

# 연금보험상품 경쟁력 제고 방안: **BACK TO THE BASICS**

(초고령사회를 대비한 개인연금 경쟁력 제고방안)

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# Overview

1. What are the basics?
2. Transferring the longevity risk
3. Take advantage of long-term investing
4. Concluding remarks

# What are the basics?

$l_x$ : 생존자수,  $r_t$ : 투자수익률

$$\mathbb{E}[l_x \times r_t]$$

$$\mathbb{V}[l_x \times r_t]$$

경쟁력(보장성) ↓ & 수익성 ↓

{ Mortality Improvement × Adverse Selection ⇒ Higher Loadings  
 { Lower investment returns

소비자에게는 노후에 장수위험 등을 두텁게 보장하는 연금보험 상품이 필요하고, 제공자인 생명보험회사는 확실한 수익성을 원하고 있음.

# Transferring the longevity risk

Transferring the longevity risk from an insurer to policyholders reduces required risk capital, i.e., capital cost ↓ then annuity premium ↓.

## Insightful annuity designs from academic studies:

- 1 Denuit, Michel, Steven Haberman, and Arthur Renshaw. 2011. “Longevity-Indexed Life Annuities”. *North American Actuarial Journal* 15: 97–111.
- 2 Milevsky, Moshe A., and Thomas S. Salisbury. 2015. “Optimal Retirement Income Tontines”. *Insurance: Mathematics and Economics* 64: 91–105.
- 3 Chen, An, Yusha Chen, and Xian Xu. 2022. “Care-Dependent Tontines”. *Insurance: Mathematics and Economics* 106: 69–89.

## Denuit et al. (2011), “Longevity-Indexed Life Annuities”

Suggest that the annuity benefit at time  $k$  is adjusted by the factor

$$i_{t_0+k} = \frac{{}_k p_{x_0}^{ref}(t_0)}{{}_k p_{x_0}^{obs}(t_0)}.$$

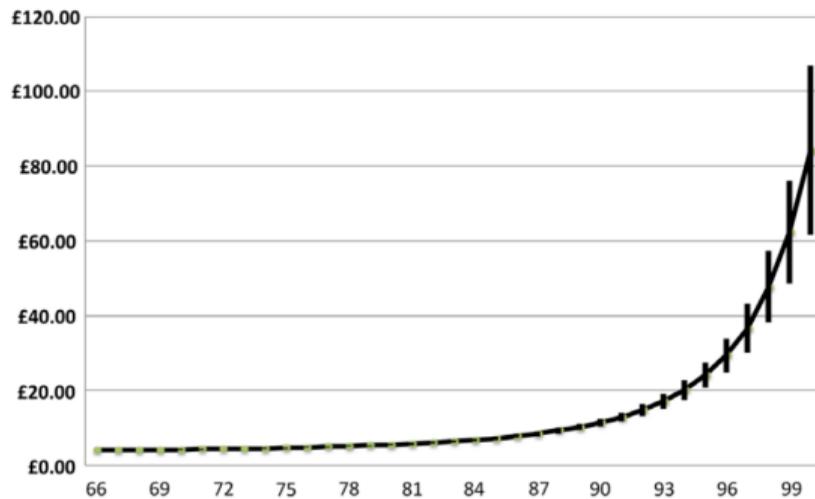
In other words, the annuity benefits depend on the “expected/actual” ratio of reference population data.

⇒ Longevity risk partly transferred to policyholders; i.e., systemic risk ↓↓.

