

# Evolution and Current Structure of Housing Guarantee System in Korea

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# Pre-sale of Housing System in Korea

- Construction companies generally sell new houses including apartments before they are complete in Korea.
- This pre-sale of housing system has been widely used for construction financing of new homes since 1984.



# Pre-sale of Housing System in Korea

- Under the system, home buyers usually pay the initial contract fees and final payments with their own money and borrow money from lenders in groups for middle payments for new homes that are still under construction.
- Middle money accounts for a large portion of housing price.
- The pre-sale of housing system has promoted the construction of new houses, although construction companies have limited resources.



# Pre-sale of Housing System in Korea





# Construction Companies May Fail to Deliver Houses to Home Buyers

- However, home buyers are exposed to risk that construction companies may not be able to complete the housing construction and thus fail to deliver new homes to home buyers.



# Household Assets and Liabilities in Korea

- According to the survey of household finances and living conditions in 2015 by the Statistics Korea, as of the end of March 2015, the mean value of household assets and liabilities recorded 342.46 million won and 61.81 million won, respectively.
- Household financial assets made up 26.5% of the total assets, whereas real assets accounted for 73.5% of the total assets.

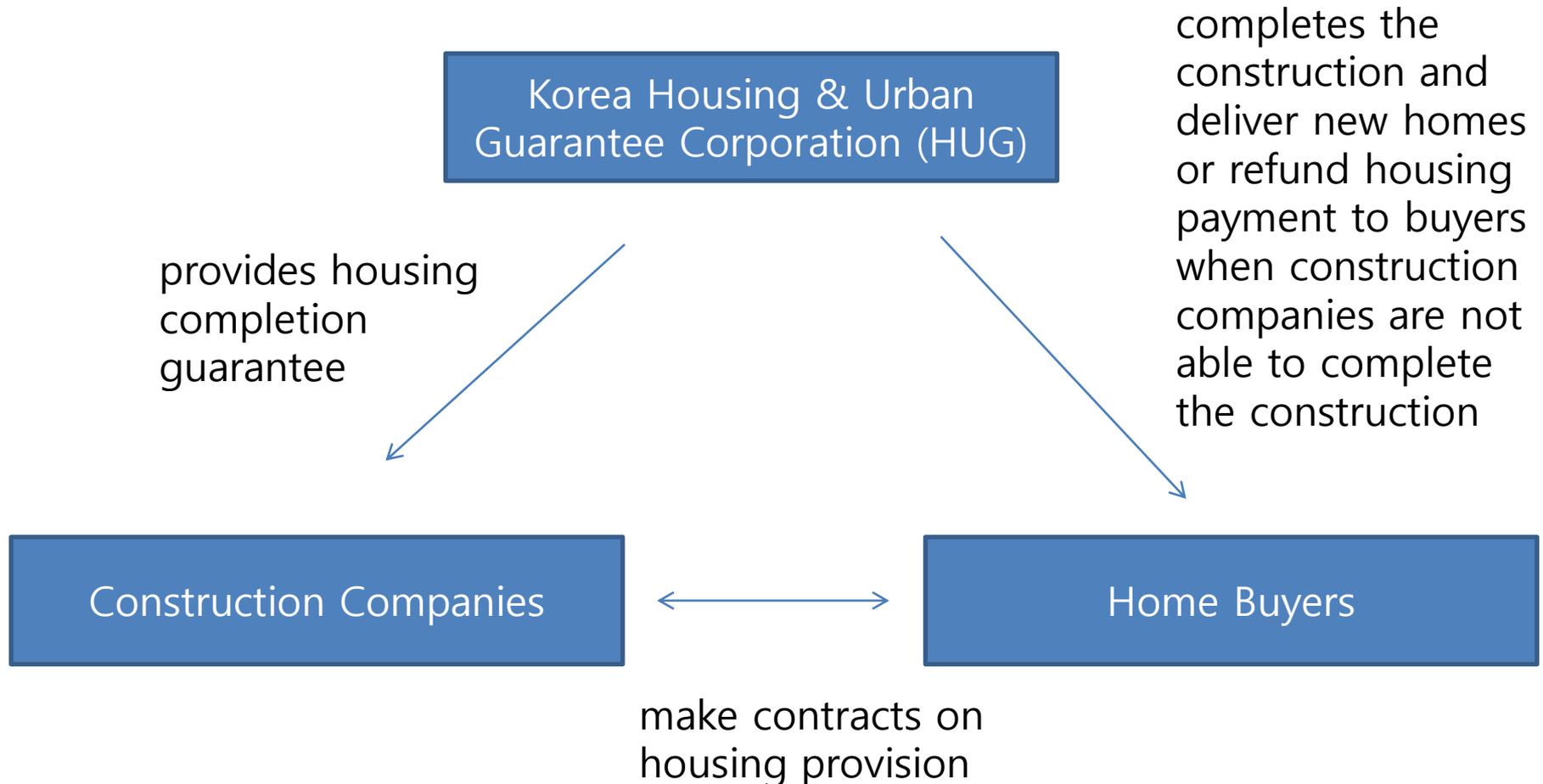


# Housing Guarantee System in Korea

- In order to protect home buyers from such risk, Korea Housing & Urban Guarantee Corporation (HUG), a state-run institution, provides housing completion guarantee to construction companies.
- In this guarantee, HUG will complete the construction and deliver new homes or refund housing payment to buyers when construction companies are not able to complete the construction.
- HUG is the only institution in Korea, which provides such guarantee service.



