of existing fields and the rising marginal costs of finding, developing and producing from new fields. This tends to put a floor on oil prices as low prices tend to quickly cause high marginal cost producers to shut in wells or simply not invest in new E&P projects. It also results in a backward shift in the supply curve as marginal barrels of production that replace the ongoing decline in lower cost existing production require and demand a higher price for each existing barrel delivered. Finally, it contributes to a more inelastic supply curve, as well as the high costs of new development require a greater price change than in the past to bring on new production.

- Although expropriation risks have existed throughout oil's history, expropriations did not typically result in a reduction in available output. The post 9/11 environment is different, however, as oil producers have had to evaluate both the high volatility and uncertainty of prices received and the heightened risk of supply disruptions from acts of terrorism. This is what we've called the terrorism premium – the magnitude of which we have believed could be nearly $10 per barrel (an estimate that is hard to prove, however). Clearly, given the risk that expected supplies from new and existing wells and fields might be disrupted and the expectation that such disruptions are quite likely, oil producers must demand a higher price for every barrel of oil delivered. This risk preference shift results in a backward shift in the oil supply curve. Suppliers will rationally demand a higher price to deliver today's existing equilibrium level of output.

In our estimation, by 2005, the worldwide supply curve must have shifted backward from 2001's level by approximately 1.5-2%. This is the equivalent of demanding nearly $28 per barrel for the same roughly 78 million barrels per day (MMBD) of output worldwide producers would have been willing to supply at $22 per barrel in 2001. Furthermore, the incentive necessary to encourage new output has made the supply curve significantly more inelastic. The oil supply curves are displayed in Figure 1. They are labeled S_e 2001 (describing the old equilibrium supply curve), S_c 2005 (today's supply curve with a –1.5% backward shift from S_e 2001), and S_{fixed} (the supply curve assuming that short-term worldwide supply is fixed at all prices at an additional –1.5% backward shift to approximately 83 MMBD under the assumption that large supply disruptions are and will affect the market). In conjunction with the demand curve shifts, one can see that the impact on equilibrium prices is quite dramatic.

Shifts in the Demand Curve

Many of the risk preference and expectation shifts that affect suppliers also influence consumers of oil and natural gas. Three key influences are important to discuss:

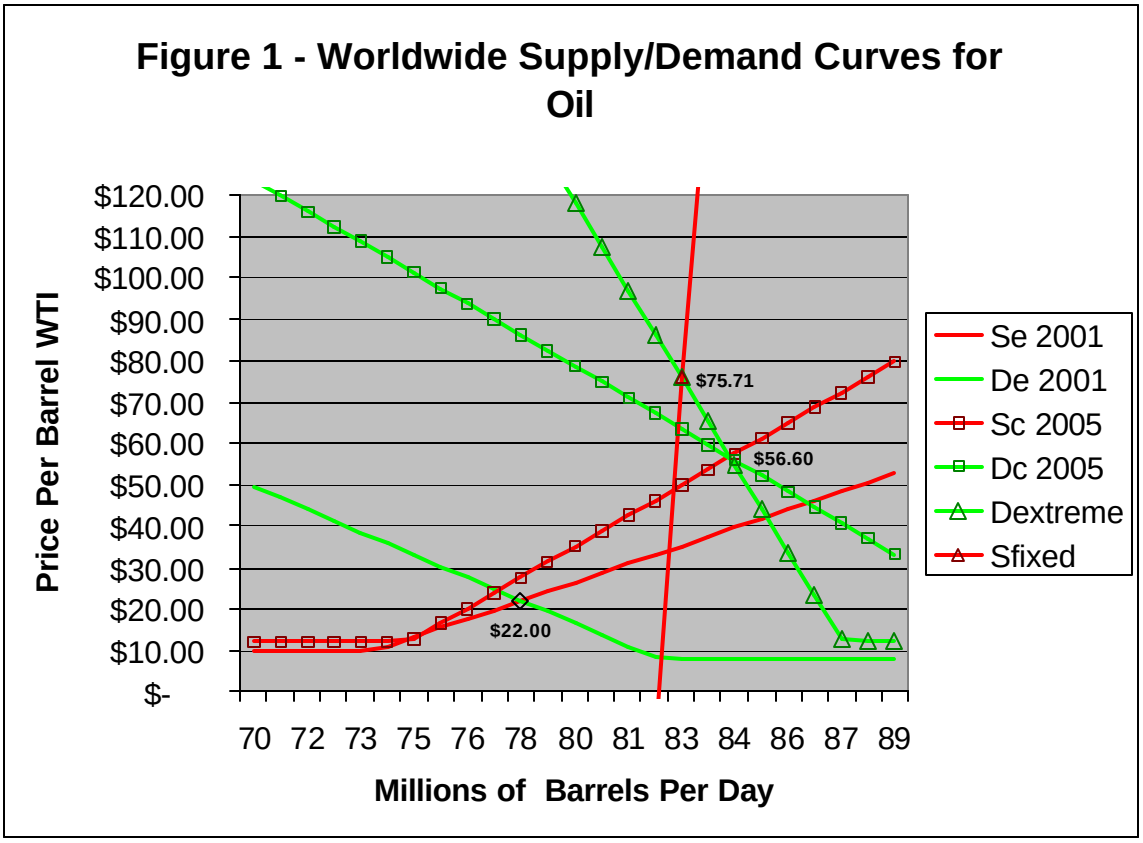
- In the short term, the demand curve is even more price inelastic than the supply curve. In the U.S., this is clearly displayed by the virtual non-impact on miles driven from the massive rise in gasoline prices just this year. In the short run, consumers of energy are unable to meaningfully adjust their consumption patterns. This is why we believe that the price elasticity of demand has historically been approximately a 12/1 ratio – it takes a 12% increase in price to reduce demand by 1% from equilibrium prices. Yet on a worldwide basis today, energy hungry developing countries with high real GDP growth rates (China and India), combined with growing U.S. demand (as reflected in rising miles driven at a time when fuel economy has not improved, have made demand even less sensitive to price change. Today, price actions are more consistent with a price elasticity ratio of 20/1 at equilibrium prices. This high level of inelasticity, however, is not likely to be permanent.

