February 3, 2015

Oil Price Impacts on Cement Consumption

Overview

Oil prices have fallen dramatically. West Texas Intermediate crude oil prices currently stand at roughly half their price level that existed in June. PCA’s fall forecast projections integrated earlier Energy Information Agency (EIA) oil price projections that did not reflect the oil price decay that recently materialized. The EIA has only recently revised its projections for oil prices. The new EIA projections hold several adjustments to the overall economic outlook, construction markets, and concrete’s price competitiveness against competing building materials. The purpose of this flash report is to identify adjustments to PCA’s fall forecast.

The Oil Price Outlook

The outlook for oil prices contains extreme uncertainty. Forecasting energy prices is a complex endeavor, and an effort beyond PCA’s capabilities. In lieu of in-house oil projections, PCA relies on EIA projections contained in their short-term and long-term annual forecasts. The current EIA short term oil price forecast (two year projection) expects oil prices will average $55 per barrel for West Texas Intermediate oil during 2015 and $71 per barrel for 2016. Unfortunately, longer term EIA projections through 2040 were last conducted in May of 2014 – prior to the decay in oil prices that began in earnest in
October 2014. As a result, no longer term EIA forecast exists that reflects recent market developments. In the May forecast, however, the EIA projected $102 per barrel price for West Texas Intermediate oil in 2023. In contrast to short term cyclical developments, longer term structural trends typically dominate oil price forecasts. Longer term structural issues are generally slow to change. The longer term trends envisioned by the EIA may not have changed significantly since the EIA's last forecast. Given time, the oil market will settle and eventually react to the short term cyclical disruption. This suggests that the EIA's projection of $102 per barrel for 2023 may still hold. This assessment is reinforced by a survey of oil price forecasters. The price path and mechanism of getting there, however, will be different. The EIA's last forecast showed oil prices declining through 2015, followed by sustained increases in oil prices during 2016-2023. Through an interpolative patchwork, PCA has knit together an EIA based price forecast for West Texas Intermediate oil through 2023.

Incorporating these EIA based projections into PCA models results in adjustments to overall United States’ economic growth including uneven regional benefits and/or drags. A great deal of uncertainty should be attached to the near-term oil price projections. Some analysts expect oil prices will remain near $45 per barrel during 2015-2016 before resuming on a gradual ramp-up. In any case, if oil prices remain low, they will impact the construction market and the sub-sector distribution of growth. Furthermore, the adjusted oil price outlook impacts concrete’s price competitiveness against competing building materials – particularly against asphalt.

**General Economic Impacts**

Low oil prices are beneficial to United States economic growth and are expected to add 20 to 30 basis points to real GDP growth rates during 2015-2016. While low oil prices support stronger national economic growth, it will disrupt regional growth among energy producing states. Consider the following rough assessments. It should be kept in mind that while many of these factors are likely to come into play, the individual impacts could be modest. Collectively, however, these factors paint a stronger near-term economic outlook.

**Low Oil Prices Enhance Consumer Spending**

- Low oil prices reduce households’ expenditures at the pump. Compared to year ago levels, households are currently spending $159 per month less on gasoline. PCA estimates consumers will receive a $150 billion windfall during 2015 from lower prices at the pump.

- Oil heating fuel is also expected to decline and reduce oil heating expenditures by nearly 35% or roughly $639 per household. Roughly 6% of all homes rely on oil heat with most of the reliance centered in the northeast. PCA estimates that the decline in home heating prices will create a $4 to $5 billion windfall for homeowners using oil heat during 2015, $2.1 billion in 2016, $1.5 billion in 2017, $1.0 billion in 2018 and $600 million in 2019. Keep in mind, the decline in oil fuel prices will impact the price of competing fuels as well – amplifying the potential saving for homeowners.

- From a historical perspective, a 10% change in oil prices results in roughly a 1.5% inverse change in consumer sentiment. At current oil price levels, that implies roughly a 6% to 8% increase in consumer confidence during 2015. Stronger consumer confidence directly translates into stronger consumer spending.

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1 While many forecasters project similar patterns contained in this report, some suggest the low oil prices will result in underinvestment to develop new wells and could trigger substantial ($200) price increases.

