Beyond Mortgages: Equity Financing for Homes

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HOME EQUITY

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

- In the U.S., a major potential asset class ($15.8 trillion, 12/31/2015)

- 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 EXISTS FOR SHARING HOME EQUITY.

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

<table>
<thead>
<tr>
<th></th>
<th>Single Home</th>
<th>Single Home</th>
<th>Regional Portfolio</th>
<th>Regional Portfolio</th>
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<td>14.26%</td>
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<td>11.94%</td>
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</table>


- 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
AND INVESTORS CANNOT ACCESS A MAJOR INVESTMENT CLASS

- Historically low correlations of home prices with S&P500, Treasuries:

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

<table>
<thead>
<tr>
<th></th>
<th>ATL</th>
<th>CHI</th>
<th>DAL</th>
<th>SF</th>
<th>S&amp;P</th>
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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

➢ More recently,
Correlation FHFA’s HPI, S&P500, rolling 3-yr horizon, 1991-2015: 0.21

Conclusion: Home Equity is a substantial and diversifying asset class
DEBT IS THE ONLY EXTERNAL SOURCE OF HOME FINANCING

A $25 trillion residential market, but only debt financing is available

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

  ![Graph showing the value of U.S. housing stock and single-family mortgage debt outstanding]

- For current purchases, average LTV (2014) is 77.5%
- First time buyers now can borrow up to 97%...(in England, 100% if parents back)
- Leverage ➔ potential foreclosure and market instability: seriously underwater loans (10/2015) = 12.7% of all mortgaged properties (v. peak 28.6% in 2012)
WITH A MARKET FOR TRADING FRACTIONAL HOME EQUITY...

- **Homeowners with substantial home equity could diversify**
  - Lower risk exposure to single asset
  - Lower ongoing debt service burden than using HELOCs, second mortgages

- **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 down payment
    - 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**
Investors could have access a large new diversifying asset class

- Home equity fractions could be pooled, securitized, tranched
- Pools separated by
  - Geographic region
  - Home value, or
  - Mortgage LTV
  - Etc.
- Pool payoffs could be tranched, e.g. by timing of payoffs
- Home Equity markets could develop as did mortgage markets

Note that HEFI pools could be liquidated by a fixed horizon (e.g. 20 yrs) even if some individual HEFIs not terminated

- Remaining HEFIs now have shorter (by 20 years) horizons, likely to be significantly in- or out-of-the-money (so value less variable)
  - These features would facilitate liquidity of remaining pool
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 termination

- **Home equity value** is the difference between home value at termination and the mortgage principal at time of HEFI initiation
- **Termination T** is the first date of future sale, default, cash-out refinancing, or voluntary termination

Note the Termination date is determined by the homeowner, random ex ante

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

where \( k \) = HEFI share of equity (possibly a function of \( T \)); \( P(T) \) is value of home at \( T \); \( M_0 \) is initial mortgage principal
PROPERTIES OF HEFIs

- The HEFI is junior to the initial mortgage, secured by a lien on the property
- The HEFI has limited liability: not responsible to pay mortgage if home underwater
- The HEFI receives no interest or other payments prior to termination
  - *First mortgage must be fully repaid* at home sale before HEFI gets anything
- The HEFI is transferrable and is entirely separate from the mortgage
- HEFIs can be pooled and/or tranched, just as mortgages are
- Independent appraisals of home value at HEFI initiation and at termination

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., Termination)

- Do these asymmetries create “moral hazard” if HEFI present??
  - Strategic default or termination
  - Maintenance and Improvements
VALUATION OF HEFIs

The HEFI contract has properties of a call option on home equity, but with an important difference:

A random Termination (or exercise) date that is determined by the seller (the homeowner), not the buyer.

---Similar to the mortgage prepayment option of a borrower.

• At each time and state (home value), the homeowner (with mortgage and HEFI) must determine whether to:

  (i) Continue to pay mortgage and not terminate HEFI
  (ii) Continue to pay on mortgage and voluntarily terminate HEFI
  (iii) Sell home, pay remaining mortgage principal and HEFI*
  (iv) Default (surrender home to bank)*

*May be voluntary, or determined by exogenous factors (e.g. job location change)
# A BINOMIAL EXAMPLE

## Assumptions

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<tr>
<td>Net rental value</td>
<td>2.00%</td>
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<tr>
<td>Home Ownership Premium</td>
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<tr>
<td>Home Selling Cost</td>
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<td>30-yr. Mortgage rate</td>
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<td>5-year mortgage payment</td>
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<td>Initial LTV</td>
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<tr>
<td>HEFI Share</td>
<td>50.0%</td>
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**Note:** 5-year up move 25.1%  
5-year down move -20.0%

## 1. Evolution of Home Value

<table>
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<tr>
<th>YEARS AFTER INITIATION</th>
<th>0</th>
<th>5</th>
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</tbody>
</table>

## 2. HEFI Value - Sell Home at End and Pay HEFI (no early Termination)

HEFI has 50% share of final home equity; Equity = Home value less Initial Loan Principal 80

<table>
<thead>
<tr>
<th>YEARS T AFTER INITIATION</th>
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<th>10</th>
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</tbody>
</table>

Initial HEFI value of 12.3 from working backward through tree from final HEFI values.  
HEFI value of 12.3 > 10, the amount HEFI investors pay to homeowner at initiation (50% of initial equity).  
Investors see value gain.
Earlier termination of HEFI for exogenous reasons somewhat reduces value, but still is fair to investor.
EXOGENOUS VS STRATEGIC HOME SALES

Previous table assumes homeowner sell at random horizons up to full 30-year period. Most home sales (c. 90%) are for reasons other than purely financial.

