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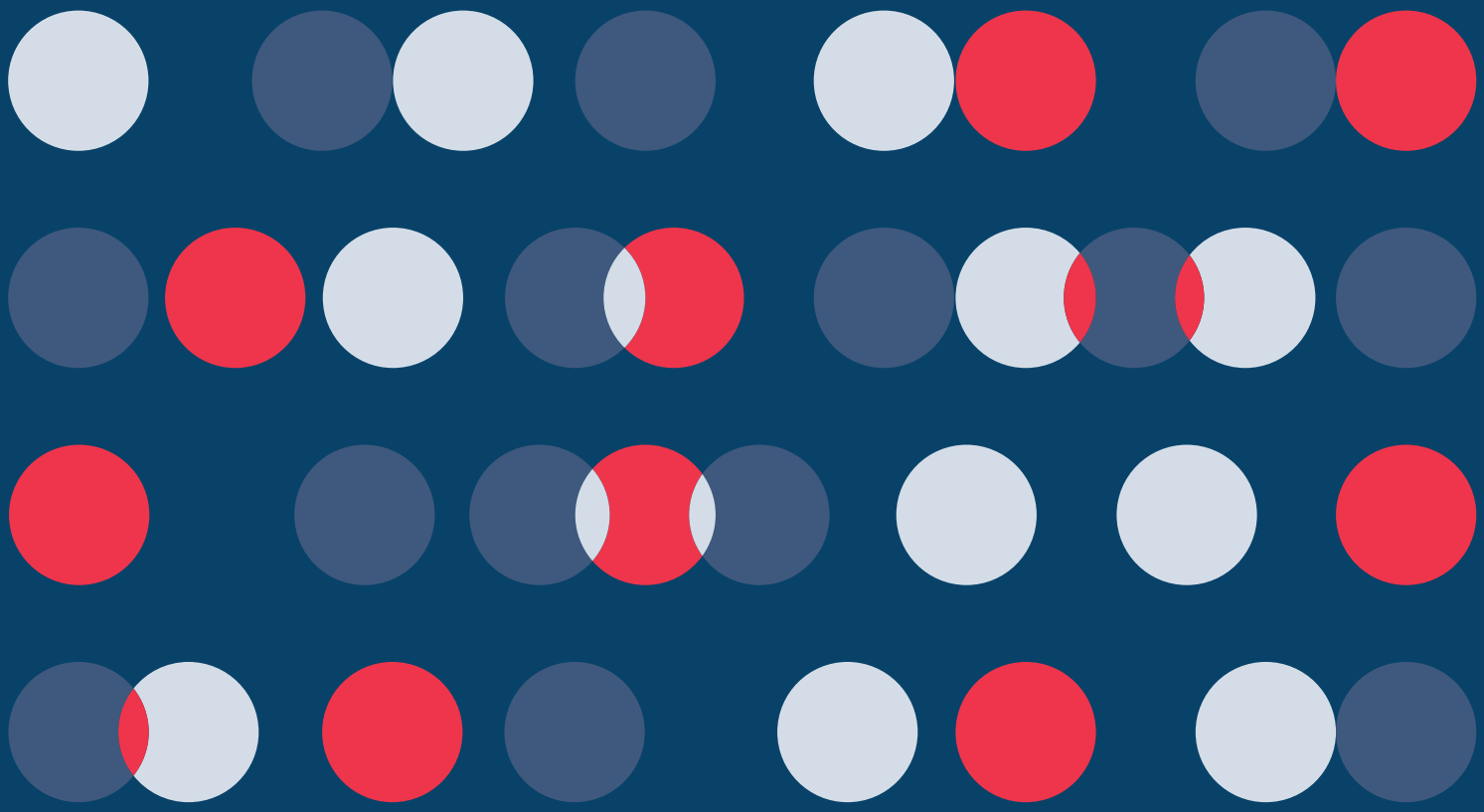
RESEARCH REPORT

THE ROLE OF MARKET INFRASTRUCTURE IN THE DEVELOPMENT OF THE BASE METALS MARKET



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SUMMARY

The commodities market for base metals is not only a venue for trading base metals, but also a place where industrial enterprises engage in hedging and exercise risk management. In light of this, a sound infrastructure system underpinning the market has become increasingly important in serving the needs of industrial customers and the real economy.

The base metals markets in the West have all gone through the gradual evolution from their embryonic forms to where they are as mature markets today. This market in the United States, for example, also faced the problem of insufficient regulation to maintain market order and insufficient standardisation at its early stage of development. Their experience accentuated the importance of sound major infrastructure and trade-support mechanisms in supporting the base metals trading system and thereby driving the growth of the base metals market. Further, the standardisation, modernisation and informatisation of such infrastructure and trade-support mechanisms could enhance the operational efficiency and economic benefits of market participants, while remarkably improving the internal management efficiency of industrial enterprises and reducing costs.

Among all the infrastructures underpinning the spot commodities market, a well-developed warehouse logistics system is considered the most important. Safety of the warehouse system is a cornerstone of spot trading in commodities in that it gives participants the assurance to conduct various types of related business. Thus, a warehouse network which can provide reliable global reference prices and “markets of last resort” for base metals market participants is an indispensable and fundamental part of the physical metals market. Spot trading of base metals often requires huge financing support in the entire production and logistics process because of the time lag in capital recycling. Given such a large demand for financing support, base metals manufacturers and traders often get operationally constrained during economic downturn when such financing support is insufficient. This kind of financing support efficiency is also lowered in case of irrational warehouse receipt financing practices whereby the credibility of the warehouse receipts cannot be guaranteed. Since base metals by nature are of high value, easy to transport and store, readily liquid and subject to a clearly defined quality grading system, they are actually very good financing tools. Therefore, warehouse receipt financing has become a crucial integral part of the spot market in base metals. The outbreak of the global financial crisis in 2008 reflected to a certain extent the serious lack of flexibility of market participants in withstanding financial and economic turmoil as well as the deficiency in market transparency. Against this backdrop, global financial markets at all levels have begun shifting to adopt central clearing and settlement in place of a bilateral system in certain sectors. The commodity financial derivatives market for base metals is hardly an exception.

