Equity Release – Options and Guarantees

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AGENDA

- Product Types
- Option Characteristics
- Asset Models
- Assessing the "No Negative Equity Guarantee"
- Costing the NNEG
- Securitisations

Before We Begin…

- **Peer Review**
  - This presentation has been peer reviewed by Dion Russell of Tillinghast
  - However, the author is responsible for any errors that may remain
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Equity Release Product Types

- **Reverse mortgages (RM)**
  - Most common form of product in Australia at present
  - Interest roll-up mortgage
  - Provider usually offers a “no negative equity guarantee” (NNEG) i.e. that mortgagor can never owe more than the proceeds of sale of the property
- **Shared appreciation mortgages (SAM)**
  - Bank of Scotland introduced in the UK in mid 90s
  - Media/ASIC commentary suggests that two SAMs are close to launch here
  - The provider takes a geared equity interest in the property, with some protections
  - Homeowner pays no interest
- **Home reversion schemes (not the focus of today)**
  - Limited presence in Australia (one of the early operators is already in difficulty)
  - House is “sold” upfront to a financer (precise sale structure varies)
  - Sale price is a substantial discount (varying by age) to the assessed property value
  - Homeowner retains a right of abode for their lifetime
  - Homeowner pays no interest

Key Features of Reverse Mortgage

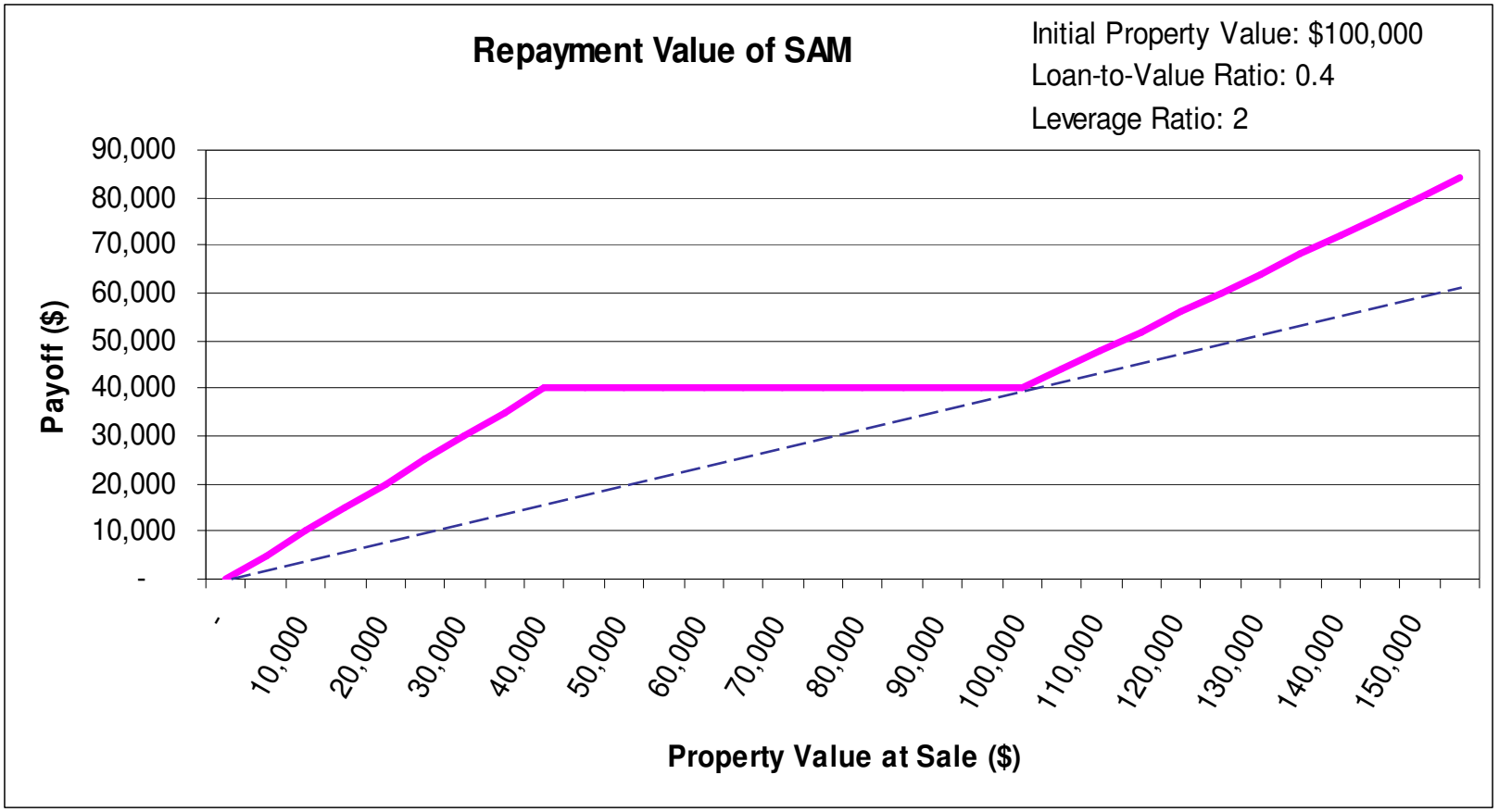
- Lender may offer either variable or fixed rates of interest
- Interest is rolled-up and is paid at the maturity of the loan
- Lender lends up to a maximum initial loan-to-value ratio ("LVR") which varies by age e.g. 20% at age 65, 30% at age 75, 40% at age 85
- Duration of mortgage is inherently uncertain - death and "disability" will be major determinants of duration given the likely age profile of mortgagors
- If the product offers a NNEG to the customer then, at the point of mortgage repayment, the amount payable to the lender will depend on the prevailing value of the property:

Property Price > Principal + Interest ?	Lender Receives
Yes	Principal + Rolled-Up Interest
No	Proceeds of Property's Sale

Key Features of SAM

- Provider advances up to a maximum initial "loan"-to-value ratio varying by age
- Duration of mortgage is inherently uncertain - death and "disability" will again be major determinants of duration if the SAM is sold to the retiree market
- The provider has a geared participation in any capital gain ("geared upside"), for example:
  - The maximum "LVR" might be 40% for a given age
  - The gearing ratio might be "2 times"
  - In this case, the provider receives 80% (2 x 40) of any increase in value of the property
- The provider also has downside protection of part/all of principal originally advanced but on a non-recourse basis
- The pay-off to the SAM provider is very different from a reverse mortgage

Option Characteristics of a SAM

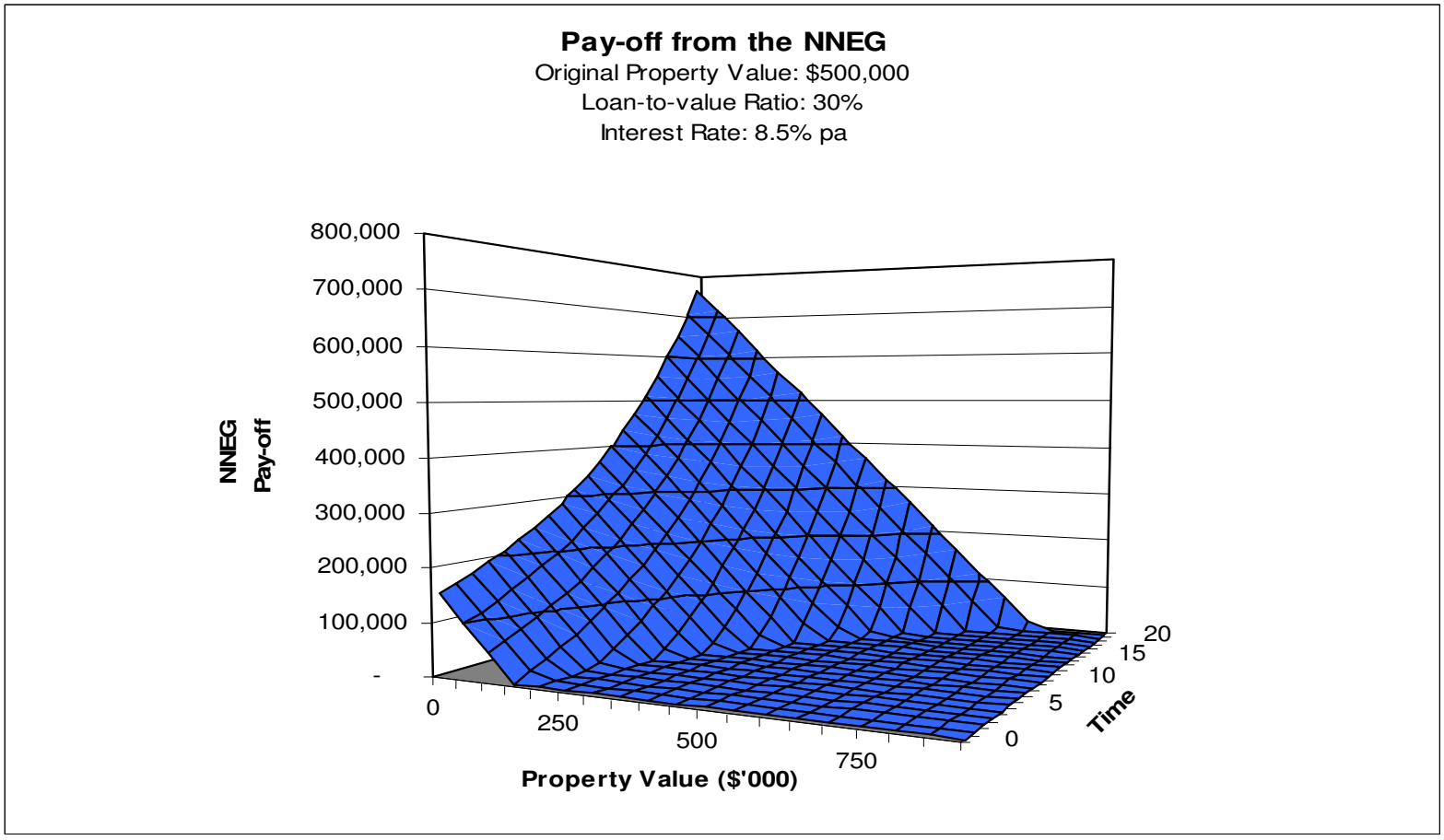


Deconstructing a RM

Property Price > Principal + Interest ?	Lender Receives
Yes	Principal + Rolled-Up Interest
No	Proceeds of Property's Sale

- A reverse mortgage with a NNEG represents a "package" of two component products
- The first component is an interest roll-up mortgage of uncertain term which always provides for the repayment of principal plus rolled-up interest
- The second component is a put option sold by the RM provider, under which the RM provider has an asymmetric pay-off obligation to the mortgagor:
  - Put option pay-off = Max [0 , (Principal + Interest) – Property Value]
  - The option's pay-off represents an amount owed to the mortgagor by the RM provider
- The combination of these components provides the lender's pay-off in the table
- It should be noted that the put option is also of uncertain term

The NNEG as a Put Option



NNEG Pay-Off = Max [0 , (Principal + Interest) – Property Value]

Nature of the NNEG Risk

