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Oxford ENERGY FORUM

A QUARTERLY JOURNAL FOR DEBATING ENERGY ISSUES AND POLICIES

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Oil Price Benchmarks in International Trade

Although the robustness of the oil benchmarks has been the focus of industry discussion for many years, it is only in the last four years that it has become a key focus of government and regulatory scrutiny. This has taken various forms, but two key strands have been for tighter regulation of the derivatives markets, including futures; and closer monitoring of the price reporting agencies (PRAs) whose daily assessments are used in the pricing of billions of dollars of oil and gas, and related derivatives contracts. In the last year, the divergence of the US benchmark West Texas Intermediate from other marker grades has renewed the focus on how well the various benchmarks are performing. Because of declining production volumes, Brent and Dubai have already been subject to such scrutiny. More recently, the price reporting agency Platts made a significant but controversial change to its assessment of Dated Brent that led for calls in some quarters for tighter regulation of the physical market.

This new focus on the role and validity of the various oil benchmarks provides the raison d'etre for the current edition of the Oxford Energy Forum.

The debate is kicked off by Jorge Montepeque from Platts, whose price assessments have traditionally been the most widely used by the industry in contracts and pricing models. Montepeque traces the evolution of the influential Dated Brent benchmark, arguing that it has become a truly global benchmark.

Liz Bossley, chief executive of Consilience Energy Advisory Group, has a different perspective. Arguing that the time has come for another 'oil change', she tracks the impact of changes made by Platts to its Dated Brent assessment timeframe on futures and related derivatives markets. Bossley says there is a lack of clarity over who regulates the Dated Brent and BFOE markets.

The Platts system of 'window' assessment has been controversial because, as well as allowing orderly price discovery, it undeniably has features characteristic of a trading exchange. Oil analyst Christophe Barret provides a detailed insight into how the Platts window works, and explains the links between the Dated Brent and cash BFOE markets whose value is discovered in the window, and Brent futures traded on the Intercontinental Exchange. He concludes by arguing that 'physical oil trading must rely on a physical benchmark to price its trades' and that 'the existence of such

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prices is an anchor for futures markets, and should guarantee that they do not disconnect too long from oil fundamentals.'

Peter Stewart, chief economist of KBC Energy Economics, looks at the linkage between the physical and forward markets by examining the impact that the backwardation or contango in the market has on the magnitude of the differentials to Dated Brent that are negotiated in the market. Stewart believes that more research is needed on the movement of crude oil differentials, and that this has relevance to the debate on whether futures markets provide a reliable barometer of oil prices.

Mike Davis at the Intercontinental Exchange follows with an overall assessment of the robustness of the Brent/ BFOE complex as a benchmark. He argues that, while stresses and strains may be experienced in the constituents of the benchmark, it is the closely integrated and connected nature of the Brent/BFOE complex as a whole that gives the North Sea benchmark its strength.

Switching to the US benchmark WTI, Amrita Sen at Barclays Capital provides a closely reasoned analysis of how and why WTI futures have delinked not only from Brent, but other US domestic crude oils and other international benchmarks. According to Sen: 'The latest dislocation of WTI relative to other benchmarks has been the longest and the most prominent one, redefining its relationship in its entirety.'

This delinking of WTI from other US and world markets has thrown up a big question mark over its validity as an oil benchmark. Peter Caddy at Petroleum Argus, the price reporting agency whose crude oil assessments are now widely used to price oil throughout the United States, suggests that the Argus Sour Crude Index provides a robust mechanism that reconnects the physical and futures markets.

Bassam Fattouh of Oxford Institute of Energy Studies focuses on the third main international benchmark, Dubai, which constitutes the basis of pricing of millions of barrels destined to Asia. He argues that despite its relatively low physical base and the thin trading activity in the Platt's window, market players have retained confidence in the benchmark due to the reluctance of key exporters to shift to an alternative pricing mechanism and the deep financial layers that have emerged around Dubai and which have linked Dubai to the highly liquid Brent complex. Fattouh argues that market players have managed to overcome some of the problems associated with the decline in Dubai's physical production. However, these 'solutions' have created their own serious shortcomings raising doubts about whether Dubai remains a meaningful market.

Finally, Salvatore Carollo of ENI and Giacomo Luciani of Princeton take a close look at the problems around the benchmarks. Noting the huge disparity between physical volumes of oil traded and that exchanged on the futures market, Carollo argues that the oil markets are out of control and takes OPEC to task for taking a back seat in solving the problem, though it may now be too late.

Luciani follows a similar path, urging that the Middle East resume centre-stage in helping develop better instruments to achieve market stability. He suggests that the Gulf producers, notably Saudi Arabia, take a proactive role in allowing their oil to be traded. This would be achieved by simply removing destination restrictions, or 'preferably' by designing the rules on the basis of which they themselves, either individually or as a group (GCC), would create a market for their crude.

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Oil Price Benchmarks in International Trade

JORGE MONTEPEQUE traces Brent's leap as a core world energy benchmark

Dated Brent emerged last year as the clear leader among global crude oil benchmarks amid a background of challenges and shifts in the world crude markets. As a benchmark, Dated Brent experienced a global sweep in industry use in 2011 from Australasia to South America, following a dramatic and damaging period of price disconnect by US West Texas Intermediate and similar issues with the Asia Pacific Price Index (APPI), a secondary pricing system.

Physical Brent matured as the core world indicator of value, stemming from its strong underlying North Sea base and its ability to reflect the power of arbitrage from Russia and Central Asia to Asia and the Americas. Dated Brent also ratified its position as the global marker of crude due to its response to geopolitics. The price of Dated Brent rises in times of crude shortness, or perceived constraints, due to political issues and falls when those supply issues have dissipated.

While challenges and evolution in crude pricing systems will continue as the flows of oil and the logistics change, Dated Brent is better positioned than its competitors as its price formation is in an open market environment and free of logistical, legal or political constraints.

The global crude pricing system has largely consolidated into three key core benchmarks, namely Dated Brent, WTI and Dubai. Each of the three is trans-regional in nature, but historically, the breakdown is as follows – Dubai for the Middle East for sales into Asia, WTI for North and South American sales and Dated Brent's core regions of Europe, Mediterranean, Africa and Russia, although expanding as far as Australia.

There have been other pockets of pricing, chiefly Asia Pacific Price Index, which shifted into disuse in Malaysia, Indonesia and other Asia Pacific countries following a period of disconnect. The multi-year effort by the Dubai Mercantile Exchange to broaden the appeal of its Oman futures contract beyond the Dubai and Oman grades has found little support, and less than 1 million b/d of physical crude prices against the contract. By comparison the global oil market is roughly 87 mb/d.

If pricing were physical edifice, both Dubai and WTI would be two supporting blocks playing junior roles to a mature and senior world pricing system linked to physical Brent.

While Brent sits at the summit among commodities benchmarks, Dubai, the crude benchmark for the Middle East and Asia, also grew in use in 2011, notably with its adoption for Russia's sale of ESPO crude out of the port of Kozmino. ESPO is primarily priced using Dubai as the base, but a handful of cargoes have been sold linked to Dated Brent. Dubai's core territory is the Middle East and the ESPO pricing has demonstrated that any crude competing directly against Middle Eastern supplies will gravitate towards the same pricing base. Dubai physical partials trading grew by roughly 50 percent in 2011 versus 2010 as a reflection of more direct hedging by participants. Figure 1 shows the number of partials on a yearly basis. Each partial is for 25,000 bbls and each buyer or seller acquires the obligation of taking delivery or delivering a physical cargo after completing trading of 19 partials with the same counterparty.

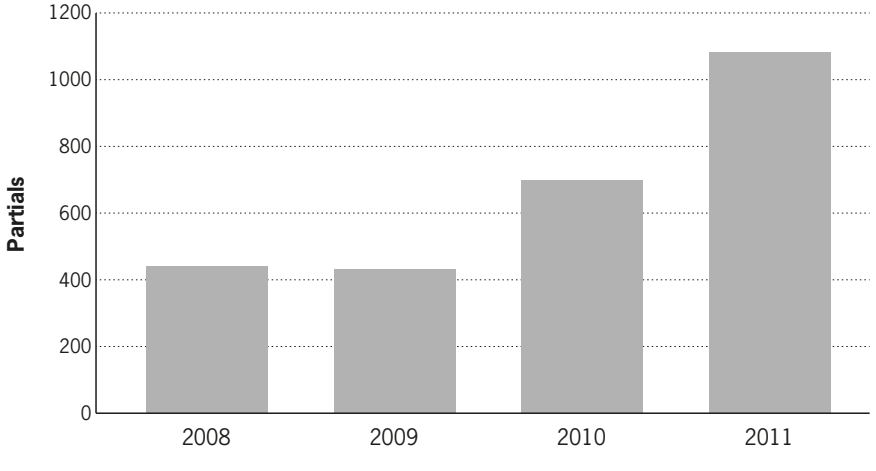
While both Brent and Dubai grew in acceptance, the situation was very different in the Americas. In the tripartite price system, the US light sweet crude benchmark, known as 'WTI' by the oil trading industry, has emerged from an annus horribilis, playing a much diminished but still important role in futures pricing as logistics played havoc on its reliability as a representation of market value – not just as a world indicator but also as a barometer of value on its home turf.

Crude oil market participants are continuously reviewing pricing systems, with producers typically taking the lead in changing the pricing basis if they feel the results are not matching expectations. Saudi Arabia, for instance, switched away from WTI as the US benchmark narrowly reflected market conditions in the Cushing area and failed to move in line with conditions in the US Gulf, the largest concentrated refining centre in the world.

With the USA as the world's leading crude importer, benchmark WTI prices were historically a reflection of international prices plus freight costs, but the disconnect between Dated Brent and WTI has become increasingly unpredictable and thus has undermined WTI's value as a reliable indicator. In 2011, WTI traded nearly $5 below Brent at the start of the year and then fell to more than $25 under Brent. This variability impacts hedges and the overall usefulness of WTI as a benchmark for pricing physical crude.

The land-locked delivery point of Cushing, Oklahoma meant WTI was a reflection of localised fundamentals which have seen huge changes in the USA, with extra production from Canada and the Midcontinent area. This led to significant oversupply of crude at

Figure 1: Dubai Partials Annual Volumes



Cushing, while the existing infrastructure has only limited capacity to ship oil out of Cushing to locations where it is needed. The disconnect between WTI and Brent in futures or between WTI and physical Brent or other physical indicators sparked a debate on the relevance and accuracy of crude oil benchmarks. While both crude oils reflect a value based on the conditions where price is set, Dated Brent pricing is set under conditions where if the price is too high it attracts competing crudes. Conversely, if the price of Dated Brent is too low, it is shipped elsewhere. As an example, witness the December sales of North Sea crude oil to South Korea as the country lowered its import tax rate and Forties made sense as a crude input.

WTI, on the other hand, can fall significantly below the prices refiners pay in the Gulf as one of the pipelines connecting Cushing and the USGC is pointing in the wrong direction and other projects like TransCanada's Keystone XL pipeline are subject to extensive and almost dilatory regulatory scrutiny, as witnessed by the US State Department's rejection of TransCanada's cross-border permit in January 2012. This has also resulted in an obvious disconnect between WTI and Louisiana Light Sweet crude oil, another benchmark of value in the US Gulf Coast. Figure 2 shows the price disconnect between the two crudes where LLS has been trading on average at $17/b (during 2011) over WTI and at some points near $30/b over. The two crude oils are seen as fairly similar even though WTI reflects a quality of 38–40 degrees API, and Light Louisiana Sweet a quality of 34–41 degrees, meaning that there is more uncertainty with the LLS delivered quality.

The discount of WTI to Brent and LLS has been narrowing in recent months, reflecting Conoco's sale of its 50 percent interest in the 410,000 b/d Seaway pipeline, which connects the US Gulf Coast to Cushing, OK, to Enterprise. Enterprise intends to reverse the line by the second quarter of 2012 with 150,000 b/d initially available, and finished capacity of the reversed line at 400,000 b/d by early 2013. The company announced in January that it had set June as the month for the pipeline reversal. This is seen as theoretically narrowing the spread or even returning it to 'normal' territory. The initial market reaction to the definitive announcement on the reversal has been somewhat disappointing as on the same date the spread between Brent and WTI actually widened. Other projects to relieve the oversupply situation for WTI at Cushing have also been proposed, including the now 'on-hold' Keystone XL project (Cushing Marketlink – 500,000 b/d to the US Gulf Coast) and Enterprise/Enbridge's 800,000 b/d proposed Wrangler project. The disconnect of WTI has been exceptionally volatile and therefore users of the index in crude sales have increasingly found it less useful as both a benchmark to price crude oils or as a tool to hedge the exposure.

Another factor undermining WTI's relevance is its steep contango structure relative to Brent. Contango is defined as a forward curve structure where prompt prices are at a discount to forward prices. This makes the US benchmark less attractive as an investment tool than Brent as the monthly roll of investment vehicles (such as the GSCI) lead to a consumption of the capital, as the fund would sell maturing positions at a discount to those positions it would need to buy for the next month to roll the position forward.

The main problem is that a similar position in Brent would lead to a lower consumption of the capital in the roll due to the statistical occurrence of a larger contango in WTI than in Brent. As an observation, the average value of NYMEX WTI M1/M2 spread in the past three years was minus $1.00/b, while that in ICE Brent was minus $0.28/b.

In the past few months, two large indexes, the GSCI and the UBS/DJ index both announced a reduction in the weighting of WTI in their indices and a growth in the weight of Brent as follows: On 11 October 2011, UBS/DJ announced the rebalancing of the index with WTI's weight going down from 14.7 to 9.68 percent and Brent entering the index for the first time, with a weighting of 5.31 percent. Previously, the WTI contract accounted for the entire crude oil component of the Dow Jones-UBS Commodity Index. Brent now accounts for one-third of the index's crude-oil component, while WTI accounts for the rest, Dow Jones Indexes said. And on 4 November 2011, GSCI announced the rebalancing of its index, with WTI sliding from 32.53 to 30.25 percent, and Brent moving up to 17.35 percent from 15.93 percent. The weights in the index are based on trading volume, and Brent, through its futures contract on the IntercontinentalExchange, saw a surge last year relative to NYMEX WTI.

Several companies have also announced rather publicly their displeasure with WTI as a hedging tool because they felt the impact on their bottom line as WTI ceased to work as a proxy for the commodities they were hedging. Some of the world's largest airlines including Delta and Southwest moved their jet fuel hedges away from the US crude benchmark and were quoted by the Financial Times early in 2011 as saying: 'WTI, which is the instrument that many of us hedge in

Figure 2: WTI Minus Cash LLS Nearby Month

this market, has dislocated from Brent in terms of pricing.' Southwest airlines said it was paring back its hedging process due to the non-correlation and was quoted by the FT saying: 'Like other North American carriers hedged with WTI, [we] are presently concerned with the current disconnect between WTI and Brent.'

In a typical hedge, an entity would buy or 'price in' a position on outright price, and sell an equal but opposite position on a flat price basis against the price intake. The hedge works perfectly if there is no basis risk, and the commodities rise and fall in unison or are very closely aligned.

WTI has a great advantage in its enormous liquidity as the senior futures contract, but its general connectivity with refined products has been under question since 2010. Hedgers expect a correlation in market prices and if WTI fails to keep pace with global trends the usefulness declines. This lack of synchronicity became grave as global crude prices diverged at the start of the Arab Spring in 2011. The Libyan uprising reduced global oil production, with roughly 1.5 mb/d of light sweet crude oil production left in the ground. Crude oil prices naturally rose and markets moved into backwardation, with light products such as gasoline and heating oil rising.

However the behaviour was altogether different on the other side of the Atlantic as WTI failed to respond. Through a natural process of arbitrage, a price rise in one area of the world is rapidly transferred to another, as either exports cease from the area that is facing an initial rise in price and thereby affect prices elsewhere, or the high-price region attracts imports from elsewhere. The price of US crude fell relative to Brent or any other major crude oil. So, anyone who hedged against a potentially adverse price movement by buying WTI hedges bought an insurance that turned out to be ineffectual and often exaggerated losses. This situation was exacerbated by the natural practice of hedgers of looking for markets with deep liquidity such as WTI futures.

The core problem in the WTI oversupply situation has been the bottleneck at the Cushing, Oklahoma area due to the lack of pipelines to carry the crude to other markets. The aforementioned reversal of the 410,000 b/d Seaway pipeline is seen as providing a boost to the long-term viability of the benchmark, but the line is not expected to reach its pre-reversal capacity level until sometime in 2013.

As previously mentioned, President Obama and the US State Department have sent TransCanada's Keystone XL pipeline effort back to the drawing board. The economic pressure and the potential for arbitrage is so large at present – bottled-up crude is trading roughly at a $10 discount to where it would trade if a Cushing-to-USGC pipeline were operating. One would expect a new and improved proposal to come back on Keystone XL fairly soon, if not right after the November elections. But in the meantime, the market must move on, and the market will efficiently find alternative solutions. North Dakota's Bakken crude oil is moving by train to markets in the US east coast at a cost of $10–12/b, due to the lack of infrastructure. Trains are notoriously slow and less efficient than movements by pipeline.