# Housing Guarantee System in Korea

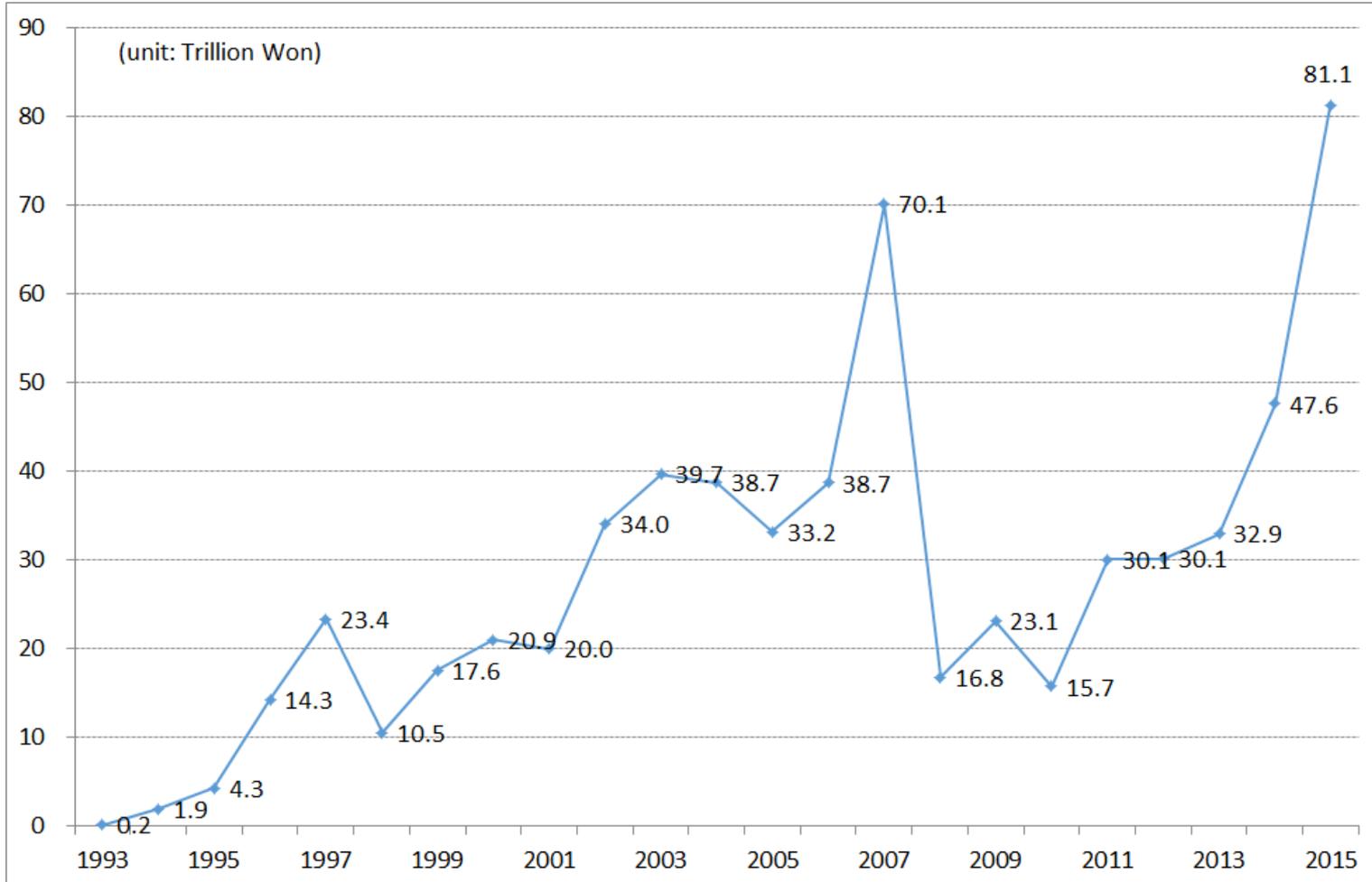


# Do We Need New Housing Guarantee System?

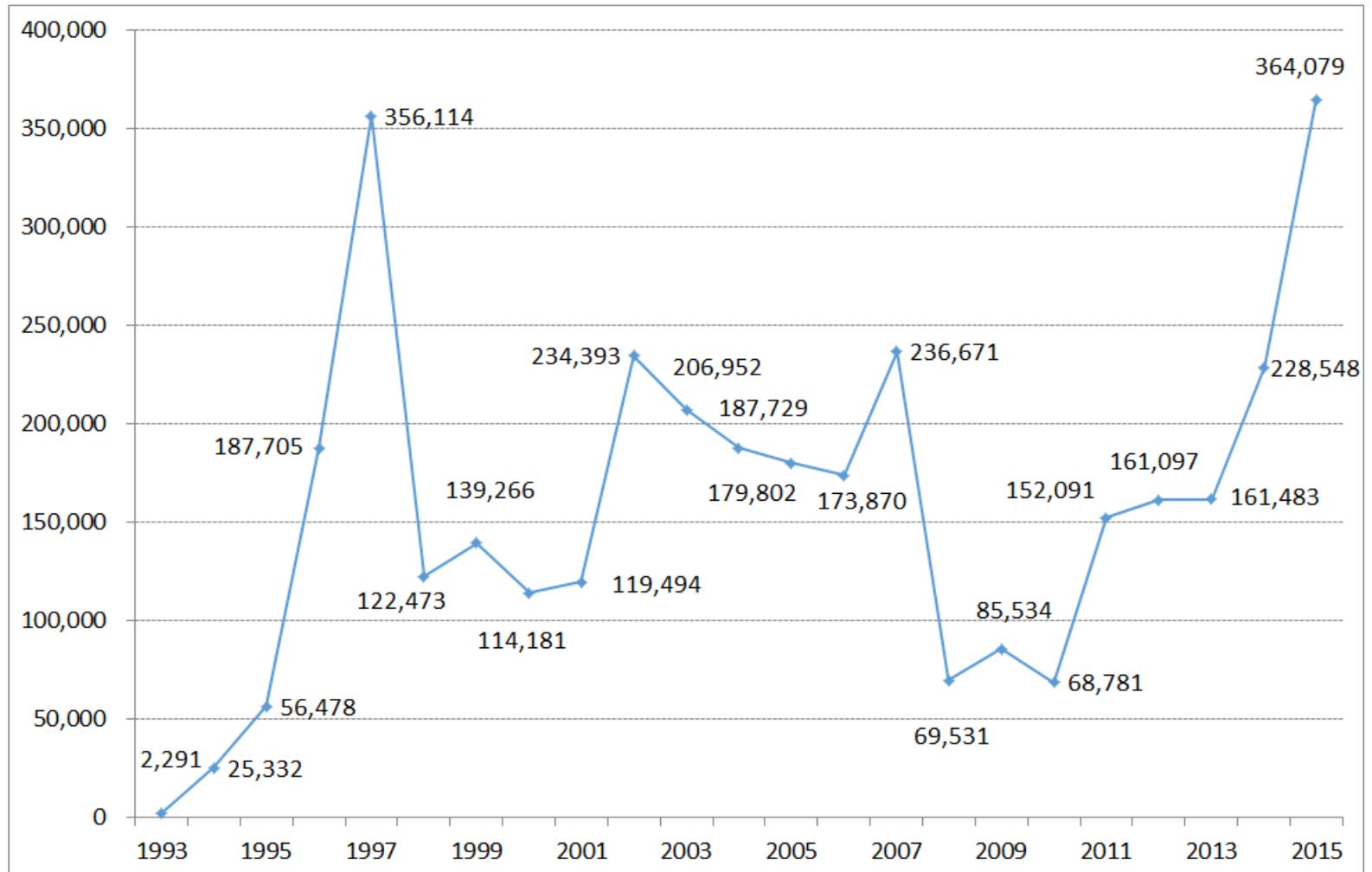
- Recently, there is a debate on whether private insurance companies also should be allowed to provide housing completion guarantee to construction companies.
- The main argument for the participation of private insurance companies in this market is that the competition between HUG and private insurance companies may lower the insurance premium paid by construction companies and thus will lead to lower housing price for home buyers.



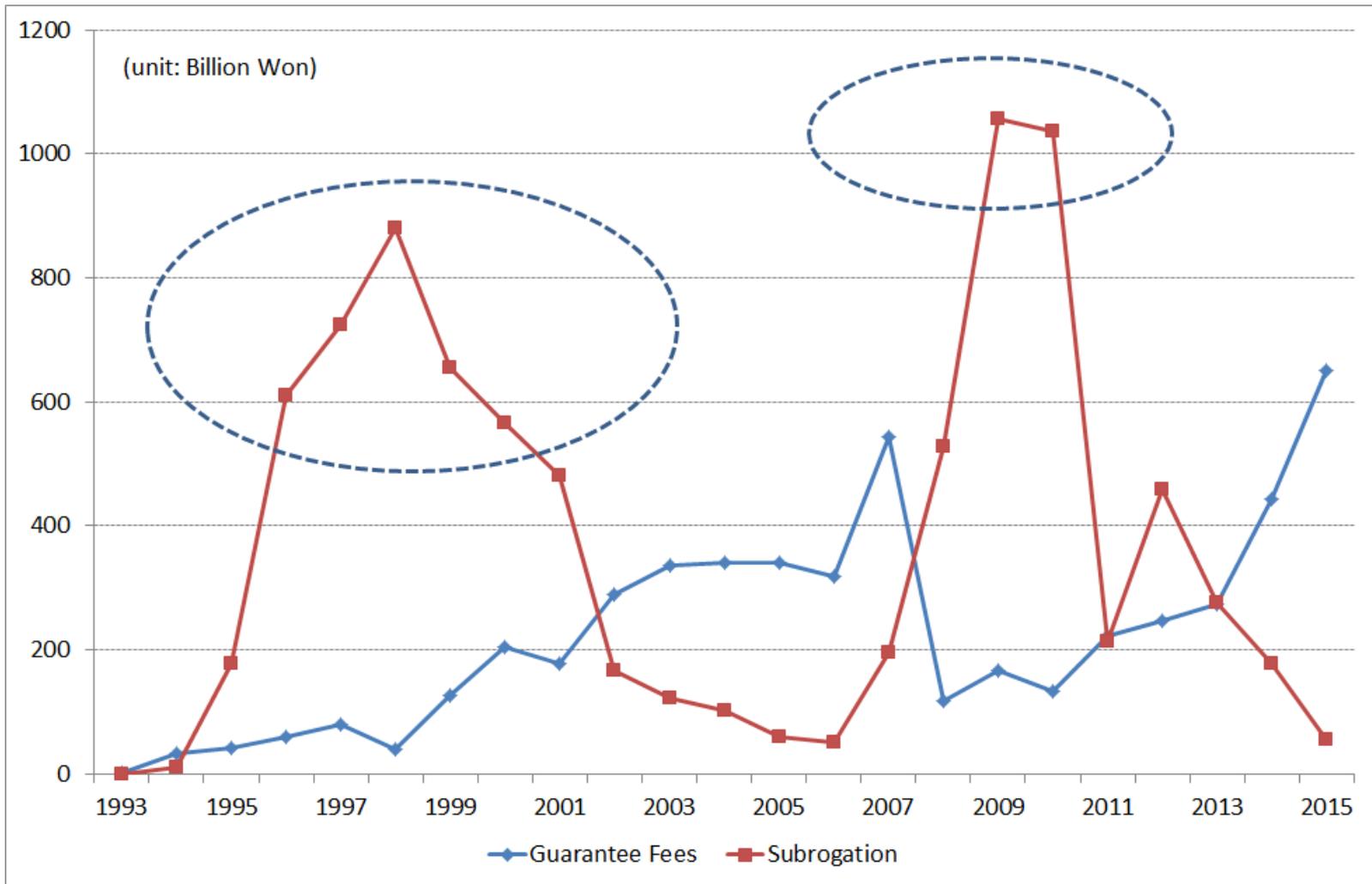
# Housing Completion Guarantee Amount By HUG



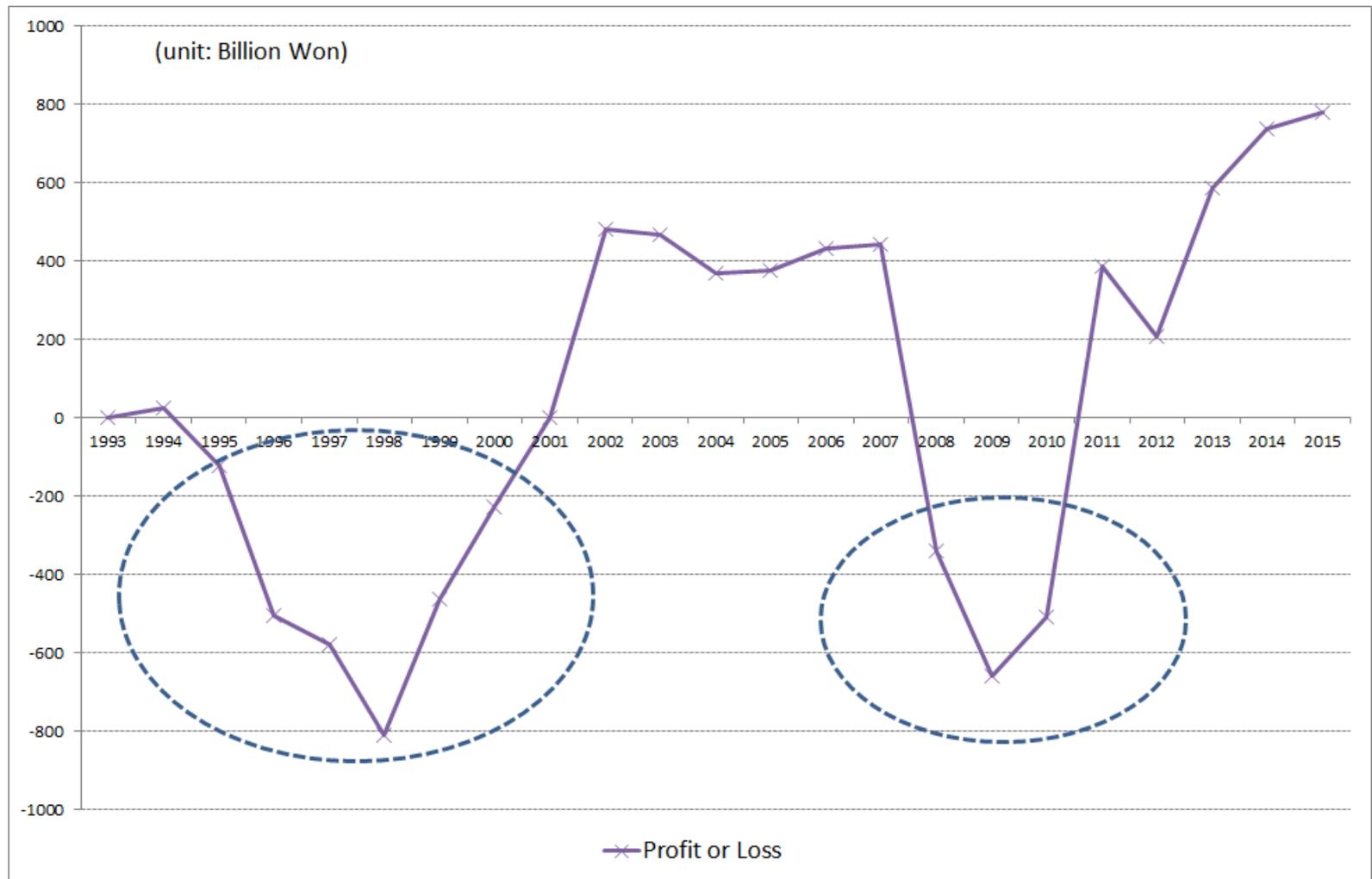
# # Households Guaranteed By HUG



# Housing Completion Guarantee Fees and Subrogation By HUG



# Profit or Loss from Guarantee Businesses By HUG



# Profit or Loss from Guarantee Businesses By HUG

- HUG realized losses for two periods: (i) the first period from 1995 to 2000 and (ii) the second period from 2008 to 2010.
- The amounts of cumulative losses for the first and second periods were 2.7 trillion won and 1.5 trillion won, respectively.
- Given the size of guarantee businesses by HUG at the end of 2015, I have estimated the possible losses for HUG due to guarantee businesses may reach 6.1 trillion won (1.7 trillion won) if we suffer from the same type of crisis for the first (second) period.



