

# Package ‘TSE’

June 20, 2019

**Type** Package

**Title** Total Survey Error

**Version** 0.1.0

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**Description** Calculates total survey error (TSE) for one or more surveys, using common scale-dependent and/or scale-independent metrics. On TSE, see: Weisberg, Herbert (2005, ISBN:0-226-89128-3); Biemer, Paul (2010) <doi:10.1093/poq/nfq058>.

**Note** Package TSE works directly from the data set – no hand calculations required. Just upload a properly structured data set (see TESTNUMB and its documentation), properly input column names (see examples in the functions documentation), and run your functions.

**Imports** stats

**Depends** R (>= 3.5)

**License** GPL (>= 2)

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 6.1.1

**Suggests** knitr, rmarkdown

**NeedsCompilation** no

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**Repository** CRAN

**Date/Publication** 2019-06-20 09:10:03 UTC

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AVEMAE	<i>Calculate average mean absolute error (aMAE)</i>
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### Description

Calculates average mean absolute error (aMAE) for one or more surveys

### Usage

```
AVEMAE(Actuals1 = data.frame(), Observed1 = data.frame(), ...)
```

### Arguments

Actuals1	= data from a "gold standard" survey; objects are variable columns from "gold standard" survey that correspond to variable columns Observed1
Observed1	= data from survey 1; objects are variable columns from survey 1 that correspond to variable columns from Actuals1
...	= "gold standard" data/survey # data for additional surveys

### Details

aMAE for survey # => mean value of the MAEs for specified variables in survey # => mean value of MAEs for objects in Observed#=data.frame()

### Value

Average mean absolute error (aMAE)

### Note

Make sure to properly order inputs, per the example: Actuals1=data.frame() objects and corresponding Observed1=data.frame() objects must be given in the same order as each other; and ... must be given in numbered pairs of Actuals#, Observed#, and those pairs given in sequence of their #s.

**Examples**

```
AVEMAPE(Actuals1=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed1=data.frame(TESTNUMB$O1Q1, TESTNUMB$O1Q2),
Actuals2=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed2=data.frame(TESTNUMB$O2Q1, TESTNUMB$O2Q2),
Actuals3=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed3=data.frame(TESTNUMB$O3Q1, TESTNUMB$O3Q2))
```

---

AVEMAPE

*Calculate average mean absolute percentage error (aMAPE)*


---

**Description**

Calculates average mean absolute percentage error (aMAPE) for one or more surveys

**Usage**

```
AVEMAPE(Actuals1 = data.frame(), Observed1 = data.frame(), ...)
```

**Arguments**

Actuals1	= data from a "gold standard" survey; objects are variable columns from "gold standard" survey that correspond to variable columns Observed1
Observed1	= data from survey 1; objects are variable columns from survey 1 that correspond to variable columns from Actuals1
...	= "gold standard" data/survey # data for additional surveys

**Details**

aMAPE for survey # => mean value of the MAPEs for specified variables in survey # => mean value of MAPEs for objects in Observed#=data.frame()

**Value**

Average mean absolute percentage error (aMAPE)

**Note**

Make sure to properly order inputs, per the example: Actuals1=data.frame() objects and corresponding Observed1=data.frame() objects must be given in the same order as each other; and ... must be given in numbered pairs of Actuals#, Observed#, and those pairs given in sequence of their #s.

**Examples**

```

AVEMAPE(Actuals1=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed1=data.frame(TESTNUMB$O1Q1, TESTNUMB$O1Q2),
Actuals2=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed2=data.frame(TESTNUMB$O2Q1, TESTNUMB$O2Q2),
Actuals3=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed3=data.frame(TESTNUMB$O3Q1, TESTNUMB$O3Q2))

```

---

AVEMSE	<i>Calculate average mean squared error (aMSE) with bias-variance decomposition</i>
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---

**Description**

Calculates average mean squared error (aMSE) with bias-variance decomposition for one or more surveys

**Usage**

```
AVEMSE(Actuals1 = data.frame(), Observed1 = data.frame(), ...)
```

**Arguments**

Actuals1	= data from a "gold standard" survey; objects are variable columns from "gold standard" survey that correspond to variable columns Observed1
Observed1	= data from survey 1; objects are variable columns from survey 1 that correspond to variable columns from Actuals1
...	= "gold standard" data/survey # data for additional surveys

**Details**

aMSE for survey # => mean value of the MSEs for specified variables in survey # => mean value of MSEs for objects in Observed#=data.frame()

**Value**

Average mean squared error (aMSE) with bias-variance decomposition

**Note**

Make sure to properly order inputs, per the example: Actuals1=data.frame() objects and corresponding Observed1=data.frame() objects must be given in the same order as each other; and ... must be given in numbered pairs of Actuals#, Observed#, and those pairs given in sequence of their #s.

