Three Dimensional Interpretations of the Korean Housing Market: Structural Relationships among Sales, Chonsei, and Monthly Rent Markets

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Abstract

This study suggests three dimensional interpretation of the Korean housing market and carried out empirical analysis, using the simultaneous-equation model, on relationships among three market, supply, demand, Expected price, and market interest rate. The main findings are following. First, the effect of the expected housing supply is bigger in the sale than in the rent. Second, demand factor has a negative(-) relationship with the rent. This result is in accord with the principle. Third, market interest rate, in the empirical analysis, has a negative(-) relationship with the chonsei. This paper presents logic of that result by using interpretation about the conversion rate. Finally, this paper assumes that the chonsei market has a characteristic of both the rent market and the sale market and presents an empirical evidence for this characteristic.

KeyWords: Sale, Chonsei, Monthly Rent, Simultaneous Equation System
I. Introduction

The existing research on the Korean housing market has mostly based on the usual dichotomous view that the housing market consists of a single sales market and a single chonsei market as a representative rental market, because chonsei has been a dominant rental contract type in Korea. However, for the recent years, the monthly-rent-with-variable-deposit (MRVD) market has taken a substantial portion of the rental housing market (add some explanations on the market change with some statistics) and its share is growing. This change in market configuration may be accepted as a signal that the dichotomous view of chonsei vs. sales markets is not be eligible any more.

In the conventional research dealing with both sales and chonsei markets, chonsei is an awkward rental contract type to be analyzed, since it is a lump-sum deposit, which is returned to the renters at the end of the contract, without monthly payment. However, it should be converted to a certain amount of monthly rent in order to use the common methodologies developed to analyze the rental housing market in the Western countries. Usually chonsei deposit is converted to monthly rent by using a market interest rate. However, there is no common rule on which interest rate should be used. It depends on researchers’ choices. However, in the market, the conversion rate of chonsei to monthly rent in the MRVD market is always much higher than any types of interest rates.

Recently, some studies (add reference) on chonsei and monthly rent markets suggest that an opportunity cost of chonsei deposit is not a market interest rate but an expected rate of returns on investment in the housing sales market, since the chonsei deposit is commonly used for the landlords to purchase the house with seeking for leverage effect in investment. This leverage-effect-seeking usage of chonsei deposit can make the chonsei market to maintain a more tight relationship with the sales market than the usual rental market with monthly rent.

On these understandings, this study assumes that chonsei market has mixed characteristics of both rental and sales markets. This paper aims to explore the relationships among three types of sub-markets in Korean housing market, such as sales, chonsei, and monthly rent markets. Each sub-market may be affected by market fundamentals in an independent way and also affects with each other. This paper analyzes the structural relationship between the three sub-markets using simultaneous equation models.
II. Theoretical Review

Three Dimensional Configuration of the Housing Market

Chonsei is a unique rental contract type in the Korean housing market, in which the tenant pays an upfront deposit in the beginning of the contract period with no requirement for paying monthly rent, and the deposit is fully refunded at the end of the contract period. Recently, monthly-rent-with-variable-deposit (MRVD) is becoming another major form of rental contract type in Korea. It has not been fully recognized even though it has existed with a significant portion of the rental market in Korea for a long time. In the MRVD market, the tenant pays both an up-front deposit and monthly rent. This deposit is smaller than the amount of the corresponding chonsei but is fully refunded at the end of rental contract like chonsei. To fill the gap between the corresponding chonsei deposit and deposit in MRVD, it requires relatively small amount of monthly-rent than pure monthly rent. Although pure monthly rent market exists in Korea, it is not surveyed regularly nor does taking a significant share in the Korean housing market.

Recently, MRVD has obtained market attention, and market surveys on the MRVD are regularly being performed. With these efforts, chonsei to monthly rent conversion rate (shortly conversion-rate, hereafter) has been surveyed and reported in a regular base. Using this conversion rate, we can estimate pure monthly rent from MRVD cases and build pure monthly rent index. If we add monthly rent up to the chonsei and sales price configuration of Korean housing market, we can build a three dimensional structure of the housing market (Lee and Kim and Ahn, 2003). Fig. 1 illustrates the three dimensions of the housing market and relationships between each market.

