

OPEC Spare Capacity and the Term Structure of Oil Futures Prices

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Crude Oil's Importance for Commodity Indices

For investors in commodity programs, the return potential from holding crude oil futures contracts, in particular, is of crucial importance. Why is this the case? First of all, the main commodity indices are heavily weighted in the petroleum complex, and so the fortunes of crude oil weigh heavily on commodity index results. For example, when one regresses S&P GSCI Total Returns against WTI Crude Oil's Excess Returns, using weekly data, from 12/30/94 to 8/29/14, the resulting R-squared is 84%. A second reason is that in order for a commodity index to not only hedge bond investments against inflation, but also do so effectively for equity investments, then the index needs to have a concentration in the petroleum complex, as demonstrated in Froot (1995).

In this article, we are going to look into whether we can parsimoniously explain whether holding long futures positions in crude oil is a wise decision or not. It turns out that whether OPEC spare capacity is at comfortable levels or not would have been very helpful in making this decision, at least since the 1990s. Given the strength of this historical relationship, we can then speculate that it may be wise to examine current levels of OPEC spare capacity before deciding upon structural crude oil futures positions.

The rest of this article will explain how we came to this determination.

Structural Curve Shape of Individual Futures Contracts

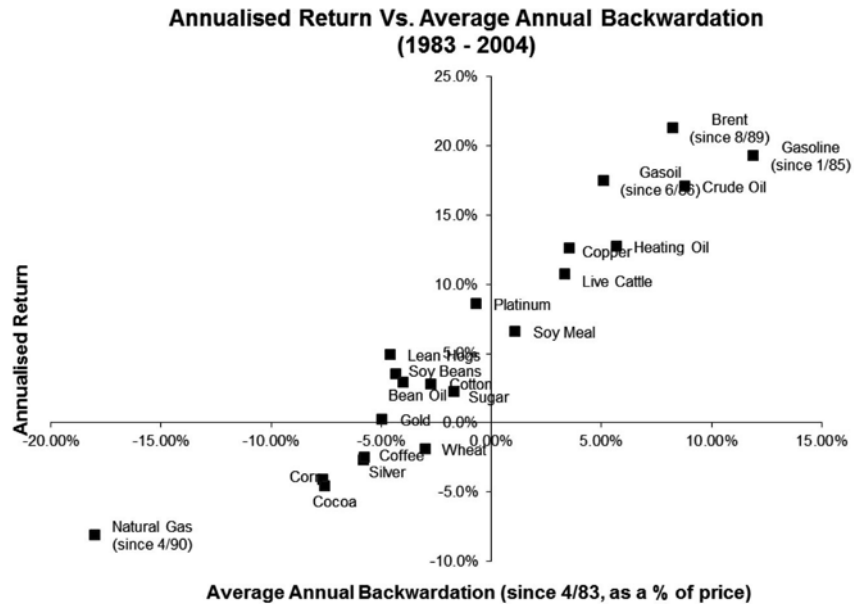
We will start our exploration of the key determinants of crude oil futures returns by posing the following question about all commodity futures contracts. What property seems to have a strong influence on whether an individual futures contract has a positive return over the long run? We will then check if the answer to this question might specifically apply to crude oil futures contracts.

There is comfort in the peer-reviewed literature with treating a commodity futures contract's curve shape as *predictive* of future returns. By futures curve shape, we mean whether a futures market is trading in backwardation or contango. Futures traders frequently refer to the term structure of a futures contract as a "curve": the futures prices for each maturity are on the y-axis while the maturity of each contract is plotted on the x-axis, which thereby traces out a "futures price curve." When the front-month price trades at a premium to deferred-delivery contracts, this is known as *backwardation*. Correspondingly, when the front-month price trades at a discount to deferred delivery contracts, this is known as *contango*.

As discussed in Till (2014), amongst the research covering the determinants of commodity futures returns is the work by Gorton et al. (2013). These researchers examine 31 commodity futures over the period from 1971 to 2010. They find that "a portfolio that selects commodities with a relatively high basis ... significantly outperforms a portfolio with a low basis ..." The authors define "basis" as "the difference between the current spot price and the contemporaneous futures price." In other words, the winning portfolios contain futures contracts that are relatively more backwardated than the losing portfolios. The authors provide a fundamental rationale for their results, linking relatively high-basis futures contracts with relatively low inventories (and correspondingly, relatively more scarcity).

In related findings, other authors, starting with Nash (2001) and including Gunzberg and Kaplan (2007), have variously shown how the level and frequency of backwardation have determined returns *across individual commodity futures contracts* over approximately 15 to 20-year time frames. For example, please see Figure 1.

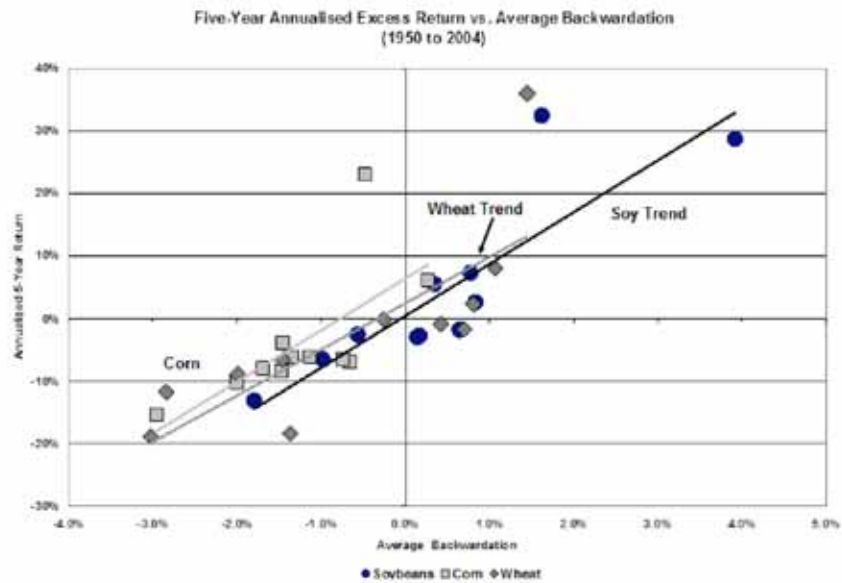
Figure 1



Graph based on Nash and Shrayner (2005), Slide 2

Separately but related, Feldman and Till (2006) discuss how, over a 50-year-plus time frame, the returns of three agricultural futures contracts were linearly related to their curve shapes across time, clarifying that this result only became apparent at five-year intervals, as shown in Figure 2.