**Examples**

```

AVEMSE(Actuals1=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed1=data.frame(TESTNUMB$O1Q1, TESTNUMB$O1Q2),
Actuals2=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed2=data.frame(TESTNUMB$O2Q1, TESTNUMB$O2Q2),
Actuals3=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed3=data.frame(TESTNUMB$O3Q1, TESTNUMB$O3Q2))

```

---

AVEMSLE

*Calculate average mean squared logarithmic error (aMSLE)*


---

**Description**

Calculates average mean squared logarithmic error (aMSLE) for one or more surveys

**Usage**

```
AVEMSLE(Actuals1 = data.frame(), Observed1 = data.frame(), ...)
```

**Arguments**

Actuals1	= data from a "gold standard" survey; objects are variable columns from "gold standard" survey that correspond to variable columns Observed1
Observed1	= data from survey 1; objects are variable columns from survey 1 that correspond to variable columns from Actuals1
...	= "gold standard" data/survey # data for additional surveys

**Details**

aMSLE for survey # => mean value of the MSLEs for specified variables in survey # => mean value of MSLEs for objects in Observed#=data.frame()

**Value**

Average mean squared logarithmic error (aMSLE)

**Note**

Make sure to properly order inputs, per the example: Actuals1=data.frame() objects and corresponding Observed1=data.frame() objects must be given in the same order as each other; and ... must be given in numbered pairs of Actuals#, Observed#, and those pairs given in sequence of their #s.

**Examples**

```

AVEMSLE(Actuals1=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed1=data.frame(TESTNUMB$O1Q1, TESTNUMB$O1Q2),
Actuals2=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed2=data.frame(TESTNUMB$O2Q1, TESTNUMB$O2Q2),
Actuals3=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed3=data.frame(TESTNUMB$O3Q1, TESTNUMB$O3Q2))

```

---

AVERAE

*Calculate average relative absolute error (aRAE)*


---

**Description**

Calculates average relative absolute error (aRAE) for one or more surveys

**Usage**

```
AVERAE(Actuals1 = data.frame(), Observed1 = data.frame(), ...)
```

**Arguments**

Actuals1	= data from a "gold standard" survey; objects are variable columns from "gold standard" survey that correspond to variable columns Observed1
Observed1	= data from survey 1; objects are variable columns from survey 1 that correspond to variable columns from Actuals1
...	= "gold standard" data/survey # data for additional surveys

**Details**

aRAE for survey # => mean value of the RAEs for specified variables in survey # => mean value of RAEs for objects in Observed#=data.frame()

**Value**

Average relative absolute error (aRAE)

**Note**

Make sure to properly order inputs, per the example: Actuals1=data.frame() objects and corresponding Observed1=data.frame() objects must be given in the same order as each other; and ... must be given in numbered pairs of Actuals#, Observed#, and those pairs given in sequence of their #s.

**Examples**

```
AVERAE(Actuals1=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed1=data.frame(TESTNUMB$O1Q1, TESTNUMB$O1Q2),
Actuals2=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed2=data.frame(TESTNUMB$O2Q1, TESTNUMB$O2Q2),
Actuals3=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed3=data.frame(TESTNUMB$O3Q1, TESTNUMB$O3Q2))
```

---

AVERMSE

*Calculate average root mean squared error (aRMSE)*


---

**Description**

Calculates average root mean squared error (aRMSE) for one or more surveys

**Usage**

```
AVERMSE(Actuals1 = data.frame(), Observed1 = data.frame(), ...)
```

**Arguments**

Actuals1	= data from a "gold standard" survey; objects are variable columns from "gold standard" survey that correspond to variable columns Observed1
Observed1	= data from survey 1; objects are variable columns from survey 1 that correspond to variable columns from Actuals1
...	= "gold standard" data/survey # data for additional surveys

**Details**

aRMSE for survey # => mean value of the RMSEs for specified variables in survey # => mean value of RMSEs for objects in Observed#=data.frame()

**Value**

Average root mean squared error (aRMSE)

**Note**

Make sure to properly order inputs, per the example: Actuals1=data.frame() objects and corresponding Observed1=data.frame() objects must be given in the same order as each other; and ... must be given in numbered pairs of Actuals#, Observed#, and those pairs given in sequence of their #s.