Three dimensional configuration of the housing market provides a new viewpoint that differs from the conventional one. In this formulation, price in each sub-market can move independently, while they are related in reasonable ways. The relationships among the sub-markets are expressed with three relational indices including the conversion rate for
monthly rent and chonsei markets, rent-to-value ratio for monthly rent and sales markets, and chonsei-to-price ratio for chonsei and sales markets.

![Figure 1: Three Dimension of the Korean Housing Market.](image)

**Theoretical Interpretation of the Rental Housing Market in Korea**

For analysis of the housing market, price represents the market. For sales and chonsei markets, sales prices and chonsei amounts are observed. However, for the monthly rent market, market prices are not directly observed. Instead, we can observe MRVD and can calculate an imaginary pure monthly rent \( R_0 \) using the market conversion rate \( k \) and a pair of monthly rent \( R \) and deposit in MRVD observed \( D \) as the following.

\[
R_0 = R + kD
\]  

(1)

In addition, if a chonsei deposit and a pair of monthly rent and deposit in MRVD are observed for the same house, the conversion rate is calculated as in

\[
k = \frac{R}{C - D}
\]  

(2)
Recently a series of research to interpret the conversion rate have been steadily conducted (Lee and Chung and Lee, 2002; Lee and Lee and Ahn, 2003; Chung and Sim, 2005; Kim, 2006). In these researches, the conversion rate is not defined as a market interest rate but rather as an expected rate of returns on investment of the landlord (Lee and Chung and Lee, 2002). If the leverage-effect-seeking behavior of landlords on chonsei prevails, ROE ($k_c$) can be denoted as equation (3). Here, denominator is net investment of the landlord and numerator is the sum of operating income ($R$) and expected capital gain ($aP$).

$$k_c = \frac{R + aP}{P - D}$$  \hspace{1cm} (3)

From equation (3), if we solve for monthly rent, we can obtain equation (4). Equation (4) shows the conversion rate should be the rate of returns on investment.

$$R = -k_c D + (k_c - a)P$$  \hspace{1cm} (4)

In monthly rent contract, there is no deposit required. Therefore, equation (4) could be transformed to equation (5). This equation indicates that the conversion rate is the sum of a rental income yield ($\frac{R_0}{P}$) and an expected price appreciation ($a$).

$$k = k_c = \frac{R_0}{P} + a$$  \hspace{1cm} (5)

Under an arbitrage condition in housing market, the conversion rate or ROE is the combination of a market interest rate ($i$), a risk premium maintained in the housing market ($i_r$), and a property tax rate ($t$) like in equation (6).

$$k = k_c = i + i_r + t$$  \hspace{1cm} (6)
III. Empirical Model Developments

Let's construct an empirical model for three dimensional setting of the housing market in Korea. In the monthly rent market, the variation of rent is assumed to be affected by supply and demand factor. At the same time, Rent market interacts with price in the sale market and market interest rate because Rent is defined as a present price that is discounted by a market interest rate. Therefore, Rent market function is such that,

\[ R = f(P, \text{Economy}) \]  
(7)

The sales market function (Eq. 8) consists of market fundamentals (supply and demand factors) and an expected price appreciation rate. Market fundamentals may be also responsible for an expected price rising rate. However, it is open to question as to whether two factors are independent to each other or not.

\[ C = f(P, R, \text{Expected Price}, \text{Interest Rate}) \]  
(8)

The chonsei market function needs a complex interpretation. Controlling factors of the chonsei market encompass those of the monthly rent market. However, Chonsei market can be affected by the sales market due to the leverage-effect-seeking behavior of the landlord. For the sake of simplicity, we consider only additional two factors including an interest rate and an expected price appreciation rate for controlling the sales market related characteristics.

\[ P = f(R, \text{Expected Price}, \text{Economy}) \]  
(9)

This paper seeks to interpret a structure in which each market is not independent to each other and use the simultaneous-equation model. The simultaneous-equation model is generally used to structure the relationship between a lot of endogenous variables and exogenous variables. If a
variable has an interdependency relationship with other variable, the ordinary least square (OLS) estimator does not report consistent results.