Figure 2



Graph based on research undertaken during the work that led to the article by Feldman and Till (2006).

"Average backwardation" is here defined as the average monthly "percentage of backwardation" for each front-month agricultural futures contract, calculated over five-year time horizons.

"Excess return" refers to the futures-only returns from buying and rolling futures contracts. This return calculation excludes returns from the collateral that would be held in fully collateralising such a program. Therefore, they are the returns in "excess" of the collateral return. For further detail on these calculations, please refer to Feldman and Till (2006).

The data points that are the outliers in Figure 2 illustrate the exception to the curve shape being the long-term driver of returns; and that is when there is a monetary devaluation, as occurred in the 1970-to-1974 time frame. Therefore, the caveat to the curve shape being the long-term driver is that this assumes overall price stability.

From Geman (2005), we know that spot commodity prices are generally mean-reverting; or as futures traders would say, high prices cure high prices, and low prices cure low prices. How then can an individual futures contract have either long-term positive or negative returns if a commodity's spot price has a tendency to mean-revert? It is when a futures contract also has a

tendency to trade at a discount (or premium) to the spot price, then this slight benefit (or cost) only adds up meaningfully over long time-horizons; otherwise, a contract's immensely-volatile spot price dominates as the futures contract's source of return.

This result is analogous to dividends being a key source of return for equities. This result is only apparent starting at five-year holding periods, as shown by Cochrane (1999).

Portfolio-Level Returns from Rebalancing

At the individual-contract level, it appears that the *structural curve shape* of a contract has a strong influence on the contract's long-term return prospects. To be complete, we should note that we have only been discussing the return prospects for *individual* contracts. Somewhat surprisingly perhaps, there is an additional return opportunity at the *portfolio* level, which can be potentially earned even if the geometric average returns of individual contracts are zero, as demonstrated by Sanders and Irwin (2012) in Figure 3.

Figure 3: Hypothetical Example Demonstrating Two Assets Having Zero Geometric Returns While the Portfolio of the Two Assets Has Positive Returns Due to Rebalancing

Time	Price Asset 1	Price Asset 2	Return Asset 1	Return Asset 2	Equal Weighted Return
1	10	10			
2	20	30	100%	200%	150%
3	30	40	50%	33%	42%
4	40	50	33%	25%	29%
5	50	60	25%	20%	23%
6	50	40	0%	-33%	-17%
7	40	10	-20%	-75%	-48%
8	30	20	-25%	100%	38%
9	20	20	-33%	0%	-17%
10	10	10	-50%	-50%	-50%
	Arithmetic Average		9%	24%	17%
	Geometric Average		0%	0%	4%

Table based on Sanders and Irwin (2011), Table 2.

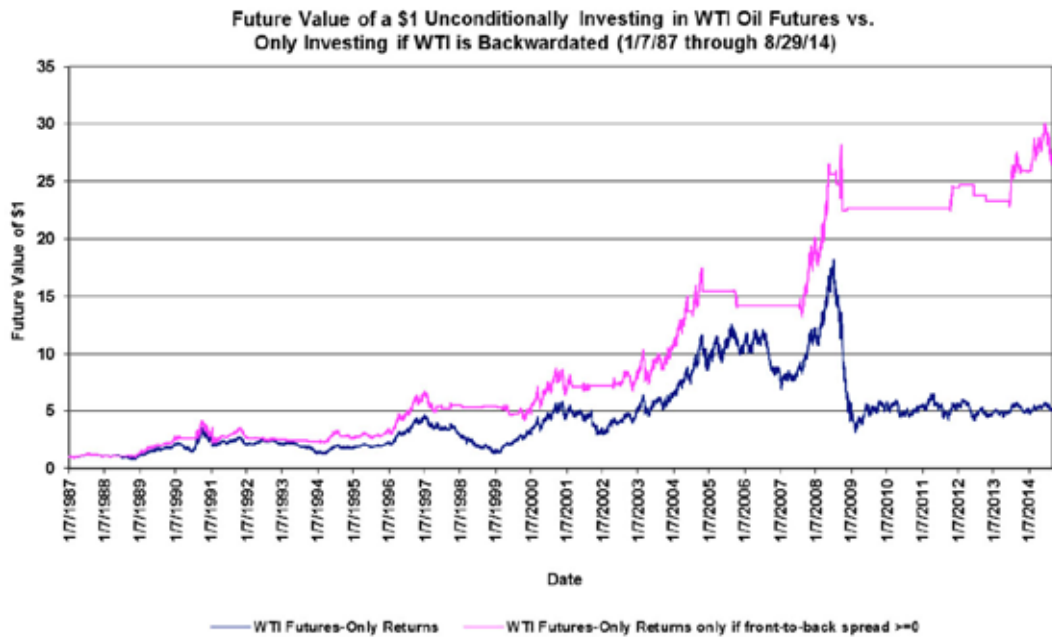
"[A] 'rebalancing return' ... can naturally accrue from periodically resetting a portfolio of assets back to its strategic weights, causing the investor to sell assets that have gone up in value and buy assets that have declined," as explained by Greer et al. (2014) and also covered in Greer (2000).

Structural Curve Shape and the Implications for Crude Oil Futures Contracts

Returning to the discussion on the structural shape of individual futures contracts, has the shape of a crude oil futures curve demonstrably mattered for a contract's long-term returns? The short answer is yes.

Figure 4 shows how *substantial* the return difference is, depending on whether one holds WTI futures contracts unconditionally versus only if the first-month futures price minus the second-month futures price is positive (i.e. if the front-to-back spread is in backwardation). For this latter state-of-the-world, one only held WTI futures contract if the curve was in backwardation the previous day.

Figure 4



Source of Data: The Bloomberg.
The Bloomberg ticker for WTI Futures-Only Returns is "SPGSCLP <index>".

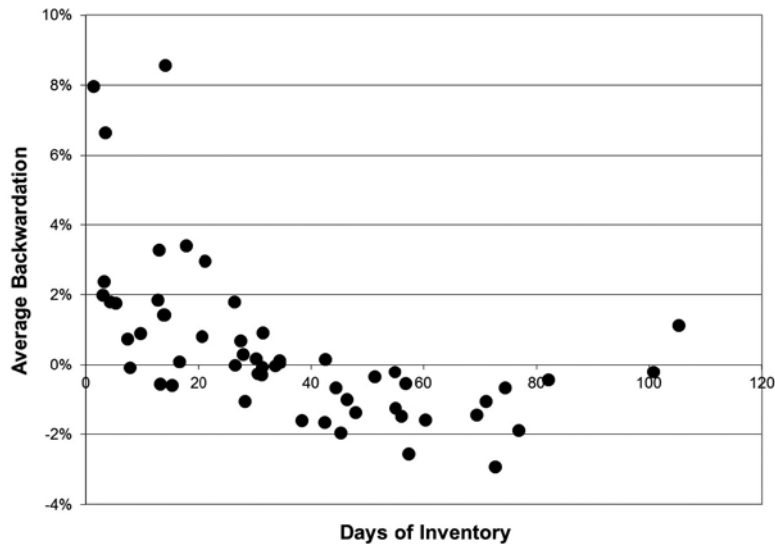
The annualised returns from 1987 through recently for holding and rolling WTI futures contracts have been 6.2% per year over T-bills. Correspondingly, the returns over the same period for only holding WTI futures contract when the contract's front-to-back spread was in backwardation the previous day were 12.8% per year over T-bills.

