Equity Release Assumption Setting

Gina Craske
Colin Wilson

Types of Equity Release Products

- Reverse Mortgage/Home Income
  - Provider lends home owner cash which must be repaid with rolled up interest on death or move to long term care, cash may be taken all up front or in stages
- Reversions
  - Provider buys a share/all of the home owner's property, who lives in the property rent free until they die or move to long term care. The price paid reflects the time till the provider expects to get their share of the house. Can be sold with back to back annuities.
- Shared Appreciation
  - Home owner gives up the right to some of the capital gain on the property in return for paying reduced or no interest on that part of the borrowings.

Reverse Mortgages

- Loan Types
  - Fixed / variable
  - Lump sum / income / redraws
- Low maximum LTV's
  - Age dependent:
- No Negative Equity Guarantees
  - Repayment on death or move to care is not higher than the value of the property value.
- Housing Maintenance
  - Regular valuations
- Other Obligations
  - Insurance, Rates, Prior approval for renovations

Risks to the provider (reverse mortgages)

- House price inflation (can be exasperated by longevity)
- Movements in interest rates
- Higher mortality/move to long term care than expected
- Reputational risk
- Individual house price volatility
- Lack of data
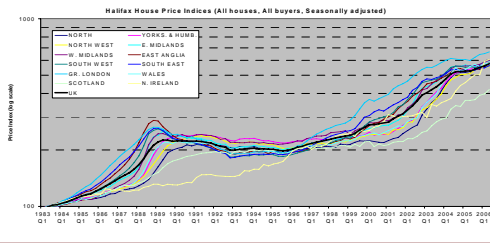- Lapses/remortgages and the correlation with interest rates

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Elements in the basis

- HPI rates
- Interest Rates
- Mortality
- Move to long term care
- Other lapses/surrenders
- Expenses

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Setting HPI Assumptions

Data Issues

- Problems of index construction
  - Transactions / standardised
- Limited data
  - Single 30 year history for regional data
- Insufficient granularity
  - For equity release, may need assumption for *individual house* volatility, not index
- Lack of (prospective) model consensus
  - Climate change?
  - Population growth?

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Halifax Indices

Halifax House Price Indices (All houses, All buyers, Seasonally adjusted)

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Quarterly Log Changes

	NORTH	YORKS. & HUMB.	NORTH WEST	E. MIDLDS	W. MIDLDS	EAST ANGLIA	SOUTH WEST	SOUTH EAST	GR. LONDON	WALES	SCOT.	N. IRELAND	UK
Mean	0.019	0.020	0.019	0.020	0.019	0.019	0.019	0.019	0.021	0.019	0.016	0.020	0.019
S.d.	0.030	0.029	0.027	0.033	0.033	0.034	0.033	0.029	0.029	0.033	0.024	0.035	0.023
Ann'd mean	0.075	0.078	0.075	0.078	0.078	0.077	0.077	0.076	0.083	0.076	0.063	0.079	0.077
Ann'd s.d.	0.060	0.058	0.054	0.065	0.067	0.069	0.065	0.059	0.057	0.066	0.049	0.069	0.045
Autocorrel	0.64	0.76	0.66	0.67	0.59	0.75	0.74	0.71	0.75	0.53	0.04	-0.14	0.83
Percentiles for quarterly log price changes													
10	0.072	0.057	0.058	0.052	0.055	0.053	0.056	0.053	0.057	0.058	0.048	0.061	0.048
50	0.013	0.015	0.013	0.014	0.013	0.019	0.017	0.021	0.026	0.016	0.015	0.016	0.017
90	-0.011	-0.008	-0.006	-0.010	-0.010	-0.020	-0.017	-0.017	-0.024	-0.015	-0.009	-0.016	-0.007
Regression of quarterly log price changes on national index													
β	0.791	1.056	0.859	1.319	1.302	1.139	1.264	1.021	0.916	1.125	0.468	0.047	1.000
α	0.004	-0.001	0.002	-0.006	-0.006	-0.003	-0.005	-0.001	0.003	-0.002	0.007	0.019	0.000
σ	0.024	0.017	0.019	0.013	0.016	0.023	0.016	0.018	0.020	0.021	0.022	0.035	0.000

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Correlations of Quarterly Changes

