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Empirical Analysis of Operating Results of Listed Companies Under the Multiple Regression Model Standard—Based on the Data Verification of China's 2022 Real Estate A-Share Financial Interim Report

Shuyang Chen[1] & Yun Liu[1]

[1] Guangzhou Huashang College, Guangzhou 511300, China

Correspondence: Shuyang Chen, Guangzhou Huashang College, Guangzhou 511300, China.

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Abstract

The real estate economy is also a commodity economy, the proper development of the real estate economy is conducive to improve the national tax revenue and promote the people's employment and entrepreneurship, which can achieve the sustained and stable growth of the national economy. The real estate economy is not only related to the construction and building materials industries, but also closely related to many real industries. It has the basic role of leveraging the common circular development of various industries. For example, furniture and household appliances, kitchenware, grocery retail, sports and tourism, art education and other industries can be developed on the basis of the real estate industry. In the process of the rapid development of real estate, various problems will gradually appear. Based on the analysis of 2022 and 2021 interim financial reports, this paper uses multiple regression model to find out the factors that affect the profitability of real estate enterprises, and proposes measures to improve the profitability of real estate enterprises based on the analysis results.

Keywords: real estate company, multiple regression model, operating results, economic impact

1. Introduction

As an important pillar industry of people's livelihood project, real estate is related to the national economy. The real estate industry involves a wide range of industries, many upstream and downstream related industries, and is closely related to various industries in the economy, all of which make the real estate industry in the leading industry position, generating a strong driving force for social and economic growth. At present, although local governments and residents are enjoying the dividends brought by the real estate boom, there is a certain bubble in the real estate market, and the bubble is accumulating and growing. Due to the important role of the real estate industry in the national macro economy, the country government has done a lot of work in the real estate policy control over the years. In many cities today, the development of the real estate industry is closely related to the local economy. Excessive regulation of the real estate industry may lead to a decline in economic growth and hinder regional economic development.In order to ensure the smooth movement of our economy, it is extremely important to solve the problems affecting economic benefits of real estate enterprises.

2. Literature Review

The importance of real estate enterprises to social and economic development has been studied by many scholars. (Wang, 2021) pointed out that the relative opposition between real estate and the real economy can easily lead to false prosperity and speculative mania; it will inhibit consumption and cause depression in all industries; it will gradually cause many real enterprises to lose confidence in production and operation; and the overall operation of the social economy will face huge risks. The development of real estate enterprises affects national taxation,

unemployment rate, bank bankruptcy risk and so on. (Gao, 2021) pointed out that the real estate economy has an important impact on local fiscal revenue, which has a certain impact on local economic development and residents' consumption levels.

Some scholars have used more specific data to illustrate the impact of the real estate industry on other industries. (Fan et al, 2022) using the panel data of 30 provinces, municipalities and autonomous regions in China from 1999 to 2017, the real estate market-oriented reform, financial development and the real economy are empirically tested from the first perspective of real estate. The study found that the market-oriented reform of the real estate industry has significantly promoted the development of the real economy. It reveals the internal motivation of the macroeconomic risk of "moving from the real to the virtual". (Lu, 2022) research shows that the influence of China's current real estate industry and its sensitivity to the market are higher than the industry average in all sectors. For example, 1% of the output of the real estate industry will lead to a 1.5% to 2% increase in the output benefits of related industries and industries. There are direct or indirect connections between the development of the real estate industry and many fields such as construction, transportation, and finance.

Based on the US micro-survey data, (Corradin & Popov, 2015) concluded that rising housing prices can significantly increase the motivation of residents to start their own businesses, and a 10% increase in average housing prices will increase the entrepreneurial rate by 14%. However, Chinese scholar (Xu, 2017) pointed out that excessive housing prices may suppress consumption through budget constraint effects and substitution effects, and squeeze investment in the real economy, affecting the healthy development of the real economy. (Chen Binkai et al, 2015) showed that rising housing prices are an important factor hindering the steady growth of China's economy. High housing prices lead to the misallocation of market resources and reduce the efficiency of resource allocation, thereby reducing total factor productivity.

