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Investment Newsletter – March 2015

This newsletter starts with an analysis of how Saudi Arabia may be applying game theory to its price setting role in the oil market. If this is not of interest, skip to the end where we'll update performance of the Short Term Income strategy.

Oil Markets Analysis – Demand, Supply, and the Saudi's Game

An introductory college course in economics explains market prices in terms of supply and demand. For normal goods, as prices fall the quantity demanded increases and the quantity supplied decreases (and vice-versa when prices rise). Prices are signals of scarcity or abundance that affect the behavior of consumers and producers to balance the supply and demand for goods. Of course time is a factor. It takes time to find and produce more oil and it takes time to change our use of energy by buying more or less efficient cars. Thus we have short term and long term effects.

Saudi Arabia, as the largest producer in the Organization of Petroleum Exporting Countries (OPEC), has historically been the one producer with both the ability and willingness to adjust production up or down by enough to steer world oil prices in the short run. Longer run, their ability to raise prices is constrained by the potential for increased supplies outside of OPEC. Let's focus on their short term decision as a starting point.

The key thing to understand is that demand for oil is not very sensitive to price in the short run; it is hard for a consumer to adjust behavior in the short turn. Estimates of this sensitivity vary widely but let's use those from the International Monetary Fund (IMF). Their estimate for this sensitivity (called the price elasticity of demand) in the short run is -.02. This means that a 50% increase in the price of oil would decrease the quantity used by 1% (= 50% * -.02) and vice-versa.

In 2014 the world used about 93 million barrels of oil per day. Analysts estimate that production was about 1 million barrels in excess of demand – roughly 1.1%. Unless Saudi Arabia reduces supply, prices must fall by 54% to push demand up enough to match supply. This would seem to explain what we've seen.

With this background on oil markets in mind, let's take a closer look at Saudi Arabia's decision to maintain current production levels rather than cutting supply as most market participants expected (which they have traditionally done when supply exceeded demand). The reason they've done so in the past is that it is in their interest to do so – at least in the short run. Let's do the arithmetic to illustrate.

Saudi Arabia produced about 9.6 million barrels of oil per day in 2014 whereas they could have cut production to 8.6 million barrels per day and thereby kept the price of oil up around $100 per barrel. Their production costs are estimated at $10 barrel. This means they have following payoffs for their 2 possible decisions:

1. Maintain production at 9.6 million barrels per day, sell oil at $50/barrel to earn total profits of $384 million per day = ($50 - $10) * 9.6 million.
2. Cut production to 8.6 million barrels per day, sell oil at $100/barrel to earn total profits of $774 million per day = ($100 - $10) * 8.6 million.

So it seems that Saudi Arabia is hurting itself. By maintaining production and keeping the market over-supplied they are reducing their own profits by $390 million per day – they cut their profit by 50%! This is why it was so unexpected. To understand why, we need a long term view and we need to add a different branch of economic analysis called Game Theory.

In the short run world oil supply is very inelastic – meaning it doesn't change much as prices change because once the wells are drilled it costs very little to pump oil and so producers are reluctant to stop pumping. This is because most of the producers are not large enough by themselves to see a gain from a production cut. In the long run, however, producers take into account the full cost of finding and drilling for new oil. As prices rise, higher cost oil fields become profitable to develop but as prices fall producers cut back projects to focus on the lowest cost oil. The range of projects available causes long run oil supply to move up or down according to the expected selling prices over the lives of the projects. Currently the consensus seems to be that a long run oil price of $80 would cause supply and demand to balance out. Prior to the U.S. shale drilling revolution, the price to balance supply and demand was much higher, probably close to $100. The oil projects that are just barely economical determine the industry's marginal cost of production and therefore the supply response to changes in prices.

There are varying time lags for different oil projects and decisions must be made taking into account the uncertainty of the future oil price to be received when the project is producing. The greater this uncertainty, the riskier the project, and the higher the expected return on capital must be to justify the risks of going forward. Hence volatility in oil prices raises the marginal costs of producers and therefore reduces the amount of future supply for any level of today's prices.

