

# FFY\_ROUWENHORST AR1 Shock Discretization Example

back to [Fan's Intro Math for Econ](#), [Matlab Examples](#), or [Dynamic Asset Repositories](#)

This is the example vignette for function: [ffynetrouwenhorst](#) from the [MEconTools Package](#). See also [ffynettauchen](#) function from the [MEconTools Package](#). This function discretize a mean zero AR1 process, uses Rouwenhorst (1995). See [AR 1 Example](#) for some details on how the AR1 process works. And See [Kopecky and Suen \(2010\)](#).

## Test FFY\_ROUWENHORST Defaults

Call the function with defaults.

```
ffynetrouwenhorst();
```

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

          i      idx      ndim      numel      rowN      colN      sum      mean      std      coefvari      min
          -      -      -      -      -      -      -      -      -      -      -
ar_disc_ar1      1      1      2      5      5      1      0      0      0.39528      Inf      -0.5
mt_disc_ar1_trans 2     11      2     25      5      5      5      0.2      0.18246      0.91229      0.0016

xxx TABLE:ar_disc_ar1 xxxxxxxxxxxxxxxxxxxxx
c1
-----
r1      -0.5
r2     -0.25
r3       0
r4      0.25
r5      0.5

xxx TABLE:mt_disc_ar1_trans xxxxxxxxxxxxxxxxxxxxx
c1      c2      c3      c4      c5
-----
r1      0.4096      0.4096      0.1536      0.0256      0.0016
r2      0.1024      0.4864      0.3264      0.0784      0.0064
r3      0.0256      0.2176      0.5136      0.2176      0.0256
r4      0.0064      0.0784      0.3264      0.4864      0.1024
r5      0.0016      0.0256      0.1536      0.4096      0.4096

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XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
CONTAINER NAME: mp_container_map Scalars
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

          i      idx      value
          -      -      -
fl_ar1_beg      1      2      -0.5
fl_ar1_end      2      3       0.5
fl_ar1_persistence 3      4       0.6
fl_ar1_step      4      5      0.25
fl_p0            5      6      0.8
fl_q0            6      7      0.8
fl_shk_std       7      8      0.2
fl_sig_ar1       8      9      0.25
```

## Test FFY\_ROUWENHORST Specify Parameters

With a grid of 10 points, the Rwouenhorst bounds on standard deviations are equal to Tauchen bounds of 3.  
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] = ...
    deal(0.60, 0.10, 10, true);
ffyr_rouwenhorst(fl_ar1_persistence, fl_shk_std, it_disc_points, bl_verbose);
```

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

	i	idx	ndim	numel	rowN	colN	sum	mean	std	coefva
	—	—	—	—	—	—	—	—	—	—
ar_disc_ar1	1	1	2	10	10	1	5.5511e-17	5.5511e-18	0.2523	4.5451e
mt_disc_ar1_trans	2	11	2	100	10	10	10	0.1	0.11724	1.1

```
xxx TABLE:ar_disc_ar1 xxxxxxxxxxxxxxxxxxxxx
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 xxxxxxxxxxxxxxxxxxxxx
```

	c1	c2	c3	c4	c5	c6	c7	c8
	—	—	—	—	—	—	—	—
r1	0.13422	0.30199	0.30199	0.17616	0.06606	0.016515	0.0027525	0.00029491
r2	0.033554	0.20133	0.32716	0.26424	0.12662	0.038535	0.0075694	0.00093389
r3	0.0083886	0.081789	0.26267	0.32755	0.21401	0.082747	0.019741	0.0028677
r4	0.0020972	0.028312	0.14038	0.30946	0.30369	0.15877	0.047989	0.0084603
r5	0.00052429	0.009044	0.061145	0.20246	0.33477	0.25969	0.10585	0.023642
r6	0.00013107	0.0027525	0.023642	0.10585	0.25969	0.33477	0.20246	0.061145
r7	3.2768e-05	0.00081101	0.0084603	0.047989	0.15877	0.30369	0.30946	0.14038
r8	8.192e-06	0.00023347	0.0028677	0.019741	0.082747	0.21401	0.32755	0.26267
r9	2.048e-06	6.6048e-05	0.00093389	0.0075694	0.038535	0.12662	0.26424	0.32716
r10	5.12e-07	1.8432e-05	0.00029491	0.0027525	0.016515	0.06606	0.17616	0.30199

```
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XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
CONTAINER NAME: mp_container_map Scalars
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

	i	idx	value
	—	—	—
fl_ar1_beg	1	2	-0.375
fl_ar1_end	2	3	0.375
fl_ar1_persistence	3	4	0.6
fl_ar1_step	4	5	0.083333

fl_p0	5	6	0.8
fl_q0	6	7	0.8
fl_shk_std	7	8	0.1
fl_sig_ar1	8	9	0.125
it_std_bound	9	10	0

## Test FFY\_ROUWENHORST High Persistence, Low SD