- Perhaps 3% -10% could be thought of as *endogenous* decisions because of financial factors. So exogenous factors are more likely to cause sale.

ENODOGENOUS DEFAULT, HOME SALE, and HEFI TERMINATION DECISIONS

• To determine optimal financial decisions by homeowner, use *backward recursion* at each node (dynamic programming) to compare:

<table>
<thead>
<tr>
<th>Homeowner Value if continue vs. actions that will terminate HEFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>• “Strategic” Default (which will terminate HEFI with zero value)</td>
</tr>
<tr>
<td>• Endogenous Home Sale (which will terminate HEFI)</td>
</tr>
<tr>
<td>• HEFI Termination without sale or default</td>
</tr>
</tbody>
</table>

• Questions that can be answered:

1) Valuation of HEFIs given the homeowner’s optimal strategy
   • Previous assumption that HEFI will never be terminated is naive

2) Effect of HEFIs (and mortgage LTV) on optimal default and home sale

3) Design of HEFI sharing fractions to be fair to homeowner, investor
# THE HOMEOWNER’S OPTIMAL STRATEGY

## 4. EVOLUTION OF HOMEOWNER VALUE - Homeowner can default/sell home/End HEFI

HEFI has 50% share of final home equity

<table>
<thead>
<tr>
<th>YEARS AFTER INITIATION</th>
<th>0</th>
<th>5</th>
<th>10</th>
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</table>

**At Each Node:** *Maximize homeowner value* by choosing one of the following

- Continue home ownership, mortgage servicing with HEFI, or
- Continue and terminate HEFI (with required payment to HEFI investor)
- Sell home, terminating HEFI and mortgage (with appropriate payments)
- Default

**Observation:** HEFI share = 0% (no HEFI), *Sell and Default decisions unchanged*
## HEFI VALUE GIVEN HOMEOWNER’S OPTIMAL STRATEGY

### 5. EVOLUTION OF HEFI VALUE - Homeowner can default/sell home/End HEFI

<table>
<thead>
<tr>
<th>YEARS AFTER INITIATION</th>
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<th>10</th>
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- **Observe:** HEFI Value 8.8 < 10, the amount investor paid homeowner for HEFI!
- **Therefore:**

  A 50% share is now unfair to investor: would need 57% share
HEFI TERMINATION FEE AND HEFI DESIGN

• Rather than raise HEFI share to 57%, may prefer to keep at 50%--but how can we be fair to the investor? *Early termination fees* are a possible response

  o Note: prepayment charges are legal for mortgages, even though regulatory agencies don’t like long-lasting ones
  (http://www.freddiemac.com/singlefamily/pdf/ppm.pdf)

  o Assume a cancellation fee of 5 during the first 5 years. Fair to investor (10.6 > 10)

### 6. EVOLUTION OF HEFI VALUE - Homeowner can default/sell home/End HEFI w Penalty

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COMPARATIVE STATICS OF HEFI VALUATION

Observations:

- 50% initial equity does not necessarily imply 50% share at sale is fair to investor (or homeowner)!
  - If future share < 50% (for any LTV), prepayment penalties needed to avoid immediate arbitrage from “flip”

- Lower Initial LTV ➔ higher future equity share required (lower HEFI optionality value from limited liability)

- Longer expected time horizon ➔ higher share required when LTV < 70 (larger use value)

HEFI contract design important to assure fair valuations, minimal adverse effects
CONCERNS (1): ADVERSE SELECTION

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: *Is a buyer using a HEFI, and putting less money down, a worse default risk?*
   
   A3: Purchasers who can afford lower down payments generally have lower income and fewer liquid assets—and thus are worse credit risks
      - But income and liquid assets are observable, and are currently used in assessing credit risks
      - Unclear that HEFI choice adds *incremental* risks:
         - HEFI imposes no cash demands before mortgage *fully repaid*
         - If HEFI permits lower mortgage, *less* credit risk
CONCERNS (2): MORAL HAZARD

Q4: Will homeowner fail to maintain property fully?
   A4: Most maintenance has relatively short half-life, (e.g. mowing lawn)
       100% of benefits accrue to occupant
       o But deferred maintenance can be required (as with many home
          loans) and be charged for at time of home appraisal/sale

Q5: Will homeowner fail to make valuable improvements?
   A5: Credits for improvements can be subtracted from equity calculation
       o Banks and appraisers often use schedules (for type and age of
          improvements) in adjusting property valuations

Q6: Will homeowners strategically default earlier?
   A6: Default choice with/without HEFI considered in Valuation section
       o Given typical parameters, effect of HEFI on default is minimal
         ➢ Homeowners default only when deep underwater

To reduce moral hazard concerns, HEFI share k ≤ 50%, perhaps considerably less
WHY HAVEN’T WE SEEN EQUITY SHARING BEFORE?

- **We have! Shared Appreciation Mortgages** (SAMs)
  - Very modest use (Stanford; Berkeley; Cambridge; UK)
    - 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 tranched by payoffs
    - (e.g. first 20% of underlying contract payoffs to first tranche, etc.)
  - HEFI pools may be liquidated before all individual HEFIs paid off

- **Moral hazard, adverse selection concerns** (better contract design can minimize)
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  
  - Reduced exposure to price variations of large undiversified asset

- **Investors to access a large new diversifying asset class**  
  - Pools of HEFIs will be securitized, can be stratified, e.g. by region, home values, LTVs, etc. Could be tranched, e.g. by time of payments  
  - 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**

**Formal modeling can facilitate understanding** homeowner incentives, appropriate valuation, and issues of contract design