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KOREAN REAL ESTATE MARKET AND BOOSTING POLICIES : FOCUSING ON MORTGAGE LOANS

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ABSTRACT: Currently, Korean real estate market has experienced cooling down of the business because of the global economic crisis which resulted from the subprime mortgage lending practice. In response, the Korean government has enforced various policies at the base of deregulating real estate speculation, such as increasing Loan to value ratio (LTV) in order to stimulate housing demand and supply. However, these policies seemed to result in deep confusion in the Korean housing market. Furthermore, analysis for housing market forecasting, especially international financial crisis on Korean real estate market, has been partial and fragmentary, therefore comprehensive solution and systematical approach is required to analyze the real estate and real estate financial market including causal nexus between market determining factors. In an integrated point of view, applying the system dynamics modeling, the paper aims at proposing Korean Real Estate and Mortgage market dynamics models based on fundamental principles of housing market determined by supply and demand. We also find the impact of deregulation policies focusing on mortgage loan which is the main factors of policies.

Keywords : System Dynamics, Real Estate Market, Mortgage Loan, LTV

1. INTRODUCTION

Over the past three years, subprime mortgage crisis which resulted from mortgage delinquencies increase, especially among riskier loans has caused financial crisis internationally. Because of this, homeowners, lenders, financial institutions, and investors have felt anxiety about economic recession like the Great Depression [1]. Similarly, Korea is no exception to this rule. Korean real estate market has also experienced cooling down of the business because of the global economic crisis result from the subprime mortgage.

From the beginning of the 2000, however, housing values in Korean real estate market has sky-rocketed, accordingly [2], the Korean government has regulated speculative demands to burst house price bubble. Especially, from the early 2005 to the late 2007, the Korean government adopted policies which restrain housing loan such as increasing interest rates and limiting an amount of loans. (i.e., Loan-to-value Ratio and Debt to Income decrease) Furthermore, Korean secondary mortgage market hasn't been activated, so the Korean real estate finance market crisis such as subprime mortgage crisis wouldn't happen. On the other hand, after the subprime mortgage crisis, Korean real estate market has suffered from house value decrease and contraction of housing transaction. Consequently, in the second half of the 2008, the Korean government was forced to adopt

boosting policies at the base of deregulation of the real estate speculation such as Loan to Value ratio (LTV) increase and Debt to Income (DTI) increase in order to stimulate housing transactions and boost house prices. But these policies could bring about the second subprime mortgage crisis in Korea, because the over-collateralized, high risk securities which will be circulated in secondary mortgage market would create a monster in the market as no one could determine the true value or risk of these derivatives [1].

Therefore, in an integrated point of view, applying the system dynamics modeling, the paper aims at proposing Korean real estate and Mortgage market dynamics models based on fundamental principles of housing market determined by supply and demand. First, we develop a universal real estate and mortgage market model and analyze the impact of deregulation policies while focusing on mortgage loan expansion, which is the main factor of these policies. Second, we propose comprehensive solution and systematical approach including causal nexus between market determining factors.

2. OVERVIEW OF KOREAN REAL ESTATE MARKET

2.1 Korean Housing Market Structure

In general, house price is determined by the supply and demand function, which is acknowledged as the market

principle. As illustrated by Fig.1, *Housing Supply* includes *Newly-Built Housing* and *Existing Housing on Sale*. *Housing Demand* is derived from the sum of both *Actual Demand* and *Investment Demand*. *Actual Demand* represents a means of living and *Investment Demand* means the demand for property accumulation.
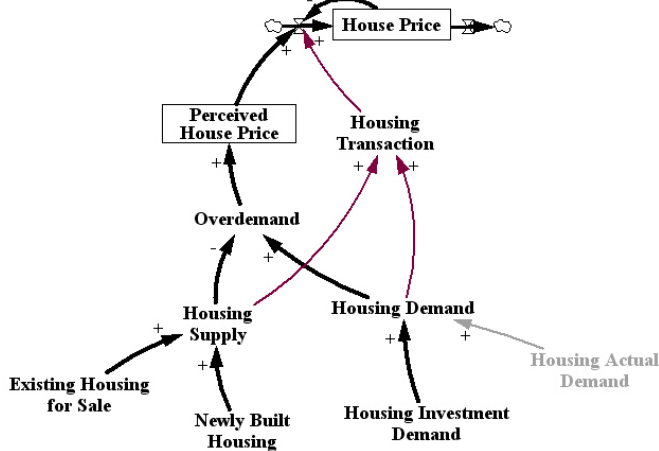

