

Package ‘REREFACT’

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Title Reordering and/or Reflecting Factors for Simulation Studies with
Exploratory Factor Analysis

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Description Executes a post-rotation algorithm that REorders and/or Reflects FAC-
Tors (REREFACT) for each replication of a simulation study with exploratory factor analysis.

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REREFACT-package	<i>A post-rotation algorithm that REorders and/or REflects FACTors for each replication of a simulation study with exploratory factor analysis</i>
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Description

The REREFACT package is an open source package for R (R Development Core Team, 2015), which provides user-defined functions for accessing a post-rotation algorithm that REorders and/or REflects FACTors for each replication of a simulation study with exploratory factor analysis.

Details

The purpose of REREFACT is to provide a general algorithm written in freely available software, R, dedicated to addressing the possibility that a non-uniform order and/or sign pattern of the factors may be observed across replications of a simulation study with exploratory factor analysis. The algorithm implemented in REREFACT proceeds in four steps. Step 1 determines the total number of equivalent forms, I , of the vector of factors, η . Step 2 indexes, $i=1,2,\dots, I$, each equivalent form of η (i.e., η_{i}) via a unique permutation matrix, P (i.e., P_{i}). Step 3 determines which η_{i} each replication follows. Step 4 uses the appropriate P_{i} to reorder and/or re-sign parameter estimates within each replication so that all replications uniformly follow the order and sign pattern defined by the population values. REREFACT is important because simulation studies that combine parameter estimates across replications where the factors do not uniformly follow the order and/or sign pattern defined by the population values may yield misleading results for outcomes commonly of interest in these studies.

Author(s)

Soyeon Ahn, Cengiz Zopluoglu, Seniz Celimli, Min Lu, & Nicholas D. Myers; Maintainer: Soyeon Ahn <s.ahn@miami.edu>

References

Myers, N. D., Ahn, S., Lu, M., Celimli, S., Zopluoglu, C. (2016). REREFACT: An R package for re-ordering and reflecting factors for simulation studies with Exploratory Factor Analysis. Manuscript submitted for publication.

See Also

[rerefact](#), [correct_alpha](#), [correct_beta](#), [correct_lambda](#), [correct_psi](#), [correct_gamma](#)

correct_alpha	<i>Re-orders and/or re-signs as needed within the estimated intercept or mean vector for each replication</i>
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Description

The correct_alpha function accomplishes Step 4 of the algorithm with regard to replications of the estimated intercept or mean vector. More specifically, the correct_alpha function re-orders and/or re-signs as needed within the estimated intercept or mean vector for each replication so that all replications uniformly follow the order and sign pattern defined by the population values.

Usage

```
correct_alpha(P_data, rep, n.eta, sample_alpha)
```

Arguments

P_data	a list containing the correct permutation matrix, P _i , for each replication.
rep	the number of replications.
n.eta	the total number of latent variables within eta.
sample_alpha	a list containing replications of the estimated intercept or mean vector.

Details

The correct_alpha function uses P to re-order and/or re-sign as needed within the estimated intercept or mean vector for each replication of a simulation study with exploratory factor analysis. This function returns a list, correct_alpha, of the re-ordered and/or re-signed estimated intercept or mean vector for each replication and saves the list as a text file to the designated working directory.

Author(s)

Soyeon Ahn, Cengiz Zopluoglu, Seniz Celimli, Min Lu, & Nicholas D. Myers

References

Myers, N. D., Ahn, S., Lu, M., Celimli, S., Zopluoglu, C. (2016). REREFAC: An R package for re-ordering and reflecting factors for simulation studies with Exploratory Factor Analysis. Manuscript submitted for publication.

See Also

[rerefact](#), [correct_beta](#), [correct_lambda](#), [correct_psi](#), [correct_gamma](#)

Examples

```
# Load the P for Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

data(P_esem)

# Load 200 replications of the estimated intercept or mean vector provided by replication
# numbers 1 through 100 and 4701 through 4800 in Example 2 from
# Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

data(sample_alpha_esem)

# Specify the following arguments within the correct_alpha function for Example 2 from
# Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

correct_alpha(P_data=P_esem, rep=200, n.eta=4, sample_alpha=sample_alpha_esem)
```

correct_beta	<i>Re-orders and/or re-signs as needed within the estimated eta on eta regression coefficient matrix for each replication</i>
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Description

The correct_beta function accomplishes Step 4 of the algorithm with regard to replications of the estimated eta on eta regression coefficient matrix. More specifically, the correct_beta function re-orders and/or re-signs as needed within the estimated eta on eta regression coefficient matrix for each replication of a simulation study with exploratory factor analysis.

