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Price formation for small crude streams

6^{th} Joint IEA-IEF-OPEC Workshop

Jim Nicholson, Senior Vice President, Editorial

15 March 2018

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Market Reporting
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illuminating the markets

Argus' methodological approach (1)

- Tailored to each market and product.
- Designed to capture the greatest **liquidity** and bring **transparency** to the price assessment process.
- Conducted by highly trained reporters and experienced editors.
- Not susceptible to distortion in late day activity.
- All methodologies available at argusmedia.com/methodology

Argus' methodological approach (2)

- Argus reporters are in close daily contact with participants in every wholesale energy market – a broad spread of buyers, sellers, traders, brokers, financial institutions.
- Where possible, we use an all day **volume weighted average (VWA)** of reported deals, e.g. US pipeline crudes, European gasoline barges.
- In the absence of sufficient liquidity, we employ **intelligent assessment** based on deals reported, bids/offers, market trends.
- In crude markets this can include taking into account the price of similar grades, changes in the value of product yields, etc.
- Information supporting assessments is logged and made available to auditors as part of our compliance programme.

Demand for prices of smaller, or less visible streams

- In recent years, demand has grown for a number of independently calculated prices for smaller crude streams, with little or no spot market liquidity or transparency.

- Argus has responded by developing an alternative **calculated** methodology based on the product yields of these grades relative to those of crudes with more market visibility and reliable spot market assessments.

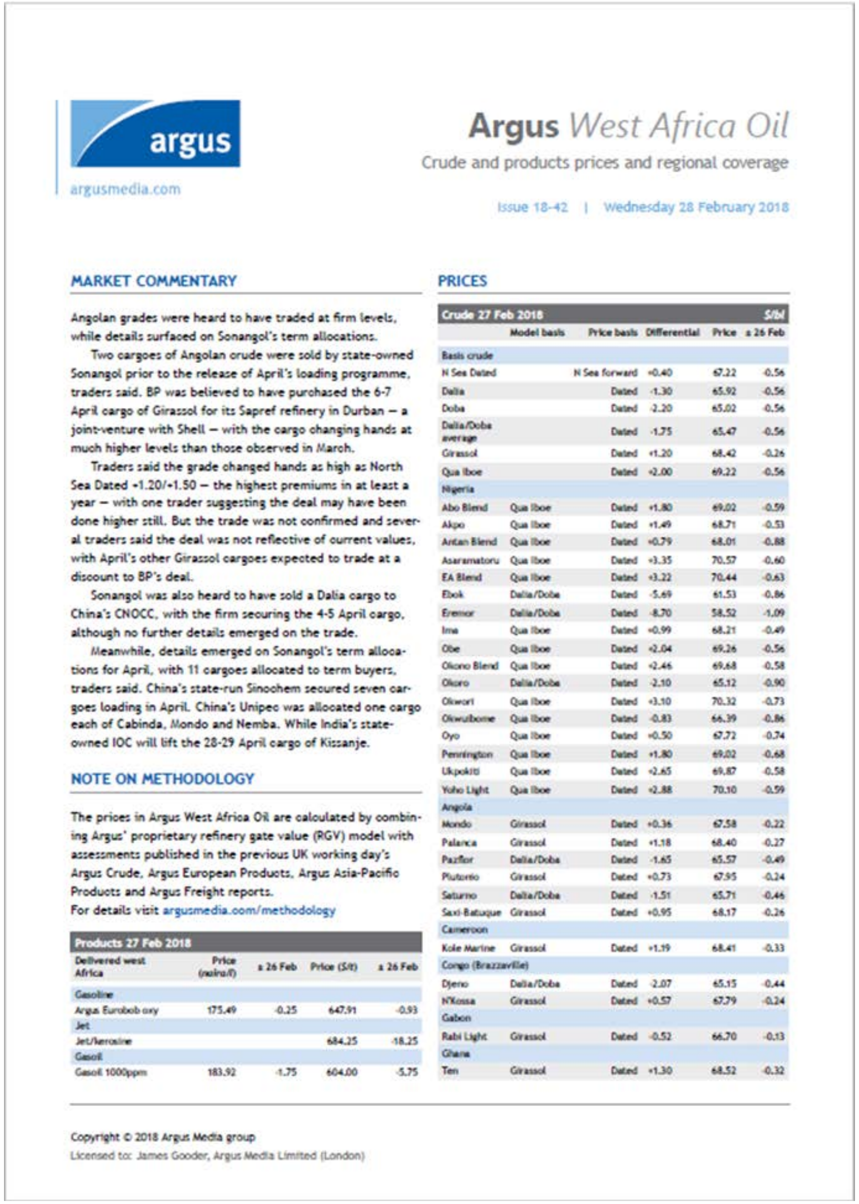
- These prices are often used when calculating official selling prices and tax reference prices, as well as being a guide for negotiations.