For those wishing to trade crude futures or hedge pricing exposure in crude oil, the market offers other alternatives such as swaps or the relatively liquid Intercontinental Exchange. But ICE Brent futures is still junior to WTI futures in volume terms, although the gap is closing in at times. The liquidity in both exchanges has been expanding very rapidly in recent years. Daily volumes have reached over 1.5 billion barrels of trade in both exchanges. While volume on both exchanges has been on a general uptrend – with the occasional concerns that growth will be affected by either regulation or trade financing issues – it has been growing at different rates on both sides of the Atlantic with Brent closing in on the heels of WTI. On several occasions, the Intercontinental Exchange has noted, the volume actually inverted as Brent futures traded more than WTI. Figure 3 shows the spread between the two crude futures contracts' trading volumes on a monthly average basis. The narrowing of the volume is particularly evident from the second half of 2011. And at the end of January 2012, open interest in Brent futures reached 1.0 billion barrels.

The change in the futures volume trend has several explanations, with the recent change in the weighting of the major commodity indices expected potentially to narrow the spread further in 2012, although sources say one of the core reasons so far has been the rising popularity of Dated Brent as a physical benchmark globally.

In the past year, Malaysia adopted Dated Brent as its core benchmark for all of its crude production, including its flagship Tapis Blend. This was significant as Tapis itself has previously filled the role of regional light sweet benchmark, powering the APPI index system that was widely used in Indonesia, Australia and Vietnam among others.

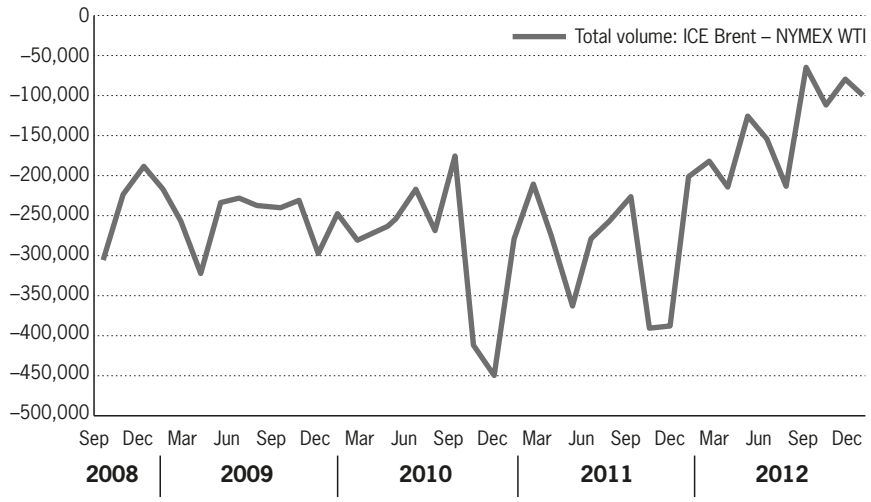
Petronas, Malaysia's state oil company, also had experience of pricing its crude for spot sales using a variety of other benchmarks, including Dated Brent and WTI. After careful study, Petronas decided to adopt Dated Brent as its sole benchmark for pricing in 2011. This adoption of Dated Brent was seen as a ringing endorsement by many regional market players as the change was implemented following extensive consultation with its numerous customers and trading partners across Asia.

Prior to the headline event by Petronas last year, other producers had already made the shift, with several Australian producers switching from APPI to Dated Brent as they had quantified deviations in the APPI benchmark that were unpalatable. By the start of 2012, virtually all Australian crude and condensate was pricing against Dated Brent. The switch continued to gather speed with Papua New Guinea, Philippines and Vietnam also shifting more streams to a Dated Brent-related pricing basis.

At the core, the switch to Dated Brent in Asia is easily understood. These producers analysed market behaviour and concluded that Dated Brent typically reflected global market fundamentals and reacted to wider price-moving events such as production losses or geopolitical upheaval. Other benchmarks, such as WTI, would react to supply and demand on a more micro-regional basis and as a result would lose their correlation to world events.

The impact of Dated Brent has been felt in the natural home territory of WTI, the Americas, with crude oil market participants pricing more cargoes related to Brent when offered or sold into US markets. Marketers offering crudes in the USA would acquire imported cargoes on a Dated Brent basis, and if offered on a WTI basis, the basis differentials for the transaction would be governed by

Figure 3: Total Volume: NYMEX WTI–ICE Brent, Monthly Averages, Contracts/day



the Brent/WTI spread rather than just against WTI, as was the case in prior years. For instance, North Dakota's sales of Bakken crude into the US Northeast have been done against Brent rather than WTI in some cases.

South American crude sales to the USA, which were previously tied in to WTI, started to stray with Colombia and Ecuador offering cargoes on a Dated Brent related basis. Brazil, the ever-expanding production giant, has also moved more crude on a Brent related basis.

The lesson is clear – pricing benchmarks may be challenged by logistical, regulatory, geopolitical or geological conditions, but if they fail to adapt quickly, their usefulness ebbs away. While the market offers numerous sophisticated instruments, the core stakeholders of the commodity depend on the physical production and a convergence between the price of the physical and the general world market. If the price is believed to be disconnected from global market conditions, the usefulness of the benchmark diminishes. Another required element in any pricing benchmark is the convergence between the financial instruments, such as futures, and the physical market.

Dated Brent has found success as a global crude oil benchmark. Pressure continues to build on some producers using mechanisms such as Bwave (a weighted average derived from Brent futures) to switch, with refiners concluding that it is easier to hedge exposure against Dated Brent due to the fact that the assessments reflect a rolling forward period rather than a particular one-month period. This difference may appear insignificant from afar – in the world of crude oil benchmarks, only Dated Brent reflects a forward time period with specific dates that moves forward one day at a time. This process ensures that a rise or fall in prices is a function of supply and demand, and not a function of a monthly roll.

The Dated Brent market is not without its challenges, and the need to evolve and adapt to changing market conditions is ever present. Platts has worked closely with the industry to implement a change in the forward dates reflected in its assessment process, expanding the assessment window to 10–25 days forward rather than the previous 10–21 days. The adjustment to the date range was in recognition of prevailing market practice, as the industry typically buys and sells cargoes further in the future as a response to declining production and the need for the refiners to schedule their crude oil intake in advance.

The change was full of technicalities as it required a change in the contractual practice, changes in the industry's General Terms & Conditions, and also led to both ICE and the CME launching futures contracts reflecting the new 25-day pricing system.

The change was formally proposed in June 2011 with an implementation date of 6 January 2012. All the technicalities, contractual and trading practices prevailing in the physical Brent market fully incorporated the change, with plans currently underway to further reset the dated period to a full month ahead rather than the current 25-day end point by January 2015. The driver for these market practice changes continues to be a desire in the industry to buy and sell crude cargoes further in advance and the pricing systems will adapt to the these changes. ■

Oil Price Benchmarks in International Trade

LIZ BOSSLEY argues it is time for another oil change

The Brent market is reputed to determine the price for about two-thirds of the world's oil trade. Yet Brent is probably the least appropriately regulated commodity market in the world.

The two-thirds estimate is difficult to verify because so much of what is traded takes place in the opaque over-the-counter ('OTC') market. Nevertheless the proportion of international oil pricing that relies on a Brent index is undeniably large and is still growing.

While Brent looks set to be caught in the cross-fire of the Dodd Frank Wall Street Reform and Consumer Protection Act, particularly the Volcker Rule, the fundamental characteristics of the Brent oil market were changed in January 2012 without so much as the raising of a regulatory eyebrow.

Oil Trading

A quick refresher on how oil trading and the Brent market work:

- When cargoes of physical oil are traded the buyer and seller do not usually agree a price for the oil, for example $110/b. Instead they agree a price formula. There are various ways the formula might be expressed,

but probably the most common is something along the lines of the average of the prices of Dated Brent as quoted by a publication, such as Argus or Platts, on five days related to the loading date of the cargo, +/– a differential to reflect the difference in the value of the oil being traded compared with the value of Brent.

- Once sale of the physical cargo is agreed, the buyer and the seller of the cargo independently of each other can unbundle the price formula into its various components and manage separately the risk associated with each component. This allows buyers and sellers to separate the decision to acquire or dispose of a physical cargo of oil from the decision to manage the net hedged price applicable to the deal.

On 1 January 2012 some key changes were made to the five distinct contracts that make up the 'Brent' market in which elements of a crude oil price formula can be managed. Prior to that date the contracts' characteristics were as follows:

1. Dated Brent is a market in identifiable cargoes of a basket of crudes – Brent, Forties, Oseberg and Ekofisk, or 'BFOE' – with a confirmed three-day loading date range for delivery in the next 21 days;
2. Forward Brent known as 21-day BFOE. This is a contract for cargoes of either Brent, Forties, Oseberg or Ekofisk with a three-day loading date range from at least 21 days in the future up to about 6–9 months in the future. The actual three-day loading date range and the grade of the cargo are not known at the time of the transaction and are only confirmed by the seller 21 days in advance of loading;
3. Brent Futures traded in lots of 1000 barrels on regulated futures exchanges – CME NYMEX, DME and most actively on ICE. The contract refers to Brent oil for delivery at a future time period and is cash settled by reference to the 21-day BFOE market;
4. Brent swaps and options, otherwise referred to as OTC Brent derivatives, that are priced by reference to Dated Brent, 21-day BFOE or Brent futures; and,
5. The contract-for-difference ('CFD'), dated-to-paper swaps market. This is a market in the price differential between Dated Brent and the first 21-day BFOE forward contract. A variation on this contract is the dated-to frontline ('DFL') market. This is a market in the price differential between Dated Brent and the first quoted Brent regulated futures contract.

These contracts are inextricably inter-twined and provide benchmarks for the pricing of crude oil as geographically scattered as North West Europe, Africa, the Mediterranean, some Middle East sales with western destinations, some South American sales and trades in parts of the Asia-Pacific region, including New Zealand. Increasingly Brent is providing the benchmark for US Gulf Coast imports following the disconnection of the US domestic market from the international sea-going trade. Additionally, Brent provides a price touchstone for international oil tax reference prices and the price that is used to calculate cost recovery and profit oil in Production Sharing Contracts around the world.

The Brent suite of contracts has evolved over time. From 2002, in response to declining physical Brent production, trades in cargoes of two additional North Sea grades of crude oil, Forties and Oseberg, were considered along with Brent when assessing the price of Dated Brent. At the same time Forties and Oseberg were added to make a basket of grades that could be delivered into the then Brent forward 15-day market and the notice period was changed from 15 days to 21 days. This was done to prevent traders cornering the market in physical Brent cargoes and squeezing the forward contract. In 2007, Ekofisk was added to the Brent basket and a price de-escalator was introduced to reflect a quantum change in the quality of Forties when the lower quality Buzzard field was added to Forties Blend.

The New Brent Landscape

In summer 2011 the price reporting agency most commonly used as a Brent price reference source, Platts, decided that it would like to consider more cargoes of Brent, Forties, Oseberg and Ekofisk in assessing the price of the prominent Dated Brent marker and would look at cargoes of the four grades loading up to 25 days forward, rather than just 21 days forward. At the same time it announced that it would like to change the notice period in the 21-day BFOE contract to 25 days. To accommodate this change the ICE Brent futures contract would have to expire earlier.

Shell International Trading and Shipping Company Limited ('Stasco') responded in a carefully worded open letter in its capacity 'as custodian of the SUKO90 contract that governs BFOE trades', i.e. the general terms and conditions of trade for the 21-day BFOE contract. This letter pointed out that 'to successfully implement these changes, the four BFOE loading programs will have to be issued earlier (approximately five days)' which requires the consent of all partners in the offshore joint venture operating agreements in all four crude blends. Dozens of agreements involving an estimated 75–100 companies would have to be changed formally.

Furthermore, Stasco pointed out, 'an extension of the BFOE contract to 25 days calls for a change in the monthly expiry date of Brent Futures. If the expiry date remains as it currently is [middle of month M for the M+1 contract], but the contract governing BFOE trades is changed to reflect the 25 day nomination period, this will result in a lower number of available BFOE cargoes forming the basis for the expiring futures contract. ...This choice will artificially change the value of the instrument.'

To allow time for all the contracts to be changed and to ensure that the change in the futures contract expiry would impact on the minimum of futures contract open interest at the time of the change, Stasco proposed that the changes be deferred until the first quarter of 2013.

Despite this plea Platts announced it would introduce its changes from the beginning of 2012.

Who is the Oil Market Regulator?

ICE scrambled to introduce a new contract on 5 December 2011 called 'Brent NX', to run in parallel with the existing Brent contract, for deliveries from December 2012 to December 2019. The expiry date of these contracts will be around 8th to 10th M-1 for contract month M. The expiry dates for contracts for delivery in March 2015 and beyond will be the last working day of month M-2. It is anticipated that the two separate

Brent contracts will eventually become one, based on the revised expiry dates.

One might reasonably ask what role the regulator took in approving Platts' actions. The answer appears to be none. Platts is unregulated. The Financial Services Authority must have been consulted and must have approved the change to the Brent futures contract because that is regulated. However the value of OTC derivative swaps and options contracts stretching more than five years forward has been changed without a peep out of any regulator. The oil industry does not have a regulator with clear responsibility for oversight of the Dated Brent and 25-day BFOE markets off of which physical and derivative contracts are priced, nor is there a regulator with responsibility for oversight of the ancillary CFD and DFL contracts.

Perversely this lack of regulatory oversight ties the hands of the oil industry in challenging any changes imposed on these price management tools by external parties: there is no regulated forum in which such matters can be discussed and agreed amongst participants and stakeholders without fear of accusations of collusion.

Some of the biggest stakeholders in the Brent market are banks, particularly US banks, who have large-scale, long-term derivative contracts on their books. Yet their voices have been noticeably absent in the debate. This may be because they are preoccupied with fighting a rear-guard action against the US Dodd-Frank Act and the Volcker Rule in particular. Dodd Frank is not directly aimed at commodity markets such as oil, but the oil market is being swept up in its provisions.

Dodd Frank and Volcker

Dodd Frank is US legislation that was signed on 21 July 2010, but which has not yet been implemented. It was prompted by the financial crisis that began to unfold in 2008 with the collapse of Lehman Bros. It introduces a much harsher regulatory framework for financial institutions to eliminate systemic risk and to ensure that any adverse consequences arising from trading in toxic instruments fall on the bank doing the trades and on its shareholders and not on the US taxpayer.

Two of its provisions of direct relevance to the oil market in general and the Brent market in particular are: the objective of having OTC swaps and options cleared by regulated exchanges or clearing houses where the risks can be measured and monitored more closely by a regulator; and, the Volcker Rule's prohibition on banks having a proprietary trading book while offering market-making services simultaneously.

The capture of the oil commodity in the Dodd Frank net is dangerous for the Brent market on several counts:

- it forces highly structured derivative products into the straitjacket of plain vanilla regulated instruments that are inappropriate for the needs of hedgers and project developers;
- it concentrates risk into a limited number of clearing houses just at the time that the market is reeling from the entry into administration of MF Global, allegedly taking supposed segregated client funds with it;
- it makes some of the biggest liquidity providers to the Brent market, the US banks, choose between trading on their own account and offering less lucrative market-making services to risk managers, leaving little doubt as to which way that decision will go; and,
- it misses the fact that one of the biggest commodity markets in the world, oil, is teetering on a crumbling base of North Sea oil production with no effective regulatory oversight of the process by which the base is to be re-enforced.

The simple passage of time will dictate that further fundamental changes will be needed to the Brent suite of contracts as production of the basket grades – Brent, Forties, Oseberg and Ekofisk – declines further.

What is needed is first to take oil out of the scope of Dodd Frank where it does not belong. Secondly, we need an international regulator with an understanding of the underlying business to supervise while the oil industry works out its own solutions to what are purely mechanical and logistical issues, safe in the knowledge that they will not be accused of collusion or market manipulation. ■

Oil Price Benchmarks in International Trade

CHRISTOPHE BARRET offers insights from the assessment process.

Brent prices: physical or future prices?

Oil prices' return to record high levels has reignited the debate on oil price formation. The dual aspect of oil – investment product and commodity used in the production of commercial fuels – has helped to develop a schizophrenic approach to oil price formation. On the one hand, oil prices are seen as resulting from financial investors' investment in commodities, always on the long side, helped by recent financial innovations promoting investment diversification. On the other hand, oil prices must be compatible with oil market balances, or there is an excess of physical oil and ever-growing inventories.

At the heart of the debate are the relationships between oil futures prices and the physical price for oil. More recently, it has been argued that futures prices impact physical prices in a direct manner, through the methodology of the assessment process or the Price Reporting Agencies. A detailed look at the process of price assessment by PRAs shows that it is unlikely to be the case. On the contrary, it appears that changes in PRAs' methodology in the past ten years, first developed to avoid price manipulation, today can guarantee an anchor to the physical market for oil prices.

