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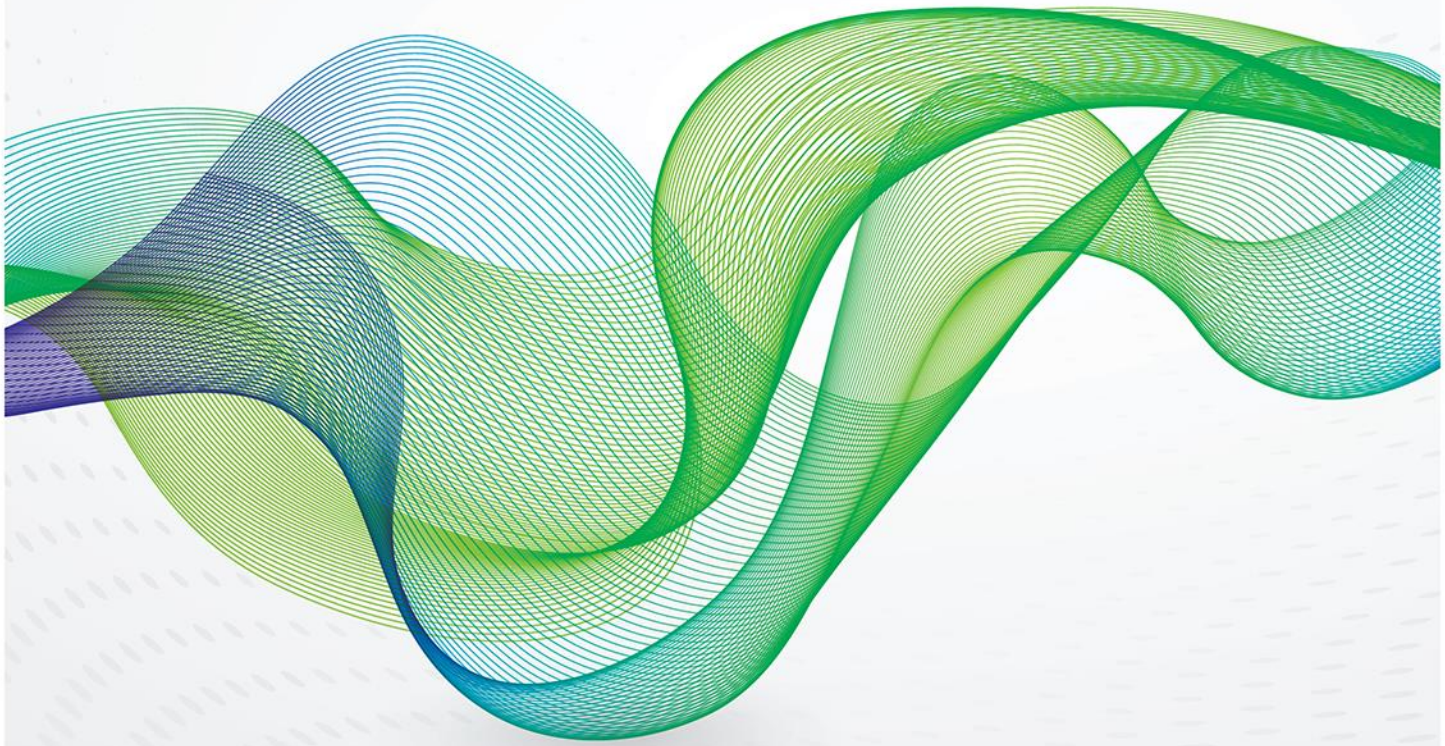
Nigerian Barrels and the Demand Shock:

Differentials and Changing Oil Trade Flows



OXFORD ENERGY COMMENT

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Introduction

While most of the recent analysis has focused on the impact of supply and demand shocks on futures prices, the impact of these shocks on the shift in oil trade flows and on the dynamics of physical differentials has received much less attention. This is despite the fact that physical differentials provide valuable information about oil market conditions and about key shifts in its dynamics.[1] Particularly, in this current environment of high uncertainty about the pace of demand recovery,[2] these differentials and their changes over time provide valuable clues to assess the strength of the recent price rally. In an oversupplied market, sellers have to adjust the crude differentials to make their crude oil more attractive to end users. The relative prices of key benchmarks and freight rates also need to adjust so as to give an incentive for traders to move crude from surplus to deficit areas and clear the surplus. As markets start showing signs of recovery, this is reflected in the strengthening of the physical differentials relative to their benchmarks and the adjustment in the spreads between benchmarks. Despite the severity of the current crisis, these adjustment mechanisms have performed as expected.

In this complex web of differentials and shifts in trade flows, West African crudes, particularly Nigerian crudes, play an important role as the swing barrels both to the east and the west of the Atlantic basin. Nigerian grades also have many features, particularly their tradability on a spot basis, which make them a bellwether of changes in market fundamentals. The predominance of spot trading is rewarding in tight market conditions as traders compete to bid up the quality differentials. But in the face of an adverse demand shock, Nigerian cargoes are the first to be distressed (i.e. the cargoes remained unsold) with unsold barrels ending up in over-ground storage both on-land and floating storage.