- These prices are so far limited to a range of west African grades published daily in the **Argus West Africa Oil** report, and the **Oriente implied fob** price which appears in the daily Argus Crude report.

Argus West Africa Oil

- 28 grades of regional crude priced daily on an fob basis, including 17 Nigerian grades and others from Angola, Cameroon, Congo (Brazzaville), Gabon and Ghana.

- Calculated using a proprietary refinery model for a typical complex plant in NW Europe or Singapore and Argus' spot market assessments for grades of similar quality going to the same destinations.



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Argus *West Africa Oil*

Crude and products prices and regional coverage

Issue 18-42 | Wednesday 28 February 2018

MARKET COMMENTARY

Angolan grades were heard to have traded at firm levels, while details surfaced on Sonangol's term allocations.

Two cargoes of Angolan crude were sold by state-owned Sonangol prior to the release of April's loading programme, traders said. BP was believed to have purchased the 6-7 April cargo of Girassol for its Sapref refinery in Durban – a joint-venture with Shell – with the cargo changing hands at much higher levels than those observed in March.

Traders said the grade changed hands as high as North Sea Dated +1.20/+1.50 – the highest premiums in at least a year – with one trader suggesting the deal may have been done higher still. But the trade was not confirmed and several traders said the deal was not reflective of current values, with April's other Girassol cargoes expected to trade at a discount to BP's deal.

Sonangol was also heard to have sold a Dalia cargo to China's CNOCC, with the firm securing the 4-5 April cargo, although no further details emerged on the trade.

Meanwhile, details emerged on Sonangol's term allocations for April, with 11 cargoes allocated to term buyers, traders said. China's state-run Sinochem secured seven cargoes loading in April. China's Unipec was allocated one cargo each of Cabinda, Mondo and Nemba. While India's state-owned IOC will lift the 28-29 April cargo of Kissanje.

NOTE ON METHODOLOGY

The prices in Argus West Africa Oil are calculated by combining Argus' proprietary refinery gate value (RGV) model with assessments published in the previous UK working day's Argus Crude, Argus European Products, Argus Asia-Pacific Products and Argus Freight reports.

For details visit argusmedia.com/methodology

Products 27 Feb 2018				
Delivered west Africa	Price (naira/l)	± 26 Feb	Price ($/t)	± 26 Feb
Gasoline				
Argus Eurobob oxy	175.49	-0.25	647.91	-0.93
Jet				
Jet/kerosine			684.25	-18.25
Gasoil				
Gasoil 1000ppm	183.92	-1.75	604.00	-5.75

