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Brent prices: Impact of PRA methodology on price formation

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Oil prices are largely formed at the junction of the financial sphere and the physical sphere. This is particularly true for the main markers, such as Brent prices. The term "Brent prices" may refer to several type of contracts (see, for example, Bossley 1999) traded by physical and financial participants. The main contracts interacting in the Brent sphere are ICE Brent futures contracts, Dtd. Brent, Forward Brent and Brent CFDs. In this article we look at the interaction between these contracts, resulting in part from the price assessment methodology of Price Reporting Agencies (PRAs). Our conclusion is that changes in PRAs methodology in the past ten years, first aimed at avoiding price manipulation, today can guarantee an anchor to the physical market for oil prices.

The question of the relationships between physical and financial oil prices is particularly crucial at a time when oil prices in the futures markets can be largely impacted by passive investments in commodities, loose monetary policy or financial plays on futures markets. 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 side, 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 stocks. At the heart of the debate are the relationships between oil futures prices and the physical price for oil. While oil futures prices are likely to respond to new demand from commodity investors, the physical price for oil must remain compatible with oil market fundamentals. In a simple approach, the only way futures price increases can impact physical oil prices would be through carry trade. High demand for futures contracts would increase forward prices versus spot prices, creating a contango and giving incentives to traders to put oil into storage. The result would therefore be to remove oil physically from the

market and tighten the physical market. More sophisticated models, where delays in reaction and very low price elasticity of demand are considered, show that even small imbalances can create large price variations, with no immediate impact on fundamentals (see Babusiaux and Pierru 2010). The impact of future markets could therefore contribute to establish oil prices in a very wide range, which would remain compatible with short term fundamentals. 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 (see for example Fattouh, 2011, p. 50). If it is the case, it could be problematic, because futures prices do not always respond to physical oil market balances and can be formed in part outside the sphere of the physical oil market. Physical oil prices linked to futures could send an incorrect signal to oil markets, further accentuating imbalances in some cases. It is therefore crucial to understand the formation of physical oil prices, the role of futures prices in PRA assessments and the links between futures, forward and spot prices resulting from the assessment process.

In the first section of the article we look briefly at the functioning of the Brent market. In the second section, we review the details of the process of price assessment by the main Price Reporting Agencies, and in particular assessments used in the formation of the Dtd. Brent quote. In a third section we look at the computation of the Dtd. Brent quote. The fourth section concludes with the interaction between physical and future oil prices.

(1) Brent Market

Most physical crude trade is down in OTC, non-public, deals between oil producers, traders and refiners. Oil prices are therefore not directly visible, but are rather assessed and reported by Price Reporting Agencies (PRA) 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% of world crude trade. A West African producer, for example, will sell crude oil to a refiner in Europe or the US at a differential to Dtd. Brent price. A Middle East producer could index its contractual crude sales to a European refiner to a Brent-related formula. In Europe, North Sea grades are generally exchanged at a differential to Dtd. Brent or Forward Brent price.

The market for North Sea crudes obeys some peculiar rules, inherited from the history of market practice, described in detail in Horsnell and Mabro (1993) or in more general terms in Bossley (1999). Since then, however, the market has undergone very significant changes. The physical market is dominated by the Brent forward contract, resulting in the delivery of 600kbl cargoes of Brent, Forties, Oseberg or Ekofisk. A quick history of the contract helps to understand current market practices.

Historically, the Brent Forward contract referred to a cargo of Brent crude oil in a forward month, which has to be made available by the seller to the buyer in a given month –with no date specified in the month. Brent forward was first referred to as the 15-day contract, because the seller had to inform the buyer of the particular cargo it

intended to sell in the contract at least 15 business day before the loading period. Cargoes were of 500kbl, with an operational tolerance of +/- 5%. Once a cargo has been nominated through a 15-day contract, the status of the 15-day contract changes (it becomes attached to a "wet" cargo) because it now relates to particular dates of loading (generally 3 days) and the volume of the cargo (max or min) has been decided by the buyer.

The process of moving from forward market to physical market (Forward Brent becoming a particular cargo of Brent crude oil) is as follow:

(a) Refiners, producers and traders enter into a 15-day contract agreement for a particular month.
(b) Brent shipping operator (Shell) announces the loading programs at least 15 days before the month start to be wet.
(c) Brent equity producers start the chain of nominating cargoes to buyers (or they can keep the cargoes for themselves). A buyer benefiting from a nomination can keep the cargo or pass it to another player in the market, with whom it has another 15-day contract. Participants on the buying side of the contract must accept the cargo nominated, as long as it is notified 15 days before the start of the date of loading at before 5 PM. After this deadline, the cargo becomes wet, physical, with a precise date of loading and stays with the participant last notified. If Brent prices are in backwardation traders have an interest to keep a cargo and, on the contrary, to pass it if the market is in contango.
(d) When a cargo becomes wet it appears in a different market: the market for Brent Dated, with cargoes loading between 7 and 15 days, can continue to change hands.

Prices for the different maturities of 15-day contracts and Dtd Brent are assessed by PRAs, by calling market participants at the end of the day to record deals happening. Dtd Brent price has become largely used in contracts for the pricing of crude oil worldwide. Since 1989, a Brent futures market has developed (first on London IPE and then on ICE), based on the Brent physical market.

