FFY_TAUCHEN AR1 Shock Discretization Example

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This is the example vignette for function: **ffy_tauchen** from the **MEconTools Package.** : See also the **ffy_rouwenhorst** function from the **MEconTools Package.** This function discretize a mean zero AR1 process, uses Tauchen (1986). See AR 1 Example for some details on how the AR1 process works. And See Kopecky and Suen (2010).

Test FFY_TAUCHEN Defaults

Call the function with defaults. Default sd bounds arer plus and minus 4. This is used in the following examples, unless otherwise specified as the 5th parameter.

```
ffy_tauchen();
```

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xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
CONTAINER NAME: mp_container_map ND Array (Matrix etc)
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
                          i    idx    ndim    numel    rowN    colN    sum    mean      std      coefvari       min
                          _    ___    ____    _____    ____    ____    ___    ____    _______    ________    _______

    ar_disc_ar1           1     1      2        5       5       1       0       0    0.79057        Inf
    mt_disc_ar1_trans     2     6      2       25       5       5       5     0.2    0.27623     1.3812     7.3923e-

xxx TABLE:ar_disc_ar1 xxxxxxxxxxxxxxxxx
           c1
          ____

    r1      -1
    r2    -0.5
    r3       0
    r4     0.5
    r5       1

xxx TABLE:mt_disc_ar1_trans xxxxxxxxxxxxxxxxx
              c1            c2           c3           c4           c5
          __________    __________    ________    _________    _________

    r1       0.22663       0.73331    0.040048    1.0689e-05    7.3923e-12
    r2      0.012224       0.58648     0.39831     0.0029797     7.605e-08
    r3     8.8417e-05       0.10556      0.7887       0.10556    8.8417e-05
    r4      7.605e-08     0.0029797     0.39831       0.58648      0.012224
    r5     7.3923e-12    1.0689e-05    0.040048       0.73331       0.22663

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CONTAINER NAME: mp_container_map Scalars
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
                          i    idx    value
                          _    ___    _____

    fl_ar1_persistence    1     2      0.6
    fl_ar1_step           2     3      0.5
    fl_shk_std            3     4      0.2
    it_std_bound          4     5        4
```

Test FFY_TAUCHEN Specify Parameters

With a grid of 10 points, the sd bounds on Tauchen and Rouwenhorst are identical. With the not extremely persistent shock process here, the Tauchen and Rouwenhorst Results are very similar.

```
[fl_ar1_persistence, fl_shk_std, it_disc_points, bl_verbose, it_std_bound] = ...
    deal(0.60, 0.10, 10, true, 3);
ffy_tauchen(fl_ar1_persistence, fl_shk_std, it_disc_points, bl_verbose, it_std_bound);
```

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CONTAINER NAME: mp_container_map ND Array (Matrix etc)
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
                          i    idx    ndim    numel    rowN    colN        sum           mean          std       coef
                          _    ___    ____    _____    ____    ____    __________    __________    _______    _____

    ar_disc_ar1           1      1       2       10      10       1    -7.2164e-16    -7.2164e-17     0.2523    -3.49
    mt_disc_ar1_trans     2      6       2      100      10      10              10            0.1    0.11456

xxx TABLE:ar_disc_ar1 xxxxxxxxxxxxxxxxx
              c1
            ________

    r1         -0.375
    r2       -0.29167
    r3       -0.20833
    r4         -0.125
    r5       -0.041667
    r6        0.041667
    r7           0.125
    r8         0.20833
    r9         0.29167
    r10          0.375

xxx TABLE:mt_disc_ar1_trans xxxxxxxxxxxxxxxxx
              c1            c2            c3            c4            c5            c6            c7            c8
            _________    _________    _________    _________    _______    _______    _________    _________

    r1        0.13933      0.26196      0.31887      0.20154    0.066066    0.011201    0.00097859    4.3874e-05
    r2       0.056673      0.16995      0.30658      0.28713      0.1396    0.035167     0.0045756    0.00030628
    r3        0.01861     0.087039      0.23281      0.32308     0.23281    0.087039      0.016841     0.0016806
    r4      0.0048925     0.035167       0.1396      0.28713     0.30658     0.16995      0.048841     0.0072547
    r5      0.0010235     0.011201     0.066066      0.20154     0.31887     0.26196       0.11169       0.02466
    r6     0.00016962    0.0028101      0.02466      0.11169     0.26196     0.31887       0.20154      0.066066
    r7     2.2197e-05    0.00055483    0.0072547     0.048841    0.16995     0.30658       0.28713       0.1396
    r8     2.2881e-06    8.6129e-05    0.0016806     0.016841    0.087039    0.23281       0.32308      0.23281
    r9     1.8543e-07    1.0503e-05    0.00030628    0.0045756   0.035167    0.1396        0.28713      0.30658
    r10    1.1798e-08    1.0053e-06    4.3874e-05    0.00097859  0.011201    0.066066      0.20154      0.31887

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CONTAINER NAME: mp_container_map Scalars
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
                          i    idx     value
                          _    ___    ________

    fl_ar1_persistence    1      2         0.6
    fl_ar1_step           2      3    0.083333
    fl_shk_std            3      4         0.1
    it_std_bound          4      5           3
```

