Life Annuities Solutions

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1.

```
## Package:  lifecontingencies
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## Version:  1.2.3
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## BugReport: http://github.com/spedygiorgio/lifecontingencies/issues
```

Time	Payment	Discounting Factor with i = .08	prob_65	APV payment
0	1000	1.000	1.000	1000.00
1	1000	0.926	0.979	906.18
2	1000	0.857	0.956	819.52
3	1000	0.794	0.932	739.51
4	1000	0.735	0.906	665.70
5	1000	0.681	0.878	597.67
6	1000	0.630	0.849	535.04
7	1000	0.583	0.818	477.44
8	1000	0.540	0.786	424.56
9	1000	0.500	0.752	376.09
10	1000	0.463	0.716	331.75
11	1000	0.429	0.679	291.30
12	1000	0.397	0.641	254.49
13	1000	0.368	0.601	221.11
14	1000	0.340	0.561	190.94
15	1000	0.315	0.520	163.79
16	1000	0.292	0.478	139.48
17	1000	0.270	0.436	117.83
18	1000	0.250	0.394	98.67
19	1000	0.232	0.353	81.83
			Total	**8432.90**

The actuarial present value is $8,432.90.

This is significantly less than the $10,209.06 APV that we computed for the 40 year old. Although both annuities were computed at the same interest rate over the same amount of years, we see a large difference due to the differing probabilities in the life tables.

The probability of survival in each respective time step was lower for the 65 year old, relative to the 40 year old. It makes sense that this would lead to a lower actuarial present value. We would expect the value of the life annuity, which depends on mortality, to be lower if there's less chance of making the payments.

2.

```r
data("soa08")
prob_2 <- rep(NA, 111)                    # 111 because lifetable ends at 141
prob_2[1] = 1                              # probability of first payment is 1
for(i in 1:110){                  # get the probabilities from the rest of the lifetable
  prob_2[i+1] <- pxt(soa08, x = 30, t = i)            # [i+1] for indexing
}
payments_2 <- rep(10000, 111)
interest_2 <- .06
years_2 <- 0:110            # first payment is at year "0" because it's an annuity-due
presentValue(cashFlows = payments_2, timeIds = years_2, interestRates = interest_2,
                      probabilities = prob_2)
```

```
## [1] 158561.2
```