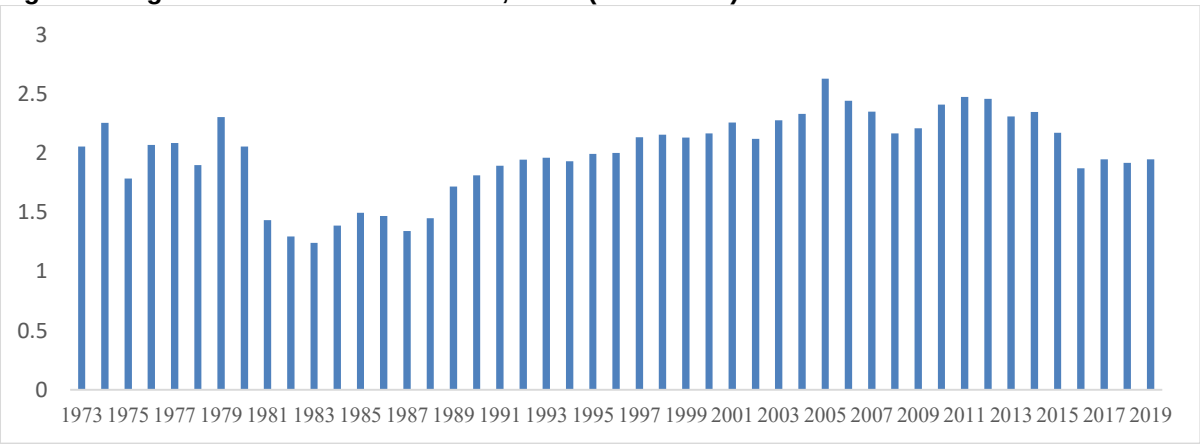
In this Comment, we first discuss some of the key characteristics of Nigerian crudes, then explain the market adjustment mechanisms in physical differentials, Dated Brent relative to futures, the spread between Dubai and Brent, and freight rates that allow the clearance of Nigerian barrels in an over-supplied market, and how understanding these mechanisms could prove useful in assessing the strength of the current recovery.

Key Features of Nigerian Crudes

Nigerian crudes have many features that make them highly tradable and most responsive to changes in market fundamentals. These features include:

- **High Volume:** Nigeria is a major OPEC producer with high volumes of production of around 2 million b/d (see Figure 1). Under the OPEC agreement, Nigeria is expected to cut its production to 1.4 mb/d between May and July, but the country's compliance has been low standing only at around 60 per cent in May.

Figure 1: Nigerian Crude Oil Production, mb/d (1973–2019)



Source: EIA

[1] Fattouh, B. and A. Imsirovic (2020), 'Shocks and Differentials: How are the oil markets coping?' Oxford Energy Comment, Oxford: Oxford Institute for Energy Studies.
[2] Fattouh, B. and A. Economou (2020), 'Is the worst of the oil crisis behind us?', Oxford Energy Comment, Oxford: Oxford Institute for Energy Studies.

- **High Quality:** All Nigerian crude oil grades are of very high quality.[3] They consist of light and medium heavy density and have very low sulphur content and thus usually command a good premium over North See Dated or Dated Brent. A key Nigerian grade is Bonny Light which has high gravity (32.1) and low sulphur content (0.16 per cent). Another key grade is Qua Iboe with gravity of 37.6 and sulphur content of 0.10 per cent. Historically, these grades yield high amounts of gasoline, light naphtha, jet fuel and diesel and usually trade at a premium to their Brent benchmarks.

Table 1: Key Nigerian Grades and Qualities

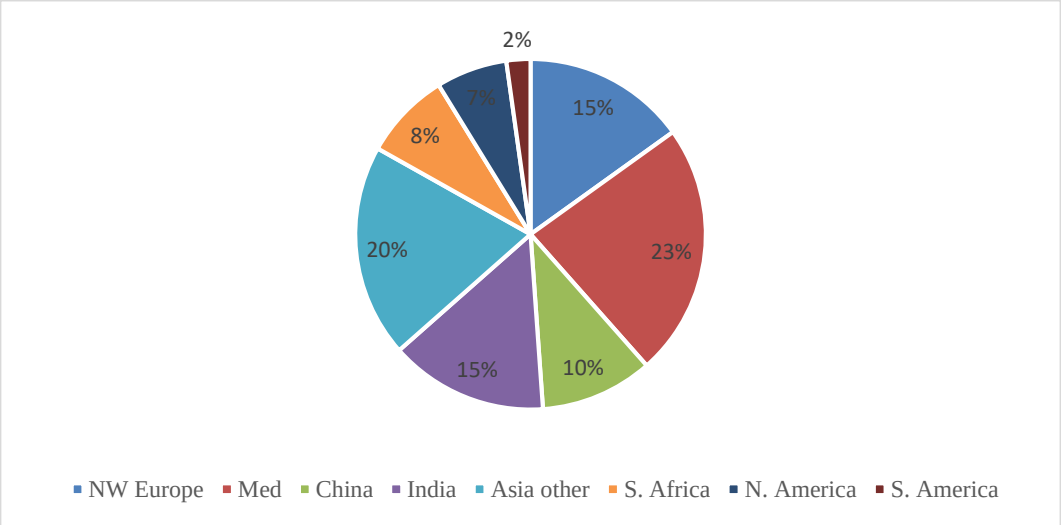
Grade	API	S%	TAN	Quality
AGBAMI	48	0.04	0.05	light
AKPO	46	0.06	0.05	light
AMENAM BLEND	39	0.1	0.03	light
ANTAN	28	0.03	0.7	medium
BONGA	29	0.25	0.45	medium
BONNY LIGHT	35	0.15	0.25	light
BRASS BLEND	40	0.2	0.15	light
EA BLEND	36	0.1	0.2	light
EGINA	27	0.3	0.2	medium
ERHA	35	0.2	0.15	medium
ESCRAVOS	32	0.2	0.6	light
FORCADOS BLEND	32	0.2	0.4	medium
IMA CRUDE	46	0.05		light
OKONO	42	0.06	0.1	light
OKWUIBOME	24	0.1		medium
QUA IBOE	37.5	0.12	0.35	light
USAN	31	0.25		medium
YOHO	41	0.6	0.25	light