PRICES

Crude 27 Feb 2018					$/bl
	Model basis	Price basis	Differential	Price	± 26 Feb
Basis crude					
N Sea Dated		N Sea forward	+0.40	67.22	-0.56
Dalia		Dated	-1.30	65.92	-0.56
Doba		Dated	-2.20	65.02	-0.56
Dalia/Doba average		Dated	-1.75	65.47	-0.56
Girassol		Dated	+1.20	68.42	-0.26
Qua Iboe		Dated	+2.00	69.22	-0.56
Nigeria					
Abo Blend	Qua Iboe	Dated	+1.80	69.02	-0.59
Akpo	Qua Iboe	Dated	+1.49	68.71	-0.53
Antan Blend	Qua Iboe	Dated	+0.79	68.01	-0.88
Asaramatoru	Qua Iboe	Dated	+3.35	70.57	-0.60
EA Blend	Qua Iboe	Dated	+3.22	70.44	-0.63
Ebok	Dalia/Doba	Dated	-5.69	61.53	-0.86
Eremor	Dalia/Doba	Dated	-8.70	58.52	-1.09
Ima	Qua Iboe	Dated	+0.99	68.21	-0.49
Obe	Qua Iboe	Dated	+2.04	69.26	-0.56
Okono Blend	Qua Iboe	Dated	+2.46	69.68	-0.58
Okoro	Dalia/Doba	Dated	-2.10	65.12	-0.90
Okwori	Qua Iboe	Dated	+3.10	70.32	-0.73
Okwuibome	Qua Iboe	Dated	-0.83	66.39	-0.86
Oyo	Qua Iboe	Dated	+0.50	67.72	-0.74
Pennington	Qua Iboe	Dated	+1.80	69.02	-0.68
Ukpokiti	Qua Iboe	Dated	+2.65	69.87	-0.58
Yoho Light	Qua Iboe	Dated	+2.88	70.10	-0.59
Angola					
Mondo	Girassol	Dated	+0.36	67.58	-0.22
Palanca	Girassol	Dated	+1.18	68.40	-0.27
Pazflor	Dalia/Doba	Dated	-1.65	65.57	-0.49
Plutonio	Girassol	Dated	+0.73	67.95	-0.24
Saturno	Dalia/Doba	Dated	-1.51	65.71	-0.46
Saxi-Batuque	Girassol	Dated	+0.95	68.17	-0.26
Cameroon					
Kole Marine	Girassol	Dated	+1.19	68.41	-0.33
Congo (Brazzaville)					
Djeno	Dalia/Doba	Dated	-2.07	65.15	-0.44
N'Kossa	Girassol	Dated	+0.57	67.79	-0.24
Gabon					
Rabi Light	Girassol	Dated	-0.52	66.70	-0.13
Ghana					
Ten	Girassol	Dated	+1.30	68.52	-0.32

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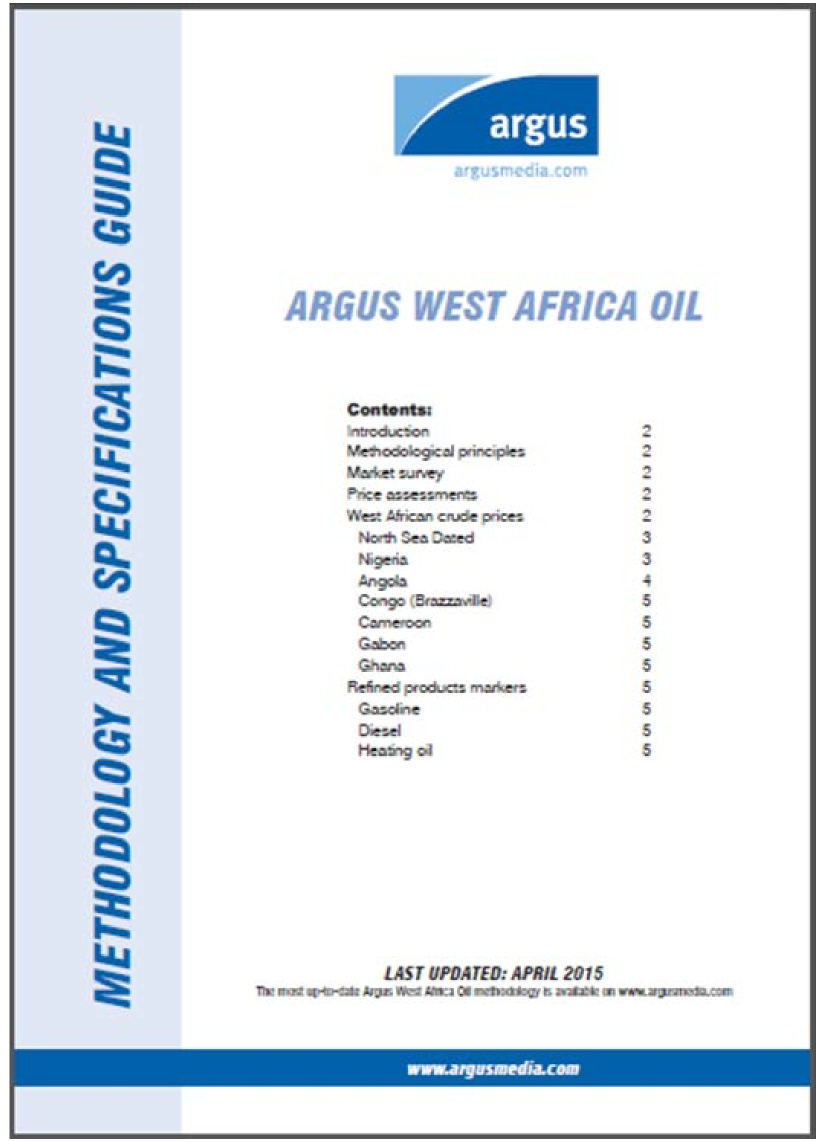
The method

