

Understanding steel scrap and the new LME ferrous contracts

From the LME Research Team

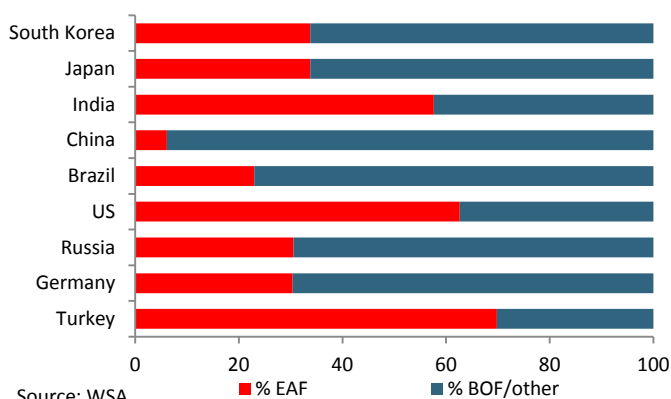
Scrap markets have historically been very volatile, often even challenging the level of fluctuation seen in major currencies. With scrap representing up to 70% of steel production costs, the steel industry has to date been vulnerable to such price moves. The LME Steel Scrap contract launches on 23 November, at a crucial time for the steel industry which is suffering squeezed margins. This new contract will allow steel producers to lock in raw material prices - currently trading at six-year lows - and gain the certainty that comes with managing price volatility. LME Steel Scrap is cash settled according to the TSI Turkish Import HMS #1&2 80:20, CFR Iskenderun Port Index price, a uniquely relevant price for scrap markets globally.

Importance of scrap in steel production

Steel is produced via two main methods: electric arc furnace (EAF) and blast oxygen furnace (BOF). In an EAF scrap steel is melted by the heat from an electric arc; while blast furnaces melt iron ore and coking coal to create pig iron, which is then combined with oxygen and limestone to make steel.

Scrap consuming EAFs are responsible for 426 million tonnes of annual steel production, or 26% of global output. In the West, EAFs are more dominant and produce 60% of US and 70% of Turkish steel¹.

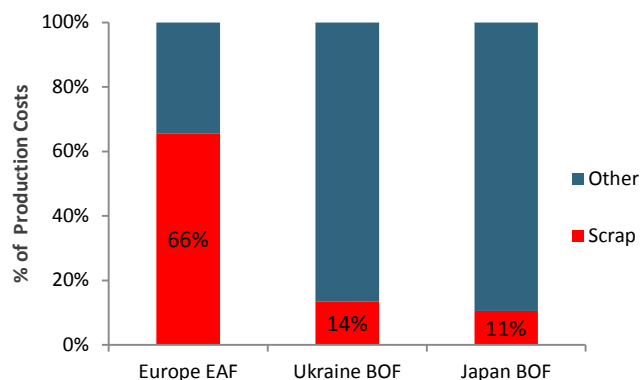
Steel output by production method, 2014



In total, EAFs make up over 80%² of the long steel production capacity in Europe. With the launch of the LME Steel Scrap contract in tandem with the LME Steel Rebar contract, the LME will cover the whole supply chain for long steel production from initial inputs (scrap) through intermediate stages (billet) to final products (rebar).

Even in iron ore-consuming blast furnaces, scrap remains an important additive and can make up 10-20% of the total raw material mix.

Scrap as a percentage of steel production costs, 2015



As a proportion of costs, movements in scrap prices can have a major impact on a steel mill's profitability.

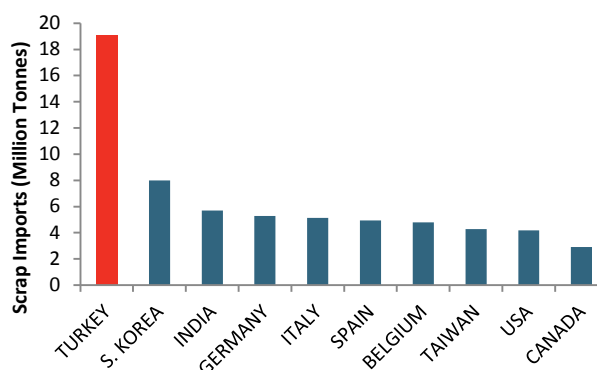
Scrap represented over 60% of the conversion costs of a typical EAF in 2015. Blast furnaces can also have more than 10% of their costs related to scrap inputs³.