Problems started to arise in the 2000s when the natural decline in Brent production significantly reduced liquidity in the market, increasing the possibilities of squeezes and pricing plays on the main marker. Between 2000 and 2002, several squeezes and price games occurred, introducing significant distortions to prices. To address this problem Platts (the main PRA for Brent; Platts prices were used in most contracts) and the oil industry took several measures. In 2002, in order to increase the number of cargoes deliverable in the forward contract, the assessment period was changed from 7-15 days to 10-21 days, and Forties and Oseberg were included in the set of crudes deliverable into the forward contract. Later on, in 2007, Ekofisk was included, and on January 6th 2012 the assessment period was extended to 10-25 days. With the introduction of other grades as deliverable to the forward contract, the Dtd Brent (or Dtd BFOE) quote does not refer only to the Brent blend. It is now the cheapest of the Brent, Forties, Oseberg and Ekofisk assessment of cargoes loading in the next 10 to 25 days. In practice, since the start-up of the Buzzard field feeding the Forties blend in January 2007, Forties has almost always been the cheapest of the four grades (Buzzard has a greater sulphur content than the other Forties grades, which reduces its

prices). Since mid- 2007, Platts has introduced a 'de-escalator' in its Forties assessments, representing the premium a seller has to pay to the buyer based on sulphur content. The quality of Forties can change when the Buzzard field is in maintenance, improving the quality of the grade and increasing its price above other grades. In general, however, Forties makes the Dtd Brent quote and accounts for almost all crude delivered through the Forward Brent contract unless sellers no longer have this option. The addition of other grades to the Dtd Brent Forward contract has put a cap on potential squeezes on Brent.

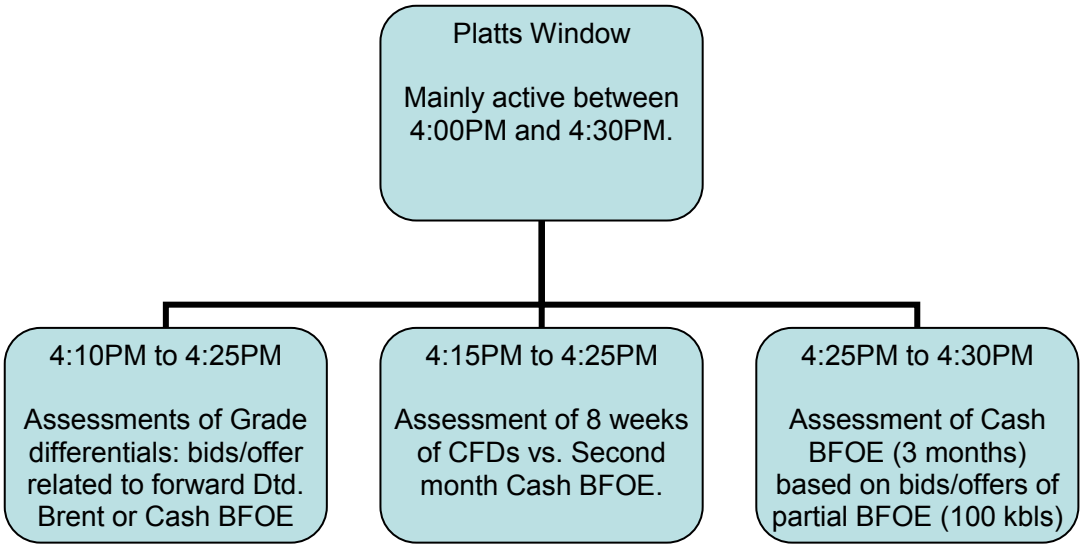
The Dtd Brent quote today reflects the value of the cheapest cargoes of Brent, Forties, Oseberg and Ekofisk, of 600,000bl, with an operational tolerance of +/- 1%, loading in the next 10 to 25 days. It is therefore a short-term forward contract. When this price is used in contracts to price physical cargoes loading at around the day of the quote, there is a mismatch between Dtd Brent prices, referring to cargoes loading on average in 17-18 days, and the value of a cargo loading in the day of the assessment. This time lag impacts the differentials of physical grades to Dtd Brent. In times of contango, grade differentials are likely to bear a negative element to reflect the value of the time. Alternatively, backwardation should inflate grade differentials.

Dtd Brent price assessed by Platts remains the most important marker for world crude trade. It is estimated that prices linked to Brent assessment are used for more than half of world crude trade. Dtd 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 defined more precisely. PRAs' Dtd Brent price assessment process is no longer a simple one – but it has become more reliable and offers less room for price distortion.

The process involves the sequential assessment of various grade differentials to Dtd Brent strip, the assessment of CFDs (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 Dtd Brent quote published by the PRAs follows a reversal of the chronological process of assessment: it starts with Forward 21-day prices (assessed last), used together with CFDs to compute North Sea Dtd Strip (anticipated Dtd), from which the prices of Brent, Forties, Oseberg and Ekofisk are computed using an assessment of their differentials ... and finally Dtd Brent is computed as the most competitive (minimum) of the four grades. This Dtd Brent quote is largely used in contracts as a basis for price formula. For example, a cargo price will be agreed in a formula based on the Dtd Brent quote in the few days surrounding the bill of lading plus a differential negotiated between the seller and the buyer. Platts' and Argus' assessment follows a

similar process, with minor differences in the computation of Dtd North Sea strip or their assessment of Forward Brent prices.

(2) 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 4:30PM. 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 (oil product, crude, forward,..). 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. Bid and ask appear on the Ewindow screen, with the name of participants. In the North Sea, grade prices discussed are for crude oil cargoes of 600,000bl, loading in the next 10 to 25 days. Paper deals in general concern partial cargoes of 100,000bl.

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 Dtd Brent or to Forward 25-day Brent contract, should be expressed before 4:10PM. 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 4:15PM and 4:25PM. 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 4:30PM. 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 4:30PM 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 4:00PM and 4:30PM 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 4:29PM and 4:30PM to assess Forward Brent prices. Deals are reported to Argus by market participants, in general before 5:00PM, and posted by the PRA on Argus Crude Oil Bulleting 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).

(a) Grade Assessments (differential to Dtd. Brent or to Forward Brent, or both).

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 4:00PM. Bids and offer are generally presented at a differential to Dtd. 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) and their evolution can therefore be followed by the whole market. Buyers and seller discuss openly physical crude prices in the window, at a differential to Dtd. Brent or to Forward Brent (also called Cash BFOE), or both. To do so they use an implicit assessment of the spread between Dtd. Brent and Cash BFOE, depending on the day of loading. At the time of grade negotiations, Platts assessment of both Forward Brent and North Sea Dated strip are not published yet – because CFDs and Cash BFOE assessment will happen later.