- Increased security risks pose a similar problem for oil consumers as for producers. The uncertainty of supply sources results in a risk preference shift toward insuring access to supply by offering a higher price. In our view, this risk preference is manifest by a likely 2% outward shift in the demand curve such that oil consumers would be willing to pay $9 per barrel more today than they paid in 2001 for the same volume consumed in that year. This is not far from our $10 per barrel estimate of the terrorist/security risk premium priced into today's oil contracts.

- The emergence of China and India, which have low (but rapidly rising) energy consumption per capita compared to the developed western countries, as high real growth countries has contributed to a high growth in energy demanded

at every price level along the demand curve. In our estimation, at $22 per barrel, the world **desired** to consume at least 15% more oil in 2005 than was consumed in 2001 (representing a roughly 3.5% per year increase in desired/demanded consumption), also resulting in an outward shift in the demand curve.

The oil demand curves displayed in Figure 1 are labeled D_e 2001 (describing the old equilibrium demand curve), D_c 2005 (today's demand curve with a combined outward shift in demand at all levels of price equal to 17%), and $D_{extreme}$ (representing a short-term extremely inelastic demand function).



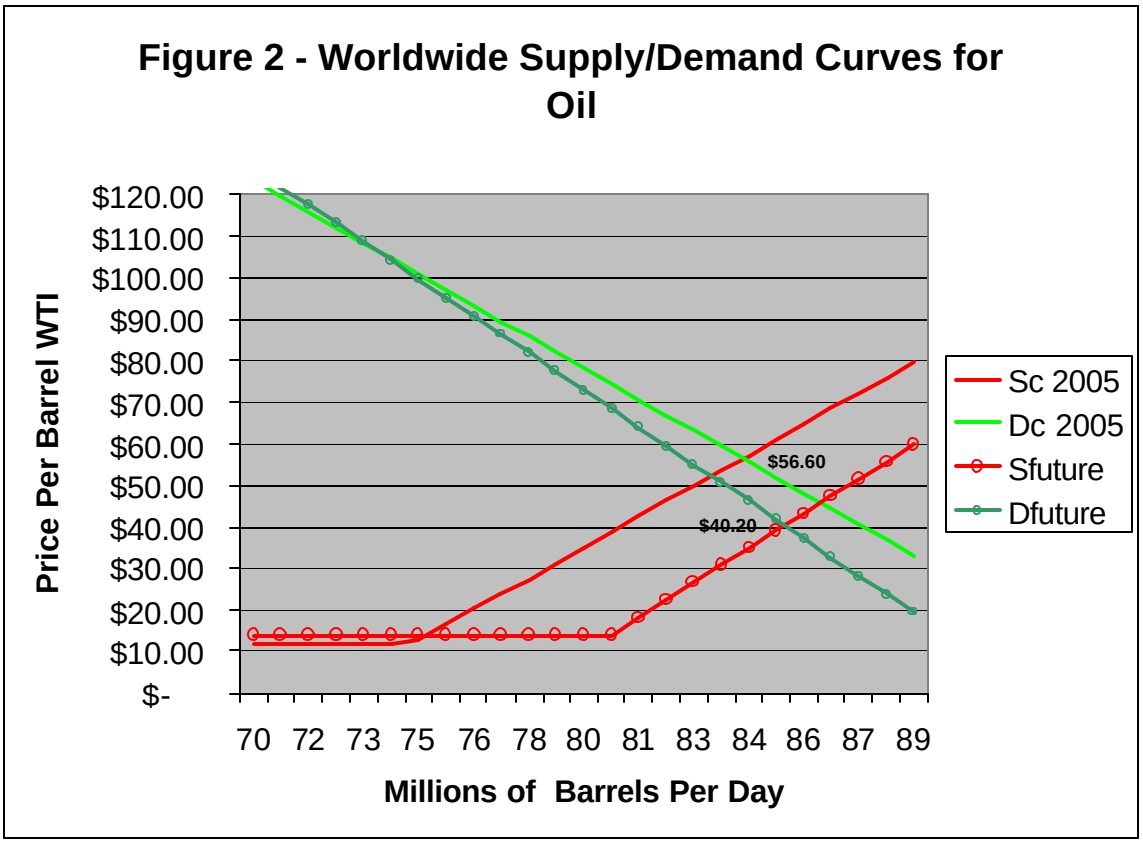
Just because the world **desires** to consume more oil and natural gas doesn't mean it will get sufficient growth in output to allow actual consumption to rise this much. In fact, consumption did not rise this much in the four years since 2001; it grew less than 2% per year. Figure 1 above illustrates the net effect of the shift in supply and demand curves since 2001 as well as the extreme price moves of late.

The shift in supply and demand curves suggests that in order to secure an advance in worldwide oil consumption from approximately 78 MMBD in 2001 to over 84 MMBD in 2005, the short-term equilibrium level of oil prices would need to rise from our assumption of $22 per barrel to over $56/barrel! This is the intersection point identified for the S_c 2005 and D_c 2005 curves. [*One should not interpret this result as having the precision in outcome that is suggested by the graphs. Rather, it should be thought of as indicative of the general trend and level suggested by this analysis.]