A global price for scrap markets

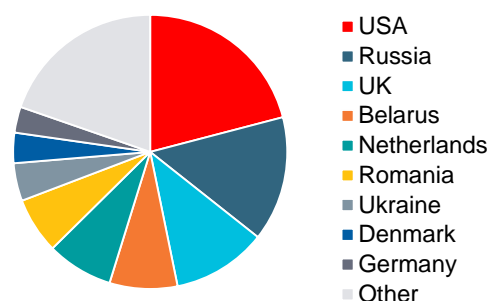
Turkey is the largest global importer of scrap, importing over 19 million tonnes in 2014, the equivalent of 19% of the global scrap trade⁴, from diversified sources spread across the world. As a result, the Turkish import price is best positioned to become an effective global price.

Given the continuous level of interaction Turkish steel mills have with scrap suppliers globally, it is to be expected that the Turkish import price has a strong correlation with other major prices⁴.

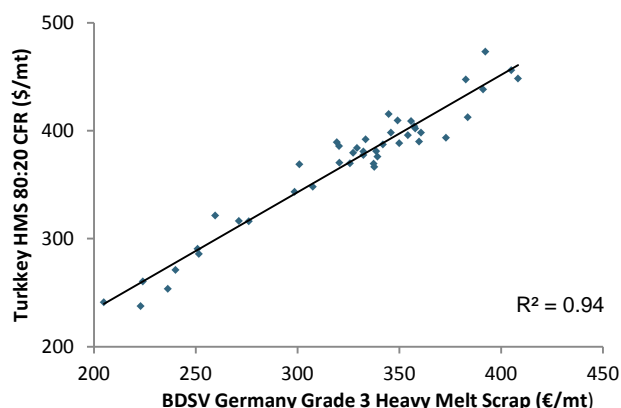
Steel scrap imports by country, 2014



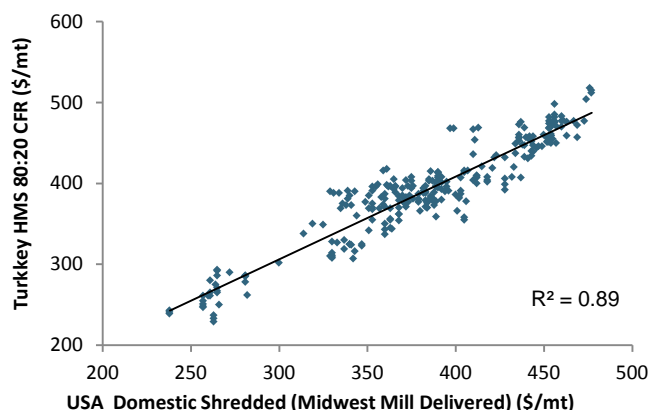
Turkey's steel scrap imports by source country, 2014



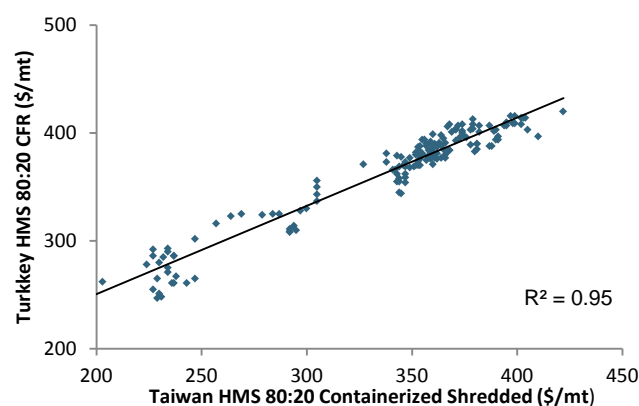
HMS 80:20, Turkey CFR v Germany domestic (Monthly, 2012 - Aug 2015)



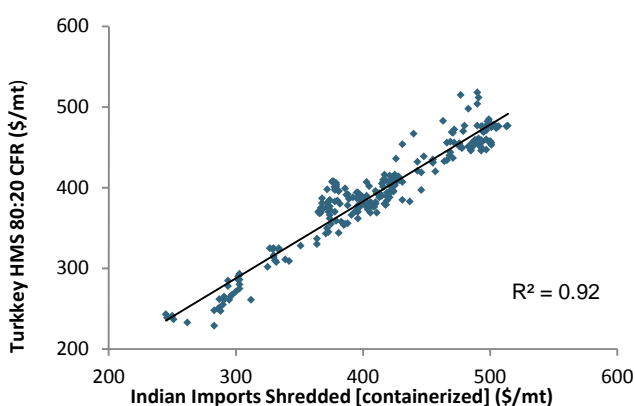
HMS 80:20, Turkey CFR v Shredded USA Domestic (Weekly, Apr 2010 - Aug 2015)



