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STATE-SPONSORED PENSIONS FOR PRIVATE SECTOR WORKERS: THE CASE FOR POOLED ANNUITIES AND TONTINES

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Background

Many retirees are underprepared for retirement

- Lack of access to retirement saving programs
- Under-saving
- Lack of financial literacy and knowledge

Defined contribution (DC) plans are typically savings oriented...

...but retirees need a way to transform that savings into lifetime income

...and traditional withdrawal strategies are highly uncertain (longevity risk)

...and people tend not to purchase annuities on their own (annuity puzzle)



Motivation

States have begun to address these issues by introducing state-sponsored retirement saving programs (e.g., ‘Secure Choice’ plans)

These programs address the *access* and *under-saving* problems...
...but not the problem of transforming savings into *lifetime income*

Tontine pensions or pooled annuities are a natural solution

- Efficient, low-cost
- Assured lifetime income
- States could sponsor and outsource operations to private companies (similar to 529 plans)
- Private entities could also sponsor them (e.g., corporate DC plans, private companies)

In our paper, we call this solution: *Lifetime Assurance Funds*



Modern tontines

Tontines combine an investment with a payout scheme

- Investment is irrevocable
- Upon death, account balances are transferred to surviving members
- In this way, investors collect a longevity yield (mortality credits) for as long as they survive

Tontines pool and diversify the individual longevity risks of their members

- Members collectively share longevity risk
- No third-party guarantor/insurer
- No guarantee premiums, no risk reserve requirements, no counterparty risk

Payouts self-adjust to ensure the tontine *remains fully funded at all times*

Think of tontines as *actuarially-fair, non-insured* annuities



The life-cycle model

Menahem Yaari[†] showed that for risk-averse utility-maximizing individuals:

- *Actuarially-fair* life annuities are optimal
- Those with bequest motives might only partially annuitize

But people tend not to buy them (the “annuity puzzle”)

Some reasons: Guaranteed commercial annuities are opaque and not actuarially-fair

- Reserve requirements
- Hedging costs
- Other expenses and profit margins



[†] Yaari, M.E. (1965), Uncertain Lifetime, Life Insurance and the Theory of the Consumer, *The Review of Economic Studies*, Vol. 32(2), pg. 137-150

The retiree's dilemma: invest or insure?




**Self
Drawdown**

Longevity risk pooling
 Mortality credits
 Third-party guarantee

Irrevocable
 Guarantee costs
 Counterparty risk

Full control



**Guaranteed
Annuity**

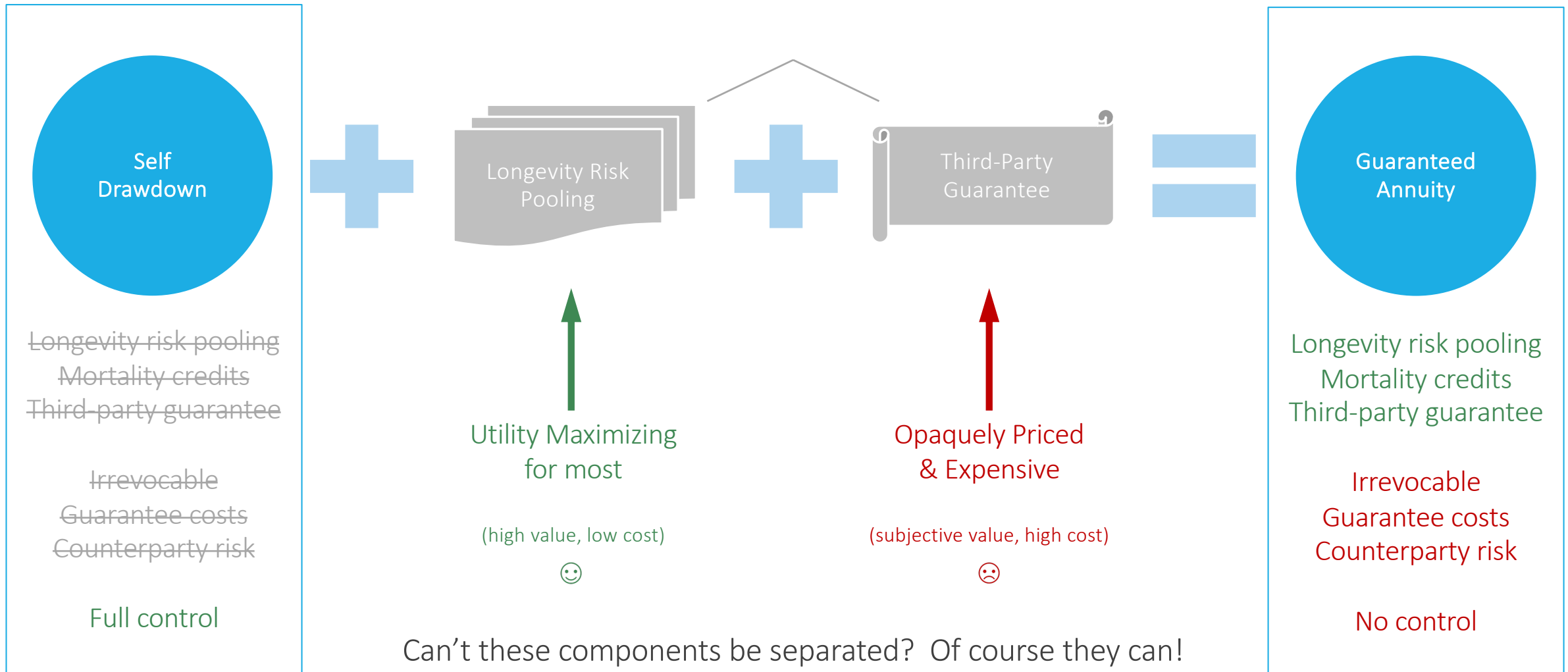
Longevity risk pooling
 Mortality credits
 Third-party guarantee

