

An Update on Australian Iron Ore Price-Setting Arrangements¹

The iron ore spot market has become increasingly important for Australian exporters over recent years. This note documents how the daily spot price for iron ore landed in China, as published by The Steel Index, is measured, and details the various forms of price setting used by the major iron ore miners. Based on company reports and market analysts, we estimate that monthly contracts and spot market sales now account for close to 60 per cent of all iron ore exports, compared with 20-30 per cent in mid 2010, and almost nil prior to 2009 when annual contracts were central in price-setting.

In other developments, trading has just begun on two iron ore spot trading platforms, while the iron ore derivatives market continues to develop. Both remain in their infancy, but have the capacity to increase transparency and to facilitate price discovery in the iron ore market in the future.

Introduction

Until recently, Australia's iron ore trade was dominated by fixed-term price contracts, either annual or quarterly. Since late 2011, however, iron ore producers have begun to sell a much higher share of ore on short-term price indexes, raising the importance of understanding how the Chinese spot price is measured; and making Australia's terms of trade (and the monthly RBA Index of Commodity Prices) more susceptible to spot market volatility. In light of this, we document how the daily spot price for iron ore landed in China is measured, and outline the price setting mechanisms that together form the average Australian export price of iron ore. We also briefly outline how the new global iron ore trading platforms, CBMX and globalORE, are likely to operate, and provide an update on developments in the iron ore derivatives market.

Measurement of the Chinese iron ore spot price

There are three providers of physical spot prices for iron ore imported into China by sea: The Steel Index (TSI), The Metal Bulletin and Platts. EAF use TSI because it's timely (daily) and accessible from Bloomberg (Graph 1).² Like its competitors, TSI constructs this measure by collecting daily spot trades from market participants (e.g. miners, steel producers and brokers).³ The recorded transactions are usually of a minimum quantity of 20kt⁴ and are on a cost and freight (CFR) basis.⁵ As each trade involves differing iron contents (in the range of 55 per cent and 68 per cent) and delivery to different Chinese ports, the trades are "normalized".

¹ Name Redacted made a valuable contribution to this note – undertaking some of the research documented.

² EAF use weekly TSI spot price data from November 2008 to June 2009. Prior to November 2008, TSI data is not available. We splice weekly TSI data on to weekly iron ore price series from The Metal Bulletin and Steel Business Briefing.

³ The four major miners in the global iron ore market are Rio Tinto, BHP Billiton, Fortescue Metals Group and Vale. The major buyers include a small number of large, government-owned Chinese importers, as well as a relatively large number of small, Chinese steel mills and brokers (see [Holloway et al 2010](#)).

⁴ The minimum trade size for recorded transactions in the TSI is 20kt. The minimum trade size used by Platts and The Metal Bulletin are 30-35kt and 35kt respectively (see [Credit Suisse Presentation](#)). This is also consistent with Hodge (forthcoming).

⁵ CFR requires the seller to bear the costs of shipping goods to the buyer.

This makes the recorded transaction better reflect a shipment to a particular Chinese port and of particular iron content (in the case of the TSI, 62 per cent iron content and delivered to Tianjin Port). A volume-weighted average is then taken of the normalised prices (outliers are removed and the weight of any single data provider is capped), producing a daily index price. Because Australia's miners have indicated that sales are negotiated on a Free On Board (FOB) basis,⁶ EAF use the Dampier to Qingdao freight cost sourced from Bloomberg to transform the spot price into this format (Graph 2).⁷ Large changes to shipping costs have the potential to influence EAF's estimated FOB iron ore spot price. However, the abundance of available ships is expected to keep freight costs contained for some time.⁸

The daily spot price calculation includes only transactions already on route to buyers, or where the cargo will be loaded and ready for shipping within 4 weeks of the transaction date. (For more information, please see: [The Steel Index \(2008 p. 8\)](#)). On balance, the spot price for iron ore appears to be a relatively timely indicator of end-user demand.