Brent Marker Remains Essential

Most physical crude trade is done in Over-the-Counter (OTC), non-public, deals between oil producers, traders and refiners. Oil prices are therefore not directly visible,

but are rather assessed and reported by PRAs shortly after the end of the trading day. Oil is exchanged through long-term contracts or spot purchase agreements. In most deals, term contract or spot trade, oil is priced at a differential to a marker, which is the price of a particular crude oil, reported by a particular PRA. Brent-related prices are the marker for more than 50 percent of world crude trade.

Dated Brent price assessments used the most by the industry are those of Platts and, to a lesser extent, Argus. Both PRAs use a broadly similar methodology. The process of assessment has evolved with the Brent contract and market practice. Until the end of the 1990s, journalists used to call market participants and brokers at the end of the trading day to get a sense of prices (forward, dated and grades) and deals concluded during the day, and published their assessment often based on a simple average. The process is very different today as, for the purposes of assessment, a large number of the deals in different markets have become organised, controlled, visible and the rules of assessment are defined more precisely. PRAs' Dated Brent price assessment process is no longer simple – but it has become more reliable and offers less room for price distortion.

The process involves the sequential assessment of various grade differentials to Dated Brent strip, the assessment of Contracts-for-Differences (short-term swaps) for the weeks around the assessment period as a differential to forward contract, and finally the assessment of the forward contract (known as the 21-day or, since 6 January 2012, the 25-day contract) – the only flat price assessment in the process. The computation of the Dated Brent quote published by the PRAs follows a reversal of the chronological process of assessment: it starts with Forward 25-day prices (assessed last), used together with CFDs to compute North Sea Dated Strip (anticipated Dated), from which the prices of Brent, Forties, Oseberg and Ekofisk are computed using an assessment of their differentials ... and finally Dated Brent is computed as the most competitive (minimum) of the four grades.

The Assessment of Grade Differentials, CFDs and Forward Brent: Platts' Window

Platts' European crude price assessment occurs every business day, mostly between 4:00 pm and 4:30 pm. Platts has a dedicated room where assessment occurs, which looks pretty much like a small trading floor, where price editors are organised by desk covering a particular product. Bids and offers are generally communicated to Platts' editors by Yahoo messenger and, when the technology is available to the market concerned, immediately put into Platts' 'Ewindow', a trading platform, and on a dedicated page of its wire service (PAG003). Main market participants also have Ewindow installed on their own computer, so that they can put their bids and offer directly on the system. The Ewindow software interface has been developed by ICE for Platts, and looks pretty much like the ICE interface. It is a trading platform with Platts' rules. Participants put their bid and ask into Ewindow and, when a deal is done, can clear this OTC deal on ICE (if they have configured the software that way). Through Ewindow, market participants have immediate knowledge of offers and bids on a particular contract. Platts' editors can intervene if they think that the changes in bids/ask are too large, prices are 'out of the market' or a deal appears to have been agreed for pricing reasons (for example a participant accepts an offer from A at a higher price than an existing offer from B). It is an OTC market, so participants know who is offering what.

Bids and offers of market participants are communicated to Platts' editors in a precise time frame, called 'Platts' window', and can be modified in the assessment period under precise rules. Market participant interest in North Sea crude oil, generally expressed as a bid or offer on a differential to Dated Brent or to Forward 25-day Brent contract, should be expressed before 4:10 pm. Other physical grades commonly traded during the window, such as Ural or West African crude oil, should be presented to the window slightly earlier. Market participants can change their bids and offers on the physical grades until 4:25 pm. The assessment of CFD occurs between 4:15 pm and 4:25 pm. The assessment of Forward Brent contracts (for the next three months) occurs in the last five minutes of the window, between 4:25 pm and 4:30 pm. The basis for Platts' assessment is Market On Close (MOC) methodology, which states that the assessment should reflect the latest trade(s) happening in the window. For the Forward Brent, the last seconds of the window before the 4:30 pm cut off, are particularly crucial for price determination and introduce significant stress for both Platts' editors and large North Sea traders. The aim of MOC methodology is to reflect market prices at the end of the assessment period. It also has the advantage of improving liquidity, because it concentrates trades in a very short time period. Most big players are present in the window between 4:00 pm and 4:30 pm and, having carefully prepared their trades before the window, can quickly post and modify their bids and offers.

Argus has a slightly different methodology, and uses the average of deals transacted between 4:29 pm and 4:30 pm to assess Forward Brent prices. Deals are reported to Argus by market participants, in general before 5:00 pm, and posted by the PRA on Argus Crude Oil Bulletin Board. The result looks pretty much like Platts PGA003 page. Some large participants send Argus every day a list of what they did during the window. While Argus mentions in its methodology guide that, in the event there is no bid or Forward Brent it uses an estimate based on EFP and future prices, this almost never happens. The assessment process covers three main elements: the grades (physical crude oil), the CFDs and the Forward Brent (25-day).

In a typical assessment day, bids for non-North Sea crude (Urals) start to appear first, around 15:45. North Sea crude bids appear slightly after 4:00 pm. Bids and offer are generally presented at a differential to Dated Brent or to the front month of the Forward Brent contract. Participants have until 4:25 pm to modify their bids and offers, in order to achieve a deal. Bids appear on Ewindow and on a specific page of Platts' wire service (PGA003), so their evolution can therefore be followed by the whole market.

CFDs are assessed then, in part in the same time frame as the grades. These are short-term swaps of the price of Dated Brent to be assessed in the next few weeks vs. the second month of the Forward Brent contract (25-days), with cash settlements, covering 8 calendar weeks from the date of their assessment (included in the first week). By buying or selling CFDs, market participants can guarantee a price for the week of crude deliveries equal to Forward Brent +

CFD for the week, therefore obtaining a more precise hedge of their risk than by using futures or forward contracts only. The market for CFDs is very liquid and assessed in Platts' window, between 4:15 pm and 4:25 pm Considering Argus data of deals happening in the window between January 2006 and Dec 2011, deals appear to occur mainly for contracts of 100 kbls, 200 kbls or 300 kbls. Roughly 55 percent of the deals are for 100kbls contracts, 24 percent for 200Kbls, 6.5 percent for 300kbls and 2.5 percent for 500kbls. The market appears very active, as there are on average more than six deals happening every day. There are many participants in the CFD market, with as much as 45 companies trading regularly. These include oil companies, oil traders and some banks. However, 12 of the 45 participants – the large physical participants – account for more than 80 percent of the trades.

Finally, Cash BFOE prices (Forward Brent) are assessed in the last minutes of the window for three forward months. These are forward contracts for a particular month, with no specified date of loading. In most cases, Cash BFOE prices refer to partial cargoes (of 100 kbls) and start to be offered before 16:24. Between June 2007 and the end of 2011, in the Argus database of deals happening during the window, partial 100 kbls represented 80 percent of total deals, 200 kbls 12 percent, 600 kbls (a complete cargo) 3.5 percent and 300 kbls 3.25 percent. Large volume contracts (600kbls) trade most the day following the expiry of the ICE Future contracts (16 of the month), as Forward Brent participants want to influence the settlement of the future contract. The volume of Forward Brent deals has significantly increased since 2008, rising from 200 kb/d in 2008 to 540 kb/d in both 2010 and 2011. Prices can be modified through 16:30. The last seconds of the window are particularly active, as Platts' Market on Close methodology makes deals occurring at the end of the window particularly important. The assessment process ends at 16:30:00:99, when a Platts' editor shouts 'Time!' in the assessment room. Argus has a slightly different methodology, considering an average of deals happening in the last minute of the window (16:29–16:30). The three months of Cash BFOE are the only flat prices discussed in the window and serve as a reference for the computation of all other assessments. The Forward Brent contract is a very small club, with a limited number of participants: big oil traders and large oil companies. In the window, roughly ten participants contribute to the contract assessment. Shell, Total and Vitol make roughly half of the trades reported. Even though 80 percent of the trades concern partial cargos of 100kbls, participants must be ready to take delivery of physical cargoes and able to participate in the window.

The Dated Brent quote is then computed from the various assessments. This quote is particularly important because it is the price included in many contracts related to Brent. With the assessment of the second month Forward Brent contract and CFDs for the period covered in the assessment, PRAs compute a North Sea Dated Strip which would represent the average price of Dated Brent that can be guaranteed today for delivery in the 10–25 days of assessment. This Dated North Sea Strip will be the basis to which apply grade differentials, as it represents an expectation of the value of Dated Brent at a particular time of loading. By doing so, an outright price for Brent, Forties, Oseberg and Ekofisk is computed from the differentials assessed in the window and the Dated North Sea Strip. Dated Brent quote for the day is then computed as the cheapest of the four grades Brent, Forties, Oseberg and Ekofisk.

The process of price assessment by PRAs has drastically changed in recent years. It moved from a situation where PRAs were observers of market trades, with reporters calling market participants at the end of the trading day, to a situation where they are organising the exchanges in a particular way, to obtain what they believed to be the most representative prices. If market participants want their activity to be reported (and to impact the quotes) they must follow the rules and guidelines established by PRAs. Although the physical crude market remains essentially OTC, the activity on the main price markers is public and observable by any participant in the market.

Looking precisely at PRAs' price assessment methodology, there is no direct impact of future prices on the physical oil price assessment. Dated Brent quote results from Forward Brent assessment within the window, CFDs assessment and grade differential assessment. All these assessments occur in a process of transparent bids and offers, largely dominated by the main physical oil market players. The link between futures and forward (therefore spot) prices exists, however, but is more linked to market practices than to the process of price assessment. As such it can be broken if need be. In addition, it is a two-way relationship: futures prices may influence Forward prices and the physical market has an impact on future markets.

The Link between Futures, Forward and Physical Prices

While futures prices do not directly enter in the physical price assessment of Dated Brent, they can affect physical crude prices in several other ways.

First, prices for certain exports of Middle Eastern countries to Europe are directly indexed on a transformation of futures prices. Saudi, Kuwait or Iranian crude oil sold to Europe, are directly indexed on a weighted average of ICE Brent prices (BWAVE) in a trading day (prices weighted by volume). Saudi Aramco announces with roughly one month notice (at the start of month t for month t+1) the value of the differential for its crude to oil companies, and the price paid by the buyer is based on an average of ICE Brent price around the day of cargo arrival corrected from the differential previously announced. Oil companies do not have the opportunity to negotiate the price, but they can slightly adjust their crude intake of Saudi grades based on the amount contracted. For these crudes, a change in futures prices (front month) has automatically an impact on prices. In addition, ICE Brent contract converges to Forward Brent at its settlement, even though numerous differences between ICE Brent contract and Forward Brent contract could make their prices different. Indeed, these contracts trade on different kinds of markets (OTC and futures), concern different volumes (futures Brent contracts are for 1000 bls while in the forward market, most exchanges refer to Partial Cash BFOE of 100 kbls) and, while the forward contract can end with a physical delivery or a book out, futures Brent contracts have in general a cash settlement. In addition, the two contracts do not concern the same period. ICE Brent contracts expire on the 15th of the month, on an average of the value of Front month Forward contract in

the next day which, at the time, refers to a relatively limited number of cargoes. On the 16th of January, the forward February contract refers to cargoes loading in more than 25 days and before end February, i.e between the 10th and 29th February (or even less time if we take into account the loading period).

In practice, however, futures and forward prices remain very close to each other, in particular at the end of the window. ICE publishes every day a minute market, showing a weighted average of prices on the futures market between 4:29 pm and 4:30 pm. The spread between the absolute value of the minute marker and the Forward Brent assessment is, on average, 14.3cts/b between 2007 and 2011, while the futures/forward spread is more than $1/b at the opening and $0.64/b at the close of the market. Futures prices have a tendency to converge to Forward prices at 4:30 pm.

One of the reasons for the convergence is the fact that big oil participants have a portfolio including both Forward and Futures contracts. These can move from one market to the other through Exchanges for Physical (EFP), a direct link between the two markets. An EFP operates a switch between the positions of two participants in futures and forward markets. It transfers the position of a market participant on the ICE futures market to the Brent forward market, therefore giving an option for a subsequent physical delivery. The forward position of the second participant is, in turn, transferred to ICE. Through EFPs, a strong link is introduced between physical and futures markets. EPFs for the first three months are quoted by brokers and are generally inexpensive. We see the current market practice of big players having both instruments in their portfolios and arbitraging between futures and forwards as the main reason for the link between physical and financial markets. It does not mean, however, that futures prices dominate physical prices, both interact in oil price formation.

The strong link between physical and futures prices can however be broken during a crisis, or when the fundamentals or physical and financial prices are clearly different. It was for example the case during the Gulf war, when the price of the financial contract lagged the increase in Dated Brent and Forward prices. The price of physical crude oil jumped after Iraq invaded Kuwait in August 1990, while the price of futures contracts reacted less to the event. The fact that Dated Brent and Forward Brent are linked to the physical delivery of crude oil explains this difference with futures prices. The same happened during the 2010 strikes at French refineries. Dated Brent price was the most affected by the strikes and futures prices the less impacted. Again, the fact that Dated Brent and Forward Brent prices are related to physical deliveries instead of cash settlement explains the difference.

The disconnection of various crude prices under strong pressure on one market or the other confirms that the market, and the process of oil price assessment, is able to separate factors affecting futures prices and physical prices of oil.

Conclusion

Over time oil markets have developed a high degree of sophistication, allowing a very precise pricing of the time component in oil exchanges –particularly crucial for the industry. PRAs have evolved, from being price reporters to trade organisers in an attempt to avoid price manipulations and misreporting. Main markers in OTC trades have become more transparent, submitted to very precise rules and controlled by PRA editors. Most large oil traders are part of the process, as they want to see their trade activity reflected in prices and have a chance to influence prices. PRAs' assessments are based on voluntary participation, but are difficult to avoid.

PRAs' changes in methodology since the early 2000s, first aimed at avoiding price manipulation, seem today to have provided the tools to potentially isolate physical and futures markets. The methodology developed first to combat squeezes and price game play is used today to assess the physical market, in theory independently from the futures markets. Futures and physical prices are not equivalent and, although there is a strong link between futures and forward, the process of assessment of physical prices guarantees that these prices can evolve differently, if need be. Futures prices are likely to exhibit from time to time a dynamic that will not always reflect the shape of the physical market. In these cases, when the oil financial market temporarily disconnects from physical oil market fundamentals, physical oil trading must rely on a physical benchmark to price its trades. It is precisely the role of PRAs to assess physical markers that could continue to be used in physical trading, in theory independently from futures prices prevailing in a particular day. The existence of such prices is an anchor for futures markets, and should guarantee that they do not disconnect too long from oil fundamentals. ■

** A longer version of this article can be found on the OIES website*

Oil Price Benchmarks in International Trade

PETER STEWART considers how time gradient affects crude oil differentials: the example of Brent

Physical oil is usually priced, not at an outright price, but at a differential to some other market, either another more active physical market or a liquid futures or forward market.

In the crude oil market, the fixed or outright price is generally discovered in the futures and forward markets, and physical oils are typically priced either directly or indirectly at premiums or discounts to these prices. Futures and forward instruments are popular because market participants typically do not have to deal with the minutiae of logistical factors involved in a physical delivery of oil. This allows the widest possible participation in the market. In recent years, swaps – which are cash-settled – have also been widely used as a trading and hedging tool.

The crude oils that are used as the underlying price in such trading arrangements are often known as 'benchmarks'. In this article, we examine the structure of

the North Sea Brent market, also known as BFOE, as an example of how one very influential benchmark operates, and in particular how the time gradient of the market can affect the differentials being negotiated.

Broadly similar mechanisms are used across the geographical regions in which oil is traded, although each crude complex – North Sea, West African, Urals/Med, Middle East, Asia-Pacific, USA and Americas – applies these in different ways. The basic algebra is that the fixed price value of the commodity is the sum of an underlying reference price plus/minus a negotiated differential.

While many observers of crude oil market activity readily understand that crude oil differentials reflect the quality and location of the oil relative to the selected benchmark grade, it is perhaps less intuitive that the contango and backwardation of the market also have an impact on the differentials.

The relationship between physical and derivatives markets and how this is affected by the time gradient of the market is an area that deserves more study. This article examines these linkages from the point of view of the logic of market structure. It does not attempt an empirical/quantitative analysis of these linkages in the actual market, although we believe that such analysis is overdue and would be a useful addition to the growing literature around oil and energy benchmarks.

Expressing Prices

As examples of how the price of a physical crude oil may be expressed, either in a negotiation or in an actual contract, and with no attempt made for the prices to be realistic in current market conditions, the price of a cargo of (for instance) West African crude oil might be expressed in several different ways, including:

- Fixed price (e.g. $110/b) although this would be rather unusual
- Futures related (e.g. May ICE Brent plus $1.00/b, June WTI plus $3.00/b)
- Forward related (e.g. May cash BFOE plus $1.10/b)
- Quotes-related (e.g. Platts dated Brent plus $0.50/b, Argus ASCI plus $4.00/b)

The market value of the oil is determined by many factors: what type of oil it is, the transportation costs to consuming markets, and also the contractual terms negotiated, for instance, whether the oil is sold FOB or CIF, the timing of the delivery, the volumes being transacted, and a host of other minutiae that allow flexibilities to one or other of the transacting parties.

