

## Study on the Influence of Central Business District on House Market Price: a Case Study of Nanchang City, China

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**Abstract.** It is significant to make clear the influence of the city's central business district (CBD) on the surrounding house market price (HMP), which is reflected by the following indicators: rental and purchase price. Thus, taking Nanchang of China as a case, we choose two CBDs (Bayi Square and Honggutan) to further study this issue in this paper by using the linear regression model. The results showed: with the growth of the distance between the studied community and the CBD, the community's HMP appeared a diminishing trend. Particularly, for Bayi Square, 1 km growth of the distance between the community and the CBD, indicated that the rental and purchase prices of the community's house decreased by 167 RMB and 430 RMB/m<sup>2</sup>, respectively. Similarly, for Honggutan, 1 km distance's growth indicated that the prices decreased by 150 RMB and 717 RMB/m<sup>2</sup>. Finally, some suggestions were proposed to help people have a happy life, such as purchasing the house.

### 1. Introduction

The city's central business district (CBD) is one of the kernels of the city [1]. Generally, it has more and better resources of floating population, finance, technology, infrastructure and education, etc., when compared with any other non-CBD [2]. For example, with a large number of constructions' completion such as hotels, apartments, houses and transportation facilities, many office addresses of economic, financial, trade, information, technological and cultural organizations are located in the CBD. Therefore, more and more people, units, services institutions, and other supporting facilities gather in the CBD. Moreover, many kinds of living conditions are highly improved in this area. So, it, gradually, becomes the hub of urban, regional and even national economic development [3]. Correspondingly, the house market price (HMP) of the CBD is considered higher than that of any other areas of the city [4]. The HMP can be reflected by the following two indicators: rental and purchase price of the house. In reality, people also can easily accept the fact that houses in the central district are more expensive, but houses in the suburbs are cheaper [5].

However, it is, so far, still rare for the related studies on this issue. That is to say, it is still unclear that the influencing effect of the city's CBD on the surrounding HMP. For example, people in Nanchang city of China still do not know the exactly numerical change of the community's HMP with the growth of the distance between the sample community and the CBD. Therefore, we choose two CBDs (Bayi Square and Honggutan) of this city as examples to further study this issue in this paper, which is significant to help people plan a happy life such as purchasing our own house.

## 2. Data and Methodology

### 2.1 Description of region and data

Plots of the two CBDs in Nanchang and the selected sample communities are shown in Fig. 1. It can be easily seen that the blue areas (left and right, respectively) are the two CBDs and the red dots indicate the sample communities. Their data are sourced from the websites of Anjuke, Fangtianxia and Baidu\_map, and mostly within the 11 km range of CBD.

Totally, 100 sample communities are selected, 50 for the Bayi Square CBD and other 50 for the Honggutun CBD. The types of communities' houses are the ordinary residential buildings and are not more than 24 years old. The prices' data are the three-bedroom rental price per month and the purchase price of the second-hand house per m<sup>2</sup>, respectively. The periods are from February 2018 to January 2019 for the Honggutun CBD, and May 2018 to April 2019 for the Bayi Square CBD. The distance's data from the sample community to the CBD directly come from the Baidu\_map.