Now let's look at the Saudi choice for today's production (and therefore prices) with regard to its longer term market impact. Producers can no longer count on Saudi Arabia to cut production to maintain a certain price – their behavior is no longer predictable with certainty. Therefore, producers must consider the possibility that the current price environment may persist for an extended period. Projects that have marginal costs above the current price will not go forward, therefore reducing world oil supply from what it otherwise would have been.

We can explain Saudi Arabia's motivation for maintaining production using a simple game theory analysis of the payoffs to the production decisions of Saudi Arabia and the Rest of the World (ROW) in a 2 period game. Period 1 is the short term and period 2 is the long term. The table below is a simplified payoff table in terms of millions of dollars per day. Although the detailed assumptions here are not so important for understanding the concepts of the game, they are as follows:

Average cost of producing a barrel of oil: Saudi = $10, ROW = $40
Current oil production in millions of barrels per day: Saudi = 9.6, ROW = 83.4
Minimum production cut required to balance supply and demand = 1 million barrels
Oil prices per barrel for each period depending on supply versus demand:

	Period 1	Period 2
Supply > Demand	$50	$40
Supply <= Demand	$100	$80

Based on the above we construct the following payoff matrix for the "oil game".

Rest of World Production Choice:	Strategies in period 1 - $millions/day				Strategies in period 2 - $millions/day			
	ROW cuts production		ROW maintains Production		ROW cuts production		ROW maintains Production	
Saudi Choice:	Saudi payoff	ROW payoff	Saudi payoff	ROW payoff	Saudi payoff	ROW payoff	Saudi payoff	ROW payoff
Saudi cuts production	774	4,944	774	5,004	602	3,296	602	3,336
Saudi maintains production	864	4,944	384	834	672	3,296	288	0

The yellow shaded area for period 1 shows the current payoffs to the choices. I've circled the Saudi payoff for maintaining production that we calculated earlier. Although the magnitudes are different, the incentives seem to be the same for both sides in each of the two periods. Both should maintain production if the other side cuts production and both should cut production if the other side does not. Because the Rest of the World cannot easily coordinate a production cut, it has been up to the Saudis to cut production while the ROW producers benefited. In the short run this is the right strategy but in the case of 2 periods there is a better strategy.

By maintaining production in period 1, the Saudi's are signaling to the ROW that the payoffs in period 2 will be in the lower row – where Saudi maintains production. If this is a credible threat, and ROW believes Saudi may maintain production , ROW should choose strategy based on a payoff of 3,296 if they cut production or 0 if they do not. Thus the threat should lead to ROW cutting rather than (or in addition to) the Saudis in period 2. Assuming the Saudi threat works (as it should) they are likely to come out ahead in the long run as they will achieve the higher payoffs for a longer period - though they may need to create over supply to punish the ROW periodically to achieve long run cooperation on supply.

Note that because the ROW has much higher volume and much higher costs, the price decline has a much larger impact. The cost to ROW of cutting production is about 1% of potential profits. This is much lower than the cost of maintaining production in the case where the Saudi's don't cut – a 100% drop in profits. Therefore even if the probability of the Saudis maintaining production in period 2 is low, ROW should still cut production to protect profit against this risk. Thus, by forcing down prices in period 1 the Saudis have reduced the ROW supply for a given price in the future.

Moving from the game to the real world, by increasing the possibility of low prices and future oil price volatility, the Saudi's are essentially increasing the risk and therefore cost of capital for the oil producers in the rest of the world. The result will be less investment in new oil supply by the rest of the world and higher equilibrium oil prices.

Applying this to the world of energy related investments, we can expect the current low oil price environment to reduce new oil development projects by eliminating new projects with costs above current prices. As oil is depleted from current wells supply will slowly decline. Meanwhile demand will increase because oil has become much cheaper. Over time the market will reach balance and supply may even go below demand for a time so that oil is taken out of storage and prices rise to the point necessary for long run market balance. It is hard to predict how long this process will take but given the relatively fast decline rates of shale oil wells in the U.S. it is possible we could see oil prices rising again by late 2016. Companies selling at prices below their long run asset value will give good returns if they can survive till the adjustment process has run its course.