The soundness and effectiveness of the infrastructure and trade-support mechanisms of a commodities market is best judged by whether they are conducive to effective and efficient resource allocation, thereby helping the market and the industry to lower transaction costs. This is also one of the most fundamental purposes for which any trading platforms (including futures exchanges) exist, and their position and interests shall all be in accordance with such purpose. As for market participants, they will naturally go for whichever pricing centre that is more regularised, more transparent, with abundant participants, more internationalised and more capable of manifesting the price formation and guidance mechanism fairly and effectively. These considerations are particularly important for Mainland China’s base metals market which is in the process of development and internationalisation. Market development and improvement do take time, and ultimately the market itself will decide what best meets the needs of the industry. All these are worth our continuous attention.

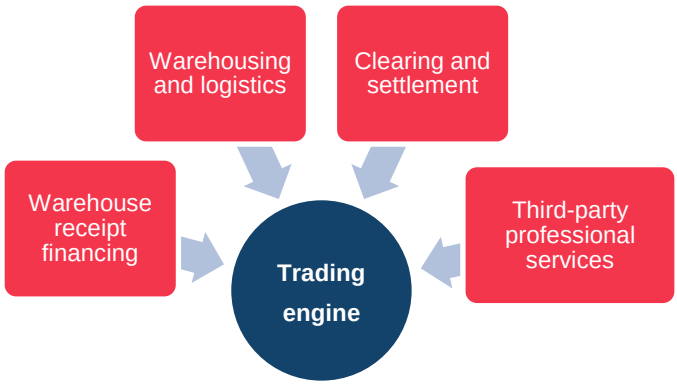
1. GLOBAL BASE METALS MARKETS: MAJOR INFRASTRUCTURE AND TRADE-SUPPORT MECHANISMS

The global base metals market is largely comprised of a decentralised over-the-counter (OTC) market and a number of centralised exchange markets, including the market of the London Metal Exchange (LME) amongst others. Base (or "non-ferrous") metals have been traded on the LME since its inception in 1877, and as the prices being quoted for those trades began to be published in the financial press, the metal industry started to use those prices as a dependable reference for their physical contracts. This continues to this day, with the majority of international base metals still priced using the LME price. In 2019, 75% of global on-exchange metal trading took place on the LME, with a total trading value of US$13.5 trillion[1]. In the late 1970s, the United States (US) stopped using the manufacturer pricing system. Since then the New York Mercantile Exchange (now COMEX) has dominated the US market. Meanwhile, the Shanghai Futures Exchange (SHFE) established in 1990 has built up the non-ferrous metal futures market in China, forming gradually a triangular competitive relationship between the LME, COMEX and SHFE[2].

The commodities markets for base metals in the West have all gone through the gradual evolution from their embryonic forms to where they are as mature markets today. This market in the US, for example, also faced the problem of insufficient regulation to maintain market order and insufficient standardisation, coupled with the lack of infrastructure such as warehousing and transportation facilities and poor creditworthiness, at its early stage of development. It has taken a long development process before regularised market order has ultimately come into play.

The US' experience accentuated the importance of sound major infrastructure such as warehousing and logistics as well as clearing and settlement, and trade-support mechanisms such as warehouse receipt financing and third-party professional services in supporting the base metals trading system (see Figure 1), which have driven the growth of the base metals market. Further, the standardisation, modernisation and informatisation of such infrastructure and trade-support mechanisms could enhance the operational efficiency and economic benefits to market participants, while remarkably improving the internal management efficiency of industrial enterprises and reducing costs.

Figure 1. Major infrastructure and trade-support mechanisms underpinning a base metals market trading platform



Source: HKEX analysis.

[1] Source: LME.

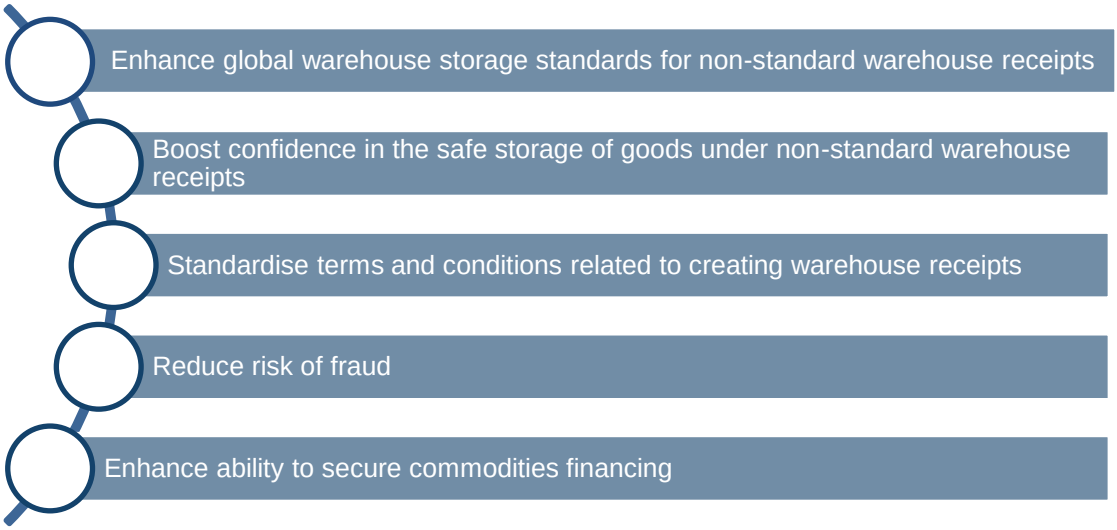
[2] See Wei Jia and Xu Xiaoya, "Research on the Pricing Power Formation Mechanism for the Nonferrous Metals Market on the LME" (〈LME 有色金屬市場定價權形成機制研究〉), *Futures and Financial Derivatives (《期貨與金融衍生品》)* (Institution of Financial Derivatives of Beijing), Vol. 105, January 2019.