Source: Argus

- **No destination restrictions:** Because of the variety of density among the grades (roughly between 24 API and 48 API) and lack of destination restrictions, Nigerian crudes are highly popular and seem to find customers in most places. The most important markets for Nigerian oil are in Asia, accounting for almost half of the total volume, followed by Europe with about 40 per cent. In Asia, the key market for Nigerian crude is India accounting for around 15 per cent of all the Nigerian exports. In Europe, the volumes are almost equally split between North West Europe (NWE) and the Mediterranean. The main European destinations are Holland, UK, Spain and Italy while Nigerian oil finds its way to refineries from the Baltics in the North to Israel and Bulgaria on the edges of the Mediterranean. It is popular in South Africa, both at Durban and Cape Town refineries due to favorable freight as well as the Saldanha Bay storage facility with some 45 million barrels of oil tanks.

[3] There is always an exception (to confirm the rule): Ebok crude may be one, with 19.8 API, 0.4% S and a very high water content (3%).

Figure 2: Nigerian Crude Export Destination (Jan–Jun 2020)



Source: Authors using Clipper data

- **Diversity of suppliers:** Unlike many other producers within OPEC whose production is totally controlled or dominated by a national oil company, several major international oil companies (IOCs) have been operating in Nigeria for decades under various production sharing agreements, with Shell, ExxonMobil, Total, ENI and Chevron being most prominent (see Table 2).

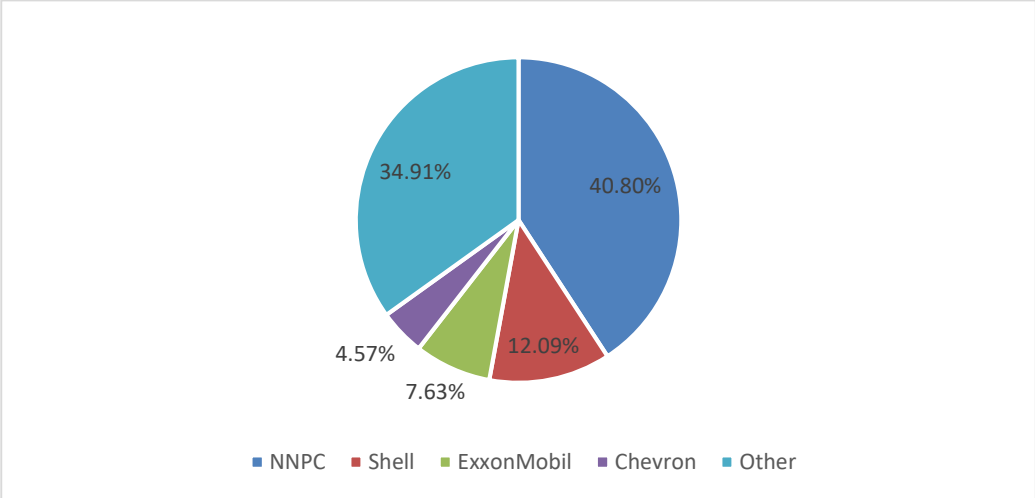
Table 2: Major Nigerian crude oil grades with approximate volumes and operators

Grade	Loading Terminal	Operator	Production (000 b/d)
AGBAMI	Chevron - Agbami FPSO	Chevron	160
AKPO	Total - Akpo FPSO	Total	100
AMENAM BLEND	Total - Odudu Terminal	Total	120
ANTAN	Sinopec - Antan Terminal	Sinopec	20
BONGA	Shell - Bonga FPSO	Shell	130
BONNY LIGHT	Shell - Bonny Offshore Terminal	Shell	270
BRASS BLEND	Eni - Brass River Terminal	ENI	100
EA BLEND	Shell - Sea Eagle FPSO	Shell	25
EGINA	Total - Egina FPSO	Total	200
ERHA	Exxon - Erha FPSO	ExxonMobil	150
ESCRAVOS	Chevron - Escravos SBM	Chevron	160
FORCADOS BLEND	Shell - Forcados SBM	Shell	270
IMA CRUDE	Amni - IMA Terminal Alisa Craig FPSO	Amni International	25
OKONO	Amni - IMA Terminal Alisa Craig FPSO	Amni International	30
OKWUIBOME	Sterling Oil - Tulja Bhavani FSO	Sandesara Group	30
QUA IBOE	Exxon - Qua Iboe SBM	ExxonMobil	220
USAN	Total - Usan FPSO	Total	35
YOHO	Exxon - Yoho Terminal	ExxonMobil	40

Source: Argus

As a part of these production sharing agreements, royalties[4] are paid to the government in crude oil. The crude is then marketed through the Nigerian National Petroleum Company (NNPC), Nigeria's national oil company. It is difficult to precisely estimate these volumes as they vary, depending on the terms of the individual agreements as well as the oil price. However, as Figure 3 shows, about 40 per cent of the oil ends up with NNPC. Shell, ExxonMobil and Chevron follow as the largest remaining lifters among the many operators ('other' make up almost 35 per cent).

