### Package ‘npsr’

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**Version** 0.1.1  
**Type** Package  
**Title** Validate Instrumental Variables using NPS  
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**Description** An R implementation of the Necessary and Probably Sufficient (NPS) test for finding valid instrumental variables, as suggested by Amit Sharma (2016, Working Paper) <http://amitsharma.in/pubs/necessary_probably_sufficient_iv_test.pdf>. The NPS test, compares the likelihood that a given set of observational data of the three variables Z, X and Y is generated by a valid instrumental variable model (Z -> X -> Y) to the likelihood that the data is generated by an invalid IV model.

**License** GPL-2  
**Encoding** UTF-8  
**LazyData** true  


**Imports** infotheo, MASS, gmp  

**RoxygenNote** 6.0.1  

**NeedsCompilation** no  

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**Repository** CRAN  

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M_air M_air_excl

Description
Calculates the marginal likelihood M_air

Usage
M_air(Q, l, m, n)

Arguments
Q Histogram of dataset (l*m*n vector)
l |Z|
m |X|
n |Y|

Value
The probability that the observations were created from a model which violates the as-if-randomness criterion but not the exclusion criterion

M_air_excl m_air

Description
Calculates the marginal likelihood M_air_excl

Usage
M_air_excl(Q, l, m, n)

Arguments
Q Histogram of dataset (l*m*n vector)
l |Z|
m |X|
n |Y|
Value

The probability that the observations were created from a model which violates the as-if-randomness criterion but not the exclusion criterion

\[ M_{\text{excl}} \]

Description

Calculates the marginal likelihood of \( M_{\text{excl}} \)

Usage

\[ M_{\text{excl}}(Q, l, m, n, N = \text{sum}(Q), S = \text{sum}(Q)) \]

Arguments

- **Q**: Histogram of dataset (\( l \times m \times n \) vector)
- **l**: \(|Z|\)
- **m**: \(|X|\)
- **n**: \(|Y|\)
- **N**: Number of Repetitions for Nested Sampling
- **S**: Number of Starting Points for Nested Sampling

Value

The probability that the observations were created from a model which violates the exclusion criterion but not the as-if-randomness criterion

\[ \text{nps.invalid} \]

Description

Calculates the ML_Invalid

Usage

\[ \text{nps.invalid}(Q, l, m, n, N = \text{sum}(Q), S = \text{sum}(Q)) \]
Arguments

<table>
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<th>Q</th>
<th>List of unique observations, should be l<em>m</em>n length</th>
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<tbody>
<tr>
<td>l</td>
<td></td>
</tr>
<tr>
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<td></td>
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<tr>
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<td></td>
</tr>
<tr>
<td>N</td>
<td>Number of Repetitions for Nested Sampling</td>
</tr>
<tr>
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**Description**

Tests the instrumental constraints on the given dataframe using entropy

**Usage**

```r
nps.necessary(df)
```

**Arguments**

- **df**: Dataframe with z, x and y

**Value**

FALSE if the data violates the constraints otherwise TRUE

**nps.test**

*Main function of the package.*

**Description**

Main function of the package.

**Usage**

```r
nps.test(df, l, m, n, N, S)
```

**Arguments**

- **df**: Dataframe with columns z,x and y
- **l**: Number of bins used to discretize Z
- **m**: Number of bins used to discretize X
- **n**: Number of bins used to discretize Y
- **N**: Number of Repetitions for Nested Sampling
- **S**: Number of Starting Points for Nested Sampling
**nps.valid**

**Value**

result object of the test including the fields: nt, valid, invalid, ratio

**Examples**

```r
nps.test(data.frame(x = runif(3), y = runif(3), z = runif(3)), 2, 2, 2, 3, 3)
```

**Description**

Calculates M_Valid

**Usage**

```r
nps.valid(Q, l, m, n, N = sum(Q), S = sum(Q))
```

**Arguments**

- **Q**
  - Histogram of dataset (|Z|*|X|*|Y| vector)
- **l**
  - |Z|
- **m**
  - |X|
- **n**
  - |Y|
- **N**
  - Number of Repetitions for Nested Sampling
- **S**
  - Number of Starting Points for Nested Sampling

**product_fraction**

Reduces out factors of fraction of products and calculates the fraction Analog to prod(num)/prod(den)

**Description**

Reduces out factors of fraction of products and calculates the fraction Analog to prod(num)/prod(den)

**Usage**

```r
product_fraction(num, den)
```

**Arguments**

- **num**
  - vector of factors of the numerator
- **den**
  - vector of factors of the denominator
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