Risk Based Capital and Pricing for Reverse Mortgages Revisited

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Background

• Funding retirement from savings – housing a major asset
• Increasing use of reverse mortgages and other equity release schemes
• Regulatory and risk requirements
• Credit crisis
Australian Reverse Mortgage Market

Market developing – similar factors to US market

Figure 1: Number of reverse mortgage loans on issue for Australia. Source: SEQUAL

Figure 3: Average Reverse Mortgage Loan Size for Australia. Source: SEQUAL

Figure 6: US Reverse Mortgage Market. Source: National Reverse Mortgage Lenders Association
Model for Risk and Pricing

- **VAR (Vector Autoregressive, Multivariate)**

\[
\hat{y}_t = \hat{W} + \hat{A}_1 y_{t-1} + \hat{A}_2 y_{t-2} + \varepsilon
\]

- **\( dMR_t \): Difference in standard variable mortgage rate**
- **\( RlnH_t \): Return for Real Log Sydney House Prices**
- **\( LnCPI_t \): Log change in NSW CPI Index**
- **\( RlnR_t \): Return for Real Sydney Rental Index**

\[
\begin{pmatrix}
  -0.0012 \\
  -0.0042 \\
   0.0041 \\
   0.0019
\end{pmatrix}
\]

\[
\hat{W} =
\begin{pmatrix}
  0.1958 & 0.0273 & -0.0235 & -0.0030 \\
-1.4206 & 0.2838 & -0.0298 & 0.0572 \\
  0.5124 & 0.0466 & 0.3191 & -0.0053 \\
-0.6814 & -0.0459 & 0.0095 & -0.2281
\end{pmatrix}
\]

\[
\hat{A}_1 =
\begin{pmatrix}
  0.1958 & 0.0273 & -0.0235 & -0.0030 \\
-1.4206 & 0.2838 & -0.0298 & 0.0572 \\
  0.5124 & 0.0466 & 0.3191 & -0.0053 \\
-0.6814 & -0.0459 & 0.0095 & -0.2281
\end{pmatrix}
\]

\[
\hat{A}_2 =
\begin{pmatrix}
  0.4023 & 0.0488 & 0.0444 & -0.0006 \\
-0.8355 & 0.3898 & 0.6724 & 0.0239 \\
  0.1083 & 0.0123 & 0.2004 & -0.0049 \\
  1.0084 & -0.2407 & 0.2440 & 0.1000
\end{pmatrix}
\]
Data - Model for Risk and Pricing

<table>
<thead>
<tr>
<th>Data Period</th>
<th>Mar-1982 to Dec-2008</th>
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<tbody>
<tr>
<td>Variable</td>
<td>Source</td>
</tr>
<tr>
<td>Standard Variable</td>
<td>Reserve Bank of Australia</td>
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<tr>
<td>Mortgage Rate</td>
<td>F05</td>
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<tr>
<td>NSW CPI</td>
<td>Australian Bureau of Statistics (ABS)</td>
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<td></td>
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<td>Sydney House Median Rental Index</td>
<td>Real Estate Institute of Australia</td>
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<td>REMP5</td>
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<tr>
<td>Female Mortality Rates</td>
<td>ABS</td>
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<td></td>
<td>Life Tables 2005-2007</td>
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<tr>
<td>US Termination Rates</td>
<td>Szymanoski (2007)</td>
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<tr>
<td></td>
<td>N/A</td>
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</tbody>
</table>

Economic variables jointly modelled
Survival curve for termination and mortality rates

(a) Simulated Mortgage Rates
(b) Simulated House Prices
Model Fit – t versus Gaussian

t-distribution improves fit

(b) $dMR$ Residuals PDF

(d) $RlnH$ Residuals PDF

(f) $LnCPI$ Residuals PDF

(h) $RlnR$ Residuals PDF
Loan Termination rates

Standard assumption 1.3x female mortality

Recent US experience

Mortality improvement impacts termination assumption
Product Cash Flows and Risks

Illustrative risk analysis – loan at age 65, $100,000, Loan to value 15%

Risk of default or insolvency when house price exceeds loan
Risk measures

VaR and TVaR most common financial risk measures
Default risk

Most defaults occur at later ages

Earlier terminations reduce default risk
Spread risk

Spread between interest rate and mortgage rate is critical

Credit crisis highlighted this risk
Sensitivity to Termination

Termination rates are important.

Little is known about termination experience.
Sensitivity to Premium

Market pricing is critical to a profitable product and to the risk exposure.
Sensitivity to Termination/Longevity

Premiums should reflect termination experience

Risk of misestimating
Conclusions

- Credit crisis has focussed attention on credit risk and margins
- Reverse mortgages growing in Australia (and internationally)
- Critical need for understanding of risks and risk management
- Models for market variables and termination/longevity and quantification of risks
Discussion and Q&A

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- **Longevity 6: 6th International Longevity Risk and Capital Markets Solutions Conference** hosted by Australian Institute of Population Ageing Research, UNSW, 9-10 September 2010, Swiss Grande Bondi Beach, Sydney. This is the major international conference bringing together leading international industry and academic minds as well as policy makers to meet and discuss the assessment of longevity risk, the market and government developments and responses needed by pension funds and insurance companies to manage this risk. Key themes are “Reinsurance and Financial Markets Solutions” and “Government Role, Public and Private Market Solutions”.