- Crude prices are based on refinery gate values (RGV) for each grade at a typical NW Europe or Singapore complex refinery, calculated according to a recent detailed assay and Argus' refined product prices.

- The difference is calculated between each RGV and the RGV of Qua Iboe for light grades, of Girassol for medium sweet grades and of an average of Dalia and Doba for heavier grades.

- These spreads are then applied to the spot differential of Qua Iboe, Girassol or Dalia/Doba as assessed in the previous day's Argus Crude report.


METHODOLOGY AND SPECIFICATIONS GUIDE

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ARGUS WEST AFRICA OIL

Contents:

LAST UPDATED: APRIL 2015
The most up-to-date Argus West Africa Oil methodology is available on www.argusmedia.com

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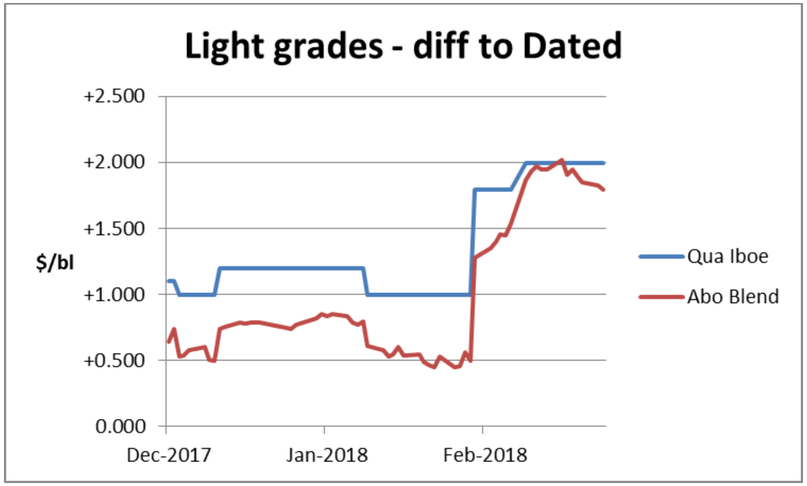
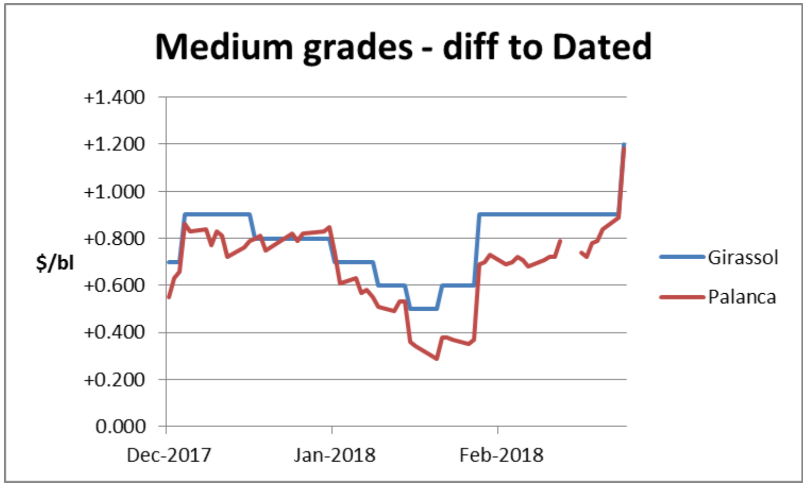
Abo Blend - an example