Fig. 1. House Price Determinants

Then, *Perceived House Price* (i.e., which is defined as possibility of price volatility perceived by consumer before *House price* is determined) is derived from *Overdemand*, which is subtracting *Housing Supply* and *Housing Demand*. This *Perceived House Price* is transformed into actual *House Price*, when the supply and demand is converted into *Housing Transaction*.

On the other hand, this model is based on the assumption that *Housing Actual Demand* couldn't play a important role, because KB Bank, which is the leading private bank in Korea, finds that the most of the housing demand think of the house as a means of property accumulation [3].
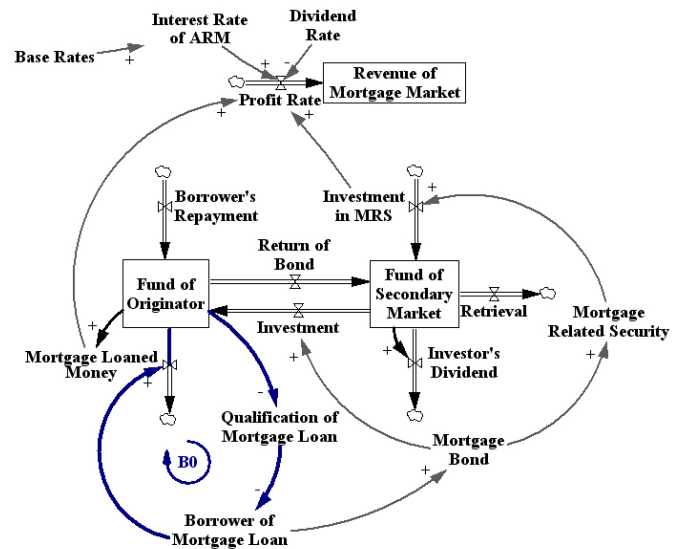
2.2 Real Estate Financial Market

Real estate finance plays an important role in housing market. While customers borrow money and credit for the purpose of developing or acquiring real estate property, financial agencies (e.g., commercial banks, mutual saving banks, other lending institutions) make profits through mortgage loans.
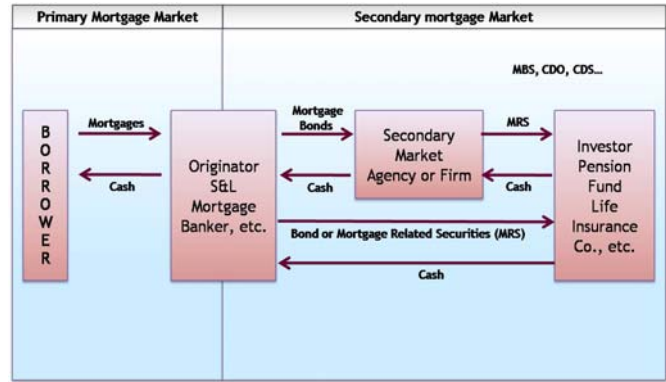
Fig. 2. Mortgage Market Structure [4]

As presented by Fig.2, Mortgages are originated by the initial lenders, such as thrifts of mortgage bankers in the primary mortgage market, while some thrifts and all mortgage bankers sell these loans in the secondary market. Agencies and firms that purchase mortgages in the secondary market most often raise the funds required for the purchase by issuing bonds or other types of debt instruments [4].

Fig. 3. Real Estate Financial Market Structure

This study expresses the general real estate financial market structure focused on mortgage market using System Dynamics (SD) modeling as illustrated by Fig.3.

