



Journal of Applied Sciences

ISSN 1812-5654

science
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Study on the Quantity Disequilibrium of Real Estate Market Effective Supply and Demand in Jiangsu Province

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Abstract: This study plans to use the disequilibrium theory to analysis the real estate market effective supply and demand in Jiangsu Province. According to the data of 1990-2009, establish the total disequilibrium of real estate demand and supply mode. calculated effective demand and supply and disequilibrium degree by demand and supply model analyses the factors of the non-equilibrium which will provide analysis tools for real estate development businesses and consumers and reference for the government macroeconomic regulation.

Key words: Disequilibrium, real estate market, effective demand, supply

INTRODUCTION

Many scholars did positive researches about the quantity disequilibrium of real estate market effective supply and demand in China. Ji (2005) stated hotter real estate development caused the disequilibrium of supply exceeding demand, investment promoted the development of real estate industry with high speed. There was insufficiency of effective demand with large latent demand which caused a large number of vacancy. Luo and Wang (2006) asserted that it was comparatively serious about unbalanced issue of effective supply and demand on commercial residential building in a certain period by analyzing the relative data of real estate market in China during 1987-2004. Zhou (2005) empirically analyzed the relationship between price fluctuation and speculation in 14 cities in China which showed disposable income had no obvious impact on the price of real estate. While speculation was the major impetus for the rising of the price of real estate which deviated long-run equilibrium value greatly. It appeared irrational exuberance in the market Li and Zheng (2001) studied the contradictory phenomena of excess supply and demand in the real estate market, thought it led to the unidentifiable situation of price information which caused the disequilibrium. Du (2010) proposed that here was disequilibrium in the real estate market which was against economic theory. Li (2010) pointed out it need to combine two way to limit the high price, namely containing speculation by implementing new policy on mortgage and increasing the supply of commercial residential building.

In the study, makes use of relevant statistics data of real estate from 1990-2009 in Jiangsu province with disequilibrium theory. combine with ADF (Augmented

Dickey-Fuller) test and PP (Phillips-Perron) test analyze the data. The results reference for the government macroeconomic regulation.

METHODOLOGY

Basic assumption: There are Marshall's Partial equilibrium theory and Walras' General equilibrium theory which produce extensive effects on economy. Disequilibrium theory applied in the study is relative to Walras', whose assumption as follows, market is perfect. Market competition is sufficient. Market information is full and smooth (Zhang and Li, 2008). Sensitive price is the only pilot light. Disequilibrium is temporary while equilibrium is the normality in the market. However, equilibrium theory asserts there is no perfect and fully competitive market, if information circulation can not go fully, it does not exist the equilibrium state under the condition of sensitive price adjustment. A certain monopolization exists in the real estate market which can not reach full competition because of capital and technology. Information can not be circulated fully among developer, investor and consumer which necessarily lead to inconsistency of supply and demand. Price can not be adjusted in time in the short term. Hence, disequilibrium theory truly reflect the operation law of real estate market.

Model setting

Principle of the minimum model: Commodity market transaction in the state of disequilibrium can generally state by equations as follows:

$$\begin{cases} D_t = \alpha_t X_t + u_t \\ S_t = \beta_t X_t + u_t \\ Q_t = \min(D_t, S_t) \end{cases}$$

D_t shows real estate demand quantity in the period of t . S_t shows real estate supply quantity in the period of t . Vector X_t , X'_t are various exogenous variables which can influence the supply and demand. X'_t and X_t are parameters estimation. u_t and u'_t are stochastic error at random and satisfy the hypothesis that both mean are zero and sequence is not relative. Q_t shows the real deal quantity in the real estate. Kornai put forward that macro economy trading volume should be less than the minimum of supply and demand in the process of studying East European, namely short edge theory. Therefore, quantity demanded and supplied usually are not equal in the real deal market. According to short edge theory, the shortage of macro quantity is common, trading volume fits trading equation (Wang and Deng, 1997):

$$Q_t = \min(D_t, S_t)$$

Disequilibrium model: The principle of the minimum model is the basis of disequilibrium model, but it doesn't reflect the true condition of real deal. Due to imperfection and insufficiency of information smoothness in the real estate market, deficiency and overabundance exist simultaneously. The principle of the minimum model is not suitable because of disequilibrium of macro economy and structure. After polymerizing of real estate market, trade volume is usually less than any value of demanding and supplying. To better grasp the market essence of disequilibrium, many scholars at home and abroad post market segmentation and consider polymerizing effects. They put forward hyperbola polymerization equation. Recently it is relatively common to adapt CES production function and hyperbola polymerization equation to study disequilibrium in the real estate.