Short Term Income Portfolio Strategy and Performance

Berkeley Investment Advisors uses several different strategy portfolios to manage client assets. The Short Term Income portfolio is a fixed income portfolio that focuses on short to intermediate term rate maturity loans and bonds. Typically shorter maturity bonds offer lower interest rates (yields) than longer maturity bonds and are less sensitive to changes in interest rates. This category of fixed income includes securities with floating interest rates that can reset periodically depending on market conditions. For example the rate paid could be set based on the 3-month London Interbank Offer Rate (3-month LIBOR).

We measure interest rate sensitivity risk as duration. This tells us how big a change in price we can expect when interest rates change. Typically a short term bond fund strategy would own bonds with durations below 3. If we held a bond with duration of 3 when rates went up 1% we would expect the bond's price to decline by 3%. In the current environment where interest rates are historically low, we have chosen to keep portfolio duration to an even lower level – currently 1.2.

Besides interest rate risk, there is also credit risk in our bond portfolio – the risk that borrowers may default and not pay all that is due. Lower rated bonds, known as high yield or junk bonds have a higher probability of default than higher rated bonds but compensate by paying higher interest rates. In a sense, default risk is similar to equity market risk as it is correlated with the performance of the economy. Individual credit risk is managed by diversifying across a large number of issuers. In this way we insure that the extra premiums earned will not get wiped out by a few companies defaulting. Given the favorable economic conditions (except for the energy sector) and the overall low level of interest rates, the return versus risk trade off has been very favorable below investment grade rated bonds. Our strategy is to accept these credit risks to earn those extra returns.

Another source of incremental yield comes from buying closed end funds that have lower trading volumes than typical exchange traded funds. These securities can be bought at a discount to the underlying bond values (and sometimes sold at a premium). In addition these funds can enhance returns through embedded

leverage at very low cost of funds - thereby enabling us to capture some of the borrowing benefits of the low rate environment rate. These borrowing rates will rise in the near term so the yield on this portfolio could drop initially as rates rise. In holding these securities we must endure more price volatility in down markets as retail investors tend to want to sell more at lows. Current market conditions are providing about .80% higher yield on our portfolio than if we held the underlying bonds directly.

   The portfolio is diversified across virtually all sectors of the fixed income market, including government bonds and mortgage backed securities. A good comparison index is the "Barclays U.S. 1-5 year Government/Credit Float Adjusted Bond Index" as represented by the Vanguard Short-Term Bond exchange traded fund (ticker BSV). This is meant to represent the short maturity U.S. bond market.

   At least some clients have had money invested in this portfolio since it was created in February 2008. The graph and table below show total returns including price and interest payments in comparison to the bond index mentioned above as implemented in the exchange traded fund (ticker BSV). Our portfolio returns calculated here are based on a particular client's account and have been reduced by annual fees of 1.25% which would apply to new accounts above $500,000 but below $1 million.

