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Decumulation Life Insurance Products After Retirement

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- PhD in Sciences, MSc. Actuarial Sciences and MSc. Mathematics
- Certified member of the Institute of Actuaries in Belgium (IA|BE)
- Past roles :
  - Professor in Actuarial Science & Finance at UCLouvain and the Universities of Strasbourg and Rabbat
  - Chairman of the Institute for Actuarial Science and Statistics (UCLouvain)
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  - Non-Life Executive Committee Member of Axa Belgium

Managing Partner
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- Certified member of the Institute of Actuaries in Belgium (IA|BE)
- 25+ years consulting and teaching experience
- Expert in the Life, Health & Pension Center of Excellence

The pension landscape in Europe

- Almost all European countries have a Pay-As-You-Go (PAYG) system as their ***first pillar***: intergenerational, repartition, (almost always) paid as a life annuity.
- The financing of this first pillar is becoming increasingly problematic (fewer workers, longer life expectancy, high pensions, sometimes indexed, etc.).
- Occupational pensions (or second pillar) are meant to supplement the state pension, which often replaces too small a share of salary. They aim to maintain the employee's standard of living after retirement.
- In countries with a strong Defined Benefit tradition, occupational pensions are still mainly paid as **annuities**. In other countries, a payment in **lump sum** (total or partial) is becoming increasingly popular.
- A standard situation is the following:
  - A person reaches the retirement age
  - Receives a limited annuity from the state (first pillar)
  - Receives a lump sum (second pillar) from an insurance company or pension fund

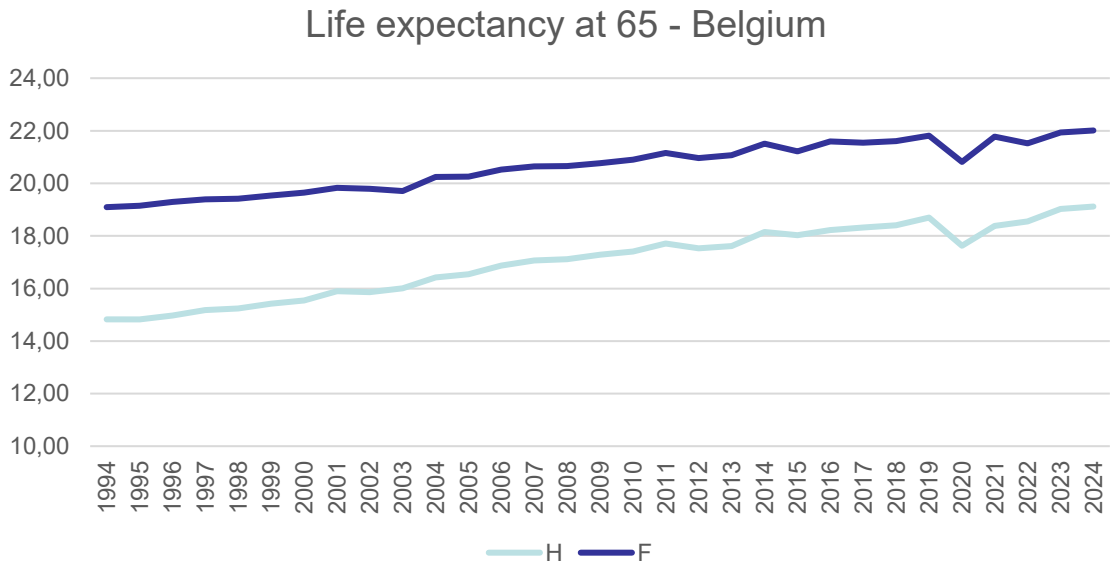
The pension landscape in Europe

- The focus of our talk is on the **best use of this lump sum**.
- Insurance companies mostly focus on the accumulation phase (savings) of the pension products, but there is a need to offer products for the 65+ phase, or decumulation. Why?
- The large uncertainties at this age are the following:
  - What is my life expectancy? ➔ enough money for my basic needs
  - What is my life expectancy in good health? ➔ enough money for my health issues
  - What do I want to leave to my children? ➔ financial legacy
- This is a very classical situation for insurers: the transfer of risk in exchange for financial stability

- Possibility for the insurers to develop innovative and flexible products for the decumulation phase

