Factors affecting housing prices in Yangtze River Delta Cities during 2000 to 2023

Anjie Sha

Abstract:

This thesis aims to develop a framework for identifying and evaluating the important factors affecting housing prices in the Yangtze River Delta region. These factors include urbanization rate, population, debt ratio, GDP, and resident income over the past 20 years for four cities: Shanghai, Hangzhou, Suzhou, and Nanjing. The Pearson correlation analysis and linear regression analysis are methods used to find and analyze the factors with the strongest correlation. These two methods enable a direct identification of the factors that most significantly affect housing prices, providing insights into their impact and predicting trends for these factors in future years.

To investigate key drivers of housing price surges in China's Yangtze River Delta (2000–2023), I analyzed historical data (avg. price ↑490% to 10,400¥/m²; Shanghai ↑12x to 50,000¥/m²) from authoritative sources (Zhang, 2024; Anjuke, 2024), designed a quantitative framework using Pearson correlation and linear regression to test five factors (population, urbanization rate, GDP, disposable income, debt ratio) across Shanghai, Hangzhou, Suzhou, and Nanjing, and established predictive models for future trends. This empirical approach addresses critical gaps in regional-specific housing economics literature.

Keywords: Housing Prices, Yangtze River Delta, Urbanization Rate, Economic Development, Pearson Correlation Analysis

1. Introduction

In recent years, housing prices in China have surged in various cities, especially in the Yangtze River Delta region, a globally recognized economic powerhouse in the world. From 2000 to 2023, the rate of increase in Chinese housing prices increased by an astonishing 490%, with the average housing price now at 10,400 yuan per square meter (Zhang, 2024). In some international metropolises such as Shanghai, the rate of increase is even higher, reaching 12 times, or about 50,000 yuan per square meter in 2023 (Anjuke, 2024).

This has sparked intense discussions among economists and scholars worldwide. Some believe this is a milestone in China's economic development,

encouraging buyers to work hard to improve their income levels, ensuring social welfare, and promoting industrial upgrading. Conversely, others hold a negative opinion, believing that the consumption capacity of residents has significantly decreased, further widening the wealth gap in society. Some people even suggest that buying a house requires "emptying six wallets," draining the savings of multiple families.

The discussion has led to a variety of opinions on the economic factors affecting housing prices, with numerous explanations for this dramatic rise. For example, Chen et al. (2024) used the SHAP method to suggest that monetary policy and economic development are key factors influencing housing prices in first-tier, second-tier, and third-tier cities in China. Therefore, many researchers analyze the economic factors affecting housing prices in China, considering both long-term and short-term perspectives, as well as developing and developed areas. Factors such as population size, urbanization rate, GDP growth rate, monetary policy, resident income, city economic development, and debt ratio all play important roles.

This thesis aims to develop a framework for identifying and evaluating the important factors affecting housing prices in the Yangtze River Delta region. These factors include policies, urbanization rate, population, debt ratio, economic development, and resident income over the past 20 years for four cities: Shanghai, Hangzhou, Suzhou, and Nanjing. The Pearson correlation coefficient and linear regression analysis will be methods used to analyze the factors with the strongest correlation. This approach enables a direct identification of the factors that most significantly affect housing prices, providing insights into their impact and predicting trends for these factors in future years.

2. Literature review

2.1 The definition of housing prices and the factors affecting housing prices

House prices (real estate prices) refer to the market value of properties, including buildings and the land they occupy, over a specific period of time. That is, house prices consist of land prices plus building prices, and they serve as the most important regulatory mechanism for the operation and resource allocation in the real estate economy (Barron's Economics, 11th ed., 2015).

However, there are many reasons for the increase in housing prices, including population, urbanization rate, per capita disposable income of residents, regional GDP, personal housing loans, and monetary policies. The definitions of these factors are as follows:

Population: Refers to the total number of individuals living under specific time and location conditions ("Population", n.d.).

Urbanization Rate: Refers to the proportion of the permanent urban population in a country or region to the total population of that country or region. It is an important indicator for measuring the level of urbanization and reflecting the urbanization process ("Urbanization Rates", n.d.).

Economic Development: The process of actual welfare growth per capita in a country or region is not only about the quantitative increase and expansion of wealth and economic entities but also implies qualitative changes, such as innovations in economic and social structures, and improvements in the quality of social life and the efficiency of inputs and outputs ("Economic Development", n.d.).