- Designed correctly, a SAM provider does not offer a NNEG guarantee (except where the property value falls below the original amount advanced)
- However, a Reverse Mortgage with a NNEG provides a substantive guarantee
- The NNEG is effectively a contingent investment performance guarantee, where the guarantee "biting" is contingent upon a combination of property market performance, interest rates and "longevity"
- "Longevity" here means the propensity to keep the RM running – death and "disability" are the key drivers of this longevity
- Unlike LMI risk on conventional mortgages, the NNEG risk is a "back-end" risk
- The NNEG is arguably a form of contingent, long term life/disability insurance packaged inside a "normal" interest roll-up mortgage contract
- To assess the risk of the NNEG requires a price model for owner-occupied residential property as an asset class – a "house price model"

Asset Model Challenges

- Problems with historical house price series:
  - Limited observations (quarterly for last 20 years or so only)
  - Timeliness of reporting
  - Impact of quality improvements on transaction data
  - "Median price" indices can be distorted by compositional changes
  - "Repeat sale" indices are likely to have upwards bias for shorter resale periods
- Using last 20 years of price data needs care:
  - Represents a single path of house prices
  - Period of "once in a generation" or even "once in a lifetime" reversion from high interest/inflation rate to low interest/inflation rate environment
  - House price returns of the last 20 years have been "supercharged"
- Asset model structure should be rational from an economic theory perspective not simply an extrapolation of last 20 years' prices:
  - Do house prices conform to traditional "random walk with drift" stock price models?
  - Should house price models be modelled as a function of underlying economic drivers (e.g. GDP, inflation, interest rates etc)?