Irrevocable
 Guarantee costs
 Counterparty risk

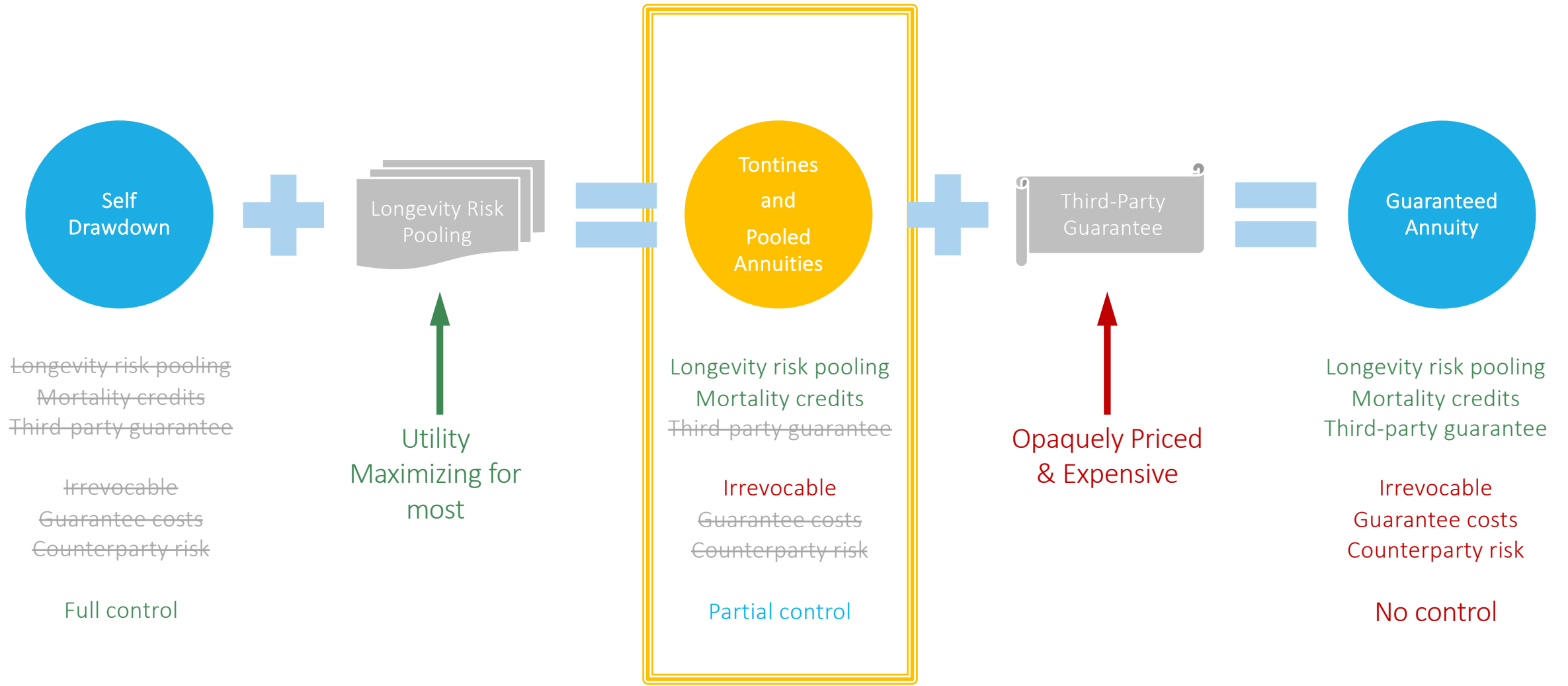
No control



Commercial annuities embed two components



High value. Low cost.



What is an assurance fund / tontine pension?

Structured as an open-ended perpetual tontine or pooled annuity

Adheres to a strict budget constraint (must always remain fully funded)

Like a mutual fund, but:

- Mortality-risk pooled, and therefore irrevocable to enforce the risk-sharing arrangement
- Account balances are forfeited upon death
- Forfeitures are redistributed to survivors in the form of mortality credits
- Pays out in the form of lifetime income

Like a commercial life annuity, but:

- Is actuarially-fair
- Payouts levels are in no way guaranteed
- Investors share systematic mortality risk



Benefits to plan sponsors and participants

Lifetime income

- Income is assured (to some maximum age, such as 120)
- Flexible: Income may begin at retirement or may be deferred to an advanced age

Efficiency

- Well-suited to the DC model (individual accounts, investment options)
- May be offered with the same investment choices that already exist in the DC plan
- Participants enjoy higher returns than with mutual funds (due to mortality credits)
- Lower cost structure than conventional annuities (no insurance or risk transfer costs)

Sustainability

- No guarantor counterparty risk (relieving fiduciary liability concerns)
- Fully funded and self-correcting (due to the budget constraint)
- Fully sustainable... forever



Consider a state-sponsored retirement saving/pension plan

Eligible employees enrolled automatically at a default contribution rate (can opt out)

The plan offers:

- Two types of accounts: regular accounts that are invested in mutual funds (the default) and assurance fund accounts
- A few investment options – e.g., a target-date fund, an equity fund, and a bond fund

Assurance funds payout starting at age 65, with two payout options:

- Lifetime uniform (expected growth rate of 0) – **initial payout is higher**
- Lifetime escalating (expected growth rate of 2.5% per year) – **initial payout is lower, but will grow**



Simplistic example

35-year-old male

Salary is \$50,000 per year, growing at 4% per year

Contributes 10% of salary

- 5% into a regular account
- 5% into an assurance fund account
- Invests in the same underlying portfolio in both accounts

Deterministic assumptions:

- Investment return is exactly 7% each year
- People die and forfeit balances exactly as expected by the mortality table*

| Selected Entries | |
|-------------------|-----|
| Death Probability | Age |
| 1% | 67 |
| 2% | 75 |
| 10% | 89 |
| 40% | 105 |
| 100% | 120 |



*2012 IAM Basic mortality table projected forward using scale G2

Pre-retirement savings accumulation

| Age | Contribution to Each Account | Regular Investment Account | | Assurance Fund Account | | |
|-----|------------------------------|----------------------------|----------------|------------------------|------------------|----------------|
| | | Investment Return | Ending Balance | Investment Return | Mortality Credit | Ending Balance |
| 35 | \$2,500 | \$86 | \$2,586 | \$86 | \$2 | \$2,588 |
| 36 | 2,600 | 270 | 5,457 | 271 | 4 | 5,463 |
| 37 | 2,704 | 475 | 8,635 | 475 | 7 | 8,649 |
| 38 | 2,812 | 701 | 12,149 | 702 | 10 | 12,174 |
| 39 | 2,925 | 951 | 16,025 | 953 | 14 | 16,066 |
| 40 | 3,042 | 1,226 | 20,293 | 1,229 | 19 | 20,356 |
| : | : | : | : | : | : | : |
| 59 | 6,408 | 15,360 | 238,051 | 15,910 | 1,275 | 247,726 |
| 60 | 6,665 | 16,893 | 261,609 | 17,570 | 1,549 | 273,510 |
| 61 | 6,931 | 18,551 | 287,091 | 19,384 | 1,882 | 301,707 |
| 62 | 7,208 | 20,344 | 314,644 | 21,367 | 2,279 | 332,562 |
| 63 | 7,497 | 22,283 | 344,424 | 23,537 | 2,751 | 366,347 |
| 64 | 7,797 | 24,378 | 376,598 | 25,913 | 3,316 | 403,372 |
| | <u>140,212</u> | <u>236,386</u> | | <u>244,385</u> | <u>18,775</u> | |