(Diaz & Tjokro Hindro, 2017) examined the relationship between eight firm factors for Indonesian real estate firms of various sizes. The findings show that days of accounts receivable is negatively associated with profitability but not for medium-sized firms. The number of days of inventory is negatively correlated for small firms, but the opposite is true for large firms, because large real estate firms have more liquid assets that can cover real estate inventory maintenance costs associated with real estate. Size and sales growth are positively correlated to the profitability of both large and small real estate companies. (Nguyen, Nghia, Hoai & Chinda, Thanwadee, 2015) mentioned in the study that in some literature reviews, 23 items that affect profit enhancement have been explored. He used 23 items to develop a questionnaire to collect data for further research. He grouped projects of the same nature, the 23 were categorized into five main factors: 1) urban population, 2) buyer capabilities, 3) housing supply, 4) housing economics, and 5) housing finance. (Liu et al, 2021) takes the listed real estate companies in the southeast coast that have been at the forefront of China's reform for many years as the research object. From the perspectives of sales revenue, cost, tax burden, profit, profit, etc., the impact of the reduction of the value-added tax rate in 2019 on listed real estate companies in the southeast coast is studied. The study concludes that the reduction of tax rate has an effective but not significant impact on corporate cash flow. Overall, the impact of tax cuts on enterprises is relatively positive.

(Yang-min, Z, 2010) explored the issue of operational efficiency (OE) among enterprises of different ownership in China's real estate industry. Starting with indicators such as net asset profit, net asset growth rate, and total capital turnover rate, and then according to the model, the paper studies the differences in OE influencing factors and balance mechanisms between private real estate enterprises and state-owned enterprises. Finally, it is concluded that the OE of private real estate enterprises is significantly higher than that of state-owned enterprises. Therefore, the author's suggestion is that not only central enterprises should withdraw from the real estate industry, but state-owned enterprises should also withdraw from the real estate industry, including provincial and municipal enterprises.

To sum up, there are a large number of research results on the development of real estate enterprises on regional social and economic development and national economic development, and there are also studies on the factors that affect the profitability of the real estate industry in various countries. However, from the perspective of profit composition, there is little analysis of the impact on the profitability of Chinese real estate companies. Therefore, this article will use multiple regression model analysis to analyze the profitability and main driving factors of China's real estate companies, which will help enrich the literature on real estate companies and real estate economics research.

3. Research Design

3.1 Sample Selection and Data Sources

This paper takes China's domestic macro environment in 2022 as the research background and takes real estate listed companies as the research object. All sample companies are selected from listed companies in China's real

estate industry. The real estate industry is an important pillar industry related to the national economy, which stimulates the development of other related industries and has a great impact on the economy. This study selects 234 sample data from the 2021 mid-year report and the 2022 mid-year report, and selects seven variables of net profit, operating income, operating cost, net assets, liabilities, inventory, and accounts receivable as data collection objects. In the selection, net profit is used as the dependent variable, and other variables are used as predictors. The six predictive variables comprehensively reflect the company's profitability, debt capacity and operating capacity.

3.2 Model Design

Explained variable: net profit

Explanatory variables: operating income, operating costs, net assets, liabilities, inventories, accounts receivable

Dummy variable: 2022 for 1 and 2021 for 0. The letter symbols are listed in Table 1.

Table 1. Variable letter symbols

Variable Name	Net profit	Dummy variables	Operating income	Operating costs	Net assets	Liabilities	Inventory	Accounts receivable
letter	y	x_1	x_2	x_3	x_4	x_5	x_6	x_7
sign assumption		-	+	-	+	?	?	?

The research adopts the regression analysis method to process the panel data, and the model is as follows:

$$y = \varphi_0 + \varphi_1 x_1 + \varphi_2 x_2 + \cdots + \varphi_7 x_7 \quad (1)$$

Data source: Sina Finance, etc.