How does the time gradient of the market affect the differentials that are negotiated for physical crude oils?

It is easy at this stage to overcomplicate the algebra, but we begin with the simple assumption that an identical commodity transacted under identical terms should only have one value at one particular time in an open and efficient market. In such a market, if a different price were to exist, arbitrage would quickly level the playing field.

We saw in the bulleted examples above that the differential varies depending on what it is a differential against. This is a normal feature of price discussions in many markets, including interest rates that may be expressed as LIBOR plus or minus, Fed Funds Rate plus or minus, or base rates of a Central Bank plus or minus, and there are many other examples. This is little different from agreeing a premium rate tariff at a difference to any base rate, for instance, the actual value of a car as list price plus or minus a sum that depends on what non-standard features are added to the standard vehicle that is referenced in the list price.

In the physical Brent market, differentials are most frequently negotiated relative to the value of the cash BFOE market, a physically deliverable forward contract, or to published values of Dated Brent itself on or around the loading date of the cargo. They are also sometimes negotiated against ICE Brent futures.

Futures-related Pricing

Let us take a simple example of the value of a cargo that is expressed as a differential to the futures price. Let us suppose the cargo is worth a fixed price of $110/b. If May ICE Brent is at $109, June ICE Brent at $108/b, and July ICE Brent at $107/b, the market is then backwardated (i.e. a premium for prompter delivery) by $1/b per month. Thus the cargo is 'worth' May ICE Brent plus $1/b, June ICE Brent plus $2/b, or July ICE Brent plus $3/b, because all these add up to $110/b, and the cargo can have only one value at any point in time.

(This is a very simple example of how the time gradient affects a differential. We will see later that a similar logic applies when pricing is on a Dated Brent-related basis, although this is less obvious).

Now suppose that May ICE Brent futures drop to $108.50/b, and the futures backwardation narrows to just $0.50/b per month, so that June ICE Brent is $108/b, and July ICE Brent is $107.50/b. What is the physical cargo worth now? The answer is, it depends.

- If a trader can negotiate a premium to May Brent of $1.50/b, the physical cargo is still worth $110/b. If that is the case, the implied differential to June ICE Brent is still $2/b while that to July ICE Brent is now $2.50/b.
- If the trader cannot negotiate anything but a $1/b premium to May ICE Brent, however, the physical cargo has lost value and is now worth $109.50/b. Expressed against June ICE Brent, this represents a differential of $1.50/b and against July ICE Brent, a differential of $2/b.

The various Brent derivatives, including cash BFOE, ICE futures and swaps trade independently of each other because they are different instruments with different contractual terms, and therefore their price and the price differences between them and the physical vary constantly. Nevertheless, because ultimately they have to converge with a physical price, there is strong interaction between the prices of the various instruments. Whereas in an efficient market an identical instrument or commodity can only have one value at a particular point in time, the price differences between the various Brent derivatives and the physical price change from second-to second, and are often volatile.

The physical and the futures are therefore inter-related but still separate markets. One has an impact on the other, but which is the driver changes over time. A very volatile futures market will usually lead de facto to volatility in the physical market, but equally any change in the physical supply or demand for crude will impact on the value of the future.

CFD-related Pricing

The most common method of pricing crude oil is in relation to the value of another physical grade of oil, usually one that is more liquid and transparent. Because physical cargoes are not commoditised, they are not traded on the exchanges. For this reason, and partly for historical reasons because the pricing agencies were publishing prices before the futures exchanges came into existence, physical market participants often use values published by pricing agencies such as Platts or Argus for the relevant benchmark grade as the reference for their physical crude oil pricing. Often the price used is that prevailing on or around the day when the cargo is loaded or discharged.

Since the advent of formula-related pricing in 1986, the Brent price has become a dominant reference point for the value of physical crude oils produced not only in the North Sea, but around the world. When I first started making oil price valuations at a pricing agency many years ago, in 1984, pretty much all crude oil discussion was on a fixed price basis. With the advent of Dated Brent-related pricing, deals were suddenly being negotiated on a Dated Brent-related price, and even Dated Brent itself would be seen trading at Dated plus 50 cents or minus 30 cents. How could this be? How could something be worth more or less than itself?

With the simple examples (above) of futures-related differentials under our belt, we can now examine in more detail how differentials on quotes-linked deals (that is, deals tied to price assessments or 'quotes' from Price Reporting Agencies (PRAs) such as Platts or Argus) respond to changes in time gradient. Because Dated Brent prices published by Platts are so widely used in crude oil transactions, we refer to Platts Dated Brent in what follows; but other benchmarks such as Argus ASCI are also frequently used in trading crude oil.

So let's go back to that cargo discussed earlier that was, and we hope still is 'worth' $110/b on a fixed price basis. If on a quotes-related basis the cargo is valued at Platts Dated Brent plus $0.50/b, what does that imply for the fixed price? The answer is nothing at all, in and of itself, because we do not know what Platts will publish on or around the loading date for the cargo, when the price will finally be set.

But if we can find some way of locking in the future value of the Platts quotes through a financial instrument, that changes the game entirely. In the Brent market, the physical value of Dated Brent can be locked in through Contracts-for-Differences or CFDs, also known as Brent 'paper' or 'swaps'. These are typically negotiated for the week of loading of the physical cargo.

The Brent weekly CFDs offer a parallel instrument to the futures and forwards for hedging the value of physical cargoes that are priced on a Dated Brent related basis. The weekly CFDs are usually quoted as differential swaps, typically based on the difference in price between the second month forward cash BFOE contract, and the Dated Brent quote as published by Platts, on the calendar days referred to in the swap agreement. There is a reasonably liquid market in such weekly swaps up to two months ahead.

In fact, the weekly CFDs form just one of a whole complex of derivative instruments such as Dated to Front-Line swaps that can be used to hedge physical cargoes whose price is tied to the value of Platts Dated Brent in the future.

We considered earlier how the fixed price of a physical cargo relates to the futures price through a differential. The mechanism is similar when it comes to Dated Brent-related pricing, only in this mechanism it is the weekly CFD that is used to 'lock in' the physical price. The CFD is a differential swap that is settled by the Dated Brent price published by Platts on one leg and on the other by the cash BFOE value. The time gradient on cash BFOE also affects the CFD value, and therefore the differential for physical 'dated' Brent to the underlying CFD.

Thus, if Dated Brent is worth $110/l, the fixed value of the swap that is 'implied' by the differential of $0.50/b to Platts quotes is $109.50. If the differential were $1.00/b, it would 'imply' a swap value of $109/b, and so on. To be clear, it is not the differential that is driving the swap value, as these move independently; but in an efficient market, any gaps between the fixed price value and the value of the underlying plus differential should be quickly eliminated by arbitrage.

In this mechanism it is perfectly possible and indeed normal for a cargo of Dated Brent to sell at Dated Brent plus or minus a differential (e.g. 50 cents/b in the example above). When the cargo loads and is priced, Platts or Argus will be making an assessment of the value of a commodity to be loaded at a future date (currently 10–25 days after the publication date), not for the actual cargo that is loading on the date of publication. This is a crucial point, as the differential will therefore vary depending on how steeply the market is either in contango or backwardation.

Physical and Futures: Which is Cause and which is Effect?

We now have a reasonable map of the relationship between the physical market, the underlying instrument used to price the physical and the differential.

A question that often arises in analysing the relationship between the physical market and related derivatives markets is a rather basic one: Which is the 'real' price of oil? Of course, the question presupposes that there is a single price of oil that is the right price, when the reality is that we have something like 500 grades of oil that are trading in the market, of which approximately two-thirds are directly or indirectly tied to the Brent price. So there is no single price that can possibly represent all these grades.

In the case of Brent, a standard answer might be that the futures derive their value from the physical, and that therefore it is the physical market that is the root price. But this oversimplifies the reality. In the real world, there is an interplay between the futures and the physical market, the former trading visibly on traders' screens on a 24-hour basis, the latter 'discovered' in the Platts window which, de facto, trades mainly in a fairly brief trading window at the end of the day (see piece above by Christophe Barret).

Physical BFOE cargo prices are most frequently expressed in the market at differentials to Platts Dated Brent assessments published on or around the bill of lading of the physical cargo. It is not unusual at all, however, for them to be expressed as a differential to cash BFOE or even to ICE Brent futures, as outright price discovery is typically in the cash BFOE or futures markets, which trade at fixed prices. The reality of the market is a complex but highly structured web of bids and offers and deals that are done on a

variety of contractual terms, all zoning in on the unique physical price that prevails at that particular point in time.

The differentials, of course, will vary depending on which instrument is being used as the underlying reference point. But because these instruments themselves have a time gradient, while an identical commodity being traded under identical contractual terms has only one value at any point in time, the differentials also vary depending on how far along the forward curve is being referenced, and by the degree of contango or backwardation in the market. ■

Oil Price Benchmarks in International Trade

MIKE DAVIS on Benchmark Pricing: a Co-dependent Matrix

The Background to Oil Pricing

Crude oil is not a homogenous commodity. Over 500 distinct global crude pricing hubs have been identified, but this large and varied group of crude grades relies heavily on just a handful of markers within them, on which the global crude price system is anchored. These marker grades, in order of global usage, include Brent, Dubai and WTI.

Brent crude is the world's most commonly used international crude oil benchmark, and is generally accepted as and referred to as the reference price for between 65 and 70 percent of international physical trade, regularly by Platts, the largest global oil Price Reporting Agency (Figure 1).

Crude Spread Trading and Price Relationships

Within the handful of markers, a degree of price hierarchy exists, with Dubai for example (which is most heavily traded on an inter-month or quality spread basis) leaning on Brent with its widely traded and highly liquid derivative structure. Dubai also leans on Brent as a highly reactive price for global signals and therefore as a key flat price guide, at least at the front of its forward price curve.

Thus, Asian refiners may use the Brent/Dubai spread to establish the relative costs and yields for globally available (i.e. seaborne) light sweet versus medium sour (Arab Gulf) crudes, and perhaps also assess the relative pricing power of complex and hydro-skimmed refineries in those terms.

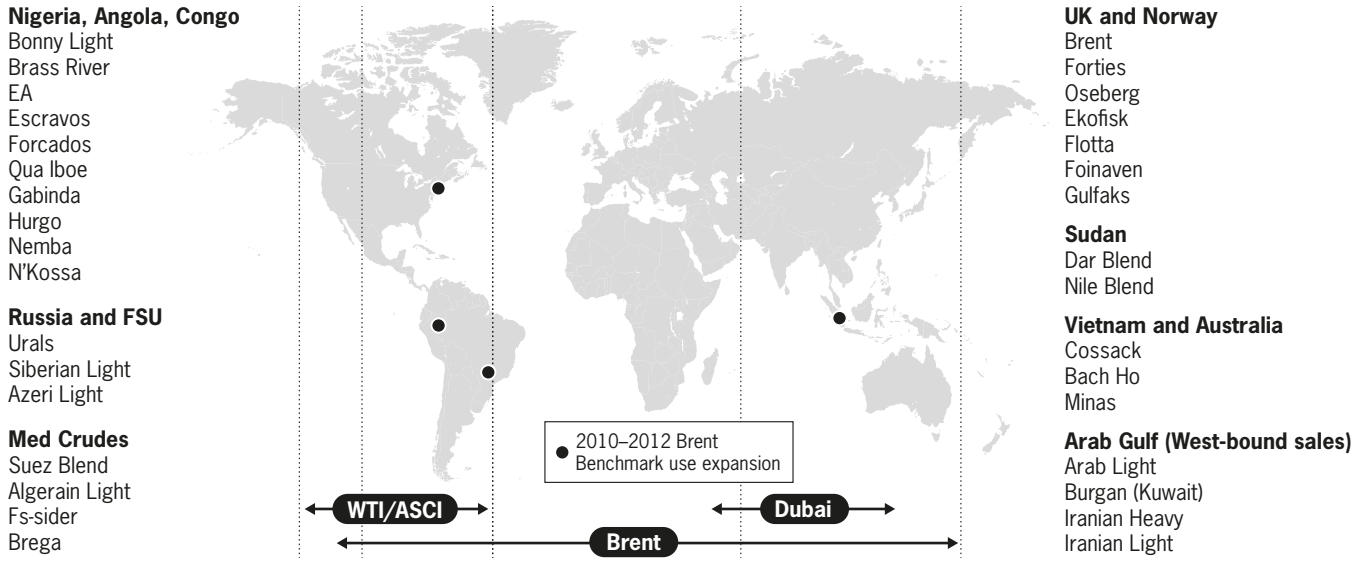
Another spread example is that of WTI/Brent, with WTI recently discounted to Brent (approaching $30/b on occasions during 2011), and also to other US Gulf and international grades, both light and heavy, including LLS, Mars, ASCI, and Dubai. The WTI/Brent geographical spread was previously a function of the inward freight differential of a few dollars from that of WTI, when Brent-referenced crudes from the eastern Atlantic seaboard readily moved across the Atlantic to meet seemingly ever-growing US gasoline demand. Nowadays, the spread mostly describes the cost of transporting WTI from its storage locations in PADD II southwards towards the primary refining centre of the Gulf of Mexico, against the prevailing direction of US pipeline capacity.

Within each of these price streams, trading flows up and down the various forward price curves, and of course across them to test relative values in 'box' trade. Each change in one area of the microstructure creates the possibility of change in another part of the same or a related price curve.

Types of Benchmark and Instruments

Any benchmark invariably contains a range of potential instruments, some

Figure 1: Brent Related Pricing Worldwide



of which may even serve as alternative benchmarks in their own right. There is much discussion over the relative parts of price streams within, as well as the merits of the overarching benchmarks themselves. In terms of Brent, for example, we can point to spot physical (Dated Brent), Cash BFOE (Forward physical Brent-Forties-Oseberg-Ekofisk cargo contracts), ICE Brent futures, and so on. Some may say that Dated Brent is the 'benchmark', and choose to assess it from that point onward independently of the rest of its related structure.

The Brent Benchmark Structure as a Matrix of Co-dependent Pricing

The short answer to the question about which part of the complex is the benchmark is to say that in a sense all parts are and none are, at least singly or separately. Dated Brent and ICE Brent are both favoured as global reference prices across multiple continents, whilst Cash or Forward (BFOE) Brent is both the immediate underlier for the ICE Brent futures contract, and the parent of Dated Brent until it acquires a vessel, loading dates and cargo number. Brent weekly or monthly CFDs, inter-month spreads (in futures, cash and swaps), EFPs (Exchange of Futures for Physical), the Dated to Frontline swap, ICE Brent First line swaps and so on, are more examples of instruments used to explore spread values and add up to a price matrix of real power, utility and robustness in establishing value for the core markers in Brent (Figure 2).

Collectively they are 'the benchmark', wherein genuine and diversified market depth and robustness lies. The structure has the liquidity to support the generation of a long forward curve for outright prices and to test all the relevant spread relationships that support pricing, hedging and trading. No other benchmark has so many related spread instruments capable of testing value across time, quality or geography.

Examples of Benchmark and Relative/spread Pricing

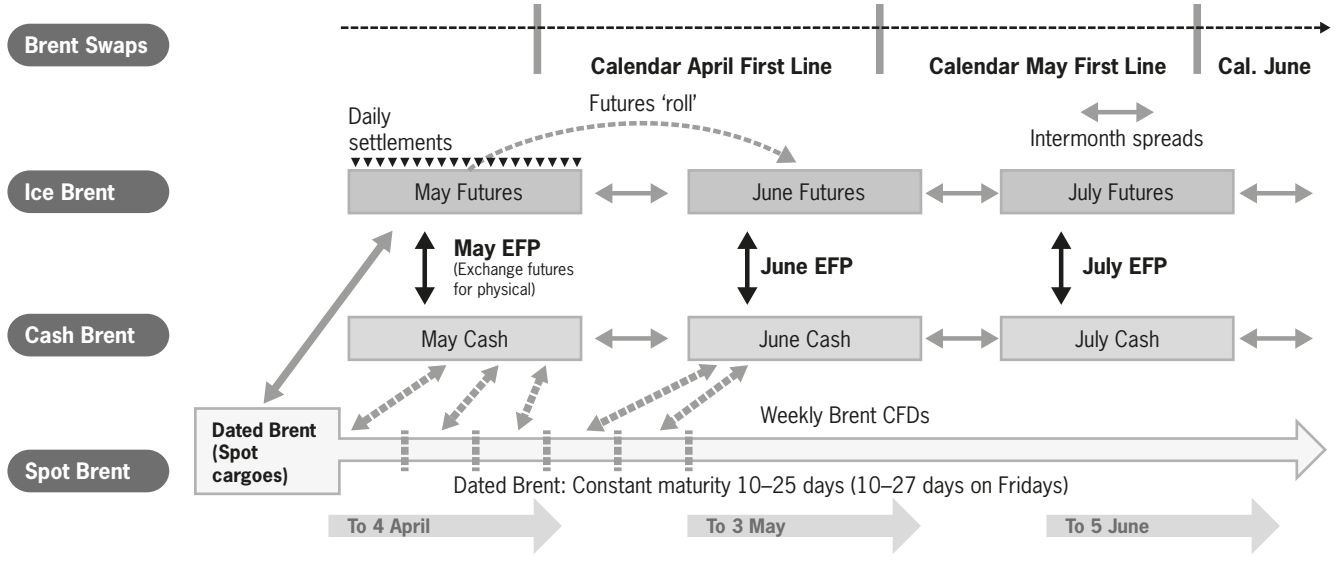
Brent is unique in retaining both a forward physical and genuine spot market in parallel with an active futures contract. In contrast, other crude markets have either not evolved into an exchange-based contract, or have seen their forward physical markets replaced by a derivative paper variant. The importance of Brent CFDs (Contracts for Difference, a swap which prices the differential between individual weeks or months of Dated Brent cargo assessments against Cash forward cargo months) for physical price assessments, and hedging between forwards and the prompt spot physical, or 'Dated' Brent, is also highly significant.