Commodity Futures Curve Shape and Inventories

We had noted previously that Gorton et al. (2013) linked relatively more backwardated futures contracts with relatively low inventories for a commodity. Conversely, when a commodity has relatively more inventories, its commodity futures contracts tend to trade in contango, as will now be explained, drawing from Till (2008). In times of surplus, commodity inventory holders receive a positive return-to-storage, as represented by the size of the contango, since they can buy a commodity for delivery in the near term at a lower price and lock in positive returns to storage by simultaneously selling the higher-priced contract for future delivery. If inventories breach primary storage capacity, a commodity futures curve will trade into deeper contango, so as to provide a return for placing the commodity in more expensive, secondary storage (or eventually, tertiary storage.) As a consequence, the general relationship is the more of a commodity's stocks that need to be stored, the more the tendency for its futures curve to trade in contango. And correspondingly, the scarcer a commodity is, the more its future curve trades in backwardation, providing no return (and no incentive) for storage.

Feldman and Till (2006) demonstrate the familiar relationship between a commodity's futures curve shape and its inventories in a scatter plot, using long-term data in the soybean markets, as shown in Figure 5.

Figure 5



Soybean Backwardation as a Function of Remaining Days of Inventory 1950–2004
Source: Feldman and Till (2006), Exhibit 9.

One should note that these explanations originally date back to 1948 with Holbrook Working's paper, the "Theory of the Inverse Carrying Charge in Futures Markets." Working had studied grain futures prices back to 1884 in order to come up with explanations of futures-contract relationships that are applicable to this day, across commodities and across time.

Special Features of the Crude Oil Markets

Following from Harrington (2005), the true buffer against crude oil price shocks should be represented as not just above-ground stocks *but also* spare production capacity. "Spare capacity refers to production capacity less actual production; it quantifies the possible increase in supply in the short-term," noted Khan (2008). More precisely, the U.S. Energy Information Administration (EIA) has defined "spare capacity as the volume of production that can be brought on within 30 days and sustained for at least 90 days. ... OPEC spare capacity provides an indicator of the world oil market's ability to respond to potential crises that reduce oil supplies," according to EIA (2014).

Crude oil markets have been able to tolerate relatively low oil inventories if there was sufficient swing capacity that could be brought on stream relatively quickly in case of any supply disruption or demand shock. Indeed, as confirmed by Abu Al-Soof (2007), it has been OPEC's policy to attempt to provide sufficient spare capacity to enhance stability in the oil markets. The IMF (2005) even referred to the "maintenance of adequate spare capacity as a public good" because of the role that spare capacity plays in reducing the volatility of oil prices.

Instead of relying on OPEC spare capacity, why would more crude oil inventories not be held globally? Rowland (1997) explained why:

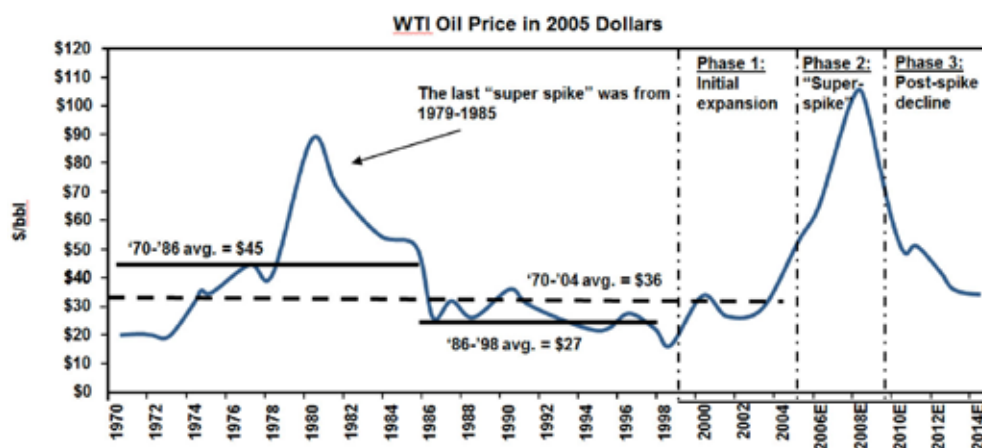
"From wellheads around the globe to burner tips, the world's oil stocks tie up enormous amounts of oil and capital. The volume of oil has been estimated at some 7-8 billion barrels of inventory, which is the equivalent of over 100 days of global oil output or 2.5 years of production from Saudi Arabia, the world's largest producer and exporter of crude oil. Even at today's low interest rates, annual financial carrying costs tied up in holding these stocks amount to around \$10 billion, which is more than the entire net income of the Royal Dutch/Shell Group, the largest private oil company in the world."

At this point, a careful reader may note a particular emphasis on OPEC spare capacity, ignoring non-OPEC producers. According to IMF (2005), "non-OPEC producers do not have the incentive to maintain spare capacity as they individually lack the necessary market power to influence oil prices".

What Has Happened When OPEC Spare Capacity Has Been Quite Low?

One might expect that if the oil market's excess supply cushion dropped to sufficiently low levels that there would be three resulting market responses: (1) there would be continuously high spot prices to encourage consumer conservation, drawing from Murti et al. (2005); (2) the markets would undertake precautionary stock building, which would then lead to persistent contangos in the crude oil futures markets, following from Harrington's (2005) arguments; and (3) any price super-spike would be temporary, once the price level was discovered that would result in demand destruction, as was essentially argued in Murti et al. (2005) and is illustrated in Figure 6.