According to Kornai's short edge theory, Burkett thought that among lots of micro-market there always exist different degree excess supply or excess demand. When it exists excess supply in the micro-market, supply quantity $(S_t - Q_t)/S_t$ will decline obviously if increasing commodity demand. Excess demand quantity $(D_t - Q_t)/D_t$ will increase comparatively. When demand continue to increase, excess demand will appear in the market and demand will be influenced $(D_t - Q_t)/D_t$. The relationship between $(S_t - Q_t)/S_t$ and $(D_t - Q_t)/D_t$ is almost equal to rectangular hyperbola:

$$r^2 = [(D_t - Q_t)/D_t] * [(S_t - Q_t)/S_t]$$

where, r shows the polymerization degree of micro-market. The trading volume can be gotten by solving the above equation:

$$Q_t = 0.5 \times (D_t + S_t) - 0.5 \times \sqrt{(D_t - S_t)^2 + 4r^2 \times D_t \times S_t}$$

By it find since $r > 0$ is economic normality, so $Q_t < \min(D_t, S_t)$ and $\lim_{r \rightarrow 0} Q_t = \min(D_t, S_t)$.

The above sign is the identical to the principle of the minimum model's. Generally speaking, the real estate market in country is in the state of deficiency and overabundance. Therefore, the study will adapt hyperbola model to study disequilibrium of real estate market in JiangShu province (Qi and Li, 2002).

ANALYSIS EXAMPLE

It mainly includes three parts. According to disequilibrium theory, setting effective supply and demand model of real estate market; selecting and arranging the data; parameter estimation which is the key point and also difficult point.

Setting effective supply and demand model of real estate market in Jiangsu province:

According to supply and demand factors affecting real estate in Jiangsu province and utilized statistical data, the study selects per capita disposable income of urban households. The average price of commercial housing sales, city population proportion and the macro-economic policy as exogenous variables of demand equation of real estate. Select the average sale price of real estate, completing volume of developing of real estate, the level of national income, political and economical factors as exogenous variables of supply equation of real estate. According to the conception of effective aggregate supply, when the investment of residential sales and price is zero, developers have no desire to supply, namely, effective supply quantity is zero. Therefore, the constant terms of effective supply equation is zero. According to disequilibrium theory, disequilibrium model of effective supply and demand of real estate market in Jiangsu province is as follows (Riddel, 2004).

Effective demand equation of real estate market in Jiangsu province:

$$D_t = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + u_{dt} \tag{1}$$

Effective supply equation of real estate market in Jiangsu province:

$$S_t = \beta_1 X_1 + \beta_2 X_5 + \beta_3 X_6 + v_{st} \tag{2}$$

Trading volume equation:

$$Q_t = 0.5 \times (D_t + S_t) - 0.5 \times \sqrt{(D_t - S_t)^2 + 4r^2 \times D_t \times S_t} \tag{3}$$

where, D_t shows demand quantity of real estate market by annual sales area of commercial housing; S_t shows supply quantity of real estate market by annual completion area of commercial housing; X_1 shows average sales price of real estate; X_2 shows per capital disposable income of urban households; X_3 shows city population proportion; X_4 shows gross domestic product; X_5 shows completion volume of investing of real estate; X_6 shows above five-year benchmark lending rates of financial institution; u_{dt} and v_{dt} show, respectively total factors affecting effective demand and supply of real estate except all the variables mentioned above; $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ and $\beta_1, \beta_2, \beta_3$ are the parameters estimation in the model; α_0 is the constant term; Q_t shows forecasting the market transaction volume; r shows market friction coefficient.

