Package 'DetLifeInsurance'

July 7, 2020

Type Package

Title Life Insurance Premium and Reserves Valuation

Version 0.1.2

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Description Methods for valuation of life insurance premiums and reserves (including variable-benefit and fractional coverage) based on ``Actuarial Mathematics" by Bowers, H.U. Gerber, J.C. Hickman, D.A. Jones and C.J. Nesbitt (1997, ISBN: 978-0938959465), ``Actuarial Mathematics for Life Contingent Risks" by Dickson, David C. M., Hardy, Mary R. and Waters, Howard R (2009) <doi:10.1017/CBO9780511800146> and ``Life Contingencies" by Jordan, C. W (1952) <doi:10.1017/S002026810005410X>. It also contains functions for equivalent interest and discount rate calculation, present and future values of annuities, and loan amortization schedule.

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Depends R (>= 3.5.0)

Encoding UTF-8

LazyData true

RoxygenNote 7.1.0

URL https://github.com/JoaquinAuza/DetLifeInsurance

BugReports https://github.com/JoaquinAuza/DetLifeInsurance/issues

VignetteBuilder knitr

Suggests knitr, rmarkdown

NeedsCompilation no

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Repository CRAN

Date/Publication 2020-07-07 09:40:10 UTC

R topics documented:

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a *Life Annuities*

Description

Calculates the present value of a life annuity.

Usage

```
a(x, h, n, k = 1, i = 0.04, data, prop = 1, assumption = "none", cap = 1)
```

Arguments

x	An integer. The age of the insuree.
h	An integer. The deferral period.
n	An integer. Number of years of coverage.
k	An integer. Number of payments per year.
i	The interest rate. A numeric type value.
data	A data.frame of the mortality table, with the first column being the age, and the second one the probability of death.
prop	A numeric value. It represents the proportion of the mortality table being used (between 0 and 1).
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths, "constant" for constant force of mortality and "none" if there is no fractional coverage).
cap	A numeric type value. The annualized value of the payment.

Value

Returns a numeric value (actuarial present value).

References

Chapter 2 of Life Contingencies (1952) by Jordan, chapter 5 of Actuarial Mathematics (1997) by Bowers, Gerber, Hickman, Jones & Nesbitt.

Examples

```
a(20,0,15,1,0.04,CSO58FALB,1,"none",1200)
a(23,7,9,1,0.04,GAM71F,1,"none",5000)
a(33,3,10,4,0.04,CSO80MANB,1,"constant",3000)
a(20,5,10,4,0.04,CSO58MANB,1,"UDD",5000)
```

A. *Life Insurance*

Description

Calculates the present value of the life insurance.

Usage

```
A.(x, h, n, k = 1, i = 0.04, data, prop = 1, assumption = "none", cap = 1)
```

Arguments

x	An integer. The age of the insuree.
h	An integer. The deferral period.
n	An integer. Number of years of coverage.
k	An integer. Number of fractions per year.
i	The interest rate. A numeric type value.
data	A data.frame of the mortality table, with the first column being the age and the second one the probability of death.
prop	A numeric value. It represents the proportion of the mortality table being used (between 0 and 1).
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths, "constant" for constant force of mortality and "none" if there is no fractional coverage).
cap	A numeric type value. The value of the payment.

Value

Returns a numeric value (actuarial present value).

References

Chapter 3 of Life Contingencies (1952) by Jordan, chapter 4 of Actuarial Mathematics (1997) by Bowers, Gerber, Hickman, Jones & Nesbitt.

Examples

```
A.(50,0,8,1,0.04,CSO80MANB,1,"none",1)
A.(60,3,10,1,0.04,CSO80MANB,1,"none",1)
A.(21,4,7,3,0.04,CSO80MANB,1,"constant",1)
A.(23,4,6,12,0.04,CSO80MANB,1,"UDD",1)
```

---

aCont *Continuous Life Annuities*

Description

Calculates the present value of a continuous life annuity.

Usage

```
aCont(x, h, n, i = 0.04, data, prop = 1, assumption = "constant", cap = 1)
```

Arguments

x	An integer. The age of the insuree.
h	An integer. The deferral period.
n	An integer. Number of years of coverage.
i	The interest rate. A numeric type value.
data	A data.frame of the mortality table, with the first column being the age and the second one the probability of death.
prop	A numeric value. It represents the proportion of the mortality table being used (between 0 and 1).
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths and "constant" for constant force of mortality).
cap	A numeric type value. The value of the payment.

Value

Returns a numeric value (the actuarial present value).

References

Chapter 2 of Life Contingencies (1952) by Jordan, chapter 5 of Actuarial Mathematics (1997) by Bowers, Gerber, Hickman, Jones & Nesbitt.

Examples

```
aCont(35,7,10,0.04,CSO80MANB,1,"constant",1)
aCont(23,5,12,0.04,CSO80MANB,1,"UDD",1)
```

ACont. *Continuous Life Insurance*

Description

Calculates the present value of a continuous life insurance.

Usage

```
ACont.(x, h, n, i = 0.04, data, prop = 1, assumption = "UDD", cap = 1)
```

Arguments

x	An integer. The age of the insuree.
h	An integer. The deferral period.
n	An integer. Number of years of coverage.
i	The interest rate. A numeric type value.
data	A data.frame of the mortality table, with the first column being the age and the second one the probability of death.
prop	A numeric value. It represents the proportion of the mortality table being used (between 0 and 1).
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths and "constant" for constant force of mortality).
cap	A numeric type value. The value of the payment.

Value

Returns a numeric (actuarial present value).

References

Chapter 3 of Life Contingencies (1952) by Jordan, chapter 4 of Actuarial Mathematics (1997) by Bowers, Gerber, Hickman, Jones & Nesbitt.

Examples

```
ACont.(24,2,10,0.04,CSO80MANB,1,"UDD",1)
ACont.(24,2,10,0.04,CSO80MANB,1,"constant",1)
```

---

aD *Decreasing Life Annuities*

Description

Calculates the present value of a decreasing life annuity.

Usage

```
aD(
  x,
  h,
  n,
  k = 1,
  i = 0.04,
  data,
  prop = 1,
```

```
  assumption = "none",
  variation = "none",
  cap = 1
)
```

Arguments

x	An integer. The age of the insuree.
h	An integer. The deferral period.
n	An integer. Number of years of coverage.
k	An integer. Number of payments per year.
i	The interest rate. A numeric type value.
data	A data.frame of the mortality table, with the first column being the age and the second one the probability of death.
prop	A numeric value. It represents the proportion of the mortality table being used (between 0 and 1).
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths, "constant" for constant force of mortality and "none" if there is no fractional coverage).
variation	A character string. "inter" if the variation it's interannual or "intra" if it's intra-annual.
cap	A numeric type value. The annualized value of the first payment.

Value

Returns a numeric value (actuarial present value).

References

Chapter 2 of Life Contingencies (1952) by Jordan, chapter 5 of Actuarial Mathematics (1997) by Bowers, Gerber, Hickman, Jones & Nesbitt.

Examples

```
aD(27,0,3,1,0.04,CSO80MANB,1,"none","none",1)
aD(32,2,8,1,0.04,CSO80MANB,1,"none","none",1)
aD(35,8,15,4,0.04,CSO80MANB,1,"constant","inter",1)
aD(21,2,5,4,0.04,CSO80MANB,1,"UDD","inter",1)
aD(54,4,16,2,0.04,CSO80MANB,1,"constant","intra",1)
aD(20,10,15,3,0.04,CSO80MANB,1,"UDD","intra",1)
```

AD. *Decreasing Life Insurance*

Description

Calculates the present value of a decreasing life insurance.