4. Empirical Research

4.1 Descriptive Analysis

Table 2. Descriptive statistics (unit: million yuan)

Name	N	Minimum value	Maximum value	Sum	Average value	Standard deviation
Net profit	234	-9480	12223	71652	306.20	1815.356
Operating income	234	10	282696	2009894	8589.29	30086.457
Operating costs	234	0	249171	1610176	6881.09	25128.228
Net assets	234	0	234600	3007584	12852.92	29446.116
Liabilities	234	0	972471	10876781	46481.97	125486.933
Inventory	234	0	1049560	11536132	49299.71	141567.982
Accounts receivable	234	0	120828	519822	2221.46	11664.286

It can be concluded from Table 2 that the difference between the minimum and maximum values of net profit is relatively large, and the average value is positive. The standard deviations of the seven indicators are relatively large, indicating that the data fluctuates greatly, that is, the differences in net profit, operating income, operating costs, net assets, liabilities, inventories and accounts receivable among various real estate companies are relatively large, especially the differences between liabilities and the difference between the two indicators of inventory is even greater. The maximum net profit is 12223 million for VankeA in 2022, the minimum is -9480 million for China Fortune Land Development in 2021; the maximum operating income is 282,696 million in Greenland Holdings in 2021, and the minimum is 10 million in Xincheng in 2022 ;The maximum operating cost is 249,171 million yuan for Greenland Holdings in 2021, and the minimum is 0 million yuan for Haide shares in 2021; the maximum value for net assets is 234,600 million yuan for Vanke in 2022, and the minimum is 0 million yuan for Tianjin Songjiang; The maximum liability is 972,471 million yuan for Vanke in 2021, and the minimum is 0 million yuan for Tianjin Songjiang; the maximum value for inventory is 1,049,560 million yuan for Vanke in 2022, and the minimum is 0 million yuan for Hyde shares in 2021; The maximum accounts

receivable is 120,828 million yuan for Greenland Holdings in 2022, and the minimum value is 0 million yuan for Hyde shares in 2021.

4.2 Correlation Analysis

Table 3. Pearson correlation analysis

	Net profit	Operating income	Operating costs	Net assets	Liabilities	Inventory	Accounts receivable
Net profit	1	.748**	.710**	.807**	.757**	.785**	.152*
Operating income	.748**	1	.997**	.802**	.902**	.898**	.678**
Operating costs	.710**	.997**	1	.761**	.876**	.870**	.713**
Net assets	.807**	.802**	.761**	1	.952**	.944**	.294**
Liabilities	.757**	.902**	.876**	.952**	1	.981**	.486**
Inventory	.785**	.898**	.870**	.944**	.981**	1	.456**
Accounts receivable	.152*	.678**	.713**	.294**	.486**	.456**	1

**p<0.01 *p<0.05

Pearson correlation analysis is to quantitatively describe the direction and closeness of the linear correlation between two quantitative variables, so dummy variables are not analyzed here. As shown in Table 3, the net profit and operating income, operating costs, net assets, liabilities, inventories and accounts receivable are all significant, and the correlation coefficient values are 0.748, 0.710, 0.807, 0.757, 0.785, 0.152. All correlation coefficients are greater than 0, which means that there is a positive correlation between net profit and operating income, operating costs, net assets, liabilities, inventory, and accounts receivable. The correlation coefficient between operating income and operating cost reaches 0.997, and there may be multiple collinearity. Since we only apply the regression results to the content analysis of the profit factor, we ignore the collinearity between operating income and operating cost.

4.3 Regression Model Analysis

4.3.1 Model Summary

Table 4. Model summary

Model	R	R^2	Adjustment R^2	Model error	Durbin-Watson
1	.944[a]	.892	.889	605.660	1.561
2	.945[b]	.892	.889	605.812	1.570

b. Predictive value: Constants, 2022 for 1, Accounts receivable^2, Net assets^2, Operating costs, Inventory, Accounts receivable, Liabilities* Inventory 0.5CIF, Operating income

It can be seen from Table 4 that 2022 for 1, operating income, operating cost, net assets, liabilities, inventory, and accounts receivable are used as independent variables, and net profit is used as the dependent variable for linear regression analysis. The model R2 is 0.892, which means 2022 for 1, operating income, operating cost, net assets, liabilities, inventory, and accounts receivable can explain 89.2% of the change in net profit. The DW value is equal to 1.570, and there is no autocorrelation problem.

