

Research on Information Transmission and Price Discovery Mechanisms in the Ferrous Metal Futures Market

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ABSTRACT

This paper focuses on the ferrous metal futures market, delving into its information transmission and price discovery mechanisms. In the theoretical study of information transmission mechanisms, the efficient market hypothesis and Hayek's theory of dispersed information serve as the foundation, analyzing multiple channels of information transmission, the information acquisition behaviors of different participants, factors affecting transmission efficiency, manifestations of information asymmetry, and their impact on price volatility mechanisms. Regarding the price discovery mechanism, the paper clarifies its definition and operational principles, outlines the composition and main characteristics of the ferrous metal futures market, analyzes specific applications of price discovery, and discusses key factors influencing the price discovery mechanism, such as supply and demand fundamentals, macroeconomic indicators, policy regulation, market participant structure, international linkage effects, and trading system design. The research aims to comprehensively reveal the operational laws of the ferrous metal futures market, providing theoretical support and practical guidance for market participants' decision-making and market regulation.

KEYWORDS

Ferrous Metal Futures; Information Transmission; Price Discovery; Market Mechanism

1 Introduction

The ferrous metal futures market, as a crucial component of modern financial markets, holds a pivotal position in the economic system. Ferrous metals such as steel and iron ore are fundamental raw materials for industrial production, and their price fluctuations directly impact the costs and profits of various industries, including construction, machinery manufacturing, and automotive. The price discovery function of the ferrous metal futures market provides price references for the spot market, guiding the rational allocation of resources. Effective information transmission is key to ensuring the normal functioning of the market's price discovery mechanism. Studying the information transmission and price discovery mechanisms in the ferrous metal futures market helps participants accurately grasp market dynamics, formulate reasonable trading strategies, and reduce market risks. Simultaneously, for regulatory authorities, a deep understanding of market mechanisms enables better formulation of regulatory policies, maintaining market stability and promoting healthy market development.

2 Literature Review

2.1 Current Research on Information Transmission Mechanisms

In the field of information transmission mechanism research, significant achievements have been made by domestic and international scholars. Domestic research primarily focuses on bidirectional transmission characteristics between markets, cross-market information transmission, and optimization of trading mechanisms. Studies indicate a significant bidirectional price guidance relationship and volatility spillover effects between stock index futures and spot markets (Li Changrong et al., 2012). There are mean and volatility spillover effects between ferrous metal futures and chemical and energy futures, with the introduction of night trading further enhancing the spillover effects of ferrous metal futures on chemical futures (Cao Tingting et al., 2022).

Additionally, night trading significantly improves information efficiency and reduces the time lag of international market information shocks (Wang Baijie et al., 2016).

International research focuses on cross-market information flow and innovations in volatility spillover models. There is a bidirectional price guidance relationship between LME and SHFE metal futures markets, with LME holding the dominant information position in copper and aluminum futures (Liu Qingfu et al., 2008).

Overall, domestic research concentrates on specific mechanisms such as ferrous metal futures and night trading systems, while international research pays more attention to the overall information transmission efficiency of financial markets and cross-market arbitrage. Despite differences in research methods and focus, both provide important theoretical support and practical guidance for the stable development of futures markets.

2.2 Current Research on Price Discovery Mechanisms

In the field of price discovery function research in futures markets, domestic and international scholars have conducted in-depth explorations from different perspectives, achieving fruitful results.

Domestic research on influencing factors indicates that futures trading volume and industry concentration positively affect pricing efficiency, while speculation negatively correlates. For example, the pricing efficiency of iron ore futures significantly improves with increased trading volume. Additionally, inverted price structures often appear in rebar and hot-rolled coil futures, reflecting market expectation divergence.

International research frameworks focus on the intersection of supply and demand curves, explaining price formation from market supply and demand relationships, while domestic research pays more attention to the intervention of policy factors in price formation, such as the profound impact of supply-side reforms on futures market prices.