Usage

```
AD.(
  x,
  h,
  n,
  k = 1,
  i = 0.04,
  data,
  prop = 1,
  assumption = "none",
  variation = "none",
  cap = 1
)
```

Arguments

x	An integer. The age of the insuree.
h	An integer. The deferral period.
n	An integer. Number of years of coverage.
k	An integer. Fractions per year.
i	The interest rate. A numeric type value.
data	A data.frame of the mortality table, with the first column being the age and the second one the probability of death.
prop	A numeric value. It represents the proportion of the mortality table being used (between 0 and 1).
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths, "constant" for constant force of mortality and "none" if there is no fractional coverage).
variation	A character string. "inter" if the variation it's interannual or "intra" if it's intra-annual.
cap	A numeric type value. Amount insured for the first year/period.

Value

Returns a numeric value (actuarial present value).

References

Chapter 3 of Life Contingencies (1952) by Jordan, chapter 4 of Actuarial Mathematics (1997) by Bowers, Gerber, Hickman, Jones & Nesbitt.

Examples

```
AD.(56,0,8,1,0.04,CSO80MANB,1,"none","none",1)
AD.(39,1,10,1,0.04,CSO80MANB,1,"none","none",1)
AD.(37,6,11,4,0.04,CSO80MANB,1,"constant","inter",1)
AD.(21,2,5,4,0.04,CSO80MANB,1,"UDD","inter",1)
AD.(54,4,16,2,0.04,CSO80MANB,1,"constant","intra",1)
AD.(20,10,15,3,0.04,CSO80MANB,1,"UDD","intra",1)
```

---

af *Present Value of An Annuity*

Description

Calculates the present value of an annuity.

Usage

```
af(l = 0, n, i)
```

Arguments

l	0 for annuity due or 1 for annuity immediate.
n	A numeric value. The number of payments.
i	A numeric value. The interest rate.

Examples

```
af(0,10,0.03)
af(1,15,0.05)
```

ArgentinaINDEC9092comb *ArgentinaINDEC9092 Males and Females Combined*

Description

Mortality table (ultimate): Argentina Instituto Nacional de Estadistica y Censos (INDEC). Nation: Argentina. Year: 1990-1992. Sex: Males and Females Combined.

Usage

```
data(ArgentinaINDEC9092comb)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=20003

ArgentinaINDEC9092F *ArgentinaINDEC9092 Female*

Description

Mortality table (ultimate): Argentina Instituto Nacional de Estadistica y Censos (INDEC). Nation: Argentina. Year: 1990-1992. Sex: Female.

Usage

```
data(ArgentinaINDEC9092F)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=20002

ArgentinaINDEC9092M *ArgentinaINDEC9092 Male*

Description

Mortality table (ultimate): Argentina Instituto Nacional de Estadistica y Censos (INDEC). Nation: Argentina. Year: 1990-1992. Sex: Male.

Usage

```
data(ArgentinaINDEC9092M)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=20001

av *Varying Life Annuities: Arithmetic Progression*

Description

Calculates the present value of a varying life annuity according to a arithmetic progression.

Usage

```
av(
  x,
  h,
  n,
  k = 1,
  r = 1,
  i = 0.04,
  data,
  prop = 1,
  assumption = "none",
  variation = "none",
  cap = 1
)
```

Arguments

x	An integer. The age on the insuree.
h	An integer. The deferral period.
n	An integer. Number of years of coverage.
k	An integer. Number of payments per year.
r	The variation rate. A numeric type value.
i	The interest rate. A numeric type value.
data	A data.frame of the mortality table, with the first column being the age and the second one the probability of death.
prop	A numeric value. It represents the proportion of the mortality table being used (between 0 and 1).
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths, "constant" for constant force of mortality and "none" if there is no fractional coverage).
variation	A character string. "inter" if the variation it's interannual or "intra" if it's intra-annual.
cap	A numeric type value. The annualized value of the first payment.

Value

Returns a numeric value (actuarial present value).

Note

For an increasing life annuity coverage, 'r' must be 1.

References

Chapter 5 of Actuarial Mathematics for Life Contingent Risks (2009) by Dickson, Hardy and Waters.

Examples

```
av(33,0,5,1,0.8,0.04,CSO80MANB,1,"none","none",1)
av(26,2,4,1,0.4,0.04,CSO80MANB,1,"none","none",1)
av(26,1,5,4,0.5,0.04,CSO80MANB,1,"constant","inter",1)
av(24,1,3,3,0.7,0.04,CSO80MANB,1,"constant","intra",1)
av(35,4,6,6,0.4,0.04,CSO80MANB,1,"UDD","inter",1)
av(40,3,7,2,0.7,0.04,CSO80MANB,1,"UDD","intra",1)
```

Av. *Varying Life Insurance: Arithmetic Progression*

Description

Calculates the present value of a varying life insurance according to a arithmetic progression.

Usage

```
Av.(
  x,
  h,
  n,
  k = 1,
  r = 1,
  i = 0.04,
  data,
  prop = 1,
  assumption = "none",
  variation = "none",
  cap = 1
)
```

Arguments

x	An integer. The age of the insuree.
h	An integer. The deferral period.
n	An integer. Number of years of coverage.
k	An integer. Fractions per year.
r	The variation rate. A numeric type value.
i	The interest rate. A numeric type value.
data	A data.frame of the mortality table, with the first column being the age and the second one the probability of death.
prop	A numeric value. It represents the proportion of the mortality table being used (between 0 and 1).
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths, "constant" for constant force of mortality and "none" if there is no fractional coverage).
variation	A character string. "inter" if the variation it's interannual or "intra" if it's intra-annual.
cap	A numeric type value. Amount insured for the first year/period.

Value

Returns a numeric value (actuarial present value).

Note

For an increasing life insurance coverage, 'r' must be 1.

References

Chapter 4 of Actuarial Mathematics for Life Contingent Risks (2009) by Dickson, Hardy and Waters.

Examples

```
Av.(43,0,4,1,0.7,0.04,CSO80MANB,1,"none","none",1)
Av.(37,1,6,1,0.3,0.04,CSO80MANB,1,"none","none",1)
Av.(25,2,3,2,0.6,0.04,CSO80MANB,1,"constant","inter",1)
Av.(37,3,6,4,0.5,0.04,CSO80MANB,1,"constant","intra",1)
Av.(40,3,5,2,0.4,0.04,CSO80MANB,1,"UDD","inter",1)
Av.(50,2,4,4,0.6,0.04,CSO80MANB,1,"UDD","intra",1)
```

---

avg *Varying Life Annuities: Geometric Progression*

Description

Calculates the present value of a varying life annuity according to a geometric progression.

Usage

```
avg(
  x,
  h,
  n,
  k = 1,
  r,
  i = 0.04,
  data,
  prop = 1,
  assumption = "none",
  variation = "none",
  cap = 1
)
```

Arguments

x	An integer. The age of the insuree.
h	An integer. The deferral period.
n	An integer. Number of years of coverage.
k	An integer. Number of payments per year.

r	The variation rate. A numeric type value.
i	The interest rate. A numeric type value.
data	A data.frame of the mortality table, with the first column being the age and the second one the probability of death.
prop	A numeric value. It represents the proportion of the mortality table being used (between 0 and 1).
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths, "constant" for constant force of mortality and "none" if there is no fractional coverage).
variation	A character string. "inter" if the variation it's interannual or "intra" if it's intra-annual.
cap	A numeric type value. The annualized value of the first payment.

Value

Returns a numeric value (actuarial present value).

References

Chapter 5 of Actuarial Mathematics for Life Contingent Risks (2009) by Dickson, Hardy and Waters.

Examples