2 Given the complexities in energy price forecasting, PCA incorporates on the Energy Information Agency’s detailed analysis and projections into its economic models. EIA’s short-term (2015) projections are incorporated into PCA’s model. Longer term, PCA includes the projected percentage decline for oil prices in 2016. From 2016, oil prices rise in equal annual increments to the 2023 EIA projection.
Inflation will remain in check. The price of oil infiltrates the cost of production among a wide range of goods, from agriculture to heavy manufacturing. Low factor costs translate into price stability – even in the context of tightening labor markets. Furthermore, low oil prices add strength to the dollar, thereby reducing import costs. Low inflation enhances real disposable income.

Low Oil Could Slow the Expected Climb in Interest Rates

- Lower near-term inflation suggests a slower achievement of the Federal Reserve’s 2% inflation target. This potentially enlarges window before Federal Reserve engages in tightening – adding to a more favorable interest rate environment for 2015-2016 compared to our fall forecast. Expected increases in the Federal Funds rate could also be smaller in magnitude and the subsequent ramp-up could be slower.

- Stronger economic growth and a diminished inflation outlook could reduce interest rate premiums. Lenders typically add two premiums including an inflation premium and a lending risk premium. Stronger job markets reduce the lending risks to consumers. Stronger overall economic growth could reduce risk to business lending. This could translate into slightly greater access to capital markets and the reduction in these premiums could translate into marginally lower interest rates.

- The potential changes in the interest pattern are expected to be very modest. Nevertheless, the favorable interest rate environment could serve to add support to consumer, corporate and mortgage borrowing.

Low Oil Could Disrupt Growth Among Energy Producing States.

- Oil prices will adversely impact oil producing regions. The decline in oil prices will also impact competing fuels such as natural gas which will also adversely impact economic activity in these regions but to a lesser degree than oil. PCA estimates that drilling activity will decline up to 37% in some regions during 2015 from 2014 levels.

- PCA estimates that 25,000 direct oil and gas extraction jobs, roughly 12%, will be lost during 2015. Another 60,000 jobs that directly support oil and gas extraction is also expected to be lost. Applying a labor multiplier of 2.3 to account for downstream job loss implies the potential total loss of 195,000 jobs. These job losses will be concentrated in the key oil producing regions and do not represent a net decline in jobs resulting from low oil prices.

- A stronger dollar, resulting from low oil prices, could also reduce United States’ export opportunities in the context of an already struggling global economy. This could adversely impact agriculture and manufacturing exports.

Low Oil Could Increase Debt Defaults

- The junk bond market represents more than $2 trillion in investment. Roughly 22% of junk bond debt is tied to small to mid-sized oil and gas producers. Low oil prices, if sustained through 2016, could push up default rates to 25%-40% according to various estimates. That translates into $100 to $175 billion in defaults. Such large losses could trigger a credit retrenchment that impacts all types of borrowing. This impact is not included in PCA estimates and represents downside risk.
State Finances Could Improve

- While energy producing states will suffer, stronger economic activity and job creation suggests stronger state fiscal conditions for energy-consuming states. PCA estimates that the net national stimulatory impact arising from oil prices is expected to add $8 billion in 2015 and $13 billion in 2016 compared to the fall forecast.

The Net Impacts

- Considering both the positive and negative impacts, PCA estimates that real GDP growth will run roughly 20 basis points higher in 2015 and 30 basis points higher in 2016 compared to our fall forecast. Most of the potential benefit to economic growth arises from stronger consumer spending which accounts for roughly 70% of United States’ economic activity.
- PCA estimates that stronger oil induced net economic growth conditions will add a net 220,000 additional jobs in 2015 and slightly more in 2016. This estimate takes into consideration job losses in energy producing regions.

General Construction Impacts

Lower oil prices impact the underlying construction fundamentals. Unfortunately, the transmission process from oil price declines to construction activity contains timing lags. It takes time for oil prices to impact consumer/business behavior, which in-turn impacts decisions to build.