Residential Income: Refers to the total value created by laborers in the material production sectors of a country over a certain period. The per capita national income indicator broadly reflects a country's level of economic development ("Income Per Capita", n.d.).

Economic Policies: Refers to the principles and measures formulated by a country or government to achieve macroeconomic policy goals such as full employment, price level stability, rapid economic growth, and balance of international payments, to enhance economic welfare and address economic issues ("Economic Policy", n.d.).

Debt Ratio: The debt ratio refers to the Mortgage-to-Income Ratio (MTI), which formula is (monthly mortgage payment / total monthly income) × 100%. It is the ratio of the monthly mortgage payment to the total monthly income. ("Mortgage to Income Ratio", n.d.). This ratio serves as a crucial indicator for measuring a borrower's ability to repay their mortgage and assists banks or lending institutions in assessing the borrower's repayment capability and credit risk.

These definitions are widely found in passages related to factors affecting housing prices, but there are divergences in the methodologies employed in the literature to quantify the topic. Many current studies on housing prices use different approaches, for example:

Tang (2023) studied the impact of the house price-to-income ratio on urban households, analyzing the consumption characteristics of urban middle-income families in various regions and constructing fixed-effects (FE) and random-effects (RE) models to investigate the impact of the housing price-to-income ratio on the overall and categorized consumption levels of urban middle-income families.

Xu, Wei, Dai, and Zhao (2010) used dummy variables to represent regional variables and derived the regression equation for factors influencing real estate prices.

Hu (2021) used panel data from 171 cities in China between 2005 and 2019 to conduct empirical analysis of the impact of urban population, labor employment, and income levels on housing prices.

2.2 Previous finding of factors affecting housing prices

Many previous studies have discussed the values of housing prices and provided their own opinions on the factors influencing housing prices in certain areas or the entire country, most of which are included in Section 2.1.

Firstly, population is a popular factor discussed by various economists. Chen et al. (2024) examined the impacts of population growth on housing prices and proposed countermeasures for controlling housing prices in cities with continuously increasing populations. Famous economist Ren (2024) points out, "In the long term, real estate depends on population." Population is one of the core factors determining demand in the real estate market. Over the long term, changes in both the size and structure of the population will profoundly impact the trends in the real estate market.

Secondly, economic development is recognized by many scholars as a major factor affecting housing prices. Wu and Zheng (2020)'s research indicates that local governments rely on land-based fiscal policies to drive urban expansion, raising housing prices through land supply and infrastructure investment. Economic growth (GDP) and housing price fluctuations show a significant positive correlation. Li and Xie (2019) also indicated that GDP growth drives up housing prices through increases in household income and capital inflows, and rising housing prices.

Thirdly, housing purchase restrictions are frequently discussed; however, many researchers have found that these restrictions do not have a significant impact on housing prices. Zhang and Li (2023) in a case study of the Wuhan Metropolitan Area introduced how housing purchase restrictions have played a role in curbing the rise of real estate prices in the short term, but their restraining effect has gradually weakened over time. Li (2019) analyzed the impact of housing purchase restrictions on housing price fluctuations and concluded that it is not a major issue because the regression model showed that purchase restrictions have very low explanatory power compared to what was expected.

Additionally, urbanization rate has been a popular issue in recent years. Some researchers such as Lu and Chen (2018) analyzed rising urbanization rates as factors that drive housing price increases, but insufficient land supply is the core mediating factor, with significant regional differences, especially in eastern China. While Liu and Wang (2020) discussed that monopolistic land supply during urbanization pushes up land prices, indirectly driving housing price increases.

Income is an important factor discussed by economists and researchers who have different opinions worldwide. Ren (2024) pointed out that income has an important effect on Chinese housing prices. While other researchers such as Chen and Guo (2017) found that although increases in household income push up house prices, the rate of increase in house prices far exceeds the rate of income growth, leading to a decline in housing affordability.

Lastly, debt ratio is a topic rarely discussed by former researchers. Some, like Yin (2024), found that the debt ratio is an important factor in Chinese cities, but the debt ratio is near its peak. Many researchers lack sufficient evidence to support this factor, but some indicate it is an important factor, so it's worth being studied as a factor affecting Yangtze River Delta housing prices.