HMS 80:20, Turkey CFR v Taiwan Import (Weekly, May 2012 - Aug 2015)



HMS 80:20, Turkey CFR v Indian Shredded Import (Weekly, Nov 2010 - Aug 2015)



Note: All prices are based on Platts/TSI with the exception of BDSV Germany

HMS 80: 20, a commercial scrap price

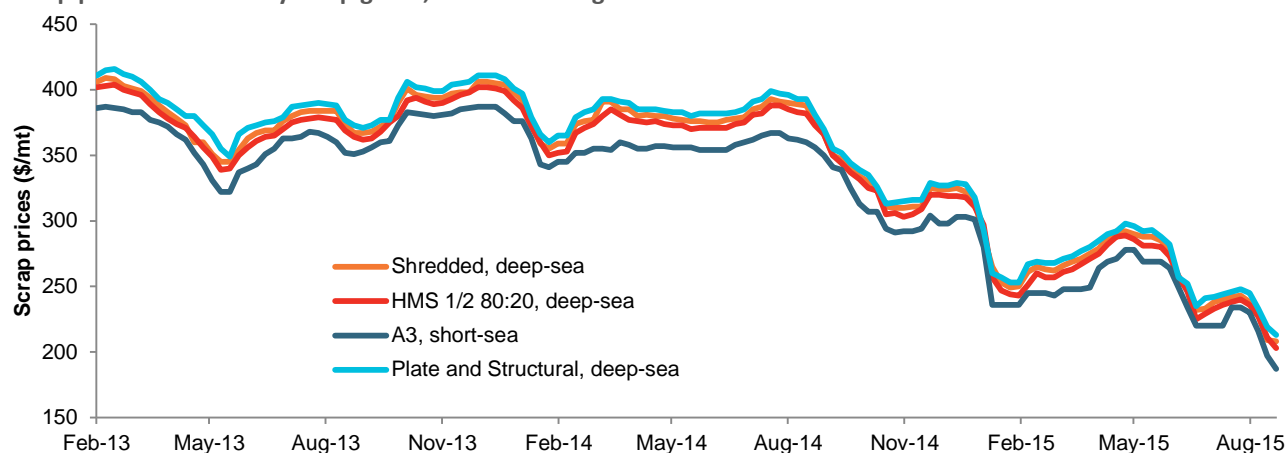
LME Steel Scrap is cash settled, which means that at the expiry date outstanding contracts are settled against the monthly average of the Turkish HMS #1&2 80:20, CFR Iskenderun Port port index. Globally, HMS #1&2 is recognized to describe a quality of commercial scrap appropriate for steel production and is frequently traded. It is a recognized and defined specification by the Institute of Steel Recycling Industries (ISRI).

As per common practice in physical transactions, Heavy Melting Scrap (HMS) is sold as a mix of quality 1 and quality 2 (HMS1 & HMS2). A premium and common fixture will sell at an 80% ratio of HMS1. HMS1 quality is scrap in any dimension not exceeding 1.5m x 0.5m, and is the term for heavier scrap of at least a 0.7mt/m density, whilst HMS2 is comparatively lighter.

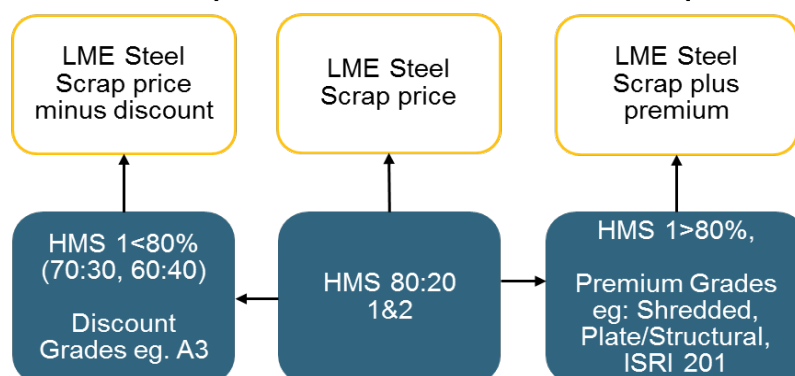
The term “deep sea” is a reference to international shipping, which with its larger cargo sizes is a preferred reference for price setting. As demonstrated, this international trade relationship renders a high correlation to shredded scrap prices globally. A similar analysis finds over a 99% correlation (Feb 2013 to Aug 2015) between CFR Turkey HMS 80:20 Deep Sea and other types of imported scrap: shredded, plate and structural (deep sea) and A3 short sea (CIS grade).