# Balance Sheets (HUG)

요약재무상태표 [ IFRS기준 ]

(단위:백만원)

Assets

Liabilities

Equity  
(Capital)

구분		2010년 결산	2011년 결산	2012년 결산	2013년 결산	2014년 결산	2015년 결산
자산	금융자산	3,710,445	4,171,200	4,425,473	4,972,001	5,491,677	5,044,770
	기타자산	1,892,612	1,499,312	1,282,562	796,670	642,645	535,024
	자산총계	5,603,057	5,670,512	5,708,035	5,768,671	6,134,322	5,579,794
부채	금융부채	226,302	67,376	93,679	95,823	109,225	141,680
	보험부채	892,818	837,462	834,652	744,445	762,598	1,056,045
	기타부채	104,381	232,245	52,781	43,165	43,640	68,162
	부채총계	1,223,501	1,137,083	981,112	883,433	915,463	1,265,887
자본	자본금	3,232,031	3,232,031	3,232,031	3,232,031	3,232,031	3,232,031
	기타	1,147,524	1,301,399	1,494,892	1,653,207	1,986,828	1,081,876
	자본총계	4,379,555	4,533,430	4,726,923	4,885,238	5,218,859	4,313,907
재무현황자료		<a href="#">다운로드</a>					

기관세부작성기준

2010년 이후 재무제표는 한국채택국제회계기준에 따라 작성

4.3 trillion won



# Do We Need New Housing Guarantee System?

- If private companies are in default and cannot fulfill their obligations from housing completion guarantee, government may be obliged to intervene.
- Otherwise, many home buyers will lose their fortune and the pre-sale of housing system may collapse.



# Do We Need New Housing Guarantee System?

- If government should intervene when private insurance companies fail in housing completion guarantee, the joining of private insurance companies in this market may result in a representative case of privatizing profits and socializing costs.
- Thus, the current system may need to be maintained as long as pre-sale of housing system is widely used for construction financing of new homes.



# Reasonable Insurances Premium Structure for Consumers in Korean Reverse Mortgage Program

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# Contents

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- Overview of Previous Studies
- Analysis Results of Optimal Monthly Payment Levels, Relation between Insurance Premium and Monthly Payment
- Criteria for the Assessment of IPS and Designing of Models for Analysis
- Relationship between Subscriber's Benefit and Guarantor's Risk
- The Effect of 2015 Revision of IPS in JTYK
- Conclusions

# Introduction

- The JTYK, a Korean reverse mortgage program for home owners, was introduced in 2007. And as of the end of 2015, the JTYK has already settled down in the Korean financial market with the accumulated number in sale since its inception is summing up to 28 thousands.
- And the Korea Housing Finance Corporation (KHFC), the guarantor of Korean reverse mortgage, is also trying to expand its usage through the alleviation of the requirement for application and conditions for utilization.
- On the other hand, early last year, the KHFC made some modification in the IPS (insurance premium structure) of the JTYK to promote its sale.
- The insurance premium was composed of two parts: initial and monthly insurance premiums.
- The former was 2% of the housing price and imposed on the subscribers when the first monthly loan was originated. The latter was 0.0417% (=0.5%/12) of the accumulated loan balance and imposed on the subscribers every month.
- Because the initial insurance premium was non-refundable unless applicants cancel their contracts within 30 days from the first day of loan contract, those who canceled their contracts after the 30 days period, made a lot of complaint about the amount of initial insurance premium.

- In response to the this, the KHFC changed the IPS from IPS(2%, 0.5%) to IPS(1.5%, 0.75%) in February 2015.
- However, until now, not much consideration was made on the appropriateness of its structure in terms of the trade-off relationship between subscribers' economic benefit and risk burden by the government.
- From this perspective, we tried to explore the empirical relationship between government's risk burden and subscribers' economic benefit under the current IPS.
- Based on the results of this analysis, we also tried to interpret the implications of the recent change in IPS and make some policy suggestions for the future operation of the program.
- As there has not been a study which analyzed the risk and benefit from the IPS of a reverse mortgage program at the same time, we suppose this study will be the first in this kind of researches.

# Overview of Previous Studies

- It is known that IPS of the JTYK just imitated that of HECM (Home Equity Conversion Mortgage) of the U.S. So, it cannot be said that enough consideration was made on the appropriateness of it.
- As a result, it was difficult to find other studies conducted related to IPS in KRM except for Kim and Kim(2013) and Jang et al.(2011).
- Kim and Kim (2013) firstly classified several age and housing price bands and compared monthly payments for each band and then they insisted that product diversification into i) only initial insurance premium product, ii) both initial and monthly insurance premium product and iii) only monthly insurance premium product should be made.
- Jang et al.(2011) appraised the appropriateness of the JTYK's IPS and they pointed out the possibility that the monthly insurance premium of the JTYK might be a little over-appropriated.
- From all the previous studies, we can conclude that enough attention has not been paid to the issue of IPS in reverse mortgage program up until now.
- Though it will be mentioned below, the amount of monthly payment even for the same combination of age and housing price can be changed considerably according to the adjustment of IPS.

# Analysis Results of Optimal Monthly Payment Levels, Relation between Insurance Premium and Monthly Payment

- From the “2015 JTYK Consumer Survey”, we can find that income gap between average desired income and average income supplemented by the JTYK is (-) in all over 70 age groups, while it shows (+) in below 70 age groups

<Table 1> Income Supplement Effect of JTYK (Unit: 10,000 KRW)

Age	60-64	65-69	70-74	75-79	80-84	Total
Average Desired Monthly Income (A)	261	209	187	162	129	206
Average Total Monthly Income when Supplemented by JTYK (B)	213	196	187	174	187	194
Monthly Income Deficiency (A-B)	48	13	0	<b>-12</b>	<b>-58</b>	12

- Also, when we check the average income substitution rate, it is 81.4% for households that use JTYK, a huge leap from 21.2% when they do not use it. It means that current JTYK has not a little income supplementing effect
- In this analysis, we start our discussion with the IPS and extend it about the change occurred in early 2015.

- Before we discuss the appropriateness of a certain IPS, we first need to check the relationship between monthly payment and IPS.
- In this analysis, we focus our discussion on the representative case of JTYK users: 70 years old and housing price of 300 million KRW.
- One thing to note is that we applied the current JTYK actuarial assumption on major risk factors when we were conducting following analysis
- From the inception of JTYK, the actuarial assumption on major risk factors are modified several times.

<Assumption on the Risk Factors in the JTYK Actuarial Model>

Date	Housing appreciation rate	Expected long-term interest rate	Life table	Prepayment rate
2007.07	3.50%	7.12%	'05 period life table	20%
2012.02	3.30%	6.33%	'10 period life table	20%
2013.02	3.00%	6.02%	'11 period life table	20%
2014.01	2.90%	5.76%	'12 period life table	20%
<b>2015.02</b>	<b>2.70%</b>	<b>5.56%</b>	<b>'13 period life table</b>	<b>20%</b>

- <Table 2> Monthly Payment Variation according to the IPS (Unit : 1,000 KRW)

		Initial Insurance Premium Rate								
		0.00%	0.25%	0.50%	0.75%	1.00%	1.25%	1.50%	1.75%	2.00%
Monthly Premium Rate (Yearly)	0.00%	553	738	783	815	840	861	879	895	910
	0.25%	819	843	864	882	898	912	925	937	949
	0.50%	882	898	913	926	938	949	959	969	978
	0.75%	924	936	947	958	968	977	986	994	1,002
	1.00%	955	965	974	983	992	1,000	1,008	1,015	1,022
	1.25%	980	988	997	1,005	1,012	1,019	1,026	1,033	1,039
	1.50%	1,000	1,008	1,016	1,023	1,029	1,036	1,042	1,048	1,054
	1.75%	1,018	1,025	1,032	1,038	1,044	1,051	1,056	1,062	1,067
	2.00%	1,033	1,040	1,046	1,052	1,058	1,063	1,069	1,074	1,079

- Monthly payment can be changed widely according to IPS.
- If the insurance premium rates increased, we will get the higher monthly payment because higher insurance premium rates can cover higher loss risk.
- And, monthly insurance premium rate has a higher marginal effect on monthly payment, we can expect that monthly insurance premium rate has a higher loss-absorption effect than initial insurance premium rate.

- After assuming that 986,000 KRW (age: 70, housing price: 300 million KRW, IPS(1.5%, 0.75%)) is an optimal level of monthly payment, we calculated the combinations of initial and monthly insurance premium rates which correspond to the monthly payment under current IPS(1.5%, 0.75%) within the interval of [0.0%, 2.0%] respectively.

<Table 3> IPS which Show Similar Monthly Payment with Current IPS(1.50%, 0.75%) (Unit: KRW)

Insurance Premium Structure (initial premium, yearly premium)	Monthly Payment	PV of Expected Insurance Premium (=PV of Expected Guarantee Loss)
(2.00%, 0.57%)	985,560	14,803,172
(1.75%, 0.66%)	985,854	15,431,841
<b>(1.50%, 0.75%)</b>	<b>985,981</b>	<b>16,054,719</b>
(1.25%, 0.84%)	985,944	16,670,806
(1.00%, 0.93%)	985,747	17,279,095
(0.75%, 1.03%)	986,295	18,058,634
(0.50%, 1.12%)	985,771	18,650,028
(0.25%, 1.22%)	985,963	19,414,576
(0.00%, 1.32%)	985,976	20,170,920

- Under similar monthly payment, expected insurance premium is much less when initial insurance premium rate is high and monthly rate is low in the IPS.
- But as the expected insurance premium is scheduled to pay out the guarantee loss in the actuarial model, we cannot understand that the size of the premium gives us any guideline for the appropriateness of a certain IPS.