Consider the following example. PCA estimates that lower oil prices could add roughly $2 billion annually in travel and hotel expenditures during 2015-2016. This translates into higher expected ROIs for these properties. Hotel occupancy rates reach 64.7% in 2015 and 65.9% in 2016 compared to fall forecast estimates of 63.1% and 64.6%. Room rates are projected to increase 4% in 2015 and 3.6% in 2016 compared against fall forecast of 3.6% and 3.4% respectively. The resulting higher net operating income lowers lending risks and enhances property valuation. This transmission process could eventually lead to increases in hotel construction. It is clear, however, that the process beginning from lower oil prices and resulting in construction increases is a long process and the impacts are somewhat diluted.

This example of the positive impact on the underlying construction fundamentals can be repeated again and again across nonresidential, residential sectors and public sectors. The length of the time lag associated with the transmission processes varies depending on the type of construction undertaken which incorporates not only an impact assessment of the new economic environment on project ROIs, but also design, financing, and project procurement activity.

In addition to a timing lag between oil price changes and economic behavior, each construction project takes time. There is considerable variability in timing lags among the types of projects. PCA estimates the time lag between an increase in real GDP growth and residential construction is roughly 6 months.

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3 The decline in oil prices, for example, has a direct impact on fertilizer costs and the fundamentals facing farm construction. Fertilizer costs can account for as much as 30% of the costs for some agricultural products. As such, lower oil prices can serve as a boost to farm income. There is a tight correlation between farm income and farm construction activity. Unfortunately, the decline in oil prices occurred post planting season and offered little help to farmer. If oil prices remain low, 2015 farm income could receive boost and materialize in an increase in farm construction activity in 2016.

4 As a further example, roughly one in five jobs are office jobs. Lower oil prices are expected to generate slightly stronger economic activity resulting in additional job creation. Of the 220,000 net total new jobs created by lower oil prices in 2015, roughly 45,000 are likely to be new office jobs. These increases result in marginal improvements in office vacancy rates – decreasing 2015 expected vacancy rates from 14.1% to 14.0%.
For nonresidential construction the transmission process is longer and the lag is estimated at 23 months. Finally, government construction lags changes in real GDP by 35 months. These are rough and broad estimates.

The key point being made is that little of the potentially positive impacts for construction activity resulting from lower oil prices will materialize in 2015, or even during the first half of 2016. Aside from construction projects related to energy drilling, PCA expects cement will increase by 45,000 metric tons in 2015 compared to the fall projections. In subsequent years PCA expects additions of 127,000 metric tons in 2016, 153,000 metric tons in 2017, 107,000 metric tons in 2018 and 56,000 metric tons in 2019.

While the positive impacts for construction activity associated with the decline in oil prices may not occur immediately and may be relatively muted, the negative impacts could be more substantial and are likely to occur more quickly. The impact of falling energy prices are expected to be more pronounced and immediate adverse affect on individual oil producing states.

The extent of the impact on state construction activity depends on the level of economic diversity within each state. The more a state relies on energy production as a contributor to gross state product, the larger the potential adverse impact. Based on oil industry wages as a percentage of total state wages, Wyoming, Alaska, Oklahoma, North Dakota have the highest exposure with energy industry wages representing 10-15% of total state wages in these regions. Texas and Louisiana, other large energy states represent 9.0% and 6.5% respectively.

Energy producing states accounted for 37% of cement consumption growth during the past 5 years. With the decay in oil prices, these states will not be as powerful source of growth in cement growth during the near-term forecast horizon and may experience an outright decline in cement consumption.

The energy development boost to the United States’ economy over the past several years has largely been accrued to fracking efforts in shale oil areas. Traditional oil and gas areas have also been key contributors. Depending on the sustained level of price decay, drilling activity and associated infrastructure and building activity could be curtailed. Given there are different cost points for each fracking region, where, and if, the curtailment occurs may depend on the breakeven prices required in each regional and the future price trend pattern for oil.
There are seven major shale regions in the United States including the Bakken, Niobrara, Permian, Eagle Ford, Haynesville, Utica and Marcellus regions. Within each region there are different qualities of shale and processes used to drill resulting in a wide variability in breakeven cost points among and within and among drilling regions.

