جامعة الملك سعود
King Saud University

Chapter#4

Life Annuities (Part2)

Salma Alsuwailem

Summary

- ✗ Whole life annuity-due

A whole life due annuity is a series payments made at the beginning of the year while an individual is alive.

- ✗ n-year temporary annuity

A due n–year term annuity guarantees payments made at the beginning of the year while an individual is alive for at most n payments.

- ✗ n-year deferred annuity

A due n–year deferred annuity guarantees payments made at the beginning of the year while an individual is alive starting in n years.

- ✗ n–year certain annuity

A n–year certain due life annuity pays at the beginning of the year while either the individual is alive or the number of payments does not exceed n.

EXAMPLES

✗ For a three-year temporary life annuity due of 100 on (75), you are given:

(i) $\int_0^x \mu(t)dt = 0.01x^{1.2}$, $x > 0$

(ii) $i = 0.11$

Calculate the actuarial present value of this annuity.

$$\ddot{a}_{x:\overline{n}|} \quad \sum_{k=0}^{n-1} v^k \, {}_kp_x$$

(A) 264

(B) 266

(C) 268

(D) 270

(E) 272

✗ For a special 3-year temporary life annuity-due on (x), you are given: (i)

t	Annuity Payment	p_{x+t}
0	15	0.95
1	20	0.90
2	25	0.85

(ii) i = 0.06

Calculate the variance of the present value random variable for this annuity.

(A) 91

(B) 102

(C) 114

(D) 127

(E) 139

King Saud University

✗ A person age 40 wins 10,000 in the actuarial lottery. Rather than receiving the money at once, the winner is offered the actuarially equivalent option of receiving an annual payment of K (at the beginning of each year) guaranteed for 10 years and continuing thereafter for life.

You are given:

(i) $i = 0.04$

(ii) $A_{40} = 0.30$

(iii) $A_{50} = 0.35$

(iv) $A^{1}_{40:\overline{10|}} = 0.09$

Calculate K.

(A) 538 (B) 541 (C) 545 (D) 548 (E) 551

✗ for a whole life annuity due of 1 on (x) payable annually:

- $q_x = 0.01$
- $q_{x+1} = 0.05$
- $i = 0.05$
- $\ddot{a}_{x+1} = 6.951$

Calculate the change in the actuarial present value of this annuity due if p_{x+1} is increased by 0.03.

$$\ddot{a}_{x:\overline{n}|} = 1 + v\, p_x\, \ddot{a}_{x+1:\overline{n-1}|}$$

(A) 0.16

(B) 0.17

(C) 0.18

(D) 0.19

(E) 0.20

✗ For a 1–year term insurance on (66.2), you are given:

(i) The insurance pays 10, 000 at the end of the half–year of death.

(ii) q_{66} = 0.06 and q_{67} = 0.08.

(iii) Mortality is uniformly distributed between integral ages.

(iv) i = 0.03.

Calculate the expected present value of the insurance.

We assume that i = 0.06 and μ = ln(1.02) for t > 0, calculate $A_X{}^{(4)}$

1/mthly Insurance

$$K_x^{(m)} = \frac{1}{m}\lfloor mT_x \rfloor$$

$$\Pr\left[K_x^{(m)} = r\right] = {}_r p_x \cdot {}_{\frac{1}{m}}q_{x+r} = {}_{r|\frac{1}{m}}q_x$$

$$A_x^{(m)} = \sum_{k=0}^{\infty} v^{(k+1)/m} \cdot {}_{\frac{k}{m}|\frac{1}{m}}q_x$$

THANKS!

Any questions?

Salma Alsuwailem