

Beyond Mortgages: Equity Financing for Homes

Hayne Leland

Professor of the Graduate School, Haas School of Business, UC Berkeley
Principal, Home Equity Securities (HES)

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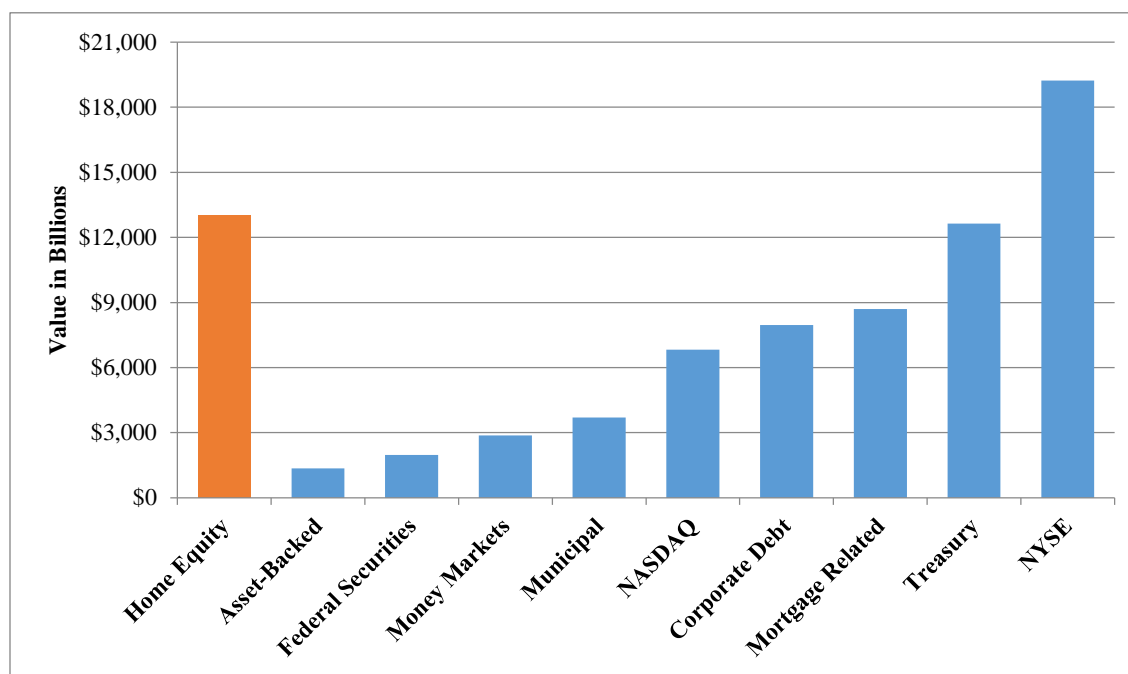
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PRELIMINARY – NOT FOR FURTHER CIRCULATION

HOME EQUITY

Home Equity (HE): Residential home value less secured borrowing (mortgages, second mortgages, HELOCs)

In the U.S., a major potential asset class (\$13 trillion in March 2015)



Larger than value of US Treasury debt, corporate debt, mortgage debt!