Why the spot market is now important

Prior to 2009, most iron ore miners operated under long-term annual contracts with customers, which, in a thin market (e.g. a small number of producers and buyers), provided certainty and aided in credit access. In the two and half years following this, the annual benchmark pricing system was replaced with quarterly contracts, with the global financial crisis the catalyst for change. The spot price for iron ore dropped 30 per cent below the annual contract price at the onset of the global financial crisis, encouraging some customers to renege on agreements and purchase spot cargoes. It also encouraged greater use of iron ore swaps – as steel mills with customers under long-term contracts sought to hedge additional price risk ([Names\(x2\) Redacted 2010](#)).

More recently, spot and monthly contracts have become, and are expected to remain, the central price-setting mechanism for iron ore. Increased use of iron ore swaps has also occurred. That short-term pricing has become more dominant is not unexpected. As markets become mature and liquidity increases, spot markets aid price discovery as intermediaries arbitrage the mismatch in pricing between producers and buyers. The major mining companies desire to move to spot market pricing probably reflects that short-term pricing should, in theory, better reveal the "true/fair" price, including expectations for the global demand and supply balance and changes in the cost of production. However, what was unexpected was the speed of the move away from the status quo. The sharp fall in the iron ore spot price in October 2011 encouraged customers to re-negotiate contracts from backward-looking indexes to shorter-term indexes (satisfying the major producers' preference to permanently sell a larger amount of ore under this arrangement). Furthermore, it was reported at the time that getting 'caught out of the money' when the

⁶ FOB basis is where the seller bears the cost of transporting goods to the port of shipment, plus loading costs, while the buyer pays the cost of freight, marine insurance, unloading and transportation from the arrival port to the final destination.

⁷ Data for the Dampier to Qingdao shipping route is only available weekly. To transform this into a daily estimate we interpolate using the daily Baltic Capesize Index.

spot price fell sharply gave the less-creditworthy steel mills pause to think about how much they value security of supply over flexibility.⁹

Today the major producers sell iron ore using a variety of shorter term price setting mechanisms, including variations on monthly and quarterly contracts (lagged and contemporaneous) and tenders for individual cargos. Unfortunately, companies do not disclose much pricing information so there is a great deal of uncertainty surrounding which pricing mechanisms precisely underpin Australia’s exports of ore. To publish the RBA’s Index of Commodity Prices (ICP) on a monthly basis, and to minimise the need for revisions, EAF estimate average export prices of iron ore.¹⁰ In order to do so it is necessary to regularly review information and subsequently make assumptions about the share of ore sold on the spot market, monthly contracts, quarterly contracts, and lagged quarterly contracts.

Table 1 shows estimated shares of iron ore exports under each pricing arrangement, which is described further below. We estimate that the share of iron ore sold on short-term index based price-setting mechanisms (spot and monthly contracts) now accounts for close to 60 per cent of exports, up from only 20 per cent in 2010. Consequently, movements in the average export price have begun to more closely align with the spot price than quarterly contracts (Graph 3). EAF groups the pricing mechanisms into five simple categories and uses a weighted average to calculate the average export price of iron ore each month:

Table 1. Share of Australian Iron Ore Exports By Price-setting Arrangement*
Per cent

	Short-term (incl. spot and monthly contracts)	Quarterly** (incl. quarterly lagged prices)	Annual JFY benchmark prices
Pre-2010	--	--	~majority
Jun-10	20	80	--
Mar-11	25	75	--
May-12	50-60	40-50	--

*RBA estimates

**Includes quarterly carryover and current quarter pricing

Source: company reports & presentations; market estimates

- **Monthly contracts:** the price of ore sold is assumed to be the previous month’s average spot price, in part due to the maximum lag time allowed between when a transaction occurs and when the ship is loaded (4 weeks; see [previous](#) section). The major miners sell a large portion of ore via this mechanism. Market reports suggest that Fortescue Metals Group (FMG) sells close to half its ore on this basis. The share of sales by BHP Billiton (BHP) and Rio Tinto (Rio) on monthly contracts are estimated at around 30 per cent each (Table 2).

⁹ According to UBS’s Equity Research team, Marius Kloppers, CEO of BHP, made comments along these lines on October 21, 2011.