# Criteria for the Assessment of IPS and Designing of Models for Analysis

- Because previous studies on the reverse mortgage IPS are rare, we cannot borrow any standardized criteria to assess it.
- By the way, the guarantee institution (KHFC) may face a high risk inherent in the JTYK. Also, the users of the JTYK can have various aspects of benefit such as monthly payment, imputed income from staying at the mortgaged housing till death and can expect housing equity when the loan contract ends.
- Therefore when trying to assess the appropriateness of a certain IPS, we have to consider all these various aspects of costs and benefits from the JTYK.
- From this point of view, we firstly introduced a new notion of “net guarantee loss” to measure the cost side of JTYK and secondly “money's worth”, “probability of positive residual housing equity” and “expected residual housing equity” to measure the benefit side of it.

## Money's Worth

- The formula below shows how the money's worth of JTYK is calculated.

$$MW = \sum_{t=1}^L \left( \frac{PV\_Cum\_pmt_t}{PV\_OLB_{mod,t}} \right) \times {}_t d_a \quad (2)$$

where  $PV\_OLB_{mod,t}$  : Present value of  $OLB_{mod,t}$

$OLB_{mod,t}$  : the debt of a subscriber at time t ( $OLB_{mod,t} = \min(OLB_t, H_t)$ )

$OLB_t$  : the outstanding loan balance at time t

$H_t$  : the housing price at time t

$L$  : the loan term

$PV\_Cum\_pmt_t$  : Present value of accumulated monthly payment at time t

${}_t d_a$  : the probability of loan termination at time t

## Probability of Positive Residual Housing Equity and the Size of Residual Housing Equity

- The size of residual equity was measured as the median value from the simulated distribution of residual equity.

$$RHE_t = \max(H_t - OLB_t, 0) \quad (3)$$

$$p_{rhe,t} = P((H_t - OLB_t) > 0) \quad (4)$$

where  $RHE_t$  : the residual housing equity  
 $p_{rhe,t}$  : the probability of positive residual housing equity at time t

## Net Guarantee Loss

- To reflect the cost side of the JTYK, we introduced NL (Net Guarantee Loss).

$$NL = PVEL - PVMIP \quad (5)$$

where  $PVEL$  : the present value of expected guarantee loss  
 $PVMIP$  : the present value of expected insurance premium

## Modeling of Risk Factors

- The criteria mentioned above can have different values according to the realized value of major risk factors. Therefore the generation of various scenario is needed to evaluate and compare the criteria value correspondent to different combination of initial and monthly insurance premium rates.

## Interest Rates and Discount Rates

- CD rate and 10 year treasury bond rate were used to forecast future JTYK interest rate and discount rate respectively. To generate the process of those rates, we adopted the Vasicek model as follows.

$$\Delta i_t = \alpha(\mu - i_t)\Delta t + \varepsilon_t\sigma\sqrt{\Delta t} \quad (6)$$

where  $i_t$  : the interest rate at time t,  $\alpha$  : the speed of reversion,  $\mu$  : the mean reversion level,

$\sigma$  : the volatility of  $i_t$ ,  $\varepsilon_t$  : a random variable which follows the standard normal distribution

<Table 4> Estimation Results for the Vasicek Model

	$\alpha$	$\mu$	$\sigma$
CD Rate	0.12493	0.025185	0.006942
10 Year Treasury Bond Rate	0.256865	0.039457	0.008579

Source: Ryu and Ma(2015)

## Housing Appreciation Rate

- In this study, the GBM (geometric brownian motion) model, which is widely used in mortgage related researches, was applied.

$$H_{t+\Delta t} = H_t \cdot \exp \left[ \left( \mu_H - \frac{\sigma^2}{2} \right) \Delta t + \sigma_H \varepsilon_t \sqrt{\Delta t} \right] \quad (7)$$

where  $H_t$  : the housing price at time t,  $\mu_H$  : the expected value,  $\sigma_H$  : volatility of housing price  
 $\varepsilon_t$  : a random variable which follows the standard normal distribution

<Table 5> Estimation Results for the Geometric Brownian Motion Model

	$\mu_H$	$\sigma_H$
Housing Appreciation Rate	3.40%	10.07%

Source: Ryu and Ma(2015)

## Mortality Rate of JTYK Users

- The life table applied in the current 2015 JTYK actuarial model is the 2013 period life table, released by the Statistics Korea.
- However, we used a cohort life table to conduct a more precise evaluation. To generate a cohort life table, long-term forecast for mortality rates in life tables should be obtained and the Lee-Carter model can be used for it.

$$\ln(q_{x,t}) = a_x + b_x k_t + \varepsilon_{x,t} \quad (x = 1, 2, \dots, n; t = 1, 2, \dots, T) \quad (8)$$

where  $q_{x,t}$  : the mortality rate in year  $t$  for the age group  $x$ ,

$a_x$  : a constant which reflect the average pattern of age group-wise mortality rate,

$b_x$  : the speed of mortality rate changes according to the changes in  $k_t$ ,

$k_t$  : the mortality index,  $\varepsilon_{x,t}$  : an error term

- Recently, Ryu and Ma (2015) appraised the risk of JTYK based on the cohort life table generated from the forecast result obtained from the Lee-Carter model application. In this study, we used the same parameters and methodology in Ryu and Ma (2015).

# Relationship between Subscriber's Benefit and Guarantor's Risk

## Money's Worth

- Table 6 show the summarized values of probability distribution of MW conducted by 30,000 trials of concurrent simulation analysis under varied IPS
- The values in Table 6 tell us that the MW will be higher under the IPS which combines high initial premium and low monthly premium.

<Table 6> Comparison of MW According to IPS

Insurance Premium Structure (initial premium, yearly premium)	Lower	Median	Upper
(2.00%, 0.50%)	0.8015	0.9861	1.7584
(2.00%, 0.57%)	0.7968	0.9800	1.7585
(1.75%, 0.66%)	0.7930	0.9765	1.7594
(1.50%, 0.75%)	0.7886	0.9758	1.7623
(1.25%, 0.84%)	0.7873	0.9722	1.7631
(1.00%, 0.93%)	0.7834	0.9719	1.7654
(0.75%, 1.03%)	0.7814	0.9693	1.7669
(0.50%, 1.12%)	0.7781	0.9685	1.7690
(0.25%, 1.22%)	0.7771	0.9680	1.7745
(0.00%, 1.32%)	0.7768	0.9660	1.7783

Note: we assumed that all the subscribers receive the same monthly payment, 985,981won, regardless of IPS

## The Size and Probability of Positive Residual Housing Equity

<Table 7> The Amount and the Occurrence Probability of Leftovers (Unit: 1,000 KRW)

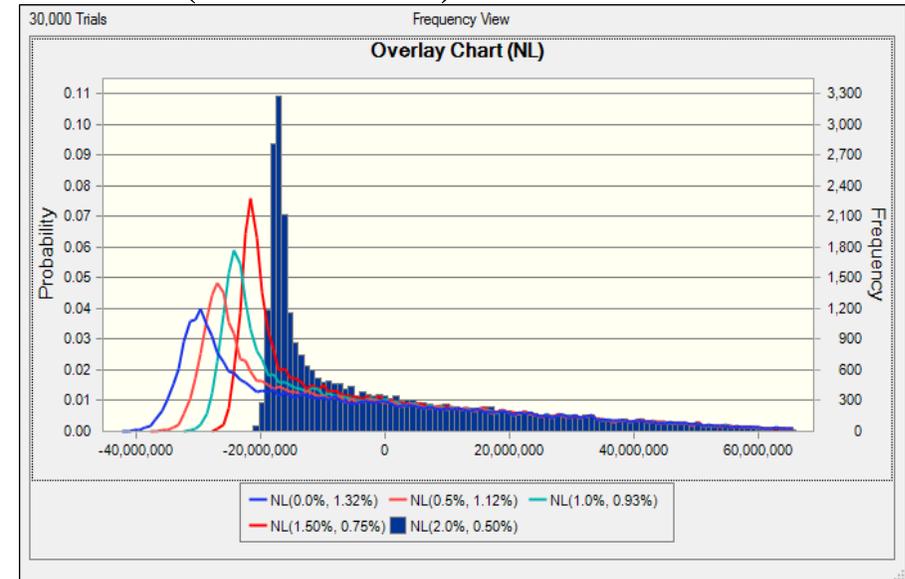
Insurance Premium Structure	Probability and Amount of Leftover	Loan Termination		
		After 132 month (the end of age 80)	After 228 month (the end of age 88)	After 372 month (the end of age 100)
(2.00%, 0.50%)	Probability	99.38%	77.06%	38.24%
	Amount	137,015	59,214	0
(2.00%, 0.57%)	Probability	99.37%	76.44%	37.31%
	Amount	136,500	57,837	0
(1.50%, 0.75%)	Probability	99.37%	75.64%	35.12%
	Amount	136,788	55,983	0
(1.00%, 0.93%)	Probability	99.38%	74.82%	33.07%
	Amount	137,139	54,131	0
(0.50%, 1.12%)	Probability	99.38%	73.91%	30.82%
	Amount	137,448	52,153	0
(0.00%, 1.32%)	Probability	99.40%	73.07%	28.51%
	Amount	137,749	50,025	0

- When the loan is terminated after 132 months, the occurrence probability of leftover in **IPS 1** (insurance premium structure combined high initial premium and low monthly premium) is expected to be slightly lower than that in **IPS 2** (insurance premium structure combined low initial premium and high monthly premium).
- This phenomenon tells us that **IPS 1** requires more costs than **IPS 2** until after 132 months. But, when the termination date is longer than after 132 months, the relationship between **IPS 1** and **IPS 2** is reversed.

## Net Guarantee Loss

<Table 8> Summarized Values of the Probability Distributions of NL (Unit: KRW)

IPS	Lower	Median	Upper
(2.00%, 0.50%)	-18,888,169	-9,282,125	54,127,847
(2.00%, 0.57%)	-20,750,980	-10,168,561	54,138,934
(1.75%, 0.66%)	-22,395,462	-10,854,495	54,146,646
(1.50%, 0.75%)	-24,005,753	-11,415,872	54,153,973
(1.25%, 0.84%)	-25,610,242	-11,947,247	54,217,665
(1.00%, 0.93%)	-27,226,998	-12,467,410	54,235,119
(0.75%, 1.03%)	-29,119,894	-13,111,895	54,250,531
(0.50%, 1.12%)	-30,726,449	-13,591,719	54,252,886
(0.25%, 1.22%)	-32,604,746	-14,135,041	54,266,446
(0.00%, 1.32%)	-34,523,507	-14,651,694	54,294,464



- All the median values of NL show negative values regardless of IPS. These results tell us that the guarantor will get net profit under 50% of probability.
- We can see the fact that the upper values in Table 8 show similar values regardless of IPS. But, both lower values or median values show relatively higher negative values in IPS 2 compare to IPS 1.
- This results tell us that the selection of **IPS 2** will increase the amount of guarantor's net profit. But, on the contrary, the subscriber's burden of costs will be increased in **IPS 2**.