Fund of Originator means the primary mortgage agencies' cash liquidity. Similarly, *Fund of Secondary Market* represented the secondary mortgage markets' (e.g., Freddi Mac Fannie Mae, Investment Bank) cash liquidity. *Mortgage bond*, which is defined as bond secured by a mortgage on a property, are backed by real estate or physical equipment that can be liquidated. *Mortgage Related Securities* means the sum of mortgage-backed security (MBS) and its derivatives. MBS is an asset-backed security whose cash flows are backed by the

principal and interest payments of a set of mortgage loans. Payments are typically made monthly over the life time of the underlying loans. [4] Furthermore, a derivative security derives its value from another security, index, or financial claim. Because the value of mortgage-backed securities (MBS's), such as MPTs and CMOs, are based on pools of mortgages, both are referred to as "derivatives". There are many other derivatives such as options, swap, and so forth [5].

Also, mortgage market earns profits by making a commission fee between *Borrower of Mortgage Loan* and *Investment in Mortgage Related Securities*. In other words, financial market lends mortgage loan to borrower at the interest rate on loan (i.e., interest rate on loan is represented as *Interest of ARM*, because Adjustable Rate Mortgage is in common use in mortgage market) related to *Base Rate*, while issuing the securities at *Dividend Rates* lower than interest rate on loan. Therefore, the more financial agencies lend mortgage loan and issues mortgage related securities, the more profits financial agencies makes. So, financial agencies keep on lending mortgage loan until agencies' fund liquidity is lacked (Loop B1). However, if they issue the MRS to ensure fund liquidity and investors buy the securities, they lend mortgage loans and issue the MRS much more.

2.3 Current Real Estate Policies in Korea

Nowadays, Korean economy is suffering from a business recession derived from international subprime crisis. In particular, Korean real estate market is badly influenced by housing transaction shrinking, the fall of house price and continuous occurrence of unsold apartment. Accordingly, to activate the business condition of real estate market, the Korean government adopted boosting policies at the base of deregulation of the real estate speculation.

On October 21, 2008, the Korean government announced comprehensive real estate program which removed the Excessive Real Estate Investment Areas (i.e., Excessive Real Estate Investment Areas are where house price bubble may happen, because of high speculative attractiveness). In Excessive Real Estate Investment Area in Korea, 40% of Loan to Value Ratio (i.e., Loan to Value Ratio means the amount of a first mortgage lien as a percentage of the total appraised value of real property. LTV is one of the key risk factors that lenders assess when qualifying borrowers for a mortgage.) and 40% of Debt to Income (i.e., Debt to Income is the percentage of a consumer's monthly gross income that goes toward paying debts.) are applied to mortgage loan which is below the 10-year-stipulated time or above 10-year- stipulated time and 6 billion won.

However, when Excessive Real Estate Investment Area is transformed into general area, LTV will be increased to 60%, and DTI will be removed.

3. SYSTEM DYNAMICS

System Dynamics is a modeling tool that provides an understanding of strategic problems in complex dynamic systems.

Table 1. Causal Loop Diagram [6]

Causal relationship	Relationship between effective factors	
A ——+—→ B	When another conditions are same	When Factor A increases (decreases), Factor B increases (decreases)
A ——-—→ B		When Factor A increases (decreases), Factor B decreases (increases)
A ——┼—→ B	Including weighted delayed time between two factors	

An SD model provides system users with insight into the feedback processes and dynamic behavior of a system. Also, this model is made up of feedback loops and their variables, which are known as causal loop diagrams or influence diagrams. Feedback loops can be divided into two categories: (1) a balancing loop which is a goal seeking structure of the system that causes balance and stability, and (2) a reinforcing loop which generates a growth process in which action builds a result that generates still greater action [7].