Figure 6: Super-Spike Prediction in 2005

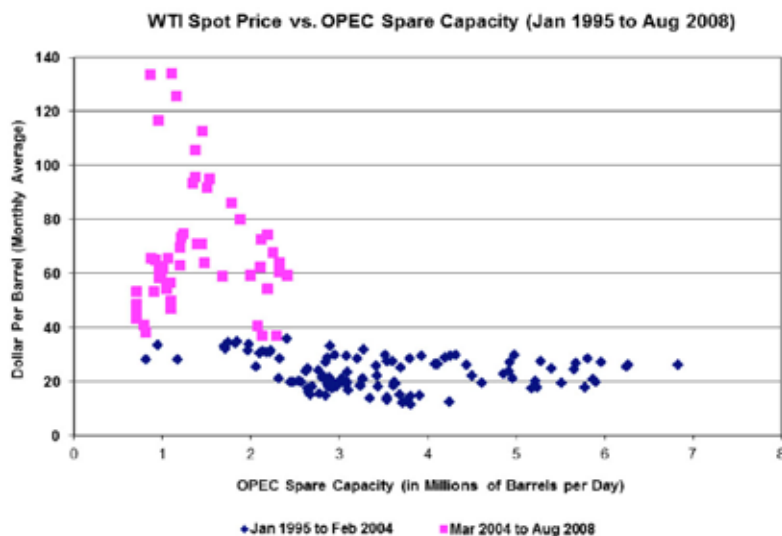


Graph based on Murti et al. (2005), Exhibit 2.

High Spot Prices

Arguably, this is exactly what happened during 2004 through mid-2008. Regarding the first point, Figure 7 illustrates how crude oil prices exploded as OPEC spare capacity collapsed.

Figure 7

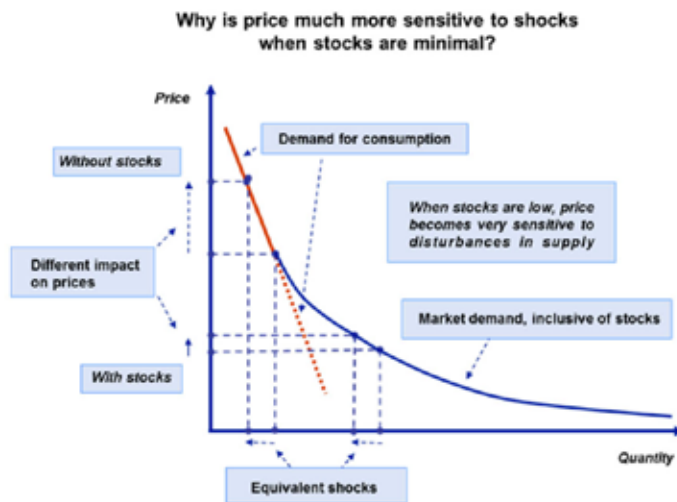


Sources of Data:

The WTI Spot Price is the "Bloomberg West Texas Intermediate Cushing Crude Oil Spot Price," accessible from the Bloomberg using the following ticker: "USCRWTIC <index>". The OPEC Spare Capacity data is from the U.S. Energy Information Administration's website. Presenting data in this fashion is based on Büyüksahin et al. (2008), Figure 10, which has a similar, but not identical, graph. Their graph, instead, shows "Non-Saudi crude oil spare production capacity" on the x-axis. In Büyüksahin (2011), Slide 49, the energy researcher shows that this relationship structurally changed after January 2009.

Figure 7 is analogous to Figure 8, which draws on Wright's (2011) work on the economics of grain price volatility. Figure 8 shows, in a highly stylised fashion, how grain prices explode when inventories decline to pinch-point levels.

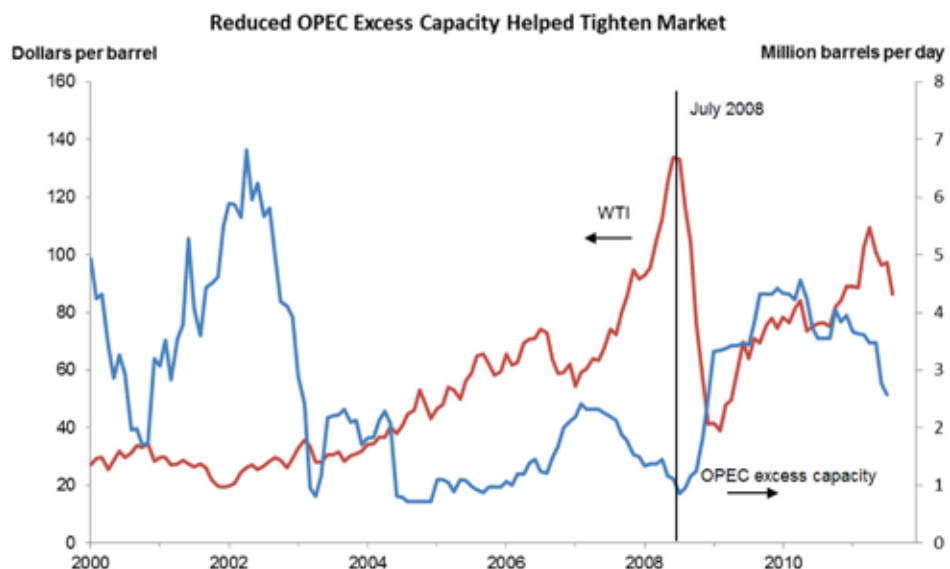
Figure 8



Source: Wright (2011), Slide 39, on "the economics of grain price volatility."

By July 2008 the excess-capacity cushion became exceptionally small relative to the risk of supply disruptions due to naturally-occurring weather events as well as due to well-telegraphed and perhaps well-rehearsed geopolitical confrontations. At that point, the role of the spot price of oil was arguably to find a level that would bring about sufficient demand destruction to increase spare capacity, which did occur quite dramatically, starting in the summer of 2008, after which the spot price of oil spectacularly dropped by about \$100 per barrel by the end of 2008, confirming Figure 6's prediction. Figure 9, which is drawn from work by researchers at the Federal Reserve Bank of Dallas, is consistent with this narrative.

Figure 9



Graph based on Plante and Yücel (2011), Chart 2.

Authors' Notes:

"Oil prices are monthly averages."

"Sources [of Data]: U.S. Energy Information Administration; Wall Street Journal."

There were a number of plausible fundamental explanations that arose from any number of incidental factors that came into play to reduce OPEC spare capacity, culminating in the 2008 oil price spike.

As covered by Amenc et al. (2008), these incidental factors included: (1) a temporary spike in diesel imports by China in advance of the Beijing Olympics; (2) purchases of light sweet crude by the U.S. Department of Energy for the Strategic Petroleum Reserve; (3) instability in Nigeria; and (4) tightening environmental requirements in Europe.

