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Stata tip 37: And the last shall be first

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Mata's built-in function list contains many useful matrix operations, but I recently came upon one that was lacking: the ability to *flip* a matrix along its rows or columns. Either of those operations can readily be done as a Mata statement, but I'd rather not remember the syntax—or have to remember what it is meant to do when I reread the code. So I wrote these two simple functions:¹

```
mata:
matrix function flipud(matrix X) {
    return(rows(X)>1 ? X[rows(X)..1,.] : X)
}

matrix function fliplr(matrix X) {
    return(cols(X)>1 ? X[.,cols(X)..1] : X)
}
end
```

These functions will flip a matrix **ud**—upside down (the first row becomes the last)—or **lr**, left to right (the first column becomes the last). Because the functions take a **matrix** argument, they may be applied to any of Mata's matrix types, including **string** matrices.

Users have asked why one would want to flip a matrix “upside down”. As it happens, doing so becomes a handy tool when creating a two-sided linear filter. Say that we have defined a vector **x**, containing a declining set of weights: a one-sided linear filter. We can turn **x** into a two-sided set of weights by using **flipud()**:

```
. mata:
_____ mata (type end to exit) _____
: x = (1\0.5\0.25\0.125\0.0625) ; x
      1
      1
1      .5
2      .25
3      .125
4      .0625
5
```

1	1
2	.5
3	.25
4	.125
5	.0625

1. I thank Mata's principal architect, William Gould, for improvements he suggested that make the code more general.

```
: x = (flipud(x[2..rows(x)] \ x); x
1
```

1	.0625
2	.125
3	.25
4	.5
5	1
6	.5
7	.25
8	.125
9	.0625

```
: end
```

To decipher that statement, note that `2..rows(x)` refers to the second through last rows of vector `x`. The statement thus flips those rows of `x` upside down and concatenates them to the original `x` by using the *column-join* operator (see [M-2] **op_join**).

As a second example, consider applying both functions to a string matrix:

```
. mata:
```

```
_____ mata (type end to exit) _____
: Greek2me = ("alpha","beta","gamma"\ "delta","epsilon","zeta"\ "eta","theta",
> "iota"\ "kappa","lambda","mu"\ "nu","xi","omicron"\ "pi",
> "rho","sigma"\ "tau","upsilon","phi"\ "chi","psi","omega")
: Greek2me
```

	1	2	3
1	alpha	beta	gamma
2	delta	epsilon	zeta
3	eta	theta	iota
4	kappa	lambda	mu
5	nu	xi	omicron
6	pi	rho	sigma
7	tau	upsilon	phi
8	chi	psi	omega

```
: lastFirst = fliplr(flipud(Greek2me)); lastFirst
1 2 3
```

1	omega	psi	chi
2	phi	upsilon	tau
3	sigma	rho	pi
4	omicron	xi	nu
5	mu	lambda	kappa
6	iota	theta	eta
7	zeta	epsilon	delta
8	gamma	beta	alpha

```
: end
```