System dynamics modeling enables a comprehensive solution and systematic approach to analyze the impact of Korean real estate policies

4. POLICY MODEL

4.1 Housing Investment Demand & House Price

In general market principle, there are significant causal relation between *Housing Investment Demand* and *House Price*. As shown in Fig.4, *Expected Profit from Trading* is an essential factor to explain that relationship. *Expected Profit from Trading* is defined as expectancy of householders' profit production when trading houses. Also, *Expected Profit from Trading* determined by time variation of *Perceived House Price* and *House Price* formed by *housing Transaction*.
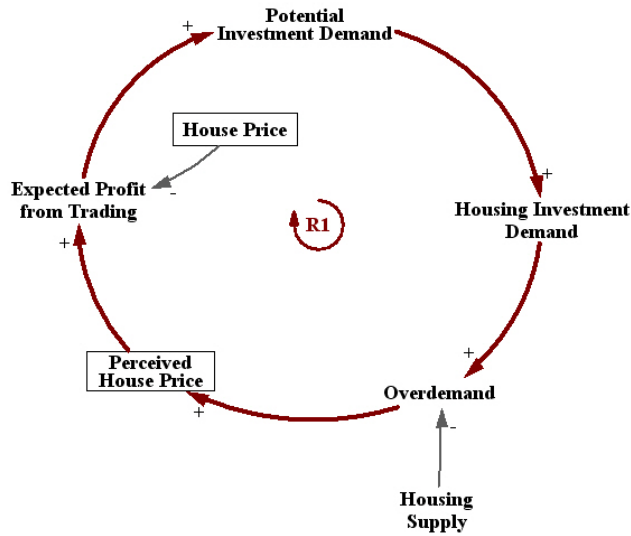
Fig. 4. House Investment Demand and Expectancy of House Price Rising

In the housing market, when *Housing Investment Demand* is high, customers expect future house price increase. (i.e., *Perceived House Price* increases.) Therefore, more powerful speculative demand will lead the market (Loop R1).

However, as shown by Fig.5., if *Perceived House Price* is transformed into *House Price* as a result of *Housing Transactions* being activated, *Expected Profit from Trading* decreases (Loop B1-a, B1-b). Accordingly, *Investment Demand* is controlled, because investors wouldn't expect coming price rise in that situation where *House Price* seems to arrived at a definite point.
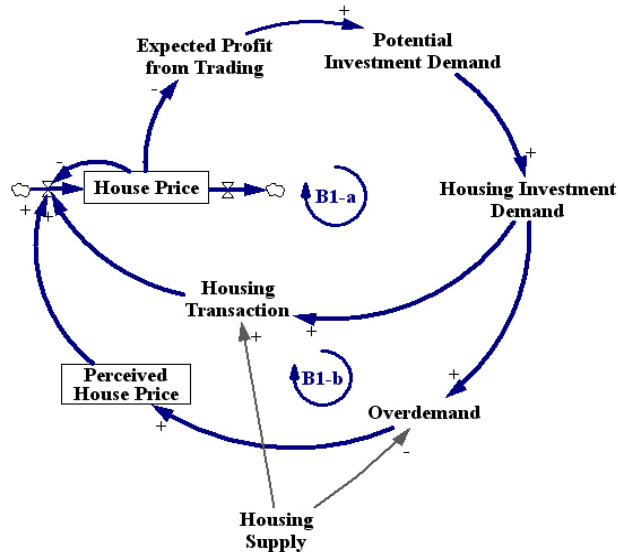