In conclusion, previous scholars have discussed the different variables of economic factors that affect housing prices in China. These include population, economic development, housing purchase restrictions, and debt ratios. Other factors such as income, urbanization rate have also been included in these researches. However, very few of them combine some of these factors into one research and analyze the correlation of these factors. Most of these passages only focus on researching a certain city or the whole country, but none of them have researched data for an area in China which represents prosperous economic development such as the Yangtze River Delta, which inspires the author's research.

The Background of Four Cities

The Yangtze River Delta region is chosen for this study because it is one of the most economically developed regions in China and has been extensively researched by economists. Located in the downstream area of the Yangtze River, bordering the Yellow Sea and the East China Sea, this region is situated at the confluence of river and sea, with numerous ports along the river and coast. It plays a crucial role in the country's infrastructure and economic position.

Shanghai

In the first three quarters of 2024, Shanghai's overall economic operation remained stable, with high-quality development being steadily advanced. Shanghai achieved a regional Gross Domestic Product (GDP) of 343.8918 billion yuan, representing a year-on-year growth of 4.7% at constant prices (Shanghai Municipal Bureau of Statistics, 2024).

Hangzhou

During the first three quarters, Hangzhou's total GDP reached 1,521.5 billion yuan, showing a nominal increase of 77.7 billion yuan and a nominal growth rate of 5.4% compared to the same period last year. Agriculture remained generally stable, with increased income from grain and vegetables. Industry saw a steady recovery, and services maintained a stable growth trend. The city's industrial output above designated size amounted to 325.2 billion yuan, growing by 4.2% year on year. The added value of the service sector reached 1,077.2 billion yuan, increasing by 4.6% year on year (Hangzhou Municipal Bureau of Statistics, 2024).

Suzhou

Suzhou achieved a regional GDP of 1,848.38 billion yuan in the first three quarters of 2024, representing a year-on-year growth of 6.0% at comparable prices. This growth was mainly attributed to the coordinated efforts of industry, services, and consumption (Suzhou Municipal People's Government, 2024).

Nanjing

Nanjing achieved a regional GDP of 1,312.443 billion yuan in the first three quarters of 2024, representing a year-on-year growth of 4.4% at constant prices. By total, the industries realized an added value of 1,328.122 billion yuan, up by 5.4% year on year (Nanjing Municipal Bureau of Statistics, 2024).

Summary

Many previous studies have thoroughly examined the factors influencing housing prices over the years, with a significant focus on either the entire country or specific cities. However, such broad or narrow focuses can be limiting for economists aiming to identify truly effective economic issues. Nationally averaged data may obscure regional phenomena, while single-city studies lack universality. Therefore, this research narrows its focus to the Yangtze River Delta region, which exemplifies China's flourishing economic development, by specifically examining four representative cities within this area.

3. Methodology

3.1 Aim

The objective of this article is to analyze the factors influencing housing prices and make predictions of factors affecting future housing prices in the Yangtze River Delta region. One of the methodologies which can significantly help the process is the SPSS model, using Pearson correlation and linear regression model, enabling the compilation and analysis of all available data that other studies might not have captured.

3.2 Data Collection

The author collected housing price data for the four Yangtze River Delta cities from Anjuke, a Chinese housing price website, covering the period from 2000 to 2023.

For specific data of factors deciding housing prices (population, urbanization, per capita disposable income, GDP, housing debt ratio), the author selected the Statistics Yearbook of the four cities as the first source of data collection. The four cities chosen are all in the Yangtze River Delta region, which share similar characteristics and is easy to research, since this region is one of the most important areas representing economic development in China. For the period dating from 2000 to 2023, the National Bureau provides detailed information for population, regional GDP, urbanization rate, and per capita disposable income. Most of the data can be found, but the debt ratio is not complete for the research cities besides Shanghai.

3.3 Way to Calculate Housing Debt Ratio in Cities

Housing debt ratio is calculated by two items: [Per capita housing loans] / [Per capita disposable income]. In Shanghai, the data for both items are available since 2001. But in the other three cities, the [per capita housing loan] data is missing; some cities only have data of long-term loans in specific years, so the author made a method to simulate housing debt ratio by hypothesizing the [per capita housing loan] data using the formula below:

"Total housing loans" (for other cities) = [Total household long-term loans (of this city)] × [(The proportion of housing loans in household long-term loans) of Shanghai]

to calculate total housing loans, then get [per capita housing loans] through [Total housing loans] / Population. Finally, get the housing debt ratio amount by [Per capita housing loans] / [Per capita disposable income of residents]. This method is based on a hypothesis that the proportion of housing loans in household long-term loans in the three cities should be the same or similar to that in Shanghai. By using this method, the author can simulate the debt ratio and put it into the SPSS correlation and regression analysis.