Usage

```
correct_beta(P_data, rep, n.eta, sample_beta)
```

Arguments

P_data	a list containing the correct permutation matrix, P _i , for each replication.
rep	the number of replications.
n.eta	the total number of latent variables within eta.
sample_beta	a list containing replications of the estimated eta on eta regression coefficient matrix.

Details

The correct_beta function uses P to re-order and/or re-sign as needed within the estimated eta on eta regression coefficient matrix for each replication of a simulation study with exploratory factor analysis. This function returns a list, correct_beta, of the re-ordered and/or re-signed estimated eta on eta regression coefficient matrix for each replication and saves the list as a text file to the designated working directory.

Author(s)

Soyeon Ahn, Cengiz Zopluoglu, Seniz Celimli, Min Lu, & Nicholas D. Myers

References

Myers, N. D., Ahn, S., Lu, M., Celimli, S., Zopluoglu, C. (2016). REREFAC: An R package for re-ordering and reflecting factors for simulation studies with Exploratory Factor Analysis. Manuscript submitted for publication.

See Also

[rerefact](#), [correct_alpha](#), [correct_gamma](#), [correct_lambda](#), [correct_psi](#)

Examples

```
# Load the P for Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

data(P_esem)

# Load 200 replications of the estimated eta on eta regression
# coefficient matrix provided by replication numbers 1 through
# 100 and 4701 through 4800 in Example 2 from
# Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

data(sample_beta_esem)

# Specify the following arguments within the correct_beta function for Example 2 from
# Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

correct_beta(P_data=P_esem, rep=200, n.eta=4, sample_beta=sample_beta_esem)
```

correct_gamma	<i>Re-orders and/or re-signs as needed within the estimated eta on x regression coefficient matrix for each replication</i>
---------------	---

Description

The correct_gamma function accomplishes Step 4 of the algorithm with regard to replications of the estimated eta on x regression coefficient matrix. More specifically, the correct_gamma function re-orders and/or re-signs as needed within the estimated eta on x regression coefficient matrix for each replication of a simulation study with exploratory factor analysis.

Usage

```
correct_gamma(P_data, rep, n.eta, sample_gamma)
```

Arguments

P_data	a list containing the correct permutation matrix, P _i , for each replication.
rep	the number of replications.
n.eta	the total number of latent variables within eta.
sample_gamma	a list containing replications of the estimated eta on eta regression coefficient matrix.

Details

The correct_gamma function uses P to re-order and/or re-sign as needed within the estimated eta on x regression coefficient matrix for each replication of a simulation study with exploratory factor analysis. This function returns a list, correct_gamma, of the re-ordered and/or re-signed estimated eta on x regression coefficient matrix for each replication and saves the list as a text file to the designated working directory.

Author(s)

Soyeon Ahn, Cengiz Zopluoglu, Seniz Celimli, Min Lu, & Nicholas D. Myers

References

Myers, N. D., Ahn, S., Lu, M., Celimli, S., Zopluoglu, C. (2016). REREFAC: An R package for re-ordering and reflecting factors for simulation studies with Exploratory Factor Analysis. Manuscript submitted for publication.

See Also

[rerefact](#), [correct_alpha](#), [correct_beta](#), [correct_lambda](#), [correct_psi](#)

Examples

```
# Load the P for Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

data(P_esem)

# Load 200 replications of the estimated eta on x regression
# coefficient matrix provided by replication
# numbers 1 through 100 and 4701 through 4800 in Example 2 from
# Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

data(sample_gamma_esem)

# Specify the following arguments within the correct_gamma function for Example 2 from
# Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

correct_gamma(P_data=P_esem, rep=200, n.eta=4, sample_gamma=sample_gamma_esem)
```

correct_lambda	<i>Re-orders and/or re-signs as needed within the estimated pattern coefficient matrix for each replication</i>
----------------	---

Description

The correct_lambda function accomplishes Step 4 of the algorithm with regard to replications of the estimated pattern coefficient matrix. More specifically, the correct_lambda function re-orders and/or re-signs as needed within the estimated pattern coefficient matrix for each replication of a simulation study with exploratory factor analysis.