Illustration of the risks

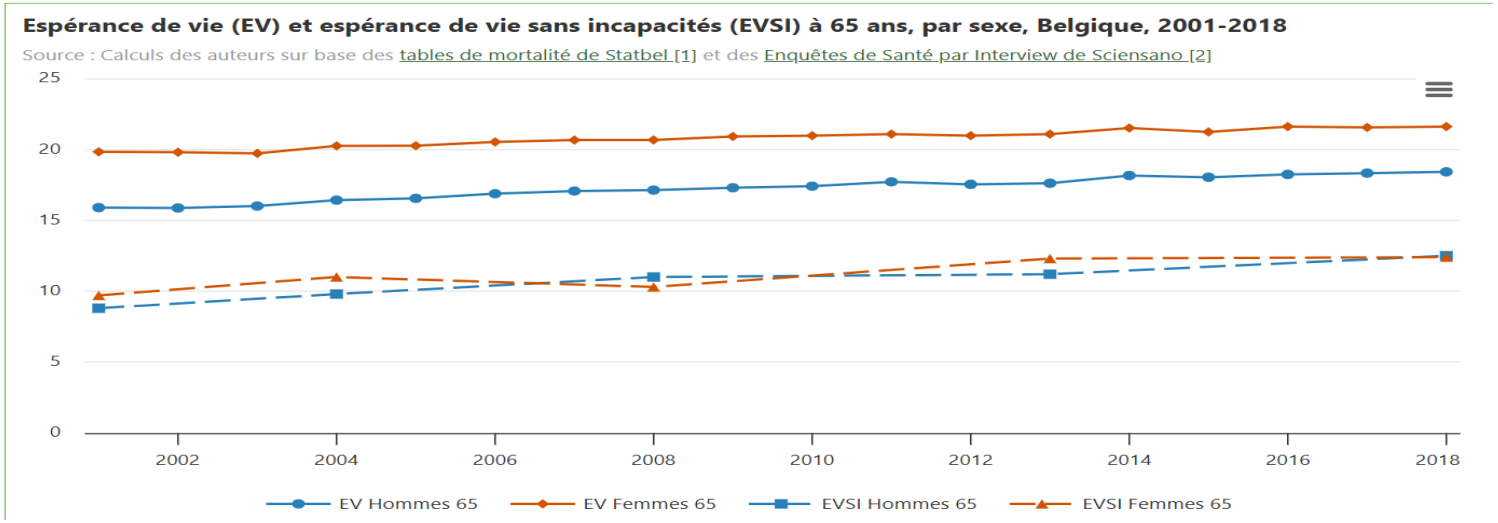
- Past evolution of life expectancy in Belgium :



- Future evolution of life expectancy in Europe

Life expectancy at 65y			
Male	2022	2050	2070
BE	18,7	21,7	23,6
EUR	18,2	21,5	23,5
Female	2022	2050	2070
BE	22,3	25,1	26,9
EUR	21,8	24,9	26,8

- Past evolution of life expectancy in good health in Belgium



Classical lifetime annuity : advantages and drawbacks

- Advantages :
  - Peace of mind: guaranteed for life, predictable cash flows, no active management…
  - (maybe) Customizable: options for inflation or spouse protection

- Drawbacks :
  - No flexibility: the contract cannot be changed once signed, no adaptability to future needs
  - Taxation: unfavourable taxation
  - No surrender option: no capital access after purchase
  - Nothing paid out in case of deaths: early death risk
  - Often expensive pricing: low financial return compared to personal investment
  - Unclear pricing: hard to compare across providers
  - Inflation erosion: the real value of payments (if fixed) declines
  - Credit risk: relies on insurer solvency

Other classical decumulation products with guarantee

- Increasing lifetime annuity
- Constant deferred lifetime annuity (pay after 10 years)
- Increasing deferred lifetime annuity (pay after 10 years)
- Temporary constant annuity (pay until 10 years)
- Temporary increasing annuity (pay until 10 years)
- Constant financial annuity

- Correct some of the drawbacks but still :
  - No flexibility: the contract cannot be changed once signed, no adaptability to future needs
  - Taxation: unfavourable taxation
  - No surrender option: no capital access after purchase
  - Often expensive pricing: low financial return compared to personal investment
  - Unclear pricing: hard to compare across providers
  - Credit risk: relies on insurer solvency

The annuity puzzle

- Fundamental theoretical result by Yaari(1965) in behavioural economy:

At retirement age and under various assumptions, annuitization is the best thing to do

(*fair pricing of annuities/no bequest motive/no liquidity constraints/no financial risky assets*)

- Main easy reason: financial return boosted by the **mortality credit**

- **Annuity puzzle**: even if annuities should be a preferred choice for many consumers at retirement, (classical) annuities in many markets are not very popular products unless they are compulsory.