1.1 Warehousing and logistics

Among all the infrastructures underpinning the spot commodities market, a well-developed warehouse logistics system is considered the most important. Safety of the warehouse system is a cornerstone of spot trading in commodities in that it gives participants the assurance to conduct various types of related businesses. The development of a spot base metals market also entails the gradual development and enhancement of a robust warehouse logistics system.

First of all, the logistics costs in commodities incurred by industrial enterprises are closely tied with the degree of standardisation of the warehouse logistics system in the market due to the large number of enterprises participating in the trading of base metals, the high turnover rate of goods, the lengthy and distributed logistic process, the lack of economies of scale, and the risk of price fluctuation and damage to goods in transit. Without an assurance of the security of warehousing and logistics, the quantity, quality and ownership of goods could not be effectively guaranteed, which in turn will constrain the business expansion in spot commodities. Therefore, the security of goods in warehouses is crucial for enterprises along the industrial chain, as well as the financial institutions and investment institutions involved, especially the numerous base metals traders. A professional and efficient network of registered warehouses can thus bring many benefits to the base metals industry, and support the market to function more efficiently (see Figure 2).

Figure 2. Benefits of a professional warehouse network to the base metals industry



Source: HKEX analysis.

Secondly, a fully-fledged warehousing and logistics system makes it possible to integrate futures trading with spot trading, i.e. the physical delivery mechanism can play an important role in futures trading, thereby ensuring that the commodities trading platform can fully deliver its functions to global base metal consumers and producers for hedging and risk management.

In commodities trading, although contracts involving ultimate physical settlement account for only a very small proportion of the total futures contracts traded, the physical delivery mechanism plays a pivotal role in linking futures prices with spot transactions in the real economy. Overseas commodities markets have invariably set up extensive standard warehouses at logistics transit centres or places where commodities consumers and suppliers cluster, as the final, or auxiliary, means of physical trading. These warehouses will store the excess supply and provide the goods when there is a shortage, so they can instantly reflect the marginal changes in supply and demand in the physical goods system, and serve practically as a reservoir of goods. Thanks to the protection offered by the physical delivery

mechanism supported by the warehouse system, changes in futures prices and spot prices can be in line and do not substantially deviate from each other, thus enabling the inventory information of the exchanges to serve as a "barometer" of the fundamentals underlying the changes in market supply and demand. Futures prices formed on an exchange that is equipped with a wide network of registered warehouses and a well-established physical delivery system can also bear testimony to the effectiveness of the "price discovery mechanism" of on-exchange futures prices. Applying the same to the base metals market, an extensive network of registered warehouses is crucial in linking the futures prices with the spot market prices. As the expiration date is approaching, the futures contract price will move closer to the spot price, because despite only a small proportion of futures contracts will be settled by physical delivery at the expiration date, the possibility of physical delivery has ensured that the metal futures price does not deviate far from the spot price. The convergence of the futures price and the spot price is of utmost importance because it forms the basis on which producers and consumers effectively hedge against movements in base metal prices. So it's the robust warehouse network that tightly binds trading and risk management via the commodities futures market with the base metals industry in the real economy.

It is a common practice in the commodities market, especially the base metals market, to generate widely accepted reference prices in physical goods contracts. Usually, the prices in the contracts between basic metal producers and consumers are determined with reference to globally accepted prices. They will also negotiate price discounts and premiums relevant to the raw material that is being bought or sold[3]. The practice of pricing materials based on reputable reference prices (excluding costs and premiums) is becoming increasingly popular given the benefits to the companies in terms of transparency, efficiency and the availability of choices. Transactions in the spot market that involve delivering metals in the future inevitably carry risks because metal prices may fluctuate significantly during the period from the signing of the contract to the final delivery, which could last for days or weeks, if not months or years. Most producers and consumers, i.e. metal producers and metal product manufacturers, will therefore adopt reliable global reference prices generated in the futures markets with physical delivery mechanisms to hedge against price risks.

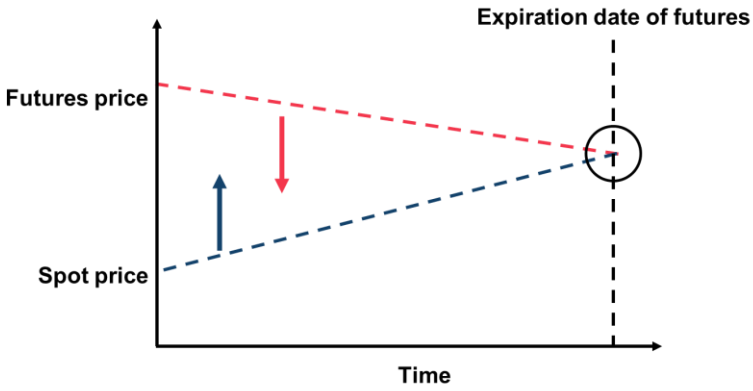
A warehouse network which can provide reliable global reference prices and terminal markets for base metals market participants constitute an indispensable and fundamental part of the spot market in metals. This is because it enables the commodities trading platform to perform the following two functions:

(1) Price discovery: Generate timely, transparent, credible and real reference prices. The prices are discovered using risk capital and are truly reflective of global supply and demand. The market's ability to hedge is predicated on its ability to discover these reference prices.