* This is the intersection point identified for the S_c 2005 and D_c 2005 curves. This level is quite astonishing all by itself, but everyone is asking – "How high can it go?" In the very short run, the oil (and natural gas for that matter) supply curve is nearly vertical, and the market clearing price is that which results from the intersection of a fixed supply, S_{fixed} , at whatever maximum level of output that is available. If one assumes that supply interruptions (Iraq, Katrina) result in a further contraction in available supply from this new $56 equilibrium level (however temporary), then oil prices could reach near $76 per barrel! We have very nearly already gotten to this level.

So, what would it take to get to the feared $100 per barrel level? If the market truly believes that $56 is the new equilibrium level of oil, a disruption and drop in the short-term available supply to around 81 MMBD (-3.5% from estimated 2005 volume) decline could cause this. Or, a rise in speculative demand (or an insistent almost non-price sensitive further outward shift in the demand curve) by 2% would have nearly the same effect. There is likely already a degree of speculation in the

market and, in our view, the likelihood of actually getting to the $100 per barrel level anytime soon is quite low. Furthermore, for $55-57 per barrel to represent the new "normal" equilibrium level of oil prices assumes that the supply and demand curves will not shift in response to the incentives to find, develop and produce as well as conserve and substitute (solar, nuclear etc).

In reality, suppliers and consumers will adjust their behavior to fit the new incentives and/or cost structure. It will simply take time. Figure 2 contemplates how the equilibrium price of oil might change over the next three years (or perhaps longer). At $56 per barrel, oil producers are highly incented to find, develop and produce, and E&P budgets are rising rapidly and far exceed the current imbedded DD&A costs per barrel (depletion, depreciation & amortization). Even if one believes that exploration opportunities are limited (which we do not), the long-term supply curve is likely to be far more elastic (perhaps 8/1) and more responsive to price changes than exists today. In addition to the incentive from the high return on investment available at today's price levels, releases from the SPR (Strategic Petroleum Reserve, which contains over 40% of U.S. crude oil stocks), more consistent Iraqi output, increased output from Canadian tar sands, and the completion of central Asia fields and pipelines could be such catalysts. A 4-5% outward shift in this more elastic supply curve would suggest that producers would find more than adequate returns over the next few years at oil prices in the mid-to-high $30s. This is particularly likely as international producers have significantly lower costs than U.S. domestic producers.