## Interpretation of Analysis Result

- According to the results we confirmed above, we can see that there exists a conflict of interest between the guarantor and the subscriber in the selection of IPS.
- In conclusion, the selection of IPS 2 is more favorable for the guarantor but, less favorable for the subscriber.

- <Table 9> Conflict of Interest between the Guarantor and the Subscriber

IPS	Subscriber	Guarantor
IPS 1(Initial Premium↑ / Monthly Premium↓)	favorable	less favorable
IPS 2(Initial Premium↓ / Monthly Premium↑)	less favorable	favorable

- In 2015, there was a revision of IPS from IPS(2.0%, 0.5%) to IPS(1.5%, 0.75%) in JTYK to alleviate the complains resulting from the minor subscribers who want to repay outstanding loan balances earlier.
- But, the purpose of the 2015 revision of IPS in JTYK is not well matched with the interpretation we represented in Table 9.

# The Effect of 2015 Revision of IPS in JTYK

- Through the results of this analysis, we can understand that there are varied dimensions we have to consider related to the problem of selecting IPS.
- If we amend IPS arbitrarily just following the minority's opinion without considering the varied aspects we discussed above, a large majority can be in a disadvantageous position.
- From this perspective, to check the effect of 2015 revision of IPS in JTYK, we reevaluated the most similar IPS compare to the previous IPS(2.0%, 0.5%) based on the three criteria we introduced in this analysis and finally confirmed that it was **IPS(1.50%, 0.60%)** instead of current **IPS(1.50%, 0.75%)** when we fixed the rate of initial insurance premium as 1.50%.
- After all, although 2015 revision of IPS in JTYK will be favorable for a minority who repay outstanding loan balance earlier but we can say that the 2015 revision result in less favorable consequence for the other majority subscribers who want to persist the contract for a long time.

<Table 10> Comparison of IPS(2.0%, 0.50%), IPS(1.50%, 0.60%), and IPS(1.50%, 0.75%) (Unit: KRW)

	IPS	Lower	Median	Upper
NL	(2.00%, 0.50%)	-18,888,169	-9,282,125	54,127,847
	<b>(1.50%, 0.60%)</b>	-19,866,478	-9,290,225	55,429,781
	(1.50%, 0.75%)	-24,005,753	-11,415,872	54,153,973
MW	(2.00%, 0.50%)	0.8015	0.9861	1.7584
	<b>(1.50%, 0.60%)</b>	0.8012	0.9867	1.7748
	(1.50%, 0.75%)	0.7886	0.9758	1.7623

<Table 11> The Probability and Amount of Leftover (Unit: 1,000 KRW)

IPS	Probability and Amount of Leftover	Loan Termination		
		After 132 month (end of age 80)	After 228 month (end of age 88)	After 372 month (end of age 100)
(2.00%, 0.50%)	Probability	99.38%	77.06%	38.24%
	Amount	137,015	59,214	0
<b>(1.50%, 0.60%)</b>	Probability	99.40%	76.93%	37.40%
	Amount	137,899	58,879	0
(1.50%, 0.75%)	Probability	99.37%	75.64%	35.12%
	Amount	136,788	55,983	0

# Conclusions

- We tried to analyze the guarantors' risks and subscribers' benefits through evaluating money's worth, residual housing equity and net guarantee loss under several assumption of IPS in JTYK.
- There has been no one who made the research related to the effect of changing IPS in reverse mortgage program on the guarantors' risks and subscribers' benefits concurrently.
- According to the results of this analysis, we can confirm that IPS 2 will be favorable for the guarantor and for the minority subscribers who consider repayment earlier, but it will be less favorable for the majority subscribers who want to persist the contract for a long time although the level of monthly payment between IPS 1 and IPS 2 is similar.
- This relationship tells us that a conflict of interest occurs whenever IPS is changed between guarantor and subscribers. As a result asymmetric information about IPS in JTYK can lead the majority subscribers have a disadvantageous position.
- Actually, we could confirm that the subscriber's MW in IPS(2.00%, 0.50%) was larger than that in IPS(1.50%, 0.75%). In addition, if we confirm the trends of housing price and outstanding loan balance until maximum life span, we can see that the increasing speed of OLB in the IPS(1.50%, 0.75%) is faster than that in IPS(2.0%, 0.50%).
- As a result, in the current IPS(1.50%, 0.75%), the probability of leftover remaining will be lower than the previous IPS(2.0%, 0.50%) and the magnitude of leftover also will be smaller than the previous IPS(2.0%, 0.50%).

- Related to this, the three evaluation criteria we introduced in this analysis can be an useful standard of judgement.
- From this perspective, to check the effect of 2015 revision of IPS in JTYK, we reevaluated the most similar IPS compare to the previous IPS(2.0%, 0.5%) based on the three criteria we introduced in this analysis and finally confirmed that it was **IPS(1.50%, 0.60%)** instead of current **IPS(1.50%, 0.75%)** when we fixed the rate of initial insurance premium as 1.50%.
- Considering the results of this analysis, we can get several lessons related to actual operation of IPS.
- Firstly, if we amend IPS just based on the amount of monthly payment, it will be unfavorable for the majority of subscribers although it was unintended.
- Secondly, if the reverse mortgage program is operated under the current IPS, the guarantor's risk will be changed according to the combination of initial premium and monthly premium although the level of monthly payment is same. So, political consideration is needed in the final selection of IPS.
- In addition, we expect that the results of this analysis can be an useful reference to decide the optimal insurance premium structure in varied reverse mortgage programs currently operated around the world.

2016 IAFICO

# Wealth Composition and Drawdown Patterns of Retirees : A Comparative Study

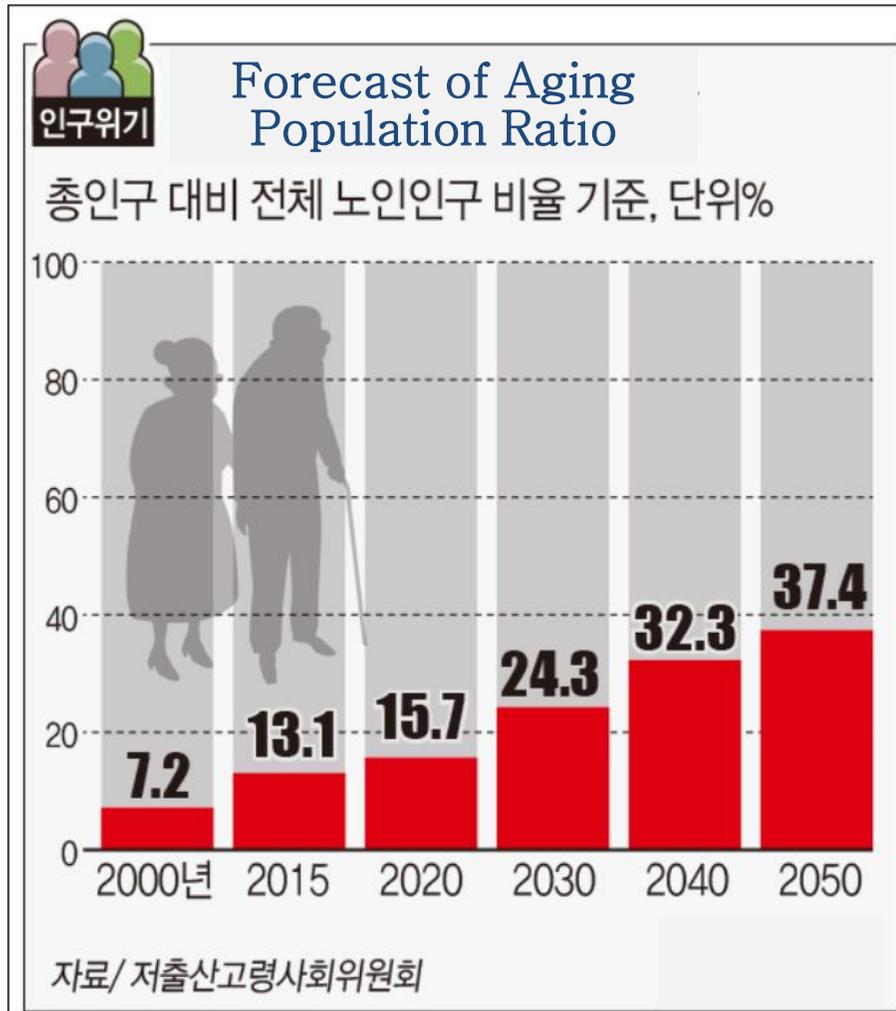
Young Man Lee, Jun Hyung Kim,  
Hyun Ah Kim, Man Cho

# Contents

- 1. Background and study purpose
- 2. Findings from prior studies
- 3. Data analyses
  - 3.1 data description
  - 3.2 findings and implications
- 4. Assessment of the RAM product in Korea
- 5. Concluding remarks

# 1-1. Background

## ● Population Aging



## ● Post-retirement....??



## 1-2. Study Purpose

### **Poterba, Venti and Weiss(2011)**

- retirement-age households : those households being headed by 65~69 years old persons
- To examine wealth compositions of those households in the U.S. who are at the starting points of retirement
- To track their wealth drawdown patterns as the aging progresses by using a household panel data set.
- While those retirement-age households tend to have a fairly significant portion of their wealth in the form of home equity, they tend NOT to monetize that in the early stage but rather to use that as a hedge against the longevity risk and a shock in medical expense in later stage of retirement.

