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 FHA's Home Equity Conversion Mortgage "HECM"

- Valuation model: identifying winners and losers

- Structural weaknesses of HECMs and possible fixes

- Broader lessons for federal credit program design

- A little on the MIT GCFP

Importance of home equity for retirees

- 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 (Poterba et. al., 2011)

- Home equity extends further down the income distribution than other forms of private retirement savings

Importance of home equity for retirees

Median Potential Annutizable Assets and Housing Equity, by potential annutizable asset percentile interval households age 62-80 in 2012
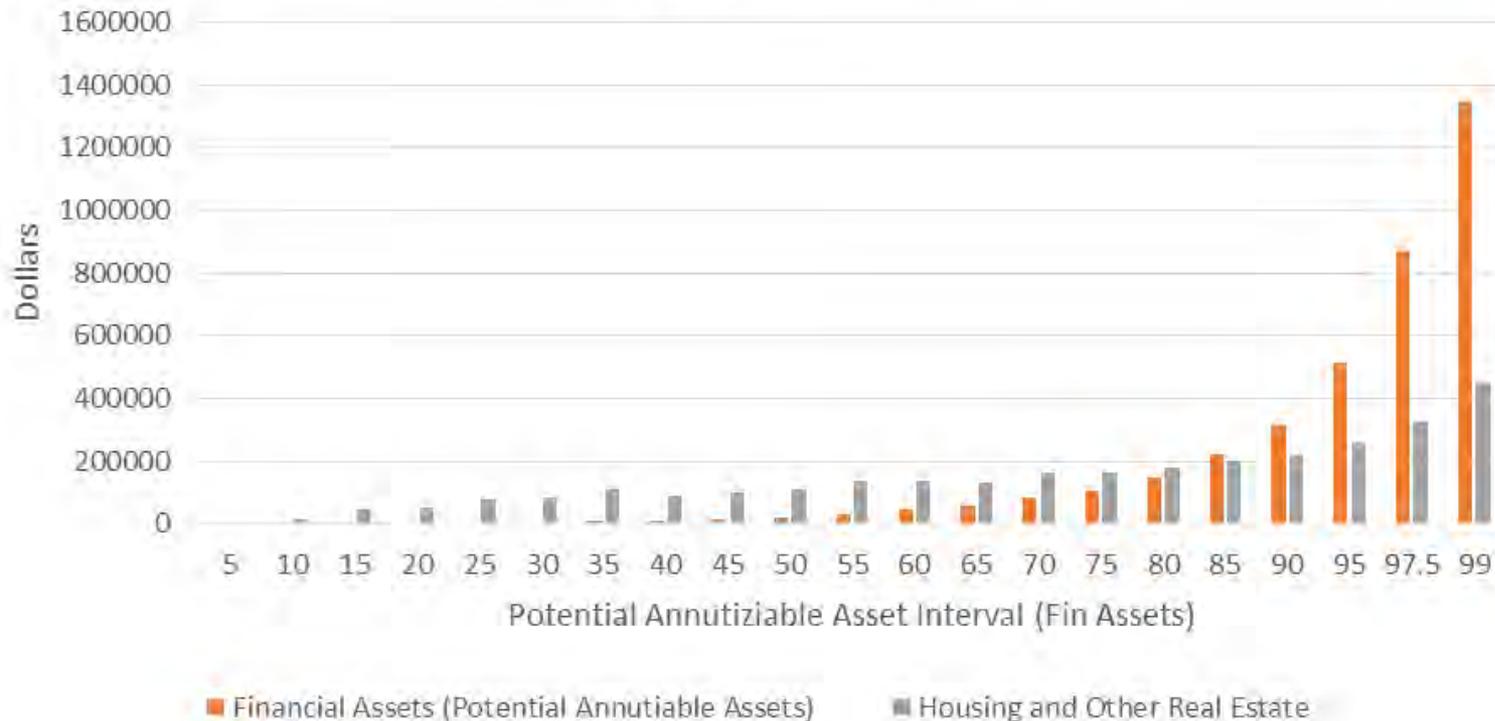
Source: HRS data; tabulations by Mark Warshawsky

Reverse mortgages

- A financial innovation designed to let older homeowners access home equity while staying in their homes for as long as they choose.

