Tontines – Sharing is Caring

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What is a tontine?

- It’s about sharing
- Flexible designs
- Can be used for different things
- Long strange history
Contents

- Historical Tontines
- Modern Research
- Product Design
- Modelling Example
Historical Tontines
Annual rent from estate paid to 13 staff – equal share

Amount participants die, share divided among survivors

Increasing amount of income for survivors

Relatively common arrangement – predates Lorenzo de Tonti
Government Debt

- Government issues debt – yield of x%

- Public purchases debt and provides a nominee (i.e. your child, the Prince, etc)

- Income paid to purchases of surviving nominees (cost to government fixed, income received increasing)

<table>
<thead>
<tr>
<th>Lorenzo de Tonti</th>
<th>King William III</th>
<th>French</th>
</tr>
</thead>
<tbody>
<tr>
<td>1653</td>
<td>1693</td>
<td>1689</td>
</tr>
<tr>
<td>Designed to generate commission for Lorenzo</td>
<td>Raised debt to fund war against the French</td>
<td>Age based interest rate – separate age classes</td>
</tr>
<tr>
<td>Marketing – do it so your family will take care of you</td>
<td>Taught by Johan de Witt</td>
<td>Eventual debasement or forced conversion to annuity</td>
</tr>
<tr>
<td></td>
<td>Interest rate of 7%, with bonus 3%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Survivors capped at 7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Annuity conversion options added later</td>
<td></td>
</tr>
</tbody>
</table>
Retirement Tontines | GSA | Tontine Account

Key design relationships

1. **Tontine payout function**
   \[ d(t) = C \times t^{\text{commencement age}} \]

2. C which is a constant, determined such as the asset pool exhausts at terminal age (e.g. age 110)

3. **Individual payout** = \( d(t) \) divided by # of survivors

Very simple and not so flexible. Is it practical?
- Consumer market: Unlikely
- Government scheme: Maybe
Open pool OK
Risk free or risky assets
Similar to annuities
Aim is for income to last as long as participants live
Higher level of ongoing actuarial management
Initial income based on an annuity factor
Ongoing income will vary to reflect mortality/investment experience

Key design relationships

1. Initial benefit (income) amount
   \[ B_0 = \text{Investment amount} \div \text{Annuity factor}_0 \]

2. Many ways to adjust ongoing benefit amount \( B_t \)
   - Adjusted as a result of experience
   - Adjusted as a result of long-term assumptions

College Retirement Equities Fund (TIAA-CREF)

Source: College Retirement Equities Fund Prospectus, TIAA, May 2016
Retirement Tontines | GSA | Tontine Account

- Open ended
- No restriction on investment options
- Aim is to earn **tontine gains** on top of investment return to fund retirement income
- Similar to an investment account
- Mortality experience can be pooled among different accounts
- Not limited to any particular drawdown options

High flexibility and transparency
- Different drawdown options possible
- Part of decumulation investment portfolio
  (More about this later)

Source: 21st century retirement - Modern tontines, Catherine Donnelly, Risk Insight Lab, Heriot-Watt University, October 2018
Product Design
What’s out there now?

Sharing is not a new concept

Funds/Stuctures

- UniSuper, TIAA
- We??

Products

- Mercer Lifetime Plus
- Nippon Gran Age?
- SPAC – Pershing Square ‘Tontine’ Holdings [not a tontine..]
Concepts (high level...)

ABP + Tontine Account
- Standard concept
- Investment Choice?
- Withdrawal/death benefits managed by tontine glidepath
- Drawdown/payout options?
- How to explain to members??

Whole of Life
- Blend of USA Tontine and deferred annuity
- Aligned with one account, member stapling
- ‘longevity insurance’ premiums
- Unlikely to fit within existing legislative or tax requirements!

Defensive Asset
- Tontine bond (Fullmer, 2019)
- Not for longevity protection
- Bond yield + mortality credit
Modelling Example
Modelling – Sample Design structure

- Modelling
- History
- Modern Research
- Product Design

Tontine Pension

- Superannuation savings
- Transfers based on Tontine glidepath
- Investment earnings on Flexibility Account balance
- Investment earnings on Tontine Account balance
- Tontine gains (mortality credits)
- Not available for lump sum withdrawals and bequest
- Drawn down according to the chosen payout schedule

Flexibility Account

- Available for lump sum withdrawals and bequest

Tontine Account

- Regular income as per the chosen payout schedule
Key product design variables

<table>
<thead>
<tr>
<th><strong>Tontine glidepath</strong></th>
<th>How much and how quickly into Tontine Account</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Drawdown schedules</strong></td>
<td>How many options and how flexible</td>
</tr>
<tr>
<td><strong>Tontine gains distributions</strong></td>
<td>Frequency and mechanism</td>
</tr>
<tr>
<td><strong>Investment options</strong></td>
<td>Between death and distribution of tontine gains</td>
</tr>
</tbody>
</table>

History

Modern Research

Product Design

Modelling
A simple example for illustration

**Tontine glidepath**

2.5% of Flexibility account is **transferred** to Tontine account each year from age 70 to age 90 to gradually build up a longevity protection over time.

**Drawdown schedule**

<table>
<thead>
<tr>
<th>Age</th>
<th>% of Tontine Pension (Flexibility + Tontine Account)</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>0%</td>
</tr>
<tr>
<td>70</td>
<td>5%</td>
</tr>
<tr>
<td>75</td>
<td>10%</td>
</tr>
<tr>
<td>80</td>
<td>15%</td>
</tr>
<tr>
<td>85</td>
<td>20%</td>
</tr>
<tr>
<td>90</td>
<td>25%</td>
</tr>
<tr>
<td>95</td>
<td>30%</td>
</tr>
<tr>
<td>100</td>
<td>35%</td>
</tr>
<tr>
<td>105</td>
<td>40%</td>
</tr>
<tr>
<td>110</td>
<td>65%</td>
</tr>
</tbody>
</table>

6.5% to 33.5% increase from age 70 to age 90.
A closed group of 1,000 female retirees aged 65
Age of death of each retirees is drawn from an assumed distribution.
The distribution was constructed from a set of cohort mortality rates based on the Australian Life Table 2010-12 for females with the 125-year improvement factors.

1,000 investment return scenarios
Balanced option – drawn from a normal distribution with a mean of 6.6% and a standard deviation of 10%

Same initial balance of $500,000
Death | Impact of tontine account

- Represent amount in Flexibility account over time
- Smooth decline over time
- Not materially different from pure ABP under the same drawdown schedule
Income | Impact of tontine account

Obvious benefit after age 85

Range of outcomes still dominated by investment experience

Volatility at advanced old ages due to a closed group.
Smoother experience can be expected for open-ended products
Thank you for listening