Selecting and arranging of data: The study studies the disequilibrium of real estate market in Jiangsu province by selecting relative data of real estate market in Jiangsu province from 1990-2009. All the data are from statistical year of Jiangsu, the sales price of real estate derive from results that sales areas of real estate divided by sales volume of real estate. To eliminate the effects of price level, all are divided by urban consumer price index. (average sales price of real estate, investment volume of real estate, gross domestic product and per capita disposable income of urban households). The data arranged is shown in Table 1.

Parameter estimation

Real estate supply-demand quantity equilibrium estimation: Equilibrium estimation means supposed

market is in the state of equilibrium. (in the state of clearing $Q_t = D_t = S_t$. Get the initial value of parameter on trading volume equation by using generalized least squares estimation on effective demand equation and effective supply equation.

Variable stationarity checking-ADF checking: If time series adopted in the process of modeling is not stationary, it probably leads to spurious regression. Therefore, to ensure the regression result, it will carry out test on the stationarity of sample data by applying extending Dickey-Fuller test (ADF test).

According to ADF test principal, first carry out stationary test to original sequence and difference sequence. Observe the scatter diagram of time series to decide whether original sequence vary at random and fluctuation trend vary with time and whether adding intercept and trend in the test. At the same time, ensure lag by AIC conduct.

Test results show original sequence of sample $D_t, S_t, X_1, X_2, X_3, X_4, X_5$ and X_6 can not refuse the original hypothesis. Namely, existing unit root is time series of unstationarity.

Cointegration test: According to unit root test result and cointegration theory, use cointegration relationship of different variables of E-G test method (1-2), first use Eviews6.0 software to regress. Regression results show in (4-5), respectively, then carry out the unit root test of regression equation residual r_{dt} and r'_{dt} , the results show in the Table 2 and 3.

Table 1: History datas about estate market in Jiangsu Province from 1990 to 2009 year

Year	Logarithm of average sales price	Logarithm of per capital disposable income	Logarithm of city population proportion	Logarithm of gross domestic product	Logarithm of completing volume of investment	Logarithm of benchmark lending rates	Logarithm of sales area of commercial housing
1990	6.366	7.289	3.045	7.214	2.460	2.274	5.522
1991	6.366	7.376	3.054	7.362	2.846	2.274	5.495
1992	6.560	7.652	3.082	7.651	3.415	2.274	5.615
1993	6.873	7.825	3.157	7.902	4.736	2.505	6.343
1994	7.073	8.196	3.178	8.267	5.027	2.642	6.425
1995	7.204	8.503	3.307	8.610	5.484	2.728	6.682
1996	7.275	8.611	3.307	8.758	5.449	2.622	6.752
1997	7.279	8.732	3.398	8.879	5.487	2.354	6.975
1998	7.371	8.725	3.450	8.905	5.705	2.156	7.186
1999	7.368	8.792	3.552	8.956	5.801	1.826	7.314
2000	7.404	8.811	3.726	9.040	5.883	1.826	7.462
2001	7.496	8.899	3.752	9.148	6.027	1.826	7.552
2002	7.563	9.025	3.800	9.285	6.299	1.751	7.750
2003	7.695	9.116	3.846	9.411	6.697	1.751	7.909
2004	7.883	9.227	3.875	9.586	7.147	1.826	8.064
2005	8.119	9.438	3.922	9.850	7.343	1.826	8.544
2006	8.187	9.558	3.949	9.992	7.553	1.923	8.716
2007	8.300	9.677	3.974	10.140	7.830	2.004	8.936
2008	8.321	9.825	3.995	10.331	8.028	1.930	8.596
2009	8.516	9.987	4.022	10.504	8.113	1.782	9.203

Table 2: Unit root test results of Eq. 1 residuals (r_{it})

Test method	ADF test	PP test
Statistic	-4.764	-4.764
1% critical value	-3.832	-3.832
5% critical value	-3.030	-3.030
10% critical value	-2.665	-2.665
p-value	0.0014	0.0014
Conclusion	Stable	Stable

Table 3: Unit root test results of Eq. 1 residuals (r'_{it})

Test method	ADF test	PP test
Statistic	-5.068	-5.173
1% critical value	-3.832	-3.832
5% critical value	-3.030	-3.030
10% critical value	-2.665	-2.665
p-value	0.0008	0.0006
Conclusion	Stable	Stable

ADF test is Augmented Dickey-Fuller test, PP test is Phillips-Perron test.

