Hacking Reverse Mortgages

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Hack *(verb).*

- To cut or sever with repeated irregular or unskillful blows

  --Merriam Webster Dictionary

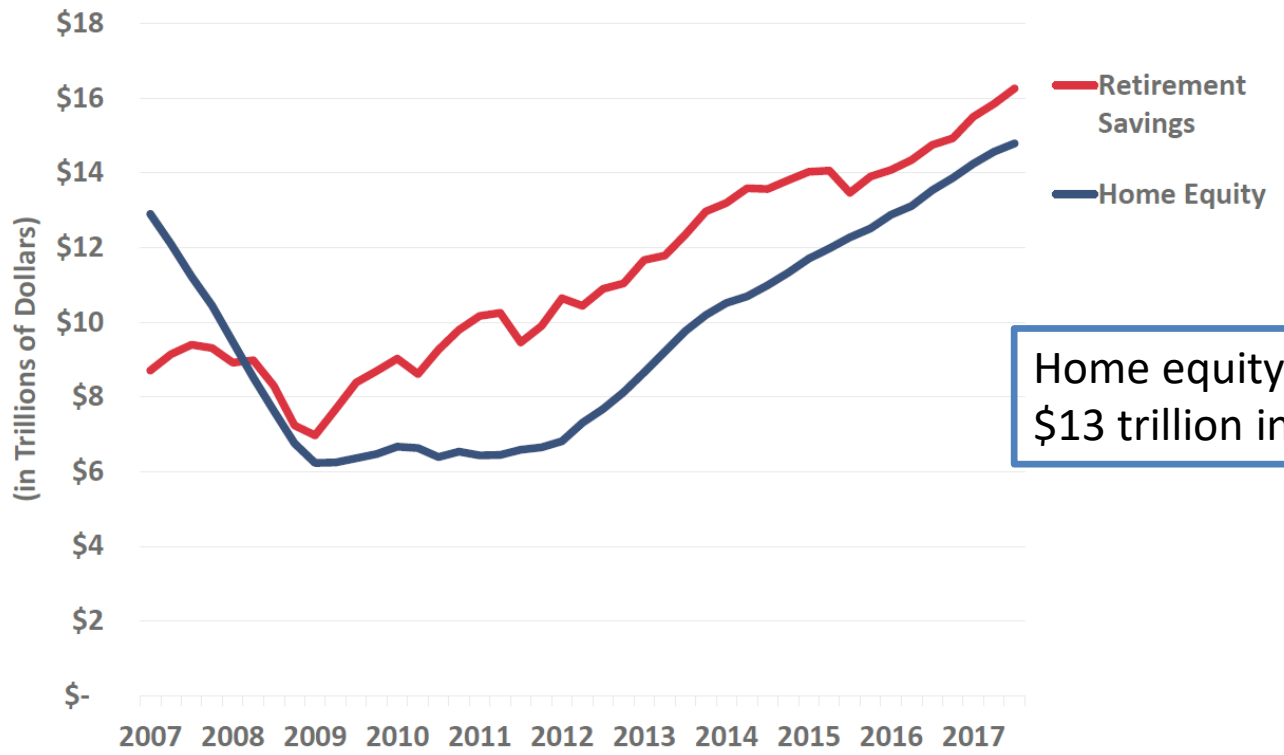
- An appropriate application of ingenuity

  --Phil Agre, MIT hacker and UCLA prof

Plan

- Importance of home equity as a retirement asset, and the promise of reverse mortgages (RMs)
- RMs in practice in the U.S.: the Home Equity Conversion Mortgage “HECM”
- Valuation model: identifying winners and losers
- Structural weaknesses of HECMs and possible fixes
- Broader lessons for gov’t credit program design

Total home equity rivals Americans' private retirement savings



Home equity topped $13 trillion in 2017

Note: Retirement Savings includes total assets in Individual Retirement Arrangements (IRAs) and defined contribution (DC) plans.