Platts for example, uses Brent CFDs and Dated cargoes and partials in the alternative, to establish value at different points in its physical assessment window (currently 10–25 days forward) for Dated Brent.

Price assessors often recognise this co-dependency in trading and hedging related crude instruments. Assessed physical forward or spot physical assessments encompass references in price terms to paper markets such as swaps and futures as well as physical bids, offers and trades. They also frequently use a matrix of related prices between flat price and spread physical and swaps such as CFDs. This is common across crude and physical product published assessments. Platts, the North Sea assessor uses both a mean in chronological terms (lifting dates; for example for dates 10–25 days forward) and across paper and physical. Each day's value in a 'window' of lifting or delivery points seeing either physical, or derivative, or both, is used to calculate the value within their relevant term structure. The range of values around the middle day of that 'window' is used to derive the eventual price designed to reflect an exact point in time, for example 16.30 GMT London time for European refined products and crude markets.

The final assessed 'price' is therefore the result of many related prices, both 'physical' and 'derivative', indicative or traded. In a market where very few nodes of that complex structure will have the kind of liquidity that one sees in modern on-screen futures markets, this is highly

Figure 2: The ICE Brent Complex and Related Instruments



desirable, rational, and reflects the way that value is tested by the traders in spot physical markets.

The Price Mechanism and Futures' increasing Contribution to Price Discovery

Exchange-listed futures are seeing an enhanced role in price discovery, as well as for risk measurement.

In a highly interconnected, data-driven world, they can give an instant response in magnitude and in time to any change in global fundamentals. The on-screen WTI/Brent spread tells you for how long the market is discounting certain potential outcomes in aggregate, pipeline builds and capacity, alternative potential outflows of Canadian crude, or the potential for even more storage in Cushing, Oklahoma. Traders may not want to wait until later in the Singapore, London or US afternoon to see what values physical prices will proclaim in terms of a reaction to global macro breaking news. Physical prices, when expressed or observable, of course discount any impacts at the same speed as futures, but the visible transmission of price is inevitably slower and more fragmented, compared with the speed and wide reaching access of on-screen futures markets. This is not to dismiss the physical, it is to recognise the characteristics and value of each market, which are co-dependent and correlated.

Futures contracts are often described as a price discovery tool, but a derivative one. Although true, because at final settlement the price is derived from the physical product, however, in the years running up to that point, and for 99 percent+ of volume, there is also genuine, real-time value in conveying an implied value of the physical market. Through spread trading, the value architecture can be tested for the most developed benchmarks i.e. benchmarks with multiple instruments over time and instruments that encompass spot physical, forward physical, futures, swaps and options, and spreads between these. In this sense, no benchmark has a more developed and co-dependent pricing structure than Brent.

Brent has versions of all these different instruments, and different parts of its structure may provide the actual physical pricing reference (for example the BWAVE or ICE Brent Futures Volume-Weighted Average price for Arab Gulf pricing into Europe), or alternatively, via spread trade, support and thus underpin the value used for a reference price from elsewhere in the structure, such as Dated or BFOE cash Brent.

The Brent Exchange for Physical (EFP)

The EFP mechanism provides an electable delivery system, but in a practical sense one that simply operates at a different point in time from a directly physically delivered future, in crossing over from a 'paper' environment to a 'physical' one. In Brent the divide is between ICE Brent futures and its cash BFOE underlier, through the medium of the EFP mechanism.

A physically delivered contract creates a different outcome by default only. In practical terms, for either, if you buy the position back, you don't go to delivery.

For ICE Brent, if you want to go to delivery, you transact an additional instrument with a small premium/discount (an EFP) and your futures position thus will become a physical one, rather than simply being cash-settled.

Effectively, both are elective mechanisms. In the majority of futures trading, whether cash settled or physically delivered contracts, the result is the same, and the quantity of volume that goes to cash-settlement or past that point to become physical is a small fraction of 1 percent of traded futures volume. It is a theoretical possibility that each lot traded could form part of a physical transaction that creates the convergence mechanism.

Crude Price Drivers and International Matrix Pricing

Some crude commentaries seem to suggest that 'the' crude price is determined either independently of refined products or somehow determined top-down by macro events. In fact refined product prices determine the price that any refiner is prepared to pay for crude feedstock. Thus crude prices are driven by end-user demand for refined products, and in aggregate for crudes based on their yield, a function of refining, which is competitive, and then in turn the available quantity and supply of crude, a supply which is relatively inelastic. Crude prices at the margin, and when fundamentals begin to turn, just a few distressed cargoes looking for a home can quickly deflate spreads and in turn the flat price.

In previous decades the most important product for refinery margins was that for US gasoline. That mantle has now passed to European distillate prices (like diesel and heating oil). These are the most consistently positive part of the barrel in global margin terms and what refiners are trying to make most of. Brent can command a higher price if it is available locally in Europe for higher distillate prices.

If a crude price is 'too high', relative to its given product yield over any period beyond the very short term, refinery run cuts will ensue, stocks build, spreads tend to weaken, and the flat price falls unless there is an arbitrage out of the region to one where alternative refining economics exist. Refined products are international, even when a given crude is not.

Physical crude prices are connected to prompt maturity derivatives at the front of the forward curve. There are numerous instruments such as EFPs (Exchange of Futures for Physical), weekly CFDs (Contracts for Difference) or DFLs (Brent Dated to Frontline swaps) that allow traders to observe or value the matrix of price relationships between physical and derivative markets and the ever-changing volatile evolution in prompt parts of the forward curve where supply and demand are relatively inelastic.

This connectivity between product and crude prices is just one more facet of the larger co-dependency of oil pricing. A major and valuable feature of this system, when infrastructure bottlenecks do not subvert the arbitrage process, is that any perceived distortion between these prices is subject to arbitrageable trade, which will always tend to mean-revert unsustainable price relationships in physical supply/demand terms as the direction of least resistance.

The analogy might be that of a flexible three-dimensional net of related prices, with a complex of co-dependent prices across the multiple instruments, in type, time, and geography, pulling upon one another, but with varying elasticities.

In conclusion, I believe that Brent has become a global benchmark in its various forms, delivering efficient, reliable and progressive price signals through the medium of a complex of interrelated physical and derivative, crude and product prices.

The physical Brent system would be of far less value and arguably incomplete without the reactiveness to global macro adjustments, transparency and near 24/7 visibility of the ICE Brent on-screen futures market, let alone the value in such a liquid forward hedging tool. The latter would be of much less value without its related physical instruments and all the price spreads that establish relative values between those constituent parts. The futures and other derivative market instruments enable risk to be addressed in multiple forms.

The United States is now home to a number of crude benchmarks. WTI is a valued watchword for Wall Street, US Mid-continental refiners and storage operators or users. LLS (Louisiana Light Sweet) was the reference price of choice for the emergency release of IEA crude stocks during Libya's extended supply outage, whilst ASCI (the Argus Sour Crude Index) is a key reference price for imports of sour crudes into the US Gulf.

Any US crude will likely suffer from a strong regional price bias until any mooted benchmark can flow to where the overwhelming majority of new global demand is coming from, i.e. in the East. Increasing US crude supply from formations such as Eagle Ford, and in North Dakota, allied to increasing Canadian flow southwards are already backing out the previous huge flows of inward global seaborne crude imports which ensured that prices were ultimately set where supply and demand cleared, within the USA. Equally, exports from the Arab Gulf are declining as domestic consumption accelerates there, and the pull from Asia further east is undeniable.

These shifts in international pricing and oil flows are nearer their beginning than their end, and seaborne benchmarks like ICE Brent or Gasoil (for refined products) are best equipped to respond to such considerable upheavals and change in the international trading patterns of crude and products. ■

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BASSAM FATTOUH looks at the Dubai benchmark and its role in the international oil pricing system

Introduction

Dubai became the main price marker for the Gulf region by default in the mid 1980s, when it was one of the few Gulf crudes available for sale on the spot market. Also, until very recently, Dubai allowed oil companies to own equity in Dubai production – unlike other countries in the Gulf such as Iran, Kuwait, and Saudi Arabia.

When the Dubai market first emerged, few trading companies participated in it, with little volume of trading taking place. This, however, changed during the period 1985–87 when many Japanese trading houses and Wall Street refiners started entering the market. But the major impetus came in 1988 when key OPEC countries abandoned the administered pricing system and started pricing their crude export to Asia on the basis of Dubai crude. Over a short period of time, Dubai became responsible for pricing millions of barrels on a daily basis, and the Dubai market became known as the 'Brent of the East'.

Despite the existence of other regional crudes with a much larger physical base, more than 25 years have now passed, and most cargoes from the Gulf destined for Asia are still priced against Dubai or Oman or a combination of these crudes. Nevertheless, the nature of the Dubai benchmark has evolved and many of the institutional and pricing details have witnessed major transformations, driven in large part by the decline in Dubai's oil production and innovations in the pricing mechanisms introduced in the 2000s. Perhaps what remains from the 1980s pricing system is just the brand name 'Dubai'.

Decline in Physical Production and the Partials System

In the early stages of its development, the Dubai benchmark only included crude oil produced from Dubai's fields, but this was to change as the production started to decline rapidly. The volume of Dubai crude production has dropped from a peak of 400,000 b/d in the period 1990–95 to under 120,000 b/d in 2004, with production hovering around 90,000 b/d in 2009 – i.e. there are about six cargoes of Dubai available for trade in every month. The most recent available data indicate that Dubai's production may have fallen further to 60,000 b/d i.e. less than four cargoes a month. Thus, though Dubai cargoes may be offered sporadically for sale on the spot market, it rarely (if ever) does trade. The government's 2007 decision not to renew the oil concession to private oil companies also meant that Dubai no longer satisfied the ownership diversification criterion, which is considered by many analysts as a pre-condition for a successful benchmark. The low volumes of production and thin trading activity rendered the process of price discovery on the basis of physical transactions not feasible most of the time.

The decline in Dubai's oil output in the 1990s and 2000s has pushed Platts, the Price Reporting Agency (PRA), to search for alternatives to maintain the viability of Dubai as a global benchmark. In 2001, Platts allowed the delivery of Oman against Dubai contracts. In 2004, it introduced a mechanism known as the 'partials mechanism', which has the effect of slicing a Dubai or Oman cargo into small parcels that are traded on the Platts window. The smallest trading unit for the Dubai and Oman partial was set at 25,000 barrels. Since operators do not allow the sale of cargoes of that volume, it meant that a seller of a partial contract is not able to meet his contractual obligation. Thus, delivery only occurs if the buyer has been able to trade 19 partials totaling 475,000 barrels with a single counterparty. Any traded amount less than 475,000 barrels is not deliverable and should be cash settled. Platts allows for the delivery of Omani crude oil or Upper Zakum against Dubai in the case of physical convergence of the contract. In a sense, Dubai has turned into a brand, or index, that represents a sour basket of mid-sour grades.

The bulk of cargoes from the Gulf destined for Asia are priced at the Platts

assessment of Dubai–Oman. Assessment of the Dubai price is based on concluded deals of partials in the Platts window, failing that on bid and offers, and failing that on information from the swap markets surrounding Dubai. The Platts window can be thought of as a structured system used for gathering information, on the basis of which Platts assesses the daily price of key physical benchmarks. The window is similar to an organised exchange where traders make bids and offers for partials, but with two major differences: (i) the parties behind the bids and offers are known, and (ii) Platts decides on the information to be considered in the assessment, i.e., the information passes through a Platts filter.

While the partials mechanism was introduced to alleviate the problem of declining liquidity, over time it revealed some drawbacks, which raised key questions about the effectiveness of the price discovery process in Dubai. The following three features stand out:

Low trading liquidity. The shift to partials trading in 2004 initially produced encouraging results, increasing the volume of trading activity and hence improving the efficiency of price discovery, reducing the bid/offer spreads, and attracting new players to the market. However, in recent years, liquidity in the Platts Dubai window has declined to a point when only few deals are concluded during a month. In many days, there is no execution of partial Dubai. Since late 2008, in 50 percent of trading days no Dubai partial trades were executed. For Oman partials, there are even fewer trades.

Trading activity is dominated by few players. Trading activity in the Platts partials is highly concentrated in the hands of few players, and in many days a small number of players dominates both sides of the trade or the bid/offer process. This has raised serious concerns that some traders, by investing in as little as a 25,000-barrel partial contract, can influence the pricing of millions of barrels traded every day. A counterargument is that market players monitor trading activity in the window very closely, and if these players believe that prices are being manipulated, they have the incentive to enter the window and exert their influence on the price. Critics, however, argue that barriers to entry can prevent such an adjustment mechanism from taking place.

The non-participation of key oil exporters. Despite Gulf exporters' massive physical base, which in principle should provide them with the power to play an influential role in signaling their price preference to the market, key oil exporters have avoided assuming this role and they currently do not participate in the Dubai window. Any signals to the market are often communicated by public announcements through OPEC or other forums. The transfer of the pricing discovery function to the Platts window helps oil exporters achieve a strategic objective: they do not want to be seen as setting or influencing oil prices directly. A common argument presented by key Gulf oil exporters is that it is the market that sets the oil price; oil exporters are simply passive players that use the PRAs' price assessments and plug these in their pricing formula. While convenient at times, this transfer of pricing power to few traders in the Platts window creates a sort of mistrust, especially at times when the Dubai price moves in unexpected and erratic ways, following heavy activity (sometimes by a single player) in the Dubai partials.

The Financial Layers of the Dubai Benchmark

Despite the relatively low physical base of Dubai and the thin trading activity in the Platts window, market players have retained confidence in such a system for a long time. In my view, this can be attributed to two key factors: (i) the reluctance of key exporters to shift to an alternative pricing mechanism and (ii) the deep financial layers that have emerged around Dubai and which have linked Dubai to the highly liquid Brent complex. These financial layers compensate for the thin trading activity in the Platts window and provide the necessary information to identify the Dubai price.

Compared to Brent, fewer financial layers have emerged around Dubai. Attempts to launch Dubai futures contracts in London and Singapore were made in the early 1990s, but such attempts did not succeed. Instead, the informal forward Dubai market remained at the heart of the Dubai complex. Being a waterborne crude, Dubai shared many of the features of the forward Brent market, with some institutional differences such as the process of nomination, the announcement of the loading schedule, and the duration of the book-out process.

Currently the two most important financial layers surrounding the Dubai market are the highly active Brent/Dubai Exchange of Futures for Swaps (EFS) and the Dubai inter-month swaps markets. These instruments are traded over the counter (OTC). The Brent/Dubai EFS allows traders to convert their Dubai price exposure into a Brent price exposure, which is easier to manage given the high liquidity of the Brent complex. The Dubai inter-month swap reflects the price differential between two swaps and thus is different from cash spreads. It allows traders to hedge their position from one month to the next. Dubai inter-month swaps are actively traded in London and Singapore, and are central to the determination of the forward Dubai price. Unofficial sources indicate large trading volumes of total Dubai swaps (the swap leg of Brent/Dubai and the intermonth combined) reaching the range of 8000–10,000 lots per day, of which around 60 percent is cleared by ICE or CME. The participants in these markets are quite diverse. They include Asian refiners, banks (Merrill Lynch, BoA, JP Morgan, Morgan Stanley, Société Générale), oil companies (BP, Shell), oil trading firms (Mercuria, Vitol), and Japanese firms (Mitsui, Sumitomo).

By linking the Dubai to the Brent complex, these markets have become central to identifying the Dubai price. This has raised some concerns as 'calls to use swaps as pricing benchmarks for physicals are at best uninformed as swaps are derivatives of the core physical instruments'. But this neglects the fact that liquidity in the Platts Dubai window is thin. In addition, the argument against using swaps is inconsistent with Platts' use of swaps (Contract for Differences, CFDs) in identifying the price of Dated Brent. It is also inconsistent with the fact that at times when no partials are trading, PRAs have no alternative but to use the financial layers to identify the Dubai price. Finally, the argument against swaps ignores the fact that the Platts window itself is some sort of an 'exchange' where financial instruments (i.e. partials) are traded and where physical delivery rarely takes place.

