**vec() — Stack matrix columns**

### Description

vec($T$) returns $T$ transformed into a column vector with one column stacked onto the next.

vech($T$) returns square and typically symmetric matrix $T$ transformed into a column vector; only the lower half of the matrix is recorded.

invvech($v$) returns vech()-style column vector $v$ transformed into a symmetric (Hermitian) matrix.

### Syntax

```
transmorphic colvector vec(transmorphic matrix $T$)
transmorphic colvector vech(transmorphic matrix $T$)
transmorphic matrix invvech(transmorphic colvector $v$)
```

### Remarks and examples

Remarks are presented under the following headings:

- **Example of vec()**
- **Example of vech() and invvec()**

#### Example of vec()

```
x  
1  2  3
1 1  2  3
2 4  5  6

: vec(x)
     
1
1
2
3
4
5
6
```
Example of vech() and invvech()

```matlab
: x
  [symmetric]
   1  2  3
   1 1  
   2 2 4
   3 3 6 9

: v = vech(x)
: v
   1
   1 1
   2
   3 3
   4 4
   5 6
   6 9

: invvech(v)
  [symmetric]
   1  2  3
   1 1  
   2 2 4
   3 3 6 9
```

Conformability

vec(T):

- \( T: r \times c \)
- \( \text{result: } r \times c \times 1 \)

vech(T):

- \( T: n \times n \)
- \( \text{result: } (n(n + 1)/2 \times 1) \)

invvech(v):

- \( v: (n(n + 1)/2 \times 1) \)
- \( \text{result: } n \times n \)

Diagnostics

vec(T) cannot fail.

vech(T) aborts with error if \( T \) is not square. vech() records only the lower triangle of \( T \); it does not require \( T \) be symmetric.

invvech(v) aborts with error if \( v \) does not have 0, 1, 3, 6, 10, \ldots rows.
Also see