Let us look at what happened on January 4th, to provide a concrete example. On this particular day, Vitol started to bid at 16:08PM for Jan 16-20 Forties at Dtd. Brent + 70cts and for Jan 20-25 Forties at Dtd. + 70cts. In response, Shell offered at 16:09 Jan 16-18 Forties at Feb Cash BFOE (i.e. Forward brent) + 100cts or at Dtd + 125cts. At 16:12 PM Shell lowered its offer of Jan 16-18 Forties to Cash BFOE +95cts and its Jan 20-22 Forties to Cash BFOE +85cts or Dtd. + 125cts. Vitol, at 16:13, improved its bid for Jan 16-20 and Jan 20-25 Forties to Dtd. +75cts. At 16:13 PM, Shell lowered its offer of Jan 16-18 Forties to Cash BFOE +90cts and Jan 20-22 Forties to cash BFOE + 80cts or Dtd + 125cts. And lowered again its prices by 5cts at 16:15PM and 16:17PM to respectively Cash BFO +75cts and Cash BFO+ 65cts. Vitol rose its bids to Dtd. +90cts at 16:18PM and Dtd. +95cts at 16:20PM. A deal was finally agreed at 16:21, when Vitol agreed to buy Shell Jan 16-18 Forties at Feb Cash BFOE + 75cts and Shell Jan 20-22 Forties at Feb Cash BFOE +65cts. These deals were taken into account by Platts in its January 4th assessment of Forties differentials, estimated at 98cts vs. Fed Dtd. Brent. In our spreadsheet calculation, Cash BFOE +65cts for Jan 16-18 and Cash BFOE+75cts for Jan 20-22 correspond indeed to North Sea Dtd.Strip (or anticipated Dtd. Brent – see below for an explanation for these terms) + 100 cts/bl. On January 4th, theses two deals were the only deals realised in the window.

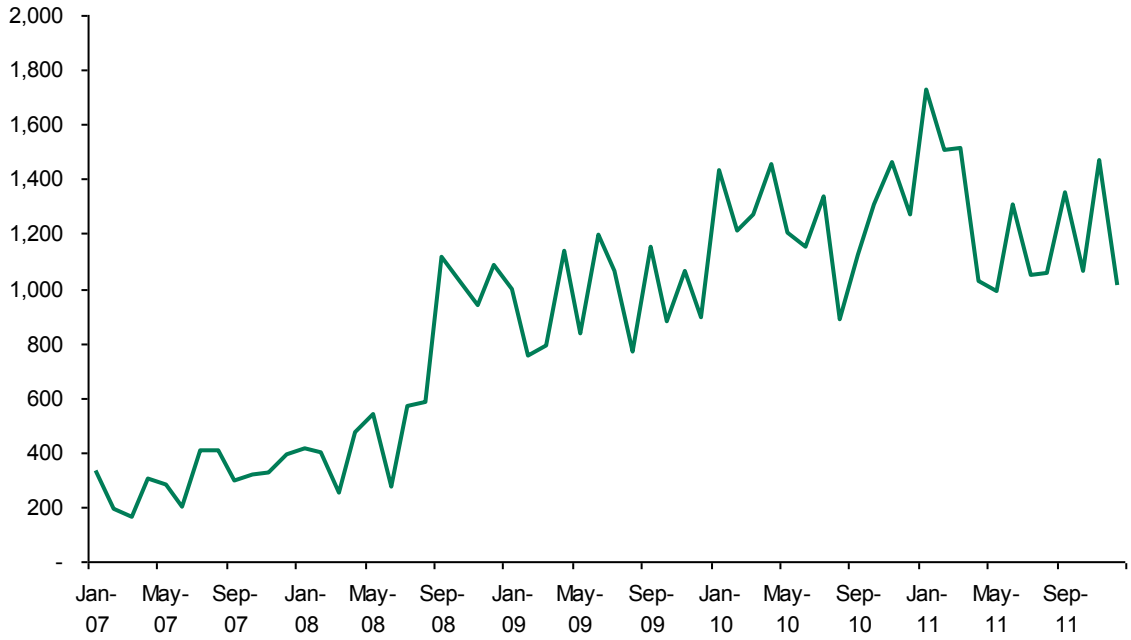
When no deal is realised for a particular grade, PRAs have to estimate the differentials of other physical grades with less information. In this case, PRAs will call brokers, traders at the end of the trading day and construct an estimate of grade prices based on this information. Forties diff and the Dtd. North Sea strip time structure will also be considered in PRAs assessments of other differential. It happens often that Forties is the only grade really traded in the window because it is what matters most to traders - as Forties usually makes the Dtd. Brent quote. In a crude oil cargo sale contracts, in general, the only price mentioned is Dtd. Brent (or a Brent related price). Other grades, such as Ekofisk, Oseberg, or West African crude, are sold at a differential to Dtd. Brent quotes around the dates of loading (or at an average of Dtd. Brent prices during the month, or another transformation of Dtd. Brent), not on their own assessments. When there are large movements in Forties prices or when the competitive advantage of Forties narrows, bids and ask for other grades start to appear in the window to be assessed by PRAs. The assessments of other grades are nevertheless important for tax purpose and, in some cases, for compensation. Some traders main have their compensation dependant on how well they did compared to the market, and their performance will be compared to grade assessments.

(b) CFDs assessments.

CFDs are assessed then, in part in the same time frame than the grades. These are short term swaps of the price of Dtd. 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). On January 4th, for example, CFDs were assessed as a differential to March Cash BFOE for the week of Jan 2nd, Jan 9th, Jan 16th, Jan 23rd, Jan 30th, Feb 06th, Feb 13th and Feb 20th. 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 only 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 today, deals appear to occur mainly for contracts of 100 kbls, 200 kbls or 300 kbls. Roughly 55% of the deals are for 100kbls contracts, 24% for 200Kbls, 6.5% for 300kbls and 2.5% for 500kbls. The market appears very active, as there is on average more than 6 deals happening every day.

Figure 1: CFD Deals in the Window (kbd)



Source: Computed from Argus Data.

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.