Short-term Income vs BSV Bond Index
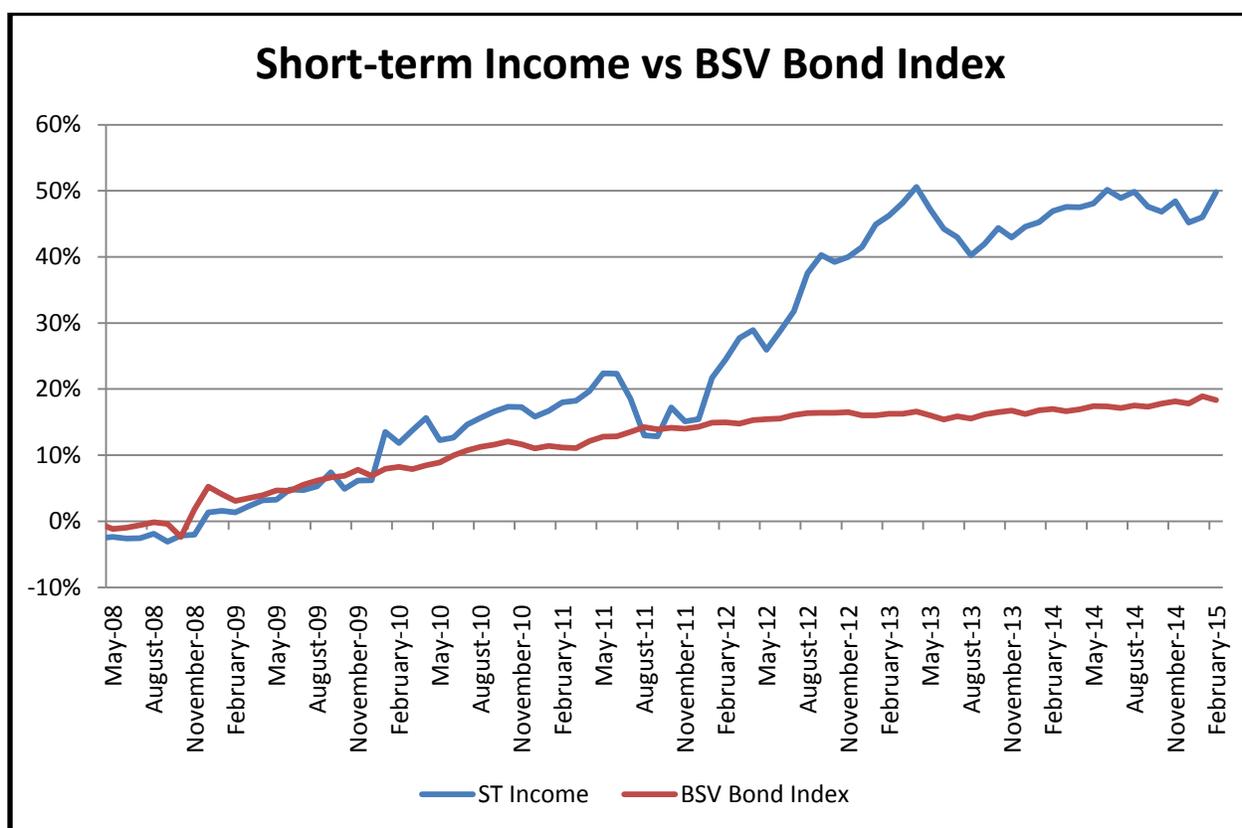
   Despite the pullback from the high hit in April 2013, the above graph shows the cumulative return for the strategy from 2/29/2008 to 2/28/2015 as 49.8%. Thus the annualized rate of return since inception (7 years ago) has been 5.95%.

Year		Returns by Year		
		Short term Income	BSV Bond Index	Difference
1	3/2008-2/2009	1.4%	3.1%	-1.7%
2	3/2009-2/2010	10.3%	5.0%	5.4%
3	3/2010-2/2011	5.5%	2.7%	2.8%
4	3/2011-2/2012	5.5%	3.4%	2.1%
5	3/2012-2/2013	17.5%	1.1%	16.3%
6	3/2013-2/2014	0.5%	0.6%	-0.2%
7	3/2014-2/2015	2.0%	1.1%	0.8%
7 Year Compounded Total		**49.8%**	**18.4%**	**31.5%**

The table and chart on the prior page make it clear that although the strategy exhibits some volatility in returns, there is much lower risk of principal loss over a year's time than in other strategies - such as stocks or long term bonds. This is the reason that many of our clients have large allocations to this strategy: we are being cautious in what appears to be a speculation driven market. The stock market looks particularly risky using historical norms. We want to avoid large losses and have funds available to buy when the market returns to a lower level.

While the strategy continues to serve its purpose as a haven from the risks of a high priced equity market, it is disappointing to see two years in a row of such low returns. This deserves some comment. There are two main factors that drove this result. The closed-end funds in the portfolio suffered significant declines in investment income over the period which caused them to cut payments to shareholders. In turn, the cut in dividends led many retail investors to sell these funds which caused discounts to underlying values to widen over the period.   It appears that the funds cashed in on built up gains 2 years ago (that they realized from declining interest rates and declining credit spreads). Because the funds are required to pay this investment income to shareholders, their distributions were inflated by these gains. Back then, investors, seeing the high dividends, bid up the shares and reduced the discounts to asset values because of the attractive yields provided. This led to a 17.5% return in the 5th year of the strategy.   But, when these artificially high yields were eventually reduced to a more normal level, investors interpreted this as a negative sign and sold in mass – depressing prices and our returns.

The silver lining to this story is that after two years of depressed returns the closed-end funds are trading at relatively large discounts to the underlying bonds. This should support better returns going forward. At March 31 2015, the weighted average discount on the closed end fund positions in the portfolio is now 7% and the overall yield after fees is 5.33%.

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