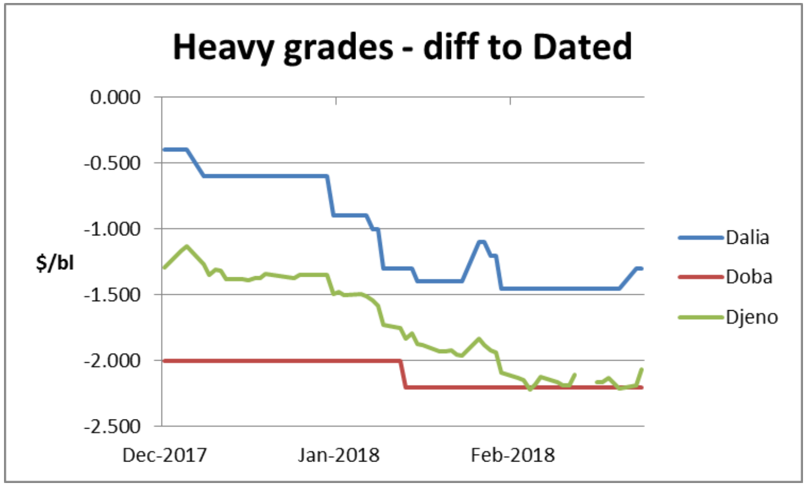
- Based on Argus product price assessments and a proprietary refining model developed for Argus Consulting:
- The RGV on 27 February 2018 for Abo Blend in NW Europe was $73.27/bl, and the RGV for Qua Iboe was $73.47/bl.
- The **RGV spread** of Abo Blend to Qua Iboe was therefore **-0.20**
- The Argus spot assessment of Qua Iboe was **Dated +2.00**
- By applying the RGV spread to the Qua Iboe spot diff we get a synthetic fob differential for Abo Blend of **Dated +1.80**
- North Sea Dated was $67.22/bl, so **the outright price of Abo Blend was $69.02/bl**.

Results of the WAFO methodology

- Prices are guided by the underlying assessments of similar crudes.
- Changes in relative refined products prices adjust the differentials relative to one another.







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Limitations

- The crude prices in Argus West Africa Oil are not to be confused with spot assessments based on reported trade of crude cargoes.
- They don't take account of impurities, disruptions, vessel restrictions, market sentiment or actual spot market activity, when it does occur.
- But in the absence of regular reported trade, this gives a reasonable guide to the *relative* value of different grades.
- Argus continues to monitor spot market activity in these grades and will launch additional assessments in Argus Crude when appropriate.
- We have already been able to do this for **Nigerian Usan** and **Ghanaian Jubilee**, which have "graduated" from this report to the main Argus Crude report and are now assessed based on reported spot market activity.

Oriente – a price resurrected

- In 2014 Argus terminated its Ecuadorean Oriente crude assessment due to severely limited and often misleading spot market information.

- The following year, at the request of the OPEC Secretariat, Argus began to publish an “Oriente implied fob” price to give an input for that crude in the OPEC Reference Basket.

- This is an outright price for Oriente derived from its product yield value at a USWC refinery. It takes the RGV value of Oriente, and subtracts the refining margin for a grade of similar quality (Mars) under the hypothetical situation that Mars were to be refined at the USWC. (There is no reliable spot assessment for Oriente, hence no refining margin for the crude itself).

- Argus’ freight assessment from Ecuador to the USWC is also subtracted to reach the **Oriente implied fob** price.

Oriente implied fob, an example

- On 2 January 2015, the average of the FCC and Coking RGVs for Oriente at the USWC was **$66.20/bl**.

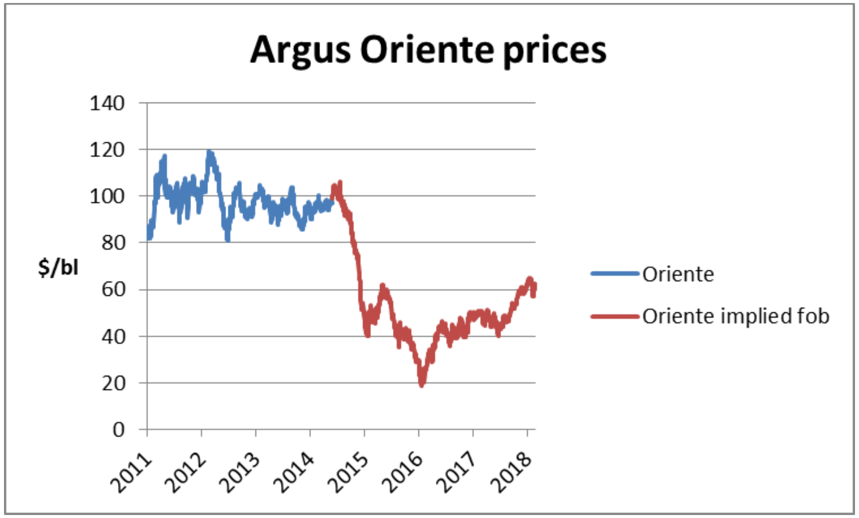
- Subtract the assessed price of freight for bringing Oriente from Ecuador to the USWC, **$3.52/bl**, to get **$62.68/bl**.

