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The Impact of Housing Price on the Performance of Listed Steel Companies Evidence in China

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Abstract

Purpose - This study explores the impact of the real estate industry on related industries for the perspective of Chinese steel companies.

Design/methodology/approach - The impact of housing prices on the 41 listed steel companies' performance was analyzed by using the panel data model. We used two kinds of housing price indexes that are set in the panel data models to estimate the range of the real estate market, driving the performance growth of steel listed companies. Moreover, the net profit of steel companies is used as the dependent variable. To test the stability of the model, ROA used as a dependent variable for the robustness test. Also, to avoid the time trend of housing prices, this paper selects the growth rate of housing prices as the primary research variable. After Fisher-type testings, there is no unit root problem in both independent and dependent variables.

Findings - The results indicated that the rise in the housing price has a positive influence on the steel company performance. When the housing price increases by 1%, the net profit of steel enterprises will increase by 5 to 20 million yuan.

Research implications or Originality - In this paper, empirical data at the micro-level and panel model are used to quantify China's real estate industry's driving effect on the iron and steel industry, providing evidence from the microdata level. It helps us to understand further the status and role of China's real estate industry in the economic structure.

Keywords: Housing Price, Listed Steel Company, Panel Data
JEL Classifications: C51, L61, R31

Ⅰ. Introduction

1. Chinese Real Estate Industry

Since the 1990s, with the rapid development of urbanization and the reform of the urban housing system, the real estate industry plays an increasingly important role in driving China's national economic growth, promoting social development, and advancing the national living

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standard. According to the National Bureau of Statistics, the real estate development investment scale increased by 503.29% from the investment amount of 15,909 billion yuan in 2005 to 95979 billion yuan in 2015. Given the structure of fixed assets investment, the real estate industry development investment accounted for approximately 18% of the total society fixed assets investment. It indicates that China's real estate industry substantially contributes to the development of the national economy.

The critical position of the real estate industry is not only reflected in the share of the national economy but also its driving effect on related industries. Statistically, the investigation and associated services of the real estate industry have not only directly driven the development of more than 20 sectors. Still, they have also indirectly influenced the demand of nearly 30 kinds of industries. Therefore, the real estate industry has been one of the most critical sectors of China's macroeconomic. Relevant research also confirms this. Boer and Morrison (1995) found that the real estate industry in Europe and the US has a significant driving effect on the growth of their related industries and the national economy. Based on the data from eight developed countries (the US, Germany, Australia, Canada, France, Denmark, New Zealand, and Japan), Pietroforte and Gregori (2003) found that in developed countries, the construction industry has a significant driving effect on its related sectors. In Asia, the Japanese government empirically studied the driving impact of the Japanese real estate industry on its industry chain-related industries (upstream areas include steel, cement, and papermaking and downstream industries include decoration, home appliances, and furniture) based on the input-output method in 1968 and 1997. Existing studies show that every 1 yen invested by the real estate industry can drive the output value of 2 yen from upstream and downstream-related sectors.

Similarly, Raufdeen and Thanuja (2008) used the input-output tables of developing countries to analyze the linkage mechanism between the construction industry and other industries in these countries. The results of their research show that a significant linkage exists in which the construction industry has an enormous driving effect on the service and manufacturing industries. Although Chinese scholars mainly focus on the impact of real estate on the overall national economy, studies on the linkage mechanism between the real estate industry and related industries remain limited. Liu (2004) studied China's real estate industry's driving effect based on the input-output analysis method earlier and found an apparent linkage between China's real estate industry and related industries. The industry level holds specific differences, such as the real estate industry has the most significant driving effect on financial, steel, and construction industries. Similar empirical studies include Wei and Yuan (2009), and Wang (2009). He (2014) constructed a corresponding CGE model based on China's 2007 input-output data. Through empirical research, he found that the rise and fall of the real estate industry considerably affected almost all other sectors, but two-way asymmetry characteristics exist. The leading role of the real estate industry is more significant than its restraining effect.

Tang and Zhang (2006) combined the data of the five industry indexes on the stock market at the capital market level. They uncovered that a significant real estate industry linkage prevails at the capital market level, and the impact of rising housing prices on upstream industries is more significant than downstream sectors.