Source: *The U.S. Federal Reserve and the Investment Company Institute*

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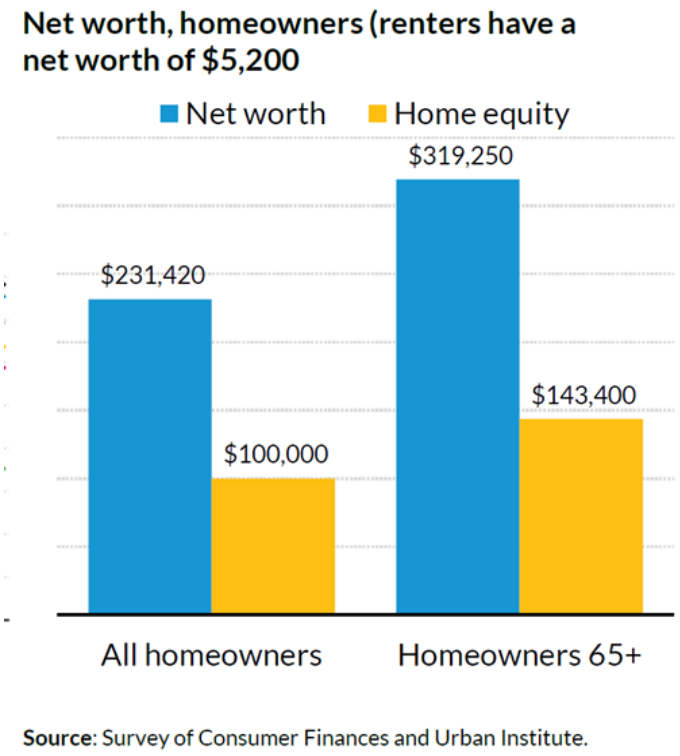
Importance of home equity for retirees

- Total home equity is almost equal to total retirement savings.
- About 80% of U.S. households over the age of 62 own their homes
- Home equity makes up about half of older households' median net worth
- Home equity extends further down the income distribution than other forms of private retirement savings
  - The 50th percentile household has $100,000 in home equity but only $28,000 in financial & retirement assets
  - Not until the 80th percentile do financial & retirement assets exceed $100,000



Source: Survey of Consumer Finances and Urban Institute.

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Retirees want to stay at home

- “Nearly 90 percent of people over age 65 want to stay in their home for as long as possible, and 80 percent believe their current residence is where they will always live.”
  - Reported findings from a 2014 AARP Survey
- Reverse mortgages, which liquefy home equity, can help people realize that goal
  - Potential market size in $ hundreds of billions

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What is a reverse mortgage?

- A reverse mortgage allows older homeowners to access a portion of home equity while staying in their homes for as long as they choose
  - Loan balance only comes due when borrower permanently moves or dies
  - House is collateral; no other recourse
  - Interest, premiums and fees rolled into balance; no cash owed until home is vacated
  - Borrower is long the house, short a loan and long a put option on the house

- Predecessor product was a "*viager*"
  - An ancient French system
  - Exchange of apartment at death for a life annuity

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Why take out a reverse mortgage?

- Help make it possible to age in place by paying for:
  - Renovations to increase accessibility
  - In-home long-term care assistance
  - Property insurance and taxes
- Supplement income from retirement assets
- Pay for medical and other emergencies
- Delay claiming Social Security to increase actuarial value of benefits
- Assist children and grandchildren (shift timing and avoid random bequests)

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Reverse mortgages in practice

- In the U.S., about 95% of reverse mortgages are originated under the **federal HECM loan guarantee program**, run by the FHA
  - HECM = Home Equity Conversion Mortgage; FHA = Federal Housing Administration
  - Established in 1988, made permanent in 1998

- Gov't guarantees loans, absorbs all default risk, charges premiums
  - Historically large losses to gov't; program rules have been tightened to reduce defaults

- Private lenders originate and service loans
  - After warehousing, loans sold into Ginnie Mae (gov't) securitizations