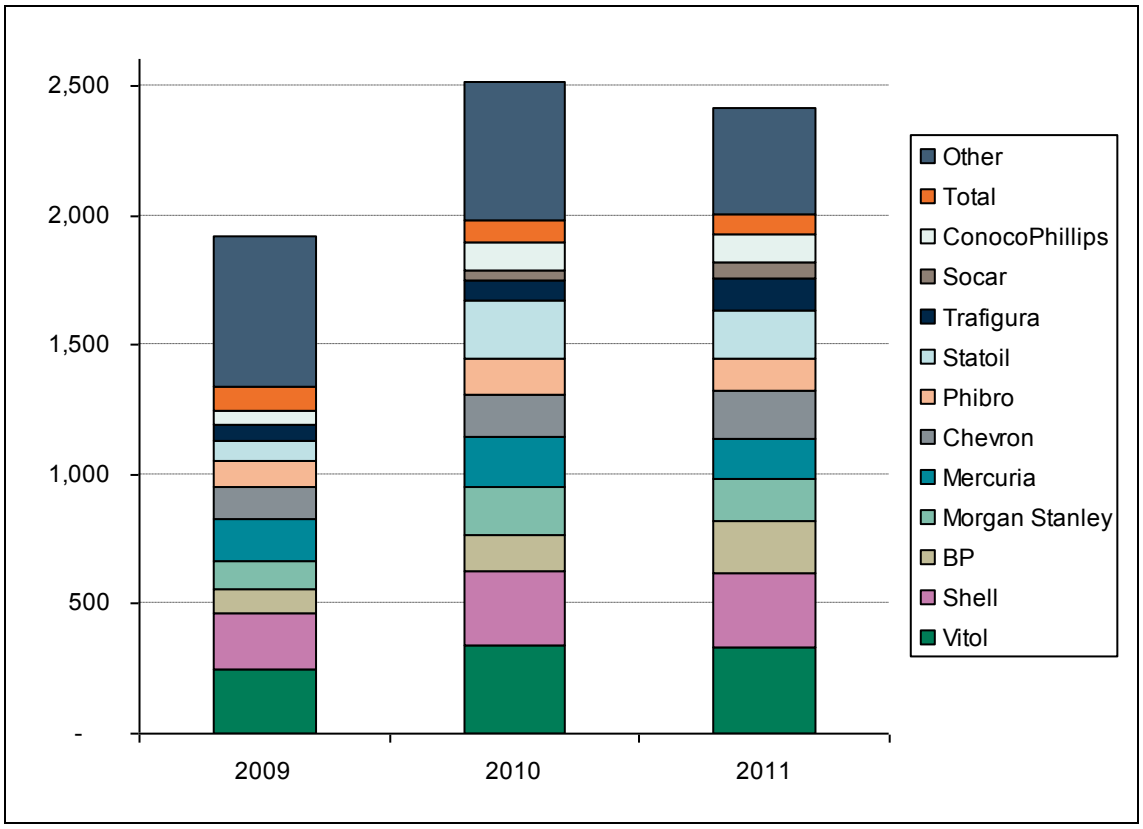
Table 1: Participants in the CFD Market (*Source: Computation based on Argus Data.)*

kbd

	Seller			Buyer		
	2009	2010	2011	2009	2010	2011
Addax	0	-	-	1	1	1
Arcadia	5	12	9	7	16	9
BNP Paribas	1	7	11	2	6	6
BP	74	72	109	24	67	89
Cargill	0	1	1	0	1	1
Chevron	71	77	68	54	83	123
Chinaoil	-	-	-	1	-	-
ConocoPhillips	23	33	43	29	72	64
Eni	-	0	2	-	-	2
Glencore	14	24	19	10	22	8
Gunvor	13	3	7	4	1	1
Hess	2	27	10	2	17	5
Hetco	-	5	26	1	2	20
IPC	2	0	0	3	2	0
Iplom	1	-	-	1	1	1
Itochu	8	8	6	11	12	7
JP Morgan	9	7	1	55	13	0
Koch	24	5	16	35	41	37
Lukoil	29	22	17	20	18	21
Maesfield	3	-	-	-	-	-
Marathon Oil	-	-	-	1	5	-
Masefield	0	4	-	1	1	-
Mercuria	60	75	77	100	120	76
Merrill Lynch	2	1	-	-	-	1
Mitsubishi	-	-	-	3	-	-
Morgan Stanley	58	98	79	51	92	82
Natixis	42	17	4	37	22	1
Neste	3	-	1	1	3	6
Nexen	4	7	10	5	10	6
Noble	1	12	6	1	7	3
OMV	15	29	28	36	52	38
Petraco	2	1	1	2	-	-
Petrodiamond	-	2	-	1	-	1
Petroplus	2	-	2	2	-	2
Phibro	68	88	66	34	49	54
Pioneer	-	-	-	0	-	-
Plains	-	-	-	2	1	-
Preem	1	-	-	4	-	-
Sahara Energy	-	-	1	-	-	-
Sempra	10	2	-	16	2	-
Shell	132	167	157	84	116	135
Sinochem	-	1	1	1	1	-
Sinopec	2	2	3	3	2	-
Socar	-	28	46	-	14	17
Sonatrach	0	1	-	7	7	2
Standard Bank	1	5	2	1	4	1
Statia	-	-	-	-	-	-
Statoil	42	106	64	37	118	122
Statoil	26	-	-	34	-	-
StatoilHydro	-	-	-	-	-	-
Suncor	-	-	0	-	-	0
Total	45	22	33	47	63	45
Trafigura	29	33	60	29	45	68
Union Texas Petroleum	-	-	-	-	-	0
Unipec	5	8	16	29	10	11
Valero	1	-	-	20	46	13
Vitol	132	249	204	112	93	125
Sum	959	1,258	1,208	959	1,258	1,208

Although there the market appear very liquid, 12 of the 45 participants –the large physical participants- account for more than 80% of the trades.

Figure 2: Trade (Buy + Sell) in CFD contracts (kbd)



Source: Computation based on Argus Data.

