Longevity Risk and Annuities in Singapore

Joelle Fong, Olivia Mitchell, and Benedict Koh
17th Australian Colloquium of Superannuation Researchers
Sydney, July 2009
Rapid aging of CPF participants (2005)

- Spore’s baby boomers start to retire.
- 23% age 55+ (5.5% in 1985)
- 9% age 24 or below (25% in 1985)
- One of the lowest fertility rates and longest life expectancies

As system matures, attention now turning to payout phase.
Brief History of CPF pension scheme

• Mandatory national saving program est. 1955.

• Currently:
  – 3.2 M members; include self-employed.
  – Member balances total S$151B.
  – DC plan financed by mandatory levies of 10-34.5% of pay (depends on age) with ceiling at $4,500/mo.
  – High contributions said to promote saving.
  – Contributions flow to 3 main accounts.
CPF Structure

Members’ Individual Accounts

Accumulation

Ordinary Account (OA) $65b
Special Account (SA) $31b
Medisave Account $43b

CPF Investment Scheme-OA
CPF Investment Scheme-SA

Other purposes:
- Education
- Home Ownership
- Family Protection

Other purposes:
- Retirement

Decumulation

Retirement Account $12.5b

@ age 55
Set aside Minimum Sum (MS) $99,600

@ age 62
Start receiving monthly payout
Payout menu @ age 62 (*Decumulation Phase*)

- **Phased Withdrawal** (default)
  - Should have Minimum Sum (MS) balance S$99,600 set aside @ age 55. (2007)
  - Payouts should last ~ 20 years (~ $790/mo.)
  - Administered by CPF Board /private banks.
  - Opportunity for bequest.

- **Life Annuity** (alternative)
  - Sold by participating private insurers (*e.g.* AIA, Prudential, NTUC Income).
  - Need full Min. Sum (*premium* = S$99,600).
  - Fixed nominal lifetime benefits (*F* ~ $480/mo; *M* $520/mo).
  - Longevity protection but not inflation.
  - Allows bequest via ‘guaranteed’ option.
Observations:

- Most participants default into phased withdrawal.
- Problem: 48% of those alive at age 65 can expect to still be alive at age 85. ➔ half will outlive CPF retirement payouts under the 20-yr PW payout!
- Possible reasons:
  - Lack full Min. Sum @ age 55 as retirement funds tied up in housing.
  - Inertia.
  - Limited selection of life annuities.
  - Perhaps low returns/high costs of annuities? Or adverse selection?
Defining money’s worth ratio (MWR)

• Money’s worth framework popular
  Chile: Thorburn, Rocha, and Morales (2005)
  Singapore / Australia: Fong WM (2002); Doyle, Mitchell, & Piggott (2004)

• Standard approach:

\[
\text{MWR} = \frac{\text{EPDV}[\text{benefits}]}{K}
= \frac{\left(\sum_{t=1}^{\infty} t P_a \cdot A_a \frac{1}{(1+i_t)^t}\right)}{K}
\]

A: annuity payout (for entry age a)
K: premium
i_t: interest rate
P_a: cumulative survival probability
Extend previous work:

• Account for specific refund characteristics:
  – Refund is lump-sum (*thus standard MWR model for joint-and-survivor annuity does not apply*)
  – Guaranteed amount + interest on death:
    From 55–62: Refund = [Full premium + accrued int].
    From 62 onward: Refund = \( \max[0, \text{Guarantee} - \text{payouts made}] \).

• Build yield curve using 20-yr bonds compared to flat interest rate or 10-yr bonds.

• Other adjustments:
  – Extrapolate population life table to age 117 (to match limiting age of annuitant group).
Formulation:

\[
EPDV = \sum_{t=1}^{83} \frac{(t-1) \cdot P_a \cdot q_{a+(t-1)} \cdot G_t}{(1+i_t)^t} + \sum_{t=84}^{\infty} \frac{t \cdot P_a \cdot A_a + (t-1) \cdot P_a \cdot q_{a+(t-1)} \cdot \max[0, G_t - \sum_{s=0}^{t-84} A_{a,s}]}{(1+i_t)^t}
\]

Key inputs:

1. Pricing quotes of the life annuities offered by participating private insurers (7/2007).
   - Sex-specific payouts \(A_a\)
   - Premium \(K\)

2. Mortality data for population and annuitant groups.
   - Actuarial \(p\) and \(q\)

3. Riskless term structure of interest rates \(i_t\)

⇒ Compute MWR for 9 annuities on offer.
Premium & sex-specific payouts:

Insurers offered similar annuities.

