Master of Science in Engineering

Housing Market Participants' Decision Process and Suggesting the Direction of Housing Policy

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Abstract

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Since the 2008 global financial crisis, Korean housing market has been stagnant. During this period, it has caused various housing market problems such as housing price reduction, rental cost increase and so on. Although the government announced policies for housing market stabilization, the market is still depressed. In order to figure out the reason why Korean housing market couldn't be recovered from recession and why the policies weren't effective, therefore, this research analyzed housing market participants (home owner, housing demand) based on the law of supply and demand as well as the psychological effect on their transaction intention under behavioral economics

(behavioral finance). Moreover, this research built the hypothesis to understand the relationship between the transaction and housing market condition to find the way of revitalizing the housing market. On the basis of the analysis, this research tested the effectiveness of announced policies using System Dynamics method. The result showed that the amount of transaction and mortgage loan was influenced by the length of time to draft policies.

Keywords: Korean Housing Market, Housing Policies, Behavioral Economics, System Dynamics

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Chapter 1. Introduction

This chapter presents the research background, problem statement, objective and scope in Korean housing market. Also, the end of this chapter, main research process is described with research process figure.

1.1 Research Background

In the early 2000s, as the housing price in Korean housing market sharply increased (Kim 2013), the housing market was booming by rising the supply and transaction of new housing (Park et al. 2008).

Due to the 2008 global financial crisis caused by the sub-prime mortgage loan, however, both domestic and foreign financial markets recognized the importance of liquidity amid the economic crisis and tightened the regulation on it (Jang 2012). Consequently, the capacity to borrow mortgage loan reduced, and it also led to decline the purchasing power of Korean housing consumers.

Furthermore, decrease in housing demand by the law of supply and demand caused housing price fall. In other words, decreased liquidity made the drop in housing value (Chung 2006, Chun 2012).

Ever since housing price continued to fall, the amount of housing transaction dwindled to about38% in 2013 compared to that of 2006 (Onnara portal 2013). Moreover, housing sales price in Seoul metropolitan area showed an increase of 20.3% in 2006 but a reduction of 3% in 2012. It means that Korean housing market has been going through a slump since 2008. As a

result, the downturn in the housing market had an influence on both homeowners and consumers as follow:

Firstly, as mortgage value went down by a drop in housing price, homeowners often couldn't pay back the loans in spite of selling their house. For this reason, not only homebuyers who got a large amount of mortgage loan are in crisis of being 'House poor', but they also suffer from losing expectation on housing price increases and having burden to repay the principal and interest of the loan.

In order to prevent a bubble effect on housing price as well as mortgage insolvency, Korean government announced plans to stabilize housing market through mortgage loan regulations which lower the DTI and LTV rate since May 2003 (Kim 2013). It performed a role not only in controlling the increase of bad loans to some degree but also in lightening the influence of global financial crisis started from the U.S. However, the total amount of Korean mortgage is up to 400 trillion won as of September 2013 and it has been on the rise (ECOS 2013). Such a circumstance indicates that Korea might run into danger of insolvent obligation caused by mortgage like the sub-prime mortgage crisis which put the U.S. at the financial risk in 2008 (Jun 2009).

The Chonsei (Korea rent contract) tenants in housing market, meanwhile, have not bought houses but renewed the contract. This is because they think renewing the contract would be better than buying a house in the circumstance that housing price has been depreciating and they also don't want to bear risk of losing their money. As this circumstance was the cause of increasing Chonsei demand, thus, not only Chonsei price has been getting higher but it

has also aggravated burden to people intending to enter housing market for the first time (Park et al. 2012). In addition, such a situation has brought about the decrease of housing transaction since Chonsei lessees don't want to buy a house despite having sufficient money (Shin 2011).

Government released policies for housing market normalization; nevertheless, it still has not been enough to revitalize housing market.

1.2 Problem Statement and Research Objective

As mentioned above, Korean housing market has been in stagnation and the problems in market affect the market participants. The present home owner and Chonsei tenants (or other tenants) have been the major participants in housing market and they are undergoing financial difficulties. In case of home owners, their principal and interest of mortgage and sense of loss by housing price drops are a burden on them. This situation mainly gives rise to the growing number of house poor and the other case of Chonsei tenants they have been suffered from expensive Chonsei price. So the problems of housing market this research would solve are as follow:

1) If the number of house poor increases, the insolvency of mortgage would also get deeper and the possibility of occurring another financial crisis in Korea would rise.

2) In case of Chonsei tenants (or other tenants), they have been suffering from rise in Chonsei price as well as a burden on people who enter housing market for the first time is getting heavier because of expensive Chonsei price. Therefore, the current situation is a hard time to both owners and tenants. However, the announced policies are still seriously ineffective on both owner and tenants.

3) There is a controversy over whether the policies are effective or not.

So the objective of this research is to analyze 1) the cause of Korean housing market stagnation after global financial crisis in 2008 and 2) the effectiveness of the policies for government to stabilize Korean housing market and 3) to suggest the direction of the housing policies based on 1), 2).

Also, another objective is to verify the hypothesis that there is the relationship between the transaction and housing market condition. The reason of building the hypothesis is that because the purpose of government policies was to stabilize the housing market through the increase of the transaction, the hypothesis could also give the direction of the housing policy.

1.3 Research Process

To solve the problem and to accomplish the objectives written above this research should have the process and the research process is described at this lower page and illustrated as follow Figure 1-1.

1) Analyzing Korean housing market based on the law of supply and demand
2) Selecting some applicable theory of behavior economics to understand the psychology of the owners and rent house tenants.
3) Analyzing the cause of decreased amount of housing transaction in present housing market from owners and tenants points based on the selected theory of behavior economics.
4) Based on the result of 1), 2), 3), System Dynamics model is developed.
5) Using System Dynamics model, the effectiveness of the announced housing policies is verified and the direction of housing policies is suggested and finally the hypothesis of this research is verified.

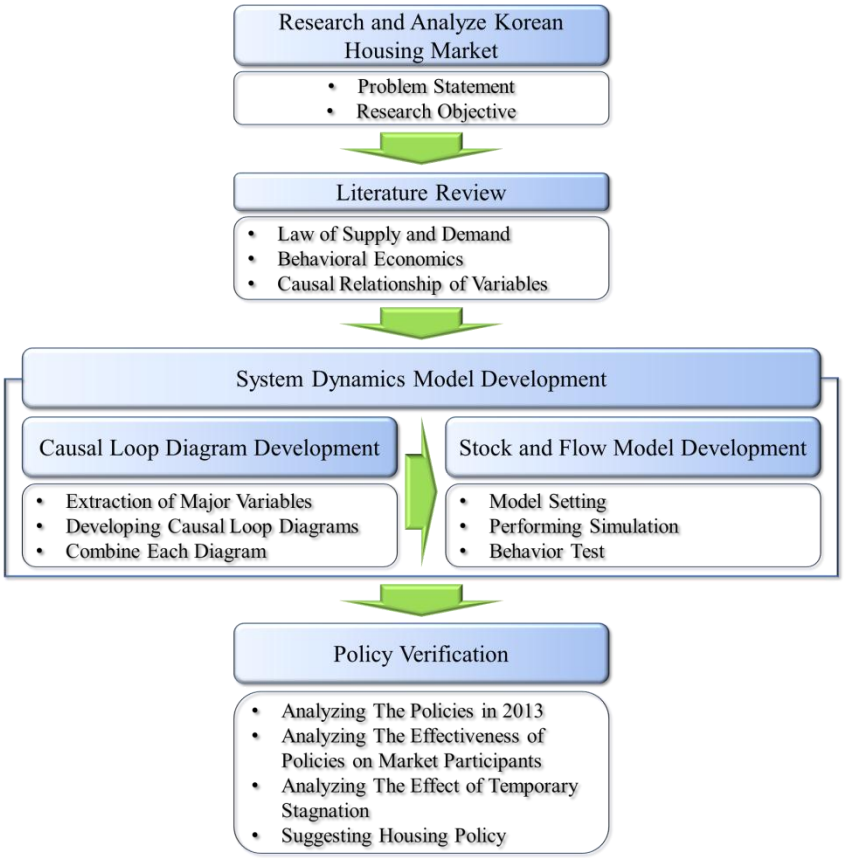


Figure 1-1. Research Process

Chapter 2. Literature Review

To examine the Korean housing market stagnation and the problems, this chapter discusses the system of both the demand and supply and the behavior of participants in Korean housing market. First, the system structure is understood through a literature review. Second, to analyze the behavior of the market participants, the psychological effect on them is researched through theory of behavior economics. Finally, introduce the system dynamics methodology which is used to simulate Korean housing market and the announced housing policies.