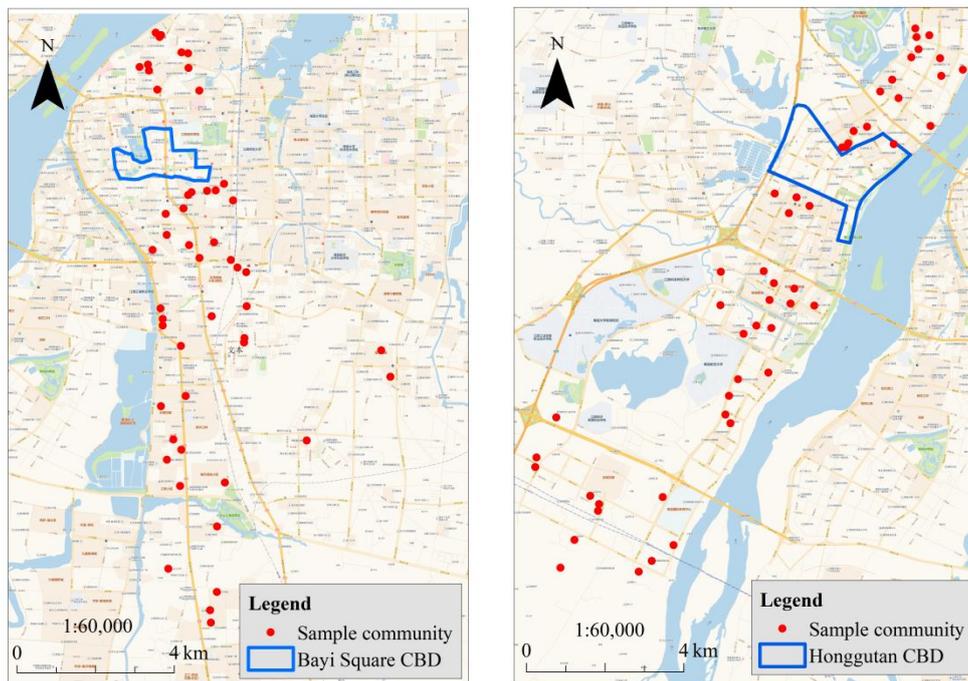


Fig. 1. Plots of the CBDs and the selected sample communities in Nanchang

### 2.2 Methodology

The univariate linear regression model is used in this study, and the general form of this model is:

$$y = C + B \times x \quad (1)$$

where  $x$  is the independent variable, and here means the distance from the community to the CBD;  $y$  is the dependent variable and means the rental price or purchase price.

$B$  is the regression coefficient or the slope of the regression line, and  $C$  is the intercept that is the longitudinal coordinate of the intersection point between the regression line and the Y axis. Typically,  $B$  and  $C$  are the most important parameters. The units of  $B$  and  $C$  are RMB and  $10^3$  RMB/m<sup>2</sup>, respectively, in this study.

## 3. Results and Discussion

### 3.1 Correlation analysis

Changes of house rental and purchase prices with the distances of the sample communities to the CBD are shown in Fig. 2. It can be easily found that both the rental and purchase prices of the sample communities to the CBD had a diminishing trend. Moreover, the surrounding prices of the Honggutun CBD were more expensive than those of the Bayi Square. For example, when the distance was 3.5 km,

the rental and purchase prices of the surrounding's community to the Honggutun CBD were  $2.56 \times 10^3$  RMB and  $16.87 \times 10^3$  RMB/m<sup>2</sup>, respectively, but the corresponding prices were  $1.74 \times 10^3$  RMB and  $13.81 \times 10^3$  RMB/m<sup>2</sup>, for the Bayi Square (Fig. 2).

The Pearson correlation test was conducted to identify the correlation relationship between the prices and the distances. The test results were shown in the left of Table 1. In Table 1, the model 1 or 2 denoted that the y was the rental or purchase prices, respectively and the x was the distance between the sample community and the CBD of Bayi Square. Similarly, the model 3 or 4 denoted that the y was also the rental or purchase prices, but the x was the distance between the community and the Honggutun CBD.

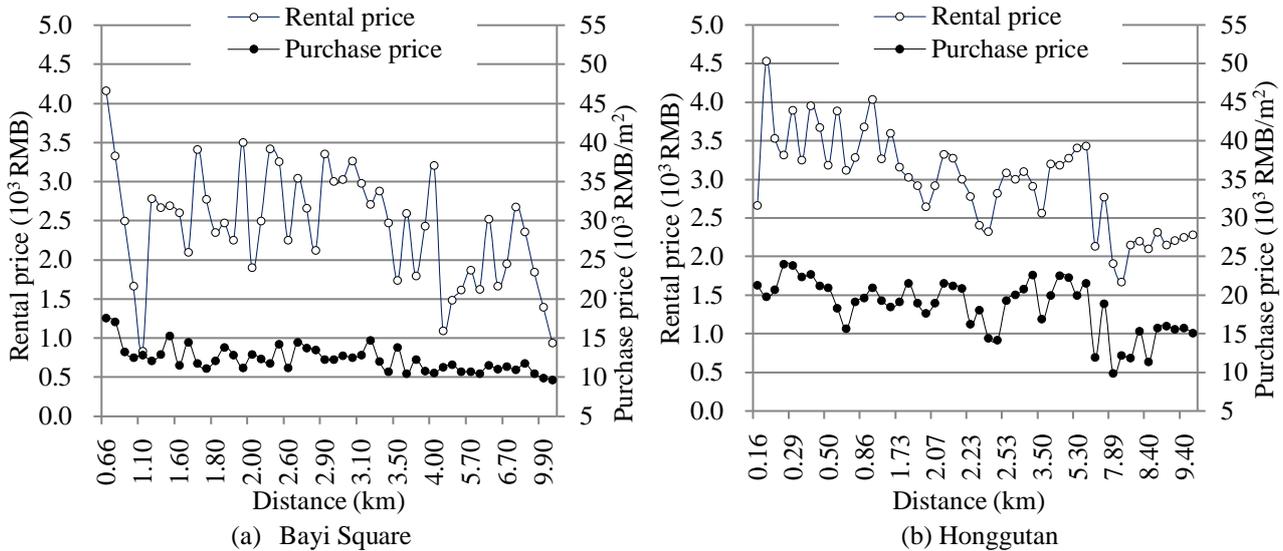


Fig. 2. Changes of house rental and purchase price with distance

It can be easily seen that the correlation coefficients of four models were -0.746, -0.640, -0.626 and -0.613, respectively, and all the results of "significant double-tailed" were 0.000 (<0.001). These indicated that the results were conspicuous, and the correlation between the prices and the distance was negative.

