# Package 'DetLifeInsurance'

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Type Package

Title Life Insurance Premium and Reserves Valuation

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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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Imports utils

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a Life A	Annuities
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# **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).
сар	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.

```
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.* 5

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).
сар	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.

```
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

aCont C	Continuous Life Annuities
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# 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

х	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).
сар	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.

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

ACont. 7

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).
сар	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.

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

8 aD

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.
сар	A numeric type value. The annualized value of the first payment.

# Value

Returns a numeric value (actuarial present value).

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# 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,CS080MANB,1,"none","none",1)
aD(32,2,8,1,0.04,CS080MANB,1,"none","none",1)
aD(35,8,15,4,0.04,CS080MANB,1,"constant","inter",1)
aD(21,2,5,4,0.04,CS080MANB,1,"UDD","inter",1)
aD(54,4,16,2,0.04,CS080MANB,1,"constant","intra",1)
aD(20,10,15,3,0.04,CS080MANB,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

Χ	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.

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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.
сар	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(1 = 0, n, i)
```

# Arguments

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

am 11

# Examples

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

am

Life Annuities for a group

# Description

Calculates the present value of a life annuity for a group.

# Usage

```
am(
    x,
    h,
    n,
    k = 1,
    i = 0.04,
    data,
    prop = 1,
    type = "joint",
    quant = 1,
    assumption = "none",
    cap = 1
)
```

# Arguments

X	A vector of intergers representing the age of each individual of the group.
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).
type	A character string. Conditions to be met in order to access the benefit of the annuity ("joint", "exactly" or "atleast").
quant	An integer. Required only if type is not "joint". If type is "exactly" it represents the exact amount of survivors required for the endowment to be payed. If type is "atleast", it represents the minimum number of survivors required.

12 Am.

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).

# **Examples**

```
ages<-c(23,34,21)
ages<-c(23,34,21)
am(ages,5,10,2,0.05,CSO80MALB,1,"joint",assumption="UDD")
am(ages,0,20,1,0.06,CSO80FALBsmoker,1,"atleast",1)
am(ages,2,15,2,0.07,CSO80FANBsmoker,0.8,"exactly",2,"constant")</pre>
```

Am.

Life Insurance of a group

#### **Description**

Calculates the present value of a life insurance coverage for a group.

#### Usage

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

#### Arguments

<b>V</b>	A Vector of intercers	representing the age of	it each individiial d	or the orollin
^	A Vector of interects	representing the age of	n cacii illulvidual (	n die Eroub.

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).

ndeath An integer. Number of deaths necessary for payment to occur.

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).

# **Examples**

```
ages<-c(22,33,44,55,66)
Am.(ages,5,15,1,0.04,CSO80MANB,1,2,"none",1)
Am.(ages,0,20,4,0.04,CSO80MANB,1,2,"UDD",1)
Am.(ages,10,25,2,0.04,CSO80MANB,1,2,"constant",1)
```

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).

```
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).

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

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Varying Life Annuities: Arithmetic Progression

av

# 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.
сар	A numeric type value. The annualized value of the first payment.

# Value

Returns a numeric value (actuarial present value).

16 Av.

# 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) \\ \end{aligned}
```

Αv.

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.
```

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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.
сар	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)
```

Varying Life Annuities: Geometric Progression

avg

# Description

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

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# Usage

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

# Arguments

х	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.
сар	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.

Avg. 19

# **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(20,2,2,0.15,0.04,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).

CSO2001FALBnonsmoker

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).

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

CSO2001FALBsmoker 21

CS02001FALBsmoker

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).

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

CS02001FANBsmoker

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).

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

CSO2001MALBsmoker 23

CS02001MALBsmoker

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).

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

24 CSO58FALB

CS02001MANBsmoker

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
```

CS058FALB

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).

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

CSO58FANB 25

CS058FANB

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
```

CS058MALB

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).

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

26 CSO80FALB

CS058MANB

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
```

CS080FALB

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).

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

CSO80FALBnonsmoker 27

CS080FALBnonsmoker

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
```

CS080FALBsmoker

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).

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

28 CSO80FANBnonsmoker

CS080FANB

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
```

CS080FANBnonsmoker

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).