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Reverse mortgages in practice

- Low take-up rates
  - Less than 0.3% of seniors take out a HECM each year
  - Outstanding principal totals $70 billion in 2017
- Weak borrower demographics (vs. for other equity extraction products)
  - Lower incomes
  - More minorities
  - Poorer credit histories
    - 30% have drop in credit of 25 points or more two years before origination,vs.15% of seniors overall
    - Average drop of credit card debt of $1,000 in year after origination, sharp rise in year prior
- All indicators point to reverse mortgages as a product of last resort

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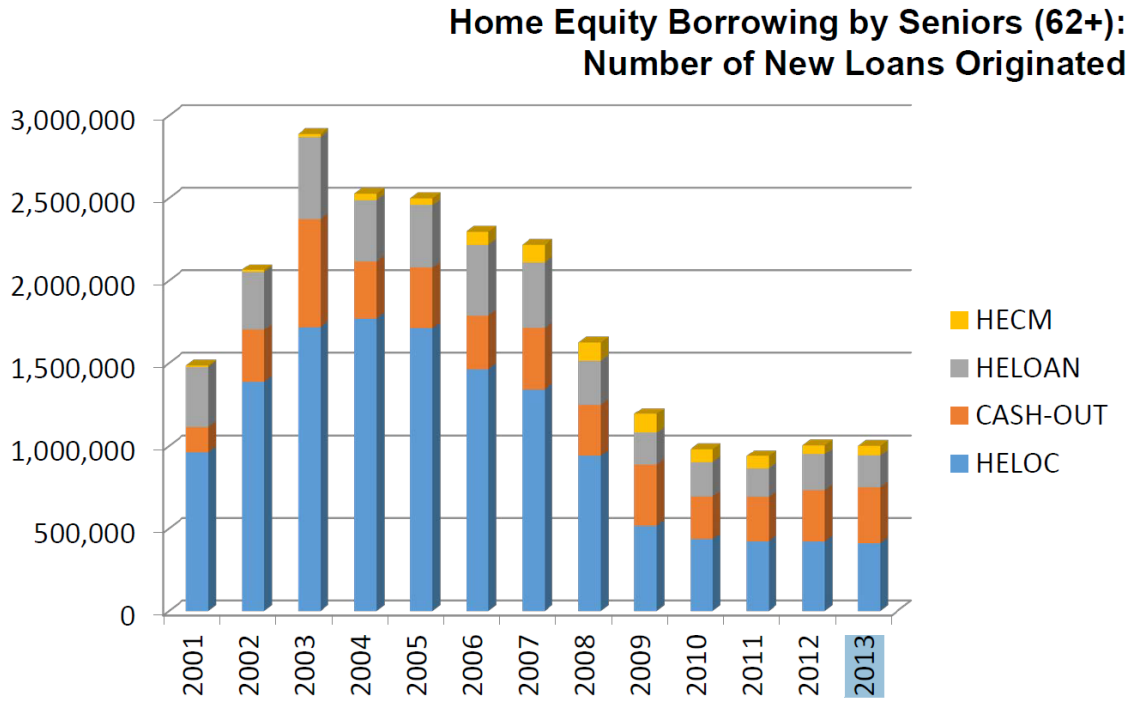
RMs are the *least popular* way for seniors to borrow against home equity



Source: Author's calculations from HUD HECM data and the Federal Reserve Bank of New York/Equifax Consumer Credit Panel (CCP)