This study aims to explore how the real estate industry affects related industries through the perspective of the steel industry. Two main reasons exist for using the steel industry as an entry

Table 1. The proportion of crude steel output in global total output

	1980	1985	1990	1995	2000	2005	2010
EU	31%	30%	28%	25%	23%	17%	12%
JPN	16%	15%	14%	14%	13%	10%	8%
US	14%	11%	12%	13%	12%	8%	6%
CN	5%	7%	9%	13%	15%	31%	44%
BRA	2%	3%	3%	3%	3%	3%	2%
KOR	1%	2%	3%	5%	5%	4%	4%

Data source: World Steel Association

point. First, the steel industry is more representative than in other sectors. Compared with other areas, the steel industry is more sensitive to changes in the real estate market. On the one hand, real estate price fluctuations significantly impact the steel industry (Tang and Zhang, 2006).

On the other hand, compared with other sectors, real estate price fluctuations can be transmitted to the steel industry more quickly (Guo and Zhong, 2016). Second is the importance of steel and the steel industry. Steel is one of the primary raw materials of the real estate industry, which dosage reaches 50 kg/㎡ in the construction of an ordinary commodity house. In the recent decade, according to the related statistics of the China Iron and Steel Association, the annual steel consumption in the real estate industry occupied 33% of China's total steel consumption.

2. Chinese Steel Industry

The Chinese steel industry started in 1949, which was developed slowly from 1949 to 1978. Then the crude steel output increased at an annual rate of 6.6% from 1979 to 2000. In 1996, the production of crude steel was over 1 billion for the first time, which accounted for about 13.5% of the global output. And in that year, China became the largest producer in the world. In 2010, the production of crude steel in China increased to 630 million, which occupied 44% of the world output. Oleksandr Movshuk (2012) found that between 1992 and 2009, the share of medium-low technology industries represented by steel and related metal products in China was stable at 15%. The advantage of steel prices is one of the reasons that the export share can remain stable. Shen (2017) compared the competitiveness of China's exports and the Republic of Korea, concluding that steel products are one of the Chinese competitive export products. Furthermore, Ji-Yong Kim(2017) studied the competitiveness of Chinese metal products in the Korean market. He found that in searching trade balance aspects through MSI, highly ranked Chinese metal items in the Korea market were steel rolling, pressing&elongation products, steel tubes, steel casting industry. The competitive advantages of Chinese steel products keep the Chinese steel industry's continued impact on the international market. Therefore, the Chinese steel industry has not only drove the national economy's rapid development but also impacted the world economy.

II. Theoretical Framework

From the perspective of the supply-demand relationship, rising housing prices are a manifes-

tation of short supply. Investing in real estate has become a "profitable" thing. A large amount of capital enters the real estate market, which increases housing supply. As one of the essential raw materials for houses, steel demand increases accordingly, thereby improving steel companies' performance. First, the research on the relationship between housing prices and housing demand comes mainly from the housing supply side. The most commonly used analytical tool is the price elasticity of real estate supply, which measures the supply's price sensitivity. Many studies used the data to estimate that the flexibility of housing supply in the US is basically between 1.5 and 4, (Schwab, 1983; Topel and Rosen, 1988; Poterba et al., 1991; DiPasquale and Wheaton, 1994; and Blackley, 1999). The model established by Malpezzi and Mayo (1997) assumes that the supply and demand of housing obey the following simultaneous equations:

$$\begin{aligned} Q_D &= \alpha_0 + \alpha_1 P_h + \alpha_2 Y + \alpha_3 D \\ Q_{s} &= \beta_0 + \beta_1 P_h \\ Q_{D} &= Q_S \end{aligned} \qquad (1)$$

Among them, Y is the income of residents, D is the population, and the third equation is the equilibrium equation of supply and demand. Malpezzi and Maclennan (2001) gave a method to solve the supply elasticity. Harter-Dreiman (2004) estimated that the US metropolitan area's supply elasticity uses cointegration and error correction models and found that the US housing supply elasticity is between 1.8 and 3.2. However, the results show that the estimated results obtained in different regions are similar. Green et al. (2005) estimated the price elasticity of housing supply in the US metropolitan area and received an average of 7.31.