Fig. 5. Housing Investment Demand & House Price self-control

4.2 Mortgage Market Behavior

In mortgage market, the primary financial agencies lend borrowers mortgage loan to make profits. As illustrated by Fig.6., the primary mortgage agencies (i.e., *Fund of Originator*) lower *Qualification of Mortgage Loan* (i.e., an amount of loans and credit rating which are possible to lending) to lend much money for making more profits. So, they become have more mortgages, but experience actual money shortage. To solve these problems, they make mortgage bonds and sell these to secondary mortgage agencies or other private investors in order to insure fund liquidity (Loop R2-a). Consequently, they are able to keep lending more mortgage loan and earn more profits.
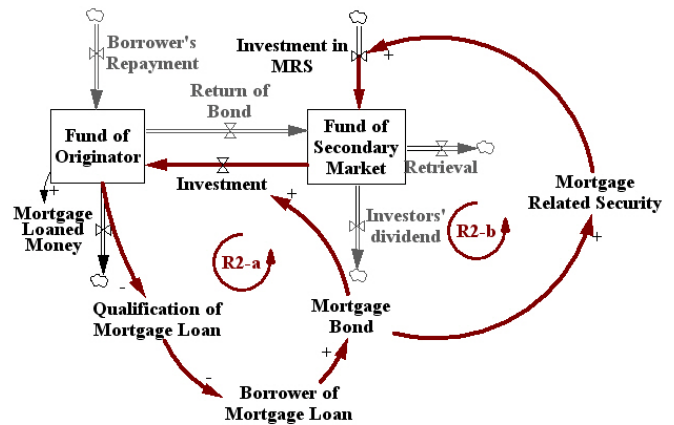

Fig. 6. Investment in Mortgage Related Securities

On the other hands, after secondary mortgage agencies other private investors invest in Mortgage Bond, they wish that they solve their fund liquidity lacking and make more profits. So, secondary mortgage agencies place *Mortgage Bonds* into a pool of similar mortgages and make *Mortgage Backed Securities* and new derivatives (i.e., a part of *Mortgage Related Securities*) in a process called "securitization". After this, secondary mortgage agencies sell the MRS to investors like private investors or investment banks (Loop R2-b). Like the primary agencies, they are able to keep investing in more mortgage bonds and make other derivatives.
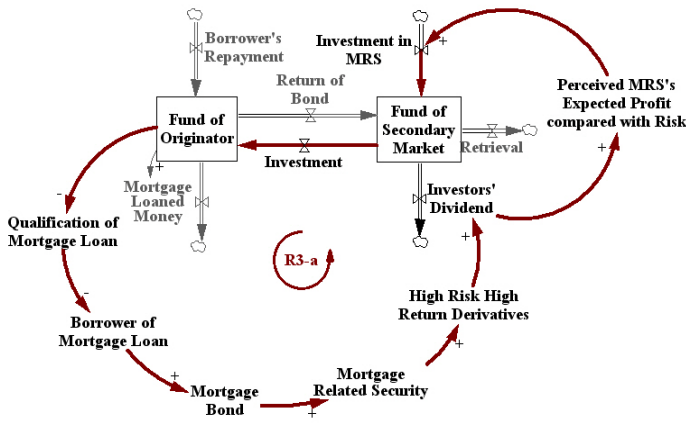
Fig. 7. Mortgage Market Activation

Fig. 8. Amplification of Derivatives Generation by Mortgage Agencies

Process of securitization has a positive effect on real estate market associated with house holding, because potential housing demand can make up a sum of money to get a house through mortgage loan. Likewise, as shown in Fig.7., R3-a Loop represent a process of mortgage loan activating by mortgage securitization. The secondary mortgage agencies make more *Mortgage Related Securities* to make profits. In this process, mortgage derivatives derived from *Mortgage Backed Securities* (e.g., Collateralized bond Obligation, Collateralized Debt Obligation, Credit Default Swap, and etc.) get diversified and transformed into high profitable but high risky financial products. These seem to bring such a high dividends that investors expect more profit from these derivatives (i.e., *Perceived MRS's Expected Profit compared with Risk increases*), so they attempt to invest in derivatives more and more. Consequently, the primary agencies get much fund liquidity to lend mortgage loans (Loop R3-a).