4.3.2 ANOVA Analysis

Table 5. ANOVA

Model		Sum of squares	df	Mean square	F	p value
1	Regression	684953402	7	97850486	266	.000[a]
	Residuals	82902248	226	366824		
	Total	767855650	233			

2	Regression	685278694	8	85659836	233.4	.000[b]
	Residuals	82576955	225	367008		
	Total	767855650	233			

b. Predictive value: Constants, 2022 for 1, Accounts receivable^2, Net assets^2, Operating costs, Inventory, Accounts receivable, Liabilities* Inventory 0.5CIF, Operating income

It can be seen from Table 5 that when the F-test is performed on the model, it is found that the model passes the F-test (p=0.000<0.05), which means that the model construction is meaningful.

4.3.3 Analysis of Regression Model Results

Table 6. Regression Coefficients

Model		Non-standardized coefficient		Standardized coefficient	T	*p*
		B	Standard error	Beta		
1	Constants	-102.300	48.204		-2.122	.035
	Operating income**	.580	.047	9.610	12.280	.000
	Operating costs**	-.580	.053	-8.029	-10.879	.000
	Net assets^2**	1.248E-7	.000	.411	2.441	.015
	Liabilities*Inventory0.5CIF**	-1.211E-5	.000	-.772	-3.297	.001
	Inventory**	-.005	.001	-.401	-3.756	.000
	Accounts receivable**	-.131	.014	-.839	-9.635	.000
	Accounts receivable^2**	1.026E-6	.000	.687	6.406	.000
2	Constants	-61.874	64.565		-.958	.339
	2022 for 1	-76.928	81.712	-.021	-.941	.347
	Operating income**	.570	.048	9.448	11.789	.000
	Operating costs**	-.569	.055	-7.877	-10.425	.000
	Net assets^2**	1.341E-7	.000	.442	2.575	.011
	Liabilities*Inventory0.5CIF**	-1.261E-5	.000	-.804	-3.398	.001
	Inventory**	-.005	.001	-.385	-3.569	.000
	Accounts receivable**	-.132	.014	-.845	-9.677	.000
	Accounts receivable^2**	1.042E-6	.000	.698	6.469	.000

**: p<0.01

According to Table 6, except for dummy variables, other variables of the model have passed 95% of the t-test. Among them, the combination of liabilities and inventory explains net profit, net assets explain profit as a quadratic term, and accounts receivable explain profit Explanation is also a quadratic term. The regression model is as follows:

Model 1:

$$y = -102.300 + 0.58x_2 - 0.58x_3 + (1.248\mathrm{E} - 7)x_4^2 - (1.211E + 5)x_5x_60.5CIF - 0.005x_6 - 0.131x_7 + (1.026\mathrm{E} - 6)\mathrm{x}_7^2 \quad (2)$$

Model 2:

$$y = -61.874 - 76.928x_1 + 0.57x_2 - 0.569x_3 + (1.341\mathrm{E} - 7)x_4^2 - (1.261E + 5)x_5x_60.5CIF - 0.005x_6 - 0.132x_7 + (1.042\mathrm{E} - 6)\mathrm{x}_7^2 \quad (3)$$

4.4 Profitability Analysis

According to Model 2, under the influence of common factors, the period has a negative impact on profits, which reflects that the real estate economy may be more depressed in 2022. The absolute changes of each factor

are shown in Table 7. The net profit of the 2022 mid-year report and the same period of 2021 decreased by 59.95%; operating income decreased by 10.61%; net assets decreased by 5.52%; liabilities decreased by 7.19%; assets decreased by 6.83%; operating costs decreased 8.06%; inventory decreased by 0.38%; accounts receivable increased by 8.98%. In the model, the interaction of debt and inventory has a significant negative effect on profit, indicating that the inventory formed by real estate loans has a very large negative impact on profit.