Source: S. Moulton, Ohio State

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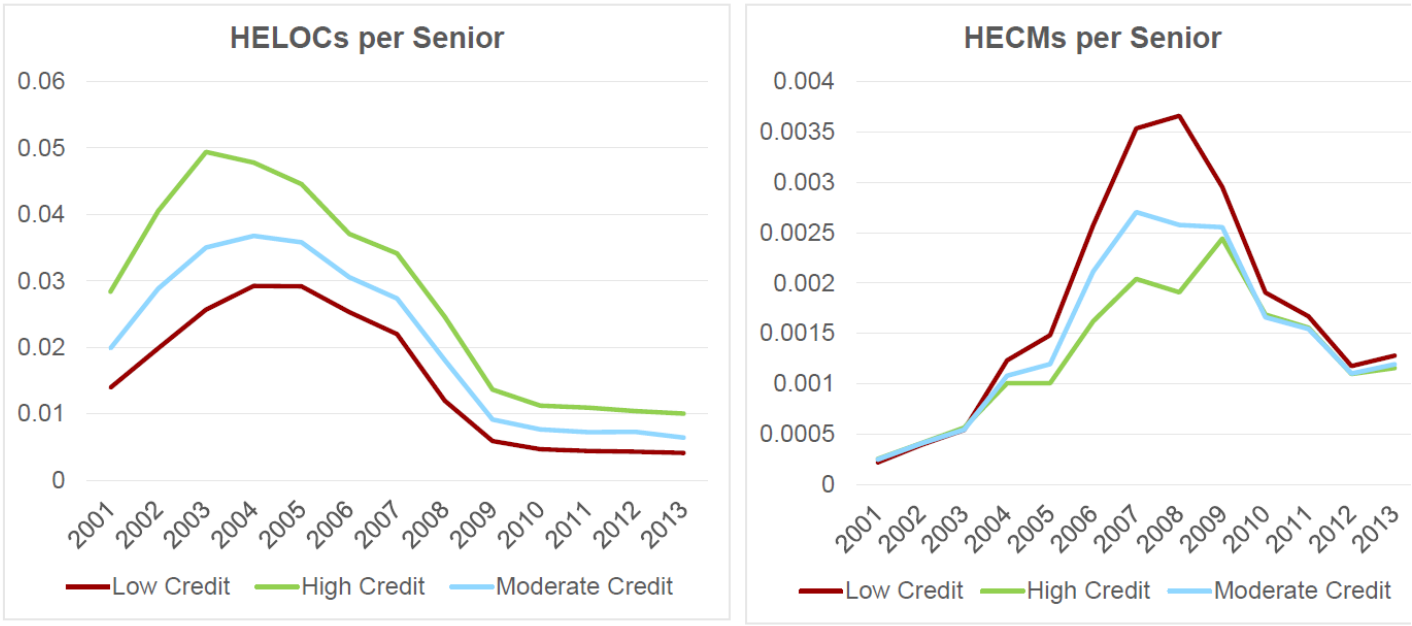
Borrowers with poor credit are the most frequent users of RMs. They are the least frequent users of HELOCs.

Loan Originations by Consumer Credit Conditions



Source: S. Moulton, Ohio State

Source: Author's calculations from HUD HECM data and the Federal Reserve Bank of New York/Equifax Consumer Credit Panel (CCP)

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A “Reverse Mortgage Puzzle”

- Why is a subsidized financial product that appears to solve the problem of liquefying home equity for older households so unpopular?
- Literature has suggested several possible answers:
  - distrust and lack of understanding exacerbated by the product’s complexity;
  - reluctance to spend bequests;
  - high upfront costs;
  - limited need because of Medicaid coverage.

A “Reverse Mortgage Puzzle”

- Why is a subsidized financial product that appears to solve the problem of liquefying home equity for older households so unpopular?
- The analysis here suggests a purely financial reason: HECMs are very expensive for borrowers, and unnecessarily so

Preview of results from valuation model

- HECMs are very costly for borrowers
  - Average fair value NPV of -$27,000 per loan (-18.6% of LOC)
  - Exception is “ruthless” strategy that earns $53,000
- HECMs are moderately costly for the government
  - Average fair value NPV of -$4,000 per loan (-2.8% of LOC)
  - Ruthless strategy costs $55,000
- The winners are private lenders
  - Average fair value NPV of $31,000 per loan (21.4% of LOC)
- Qualitative conclusions are robust to variations in house price volatility, moving frequency, age at origination, etc.