The research on the supply-side characteristics of China's real estate market is also vibrant. Li (2012) used provincial panel data and variable coefficient models to estimate the rural housing supply. The results are between −0.65 and 7.5, and apparent differences exist in different regions. The research of Zou and Niu (2010), based on national data, also obtained the price elasticity of supply, and the result was 0.83. Wang et al. (2012) used 35 large- and medium-sized cities to estimate the elasticity of China's housing supply between 2.8 and 5.6. Wan, Gao, (2004), Zhai, and Guo (2018) found in the analysis of the key influencing factors of commercial housing supply that compared with other factors, the housing price supply elasticity is the largest.

Although the methods used for the study of housing supply price elasticity, the variables used (mainly for the measurement of housing supply), the models used are different. Nonetheless, the calculated price elasticity of housing supply is positive, and all verify the conclusion that rising housing prices bring new flows to the real estate market.

Steel is the raw material for new housing. According to estimates, the amount of ordinary commercial house used in construction is 50 kg/㎡. Liang, Gao, and He (2006) used the VAR model to conclude that housing supply would positively affect steel output. Therefore, the rise in house prices and the increase in new housing increases the demand for steel.

For listed steel companies, we assume the following profit function.

$$Profit = (P_{steel} - C_{steel}) * Q \qquad (2)$$

Among them, Q is the quantity and Psteel is the steel price. China's steel industry is relatively competitive. From 2011 to 2014, the top-10 steel companies in China accounted for 48.4%, 45.9%, 39.41%, and 36.58% of the total industry output. The industry's concentration is not rising but falling, showing a trend of anti-monopoly. According to Bain classification, China's steel industry is far from a monopolistic industry, and the overall situation is "big but not strong, small but not weak." Therefore, we can presume that Chinese steel companies are "recipients" of market prices. Csteel is the unit cost. This is related to many factors, such as the endowment, scale, and business layout of each company. Therefore, it cannot be accurately measured. This study assumes that each company prefers to use its endowments to reduce costs as much as possible so that the unit amount of profit (Psteel−Csteel) remains within a relatively stable range. Under this premise, the company's profit is mainly determined by the amount of steel sold. Therefore, the rise in housing prices increases the demand for steel

Ⅲ. Literature Review

1. The Relevance Research of the Real Estate Industry and the Steel Industry

Researches focusing on the relationship between the steel industry and the real estate industry focuses on Chinese journals. Shi (1997), the Chinese scholar, suggested that the development of the real estate industry can improve the development of more than 50 industries such as building materials and metallurgy industries, and the development of nearly 2000 products. However, there was no empirical study in this research.

Li (2002) calculated the driven effects of the real estate industry from the aspect of the inducing outcome of real estate investigation. This research concluded that every ¥10,000 million real estate investigation could induce ¥12,361 million in the manufacturing industry and ¥9076 million in the building industry. Nevertheless, this paper did not supply the calculation process and method.

Wang and Liu (2004) used the input-output model to analyze the relationship between the real estate industry and related industries. This study concluded that the real estate industry directly drove the development of the steel industry, chemistry industry, and agriculture industry.

Li and Wang (2010) used the input-output model to analyze the industry orientation of the real estate industry in the national economy of China, the USA, the UK, and Japan. Moreover, the driving effect of the real estate industry for other related industries was quantified. The research findings showed that the driving force was increasingly influential. However, the conclusion was not suitable for the other three countries because of the different economic structures in different countries.

Liu (2009) selected the quarterly business index from 2000 to 2007 of the real estate industry and other related industries, using Granger Casually Test and impulse response function, finding that the effect on the national economy of the real estate industry realized by its impact for industry. This research also found that the real estate industry had a strong positive effect on the metal product industry.

Time series models are also often used in this type of research. Liang, Gao, and He (2006) se-

lected the quarterly statistics from 1995 to 2005, which were completed an investment in real estate, steel production, concrete production, and glass production. Furthermore, these statistics were analyzed by vector autoregressive model and impulse response function. A conclusion was drawn that the real estate industry's driving impact on the steel industry was characterized by the positive, long-termed impact, which lasted nearly ten years.