**Examples**

```

AVERMSE(Actuals1=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed1=data.frame(TESTNUMB$O1Q1, TESTNUMB$O1Q2),
Actuals2=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed2=data.frame(TESTNUMB$O2Q1, TESTNUMB$O2Q2),
Actuals3=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed3=data.frame(TESTNUMB$O3Q1, TESTNUMB$O3Q2))

```

---

AVERMSLE

*Calculate average root mean squared logarithmic error (aRMSLE)*


---

**Description**

Calculates average root mean squared logarithmic error (aRMSLE) for one or more surveys

**Usage**

```
AVERMSLE(Actuals1 = data.frame(), Observed1 = data.frame(), ...)
```

**Arguments**

Actuals1	= data from a "gold standard" survey; objects are variable columns from "gold standard" survey that correspond to variable columns Observed1
Observed1	= data from survey 1; objects are variable columns from survey 1 that correspond to variable columns from Actuals1
...	= "gold standard" data/survey # data for additional surveys

**Details**

aRMSLE for survey # => mean value of the RMSLEs for specified variables in survey # => mean value of RMSLEs for objects in Observed#=data.frame()

**Value**

Average root mean squared logarithmic error (aRMSLE)

**Note**

Make sure to properly order inputs, per the example: Actuals1=data.frame() objects and corresponding Observed1=data.frame() objects must be given in the same order as each other; and ... must be given in numbered pairs of Actuals#, Observed#, and those pairs given in sequence of their #s.



**Examples**

```

AVERMSLE(Actuals1=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed1=data.frame(TESTNUMB$O1Q1, TESTNUMB$O1Q2),
Actuals2=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed2=data.frame(TESTNUMB$O2Q1, TESTNUMB$O2Q2),
Actuals3=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed3=data.frame(TESTNUMB$O3Q1, TESTNUMB$O3Q2))

```

---

AVERRSE

*Calculate average root relative squared error (aRRSE)*


---

**Description**

Calculates average root relative squared error (aRRSE) for one or more surveys

**Usage**

```
AVERRSE(Actuals1 = data.frame(), Observed1 = data.frame(), ...)
```

**Arguments**

Actuals1	= data from a "gold standard" survey; objects are variable columns from "gold standard" survey that correspond to variable columns Observed1
Observed1	= data from survey 1; objects are variable columns from survey 1 that correspond to variable columns from Actuals1
...	= "gold standard" data/survey # data for additional surveys

**Details**

aRRSE for survey # => mean value of the RRSEs for specified variables in survey # => mean value of RRSEs for objects in Observed#=data.frame()

**Value**

Average root relative squared error (aRRSE)

**Note**

Make sure to properly order inputs, per the example: Actuals1=data.frame() objects and corresponding Observed1=data.frame() objects must be given in the same order as each other; and ... must be given in numbered pairs of Actuals#, Observed#, and those pairs given in sequence of their #s.

**Examples**

```

AVERRSE(Actuals1=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed1=data.frame(TESTNUMB$O1Q1, TESTNUMB$O1Q2),
Actuals2=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed2=data.frame(TESTNUMB$O2Q1, TESTNUMB$O2Q2),
Actuals3=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed3=data.frame(TESTNUMB$O3Q1, TESTNUMB$O3Q2))

```

---

AVERSE

*Calculate average relative squared error (aRSE)*


---

**Description**

Calculates average relative squared error (aRSE) for one or more surveys

**Usage**

```
AVERRSE(Actuals1 = data.frame(), Observed1 = data.frame(), ...)
```

**Arguments**

Actuals1	= data from a "gold standard" survey; objects are variable columns from "gold standard" survey that correspond to variable columns Observed1
Observed1	= data from survey 1; objects are variable columns from survey 1 that correspond to variable columns from Actuals1
...	= "gold standard" data/survey # data for additional surveys

**Details**

aRSE for survey # => mean value of the RSEs for specified variables in survey # => mean value of RSEs for objects in Observed#=data.frame()

**Value**

Average relative squared error (aRSE)

**Note**

Make sure to properly order inputs, per the example: Actuals1=data.frame() objects and corresponding Observed1=data.frame() objects must be given in the same order as each other; and ... must be given in numbered pairs of Actuals#, Observed#, and those pairs given in sequence of their #s.

**Examples**

```

AVERSE(Actuals1=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed1=data.frame(TESTNUMB$O1Q1, TESTNUMB$O1Q2),
Actuals2=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed2=data.frame(TESTNUMB$O2Q1, TESTNUMB$O2Q2),
Actuals3=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed3=data.frame(TESTNUMB$O3Q1, TESTNUMB$O3Q2))

```

---

AVESMAPE	<i>Calculate average symmetric mean absolute percentage error (aSMAPE)</i>
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---

**Description**

Calculates average symmetric mean absolute percentage error (aSMAPE) for one or more surveys

**Usage**

```
AVESMAPE(Actuals1 = data.frame(), Observed1 = data.frame(), ...)
```

**Arguments**

Actuals1	= data from a "gold standard" survey; objects are variable columns from "gold standard" survey that correspond to variable columns Observed1
Observed1	= data from survey 1; objects are variable columns from survey 1 that correspond to variable columns from Actuals1
...	= "gold standard" data/survey # data for additional surveys

**Details**

aSMAPE for survey # => mean value of the SMAPEs for specified variables in survey # => mean value of SMAPEs for objects in Observed#=data.frame()

**Value**

Average symmetric mean absolute percentage error (aSMAPE)

**Note**

Make sure to properly order inputs, per the example: Actuals1=data.frame() objects and corresponding Observed1=data.frame() objects must be given in the same order as each other; and ... must be given in numbered pairs of Actuals#, Observed#, and those pairs given in sequence of their #s.