(2) Price convergence: Products underlying the contracts are settled and delivered through a secure and reliable global warehouse network. This is critical because it means that the futures price discovered in the market will tend to converge with the spot price of the metal (see Figure 3).

[3] There are nonetheless exceptions, such as the steel market where contract prices are always fixed and include all production costs, expenses, insurance premiums, etc., or spot prices are directly adopted, thereby exposing contract holders to the risk of market price fluctuations.

Figure 3. Convergence of spot price and futures price in the commodities market



Note: The scenario is where the futures price is higher than the spot price.

Source: HKEX analysis.

The major benefits of linking physical contracts to a reference price are discussed below:

- Against the backdrop of a fragmented global economy and a complex value chain, it is increasingly difficult for producers and consumers to beat the market on an ongoing basis. Instead, by agreeing to trade at market prices, market participants could benefit from the greater transparency provided by these price discovery entities and mechanisms. Therefore, companies could turn their focus to negotiating the price premiums or discounts between base metals and specific products. Such premiums and discounts are based on many factors, including some of the most frequently mentioned factors like geographic location, material grade, impurities, and delivery conditions.
- Through the provision of a robust and regulated trading venue for price discovery, market participants that refer to the prices discovered on the venue will be able to keep fully abreast of the latest market conditions. This will enable them to continuously and autonomously discover the market prices of metals without the need of investing a lot of resources to collect information.
- Companies that refer to globally recognised prices could retain the option to hedge their risk exposure to the benchmark metal price without bearing the underlying risks of such risk exposure.

It is worth noting that as a delivery point, the warehouse must be near the metal consumers who use the metals to produce downstream products. North America and Northern Europe used to be the world's major manufacturing centres in the base metals industry chains. Nowadays, more and more manufacturing industries have moved to Asia. Taking the warehouse system of LME as an example, it has approved an increasing number of warehouse locations in Asia over the years, such as Kaohsiung, Incheon, and Yokohama. As for China, after decades of rapid economic growth, it has emerged as the second largest economy in the world[4], and has effectively become a "world factory". Given China's economic power, the approved warehouses of LME in Asia are more capable than those in other regions in providing convenient services for metal consumers in Asia, particularly those in China. A warehouse network that covers the whole world can ensure that the need for physical delivery is sufficiently met. In other words, through a globally recognised warehouse network for physical delivery of metals could fulfil the needs of industrial enterprises and the real economy at large.

[4] China overtook Japan in 2010 to become the world's second largest economy. Japan ranked third, with its nominal gross domestic product being US$5,474.2 billion, which was US$404.4 million less than that of China. Source: *People.cn* (http://politics.people.com.cn/GB/1026/13594169.html).

1.2 Warehouse receipt financing

Spot trading of base metals often requires huge financing support in the entire production and logistics process because of the lag in capital recycling. Given such a large demand for financing support, base metals manufacturers and traders often get operationally constrained during an economic downturn when such financing support is insufficient. This kind of financing support efficiency is also lowered in case of irrational warehouse receipt financing practices whereby the credibility of the warehouse receipts cannot be guaranteed. Since base metals by nature are of high value, easy to transport and store, readily liquid and subject to a clearly defined quality grading system, they are actually very good financing tools. Therefore, warehouse receipt financing has become a crucial integral part of the spot market in base metals. As observed from the situation of corporate users, some industrial enterprises are struggling with the problems of capital liquidity, high costs and limited means of financing, manifested in the following areas:

- **Transaction** — The multi-layer traditional sales chain that consists of producers, large-scale traders and multi-level agents, etc., pushes up the cost of information and the increase in price at various levels results in higher transaction costs;
- **Production** — The process from the purchase of raw materials to the investment in fixed assets to final production creates huge cash flow pressure during the period between input and output;
- **Trade** — The trading model based on credit sales leads to huge prepayments as well as difficulties and time lags in recovery of accounts receivables, which in turn brings the problem of insufficient working capital.

Due to the various distinctive structural features of the global commodities market, such as large initial capital investments, long global shipping routes and protracted production cycles, it has become common for market participants to secure commodity financing to support their trading and operational management, and such financing has achieved a considerable scale. Commodity financing is also widely used in the base metals industry, with many tailor-made financing arrangements, including mining, trade, and inventory financing. These have been adopted by participants for decades, or even centuries[5]. A common feature of these financing businesses is that they are taking advantage of the future economic value of the companies' assets, whether they already exist in the form of refined materials or are still under development or pending mining from underground. The benefits of commodity financing from the respective perspectives of lenders and borrowers are discussed below.

For lenders, in general, they could ask the borrowers to hedge the metals which they use as collateral for their loans, thereby helping reduce the lenders' exposure to various risks (as described below) and achieve a better risk-adjusted return on their capital.

Firstly, hedging reduces the risk of the loan itself, because the value of the collateral is protected during the loan period. In the event of default of contract and subsequent foreclosure, the value of the asset will not be affected by the prevailing market price because the lender can sell the asset at the prevailing market price and make up any shortfall through the hedging. This is the main reason why lenders reward borrowers who hedge with a smaller haircut on the collateral.

Secondly, hedging can reduce the counterparty risk in this kind of financing transactions, because borrowers who have made hedging arrangements often bear less price risk. This will allow lenders to increase their risk exposure in relation to certain companies based on their own preferences.

[5] Source: "Commodity financing: how hedging on-exchange can benefit both borrowers and lenders", *LME Insight* on LME's website, August 2018.

From the borrowers' perspective, hedging will also bring many benefits to them in financing transactions.