2. The Research Aiming to the Performance of Listed Steel Company

China's steel industry is an integral part of the manufacturing industry, and there are many studies related to the performance of steel enterprises. Xu and Gao (2004) used the data envelopment analysis method and the Malmquist index to evaluate Chinese massive iron and steel enterprises' competitiveness. And its dynamic evolution trend, according to the efficiency and effectiveness of value creation in enterprises.

Yang and Wu (2006) used CCR and BBC models of DEA to measure the efficiency of steel listed companies, the results of which were used to analyze the scale efficiency, technological progress, productivity indicators, and internal relations in listed companies.

Xia, Zhang, and Yang (2007) determined and analyzed the technical efficiency and scale efficiency of the listed companies by using the DEA model, according to the cross-sectional data of 29 listed companies in China in 2005.

Han (2008) improved the productivity and production efficiency of China's iron and steel listed companies through the two-step method called DEA-TOBIT. The results show that the iron and steel industry in China needed to improve the technical conditions to achieve the improvement of the efficiency of the iron and steel enterprises.

There are also many scholars using multiple regression methods for research. Liu, Liu, and Wang (2009) evaluated the performance of 32 Steel Listed Companies in 2007 from four aspects, which were profitability, development ability, operation ability, and solvency by using factor analysis and cluster analysis methods. Then the blue-chip companies were evaluated.

Liu and Huang (2010) used the factor analysis method to analyze the performance based on the financial indicators of steel listed companies. The results showed that low profitability and risk tolerance, mainly leading to the reduced overall efficiency of steel enterprises.

Zhang (2016) found that the level of return on investment and the control level of cash flow had a significant influence on the profitability, through the empirical analysis of the profitability of some listed companies.

Zhou (2009) used the multiple regression model to analyze iron and Steel Listed companies' financial data in the past four years, from 2002 to 2006. The research finding was that the turnover of current assets had a positive impact on corporate profitability.

Recently, some scholars began to use the panel data regression model for analysis. Liang (2012) selected ROA as the dependent variable. It analyzed the short-term debt ratio, long-term debt rate, capitalization rate, company scale, and other variables as independent variables based on 30 listed steel companies' financial panel data from 2006 to 2010. The results showed that short-term debt ratio, long-term debt ratio, and capitalization rate were negatively correlated with ROA. Furthermore, the company's size and the shareholding proportion of the largest shareholder positively correlated with ROA.

Liu, Wu, and Wang (2016) analyzed the performance, basing on the panel data of 28 iron and steel companies from 2008 to 2014, combining the two methods of factor analysis and panel regression. The results showed that the size of the company and the capital structure of the company were negatively correlated to the performance of the company. The proportion of the first large shareholders was positively related to the steel companies' performance, but the relation was not significant; the growth was significantly positively correlated with the steel companies' operating performance.

To sum up, the relevant research still has some shortcomings as follows:

Most of the previous researches selected as the macro-level data. Using the input-output model and the Var model to observe the relationship between the two sectors from the macro level, the performance changing situation of steel companies caused by the housing price fluctuation cannot be reflected.

Secondly, the previous studies on the performance of Steel companies mainly adopted DEA, factor analysis, and principal component analysis, linear regression. The shortcoming of using the first two methods is that these methods can not reveal the long-term impact of the factors on the company performance for using cross-section data. Besides, most research only explores the effects of endogenous factors such as enterprise technical efficiency and debt ratio. The external factors, such as the overall macro-economic operation, the real estate industry, industry, and other factors, are not considered. Thus, this study uses panel data to explore the impact of macro-level housing price changes on the performance of steel listed companies on a micro level and further reveals the driving effect of the real estate industry on the iron and steel industry. The difference from previous research is that: 1) Different data types and models. The existing research on the correlation between the real estate and steel industry mostly uses macro-level data and time series models. For the first time in this paper, empirical data at the micro-level and panel model are used to quantify the driving effect of China's real estate industry on the iron and steel industry, providing evidence from the microdata level. 2) More representative. We use Wind industrial database. It includes 27 listed companies and considers the leading businesses, such as steel wire rope, steel pipe, and steel trade. The activities of these companies are closely related to housing construction. Data samples reflect the overall level of the steel industry quite well. 3) Innovation in variables: to make the results of quantitative analysis closer to the actual level, two kinds of housing price indexes are set to estimate the range of real estate market driving the performance growth of steel listed companies. Besides, considering that the overall economic environment and other macro factors will affect the performance of listed steel companies, we added two dummy variables, macroeconomic prosperity index, and industrial added value.