There are several estimation methods to apply for a simultaneous-equation model. The selection of estimation method is usually decided by the problem of identification. According to the number of endogenous and exogenous variables, the simultaneous-equation system is unidentified or exactly identified or over-identified. This identification condition is also discriminated by order condition and rank condition. In this paper, the price variables in three sub-markets are selected as endogenous and the others are treated as exogenous. Therefore, it is reasonable to say that the simultaneous equation system is over-identified. In the case of over-identified model, TSLS (Two Stage Least Square Model) and LIML (Limited Information Maximum Likelihood Method) is generally used and 3SLS (Three Stage Least Square Model) and FIML (Full Information Likelihood Method) is also adoptable. This study adopts TSLS estimation because this estimation is relatively less sensitive to the misspecification problem.

IV. Data and Results of Estimation

Data

This paper uses the quarterly data for the twelve quarter period from 3th quarter 2001, when the conversion rate was reported. In order to identify housing market structure, this paper uses the housing price index and chonsei index of the Korean Kookmin Bank as the substitution variable for each market value. The perfect monthly-rent index is calculated from the chonsei index using the conversion rate. For the supply side, the apartment stock is substituted to the cumulated household number obtained from R114. An expected apartment supply is assumed to be identical to the sum of household numbers that is scheduled to supply from the start quarter to after 4 quarter. For demand side, the average income of household, including both regular and irregular income and released by the Korea National Statistical Office, is used. In order to represent an expected price rising rate, a price increasing rate for the past 12 months is used.
The yield rate of 3 year maturity corporate bonds released by the Bank of Korea is used as the substitution variable of market interest rate. The descriptive statistics are summarized in Table 1.

Table 1 Descriptive Statistics of Each Data

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Std. Dev.</th>
<th>Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chonsei (C)</td>
<td>100.12</td>
<td>89.64</td>
<td>112.58</td>
<td>5.69</td>
<td>23</td>
</tr>
<tr>
<td>Monthly Rent (R)</td>
<td>93.57</td>
<td>81.79</td>
<td>109.24</td>
<td>8.47</td>
<td>23</td>
</tr>
<tr>
<td>Sale Price (P)</td>
<td>100.14</td>
<td>67.68</td>
<td>137.97</td>
<td>17.15</td>
<td>23</td>
</tr>
<tr>
<td>Housing Stock (Hs)</td>
<td>748,800</td>
<td>580,984</td>
<td>897,572</td>
<td>102,643</td>
<td>23</td>
</tr>
<tr>
<td>Expected Housing Supply (Hs12)</td>
<td>54,831</td>
<td>29,951</td>
<td>74,919</td>
<td>13,269</td>
<td>23</td>
</tr>
<tr>
<td>Income (Inc)</td>
<td>3,102,996.30</td>
<td>2,709,832.00</td>
<td>3,764,135.00</td>
<td>294,298.86</td>
<td>23</td>
</tr>
<tr>
<td>3 year maturity corporate bonds (CB3)</td>
<td>5.42</td>
<td>3.87</td>
<td>7.01</td>
<td>0.85</td>
<td>23</td>
</tr>
<tr>
<td>Price increasing rate for the past 12 months (A12)</td>
<td>1.08</td>
<td>-0.07</td>
<td>2.51</td>
<td>0.75</td>
<td>23</td>
</tr>
</tbody>
</table>

( ) is a simplified character

The trend of each data is respectively represented as in Fig 2. Let's examine the trend of each market. In the sale market, its trend is generally increasing although the trend is decreasing in some period. However, in the rent market, its trend is decreasing from 3th quarter 2001 to 1th quarter 2005 and increasing from that to last quarter in which the level of the Rent market index is around the level of the 1st quarter 2001. In the Chonsei market, its trend is increasing to 3th quarter 2002, increasing after that quarter, and decreasing again.

The trend of income variable keeps increasing all the periods. The apartment stock is increasing but the expected apartment supply is maintained in decreasing. The interest rate and the price increasing rate for the past 12 months have a trend similar to each other. This similarity is significant, when we consider the arbitrage condition in that the market interest rate is suggested to have a linear relationship with expected price rate.
The result of the correlation analysis between variables is summarized as in Table 2. The rent market is positively correlated to the chonsei market and negatively to the Sale market. The apartment stock is positively correlated to the rent market but negatively to both the sale and the chonsei market. The interest rate is positively correlated to both the rent and the chonsei market but negatively to the sale market.