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

CSO80FANBsmoker 29

CS080FANBsmoker

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
```

CS080MALB

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).

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

30 CSO80MALBsmoker

CS080MALBnonsmoker

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
```

CS080MALBsmoker

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).

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

CSO80MANB 31

CS080MANB

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

CS080MANBnonsmoker

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

32 E

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).
сар	A numeric type value. The payment.

Em 33

# 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)
```

 $\mathsf{Em}$ 

Group Pure Endowment

# Description

Calculates the Pure endowments for a group of insurees.

# Usage

```
Em(
    x,
    n,
    i = 0.04,
    data,
    prop = 1,
    type = "joint",
    quant = 1,
    assumption = "none",
    cap = 1
)
```

# Arguments

X	A vector of integers. The age of the insurees.
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 $1$ ).
type	A character string. Conditions to be met in order to access the benefit of the endowment ("joint", "exactly" or "atleast").
quant	An integer. Required only if type is not "joint". If type is "exactly" it represents the exact amount of survivors required for the endowment to be payed. If type is "atleast", it represents the minimum number of survivors required.

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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.

#### **Examples**

```
ages<-c(23,33,33)
Em(ages,15,0.04,CSO80MANB,1,"joint")
Em(ages,20.5,0.04,CSO80MANB,1,"joint",assumption = "constant",cap= 1)
Em(ages,10.5,0.04,CSO80MANB,1,"joint",assumption = "UDD", cap=1)
ages<-c(20,23,24,25)
Em(ages,15,0.04,CSO80MANB,1,"exactly",1,"none",1)
Em(ages,24.2,0.04,CSO80MANB,1,"exactly",2,"constant",1)
Em(ages,8.2,0.04,CSO80MANB,1,"exactly",3,"UDD",1)

ages<-c(40,42,56,57,58,59)
Em(ages,15,0.04,CSO80MANB,1,"atleast",1,"none",1)
Em(ages,25.5,0.04,CSO80MANB,1,"atleast",4,"constant",1)
Em(ages,15.3,0.04,CSO80MANB,1,"atleast",3,"UDD",1)
```

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.

*GAM71F* 35

#### 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).

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#### 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 37

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
```

38 GAM94MANB

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

JointSurvival 39

JointSurvival	Joint Survival Probability	

# **Description**

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

# Usage

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

# **Arguments**

x A vector 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**

```
ages<-c(34,45,52,65)
JointSurvival(ages,10,CSO80FALB)</pre>
```

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"
	).

40 MAyP0206activeM

### Value

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

### **Examples**

```
\label{loan_amortization} 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)

MAyP0206CAF 41

# **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

42 MAyP0206retiredM

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 43

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

44 Mi85M

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 45

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.
VØ	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).

46 PremiumFrac

### **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(30,2,2,1000000,0.04,0.07,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(45,2,2,1000000,0.04,0.06,CSO80MANB,1,"outstanding_debt","constant_principal")
Payment_Protection(45,2,2,1000000,0.04,0.05,CSO80MANB,1,"payments","constant_principal")
Payment_Protection(35,2,1,1000000,0.04,0.05,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.

qfrac 47

# 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

Χ	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 $0\ \mathrm{and}\ 1$ ).

# Value

The fractional probability of death.

# **Examples**

```
qfrac(27,1,4,0.04,CSO80MANB,"constant",1)
qfrac(20,0,12,0.04,CSO80MANB,"UDD",0.8)
```

48 RV04F

# 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).

RV04M 49

### 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(1 = 0, n, i)
```

# **Arguments**

- 1 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)
```

Table\_Dormoy

Survival	Survival Probability	ity

# Description

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

# Usage

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

# Arguments

Х	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)
Survival(31,33,CSO80MANB,0.8)
```

Table_Dormoy L	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.
а	A numeric type value. A parameter of the law.