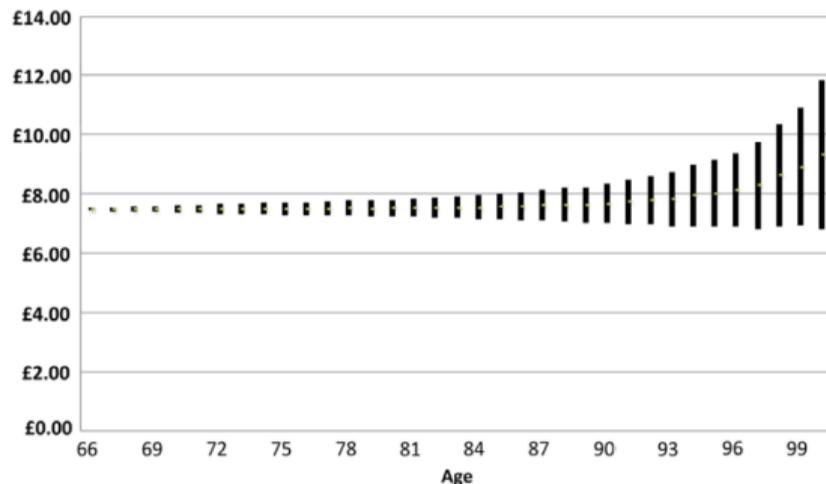
# Milevsky & Salisbury (2015), “Optimal Retirement Income Tontines”

## Tontines completely transfer the risk to the policyholders!

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



Range of **Optimal** Tontine Payout at **4% Interest**: Gompertz Mortality  
10th vs. 90th percentile:  $n = 400$  ( $m=88.721$ ,  $b=10$ )



It is also possible to generate somewhat stable annuity benefits.

## Chen et al. (2022). “Care-Dependent Tontines”

Care-dependent (LTC) benefits are viewed as an advance of additional “mortality credit”.

**Table 5.3**

Risk loading  $F_0$  for different pool sizes  $n$  using the baseline parameter setting from Table 5.1. Net premium  $P_0^{oc1} = P_0^{oc2} = P_0^{ac} = v = 10000$ , subjective discount rate  $\rho = 0.02$ , risk-free rate  $r = 0.02$ , initial age  $x = 60$ , risk aversion coefficient  $\gamma = 2$ , and payment weighting factor  $\alpha = 0.5$ .

$n$	$F_0^{oc1}$	$F_0^{oc2}$	$F_0^{ac}$
10	144	270	595
100	41	14.9	595
500	37.7	0.978	595
1000	37.6	0.255	595
2000	37.6	0.0648	595
5000	37.6	0.0071	595

# Take advantage of long-term investing

For a long retirement period, we may combine equity-indexed & longevity-linked annuity with some guarantees, see Kabuche (2023).

We can also guide policyholders to purchase deferred annuities during their working period to maximize their retirement income utility.

- On October 23, 2014, the US Treasury allows target date funds to include DAs among their assets in 401(k) plans.
- 1 Owadally, Iqbal, Chul Jang, and Andrew Clare. 2021. “Optimal investment for a retirement plan with deferred annuities”. *Insurance: Mathematics and Economics*, 98, 51–62.
  - 2 Jang, Chul, Andrew Clare, and Iqbal Owadally. 2022. Glide paths for a retirement plan with deferred annuities. *Journal of Pension Economics and Finance*, 21(4), 565–581.