2.1 Features of Korean Housing Market

House plays the role as dwelling and asset for investment for the people who buy the house (Kim 2008). On the house owner side, except the house which is used to dwell other extra houses are used for investment goods. The extra houses are used for the rent house used by the people who can't buy house and who newly enter the housing market (Park et al. 2012). The house owner could get profits from investing houses (1.Rent fee, 2.Interest by saving the deposit of rent house, 3.Capital gain from increasing house price). The owner can solve cash flow problem easily using the deposit and when the housing market is in the boom, the owner get profit by leverage effect. So the Chonsei contract and monthly rent with deposit could exist on the Korean housing market (Lee 2002).

Most of housing lessees are the people who plan to buy house for the first

time and they are living in rent house saving the money for buying house before they possess their house. And housing lessees' deposit is used for money which play the role to solve liquidity problem when they buy house. So the housing lessees play the role of potential housing demand in housing market (Lee and Lee 2006; Lee 2003; Cho 2010). When the potential demands have the ability to own house, if they convert owners from lessees the demand in the housing market could remain optimal level and the reasonable house price and rent price could be formed. However, in the present Korean housing market, potential housing demands postpone buying houses because of market stagnation and the rent housing demand is increasing because they combine with rent housing demand (Park et al. 2012). So it causes many problems (1. Continuously increasing rent housing fee and price, 2. Decreased investment value of owner's house.). Decreased investment value of house causes that owner can't sell their house when they want. So the cash-flow of owners is deteriorated and it make many house poors.

To solve the previously said problems, many researches analyzing the factors effecting on housing market and market mechanism were studied. (Interrelationship of both 1) house price and interest rate, 2) house price and psychological factors, 3) tax rate and housing market trend in Korea, 4) the cause of increasing rent housing(Chonsei contract) price, 5)forecasting housing market trend)

However, because these are empirical researches these have limitations like that it is hard to analyze housing market dynamics based on how the factors

effect on Korean housing market. Park et al. used System Dynamics methodology to analyze the casual relationship between the factors effecting on Korean housing market. The research extracted the major factors in housing market based on the law of demand and supply and macroscopically analyzed the housing market mechanism using the factors. It is meaningful that Park et al. (2010) considered the feedback system of the major factors in housing market to overcome the empirical researches' limitation.

2.2 Housing Market Participants' Behavior

To overcome the limitation mentioned above, the relationship of housing market variables and the housing market mechanism should be researched to analyze the market appropriately. So it is needed to analyze the housing market variables and the participant behavior which affects the variables and housing market mechanism so the causal relationship is researched based on previous researches.

The house price in the market is formed by each participant's transaction (Park et al. 2012). So analyzing the participants' behavior is significant. Jeong (2011) researched housing market on the participant's side and argued that there were many situation which couldn't explain using conventional economic principles and analyzed the price distortion in terms of the investor's psychological points. Lee (2011), Ryu and Koh (2012), Lim (2011) argued that there is no reason to have correlation between price and transaction on the premise of both rational human judgment and rationality which were the basis of conventional economic principles but the correlation was found in the world. It can be argued that the amount of transaction would decrease because there may be no person who wants to buy a house when the house price decrease but when the house price increase the amount of transaction decrease in accordance with the principle of supply and demand, so the relation of both price and transaction amount is not logically inevitable. Joeng (2011) argued that the relation of price and transaction was found in Korean housing market and there was exceptional situation that the house price and transaction amount simultaneously increase in Korean housing

market like the bubble effect. To analyze the exceptional situation like the bubble effect many researches were carried on in many areas, particularly the fusion research (Behavioral Economics) of both economics and the psychological factor of human was developed to study economic dynamics based on the participants' behavior in the market.

Behavioral Economics (Behavioral Finance) is the principle to explain the causal relationship of economic dynamics which was not accounted for clearly using conventional economic principles and the behavioral economics doesn't deny the conventional economics which base rational human's decision making on but behavioral economics is the principle to analyze the participants' irrational behavior pattern in market (Olsen 1998).

The reason why it make sense to analyze the market combining the human's psychology and economic principles, is that the psychological factors influence the purchase when the demand buy durable goods (houses) (Katona 1968) and at the house owner's perspective, the decision to sell their house is affected by psychological factors formed by profit and loss because house is the investment goods to the owner (Shefrin and Meir 1985). Ryu and Koh studied how the psychological factors of demand related to house price using psychological index announced by Korea bank and Choi et al. (2004) to explain the cause of sharply increased price of apartment in seoul, developed the model based on the expectation hypothesis of the macro economics. Jo et al. (2010) analyzed the effect of psychological factor on house price using behavioral economics and argue that the factors influenced the rate of return occurred by houses. However, these researches have limitations that it

couldn’t explain the causal relationship of how the psychological factors of market participants affect the market because the researches were performed empirically using statistical data.

2.3 System Dynamics

To overcome the empirical research's limitation, it is needed to analyze the causal relationship between housing market variables and participant behavior and the proper methodology to analyze the relationship should also be needed.

System dynamics methodology is useful to analyze industrial, economics, and social system including many factors and provides dynamic method to the complex nonlinear system (Sterrman 2000). System dynamics focuses on the feedback process of variables of system and base on causal relationship of variables (Hwang et al. 2010). The causal feedback loop is made up of balancing loop and reinforcing loop. The balancing loop act to balance and normalize the system and the reinforcing loop has the character which augments the change of the system (Ahmad and Simonovic 2000).

System dynamics is effective to analyze complex system (e. g. housing market) having invisible feedback system because it bases on the relationship of both the structure and behavior of the system. System dynamics could suggest analytic solution to the problem like bubble effect in housing market because system dynamics focus on causal analysis of variables.

Contrary to empirical research the goal of which is numerical accuracy, the analysis goal of system dynamics is structural accuracy. So system dynamics is effective to use human factor variables which were hard to quantify (Kim et al. 1999). That is the reason why this research use system dynamics methodology and why system dynamics is effective to graft behavioral economics into analysis of market participants' behavior. Figure 2-1 shows the legends of system dynamics.

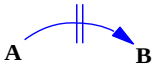
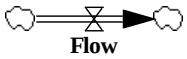
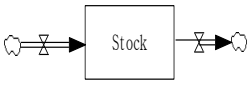
Legends	Explanation	
	When all other conditions are identical	When Factor A increases (decreases), Factor B increases (decreases)
		When Factor A increases (decreases), Factor B decreases (increases)
	Including weighted delayed time between two factors	
	Flows : Define the rate of change in system states and control quantities flowing into and out of stocks, also called ‘Rates’	
	Stocks : Define the state of a system and represent stored quantities, also called ‘Levels’	
	Positive feedback or self-reinforcing loop	
	Negative feedback or self-balancing loop	

Figure 2-1. Legend of System Dynamics (Sterman,2000)

2.4 Summary

The house plays a role of investment goods and space for living. The other houses except for living are leased to the rent demand. The deposit and profit from the house solve the liquidity problem of owner, and therefore the Chonsei contract and monthly rent contract could remain in Korean housing market.