**Examples**

```
AVESMAPE(Actuals1=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed1=data.frame(TESTNUMB$O1Q1, TESTNUMB$O1Q2),
Actuals2=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed2=data.frame(TESTNUMB$O2Q1, TESTNUMB$O2Q2),
Actuals3=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed3=data.frame(TESTNUMB$O3Q1, TESTNUMB$O3Q2))
```

---

FULLSD

---

*Calculate full scale-dependent statistics*


---

**Description**

Calculates full scale-dependent statistics for one or more surveys

**Usage**

```
FULLSD(Actuals1 = data.frame(), Observed1 = data.frame(), ...)
```

**Arguments**

Actuals1	= data from a "gold standard" survey; objects are variable columns from "gold standard" survey that correspond to variable columns Observed1
Observed1	= data from survey 1; objects are variable columns from survey 1 that correspond to variable columns from Actuals1
...	= "gold standard" data/survey # data for additional surveys

**Value**

Full scale-dependent statistics

**Note**

Make sure to properly order inputs, per the example: Actuals1=data.frame() objects and corresponding Observed1=data.frame() objects must be given in the same order as each other; and ... must be given in numbered pairs of Actuals#, Observed#, and those pairs given in sequence of their #s.

**Examples**

```
FULLSD(Actuals1=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed1=data.frame(TESTNUMB$O1Q1, TESTNUMB$O1Q2),
Actuals2=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed2=data.frame(TESTNUMB$O2Q1, TESTNUMB$O2Q2),
Actuals3=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),
Observed3=data.frame(TESTNUMB$O3Q1, TESTNUMB$O3Q2))
```

---

FULLSI	<i>Calculate full scale-independent statistics</i>
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---

**Description**

Calculates full scale-independent statistics for one or more surveys

**Usage**

```
FULLSI(Actuals1 = data.frame(), Observed1 = data.frame(), ...)
```

**Arguments**

Actuals1	= data from a "gold standard" survey; objects are variable columns from "gold standard" survey that correspond to variable columns Observed1
Observed1	= data from survey 1; objects are variable columns from survey 1 that correspond to variable columns from Actuals1
...	= "gold standard" data/survey # data for additional surveys

**Value**

Full scale-independent statistics

**Note**

Make sure to properly order inputs, per the example: Actuals1=data.frame() objects and corresponding Observed1=data.frame() objects must be given in the same order as each other; and ... must be given in numbered pairs of Actuals#, Observed#, and those pairs given in sequence of their #s.

**Examples**

```
FULLSI(Actuals1=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),  
Observed1=data.frame(TESTNUMB$O1Q1, TESTNUMB$O1Q2),  
Actuals2=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),  
Observed2=data.frame(TESTNUMB$O2Q1, TESTNUMB$O2Q2),  
Actuals3=data.frame(TESTNUMB$AQ1, TESTNUMB$AQ2),  
Observed3=data.frame(TESTNUMB$O3Q1, TESTNUMB$O3Q2))
```

---

TESTNUMB	<i>A data set created by merging four smaller data sets. Three of those smaller data sets are data from three surveys (O1, O2, O3); the other is data from a "gold standard" survey (A1). All four smaller data sets consist of the same three variables (Q1, Q2, Q3): responses to the same three questions, asked by each survey from the same 10 respondents (ID), along the same 1-99 response scale.</i>
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---

### Description

A data set created by merging four smaller data sets. Three of those smaller data sets are data from three surveys (O1, O2, O3); the other is data from a "gold standard" survey (A1). All four smaller data sets consist of the same three variables (Q1, Q2, Q3): responses to the same three questions, asked by each survey from the same 10 respondents (ID), along the same 1-99 response scale.

### Usage

TESTNUMB

### Format

A data frame with 10 rows and 13 variables

**ID, AQ1, AQ2, AQ3, O1Q1, O1Q2, O1Q3, O2Q1, O2Q2, O2Q3, O3Q1, O3Q2, O3Q3** sets of three variables from each of four surveys, merged together

### Source

Example data generated by author

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