The high correlations show how the TSI Turkish Import HMS #1&2 80:20 index price has moved in line with other scrap grades and regions. Within a series relatively small discounts and premiums the TSI Turkish Import HMS #1&2 80:20 index price is relevant for most scrap consumers and merchants.

Scrap prices over time by scrap grade, Feb 2013 – Aug 2015



LME Steel Scrap Price is Relevant For Different Scrap Grades



Hedging example

Steel producers can buy an LME Steel Scrap contract for a forward date (up to 15 months) at today's quoted prices to effectively lock in the future raw material cost.

A worked example is shown below:

1 Jan 2016 - a steel mill plans to receive a delivery of scrap in March 2016

1 Jan 2016 - the steel mill buys the March LME Steel Scrap contract currently trading at **\$210/mt**

20 March 2016 - the steel mill buys scrap at current price **\$220/mt**

20 March 2016 - the steel mill settles the March LME Steel Scrap contract at **\$220/mt**

LME Steel Scrap profit: \$10/mt

Physical scrap purchase: \$220/mt

Net purchase price: \$210/mt

To learn more about hedging on the LME visit:

www.lme.com/trading/risk-management

Cash settlement

The LME Steel Scrap contract is cash settled. At contract expiry any outstanding LME Steel Scrap positions will be settled according to the monthly average of the TSI assessed index of Turkish Import Scrap – the TSI Turkish Import HMS #1&2 80:20, CFR Iskenderun Port Index. The TSI benchmark price has been carefully chosen for acceptance across the steel industry and comprehensive methodology, taking account of IOSCO standards.

Cash settlement is new to the LME but is commonplace in most commodity markets. The LME remains committed to price discovery by physical settlement in its base metals suite, however the physical delivery of steel is

challenging for various reasons:

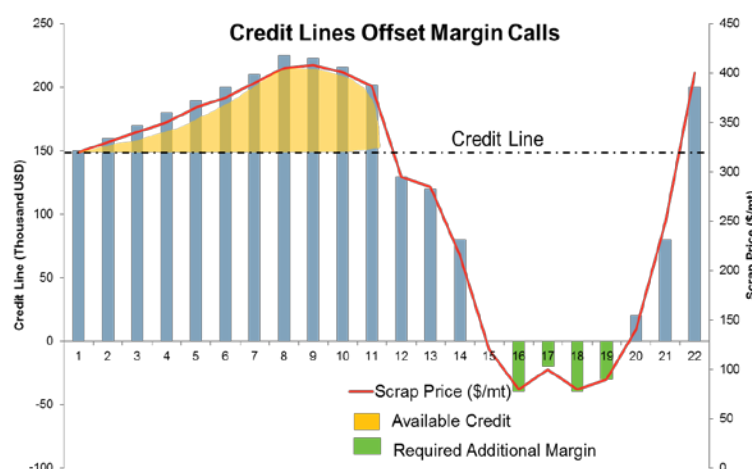
- Steel rusts and deteriorates over time
- Storage and transportation costs are very high relative to the value of the metal
- Scrap is difficult to transport due to its irregular shape and composition

With guidance from industry, the LME believes it is logical to maintain a physically delivered billet contract to ensure price convergence, and to act as the core of a suite of products that can then be cash-settled, with the market able to trade spreads back to the billet contract. In this way, the LME aims to deliver the optimal balance between physically settled and cash-settled contracts.

Credit lines and realized variation margins

Hedging on the LME must take place through one of the approved and regulated LME member firms. Subject to the due diligence and internal practices of the member firm, they may be willing to grant credit lines which offset the need for the consumer to post additional margin calls should prices move against the position.

Unlike the existing LME base metals "forward" contracts, margins on LME Steel Scrap are realised and settled on a daily basis.