7.1% higher



Assurance fund payouts: uniform payout option

| Age | Beginning Balance | Payout | Investment Return | Mortality Credit | Ending Balance |
|-----|-------------------|-----------|-------------------|------------------|----------------|
| 65 | \$403,372 | \$36,264 | \$25,698 | \$3,570 | \$396,376 |
| 66 | 396,376 | 36,264 | 25,208 | 3,694 | 389,014 |
| 67 | 389,014 | 36,264 | 24,693 | 3,845 | 381,288 |
| 68 | 381,288 | 36,264 | 24,152 | 4,026 | 373,201 |
| 69 | 373,201 | 36,264 | 23,586 | 4,240 | 364,763 |
| 70 | 364,763 | 36,264 | 22,995 | 4,492 | 355,987 |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| 117 | 74,396 | 36,264 | 2,669 | 27,201 | 68,002 |
| 118 | 68,002 | 36,264 | 2,222 | 22,640 | 56,599 |
| 119 | 56,599 | 36,264 | 1,423 | 14,506 | 36,264 |
| 120 | 36,264 | 36,264 | 0 | 0 | 0 |
| | | 2,030,783 | 578,571 | 1,048,840 | |



A regular account with the same payouts would run out of money at age 84

Assurance fund payouts: escalating payout option

| Age | Beginning Balance | Payout | Investment Return | Mortality Credit | Ending Balance |
|-----|-------------------|-----------|-------------------|------------------|----------------|
| 65 | \$403,372 | \$29,195 | \$26,192 | \$3,639 | \$404,008 |
| 66 | 404,008 | 29,925 | 26,186 | 3,838 | 404,107 |
| 67 | 404,107 | 30,673 | 26,140 | 4,071 | 403,644 |
| 68 | 403,644 | 31,440 | 26,054 | 4,343 | 402,601 |
| 69 | 402,601 | 32,226 | 25,926 | 4,661 | 400,963 |
| 70 | 400,963 | 33,032 | 25,755 | 5,031 | 398,717 |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| 117 | 220,871 | 105,427 | 8,081 | 82,349 | 205,873 |
| 118 | 205,873 | 108,063 | 6,847 | 69,771 | 174,429 |
| 119 | 174,429 | 110,765 | 4,456 | 45,414 | 113,534 |
| 120 | 113,534 | 113,534 | 0 | 0 | 0 |
| | | 3,487,075 | 833,586 | 2,250,117 | |

The escalating payout exceeds that of the uniform option starting at age 74

A regular account with the same payouts would run out of money at age 85



Monte Carlo simulation

The variability of a tontine's payouts is a function of:

- The size of the tontine pool (the law of large numbers)
- The variability of the underlying investment returns

We develop a simulation model, with randomly drawn:

- Membership characteristics (age, gender, account size, portfolio selection)
- Portfolio returns
- Times of death*