```
avg(33,0,5,1,0.8,0.04,CSO80MANB,1,"none","none",1)
avg(26,2,4,1,0.4,0.04,CSO80MANB,1,"none","none",1)
avg(20,2,2,2,0.15,0.04,CSO80MANB,1,"constant","inter",1)
avg(40,5,5,3,0.07,0.04,CSO80MANB,1,"constant","intra",1)
avg(27,0,15,4,0.06,0.04,CSO80MANB,1,"UDD","inter",1)
avg(34,7,12,6,0.03,0.04,CSO80MANB,1,"UDD","intra",1)
```

Avg. *Varying Life Insurance: Geometric Progression*

Description

Calculates the present value of a varying life insurance according to a geometric progression.

Usage

```
Avg.(
  x,
  h,
  n,
  k = 1,
```

```
  r,
  i = 0.04,
  data,
  prop = 1,
  assumption = "none",
  variation = "none",
  cap = 1
)
```

Arguments

x	An integer. The age of the insuree.
h	An integer. The deferral period.
n	An integer. Number of years of coverage.
k	An integer. Fractions per year.
r	The variation rate. A numeric type value.
i	The interest rate. A numeric type value.
data	A data.frame of the mortality table, with the first column being the age and the second one the probability of death.
prop	A numeric value. It represents the proportion of the mortality table being used (between 0 and 1).
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths, "constant" for constant force of mortality and "none" if there is no fractional coverage).
variation	A character string. "inter" if the variation it's interannual or "intra" if it's intra-annual.
cap	A numeric type value. Amount insured for the first year/period.

Value

Returns a numeric value (actuarial present value).

References

Chapter 4 of Actuarial Mathematics for Life Contingent Risks (2009) by Dickson, Hardy and Waters.

Examples

```
Avg.(33,0,5,1,0.8,0.04,CSO80MANB,1,"none","none",1)
Avg.(26,2,4,1,0.4,0.04,CSO80MANB,1,"none","none",1)
Avg.(25,0,15,2,0.25,0.04,CSO80MANB,1,"constant","inter",1)
Avg.(37,10,10,4,0.05,0.04,CSO80MANB,1,"constant","intra",1)
Avg.(40,5,20,6,0.04,0.04,CSO80MANB,1,"UDD","inter",1)
Avg.(20,0,80,12,0.01,0.04,CSO80MANB,1,"UDD","intra",1)
```

CSO2001FALBnonsmoker *CSO2001 Female Age Last Birthday Non-smoker*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 2001. Sex: Female. Basis: Age Last Birthday. Smoker: No.

Usage

```
data(CSO2001FALBnonsmoker)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=1517

CSO2001FALBsmoker *CSO2001 Female Age Last Birthday Smoker*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 2001. Sex: Female. Basis: Age Last Birthday. Smoker: yes.

Usage

```
data(CSO2001FALBsmoker)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=1519

CSO2001FANBnonsmoker *CSO2001 Female Age Nearest Birthday Non-smoker*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 2001. Sex: Female. Basis: Age Nearest Birthday. Smoker: No.

Usage

```
data(CSO2001FANBnonsmoker)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=1140

CSO2001FANBsmoker *CSO2001 Female Age Nearest Birthday Smoker*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 2001. Sex: Female. Basis: Age Nearest Birthday. Smoker: Yes.

Usage

```
data(CSO2001FANBsmoker)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=1141

CSO2001MALBnonsmoker *CSO2001 Male Age Last Birthday Non-smoker*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 2001. Sex: Male. Basis: Age Last Birthday. Smoker: No.

Usage

```
data(CSO2001MALBnonsmoker)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=1516

CSO2001MALBsmoker *CSO2001 Male Age Last Birthday Smoker*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 2001. Sex: Male. Basis: Age Last Birthday. Smoker: yes.

Usage

```
data(CSO2001MALBsmoker)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=1518

CSO2001MANBnonsmoker *CSO2001 Male Age Nearest Birthday Non-smoker*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 2001. Sex: Male. Basis: Age Nearest Birthday. Smoker: No.

Usage

```
data(CSO2001MANBnonsmoker)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=1137

CSO2001MANBsmoker *CSO2001 Male Age Nearest Birthday Smoker*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 2001. Sex: Male. Basis: Age Nearest Birthday. Smoker: Yes.

Usage

```
data(CSO2001MANBsmoker)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=1138

CSO58FALB *CSO58 Female Age Last Birthday*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Year: 1958. Nation: United States of America. Sex: Female. Basis: Age Last Birthday.

Usage

```
data(CSO58FALB)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=8

CSO58FANB *CSO58 Female Age Nearest Birthday*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 1958. Sex: Female. Basis: Age Nearest Birthday.

Usage

```
data(CSO58FANB)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=6

CSO58MALB *CSO58 Male Age Last Birthday*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 1958. Sex: Male. Basis: Age Last Birthday.

Usage

```
data(CSO58MALB)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=7

CSO58MANB *CSO58 Male Age Nearest Birthday*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 1958. Sex: Male. Basis: Age Nearest Birthday.

Usage

```
data(CSO58MANB)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=5

CSO80FALB *CSO80 Female Age Last Birthday*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 1980. Sex: Female Age method: Age Last Birthday.

Usage

```
data(CSO80FALB)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=35

CSO80FALBnonsmoker *CSO80 Female Age Last Birthday non-smoker*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 1980. Sex: Female. Basis: Age Last Birthday. Smoker: No.

Usage

```
data(CSO80FALBnonsmoker)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=37

CSO80FALBsmoker *CSO80 Female Age Last Birthday smoker*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 1980. Sex: Female. Basis: Age Last Birthday. Smoker: Yes.

Usage

```
data(CSO80FALBsmoker)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=39

CSO80FANB *CSO80 Female Age Nearest Birthday*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 1980. Sex: Female. Basis: Age Nearest Birthday.

Usage

```
data(CSO80FANB)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=36

CSO80FANBnonsmoker *CSO80 Female Age Nearest Birthday Non-smoker*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 1980. Sex: Female. Basis: Age Nearest Birthday. Smoker: No.

Usage

```
data(CSO80FANBnonsmoker)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=38

CSO80FANBsmoker *CSO80 Female Age Nearest Birthday Smoker*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 1980. Sex: Female. Basis: Age Nearest Birthday. Smoker: Yes.

Usage

```
data(CSO80FANBsmoker)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=40

CSO80MALB *CSO80 Male Age Last Birthday*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 1980. Sex: Male. Basis: Age Last Birthday.

Usage

```
data(CSO80MALB)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=41

CSO80MALBnonsmoker *CSO80 Male Age Last Birthday Non-smoker*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 1980. Sex: Male. Basis: Age Last Birthday. Smoker: No.

Usage

```
data(CSO80MALBnonsmoker)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=43

CSO80MALBsmoker *CSO80 Male Age Last Birthday Smoker*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 1980. Sex: Male. Basis: Age Last Birthday. Smoker: Yes.

Usage

```
data(CSO80MALBsmoker)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=45

CSO80MANB *CSO80 Male Age Nearest Birthday*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 1980. Sex: Male. Age method: Age Nearest Birthday.