The rent demand is the potential house demand because the deposit of the rent house is used to buy their house. However, because of market stagnation, the potential demand has postponed buying house. So the rent house price increased and the profit of house owner decreased.

To solve the housing market problem, many researches have studied. However, the most of researches are progressed empirically so there was limitation that it couldn't analyze causal relationship of the factors in housing market.

The behavioral economics (finance) is the principle to analyze unreasonable behavior of market participants and the principle focus on psychological factors of market participants. It is meaningful to graft the psychological factors onto the conventional economics based on the principle of behavioral economics because the psychological factors affect the supply and demand in market when they transact their house.

Therefore, the methodology to graft these principles each other is needed and the System Dynamics could be appropriate methodology. The System Dynamics methodology is useful to analyze the complex system including many factors and the human factors which it is difficult to analyze empirically.

The system dynamics focuses on the structure of systems so the system dynamics is useful when the behavioral economics principle is applied to the Housing market which is made of many factors and complex feedback loops.

The Figure 2-2 explains why the system dynamics methodology is useful to this research and the explanation is as follow.

As mentioned above, the housing market is economic system made of many variables which are complicated and are related each other. The behavioral economics deals with the psychological decision process of the market participants which affect the economic activities so the behavioral economics could explain the complex causal relationship of market variables based on the psychological decision process. Therefore, it is useful to use system dynamics because it analyzes the complex economic system based on the systematic recognition so it is appropriate measure to use system dynamics.

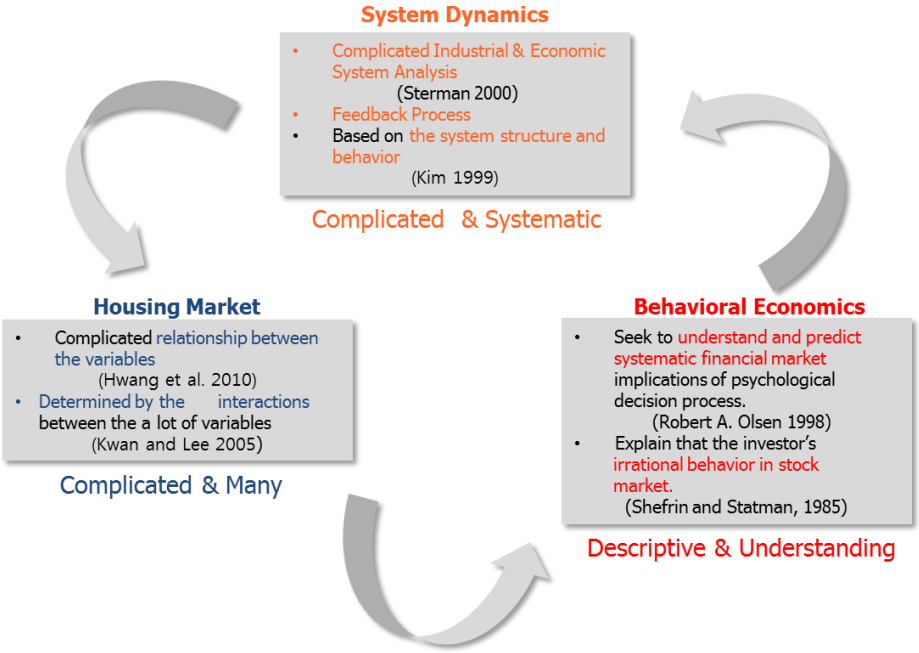


Figure 2-2. Housing Market Analysis using System Dynamics

Chapter 3. Analysis of Housing Market Principle and Development of System Dynamics Model

To explain the housing market principle and to show the dynamics of housing market variables, this research developed the system dynamics model. The purposes of this model is to analyze the causal relationship between the variables which were researched based on the previous researches and how the psychological factors affect the decision process of market participants.

This model was made of the law of demand and supply and the principles of behavioral economics. This model limits the housing supply to the houses which were sold by owner and except the houses which were built by construction companies and supplied by policies of government. The scope of the housing demand was limited to the demands which sold their house, have lived in rent house, entered to housing market for the first time, and were investment demands. And this model includes partially the supply and demand of rent housing (Chonsei) market.

The housing market analysis model of this research is developed based on the causal loop Figure 3-1, 3-2 and each loop can be integrated. However, for the ease of explanation, each part of the model was described in accordance with meaning and causality and the causal relationship of variables based on the previous research which suggested the relation of variables in housing market.

3.1 Demand and Supply Model of Housing Market

The purpose of buying houses is to possess the space for living and to gain the profit by investing in house (Kim 2008). The people who want only the space for living meet their demand by rent house (Chonsei, monthly rent, etc.). If the people buy single house, the house plays the role of both space for living and investment goods and if the people possess more than two houses, except the house for living, other houses would be investment goods. Changes in demand and supply were described based on the law of demand and supply.

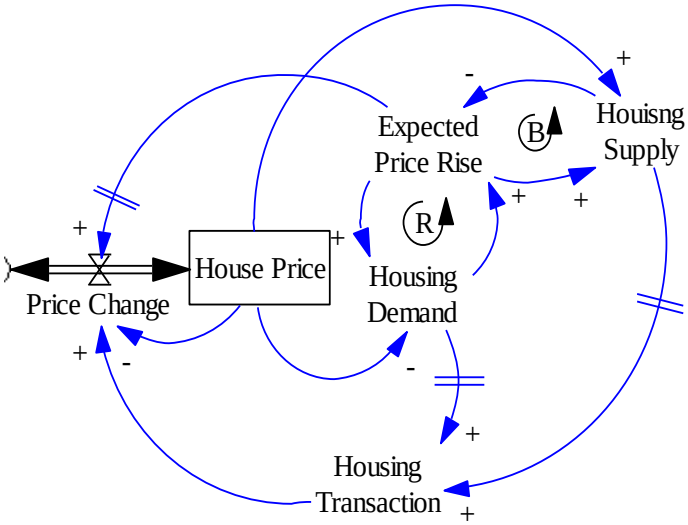


Figure 3-1. Law of Demand and Supply in Housing Market

There is a certain amount of demand which enter housing market for the first time. They rent or buy the house for living depending on market condition. Also there are potential demands which have already entered housing market and have the ability to buy house but live in rent house and investment demands which want to get profit by house exist in housing market. They switch to the demand to buy houses in accordance with market condition

(Hwang et al. 2008; Lee and Lee 2006). When the switched demand buy the house of supply the transaction occur in housing market. To show the process of occurring transaction the model assumed that there is a certain amount of demand in housing market. Also this model defined that the housing demand of this model already had the money to buy house and they decided to buy house of supply when they didn't make a loss by buying house. In ideal market, the transaction occurs by supply and demand and the market maintain a balance according to the law of demand and supply. The explanation of this situation is described as follows.

If the housing market loses the balance of demand and supply by the certain circumstance and the demand increase, the expectation of that house price might increase would be formed (Figure 3-1.: 'House price' increase → 'Expected price rise' increase). The expected price rise means the amount of house price increase by increased demand and it is reflected later in the house price by transaction.

When the housing demand also increases, if the housing supply meets the demand, the amount of transaction would increase. So to make the house price equilibrium the range of fluctuation in price increase and it augment the house price (Figure 3-1.: 'Housing demand' increases → 'Housing transaction' increases → the range of 'price change' increase → 'house price' increase)(Lim 2011). When the house price rise by the increased transaction amount, this situation makes the balancing loop decreasing expected price rise (Figure 3-1.: 'house price' increases → 'housing demand' decreases → 'expected price rise' decreases → the range of 'price change' decreases → 'house price' decreases).