  - Liquefies home equity

  - Provides longevity insurance

- Predecessor is a "*viager*"

  - An ancient French system for selling apartments and obtaining a life annuity

Related literature

- Cocco, Joao and Paula Lopes (2015)

- Davidoff, Thomas (various years with various coauthors)

- Moulton, Stephanie, Samuel Dodini, Donald Haurin, and Maximilian Schmeiser. (2015)

- Nakajima, Makoto, and Irina Telyukova, (2014a & b)

- Warshawsky, Mark and Tatevik Zohrabyan, (2016)

- Many practitioners, FHA Actuarial Report

- Lucas (2012), '"Valuation of Government Policies and Projects" *Annual Review of Financial Economics*

Reverse mortgages

- Basic design features:

  - Homeowner gets a loan (or LOC or annuity) capped at portion of current home equity

  - House is collateral; no other recourse

  - Interest, premiums and fees rolled into loan balance so no cash owed until home is vacated

  - Balance comes due when borrower permanently moves or dies

    - If balance < house value, investors get balance, borrower or heirs get house

    - If balance > house value, investors get house value

  - A financial derivative: borrower is long their house, short a loan and long a put option, all with an indefinite maturity

Potential uses of reverse mortgages

- Makes it possible to age in place
  - Avoids utility cost of moving
  - Avoids high-cost nursing home care
  - Annuity stream could cover insurance and taxes
  - Helps pay for in-home long-term care assistance
- Pay for medical and other emergencies
- Delay claiming Social Security to increase actuarial value of benefits
- Assist children or grandchildren (shift timing and avoid random bequests)
- Buffer changes in cash flows from retirement assets

Reverse mortgages in practice

- In the U.S., about 95% of reverse mortgages are originated under the FHA's HECM program

  - HECM = Home Equity Conversion Mortgage

  - FHA = Federal Housing Administration (part of housing agency HUD)

  - Historically costly for HUD

- A very unpopular product
  - <2% of eligible households take out a HECM each year (Moulton et. al., 2015)
  - Only $16 billion originated in 2015

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;

  - limited need because of Medicaid coverage;

  - reluctance to spend bequests;

  - high *upfront* costs

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.

  - Complement to, not substitute for, other reasons suggested

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 robust to changes in house price vol., 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) and receives insurance premium

  – Lenders' function is mostly administrative

  – Program rules **mandate** high fees for lenders; lenders can and do charge high rate spreads

  – Combination of premiums, fees and spreads far exceed cost of default risk and reasonable admin costs

- *Deeper question we will return to: why competition doesn't reduce costs to borrowers and gains to lenders?*

HECM market structure

- A federal *loan guarantee program*

- Gov't guarantees that lenders made whole up to insured limit; sets rules

- Private lenders originate and fund HECMs

- Most HECMs are funded by securitizing them through Ginnie Mae (also part of HUD)

HECM program rules

- Detailed and complex rules

  - http://portal.hud.gov/hudportal/HUD?src=/program_offices/administration/hudclips/handbooks/hsgh/4235.1

HECM program rules

- Key features
  - **Basic features as above**
    - No money due until move or die; no liability beyond house
  - **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)
  - **Counseling required**

HECM program rules

- **Cost Drivers: interest rates and fees**

  - **Origination fees** ($2,500 to $6000; based on house value) + closing costs (appraisal, etc.)