Therefore, in theory (and in practice to a large extent), the price of Dubai may be identified without resorting to any physical dimension or a window. It can

be derived from the financial layers that have emerged around Dubai and Brent (for instance, Argus identifies the Dubai price on the basis of the EFS market). The Brent complex sets the oil price level while the EFS and the inter-month Dubai spread market set the price differentials against Brent. These differentials are in turn used to calculate a flat price for Dubai. In practice, this is how trades are often reported. For instance, strong Asian demand relative to Europe reduces Brent's premium to Dubai, causing the Brent/Dubai EFS to fall and encouraging traders to send crude from the Atlantic Basin to Asia. The adjustment in the price differential is reflected in a higher Dubai price level. In other words, the Dubai market is just an extension, or another layer, of the Brent complex. The Dubai partials window tries to give Dubai a sense of distinctiveness. In reality, it fails to do so, as the high liquidity of the OTC market dominates other sources of price discovery. At times when partials trading activity is thin, one should question whether Dubai's Platts window provides a more effective mechanism for price discovery than the OTC layers.

In addition to the OTC markets discussed above, another financial layer has recently emerged around Dubai–Oman. In June 2007, the Dubai Mercantile Exchange (DME) launched the Oman Crude Oil Futures Contract to serve as a pricing benchmark for the Gulf region. Both Oman and Dubai use the DME futures market for pricing their crude oil exports to Asia. However, these have been the exceptions so far. None of the big Gulf producers such as Saudi Arabia, Abu Dhabi, Kuwait, Qatar, and Iran have yet made the shift. This raises the question of why other Middle Eastern producers have not been enthusiastic in shifting to the DME contract for pricing crude oil. It is certainly not because they are apprehensive about using futures prices in their pricing formula; many of these exporters already price their crude oil exports to Europe on the basis of BWAVE, an index calculated on the basis of prices obtained in the Brent futures market.

The Dubai Benchmark and some Wider Lessons for the Pricing System

The above discussion reveals some wider observations regarding the current international oil pricing system:

1. The financial layers that have emerged around crude oil benchmarks have become central, not only for market participants to hedge their risk and to bet on oil price movements, but also to the oil price identification process. At early stages of the current pricing system, linking prices to benchmarks in formula pricing, provided producers and consumers with a sense of comfort that the price was grounded in the physical dimension of the market. This implicitly assumes that the process of identifying the price of benchmarks can be isolated from the financial layers. However, this is far from the reality. In the case of Dubai, the price identification process reveals that the different layers of the oil market form a complex web of links, all of which play a role in the price discovery process. The information derived from financial layers is essential for identifying the Dubai price and may surpass the importance of information gathered through other 'constructed' platforms.
2. Since physical benchmarks constitute the pricing basis of the large majority of physical transactions, some observers claim that derivatives instruments such as futures, forwards, options, and swaps derive their value from the price of these physical benchmarks, i.e., that the prices of these physical benchmarks drive the prices in paper markets. However, this is a gross oversimplification and does not accurately reflect the process of crude oil price formation, at least in the case of Dubai. The issue of whether the paper market drives the physical market or the other way around is difficult to construct theoretically and test empirically, and requires further research.
3. The level of the crude oil price, which is what consumers, producers, and their governments are most concerned with, is not the most relevant feature in the current pricing system. Instead, the identification of price differentials, and the adjustments in these differentials in the various layers, underpins the basis of the current crude oil pricing system.

Conclusion

In 2000, Paul Horsnell argued that 'Dubai has ceased to be a meaningful market, and has become increasingly distorted.' A decade has now passed and Dubai still constitutes the main benchmark for pricing oil cargoes destined for Asia. Through a series of innovations – stronger links with the Brent complex, and transformation of Dubai into a brand name – market players have overcome some of the problems associated with the decline in physical production. However, these 'solutions' have created their own serious shortcomings, which raise doubts about whether Dubai really remains a meaningful market. This shows that as long as key market participants have an interest in maintaining the system, it will prevail. So far, the main market players – such as oil companies, refineries, oil exporters, physical traders, and financial players – have no interest in rocking the boat. But history has shown that players' interests could diverge and that structural transformations could occur, and if this happens, Dubai is likely to be the least immune to radical changes in the international pricing system. ■

Oil Price Benchmarks in International Trade

AMRITA SEN analyses how and when WTI wandered away …

Since the adoption of formula pricing in 1986, West Texas Intermediate (WTI) has served as one of the main international benchmarks, along with Brent and Dubai, against which other types of crude oil are priced. In principle, the movement in WTI prices is supposed to reflect supply-demand conditions in the United States, the largest consumer and oil importer in the world.

The WTI market is characterised by a large number of independent producers who sell their crude oil to gatherers based on posted price. The oil is then brought into Midland and directed either towards

the Gulf Coast refining areas or towards Cushing, Oklahoma. Cushing was the centre of US exploration from nearby fields in 1915 when it produced around 30 percent of higher-grade US oil. While production peaked that year, the web of infrastructure and storage influenced NYMEX's decision to use Cushing as the pricing point for WTI contracts in 1983. Cushing is a landlocked interconnect through which crude volumes move. The Cushing pipeline interconnect is spread over 9 square miles and has crude oil storage capacity around 65 mb (50 operable). Due to pipeline logistics, once the oil flows outwards from Midland towards Cushing, WTI can only go in one direction: north, towards Chicago. Thus, if there is a shortfall in demand from refineries in the Chicago area, there are no opportunities to re-direct oil flows out of Cushing towards other refining centres where there might be more demand for crude oil.

It has long been recognised that the link of WTI prices to other international benchmarks and to oil prices in other US regions is partly dictated by infrastructure logistics. Thus, WTI exists in the closed conditions of the Midwest, governed to the greatest extent by regional refinery dynamics, burgeoning flows from western Canada and by the logistics of the plumbing of pipelines in the region, all seen from the viewpoint of the value of oil in storage in Cushing. The recent disconnection of WTI prices is a clear example of how pipeline logistics can dislocate WTI not only from the rest of the world, but also from other US regions. While this is not the first time this has happened, it is the most severe and prolonged occurrence. In fact, in the past, the main logistical bottlenecks impaired the market's ability to get enough oil into Cushing; this bottleneck in many instances resulted in serious dislocations and WTI rising to very high levels compared to other benchmarks. The problem is now reversed: while the ability to get oil into Cushing has increased, the ability to shift this oil out of the region and to provide a relief valve for Cushing has been very limited.

In the recent past, for instance in 2007, the logistical constraints at Cushing have resulted in a short-term build-up in crude there, which then logically creates significant downward pressure at the front of the curve. The feedback then created distorted sets of time spreads reflected in the large differential between nearby contracts and further away contracts, i.e. the WTI structure flips into a fairly steep contango. Second, WTI decoupled from Brent, and other benchmarks like Light Louisiana Crude (LLS), evident in the large differential between the prices of the two (Figure 1). Finally, the build-up of stockpiles around the area of Cushing usually also resulted in the sour-sweet crude oil price differential narrowing significantly. Figure 2 shows that, while WTI was trading at a premium of more than $15 to the heavier and sourer Mars crude grade in the middle of 2008, the differential flipped to a small discount in early 2009 and now to a sustained discount of over $20 per barrel. The same is true for the heavy Mexican Maya Blend, which now trades at a premium to WTI.

However, the latest dislocation of WTI relative to other benchmarks has been the longest and the most prominent one, redefining its relationship in its entirety. The start of the dislocation dates back to the start-up of the Keystone pipeline. The Keystone Pipeline System brings Canadian crude to the US Midwest, with Keystone Cushing (Phase II) an extension of the Keystone Pipeline from Nebraska to Cushing, Oklahoma. Phase I, connecting Alberta with Illinois, has a maximum capacity to transport 435 thousand b/d of oil sands crude to Midwest refineries. With the Cushing extension, the overall Keystone system's capacity is raised to 591 thousand b/d, with the extension itself being able to transport about 156 thousand b/d. Since Q1 11, the pricing structure for WTI started assuming that all storage in Cushing was already full, or more precisely that it is inevitable that it will fill following the start-up of the Keystone pipeline connection into Cushing. It is that expectation which then dominated, together with the recalibration of expectations on domestic production, sealing the fate for WTI. With Canadian oil sands output rising strongly and conventional production declines easing significantly, together with Canada's inability to export crude outside the USA due to infrastructural constraints, the net result would be increased flows towards Cushing. Notwithstanding technical outages, the steady stream of new projects is set to add around 200 thousand b/d of capacity in 2011 and 250 thousand b/d in 2012, with the bulk of the growth materialising from heavy bitumen crude. Thus, an

Figure 1: LLS and Brent Differential to WTI (1st month), $/bbl

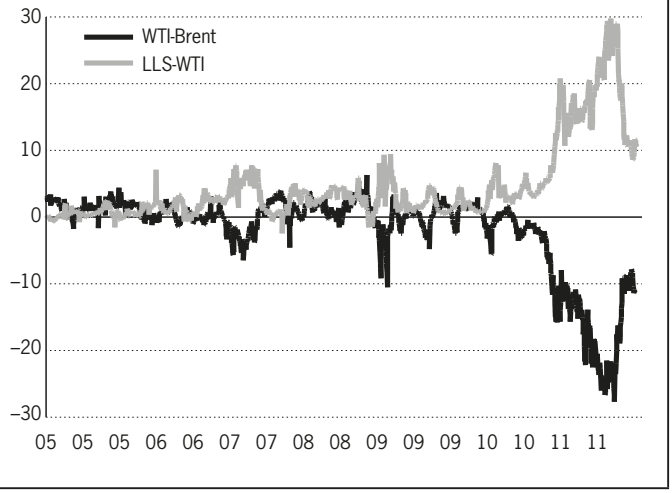
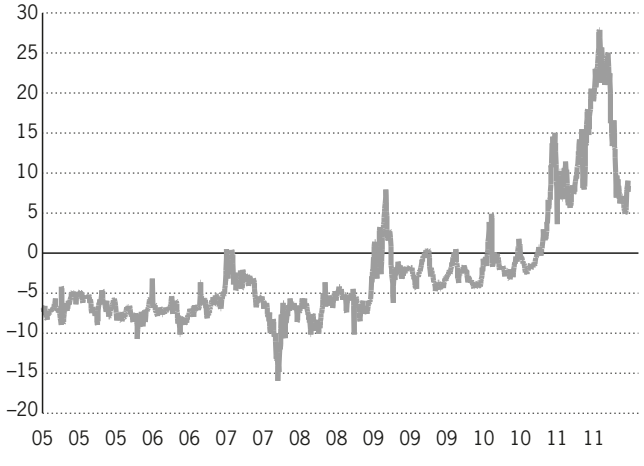


Figure 2: Heavy-light Differentials (Mars-WTI), $/bbl



existing sensitivity to local and specific intra-regional factors has been heightened by the start-up of the Keystone pipeline, resulting in intensified dislocations. This trend has been exacerbated by the increasing ability of US refineries to process heavy crude, and with additional coking projects slated to come online through this year and next, Canadian bitumen should continue to find a home in the US Midwest.

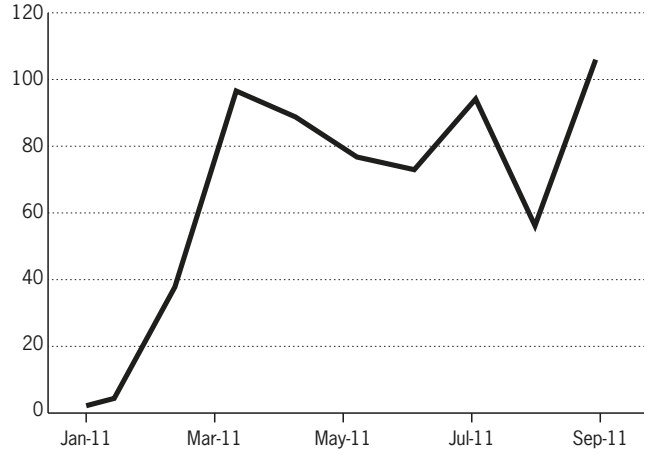
Furthermore, as mentioned above, the rapid commercialisation of liquids-rich shale plays in the United States provided some buoyant expectations of domestic US oil production, with the large part of that volume expected to make its way to Cushing, effectively backing out crude demand from that hub. Indeed, over the past two years, there has been a tangible acceleration in the discovery and rapid development of shale and tight sands plays in North America, especially plays that have extensive liquids windows. In 2011, this most positive trend has shown no signs of abating.

These days, the time line from discovering a promising liquids-rich shale play to commercial production has become astonishingly compressed. From emergent to core in two years has been the story for most of the American shale plays. The Bakken formation in North Dakota has been the poster-child of oil shales in the USA, with the rise in production phenomenal. In 2007, North Dakota's oil output stood at 124 thousand b/d, 16 percent of which (20 thousand b/d) was accounted for by Bakken, where a total of 441 wells had been drilled. Today, the state's output has grown to 500 thousand b/d (Figure 4), constituting just above half of the total Midwest production and the number of wells in the state stands at a staggering 6060. The success achieved in Bakken is fuelling the idea that similar results can be obtained in other shale-plays across the country, and in particular, Eagle Ford, where a large area of recoverable liquids play has been discovered. Moreover, precisely due to the lack of proper long-distance pipelines, companies such as Enbridge have added short-haul capacity to tie in to existing systems from Bakken with similar arrangements likely to be made for Eagle Ford liquids too.

Nonetheless, despite the general expectation that Cushing would fill up, today, Cushing stocks stand at their lowest levels since November 2009. Pipelines such as Seaway, Cappline and Spearhead have sent significantly lower volumes through 2011, due to this very dislocation of WTI. Moreover, depressed WTI values have already encouraged increased shipments by truck, trains and barges and, while these volumes remain small in relation to the growth in production, they are likely to continue to increase. If all of it came to fruition, 2012 could see an enormous 330 thousand b/d of new railway capacity between Bakken and St. James come online, with further chunky volumes of over 0.5 mb/d in 2013 and 2014 currently scheduled. Indeed, the greater the dislocation in WTI, the greater the incentive to speed up the takeaway capacity from the Midwest, and also the greater the incentive to send lower volumes to Cushing, wherever feasible. Equally, due to this very dislocation in WTI, refinery margins in the Midwest have been extremely attractive, reflected in fairly strong refinery runs seen over the past few months. Finally, Cushing storage itself has increased steadily and by the end of April this year, nameplate capacity would stand at over 75 mb, with current utilisation at just 48 percent (of operable capacity). Thus, much of the record $25+ dislocation in WTI was predicated on the theoretical possibility of Cushing being full, should all of the incremental Canadian and US oil output head there, as it remained landlocked, rather than being backed by actual data. Current fundamentals at Cushing, brought about by a sharp compression in pipeline flows from PADD 3 to PADD 2 along with increased takeaway capacity by rail etc, have not warranted as sharp a WTI dislocation as we had witnessed for most of 2011.

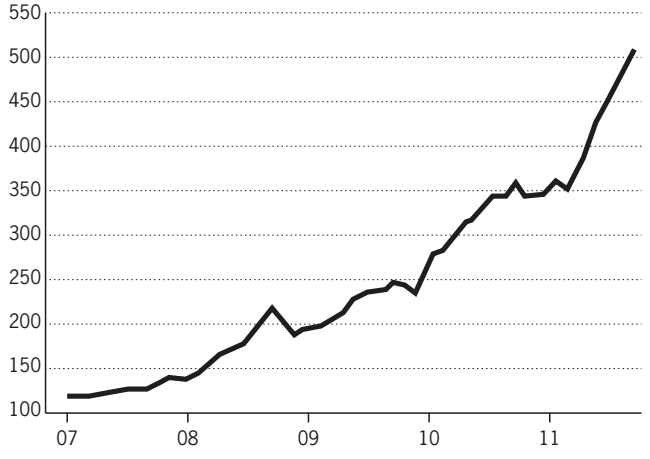
Two months ago, though, the announcement of the reversal of the Seaway pipeline resulted in a significant narrowing of the WTI-Brent and other similar spreads, due to the notion that the so-called US Midwest glut will now be resolved. Seaway could add a potential 350–400 thousand b/d off-take from Cushing by 2013, with the initial 150 thousand b/d being shipped by Q2 12. However, behind all this euphoria, a lot of key pipelines have actually been cancelled. Due to considerable political opposition, decision on the 0.6 mb/d Keystone XL pipeline has now been postponed, although the Republicans have attached it to the tax cut bill. Following Seaway's decision, the 0.8 mb/d

Figure 3: Keystone Pipeline Flow into Cushing, thousand b/d



Source: Genscape, Barclays Capital

Figure 4: North Dakota Oil Production, thousand b/d



Source: North Dakota government statistics, Barclays Capital

Wrangler pipeline is no longer coming online, and thus, outside the reversal of the 0.2 mb/d Longhorn and 0.4 mb/d Seaway, there is suddenly no new pipeline scheduled to alleviate growing supply into Cushing. What Seaway, nonetheless, does do is unlock the perception that Cushing is entirely landlocked with no infrastructure to move crude out to the Gulf Coast. But, given that some of the key pipelines have either been cancelled or postponed, effectively there has now been a net reduction in the potential takeaway capacity from Cushing in 2013, despite Seaway's reversal. Moreover, the movement of crude from Cushing by rail requires the WTI-LLS price differential to be around $8–$12 per barrel, which in effect would be the resultant boundaries of WTI's spread with benchmarks like LLS and Brent. If the spread falls below that, rail movement is no longer economical and extra volumes would start to move into Cushing, in turn widening WTI's spread to other benchmarks again until the conditions were reversed. Finally, as WTI's discount narrows, pipelines like Spearhead are likely to see an increase in flows (for instance, the Canadians are now sending larger volumes through Spearhead for February delivery) and could result in stock builds at Cushing.