How to boost the annuity market

- Even if theoretically optimal for the consumer, classical lifetime annuities are not a first choice for many individuals and can be very expensive for the insurer in terms of cost of capital (*longevity and interest long term guarantees*)

- Optimal financial allocation strategies should also be used after retirement
- Longevity risk could be shared between the insurer and the annuitant, exactly as the financial risk can be shared when using unit linked contracts
- Mortality credit is a powerful return engine especially at old ages in absence of bequest motive
- **Concept of derisking**: products of distribution at retirement age for a (very) long period of time including the mortality credit for annuitant but more flexible in terms of investment / longevity risk sharing between the insurer and the consumer

Revisitation of classical lifetime constant annuities

- Initial computation of the annuity:

$$P = \frac{C}{\ddot{a}_x}$$

$$\ddot{a}_x = \sum_{j=0}^{\omega-x} {}_j p_x \frac{1}{(1+i)^j} \quad (\, i = \text{discount rate} \,; \quad p = \text{survival probabilities})$$

- Provisions at time t:

$$V(t) = P.\ddot{a}_{x+t}$$

- Recursive relation of the provision:

$$V(t) = ((V(t-1) - P).(1+i).(1+\frac{q_{x+t-1}}{p_{x+t-1}})$$

Financial return
Guaranteed interest rate

Mortality credit
Guaranteed life table

- Update of the annuity to pay at time t:
annuitization of the available provision: a lifetime annuity is a succession of lifetime annuities at attained ages:

$$P(t) = V(t) / \ddot{a}_{x+t} = P$$

Financial risk sharing : Equity linked annuities (ELA)

- Investment of the initial single premium (capital C) in a risky investment fund
- The annuitant will benefit of the real investment returns of the fund
- No financial guarantee of the insurer/partial guarantee (*unit linked principles*)
- Longevity guarantee of the insurer through a guaranteed life table

  - Initial annuity: $P_0 = \frac{C}{\ddot{a}_x}$
  - Evolution of the provisions:

$$V(t) = ((V(t-1) - P_{t-1}).(1 + r_t).(1 + \frac{q_{x+t-1}}{p_{x+t-1}})$$

Financial return of the fund (successive random variables) ; with eventual risk sharing or partial guarantees

  - Evolution of the annuities:

$$P_t = \frac{V(t)}{\ddot{a}_{x+t}(i_t)}$$

Eventual update of the technical rate

Longevity risk sharing : Group self annuities (GSA)

- Investment of the initial single premium (capital C) in a risk-free asset
- The annuitant will benefit of the guaranteed interest rate
- The mortality credit is not guaranteed but is based totally (or partially) on the mortality experience of the portfolio

  - Initial annuity: $P_0 = \frac{C}{\ddot{a}_x}$
  - Evolution of the provisions:

$$V(t) = ((V(t-1) - P_{t-1}).(1+i).(1+\frac{q_{x+t-1}(t)}{p_{x+t-1}(t)})$$

Observed ex post mortality experience of the group of annuitants

  - Evolution of the annuities:

$$P_t = \frac{V(t)}{\ddot{a}_{x+t}(p_t)}$$

Eventual update of the life table

Utility theory of preferences in an uncertain environment

- How to model individual preferences in terms of product at retirement age? Is annuitization a good idea? Which annuitization?

- Traditional tool in economic theory to appreciate future random cash flows in terms of individual ranking: **utility theory**

- **4 Basic principles:**
  - What matters for an individual is not the money itself, but the utility generated by this amount of money
  - In an uncertain environment people should maximize the expected discounted utility of their investments
  - Utility function is a non decreasing (*we prefer more than less*) and concave (*the first euros are more appreciated*) function
  - Each individual has his/her own utility function, reflecting some degree of personal risk aversion and integrating subjective discount and probabilities

Utility theory of preferences in an uncertain environment

- **Illustration**: we consider two financial /life insurance products P1 and P2 equally priced initially and generating at different future times random cash flows X and Y (*randomness can be financial and/or biometric*).

  We assume a utility function U and a personal discount rate r*. Then the expected utility of product P1/P2 is given by given by:

$$EU(P1) = \sum_{j=1}^{n} \frac{1}{(1+r^*)^{t_j}} E^*(U(X_{t_j}))$$

$$EU(P2) = \sum_{k=1}^{m} \frac{1}{(1+r^*)^{s_k}} E^*(U(Y_{s_k}))$$

Subjective probability distribution

U(x) : personal utility function (risk preferences)

Personal discount rate (time impatience)

The consumer chooses the product with the best value of the utility.

Two individuals with different profiles can make different choices.

Utility theory of preferences in an uncertain environment

- Classical example of utility function / iso elastic utility:

$$U(x) = \frac{x^{1-\gamma}}{1-\gamma} \qquad (\gamma \geq 0;\ \gamma \neq 1)$$

- When the parameter γ increases, the risk aversion increases; the limit case γ=0 corresponds to a risk neutral investor.
- The value of the utility function itself has no interpretation; just a ranking tool !
- We can also compute the ***Certain Equivalent:*** constant amount at initial time having the same utility value as the utility of the product:

$$CE(P1) = U^{-1}(E(U(P1)))$$

Reacfin
White paper to come soon!
(www.reacfin.com)

Sources

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