```
[fl_ar1_persistence, fl_shk_std, it_disc_points, bl_verbose] = ...
    deal(0.90, 0.02, 7, true);
[ar_z, mt_z_trans] = ffy_tauschen(fl_ar1_persistence, fl_shk_std, it_disc_points, bl_verbose);
```

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

	i	idx	ndim	numel	rowN	colN	sum	mean	std	coefv
ar_disc_ar1	1	1	2	7	7	1	2.7756e-17	3.9651e-18	0.099119	2.4998
mt_disc_ar1_trans	2	6	2	49	7	7	7	0.14286	0.24922	1.

```
xxx TABLE:ar_disc_ar1 xxxxxxxxxxxxxxxxxxxxx
c1
```

r1	-0.13765
r2	-0.091766
r3	-0.045883
r4	1.3878e-17
r5	0.045883
r6	0.091766
r7	0.13765

```
xxx TABLE:mt_disc_ar1_trans xxxxxxxxxxxxxxxxxxxxx
```

	c1	c2	c3	c4	c5	c6	c7
r1	0.67682	0.32022	0.0029525	2.2423e-07	1.058e-13	0	0
r2	0.054147	0.7002	0.24422	0.0014299	6.5815e-08	1.8541e-14	0
r3	0.00012097	0.084213	0.73627	0.17874	0.00065947	1.8356e-08	3.1086e-15
r4	4.8643e-09	0.00028953	0.12539	0.74865	0.12539	0.00028953	4.8643e-09
r5	3.0921e-15	1.8356e-08	0.00065947	0.17874	0.73627	0.084213	0.00012097
r6	2.9554e-23	1.8558e-14	6.5815e-08	0.0014299	0.24422	0.7002	0.054147
r7	4.1477e-33	2.8319e-22	1.0576e-13	2.2423e-07	0.0029525	0.32022	0.67682

```
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XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
CONTAINER NAME: mp_container_map Scalars
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

	i	idx	value
fl_ar1_persistence	1	2	0.9
fl_ar1_step	2	3	0.045883
fl_shk_std	3	4	0.02
it_std_bound	4	5	3

```
ar_z_stationary = mt_z_trans^1000;
ar_z_stationary = ar_z_stationary(1,:);
fl_labor_agg = ar_z_stationary*exp(ar_z);
ar_z = exp(ar_z')/fl_labor_agg;
```

## Test FFY\_ROUWENHORST Low Persistence, Low SD

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

```
-----
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
CONTAINER NAME: mp_container_map ND Array (Matrix etc)
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
      i      idx      ndim      numel      rowN      colN      sum      mean      std      coefvari      m
      -      -      -      -      -      -      -      -      -      -      -
ar_disc_ar1      1      1      2      7      7      1      0      0      0.017639      Inf      -0.0
mt_disc_ar1_trans      2      11      2      49      7      7      7      0.14286      0.10985      0.76893      0.0

xxx TABLE:ar_disc_ar1 xxxxxxxxxxxxxxxxxxxxx
      c1
      -
r1      -0.024496
r2      -0.016331
r3      -0.0081654
r4      0
r5      0.0081654
r6      0.016331
r7      0.024496
```

```
xxx TABLE:mt_disc_ar1_trans xxxxxxxxxxxxxxxxxxxxx
      c1      c2      c3      c4      c5      c6      c7
      -      -      -      -      -      -      -
r1      0.016586      0.097547      0.23904      0.31241      0.22966      0.090047      0.014711
r2      0.016258      0.096266      0.23749      0.31247      0.23124      0.091266      0.015008
r3      0.015936      0.094997      0.23594      0.31251      0.23281      0.092497      0.015311
r4      0.01562      0.093741      0.23438      0.31252      0.23438      0.093741      0.01562
r5      0.015311      0.092497      0.23281      0.31251      0.23594      0.094997      0.015936
r6      0.015008      0.091266      0.23124      0.31247      0.23749      0.096266      0.016258
r7      0.014711      0.090047      0.22966      0.31241      0.23904      0.097547      0.016586
```

```
-----
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
CONTAINER NAME: mp_container_map Scalars
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
      i      idx      value
      -      -      -
fl_ar1_beg      1      2      -0.024496
fl_ar1_end      2      3      0.024496
fl_ar1_persistence      3      4      0.01
fl_ar1_step      4      5      0.0081654
fl_p0      5      6      0.505
fl_q0      6      7      0.505
fl_shk_std      7      8      0.01
fl_sig_ar1      8      9      0.010001
it_std_bound      9      10      0
```