Usage

```
correct_lambda(P_data, rep, n.eta, sample_lambda)
```

Arguments

P_data	a list containing the correct permutation matrix, P _i , for each replication.
rep	the number of replications.
n.eta	the total number of latent variables within eta.
sample_lambda	a list containing replications of the estimated pattern coefficient matrix.

Details

The correct_lambda function uses P to re-order and/or re-sign as needed within the estimated pattern coefficient matrix for each replication of a simulation study with exploratory factor analysis. This function returns a list, correct_lambda, of the re-ordered and/or re-signed estimated pattern coefficient matrix for each replication and saves the list as a text file to the designated working directory.

Author(s)

Soyeon Ahn, Cengiz Zopluoglu, Seniz Celimli, Min Lu, & Nicholas D. Myers

References

Myers, N. D., Ahn, S., Lu, M., Celimli, S., Zopluoglu, C. (2016). REREFAC: An R package for re-ordering and reflecting factors for simulation studies with Exploratory Factor Analysis. Manuscript submitted for publication.

See Also

[rerefact](#), [correct_alpha](#), [correct_beta](#), [correct_gamma](#), [correct_psi](#)

Examples

```
# Load the P for Example 1 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

data(P_efa)

# Load 200 replications of the estimated pattern coefficient matrix provided by replication
# numbers 1 through 100 and 4701 through 4800 in Example 1 from
# Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

data(sample_lambda_efa)

# Specify the following arguments within the correct_lambda function for Example 1 from
# Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

correct_lambda(P_data=P_efa, rep=200, n.eta=3, sample_lambda=sample_lambda_efa)

# Load the P for Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

data(P_esem)

# Load 200 replications of the estimated pattern coefficient matrix provided by replication
# numbers 1 through 100 and 4701 through 4800 in Example 2 from
# Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

data(sample_lambda_esem)

# Specify the following arguments within the correct_lambda function for Example 2 from
# Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

correct_lambda(P_data=P_esem, rep=200, n.eta=4, sample_lambda=sample_lambda_esem)
```

correct_psi	<i>Re-orders and/or re-signs as needed within the estimated covariance matrix for the vector of residuals for eta for each replication</i>
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Description

The `correct_psi` function accomplishes Step 4 of the algorithm with regard to replications of the estimated covariance matrix for the vector of residuals for η . More specifically, the `correct_psi` function re-orders and/or re-signs as needed within the estimated covariance matrix for the vector of residuals for η for each replication of a simulation study with exploratory factor analysis.

Usage

```
correct_psi(P_data, rep, n.eta, sample_psi)
```


Arguments

P_data	a list containing the correct permutation matrix, P _i , for each replication.
rep	the number of replications.
n.eta	the total number of latent variables within eta.
sample_psi	a list containing replications of the estimated covariance matrix for the vector of residuals for eta.

Details

The correct_psi function uses P to re-order and/or re-sign as needed within the estimated covariance matrix for the vector of residuals for eta for each replication of a simulation study with exploratory factor analysis. This function returns a list, correct_psi, of the re-ordered and/or re-signed estimated covariance matrix for the vector of residuals for eta for each replication and saves the list as a text file to the designated working directory.

Author(s)

Soyeon Ahn, Cengiz Zopluoglu, Seniz Celimli, Min Lu, & Nicholas D. Myers

References

Myers, N. D., Ahn, S., Lu, M., Celimli, S., Zopluoglu, C. (2016). REREFAC: An R package for re-ordering and reflecting factors for simulation studies with Exploratory Factor Analysis. Manuscript submitted for publication.

See Also

[rerefact](#), [correct_alpha](#), [correct_beta](#), [correct_lambda](#), [correct_gamma](#)

Examples

```
# Load the P for Example 1 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

data(P_efa)

# Load 200 replications of the estimated covariance matrix
# for the vector of residuals for eta provided by
# replication numbers 1 through 100 and 4701 through 4800 in Example 1 from
# Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

data(sample_psi_efa)

# Specify the following arguments within the correct_psi function for Example 1 from
# Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

correct_psi(P_data=P_efa, rep=200, n.eta=3, sample_psi=sample_psi_efa)

# Load the P for Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

data(P_esem)
```

```

# Load 200 replications of the estimated covariance matrix
# for the vector of residuals for eta provided by
# replication numbers 1 through 100 and 4701 through 4800 in Example 2 from
# Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

data(sample_psi_ese)

# Specify the following arguments within the correct_psi function for Example 2 from
# Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

correct_psi(P_data=P_ese, rep=200,n.eta=4, sample_psi=sample_psi_ese)