With energy efficiency once again a top goal among corporations and the general population, the world has likely been launched onto another 10-15-year cycle of massive investment in energy efficiency. This may be in the form of replacement of cars with more fuel-efficient models (same with appliances) or conservation and substitution efforts. The end of demand from filling the SPR should also be a material short-run reduction in consumption. Despite the desire to consume more, the worldwide demand curve will almost certainly react to the perception that today's prices will be sustained by shifting backward by 2-3%. Worldwide consumers won't want to continue to consume today's quantities of oil at $55, $65 or $75 if they can find ways to conserve and substitute. Since U.S. consumption is still three times that of China, reduced demand from U.S. conservation could easily support continued growth in consumption from China. They would more likely demand this amount in the upper $40s per barrel, maintaining a security and world growth demand premium over the supply curve. The overall result should be a modest 1.5% expansion in worldwide consumption (to over 85 MMBD) over the next three years, while at the same time prices trend back down toward the $40 per barrel highlighted by the intersection of the supply and demand curves in Figure 2 above.

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This intersection point demonstrates that oil price changes do not have to be a one-directional trend (up) even while consumption grows from the likely 2005 level. It also recognizes that the cost of finding, developing and producing that marginal barrel of oil has risen significantly - perhaps to the mid-$20s in the U.S. (by Bernstein Research's estimates) and should continue to rise. The impact on publicly-traded oil companies should be that today's extraordinary earnings per share levels and returns on capital will not persist, but even at $40 per barrel, the earning power of the industry and the return on its low historic-cost investment and capital base will remain well above the past norms and much of the rest of corporate America.

Since today's consumption has been demand-growth driven in the face of supply constraints, there are a couple of risks to this forecast. Worldwide economic growth, particularly that driven by China and India, could follow a booming path (with no chance within a three-year time horizon for the demand curve to shift backward). The supply response (expansion) might be similar, but the demand curve would continue to shift out as countries in effect compete for energy resources to support their growth rates. In this case, a price in the low-to-mid $50s might be necessary to balance supply and demand (but with a higher growth rate in consumption). Or a slowdown in worldwide economic growth (accompanying a U.S. recession and probably a banking crisis in China) might cause the demand curve to shift back even further, causing oil prices to drop all the way to low-to-mid $30s. Yet even with the volatility in prices accompanying the rise and fall of speculative demand, rising marginal costs per barrel are likely to make the high $20s an absolute floor for prices rather than the mid-teens of a decade ago.

Natural Gas Supply & Demand Shifts

The natural gas supply/demand outlook displayed in Figures 3 and 4 (and the supply and demand curve definitions are identical with those for oil) is similar in most respects to oil but dissimilar because the North American market is a trapped market. As recently as the early-to-mid 1990s, natural gas sold at roughly an average 35% BTU equivalent price discount to oil (WTI), and a normal equilibrium oil price at $22 would be consistent with gas near $2.50-2.75 per MCF. We believe that by 2001, this relationship put gas at closer to $2.90-$3.00 per MCF in 2001 (S_e 2001 and D_e 2001). Worldwide discovery of reserves and supplies of natural gas are far greater than that available in North America. While residential use of gas (primarily for home and water heating) has risen progressively and represents 22% of demand, power generation has been a key incremental consumer (25% of 2004 consumption) as "clean" power production has been enhanced by the energy efficiency of Combined Cycle Gas Turbine (CCGT) technology for intermediate-load electricity production. This has both modestly smoothed the seasonal demand for gas (winter heating versus summer power production for air conditioning) and increased the uncertainty that summer injections (at storage sites) will always be sufficient to meet winter demand. As a result, these incremental sources of demand growth began to change this relationship by the late 1990s, such that gas, while highly volatile in price, is likely to sell at a BTU equivalent premium to residual fuel oil (called resid).

Furthermore, since natural gas fields have experienced far higher decline rates than oil fields and since imports via LNG storage facilities are only currently able to supply 3% of the North American consumption, the supply curve for natural gas is far more inelastic than for oil. The volatility of natural gas prices historically would be consistent with a price elasticity of supply of approximately 12/1 (a 12% price change would result in a 1% supply increase at equilibrium) but with seasonal and short-run supply virtually fixed, today this ratio is likely to be twice this level. The high decline rates in field production and rapidly rising costs of exploration most likely generated a 3% backward shift in the supply curve since 2001, twice the shift in the oil market. On that basis, producers would be only willing to offer the same supply, 61.5-62 billion cubic feet per day (BCFD), at $5.50-$6.00 per MCF rather than $3.00 ($S_c$ 2005).