### 3.2 Regression results

Based on the Pearson correlation analysis, a further regression analysis can be made and a linear regression equation of one variable can be constructed. The detailed analysis results were shown in the right of Table 1. It can be easily seen that the values of four models' R<sup>2</sup> were 0.392, 0.376, 0.556 and 0.409, and the adjusted R<sup>2</sup> were 0.379, 0.363, 0.547 and 0.397, respectively. These indicated that the "model's fitting degree" of the four constructed equations were reasonable. In addition, the F statistics' values were 30.914, 28.890, 60.218 and 33.217, respectively, and all the values of sig. were 0.000 (<0.001), which rejected the hypothesis that these models were not significant. Therefore, the four linear equations can be listed as follows:

$$y_1 = 3.14 - 167.3 \times x_1 \tag{2}$$

$$y_2 = 13.84 - 430.3 \times x_2 \tag{3}$$

$$y_3 = 3.50 - 149.5 \times x_3 \tag{4}$$

$$y_4 = 21.01 - 716.6 \times x_4 \tag{5}$$

where,  $x_1$  meant the distance from the surrounding community to the CBD of Bayi Square, and  $y_1$  meant the rental price of the sample community around the CBD of Bayi Square;  $x_2$  had the same meaning as  $x_1$ , but  $y_2$  meant the purchase price of the sample community around the CBD of Bayi Square. Similarly,  $x_3$  meant the distance from the surrounding community to the Honggutun CBD, and  $y_3$  meant the rental price of the sample community around the Honggutun CBD;  $x_4$  had the same meaning as  $x_3$ , but  $y_4$  meant the purchase price of the sample community around the Honggutun CBD.

Based on the equation (2) and (3), a 1km growth of the distance  $x_1$  ( $x_2$ ), meant that the rental and the purchase prices of the sample community  $y_1$  ( $y_2$ ) decreased by 167 RMB and 430 RMB/m<sup>2</sup>, respectively. Similarly, based on the equation (4) and (5), a 1km growth of the distance  $x_3$  ( $x_4$ ), meant that the rental and the purchase prices of the sample community  $y_3$  ( $y_4$ ) decreased by 150 RMB and 717 RMB/m<sup>2</sup>.

In short, for every 1km growth of the distance between the community and the CBD of Bayi Square, the monthly rental price and average purchase price of the community will decrease by 167 RMB and 430 RMB/m<sup>2</sup>, respectively. Correspondingly, the prices will decrease by 150RMB and 717 RMB/m<sup>2</sup> for the Honggutan CBD. Therefore, if we have enough money, we can live in the CBD; otherwise, we can only live in the suburbs, far from the CBD.

Table 1. The results of Pesrson correlation test (left) and regression analysis (right)

Num	Correlation coefficient	Significant double-tailed	R <sup>2</sup>	Adjusted R <sup>2</sup>	Parameters		F	Sig
					B (RMB)	C (10 <sup>3</sup> RMB)		
1	- 0.626	0.000	0.392	0.379	- 167.3	3.14	30.914	0.000
2	- 0.613	0.000	0.376	0.363	- 430.3	13.84	28.890	0.000
3	- 0.746	0.000	0.556	0.547	- 149.5	3.50	60.218	0.000
4	- 0.64	0.000	0.409	0.397	- 716.6	21.01	33.217	0.000

#### 4. Conclusion and suggestion

Taking Nanchang city of China as a case, we choose two CBDs (Bayi Square and Honggutan) as examples to further study the influence of urban CBD on the surrounding HMP (rental and purchase prices) by using the linear regression model. The results showed: with the growth of the distance between the studied community and the CBD, the community's HMP appeared a diminishing trend. Particularly, for Bayi Square CBD, every 1 km growth of the distance between the community and the CBD, indicated that the rental and purchase prices of the community's house decreased by 167 RMB and 430 RMB/m<sup>2</sup>, respectively. Similarly, for Honggutan CBD, every 1 km distance's growth indicated that the two prices decreased by 150 RMB and 717 RMB/m<sup>2</sup>. Therefore, it is necessary for us to work hard and earn more and more money to increase the chance of having a happy life, such as purchasing our own house in the CBD. Otherwise, we can only live in the suburbs.

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