Figure 3: Nigerian Loadings by Company, December 2019



Source: Argus

- **Access to crude:** Many players have access to Nigerian crude for sale in international markets and although the process in which Nigerian crudes are marketed is highly complex, it does make the crude highly tradable. There are three main ways to get access to Nigerian oil:
  - Equity production: This is available to a handful of IOCs operating in Nigeria. Equity producers have a right to sell their oil without any differential pricing or destination restrictions, which makes Nigerian oil a very tradeable crude. They can sell to the highest bidder in Europe, on Brent Dated basis or arbitrage the oil eastwards, and sell it on Dubai basis.
  - 'Direct Sale, Direct Purchase' (DSDP) agreement or 'oil for products exchange': Due to growing population, poorly operating refineries and fuel subsidies, Nigeria is chronically short of products such as gasoline and diesel. Such purchases are paid for in crude oil through DSDP contracts and roughly 3 million barrels of crude is awarded every month on this basis.[5]
  - Term contracts: Another peculiarity of the Nigerian oil market are term contracts with third parties. Every year, NNPC awards each qualifying company, one or more contracts of about 33 thousand b/d (or one cargo per month). NNPC tends to award these contracts to a very wide range of companies, which are, in most cases not end users. In 2017, there were 39[6] companies with NNPC term contracts which exceeded the oil available for sale. Details about the awarded term contract are not publicly available, but some informed sources indicate that up to a hundred different companies were involved in 2020 awards. The process of awarding the contracts seem as opaque as the upstream production sharing agreements.

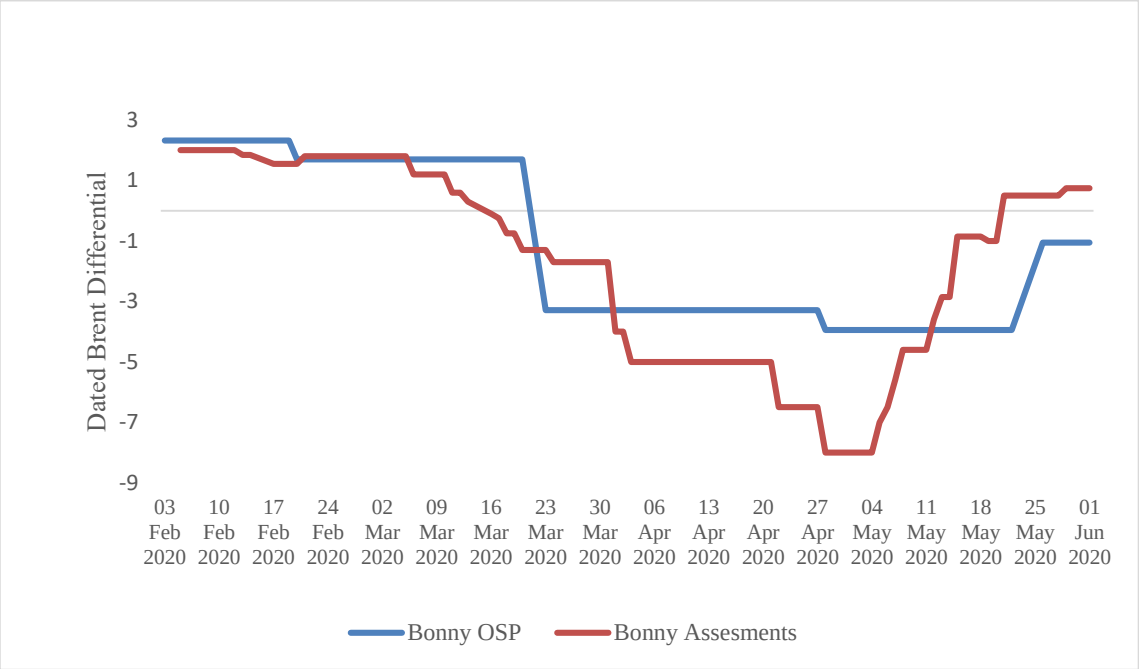
[4] Nigeria has one of the most complex and opaque royalty systems, with agreements varying with a myriad of factors including timing of the contract, location and terrain, water depth, oil quality, production volumes and so on.
[5] Depending on relative prices of crude oil and products.
[6] 'Nigeria's NNPC awards 2017 crude oil term contracts to 39 companies' in: https://www.reuters.com/article/ozabs-uk-nigeria-oil-contracts-idAFKBN14O0GI

- **Tradability on spot basis:** Adding to the complexity of Nigerian oil contracts is that they allow contract holder to nominate five grades of crude acceptable to the buyer. NNPC can deliver any of these grades of their own choosing. It is not clear what method NNPC uses to allocate these barrels. There is no guarantee on the NNPC part to supply the agreed volumes. In fact, there is no guarantee that the buyer will obtain any oil at all, despite having signed the contract. It is not uncommon for a holder of a term contract for one cargo per month to get only one cargo (or even none) in a whole year.[7] Allocation becomes clearer only when the monthly loading programmes are released. These are not always complete and additional cargoes are often added later. Given the nature of the term contract process, it is very difficult for a refiner to have a term contract with NNPC. Even though some refiners have term contracts, there is no guarantee that they will get the grade they need, at the time they need it. In fact, there is no guarantee that they will get any barrels at all. India, a key market for Nigerian grades, tends to buy oil in monthly tenders. Co-loading barrels on a very large crude carrier (VLCC) can make scheduling a very complex operation. Only an equity producer such as ENI, Chevron, Shell, ExxonMobil, Total, or a large trader with multiple term contracts can guarantee timely delivery of a particular grade, making them a preferred partner for such long-term contracts. This has major implications for the marketing of Nigerian crudes. On the one hand, refiners need certainty in terms of grade quality and loading dates and thus find it difficult to buy directly from NNPC. On the other hand, most of the volumes end up either with traders or trading arms of the major oil companies. As a result, a large volume of oil is traded on a spot basis.
- **OSP and Spot Market Assessment:** In line with many other producers, NNPC does not disclose the way they set their official selling prices (OSPs) or differentials, which are set against Dated Brent. It is generally accepted to be a function of the spot market price movements in the previous month. In other words, if the OSP for Bonny Light, for example is Dated Brent +$.050/barrel in one month, and the grade is trading in the spot market at +$0.70, the OSP in the following month will increase by $0.20. When the spot price is below the OSPs, experienced traders will 'offload' the barrels as quickly as they can, as close to the OSPs as possible, to minimise their losses. The term contract holders will be losing money on their long-term contracts and expect and probably even demand lower OSPs in the subsequent period, in order to re-coup their losses. As a result, there is an implied and close relationship between the OSPs and spot prices: When the OSP is set low relative to the market, the informed trader will buy as many cargoes as possible, creating an upward momentum in the spot price. Equally, when the OSPs are high, there will be aggressive selling of spot cargoes causing an accelerated fall in the differentials.[8] This feature of the Nigerian barrels makes them even more responsive to the prevailing market conditions.