Usage

```
data(CSO80MANB)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=42

CSO80MANBnonsmoker *CSO80 Male Age Nearest Birthday Non-smoker*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 1980. Sex: Male. Basis: Age Nearest Birthday. Smoker: No.

Usage

```
data(CSO80MANBnonsmoker)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=44

CSO80MANBsmoker *CSO80 Male Age Nearest Birthday Smoker*

Description

Mortality table (ultimate): Commissioner's Standard Ordinary. Nation: United States of America. Year: 1980. Sex: Male. Basis: Age Nearest Birthday. Smoker: Yes.

Usage

```
data(CSO80MANBsmoker)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=46

E *Pure Endowment*

Description

Calculates the Pure endowments.

Usage

```
E(x, n, i = 0.04, data, prop = 1, assumption = "none", cap = 1)
```

Arguments

x	An integer. The age of the insuree.
n	The term of the endowment. An integer, for annual coverage, or a numeric for fractional coverage.
i	The interest rate. A numeric type value.
data	A data.frame containing the mortality table, with the first column being the age and the second one, the probability of death.
prop	A numeric value. It represents the proportion of the mortality table being used (between 0 and 1).
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths, "constant" for constant force of mortality and "none" if there is no fractional coverage).
cap	A numeric type value. The payment.

References

Chapter 2 of Life Contingencies (1952) by Jordan.

Examples

```
E(45,10,0.04,CSO80MANB,1,"none",1000)
E(24,1.6,0.04,CSO80MANB,1,"constant",17000)
E(26,2.4,0.04,CSO58FALB,1,"UDD",3500)
```

Fractional_table *Fractional table of mortality*

Description

Creates a fractional mortality table for a given mortality table.

Usage

```
Fractional_table(data, frac, i = 0.04, assumption = "UDD")
```

Arguments

data	A data.frame of the annual mortality table, with the first column being the age and the second one the probability of death.
frac	An integer. The number of fractions per year.
i	A numeric type value. The interest rate.
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths and "constant" for constant force of mortality).

Value

Returns a data.frame object containing fractional age and death probability vectors.

References

Chapter 3 of Actuarial Mathematics (1997) by Bowers, Gerber, Hickman, Jones & Nesbitt

Examples

```
Fractional_table(CSO80MANB,2,0.04,"constant")
Fractional_table(CSO80MANB,2,0.04,"UDD")
```

GAM71F *GAM71 Female*

Description

Mortality table (ultimate): Group Annuity Mortality. Nation: United States of America. Year: 1971. Sex: Female.

Usage

```
data(GAM71F)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=817, http://servicios.infoleg.gob.ar/infolegInternet/anexos/80000-84999/81029/norma.htm

---

GAM71M *GAM71 Male*

Description

Mortality table (ultimate): Group Annuity Mortality. Nation: United States of America. Year: 1971. Sex: Male.

Usage

```
data(GAM71M)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=818, http://servicios.infoleg.gob.ar/infolegInternet/anexos/80000-84999/81029/norma.htm

---

GAM83F *GAM83 Female*

Description

Mortality table (ultimate): Group Annuity Mortality. Nation: United States of America. Year: 1983. Sex: Female.

Usage

```
data(GAM83F)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=825

GAM83M *GAM83 Male*

Description

Mortality table (ultimate): Group Annuity Mortality. Nation: United States of America. Year: 1983. Sex: Male.

Usage

```
data(GAM83M)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=826

GAM94F *GAM94 Female*

Description

Mortality table (ultimate): Group Annuity Mortality. Year: 1994. Sex: Female.

Usage

```
data(GAM94F)
```

Format

a dataframe containing a column for age (x) and a column for death probability (q)

References

https://mort.soa.org/

GAM94FANB *GAM94 Female Age Nearest Birthday*

Description

Mortality table (ultimate): Group Annuity Mortality. Nation: United States of America. Year: 1994. Sex: Female. Basis: Age Nearest Birthday.

Usage

```
data(GAM94FANB)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=834

GAM94M *GAM94 Male*

Description

Mortality table (ultimate): Group Annuity Mortality. Year: 1994. Sex: Male.

Usage

```
data(GAM94M)
```

Format

a dataframe containing a column for age (x) and a column for death probability (q)

References

https://mort.soa.org/

GAM94MANB *GAM94 Male Age Nearest Birthday*

Description

Mortality table (ultimate): Group Annuity Mortality. Nation: United States of America. Year: 1994. Sex: Male. Basis: Age Nearest Birthday.

Usage

```
data(GAM94MANB)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=835

Loan_amortization *Loan Amortization*

Description

Calculates the amortization schedule.

Usage

```
Loan_amortization(V0, n, i, i2 = 0, alic = 0, ins = 0, method)
```

Arguments

V0	A numeric type value. Loan value.
n	A numeric type value. The number of payments.
i	A numeric type value or a vector of them. The interest rate of the loan.
i2	A numeric type value. The interest rate of the saving account.
alic	A numeric type value. Interest tax rate.
ins	A numeric type value. The rate of V0 to be paid in each period.
method	A string. Amortization method used ("constant_installment","interest_only", "constant_principal", "interest_only_wsavings_account" or "constant_installment_varintrate").

Value

Returns a data.frame object containing Period, Payment, Pure Payment, Intrest, Amortization, Insurance, TAX and Outstanding debt.

Examples

```
Loan_amortization(1000,12,0.04,0,0.21,0.01,"constant_installment")
Loan_amortization(12000,15,0.04,0,0.21,0.01,"interest_only")
Loan_amortization(13000,10,0.04,0,0.21,0.01,"constant_principal")
Loan_amortization(15000,20,0.04,0.05,0.21,0.01,"interest_only_wsavings_account")
Loan_amortization(5000,5,0.04,0,0.21,0.01,"constant_installment_varintrate")
```

MAyP0206activeF *MAyP0206 Active Female*

Description

Mortality table (ultimate): Mortalidad Activos y Pasivos. Nation: Argentina. Year: 2002-2006. Sex: Female. Status: Active.

Usage

```
data(MAyP0206activeF)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=20005

MAyP0206activeM *MAyP0206 Active Male*

Description

Mortality table (ultimate): Mortalidad Activos y Pasivos. Nation: Argentina. Year: 2002-2006. Sex: Male. Status: Active.

Usage

```
data(MAyP0206activeM)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=20004

MAyP0206CAF *MAyP0206 Combined Active and Retired Female*

Description

Mortality table (ultimate): Mortalidad Activos y Pasivos. Nation: Argentina. Year: 2002-2006. Sex: Female. Status: Combined Active and Retired.

Usage

```
data(MAyP0206CAF)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=20009

MAyP0206CAM *MAyP0206 Combined Active and Retired Male*

Description

Mortality table (ultimate): Mortalidad Activos y Pasivos. Nation: Argentina. Year: 2002-2006. Sex: Male. Status: Combined Active and Retired.

Usage

```
data(MAyP0206CAM)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=20008

MAyP0206retiredF *MAyP0206 Retired Female*

Description

Mortality table (ultimate): Mortalidad Activos y Pasivos. Nation: Argentina. Year: 2002-2006. Sex: Female. Status: Retired.

Usage

```
data(MAyP0206retiredF)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=20007

MAyP0206retiredM *MAyP0206 Retired Male*

Description

Mortality table (ultimate): Mortalidad Activos y Pasivos. Nation: Argentina. Year: 2002-2006. Sex: Male. Status: Retired.