  - **Annual fees**

    - Mortgage insurance premium to gov't is .5% upfront on house value; **1.25% annually** on loan balance

    - Lender sets **annual interest rate spread (typically between 1% & 3%;** mandated caps and floors) + servicing fees up to $360/yr

  - **Combined annual fees and rates of about LIBOR + 4%**

    - Annual fees and rates are the largest driver of cost, although upfront fees have drawn more attention

HECM program rules

- Many **embedded options** complicate valuation
  - Lenders have put option written by the gov't
    - Lenders can sell loan to FHA when balance reaches 98% of insured limit (= initial house value); they generally do
  - Borrowers pick form of payment
    - lump-sum payout, LOC, tenure annuity, term annuity, or combo
  - Borrowers pick fixed or floating rate; lenders set offered rates
  - Borrowers can prepay without penalties
  - Borrowers pick whether and when to sell house
    - Appreciated houses are sold at faster rates, increasing government cost
  - Borrowers pick level of home maintenance
  - Borrowers decide when to take out a HECM
    - Higher usage in areas with high appreciation rates, minorities, low income

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Valuation model

- <u>Step 1</u>: Project stochastic cash flows over life of a loan for different borrower types, simulated via Monte Carlo

  - Function of mortality and moving rates, and drawdown behavior

  - Cash flows split between borrowers, government, lenders

- <u>Step 2</u>: Discount cash flows to origination at relevant discount rate:

  - (1) risk-adjusted to get fair value estimates; and

  - (2) gov't discounting rules to compute budgetary cost

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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 nominal growth rate; 16% volatility
  - Risk-neutral implementation assumes 1% risk premium in housing returns
  - Initial house value distribution based on FHA Actuarial Report

- Risk adjustment:
  - "Risk-neutral pricing" used to estimate fair value estimates
  - Implemented by adjusting down physical nominal house price drift (assumed to be 2.5%) by risk premium in housing returns (assumed to be 1%)

Initial house values and borrowing limits

Table 3.3.1 Distribution of House Values at Origination					
House Value	$100,000	$200,000	$262,000	$443,500	$625,000
Frequency	.05	.3	.4	.2	.05

Table 3.3.2 Principal Limit Factors by Projected Rate and Age							
Rate/ Age	25	35	45	55	65	75	85
5.5%	0.302	0.341	0.381	0.419	0.478	0.553	0.644
7%	0.146	0.187	0.228	0.270	0.332	0.410	0.513
8.5%	0.042	0.087	0.133	0.171	0.227	0.304	0.414

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Valuation model

- Borrower types
  - (1) draw entire line in year 1 (80% of population)
  - (2) draw 50% in year 1 and 50% in year 3 (5% of population)
  - (3) draw 50% in year 1 and nothing more (5% of population)
  - (4) ruthless (10% of population)

- Program rules as previously described

- *Note: Annuities are assumed to be priced to be equivalent in value to lump-sum withdrawals*

The ruthless strategy

- Proposed by Thomas Davidoff as creating a 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 premiums 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 & discounted to origination date

Results ($)

Table 4.1

Panel 1: Risk adjusted NPV ($)

	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 (%)

Table 4.1 Panel 2				
Risk adjusted NPV as percentage of initial LOC				
	Borrowers	Government	Lenders	
Base case				
population-weighted average	-18.9	-2.7	21.4	
ruthless	36.7	-38.1	1.3	
full draw in year 1	-25.1	0.9	24.0	
50% draw in year 1, rest in year 3	-22.4	-0.2	22.3	
50% draw in year 1	-27.2	7.2	19.9	
never draw	-7.2	2.3	4.8	
< =age 75	-20.9	-2.8	23.5	
> age 75	-14.0	-2.6	16.4	

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

Interpretation of main 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
  - B/c 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

- Costs may be (unnecessarily) high
  - high marketing and selling costs could dissipate rents
  - Possibly high risk premia on longevity and prepayment risk
  - GNMA securities may be poorly structured from investor perspective