¹⁰ Because exporters of iron ore have confirming status they may amend their customers declaration forms up to six months following their initial submission. This means that the ABS’s International Trade in Goods and Services numbers tend to get revised heavily. As a consequence, even when ABS data is available, EAF continue to use internal estimates in the ICP until the ITGS data appears to be finalised.

- **Spot market:** unsurprisingly, we use the average daily spot price for iron ore for the monthly price. This captures all ore sold based on one-on-one price negotiations with customers and shipment tenders awarded to the highest bidders. Company reports suggest that FMG sells close to half all exports via this price-setting mechanism. We estimate that BHP and Rio sell around 30 per cent and 15 per cent respectively on spot trades.
- **Quarterly contracts/current quarter pricing:** the price of ore sold using this mechanism is assumed to reflect contemporaneous movements in the daily spot price for iron ore in the quarter (the average of the quarter-to-date daily spot price). While there is no published quarterly contract price released by the major miners or large customers (and a high degree of uncertainty about how this price might be calculated), the quantity of ore sold under this price-setting arrangement remains non-trivial. Some large Japanese mills still reportedly prefer quarterly pricing (including quarterly lagged pricing; see below).¹¹ According to some market analysts, the share ranges from somewhere between 15 per cent and 40 per cent ranges for BHP and Rio.
- **Quarterly lagged contracts:** the price of ore sold using this price-setting mechanism reflects the average daily spot price of the previous quarter, lagged one month. For example, the December quarterly lagged contract price is based on the average daily spot price over June-August, rather than July-September. This price has sometimes been referred to as the *Vale* quarter (as the Brazilian miner reportedly estimates contract prices this way). For BHP, we estimate the share of ore sold under this price is around 20 per cent and Rio is around 40 per cent.¹²
- **Quarterly carryover:** the price of carryover sales is assumed to reflect the previous quarterly lagged contract price. It reflects the proportion of ore sold during the month that has been delayed due to unforeseen disruptions to production, rail or ship loading. However, there is little detail on the quantity of ore sold this way, and whether it would be enforced by customers – a situation heavily dependent on the level and direction of the spot market. We assume that the amount of iron ore sold on a carryover basis is trivial.

Table 2. Iron Ore Price-setting By Producer

	Per cent	
	Short-term (incl. spot & monthly contracts)	Quarterly (incl. quarterly lagged prices)
BHP	60+	40 or less
Rio	50-60	40-50
FMG	~majority	0
Vale	70	30

*RBA estimates as at May 2012.
Source: company reports & presentations; market estimates

Whether the major global iron ore miners increase the share of ore sold via toward short-term pricing even further (e.g. above 60 per cent) is still unclear, and probably will depend on a range of factors, including: the size, geographical location and preference of customers (in the past large steel mills in Japan have been somewhat reluctant to move toward monthly or spot pricing); and the nature and diversification of each miners' own operations (such as the cost of production in regards to iron ore as well as the perceived risk based on the total portfolio of resources sold).

¹¹ See, for example, [Rio, 2011](#).

¹² Rio reported in [March](#) that 40 per cent of iron ore sales were priced with reference to a quarterly lagged contract.

Other Developments in Iron Ore Markets

Global Iron Ore Physical Trading Platforms

The value of physical world trade in iron ore has soared over the past decade, reaching more than US\$150 billion in 2011. It is now five times bigger than the value of global trade in wheat, for instance.¹³ Surprisingly, though, the iron ore spot market has remained one of the least developed in terms of price transparency and investor presence. In January 2012, state-owned China Beijing International Mining Exchange (CBMX) announced plans to operate a newly created online global iron ore trading platform. Trading on the exchange opened in mid May. Furthermore, globalORE, an alternative global trading platform for iron ore based in Singapore, opened for trading on May 30.

In principle, a global trading platform should improve transparency and liquidity in the iron ore spot market, thereby aiding price discovery (benefiting both producers and consumers of the ore worldwide), and should encourage further development of iron ore derivative markets (as firms increase their use of hedging instruments). Other essential metals, energy and foods are routinely traded on international spot and futures markets. To date all four of the major global iron ore miners have agreed in principle to CBMX's trading platform (as well as several major Chinese steelmakers including the China Iron and Steel Association). Media outlets report that current membership of the CBMX is close to 140.¹⁴ The major shareholders of globalORE, includes most of the major miners (e.g. Rio, BHP and Vale) as well as some Chinese steel mills such as Baosteel.