Based on monthly EIA oil price estimates, oil prices will exceed $60 per barrel by the fourth quarter of 2015 and slowly increases through to 2016 reaching an average of $71 per barrel. Thereafter, oil prices will rise $5 to $6 annually through 2019. These projected oil price levels are compared against PCA’s survey of shale field breakeven points to determine potential impacts on drilling activity and correlated infrastructure and buildings activity. To this end, PCA has grouped the 19 shale field survey price points into three categories. Category one consists of fracking areas with price breakeven points below $50 per barrel. Category two consists of fracking areas with price breakeven points between $51 per barrel and $65 per barrel. Finally, category three consists of fracking areas with price breakeven points above $65 per barrel.

<table>
<thead>
<tr>
<th>Location</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marcellus Shale - 5W Liquid Rich Pennsylvania</td>
<td>$24.23</td>
</tr>
<tr>
<td>Marcellus Shale - Super Rich Pennsylvania</td>
<td>$25.63</td>
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<tr>
<td>Utica - Wet Gas Ohio</td>
<td>$32.39</td>
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<tr>
<td>Mississippian Horizontal - East Mississippi</td>
<td>$42.15</td>
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<tr>
<td>Utica - Liquid Rich Ohio</td>
<td>$44.04</td>
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<td>Eagle Ford - Liquids Rich Texas</td>
<td>$46.02</td>
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<tr>
<td>Niobrara - Wattenberg CO, WY, Neb</td>
<td>$46.10</td>
</tr>
<tr>
<td>Wolfcamp - N. Midland West Texas</td>
<td>$53.92</td>
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<tr>
<td>Eagle Ford - Oil Window Texas</td>
<td>$55.29</td>
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<tr>
<td>Wolfcamp - S. Midland Texas</td>
<td>$61.57</td>
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<tr>
<td>Mississippian Horizontal - West Mississippi</td>
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<tr>
<td>Wolfberry Texas</td>
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<tr>
<td>Bakken Shale Montana, North Dakota</td>
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<tr>
<td>Wolfcamp - N. Delaware Texas</td>
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<tr>
<td>Uinta - Green River Utah, Colorado</td>
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<tr>
<td>Uinta - Wasatch - Horizontal Utah, Colorado</td>
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<tr>
<td>Granite Wash - Liquid Rich KS, TX, OK</td>
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<tr>
<td>Uinta - Wasatch - Vertical Utah, Colorado</td>
<td>$74.95</td>
</tr>
<tr>
<td>Barnett Shale - Southern Liquid Rich Texas</td>
<td>$84.45</td>
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</tbody>
</table>

Drilling and investment activity among producers in each group will be hindered in 2015 and perhaps 2016. The extent of damage depends on the depth of the oil price decline and it length of time before prices rebound. Category one producers are expected to suffer the least distress and category three the most distress. Several producers among category one producers, such as those in the Marcellus and Utica regions in Pennsylvania and Ohio are among the lowest cost shale oil producers in the United States – requiring a breakeven price of less than $35 per barrel and are expected to be shielded from the adverse impact on operations and investment from low oil prices. Marginal and temporary disruptions in operations and investments are expected to materialize in the Eagle Ford liquid rich and Niobrara Wattenberg areas.

Category two producers are expected to experience reduction in drilling activity and correlated infrastructure investments. These disruptions in operation are expected to be temporary, with no disruptions spilling over into 2016. At the low end of the breakeven price spectrum, Wolfcamp North Midland and Eagle Ford – Oil Window are expected to experience moderate disruptions through the first half of 2015. This is based on the EIA’s projected average oil price of $49 per barrel for the first half of 2015. As oil prices ramp up during the second half of 2015 with the expectations of further gains,
operations among these areas will resume. Category two producers at the higher end of the breakeven price range are expected to experience longer and somewhat harsher disruptions. This includes producers in the Wolfcamp South Midland, Mississipian Horizontal West, Wolfberry, and Bakken fields.

Category three producers are expected to experience longer and harsher disruptions in drilling activity and investments. According to the EIA, $71 per barrel oil will not materialize until the second half of 2016. For many of the category three producers this could imply more than a full year of disruption in operations, drilling and investments. The largest adverse impact resulting from the oil price decline is expected to be concentrated in these areas.