	NORTH	YORKS. & HUMB.	NORTH WEST	E. MIDLDS	W. MIDLDS	EAST ANGLIA	SOUTH WEST	SOUTH EAST	GR. LON	WALES	SCOT.	N. IRE
YORKS. & HUMB.	0.78											
NORTH WEST	0.78	0.84										
E. MIDLANDS	0.47	0.74	0.65									
W. MIDLANDS	0.45	0.75	0.59	0.85								
EAST ANGLIA	0.17	0.38	0.25	0.67	0.71							
SOUTH WEST	0.24	0.54	0.42	0.84	0.85	0.86						
SOUTH EAST	0.19	0.37	0.25	0.71	0.65	0.85	0.86					
GR. LONDON	0.13	0.31	0.25	0.59	0.54	0.74	0.76	0.85				
WALES	0.69	0.77	0.68	0.70	0.74	0.50	0.59	0.47	0.36			
SCOTLAND	0.53	0.58	0.48	0.37	0.38	0.05	0.16	0.12	0.10	0.37		
N. IRELAND	0.05	0.04	0.08	0.01	0.05	0.04	0.00	-0.06	-0.10	0.14	-0.01	
UK	0.60	0.82	0.73	0.91	0.89	0.75	0.87	0.79	0.72	0.78	0.44	0.03

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(Overlapping) 5 Year Log Changes

	NORTH	YORKS. & HUMB.	NORTH WEST	E. MIDLDS	W. MIDLDS	EAST ANGLIA	SOUTH WEST	SOUTH EAST	GR. LONDON	WALES	SCOT.	N. IRELAND	UK
Mean	0.345	0.354	0.345	0.371	0.383	0.355	0.374	0.357	0.385	0.358	0.260	0.332	0.355
S.d.	0.311	0.332	0.313	0.341	0.327	0.388	0.364	0.354	0.376	0.316	0.184	0.139	0.291
Ann'd mean	0.069	0.071	0.069	0.074	0.077	0.071	0.075	0.071	0.077	0.072	0.052	0.066	0.071
Ann'd s.d.	0.139	0.149	0.140	0.152	0.146	0.173	0.163	0.158	0.168	0.141	0.082	0.062	0.130
Percentiles for log price changes													
10	0.822	0.768	0.739	0.776	0.772	0.794	0.773	0.716	0.742	0.787	0.482	0.478	0.693
50	0.305	0.337	0.346	0.370	0.377	0.412	0.472	0.479	0.499	0.338	0.264	0.342	0.362
90	-0.038	-0.039	-0.066	-0.124	-0.085	-0.161	-0.176	-0.168	-0.204	-0.065	0.054	0.168	-0.091

- Positive auto-correlation leads to higher annualised standard deviations

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Model Output – Random Walk

	1	5	10	20	20Y %Growth
Average	1.05	1.29	1.69	3.17	0.059
1	1.36	2.35	3.96	13.29	0.138
5	1.27	1.95	2.99	7.35	0.105
25	1.13	1.49	2.04	3.77	0.069
50	1.04	1.25	1.57	2.45	0.046
75	0.96	1.04	1.21	1.61	0.024
95	0.86	0.80	0.83	0.94	-0.003
99	0.80	0.67	0.63	0.61	-0.024

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Model Output – Mean Reversion

	1	5	10	20	20Y %Growth
Average	1.05	1.30	1.72	3.21	0.060
1	1.37	2.16	3.60	12.00	0.132
5	1.27	1.87	2.81	7.02	0.102
25	1.13	1.48	2.01	3.76	0.068
50	1.05	1.27	1.62	2.58	0.048
75	0.97	1.09	1.31	1.87	0.032
95	0.86	0.86	0.95	1.18	0.008
99	0.80	0.75	0.77	0.87	-0.007

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Questionnaire

Questionnaire - results

- Just under 30 providers were contacted
- Around 15 responses
- Only 4 respondents filled the questionnaire in
- Others either
  - "commercially sensitive"
  - "don't do any modelling"

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Mortality/LTC

- Mortality tables – varied (PPM, PMA, PML, IML)
- Mortality - all 100%
- Improvements – mainly 100% mc, 1 used 92 basis
- Little use of selection
- Large variation in LTC (2% mortality to 50%)
- All LTC assumptions age dependent
- Lapses around 1%-2% where used
- 1 company considered correlation with interest rates
- None used own data, some use of working paper and rating tables

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Methodology

- Decrements - deterministic
- 1 company used stochastic interest rates
- 2 companies modelled HPI deterministically and 2 stochastically (1 closed form)
- 2 companies hedged out the interest rate
- 1 company uses the assets to back annuities

