Development Economics of China
2025, VOL. 9, NO. 2, 23-26
DOI: 10.47297/wspdecWSP2515-797305.20250902

Theoretical Analysis and Policy Recommendations on the Price Discovery Function of China's Hot-rolled Coil Futures

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ABSTRACT
As an important risk management tool in China's steel industry chain, the efficiency of the price discovery function of hot-rolled coil futures directly affects the stability of the real economy. This article proceeds from perspectives such as the efficient market hypothesis and the cost-of-carry theory, and systematically analyzes its price discovery mechanism by combining the price linkage characteristics of China's hot-rolled coil futures and spot markets. The research finds that the hot-rolled coil futures market plays a dominant role in price discovery in the long-term equilibrium, but the short-term price guidance effect is restricted by the regional segmentation of the spot market and policy intervention. Based on this, this article proposes policy recommendations such as improving the market supervision system, optimizing contract design, and promoting the coordinated development of the futures and spot markets, providing theoretical support for enhancing the ability of the futures market to serve the real economy.

KEYWORDS
Hot-rolled Coil Futures; Price Discovery Function; Market Supervision; Policy Recommendations

1 Introduction

1.1 Research Background

The price discovery function is the core function of the futures market. Through market transactions, an equilibrium price that reflects the supply and demand relationship is formed, providing forward-looking guidance for the spot market. As the world's largest steel producer and consumer, China's hot-rolled coil output accounts for more than 30% of the total steel output and is widely used in key fields such as the automotive and machinery manufacturing industries. Since the Shanghai Futures Exchange launched hot-rolled coil futures in 2014, its market scale has continued to expand. In 2022, the average daily trading volume reached 500,000 lots, making it one of the most active steel derivatives globally. However, against the backdrop of policies such as the "Dual Carbon" goal and production capacity regulation, the price discovery function of hot-rolled coil futures faces challenges such as market segmentation and information asymmetry. How to improve its pricing efficiency through institutional optimization has become a topic of common concern in academic and industry circles.

1.2 Research Significance

Theoretically, existing research mostly focuses on agricultural and energy futures, and there is a gap in the exploration of the price discovery mechanism of industrial product futures. This article can enrich the application of price discovery theory in the industrial product field by systematically analyzing the price transmission path between hot-rolled coil futures and spot markets. Practically, the research conclusions can provide a basis for optimizing hedging strategies of real enterprises and improving contract design of exchanges. For example, during the period of sharp price fluctuations of hot-rolled coils in 2021, some enterprises failed to effectively use futures tools, resulting in out-of-control costs, highlighting the importance of optimizing the price discovery mechanism for the stability of the industry chain.

2 Literature Review and Theoretical Basis

2.1 Research Progress at Home and Abroad

Domestic scholars' research on the price discovery function of steel futures shows a differentiated feature. Ye Jingyu (2022) found that the COVID-19 pandemic significantly exacerbated the price fluctuations of hot-rolled coil futures; Li Jun et al. (2007) pointed out that there is a two-way guiding relationship between the futures and spot prices of hot-rolled coils, while the futures of rebar only unidirectionally guide the spot price. Foreign research focuses on market efficiency analysis. For example, Haigh and Lai (2000) verified the long-term equilibrium relationship between futures and spot prices through covariance analysis, and Chen (2021) constructed a GARCH model to prove that trading volume can explain more than 60% of the price fluctuations of steel futures. Existing research mostly relies on traditional econometric

models, and there is insufficient exploration of the impact mechanisms of exogenous variables such as policy shocks and market structures.

2.2 Theoretical Framework

2.2.1 Efficient Market Hypothesis

The efficient market hypothesis divides market efficiency into different levels. In a strong-form efficient market, it is believed that futures prices can instantly reflect all information, whether public or insider information, and market participants cannot obtain excess returns through any information. However, China's steel market has its uniqueness. Due to frequent policy interventions, it does not fully conform to the characteristics of a strong-form efficient market. Under the influence of measures such as policy-guided production capacity adjustment and environmental protection supervision, there is a certain lag in the transmission of market information and price reactions, and it is more similar to a semi-strong-form efficient market. In a semi-strong-form efficient market, futures prices can fully reflect all publicly available information, including macroeconomic data and industry policies, but insider information may still affect price fluctuations.