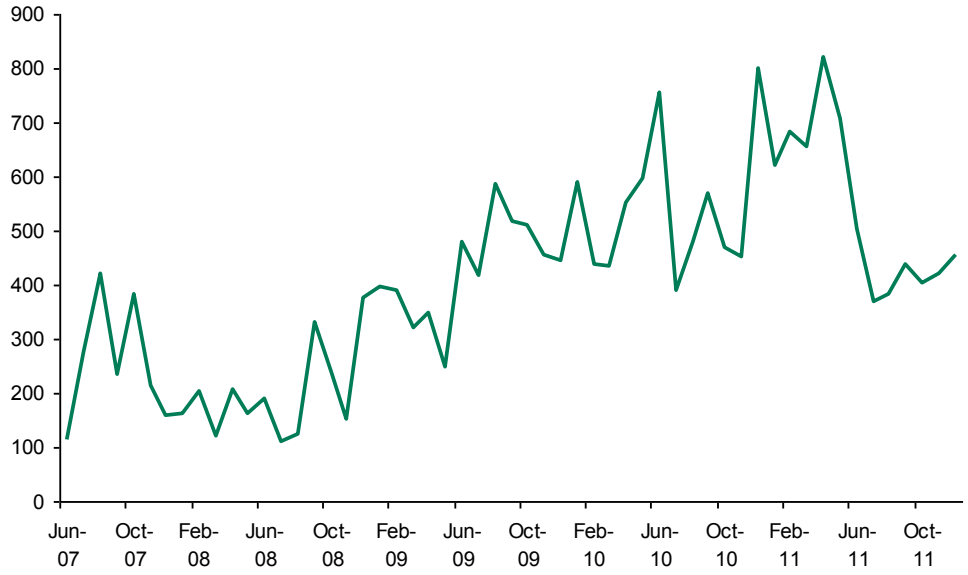
The assessment of CFD prices is particularly important because it is used by PRAs, combined with the assessment of Cash BFOE (Forward 25-days), in the computation of a Daily forward Dtd. Brent. The goal is to obtain an explicit assessment of the daily value of Dtd. Brent in the assessment period (10 to 25 days), as it appears implicit in the CFDs market. PRAs interpret Forward Brent + CFD as the expected value for Dtd. Brent in the next few weeks. An interpolation of this value through the assessment period provides an estimate of the expected value for Dtd. Brent in the period, to which grade differential could be applied.

On January 4th, 2012, CFD discussion started at 16:08PM, with an offer for the weeks of Jan 9 and Jan 16 from Phibro. The week of Jan 23 started to be discussed shortly after. The CFD market was more active than the grade market, with participation of Phibro, Mercuria, Statsco, Morgan Stanley, Vitol, Trafigura and Totsa. Discussions focused on the three weeks of the assessment period. Few deals were however concluded. CFDs started to be offered at relatively high levels compared to March Cash BFOE, around $0.65 for Jan 9- Jan 13, $0.4 for Jan 16-20 and $0.25 for Jan 23 – Jan 27 but were thereafter negotiated lower. Deals occurred at 16:24PM, with Chevron buying Jan 23-27 from Stasco at $0.0 for 100 kbls, and at 16:27PM, with Vitol buying Jan 16-20 from Stasco at $0.1 for 100 kbls. These deals were reflected in Platts assessment, with CFD Jan 16/20 estimated at $0.09/$0.11 and CFD Jan 23/27 assessed at $-0.01/0.01. These differentials are vs. March Cash BFOE. Other weeks were estimated by taking into consideration bids and offers not ending with a deal.

(c) Assessment of Forward Brent (25-days) contract.

Finally, Cash BFOE prices (Forward Brent) are assessed in the last minutes of the window. 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 16:24PM. Between June 2007 and the end of 2011, in Argus database of deal happening during the window, partial 100 kbls represented 80% of total deals, 200 kbls 12%, 600 kbls (a complete cargo) 3.5% and 300 kbls 3.25%. 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 (based on a weighted average of deals occurring one day after the settlement date – in general the 15th of the month- on the Forward Brent market). The volume of Forward Brent deal has significantly increased since 2008, rising from 200 kbd in 2008 to 540 kbd in both 2010 and 2011. I

Figure 3: Forward Brent Deals in the window (kbd).



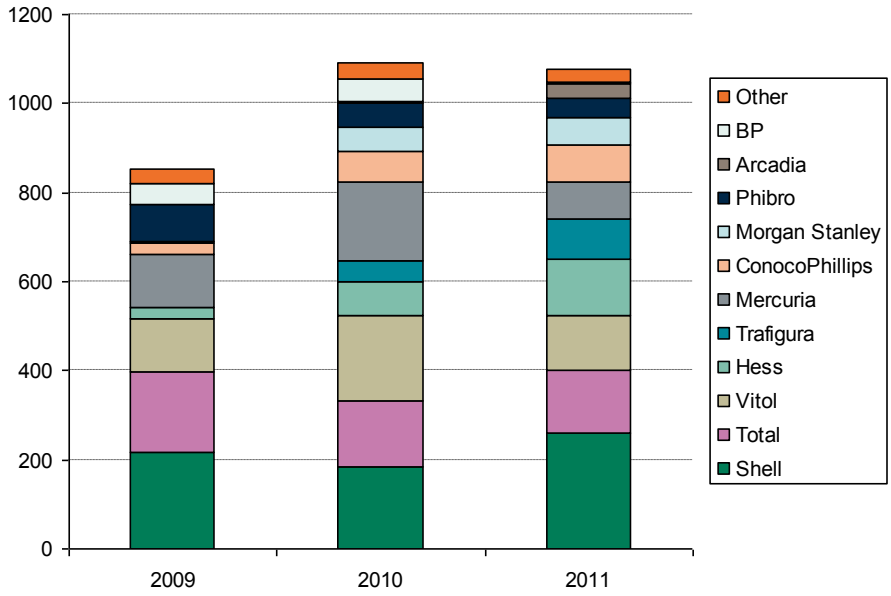
Source: Calculation from Argus data

Prices can be modified through 16:30PM. 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 month of Cash BFOE are the only flat prices discussed in the window and serve as a reference for the computation of all other assessments.