Precautionary Stock Building

Data Problems

Our second point had been that at sufficiently low levels of OPEC spare capacity, the markets would undertake precautionary stock building, which would then lead to persistent contangos in the crude oil futures markets. At this point, our narrative is admittedly, but necessarily, speculative. A perceptive reader of crude-oil narratives would note that U.S. crude oil inventories actually declined prior to mid-2008 (although floating storage did increase from March through May 2008), as noted by Plante and Yücel (2011).

Here is the problem. "Reliable inventory data outside the OECD is often absent. ... This is worrying because it is the non-OECD that currently provides almost all demand growth globally. The data is worst where it is needed most," explained McCracken (2014). In summary, there is not reliable data for *global* crude oil inventories.

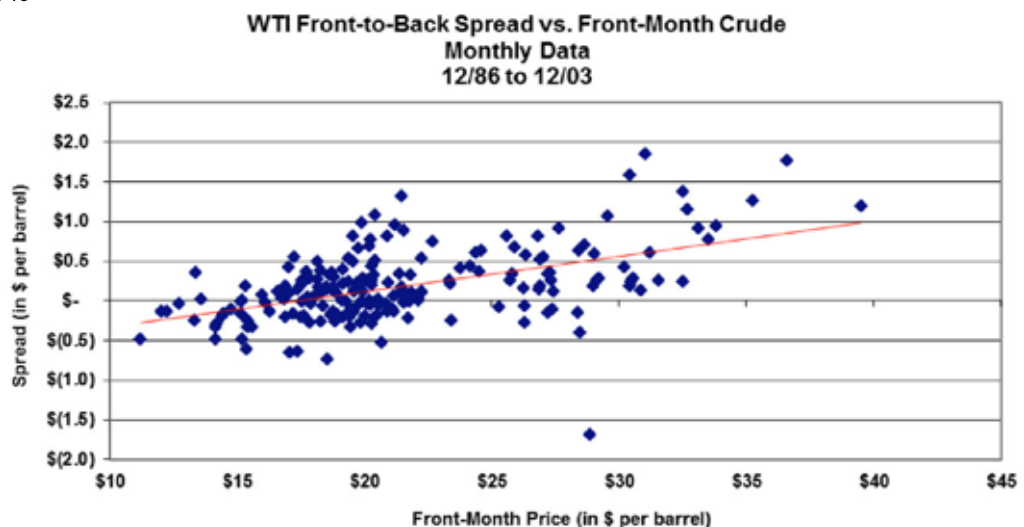
Persistent Contangos

But thankfully, given the transparent commodity futures markets, we can examine whether there were persistent contangos in the crude oil futures curves during 2004 through to mid-2008. From 3/1/04 to 7/31/08, the WTI front-to-back spread averaged -44c while the Brent front-to-back spread averaged -30c. During this time period, the WTI front-to-back spread traded in contango 68% of the time while the Brent front-to-back spread traded in contango 65% of the time. Each crude oil futures market provided persistent, but not continuous, opportunities for earning a return-for-storage.

Structural Deficiencies

In hindsight, we can point out the structural deficiencies in 2008's (temporary) crude oil bull market. The ultimately bearish factors were as listed above: (a) a diminishing of OPEC spare capacity, and (b) a persistence in oil futures contract contangos, which historically had been inconsistent with strong returns. Figure 10 illustrates the typical relationship of high spot prices instead being associated with greater levels of backwardation, prior to 2004.

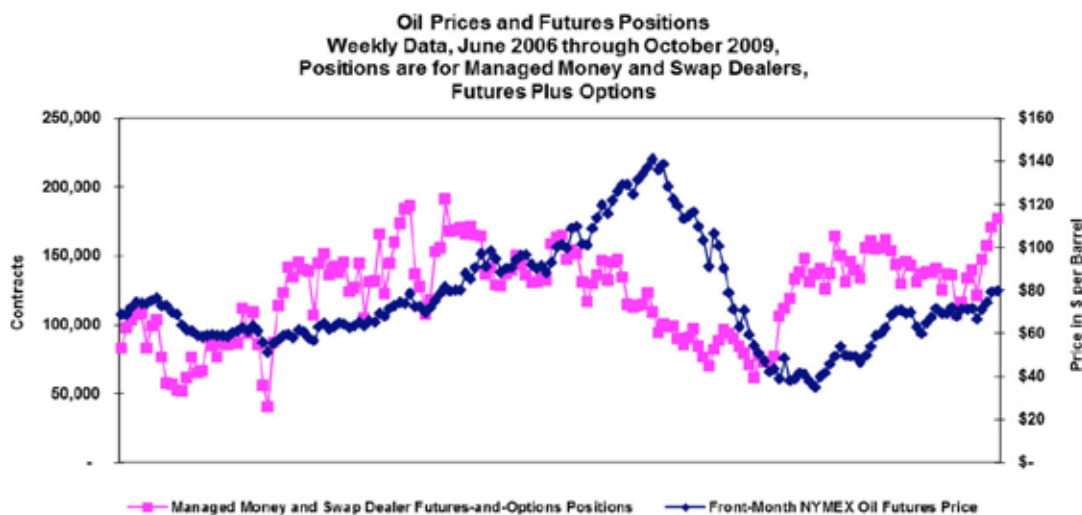
Place Figure 10



Source of Data: The Bloomberg.

It is plausible that there were perceptive crude oil traders who were aware of the structural deficiencies in the 2008 oil price spike. As evidence, Figure 11 shows that according to Commodity Futures Trading Commission (CFTC) data, market participants who were classified as "managed money" and "swap dealers" *did* reduce their positions in the oil market in the months preceding the July 2008 price peak. For these two classes of traders, one advantage of having reduced their positions, as the market was dramatically rallying, is that one could not logically refer to their trading strategies as "predatory."

Place Figure 11



Graph based on Ribeiro et al. (2009), Chart 1.

Finally, we would note that the third point above, that the price super-spike would be temporary was, in fact, what occurred.

The Link Between OPEC Spare Capacity and the Crude Oil Futures Curve Shape

In reviewing the above, we are essentially arguing that the amount of OPEC spare capacity is a plausible determinant of a crude oil futures curve shape, particularly if a crude oil futures contract does not have local logistical bottlenecks and is therefore seamlessly connected to the global marketplace. With sufficient OPEC oil spare capacity, there would not be a need for prohibitively expensive precautionary inventories. And with sufficiently low inventories, we would expect that an oil market's futures curve would trade in backwardation.

Is there direct empirical support for linking the amount of OPEC spare capacity to the structural shape of a crude oil futures curve? The short answer is yes, but with a couple of caveats.