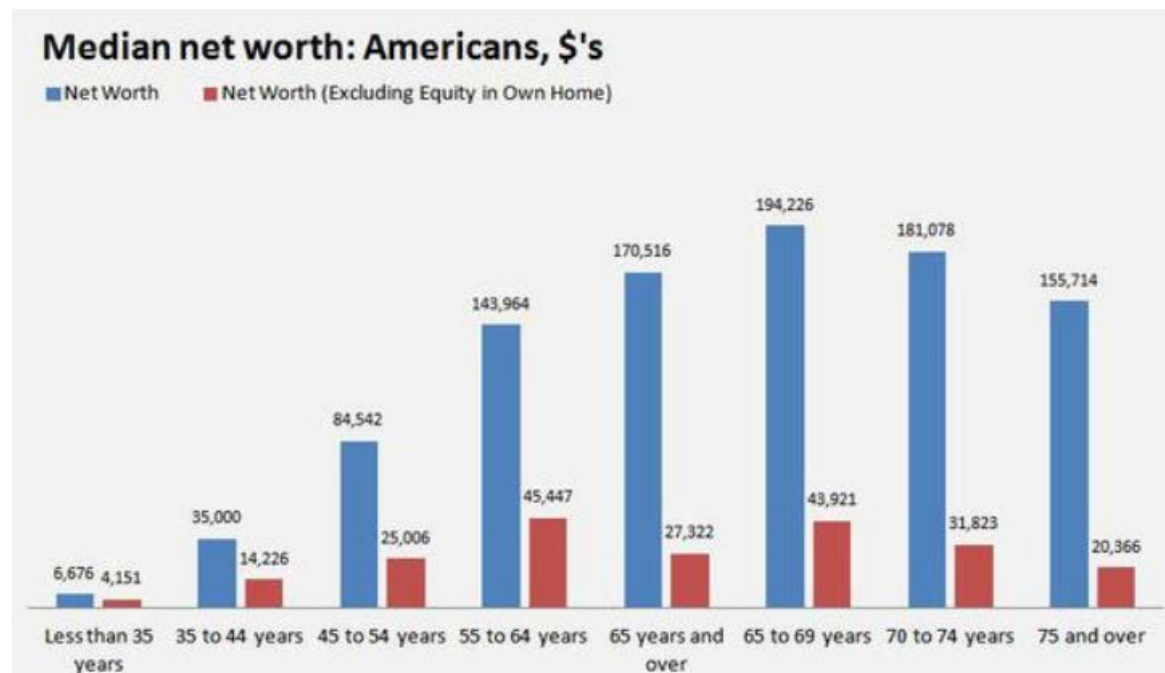
HOME EQUITY: A SUBSTANTIAL FRACTION OF HOUSEHOLD NET WORTH

Home equity's share in total household wealth is about 25% (2011)

<http://www.census.gov/housing/hvs/data/histtabs.html>

...but this statistic is skewed by the very wealthy:

For the *median* US household, home equity is about 75% of wealth



SOURCE: U.S. CENSUS BUREAU.

<https://www.census.gov/people/wealth/files/Wealth%20Highlights%202011.pdf>

BUT NO MARKET FOR TRADING HOME EQUITY

- You either own 100% of your residence, or 0% (a renter!)
- Homeowners can't diversify their largest asset holding
 - That asset is risky: annual standard deviation of single home about 10%

Table 4. Annualized standard deviation of one-year vs. five-year home investment.

	Single Home	Single Home	Regional Portfolio	Regional Portfolio
	One Year	Five Years	One Year	Five Years
Atlanta	9.52%	7.08%	3.24%	3.16%
Chicago	10.54%	10.06%	4.85%	7.18%
Dallas	11.76%	11.75%	6.48%	8.80%
San Francisco	12.69%	14.26%	8.48%	11.94%

Source: W. Goetzmann, "The Single Family Home in the Investment Portfolio," *Journal of Real Estate Finance and Economics*, 1993. Quarterly data from 1971-1986. Note: 5-yr standard deviation reflects positive serial correlation, reduced selling risk.

- With 80% mortgage, *home equity* → home price *leveraged five times*
- Home price vol = 10%/year → **Home equity vol ≈ 50%/year**
- **But pooling can substantially reduce risk, as seen above**

INVESTORS CANNOT ACCESS A MAJOR INVESTMENT CLASS

- Historically low correlations of home prices with S&P, Treasuries:

Table 5. Correlation of housing and other investments. (Coefficients adjusted to reflect single home investment.)

ATL	1.00									
CHI	-.01	1.00								
DAL	.06	.12	1.00							
SF	.04	.20	.19	1.00						
S&P	-.18	-.11	.01	-.04	1.00					
LTG	-.15	-.11	-.24	-.29	.11	1.00				
TB	.192	-.32	.00	-.20	-.07	.22	1.00			
INF	.31	.03	.24	.30	-.02	-.17	.41	1.00		
4CY	.22	.36	.44	.55	-.20	-.54	-.22	.56	1.00	
	ATL	CHI	DAL	SF	S&P	LTG	TB	INF	4CY	

Note: Correlations based upon annual returns calculated over the maximum available data. Financial asset data extends back to 1926, and is used with the permission of Ibbotson Associates, Chicago.