Overall, the start up of Keystone followed by the boom in shale oil has proved to be a massively destabilising development for the WTI market given the tidal wave of expectations of full storage it has created. Across all points last year, there has actually been a lot of spare storage at Cushing available and there is more coming, but the market perception is that, however much is spare, there is now a structural imbalance at the margin that means all spare storage must inevitably fill. Neither Keystone not shale oil will destroy the WTI market, but their impact on expectations and the creation of the enormous rift with values on the Gulf Coast seem to suggest that WTI's days of being seen as a global marker may be drawing to a close. ■

Oil Price Benchmarks in International Trade

PETER CADDY sees a new US crude benchmark emerge

Over the past year the price of West Texas Intermediate (WTI), the main crude price reference in the United States, has shown record discounts to North Sea Brent, the main crude price reference in Europe. This was widely expected by the industry but caught many others by surprise.

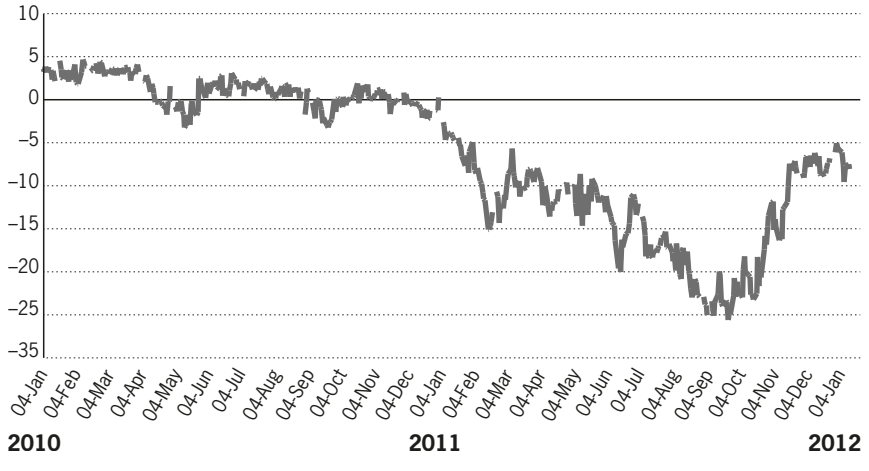
Usually the price of WTI is at a premium to Brent. The two crudes are of similar quality but there is a traditional WTI price premium because the USA is an importer of crude and needs to price at a premium to attract imported crude such as Brent. The reason for the WTI Brent price inversion addresses much of the confusion currently associated with trans-atlantic oil price differentials. And the consequence of the WTI inversion, the development of a new crude benchmark in the USA, also illustrates the relationship between futures prices and the physical market in a way that is well understood by the industry but often misunderstood by outsiders.

Price is critical to the flow of supply to consumers. The price signal tells the industry to produce or import more, or to produce or import less, in order to keep supply and demand in balance. Price benchmarks are a part of this critical price information because they allow different crudes to be evaluated under the same set of conditions allowing both sellers and buyers to obtain the best possible price and to operate in the most efficient manner. The price benchmarks also allow companies to manage their price risk.

The act of satisfying the customer with appropriate supply at the appropriate time creates efficiency, the benefits of which are shared by everyone. But if inappropriate benchmarks are used then the wrong price signals will be generated, supply will not be available to meet demand and the cost of this inefficiency will be borne by the consumer. The emergence of a new, more relevant, benchmark on the US Gulf coast was a prime example of how the industry, producers and refiners, worked together with a price reporting company to solve a potential problem before most of the world realised that it existed.

Domestically produced crude in the United States is priced relative to the price of the Chicago Mercantile Exchange's light sweet crude futures contract (colloquially called CME WTI). This is a very successful futures contract with the equivalent of 500 million barrels traded a day. The futures contract goes to physical delivery at Cushing, Oklahoma, an inland storage complex that is connected by pipeline to the WTI oil field at Midland, Texas. Other pipelines flow into the storage complex bringing large volumes of crude especially from Canada. However there has not been sufficient pipeline capacity to take crude from storage at Cushing to the refining centre on the US Gulf coast; consequently over the past year inventory at Cushing has built up and has

Figure 1: CME WTI less Argus North Sea Dated $/bl



been forced to clear to regional refineries at prices discounted to international levels. This has caused the WTI Brent price inversion. The price of WTI has become disconnected from global markets and has reflected the local landlocked supply and demand situation in the midcontinent of the USA. The price of physical crude at Cushing naturally becomes reflected in the price of the CME WTI futures contract because the futures contract goes to delivery at Cushing. But the conditions that determine the price at Cushing have been very different to the pricing conditions in the international market. The two became disconnected because of the inadequate pipeline connection between the US midcontinent and the US Gulf coast.

Traditionally US imports have been priced relative to WTI prices. But the anticipated disconnect between WTI prices and the international market has changed pricing formulas. Saudi Arabia, through its national oil company Saudi Aramco, previously sold its crude to US Gulf coast refiners, like other sellers of crude, on a pricing formula related to WTI. Saudi Arabian crude is of a different quality to WTI and competes with other crudes at the US Gulf coast, not at Cushing, so the Saudis priced their sales with a monthly price differential to WTI to take into account quality, timing and locational differences between the Gulf coast physical market and the Cushing price. But the problem was that the differential had to be set in advance of the crude arriving and was set for a calendar month. Circumstances could and would change between the initial setting of the differential and the end of the calendar month of pricing with the consequence that the differential would end up far too high or far too low. If Saudi crude prices were too high then US Gulf coast refiners would suffer, potentially very badly, in volatile price conditions. If the prices were too low the Saudis would be encouraged to seek better prices elsewhere leaving the US refiners without a sufficient supply of crude. It was essential therefore to identify or develop a benchmark that would allow Saudi crude to be priced in a stable manner.

The answer was the Argus Sour Crude Index (ASCI) price, which provides a daily benchmark for medium sour crude sold in the US Gulf coast market. Its key benefit is that buyers and sellers have a representative US Gulf coast price for long-term contracts. The daily ASCI price is a volume weighted average of the deals reported for three medium sour grades of US Gulf coast crude: Mars, Poseidon and Southern Green Canyon. These grades are actively traded on the US Gulf coast with a wide array of buyers and sellers. The deals are priced, like other domestic US grades, at differentials to WTI. But by constructing a new benchmark that incorporated the differentials of the physical grades, in addition to the underlying WTI price, the ASCI price naturally compensates for any swings in the price of WTI that reflects its landlocked nature. So if the price of WTI falls relative to international levels the grade differentials, established at the Gulf coast, adjust and compensate. And similarly if the price of WTI rises relative to global prices the physical differentials of the grades adjust accordingly. Establishing a benchmark that incorporates the physical differential for physically traded crudes, in addition to the underlying price reference of WTI, allowed differentials for Saudi crude to be set according to quality without the risk that the underlying price reference could be distorted by volatility on WTI.

The concept has proved very successful. Saudi Aramco began using the ASCI price for sales to the US Gulf coast market in January 2010, Kuwait followed in February, and Iraq in March. The contracts use the ASCI benchmark with monthly adjustment factors but these factors are relatively stable month on month providing everyone with a greater sense of pricing confidence. As a result Middle East crude has steadily flowed into the USA without bankrupting US Gulf coast refiners, as both buyers and sellers are confident that they have a benchmark that reflects international prices. Furthermore because ASCI uses WTI within its formula the opportunity for buyers to manage their price risk on CME WTI futures remains.

The success of the ASCI benchmark throws light on the nature of crude pricing. It is widely assumed in academic circles that crude oil is, or should be, priced against a futures benchmark. This doesn't happen in the real world because the price of any physical crude will have a basis risk compared with any futures contract. This basis risk will reflect the difference in the contract terms, and the elements that tend to carry the greatest risk will be timing, quality and location. These risks can be managed through differentials but if the differentials are set for a month, as they tend to be in long-haul term contracts, then the risk from the underlying unpredictability of the futures price compared with the set monthly differential is high. What has emerged on the US Gulf coast is a futures market providing a price reference, a reference that is liquid and is used for price risk management, but which is not used as the physical benchmark for Arab Gulf imports.

The physical benchmark, the price that provides the baseline for evaluating the alternative values of prompt physical crude, is the ASCI price, which incorporates both the price reference and the collective differentials of a set of highly traded physical crudes. This does not mean that CME's WTI futures contract is a failure – it is still used extensively for hedging and managing risk along the forward curve. Nor does it mean that a futures contract based on the ASCI benchmark could, or should, replace the CME WTI contract. Instead it shows that price risk management through a futures contract requires a liquid contract but such a liquid futures contract is rarely an appropriate benchmark for physical crude. This contrast is even more apparent in Europe where the basis risk between the first month forward contract for ICE Brent futures carries an even greater time basis risk to physical prompt crude than is the case for CME WTI and WTI cash in the USA.

Going forward, the disconnect between WTI prices and the Gulf coast is creating a secondary benchmark in Light Louisiana Sweet (LLS). LLS is actively traded and LLS look-a-like crude can be created from blending other crudes. Trade activity on LLS swaps has risen sharply as global crude market participants hedge their physical exposure and traders are now deriving their differentials to WTI by starting with the LLS-Brent spread. Refiners and producers along the US Gulf coast have shifted to marking their quarterly and annual reports to LLS prices instead of WTI. The WTI price inversion looks like continuing because of the storage volumes at Cushing, although several pipeline projects have been proposed to take crude from Cushing down to the US Gulf coast which would have the consequence of bringing WTI prices back in line with international levels.

The two main projects under discussion are the reversal of the Seaway

pipeline and the Wrangler pipeline. Approval to build a new pipeline to the Gulf coast called Keystone XL has been delayed until later this year, adding to uncertainty about the duration of the WTI dislocation. But the likelihood remains that prices at Cushing will not represent value at the US Gulf coast. The impact of the disconnect is now being felt on the pricing of sweet crudes. Oil companies are increasingly benchmarking against a price from the physical oil trade in LLS that reacts to global as well as local fundamentals. And because LLS is a blended crude it can be created by mixing either foreign or domestic crudes, so can respond to supply developments from imports and the new shale production. Price risk management is already occurring in the incipient LLS swaps market and also, because LLS is traded at a differential to WTI, on the CME. LLS has already become a robust marker crude. And it looks like imitating the ASCI price in providing that important distinction between a physical benchmark and a futures pricing reference. ■

Oil Price Benchmarks in International Trade

GIACOMO LUCIANI urges Gulf producers to be more proactive in creating a market for their crude

Speaking at the inaugural session of the World Future Energy Summit in Abu Dhabi, Chinese Prime Minister Wen Jiabao, was quoted as saying: 'To *stabilise the oil and natural gas market*, we may consider establishing, under the G20 framework, a global energy market governance mechanism that involves energy suppliers, consumers and transit countries.' (...) 'We need to formulate ... *binding international rules* **through consultation and dialogue, and set up multilateral coordination mechanisms covering *forecast and early warning, price coordination, financial regulation and emergency response*.' (emphasis added)**

On the same day, the Saudi Minister of Petroleum, Ali Naimi in an interview with CNN said: '***Our wish and hope is we can stabilise this oil price*** and keep it at a level around $100 a barrel. If we were able as producers and consumers to average $100 I think the world economy would be in better shape.' A few days later, the recently appointed Governor of SAMA – Saudi Arabia's central bank – said that the Kingdom would offer excess oil production capacity if needed to balance oil prices, and that he expected prices to stay stable.

It is then evident that the issue of price 'stability' remains very much a concern of major importers and exporters alike – notwithstanding that, relatively speaking, prices have been rather stable since the spring of 2009. This should be no surprise, because relative stability is explained by contingent circumstances, and may not last long. A structurally unstable market may well display temporary stability.

Tight liquidity and credit conditions obviously are an obstacle to speculative position taking, and the appetite for risk remains quite scarce. Lingering doubts about the strength and persistence of a global recovery cast a shadow on the otherwise prevailing narrative – which insists on investment on new oil production capacity being insufficient and supply being inevitably tight in the middle of the current decade.

Developments in the United States – the rapid increase in 'light tight' production and the macroscopic dislocation of WTI, which has only partially been reabsorbed – also discouraged the formation of a new price wave, although their significance for global supply/demand equilibrium is manifestly limited.

Yet it is not difficult to see how either geopolitical developments (sanctions on Iran, even if there is no attempt at closing the Strait of Hormuz; or a worsening of security conditions in Iraq, leading to an evaporation of the prospect that Iraqi production may soon significantly increase); or simply a consolidation of growth in the United States and enough of a continuation in China, may again convince the market that oil prices have only one direction to go, and that is upwards. Then expectations will turn into self-fulfilling predictions, and investors will push prices up, waiting for others to let them climb further.

The inadequacy of policy instrumentation proposed in order to achieve price stability borders on the incredible. Ali Naimi has no other tool in his box except issuing declarations: 'Our wish and hope...', but no indication whatsoever of steps to be taken to obtain the desired result. Even the intent of the Minister has largely been misunderstood in the press, that read it as a target, a minimum level of prices acceptable to the Saudis, up from the $75/b that King Abdullah had described as 'fair' three years earlier. In fact, the Saudi Minister cannot ignore that the King's 'fair' price has been exceeded systematically since early 2010; and even his desired price of $100/b is lower than the front month Brent price has been for most days in the past year.

At the opposite extreme, the Chinese Premier's suggestion that the G20 moves to establish 'binding international rules' 'covering forecast and early warning, price coordination, financial regulation and emergency response' demonstrates little understanding of the functioning of oil markets.

In fact, it would be possible, through a package of coordinated policy initiatives, to achieve greater stability and predictability in oil prices; but the exercise must be rooted in the reality of the oil market as it exists today, introducing gradual change rather than imposing political or administrative controls.

The most obvious weakness of the current market organisation is its reliance on two benchmarks – WTI and Brent – whose validity for global oil price discovery has been continually eroding, and is now highly questionable.

In the case of WTI, insufficient pipeline capacity to pump crude oil out of Cushing has led to a prolonged disconnect between the two markers. Although the situation has improved after it was announced that the flow of the Seaway pipeline is to be reversed, this is hardly a longer-term solution, considering that production in the Midwestern states is expected to increase significantly. At the time of writing, the net impact of President Obama's rejection of the

Keystone pipeline project is not yet clear. In any case, it is now evident that the price of light, sweet crude for delivery at Cushing is influenced by inland US logistics much more than by global demand and supply. One can hardly see how the Nymex contract may continue to serve as price discovery or hedging tool for seaborne crude oils, whether imported into the United States or traded between non-US parties.

Brent has fared better, but the physical base of it, notwithstanding the enlargement of the pool to include Forties, Oseberg and Ekofisk, is dwindling. In addition, the trade is moving rapidly towards the East, and it is not at all clear why Gulf crude sold to China, Japan or Korea should be priced out of a North Atlantic base.

Yet a benchmark, once established, attracts liquidity; and liquidity attracts further liquidity. Such circularity creates an extraordinary inertia that makes it extremely difficult for one or more alternative benchmarks to arise and syphon liquidity away from established benchmarks, even if the latter are ailing and increasingly unreliable. Nevertheless, immortality cannot possibly exist even for benchmarks: sooner or later shifting equilibria and market realities will impose a realignment of the market around one or more new markers.

The issue therefore is whether it is preferable to keep patching up benchmarks whose validity for price discovery has almost completely waned, or to move in the direction of facilitating a transition.

How can a transition be sought? Obviously we should be looking for alternative benchmarks and move in the direction of designing a market based on them. There is no simple solution to this puzzle, but several alternatives can and should be explored. The community of predominantly physical traders should actively engage in this exercise.

Solutions that have been proposed include an Eastern Mediterranean base (e.g. Ceyhan, where Azeri, Iraqi and possibly Russian and Kazakh crude oils may converge, if the Samsun-Ceyhan pipeline is ever laid. Alternatively, Novorossiysk may be considered as a base for Russian, Kazakh and Azeri crude, although the lack of a by-pass offering an alternative to passage through the Turkish Straits is a major drawback. Furthermore, both of these alternatives may still be too 'Western orientated'. The ESPO pipeline has been suggested as an alternative base for trading Eastern Siberian crude in the Far East. All of these possibilities may be worth exploring.