Firstly, a smaller haircut on the collateral, given other conditions are the same, implies a larger sum of loan to be lent to the borrower and thus saves it from more expensive forms of financing (such as unsecured debt or equity financing), thereby enhancing the operational efficiency of the borrower's working capital. For example, the borrower can then use the extra capital to offer more competitive payment terms to its customers and suppliers or to reinvest the same amount of capital in the enterprise or development projects.

Secondly, hedging usually reduces price risk exposure and so the impact of metal price fluctuations on profits. By making hedging arrangements, corporate borrowers will be able to focus more on their core businesses rather than devoting considerable efforts on predicting future price movements of their assets.

There are two major ways to hedge risks using collaterals in financing transactions: via the on-exchange market or the OTC market. Exchanges provide counterparties with a centralised trading venue with two-way liquidity and transparent prices. The OTC market, on the other hand, is characterised by bilateral transactions which are usually limited to two counterparties. Table 1 sets out some key issues that need to be considered when engaging in hedging in financing transactions conducted on-exchange or in the OTC market.

Table 1. Commodity financing on-exchange vs OTC

Consideration	Impact	On-exchange commodity financing	OTC commodity financing
Managing margin requirements in hedging	The company has to consider the additional working capital required for managing initial margin and variation margin	Initial and variation margins can be financed by the lender itself or by a third-party professional institution via a tripartite agreement for margin funding	OTC transactions often do not require margins, but are exposed to higher counterparty risk, which can result in much wider spreads in order to include credit value adjustment charges
The hedge needed to match the financing (including any amortisation)	Excessive or inadequate hedging would create risks for both counterparties	Adequate liquidity offered by on-exchange markets allow for adjustments of the hedge to match any changes in the financing schedule	OTC transactions are bespoke according to specific requirements of both parties. Any subsequent adjustments would require the agreement of both parties
In case of a default the hedge and the loan should be exited simultaneously	Uncoordinated unwinding of the two could create unbalanced and unhedged positions	On-exchange positions can be closed out in the market with new counterparties	As the OTC transaction is bilateral, appropriate clauses must be agreed upon at the beginning of the deal with regard to the unwinding process of the hedge in case of default

Source: HKEX analysis.

The above discussion and comparison reveal that proper risk management arrangements (such as hedging) in commodity financing can facilitate more effective capital allocation, benefiting all parties to the transaction. The borrower will have access to broader financial resources at a lower cost, thereby improving its capital structure. The lender can increase its risk exposure in certain companies and industries while circumventing specific risks (such as metal price risks). Another key point that should be re-emphasised is that the effective operation of trade finance also requires an extensive warehouse network.

1.3 Clearing and settlement

Spot trading venues for base metal commodities usually integrate all functions including trading, clearing and settlement, and depository. These trading venues often lack effective management of funds or capital involved in the clearing and settlement processes. Due to the long transaction chain and the absence of professional risk management mechanisms, the entire transaction chain is exposed to risks associated with transaction defaults, price fluctuations, ownership of rights to goods, and financing credit. Among the said risks, default risk is often triggered as a result of market price movements after a contact is agreed. Bilateral commodity trades lack a unified payment settlement system. The market also faces the problems concerning the safety of funds in spot market trading as well as the fragile credit system. These problems usually weigh on the execution efficiency and effectiveness of the post-trade phases of such contracts.

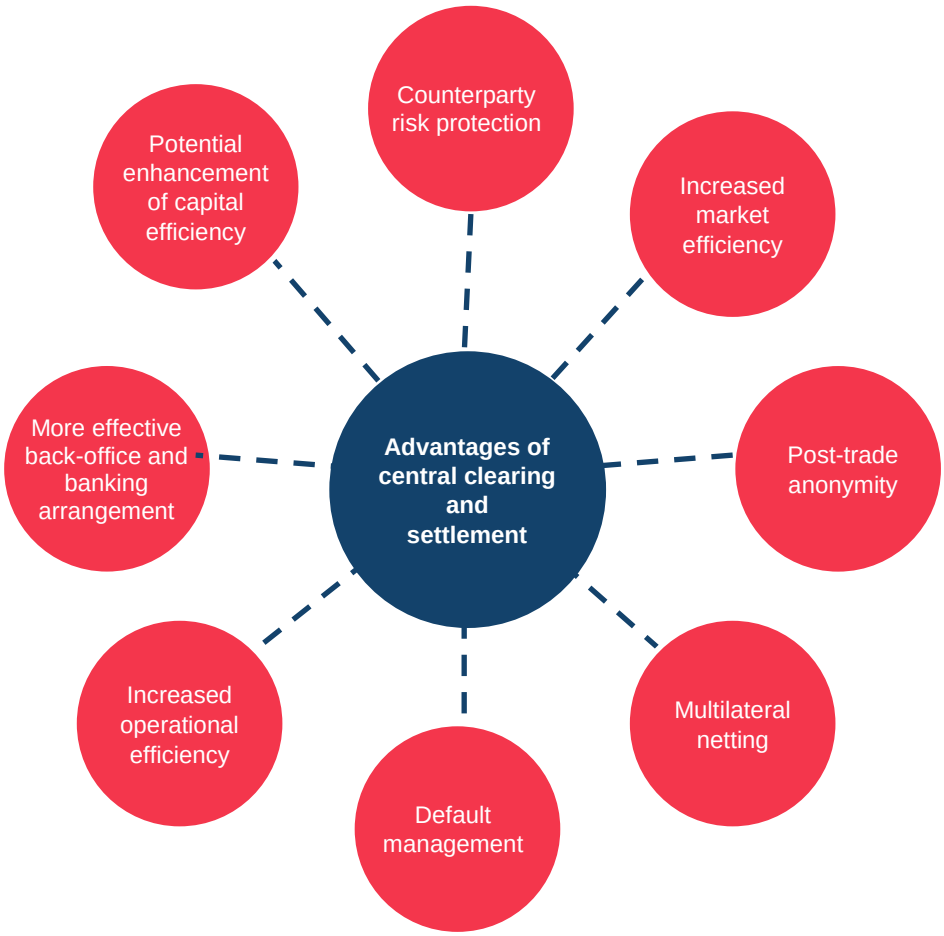
The outbreak of the global financial crisis in 2008 reflected to a certain extent the serious lack of flexibility of market participants in withstanding financial and economic turmoil as well as the deficiency in market transparency. Specifically, the lack of transparency and the increasingly complex products spectrum in certain derivatives markets which have impacted various segments of the financial market were considered to be the major factors causing the global financial crisis and triggering systemic risks. Such lack of market transparency and large-scale market disorder were, according to major international regulatory bodies which studied the causes of the crisis, attributable to, inter alia, the absence of supervision of certain OTC derivatives trading as well as their distinctive nature as bilateral transactions. Against this backdrop, global financial markets at all levels have begun shifting to adopt central clearing and settlement in place of bilateral clearing system in certain sectors. The commodity financial derivatives market for base metals is hardly an exception.