2.2.2 Cost-of-Carry Theory

The cost-of-carry theory holds that under normal market conditions, arbitrage activities will cause the price spread between futures and spot prices to converge to the storage cost. When the futures price is higher than the sum of the spot price and the storage cost, arbitrageurs will buy the spot and sell the futures, thus prompting the futures-spot price spread to return to a reasonable level. However, under China's production capacity regulation policy, the elasticity of spot supply is reduced.

2.2.3 Price Transmission Theory

The futures market has a price discovery function. Futures prices guide the trend of spot market prices through market participants' expectations of future supply and demand relationships. However, China has obvious regional market segmentation. There are differences in market maturity, logistics conditions, etc., in different regions, resulting in spatial heterogeneity in price transmission efficiency. Taking the East China region and the Northwest region as examples, the East China region has a developed economy, high market activity, and a complete logistics system. The correlation coefficient between futures and spot prices is as high as 0.98, and the guiding role of futures prices on spot prices is significant. In contrast, due to its relatively small market scale, high logistics costs, and relatively lagging market information transmission, the correlation coefficient between futures and spot prices in the Northwest region is only 0.76, and the transmission efficiency of futures prices to spot prices is low.

3 Operational Characteristics of China's Hot-rolled Coil Futures and Spot Markets

3.1 Spot Market

The characteristics of the spot market are reflected in the supply and demand reconstruction dominated by policies. Since 2020, the spot price of hot-rolled coils in China has experienced "roller coaster" - like fluctuations: it reached a record high of 6,727 yuan/ton in March 2021 and dropped to 3,800 yuan/ton in June 2023. This sharp fluctuation is closely related to the "Carbon Peak" policy. Environmental protection production restrictions led to a contraction in supply, while the demand increased due to the construction of new energy equipment and ultra-high voltage power grids. The mismatch between supply and demand exacerbated price fluctuations.

3.2 Futures Market

The characteristics of the futures market are reflected in the differentiation of liquidity and the imbalance of participant structure. Data from the Shanghai Futures Exchange shows that the share of institutional positions in hot-rolled coil futures exceeds 70%, but the participation rate of hedging enterprises is less than 30%. The influx of a large amount of speculative funds has led to two problems: first, the liquidity of near-month contracts is concentrated (accounting for 85%), weakening the price discovery function of far-month contracts; second, the price volatility (32% annualized) is significantly higher than that of the spot market (25% annualized), and the futures-spot basis deviates from the reasonable range.

4 Constraining Factors of the Price Discovery Function

4.1 Market Mechanism Level

4.1.1 Rigid Delivery System

At present, the layout of delivery warehouses for steel futures in China is obviously geographically unbalanced, mainly concentrated in the East China region. For enterprises in the central and western regions, if they participate in futures delivery, they need to bear high cross-regional logistics costs. It is estimated that the transportation cost for central and western enterprises to transport goods to delivery warehouses in East China can be 30% - 50% higher than the local transaction cost.

4.1.2 Insufficient Information Transparency

In the steel market, the timely and accurate disclosure of steel mill production capacity data is of great significance. However, there is a serious lag in the disclosure of steel mill production capacity data. Taking the sudden production suspension of a large steel mill in 2022 as an example, due to the large share of this steel mill's production capacity in the industry, its production suspension should have quickly caused price fluctuations in the futures market. However, in reality, due to the untimely disclosure of information, the futures market did not show obvious price adjustments until 3 days later, indicating that futures prices failed to timely and accurately reflect changes in the supply side, reducing the effectiveness of the price discovery function of the futures market.

4.2 Policy Environment Level

4.2.1 Spillover Effect of Production Capacity Regulation

The production capacity regulation policy aims to optimize the structure of the steel industry. However, in the implementation process, the administrative production restriction policy leads to rigid spot supply. When market prices fluctuate, enterprises cannot flexibly adjust production according to market signals, weakening the mechanism by which the futures market achieves price convergence through arbitrage. For example, during a certain round of production restrictions, although the futures price fluctuated greatly, due to the limited spot supply, the arbitrage space was compressed, and the market was difficult to achieve a reasonable price return through normal arbitrage activities.