IV. Data &Method

1. Sample Selection

All data are selected from the National Bureau of Statistics of China and the Wind database.

In this study, the listed steel companies in the steel industry index issued by Wind companies are taken as samples. There are 42 stocks in the index's constituent stock list, 41 of which are

A shares and 1 is B shares. Considering that A-share and B-share have a different market environment and regulatory mechanism, and the fact that only A-share listed companies are taken as the research object in relevant studies, so only 41 A-share steel listed companies are selected in this study. The main businesses of these 41 listed steel companies are not all concentrated in real estate steel, which makes the chosen samples more representative and can reflect the steel industry's overall operation. The time of the example is from the first quarter of 2011 to the fourth quarter of 2017. As some companies are listed after 2011, the final data type is unbalanced panel quarterly data. We sorted out 1068 observations.

2. Variable and Methodology

2.1. Measurement of the Steel Company's Performance

As the research object and the purpose of the research are different, there is a significant difference when the domestic and foreign scholars choose the company's performance evaluation index. Such as return on assets, return on equity, net profit, Tobin Q, and economic added value (EVA). This study chooses net profit as a variable to measure the company's performance. There are two main reasons. First, return on assets worth and the return on equity are usually used in the study of which observation objects use annual data. The idea is that these two indicators reflect the ability to gain profit through managing the total assets and equity assets of shareholders. It usually takes an accounting year to ensure the full operation of the capital for observing the more stable profitability. There are some flaws in China's capital market, so it is limited to apply to Tobin Q in China. Net profit is usually used when selecting annual or semi-annual data. The quarterly panel data will be used in this study, so net profit is more appropriate. Second, as the steel industry is a cyclical industry of which cyclicity stems from inventory. When the demand for steel in the real estate market changes, its performance will be directly impacted by affecting the sales volume of steel products. In the above indicators, net profit can most directly reflect the sales volume.

In order to test the stability of the model, ROA will be used as a dependent variable for the robustness test.

2.2. Measurement of the Supply and Demand in the Real Estate Market

In this paper, we are using the real estate price as a measurement of real estate development. Therore, this study selects housing prices as an indicator to reflect changes in the supply and demand for real estate. Due to the characteristics of heavyweight and high transportation β costs, the demander often purchases from the adjacent steel plants in the actual iron and steel trade activities. In data collection, it is impossible to collect the specific business scope of each company due to objective reasons. Therefore, we determine the main research variables according to two different hypotheses. First, it is assumed that each company's performance is only affected by the average housing prices in each region, which means that the scope of each steel company's sale is limited to its location. At this time, the average housing price of each listed company's location is chosen as the primary research variable. For example, JIANGSU SHAGANG Co., Ltd. (Stock Code: SZ002075) is located in Jiangsu Province, China; then, it is assumed that its sales scope is limited to Jiangsu Province. Therefore, we only consider the impact on the enter-

prise when the housing price changes in Jiangsu Province. Second, it is assumed that each of the 41 listed companies' performance is affected by the China average price, which means that the scope of each listed Steel company's steel sales is not limited to the region where the company located. Therefore, the average housing price in the whole country is chosen as the primary research variable. After taking the logarithm of the national average house price and regional average house price, it is found that the unit root problem still exists. Therefore, we take the growth rate of the housing price as the primary research variable.

This article does not directly use housing prices as a variable of supply and demand in the real estate market. There are two main reasons. First, in the past ten years, China's real estate market has been on the rise, and house prices have increased year by year. It leads to a temporal trend in the variable of house prices. Second many urban economists believe that housing prices will adjust themselves to ensure a balance between housing stock and housing demand. The research by Mayer and Somerville (1996) shows that it is better to depict the increase of a new house supply based on changes in existing house prices. The research by Mayer and Somerville (1996) shows that new houses' construction is stimulated based on changes in the number of existing dwellings. The fluctuation of housing prices can better reflect the supply of new houses in the market. Therefore, this paper uses the idea of Mayer and Somerville (1996) and Liu (2014) and uses the growth rate of house prices as the primary research variable. Moreover, the unit root test result of input variables shows that the growth rate of housing prices, net profit, and ROA have no time trend problem.