## Test FFY\_ROUWENHORST High Persistence, High SD

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

```
-----
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
CONTAINER NAME: mp_container_map ND Array (Matrix etc)
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

	i	idx	ndim	numel	rowN	colN	sum	mean	std	coefvar
	—	—	—	—	—	—	—	—	—	—
ar_disc_ar1	1	1	2	7	7	1	3.5527e-15	5.0753e-16	12.378	2.439e-1
mt_disc_ar1_trans	2	11	2	49	7	7	7	0.14286	0.34148	2.39

```
xxx TABLE:ar_disc_ar1 xxxxxxxxxxxxxxxxxxxxx
c1
```

r1	-17.19
r2	-11.46
r3	-5.7301
r4	0
r5	5.7301
r6	11.46
r7	17.19

```
xxx TABLE:mt_disc_ar1_trans xxxxxxxxxxxxxxxxxxxxx
```

	c1	c2	c3	c4	c5	c6	c7
	—	—	—	—	—	—	—
r1	0.97037	0.029257	0.00036756	2.4627e-06	9.2815e-09	1.8656e-11	1.5625e-14
r2	0.0048762	0.9705	0.024382	0.00024504	1.2314e-06	3.0938e-09	3.1094e-12
r3	2.4504e-05	0.009753	0.97057	0.019506	0.00014703	4.9254e-07	6.1877e-10
r4	1.2313e-07	7.3513e-05	0.01463	0.97059	0.01463	7.3513e-05	1.2313e-07
r5	6.1877e-10	4.9254e-07	0.00014703	0.019506	0.97057	0.009753	2.4504e-05
r6	3.1094e-12	3.0938e-09	1.2314e-06	0.00024504	0.024382	0.9705	0.0048762
r7	1.5625e-14	1.8656e-11	9.2815e-09	2.4627e-06	0.00036756	0.029257	0.97037

```
-----
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
CONTAINER NAME: mp_container_map Scalars
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

	i	idx	value
	—	—	—
fl_ar1_beg	1	2	-17.19
fl_ar1_end	2	3	17.19
fl_ar1_persistence	3	4	0.99
fl_ar1_step	4	5	5.7301
fl_p0	5	6	0.995
fl_q0	6	7	0.995
fl_shk_std	7	8	0.99
fl_sig_ar1	8	9	7.0179
it_std_bound	9	10	0

## Test FFY\_ROUWENHORST Low Persistence, Low SD

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

XXX  
CONTAINER NAME: mp\_container\_map ND Array (Matrix etc)  
XXX

	i	idx	ndim	numel	rowN	colN	sum	mean	std	coefvari	m
	—	—	—	—	—	—	—	—	—	—	—
ar_disc_ar1	1	1	2	7	7	1	0	0	0.017639	Inf	-0.0
mt_disc_ar1_trans	2	11	2	49	7	7	7	0.14286	0.10985	0.76893	0.0

xxx TABLE:ar\_disc\_ar1 XXXXXXXXXXXXXXXXXXXXX  
c1

	—
r1	-0.024496
r2	-0.016331
r3	-0.0081654
r4	0
r5	0.0081654
r6	0.016331
r7	0.024496

xxx TABLE:mt\_disc\_ar1\_trans XXXXXXXXXXXXXXXXXXXXX

	c1	c2	c3	c4	c5	c6	c7
	—	—	—	—	—	—	—
r1	0.016586	0.097547	0.23904	0.31241	0.22966	0.090047	0.014711
r2	0.016258	0.096266	0.23749	0.31247	0.23124	0.091266	0.015008
r3	0.015936	0.094997	0.23594	0.31251	0.23281	0.092497	0.015311
r4	0.01562	0.093741	0.23438	0.31252	0.23438	0.093741	0.01562
r5	0.015311	0.092497	0.23281	0.31251	0.23594	0.094997	0.015936
r6	0.015008	0.091266	0.23124	0.31247	0.23749	0.096266	0.016258
r7	0.014711	0.090047	0.22966	0.31241	0.23904	0.097547	0.016586

-----  
XXX  
CONTAINER NAME: mp\_container\_map Scalars  
XXX

	i	idx	value
	—	—	—
fl_ar1_beg	1	2	-0.024496
fl_ar1_end	2	3	0.024496
fl_ar1_persistence	3	4	0.01
fl_ar1_step	4	5	0.0081654
fl_p0	5	6	0.505
fl_q0	6	7	0.505
fl_shk_std	7	8	0.01
fl_sig_ar1	8	9	0.010001
it_std_bound	9	10	0