First of all, official reporting agencies and professional oil analysts use different definitions of OPEC spare capacity, including what precisely "effective" spare capacity actually is. Therefore, we will need to precisely note the source of our OPEC spare capacity data so that oil-market aficionados can determine whether our results are credible or not.

Secondly, for a longer term study of this issue, we need to focus on the Brent crude oil futures markets. At this point, it is only the Brent contract that has been consistently connected to the global oil market. As discussed by Blas (2011), "From time to time, the [WTI] contract [had] disconnect[ed] from the global oil market due to logistical troubles at its landlocked point of delivery in Cushing, Oklahoma". This had meant that as compared to the Brent futures contract, the WTI futures contract had a greater propensity to trade in contango, as surplus inventories built up in the U.S. That said, due to the "ingenuity of logistical engineers", the WTI oil futures market has now effectively reconnected to the global oil marketplace, to quote Platts (2013).

Essentially, noted JP Morgan (2013), “the boom in ... [domestic oil] production has [now] been well absorbed by existing U.S. infrastructure ... [T]ruck, rail, and barge have all served to move the large increase in domestic crude supplies to U.S. refineries,” whom, in turn, can export petroleum products abroad. Because the WTI market is now reconnected to the global oil marketplace, we expect that our Brent results would now apply to WTI as well.

The empirical results on linking OPEC spare capacity to an oil futures curve are as follows. Using EIA monthly data since 1995, we find that once OPEC spare capacity became lower than 1.8 million barrels per day for longer than a quarter, then the Brent front-to-back spread has traded in contango, on average, for the next two years. Till (2014) includes additional back-tested work that is consistent with these results. That said, one must be very careful with back-tested results in making future predictions, but at least these historical results add evidence to our line of argument.

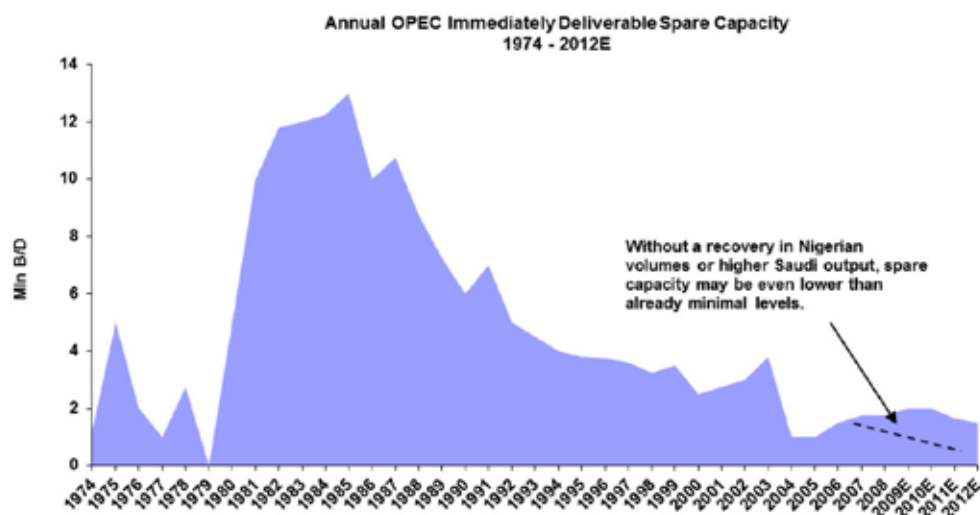
To be complete, one caveat with these results is that there are month-to-month transient factors that also influence a crude oil futures contract’s shape, as covered in Appendix A.

We should note that we are not the first to link OPEC spare capacity to a crude oil futures curve’s shape. Building on past work, Haigh and Dannesboe (2014), for example, found a statistically significant relationship through co-integration methods. Of note, though, we have focused on Brent futures contract front-to-back spreads while Haigh and Dannesboe (2014) mainly focused on the spread between the WTI nearby futures contract versus the 12TH-month contract maturity.

Current Expectations on OPEC Spare Capacity

What are the current expectations for OPEC spare capacity going forward? There is definitely not universal agreement on this topic, but BP’s January 2014 Energy Outlook included a (base-case) forecast that by 2018, OPEC spare capacity would increase to levels last seen in the late 1980s. Figure 12 provides historical spare capacity figures since 1974 from Murti et al. (2008).

Figure 12



Graph based on Murti et al. (2008), Left-Hand-Side of Exhibit 3.

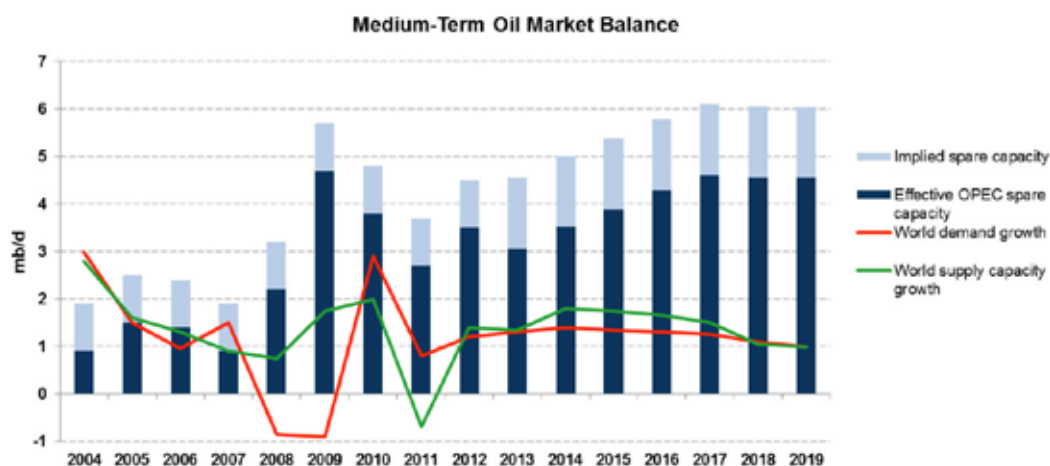
Authors’ Note: “Sources [of Data]: “IEA, Goldman Sachs Research Estimates.”

This figure illustrates how ample OPEC spare capacity was during most of the 1980s.