[7] Why NNPC signs so many contracts and how they allocate the oil to each is not clear. What is clear is that the contracts are very valuable and can trade in the secondary market for very large premiums. This is not a transparent market, but premiums of well over $0.50/ barrel were mentioned for 2020 contracts. What justify such high premium? Nigerian grades are certainly of high quality and very fungible commodity due to few destination restrictions. Being able to move the barrels to the highest paying market anywhere in the world is certainly valuable. The pricing optionality offered as a part of the contract is valuable too, especially in volatile markets.

[8] As can be seen from Figure 4 below, that this is precisely what happened in March this year: High OSPs at the time of a demand shock resulted in aggressive selling of cargoes and a rapid decline in differentials, by well over $5/ bbl. OSPs took some time to adjust. When they did adjust below -$3 level, the Chinese buying spree in May resulted in a very quick recovery and a sudden and sharp improvement in the quality differentials.

Figure 4: Bonny Light crude, OSPs v Spot market assessment



Source: Argus

- **Pricing options:** Another key features that adds to the attractiveness of the Nigerian barrels is the pricing options that NNPC offers its buyers. From a buyers' perspective, pricing options offer flexibility which can be an attractive feature of the crude, especially in volatile markets.[9] It should be noted that this option is given to the term contract holder only and does not necessarily have to be passed on to the end user. In fact it is normally exercised by a trader, or trading arm of a major oil company, used to extracting value from such options.

Tradability on Spot Basis and Responsiveness to Market Conditions

The above features, particularly that large volumes of Nigerian barrels are traded on a spot basis and the fact that Nigerian grades are popular and thus can flow East or West of the Atlantic basin, make the Nigerian barrels an excellent indicator of sudden changes in the market conditions. While the predominance of spot trading is rewarding in tight market conditions, as traders bid up the quality differentials, Nigerian cargoes are the first to remain unsold in weak times.

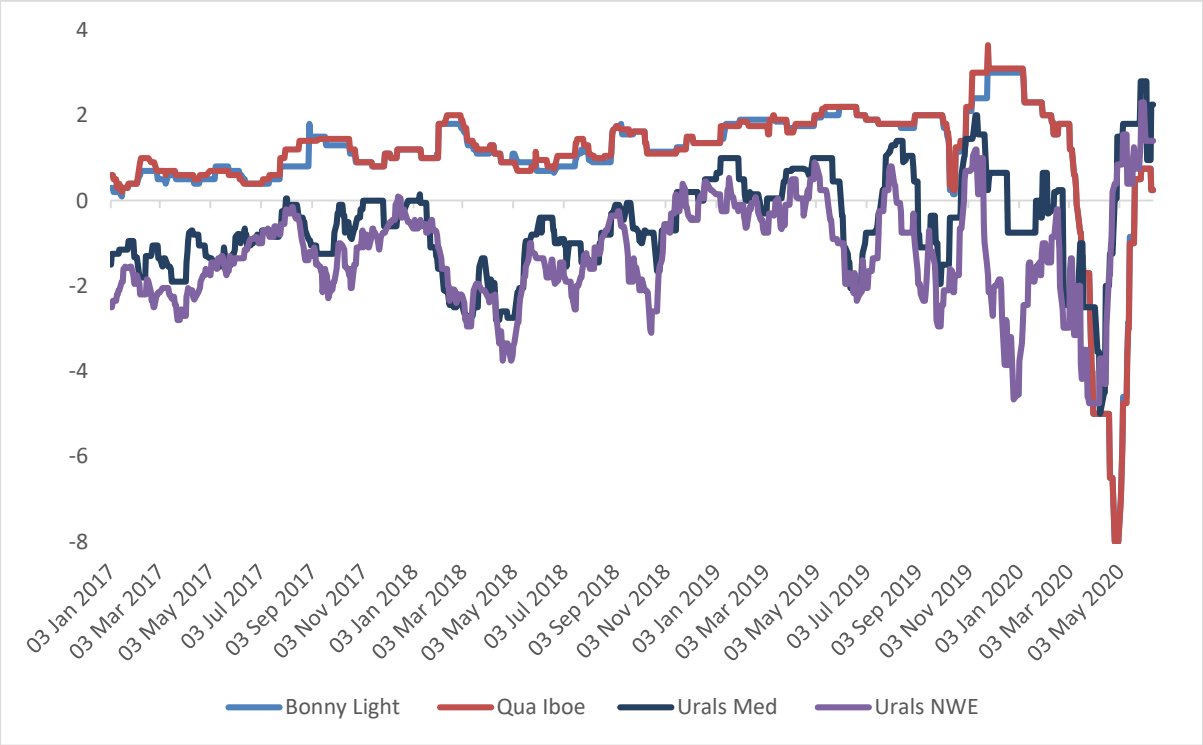
As global oil demand contraction reached its peak in April 2020 and key OPEC+ members started increasing their production after the breaking of the March OPEC+ agreement, the differentials fell sharply, trading from premiums to Atlantic benchmarks in early March to large discounts by mid-April. Nigerian differentials for the flagship Bonny Light and Qua Iboe grades fell to -$8/barrel as sellers struggled to find home for their cargoes (See Figure 5). Given that gasoline and jet fuel consumption accounted for the bulk of decline in global oil demand, this had a bigger impact on light sweet crudes which recovered much slower than sour grades. As a result, grades such as Nigerian Bonny Light have been trading lower than sour barrels such as Urals in recent weeks (see Figure 5).