## 1-2. Study Purpose

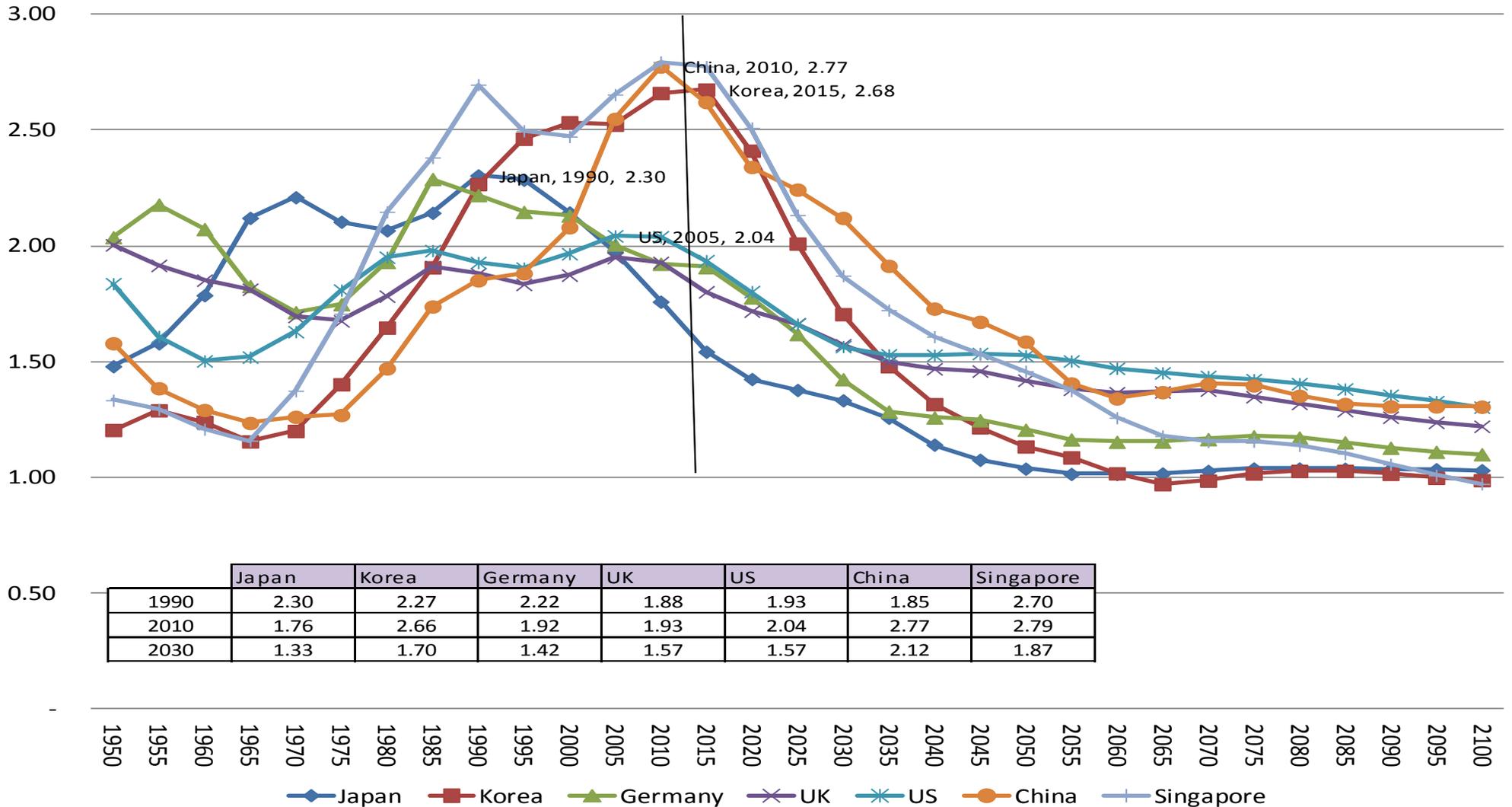
- **To document the wealth composition and its drawdown patterns of the retirement-age households in Korea**
  - **Data:** the Korean Longitudinal Study of Aging(KLoSA), 2006~2012
  - Wealth component along with several others (e.g., primary residence, non-residence real estate, financial asset, among others)
  - **Retirement-age households:** whose heads are in the 60~64 and 65~69 year old age cohorts
  - **household types:** single-person households, married couples (two-person), and others retirement

## 1-2. Study Purpose

- **To examine policy options to safely monetize housing and other real estate assets held by them**
  - To assess the role of reverse annuity mortgage (RAM) as a welfare-enhancing monetizing mechanism for home equity
  - To examine how effective the product has been in serving the retirement-age households and what consumer protection issues have emerged out of the Korean experience

## 2. Trend and Prior Findings

### Inverse Dependency Ratio (Working-Age Pop/Non-Working Age Pop)



## 2. Trend and Prior Findings

### ● **Market penetration of RAM**

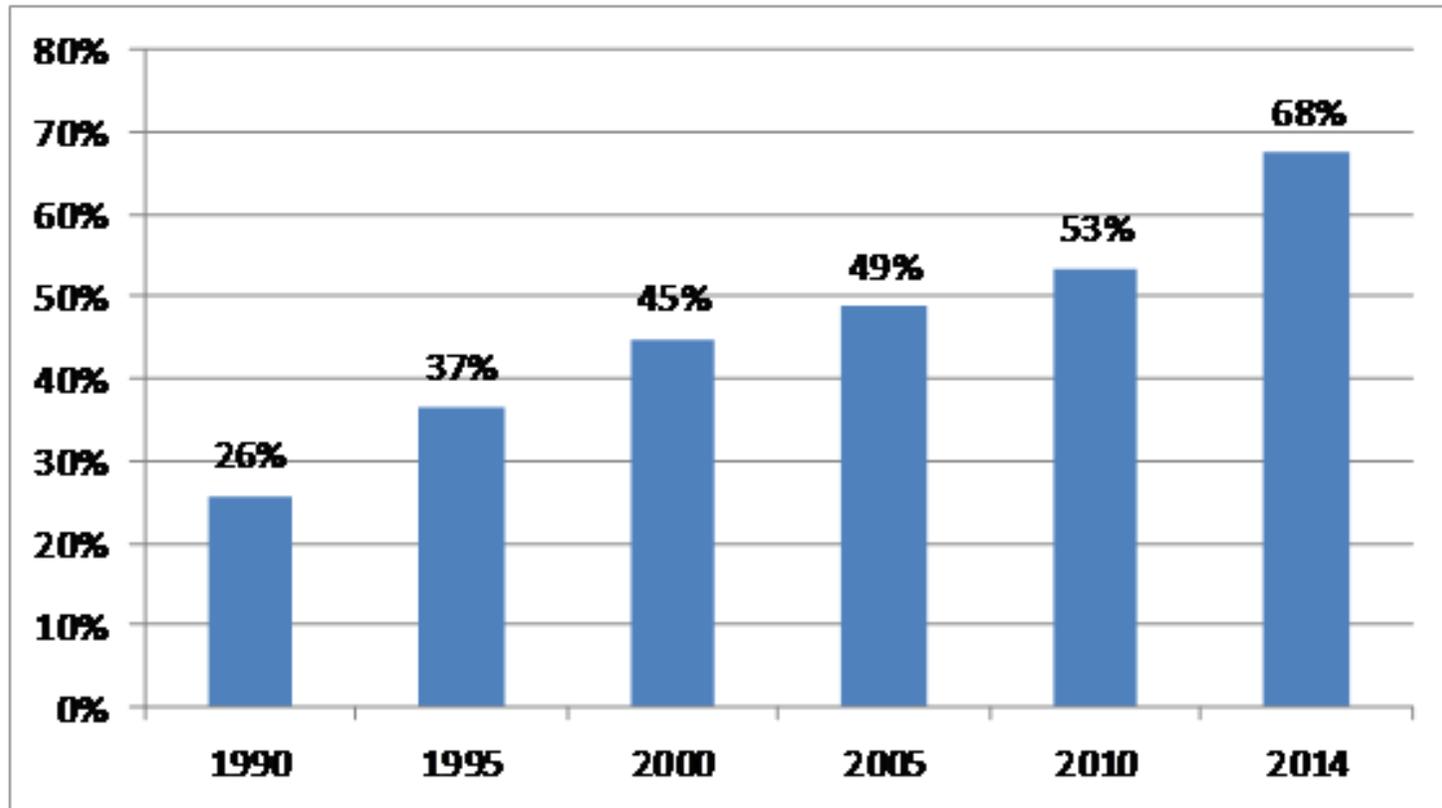
- In the U.S., the RAM contracts as a share to the total eligible households increased in recent years but take only 2.1 percent in 2011. (Nakajima and Telyukova, 2014)

### ● **Several embedded risks to RAM**

- the crossover-risk (Min and Cho, 2009)
- the housing price risk (Lee et al., 2012)
- the longevity risk (Choi, 2015)
- both moral hazard and adverse selection problems (Davidoff, 2014)

## 2. Trend and Prior Findings

Ratio of those who do not live with children  
(among people who are 65 or older)



# 3.1. Data Analyses

## ● Data Description

- **Data:** the Korean Longitudinal Study of Aging(KLoSA), 2006~2012
- **household types:** single-person households, married couples (two-person), and other retirement
- **the annuitized pension amount** (for type  $\tau$ )

$$(1) \quad W_t^\tau = P_t^\tau + \frac{S_{t+1}^a \cdot P_t^\tau}{(1+r_t)^1} + \frac{S_{t+2}^a \cdot P_t^\tau}{(1+r_t)^2} + \dots + \frac{S_{t+k}^a \cdot P_t^\tau}{(1+r_t)^k}$$

$$(2) \quad S_{t+i}^a = (1 - D_{t+1}^a) \cdot (1 - D_{t+2}^a) \cdot \dots \cdot (1 - D_{t+i-1}^a) \cdot (1 - D_{t+i}^a)$$

$W_t^\tau$ : Annuitized pension amount at time t (2006 in our case)

$P_t^\tau$  : Annual pension amount (assumed to be constant over time)

$S_{t+i}^a$ : Cumulative expected survival rate for age a projected for time t+i at time t

$D_{t+i}^a$ : Expected death rate for age a at time t in time t+i

$r_t$  : Discount rate (the 91 days CD rate+1.1% in our case) at time t

t+k : Maximum age to live (100 years old)