Of course, an efficient and global iron ore trading platform is still likely some way off. The trading platforms will need to demonstrate credibility and reliability, with appropriate trading regulations, credit limits, enforcement and transparency. Criticisms of the CBMX have focussed on a lack of perceived independence and a physical clearing house. It is also unclear how Chinese customers might respond to increased price volatility on an online exchange run by a state-owned business, particularly if prices increased significantly. Some of these limitations, however, may be less relevant for the globalORE trading platform.

Any platform would also require depth and diversity in trading so as to make the initiative worthwhile (a large amount of trading from a diverse and wide range of producers, customers, brokers, trading houses etc). This may then provide an improvement over the existing physical spot price indexes for trade with Chinese customers.¹⁵ UBS market analysts argue that the size of global iron ore trade provides scope for sufficient liquidity at two global iron ore exchanges over the medium-to-longer term.¹⁶ Market participants will likely also need time to become at ease with market operations. Any platform would require, crucially, the major iron ore miners to actively participate (via in-house trading or brokers etc), rather than giving only passive support.

Iron Ore Swaps/Forwards Market

Previous research by [Names Redacted\(x2\) \(2010\)](#) has documented the infant state of the iron ore derivatives market and the potential for this market to develop. The increasing use of the iron ore spot market is likely to continue to generate greater demand for hedging instruments such as fixed-for-floating commodity swaps and forward contracts. Iron ore swaps are effectively a series of cash-settled forward contracts on iron ore over a certain period of time, and because they are forward looking, should give some indication of where spot prices are heading. Graph 4 shows the relationship between the three-month ahead swap and the spot price for iron ore. Media reports suggest that most iron ore swaps globally are cleared through The Singapore Exchange (SGX). Data from the [SGX website](#)

¹³ See [BREE \(2012\)](#) and [ABARES \(2012\)](#).

¹⁴ See news [article](#).

¹⁵ Some analyst estimates, quoted in the media, suggest that the volume of trade required to give sufficient depth would be about 100 to 200 million tonnes (between 10 and 20 per cent of annual world exports in 2011). See news [article](#).

¹⁶ World exports of iron ore were 1,075Mt in 2011, and are expected to grow strongly over the next half a decade ([BREE 2012](#)).

indicates open interest on iron ore swaps equivalent to 5¼ million tonnes in April 2012 (amounting to roughly 6 per cent of monthly world exports of iron ore). This is up from 3¼ million tonnes in April 2011 and a five-fold increase since April 2010.¹⁷

Any global iron ore trading platform, if it proceeds and leads to increased transparency and liquidity, should improve the efficiency and encourage the expansion of iron ore derivative markets. Although current swaps and forward contracts are settled against existing spot price indices, including TSI, these, in principle, could be re-linked to a new reference price (provided it was perceived as the leading reference price).¹⁸ This would allow firms to better hedge exposures to movements in spot prices and would influence movements in the spot price itself. Unfortunately, this appears unlikely in the short-term. Firstly, both exchanges will need to demonstrate credibility and reliability before being perceived as the

leading reference price and this is likely to take some time. Secondly, it's unclear whether CBMX will allow its reference price to be the basis for cash settlements of swaps and forward contracts. The Chairman of the China Steel & Iron Association, one of the major organisations backing this platform, is quoted by media outlets as saying, "[t]he new platform will not allow financial organizations and banks to participate to avoid... speculation and will not trade iron ore derivatives either."¹⁹

Economic Analysis Department
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¹⁷ Credit Suisse Iron Ore Forward Contracts are also available from Bloomberg (and have been used in previous research by [Name Redacted 2011](#)). These contracts are available on a monthly, quarterly or on a calendar year basis. The contract price is based on the average of The Metal Bulletin and the Steel Business Briefing prices for the period (with an iron content of 62.5 per cent).

¹⁸ Furthermore, the exchange itself could launch trading and clearing services for iron ore derivatives.

¹⁹ See, for example, <http://www.steelguru.com>.