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Top HECM lenders, 2015

Rank	Lender	Loans Month	Loans YTD	% Market Share	% change Month	% change YTD
1	AMERICAN ADVISORS GROUP	1,162	12,169	23.51%	11.73%	64.16%
2	ONE REVERSE MORTGAGE LLC	540	4,952	10.93%	45.95%	-8.38%
3	RMS/SECURITY ONE LENDING	497	5,107	10.06%	18.9%	-32.23%
4	URBAN FINANCIAL OF AMERICA LLC	344	3,349	6.96%	19.44%	-15.28%
5	LIBERTY HOME EQUITY SOLUTIONS INC	271	4,660	5.48%	-13.69%	-30.07%
6	REVERSE MORTGAGE FUNDING LLC	215	1,077	4.35%	31.9%	
7	PROFICIO MORTGAGE VENTURES LLC	159	1,737	3.22%	19.55%	-31.78%
8	LIVE WELL FINANCIAL INC	133	951	2.69%	11.76%	1,278.26%
9	MAVERICK FUNDING CORP	104	802	2.1%	-9.57%	-1.96%
10	GENERATION MORTGAGE COMPANY	69	1,438	1.4%	-5.48%	-42.59%
11	CHERRY CREEK MORTGAGE CO INC	67	504	1.36%	34.0%	-41.33%
12	UNITED NORTHERN MORTGAGE BANKERS LTD	61	554	1.23%	-21.79%	59.2%
13	PLAZA HOME MORTGAGE INC	55	444	1.11%	14.58%	33.33%
13	HIGH TECH LENDING INC	55	511	1.11%	-39.56%	-11.74%
15	FIRSTBANK	51	407	1.03%	45.71%	19.01%
16	MONEY HOUSE INC	47	292	0.95%	56.67%	-45.42%
17	OPEN MORTGAGE LLC	44	413	0.89%	-31.25%	-39.8%
18	SUN WEST MORTGAGE CO INC	42	474	0.85%	-17.65%	-45.95%
19	ADVISORS MORTGAGE GROUP LLC	35	344	0.71%	16.67%	97.7%
19	NET EQUITY FINANCIAL INC	35	609	0.71%	-22.22%	26.61%

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 (currently mandatory) cap would reduce prepayment and longevity risks
    - E.g., penalize ruthless strategy to reduce value of put option
  - Reasons for no private innovation could include potential liability, and difficulty competing with government-endorsed product, regulatory barriers to entry
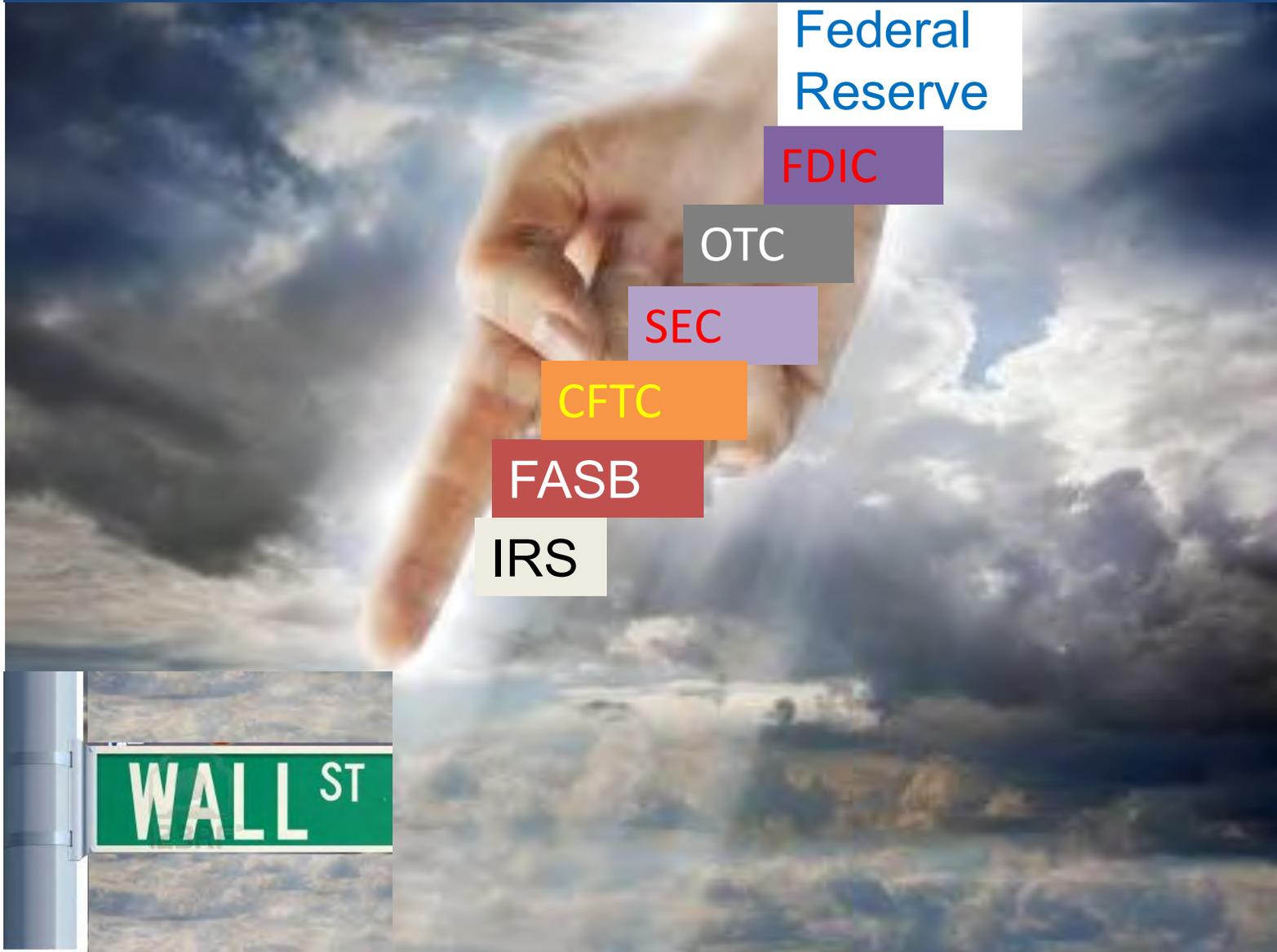
Potential cost reductions