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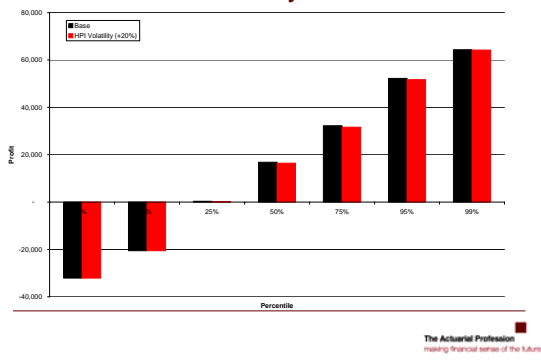The Actuarial Profession
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Example Sensitivities

Base Case Assumptions

- Male, age 65, House Value £250k, LTV 23% (£57.5k)
- Mortality: PXA92, CMI MC
- Move to LTC: 0%, 10%, 20%, 30%, 40% by duration
- Lapses, expenses: zero
- Profit margin: 1.11%
- Interest Rates, HPI: stochastic, calibrated to current economic conditions at 30 June 2006
- 5,000 scenarios

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Sensitivities Applied

- Mortality: base rates +/-30%
- HPI: 120% HPI volatility (12% to 14.4%)
- LTV 40% + HPI 20%
- Lapse rates: introduce interest sensitive lapse rates:

Loan rate less interest rate	Lapse rate
1 – 200bps	0%
200 – 300bps	2%
300 – 400bps	5%
400 – 500bps	10%
>500bps	15%

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Base Results – Profit Distribution
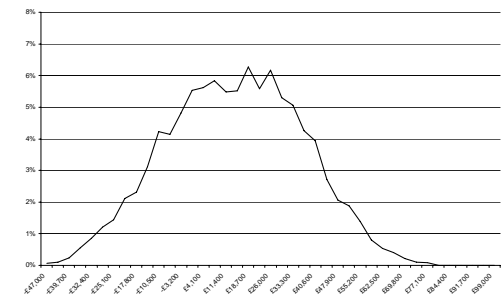
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Mortality Sensitivity
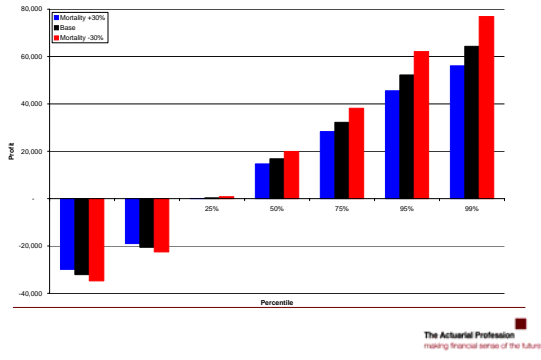
Increase HPI Volatility – HPI Losses

Increase HPI Volatility
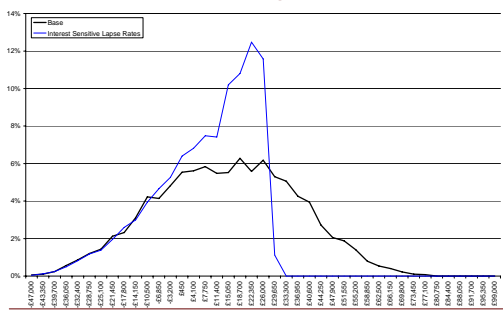
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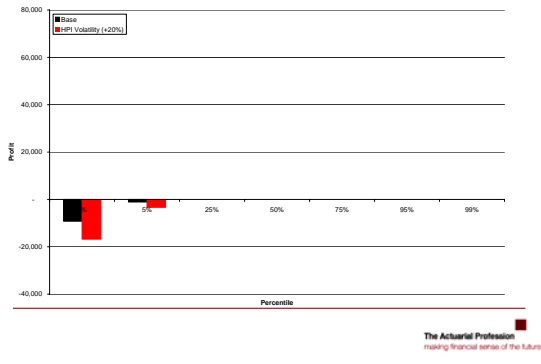
Increase HPI Volatility – HPI Losses
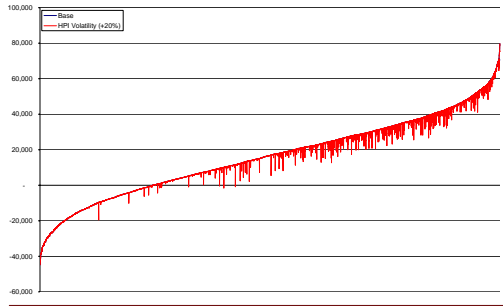
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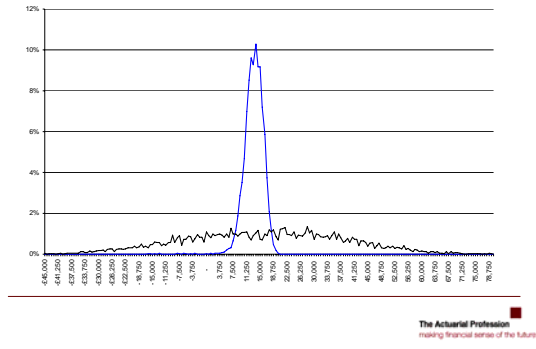making financial sense of the future