3.4 Use of the SPSS System

The author uses the correlation and regression model to analyze the importance of different factors affecting housing prices. Correlation analysis is used to measure and es-

tablish the strength and direction of the linear relationship between two continuous variables. The author uses the correlation method to determine the relationship between housing prices and several factors, also ascertaining the strength of the correlation between individual factors and housing prices. Linear regression analysis goes beyond measuring association by allowing researchers to predict or explain an outcome variable (dependent variable) based on one or more predictor variables (independent variables).

4.Results

4.1 Shanghai

Shanghai		Average Housing Price（Yuan）for new house
Population(10K People)	Coefficient	0.789**
	p value	0
	Sample	24
Urbanization Rate	Coefficient	0.480*
	p value	0.018
	Sample	24
Per capita disposable income of residents（Yuan）	Coefficient	0.915
	p value	0.264
	Sample	24
Regional GDP（100M Yuan）	Coefficient	0.159
	p value	0.457
	Sample	24
Housing debt ratio	Coefficient	0.742**
	p value	0
	Sample	24

Figure 1 Shanghai correlation results

From figure 1, the author indicates in Shanghai, population, urbanization and debt ratio all show positive correlation with housing prices, with population having the most significance. (p value for three factors are 0.000, 0.018, 0.000, all smaller than 0.05. For the three factors, the correlation coefficients are 0.789, 0.48 and 0.742.) Disposable income and regional GDP has no correlation with change in housing prices, as the p value of the two factors are 0.264 and 0.457, much bigger than 0.05.

Shanghai	Regression results (n=23)							
	Unstandardized Coefficients		Standardized Coefficients	t	p	Collinearity Diagnostics	
	B	Standard errors	Beta			VIF	Tolerance
常数	-51972.661	34323.158	-	-1.514	0.146	-	-
Population(10K)	51.775	11.403	0.791	4.541	0.000**	2.923	0.342
Urbanization_Rate	-86588.72	57302.213	-0.25	-1.511	0.147	2.63	0.38
Housing debt ratio	56621.368	14521.475	0.44	3.899	0.001**	1.227	0.815
R 2	0.803						
调整R 2	0.771						
F	F (3,19)=25.738,p=0.000						
D-W值	0.706						

Figure 2 Shanghai regression results

From figure 2, it can be seen that the model formula is: Average Housing Price (Yuan) = 51972.661 + 51.775 * Population(10K) - 86588.720 * Urbanization Rate + 56621.368 * Housing debt ratio. The model's R² value is 0.803, indicating that Population(10K), Urbanization Rate, and Housing debt ratio together explain 80.3% of the variation in Average Housing Price(Yuan).

4.2 Hangzhou

Hangzhou		Average Housing Price（Yuan）for new house
Population(10K People)	Coefficient	0.975**
	p value	0
	Sample	24
Urbanization Rate	Coefficient	0.939**
	p value	0
	Sample	24
Per capita disposable income of residents（Yuan）	Coefficient	0.972**
	p value	0
	Sample	24
Regional GDP（100M Yuan）	Coefficient	0.978**
	p value	0
	Sample	24
Housing debt ratio	Coefficient	0.913**
	p value	0.001
	Sample	24

Figure 3 Hangzhou correlation results

From figure 3, the author indicates in Hangzhou, population, urbanization, disposable income, regional GDP, and debt ratio all show positive correlation with housing prices (as all the p values are less than 0.05 and the coef-

ficients are positive), with regional GDP having the most significance (r=0.978) and housing debt ratio has the least significance (r=0.913).

Regression results (n=8)								
Hangzhou	Unstandardized Coefficients		Standardized Coefficients	t	p	Collinearity Diagnostics	
	B	Standard Error	Beta			VIF	Tolerance
常数	73844.027	6659.814	-	11.088	0.008**	-	-
Population(10K)	52.385	13.427	1.265	3.901	0.06	255.612	0.004
Urbanization_Rate	-131212.464	13220.366	-1.111	-9.925	0.010**	30.465	0.033
Per_capita_disposable_income(Yuan)	-0.01	0.092	-0.015	-0.105	0.926	50.722	0.02
GDP(100MYuan)	-1.287	0.447	-0.861	-2.882	0.102	216.859	0.005
Housing debt ratio	27765.522	2109.63	1.596	13.161	0.006**	35.752	0.028
R 2	0.999						
调整R 2	0.997						
F	F (5,2)=485.694,p=0.002						
D-W值	3.237						