3. Selection of Control Variables

According to the previous research, we choose the asset-liability rate, total assets, three charges rate, and current asset turnover rate to measure the company's capital structure, company size, cost control, and ongoing asset operation ability.

At the macro level, we choose the industrial added value and China's macroeconomic prosperity index to describe the industrial development environment and the macroeconomic environment.

4. Method and Model

In this study, the net profit group is taken as the dependent variable. The growth rate of national average housing prices and local housing prices is considered the primary research variable to establish a panel fixed-effect model and random effect model. However, when the national average residential price growth rate is the primary variable, which is essentially a dummy variable, it can not be calculated by the fixed effect model. So we just figured it by a random-effects model. Then, in the robustness test part, we will use ROA instead of net profit to test. The main models are as follows:

Model 1(Random Model)

$$Netprofit = \alpha + \beta_1 * Napricegro + \beta_2 * Liaratio + \beta_3 * Logasset + \beta_4 * \mathrm{Exp}enseration + \beta_5 * Turnoverration + \beta_6 Index + \beta_7 * Logindusadd + \varepsilon$$

Model 2(Fixed Model)

$$Netprofit = \alpha + \beta_1 * Repricegro + \beta_2 * Liaratio + \beta_3 * Logasset + \beta_4 * \mathrm{Exp}enseration + \beta_5 * Turnoverration + \beta_6 * Index + \beta_7 * Logindusadd + \varepsilon$$

Model 3(Random Model)

$$Netprofit = \alpha + \beta_1 * Repricegro + \beta_2 * Liaratio + \beta_3 * Logasset + \beta_4 * \mathrm{Exp}enseration + \beta_5 * Turnoverration + \beta_6 * Index + \beta_7 * Logindusadd + \varepsilon$$

5. The List of All Variables

This study takes the log of industrial added value and the company's total assets. As the net profit is negative, that is impossible to make a logarithm, 100 million yuan is chosen as the unit of the net benefit to reduce its magnitude.

Table 2. Variable List

Variable	Label	Log
Net profit	Quarterly net profit before tax for each company	NO
ROA	Net profit before tax / total assets	NO
The growth rate of national housing price	(the national average housing price of the quarter - the national average housing price in the last quarter)/ the national average housing price in the last quarter	NO
The growth rate of regional housing price	(regional average housing price of the quarter - regional average housing price in the last quarter)/ regional average housing price in the last quarter	NO
Asset-liability ratio	Reflecting the company's asset structure	NO
Total assets	Reflect the size of the company's assets	YES
Three charges rate	The ratio of the sum of operating expenses, financial expenses and handling expenses to main business income	NO
Current asset turnover	The ratio of net income of the main business to average current assets	NO
Macro-economic climate index	Reflecting the operation of the national economy in the current quarter (1996 is the 100% benchmark)	NO
Industrial added value	The new value of all industrial enterprises of the production in the current quarter. Industrial added value = total industrial output - industrial intermediate input	YES

Ⅳ. Hypothesis

H1: The rise of the national average housing price will have a positive impact on the performance of steel listed companies.

H2: The rising housing price in the region where the steel listed companies are located will have a positive impact on the performance of steel listed companies.

H3: Asset liability ratio will be negatively correlated with the performance of steel listed companies.

H4 : The size of the company will be positively related to the performance of steel listed companies.

H5: The rise of the three charges rate will have a negative impact on steel companies' performance.

H6: The increase of current asset turnover will have a positive impact on the performance of steel companies

H7: The macroeconomic climate index will have a positive impact on the performance of steel listed companies.

H8: Industrial added value will have a positive impact on the performance of steel listed companies.

Ⅴ. Empirical Analysis

1. Descriptive Statistics

The result of descriptive statistics is shown as follow:

The primary research variable, the mean value of the growth rate of the national average housing price is 0.019, which is close to 0.021, the mean value of the local housing price. However, the variation range (-0.368~0.491) of the growth rate of local housing prices is larger than the change range(-0.076~0.191) of the growth rate of the national average housing price. The average net profit is 54 million yuan. The mean value of ROA is 0.2%, which is low. It may be because quarterly data can not fully reflect the characteristics of the index.