Usage

```
data(MAyP0206retiredM)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=20006

`Mi06F` *Mi06 Female*

Description

Mortality table (ultimate): Mortalidad Invalidez. Nation: Chile. Year: 2006. Sex: Female.

Usage

```
data(Mi06F)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

Note

for more information on how to adjust the values of the table using an 'improvement rate' visit: https://www.spensiones.cl/portal/compendio/596/w3-propertyvalue-3537.html

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=2713,https://www.spensiones.cl/portal/compendio/596/w3-propertyvalue-3542.html

---

`Mi06M` *Mi06 Male*

Description

Mortality table (ultimate): Mortalidad Invalidez. Nation: Chile. Year: 2006. Sex: Male.

Usage

```
data(Mi06M)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

Note

For more information on how to adjust the values of the table using an 'improvement rate' visit: https://www.spensiones.cl/portal/compendio/596/w3-propertyvalue-3537.html

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=2712,https://www.spensiones.cl/portal/compendio/596/w3-propertyvalue-3542.html

Mi85F *Mi85 Female*

Description

Mortality table (ultimate): Mortalidad Invalidez. Nation: Chile. Year: 1985. Sex: Female.

Usage

```
data(Mi85F)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

http://servicios.infoleg.gob.ar/infolegInternet/anexos/80000-84999/81029/norma.htm

Mi85M *Mi85 Male*

Description

Mortality table (ultimate): Mortalidad Invalidez. Nation: Chile. Year: 1985. Sex: Male.

Usage

```
data(Mi85M)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

http://servicios.infoleg.gob.ar/infolegInternet/anexos/80000-84999/81029/norma.htm

`Payment_Protection` *Payment Protection*

Description

Calculates the present value of the loan insurance.

Usage

```
Payment_Protection(
  x,
  n,
  k = 1,
  V0,
  i = 0.04,
  ip = 0.04,
  data,
  prop = 1,
  type = "outstanding_debt",
  method = "interest_only"
)
```

Arguments

`x`	An integer. The age of the insuree.
`n`	An integer. Loan term (in years).
`k`	An integer. Number of payments per year.
`V0`	A numeric type value. Loan value.
`i`	The interest rate. A numeric type value.
`ip`	The interest rate of the loan. A numeric type value.
`data`	A data.frame of the mortality table, with the first column being the age and the second one the probability of death.
`prop`	A numeric value. It represents the proportion of the mortality table being used (between 0 and 1).
`type`	A character string. The type of loan protection/reimburstment ("outstanding_debt" or "payments").
`method`	A character string. Amortization scheme ("constant_instalment", "interest_only" or "constant_principal").

Value

Returns a numeric value (actuarial present value).

Examples

```
Payment_Protection(35,2,1,1000000,0.04,0.06,CSO80MANB,1,"payments","constant_instalment")
Payment_Protection(43,2,1,1000000,0.04,0.07,CSO80MANB,1,"outstanding_debt","constant_instalment")
Payment_Protection(30,2,2,1000000,0.04,0.06,CSO80MANB,1,"payments","constant_instalment")
Payment_Protection(20,2,2,1000000,0.04,0.07,CSO80MANB,1,"outstanding_debt","constant_instalment")
Payment_Protection(33,2,1,1000000,0.04,0.05,CSO80MANB,1,"payments","interest_only")
Payment_Protection(56,2,1,1000000,0.04,0.06,CSO80MANB,1,"outstanding_debt","interest_only")
Payment_Protection(40,2,2,1000000,0.04,0.06,CSO80MANB,1,"payments","interest_only")
Payment_Protection(25,2,2,1000000,0.04,0.05,CSO80MANB,1,"outstanding_debt","interest_only")
Payment_Protection(23,2,1,1000000,0.04,0.07,CSO80MANB,1,"payments","constant_principal")
Payment_Protection(35,2,1,1000000,0.04,0.06,CSO80MANB,1,"outstanding_debt","constant_principal")
Payment_Protection(45,2,2,1000000,0.04,0.05,CSO80MANB,1,"payments","constant_principal")
Payment_Protection(35,2,2,1000000,0.04,0.07,CSO80MANB,1,"outstanding_debt","constant_principal")
```

PremiumFrac *Fractional Premium*

Description

Calculates the annualized value of the fractional premiums.

Usage

```
PremiumFrac(px1, x, m, k, i = 0.04, data, prop = 1, effect = "yes", assumption)
```

Arguments

px1	A numeric type value. The value of the single net premium.
x	An integer. The age of the insuree.
m	An integer. Years of premium payment.
k	An integer. Number of premiums per year.
i	The interest rate. A numeric type value.
data	A data.frame of the mortality table, with the first column being the age and the second one the probability of death.
prop	A numeric value. It represents the proportion of the mortality table used (between 0 and 1).
effect	A character string. This parameter indicates if, in the event of death, the insuree is released from paying the remaining fractional premiums of that year ("yes" or "no")
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths and "constant" for constant force of mortality).

Value

Returns the annualized value of the fractional premium.

Note

If k=1, regardless of the "effect", the returned value is the annual premium.

References

Chapter 4 of Actuarial Mathematics for Life Contingent Risks (2009) by Dickson, Hardy and Waters

Examples

```
PremiumFrac(1000,20,10,2,0.04,CSO80MANB,1,"yes","constant")
PremiumFrac(1000,20,10,2,0.04,CSO80MANB,1,"no","UDD")
```

---

qfrac *Fractional Probability of Death*

Description

Calculates the fractional probability for a person of x+s/k dies before age x+(s+1)/k.

Usage

```
qfrac(x, s, k, i, data, assumption, prop)
```

Arguments

x	An integer. The age of the insuree.
s	An integer. Fraction of the year.
k	An integer. Number of fractions per year.
i	The interest rate. A numeric type value.
data	A data.frame containing the mortality table, with the first column being the age and the second one, the probability of death.
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths and "constant" for constant force of mortality).
prop	A numeric value. It represents the proportion of the mortality table being used (between 0 and 1).

Value

The fractional probability of death.

Examples

```
qfrac(27,1,4,0.04,CSO80MANB,"constant",1)
qfrac(20,0,12,0.04,CSO80MANB,"UDD",1)
```

Rate_converter *Interest & Discount Rate Converter*

Description

Converts nominal and effective interest and discount rates.

Usage

```
Rate_converter(num, rate1, m, rate2, k, type = "days")
```

Arguments

num	A numeric type value. It is the interest/discount rate to be converted.
rate1	A string ("i", "d","f" or "j"). Type of interest/discount rate to be converted.
m	number of capitalizations.
rate2	A string ("i" for effective interest rate, "d" for effective discount rate,"f" for nominal discount rate, "j" for nominal interest rate).Type of interest/discount rate to obtain.
k	An integer. Number of capitalizations per year.
type	A string. Reference for "k", indicating whether it is expressed as a fraction or as days ("frac" or "days").

Examples

```
Rate_converter(0.04,"i",1,"i",6,"frac")
Rate_converter(0.04,"f",1,"j",6,"frac")
Rate_converter(0.04,"f",365,"d",60,"days")
Rate_converter(0.04,"f",365,"f",60,"days")
```

RV04F *RV04 Female*

Description

Mortality table (ultimate): Renta Vitalicia. Nation: Chile. Year: 2004. Sex: Female.

Usage

```
data(RV04F)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=1500

RV04M *RV04 Male*

Description

Mortality table (ultimate): Renta Vitalicia. Nation: Chile. Year: 2004. Sex: Male.

Usage

```
data(RV04M)
```

Format

A data frame containing a column for age (x) and a column for death probability (q).

References

https://mort.soa.org/ViewTable.aspx?&TableIdentity=1499

---

sf *Future Value of an Annuity*

Description

Calculates the future value of an annuity.