## 3-2. Findings and Comparisons

### ● Composition of Household Wealth in Korea (by household type as of 2012)

- An extreme of 'Real estate-rich-cash-poor' retirees

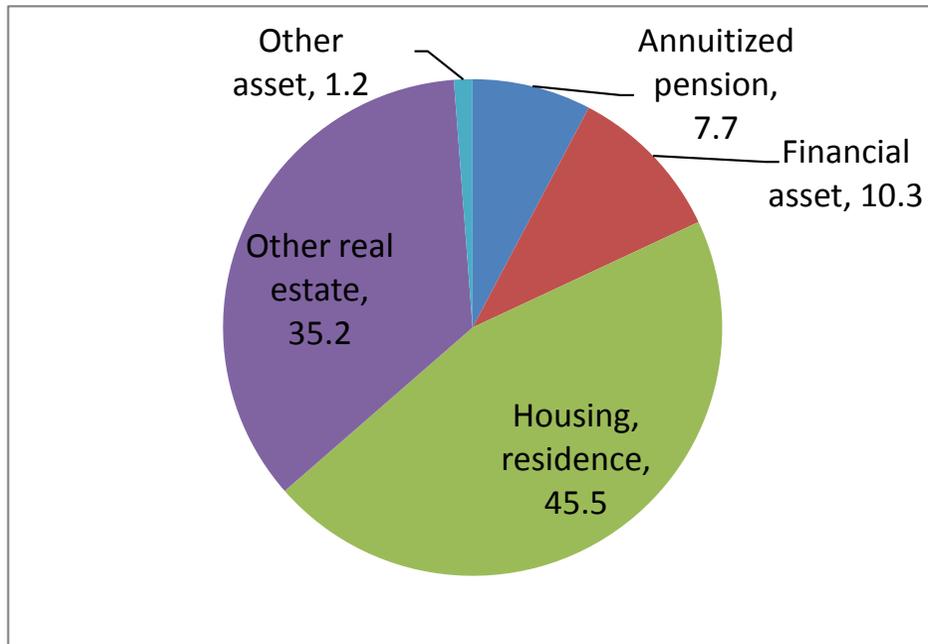
	Single person household		Married couples		Others	
<b>Total</b>	<b>10,314.2</b>	<b>%</b>	<b>28,764.5</b>	<b>%</b>	<b>23,230.0</b>	<b>%</b>
Annuitized pension	1,164.1	11.3	2,228.0	7.7	1,411.4	6.1
Financial asset	559.5	5.4	2,974.0	10.3	1,795.6	7.7
<b>Real Estate asset</b>	<b>8,572.5</b>	<b>83.1</b>	<b>23,222.7</b>	<b>80.7</b>	<b>19,700.8</b>	<b>84.8</b>
Current residence	6,952.3	67.4	13,085.0	45.5	12,366.8	53.2
Home-owned	6,368.8	61.7	12,145.8	42.2	11,330.1	48.8
Rental deposit	583.5	5.7	939.2	3.3	1,036.8	4.5
Other real estate asset	1,620.2	15.7	10,137.7	35.2	7,334.0	31.6
Other asset	18.1	0.2	339.8	1.2	322.1	1.4

\*Unit: 10,000 Won

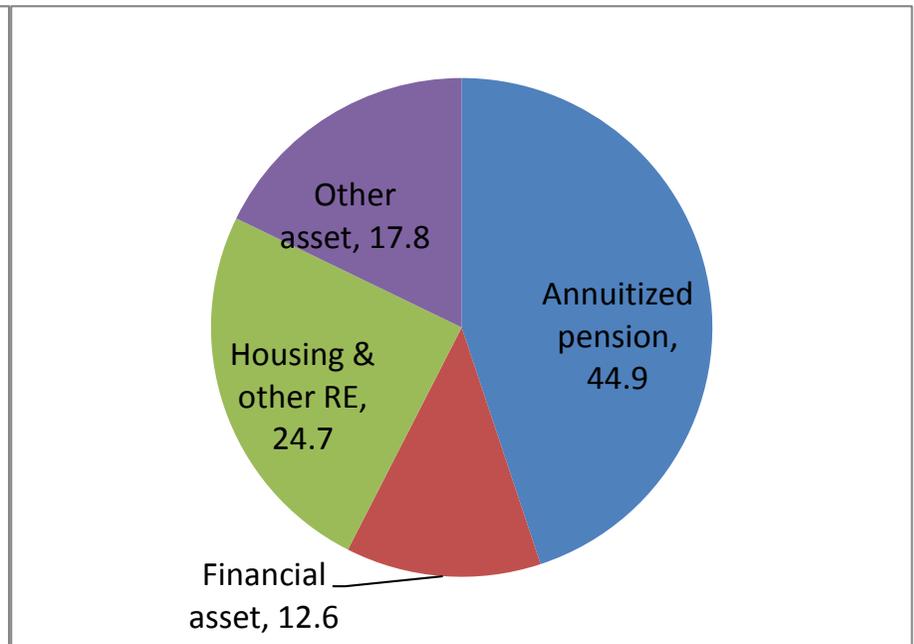
## 3-2. Findings and Comparisons

### ● Wealth Composition of "Retirement-Age" Households, Korea vs. US

Composition of household wealth (%), Korea  
(Married couple at retirement age)



Composition of household wealth (%), U.S.A  
(Married couple at retirement age)



## 3.2. Findings and Comparisons

### Changes in Household Wealth in Korea, 2006 to 2012

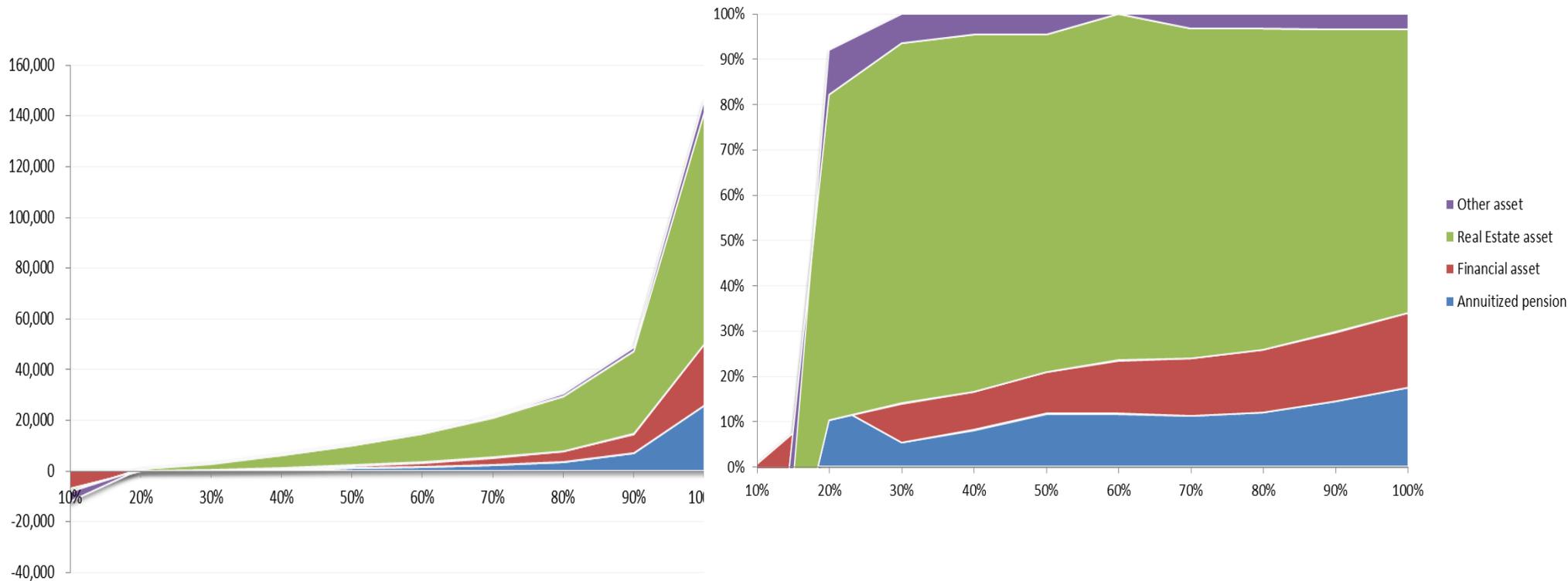
	Single person household			Married couples			Others		
	2006	2012	Δ*	2006	2012	Δ*	2006	2012	Δ*
<b>Total</b>	7,696.7	10,314.2	4.9%	15,979.5	28,764.5	10.3%	14,005.3	23,230.0	8.8%
Annuitized pension	1,405.6	1,164.1	-3.0%	2,195.2	2,228.0	0.3%	1,658.9	1,411.4	-2.7%
Financial asset	474.8	559.5	2.7%	2,194.3	2,974.0	5.2%	1,964.2	1,795.6	-1.5%
<b>Real Estate asset</b>	<b>5,880.5</b>	<b>8,572.5</b>	<b>6.4%</b>	<b>11,514.4</b>	<b>23,222.7</b>	<b>12.4%</b>	<b>10,299.8</b>	<b>19,700.8</b>	<b>11.4%</b>
Current residence	4,588.5	6,952.3	7.1%	9,175.4	13,085.0	6.1%	8,375.4	12,366.8	6.7%
Home-owned	4,136.6	6,368.8	7.4%	8,478.5	12,145.8	6.2%	7,634.5	11,330.1	6.8%
Rental deposit	451.8	583.5	4.3%	696.9	939.2	5.1%	740.9	1,036.8	5.8%
Other real estate	1,292.0	1,620.2	3.8%	2,339.1	10,137.7	27.7%	1,924.3	7,334.0	25.0%
Other asset	-64.1	18.1	--	75.6	339.8	28.5%	92.5	322.1	23.1%