```

pop_L_efa	<i>The population pattern coefficient matrix</i>
-----------	--

Description

The population pattern coefficient matrix in Example 1 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

Usage

```
data(pop_L_efa)
```

Format

This dataset contains the population 10×3 pattern coefficient matrix in Example 1 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

pop_L_ese	<i>The population pattern coefficient matrix</i>
-----------	--

Description

The population pattern coefficient matrix in Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

Usage

```
data(pop_L_ese)
```

Format

This text file contains the population 11×4 pattern coefficient matrix in Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

P_efa

The correct permutation matrix, P_i, for each replication

Description

A list containing 200 correct P_i to re-order and/or re-sign as needed within the relevant parameter estimates provided by replication numbers 1 through 100 and 4701 through 4800 in Example 1 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

Usage

data(P_efa)

Format

This dataset contains a list containing 200 correct 3*3 P_i to re-order and/or re-sign as needed within the relevant parameter estimates provided by replication numbers 1 through 100 and 4701 through 4800 in Example 1 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

P_esem

The correct permutation matrix, P_i, for each replication

Description

A list containing 200 correct P_i to re-order and/or re-sign as needed within the relevant parameter estimates provided by replication numbers 1 through 100 and 4701 through 4800 in Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

Usage

data(P_esem)

Format

This dataset contains a list containing 200 correct 4*4 P_i to re-order and/or re-sign as needed within the relevant parameter estimates provided by replication numbers 1 through 100 and 4701 through 4800 in Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

rerefact	<i>Identifies an appropriate permutation matrix for each replication</i>
----------	--

Description

The rerefact function accomplishes Step 1 thru Step 3 of the algorithm and creates the P that is used in the correct_alpha, correct_beta, correct_gamma, correct_lambda and correct_psi functions to accomplish Step 4 of the algorithm.

Usage

```
rerefact(n.factor, n.eta, n.var, pop_lambda, sample_lambda)
```

Arguments

n.factor	the number of latent variables within eta that may be affected by indeterminacies within eta.
n.eta	the total number of latent variables within eta.
n.var	the number of observed endogenous variables with regard to n.factor.
pop_lambda	the population pattern coefficient matrix.
sample_lambda	a list containing replications of the estimated pattern coefficient matrix.

Details

The rerefact function accomplishes Step 1 thru Step 3 of the algorithm. Step 1 determines the total number of equivalent forms of eta that can result from indeterminacies within eta (i.e., I) and provides the result with the n.perm value. Step 2 indexes, $i=1,2,\dots, I$, each equivalent form of eta (i.e., eta_i) via a unique permutation matrix, P (i.e., P_i) and provides the result with the permutation value. Step 3 determines which eta_i each replication follows and provides the result with the correct.permutation value. At the conclusion of Step 3 P is automatically returned and saved as a text file to the designated working directory.

Value

n.perm	the total number of equivalent forms of eta that can result from indeterminacies within eta (i.e., I) and provides the result for Step 1 of the algorithm.
permutation	a matrix that indexes within I via a unique, orthogonal permutation matrix for each equivalent form of eta and provides the result for Step 2 of the algorithm.
correct.permutation	a matrix that provides the specific equivalent form of eta (within the set indexed in Step 2) that each replication follows and provides the result for Step 3 of the algorithm.
replication.permutation	a table that provides the specific equivalent form of eta (within the set indexed in Step 2) that each replication follows.

summary.permutation

a table that provides a count of the number of replications observed within each specific equivalent form of eta (within the set indexed in Step 2).

Author(s)

Soyeon Ahn, Cengiz Zopluoglu, Seniz Celimli, Min Lu, & Nicholas D. Myers

References

Myers, N. D., Ahn, S., Lu, M., Celimli, S., Zopluoglu, C. (2016). REREFAC: An R package for re-ordering and reflecting factors for simulation studies with Exploratory Factor Analysis. Manuscript submitted for publication.