- Model used to ask:

- By how much might lender interest rate spreads and insurance premiums be lowered?
  - Leaving lenders with NPV of about $4500 to cover admin
  - Leaving gov't with NPV of about $1000
  - Lender spread is 1% (vs. 2.75% in base case)
  - Gov't insurance premium is 1% (vs. 1.25% in base case)

- And what if ruthless strategy were also ruled out?
  - Gov't insurance premium is 0.85% (vs. 1.25% in base case)

- **Potential reduction in annual costs > 2%!**

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Lessons for government credit programs

- HECMs (and other gov't credit programs) cost more than what is reported in the federal budget

- 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

- *This analysis is part of a broader research agenda to design and implement models to estimate fair value subsidy costs for gov't credit programs.*

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Academics have studied government as a regulator of financial institutions

Federal Reserve

FDIC
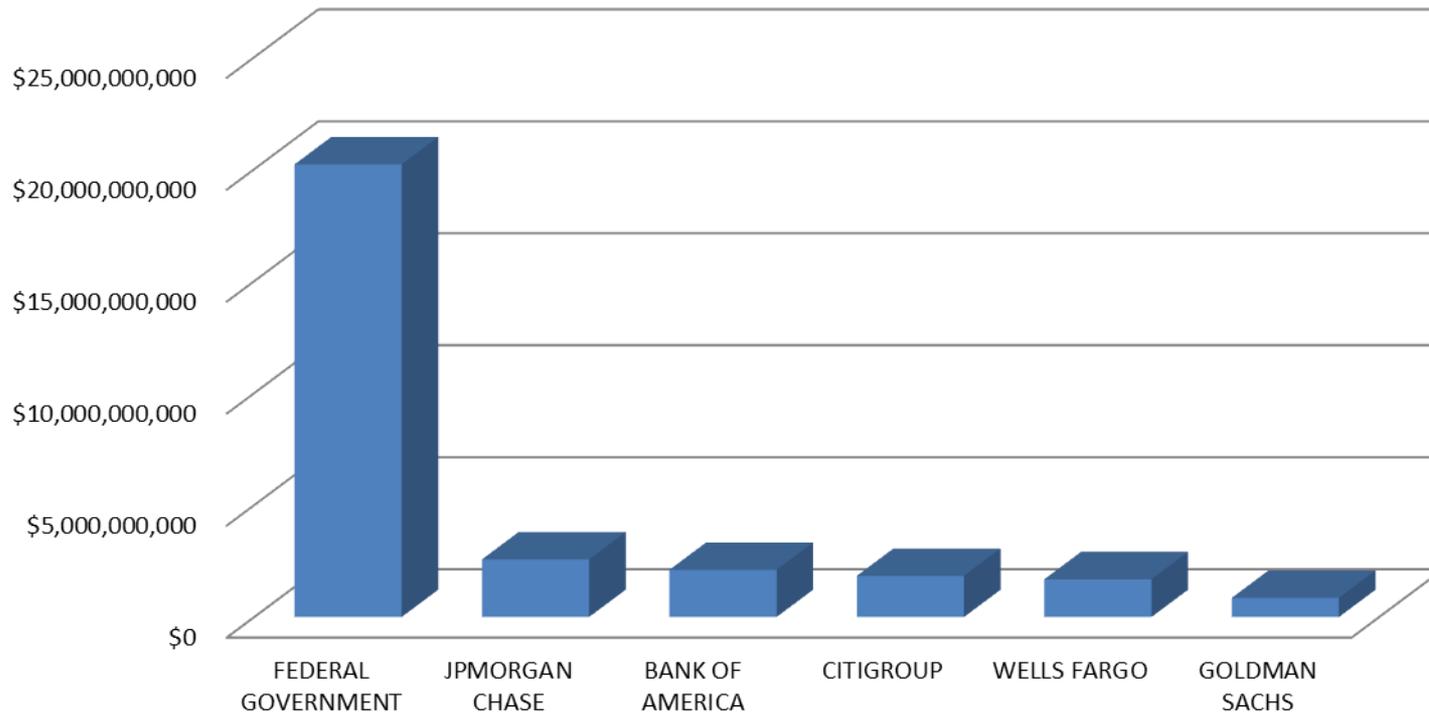
OTC

SEC

CFTC

FASB

IRS

WALL ST

But relatively little work has been done on the government as major financial institution in its own right…
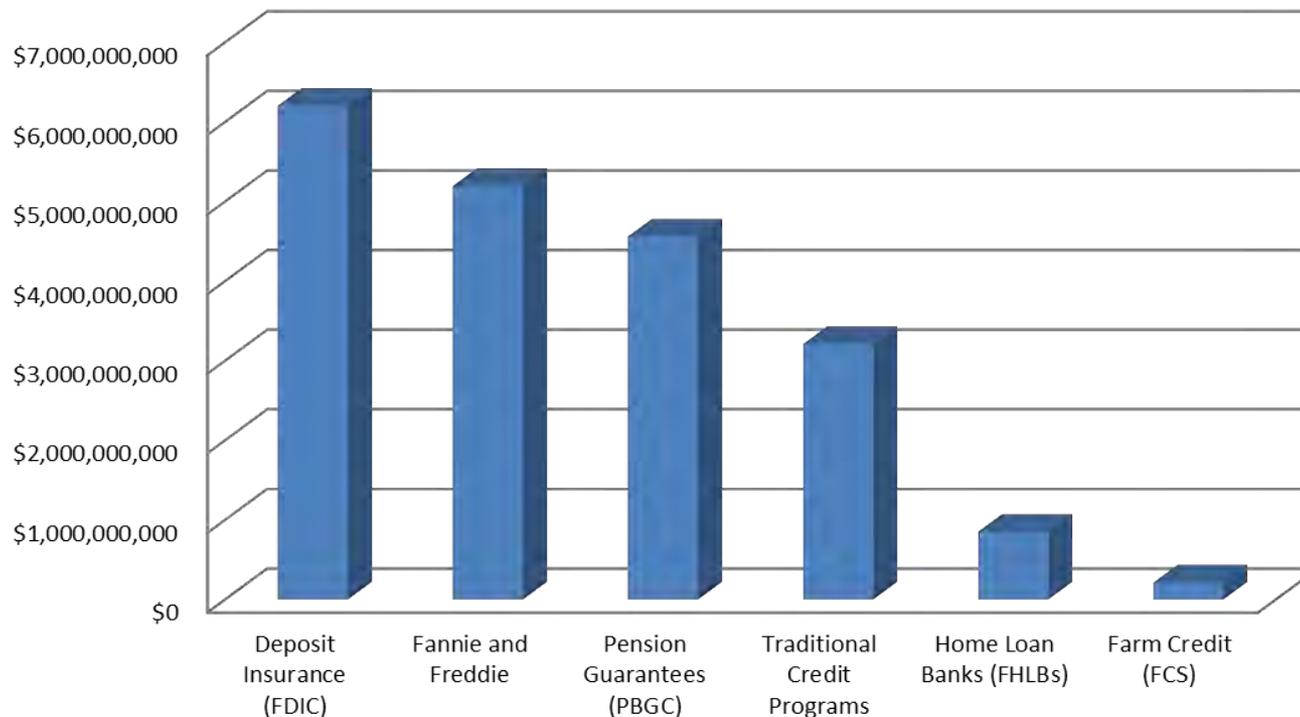
Largest financial institutions