However, it is clear that the only longer-term solution to having a truly global marker is to base one on oil exports from the Gulf. The Gulf is and will remain the origin of the most important crude oil flows, serving markets all over the world. A stable global oil market can only be based on a Gulf marker.

That requires that the Gulf oil producers – Saudi Arabia first and foremost – accept that their oil be traded. They could take a 'permissive' attitude – simply scrapping destination restrictions, and allowing a secondary market to develop in their crude qualities. Or, and in my opinion preferably, they may take a more active stance, and design the rules on the basis of which they themselves, either individually or as a group (GCC), will create a market for their crude.

"The most obvious weakness of the current market organisation is its reliance on two benchmarks – WTI and Brent."

The way in which this can be achieved is through controlled auctions for primary sales – i.e. the sales from the NOC of the relevant country to third party buyers. Auctions should be conducted at frequent intervals with no ex ante engagement as to the quantities that will be sold. The seller will receive bids for how much each buyer is ready to buy at which price, and will simultaneously decide on the quantities that are to be sold and at which price. Primary sales should preferably take place well in advance of the delivery date (perhaps three months forward) so that buyers will have an opportunity to trade on the secondary market until the oil is actually lifted.

If well implemented, this mechanism will give the major Gulf oil-producing countries the possibility to credibly influence prices. If applied too rigidly, the mechanism may even freeze prices for a while, but this would not be wise on the part of the producers. They should rather allow market forces to emerge through the auctions and secondary trading, and constantly adjust prices, at the same time keeping variations under control.

The smooth functioning of a cleverly designed, Gulf based oil marker may further be enhanced by some other emerging trends. The most important is probably the tendency among Gulf NOCs to invest in refining both domestically and in key markets abroad, thus selling more of their oil as products rather than crude. Under the leadership of Khaled al Faleh, Saudi Aramco now envisages lifting its refining capacity to 8 mb/d, with a large share located in China. It is not by chance that the company has launched the Saudi Aramco Products Trading Company, which became operational in the early days of 2012. Products sales are necessarily much more closely related to specific demand conditions in the various national markets, and less vulnerable to the influence of financial variables.

Another key trend is the rising importance of Far Eastern markets – notably China. China can offer something that the free markets of the industrial countries cannot offer: demand security. The latter is very important for the Gulf producers, and the key to ensuring that sufficient investment will go into production capacity. We should not be surprised the day that we shall witness the birth of a 'China Medium Term Oil Price', in the context of long-term supply agreements that are already implicit in decisions concerning refinery investment localisation.

In other words, it is not at all to be excluded that the oil market might evolve in the direction of being less global and more regional – thus coming to more closely resemble the natural gas market. With WTI increasingly reflecting domestic US conditions, and trade between the Gulf and the Far East closely controlled by governments, multiple regional prices may well become the rule. Arbitrage would still be possible, but not to an extent that would eliminate differences.

The ensuing 'fragmentation' of oil prices may well increase the influence of fundamentals, encourage divergent expectations, and, in the end, lead to a more stable and predictable system of oil prices.

Oil Price Benchmarks in International Trade

SALVATORE CAROLLO considers the divorce between Brent and the oil prices

For some years now, the price of oil has been out of control. None of the industry players, oil companies, producing or consuming countries, is able to set the price level or influence its movement. The price of oil, in the imagination of some consumers, is still determined within the context of the power balance between producers and consumers that developed during the 1970s and 1980s. Since the end of 1998, however, no one has been able to forecast the oil price correctly, showing there is no control over the fundamentals of the market and no comprehension by observers of its real dynamics.

The main economic principle that the price is determined by the interaction between demand and supply, applied toutcourt to the oil market does not work. OPEC has implemented output cuts and hikes on numerous occasions, but always with limited effects. To every public announcement of increased production by the OPEC countries, the markets have responded with an increase in the crude oil price by at least a couple of dollars per barrel. And vice versa, when OPEC has announced output cuts (Figure 1).

It is therefore reasonable to question whether the supply-demand framework should be applied to the oil market. Or, rather, that the technological complexity of this market does not allow it to be modelled on the simple relationship between demand and supply at a global level.

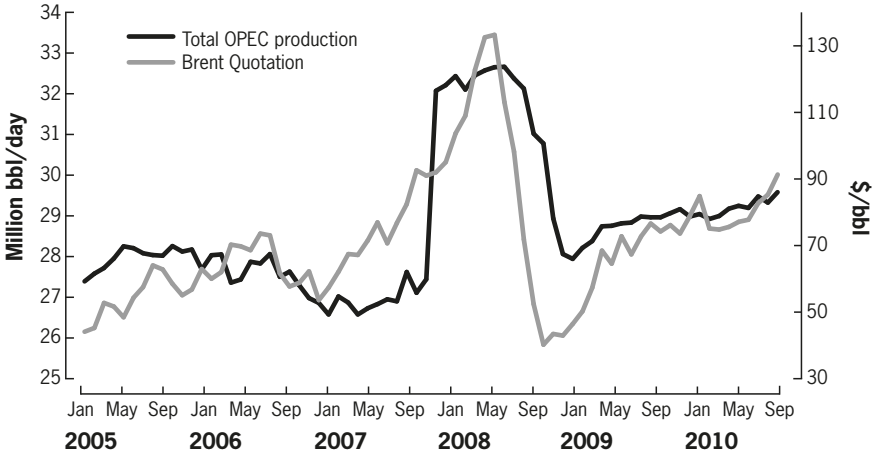
One starting point should be the recognition that what is commonly called the oil market is actually composed of different markets which operate separately and independently but which are linked by certain complex forms of interactions (Figure 2). We cannot neglect the dramatic developments of the futures market and its predominant role in today's world economy.

The upward trend in prices underwent a brisk acceleration in spring 2008 and went on to touch a peak of $144/b in summer. After this we saw a spectacular nosedive of almost $110/b. Analysts, economists and commentators have tried in all possible ways to provide explanations, (sometimes far-fetched) for this apparently unexplainable phenomenon. The growing divergence between the physical crude oil market and the dynamics of the crude oil price seems more and more linked to:

- The distortions created by the new environmental laws, in the context of the lack of adequate investments in the world refining sector.
- The effects deriving from the historical OPEC decision to index the price of their crude oils to the financial market of Brent.

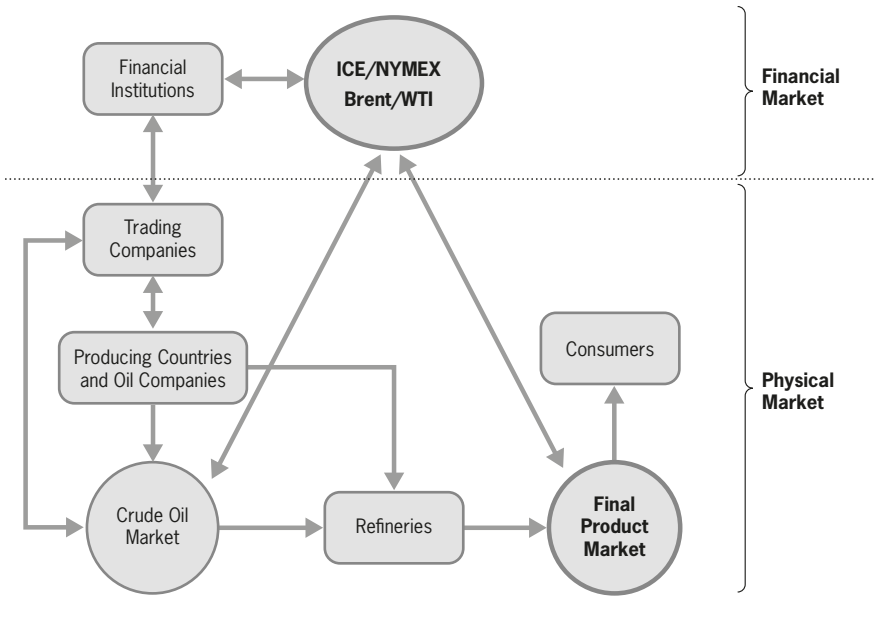
The development of environmental regulations in the last two decades has created burdensome (but unchallengeable) limits on the oil industry, but has not driven the bodies concerned to make the investments necessary to create 'compliant' energy and products. The result of these divergent processes has been the net reduction of availability of finished products marketable in the western industrialised countries. Clean gasoline and gasoil have become short. A glance

Figure 1: OPEC Production vs. Brent



Source: International Energy Agency

Figure 2: Complexity and Interdependence in the Oil Market



at the newspapers is enough to discover the limitations imposed on motorists in Middle Eastern countries (Iran, Egypt) or all of West Africa.

The deficit of these high-quality finished products has bolstered the rise in crude oil prices, particularly the light varieties such as those from the North Sea or North Africa. This is somewhat like what would happen if, for some reason, a rule was introduced to allow the sale of only choice cuts of meat (fillet steak, entrecôte, silverside): the price of these would rise but so would the price of the cow.

In December 1988, OPEC decided to adopt as reference for the price of crude oil (rather than the value of the Arabian light, the Saudi crude of light quality), the value of the Brent. At that time, everyone thought that this was the price of the crude produced in the North Sea the name of which was indeed Brent. No one realised that this was a misunderstanding, a case of a homonym. The Brent in question was not a crude oil, but a financial commodity.

Let us imagine, for a moment and as a game that OPEC had decided to adopt, as a reference for fixing the price of oil, the value of a particular type of cherry tomato, to which the creator and biggest producer gave the name of 'Brent'. Once the decision was taken, it would become obvious that the price of oil would depend, almost exclusively, on the supply and demand of Brent cherry tomatoes on the international market. Plentiful harvest would yield low prices; a difficult year would yield high prices. Cherry tomatoes in fashion would yield high prices; and so on. In this context, no one would dream of looking at the supply and demand of the physical crude oil to analyse the movements of the price or to make predictions of the future.

What is in fact the Brent market, the true one that defines the price of oil? In the eighties a paper market was created, that of the futures contracts, which are like plastic cards (or stickers) on which a barrel of crude is depicted. Whoever buys these plastic cards buys the 'picture' of a barrel, but does not have any possibility of exchanging a plastic card with a real barrel. The market of the oil stickers is a market that is almost totally independent from the real oil market, with bodies that operate there and dominate it and that normally have no relationship with or interest in the oil industry.

In December 1988, the OPEC countries decided that the price of their crude oils would be fixed on the basis of the value of the 'oil stickers'. This was an almost unnoticed change of a geo-political nature that transferred control and management of the international oil market out of the hands of the OPEC countries to those of the City of London and Wall Street. This was the event that overturned the balance of power that had been established starting from the crisis of 1973.

For years the constant expansion of this parallel market supported the real market. The value of the 'picture of the barrel' was almost always higher than the one the physical market would have guaranteed, bringing benefits to those who invest in this sector and to the various producing countries. Yes, it is a crazy game, but with a useful purpose.

In the autumn of 2008, the bankruptcy of the principal banks, that owned massive quantities of oil stickers, obliged them to sell the oil stickers therefore causing a slump in the value of such stickers and hence in the price of oil, the reference value of which derives from these.

Initially, the oil futures market had in common with the oil market, apart from the name Brent, the historic fact that it was born to support the trading operations of the oil companies, as a financial instrument to provide risk hedging against oscillations in crude oil prices.

At the start of the year 2000, the oil futures market detached itself almost completely from its original nature, becoming a market purely for financial purposes. International banks entered this business without having any involvement in the oil business, just as an opportunity to make profit, but also some oil companies and almost all the oil trading organisations were starting to consider the futures market as an independent business beyond the hedging purposes.

All those analysts who tried to explain the movements of the crude oil price on the basis of the evolution of the relationship between demand and supply of physical crude have failed, simply because the link between the financial market and the crude oil market has become increasingly ephemeral or even non-existent.

Table 1 clearly shows how the volume of business on the crude oil futures market has risen tenfold in the last ten years, closely following the entry of the great financial institutions in this field and the change in the attitude of the traditional oil players. This has caused a complete disruption of the internal dynamics of the oil market.

During the years 2008–2010, with world crude and NGL production around 86 million barrels/day, only about 20 mb/d were marketed. The remainder, about 65 million b/d, was not put on the international markets because it was consumed directly by the producing countries.

Now let's look at the volumes traded on the Exchange: here we have a totally different picture and with degrees of magnitude enormously higher. During 2008–2010, about $51 thousand billion were traded on the futures market, that is to say, 27 times more than the value traded on the physical market and about 6–7 times more than the entire world production of crude. The physical market represents only 3.8 percent of what we call the 'Oil Market'. And OPEC is just 30 percent of the 3.8 percent. In such a context, can OPEC really determine or even influence the oil price?

Table 1: Comparative Analysis of the Value of WTI and Brent in the Financial and Physical Markets, January 2008–December 2010

	Production of physical crude oil	Transactions of physical crude oil	Transaction of equivalent oil in the financial market	Ratio Futures/physical	Ratio Physical/futures
Volume (billion barrels)	93.7	23.4	623.1	27	3.8%
Value (billion $)	7,594	1,899	50,806	27	3.7%

Sources: Nymex, ICE, IEA

Asinus Muses

That 1980's show

It's that time again: a new Conservative government in Britain needs to distract its population from its mismanagement of the macroeconomy. So we're due another Falklands conflict. Fortunately, neither side of the altercation is in any position, financially or militarily, to turn their tiff into a physical confrontation. But there has been plenty of huffing and puffing. The Argentines have complained to the UN, while the UK sent the destroyer HMS Dauntless, and Prince William in military garb, to the island, in what one observer described as 'William-waving'.

In a set of extraordinary rhetorical googlies, the UK has accused Argentina of colonialism, while the Argentine president, Cristina Fernandez, exhorted the UK to 'give peace a chance'. The great Argentine writer Jorge Luis Borges famously described the last Falklands conflict as 'a fight between two bald men over a comb'. If only that were still accurate. Unfortunately the islands are no longer merely a comb: now, both sides are keen to shine up their bald pates with the oil that lies under the surrounding sea. For it turns out – surprise! – that an otherwise-absurd disagreement is really about resource ownership.

Colonial swings and roundabouts

Asinus finds it difficult to muster much sympathy for either side. For the British, if it were really about self-determination of the 3000-odd islanders (and I use the term 'odd' advisedly), who were awarded British citizenship only in 1983, then they could accept that the oil is on the Argentine continental shelf and just give up the drilling rights. That would surely be enough for the South Americans. On the Argentine side, the idea that the occupation by the British in 1833 was outrageous colonialism sits uncomfortably with the fact that the Argentines were proudly murdering their own indigenous folk and taking their land, the original natural resource, through the 1870s and beyond in the famous 'Conquest of the Desert', the 'Desert' in question being the home of said indigenous peoples.

Fathers of the people

Argentina's influence extends beyond the southern Atlantic all the way to Southern Europe, where the 'Argentine solution' remains a likely outcome for Greece – default on your debts, drop your currency peg, and clean up the resulting mess on your own terms. In the wake of Argentina's default in 2002 the MIT economists Rudiger Dornbusch and Ricardo Caballero argued that the country should give up economic policy-making to a panel of external 'experts'. Such *éminences grises* would of course be trusted to run the economy to the benefit of the people, and much more effectively than anyone those people might be foolish enough to vote into office. Argentina didn't accept the offer (and has since averaged about 8 percent growth). Greece, without even having pulled the Argentine plug, has jumped directly to the stage of being told to give up its sovereignty: Germany is demanding that Greece commit to austerity measures that would tie the hands of the next government, whoever gets in – neatly bypassing the notion that democracy is supposed to mean that voters get some input to policy making. One Greek politician dramatically declared that Greece 'can do without the German boot.'

Apparently it can, in that Greece's new provisional government is succeeding in stamping out opposition all on its own, having pushed through their desired austerity measures in the face of massive popular opposition. With exquisite irony, the unelected 'technocratic' Prime Minister Lucas Papademos stated that 'Vandalism, violence and destruction have no place in a democratic country and won't be tolerated.' Asinus cannot resist responding to the wonderfully named Father of the People: and what about in your country?

They live to serve

Some think that rule by technocrats runs counter to the great Greek tradition of democracy. But while they may have invented the concept, Asinus notes that the original version was not altogether unlike the current set up: 'the people' for whom, and by whom, the original Athenian polity was run did not extend beyond about 30,000 men, or 10 percent of the population (according to our modern-day Oracle, Wikipedia). Back then, membership of this elite was achieved through military service. In the modern world the requirement is financial service. Papademos was governor of the Central Bank of Greece while Goldman Sachs was helping the government hide its debts from the European Union – the same Goldman Sachs that is the former employer of both the Prime Minister of Italy, Mario Monti, and the President of the European Central Bank, Mario Draghi. (As ever, the Americans are ahead of the curve on this, having had Goldman US Treasury Secretaries since the 1990s.)

Stir it up

In his last missive Asinus reported on Britain's argument with the rest of Europe over fiscal monitoring, a conflict in which we are probably on the same side as Greece. Such matters make our long-running disagreement over the 'Elgin Marbles' look rather trivial. Now if only they were to find oil under the Parthenon, things might get really interesting.

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