10,000-person membership pool

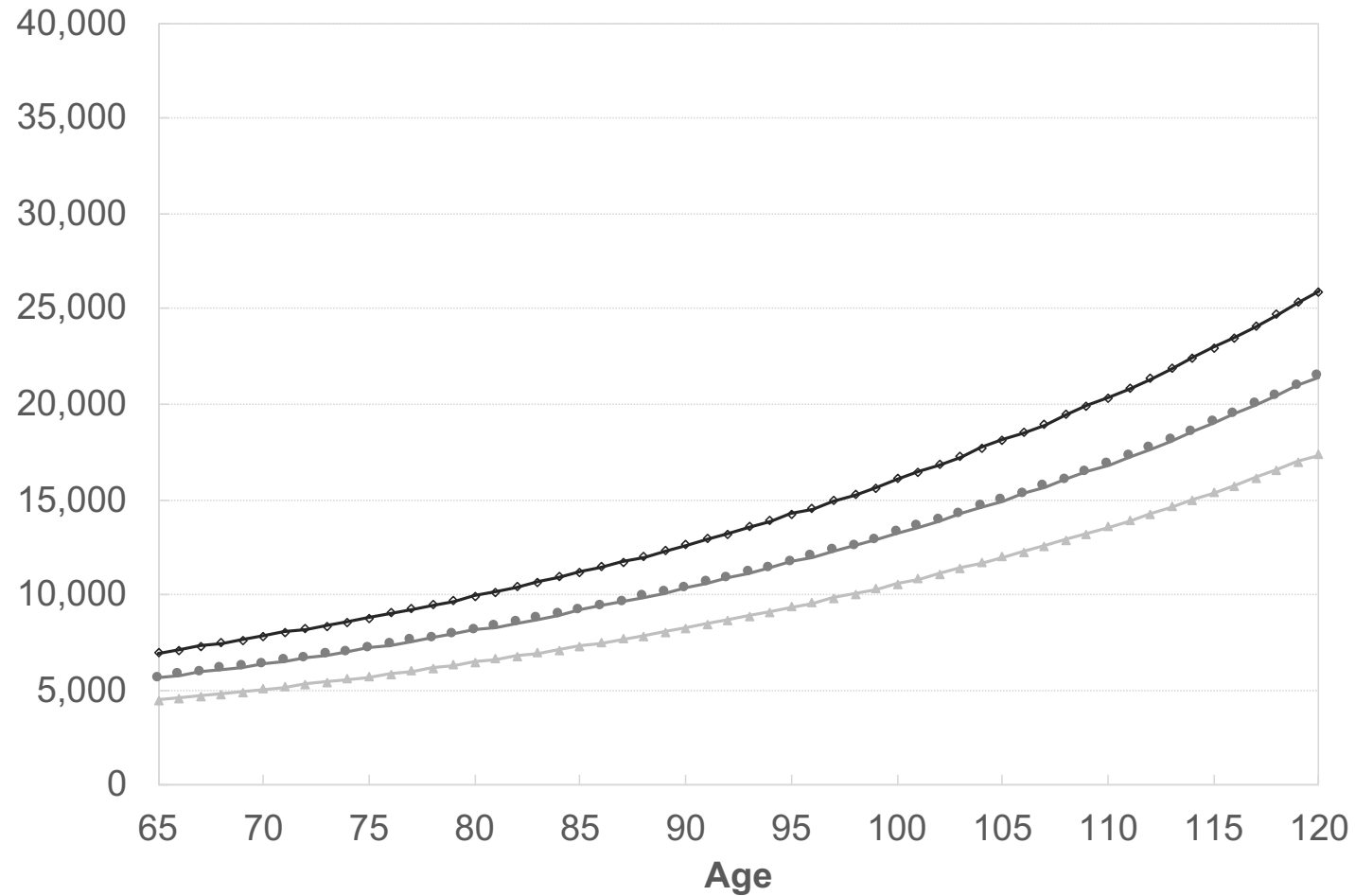
10,000 simulation runs



*Mortality rates are based on the 2012 IAM Basic mortality table projected forward using scale G2

Simulation: Expected payout by portfolio* Escalating payout option

Expected Annual Payout per \$100,000 Invested



Initial payout
 \$6,945 (stock)
 \$5,655 (blend)
 \$4,462 (bond)