\* Average annual compounded growth rate

\* unit: 10,000 KRW

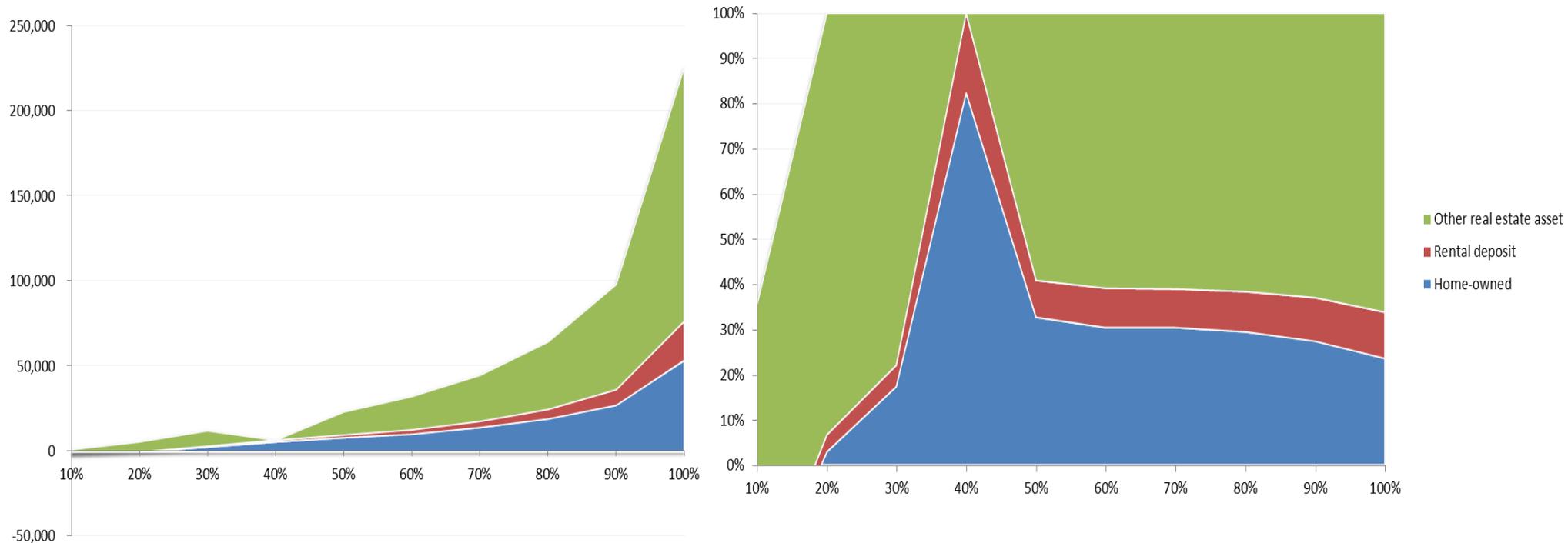
## 3.2. Findings and Comparisons

### Asset composition by asset strata – All households (as of 2012)



## 3-2. Findings and Comparisons

### Composition of real estate asset by asset-strata– All households(as of 2012)



## 4. RAM in Korea: A viable policy option?

### ● Overview of Housing Pension(1/2)

#### 1) Eligible Borrower

- Age requirement

The Homeowner must be 60 years old or older at the date of property collateralize.

EX1: Homeowner(63y), spouse(58y) -> eligible,

EX2: Homeowner(58y), spouse(63Y) -> ineligible

- Number of property owned(for both borrower and his/her spouse)  
Must be qualified for one of below

#### 2) Terms of guarantee(For Life)

- To the death of both the homeowner and his/her spouse

#### 3) Payment Types & Payment Options

- Payment Type: Tenure Type, Modified Tenure Type, Term Type
- Payment Options: Fixed, Increasing, Decreasing, Two-Phase Option



## 4. RAM in Korea: A viable policy option?

### ● Overview of Housing Pension(2/2)

#### 4) **Loan interest rate**(3-month CD rate + 1.1%)

- The monthly interest is 3 month-adjustable CD rate +1.1% of the loan balance

#### 5) **Guarantee Fee(Initial Guarantee Fee and Annual Guarantee Fee)**

- Initial guarantee fee : 2% of the house price is charged once when the first monthly loan payment is made.
- Annual guarantee fee : 0.5% of the loan balance is charged annually and paid on a monthly basis.

#### 6) **Offering of Collateral**

- KHFC sets the 1st mortgage claim on the house

#### 7) **Loan repayment**

- Lump sum repayment with the proceeds from selling the property after the death of HP users

## 4. RAM in Korea: A viable policy option?

- An extreme of the asset-rich-cash poor condition
  - + the current RAMs are consumer-friendly products
  - ☞ However, the subscription rate is still low, Why?

### RAM subscription rates in Korea (among eligible households\*)

	2007	2009	2011	2013	2015
(A) > 60 years old	2,540,236	2,767,487	3,009,609	3,267,756	3,587,377
(B) > 65 years old	1,802,637	1,974,848	2,156,329	2,360,559	2,564,012
(C) New subscriptions	515	1,124	2,936	5,296	6,486
(D) Cumulative subscriptions	515	2,334	7,286	17,595	29,120
(D) / (B)	0.02%	0.08%	0.24%	0.54%	0.81%
(D) / (A)	0.03%	0.12%	0.34%	0.75%	1.14%

\* Owner-occupying one-unit holders who are 60 or older (65 or older before 2009)

## 4. RAM in Korea: A viable policy option?

- To find the factors that explain the low subscription rates for the RAM products

Binary logic choice model	Model 1	
Variable	Coefficient	z-Statistic
C	1.16	1.60
Age	-0.04***	-4.27
Edu_H	0.33***	2.69
Edu_C	0.18	0.98
Dummy_Couple	-0.12	-0.84
Dummy_Coresid_Child	-0.03	-0.23
Resid_Income	-0.02	-1.08
Multi_Own	0.65***	3.63
Price_House	0.01***	2.88
Non_Resid Asset	-0.01*	-1.93
Dummy_Bequest	-1.09***	-9.16
Dummy_Partial Bequest	-0.61***	-4.17
Dummy_Hear_Pension	0.41**	2.44
Dummy_Know_Pension	0.31**	2.26
McFadden R-squared		0.08
H-L Statistic		13.4 (Prob. 0.10)
Andrews Statistic		15.8 (Prob. 0.12)
Observation		3,000

## 4. RAM in Korea: A viable policy option?

### ● Recent survey result by KHFC(2015)

(multiple selections allowed)

- ✓ 78.1% : reduction of asset for inheritance
- ✓ 64.3% : value appreciation of asset not reflected in payments
- ✓ 64.1% : payment lower than expected
- ✓ 50.4% : total payment likely to be less than property value

### ● Above survey results reveals negative perception on net gain and publicly guaranteed by HF.

- Among those who do not subscribe
  - ✓ 17.5% properly understood the product feature
  - ✓ 79.5% only heard about the product.

## 5. Concluding Remarks

- **To examine the wealth composition and its drawdown patterns of the retirement-age households in Korea**
  - The average proportion of real estate in Korea is far greater than that in the U.S., over 80 percent vs. 24.7.
  - the ratio the annuitized public and private pensions is far higher in the U.S. compared to Korea, 44.9 percent vs. 7.7 percent in Korea.
  - the proportion of non-residence real estate rapidly rose between 2006 and 2012 in Korea, quite dramatically for certain consumer cohorts.

## 5. Concluding Remarks

- **To examine Assessment on the RAM product in Korea in terms of its capability to monetize real estate assets held by retirees in the country.**
  - while the traditional asset-based welfare system for elderlies is in a rapid transition, retirees in Korea are still inclined to put their homes to their children.
  - In addition, it appears that consumer education of various sorts on the RAM products should be heightened.
  - As a last point, how to monetize non-residence real estate, which takes another fairly large portion in household wealth in Korea, should also be the topic that warrants careful investigation in research community as well as in policy circle.

따뜻한 복귀, 국민행복의 기술

**Thank you!**



# Consumer Protection in Korean Mortgage Market

[Discussion]

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# Evolution and Current Structure of Housing Guarantee System in Korea

- Presales of houses
  - Singapore, Hong Kong, Vancouver, Los Angeles
  - Unique guarantee system by HUG in Korea
  - But, the HUG has an exclusive right
  
- Potential competition
  - In a potential crisis, the government may intervene the mkt
  - The state-run institution needs to take its role

- Forward contract in housing markets but unique in Korea
  - Guarantee system
  - Financing mechanisms (regular installments)
- Financial product + **Surety Bond**
  - Subrogation: the insurer can pay off the debts of a construction company upon request of home buyers
  - Completing the obligation by finishing the project.

# Reasonable Insurance Premium Structure for Consumers in Reverse Mortgage Program

- Premium structure for the reverse mortgage
  - Initial guarantee fee vs. yearly guarantee fee

주택금융공사, 주택연금 보증료율 체계 조정

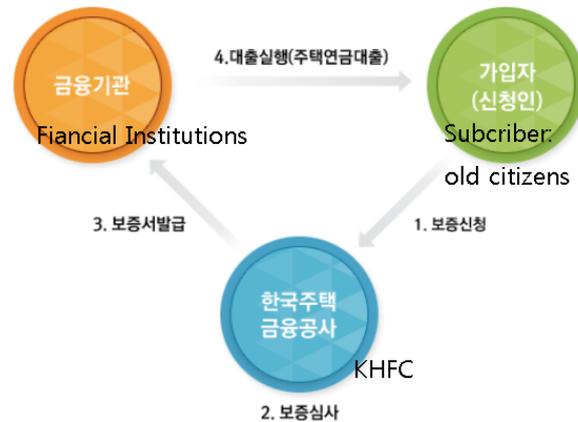
- 초기보증료율 인하, 연보보증료율 인상 -

<보증료율 변경 내용>

구 분	현행	변경(안)	비고
초기보증료율	2.0%	1.5%	0.5%p ↓
연보보증료율	0.5%	0.75%	0.25%p ↑

- The change in the premium structure
  - “To lower financial burdens for subscribers”: unclear policy effects

- Guarantee system



- Its effects vary across old citizens

- The change benefits for one who cancels the product right after the subscription

Table 8 | Summarized Values of the Probability Distributions of NL

(Unit: KRW)

Insurance Premium Structure (initial premium, yearly premium)	Lower	Median	Upper
(2.00%, 0.50%)	-18,888,169	-9,282,125	54,127,847
(2.00%, 0.57%)	-20,750,980	-10,168,561	54,138,934
(1.75%, 0.66%)	-22,395,462	-10,854,495	54,146,646
(1.50%, 0.75%)	-24,005,753	-11,415,872	54,153,973
(1.25%, 0.84%)	-25,610,242	-11,947,247	54,217,665
(1.00%, 0.93%)	-27,226,998	-12,467,410	54,235,119
(0.75%, 1.03%)	-29,119,894	-13,111,895	54,250,531
(0.50%, 1.12%)	-30,726,449	-13,591,719	54,252,886
(0.25%, 1.22%)	-32,604,746	-14,135,041	54,266,446
(0.00%, 1.32%)	-34,523,507	-14,651,694	54,294,464

# Wealth Composition and Draw Down Patterns of Retirees

- Old citizens' comparisons between US and Korea
  - Wealth composition for retirees (share of real estate )
  - Annuitized public and private pension
  - Share of financial assets
- Minimal penetration for RAM
  - A strong correlation between bequest incentive and RAM subscription rate
  - Policies for consumer protection such as education

- Bernheim, Shleifer and Summers (1985, JPE)
  - Strategic bequest motive : compensation for services from children
  - Comparisons among Asian countries such as Hong Kong and Japan
  
- Mayer and Simons (1994, REE)
  - Simultaneous decision
  - Wealth bequest vs. housing bequest: old citizens may bequest cash by subscribing a reverse mortgage.