Figure 13 illustrates spare capacity projections from the International Energy Agency (IEA). The IEA’s *Medium-Term Oil Market Report 2014*, though, heavily caveated their projections: “On paper, forecast supply and demand growth for the rest of the decade imply a comfortable level of OPEC spare production capacity, i.e. the notional difference between OPEC’s nominal

crude production capacity and the amount of OPEC crude needed to balance the market, normally a good indicator of the relative tightness or looseness of market balances. Implied spare capacity rises by 1.23m b/d between 2013 and 2016 and plateaus at just above 6m b/d for the remainder of the forecast period to 2019. The trouble is that much of that spare capacity is itself subject to high disruption risks, or is off-limits to the market for reasons independent from OPEC policy, such as domestic unrest or international sanctions. In practice, only a fraction of OPEC's implied production capacity will likely be available to the market at any given time, and nearly all of that [is] in Saudi Arabia. For the rest of the decade, this 'effective' spare capacity may not exceed 4.6m b/d, and will likely remain below 4m b/d in 2014- 15."

Figure 13



Graph based on IEA (2014), Figure ES.1.

The IEA's *Medium-Term Oil Market Report 2014* heavily caveated their projections, including that nearly all "effective" spare capacity is in Saudi Arabia.

Backwardation Strategies

If the IEA's projections for "effective" spare capacity do turn out to be correct, then OPEC spare capacity would not be at pinch-point levels for the foreseeable future. Further assuming that Saudi Arabia remains the "reliable 'central banker' of the oil market," quoting *Reuters* (2014), then it is plausible that crude oil futures curves will *on average* trade in backwardation, as had been the case prior to 2004.

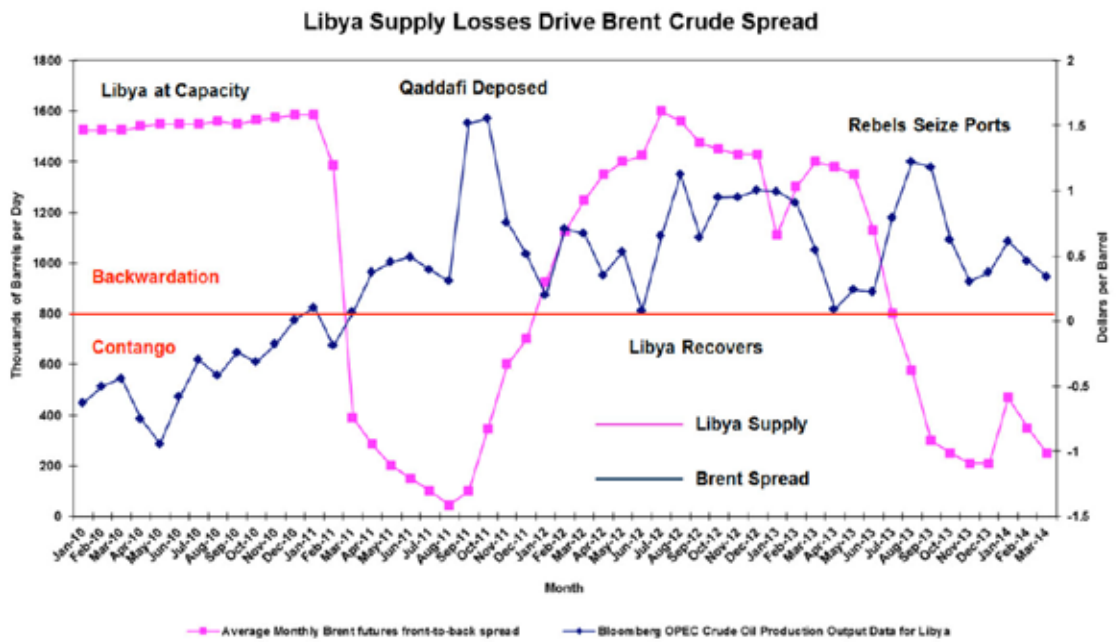
Johnson and Sharenow (2013) concur, noting "as long as Saudi Arabia maintains the ability to manage imbalances in the market and shale extraction prospects remain good, we expect the oil market roll yield to look similar to that in the 1990s," which, in turn, had been largely positive. For historical perspective, Goldman Sachs (2003) reported that from March 1983 through February 2003, the WTI futures contract had "been in backwardation 62% of the time[,] delivering an average yield of 0.78% per month".

What does this mean for commodity indices and oil-futures trading strategies? Crude oil futures curves could become reliably backwardated again, which, in turn, would mean that commodity indices and trading strategies that capitalise on this structure may come back into vogue.

A final note to add is that a structural holding in crude oil futures contracts has historically made most sense in a diversified investment portfolio rather than as a standalone strategy. This is one obvious conclusion from considering the 1986 scenario, as covered in Appendix B.

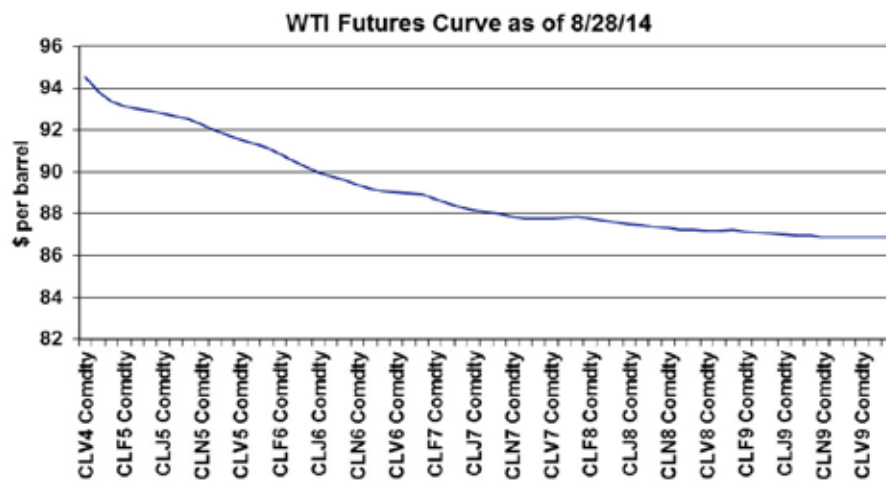
Figures

A-1
 Geopolitical Surprises: A Recent Example



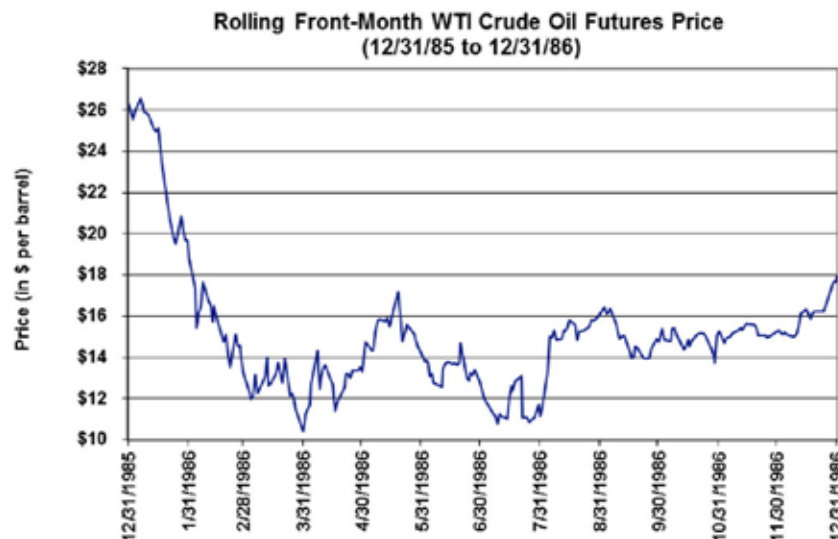
Graph based on Smith (2014), Chart of the Day.