The expected price rise also means the profit of the market participants by

housing transaction when the expected price rise is reflected later in house price. The profit which would be generated by transaction also controls the amount of demand in housing market instead of housing price and the change in demand by profit makes the reinforcing loop. For example if it is anticipated that the expected price rise increase more comparing to housing price, the housing demand would buy the houses to get future profit and it would increase the housing demand again (Figure 3-1.: 'Expected price rise' increase → 'Housing demand' increases → 'Expected price rise' increases again). If the amount of housing transaction is few in the market, the expected price rise couldn't be reflected totally in house price and it would be anticipated that there would be profit comparing to the present house price and this circumstance would cause that the demand increases again. So as the expected price rise increase more, demands grow more. It causes house price increase again but the house price get to rise so the amount of housing supply also increase and finally the market be in equilibrium (Figure 3-1. : 'House price' increases → 'Housing supply' increases).

To know the activity mechanism of supply, this research defined the housing supply as the house owners who have the houses more than one. There are suppliers in market who sell their houses for the capital gain and for retirement savings. So this research assume that there are certain amount of housing supply in market like housing demand and define that the supplier sell their house when they can expect the profit by selling their houses.

When the market loses the balance of both demand and supply by certain situation and so the supply increase in market, the expectation price rise would decrease and it cause house price decline (Figure 3-1.: 'Housing supply' increases → 'Expected price rise' decreases or disappears → The range of

‘Price change’ decreases → ‘House price’ decreases). This situation makes the balancing loop which play the role of finding equilibrium price because the housing supply increases when the house price rise. So this loop regulate the reinforcing loop of housing demand.

So it can be known that the hosing price is formed by housing demand and supply (Jang 2010), which means that there is the process that housing price finds balanced price keeping fluctuating by transaction (Hur et al. 2008). In other word when the perceive price of both demand and supply is balanced the transaction occur and the house price formed by the transaction function as the reference price of other transactions (Figure 3-1.: ‘Housing transaction’ increases → The range of ‘price change’ expands → ‘Housing price’ increases → ‘Housing demand’ falls; ‘Housing supply’ increases → The range of ‘price change’ fluctuates → ‘Housing price’ changes)(Tversky and Kahneman 1979; Kim and Lee 2011). As the amount of transaction also increases in market the expected price rise is reflected in market smoothly. It is because the latest price is released in market and so the accuracy of price information gets higher. Thus the price gap between demand and supply diminishes and it makes the housing market close to the efficient market. In the normal housing market, the house price is balanced through the transaction. However, the transaction amount has decreased after 2008 so the price information couldn’t be reflected smoothly in market. Therefore there is the distortion of housing price in present Korean housing market. The cause of price distortions is the decreased transaction amount and the explanation of it is described as follows.

The housing demands have intention to buy house because of the expensive rent house price, the unstable rent contract (Park et al. 2012) and the increased purchasing power by the low interest rate and decreased house price

(Park 2010). However, the houses lose the investment value in present market because the house price has decreased since 2008 global financial crisis. So the house demands postpone buying house and renew the rent contract, which cause the rent demands and rent price increase and the amount of transaction decreases (Shin 2011).

The house supplier(owner) consider selling their house because of burden caused by mortgage loan interest(유지연 2010), but they have another consideration that they postpone selling the house by the time when the house price increase. It is because the capital gain was decreased because of housing market stagnation and the profit rate was decreased, which is caused by tax and interest of mortgage loan, so they want to recover decreased profit rate (Im 2011). The cause of this situation is that the amount of transaction is few and so the house price is changeless because the price change is slight.

The psychological analysis of the cause that market participants (housing demand and supply) postpone transacting house is described as follows.

3.2 Market participants' Decision Process Model

Before this chapter, this research explained the law of demand and supply of housing market. Transaction is also important variables in housing market so the transaction is analyzed as follow.

The housing transaction influences the house price and market participants and promotes transaction again (Hur et al. 2008; Ryu and Koh 2012). Figure 3-2. shows the effect of housing transaction and price on market participants and the explanation is described as follows.

As show in Figure 3-2. the housing demands have certain time to decide to buy house before transaction (This model express the certain time as delay mark on the link between housing demand and housing transaction). For example, even in case that the demands can expect the profit from buying house, they have the time to search the house which the demands can get maximum profit from. If the demands spend more time to search, the demand would exist in market but the transaction amount would decrease or disappear. The fluctuation of length of time can be explained by the herd behavior of behavioral economics' principle. The thread of herd behavior is that the market participants don't decide their intention based on rational judgment but based on the decision of the herd (Scharfstein and Stein 1990). In other words, the market participants who didn't have enough information for rational decision, would feel anxiety about wrong choice so they get to want to relieve the anxiety and consequently they get to believe that the other people of the participants group (Herd) have more information and also believe that they would decide more rightly. Therefore, they get to decide based on the other

participant choices. In this model, the transaction in market represents the behavior of herd, as the amount of transaction increases, the bulk of herd would increase and also the effect of herd on market participants would grow too. So this research assume that if the transaction amount increases the decision time to buy for demand would decrease and if the transaction amount decrease, the decision time to buy for demand would increase.

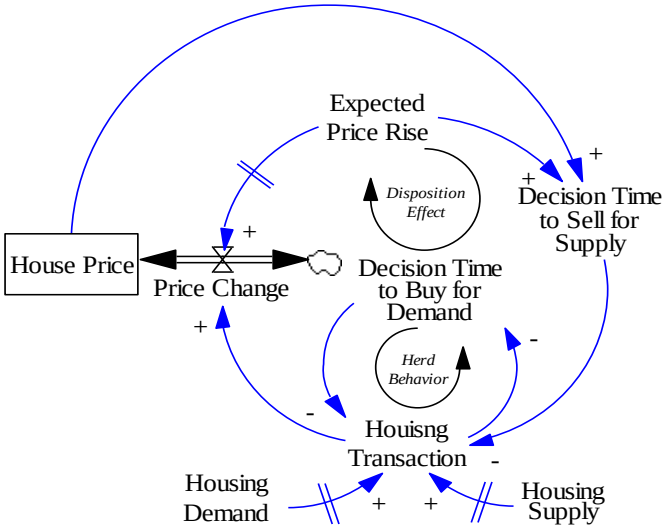


Figure 3-2. Housing Market Participants' Decision Process for Transaction

Figure 3-2. shows the process that the increased housing transaction makes decision time to buy for demand decrease. The increase in housing transaction means that there are many demands so the more transaction occur in market and the effect of herd behavior get to increase, which make the decision time to buy for demand decrease. Thus it increases the transaction amount more (Figure 3-2.: 'Decision time to buy for demand' is reduced → 'Housing

transaction' increases). Therefore, when the housing market is in the boom, decision time to buy for demand would be reduced and so the transaction amount would increase because the effect of herd behavior on demand increased (Figure 3-2.: 'Housing transaction' increases → 'Decision time to buy for demand' is reduced → 'Housing transaction' increases again). If the housing market is in extreme situation like market stagnation or market boom, the amount of transaction affect the amount of demand as well as the decision time to buy for demand. For example, although the demands don't have ability to buy house, they decide to buy house making a loan at the bank (Figure 3-2.: 'Housing transaction' increases → 'Housing demand' gets to increase). Like the housing market stagnation after 2008, the decision time of demands increased and thus the transaction has occurred rarely in market because the herd which is the group not to intend to buy house was formed and the amount of demand in market decreased too. Therefore, it would get to be hard more that the market is normalized (Figure 3-2.: 'Housing transaction' decreases → 'Decision time to buy for demand' increases → 'Housing transaction' decreases more; 'Housing transaction' decreases → 'Housing demand' decreases too). So it gives an explanation that the transaction and house price change in the same direction (Figure 3-2.: 'Housing transaction' increases → the range of 'price change' increases → 'Housing price' increases)(Lim 2011).