Test FFY_TAUCHEN High Persistence, Low SD

```
[fl_ar1_persistence, fl_shk_std, it_disc_points, bl_verbose] = ...
    deal(0.99, 0.01, 7, true);
ffy_tauchen(fl_ar1_persistence, fl_shk_std, it_disc_points, bl_verbose);
```

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CONTAINER NAME: mp_container_map ND Array (Matrix etc)
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
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	i	idx	ndim	numel	rowN	colN	sum	mean	std	coef
ar_disc_ar1	1	1	2	7	7	1	-5.5511e-17	-7.9302e-18	0.20418	-2.57
mt_disc_ar1_trans	2	6	2	49	7	7	7	0.14286	0.35355	

```
xxx TABLE:ar_disc_ar1 xxxxxxxxxxxxxxxxx
```

	c1
r1	-0.28355
r2	-0.18903
r3	-0.094517
r4	-2.7756e-17
r5	0.094517
r6	0.18903
r7	0.28355

```
xxx TABLE:mt_disc_ar1_trans xxxxxxxxxxxxxxxxx
```

	c1	c2	c3	c4	c5	c6	c7
r1	1	4.4497e-06	0	0	0	0	0
r2	4.4412e-07	1	2.8552e-06	0	0	0	0
r3	1.632e-46	7.1638e-07	1	1.8164e-06	0	0	0
r4	9.6185e-124	6.3021e-46	1.1456e-06	1	1.1456e-06	0	0
r5	6.3206e-239	8.9712e-123	2.4121e-45	1.8164e-06	1	7.1638e-07	0
r6	0	1.426e-237	8.2932e-122	9.1503e-45	2.8552e-06	1	4.4412e-07
r7	0	0	3.1885e-236	7.5984e-121	3.4405e-44	4.4497e-06	1

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CONTAINER NAME: mp_container_map Scalars
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
```

	i	idx	value
fl_ar1_persistence	1	2	0.99
fl_ar1_step	2	3	0.094517
fl_shk_std	3	4	0.01
it_std_bound	4	5	4

Test FFY_TAUCHEN Low Persistence, Low SD

```
[fl_ar1_persistence, fl_shk_std, it_disc_points, bl_verbose] = ...
    deal(0.01, 0.01, 7, true);
ffy_tauchen(fl_ar1_persistence, fl_shk_std, it_disc_points, bl_verbose);
```

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xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
CONTAINER NAME: mp_container_map ND Array (Matrix etc)
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
```

	i	idx	ndim	numel	rowN	colN	sum	mean	std	coefvari	m
ar_disc_ar1	1	1	2	7	7	1	0	0	0.028805	Inf	-0.
mt_disc_ar1_trans	2	6	2	49	7	7	7	0.14286	0.17448	1.2213	0.00

xxx TABLE:ar_disc_ar1 xxxxxxxxxxxxxxxxx

	c1
r1	-0.040002
r2	-0.026668
r3	-0.013334
r4	0
r5	0.013334
r6	0.026668
r7	0.040002

xxx TABLE:mt_disc_ar1_trans xxxxxxxxxxxxxxxxx

	c1	c2	c3	c4	c5	c6	c7
r1	0.00049475	0.024497	0.24044	0.4947	0.21921	0.020299	0.00037109
r2	0.00047179	0.023751	0.23685	0.49488	0.2227	0.020954	0.00038948
r3	0.00044982	0.023024	0.23329	0.495	0.22621	0.021626	0.0004087
r4	0.0004288	0.022316	0.22974	0.49504	0.22974	0.022316	0.0004288
r5	0.0004087	0.021626	0.22621	0.495	0.23329	0.023024	0.00044982
r6	0.00038948	0.020954	0.2227	0.49488	0.23685	0.023751	0.00047179
r7	0.00037109	0.020299	0.21921	0.4947	0.24044	0.024497	0.00049475

