From Tontines to Annuities (in 20 minutes)

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18 April 2019 (Brookings)
Tontines in the news: Canada’s 2019 Budget

Budget 2019 proposes to amend the tax rules to permit PRPPs and defined contribution RPPs to provide a variable payment life annuity (VPLA) to members directly from the plan. A VPLA will provide payments that vary based on the investment performance of the underlying annuities fund and on the mortality experience of VPLA annuitants.

Annuities fund

PRPP and defined contribution RPP administrators will be permitted to establish a separate annuities fund under the plan to receive transfers of amounts from members’ accounts to provide VPLAs. Only transfers from a member’s account will be permitted to be made to the annuities fund. Direct employee and employer contributions to the annuities fund will not be permitted.

A minimum of 10 retired members will be required to participate in a VPLA arrangement in order for a plan to establish such an arrangement and it must be reasonable to expect that at least 10 retired members will participate in the arrangement on an ongoing basis.
Long-term borrowing by English & French government.

Back in the 17th Century

Example: 17th Century Tontine with 10% Annual Dividend

Annuitant, Subscriber, Investor.

Nominee

Tontine Issuer, Sponsor or Government

Dividend to Annuitant
While Nominee is Alive

Nominee Dies

Payment Obligations End

£ 100

£ 10 + ?

£ 10 + ?

£ 10 + ?

£ 0
Example: Lending £2000 to a 17th Century King

Example: Classic Tontine with 20 Investors
(= Nominee = Annuitant)

Example: Classic Tontine with 20 Investors
(= Nominee = Annuitant)
Example: Classic Tontine with 20 Investors

While Everyone is Alive
After Some Deaths

Example: Classic Tontine with 20 Investors

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Computing the dividend per tontine share...

With 16 investors alive and 4 investors dead, the dividend calculation is:

\[
\frac{\£200}{16} = \£12.5 = \£10 + \£2.5
\]

Dividend is (i.) interest of 10% plus (ii.) mortality credits of 2.5%.
Dividend per Share

Why the revisions?

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Dividend per Share: 4 Investors Remaining in the Pool

£200 \div 4 \text{ survivors} = £50 \text{ dividend per survivor}
Dividend per Share: The Last One Standing

Winner!

£ 200 Annuity for life…
What Happens to the Principal?

...It is gone!
The (Expected) Payout Structure of Lorenzo’s Tontine
Not Very Optimal Looking...

Range of Flat 4% Tontine Payout Purchased at 65: Gompertz Mortality
10th vs. 90th percentile: n = 400 (m=88.721, b=10)
Compare & Contrast: Tontine vs. Life Annuity

Tontine vs. Life Annuity

Tontine
- Total interest paid each year to group known in advance
- Payments to survivors increase...and the longer they live the more they get!

Life Annuity
- As people die, total paid out to group declines over time
- Payments and income to survivors stays relatively constant
Endorsement by the Greatest (or First) Economist
Written in the late 18th Century

Adam Smith:
“Tontine Appeals to the Gambling Instinct”

“...from the confidence which every man naturally has in his own good fortune, the principle upon which is founded the success of all lotteries, [the tontine] annuity generally sells for some-thing more than it is worth. In countries where it is usual for government to raise money by granting annuities, tontines are upon this account generally preferred to annuities for separate lives..."
Endorsement by the Greatest (or First) Treasury Secretary
Written in the late 18th Century

Alexander Hamilton's Tontine Proposal
Robert M. Jennings, Donald F. Swanson and Andrew P. Trout
The William and Mary Quarterly

Published by: Omohundro Institute of Early American History and Culture
DOI: 10.2307/1922216
Stable URL: http://www.jstor.org/stable/1922216
Page Count: 9

Topics: Tontines, Life annuities, Public debt, Interest, Mortality, Interest rates, Credit, Annuities, Sinking funds, Age groups.
Imagine you are about to retire and are (only) given a choice between a 14% life annuity and a tontine paying 8%. Which would you select?

What would (rational) choice depend on?

- Your health relative to the tontine pool.
- Credit rating of the insurance company.
- Risk aversion & consumption preferences.
- Pricing and the term structure of interest rates.
- Long-term inflation expectations
Some More Annuity Puzzles…  
What do people actually buy?

<table>
<thead>
<tr>
<th>Income Annuity Type</th>
<th>Q1.2019</th>
<th>Q4.2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>For Life Only <em>(No guarantee)</em></td>
<td>14.4%</td>
<td>25.3%</td>
</tr>
<tr>
<td>Life with Guarantee Period</td>
<td>36.2%</td>
<td>56.2%</td>
</tr>
<tr>
<td>Cash or Installment Refund</td>
<td>49.4%</td>
<td>18.5%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Analysis: Moshe A. Milevsky
Some More Annuity Puzzles...

Does anyone worry about inflation?

<table>
<thead>
<tr>
<th>Inflation Indexed Income</th>
<th>Q1.2019</th>
<th>Q4.2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Requested</td>
<td>97.0%</td>
<td>96.0%</td>
</tr>
<tr>
<td>CPI-u Index</td>
<td>0.0%</td>
<td>1.0%</td>
</tr>
<tr>
<td>COLA</td>
<td>3.0%</td>
<td>3.0%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**Takeaway:** Only economists buy real annuities.


Analysis: Moshe A. Milevsky
Tontine vs. Annuity Choice isn’t Hypothetical...

In the year 1693 investors in England were given this exact choice.

The Million Act...to finance the war with France

Choice A
- £100
- Annuity 14% For Life

Choice B
- £100
- Tontine 10% for 7 years 7% thereafter

1693
1700
1705
1710
1715

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An Optimal (Natural) Tontine’s Payout to the Syndicate

Some quick intuition

Many ways to design a tontine in which the PV of the guaranteed dividends is equal to the original contribution.

IV = Optimal Tontine....
Note: Tontine thinking is more important than tontine structure.

Remember that insurance companies charge for absorbing longevity risk and the (capital) cost will continue to increase over time. Do consumers really want all their systematic mortality risk eliminated?

Offer a portfolio choice between (i.) sharing systematic longevity risk with others, and (ii.) transferring the risk to an insurance company.

At the very least, explain the tontine first, which might nudge people towards annuities...