Figure 4 Hangzhou regression results

From figure 4, it can be seen that the model formula is: Average Housing Price (Yuan) = 73844.027 + 52.385 * Population(10K) - 131212.464 * Urbanization Rate - 0.010 * Per capita disposable income (Yuan) - 1.287 * GDP (100MYuan) + 27765.522 * Housing debt ratio. The model's R^2 value is 0.999, indicating that Popula-

tion(10K), Urbanization Rate, Per capita disposable income(Yuan), GDP(100MYuan), and Housing debt ratio together explain 99.9% of the variation in Average Housing Price(Yuan).

4.3 Suzhou

Suzhou		Average Housing Price（Yuan）
Population(10K People)	Coefficient	0.841**
	p value	0
	Sample	24
Urbanization Rate	Coefficient	0.842**
	p value	0
	Sample	24
Per capita disposable income of residents (Yuan)	Coefficient	0.963**
	p value	0
	Sample	24
Regional GDP (100M Yuan)	Coefficient	0.955**
	p value	0
	Sample	24
Housing debt ratio	Coefficient	0.943**
	p value	0
	Sample	24

Figure 5 Suzhou correlation results

From figure 5, the author indicates in Suzhou, the five factors all show positive correlation with housing prices, with disposable income having the most significance. (p value for all factors are 0.000, disposable income has a

correlation coefficient of 0.963, bigger than population's coefficient of 0.8415, urbanization rate of 0.842, regional GDP of 0.955 and debt ratio of 0.943.)

Suzhou	Unstandardized Coefficients		Standardized Coefficients	t	p	Collinearity Diagnostics	
	B	Standard Error	Beta			VIF	Tolerance
常数	36400.507	39391.255	-	0.924	0.386	-	-
Population(10K)	5.448	27.161	0.05	0.201	0.847	14.111	0.071
Urbanization_Rate	-69826.459	37413.201	-0.489	-1.866	0.104	15.761	0.063
Per_capita_disposable_income(Yuan)	1.041	0.354	2.739	2.94	0.022*	198.995	0.005
GDP(100MYuan)	-3.388	1.088	-2.568	-3.115	0.017*	155.839	0.006
Housing debt ratio	41092.207	11603.645	1.225	3.541	0.009**	27.45	0.036
R 2	0.969						
调整R 2	0.948						
F	F (5,7)=44.457,p=0.000						
D-W值	2.617						

Figure 6 Suzhou regression results

From figure 6, the model formula is: Average Housing Price (Yuan) = 36400.507 + 5.448 * Population(10K) - 69826.459 * Urbanization Rate + 1.041 * Per capita disposable income (Yuan) - 3.388 * GDP (100MYuan) + 41092.207 * Housing debt ratio. The model's R^2 value is 0.969, indicating that Population(10K), Urban-

ization Rate, Per capita disposable income(Yuan), GDP(100MYuan), and Housing debt ratio together explain 96.9% of the variation in Average Housing Price(Yuan).

4.4 Nanjing

Nanjing		Average Housing Price（Yuan per square meters）
Population(10K People)	Coefficient	0.928**
	p value	0
	Sample	24
Urbanization Rate	Coefficient	0.919**
	p value	0
	Sample	24
Per capita disposable income（Yuan）	Coefficient	0.988**
	p value	0
	Sample	24
Regional GDP（100M Yuan）	Coefficient	0.991**
	p value	0
	Sample	24
Housing debt ratio	Coefficient	0.856**
	p value	0.009
	Sample	24

Figure 7 Nanjing correlation results

From figure 7, the author indicates in Nanjing, the five factors also show positive correlation with housing prices, with disposable income having the most significance. (p value for all factors besides debt ratio are 0.000, with debt ratio having a correlation of 0.009. disposable income has a correlation coefficient of 0.988, population of 0.928, urbanization rate of 0.919, regional GDP of 0.991 and debt ratio of 0.856, which shows disposable income is most correlated.)