Usage

```
sf(l = 0, n, i)
```

Arguments

l	0 for annuity due or 1 for annuity immediate.
n	A numeric value. The number of payments.
i	A numeric value. The interest rate.

Examples

```
sf(0,12,0.05)
sf(1,23,0.04)
```

Survival *Survival Probability*

Description

Calculates the probability of survival given a mortality table for an individual or a group.

Usage

```
Survival(x, n, data, prop = 1)
```

Arguments

x	An integer or a vector including only integers representing the age of each individual.
n	An integer. The term.
data	A data.frame of the mortality table, with the first column being the age and the second one, the probability of death.
prop	A numeric value. The proportion of the mortality table used, between 0 and 1.

Examples

```
Survival(20,2,CSO58MANB,1)
```

Table_Dormoy *Dormoy's Law of Mortality Table Creator*

Description

Creates a mortality table under Dormoy's law.

Usage

```
Table_Dormoy(x0, omega, a)
```

Arguments

x0	A numeric type value. The initial age of the table.
omega	A numeric type value. The final age of the table.
a	A numeric type value. A parameter of the law.

Value

Returns a data.frame object containing age and death probabilities.

References

Chapter 3 (p 77-78) of Actuarial Mathematics (1997) by Bowers, Gerber, Hickman, Jones & Nesbitt.

Examples

```
Table_Dormoy(0,100,0.98)
```

Table_Gompertz *Gompertz's Law of Mortality Table Creator*

Description

Creates a mortality table under Gompertz's law.

Usage

```
Table_Gompertz(x0, omega, B, C)
```

Arguments

x0	A numeric type value. The initial age of the table.
omega	A numeric type value. The final age of the table.
B	A numeric type value. A parameter of the law.
C	A numeric type value. A parameter of the law.

Value

Returns a data.frame object containing age and death probabilities.

References

Chapter 3 (p 77-78) of Actuarial Mathematics (1997) by Bowers, Gerber, Hickman, Jones & Nesbitt.

Examples

```
Table_Gompertz(0,100,0.00008,1.07)
```

`Table_Makeham` *Makeham's Law of Mortality Table Creator*

Description

Creates a mortality table under Makeham's law.

Usage

```
Table_Makeham(x0, omega, A, B, C)
```

Arguments

`x0`	A numeric type value. The initial age of the table.
`omega`	A numeric type value. The final age of the table.
`A`	A numeric type value. A parameter of the law.
`B`	A numeric type value. A parameter of the law.
`C`	A numeric type value. A parameter of the law.

Value

Returns a data.frame object containing age and death probabilities.

Note

The parameters are usually confined to the ranges shown below: 0.001 < A < 0.003, 10^(-6) < B < 10(-3), 1.08 < C < 1.12.

References

Chapter 3 (p 77-78) of Actuarial Mathematics (1997) by Bowers, Gerber, Hickman, Jones & Nesbitt.

Examples

```
Table_Makeham(0,100,0.002,3*10^(-4),1.124)
```

Table_Moivre *de Moivre's Law of Mortality Table Creator*

Description

Creates a mortality table under de Moivre's law.

Usage

```
Table_Moivre(x0, omega)
```

Arguments

x0	A numeric type value. The initial age of the table.
omega	A numeric type value. The final age of the table.

Value

Returns a data.frame object containing age and death probabilities.

References

Chapter 3 (p 77-78) of Actuarial Mathematics (1997) by Bowers, Gerber, Hickman, Jones & Nesbitt.

Examples

```
Table_Moivre(0,100)
```

V_a *Reserve Valuation for Life Annuities*

Description

Calculates the reserve for the life Annuity up to the moment 't'.

Usage

```
V_a(
  px,
  x,
  h,
  n,
  k = 1,
  cantprem = 1,
```

```
  premperyear = 1,
  i = 0.04,
  data,
  prop = 1,
  assumption = "none",
  cap,
  t
)
```

Arguments

px	A numeric value. The value of the premium paid in each period.
x	An integer. The age of the insuree.
h	An integer. The deferral period.
n	An integer. Number of years of coverage.
k	An integer. Number of payments per year.
cantprem	An integer. The total number of premiums.
premperyear	An integer. The number of premiums to be paid per year.
i	The interest rate. A numeric type value.
data	A data.frame containing the mortality table, with the first column being the age and the second one, the probability of death.
prop	A numeric value. It represents the proportion of the mortality table used (between 0 and 1).
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths, "constant" for constant force of mortality and "none" if there is no fractional coverage).
cap	A numeric type value. The annualized value of the payment.
t	An integer. The moment of valuation (in months if it is a fractional coverage or in years if it is not).

Value

A data frame with Premium, Risk, 1/E and reserve values up to the moment t.

References

Chapter 5 of Life Contingencies (1952) by Jordan, Chapter 11 of Actuarial Mathematics for Life Contingent Risks (2009) by Dickson, Hardy and Waters.

Examples

```
V_a(147.814202915034,20,5,10,1,5,1,0.04,CSO80MANB,1,"none",100,15)
V_a(148.324902023591/12,20,5,10,4,60,12,0.04,CSO80MANB,1,"constant",100,178)
V_a(223633.861110949,25,0,25,12,10,1,0.04,CSO80MANB,1,"UDD",120000,300)
```

V_A. *Reserve for Life Insurance*

Description

Calculates the reserve for the life insurance up to the moment 't'.

Usage

```
V_A.(
  px,
  x,
  h,
  n,
  k = 1,
  cantprem = 1,
  premperyear = 1,
  i = 0.04,
  data,
  prop = 1,
  assumption = "none",
  cap,
  t
)
```

Arguments

px	A numeric value. The value of the premium paid in each period.
x	An integer. The age of the insuree.
h	An integer. The deferral period.
n	An integer. Number of years of coverage.
k	An integer. Number of fractions per year.
cantprem	An integer. The total number of premiums.
premperyear	An integer. The number of premiums to be paid per year.
i	The interest rate. A numeric type value.
data	A data.frame containing the mortality table, with the first column being the age and the second one, the probability of death.
prop	A numeric value. It represents the proportion of the mortality table used (between 0 and 1).
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths, "constant" for constant force of mortality and "none" if there is no fractional coverage)
cap	A numeric type value. The value of the payment.
t	An integer. The moment of valuation (in months if it is a fractional coverage or in years if it is not).

Value

A data frame with Premium, Risk, 1/E and reserve values up to the moment t.

References

Chapter 5 of Life Contingencies (1952) by Jordan, Chapter 11 of Actuarial Mathematics for Life Contingent Risks (2009) by Dickson, Hardy and Waters.

Examples

```
V_A.(26673.3602688847,25,2,3,1,2,1,0.04,CSO80MANB,1,"none",12000000,5)
V_A.(27446.2077993839/12,25,2,3,2,24,12,0.04,CSO80MANB,1,"UDD",12000000,60)
V_A.(27376.5521158244/12,25,2,3,2,24,12,0.04,CSO80MANB,1,"constant",12000000,60)
```

V_aD *Reserve Valuation for Decreasing life annuities*

Description

Calculates the reserve for the decreasing life annuity up to the moment 't'.