Table\_Gompertz 51

# 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.
В	A numeric type value. A parameter of the law.
С	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)
```

52 Table\_Makeham

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.
Α	A numeric type value. A parameter of the law.
В	A numeric type value. A parameter of the law.
С	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 53

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,
```

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

# **Arguments**

рх	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).
сар	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**

```
\label{eq:Vactorian} $$V_a(147.814202915034,20,5,10,1,5,1,0.04,CSO80MANB,1,"none",100,15)$$ $$V_a(148.324902023591/12,20,5,10,4,60,12,0.04,CSO80MANB,1,"constant",100,178)$$ $$V_a(223633.861110949,25,0,25,12,10,1,0.04,CSO80MANB,1,"UDD",120000,300)$$
```

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

рх	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)
сар	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).

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# 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,CS080MANB,1,"none",12000000,5)
V_A.(27446.2077993839/12,25,2,3,2,24,12,0.04,CS080MANB,1,"UDD",12000000,60)
V_A.(27376.5521158244/12,25,2,3,2,24,12,0.04,CS080MANB,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(
  рx,
  Х,
  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.

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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.
сар	A numeric type value. The annualized value of the first payment.

# Value

t

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

in years if it is not).

# References

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

An integer. The moment of valuation (in months if it is a fractional coverage or

# **Examples**

V\_AD.

Reserve Valuation for Decreasing Life Insurance

# Description

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

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# Usage

```
V_AD.(
 рx,
  х,
 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 $0\ \mathrm{and}\ 1$ ).
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.
сар	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.

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### 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**

```
 \begin{array}{l} V_{AD.}(251.489227521537,20,2,2,1,2,1,0.04,CSO80MANB,1,"none","none",100000,4) \\ V_{AD.}(432.974179723949/12,20,2,2,2,24,12,0.04,CSO80MANB,1,"UDD","intra",100000,48) \\ V_{AD.}(258.794207318685/12,20,2,2,2,24,12,0.04,CSO80MANB,1,"UDD","inter",100000,48) \\ V_{AD.}(412.784641829906/12,20,2,2,2,24,12,0.04,CSO80MANB,1,"constant","intra",100000,48) \\ V_{AD.}(258.189935788232/12,20,2,2,2,24,12,0.04,CSO80MANB,1,"constant","inter",100000,48) \\ \end{array}
```

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(
  рx,
  Х,
  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.

 $V_Av$ .

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.
сар	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

#### Value

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

in years if it is not).

#### 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**

 $V_Av$ .

Reserve Valuation for Varying Life Insurance: Arithmetic Progression

# Description

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

V\_Av. 61

# Usage

```
V_Av.(
  рx,
  Х,
  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.
сар	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).

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# 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

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
)
```

V\_avg 63

### **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.
сар	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.

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.(
  рx,
  Х,
  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).

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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.
сар	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\_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**

рх	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).
сар	A numeric type value. The payment.
t	An integer. The moment of valuation (in months if it is a fractional coverage or

### Value

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

in years if it is not).

#### 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,CS080MANB,1,"none",1000,10)
V_E(9383.64446819386/12,20,2,12,12,0.04,CS080MANB,1,"constant",10000,24)
V_E(9383.64446819386/12,20,2,12,12,0.04,CS080MANB,1,"constant",10000,24)
```

V\_Payment\_Protection Reserve valuation for Payment Protection

# Description

Calculates the reserve for the loan insurance up to the moment t.

# Usage

```
V_Payment_Protection(
  рx,
 Х,
 n,
 k = 1,
 cantprem = 1,
 premperyear = 1,
  i = 0.04,
  ip = 0.04,
 data,
 prop = 1,
  type = "outstanding_debt",
 method = "interest_only",
 ٧0,
  t
)
```

# **Arguments**

px	A numeric value. The value of the premium paid in each period.
x	An integer. The age of the insuree.
n	An integer. Loan term (in years).
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.
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 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").
V0	A numeric type value. Loan value.
t	An integer. The moment of valuation (in months if it is a fractional coverage or in years if it is not).

### Value

Returns the actuarial present value of the loan protection.

# Examples

```
 px1 < -31.6216618772779 \\ c1 < -10500 \\ V_Payment_Protection(px1,30,25,1,10,1,0.06,0.07,CSO80FANB,1,"payments","constant_instalment",c1,25)
```

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