On the other hands, as illustrated by Fig.8., the more investors buy mortgage derivatives, the more mortgage agencies make profits through a commission fee (i.e., *Investment in MRS* increases, then *Revenue of Mortgage Market* increases). Before long, mortgage market becomes a high profitable investment market, so competition in an earning rate of mortgage derivatives would be deepen because of market participants increase (i.e., *High Risk High Return Derivatives* increases). Accordingly, MRS is more popular, because of high returns, therefore mortgage agencies issues more high profitable but more risky and changeling derivatives. In other words, derivatives are such transformed through lots of process of securitization that investors cannot recognize the derivatives' origin. Therefore no one could determine the true value or risk of these derivatives
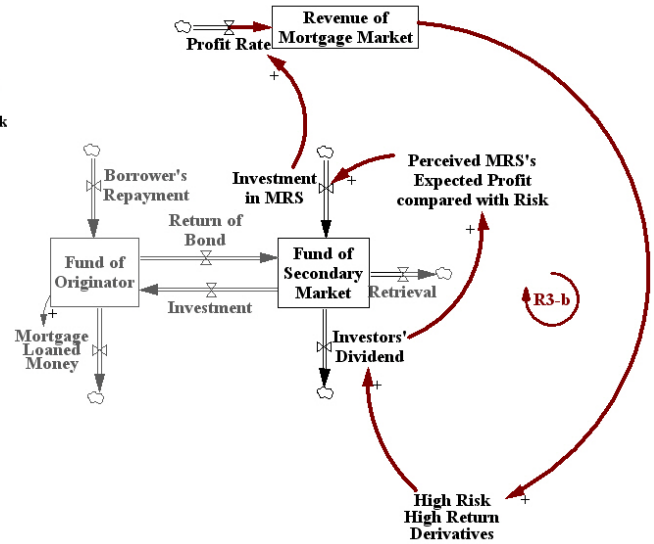
However, as shown in Fig.9., while *High Risk High Return Derivatives* increases, the risk, which wouldn't be able to be recognized by investors, become increases more. As soon as investors recognize the *MRS's Risk*, *Perceived MRS's Expected Profit compared with Risk* decrease, so they try to retrieve invested fund from mortgage market. Especially, if *Personal Default Rate* increases, mortgage bonds' worth depreciation lead to MRS derivatives' risk increases derived from mortgage bonds' risk. Consequently, mortgage agencies reduce high risk derivatives because investors recognize their investment risk.
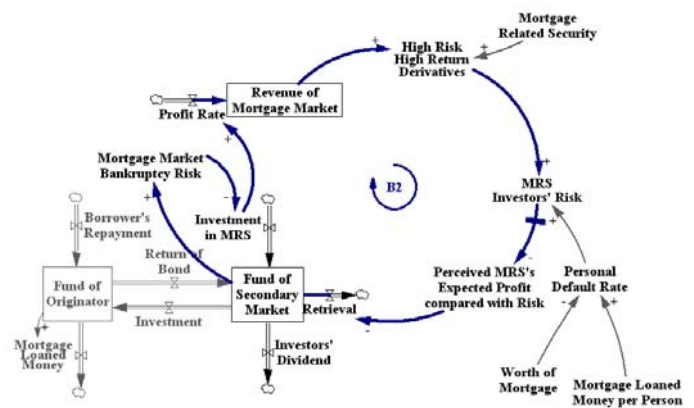

Fig. 9. Adjustment of Derivatives Generation by Mortgage Agencies

As represented by Fig.10., there are reinforcing relationships between *House Price* and *Mortgage Loan*. If

House Price increases, householders get more *Rental Profit* and Mortgage become more valuable, so they would repay mortgage loans much sincerely and mortgage agencies try to lend mortgage loan because of borrowers' credit. Conversely, if *House Price* decreases, Householders could default on obligation to repay mortgage loan, because they fail to pay one's financial debt, or *Personal Default Rate* increases (i.e., After borrowers compare the remainder of mortgage loan with house value, they could default on obligation to repay mortgage loan). In the result of this, mortgage agencies would experience fund liquidity shortage, so housing transactions and housing demands would fall off (Loop R4-a, R4-b).