On January 4th, 2012, Cash BFOE partial started to be offered at 16:24PM. Cash BFOE Feb (the first month) was first offered at $113.5 for 100kbls and simultaneously bid at $112.0 by Mercuria. This first action was followed by similar bids from Hetco and Totsa. March contract (the second month) started to be discuss just after, also at 16:24PM, with a bid from Vitol at $111.7 and an offer from Totsa at $113. Feb and Mar contracts were thereafter discussed between Mercuria, Totsa, Stasco, Vitol and Hetco, with participants progressively increasing their bids and lowering their offers. Some participants increased their bid for March contract while lowering their offer of Feb contract. At 16:29PM, the first deal occurred with Totsa selling Cash BFOE Mar (partial 100 kbls) to Vitol for $112. Vitol, few seconds later, bought a Cash BFOE partial Feb from Hetco at $112.49. At 16:30, Totsa sold another Cash BFOE partial Mar at $112.06. Platts took these deals in consideration and assessed Brent Forward for February at 112.5 / 112.52 and March at 112.09/112.11.

The Forward Brent contract is a very small club, with a limited number of participants. In the window, roughly 10 participants contribute to the contract assessment. Shell, Total and Vitol make roughly half of the trades reported (Sale + Purchase).

Figure 4: Trade (buy + sell) in Forward Brent Contract (kbd)



Source: Computed from Argus Data.

Even though 80% of the trades concern partial cargos of 100kbld, participants must be ready to take delivery of physical cargoes and able (software, credit conditions, ..) to participate in the window. Only large oil companies and big traders meet these conditions are able to influence the price of Forward Brent contract.

Table 2: Sellers and Buyers of Forward Brent Contract (kb/d)

	Seller			**Buyer**		
kb/d						
	2009	2010	2011	2009	2010	2011
Arcadia	-	4	25	-	2	10
BP	30	33	1	16	16	2
Chevron	1	2	3	-	-	-
ConocoPhillips	12	34	42	12	35	38
Glencore	0	-	-	1	-	-
Hess	11	38	6	10	32	2
Hetco	1	6	73	1	1	48
Maesfield	-	-	-	1	-	-
Mercuria	66	92	43	55	87	41
Morgan Stanley	0	29	42	3	22	20
Noble	1	6	7	1	5	1
Phibro	35	30	30	48	25	13
Sempra	14	9	4	14	8	2
Shell	135	108	104	83	76	157
Statoil	2	-	9	-	3	2
Total	58	66	59	121	83	80
Trafigura	-	29	33	-	16	56
Vitol	62	58	57	59	134	66
Sum	426	545	538	426	545	538

Source: Computed from Argus Data.

Equity owners are the main participants in the Forward Brent market, followed by large oil traders. The surprise in this data comes from the very sharp fall in BP (although an equity owner) participation in the market in 2011. The data we have from Argus are mainly for the 4:00PM – 4:30PM window, and are believed to cover roughly 60% of paper trade. Companies are likely to continue exchanging Cash BFOE contract outside the window and we are missing these trades.

In the window, three months of Forward Brent are assessed, starting from the month following the date of the assessment. Through the end of January, for example, the front month will be February. With the increase to 25 days nomination period, however, Platts introduced a change in its assessment of the front month. Until the 6th of the month, all forward Brent contracts outright prices are assessed, but after that the font month will be computed from the spread assessed on the 6th of the month. For

example, the spread between the Forward Brent contract of March 2012 and February 2012 remains pegged at 0.02, its value of January 6th, for the rest of January.

(3) The computation of Dtd. Brent quote.

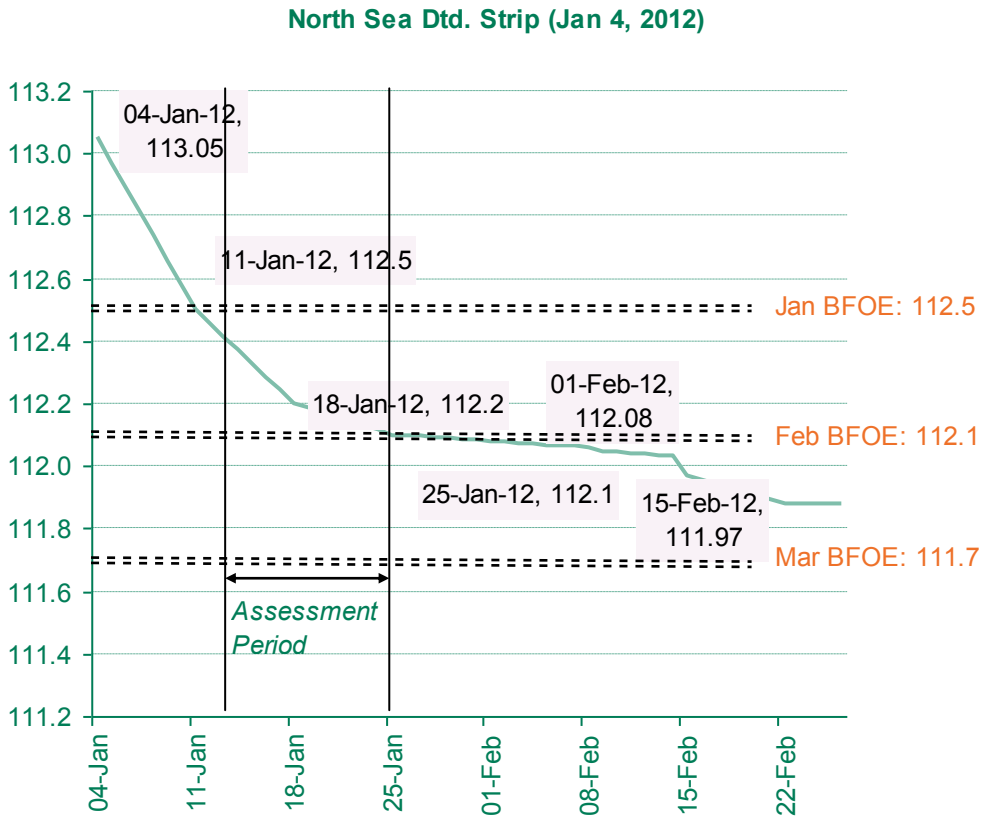
The Dtd. Brent quote is then computed from the various assessments. This quote is particularly important because it is the price included in many contracts related to Brent.