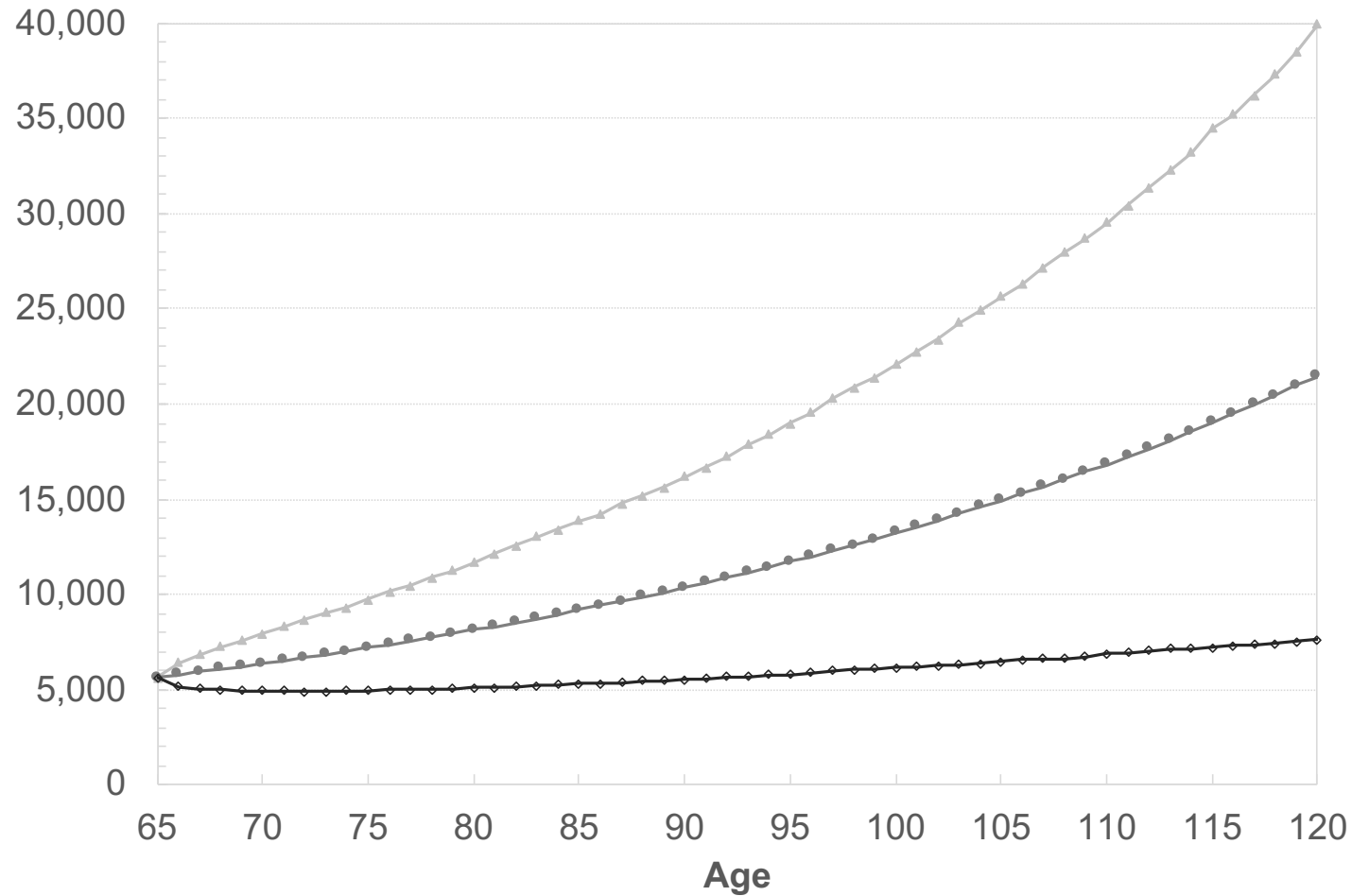
* Bonds (3% expected return and 4% volatility)
 50/50 Blend (5% expected return and 8.73% volatility)
 Stocks (7% expected return and 17% volatility)

—▲— Bond —●— Blend —◇— Stock



Simulation: Blended 50% equity portfolio and 50% bond portfolio* Escalating payout option