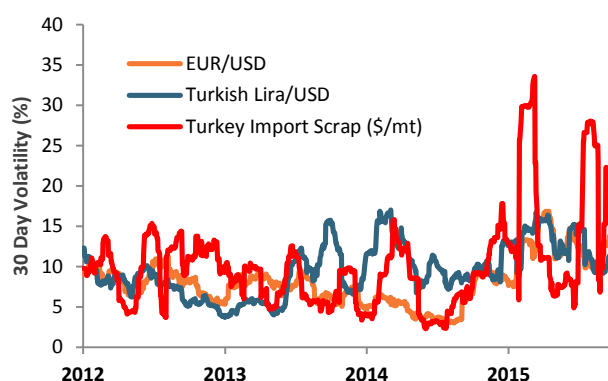
Volatility in global scrap markets

Historically steel scrap prices have been volatile; often even challenging the levels of fluctuation in major currencies. With several key themes unravelling in the global scrap markets, major price moves may continue to be commonplace. The LME's cash settled scrap futures contract comes at a crucial time to enable the steel industry to hedge and lock in stable raw material prices, and for the financial community to gain exposure to a new volatile market with unique supply and demand drivers.

HMS 80:20 Turkey CFR, 2010-2015



HMS 80:20 Turkey CFR v EUR/USD v TRY/USD, 2012-2015

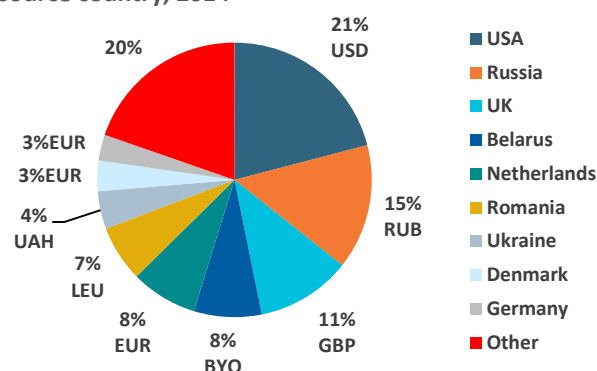


1. Currency swings affect global trade

Scrap markets are global, with 50% of trade sourced from six different countries and pricing across different major currencies. The US dollar, Euro, British pound and the Russian ruble are all

significant to scrap markets, yet scrap itself would be unlikely to impact the currencies in turn. This is in stark comparison to those commodities which represent a significant portion of the suppliers' GDP, for example, iron ore and the Australian dollar, copper and the Chilean peso.

Turkey's steel scrap imports by currency used and source country, 2014



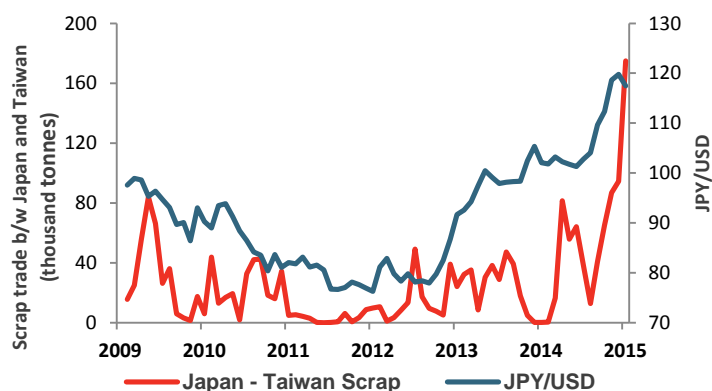
The United States is the largest exporter of scrap, exporting 15.3 million tonnes or 30% of global trade last year⁵. Moves in the US dollar naturally flow through to the global market.

US scrap exports and US share of global scrap trade, 2004-2014



Blips in pricing as importing countries switch to cheaper exporter currencies are commonplace. This can deplete supply, as consumers shun sources, and rebalance competition.

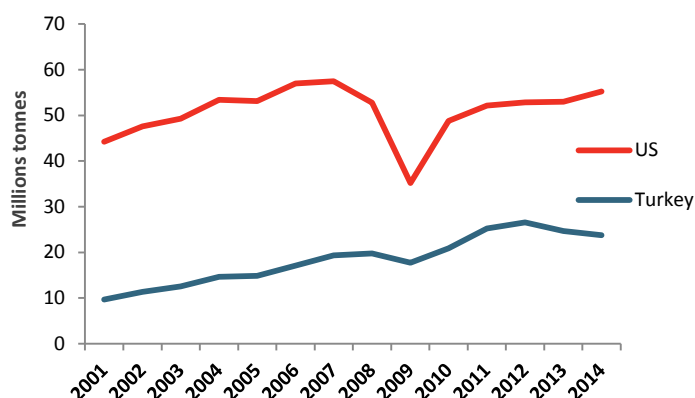
Scrap trade b/w Japan and Taiwan v JPY/USD, 2009-2015



2. Steel goes electric, demand surges

EAFs, which rely mostly on scrap, are responsible for approximately 26% of global steel production and have been growing at an average rate of 5% since 2010⁶. The dominant production method, converting iron ore by blast furnace, is more capital intensive, more polluting and less flexible to pausing and restarting. A continued shift towards EAFs has the potential to create a significant tightening of future scrap supply.