ATL = Atlanta area, CHI = Chicago, DAL = Dallas, SF = San Francisco

LTG = long term government bonds, TB = Treasury bills, INF = inflation, 4CY = 4 city index

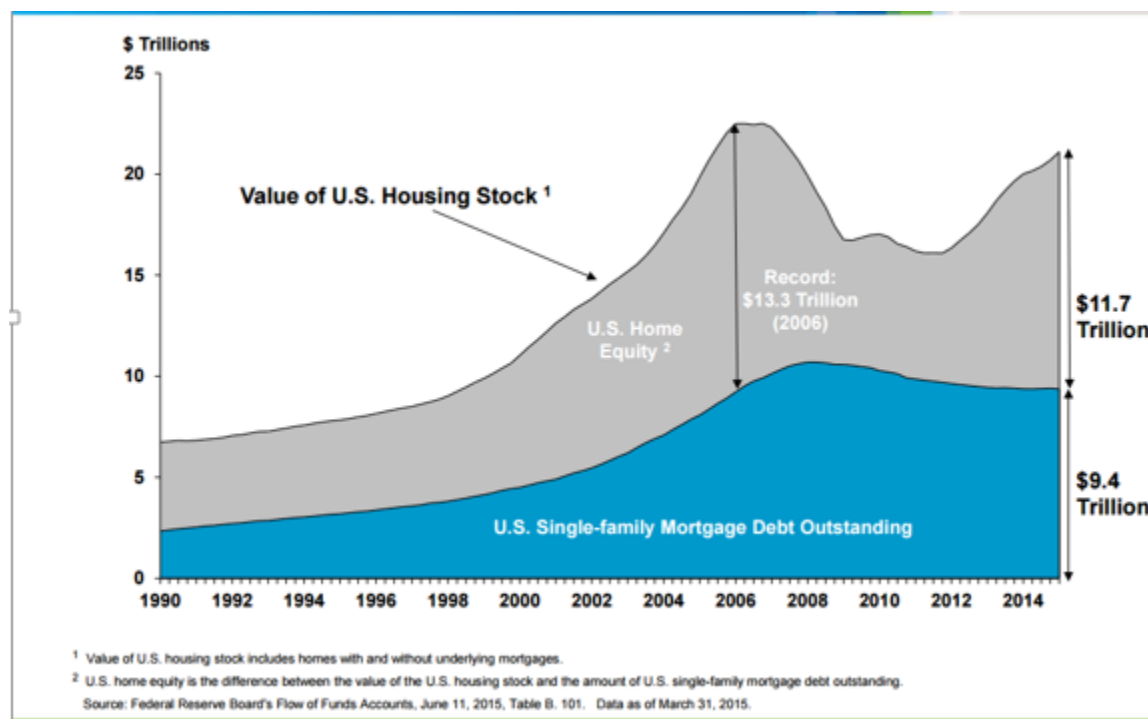
Source: W. Goetzmann, "The Single Family Home in the Investment Portfolio," *Journal of Real Estate Finance and Economics*, 1993.

➤ More recently: Correlation FHFA's HPI, S&P 500 3-yr, 1991-2015: 0.21

DEBT IS THE *ONLY* EXTERNAL SOURCE OF HOME FINANCING

A \$20 trillion residential market, but only debt financing is available

- For all U.S. Households, debt = 44.4% of current home value:



- For current purchases, average LTV (2014) is 77.5%
- First time buyers now can borrow up to 97%... at 1.35%/yr. insurance cost
- Leverage → potential foreclosure and market instability: seriously underwater loans (3/2015)= 13.2% of all mortgaged properties (v. peak 28.6% in 2012)

WITH A MARKET FOR TRADING FRACTIONAL HOME EQUITY...

