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

```stata
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:

\[ X = Y[\text{invorder}(p), .] \]
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 \( P \), \texttt{invorder}(p) is the permutation vector corresponding to permutation matrix \( P^{-1} \).

\texttt{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 \texttt{revorder}(p) would permute the rows of \( X \) so that the diagonal elements would be in descending order.

### Conformability

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

- \( p \): \( r \times 1 \) or \( 1 \times c \)
- \texttt{result}: \( r \times 1 \) or \( 1 \times c \)

### Diagnostics

\texttt{invorder}(p) and \texttt{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  