house. So, government expected that it could activate function of Loop R1, in other words, after they raise *Perceived House Price* by increasing *Housing Investment Demand*, they will be able to activate *Housing Transaction*. More than, it could activate mortgage market by operating loop R2-a and loop R2-b, as a result of this, they keep on stimulating housing demand in order to maintain adequate house price.
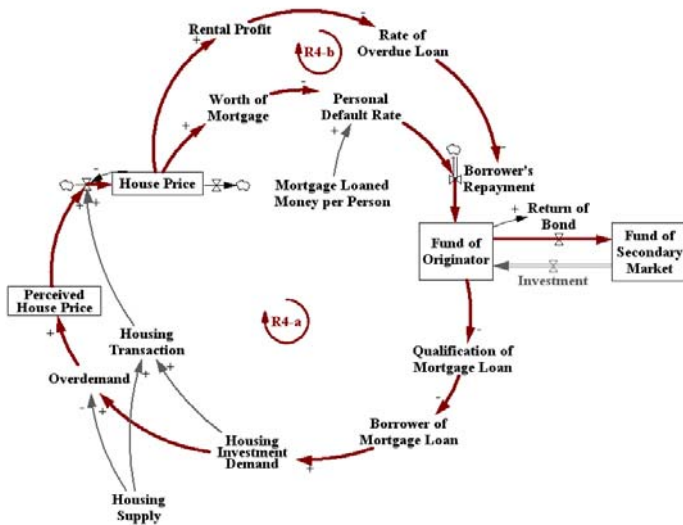

Fig. 10. Relationship between House Price and Mortgage Loan

5. POLICY ANALYSIS

This study attempts to analyze the fundamental structure of the Korean real estate and mortgage market with a focus on profit-seeking behaviors of borrower, lender, and investors. Based on the result of this modeling and analysis, Korean current deregulation policies will be examined.

The Korean Government adopted policies to activate housing transaction and prevent a sudden house price drop, especially removing a part of Real Estate Investment Area and an accompanying deregulation of mortgage loan. , In other words, LTV of this area will be increased to 60%, and DTI will be removed.

Fig.11. represents the Korean government's desired effect of those policies. The Korean government increases LTV and DTI to expand housing demand by lending much money to borrowers who have aspirations to own their
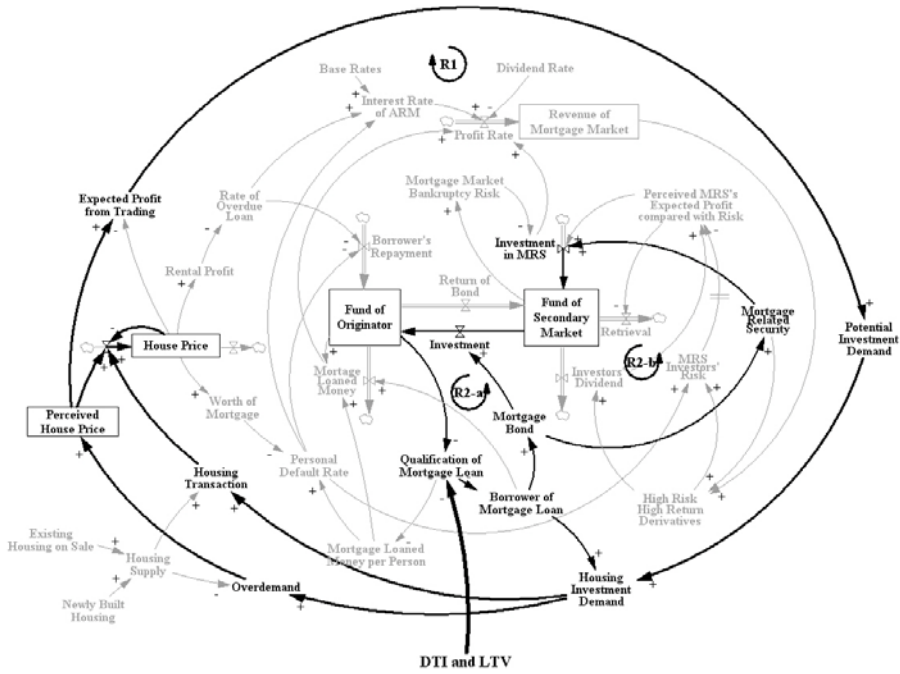
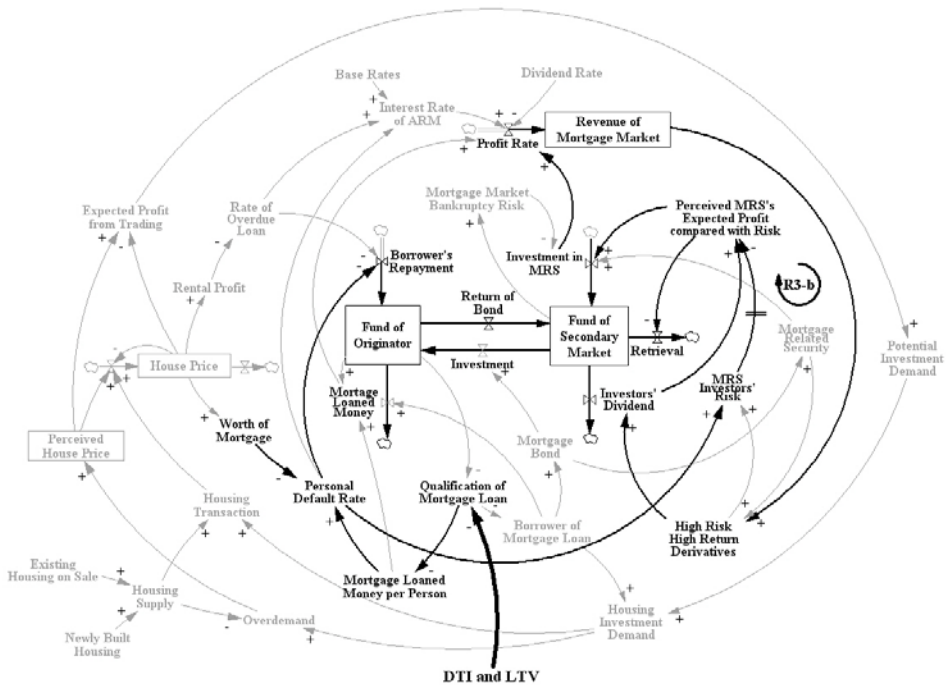**Fig. 11.** Government Expectation of Policies' Effects