Base = 40%LTV, HPI 20%
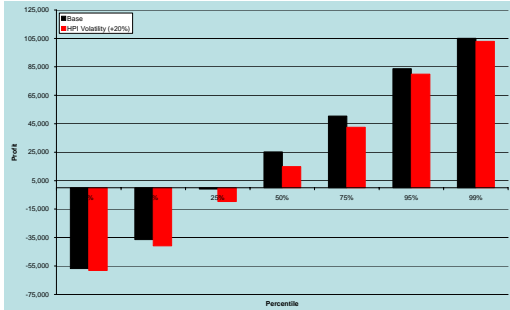
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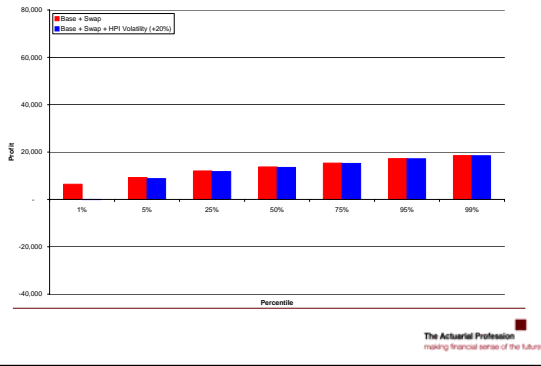making financial sense of the future

Interest Sensitive Lapse Rates

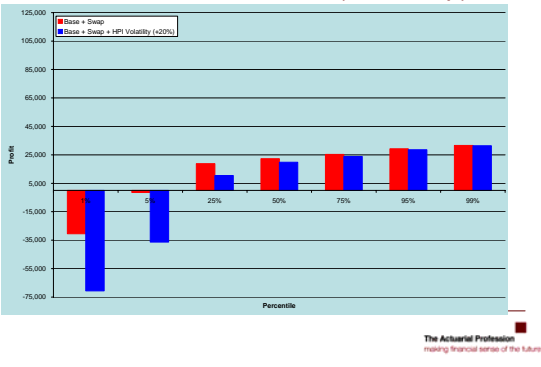The Actuarial Profession
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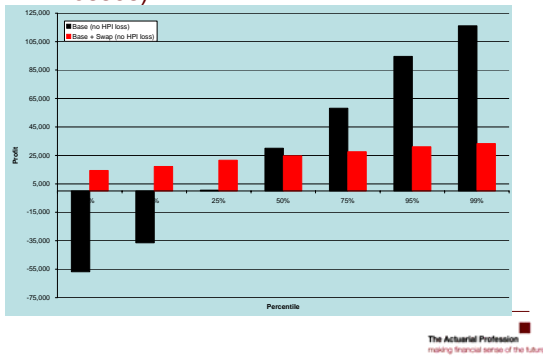
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Base Results – Impact of Swap

Impact of HPI Sensitivity assuming Swap

Base = 40%LTV, HPI 20% (with swap)

Base = 40%LTV, HPI 20% (with swap, no HPI losses)

Other Issues

- Accounting treatment of the asset
- Real world or market consistent
- Dividend yields
- Lack of market for pricing options
- Prevention of poor persistency and protection of profits

Conclusions

- Hedging interest rate risk is effective but reduced by offs being different to expected
- Consider how to model HPI/interest rate correlation
- Sensitive to lapses/surrenders but no data, penalties key
- HPI really kicks in with higher LTV and when interest rates are hedged