As shown in Figure 3-2. the housing supply has the time to search the transaction which give the supplier the maximum profit like the housing demand when the supply sell their houses (it is expressed using delay mark). It means that even if the certain demand wants to buy the supplier's houses the supplier would wait the demand who give a better condition depending on

market condition. The process of decision time to sell for supply is described as follows.

As seen in Figure 3-2. the time to sell the house of supply is decided depending on the decision time to sell for supply and the more short the decision time, the more the amount of transaction get to be. The decision time to sell for supply depends on the intention of supplier and the intention is formed by the psychological factors of supplier. If the supply can expect the profit from selling their house, they would get the intention to sale their house, and if they can expect more profit, their intention would be stronger. On the contrary to it, if they forecast to make a loss from selling their house, the intention would decrease. This situation can be explained by 'Disposition Effect' of behavioral economics (Shefrin and Meir 1985). The tread of disposition effect is that if the investor forecasts to get a loss from selling their investment goods, they postpone selling their goods when they can recover the loss, and if the investor can expect the profit, they get to have the intention to sell their goods, and the stronger intention would be, the more profit they could expect.

Figure 3-2. shows that the decision time to sell for supply changes depending on the profit from selling house. The profit of supply is decided by the gap between the present house price and the expected price rise after selling the house.

When the housing supply can expect the profit after the transaction, the intention to sell the house of supply increases to get the profit and the decision time to sell for supply is reduced too. It is because the disposition effect of supply base on 'Loss Aversion' (Tversky and Kahneman 1991). For example, When the housing market in the boom, the supply could expect to get profit

from housing transaction, but if they don't sell their house, the profit remains 'the expected profit'. The expected profit isn't 'the real profit' so the profit has risk of being reduced or being zero. Therefore, the supplier sells their houses as soon as possible and also the decision time to sell for supply decreases because they don't want to feel the risk. The more the supply can expect the profit, the stronger the effect of loss aversion on supplier is and finally it reduce the decision time of supply.

If the decision time to sell for supply decrease depending on the profit and there are the demand in market, the amount of transaction would increase (Figure 3-2. 'Expected profit rise' increases → 'Decision time to sell for supply' decreases → 'Housing transaction' increases). As the amount of housing transaction increases, the demand also increase because of the herd behavior of demand and thus the house price increases and finally the supply increases as well (Figure 3-1.: 'House price' increases → 'Housing demand' increases too). In this case, the supply as the housing supply increases the house price gets to decrease and also the market would be in balance based on the law of demand and supply. However, if the amount of housing transaction doesn't keep optimal level, the price information formed through transactions can't get to be reflected in market so it makes the perceived price gap between the demand and supply, which finally makes the market more aggravated. Therefore, when the housing market is in stagnation like the present, it would be of help to augment the transaction amount to provide the price information to the market, which coincide in opinion with Park and Yu (2010) who argued that the decrease in transaction amount is more serious than in the house price.

In the present situation where the decision time to buy for demand increased caused by reduced intention to buy house, the housing demand

convert to the rent demand and it cause the rent(Chonsei, monthly rent, etc.) fee increases (Park et al. 2012). Converting the rent housing demand makes the amount of transaction reduced and also makes the profit of supply aggravated, which decreases the intention to sell houses of suppliers. Finally this situation makes the reinforcing loop and it makes the housing market be in stagnation.

3.3 Summary

There is certain amount of housing demand in market. The amount of demand is decided by both housing price and expected price rise (profit from buying house). There is also certain amount of housing supply in market. The amount of housing supply is controlled depending on the house price. So it can be known that the house price is decided by the balance of both the demand and supply and it means that there is the process of finding the balanced price.

The housing transaction plays the role of balancing the house price. It is because the price decided by the transaction plays the role of price information for the other transactions. So the more transactions occur in market the more information exist in market, and the more the information is accurate. So the price gap between supply and demand is reduced and it makes the market efficient.

However, the amount of transaction has decreased since 2008 global financial crisis because the supply and demand have postponed transacting the houses.

As mentioned above, the transaction affects market participants and it promotes the transaction again. The demand and supply have the certain time to search the best transaction and the time is decided by psychological factors. The psychological factors of demand are decided by the herd behavior and the magnitude of the effect depends on the amount of transaction, because the amount of transaction represents the behavior of herd. The amount of transaction is very few in housing market so the demand loses the intention to

buy house. Therefore, the decision time to buy for demand increases and it causes the transaction amount decreases.

The supply also has the time to decide to sell their house. The time depends on the disposition effect and the magnitude of the effect is decided by the profit from selling the house. However, depending on the law of demand, the house price has been decreased since 2008 and the transaction amount is very few so the profit of supply has been reduced too. Therefore, the decision time to sell for supply increased and it cause the transaction amount is reduced again.

As the transaction amount decreased, the gap of perceived price of supply and demand has been wide, it make the market worsen. So it is helpful to the market to make the amount of transaction increase and it concurs with the previous research arguing the decrease in transaction more serious to market than the decrease in price.

Chapter 4. System Dynamics Model

Behavior Tests

The law of demand and supply of housing market and the decision process of housing market participants were analyzed as written before and the causal loops were developed based on the analysis.

The system dynamics model developed based on the causal loops and it went through the behavior tests to know this model has the validity to analyze the housing policies announced by government in 2013. To test this model, Figure 3-1, 3-2 was integrated like Figure 4-1. The test way is described as follows.

This research simulated the market in stagnation and compared the result to real data for the first validation, and to retain more confidence, this model applied the policies announced by government and the result is also compared to real data. The major factor of the policies which is mainly simulated is the change in acquisition tax of house.

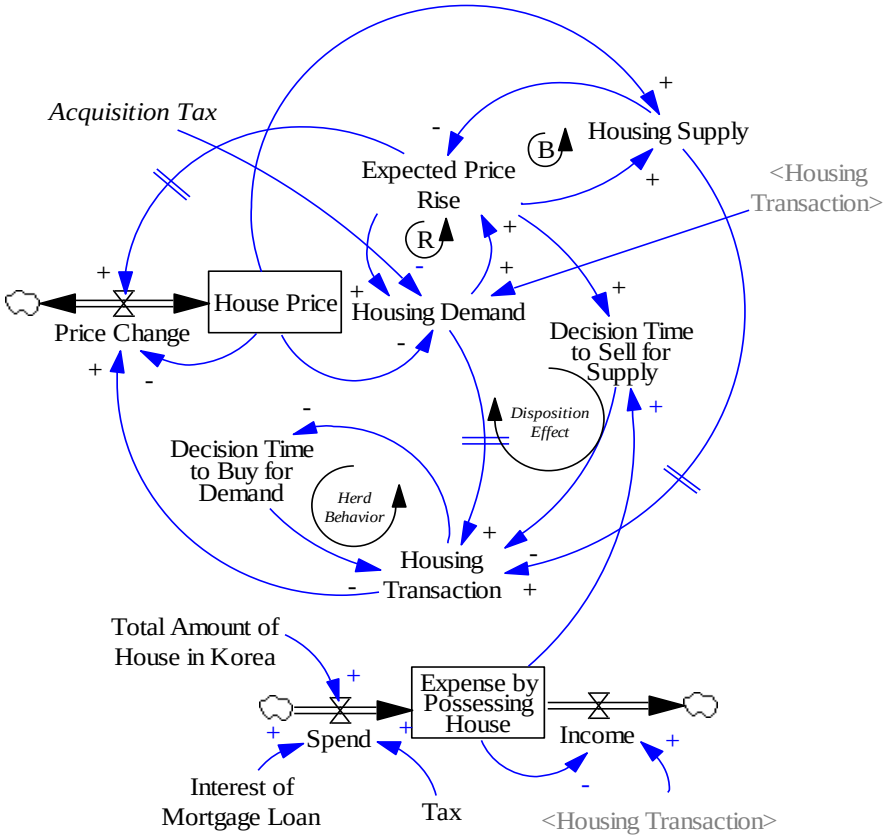


Figure 4-1. Integrated SD Model of Housing Market

4.1 Reducing Purchasing Power

Figure 4-2(a). is the housing sales price index by type before and after 2008 global financial crisis comparing to Nov. 2012 (KOSIS 2013). The global financial crisis was accelerated by the bankrupt of Lehman Brother's in Sep. 15. 2008 (Park and Song 2013). So as the expectation of demands which the price of investment goods would increase, decreased, which make the purchasing power of demand reduced (Chun 2012). Figure 4-2(a) shows that the decrease in demand makes the housing price decrease, which caused by reduced purchasing power of demand after 2008.