What explains who wins and who loses?

- Program rules and structure
  - Government bears all of the default risk (writes the put option)
  - Program rules **mandate high fees** for lenders
  - Lenders **charge high rate** spreads
  - Combination of premiums, fees and spreads exceeds cost of default risk
  - Lenders bear no default risk but earn high fees and spreads
- *Deeper question we will return to: why competition doesn't reduce costs to borrowers and gains to lenders?*

HECM program rules

- Key features
  - **Borrower must be age 62 or older** (co-borrower can be younger spouse)
  - **Maximum loan or LOC** is function of (1) age of youngest borrower, (2) interest rates, (3) house value, (4) cap $625,000
    - Typical amount is about 50% of current home value
  - **Loan limit grows over time** at rate of interest charged + insurance premium
  - **Existing mortgage must be paid off** (can use HECM funds)

HECM program rules

- **Cost Drivers: Interest Rates and Fees**
  - **Origination fees ($2,500 to $6000; based on house value)**
  - **Annual cost components:**
    - Servicing fees up to $360/yr + closing costs (appraisal, etc.)
    - Mortgage insurance premium .5% upfront on house value; **1.25% annually** on loan balance *(2014 rules)*
    - Lender sets **annual interest rate spread (typically between 1% & 3%;** mandated caps and floors)
  - **Combined annual fees and rates of about LIBOR + 4%**
    - Some have emphasized the high upfront fee, but the annual fees and rates are the most significant cost driver

HECM program rules

- **Many embedded options that complicate valuation**
  - Lenders can sell loan to FHA when balance reaches 98% of insured limit, which is initial house value; they usually do
  - Borrower picks form of payment
    - lump-sum, LOC, tenure annuity, term annuity, or combo
  - Borrower picks fixed or floating rate; lender sets offered rates
  - Borrower chooses whether to repay; no prepayment penalties
  - Borrower picks whether and when to sell house
    - Appreciated houses are sold at faster rates, increasing government cost
  - Borrower picks how much to maintain house
  - Borrower picks when to take out HECM
    - Higher usage in areas with high appreciation rates, minorities, low income

Valuation model

- Projects stochastic cash flows over life of loan for different borrower types, simulated via Monte Carlo
  - Function of mortality and moving rates, and borrower behavior
  - Cash flows split between borrowers, government, lenders
- Discount rates: (1) risk-adjusted to get fair value costs; and (2) gov't discounting rules
- Risk adjustment:
  - "Risk-neutral pricing" used to estimate fair value estimates
  - Implemented by adjusting down physical house price drift (assumed to be 2.5%) by risk premium in housing returns (assumed to be 1%)

Valuation model

- House prices follow a geometric random walk with drift
  - Assumed to be the only source of priced risk
  - Base case: 2.5% average growth rate; 16% volatility
  - Risk-neutral implementation assumes 1% risk premium in housing returns
  - Initial value distribution based on FHA Actuarial Report
- Borrower behavior types
  - (1) ruthless (10% of population)
  - (2) draw entire line in year 1 (80% of population)
  - (3) draw 50% in year 1 and 50% in year 3 (5% of population)
  - (4) draw 50% in year 1 and nothing more (5% of population)
- Program rules incorporated as previously described

The ruthless strategy

- Proposed by Thomas Davidoff as creating a different reverse mortgage puzzle
  - Davidoff Thomas. (2015). "Can 'High Costs' Justify Weak Demand for the Home Equity Conversion Mortgage?"
  - Davidoff, Thomas and Jake Wetzel (2014), “Do Reverse Mortgage Borrowers Use Credit Ruthlessly?”
- The strategy:
  - Take out LOC but do not draw on it
  - When you sell your house, if house value < LOC limit, draw the maximum; otherwise draw nothing
  - Takes advantage of put option and avoids insurance premium and rate spread