Overall, domestic and international research on the price discovery function of futures markets has complementary focuses. Domestic research delves into the characteristics of local market varieties and policy impacts, while international research provides references from mature market mechanisms and classical theoretical frameworks.

3 Overview of the Ferrous Metal Futures Market

The ferrous metal futures market holds a crucial position in global financial and commodity markets. It conducts futures contract trading with ferrous metals such as iron, manganese, chromium, and related products as the underlying assets. Popular trading varieties include rebar, hot-rolled coil, iron ore, coke, and coking coal.

The market is characterized by frequent price fluctuations influenced by macroeconomic conditions, industrial policies, raw material supply, and downstream demand. For example, when the macroeconomic environment improves, industries such as construction and machinery manufacturing significantly increase demand for steel, driving up futures prices; stricter environmental policies limiting steel production capacity can cause complex price changes. Additionally, the leverage mechanism in futures trading amplifies both returns and risks, requiring participants to have strong risk management capabilities.

In the economic system, the ferrous metal futures market plays a significant role. It provides hedging tools for upstream and downstream enterprises in the steel industry chain, helping them lock in costs and profits and avoid price fluctuation risks. It also offers forward-looking price signals through the price discovery function, guiding the rational allocation of resources and promoting the healthy development of the steel industry.

4 Analysis of Information Transmission and Price Discovery Mechanisms in the Ferrous Metal Futures Market

4.1 Theoretical Research on Information Transmission Mechanisms

4.1.1 Theoretical Foundations of Information Transmission Mechanisms

The theoretical core of information transmission in financial markets lies in price discovery and information efficiency. According to the Efficient Market Hypothesis (EMH), prices reflect all available information. However, in reality, information asymmetry and transmission delays often result in markets achieving only weak or semi-strong efficiency. As a crucial component of financial markets, the price discovery mechanism in the ferrous metal futures market transforms information into price signals through trading activities, reflecting market expectations of future supply and demand relationships. Hayek's theory of dispersed information further posits that prices are tools for coordinating dispersed information. The ferrous metal futures market transmits supply and demand changes in the industry chain through price fluctuations, providing decision-making references for market participants. This information transmission mechanism not only helps participants optimize resource allocation but also offers important references for the operational decisions of physical enterprises.

4.1.2 Main Channels and Carriers of Information Transmission

Information transmission in the ferrous metal futures market relies on various channels and carriers. Firstly, exchange platforms are core carriers of information transmission. Exchanges such as the Shanghai Futures Exchange (SHFE) and the Dalian Commodity Exchange (DCE) release real-time trading data and open interest, forming benchmark prices and providing authoritative price references for investors. Secondly, industry reports and news media play significant roles in information transmission. Market analysis reports from media outlets like Hexun and Guotou Futures guide investor expectations and influence market sentiment. Additionally, professional data platforms such as the China Futures

Research Institute and Entropy Research Consulting provide data on basis and arbitrage spreads, supporting quantitative analysis and risk management. Finally, social media and online platforms (e.g., Twitter and professional forums) have become important channels for information transmission, though their short-term sentiment fluctuations may also induce noise trading, affecting market stability.

4.1.3 Types of Market Participants and Information Acquisition Behaviors

Participants in the ferrous metal futures market mainly include producers, traders, hedgers, and institutional investors, whose information acquisition behaviors differ significantly. Producers and traders primarily focus on supply chain data (e.g., inventory, capacity utilization) and use the futures market to hedge price risks, stabilizing operating profits. Institutional investors leverage high-frequency trading algorithms and macroeconomic models to capture arbitrage opportunities, with strong information acquisition capabilities, often relying on paid data platforms for advantageous information. Hedgers depend on basis analysis and industry chain reports to optimize hedging strategies, focusing more on long-term supply and demand balance. These diverse information acquisition behaviors collectively drive market information flow and price discovery.