Table 3. The Result of Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Netprofit	1,068	0.543	6.7	-38.372	83.888
ROA	1,068	0.002	0.017	-0.138	0.105
Na_price_gro	1,068	0.019	0.072	-0.076	0.191
Re_price_gro	1,068	0.021	0.081	-0.368	0.491
Liaratio	1,068	0.609	0.201	0.042	1.118
Log_asset	1,068	10.202	0.591	8.942	11.567
Expense_ratio	1,068	0.09	0.083	-0.323	1.412
Turnover_ratio	1,068	0.549	0.285	0.033	1.698
Index	1,068	96.508	2.957	92.569	102.967
Log_indus_add	1,068	12.762	0.057	12.63	12.893

The asset-liability ratio reached a maximum of 111.8%, with an average value of 60.9%, indicating that China's steel listed companies have a problem that the gearing is too high.

2. Correlation Test

Table 4. The Result of Correlation Test

	Net profit	Na price gro	Re price gro	ROA	Lia ratio	Log asset	Expese ratio	Turn over ratio	Index	Log indusadd
Netprofit	1									
Na_price_gro	0.00	1								
Re_price_gro	0.05 ***	0.4 ***	1							
ROA	0.56 ***	0.01	0.03	1						
Liaratio	-0.15 ***	0.01	0.01	-0.35 ***	1					
Log_asset	0.15 ***	-0.01	0.02	-0.14 ***	0.52 ***	1				
Expense_ratio	-0.21 ***	-0.04	-0.01	-0.29 ***	0.13 ***	-0.15 ***	1			
Turnover_ratio	0.10 ***	-0.04	0.01	0.13 ***	0.18 ***	0.33 ***	-0.38 ***	1		
Index	-0.01	0.01	0.01	0.02	0.06 *	-0.01	-0.17 ***	0.15 ***	1	
Log_indus_add	0.13 ***	-0.46 ***	-0.14 ***	0.11 ***	-0.07 **	0.02	0.11 ***	-0.06 *	-0.74 ***	1

*** significant at 1%, ** significant at 5%, * significant at 10%

3. The Regression Result

According to the results of table 5, we can find that the growth rate of the national average

Table 5. Fixed Effects Model and Random Effects Model

	Dependent variable: netprofit					
	1		2		3	
	Random effects effects		Fixed effects		Random effects	
	coef.	Std.Err	coef.	Std.Err	coef.	Std.Err
Na_price_gro	20.127***	3.075				
Re_price_gro			5.070**	2.131	5.299**	2.138
Liaratio	-8.866***	1.894	-10.482***	2.385	-9.210***	1.845
Log_asset	2.465***	0.842	2.603	1.761	2.700***	0.787
Expense_ratio	-10.407***	2.52	-11.514***	2.596	-11.410***	2.56
Turnover_ratio	3.008***	1.025	4.149***	1.165	2.769***	1.023
Index	0.648***	0.102	0.298***	0.09	0.337***	0.089
Log_indus_add	51.436***	5.751	28.100***	4.586	29.059***	4.503
_cons	-739.354***	81.404	-408.336***	64.468	-425.455***	64.089
vif	2.08				1.62	
R^2	**13.95%**		**10.92%**		**10.80%**	

*** significant at 1%, ** significant at 5%, * significant at 10%

house price is the leading research variable (model 1) or the growth rate of a local average house price of steel companies is the primary research variable (model 2 and model 3). The growth rate of housing price is positively proportional to the net profit. It is consistent with our H1 hypothesis. The rise of the house price reflects that the supply of the real estate market is less than the demand. And according to the "four-quadrant model' of the real estate market, when the quantity is less than the application, it will first lead to the rise of the rent, which leads to the housing price rise. When housing prices rise to a critical point, capital market funds will flow into the real estate market, causing the increase of the housing supply. As the construction area increases, the demand for steel will increase, which makes the performance of steel listed companies better.