Valuation model

- Demographics:
  - Mortality & move rates by age based on IRS & Census data.
  - Age distribution of borrowers based on FHA Actuarial Report
- Interest rates:
  - Short-term rate fixed at 1%;
  - risk-neutral and government discount rate fixed at 2%
- More on Monte Carlo:
  - Over borrower types and over time (maximum of 50 years)
  - Draws from random number generator determine annual house price changes, and whether move or die (exit)
  - If exit repay min(house value, loan balance)
  - Cash flows to/from borrowers, gov't, lenders recorded and discounted to present

Results ($)

Table 4.1

Panel 1: Risk adjusted NPV ($)	**For $145,000 line of credit**		
	Borrowers	**Government**	**Lenders**
Base case			
population-weighted average	**-27,415**	**-3,970**	**31,075**
ruthless	53,149	-55,287	1,838
full draw in year 1	-36,412	1,319	34,793
50% draw in year 1, rest in year 3	-32,539	-313	32,330
50% draw in year 1	-39,480	10,381	28,798
never draw	-10,503	3,311	6,892
< =age 75	-30,353	-4,048	34,097
> age 75	-20,290	-3,783	23,742

Results ($)

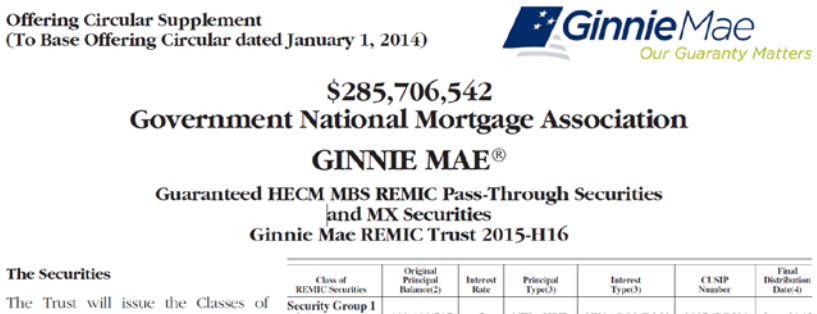
Variants	Borrowers	Government	Lenders
vol = .3 overall	15,295	-46,664	31,013
vol = .3 ruthless	96,997	-98,522	1,225
vol = .1 overall	-45,669	14,279	31,089
vol = .1 ruthless	34,384	-36,669	1,986
<=age 75 ruthless	64,872	-66,472	1,300
>75 ruthless	24,713	-28,155	3,142
flat 10% odds of moving	-18,286	-642	18,601
moving odds up with HPA	-20,007	-10,024	29,721
.5% lower HPA	-19,875	-11,477	31,040

Intuition for qualitative results

- Anything that increases the loan balance early on, or that increases the average life of the loan, makes it more expensive for the borrower
  - Reasons is that annual fees are high relative to the value of the risk transfer
- Higher house price volatility increases the value of the put option
  - Beneficial to borrowers, detrimental to government, neutral to lenders

Why doesn't competition improve outcomes?

- ***No a priori reason to presume a gov't designed credit market will be competitive or low cost***
- Impediments to competition in HECM market:
  - Opaque prices, (too) many options
  - Older households may be reluctant to shop, or lack the know-how to compare offers
  - No information on rates or fees online; no-name intermediaries, many low-volume lenders
- Lender costs are (unnecessarily) high
  - high marketing and selling costs could dissipate the rents from market power
  - unnecessarily high funding costs in Ginnie Mae HMBS market



Offering Circular Supplement
(To Base Offering Circular dated January 1, 2014)

GinnieMae
Our Guaranty Matters

$285,706,542
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GINNIE MAE®
Guaranteed HECM MBS REMIC Pass-Through Securities
and MX Securities
Ginnie Mae REMIC Trust 2015-H16

The Securities

The Trust will issue the Classes of

Class of REMIC Securities	Original Principal Balance(2)	Interest Rate	Principal Type(3)	Interest Type(3)	CUSIP Number	Final Distribution Date(4)
Security Group 1						