4.1.4 Factors Affecting Information Transmission Efficiency

Information transmission efficiency is influenced by various factors. Firstly, information dissemination speed is crucial. The proliferation of social media accelerates information diffusion but may also increase noise trading, affecting market stability. Secondly, the asymmetry of information acquisition costs impacts market efficiency. Institutional investors gain information advantages through paid data platforms, while retail investors primarily rely on public information, potentially exacerbating market unfairness. Additionally, the completeness of market regulation directly affects information transmission efficiency. Sound information disclosure systems (e.g., transparency of environmental policies) enhance market transparency and reduce information asymmetry. Finally, investor behavior is a key factor influencing information transmission efficiency. The interplay between rational decision-making and emotional trading may cause price fluctuations, and excessive market sentiment reactions may undermine information transmission efficiency.

4.1.5 Manifestations of Information Asymmetry

Information asymmetry in the ferrous metal futures market mainly manifests as differences in fundamental information, technical analysis advantages, and insider trading risks. Producers possess internal data such as inventory and capacity, while ordinary investors often lag in acquiring such information, leading to information acquisition asymmetry. Institutional investors use algorithmic models to capture high-frequency trading signals, with technical analysis capabilities significantly superior to retail investors, further exacerbating information asymmetry. Moreover, non-public information on policy changes or major corporate decisions may be misused, leading to insider trading risks and undermining market fairness. These information asymmetry phenomena not only affect market efficiency but may also weaken investor confidence.

4.1.6 Mechanisms of Information Transmission on Price Volatility

The impact of information transmission on price volatility in the ferrous metal futures market is mainly reflected in industry chain linkage, cross-market spillover, and policy transmission. For example, rising iron ore prices increase steelmaking costs, leading to higher rebar futures prices, forming price linkage across the industry chain. Night trading enhances mean and volatility spillover effects between domestic and international markets, allowing international market information to quickly transmit to domestic markets. Additionally, environmental production restriction policies rapidly affect coke futures prices through industry reports, with the speed of policy information transmission directly influencing market price reaction efficiency. These mechanisms collectively make information transmission a significant driver of price volatility.

4.2 Theoretical Research on Price Discovery Mechanisms

4.2.1 Definition and Operational Principles of Price Discovery Mechanisms

The price discovery mechanism is a core function of futures markets, referring to the formation of prices reflecting market supply and demand relationships and future expectations through open bidding, information integration, and standardized contract trading. Its operational principles mainly include contract standardization, open bidding and information transparency, and forward-looking pricing. Firstly, futures contracts are highly standardized in terms of

trading units and delivery times, reducing transaction costs and attracting diverse participants (e.g., producers, traders, speculators). For example, ferrous metal futures such as iron ore and rebar adopt uniform specifications, ensuring price comparability. Secondly, buyers and sellers publicly quote prices on centralized trading platforms, with market information (e.g., trading volume, open interest) disclosed in real-time, ensuring transparency in the price formation process. For instance, rebar futures prices on the Shanghai Futures Exchange reflect real-time supply and demand dynamics. Finally, futures prices not only incorporate current supply and demand information but also integrate market expectations of future macroeconomic and policy adjustments (e.g., environmental production restrictions). For example, iron ore futures prices often reflect global mine production increases or infrastructure investment expectations in advance.

4.2.2 Specific Application Forms of Price Discovery Mechanisms

The specific application forms of price discovery mechanisms in the ferrous metal futures market include long-short game and equilibrium pricing, futures-spot price convergence mechanisms, and cross-market information transmission. Firstly, producers (short positions) and traders (long positions) game based on cost, inventory, and other information to form equilibrium prices. For example, steel mills lock in profits through selling hedges, while speculators correct price deviations through spread trading. Secondly, the delivery system forces futures prices to converge with spot prices at contract expiration, expressed as: $F(T) = S(T) + \text{carrying cost} - \text{convenience yield}$, where $F(T)$ is the futures price and $S(T)$ is the spot price. This mechanism ensures long-term consistency between futures and spot prices. Finally, futures markets quickly absorb new information (e.g., policy changes) through high liquidity and transmit it to spot markets. For example, after the announcement of environmental production restriction policies, rebar futures prices usually react before spot prices, reflecting the leading role of futures markets in information transmission.