A-2



Source of Data: The Bloomberg.

B-1



Source of Data: The Bloomberg.

Appendix A

Month-to-Month Factors Influencing a Crude Oil Futures Curve Shape

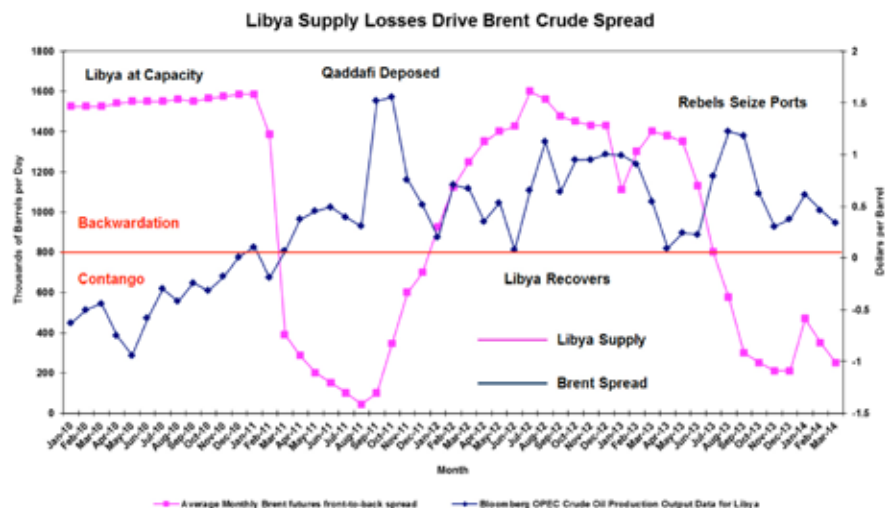
One issue to clarify is that while historically it is the case that sufficient OPEC spare capacity can be linked to backwardated curve shapes on average, this obviously does not mean that both Brent and WTI curves will always be in backwardation under this condition. Geopolitical surprises and seasonal factors can both directly impact month-to-month inventory balances, and therefore, an oil futures contract's curve shape.

Geopolitical Surprises: Recent Example

The varying prospects for Libyan exports have influenced Brent time-spreads in the recent past. Even now, Libyan oil production is a wild card, making logical inventory-holding decisions harder to achieved, as noted by Currie et al. (2014) and Martin and Kabra (2014).

Figure A-1 illustrates how the varying (and unpredictable) fortunes of Libyan supply have had an effect on the Brent curve during the last four years. When there was surprise drop in Libyan supply, the curve has traded in backwardation; and when supply has unpredictably recovered, the Brent curve has traded in contango.

Figure A-1: Geopolitical Surprises: A Recent Example

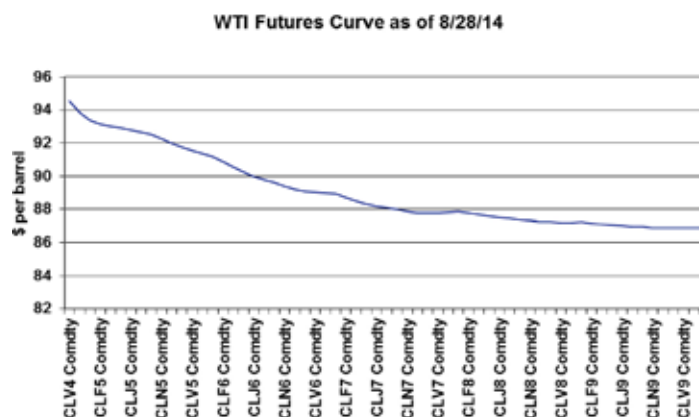


Graph based on Smith (2014), Chart of the Day

Seasonal Factors: Recent Example

Seasonal factors can also temporarily impact an oil futures contract's curve shape. For example, recently WTI time-spreads reached their most backwardated level since 2008, as illustrated in Figure A-2.

Figure A-2:



Source of Data: The Bloomberg

"This strength in spreads will likely ease though into the fall as the seasonal refinery maintenance season should help reverse the outflow of Cushing inventories" to Gulf Coast refineries, according to Currie et al. (2014).

Appendix B

Consideration of the "1986 Oil Tactic"

Another caveat with this paper's conclusions involves more broadly taking into consideration market-share strategies and geopolitical factors. For example, in 1986, as recounted by Gately (1986), "Saudi Arabia and some of its neighbors [decided] to increase their share of the oil market," which set off an oil price collapse, as illustrated in the Figure B-1. "Unlike other producers, they did not suffer large revenue losses because the price declines were offset by their output increases," continued Gately (1986).

Analysts at J.P. Morgan (2014) and at Merrill Lynch [in Blanch et al. (2014)] have both separately discussed the possibility of increased oil supplies from the U.S. (via the Strategic Petroleum Reserve) and from Saudi Arabia (via output increases), respectively, as a potential tactic during current geopolitical confrontations.

What happened to holdings of oil futures contracts back in 1986?

By passively holding and rolling WTI futures contracts, one would have lost -25.5% in 1986. Correspondingly, during that time, if one only held WTI futures contracts if the contract was backwarddated at the close of the previous day, then the losses were significantly lower at -8.8%, again demonstrating the importance of curve shape as a signal.

Simultaneously, U.S. equity returns did fine in 1986; declines in the price of crude oil are arguably like a tax cut for the economy. The S&P returned +13.2% over T-bills during 1986.

These results are consistent with the findings of Driesprong et al. (2008), who generally found across developed markets, "on average, a decrease in this month's oil price indicates a higher stock market return next month. The impact of changes in oil prices on stock returns tends to be economically large."

The significance of these results is in providing historical evidence that equity investments can potentially serve as a diversifier to a standalone position in crude oil futures contracts.

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