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Top HECM lenders, 2017—notable absence of established financial institutions

Rank	Lender	Loans Month	Loans YTD	% Market Share
1	AMERICAN ADVISORS GROUP	1,141	12,778	23.95%
2	REVERSE MORTGAGE FUNDING LLC	457	4,616	9.59%
3	FINANCE OF AMERICA REVERSE LLC	435	5,406	9.13%
4	RETIREMENT FUNDING SOLUTIONS (RFS) / SYNERGY ONE LENDING INC	340	3,351	7.14%
5	ONE REVERSE MORTGAGE LLC	265	3,080	5.56%
6	LIBERTY HOME EQUITY SOLUTIONS INC	192	3,504	4.03%
7	LIVE WELL FINANCIAL INC	183	1,926	3.84%
8	LONGBRIDGE FINANCIAL LLC	106	540	2.22%
9	FIRSTBANK	100	901	2.1%
10	REVERSE MORTGAGESCOM INC	89	1,024	1.87%

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Why doesn’t competition improve outcomes?

- Product innovation
  - Arguably there would be a market for simpler reverse mortgages with less optionality and lower cost to borrowers
    - E.g., floating rate w/out cap would reduce prepayment and longevity risks
    - E.g., penalize ruthless strategy to reduce value of put option
  - Reasons for no innovation could include potential liability, and difficulty competing with government-endorsed product, regulatory barriers to entry

Potential cost reductions

- **Model used to ask:**
- **How much lender interest rate spreads and insurance premiums could be lowered?**
  - Leaving lenders with NPV of about $4500 to cover admin
  - Leaving gov't with NPV of about $1000
  - Lender spread is 1% (from 2.75% in base case)
  - Gov't insurance premium is 1% (from 1.25% in base case)
- **And what if ruthless strategy were also ruled out?**
  - Gov't insurance premium is 0.85% (from 1.25% in base case)
- **Suggests potential reduction in annual costs > 2%**

Lessons for government credit programs

- HECMs comprise a small fraction of the over $3 trillion outstanding in federal direct and guaranteed loans
- Under gov't accounting rules (which use same cash flows but Treasury rates to discount), HECMs appear profitable:
  - Fair value NPV = -$4,000 (this analysis)
  - Budgetary NPV = $10,500 (this analysis w/gov't discounting)
  - Systematic understatement of credit costs tends to distort decision-making and creates hidden subsidies
  - Analysis here is part of a research agenda to increase transparency of credit programs by designing and implementing models to estimate fair value subsidy costs

Lessons for government credit programs

- The finding that a federally guaranteed loan program provides greater benefits to guaranteed lenders than to the intended beneficiaries is not unique to HECMs.
- Related analyses reach similar conclusions:
  - Now-discontinued Guaranteed Student Loan program (Lucas and Moore, 2010)
  - Small Business Administration's 7a program (de Andrade and Lucas, 2013)

Lessons for government credit programs

- Guaranteed lending vs. direct lending—which is more efficient?
  - Guaranteed lending can be efficient when monitoring and screening borrowers is important and guaranteed lenders are required to have skin-in-the-game
  - Guaranteed lending can be costly to the gov't and borrowers when fees are set by regulation rather than by market forces
  - The guarantee benefits may be captured by lenders if the market structure is insufficiently competitive

Lessons for government credit programs

- HECM structure has the downside of guaranteed lending with little of the upside:
  - No judgmental screening is needed; eligibility by simple rules
  - No monitoring because no required payments
  - Fees set to fixed levels; no restrictions on rate spreads
  - In sum, a poster child for bad program design

- Time to rethink structure?

Conclusions

- Great potential for reverse mortgages to unlock private retirement savings and increase welfare of retirees
- Current market is dominated by gov't HECM product
- Under program rules, borrowers lose and lenders win
- Policy makers in other countries, particularly in Asia, are interested in promoting reverse mortgages. So far there has been limited take-up of those products also.

Hacking Reverse Mortgages

- Thank you!