Furthermore, when the national housing price growth rate is taken as the primary research variable, the coefficient is 20.127; that is to say, the net profit of steel listed companies will increase by an average of 20 million RMB for every 1% increase of housing price growth rate. Simultaneously, in model 2 and model 3, the coefficient of the housing price growth rate in each region is only about 5%. That is to say, for every 1% increase in the average housing price in the area where the steel company is located, the net profit of the steel company will increase by about 5 million yuan. We think the difference is reasonable. The homogenization of construction steel represented by screw steel is very serious, considering some objective factors such as transportation cost. The products of a steel listed company can not be sold to all regions of the country, and it is unlikely that they can only be sold locally without exploiting the surrounding market. So, when choosing the growth rate of national housing prices and the growth rate of local housing prices as the primary research variables, we make two more extreme hypotheses. Therefore, when the growth rate of housing price increases by 1%, the growth rate of net profit of steel companies should be between 5 million and 20 million RMB. For the control variables, the three charges rate is significant at the level of 1% in the three models, and all have a negative correlation with the net profit. It shows that the high proportion of debt cost and operating costs will inhibit the profitability of iron and steel companies. In recent years, there is a top gearing problem in Chinese steel enterprises. Large-scale debt makes the company bear high financing costs. The current asset turnover rate is positively correlated with net profit, and it is significant at the level of 1%. The inventory of iron and steel companies has the characteristics of large volume and high value. Improving the inventory turnover rate can reduce the loss of inventory circulation, reduce the occupation of funds. The company's total assets are only significant in models 1 and 3, but not in model 1. But according to the Hausmann test, model 2 is better than model 3.

The reason may be that the scale advantage brought by the enormous assets is not apparent in the current situation of excessive steel production capacity and fierce competition of product homogenization. Macro-level, the national economic perspective index, and the industrial added value are significant at the 1% level and are positively related to the company's performance. The environment of the whole country's economic operation will have a substantial impact on the performance of the listed companies. At the same time, as a downstream industry of the steel industry, Industry's development situation directly determines the demand for steel.

Table 6. Models with ROA as Dependent Variable

	Dependent variable: roa					
	4		5		6	
	Random effects effects		Fixed effects		Random effects	
	coef.	Std.Err	coef.	Std.Err	coef.	Std.Err
Na_price_gro	0.049***	0.008				
Re_price_gro			0.010*	0.005	0.012**	0.006
Liaratio	-0.035***	0.004	-0.058***	0.006	-0.035***	0.004
Log_asset	0.001	0.002	0.020***	0.005	0.001	0.002
Expense_ratio	-0.041***	0.006	-0.042***	0.007	-0.043***	0.007
Turnover_ratio	0.011***	0.002	0.019***	0.003	0.011***	0.002
Index	0.002***	0	0.001***	0	0.001***	0
Log_indus_add	0.127***	0.015	0.055***	0.012	0.072***	0.012
_cons	-1.765***	0.214	-0.964***	0.166	-0.992***	0.167
vif	2.08				1.62	
R^2	**21.22%**		**20.84%**		**18.80%**	

*** significant at 1%, ** significant at 5%, * significant at 10%

4. Robustness Test

To test the robustness of the central part of the study, the ROA is used to replace the net profit as the dependent variable. The Regression analysis is carried out by using the fixed effect and the random effect model. The followings are the results of the study.

When the growth rate of the national average housing price is the primary variable, which is essentially a dummy variable, so we just calculated it by a random-effects model. By comparing models 4,5 and 6 with models 1,2, and 3, it can be found that both the significance of the variables and the symbols of the coefficients are the same, which further verifies the stability of the established model.

VI. Conclusion

This study further confirmed the impact of the real estate market on firms' performance in related industries from the steel industry perspective. It is concluded that the growth rate of the national average housing price or the growth rate of the housing price in the region where the companies are located will affect the performance of the 41 listed Steel company through the empirical analysis of the panel regression. When housing prices rise, net profits and ROA that reflect iron and steel companies' production will increase. When the growth rate of housing price increases by 1%, the net profit of steel companies (Steel company's quarterly net profit) will increase by 5 to 20 million yuan. The conclusion reflects the Chinese real estate industry's positive impact on companies' performance in related sectors. It highlights the vital position of the Chinese real estate industry. Therefore, the government's policy of the real estate market needs to maintain a more cautious attitude.

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