Keep in mind, it is not only the shale producers that will be adversely impacted by the oil price decline. Traditional drilling will also be adversely impacted. According to PCA estimates that drilling activity will decline as much as 37% in some regions during 2015 from 2014 levels. In terms of cement consumption, this drag in drilling activity represents as much as a one million ton reduction in oil well cement consumption during 2015. Infrastructure and building construction correlated to drilling activity could amplify this drag and result in an additional one million ton decline in cement consumption from this sector of construction. As oil prices rise, these types of construction activity will contribute to growth in cement consumption during 2017-2019 but compared to the fall forecast but at lower volumes than previously anticipated.

**Relative Concrete Price Competitive Assessments**

Since liquid asphalt is a residual from crude oil refining, rising oil prices have been highly correlated with rising asphalt prices. Correlation analysis between annual percent changes in oil prices and the six month lagged annual percent change in asphalt prices suggest asphalt prices rose 7% for every 10% increase in oil prices during the past 10 years. With the introduction of cokers at refineries, the increase in asphalt prices has been even stronger. During 2006 through mid-2014 oil prices rose 61.5% and asphalt prices rose 87.8%. Concrete prices have not increased anywhere near that pace. As a result, concrete paved roads held both an initial and life cycle cost advantage over many types of roadways.
Some concerns have been raised that as oil prices decay, the potential exists that concrete’s relative price position against asphalt will in turn favor asphalt. Given the historical correlation between oil price changes and asphalt price changes, PCA estimated that the initial cost breakeven point for urban roadways is $76.5 per barrel of oil. The lifecycle breakeven point is estimated at $71 per barrel.

Given the depressed level of oil prices and based on historical relationships between oil prices changes and asphalt changes, asphalt paved roads should have regained its competitive advantage over concrete pavement on both and initial bid and life cycle cost basis. Unfortunately for DOTs, declines oil prices have a much weaker correlation to declines in asphalt prices. The two years prior to the oil price collapse asphalt prices declined 2% for every 10% decline in oil prices.

This may be explained by the impact of the increased introduction of cokers at oil refineries which reduce or eliminate bitumen or liquid asphalt production. This could result in substantive reductions in asphalt supply at a time when cycle demand is increasing. In such an environment, the market dynamics could mask the lower input cost typically associated with low oil prices. Indeed, during the second half of 2014 oil prices declined 44%. During the same time horizon asphalt prices increased 1.5% - reaching a new record high in December. No decline in asphalt prices have yet to materialize given six months of data since the beginning of the oil price decline.

**Low Oil Prices Could Weigh in Assessments to Re-open Idled Plants**

During the recession, depressed cement consumption forced a dramatic reduction in imports and the temporary closure of cement plants. As cement consumption recovers, capacity utilization will increase and eventually cement companies will assess how to supply the expected future incremental increases in demand. These decisions will be made in the context of the prevailing economic conditions and an evaluation of relative costs.

![Temporary Plant Shutdowns; Planned Expansions & Greenfields](image-url)
Typically, declining oil prices are consistent with a strengthening dollar. Declining oil prices often indicate a weakening in global demand brought about by weak economic global growth. Commodity prices, such as oil, weaken. This development has occurred in the context of stronger United States economic growth and its emergence as a much larger energy producer. United States’ net imports decline, reducing the amount of dollars supplied to international currency markets (current account). Furthermore, the United States becomes a safe haven given the economic uncertainty around the world and attracts capital account inflows. These dynamics strengthen the dollar.

A stronger dollar outlook is now a characteristic of many global projections. This implies lower import costs for all goods, including cement. This advantage may be amplified by depressed freight rates. Slower global economic growth in the context of relatively robust dry-bulk capacity expansion has worked to depress dry-bulk freight rates and bunker fuel costs.

Keep in mind, NESHAP regulations go into effect this year. Domestic planned re-openings must comply with emission standards which could imply costly emission control equipment. If EIA projections regarding the outlook for oil prices are correct, then the equation deciding whether to go with domestic or foreign source cement during the next two years may now favor the import side compared to similar assessments performed three months ago.

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