invorder( ) — Permutation vector manipulation

**Description**

invorder( p ) returns the permutation vector that undoes the permutation performed by p.

revorder( p ) returns the permutation vector that is the reverse of the permutation performed by p.

**Syntax**

```
real vector invorder(real vector p)
real vector revorder(real vector p)
```

where p is assumed to be a permutation vector.

**Remarks and examples**

See [M-1] Permutation for a description of permutation vectors. To summarize,

1. Permutation vectors p are used to permute the rows or columns of a matrix X: r × c.
   
   If p is intended to permute the rows of X, the permuted X is obtained via Y = X[ p, . ].
   
   If p is intended to permute the columns of X, the permuted X is obtained via
   Y = X[ ., p ].

2. If p is intended to permute the rows of X, it is called a row-permutation vector. Row-
   permutation vectors are r × 1 column vectors.

3. If p is intended to permute the columns of X, it is called a column-permutation vector.
   Column-permutation vectors are 1 × c row vectors.

4. Row-permutation vectors contain a permutation of the integers 1 to r.

5. Column-permutation vectors contain a permutation of the integers 1 to c.

Let us assume that p is a row-permutation vector, so that

Y = X[ p, . ]

invorder( p ) returns the row-permutation vector that undoes p:

X = Y[ invorder( p ), . ]
That is, using the matrix notation of [M-1] Permutation,

\[ Y = PX \quad \text{implies} \quad X = P^{-1}Y \]

If \( p \) is the permutation vector corresponding to permutation matrix \( P \), \text{invorder}(p)\) is the permutation vector corresponding to permutation matrix \( P^{-1} \).

\text{revorder}(p)\) returns the permutation vector that reverses the order of \( p \). For instance, say that row-permutation vector \( p \) permutes the rows of \( X \) so that the diagonal elements are in ascending order. Then \text{revorder}(p)\) would permute the rows of \( X \) so that the diagonal elements would be in descending order.

**Conformability**

\text{invorder}(p), \text{revorder}(p):

\[ p: \quad r \times 1 \quad \text{or} \quad 1 \times c \]

\[ \text{result}: \quad r \times 1 \quad \text{or} \quad 1 \times c \]

**Diagnostics**

\text{invorder}(p)\) and \text{revorder}(p)\) can abort with error or can produce meaningless results when \( p \) is not a permutation vector.

**Also see**

[M-1] Permutation — An aside on permutation matrices and vectors