**Table 2 The Results of Correlation**

<table>
<thead>
<tr>
<th></th>
<th>R</th>
<th>J</th>
<th>P</th>
<th>A12</th>
<th>HS</th>
<th>HS12</th>
<th>INC</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>1</td>
<td>0.348</td>
<td>-0.455</td>
<td>0.911</td>
<td>-0.625</td>
<td>0.159</td>
<td>-0.473</td>
<td>0.868</td>
</tr>
<tr>
<td>J</td>
<td>0.348</td>
<td>1</td>
<td>0.629</td>
<td>0.546</td>
<td>0.383</td>
<td>-0.378</td>
<td>0.453</td>
<td>0.096</td>
</tr>
<tr>
<td>P</td>
<td>-0.455</td>
<td>0.629</td>
<td>1</td>
<td>-0.265</td>
<td>0.941</td>
<td>-0.672</td>
<td>0.915</td>
<td>-0.605</td>
</tr>
<tr>
<td>A12</td>
<td>0.911</td>
<td>0.546</td>
<td>-0.265</td>
<td>1</td>
<td>-0.514</td>
<td>0.252</td>
<td>-0.392</td>
<td>0.774</td>
</tr>
<tr>
<td>HS</td>
<td>-0.625</td>
<td>0.383</td>
<td>0.941</td>
<td>-0.514</td>
<td>1</td>
<td>-0.761</td>
<td>0.947</td>
<td>-0.716</td>
</tr>
<tr>
<td>HS12</td>
<td>0.159</td>
<td>-0.378</td>
<td>-0.672</td>
<td>0.252</td>
<td>-0.761</td>
<td>1</td>
<td>-0.826</td>
<td>0.302</td>
</tr>
<tr>
<td>INC</td>
<td>-0.473</td>
<td>0.453</td>
<td>0.915</td>
<td>-0.392</td>
<td>0.947</td>
<td>-0.826</td>
<td>1</td>
<td>-0.589</td>
</tr>
<tr>
<td>I</td>
<td>0.868</td>
<td>0.096</td>
<td>-0.605</td>
<td>0.774</td>
<td>-0.716</td>
<td>0.302</td>
<td>-0.589</td>
<td>1</td>
</tr>
</tbody>
</table>

**The Results of System Estimation**

In order to generate the percent growth rate, each data is transform to natural logarithms form. In the simultaneous-equation system, the endogenous variables are R, C, and P and the
exogenous variables are Hs, Hs12, Inc, A12, and I. The TSLS model uses this exogenous variable as instrument variables. The result of TSLS estimation is summarized as in Fig 2. The DW (Durbin-Watson) statistic of each equation, except the rent, lies within critical boundary at 1% level of significance. In addition, if we plot actual data, estimation, and 95% confidence bounds, all the actual lies within confidence boundary (Appendix 1). However, the significances of the sale equation's coefficients are not so good. A structural problem of system also prevents CB3 to be installed to the price equation.

Table 3 The results of TSLS estimation

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Independent Variable</th>
<th>Adjusted R2</th>
<th>DW-statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Endogenous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>0.971***</td>
<td>0.922</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>0.267***</td>
<td>1.972</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>-3.528</td>
<td>2.167</td>
<td></td>
</tr>
</tbody>
</table>

***: 1% significance

It is reported that the supply factors, so called Hs and Hs12, have a positive effect on both the rent and sale market. However, it is interesting that the elasticity of the supply factors (coefficients of Hs and Hs12) shows a distinctive pattern as to affect the sale and the rent market. The elasticity of the expected housing supply (Hs12) is estimated to be higher in the sale equation than in the rent equation. On the contrary, the elasticity of the housing stock is estimated to be less in the sale equation than in the rent equation.

It is acceptable that the increasing supply makes the price or the rent decreasing. The rent market immediately responds to the supply effect. However, the sale market is more sensitive to the supply effect in long term than that in short term. Why, then, two markets differently respond to the supply factors? This seems to be coupled with the expected price rising. In the next stage, we make more explicit statements about the relationship between the supply factors and the expected price rising factor in the sale market.

Income, as demand factor, negatively affects the rent and positively the sale market. Interpretation to effects of income seems not clear. The sale market positively affects the rent market in spite of the rent market's negative effect on the sale market. If the connection between
the price and the rent, such as $P = \frac{R}{i}$, is permitted, the coefficient’s value of $R$ in the sale($P$) equation and that of $P$ in the rent($R$) equation should present a positive(+) value. In addition, if the rent and the sale market are indifferent, the sign of coefficient on each market should be identical.