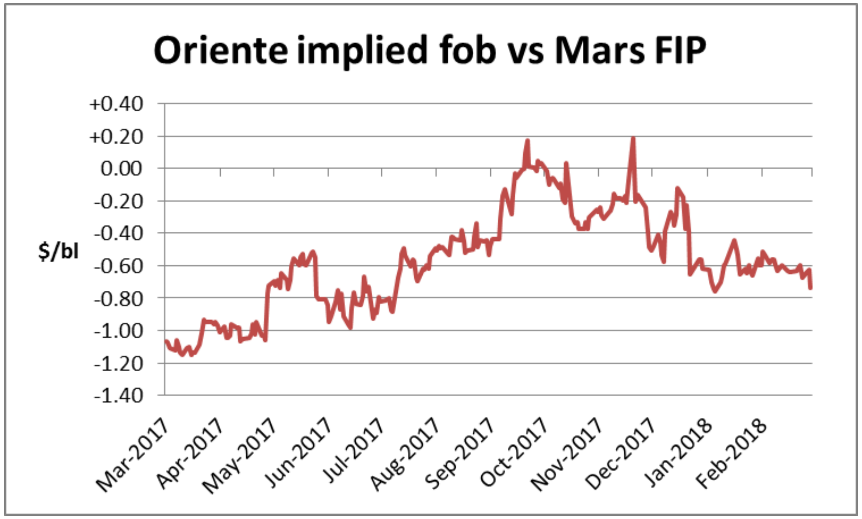
- The theoretical RGV for Mars at the USWC (again an average of FCC and Coking) was $64.36/bl, and subtracting the Mars FIP assessment of $50.89/bl gives a theoretical refining margin of **$13.47/bl**.

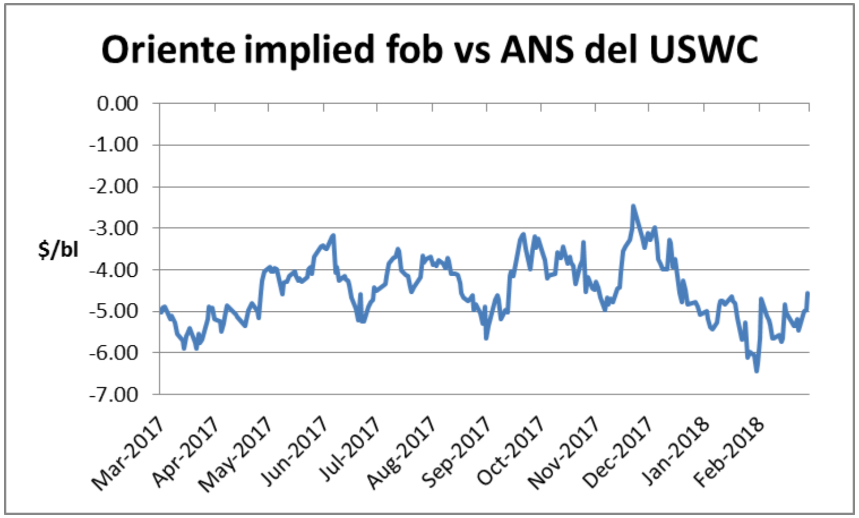
- This refining margin is subtracted from the $62.68/bl above, to give an **Oriente implied fob price** of **$49.21/bl**.

Oriente implied fob performance

- The price has a dynamic relationship with similar and competing grades.
- Changes in the values of refined products have an impact, as the model intends they should.