# TDF with deferred annuities (DAs)

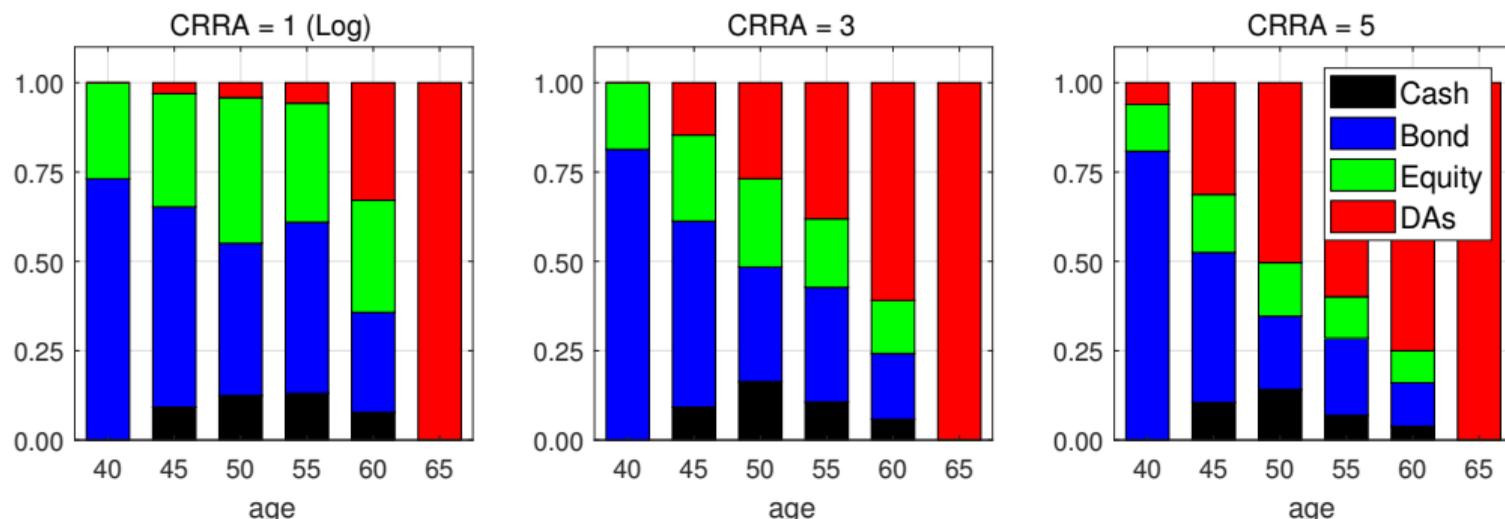


Figure 2.4 - Optimal investment and deferred annuity allocations of overall wealth on average at various ages over the planning horizon and for different risk aversion (CRRA) coefficients.

Source: Owadally et al. (2021)

# Performance of DA-enhanced glide paths

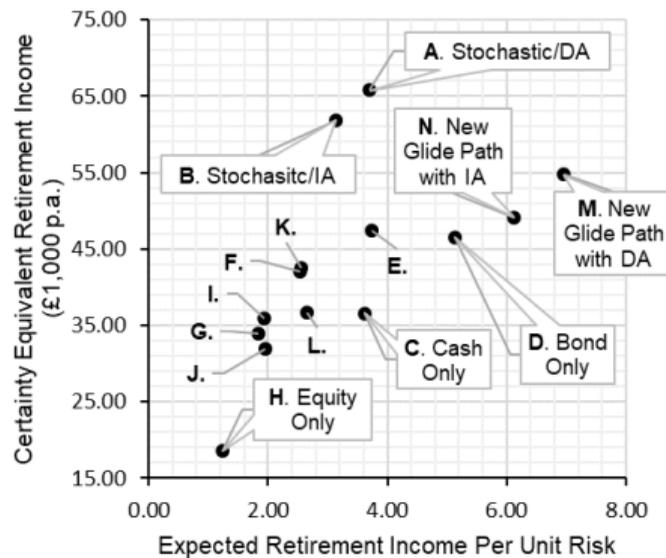


Figure 4.4 - Certainty equivalent retirement income (£1,000 p.a.) and expected retirement income per unit risk for various investment strategies.

Source: Jang et al. (2022)