Electric arc steel production in US v Turkey, 2001-2014



The US is the largest electric arc steel producer and EAFs represent over 60% of domestic output. Accordingly, its domestic scrap consumption far outweighs its exports, even as the largest exporter globally. Other major steel producing countries still remain heavily reliant on blast furnaces and any shift to cheaper electric production will be done mill by mill. The extent to which a fragmented steel industry can react to the availability of scrap as it builds new capacity may have significant implications for supply tightness and future price volatility.

The OECD identifies over 50 million tonnes of new EAF capacity that will be added outside of China in the next two years. Turkey, the world's largest importer of scrap has plans to more than double total crude steel production to 70 million tonnes by 2023⁷.

3. Scrap supply is inherently inelastic

Scrap supply is, in principle, inelastic, since the ability of suppliers to react to structural changes in demand is extremely limited. Stocks can be drawn down and collection rates can be moderately increased, but these changes have limited scope. Primary scrap sources are not incentivised by prices in the same way as the sources of other commodities. Consumers are no more or less likely to scrap their cars as scrap prices move, and yet automobiles were the largest source of US scrap last year. A total of 60% of steel scrap was generated from old goods and these can have a significant time lag before they appear as scrap, by Western standards⁸:

- Automobiles – 12+ Years
- Appliances – 15+ Years
- Construction – 30+ Years

Only a small proportion of scrap, is generated from the off-cuts of producing steel goods. Known as “prompt scrap” because of its immediateness to re-circulate, it is more closely linked to the demands of the steel sector, but its

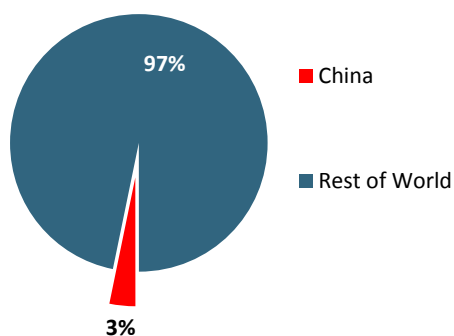
contribution is limited. According to the USGS, 23% of last year's US supply was prompt scrap. The US is a world leader in steel recycling. On a global level it would take other countries a significant amount of time and effort to reach this contribution, which still falls short of a nearly three times more dominant reliance on old goods. In China, the share of consumer goods and automobiles in the scrap mix is believed to be close to 85%⁹.

Countries can try to improve their scrap collection process and numerous government and private initiatives are underway to do so - it is, however, a serious feat of logistics. With mature economies seemingly closer to their peak in scrap generation, the outlook depends on the ability of developing economies to increase their contribution.

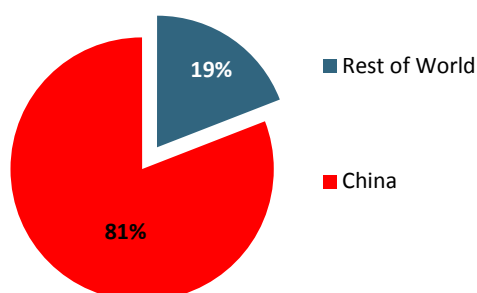
4. China – the long term game changer?

China's relationship with scrap is unique for commodities in that it is currently a minimal importer and consumer, relative to its 823 million tonnes of annual steel production.