Table 7. Analysis of Differences in Financial Absolute Indicators

	2022 mid-term report	2021 mid-term report	Differences	Change range
Net profit	20488.4	51163.27	-30674.9	-59.95%
Operating income	948649.7	1061244	-112594	-10.61%
Net assets	1461084	1546500	-85415.5	-5.52%
Liabilities	5235478	5641302	-405824	-7.19%
Assets	6696563	7187802	-491240	-6.83%
Operating costs	771299.4	838876.6	-67577.2	-8.06%
Inventory	5757070	5779062	-21991.6	-0.38%
Accounts receivable	271083	248739.3	22343.65	8.98%

From the results of financial relative indicators in Table 8, the ROE in 2022 will decrease by 1.91% compared with 2021, a year-on-year decrease of 57.61%; the net sales profit rate will decrease by 2.66%, a year-on-year decrease of 55.20%; the sales gross profit rate will decrease by 2.26%, a year-on-year decrease of 10.78%; the cost of sales increased by 2.26%, a year-on-year increase of 2.86%; the net asset interest rate decreased by 0.41%, a year-on-year decrease of 57.02%; the inventory turnover rate decreased by 1.12%, a year-on-year decrease of 7.7%; the asset turnover rate decreased by 0.6%, a year-on-year decrease of 4.05%; The asset-liability ratio decreased by 0.3%, a year-on-year decrease of 0.39%; the inventory-liability ratio decreased by 6.68%, a year-on-year decrease of 6.84%. It can be seen that the profitability in 2022 is not as good as in 2021. Combined with the analysis in Table 9, we conclude that the return on net assets will decrease by 1.906% in 2022 compared to 2021, mainly because the net sales rate reduces the return on net assets by 1.783%, and the asset turnover rate reduces the return on net assets by 0.092%. The multiplier reduces the return on net assets by 0.031%, which also shows that the company's profitability is the factor that most affects the return on net assets.

Table 8. Difference Analysis of Financial Relative Indicators

	2022 mid-term report	2021 mid-term report	Differences	Change range
ROE	1.40%	3.31%	-1.91%	-57.61%
Sales margin	2.16%	4.82%	-2.66%	-55.20%
Gross profit margin	18.70%	20.95%	-2.26%	-10.78%
Cost of sales ratio	81.30%	79.05%	2.26%	2.86%
net asset interest ratio	0.31%	0.71%	-0.41%	-57.02%
Inventory turnover ratio	13.40%	14.52%	-1.12%	-7.70%
Asset turnover ratio	14.17%	14.76%	-0.60%	-4.05%
Asset-liability ratio	78.18%	78.48%	-0.30%	-0.39%
Inventory-debt ratio	90.94%	97.62%	-6.68%	-6.84%

Table 9. Comprehensive analysis of ROE

	2022 mid-term report	2021 mid-term report	Differences	exponential logarithm	Factors influence
Sales margin	2.16%	4.82%	-2.66%	-0.8030	-1.783%
Asset turnover	14.17%	14.76%	-0.60%	-0.0414	-0.092%

ratio					
Equity Multiplier	4.583	4.648	-6.45%	-0.0140	-0.031%
ROE	1.402%	3.308%	-1.906%	-0.8583	-1.906%

5. Conclusion

5.1 Conclusion

Based on the above model and the data results obtained from the model, we can draw the conclusion that the profitability of real estate companies in the first half of 2022 will be poor. (GF Securities, (2022) [12] Part of the reason is that the high-priced land around 2018 has been carried forward one after another, which has caused the overall profit margin of the industry to decline. It is expected that the industry's profit margin will still be under pressure for a period of time in the future. And through the construction of the model, we realize that another reason lies in debt constraints and excessive inventory, which are the internal reasons for the low profits of real estate companies.

5.2 Recommendations

First of all, we should insist that the use of houses is for living, not for speculation. The government should continue to build a mechanism for the healthy development of real estate in line with the market and national conditions, restrict real estate companies from developing products on a large scale, and reduce inventory. Secondly, the government appropriately lowers the price when transferring land, thereby reducing the cost of real estate companies, and correctly guides the loan behavior of real estate companies and banks, effectively reducing the debt of real estate companies. A comprehensive control mechanism can effectively suppress the factors that affect the profits of real estate companies, so that real estate can develop healthily, and real estate companies can also achieve the goal of stable profitability. The normal operation of the real estate economy can effectively affect the economy of the whole society.

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