Nanjing	Regression results（n=8）						
	Unstandardized Coefficients		Standardized Coefficients	t	p	Collinearity Diagnostics	
	B	Standard Error	Beta			VIF	Tolerance
常数	-44039.371	56724.771	-	-0.776	0.519	-	-
Population(10K)	-120.644	69.157	-4.213	-1.744	0.223	55.835	0.018
Urbanization_Rate	236030.738	142224.254	4.139	1.66	0.239	59.549	0.017
Per_capita_disposable_income(Yuan)	-4.692	1.996	-30.539	-2.351	0.143	1615.831	0.001
GDP(100MYuan)	19.883	8.515	30.586	2.335	0.145	1642.796	0.001
Housing debt ratio	1634.625	8373.022	0.132	0.195	0.863	4.35	0.23
R 2	0.791						
调整R 2	0.269						
F	F (5,2)=1.515,p=0.443						
D-W值	2.42						

Figure 8 Nanjing regression results

From figure 8, it can be seen that the model formula is: Average Housing Price (Yuan) = -44039.371 - 120.644 * Population(10K) + 236030.738 * Urbanization Rate - 4.692 * Per capita disposable income(Yuan) + 19.883 * GDP(100MYuan) + 1634.625 * Housing debt ratio. The model's R^2 value is 0.791, indicating that Population(10K), Urbanization Rate, Per capita disposable income(Yuan), GDP(100MYuan), and Housing debt ratio together explain 79.1% of the variation in Average Housing Price(Yuan).

5. Discussion

The correlation results indicate that population, urbanization, per capita disposable income, regional GDP, and debt ratio all have a significant impact on the change in housing prices in Yangtze River Delta region cities, except Shanghai having three positively correlated factors affecting housing prices (population, urbanization rate, and debt ratio), while disposable income and GDP have no correlation. Among the four cities, per capita disposable income has the greatest impact on Suzhou and Nanjing, as population plays the most significant variable in Shanghai and GDP the most significant factor in Hangzhou.

Firstly, from 2000 to 2023, Shanghai's permanent resident population surged by 54.7% (16.08 million to 24.87 million), while residential land supply grew at only 1.5% annually (Shanghai Statistics Yearbook, 2000–2023). This severe supply-demand imbalance, compounded by land scarcity, became a key price escalator. Notably, talent-focused policies (Shanghai Municipal People's Government, 2010) attracted high-income migrants, intensifying demand for limited housing. With constrained supply, population-driven demand dominated price dynamics, outweighing urbanization and debt effects. Therefore, population changes are the primary factor related to Shanghai's housing prices.

Urbanization rate and debt ratio also have a significant effect in Shanghai. Urbanization in Shanghai has shifted from "population moving into cities" to the upgrading of urban functions (such as the expansion of Lujiazui Financial City and the development of the Lingang New Area). By enhancing regional economic value and facilities (like transportation, education), this transformation drives up housing prices. An article by Henderson (2010) also illustrates the viewpoint that "functional urbanization in mega-cities affects housing prices through the agglomeration effect of capital." However, Shanghai's urbanization rate

was already as high as 74.6% in 2000, further increasing to 89.3% in 2023 (Shanghai Statistical Yearbook, 2000–2023), approaching the levels of developed countries. With limited new urban population growth, the marginal contribution to demand is decreasing. Therefore, while the urbanization rate is related to Shanghai's housing prices, it is not the most significant factor. While the debt-to-income ratio of Shanghai residents increased from 30% in 2001 to 78% in 2023 (Shanghai Statistical Yearbook, 2001–2023), when housing prices rise, home buyers tend to take on more loans, therefore increasing their debt ratio, as they expect that the appreciation of the asset will cover the borrowing costs and generate additional returns (Chen and Wen, 2015).

However, Shanghai's GDP and income do not affect housing prices according to the correlation results. This conclusion has been supported by various articles such as Chen and Wen (2015), which indicate the uniqueness of Shanghai as a super first-tier city. As China's financial center and an international metropolis, Shanghai's housing prices are more influenced by investment demand, land supply constraints, and international capital flows, rather than being solely determined by local economic growth or household income. Additionally, the surge in Shanghai's housing prices during 2015–2016 was closely related to capital shifting from the stock market to real estate after a stock market crash, rather than changes in income or GDP growth during the same period (Shanghai University of Finance and Economics Research Group, 2017). Also, due to continuous rising prices, Shanghai's properties are being viewed as investment vehicles or wealth storage tools, making housing prices more correlated with financial market volatility (such as stock markets, overseas asset allocation) and monetary policy (like interest rates, credit easing), rather than income growth (Fang et al., 2015).