Global scrap imports, 2014



Global iron ore imports, 2014

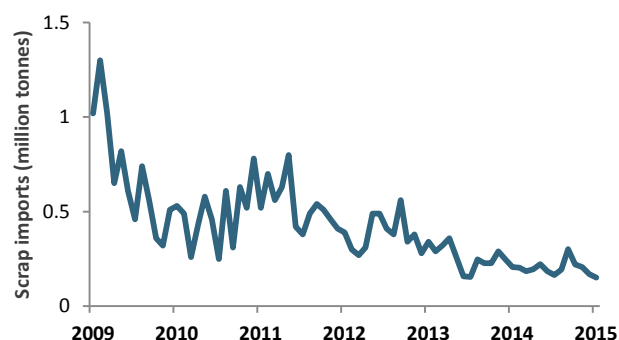


China produces around 50% of the world's steel, but electric furnaces make up only 6% of its production. Meanwhile its share of scrap in blast furnaces is as low as 8% compared with a typical 15-20% in other countries¹⁰. A move to 15% may mean as much as 54 million tonnes of additional scrap consumption, that's an extra US' worth of demand!

As the Chinese government tackles pollution, the industry is being pressured to increase its scrap consumption. Every tonne of scrap used in steelmaking is expected to reduce 1.6 mt of carbon dioxide emissions and 3 mt of solid waste, compared with iron ore usage.

A key factor for scrap utilisation is taxation. Scrap utilisation and imports have fallen after the Chinese government removed a 70% rebate on scrap VAT in 2011 sending prices significantly higher for mills. A reinstatement of this rebate could have a significant impact on scrap consumption.

Chinese steel scrap imports, 2011-2014



The extent to which China's shift to scrap will affect global markets will ultimately depend on its ability to generate and collect its own scrap domestically. BHP estimates that by 2020 China's scrap usage in blast furnaces could be as high as 20%. China's recollection period of scrap from goods is expected to be far shorter than in the West, as waves of relatively recent buildings are set to be demolished.

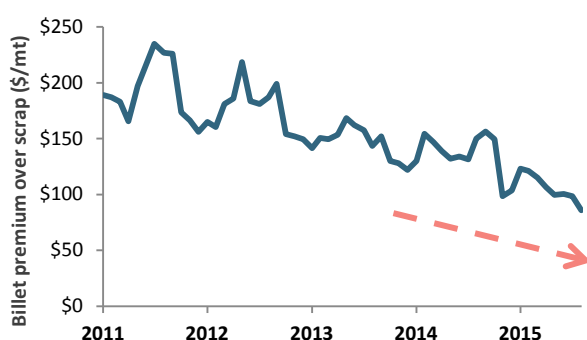
The question is whether the government's aims for scrap usage can wait that long and whether

the major logistical feat of collecting and distributing China's scrap generating potential can be achieved once furnaces accustom to a higher scrap mix. A failure to meet growing demand domestically would be a major strain on global supply.

5. Chinese billet competes with scrap

China may currently be a minimal customer and supplier of internationally traded scrap but a recent surge in exports of low priced steel billet (the semi-processed precursor product to rebar) has had a notable effect by displacing mills purchases of scrap.

Turkey imports, billet premium over scrap, 2011-2015



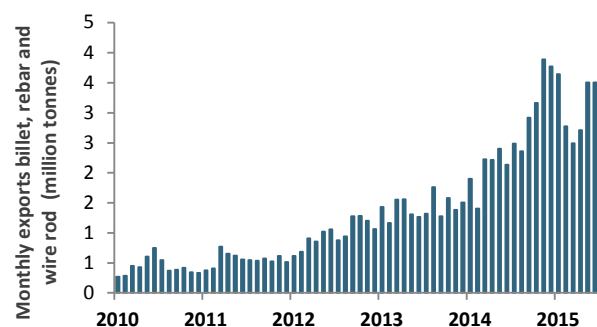
Where competitively priced, mills prefer to purchase billet over scrap because of the lower conversion costs (billet is rolled directly into rebar). Likewise, Chinese steel producers are reported to prefer exporting in billet form to save on the additional conversion costs and find billet considerably easier to market to consumers.

Total Chinese rebar/rod and billet exports surged to 31 million tonnes in 2014, as exports in the second half jumped by 50%. By the first half of 2015 exports had already reached 18 million tonnes¹¹.

How long this record supply of cheap Chinese billet can continue is uncertain. Much of the billet on offer at prices displacing scrap is expected to be loss making. Meanwhile many countries have levied antidumping charges and duties on

imports. The future of the scrap markets could hinge on the outlook for China's exports.