Assets or Insured Obligations ($000s)

Largest federal credit activities

Federally-Backed Credit Outstanding, 2014
($000s)

- Excludes the Federal Reserves emergency lending facilities
- Excludes federal health/life/P&C insurance

Lessons for government credit programs

- The finding that a federally guaranteed loan program provides **greater benefits to guaranteed lenders than to borrowers** 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

- Fundamental choice: guaranteed or direct loans
  - Guaranteed uses private funding, and usually less gov't involvement
  - Theoretically both should have similar all-in cost b/c both require origination, funding, servicing, risk-bearing, collection
  - U.S. gov't uses both extensively
    - Outstanding direct loans of $1.1 trillion in 2015
    - Outstanding guaranteed loans of $2.3 trillion in 2015 (excludes Fannie and Freddie)

Lessons for government credit programs

- When is a guaranteed or direct loan more efficient in practice?
  - It depends…
  - Guarantees efficient when monitoring and screening is important, and if lenders are required to have skin-in-the-game
  - Guarantees can be costly to the gov't and/or borrowers when fees are set by regulation rather than by market forces
    - Benefits of guarantee may be captured by lenders if the market structure is insufficiently competitive
  - Possibly better risk-sharing with direct loans, esp. of tail risk

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Lessons for government credit programs

- Application to HECMs
  - Structured to have downside of guarantees 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; limited competition

- Time to rethink program design?

Conclusions

- Great potential for reverse mortgages to unlock private retirement savings and increase welfare of retirees

- Current U.S. market is dominated by gov't HECM product

- Under program rules, borrowers lose and lenders win

- Model developed here is useful for exploring options for policy improvements, and for understanding costs and risks to gov't, lenders and borrowers

- Reverse mortgage programs in other countries are natural targets for similar analyses

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- Broad mission is to produce and disseminate:

    - **Original and timely research** at intersection of finance and policy that will lead to improved decision-making by policy-makers and regulators

    - **Innovative educational materials** and curricula that will make financial education relevant and accessible to students of public policy, employees of public institutions, and policymakers

- Opportunities include visiting fellowships, conferences, sponsored research, etc.

Research areas

- Three main tracks
  - Evaluation and management of **government financial institutions**
    - e.g., government loans and guarantees, state pensions, sovereign wealth funds
  - **Regulation** of financial markets and institutions
    - e.g., evaluation of proposed rule changes, development of methods to identify emerging risks
  - Public sector **risk management**
    - e.g., forensics on causes of crashes
    - Systemic risk measurement

Hacking Reverse Mortgages

- Thank you!