Asset Model Challenges cont'd

- Historical house price data for Australia appears to exhibit a material degree of autocorrelation
- As a consequence, the volatility measured from a single 20 year path of house prices is likely to understate the real expected volatility of the asset class
- The presence of autocorrelation in an asset model:
  - Increases the volatility of projected returns compared to the limited history of observable data
  - Gives rise to "runs" of good and bad years in projections, which has been an observed feature of house prices e.g. the "Japan" effect
- The asset model needed for assessing the risk of the NNEG is a model of individual properties, not a model of "the index":
  - Need to develop a view on how the volatility of individual properties compares with the volatility of the index
- The historical price series data implicitly includes the price effects of re-developments, renovations etc:
  - Need to exclude the effects of future capital improvements from the asset model

Residential Property Asset Models

Type of Asset Model	Observations
Mean/Variance	Simple but crude. Risk of extrapolating the past. Assumes that returns between periods are independent
Interest Rate driven	Not my preferred model. Historical price responses to interest rate changes unlikely to apply in the future. "Drift" term may be unresponsive to economic conditions being projected in the model
Inflation driven	A better model (in my view). Greater scope for capturing economic inter-relationships. Less risk of extrapolating the past. More responsive "drift" term.
GDP driven	Same comments as Inflation driven models

Summary of Asset Model Adopted

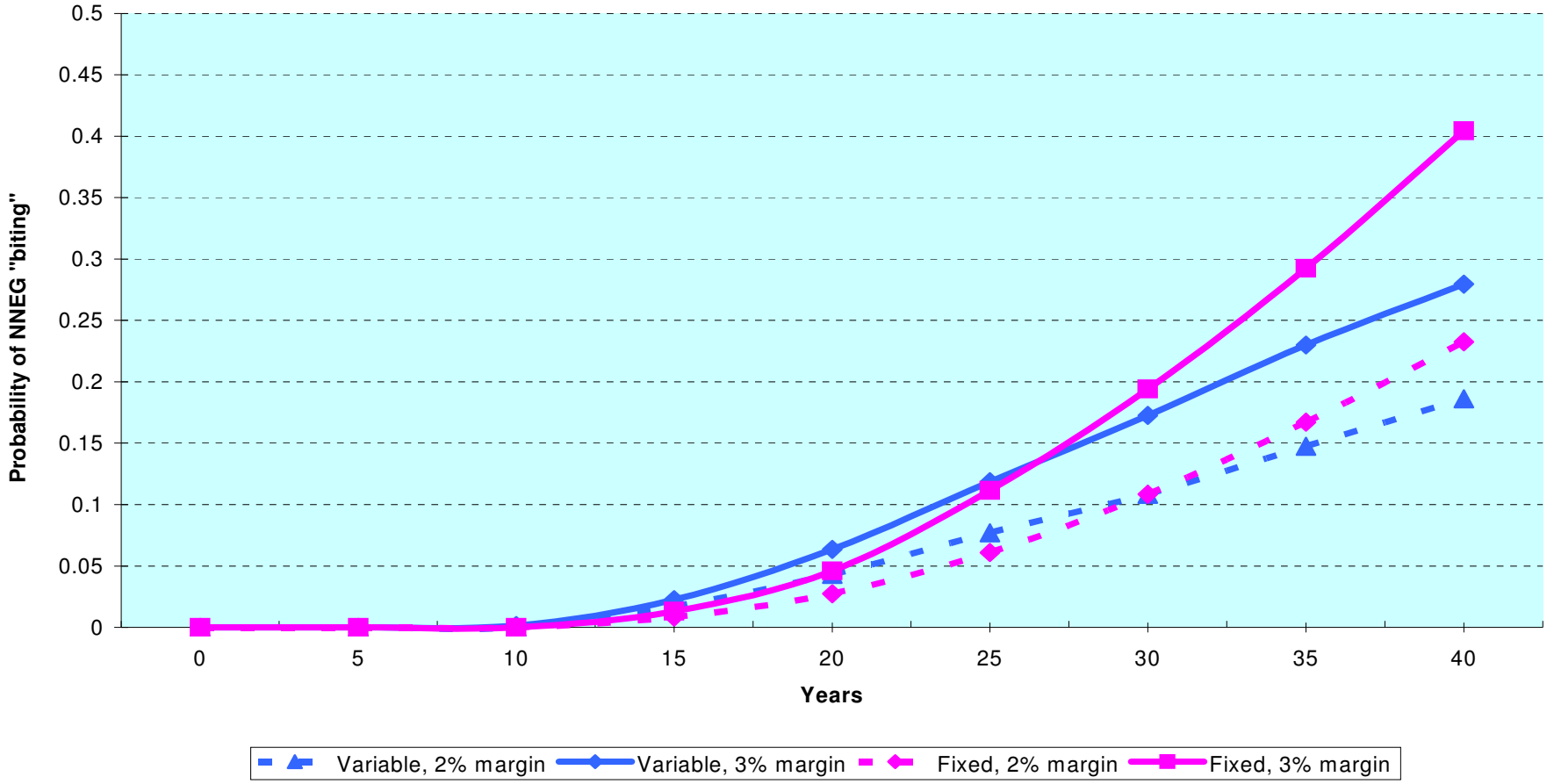
- A GDP-driven model
- Future growth rates for residential property modelled as a function of:
  - Real GDP
  - Inflation
  - Short interest rates
  - Equity prices
- Model also includes some auto-correlation i.e. the current period's projected growth rate is correlated to some extent with the previous period's growth rate
- Over the longer term, the model exhibits a drift characteristic based on projected nominal GDP (i.e. real GDP plus inflation)
- Note, this does not mean that the average projected return is nominal GDP!