DRAFT - THE FINANCIALISATION OF NATURAL GAS MARKETS IN ASIA

This note seeks to develop the Bank's understanding of spot and derivative markets for natural gas in Asia, including the depth of these markets and how they operate. The number of Asian natural gas price benchmarks has risen alongside the increasing prevalence of shorter-term natural gas pricing arrangements in the region. These developments have contributed to a rise in the demand for hedging against movements in Asian natural gas spot prices and an increase in the liquidity and depth of derivative markets for natural gas in Asia.

Background

This note seeks to develop the Bank's understanding of spot and derivative markets for natural gas in Asia, including the depth of these markets and how they operate. Most liquefied natural gas (LNG) produced in Australia is done so under long-term contracts. As a result, the Australian LNG market is largely insulated from spot price dynamics (Jenner, Lam and Poole 2017). Nevertheless, the prevalence of spot and short-term contract pricing for LNG produced in Australia is likely to increase in future. This has implications for domestic production of LNG, as well as the outlook for economic growth and inflation.

The financialisation of natural gas markets in Asia

There are two main natural gas futures markets in Asia – the Japan Korea Marker (JKM) and Singapore Sling.¹ and [China]. [How these contracts compare to established benchmarks.]

- Briefly define relevant benchmarks – reference earlier work.
- Briefly discuss geographical context e.g. Asian LNG spot prices relevant for marginal LNG supply from Australian market (Lambie 2016).

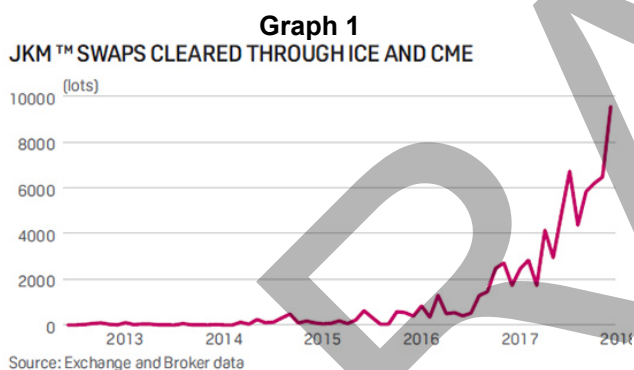
	Asian Gas Futures Markets			Established Gas Futures Markets		Japan Customs-Cleared	Asia Spot Survey	Oil Futures	
	JKM	Singapore Sling	China	Henry Hub	National Balancing Point	Average price of crude oil imported into Japan	Asia Spot	WTI	Brent
Units	USD/MMBtu	USD/MMBtu		USD/MMBtu	pence/therm	USD/M			
Contract size	10,000 MMBtu	1,000 MMBtu		10,000 MMBtu	~3000 MMBtu	MBtu			
Exchange	ICE, NYMEX	SGX		NYMEX, ICE	ICE				
Delivery port	Japan and South Korea								
Price horizon	Monthly out to 5 years, however liquidity in 1-2 years	12 months							
Settlement	Cash settled			Cash settled					
Underlying contract		Singapore sling spot							
Launched									

1

Liquidity has increased sharply in the Asian benchmarks over the last couple of years, particularly in the Japan Korea Market (JKM) (Graph 1). In part, this is due to the rise in Chinese demand for LNG as authorities have encouraged the use of natural gas over coal for household heating and industrial production to improve air quality (forthcoming work from AERU will explore this further). Turnover in the Singapore Sling contracts has increased but remains at a very low level – turnover in the first three months has already exceeded that in all of 2017, but only totalled 540 contracts, and only 54 contracts when adjusted to be of equal size as the other markets.

While liquidity has improved in Asian LNG futures markets, even in the more liquid JKM market volumes it remains well below more established natural gas markets (Graph 2). [As a result, the market isn't extensively used for hedging or as a price reference point.]