According to above charts, it can conclude that residual u_{it} and r_{it} is stable in the level of 1%, which shows that co-integration relation exists among each variable. Model as follow, respectively (Effective demand equation on the demand of real estate in Jiangsu province):

$$D = -8.7354 + 2.0420X_1 + 1.3217X_2 + 1.4297X_3 - 1.7613X_4$$

$$(2.0352)(0.4509) (0.9973) (0.2818)(1.1088) \quad (4)$$

$$t = (-4.2921) (4.5284) (1.3251) (5.0723)(-1.5884)$$

$$R^2 = 0.9939 \quad \bar{R}^2 = 0.9923 \quad F = 611.9248 \quad DW = 2.2624$$

Results show by Durbin-Watson test (DW test) because sample volume n is equal to 20 which prove the number of variable is 4 ($k = 4$), when $\alpha = 0.05$, $d_L = 0.90$, $d_U = 1.83$, it can get the result:

$$d_U < DW = 2.2624 < 4 - d_U$$

Judged by above results, the model does not exist first order positive autocorrelation coefficient. and determinants of coefficient is 0.99. Goodness of Fit is relatively high on the whole, F-value is very high which explains the overall explanatory power of explanatory variable is excellent and t-value of x_1, x_3 all manage to test in the level of 95% and t-value of x_2, x_4 manage to test in the level of 80%. Therefore, it can conclude the value of parameter estimation is the initial parameter of trading volume temporarily.

Effective supply equation of real estate in Jiangsu province can be set up as follows:

$$S = 0.9455p + 0.2511X_5 - 0.5579X_6$$

$$(0.0537) (0.0382) (0.0947) \quad (5)$$

$$t = (17.6020) (6.5637) (-5.8948)$$

$$R^2 = 0.9901 \quad \bar{R} = 0.9889 \quad DW = 2.1793$$

From the viewpoint of parameter estimation, supply sample determinants of coefficient is 0.986, Goodness of Fit is high. F-value is 523.578, the whole estimation of model is good. T-value of all explanatory variable manage to test in the level of 99%. DW value shows the model does not exist first order autocorrelation coefficient. Therefore, it can conclude the value of parameter estimation is the initial parameter of trading volume temporarily.

Analysis of parameter estimation results: Conclusion can be gotten from parameter estimation results. (1) There is positive correlation among price of commercial housing, per capital disposable income of urban households, city population proportion and efficient demand of real estate market in Jiangsu province. There is negative correlation to gross domestic product. It explains that it strengthens the effective demand to commercial housing to some extent as average disposable income increase. which fit for economic demand theory. It accelerates the development of urbanization and also promote the effective demand of real estate market. While the growth of national economy does not obviously improve effective demand of real estate market, (2) The improvement of average price of commercial housing can promote the effective supply and demand quantity of real estate in Jiangsu province. Impact on effective supply quantity is apparent, since the unchangeable thesis to developer is to pursue profit and enlarge market. However, impact on effective demand seems to be against demand theorem which fully manifest large investment and speculation on real estate market. Namely sheep-flock effect in the real estate market and (3) Negative correction between effective supply and demand of real estate market and loan interest rate of financial institution shows that increase of loan interest rate pose pressure on effective supply of real estate market and it is feasible to regulate real estate market by interest rate.

DISEQUILIBRIUM DEGREE ESTIMATION

Effective supply and demand quantity of real estate in Jiangsu province and disequilibrium degree estimation: According to the above model, logarithm value of effective demand and supply quantity of real estate in Jiangsu province in each year can be gotten with explanatory variable. According to short edge rule, define DEM and SUP, respectively as effective demand quantity and effective supply quantity of real estate market in Jiangsu Province in a certain year. Q is stimulated trade volume, disequilibrium degree of housing market effective supply and demand is Z shows:

Table 4: Results on effective demand and supply and disequilibrium degree

Year	Effective demand quantity	Effective supply quantity	Stimulated trading volume	Real trading volume	Disequilibrium degree
1990	282.71	227.19	227.19	250.02	0.244
1991	247.12	248.44	247.12	243.50	-0.005
1992	328.86	343.99	328.86	274.51	-0.046
1993	550.98	548.60	548.60	568.37	0.004
1994	730.64	654.84	654.84	616.97	0.116
1995	928.92	784.06	784.06	798.31	0.185
1996	951.55	894.60	894.60	856.13	0.064
1997	1027.41	1081.29	1027.41	1069.75	-0.052
1998	1257.35	1420.47	1257.35	1321.40	-0.130
1999	1432.78	1799.73	1432.78	1500.63	-0.256
2000	1717.36	1901.93	1717.37	1740.93	-0.107
2001	1990.27	2155.19	1990.27	1904.16	-0.083
2002	2253.43	2579.11	2253.43	2321.85	-0.145
2003	2825.21	3226.84	2825.21	2721.57	-0.142
2004	3654.52	4111.95	3654.52	3178.91	-0.125
2005	5199.37	5449.01	5199.37	5135.55	-0.048
2006	5635.86	5740.80	5635.86	6101.15	-0.019
2007	6607.86	6499.15	6499.15	7598.35	0.017
2008	6152.76	7293.84	6152.76	5412.26	-0.185
2009	8641.60	9967.65	8641.60	9922.73	-0.153

$$Z_t = \frac{DEM_t - SUP_t}{Q_t}$$

t means year. The result is seen in Table 4.

Comparing effective demand and supply quantity of real estate in Jiangsu province from 1999-2009 with real trading volume, chart 15 can be gotten. According to the chart, can judge whether it exists irrational consumption.

Results analysis: The first stage, from 1990-1993. the 18th National congress of the CPC was held in 1992, which quickened reform of political system, promoted economical construction and real estate market. Effective supply volume exceed effective demand volume. Hence, disequilibrium index descended quickly and reached its lowest point in 1993 which led to the phenomena of supply exceeding demand serious.

The second stage, from 1994-1997. Government carried out the policy of macroscopic control pointing at inflation by overhead economy in the second half year in 1993. The key point was to adjust real estate industry. By releasing relative regulation, real estate industry was hit deeply. Supply in the market gradually decreased. Disequilibrium index in this period was positive value and effective supply quantity is more than effective demand quantity in the market.

The third stage, from 1998-1999. Export and consumption growth in china were influenced by Asia financial crisis in 1997. Fix assets investment became major factor to fuel economical growth. To better promote market economy, guide the development of real estate industry reasonably and effectively, government stopped welfare-oriented public housing allocation system which caused more investment in real estate, increased effective supply quantity quickly. Therefore, disequilibrium degree descended on end which reached its peak in 1999.

The fourth stage, from 2000 to now. Entering the new era, with high households savings, effective demand increasing in real estate market, national economy turned into buyer's market from seller's market and shortage of effective demand had relieved. Disequilibrium degree in the period was still negative value, but trend was comparatively smooth which showed that it became mature and rational comparing with previous volatility. It tended to balance in the 1997. In 2008 economical recession all over the world was triggered by international financial crisis. National economy situation experienced a sudden turn for the worst. To answer the serious situation, government increased the investment in fixed assets which made effective quantity increase in real estate market. Therefore, disequilibrium degree decreased quickly. In 2009 to answer financial crisis all over the world, government adapted loose monetary policy and active fiscal policy to stimulate consumption demand of commercial housing which caused the ascend of demand.

CONCLUSION

The study makes use of relevant statistics data of real estate from 1990-2009 in Jiangsu province with disequilibrium theory, establishes effective model of supply and demand of real estate market in Jiangsu province in the basis of hyperbole model. Through the model get effective supply quantity and demand quantity of real estate market from 1990-2009 in Jiangsu province, calculate disequilibrium degree. Empirical analysis shows that disequilibrium degree can reflect the fluctuation of real estate supply and demand in the period effectively and get the conclusion that the real estate in Jiangsu is influenced by average sales price of commercial housing,

gross domestic product, per capital disposable income of urban households, process of city development and national macro-economy policy.

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