See Also

[correct_alpha](#), [correct_beta](#), [correct_lambda](#), [correct_psi](#), [correct_gamma](#)

Examples

```
# Dependent packages

require(Matrix)
require(psych)
require(gdata)
require(combinat)

# Load the population pattern coefficient matrix for Example 1 from
# Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

data(pop_L_efa)

# Load 200 replications of the estimated pattern coefficient matrix provided by
# replication numbers 1 through 100 and 4701 through 4800
# in Example 1 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

data(sample_lambda_efa)

# Specify the following arguments within the rerefact function for Example 1 from
# Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

rerefact(n.factor=3, n.eta=3, n.var=10, pop_lambda=pop_L_efa, sample_lambda=sample_lambda_efa)

# Load the population pattern coefficient matrix for Example 2 from
# Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

data(pop_L_esem)

# Load 200 replications of the estimated pattern coefficient matrix provided by
# replication numbers 1 through 100 and 4701 through 4800
# in Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).
```

```
data(sample_lambda_esem)
rerefact(n.factor=3, n.eta=4, n.var=10, pop_lambda=pop_L_esem, sample_lambda=sample_lambda_esem)
```

sample_alpha_esem	<i>Replications of the estimated intercept or mean vector</i>
-------------------	---

Description

A list containing 200 replications of the estimated intercept or mean vector provided by replication numbers 1 through 100 and 4701 through 4800 in Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

Usage

```
data(sample_alpha_esem)
```

Format

This dataset is a list that contains 200 replications of the estimated 4×1 intercept or mean vector provided by replication numbers 1 through 100 and 4701 through 4800 in Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

sample_beta_esem	<i>Replications of the estimated eta on eta regression coefficient matrix</i>
------------------	---

Description

A list containing 200 replications of the estimated eta on eta regression coefficient matrix provided by replication numbers 1 through 100 and 4701 through 4800 in Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

Usage

```
data(sample_beta_esem)
```

Format

This dataset is a list that contains 200 replications of the estimated 4×4 eta on eta regression coefficient matrix provided by replication numbers 1 through 100 and 4701 through 4800 in Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

sample_gamma_esem	<i>Replications of the estimated eta on x regression coefficient matrix</i>
-------------------	---

Description

A list containing 200 replications of the estimated eta on x regression coefficient matrix provided by replication numbers 1 through 100 and 4701 through 4800 in Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

Usage

```
data(sample_gamma_esem)
```

Format

This dataset is a list that contains 200 replications of the estimated 4×1 eta on x regression coefficient matrix provided by replication numbers 1 through 100 and 4701 through 4800 in Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

sample_lambda_efa	<i>Replications of the estimated pattern coefficient matrix</i>
-------------------	---

Description

A list containing 200 replications of the estimated pattern coefficient matrix provided by replication numbers 1 through 100 and 4701 through 4800 in Example 1 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

Usage

```
data(sample_lambda_efa)
```

Format

This dataset is a list that contains 200 replications of the estimated 10×3 pattern coefficient matrix provided by replication numbers 1 through 100 and 4701 through 4800 in Example 1 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

sample_lambda_esem	<i>Replications of the estimated pattern coefficient matrix</i>
--------------------	---

Description

A list containing 200 replications of the estimated pattern coefficient matrix provided by replication numbers 1 through 100 and 4701 through 4800 in Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

Usage

```
data(sample_lambda_esem)
```

Format

This dataset is a list that contains 200 replications of the estimated 11×4 pattern coefficient matrix provided by replication numbers 1 through 100 and 4701 through 4800 in Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

sample_psi_efa	<i>Replications of the estimated covariance matrix for the vector of residuals for eta</i>
----------------	--

Description

A list containing 200 replications of the estimated covariance matrix for the vector of residuals for eta provided by replication numbers 1 through 100 and 4701 through 4800 in Example 1 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

Usage

```
data(sample_psi_efa)
```

Format

This dataset is a list that contains 200 replications of the estimated 3×3 covariance matrix for the vector of residuals for eta provided by replication numbers 1 through 100 and 4701 through 4800 in Example 1 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

sample_psi_esem	<i>Replications of the estimated covariance matrix for the vector of residuals for eta</i>
-----------------	--

Description

A list containing 200 replications of the estimated covariance matrix for the vector of residuals for eta provided by replication numbers 1 through 100 and 4701 through 4800 in Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

Usage

```
data(sample_psi_esem)
```

Format

This dataset is a list that contains 200 replications of the estimated 4*4 covariance matrix for the vector of residuals for eta provided by replication numbers 1 through 100 and 4701 through 4800 in Example 2 from Myers, Ahn, Lu, Celimli, and Zopluoglu (2016).

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