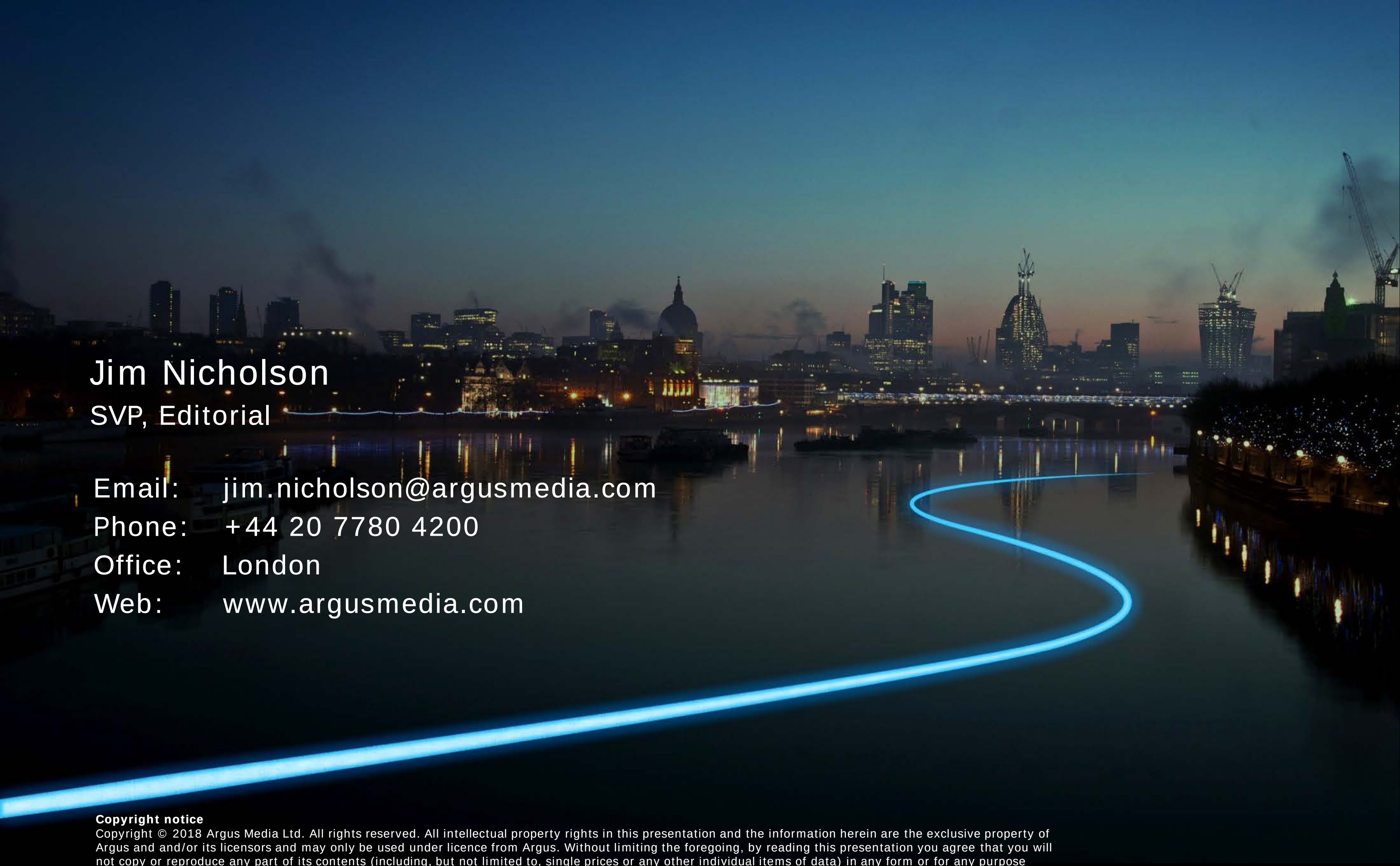


In summary

- Argus prefers to produce price assessments based on verified spot market activity.

- In the absence of reliable trade information, it is possible to produce theoretical prices, calculated using inputs including the prices of products produced from the crudes in question, as well as the price movements of similar grades with robust assessments.

- These must be treated with caution and with awareness of their limitations, as no model can entirely replicate the range of considerations that guide negotiations in an open and transparent market.



Jim Nicholson

SVP, Editorial

Email: jim.nicholson@argusmedia.com
Phone: +44 20 7780 4200
Office: London
Web: www.argusmedia.com

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