The purpose of clearing is to let both parties to a contract know clearly their respective delivery responsibilities upon settlement. Under a central clearing and settlement system, the clearing house acts as the Central Counterparty (CCP) which serves as the seller to every buyer, and the buyer to every seller, with the aim of protecting the parties to a transaction from the other party's default. Once the transaction enters the central clearing and settlement system, a contract will be established between the CCP and each clearing member (the buyer and the seller), i.e. both members now have a contract for clearing and settlement with the CCP directly.

Both parties in the transaction are required to provide guarantees to cover the risks associated with settlement. In case of a clearing member's default, the contract will still be executed via the CCP without making non-default clearing members bear any losses. In some cases, the collateral together with the client's position may be transferred to another clearing member in a process known as "porting". In this way, as a systemic risk manager, the CCP can significantly reduce the counterparty credit risk faced by clearing members, thereby minimising the cascading effects of a financial crisis (such as the 2008 global financial crisis) and preventing a single default from jeopardising the entire market.

What makes central clearing and settlement so systemically important? For market participants, the straight-through-processing of transactions and real-time risk management are two of its attractive features. On top of that, central clearing and settlement can effectively reduce the operational costs of participants by streamlining trade management and contract execution (see Figure 4). Moreover, the CCP can untangle and simplify the complex trading network that may exist in the OTC market. Multilateral netting simplifies the relationship between counterparties, which reduces any contagious risk that might deal a blow to the entire financial market and heightens the overall operational efficiency of the market.

Figure 4. Advantages of central clearing and settlement in the base metals market



Source: HKEX analysis.

In view of the advantages of the central clearing and settlement process in respect of the significant reduction of credit risk and effective risk controls that CCPs have in place in the event of default, market regulators consider such a process in place of bilateral clearing and settlement a way to prevent financial crisis like the one which happened in 2008 from recurring. By assuming the role of an intermediary between buyers and sellers, CCPs are very important to the financial market in that they can streamline complex transaction relationships, achieve netting and compression of transactions and provide effective risk management in the event of default. Apart from this, the presence of CCPs is also crucial in boosting market confidence and enabling the fair and orderly operation of the market during times of extreme volatility and in the event of counterparty default.

2. MARKET INFRASTRUCTURE CONSTRUCTION IS KEY TO SUPPORTING THE FUTURE DEVELOPMENT OF THE MAINLAND BASE METALS MARKET

2.1 Taking a market-oriented approach to explore the best solution for the long-term development of the market

The soundness and effectiveness of the infrastructure and trade-support mechanisms of a commodities market are best judged by whether they are conducive to effective and efficient resource allocation, thereby helping the market and the industry to lower transaction costs. This is also one of the most fundamental purposes for which any trading platforms (including futures exchanges) exist, and their position and interests shall all be in accordance with such purpose. As for market participants, they will naturally go for whichever pricing centre that is more regularised, more transparent, with abundant participants, more internationalised and

more capable of manifesting the price formation and guidance mechanism fairly and effectively.

From the perspective of consumers and producers of base metals in the Mainland, given the distinct pricing systems of the Mainland and the international markets, they may suffer certain economic losses and face operational uncertainty if the prices cannot be hedged effectively and smoothly. Market development and improvement do take time, and ultimately the market itself will decide what best meets the needs of the industry. All these are worth our continuous attention.

Looking ahead, the establishment of a sound ecosystem will be conducive to the healthy and complete development of the market in the long run. In particular, this ecosystem shall embody at least the following four functions or characteristics (see Figure 5):

(1) Serving the real economy and the physical market

This should be the core mission of a sound ecosystem, and such ecosystem shall provide price discovery, risk management and terminal market services.

(2) Ensuring fairness in market operation

Market fairness is the core feature of a sound ecosystem, which means that the market operates in a fair and non-discriminatory manner to all market participants. The principle of fairness shall extend beyond pure regulatory obligations and supervision, and shall be implanted more deeply in the design and implementation of the market mechanisms. This includes but is not limited to:

- allowing the broadest possible range of participants to fairly access the market for investment and risk management;
- the on-exchange market shall leverage to the fullest extent its advantages of the standardisation of product offerings and the transaction process, to deliver a trading environment that is fairer than the OTC market.