Annual Payout per \$100,000 Invested



Initial payout: \$5,655

—▲— 90th Percentile —●— Mean —◇— 10th Percentile

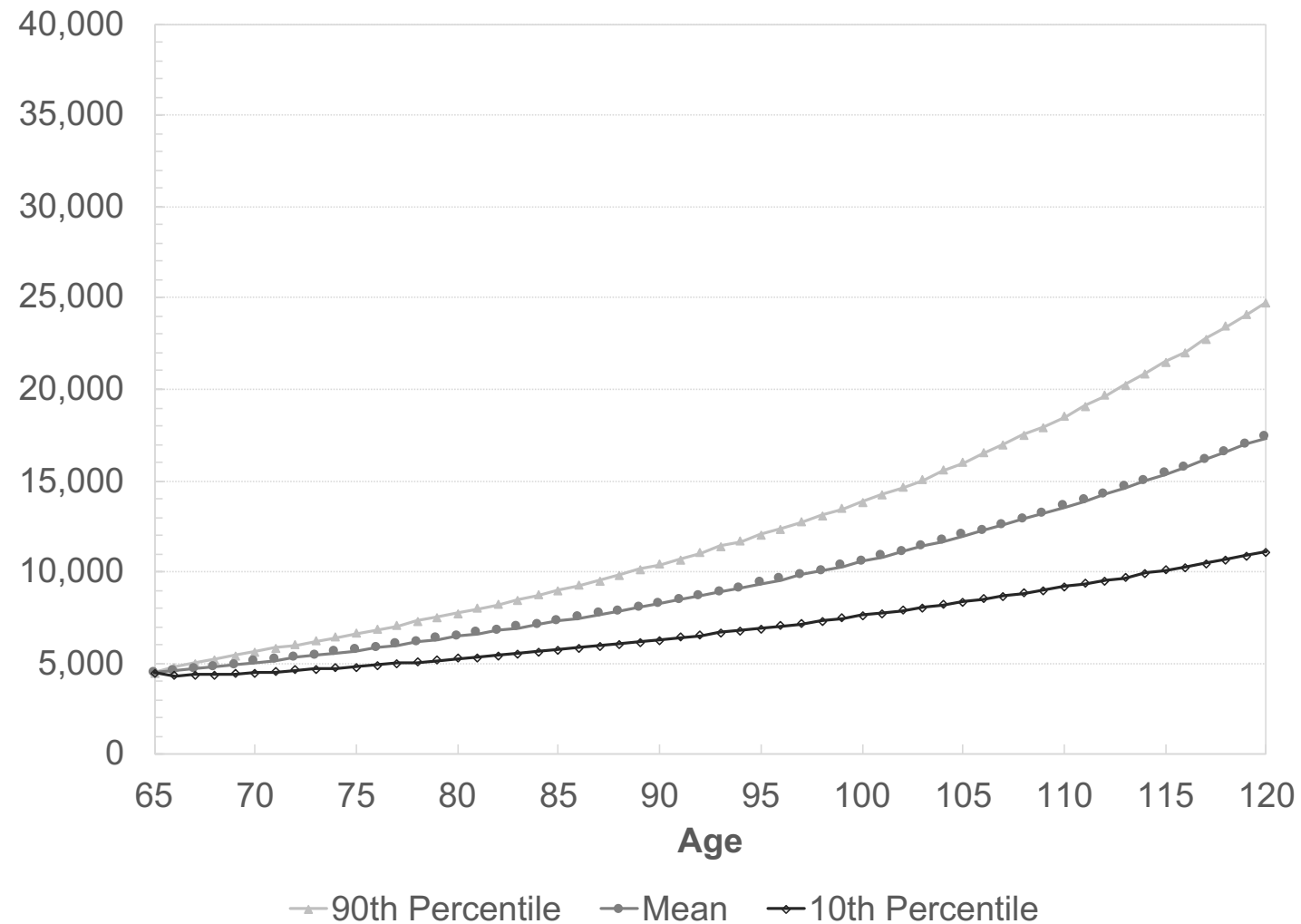


* (5% expected return and 8.73% volatility)

Simulation: Bond portfolio* Escalating payout option



Annual Payout per \$100,000 Invested



Initial payout: \$4,462
(less volatility)



* (3% expected return and 4% volatility)

Reducing volatility

Payout volatility can be minimized by:

- Encouraging a large membership pool (the law of large numbers)
- Using a more conservative investment portfolio
- Using asset/liability management techniques

Individuals may also:

- Dip into a separate "regular account" to shore up payouts that fall below some minimum level



Concluding remarks

State-sponsored assurance funds / tontine pensions:

- Are self-correcting and therefore fully sustainable, forever
- Offer low-cost universal access to pension-like lifetime income
- Offer freedom of portfolio selection
- Offer freedom to choose from a variety of payout options
- Represent a partial remedy to the annuity puzzle
 - Lower cost
 - Greater transparency



Authors

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Selected reading

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