There may be many explanations to interpret this situation. For example, if the estimated model is well specified and reflects the real world, the following interpretation may be suggested. If a customer on housing service prefers to be a landowner than to be a tenant, the customer, in the situation that the housing supply is stable in short term, may choose to enter into the sale market than to remain in the rent market. This logic assumes that a purchased housing is the superior goods in comparison with rental housing. Therefore, increasing income creates additional demand on the sale market. However, this hypothesis needs more researches and debates. Furthermore, although this effect is existing in a short term or in minor sub-market, it might be disappeared in a long term.

The estimation result reports that the coefficient of market interest rate (CB3) has a positive (+) value to the rent and a negative (-) value to the chonsei. For the relationship between the rent and a market interest rate(CB3), this relationship seems to be reasonable because a increasing market interest rate, in principle($P = \frac{R}{i}$), causes the opportunity cost of housing service decreasing. However, the relationship between the chonsei and the market interest rate is more complex than the others. In the chonsei market, Eq. 4 is transformed to $k_i = \frac{aP}{P - D}$ in which the conversion rate, if the expected price rising rate($a$) and the price($P$) is a constant, has a negative(-) relationship with the chonsei. Moreover, the market interest rate also has a positive(-) relationship(refer to Eq. 6). Therefore, the market interest rate has a negative(-) relationship with the chonsei.

The chonsei has a positive (+) relationship to both the sale and the rent market. In this case, the coefficient's value of the sale is bigger than the value of the rent. It is the reason for this situation that the landowner could use chonsei deposit to seek for leverage effect and the chonsei market, at the same time, has a characteristic as a rental market. Therefore, it is
understandable that the coefficient’s value of the chonsei and that of the rent present a positive (+) number to each other.

Lastly, there is a price increasing rate for the past 12 months as substituted variable of the expected price factor. The coefficient’s value of the expected price factor represent a positive (+) number to both the sale and the chonsei. The expected price factor directly affects the sale as increasing capital gains and indirectly affects the chonsei because of leverage effect. It is important to note that the coefficient of the expected price factor is significant although the coefficient's value, designating a expected price factor's effect on the sale, is bigger than the value of the chonsei. The coefficient of the expected price factor shows a robustness even if we exclude the relationship between the sale and the expected price factor(Fig. 3, Fig. 4).

Another interesting subject is the relationship between Market Fundamentals and the expected price factor. Fig. 5 is a case in that the supply factor's effects on the sale market are excluded and Fig. 6 is a case in that the demand factor's effect on the sale market is excluded. If the supply factors(Hs, Hs12) is not controlled(Fig. 5), the coefficient’s value of the expected price factor decreases from +0.371 to +0.160 because the supply factors has a negative(-) effect on the price. However, if the demand factor(income) is omitted from the sale equation, the coefficient's value of the expected price factor increases to +0.514. This results suggest that the expected price factor may be connected to market fundamentals.
V. Conclusions

This study assumes that the chonsei market is characterized by both the rent market and the sale market. On this assumption, this paper suggests three dimensional interpretation of the Korean housing market and carried out empirical analysis on relationships among three market, supply, demand, Expected price, and market interest rate.

The findings are following. First, For the housing stock, the rent is more sensitive than the sale. However, For the expected housing supply, the sale is more sensitive than the rent. Second, in principle, increasing demand makes the rent to be increasing. However, in the empirical result, demand factor has a negative(-) relationship with the rent. This paper suggests an interpretation that purchased housing is a superior goods. However, there remains some doubt as to be sure about this hypothesis. Third, in the empirical result, market interest rate has a negative(-) relationship with the chonsei. It is, in principle, reasonable because the conversion rate has a negative(-) relationship with the chonsei and the market interest rate also has a positive(+) relationship. Finally, it seems little doubt that the chonsei market has a strong connection to the sale market although the chonsei market is generally considered to be included in rental market.

This study adopts the simultaneous-equation model to examine a structure of the Korean housing market. It is, according to the result of the TSLS estimation, possible to identify the relationship among the coefficients of the factors. However, there are some problems to obtain a
significant coefficient. Therefore, the process to reform or improve the system seems to be required.
[ Reference ]


Appendix 1 plots of Actual, estimation, and 95% confidence bound