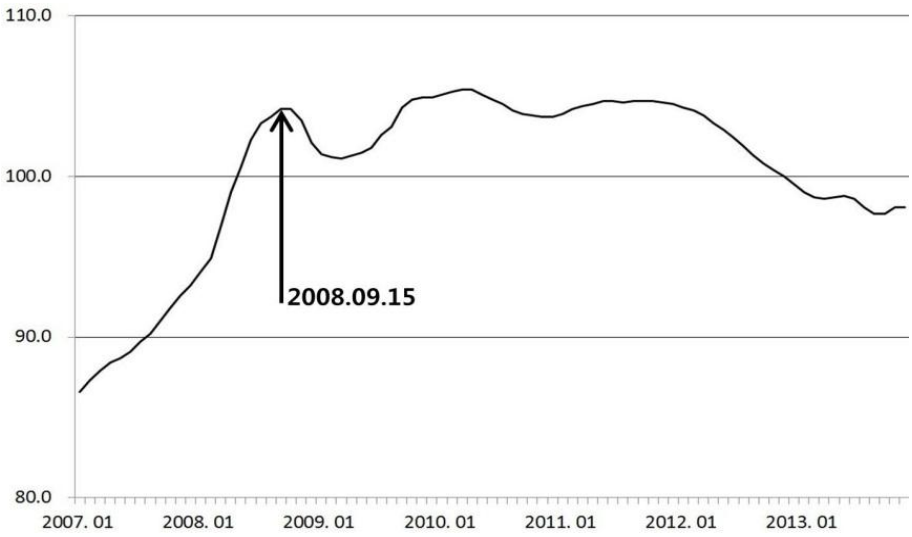


Figure 4-2(a). Housing Sales Price index by Type(Seoul) (KOSIS 2013)

This model applied the decreased purchasing power through reducing the demand which take part in market and the amount of demand decreased by 10% after 10 simulation times. The result of house price forecasting model test is

like Figure 4-2(b). Analyzing the curve of result of Figure 4-2(b). the result of simulation of house price increased slightly for certain period after 10 simulation times. However, after 20 simulation times the result shows the trend of decreasing house price and at the 100 simulation times, the trend tends to rise again. The trend of result progresses like the behavior of real data of KOSIS.

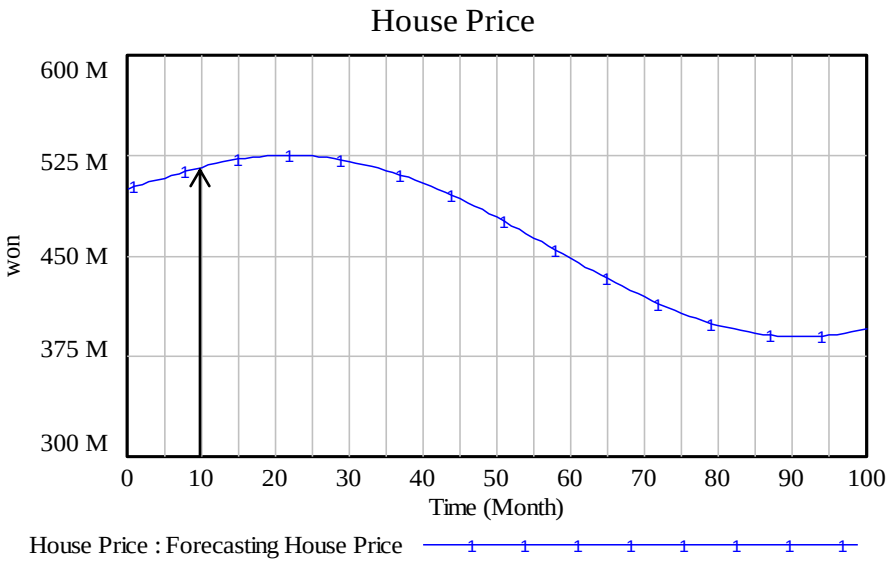


Figure 4-2(b). Result of House Price Forecasting Model

This behavior gives this modal reliability so the first verification for analyzing housing market was finished like this.

4.2 Policy of Decrease in Acquisition Tax

Korean government announced polices (4·1, 8·28, etc.) in 2013 to normalize the market in stagnation. The topic of policies is the exemption and reduction of the acquisition tax to increase the purchasing power of demands. The policies in real market appropriate differently the tax rate depending on house prices.

In order to ensure reliability the policy (8·28) is applied to this model and this model fixed the acquisition rate before the policy at 2% (Graph 2 of Figure 4-3) of house price. This model decreased the rate to 1% (Graph 1 of Figure 4-3) and the result is the Figure 4-3.

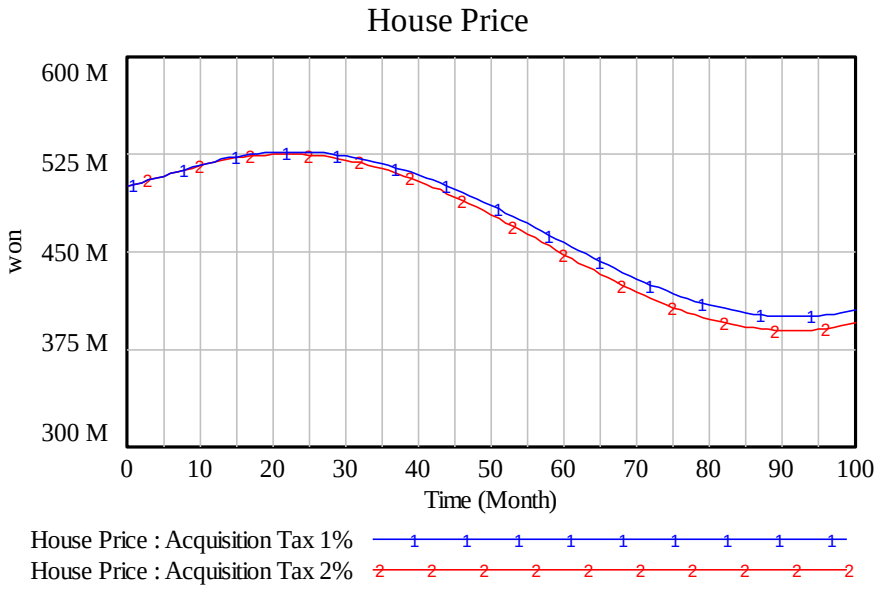


Figure 4-3. Forecasting of House Price after Reducing Acquisition Tax Policy

This result showed that the decreased rate increased the expected price

rise and it augments the demands. So the effect of the rise in house price was showed in the result. However, the range of increasing price wasn't significant.

The increasing in the trends of real data which in the house price of apartment in Seoul after the policy (4·1) in Apr. 2013 wasn't significant. (Average apartment sale price in Seoul per ㎡: 4.91mil won (Apr. 2013) → 4.9mil won (May. 2013) (r114 2013)).