Usage

```
V_aD(
  px,
  x,
  h,
  n,
  k = 1,
  cantprem = 1,
  premperyear = 1,
  i = 0.04,
  data,
  prop = 1,
  assumption = "none",
  variation = "none",
  cap,
  t
)
```

Arguments

px	A numeric value. The value of the premium paid in each period.
x	An integer. The age of the insuree.
h	An integer. The deferral period.

n	An integer. Number of years of coverage.
k	An integer. Number of payments per year.
cantprem	An integer. The total number of premiums.
premperyear	An integer. The number of premiums to be paid per year.
i	The interest rate. A numeric type value.
data	A data.frame containing the mortality table, with the first column being the age and the second one, the probability of death.
prop	A numeric value. It represents the proportion of the mortality table used (between 0 and 1).
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths, "constant" for constant force of mortality and "none" if there is no fractional coverage).
variation	A character string. "inter" if the variation it's interannual or "intra" if it's intra-annual.
cap	A numeric type value. The annualized value of the first payment.
t	An integer. The moment of valuation (in months if it is a fractional coverage or in years if it is not).

Value

A data frame with Premium, Risk, 1/E and reserve values up to the moment t.

References

Chapter 5 of Life Contingencies (1952) by Jordan, Chapter 11 of Actuarial Mathematics for Life Contingent Risks (2009) by Dickson, Hardy and Waters.

Examples

```
V_aD(139102.759700887,20,2,2,1,2,1,0.04,CSO80MANB,1,"none","none",100000,4)
V_aD(140293.253997879/12,20,2,2,2,24,12,0.04,CSO80MANB,1,"constant","inter",100000,48)
V_aD(23461.2532906378/12,20,2,2,2,24,12,0.04,CSO80MANB,1,"constant","intra",10000,48)
V_aD(23462.5668144001/12,20,2,2,2,24,12,0.04,CSO80MANB,1,"UDD","intra",10000,48)
V_aD(14029.8183844808/12,20,2,2,2,24,12,0.04,CSO80MANB,1,"UDD","inter",10000,48)
```

V_AD. *Reserve Valuation for Decreasing Life Insurance*

Description

Calculates the reserve for the decreasing life insurance up to the moment t.

Usage

```
V_AD.(
  px,
  x,
  h,
  n,
  k = 1,
  cantprem = 1,
  premperyear = 1,
  i = 0.04,
  data,
  prop = 1,
  assumption = "none",
  variation = "none",
  cap,
  t
)
```

Arguments

px	A numeric value. The value of the premium paid in each period.
x	An integer. The age of the insuree.
h	An integer. The deferral period.
n	An integer. Number of years of coverage.
k	An integer. Number of fractions per year.
cantprem	An integer. The total number of premiums.
premperyear	An integer. The number of premiums to be paid per year.
i	The interest rate. A numeric type value.
data	A data.frame containing the mortality table, with the first column being the age and the second one, the probability of death.
prop	A numeric value. It represents the proportion of the mortality table used (between 0 and 1).
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths, "constant" for constant force of mortality and "none" if there is no fractional coverage).
variation	A character string. "inter" if the variation it's inter-annual or "intra" if it's intra-annual.
cap	A numeric type value. Amount insured for the first year/period.
t	An integer. The moment of valuation (in months if it is a fractional coverage or in years if it is not).

Value

A data frame with Premium, Risk, 1/E and reserve values up to the moment t.

References

Chapter 5 of Life Contingencies (1952) by Jordan, Chapter 11 of Actuarial Mathematics for Life Contingent Risks (2009) by Dickson, Hardy and Waters.

Examples

```
V_AD.(251.489227521537,20,2,2,1,2,1,0.04,CSO80MANB,1,"none","none",100000,4)
V_AD.(432.974179723949/12,20,2,2,2,2,24,12,0.04,CSO80MANB,1,"UDD","intra",100000,48)
V_AD.(258.794207318685/12,20,2,2,2,2,24,12,0.04,CSO80MANB,1,"UDD","inter",100000,48)
V_AD.(412.784641829906/12,20,2,2,2,2,24,12,0.04,CSO80MANB,1,"constant","intra",100000,48)
V_AD.(258.189935788232/12,20,2,2,2,2,24,12,0.04,CSO80MANB,1,"constant","inter",100000,48)
```

V_av *Reserve Valuation for Varying Life Annuities: Arithmetic Progression*

Description

Calculates the reserve for the Varying Life Annuity up to the moment t.

Usage

```
V_av(
  px,
  x,
  h,
  n,
  k = 1,
  r,
  cantprem = 1,
  premperyear = 1,
  i = 0.04,
  data,
  prop = 1,
  assumption = "none",
  variation = "none",
  cap,
  t
)
```

Arguments

px	A numeric value. The value of the premium paid in each period.
x	An integer. The age of the insuree.
h	An integer. The deferral period.
n	An integer. Number of years of coverage.
k	An integer. Number of payments per year.

r	The variation rate. A numeric type value.
cantprem	An integer. The total number of premiums.
premperyear	An integer. The number of premiums to be paid per year.
i	The interest rate. A numeric type value.
data	A data.frame containing the mortality table, with the first column being the age and the second one, the probability of death.
prop	A numeric value. It represents the proportion of the mortality table used (between 0 and 1).
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths, "constant" for constant force of mortality and "none" if there is no fractional coverage).
variation	A character string. "inter" if the variation it's interannual or "intra" if it's intra-annual.
cap	A numeric type value. The annualized value of the first payment.
t	An integer. The moment of valuation (in months if it is a fractional coverage or in years if it is not).

Value

A data frame with Premium, Risk, 1/E and reserve values up to the moment t.

References

Chapter 5 of Life Contingencies (1952) by Jordan, Chapter 11 of Actuarial Mathematics for Life Contingent Risks (2009) by Dickson, Hardy and Waters.

Examples

```
V_av(9435943.49607651,20,2,2,1,0.05,2,1,0.04,CSO80MANB,1,"none","none",10000000,4)
V_av(9516712.17583443/12,20,2,2,2,0.05,24,12,0.04,CSO80MANB,1,"constant","inter",10000000,48)
V_av(9517.04683383614/12,20,2,2,2,0.05,24,12,0.04,CSO80MANB,1,"UDD","inter",10000,48)
V_av(997.404109454868/12,20,2,2,2,0.05,24,12,0.04,CSO80MANB,1,"constant","intra",1000,48)
V_av(997436.738989113/12,20,2,2,2,0.05,24,12,0.04,CSO80MANB,1,"UDD","intra",1000000,48)
V_av(28.4421691213902,40,3,7,2,0.7,1,1,0.04,CSO80MANB,1,"UDD","intra",1,120)
```

V_Av. *Reserve Valuation for Varying Life Insurance: Arithmetic Progression*

Description

Calculates the reserve for the varying life insurance up to the moment t.

Usage

```
V_Av.(
  px,
  x,
  h,
  n,
  k = 1,
  r,
  cantprem = 1,
  premperyear = 1,
  i = 0.04,
  data,
  prop = 1,
  assumption = "none",
  variation = "none",
  cap,
  t
)
```

Arguments

px	A numeric value. The value of the premium paid in each period.
x	An integer. The age of the insuree.
h	An integer. The deferral period.
n	An integer. Number of years of coverage.
k	An integer. Number of fractions per year.
r	The variation rate. A numeric type value.
cantprem	An integer. The total number of premiums.
premperyear	An integer. The number of premiums to be paid per year.
i	The interest rate. A numeric type value.
data	A data.frame containing the mortality table, with the first column being the age and the second one, the probability of death.
prop	A numeric value. It represents the proportion of the mortality table used (between 0 and 1).
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths, "constant" for constant force of mortality and "none" if there is no fractional coverage).
variation	A character string. "inter" if the variation it's interannual or "intra" if it's intra-annual.
cap	A numeric type value. Amount insured for the first year/period.
t	An integer. The moment of valuation (in months if it is a fractional coverage or in years if it is not).