Assessing NNEG Risk

- Example considered:
  - Reverse Mortgage sold at 20% LVR
  - Joint mortgagors - male 65, female 65
  - Contract provides a NNEG against the full property value
- Examine for various mortgage interest rates:
  - The risk of the NNEG biting by duration i.e. that the reverse mortgage balance exceeds the projected property value at various durations
- Examine for a fixed interest mortgage charging cost of funds plus 3% p.a. gross margin:
  - The amount of NNEG loss in scenarios where the NNEG bites
  - The present value cost of the NNEG at the outset of the reverse mortgage
  - The cost of the NNEG expressed as a per annum charge against interest margins
- Decrement rates have been modelled for deaths, aged care admission, retirement village entry, other relocations, voluntary early repayments, defaults
- It should be stressed that the figures shown in subsequent slides relate only to the specific joint mortgagor example set out above

Risk of NNEG "Biting"

LVR 20%, M65/F65
(Interest margins over 10 yr GB Yield at t=0)



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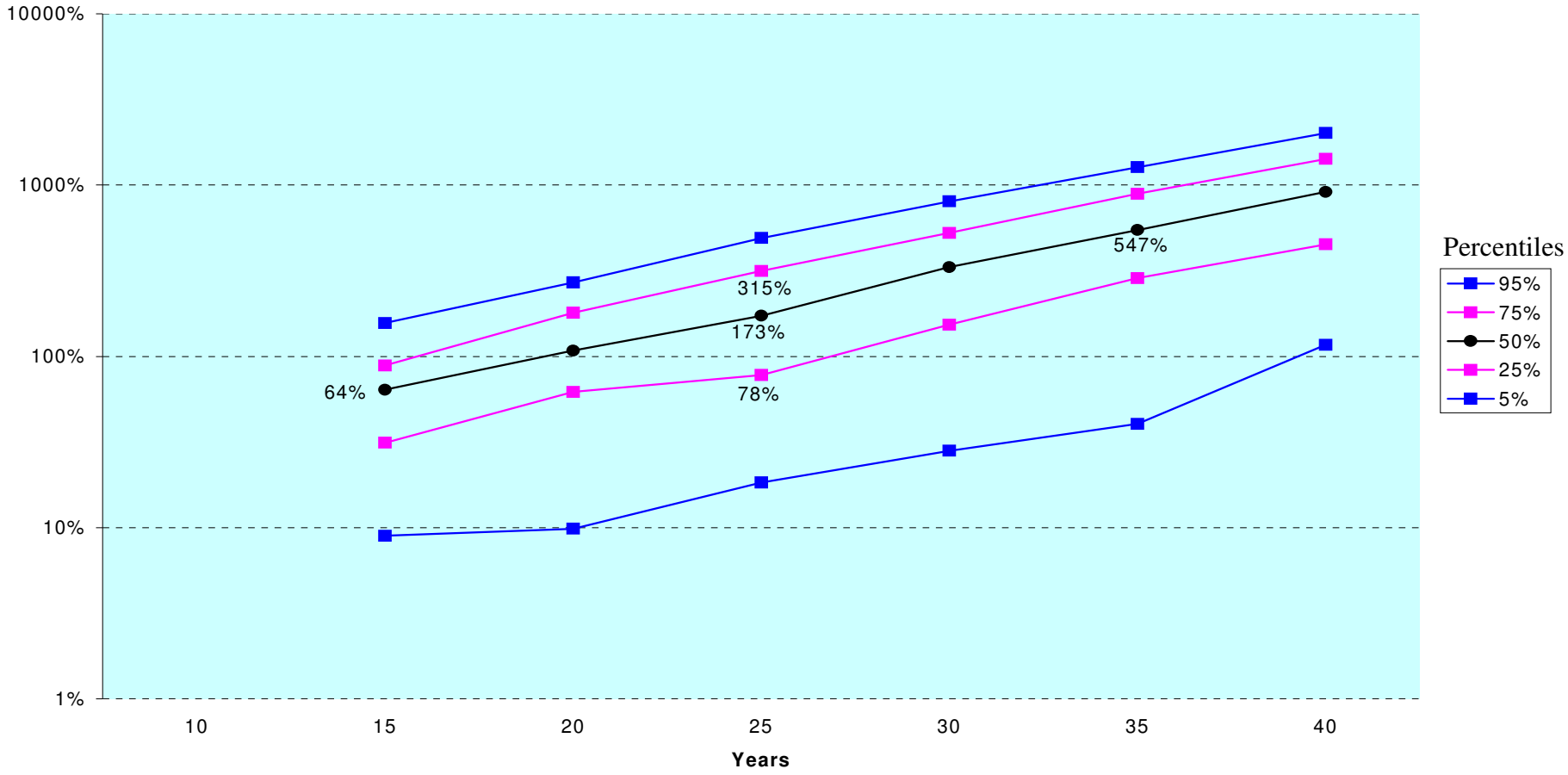
Loss When NNEG "Bites"

NNEG Pay-out as %age of Initial Loan Value
20% LVR, fixed interest rate, 3% margin



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Costing the NNEG

- Use of deterministic DCF techniques is fundamentally inappropriate because of asymmetry of return outcomes for the product provider
- Use of "real world" stochastic valuation techniques is appropriate for risk of ruin and economic loss purposes
- But "real world" stochastic valuation techniques have inherent problems when costing the NNEG:
  - Capitalise future investment risk margins which is inconsistent with market-consistent pricing principle of "no arbitrage"
  - Difficult to determine an appropriate risk-adjusted discount rate ("RDR") that makes proper allowance for the risks associated with the NNEG
- Since the NNEG is essentially a put option, option valuation techniques offer an alternative approach, for example:
  - Risk neutral or certainty-equivalent valuation techniques
  - Deflator techniques
- The following slides illustrate the extent to which these various techniques (excluding deflators) provide differing outcomes

Costing the NNEG

Valuation Method	Commentary
Deterministic with RDR	Inappropriate methodology - not examined
"Real world" stochastic	Examined using risk-adjusted and risk free discount rates
"Scaled" real world stochastic	Scaled each RW scenario in a crude attempt to remove the capitalisation of investment margins. Then examined outcomes using risk-adjusted and risk free discount rates
Option valuation technique	Examined using a range of volatility assumptions
Credit risk technique	Estimation of cost by reference to market cost of "equivalent" credit risk