- [Detail on who is trading in JKM – from liaison]
 - But Bank liaison also indicates that contacts are sceptical about an Asian LNG hub developing and that trading is too low and concentrated to overcome concerns about market manipulation
 - Bespoke players hedge using the JKM index around 1-2 years out. More likely to be buyers than sellers.
- [JKM as benchmark in contracts – liaison evidence?]
 - Platts provides the price assessments of spot LNG cargoes traded in Asia and reportedly the vast majority of deals are priced using this benchmark.
 - This is consistent with recent Bank liaison
- Nature of the market appears to still be over the counter – this means that price determination and liquidity probably still not as efficient as NBP and Henry Hub



[Also show open interest?]

[Compare prices]

- Close relationship between Asian prices – Singapore Sling and JKM tend to move together. (Believe 'Asia spot' is a survey so makes sense that this also follows quite closely.)
- Asian prices have been higher than NBP and Henry Hub.
 - Broadly in line with NBP/spread has narrowed in 2018 to date. [Are there notable events which explain periods of divergence?]
 - Henry Hub appears to move independently of NBP and Asian LNG prices.
 - JKM, Singapore Sling, NBP all display hump around northern hemisphere winter.
- [Compare to oil]
- Compare curves

- Briefly define relevant spot benchmark prices and concepts – reference earlier work
 - Avoid dynamics of contract pricing: covered in previous work.
 - Briefly discuss geographical context, e.g. Asian LNG spot prices relevant for marginal LNG supply from the Australian market (Lambie 2016).
- How useful is each reference price?
- Show and discuss some measures of financialisation for each reference price
- Market liquidity and depth for Asian futures markets. Not close to true Asia LNG price benchmark but there has been a pickup in activity over last couple of years.
- Japan Korea Marker
- Platts says that LNG swaps volumes, which are settled against its Japan Korea Marker (JKM) quadrupled in 2017. See this excellent [Reuters](#) article.
- JKM swaps are traded on the ICE and CME exchanges. Tullet Prebon also facilitates trades in JKM swaps.
- Each LNG lot is equivalent to 10000mmBtu – not clear if this is consistent across exchanges.
- [JKM LNG \(Platts\) Future on ICE](#)
 - Monthly, cash settled
 - Contracts up to 60 consecutive months out. So that is 5 years, but liaison suggest liquidity mainly in 1-2 years.
 - [Launched in 2012](#)
 - Unable to find data on website for ICE. Reportedly the lion's share of trading is done on ICE exchanges. Have asked the dealing room for help on this one.
- [Include a sentence on China to cross-reference AERU's note noting that rise in Chinese demand for LNG has partly contributed to the development of the JKM market.]
- Singapore futures exchange
- Compare levels of activity to more established futures markets
- Henry Hub (US)
- National Balancing Point (UK)
- Look at futures curves – what do they look like, what are they telling us?
- Any background info on who are the key players in these markets?
- Discuss convergence/divergence/correlations between prices, and with price of oil. What has driven this?

Use the VAR model to test for spillovers to support discussion above

- [possible extension, but highly unlikely given data limitations]
- Use Diebold and Yilmaz (2012) to create spillover index
 - Headline spillover index will give indication of how integrated global natural gas markets are
 - Individual commodity spillover indexes will show what influences each price, e.g.
 - How have Henry Hub prices influenced the Asian spot price over time?
 - How have oil prices influence the Asian spot price over time?

Outlook

- What are the implications of findings
- What do we expect to happen in the future?
- Impact of demand from Asian importers; how much of this is contestable?
- Market structure and liberalisation of Asian importers' natural gas markets
- Methodological issues, e.g. shipping and liquefaction costs

References

More external work
AERU's note

Reuters article <https://www.reuters.com/article/us-asia-lng-pricing-analysis/oil-like-gas-sp-global-platts-bags-asian-lng-price-benchmark-idUSKCN1GA05C>

Details on contracts:

Sling

<http://www.sgx.com/wps/portal/sgxweb/home/products/derivatives/commodities/gas/gas/contracts>

https://www.emcsg.com/f1415,122043/EMC_Sling_Singapore_and_North_Asia_Brochure_Final.pdf

https://www.emcsg.com/f1415,99779/Sling_Methodology_and_Specifications_Guide.pdf

https://www.emcsg.com/f1415,106648/FAQ_for_LNG_Nov_2015_Final.pdf

China

<http://www.shpgx.com/marketstock/listforlng/33>

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