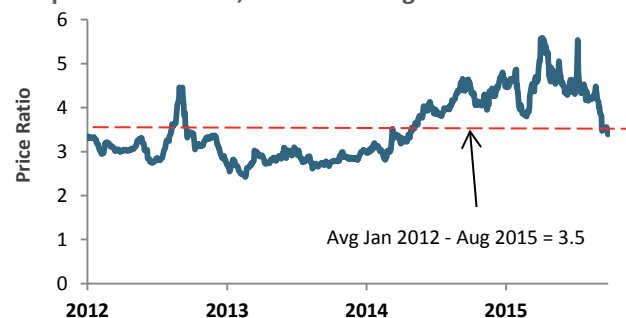
Chinese exports of billet, rebar and wire rod, 2010-2015



6. Iron ore miners take aim at low prices

In times of rising iron ore prices blast furnaces can substitute an increased amount of scrap into their raw material feed. When iron ore prices fall they do the opposite. This substitution has limits, but as a result the ratio of scrap to iron ore prices is closely watched and these prices shared a correlation rate of 75% from 2012.

Scrap v iron ore ratio, Jan 2012 – Aug 2014



The iron ore industry is by consensus one of overcapacity, as is steel. The difference however is that iron ore is far more consolidated. The "Big 4" miners produce 35% of global supply, comparatively the top ten steel producers only produce less than 27%¹².

Should correlations continue to hold true, efforts by the iron ore industry to issue a supply response to falling prices and overcapacity will

influence scrap prices. The balance to be formed between low cost supply, large expansion projects and cuts could lead to a bumpy ride for iron ore, and in turn, for scrap.

In any case, the relationship of scrap prices with a far more consolidated industry better suited for

managing overcapacity flags a serious issue for steel producers hoping to pass costs onto end consumers.

The motive for hedging is clear.

Contact us

For more information on how to trade the new LME Steel Rebar and LME Steel Scrap contracts and the relevant incentives available for market makers, get in touch with the LME Ferrous team at: ferrous@lme.com or visit our website at www.lme.com/ferrous

Accessing the LME

The only organisations able to trade contracts on the LME are its member firms. However, you do not have to be an LME member to trade on the LME. Clients who have successfully opened an account with an LME member are able to trade with and through them to access the market. Find the full list of LME members at: www.lme.com/trading/membership

| Contract specification | LME Steel Scrap | | |
|--|--|---|--------|
| Contract names and codes | LME Steel Scrap | SC | |
| Contract type | Futures | | |
| Delivery type | Cash settled | | |
| Lot size | 10 metric tonnes | | |
| Contract period | Monthly out to 15 months | | |
| Price quotation | US dollars per metric tonne | | |
| Clearable currencies | US dollars | | |
| Minimum price fluctuation (tick size) per metric tonne | Venue | OutrightCarries | |
| | LMeselect | \$0.50 | \$0.01 |
| | Inter-office | \$0.01 | \$0.01 |
| Termination of trading | Last business day of the contract month until 16:30 London time | | |
| Daily settlement procedure | LME Market Operations will calculate daily settlement values based on its published procedure | | |
| Final settlement procedure | Final settlement, following termination of the trading for a contract month, will be based on the Monthly Average Index Price of the “TSI Scrap HMS#1 and HMS#2, 80:20 Turkish Imports CFR Iskenderun Port” Index, which is available from 13:30 on the last trading day | | |
| Trading venues | LMeselect and Inter-office telephone | | |
| Trading hours | LMeselect Inter-office | 01:00-19:00 London time 24 hours a day | |
| Margining | Realised variation margins applied | | |

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¹ World Steel in figures 2015 – World Steel Association

² CRU – London presentation, 22 June 2015

³ Steelonthenet, DZI

⁴ Turkish Steel Exporters Association, ISSB

⁵ ISSB

⁶ World Steel in figures 2015 – World Steel Association

⁷ Investment Support and Promotion Agency of Turkey 2013, World Steel in figures 2015 – World Steel Association

⁸ The Global Steel Industry and Raw Materials Looking Towards 2015, Alan H. Price, American Scrap Coalition Thomas A. Danjczek, Steel Manufacturers Association

⁹ The Australian – <http://www.theaustralian.com.au/business/mining-energy/miners-steel-against-chinas-scrap-growth/story-e6frg9df-1226729549122>

¹⁰ WSA, Customs various/ Bloomberg LP, Reuters – <http://www.reuters.com/article/2015/02/06/china-steel-scrap-idUSL4N0VG46Q20150206>

¹¹ Beijing UC Steel, Rebar and wire Rod China exports, Bloomberg ticker: CNXMABQT Index

¹² Bloomberg Intelligence "New Iron Ore Model" May 2015, World Steel in figures 2015 – World Steel Association