PV Cost of NNEG

(as percentage of original loan amount for the example considered)

	Discount Rate Adopted			
Valuation Method	**Constant risk free + 5%**	**Constant risk free**	**Stochastic risk free**	
"Real world" stochastic	1%	4%	4%	✘
"Scaled" real world stochastic	2%	7.7%	8.5%	✘

	Base -4%	**Base -2%**	**"Base" Vol**	**Base +2%**	
Risk neutral option valuation	10%	14%	19%	24%	✓

- The "base" option valuation result uses volatility assumptions which are equivalent to the volatility implied by the "real world" stochastic method

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Cost of NNEG (approx)

(as bps per annum charge against interest margins)

	Base -4%	Base -2%	"Base" Vol	Base +2%
Risk neutral option valuation	45 - 50 bps	65 - 70 bps	85 – 90 bps	110 – 120 bps

- For the example considered, the per annum NNEG cost represents a significant portion of the additional interest margin charged on a reverse mortgage
- And this is before allowing for any additional costs associated with holding prudential capital above the "fair value" of the guarantee
- The NNEG cost derived from the option valuation method is materially greater than the cost derived from using a "real world" stochastic method
- The option valuation method provides an estimate of the "market consistent" cost of the NNEG
- A "real world" stochastic valuation method is likely to materially understate the real cost of the NNEG

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A Credit Risk Approach (simplified)

- Weighted probability of the NNEG biting for the example examined above is approximately 6%
- The "weights" used in this calculation are the probabilities of the reverse mortgage being repaid in the year of projection (M65/F65 combination)
- This result could be thought of as implying a 6% chance of default on principal plus interest repayment obligations over the assumed maximum 40 year life of the mortgage
- A credit risk approach to costing the NNEG might be as follows:
  - What credit rating would be assigned to a 40 year bond with a 6% risk of default over the 40 year period?
  - Possibly a AAA rating at this level of default (based on S&P historical CDO data), but the lack of interest payments on the RM might warrant a lower rating
  - What is the market cost today of credit with that credit rating and that term
  - AAA credit spread for >30 year term is c. 85 - 90 bps per annum (estimated by extrapolating Bloomberg data as at 31 Dec 2005 for terms of up to 30 years)
  - Implies a NNEG cost of c. 85 – 90 bps per annum as at 31 Dec 2005 for the example considered (or an even higher cost than this if rated less than AAA)

Conclusions from NNEG Costing

- The NNEG is a put option written by the RM provider
- The NNEG should be costed using option valuation (or similar) techniques
- "Real world" stochastic techniques are very unlikely to provide the "right" cost but are still essential for assessing capital requirements
- A credit risk approach may provide an alternative means of costing the NNEG
- However, the NNEG is arguably more of a market risk than a credit risk event:
  - The creditworthiness of the RM mortgagor is arguably irrelevant
  - There is no risk of the RM mortgagor failing to maintain interest repayments
  - The NNEG risk is a combination of property markets, interest rates and "longevity"
  - The characteristics of losses and recoveries in the event of default could be very different for a NNEG than for a conventional corporate bond of equivalent rating
  - Will a widening in credit spreads necessarily correlate with a more adverse outlook for residential property prices?
- In my view, an option pricing approach is the better approach for:
  - Costing the NNEG for pricing purposes
  - Assessing the fair value of the NNEG (where material) for financial reporting purposes

Securitisations

- Equity release products are very capital intensive due to the interest roll-up feature
- Ideal candidates to be securitised from an issuer's perspective since they enable the issuer's capital to be recycled for further lending
- The UK market has seen securitisations of both reverse mortgage and SAM portfolios
- Key differences between conventional mortgage-backed securitisations and reverse mortgage securitisations (RVMBS):
  - A RVMBS requires a very large liquidity facility (cost implications)
  - A RVMBS has materially greater exposure to long term property market performance
  - The RVMBS transfers "longevity" risk
- The earlier illustration of a 6% weighted risk of default of P+I repayments under a RM suggests that the default risk might not be considered unduly onerous
- But the NNEG is a very long term exposure with a potentially large tail risk
- This suggests the need for careful design of the "layers" within a securitisation

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