(a) The process starts with the assessment for the second month of Forward Brent (also called Cash BFOE or 25-days). This assessment is done, as mentioned earlier, in Platts window between 4:25PM and 4:30PM. This price is based on the observed trading of partial cash BFOE cargoes between large oil traders. Partial BFOE cargoes are (mostly) contracts of 100 kbls, which have to be recombined into deliverable full cargoes of 600kbls or booked out. Platts Forward Brent contract price aimed to reflect prices at 4:30PM. Argus Forward Brent assessment reflects an average of deals between 4:29 PM and 4:30PM. Participants in this highly specialised market are large oil companies, big traders, or few banks with physical trading operations.

(b) With the assessment of the second month Forward Brent contract and CFDs for the period covered in the assessment it is possible to compute a North Sea Dtd. strip which would represent the average price of Dtd. Brent that can be guaranteed today for delivery in the 10-25 days of assessment. This Dtd. North Sea Strip will be the basis to which apply grade differentials, as it represents an expectation of the value of Dtd. 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 Dtd. North Sea strip.

In the computation of the North Sea Dtd. Strip (called anticipated Dtd. Brent by Argus), there are some minor differences between Platts and Argus. Platts assumes that the value of the CFD for a particular week added to the Forward Brent assessment represents the middle of the Dtd. Brent price in the week (price on Wednesday). A linear interpolation of the different points (8 points, because the CFDs are assessed through 8 weeks) obtained this way form the Dtd. North Sea strip over the assessment period (10 to 25 days). Argus does not interpolate the value of anticipated Dtd. Brent from CFDs assessment, but adds directly this assessment to the Forward Brent contract for the week considered. In addition, Argus does not consider the week-ends in its assessment of anticipated Dtd. Brent.

Figure 5: North Sea Dtd. Strip ($/bl)



Source: Computations based on Platts assessments.

The average of North Sea Dtd. Strip toward the assessment period gives the basis toward grade differentials will be applied. As expected, the North Sea dated is surrounded by Forward Brent assessments for the relevant period.

(c) Dtd. Brent quote for the day is then computed as the cheapest of the four grades Brent, Forties, Oseberg and Ekofisk.

On January 4th, 2012, the Forward Brent second month was assessed at $112.1 from three partial BFOE deals occurring at the end of Platts windows, involving Totsa, Vitol and Hetco. CFD curve was assessed from deals occurring at 4:25PM between Chevron, Stasco and Vitol. The resulting North Sea Dtd. Strip was computed at $112.2. Vitol and Shell Forties deal at Feb Forward Brent +0.75 and +0.65 were close to Forward Dtd. +$1, reflected in Forties outright assessment of $113.18. Physical Brent was assessed at 113.6, Oseberg at 114.05 and Ekofisk at 113.55. Forties, the cheapest of the four grades, therefore made the Dtd. Brent quote of $113.8 for January 4th.

The process of price assessment by PRAs has drastically changed in recent years. It moved from a situation where PRAs were observer 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. Dtd. 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, dominated by the main physical oil market physical players. While Argus mentions in its methodology note that Futures prices can be used to assess forward prices if there is no Forward Brent trade, it almost never happens according to Argus price reporters. 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.

(4) The link between futures, forward and physical prices.

While future prices do not directly enter in the physical price assessment of Dtd. Brent, they can affect physical crude prices in several other ways: (a) part of the physical crude oil sold to Europe is directly priced on a transformation of futures prices; (b) an obvious link between Forward and Futures prices comes from the fact that the ICE future contract settlement is based on an average of Forward Brent deals during the day following the assessment; (c) market practices reinforced the link between futures and forwards. Major market player have in their portfolio both Futures and Forward contracts, and move a positions from one market to the other very easily through Exchanges for Physical (EFPs).

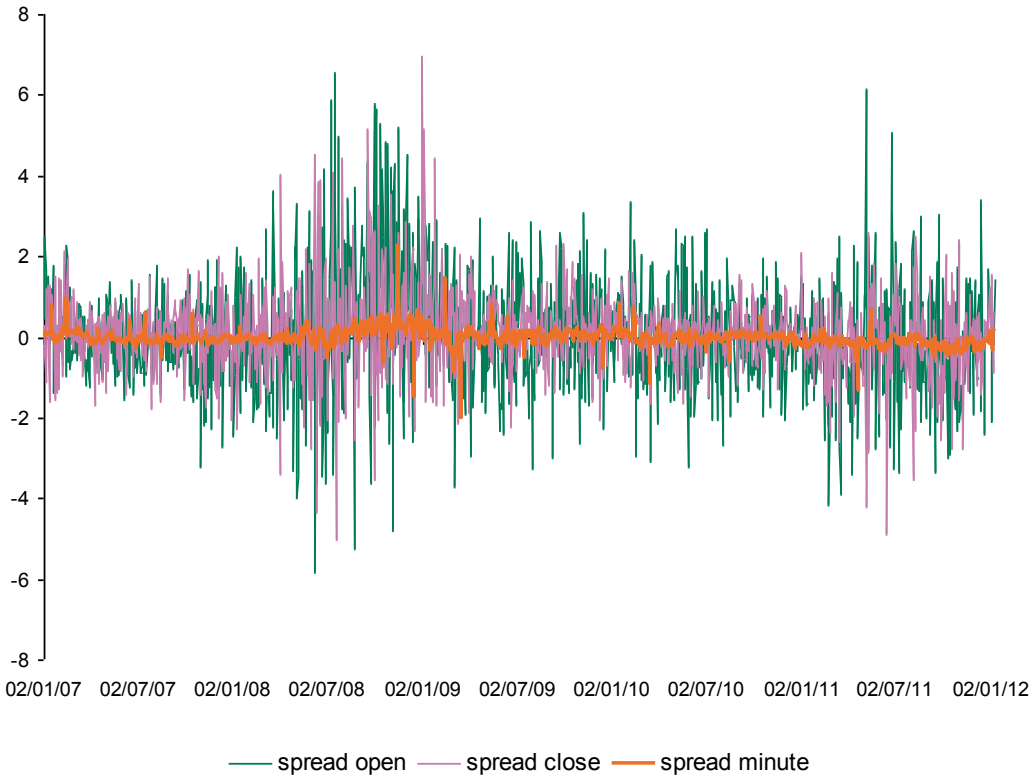
(a) Prices for certain exports of Middle Eastern countries to Europe are directly indexed on a transformation of futures prices. In practice, Saudi, Kuwait or Iranian crude oil sold to Europe, are directly indexed on a weighted average of ICE Brent prices (BWAVE) in a trading day (prices weighted by 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 future prices (front month) has automatically an impact on prices.