Despite the large discounts, Nigerian loading programmes were not fully sold, and large volumes of oil were destined for storage.[10] With European demand largely non-existent, Reuters reports that at least three dozen unsold cargoes of Nigerian crude for April and May loadings were still seeking buyers[11]

[9] See Fattouh, B. and A.Imsirovic (2020), 'Crude Oil Pricing Optionality and Contracts for Difference', Oxford Energy Comment, Oxford: Oxford Institute for Energy Studies.
[10] Total alone stored 6 million barrels out of the Nigerian April programme in Saldanah Bay.
[11] Reuters, 'W. Africa Crude-Nigerian export programmes expected, buyers elusive', 23 April 2020.

towards the end of April. The clearance of these cargoes is key to understanding the current market rebalancing and the important role that China is playing in the process.

Figure 5: Bonny Light Qua Iboe and Urals Differentials, $/Barrel

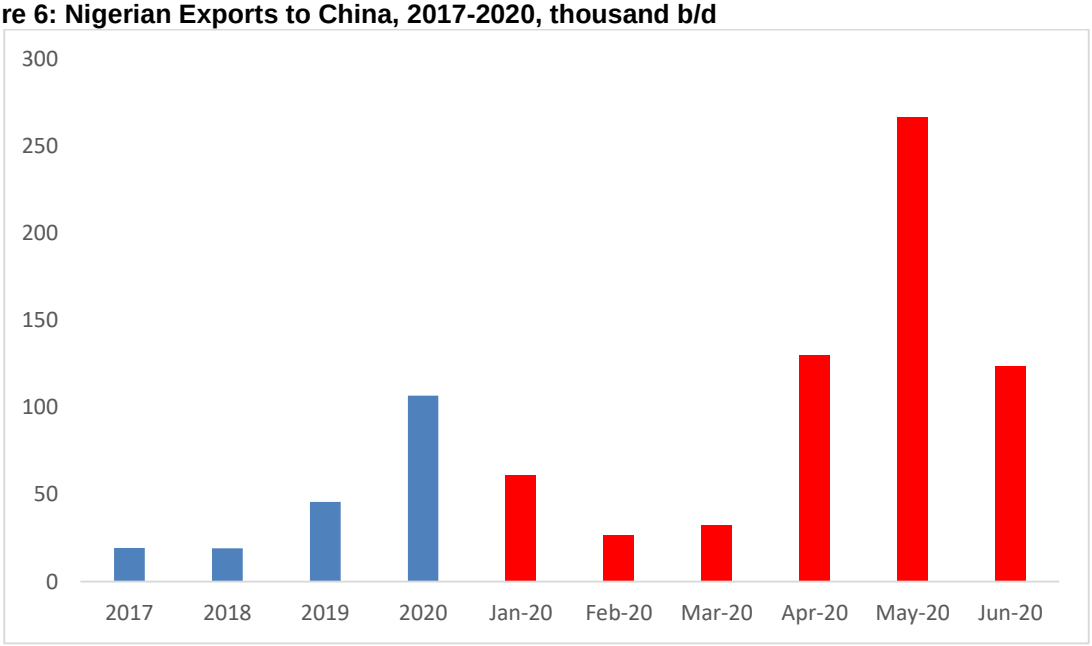


Source: Argus

As Nigerian grades became relatively cheap, China, the first country to be affected by COVID-19 but also the first country to show signs of recovery, emerged as a key buyer of Nigerian barrels although China is not a major destination for Nigerian crude. The narrowing in the Brent-Dubai spread and the fall in freight rates provided Chinese refineries with an opportunity to buy cheap Nigerian crude (see Figure 6). This was helped by the availability of empty storage in China for the strategic petroleum reserve (SPR) as well as the Chinese government protection of the refinery margins when oil falls below $40 per barrel.[12] In 2019, China's average of monthly imports stood at around 46,000 b/d. In May 2020, this stood at more than 260,000 b/d. In June 2020, Unipec alone bought about 150,000 b/d of 'ultra-cheap' Qua Iboe, and Bonny Light.[13] This happened at a time when Nigeria was supposed to curtail its production under the OPEC+ agreement. The fierce competition in China explains in part Saudi Arabia's and Russia's insistence on ensuring all parties to the OPEC+ agreement, particularly Nigeria, comply with their quotas.[14]

[12] See Maidan, M. (2020) 'China's mixed message to the oil market', The FT, May 20.
[13] 'West Africa Lifts Prices, Sees Slow Demand', Energy Intelligence, May 29, 2020.
[14] Nigerian Agbami and Akpo grades, amounting to about 260 kbd, do not count as OPEC production as they are considered condensates.