- Single Premium = $99,600 (varies with stipulated MS)
- Annuity purchased at age 55; monthly payout starts at 62 (7-year deferred).
- Level payouts; no inflation-indexing.
- Two offer annual bonus participation.

<table>
<thead>
<tr>
<th>Insurer</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia Life</td>
<td>S$505.47</td>
<td>S$454.47</td>
</tr>
<tr>
<td>Prudential</td>
<td>518.44</td>
<td>449.87</td>
</tr>
<tr>
<td>AIA</td>
<td>530.87</td>
<td>513.94</td>
</tr>
<tr>
<td>NTUC Income*</td>
<td>523.50</td>
<td>490.25</td>
</tr>
<tr>
<td></td>
<td>(591.08)</td>
<td>(557.83)</td>
</tr>
<tr>
<td>Average w/o bonus</td>
<td>519.58</td>
<td>476.98</td>
</tr>
<tr>
<td>Average w bonus</td>
<td>534.60</td>
<td>492.00</td>
</tr>
</tbody>
</table>
Mortality assumptions:

• Population tables
  – New 2007 population period tables from Singstat.
  – Limiting age 100; must extrapolate to 117.

• Annuitant tables
  – Annuitant period tables NA in Singapore.
  – Industry uses UK a(1990) ultimate tables with 5-year setback to proxy annuitant experience.
  – Same treatment in prior studies.

• We apply 15-yr mortality improvement factors to ‘cohortize’ tables
  ➔ obtained 1952 cohort tables = 2007-55.
Mortality graphs (Population vs annuitants; 2007)

Cumulative survival probability for Singaporean males (2007)

Singaporean females
* Right-tail fatter (longevity risk higher)
* Annuitant curve above pop. curve
Findings *(55-yr-old; July 2007; riskless term structure)*

<table>
<thead>
<tr>
<th></th>
<th>Population MWR</th>
<th>Annuitant MWR</th>
<th>Adverse Selection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Male</strong></td>
<td>0.862</td>
<td>0.891</td>
<td>2.89%</td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td>0.861</td>
<td>0.903</td>
<td>4.18%</td>
</tr>
</tbody>
</table>

1. Per $1 premium get $0.86 in expected annuity income using pop, $0.90 using annuitant. AS ≈ 3% (*small*).

2. Cross-country comparisons using annuitant tables:

<table>
<thead>
<tr>
<th>Year</th>
<th>MWR</th>
<th>AS</th>
</tr>
</thead>
<tbody>
<tr>
<td>US: Mitchell et al (99)</td>
<td>1995</td>
<td>0.916</td>
</tr>
<tr>
<td>UK: Finkelstein &amp; Poterba (02)</td>
<td>1998</td>
<td>0.911</td>
</tr>
</tbody>
</table>
So:

✓ Value-for-money annuities from private insurers is comparable \([MWR \sim 0.90]\).

✓ AS accounts for smaller proportion of total loadings than elsewhere.

✓ Low take-up likely due to inertia/financial illiteracy.

Implications of mandating annuitization?

• Mandating will spur overall annuity market.

• Govt as public annuity provider may offer lower loads \(\Rightarrow\) MWR Govt-offered annuity \(\approx 1\) (?)

• Participants may benefit from more attractive payouts/ greater choice.

• Difficult to reduce AS further.
Mandatory annuitization of CPF retirement balance coming:

• Default: newly-launched *CPF LIFE* annuity program run by govt.
  – Auto-inclusion of members to begin 2013.
  – Mandatory to reduce adverse selection.
  – No phased withdrawal allowed.
  – May allow private annuity providers to offer (subject to licensing)
    – *Other details to be finalized*…

• Possible crowd-out?
Thank you.

Questions or comments?

For more information: www.pensionresearchcouncil.org/