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

    ar_disc_ar1          1     1      2        7       7       1       0           0    0.15314        Inf      -0.21
    mt_disc_ar1_trans    2     6      2       49       7       7       7     0.14286    0.35338     2.4737

xxx TABLE:ar_disc_ar1 xxxxxxxxxxxxxxxxx
             c1
         ________

    r1     -0.21266
    r2     -0.14178
    r3    -0.070888
    r4            0
    r5     0.070888
    r6      0.14178
    r7      0.21266

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

    r1         0.99957     0.00043152               0               0               0               0               0
    r2      0.00011382        0.99955       0.0003337               0               0               0               0
    r3      4.8683e-27        0.00015         0.99959     0.00025684               0               0               0
    r4      1.4175e-70     1.0439e-26      0.00019675        0.99961     0.00019675               0               0
    r5     1.9884e-135      4.986e-70      2.2273e-26     0.00025684        0.99959         0.00015               0
    r6     1.2359e-221     1.149e-134      1.7451e-69     4.7287e-26      0.0003337         0.99955     0.00011382
    r7               0    1.1738e-220    6.6059e-134      6.077e-69     9.9893e-26     0.00043152         0.99957

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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     0.070888
    fl_shk_std           3     4         0.01
    it_std_bound         4     5            3
```

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
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	i	idx	ndim	numel	rowN	colN	sum	mean	std	coefv
ar_disc_ar1	1	1	2	7	7	1	3.4694e-18	4.9564e-19	0.021604	4.3588
mt_disc_ar1_trans	2	6	2	49	7	7	7	0.14286	0.13667	0.9

xxx TABLE:ar_disc_ar1 xxxxxxxxxxxxxxxxx

	c1
r1	-0.030002
r2	-0.020001
r3	-0.010001
r4	0
r5	0.010001
r6	0.020001
r7	0.030002

xxx TABLE:mt_disc_ar1_trans xxxxxxxxxxxxxxxxx

	c1	c2	c3	c4	c5	c6	c7
r1	0.0067533	0.064018	0.2484	0.38278	0.23505	0.057298	0.0057011
r2	0.0065668	0.06286	0.24618	0.38287	0.23728	0.05838	0.0058656
r3	0.0063849	0.061717	0.24396	0.38292	0.2395	0.059478	0.0060344
r4	0.0062075	0.06059	0.24173	0.38294	0.24173	0.06059	0.0062075
r5	0.0060344	0.059478	0.2395	0.38292	0.24396	0.061717	0.0063849
r6	0.0058656	0.05838	0.23728	0.38287	0.24618	0.06286	0.0065668
r7	0.0057011	0.057298	0.23505	0.38278	0.2484	0.064018	0.0067533

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xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
CONTAINER NAME: mp_container_map Scalars
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

	i	idx	value
fl_ar1_persistence	1	2	0.01
fl_ar1_step	2	3	0.010001
fl_shk_std	3	4	0.01
it_std_bound	4	5	3

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	-7.1054e-15	-1.0151e-15	15.16	-1.49
mt_disc_ar1_trans	2	6	2	49	7	7	7	0.14286	0.35338	

xxx TABLE:ar_disc_ar1 xxxxxxxxxxxxxxxxx

	c1
r1	-21.054

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    r2        -14.036
    r3        -7.0179
    r4    -1.7764e-15
    r5         7.0179
    r6         14.036
    r7         21.054

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

    r1        0.99957     0.00043152              0              0              0              0              0
    r2     0.00011382        0.99955      0.0003337              0              0              0              0
    r3     4.8683e-27        0.00015        0.99959    0.00025684              0              0              0
    r4     1.4175e-70     1.0439e-26     0.00019675       0.99961    0.00019675              0              0
    r5    1.9884e-135      4.986e-70     2.2273e-26    0.00025684       0.99959        0.00015              0
    r6    1.2359e-221     1.149e-134     1.7451e-69    4.7287e-26     0.0003337        0.99955    0.00011382
    r7              0    1.1738e-220    6.6059e-134     6.077e-69    9.9893e-26    0.00043152        0.99957

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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    7.0179
    fl_shk_std            3     4      0.99
    it_std_bound          4     5         3
```

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          coefv
                          _    ___    ____    _____    ____    ____    _________    _________    ________    _____

    ar_disc_ar1           1     1      2        7       7       1      3.4694e-18    4.9564e-19    0.021604    4.3588
    mt_disc_ar1_trans     2     6      2       49       7       7               7       0.14286     0.13667       0.9

xxx TABLE:ar_disc_ar1 xxxxxxxxxxxxxxxxx
             c1
          ________

    r1    -0.030002
    r2    -0.020001
    r3    -0.010001
    r4            0
    r5     0.010001
    r6     0.020001
    r7     0.030002

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

r1	0.0067533	0.064018	0.2484	0.38278	0.23505	0.057298	0.0057011
r2	0.0065668	0.06286	0.24618	0.38287	0.23728	0.05838	0.0058656
r3	0.0063849	0.061717	0.24396	0.38292	0.2395	0.059478	0.0060344
r4	0.0062075	0.06059	0.24173	0.38294	0.24173	0.06059	0.0062075
r5	0.0060344	0.059478	0.2395	0.38292	0.24396	0.061717	0.0063849
r6	0.0058656	0.05838	0.23728	0.38287	0.24618	0.06286	0.0065668
r7	0.0057011	0.057298	0.23505	0.38278	0.2484	0.064018	0.0067533

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xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
CONTAINER NAME: mp_container_map Scalars
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

	i	idx	value
fl_ar1_persistence	1	2	0.01
fl_ar1_step	2	3	0.010001
fl_shk_std	3	4	0.01
it_std_bound	4	5	3