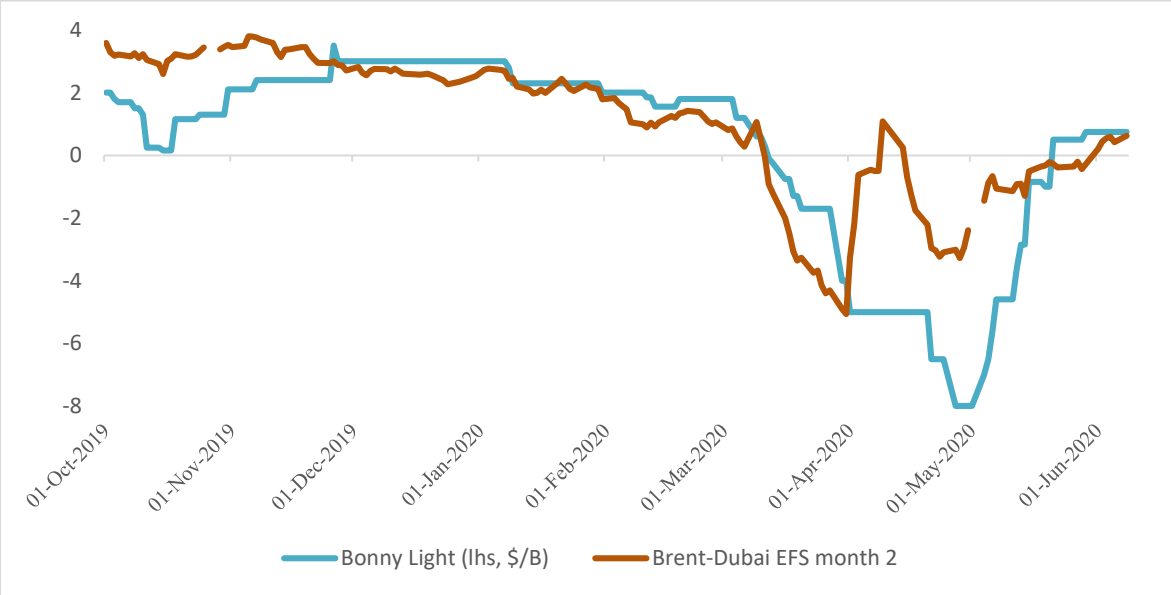
Figure 6: Nigerian Exports to China, 2017-2020, thousand b/d



Source: Authors using Kpler data

Relative prices had to adjust for the clearance to happen. Not only did the Nigerian differentials collapse in relation to Dated Brent against which they are priced, but Dated Brent itself collapsed in relation to the forward month and futures markets.[15] The pressure on Dated Brent had further impact on the Brent-Dubai spread. It is this spread that is the key to the flow of oil from the Atlantic basin to Asia. On the one hand, Brent was under pressure from the overhang of prompt oil and on the other, the marginal buying of crude was coming from China, which had started recovering from the pandemic. This narrowed Brent-Dubai spread to the extent that the EFS (the spread between the Brent futures and Dubai swaps) went negative, partly reflecting the magnitude of the contango (see Figure 7).

Figure 7: Nigerian Differentials and Brent-Dubai EFS, $/Barrel

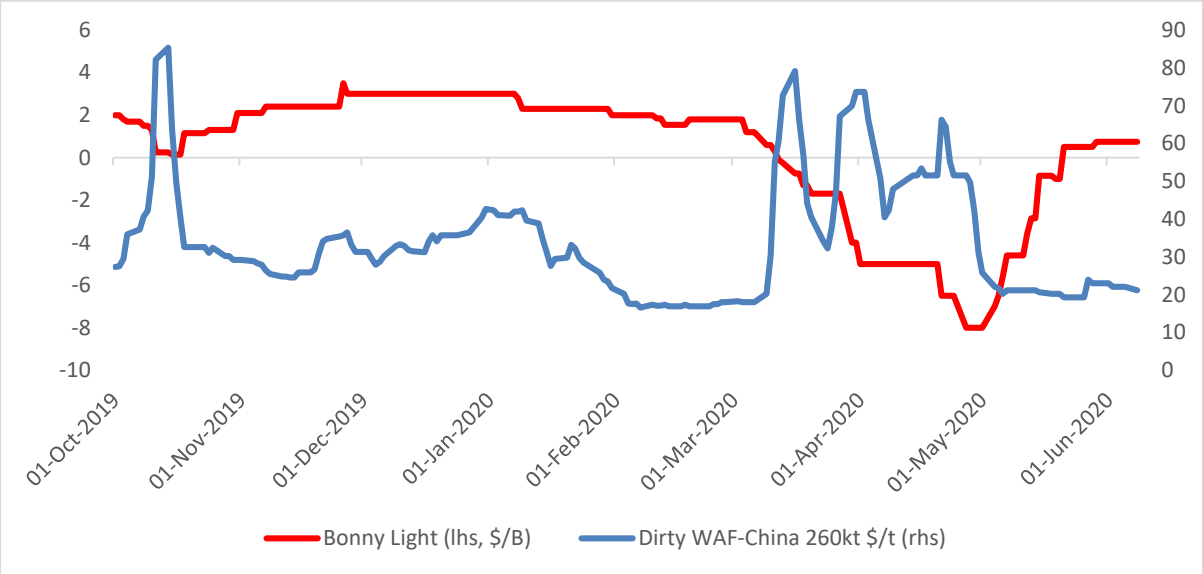


Source: Argus

[15] For an explanation, see Fattouh and Imsirovic: Shocks and Differentials: 'How are oil markets coping?', Oxford Energy Comment, April 2020.

Another factor that contributed to such large movement of crude was the decline in freight rates. Initially, the overhang of prompt oil and the need for floating storage caused the freight rates to increase, further chocking off the global movement of oil and contributing to the pressure on the differentials (see Figure 8 below). Gradually, freight rates eased, largely due to OPEC+ cuts which resulted in lower volumes of oil to be shipped. As the freight rates eased off in May, crude oil started to move East and the differentials gradually improved.