(b) 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 kind of markets (OTC and futures), concern different volumes (futures Brent contract 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 Feb contract refers to cargoes loading in more than 25 days and before end February, i.e between the 10th and 29th February (or event less time if we take into account the loading period).

(c) In practice, however, future and forward prices remain very close to each other, in particular at the end of the window. Figure 6 shows the spread between future and forward, for a comparable month, at the opening and close of ICE and at 4:30PM. ICE publishes every day a minute market, showing a weighted average of prices on the future market between 4:29PM and 4:30PM. The spread between the absolute value of the minute marker and the Forward Brent assessment is, on average, 14.3cts/bl between 2007 and 2011, while it is more than $1/bl at the opening and $0.64/bl at the close of the market. Future prices have a tendency to converge to Forward prices at 4:30PM.

Figure 6: Spread between Forward Brent and Futures Brent: Open, close, and Minute Marker ($/bl)

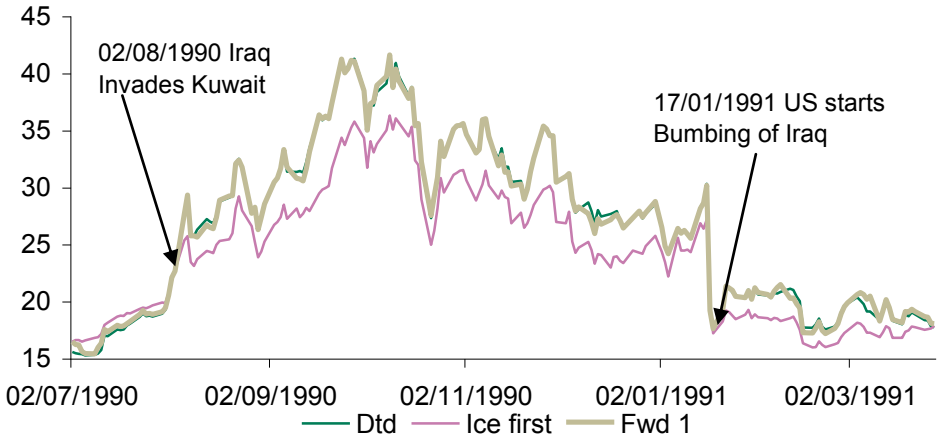


Source: Computed from Platts

One of the reasons for the convergence is the fact that big oil participants have a portfolio including both Forward and Futures contracts. There 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 future 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 month are quoted by brokers and are generally inexpensive. We see the current market practice of big players of 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 future 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 Dtd. Brent and Forward prices. The price of physical crude oil jumped after Iraq invaded Kuwait in August 1990, while the price of future contract reacted less to the event. The fact that Dtd. Brent and Forward Brent are linked to the physical delivery of crude oil explains this difference with future prices.

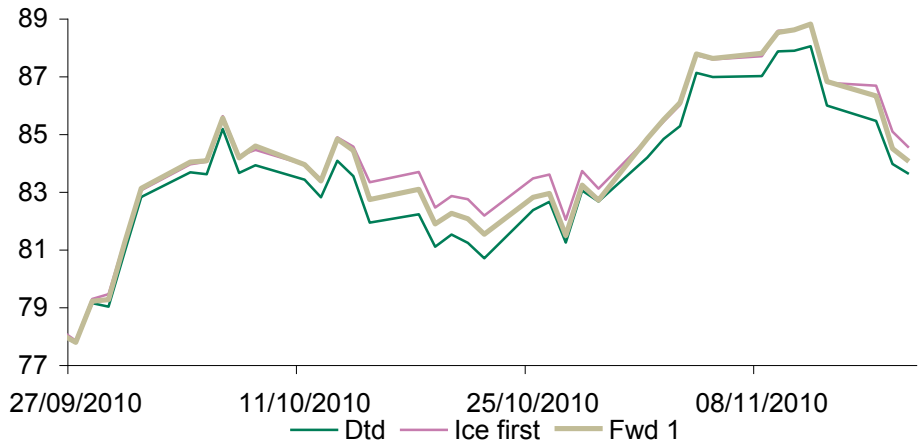
Figure 7: Oil Prices during the 1st Gulf War ($/bl)



Source: Platts, Argus

The same happened during 2010 strikes at French refineries. Dtd. Brent price was the most affected by the strikes and futures prices the less impacted. Again, the fact that Dtd. Brent and Forward Brent prices are related to physical deliveries instead of cash settlement explains the difference.

Figure 8: Oil prices during Oct. 2010 French refinery strikes ($/bl)



Source: Platts, Argus

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

Conclusion

Oil markets have developed with time a high degree of sophistication, allowing a very precise pricing of the time component in oil exchanges -particularly crucial for the oil industry. PRAs have evolved, from being price reporters to trade organisers in an attempt to avoid price manipulations and misreporting. Main markers 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 difficult to avoid.

In part under the control of PRAs, oil market appears to function quite well, with all the necessary hedging tools. PRAs changes in methodology since the early 2000s, first aimed at avoiding price manipulation, seems today to have resulted in potentially isolating physical and future markets. Tools developed first to combat squeezes and price game play are used today to assess the physical market, in theory independently from the future 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 future 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.

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