Secondly, the housing prices in Hangzhou, Suzhou, and Nanjing show a strong correlation with population size, urbanization rate, disposable income, GDP, and debt ratio. This is mainly because these three cities are still in the stage of coordinated development of "urbanization - economic growth - expansion of housing demand" (Yao, Luo, and Wang, 2013). The driving logic can be summarized into three points:

Direct demand pulls from rapid urbanization: From 2000 to 2023, the urbanization rates of these three cities increased from around 50% to 80%–85%, adding over 20 million new urban residents (with an annual growth rate of 2%–3%) (Hangzhou, Suzhou, Nanjing Statistics Yearbook, 2000–2023). The persistent release of rigid housing demand aligns with the "population-housing supply-demand model" (Alonso, 1964), where population concen-

tration increases land scarcity, thereby stimulating the rise in housing prices.

Purchasing power support from industrial upgrading and income growth: Digital economy (in Hangzhou), high-end manufacturing (in Suzhou), and educational resources (in Nanjing) have contributed to an annual increase of 8%–10% in per capita disposable income (higher than the national average of 6.5%), and from 2000 to 2023, the GDP growth rate of Hangzhou is 1260%, Suzhou's GDP growth rate is 1458%, and Nanjing's GDP growth rate is 1554% (Statistical Yearbook for Hangzhou, Suzhou, and Nanjing, 2023). Enhancing residents' ability to purchase homes. Chen and Wen (2015)'s study also supported that income growth and GDP explain 40%–50% of the changes in housing prices in secondary cities.

When the resident debt ratio rises, it usually indicates that more families in Hangzhou, Suzhou, and Nanjing are able to purchase property through loans. In a relaxed credit environment, banks are willing to offer more housing loans, which increases the demand for home purchases in the market, thereby driving up housing prices. Additionally, the families in these three cities using leverage to buy homes can achieve higher capital appreciation when housing prices rise. This positive feedback mechanism attracts more investors and owner-occupiers to enter the market, further pushing up housing prices (Fang et al., 2015).

Thirdly, the results suggest that disposable income is the most influential factor in Suzhou and Nanjing. Suzhou and Nanjing, as two key cities in the Yangtze River Delta region, boast advanced high-tech industries, services, and financial sectors. Particularly, Nanjing, as the capital of Jiangsu Province, serves as the regional political, cultural, and educational hub, such as TopThink Education (Nanjing Municipal People's Government, 2025), while Suzhou is renowned for its robust manufacturing sector and export-oriented economy, such as Philips Home Appliances Innovation Research Center (Suzhou Municipal People's Government, 2021). These high-value-added industries offer higher wage levels, increasing residents' disposable income. Suzhou and Nanjing stand out in terms of per capita income, even higher than Shanghai (Suzhou: 84,834 yuan, Nanjing: 74,076 yuan, Shanghai: 73,797 yuan) (Statistical Bulletin for Suzhou, Nanjing, and Shanghai, 2023), indicating that residents in Suzhou and Nanjing have greater average wealth and stronger purchasing power; therefore, the two cities' residents have money to invest and love doing so, which results in the strongest positive correlation with housing prices. However, another study by Wu, Gyourko, and Deng (2016) states that disposable income does not exhibit a positive correlation with housing prices, contrasting with the findings of this study. This discrepan-

cy stems from the fact that in some third-tier and fourth-tier cities, income growth has been slow or stagnant, while housing prices have been inflated by land finance policies and speculative demand, resulting in a persistently rising house price-to-income ratio. However, Wu, Gyourko, and Deng's analysis focuses on smaller cities, whereas this research examines cities in the Yangtze River Delta region — a more economically dynamic area with distinct market drivers. These regional differences likely explain the divergence in conclusions.

Fourthly, GDP impacts Hangzhou's housing price the most. In economics, when a country's GDP grows, it typically indicates an increase in economic activities and more employment opportunities, leading to a rise in housing demand, which can drive up housing prices. China's famous e-commerce company Alibaba, founded in Hangzhou in 1999, experienced rapid growth. It launched Taobao in 2003 and Alipay in 2004, leading to a significant acceleration in the development of China's e-commerce sector for nearly 15 years starting from 2003. This contributed importantly to Hangzhou's GDP (The Economist, 2025). Furthermore, after 2016, the Hangzhou government undertook massive infrastructure investments in preparation for hosting the 2022 Asian Games (Hangzhou Municipal People's Government, 2017), which led to a dramatic transformation of the city's landscape. The reasons above explain why Hangzhou's housing prices are most affected by GDP.