Value

A data frame with Premium, Risk, 1/E and reserve values up to the moment t.

References

Chapter 5 of Life Contingencies (1952) by Jordan, Chapter 11 of Actuarial Mathematics for Life Contingent Risks (2009) by Dickson, Hardy and Waters.

Examples

```
V_Av.(333.373580168544,20,2,2,1,0.05,1,1,0.04,CSO80MANB,1,"none","none",100000,4)
V_Av.(175.054867728107/12,20,2,2,2,0.05,24,12,0.04,CSO80MANB,1,"UDD","inter",100000,48)
V_Av.(183.436285298212/12,20,2,2,2,0.05,24,12,0.04,CSO80MANB,1,"UDD","intra",100000,48)
V_Av.(183.965812992762/12,20,2,2,2,0.05,24,12,0.04,CSO80MANB,1,"constant","intra",100000,48)
V_Av.(174.645127871177/12,20,2,2,2,0.05,24,12,0.04,CSO80MANB,1,"constant","inter",100000,48)
```

V_avg *Reserve Valuation for Varying Life Annuities: Geometric Progression*

Description

Calculates the reserve for the Varying Life Annuity up to the moment t.

Usage

```
V_avg(
  px,
  x,
  h,
  n,
  k = 1,
  r,
  cantprem = 1,
  premperyear = 1,
  i = 0.04,
  data,
  prop = 1,
  assumption = "none",
  variation = "none",
  cap,
  t
)
```

Arguments

px	A numeric value. The value of the premium paid in each period.
x	An integer. The age of the insuree.
h	An integer. The deferral period.
n	An integer. Number of years of coverage.
k	An integer. Number of payments per year.
r	The variation rate. A numeric type value.
cantprem	An integer. The total number of premiums.
premperyear	An integer. The number of premiums to be paid per year.
i	The interest rate. A numeric type value.
data	A data.frame containing the mortality table, with the first column being the age and the second one, the probability of death.
prop	A numeric value. It represents the proportion of the mortality table used (between 0 and 1).
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths, "constant" for constant force of mortality and "none" if there is no fractional coverage).
variation	A character string. "inter" if the variation it's interannual or "intra" if it's intra-annual.
cap	A numeric type value. The annualized value of the first payment.
t	An integer. The moment of valuation (in months if it is a fractional coverage or in years if it is not).

Value

A data frame with Premium, Risk, 1/E and reserve values up to the moment t.

References

Chapter 5 of Life Contingencies (1952) by Jordan, Chapter 11 of Actuarial Mathematics for Life Contingent Risks (2009) by Dickson, Hardy and Waters.

Examples

```
V_avg(94359.4349607651,20,2,2,1,0.05,2,1,0.04,CSO80MANB,1,"none","none",100000,4)
V_avg(95167.1217583443/12,20,2,2,2,0.05,24,12,0.04,CSO80MANB,1,"constant","inter",100000,48)
V_avg(99969.5282890978/12,20,2,2,2,0.05,24,12,0.04,CSO80MANB,1,"constant","intra",100000,48)
V_avg(95170.4683383614/12,20,2,2,2,0.05,24,12,0.04,CSO80MANB,1,"UDD","inter",100000,48)
V_avg(99972.7870462341/12,20,2,2,2,0.05,24,12,0.04,CSO80MANB,1,"UDD","intra",100000,48)
```

V_Avg. *Reserve Valuation for Varying Life Insurance: Geometric Progression*

Description

Calculates the reserve for the varying life insurance up to the moment t.

Usage

```
V_Avg.(
  px,
  x,
  h,
  n,
  k = 1,
  r,
  cantprem = 1,
  premperyear = 1,
  i = 0.04,
  data,
  prop = 1,
  assumption = "none",
  variation = "none",
  cap,
  t
)
```

Arguments

px	A numeric value. The value of the premium paid in each period.
x	An integer. The age of the insuree.
h	An integer. The deferral period.
n	An integer. Number of years of coverage.
k	An integer. Number of fractions per year.
r	The variation rate. A numeric type value.
cantprem	An integer. The total number of premiums.
premperyear	An integer. The number of premiums to be paid per year.
i	The interest rate. A numeric type value.
data	A data.frame containing the mortality table, with the first column being the age and the second one, the probability of death.
prop	A numeric value. It represents the proportion of the mortality table used (between 0 and 1).

assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths, "constant" for constant force of mortality and "none" if there is no fractional coverage).
variation	A character string. "inter" if the variation it's interannual or "intra" if it's intra-annual.
cap	A numeric type value. Amount insured for the first year/period.
t	An integer. The moment of valuation (in months if it is a fractional coverage or in years if it is not).

Value

A data frame with Premium, Risk, 1/E and reserve values up to the moment t.

References

Chapter 5 of Life Contingencies (1952) by Jordan, Chapter 11 of Actuarial Mathematics for Life Contingent Risks (2009) by Dickson, Hardy and Waters.

Examples

```
V_Avg.(170.113596880528,20,2,2,1,0.05,2,1,0.04,CSO80MANB,1,"none","none",100000,4)
V_Avg.(183.854458536232/12,20,2,2,2,0.05,24,12,0.04,CSO80MANB,1,"UDD","intra",100000,48)
V_Avg.( 175.054867728107/12,20,2,2,2,0.05,24,12,0.04,CSO80MANB,1,"UDD","inter",100000,48)
V_Avg.(184.431102889578/12,20,2,2,2,0.05,24,12,0.04,CSO80MANB,1,"constant","intra",100000,48)
V_Avg.(174.645127871158/12,20,2,2,2,0.05,24,12,0.04,CSO80MANB,1,"constant","inter",100000,48)
```

V_E *Reserve Valuation for Pure Endowments*

Description

Calculates the reserve for the Pure endowments up to the moment t.

Usage

```
V_E(
  px,
  x,
  n,
  cantprem = 1,
  premperyear = 1,
  i = 0.04,
  data,
  prop = 1,
  assumption = "none",
  cap,
  t
)
```

Arguments

px	A numeric value. The value of the premium paid in each period.
x	An integer. The age of the insuree.
n	The term of the endowment. An integer, for annual coverage, or a numeric for fractional coverage.
cantprem	An integer. The total number of premiums.
premperyear	An integer. The number of premiums to be paid per year.
i	The interest rate. A numeric type value.
data	A data.frame containing the mortality table, with the first column being the age and the second one, the probability of death.
prop	A numeric value. It represents the proportion of the mortality table used (between 0 and 1).
assumption	A character string. The assumption used for fractional ages ("UDD" for uniform distribution of deaths, "constant" for constant force of mortality and "none" if there is no fractional coverage).
cap	A numeric type value. The payment.
t	An integer. The moment of valuation (in months if it is a fractional coverage or in years if it is not).

Value

A data frame with Premium, Risk, 1/E and reserve values up to the moment t.

References

Chapter 5 of Life Contingencies (1952) by Jordan, Chapter 11 of Actuarial Mathematics for Life Contingent Risks (2009) by Dickson, Hardy and Waters.

Examples

```
V_E(663.501989747591,20,10,1,1,0.04,CSO80MANB,1,"none",1000,10)
V_E(9383.64446819386/12,20,2,12,12,0.04,CSO80MANB,1,"constant",10000,24)
V_E(9383.64446819386/12,20,2,12,12,0.04,CSO80MANB,1,"constant",10000,24)
```

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