➤ ***Homeowners with substantial equity could diversify***

- Lower risk exposure to single asset,
- Lower ongoing debt service burden than seconds, HELOCs

➤ ***Investors could have access a large new diversifying asset class***

➤ ***Home purchasers could combine debt and equity financing***

- Consider package with 70% loan (LTV ratio). Of the 30% down payment,
 - 15% from external home equity finance
 - 15% from homeowner
- Compare with 80% LTV loan, with 20% down from homeowner
 - Homeowner needs 25% less cash for downpayment
 - Pays 12.5% less monthly debt service
 - Has 33% less wealth sensitivity to home price fluctuation
 - Probability of loan being underwater after 5 yrs falls to 2.1% from 7.5% (assumes 2%/yr annual home price growth, 10%/yr volatility)

➤ ***A more stable housing sector with less leverage, fewer foreclosures***

A FRACTIONAL HOME EQUITY SHARE: How would it be structured?

- **Do not want** complications of multiple owners of a residential property
- **Do want** financial sharing *without* home ownership – but how to construct?

The Home Equity Fractional Interest (HEFI) security

**A security sold by the homeowner, providing the investor
the right to a predetermined fraction of the home equity value at maturity**

- **Maturity T** is the **first date of future sale**, default, or cash-out refinancing
 - Note the maturity date is *determined by the homeowner*, random *ex ante*
- **Home equity value** is the difference between home value at maturity and the mortgage principal at time of HEFI initiation

$$\text{HEFI Payoff at Maturity: } k * \text{MAX}[P(T) - M_0, 0]$$

where

k = HEFI share of equity; $P(T)$ is value of home at T ; M_0 is initial mortgage principal

- Important question: Does contract allow for early termination (before sale)?

PROPERTIES OF HEFIs

- The HEFI is *junior* to the initial mortgage, secured by a *lien* on property
- The HEFI *receives no interest* or other payments prior to maturity
 - *First mortgage must be fully repaid* before HEFI gets anything
- The HEFI is *transferrable and is entirely separate from the mortgage*
- HEFIs can be pooled and/or tranced, just as mortgages are
- Independent appraisals of value at HEFI initiation and at maturity

Asymmetries between Homeowner and HEFI investor

- The HEFI has no rights or responsibilities of property ownership
 - Both share gains in value symmetrically, but only the homeowner has the “dividend” of occupancy.
 - Homeowner pays all maintenance, improvements, taxes, insurance expenses
 - Homeowner pays all mortgage interest, principal
 - Homeowner decides time of sale or refinance (i.e., maturity)
- Do these asymmetries create “moral hazard” if HEFI present??
 - Strategic default or termination
 - Maintenance
 - Improvements

VALUATION OF HEFIs

The HEFI contract is like a *down-and-out call* option with random maturity

Key assumptions:

Annual Home Price VOLATILITY	10.00%
"Home use convenience yield" (rental less maintenance, taxes)	2.00%
20-Yr Treasury interest rate (annual)	2.40%

TABLE 1

Fair Value Share at Horizon for 50% Initial Equity					
% LTV	Time Horizon (Yrs)				
	5	10	15	20	25
50	56.5%	59.7%	63.4%	66.3%	69.5%
60	57.1%	58.7%	60.8%	62.1%	63.7%
70	57.4%	55.8%	55.8%	55.2%	55.3%
80	55.0%	48.9%	46.5%	44.3%	43.1%
90	42.7%	33.2%	29.6%	27.0%	25.5%

How to read Table: entry = future share k required to justify paying homeowner 50% of current equity value (scales with % current equity provided)

Observations:

- 50% initial equity does not imply 50% share at sale is fair! Time dependence.
- Lower Initial LTV → higher future equity share is required (lower optionality)
- Longer time horizon → higher share required when LTV < 70 (larger use value)
- As $T \rightarrow 0$, share must go to 50% (for any LTV), or arbitrage from "flip"

CONSTANT (MATURITY-INDEPENDENT) SHARES

- Practicality may demand that a *constant share* be chosen (independent of maturity T).
- But what is a “fair” constant level?
 - **Median** time to sale is 9 years; **mean** is almost 13 years (2014)
 - Fair share is roughly same for median and mean

TABLE 2

Fair Value Share at Horizon for 50% Initial Equity						
% LTV	Time Horizon (Yrs)					MEAN
	5	10	15	20	25	12.7
60	57.1%	58.7%	60.8%	62.1%	63.7%	59.7%
70	57.4%	55.8%	55.8%	55.2%	55.3%	56.1%
80	55.0%	48.9%	46.5%	44.3%	43.1%	48.7%
Percent selling	25%	33%	19%	9%	14%	