So it was showed that this model has the reliability to analyze the housing market through the behavior test 1, 2.

4.3 Summary

The result of house price test has the similar behavior to real data so it can be said that this system dynamics model has reliability to analyze housing market. To retain more reliability, this test conducted the second test. The housing policy announced by government in 2013 was applied and the result showed the similar behavior to real data of housing transaction amount. So the result of these tests means that this model has reliability to analyze the Korean housing market.

Chapter 5. Verifying The Effect of Policies

In this chapter, the announced policies by government would be verified using the model which was tested at Chapter 4. The purpose to verify the policy is to test the effectiveness of policy and to suggest the direction of policy based on the test results. To simulate the policies, this research applied some variables (Expense of possessing house, tax rate) to the system dynamics model. This research could forecast the ripple effect of implicated policies and could find some policy implications.

5.1 The Effect of Policies on Market Participants' Decision Process

Korean government announced two housing policies (4·1, 8·28) in 2013 to normalize the market in stagnation since 2008 global financial crisis and to enhance housing welfare of ordinary people. The tread of the policies was to relax the regulations which were carried out to control the sharply increasing house price in early 2000s when the housing market was in the boom and was to increase the housing demand. To support the policies the policies induced the purchasing power of demand through expanding the national housing fund.

The contents of the policies were that the rent demands got to be the housing demands by both exempting and reducing both acquisition tax and the transfer tax of house. The purpose of the policies is to revitalize the housing transactions. The 4·1 policy included the part of people who would buy the house for the first time but the 8·28 policy contains all people as

reducing acquisition tax permanently. After policy implementation, the transaction switched to the growth in volume comparing to 2012 and the amount of transaction in Sep. 2013 increased by 63% comparing to Nov (MOLIT 2013). However, announcing the policies in 2013 isn't connecting to the significant revitalization of market so far (MOLIT 2013). Despite Korean government implemented the integrated policies, the cause of that the market couldn't be revitalized is analyzed as follows.

The reinforcing loop of Figure 4-1. shows the effect of the acquisition tax on the housing demand when the demand buying house. To verify the effectiveness of the 8·28 policies, this model reduced the tax rate by 1% (Base case 2%), the result is like Figure 4-3. Comparing the tax rate before reducing (Graph 2 of Figure 4-3.), reducing tax by 1% couldn't affect the house price significantly (Graph 1 of Figure 4-3.). Reducing tax rate also couldn't affect the amount of transaction (Figure 5-1.).

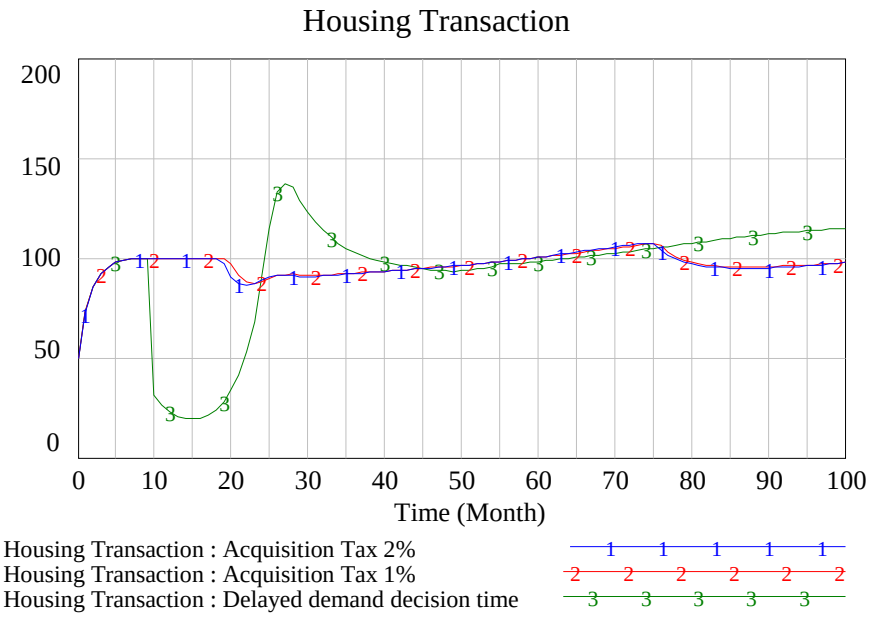


Figure 5-1. Change of Transaction Amount Depending on Policy

The reason is that because the acquisition tax is the one-time charge, the portion of tax is very small comparing to house price, and the range of changing profit by the reduced rate so there is the limitation that the reduced tax rate couldn't increase the profit (Figure 4-1.: Reducing *'Acquisition Tax'* → 'Housing Demand' increase) (Kim 2013). However, unlike the result of simulation, after announcing the policies, the amount of transaction sharply increased in real housing market and the cause of description is as follows.

The 8·28 policy which reduced the tax permanently is an extension of 4·1 policy which exempted the tax temporary and the gap of the time between the two policies converted to the time when the demands postpone buying house to get the benefit from reducing tax rate. It was not simply for the herd of demands to get the benefits, but to decide after implementing policies because

the demands couldn't forecast the market condition after implementing policies. The gap of time between the time of proposing the policy and the time of implementing is applied through delaying the 'decision time to buy for demand' and the result is showed in Graph 3 of Figure 5-1., and Graph 3 of Figure 5-2..

The increase of the decision time to buy for demand reduced the portion of converting housing demand to transaction so it caused decreasing the amount of transaction in market. Decreasing the transaction amount play the role of reducing the intention to buy through herd behavior of demands and it made the decision time to buy for demand increase so finally it made the transaction amount decrease more (Figure 4-1.: 'Housing demand' decreases → 'Housing transaction' decreases too → 'Decision time to buy for demand' increases → 'Housing transaction' decreases again).

Graph 3 of Figure 5-1. Shows that in the case of that the decision time to buy for demand increased, the amount of transaction sharply decreased at 10th simulation time and increased sharply at 20th simulation time and the reason of this situation is as follows. It is because as the time converting the housing demand to housing transaction increased, although the total amount of demand increased, the amount of transaction decreased (Figure 4-1.: 'Housing demand' increases → 'Decision time to buy for demand' increases → 'Housing transaction' decreases). However, at the end of the decision time to buy for demand, as the cumulative demand transacted with the supply at the same time, the transaction amount increased (Figure 4-1.: Decision time to buy for demand' reduced → 'Housing transaction' increased). After this

fluctuation, the amount of transaction returned to normal like the time before implementing policies, based on this result, it can be forecasted that the effectiveness of 8·28 policy is temporary.

5.2 The Impact of Delayed Policy Implementation on Participants' Decision Process and Housing Market

To see the effect of temporary stagnation caused by the time for implementing policies on both housing market and participants, the variable, Expense by possessing house, was inserted in SD model like Figure 4-1. The expense by possessing house was made up of the tax occurred by possessing house and the interest of mortgage loan. This model assumed that the expense of possessing house and the interest for the retention period is paid at the selling their house to see the disposition effect of supply. To observe all the behavioral patterns of housing market, the expense of possessing house is composed of the sum of the expense of all supply in market. The stagnation term of transaction affect the housing market significantly according to the result of this simulation.