4.2.3 Main Factors Influencing Price Discovery Mechanisms

The efficiency of price discovery mechanisms is influenced by various factors, including supply and demand fundamentals, macroeconomic indicators, policy regulation, market participant structure, international linkage effects, and trading system design. Supply and demand fundamentals are the core drivers of price discovery. On the supply side, mine capacity (e.g., production from the four major iron ore giants) and environmental production restriction intensity (e.g., 30%-50% production restrictions in Tangshan steel mills) directly affect iron ore and coke supply. On the demand side, infrastructure investment growth, real estate new construction area determine rebar demand, and manufacturing PMI reflects hot-rolled coil consumption. Macroeconomic indicators such as GDP growth, PMI, and M2 growth indirectly affect ferrous metal futures prices by influencing economic growth, manufacturing prosperity, and liquidity levels. Policy regulation, including environmental production restrictions, tariff policies, and monetary policy adjustments, directly impacts the price discovery mechanism. For example, Tangshan heating season production restrictions reduce steel supply, temporarily driving up futures prices; iron ore import tariff adjustments directly affect costs; and reserve requirement ratio and interest rate cuts stimulate infrastructure investment, boosting demand expectations. The diversity of market participant structures also significantly impacts the price discovery mechanism. Producers and traders smooth price fluctuations through hedging operations, speculators enhance liquidity through high-frequency trading, and institutional investors promote price rationality through cross-variety arbitrage. International linkage effects, such as commodity resonance and exchange rate fluctuations, indirectly affect ferrous metal futures prices. For example, rising crude oil prices increase shipping costs, indirectly affecting iron ore landed prices; the US dollar index and iron ore futures prices show a negative correlation. Trading system design, including margin system and delivery rule adjustments, directly affects market liquidity and price discovery efficiency. For example, iron ore margin ratio adjustments directly impact leverage levels, and delivery warehouse layout optimization reduces regional price differences, promoting price uniformity.

5 Opinions and Suggestions

5.1 Enhancing Information Transmission Efficiency and Fairness

Regulatory authorities should strengthen the regulation of emerging information dissemination channels such as social media, establish information review mechanisms, reduce noise trading interference, and ensure the true and accurate transmission of information. Simultaneously, promote data platforms to lower information acquisition costs, develop free or low-cost information service products for small and medium investors, and narrow market unfairness caused by information acquisition cost differences. Additionally, continuously improve information disclosure systems, requiring enterprises and related institutions to disclose information timely and comprehensively, especially in areas such

as environmental policies and major corporate decisions, enhancing market transparency.

5.2 Optimizing Market Participant Structure and Behavior Guidance

Encourage more physical enterprises to participate in the ferrous metal futures market, through policy support and training, enhance the ability of producers, traders, and other enterprises to use the futures market for risk management, stabilizing the upstream and downstream industry chain. Strengthen investor education, especially for retail investors, offer training courses on technical analysis and fundamental analysis, guide rational investment, reduce emotional trading, improve overall market investment levels, thereby optimizing information transmission and price discovery mechanisms.

5.3 Improving Price Discovery Mechanism-Related Systems

When designing trading systems, exchanges should dynamically adjust margin ratios based on market changes, ensuring market liquidity while reasonably controlling risks. Further optimize delivery rules, scientifically layout delivery warehouses, expand delivery warehouse coverage, reduce regional price differences distorting prices, and enhance the effectiveness of futures-spot price convergence. Simultaneously, strengthen the supervision and coordination of cross-market trading, establish and improve cross-market information sharing and risk monitoring mechanisms, address price fluctuations caused by international linkage effects, and ensure the stable functioning of the price discovery mechanism in the ferrous metal futures market.

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