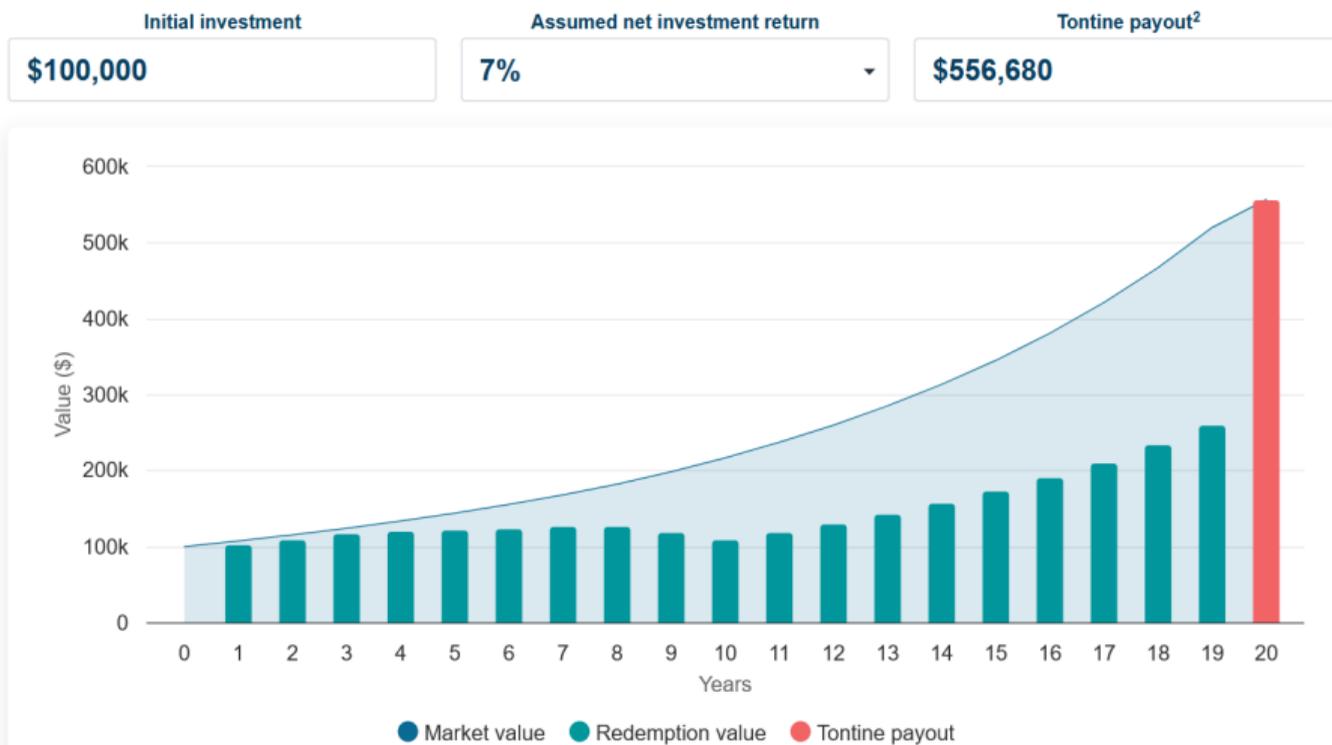
## Concluding remarks

- 초고령자에게 적합한 연금보험(종신(장수)연금 및 LTC연금)은 초장기계약으로 보험회사가 확정적으로 매력적인 급여를 제공하며 수익을 발생시킬 수 없음
- 계약자와 위험을 공유하면 보험회사는 자본비용과 위험마진을 줄여 더 나은 보장이 가능하고 수익의 불확실성도 개선할 수 있음
- 계약자(피보험자)와 장수위험을 공유하는 경우, heterogeneous longevity risks을 가진 계약자간 공정성 문제(pension equity 또는 annuity fairness)가 발생할 수 있음
- 장기요양(LTC)이나 고령거치종신연금(Deferred Income Annuity) 등의 보험구매를 위하여 적립금을 사용하는 경우, 해당 인출금액에 대해서는 연금소득세보다 낮은 세율을 적용하거나 면세혜택을 주는 것도 고려해야함
- 보험업감독규정에서 해당 보험상품의 설계 및 판매가 가능한지 검토가 필요함

**Retirement income innovations are not only for life insurers!**

# Tontine in funds - 저해지 변액보험?

GuardPath Modern Tontine (Guardian Capital, Canada announced on September 7, 2022)



## References I

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