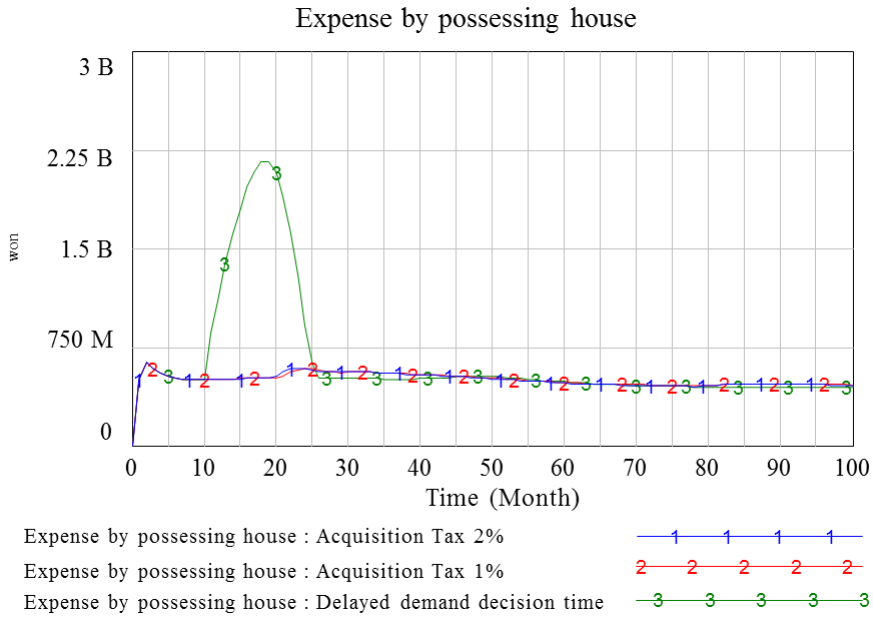


Figure 5-2. Result of Forecasting the Expense by Possessing the house

As seen in Graph 3 of Figure 5-2. it is shown that the expense by possessing house increased sharply for the time of delaying the demands' decision to buy. It can be interpreted like that the interest of supply isn't repaid smoothly because of decrease in transaction in market (Figure 4-1.: 'Housing Transaction' decreases → 'Expense by possessing House' increases). Increase in expense by possessing house means that the accumulation of both interest and tax increases and the accumulation causes decreases in the profit when the supply sales their house. Therefore, the disposition effect of supply makes the decision time to sell for supply increase and it causes the supply can't repay their loan and interest on proper time (Figure 4-1.: 'Expense by possessing house' increases → 'Decision time to sell for supply' increases → 'Housing transaction' decreases → 'Income' decreases). If the supply can't repay their

loan and interest, consequentially the bond security of Korean mortgage loan gets to be deteriorated and it would another financial crisis like U.S financial caused by Sub-Prime mortgage loan and this situation means that the more time to implement the policies increases, the more the housing market is deteriorated. It is because the more policy implementing time gets to increase, the more decision time to buy for demand gets to increase and It causes decrease in housing transaction. As written above, the decrease in housing transaction causes the security of mortgage loan bond gets to be weak. So when the policy to normalize the housing market is implemented it is needed for the policy to give the participants confidence and through quick legislative process, making the transaction occur smoothly by the reducing the decision time to buy for demand can curtail the housing market confusion.

Also as seen in Figure 5-2. the decision times decided by the psychological factors of market participants affect the housing market, if government carries out the policies to buffer the effect of psychological factors on market, it can reduce the confusion in housing market.

5.3 Summary

Korean government announced housing policies (4·1, 8·28) in 2013 to normalize the housing market. The thread of policies is to relax the previous regulations and to induce the demand to buy the house by increasing the purchasing power. The major factor of policy was the decrease or exemption in acquisition tax. The transaction increased right after the policies but it couldn't convert revitalization of market. The cause of continuous stagnation is because the acquisition tax rate has the small portion of house price and the tax is a one-time charge. However, the transaction amount sharply increased right after the policy because the time to implementing policy was prolonged so the accumulated demand transact with supply at the same time. Therefore it could be forecasted that the effectiveness of policy is temporary. However, the expense by possessing the house increased sharply during the time for which the demand postponed buying house, which implies that there would be another financial crisis in Korean housing market. So it is important to reduce the time for implementing the policy and give the participants the reliability of policies and implement the policy to buffer the psychological factors of participants.

Chapter 6. Conclusion

6.1 Conclusion

This research analyzed Korean housing market in stagnation after 2008 global financial crisis based on the law of demand and supply and the psychological factor of both supply and demand which are major market participants based on behavioral economics.

The demand in present housing market has the intention to buy the house because the rent house price increased but they have postponed buying the house because the investment value of house was reduced and the herd behavior effect of demand was reduced too by the decrease in transaction. The housing supply also has the intention to sell their houses because they has had the burden caused by the expense by possessing house but they are delaying selling their house because of the disposition effect by the deteriorated profitability of their houses. To solve the problem of housing market, government announced the policies. This research validated the policies and the result is as follows. The time for implementing the policies affected significantly the decision of participants and the amount of transaction.

The hypothesis built by this research that there was relationship between the transaction and housing market condition, was tested and the result is as follow. The transaction played as the role of reflecting ‘the expected price rise’ to the house price. Therefore, the housing market could remain balanced and the house price could change for the balance by the transaction. However, the decrease in housing transaction implies the possibility of occurring of another

financial crisis in Korea so the time for implementing policies should be reduced to prevent the confusion of housing market.

However, this research doesn't represent every market situation because every variables in housing market wasn't included but the purpose of this research is forecasting the trend of a change in housing market so this research has limitation that this research can't forecast the market variables quantificationally.

However, it is meaningful that this research analyzed the market participants at the microscopic viewpoint based on behavioral economics to forecast the effect of psychological factors on the housing market and to validate the effectiveness of the housing policies. Moreover, this research unearth the relationship between housing market variables so could get increase the explanation power through analyzing the relationship between major housing market variables. So it is significant that the causal relationship was explained because the previous empirical researches' result couldn't explain the variables dynamics.

The future research would progress to the way for increasing the reliability and power of explanation through making up for the limitation and applying more variables of market to this research's model.

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국 문 초 록

2008년 글로벌 금융위기 이후 국내의 주택시장은 침체기를 겪고 있으며 이에 따라 주택가격의 하락, 임대주택가격의 상승등과 같은 주택시장의 문제점이 발생하였다. 주택시장의 정상화를 위해 정부에서는 다양한 주택정책을 발표하였으나 주택시장은 아직 회복세를 보이지 않고 있다. 따라서 본 연구는 주택시장의 침체 원인 분석하기 위해 주택 시장의 주요 참여자인 주택보유자와 주택 수요자를 기존의 수요 공급 원리에 의해서 분석하며 이들의 거래의사에 영향을 미치는 심리적 요인을 파악하기 위해 행동경제학 이론 중 군집행동과 처분효과 이론을 인용하여 주택시장을 분석하였다. 주요 시장 참여자인 주택 수요자는 다른 수요자 군집의 결정에 의해서 심리적 영향을 받게 되며, 주택공급자는 주택을 매각할 경우의 예상 수익에 따라 심리적 영향을 받는 것으로 나타났다. 또한 본 연구는 주택시장의 정상화 방법을 찾기 위해 시장에서 거래량과 시장과의 상관관계가 있음을 가정하고 이를 검증하였다. 이를 바탕으로 본 연구는 정부에서 발표한 주택시장 안정화 정책을 시스템 다이내믹스 방법론을 사용하여 정책의 실효성을 검증하였다. 정책의 입안 기간에 따라 주택소비자의 구매결정시간과 주택공급자의 매각결정시간이 정해지는 것으로 나타났다. 또한 시장 참여자의 의사결정시간은

주택 거래량에 영향을 미치는 것으로 나타났으며, 주택 거래량은 국내 주택담보대출 총액에 영향을 주는 것으로 나타났다. 주택 담보대출 총량의 증가는 국내의 금융위기를 초래할 수 있으므로, 정부의 정책입안 시에는 정책의 발의 시점부터 정책 시행까지의 시간을 단축시키는 것이 시장의 혼란을 줄일 수 있을 것이다.

주요어: 주택시장, 주택정책, 행동경제학, 시스템 다이내믹스

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