Taking into account the high seasonal demand for natural gas, the demand curve was historically less steep than for oil (near 10/1) as power producers had more fuel switching capability between gas and fuel oil. Today's modern and efficient CCGT power plants do not have this capability and, as result, the demand curve has become more inelastic as well, such that it takes nearly a 20-25% increase in price to cause demand to contract by 1%. The outward shift in desired demand since 2001 is likely to have been at 7-8%, half the rate for oil (D_c 2005), due to the trapped demand in North America.

Given the short-run fixed nature of the supply of gas (resulting in a similarly vertical supply curve (S_{fixed}) as is the case for oil), if the market believes that $7.25 per MCF is the new market equilibrium price, a supply disruption (either from high decline rates or a Katrina-like event) could easily send the market clearing price to $11.00 per MCF (the intersection point with $D_{extreme}$). This is what has already happened, but this represents an extreme price (subject to a high degree of speculation), not a new normal price level.

Figure 3 - North American Natural Gas Supply/Demand Curves

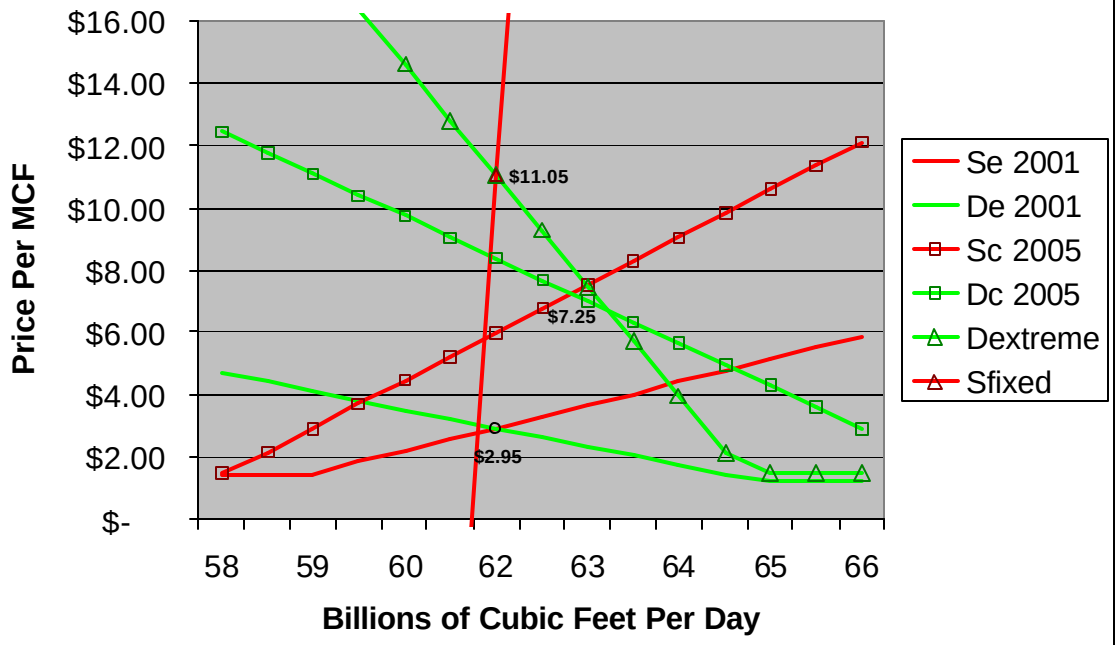
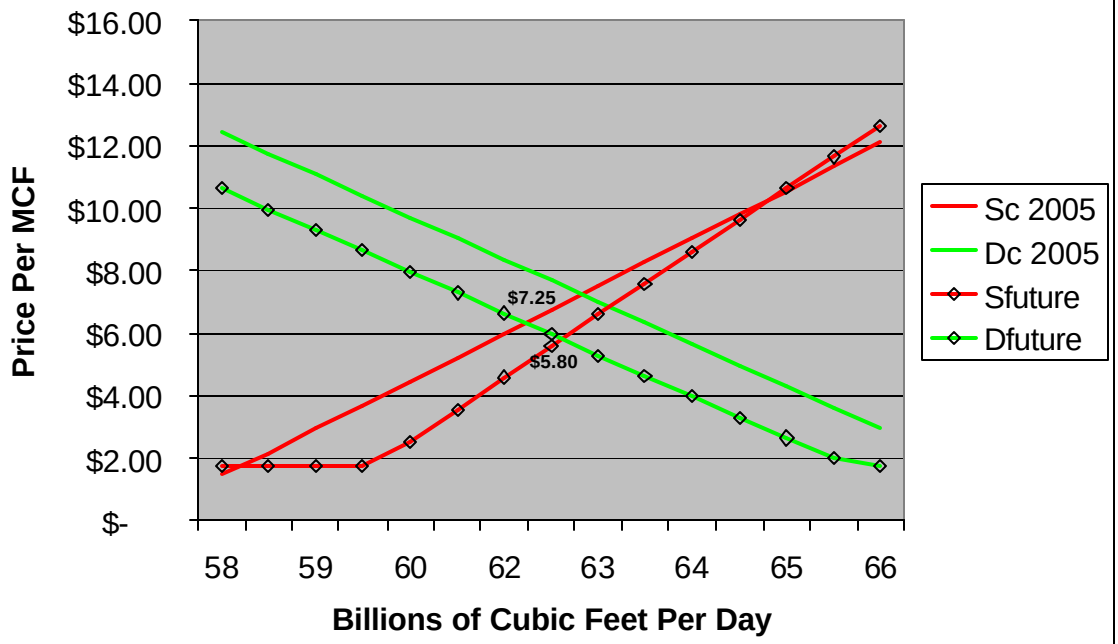