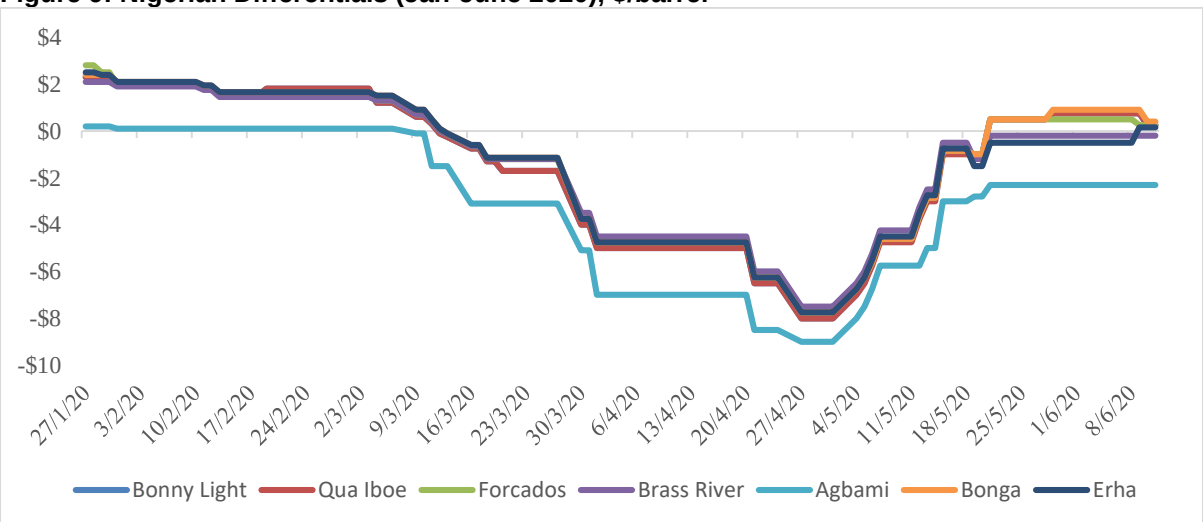
Figure 8: VLCC Freight rates ($/t) and Nigerian differentials ($/Barrel)



Source: Argus

To what extent has the recent surge in futures prices been reflected in the strengthening of Nigerian crude fundamentals? The opening of the arbitrage to Asia and Chinese opportunistic buying, coupled with OPEC+ cuts and gradual overall market recovery have resulted in strengthening Nigerian differentials alongside Dated Brent and its spread to futures Brent and Dubai. As can be seen from Figure 9, from a deep discount in April, Nigerian differentials traded at a premium to the benchmark while Dated Brent relative to futures Brent and Dubai also strengthened. These are all clear indications that the recovery in futures prices has been supported by improvement in physical indicators.

Figure 9: Nigerian Differentials (Jan-June 2020), $/barrel



Source: Argus

However, the recovery remains fragile. Despite OPEC+ cuts, Indian refineries recently picking up several cargoes[16] after the county's easing of the lockdown measures and opportunistic buying from China, many Nigerian cargoes remain unsold. In May, Reuters reports that around 50 Nigerian cargoes are yet to be sold from the June and July programmes.[17] The flattening of the forward curve and the potential shift to backwardation imply that many of the stored barrels could be released to the market. This will continue to put downward pressure on prices, especially on light sweet crudes. The potential return of Libyan oil will further add to this pressure.

Conclusion

The nature of term contracts, the diversity of suppliers, the lack of destination restrictions, and the current marketing practices, in addition to its high quality, global acceptability, and popularity among refineries across the globe allow Nigerian oil not only to play a key role as the swing barrels to the East and the West of the Atlantic basin, but also in the price formation process of key benchmarks such as Brent and Dubai. Also, its tradability on spot basis, implies that it is immediately impacted by changing market conditions and thus fast changing quality differentials and trade flows make Nigerian barrels a good indicator of changing market fundamentals. In the face of a strong demand shock, Nigerian cargoes remain unsold, differentials weaken, and time spreads between key benchmarks adjust to allow for arbitrage opportunities. They are usually the first barrels to be stored on shore as well as on the water.

Looking ahead, uncertainty surrounding demand remains the major factor shaping the recovery. There is much optimism that gasoline demand will be the fastest part of the barrel to recover. Monitoring the performance of Nigerian crudes can provide some valuable clues about the pace and shape of the recovery. If the recovery in oil demand, particularly gasoline demand, falters, then this is likely to be felt first through the weakening of Nigerian differentials and the Brent-Dubai spread, other things being equal. Although China's crude imports are expected to slow down in the second half of 2020 and crude and products stocks continue to rise, China will continue to provide an absorption mechanism for Nigerian barrels if prices fall enough and if China's demand recovery is concentrated on the light end of the barrel. If, on the other hand, the demand recovery is stronger than expected and more generalised particularly in places like Europe and India, this will be reflected in sustained recovery in Nigerian differentials and widening of the Brent-Dubai spread to keep the crude in the Atlantic basin, though this will be capped as Nigerian barrels in storage are released back to the market. Finally, since gasoline demand is expected to show the strongest recovery, how Nigerian crudes perform relative to sour crudes, particularly Urals, will provide additional clues. If oil demand and gasoline demand continue to recover as lockdowns across the globe ease and people's travel patterns shift towards greater use of personal transport, this would help strengthen the prices of Nigerian grades in absolute terms but also relative to sour crudes such as Urals.[18] Nigerian crude is likely to be a bellwether of such developments and is worth watching for clues regarding the direction the oil market is heading.

[16] Though it is believed that much of the oil sold will be supplied out of storage rather than from the July programme.
[17] Reuters (2020)'W. Africa Crude-India continues to provide silver lining for Nigerian crude', May 28.
[18] This is subject to continuing OPEC+ cuts and compliance which have a great impact on sweet - sour differential.