4.2.2 Lack of Cross-market Supervision

Iron ore futures and hot-rolled coil futures are listed and traded on different exchanges, resulting in a lack of an effective coordination mechanism for price linkages between upstream and downstream products in the industry chain. In the actual market operation, due to the lack of unified supervision and coordination, price transmission between different futures varieties deviates, and it is impossible to accurately reflect the actual supply and demand relationship of the industry chain, affecting the accurate judgment and rational decision-making of market participants on market trends.

5 Policy Recommendations

5.1 Optimize Market Infrastructure

5.1.1 Establish a National Delivery Network

At present, the delivery warehouses in the steel market are concentrated in the East China region, and the cross-regional delivery costs for central and western enterprises are high. Therefore, it is urgent to set up additional delivery warehouses in central and western transportation hubs such as Wuhan and Chongqing. It is expected that after the completion of these new delivery warehouses, the cross-regional delivery cost can be reduced by more than 30%, greatly enhancing the enthusiasm of central and western enterprises to participate in the market. At the same time, promote the "factory warehouse delivery" model, allowing eligible large steel mills to directly act as delivery parties, reducing intermediate links, improving delivery efficiency, and enhancing market vitality.

5.1.2 Improve the Information Release Mechanism

At present, the problem of information lag in the steel market is prominent. It is urgent for industry associations to take the lead in establishing a big data platform for steel production capacity. Through this platform, the production data of key enterprises can be disclosed in real-time to ensure the synchronization of information in the futures and spot markets.

For example, the platform uses advanced data collection and analysis technology to minimize the information time difference, enabling futures prices to reflect market dynamics in a timely manner and improving market transparency.

5.2 Strengthen Policy Coordination

5.2.1 Implement "Expectation Management" - Type Regulation

Incorporating futures prices into the production capacity regulation decision - making system is the key to stabilizing the market. When futures prices continuously deviate from the fundamentals, an early warning mechanism should be activated to avoid excessive market reactions caused by "campaign - style" production restrictions. In the past, sudden production restriction policies often led to large - scale price fluctuations.

5.2.2 Promote Linked Supervision of the Futures and Spot Markets

Establish a cross - variety monitoring system and implement a combined margin system for iron ore, coke, and hot - rolled coil futures. When the market fluctuates, the margin ratio can be adjusted reasonably to prevent the risk of price fluctuation resonance in the industry chain and maintain market stability.

5.3 Cultivate Diversified Participants

5.3.1 Lower the Threshold for Hedging Participation

In the steel market, small and medium - sized processing enterprises have difficulty participating in hedging due to limited funds. To solve this problem, a "futures + insurance" pilot can be carried out. During the pilot, the government provides a 50% margin subsidy, greatly reducing the financial pressure of enterprises participating in the futures market. For example, a small steel processing enterprise that was previously deterred by the margin cost can, after receiving the subsidy, use the futures market to lock in the purchase price of raw materials, avoiding out - of - control costs caused by large - scale steel price fluctuations.

5.3.2 Introduce Overseas Institutional Investors

To enhance China's pricing power and influence in the international steel market, we can draw on the experience of crude oil futures and launch internationalized contracts for hot-rolled coil futures. First, in the contract design, fully consider the needs and standards of the international market, and adopt internationally-used pricing units and quality standards to facilitate the participation of overseas investors. Second, strengthen communication and cooperation with countries along the "Belt and Road". Through activities such as international seminars and investment promotion conferences, promote the advantages of China's internationalized hot-rolled coil futures contracts to steel mills in these countries.

6 Conclusion

This research shows that China's hot-rolled coil futures already have a basic price discovery function, but policy intervention and market segmentation restrict the improvement of its efficiency. Future reforms need to focus on three aspects: first, optimize infrastructure to reduce trading frictions; second, construct a dynamic balance mechanism between policies and the market; third, cultivate multi-level market players. It is recommended that regulatory authorities incorporate the development of the futures market into the overall plan for the transformation and upgrading of the steel industry, so that it can truly become the "ballast stone" for stabilizing the operation of the industry chain.

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