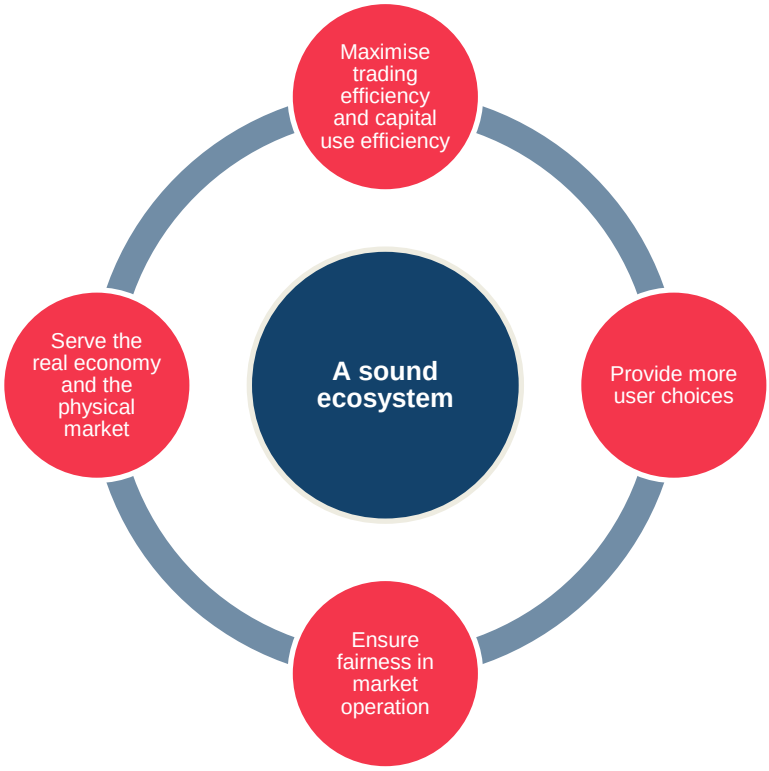
(3) Providing more user choices

With regard to the market structure, it is a natural feature of the exchange market that all market participants must comply with the same set of trading rules. That said, it is also possible to improve the various aspects of the market structure to offer certain segments of market participants with more flexible operational options provided that it does not affect other market participants. A sound ecosystem shall also continue to innovate in product offerings and strategies to accommodate investors' needs for diversified investment and risk management.

(4) Maximising the efficiency in trading and in the use of capital

Enhancement of the efficiency in trading and in the use of capital is in the common interest of market participants, exchanges and the entire market. If a market participant chooses not to execute an otherwise economically-rational hedging or investment trade due to the friction cost of that trade, the market will be considered deficient in trading efficiency and capital use efficiency.

Figure 5. Exploring the best solution for the long-term development of the market — Establishing a sound ecosystem



Source: HKEX analysis.

2.2 Strategic roles of HKEX and the LME in facilitating Mainland market participants' participation in the international base metals market

China is the world's second largest economy as well as the largest commodities importer and a major commodities consumer[6]. As a global financial centre and a gateway to the Mainland, Hong Kong has always been serving as a super-connector between Mainland China and the rest of the world. It is well positioned to serve commodities market participants and provide efficient and effective risk management services for Chinese enterprises, regional commodities trading companies and their global business partners.

As regards the base metals market, the settlement prices discovered on the markets of the LME, a wholly-owned subsidiary of Hong Kong Exchanges and Clearing Limited ("HKEX"), are universally recognised as the global standards for base metals pricing in the physical market, either for the metals' production or the raw materials. LME Clear is a central clearing house set up specifically for metal forwards, futures and options traded on LME. By adopting the latest technology for risk management, such as real-time clearing (which enables real-time supervision and management of risk exposure), LME Clear helps maintain a more stable and robust market. In terms of eligible collaterals, the LME allows clearing members to use a variety of cash and non-cash collateral, including LME warrants, to cover their liabilities. The acceptance of LME warrants as collateral can help companies release other types of collateral and improve their capital efficiency[7].

The LME's successful experience in supporting and serving the real economy in the use of base metals over the past 140 years shows that a global warehouse network and sound

[6] Source: "The history of the formation of commodity pricing centres and recommendations" (〈從歷史看大宗商品定價中心的形成及建議〉), *China Futures*, Vol.5 of 65 (2018).

[7] See Chapter 6 of this book, "The London Metal Exchange — The world's industrial metals trading and pricing venue", for details of the LME market and its operation.

settlement mechanisms with daily physical delivery are of paramount importance for commodity pricing. As of March 2020, the LME has licensed a network of more than 550 approved warehouses in 33 locations across the globe (see Figure 6), covering the vast majority of metals consumption, supply and logistics centres. With this warehouse network, market participants could sell the excess supply in return for cash through trading on LME and withdraw inventory from LME-approved warehouses when demand exceeds supply. Therefore, the LME's inventory data serves as a "barometer" of changes in the fundamentals of global base metals.

Chinese companies' participation in the trading activities on the LME can be traced back to the 1990s[8].

The LME's warehouse system has the following characteristics:

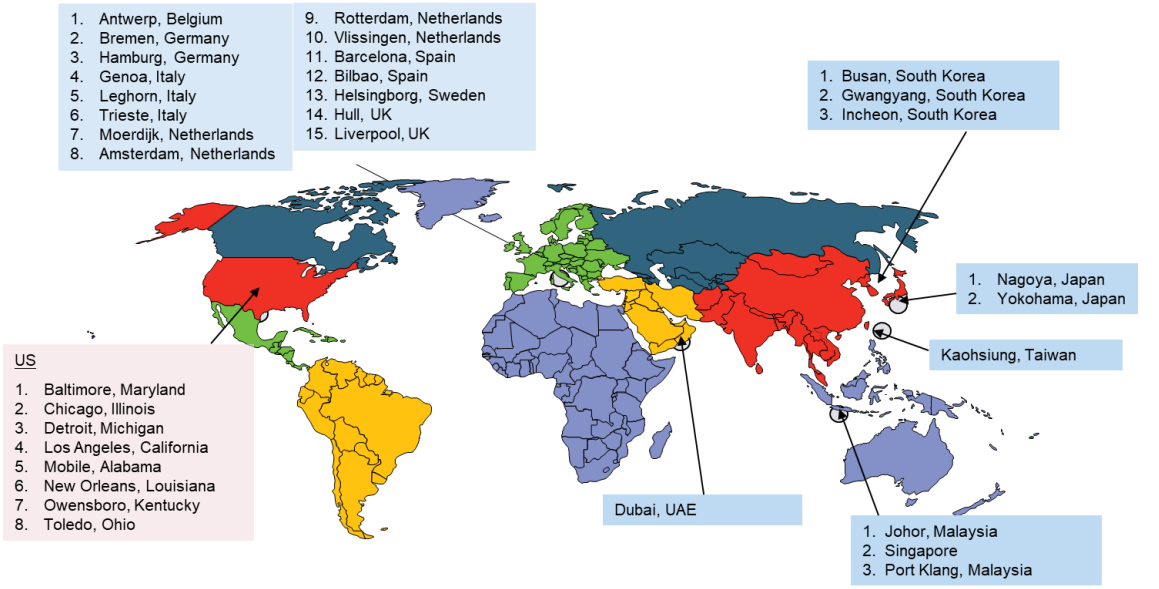
- Firstly, the LME does not own warehouses or the metals stored in them, and the specific business activities are handled by different warehousing companies. The LME is responsible for the initial review and approval of the locations of the warehouses, the warehousing companies and the specific warehouses. After the approval is granted, the daily management and operation of the warehouses, including their profit and loss management, will be fully undertaken by the respective warehousing companies. The LME then manages an ongoing audit programme for LME-approved warehouses to ensure that they continue to meet the LME's prescribed standards. In addition, warehouse companies are obligated to have an annual 100% stock count undertaken by an approved Independent Third Party Auditor.
- Secondly, the LME has imposed strict requirements on the warehousing companies in terms of their capital adequacy, management capabilities and industrial experience. In other words, only warehousing companies that have ample capital and a high standard are able to meet the LME's stringent prerequisites to become approved warehouse operators. The existing LME warehousing companies are mostly professional institutions with rich experience and good reputation, having been engaged in metal storage for many years[9].
- Thirdly, only warehousing companies approved by the LME can apply for the establishment of approved warehouses at the delivery points. Such warehouses are also the subject to the LME's requirements with respect to their logistics facilities, management capabilities, deposit and withdrawal, as well as storage capacities.
- Fourthly, the LME has established a Warehousing Committee. This committee, which is made up of representatives from approved warehouses, strengthens the relationship between the LME and the warehousing companies, meeting their respective requests and achieving a win-win situation, which has contributed to the LME's position as a global base metals commodities trading centre.

The evolution of the LME's global warehousing system could provide a strong demonstration effect for the development of the Mainland commodities market. The improvement in the warehousing system could narrow the "gap" between the spot and futures markets. It could also support the growth of the real economy, thereby facilitating the formation of a sound RMB pricing mechanism for commodities.

8 Source: LME.

9 Source: "A detailed guide to the London Metal Exchange", published on the LME's website, 2018.

Figure 6. LME's global warehouse network



Source: LME.

Against the new backdrop of Mainland China's reform and opening-up, the internationalisation of the Mainland's commodities futures markets has become a very important and imminent strategic mission. Yet, the opening-up of the Mainland market in the existing mode that focuses mainly on "inward opening" is in fact a lengthy process, which to some extent might make it difficult for Mainland market participants to exert substantial influence in international pricing in the near future. In order for the Mainland commodities futures market to take a more active role with remarkable achievements during the new round of opening-up, a two-way multiple-route approach of opening-up shall be adopted, that is to combine "inward opening" with "outward opening" and to open the gateway for investors, warehouses and prices to connect with the international market, thereby enhancing Chinese enterprises' competitive edges in the international marketplaces.

One of the feasible ways that can be considered to support achieving the said goal is to allow the LME to approve warehouses in the Mainland, so as to promote the mutual connectivity and strengthening the price interaction between the Mainland and overseas base metals markets. Through this process, the Mainland commodities futures market will be able to perform its function of serving the real economy in a more effective way, thereby accelerating the rise in China's influence over global pricing in this industry. If internationally recognised warehouses can be introduced into the Mainland, the Mainland can accumulate experience and set the global stage for warehouses run by its exchanges in the future. If LME-approved warehouses are allowed in the Mainland, Chinese enterprises will be able to participate in international pricing on equal footing while enjoying a reduced delivery cost and the convenience in physical delivery, in addition to being able to utilise and participate in the international delivery network. Mainland warehouses could also benefit from this by gaining understanding and knowledge in warehouse management models that meet international standards. All these will pave the way for Chinese enterprises and warehouses, and even the entire commodities futures market in the Mainland, to go international in the future.

3. CONCLUSION

The commodities market for base metals is not only a venue for trading base metals. A well-developed warehouse logistics system and a warehouse receipt financing mechanism, together with an effective central clearing and settlement system, are crucial market infrastructure guaranteeing the sound and orderly operation of the market and important cornerstones for serving industry customers and the real economy at large. Mature and sound infrastructure and trade-support mechanisms underpinning the commodities market should be conducive to the efficient and effective allocation of resources, thereby helping the market and the industry to reduce transaction costs. These considerations are particularly important for the base metals market in the Mainland which is undergoing the process of development and internationalisation.

Looking ahead, the balanced development of the base metals industry in Mainland China and enhancement in its efficiency in utilising resources and the environment require Mainland customers to make better use of the international futures market for risk management, and entail a more proactive role played by the Mainland futures exchanges in supporting the real economy while steering structural reform to the supply side. The LME's influence in the international base metals market stems from its development strategy of serving the real economy. Its successful experience could provide an important reference for the Mainland commodities futures market.