Fig. 12. Forecasted Side Effects of Policies

However, as illustrated by Fig.12., an excessive and indiscreet mortgage lending could generate malignant transformed derivatives like function of R3-b Loop, which have the possibility of resulting in the second subprime mortgage crisis. Similarly, if mortgage agencies lend mortgage loan to people who have low credit rating, high risk derivatives accompanied by increasing Personal Default Rate could be increased. Consequently, this situation cause default on a debt of mortgage loan borrower and *Fund of Originator,* as a result, the primary and secondary mortgage agencies may be in danger of going bankruptcy because of fund liquidity lacking such as recent subprime mortgage crisis.

On the other hand, mortgage agencies can self-adjust *Qualification of Mortgage Loan* in case of perceiving default risk. In this situation, these policies would be meaningless as these cannot stimulate *Housing Investment Demand* and *Housing Transactions*.

6. CONCLUSIONS

This study tried to analyze the Korean Government's deregulation policies on housing demands using qualitative System Dynamics modeling. Causal loop analysis of the deregulation policies explains that such policies will have little effects on real estate market in this depressed market situation.

First of all, depending on market structure and responses, those policies can result in side effects of policies rather than positive effect. In other words, deregulation on mortgage loan could be the beginning of another subprime mortgage crisis.

Second, in the Korean real estate financial market where secondary mortgage market has been inactive, the primary mortgage could not be accommodated with money by mortgage investors, even though government intends mortgage agencies to lend more mortgage loan. Furthermore, if mortgage agencies tend to restrain excessive lending because of economic slump, these policies will have little effects on stimulation of housing demands.

On the other hands, when government intends to activate secondary mortgage market, risky derivatives' generation will have to be cut off through related policies.

This study found policies' effect on real estate market logically using system dynamics, through understanding causal relationship between real estate market factors. In future study, we should apply financial behavior of construction company related housing supply. Consequently, this system dynamics model will be examined from not the perspectives of housing price, supply and demand, but also behavior of real estate financial market and construction companies. Also, attempt at validation should be made using national data on housing policies.

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