Figure 4 - North American Natural Gas Supply/Demand Curves



Indeed, natural gas demand is still subject to the impact of fuel switching, which is why the price of natural gas should trade between the BTU equivalent prices of fuel oil (resid) and heating oil. The potential price range is quite wide. As older gas-fired generators are shutdown or just used for peaking purposes, as residential and commercial customers conserve energy use, and as industrial gas uses (in products) shift to alternative raw materials, the gas demand curve is likely to shift backward by 3-4% (see D_{future} in Figure 4). This means that consumers will want less volume at all price levels than in today's environment. As a result, even with a relatively stagnant supply curve (Canadian and LNG imports mostly offsetting declining U.S. production), the intersection of S_{future} and D_{future} would produce a new equilibrium price closer to $5.75-$6.00 per MCF, not today's $7.25.

Summary & Conclusions

The outlook for energy prices and supply is not nearly as bleak as the markets currently perceive. This analysis leads us to the following beliefs:

- Although one might be tempted to believe that lower prices will be a big benefit to the inflation picture, the normal price levels over the next few years are still far higher than was believed to be likely just a few years ago. None of the recent upward spikes in prices have fully flowed through the cost chain into the rate of price increases for goods and services. These are yet to come, and $40 oil and $5.80 natural gas won't eliminate these cost pressures. It's not hard to envision the rate of change in the CPI to rise above 4% (even before Katrina) before hitting a peak.

- Given the high marginal cost of developing new oil and gas reserves and, in particular, alternative energy sources, it will be good if oil and natural gas prices don't collapse. For if they do, the renewed interest in developing high-cost reserves (whether stranded pockets of gas in the lower 48 states, pipelines to tap into the large reserves in Alaska and the McKenzie Delta region in Canada, tar sands in Canada, offshore oil and gas projects, and alternative energy, etc) will quickly fade as will the desire to conserve and invest in conservation and substitution.

- $55 oil won't cause the economy to collapse as some fear, nor will $40. Yet there is once again a wealth transfer (as was the case in the late 1970s) from oil consumers to oil producers. This loss can be offset by higher inflation with too much growth in money and credit, or this loss of wealth can be recycled into energy capital goods and energy-efficient capital investment that will offset what will otherwise be a loss in U.S. discretionary consumer incomes. Yet, the rest of the world already lives with much higher energy prices, and the U.S. can absorb this shock as well.

- Although it is not the goal of this report to forecast specific company earnings, the "normal" level of earning power of oil and natural gas companies will remain well above historic levels (particularly on historic-cost capital bases). Few analysts and economists forecast that prices will drop below $40 and others believe that $55 is the new norm. If prices fall over the next three years (or more) to $40, the stocks are quite likely to decline, but with underlying earning power on the rise, there is likely to be a new higher floor on industry valuations.

On this basis, we are evaluating the macro and industry effects on our investment strategies. We hope that this is a relatively unique and intellectually consistent ex-ante analysis and forecast that is not simply a repetition of historically observed relationships.