Source of Percent selling: <http://www.realtor.org/sites/default/files/reports/2014/2014-home-buyer-and-seller-generational-trends-report-full.pdf>

A BINOMIAL VALUATION APPROACH

Implicit in the HEFI valuation above: *Maturity is exogenous*

But could equity sharing

- Change *default on mortgage decision* by homeowners?
- Lead to *early HEFI cancellation/home sale* strategies by homeowners?

➤ Triggers of home sale (maturity)

- Job relocation (17%), want to move closer to family (15%), job loss (4%), need for different size home (25%), marriage or divorce (8%), retirement (7%), health or financial (14%)
 - Many of these triggers seem independent of existence of HEFIs
 - But others seem like they could be affected by HEFI
- The binomial model *in the Appendix* examines the effects of optimal homeowner decisions on HEFI valuation, optimal contract design

CONCERNS: ADVERSE SELECTION & MORAL HAZARD

Q1: *Does home purchaser using a HEFI have “inside information” that home is overvalued?*

A1: Unclear why purchaser would buy overvalued home, HEFI or not

Q2: *Does a current homeowner selling a HEFI believe the home is overvalued?*

A2: Perhaps, but HEFI investors will have independent appraisal

- Diversification benefit provides a clear rationale for issuing HEFI

Q3: *Will homeowner fail to maintain property fully?*

A3: Most maintenance has relatively short half-life, (e.g. mowing lawn)
100% of benefits accrue to occupant.

- Long term deferred maintenance may be inspected, charged for at time of home appraisal/sale

Q4: *Will homeowner fail to make valuable improvements?*

A4: Credits for improvements can be subtracted from equity calculation

WHY HAVEN'T WE SEEN EQUITY SHARING BEFORE?

- We have! Shared Appreciation Mortgages (SAMs)
 - Very modest use (Stanford; Berkeley; Cambridge)
 - Small programs; no standardization of contract
 - No separation of mortgage from equity share (like convertible bond)
 - No pooling or securitization
 - In UK, criticism that SAMs were poorly explained to homeowners
 - Large payments were criticized *ex post* as “unfair”
- Small heterogeneous contracts
 - HEFI contract can be standardized; perhaps “k” always constant
 - Can be pooled (regionally; by home value; by owner credit score; etc.)
- Long term; perhaps no cash flow for 30 years
 - Can be tranching by payoffs
(e.g. first 20% of underlying contract payoffs to first tranche, etc.)
 - May require repayment after maximum period (30 or less years)
- Moral hazard, adverse selection concerns (better contract design can minimize)

CONCLUSIONS

A market for home equity sharing interests (HEFIs) would allow

- ***Home purchasers to use a combination of debt and equity finance***
 - Lower exposure to single large asset by sharing price risk with investors
 - Lower ongoing debt service relative to debt-only finance
- ***Current home owners to access home value without further debt***
 - An alternative to 2nd mortgages, HELOCs, reverse mortgages
- ***Investors to access a large new diversifying asset class***
 - A potential market as large as government bonds, mortgage securities
 - Development of market can mimic growth of mortgage securitization
- ***A more stable housing sector with less leverage, fewer foreclosures***

HEFI contract design can help reduce moral hazard concerns

- ***A binomial approach facilitates understanding homeowner incentives, appropriate valuation, and optimal contract design***

APPENDIX: Binomial Example (1)

		EVOLUTION OF HOME VALUE						
ASSUMPTIONS		YEARS AFTER INITIATION						
		0	5	10	15	20	25	30
Annual volatility	10%							382.5
Treasury rate	3.00%							244.6
Net rental value	2.00%						305.9	
Home Ownership premium	1.00%					244.6		
					195.6		195.6	
Mortgage rate	4.00%		125.1	156.4	125.1	156.4	125.1	156.4
tax rate	25%							
		100.0		100.0		100.0		100.0
Initial LTV	80%		80.0		80.0		80.0	
HEFI Share	43.0%			63.9		63.9		63.9
Note: 5-year up move	25.1%				51.1		51.1	
5-year down move	-20.0%					40.9		40.9
							32.7	
								26.1