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CONTAINER NAME: mp_container_map Scalars
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

	i	idx	value
fl_ar1_persistence	1	2	0.01
fl_ar1_step	2	3	0.013334
fl_shk_std	3	4	0.01
it_std_bound	4	5	4

Test FFY_TAUCHEN High Persistence, High SD

```
[fl_ar1_persistence, fl_shk_std, it_disc_points, bl_verbose] = ...
    deal(0.99, 0.99, 7, true);
ffy_tauchen(fl_ar1_persistence, fl_shk_std, it_disc_points, bl_verbose);
```

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xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
CONTAINER NAME: mp_container_map ND Array (Matrix etc)
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

	i	idx	ndim	numel	rowN	colN	sum	mean	std	coef
ar_disc_ar1	1	1	2	7	7	1	-3.5527e-15	-5.0753e-16	20.214	-3.98
mt_disc_ar1_trans	2	6	2	49	7	7	7	0.14286	0.35355	

xxx TABLE:ar_disc_ar1 xxxxxxxxxxxxxxxxx

	c1
r1	-28.072

```
    r2    -18.714
    r3    -9.3572
    r4          0
    r5     9.3572
    r6     18.714
    r7     28.072

xxx TABLE:mt_disc_ar1_trans xxxxxxxxxxxxxxxxx
             c1             c2             c3             c4             c5             c6             c7
          ___________    ___________    ___________    ___________    ___________    ___________    ___________

    r1              1     4.4497e-06              0              0              0              0              0
    r2     4.4412e-07              1     2.8552e-06              0              0              0              0
    r3      1.632e-46     7.1638e-07              1     1.8164e-06              0              0              0
    r4    9.6185e-124     6.3021e-46     1.1456e-06              1     1.1456e-06              0              0
    r5    6.3206e-239    8.9712e-123     2.4121e-45     1.8164e-06              1    7.1638e-07              0
    r6              0     1.426e-237    8.2932e-122     9.1503e-45    2.8552e-06              1    4.4412e-07
    r7              0              0    3.1885e-236    7.5984e-121    3.4405e-44    4.4497e-06              1

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xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
CONTAINER NAME: mp_container_map Scalars
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
                          i    idx    value
                          _    ___    _____

    fl_ar1_persistence    1     2      0.99
    fl_ar1_step           2     3     9.3572
    fl_shk_std            3     4      0.99
    it_std_bound          4     5         4
```

Test FFY_TAUCHEN Low Persistence, Low SD

```
[fl_ar1_persistence, fl_shk_std, it_disc_points, bl_verbose] = ...
    deal(0.01, 0.01, 7, true);
ffy_tauchen(fl_ar1_persistence, fl_shk_std, it_disc_points, bl_verbose);
```

```
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xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
CONTAINER NAME: mp_container_map ND Array (Matrix etc)
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
                          i    idx    ndim    numel    rowN    colN    sum     mean        std        coefvari       m
                          _    ___    ____    _____    ____    ____    ___    _______    ________    ________    ____

    ar_disc_ar1           1     1      2        7       7       1       0           0    0.028805        Inf       -0.
    mt_disc_ar1_trans     2     6      2       49       7       7       7     0.14286     0.17448     1.2213     0.00

xxx TABLE:ar_disc_ar1 xxxxxxxxxxxxxxxxx
             c1
          _________

    r1    -0.040002
    r2    -0.026668
    r3    -0.013334
    r4            0
    r5     0.013334
    r6     0.026668
    r7     0.040002

xxx TABLE:mt_disc_ar1_trans xxxxxxxxxxxxxxxxx
             c1           c2          c3          c4          c5          c6          c7
          _________    ________    ________    ________    ________    ________    _________
```

r1	0.00049475	0.024497	0.24044	0.4947	0.21921	0.020299	0.00037109
r2	0.00047179	0.023751	0.23685	0.49488	0.2227	0.020954	0.00038948
r3	0.00044982	0.023024	0.23329	0.495	0.22621	0.021626	0.0004087
r4	0.0004288	0.022316	0.22974	0.49504	0.22974	0.022316	0.0004288
r5	0.0004087	0.021626	0.22621	0.495	0.23329	0.023024	0.00044982
r6	0.00038948	0.020954	0.2227	0.49488	0.23685	0.023751	0.00047179
r7	0.00037109	0.020299	0.21921	0.4947	0.24044	0.024497	0.00049475

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CONTAINER NAME: mp_container_map Scalars
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

	i	idx	value
fl_ar1_persistence	1	2	0.01
fl_ar1_step	2	3	0.013334
fl_shk_std	3	4	0.01
it_std_bound	4	5	4