Lastly, the regression results prove that the factors analyzed by the author are the main reasons affecting housing prices in Yangtze River Delta cities. However, the R^2 values of Shanghai (80.3%) and Nanjing (79.1%) are not as high as those of the other two cities (99.9% and 96.9%), which indicates housing prices in these two cities may be caused by other factors. Since 2010, Shanghai has implemented strict purchase and loan restriction policies such as requiring non-local households to have five years of social security contributions (Shanghai Housing and Urban-Rural Development Management Committee, 2016), which directly suppresses housing demand. In 2021, Nanjing also introduced a "Priority Home Purchase for Talents Policy" (Nanjing Housing Security and Real Estate Bureau, 2016), artificially boosting demand among specific groups, which was also not captured by the model.Another aspect is market expectations and speculative demand. Investors' expectations of rising housing prices in core cities of the Yangtze River Delta may result in housing market bubbles, which will cause housing prices to inflate to a large extent. Emergency situations in the economic process like this are hard to measure, leading to the model's inability to fully explain housing price fluctu-

ations (Chen and Wang, 2022).

The author has some predictions about the future of these factors affecting housing prices in Yangtze River Delta cities. According to a population forecast by the United Nations Department of Economic and Social Affairs, Population Division (2024), the population in these four cities is expected to decrease significantly, which would lead to a decrease in housing prices as well. Also, the urbanization rate in the Yangtze River Delta region would naturally increase further to world-top levels even without an influx of new residents. As a developed area with a vibrant economy, the growth rate of per capita disposable income in Yangtze River Delta cities can mirror that of Western European developed countries, reaching a growth rate of approximately 2%. While the GDP growth rate needs to be maintained at around 5% over the next decade to achieve the country's target of reaching the per capita GDP level of moderately developed countries by 2035. By comparing 2023 housing debt ratios of Yangtze River Delta cities—Hangzhou (127%), Suzhou (88%), Nanjing (93%), Shanghai (78%)—with Japan (68%) and South Korea (100%) (Yang, 2024), it is clear these cities match or exceed developed nations' levels despite less robust social benefits, suggesting their debt ratios may now be peaking and likely to decline.

6. Evaluation

This study has some advantages. In particular, by comparing and analyzing the factors affecting housing prices in the Yangtze River Delta region, the paper indicates impacts of current correlation of these factors with housing prices and provides insights into the future tendency of the factors. The data analysis and conclusions in the article can provide references for urban planning departments, helping them better plan land use and infrastructure development, thereby promoting sustainable urban development. Moreover, investors can use the analysis results in the article to predict future housing price trends, allocate assets reasonably, and reduce investment risks.

However, the essay has some points that can be improved. Firstly, the impact of policy regulations (such as purchase and loan restrictions) on housing prices has not been considered. These policies have a significant suppressive effect on housing prices in the Yangtze River Delta region, especially in Shanghai. Secondly, market expectations and speculative demand (such as market bubbles) have not been quantified, which are particularly important factors in the core cities of the Yangtze River Delta. In the future, the author will consider these factors as affecting Yangtze River Delta cities.

7. Conclusion and Summary

This paper employs the Pearson correlation and regression model to analyze how correlated the factors: population, urbanization rate, disposable income, GDP, and debt ratio are to housing prices in Yangtze River Delta cities such as Shanghai, Hangzhou, Suzhou, and Nanjing, supporting the "demand-supply driven" logic of housing prices. Additionally, it reveals Shanghai's "decoupling" phenomenon due to the city being a metropolis, providing new evidence for the theory of "special characteristics of super-large city housing prices". The results indicate disposable income has the most effect on the cities Suzhou and Nanjing, while population has the most effect on Shanghai and GDP has the most effect on Hangzhou. Interestingly, disposable income and GDP have no effect on Shanghai.

Looking ahead, if the population continues to flow into Yangtze River Delta cities, and the regional economy remains prosperous with rising GDP and per capita disposable income, local housing prices are likely to increase. Conversely, if these trends reverse, housing prices may decline. If the urbanization rate cannot be further increased, the upward pressure on housing prices from these factors would be limited. Additionally, given that the debt ratio has already peaked, if people are unwilling to take on more debt, this could also exert downward pressure on housing prices.

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