EVOLUTION OF HOMEOWNER VALUE - After Debt and HEFI Payments							
No Cancellation Other than Default							
YEARS AFTER INITIATION							
0	5	10	15	20	25	30	
							241.0
					204.4		
				164.9			166.5
			126.0		132.6		
		89.3		98.8			118.9
	55.7		66.6		86.8		
25.7		36.6		56.2			88.4
	9.8		27.1		56.8		
		1.5		25.4			62.0
			0.0		29.0		
			DEFAULT	1.9			39.7
					11.0		
							25.4

Change HEFI share (including 0%) → same default point: HEFI has little effect on timing

EVOLUTION OF HOMEOWNER VALUE - Cancellation Possible							
YEARS AFTER INITIATION							
0	5	10	15	20	25	30	
						241.0	
					204.4		
				164.9			166.5
			126.0				
		89.5		98.8		132.6	118.9
	56.7		67.2			86.8	
28.4		39.1		57.8			88.4
	15.3 end HEFI		32.792 end HEFI		61.1 end HEFI		
		4.2		28.0			62.0
			0.0			30.3 end HEFI	
			DEFAULT	2.1			39.7
					11.0		
							25.4
Blue: cannot be reached without default or end of HEFI							

EVOLUTION OF HEFI VALUE - Cancellation Possible							
YEARS AFTER INITIATION							
0	5	10	15	20	25	30	
						130.09	
					89.40		
				60.63			70.78
			40.37				
		26.12		29.58		46.49	32.85
	15.78		17.69			19.05	
7.58		8.49		9.15			8.60
	0.00 end HEFI		0.00 end HEFI		0.00 end HEFI		
		0.00		0.00			0.00
			0.00			0.00 end HEFI	
			DEFAULT	0.00			0.00
					0.00		
							0.00
Blue: cannot be reached without default or end of HEFI							

...whoops: value falls to 7.58 < 10! But say a *cancellation charge* = 5 after 5 yrs (only),

EVOLUTION OF HOMEOWNER VALUE - If Cancel at 5 yrs, Costs 5						
YEARS AFTER INITIATION						
0	5	10	15	20	25	30
						241.0
					204.4	166.5
			126.0	164.9	132.6	118.9
		89.5	67.2	98.8	86.8	88.4
27.1	56.7	39.1		57.8		
	12.0		32.792 end HEFI		61.1 end HEFI	
		4.2		28.0		62.0
			0.0		30.3 end HEFI	
			DEFAULT	2.1		39.7
					11.0	
						25.4

Blue: cannot be reached without default or end of HEFI

- Note that HEFI is now *not cancelled* until 15 years out

EVOLUTION OF HEFI VALUE - If Cancel at 5 yrs, Costs 5						
YEARS AFTER INITIATION						
0	5	10	15	20	25	30
						130.09
					89.40	70.78
			40.37	60.63	46.49	32.85
		26.12		29.58		
	15.78		17.69		19.05	
9.13		8.49		9.15		8.60
	4.08		0.00 end HEFI		0.00 end HEFI	
		0.00		0.00		0.00
			0.00		0.00 end HEFI	
			DEFAULT	0.00		0.00
					0.00	
						0.00

Blue: cannot be reached without default or end of HEFI

- Raise cancellation charge to 10? No further effect!
- Alternative: raise HEFI share to 50%, HEFI value = 10.61 (OK)

BINOMIAL MODEL CONCLUSIONS

- Binomial model permits analysis of effects of HEFI on decisions of homeowner, allows for flexible contract terms, transactions costs, etc.
 - Can calculate values to both homeowner and HEFI when optimal strategies used by homeowner
 - Effects of early exercise of HEFI – studied here
 - Effects on timing of home sale – can easily be done
 - Bigger game: effects of time (or even time/state) dependent sharing rules
- Total value can be used to study welfare effects of differing contract design, subject to incentive compatibility constraints
 - As such, becomes a part of the “optimal contract design” literature