Matlab Grid States, Choices and Optimal Choices Example

back to Fan's Reusable Matlab Repository or Dynamic Asset Repository.

Generate State Grid

There many multiple individuals, each individual's value for each state space variable is different. We duplicate that by shockCount and choicecount:

```
stateCount = 2;
shockCount = 3;
choiceCount = 4;

state1 = rand(1,stateCount)
```

```
state1 = 1×2
    0.0571    0.6694
```

```
states1ShkDup = state1(ones(shockCount*choiceCount,1),:)
```

```
states1ShkDup = 12×2
    0.0571    0.6694
    0.0571    0.6694
    0.0571    0.6694
    0.0571    0.6694
    0.0571    0.6694
    0.0571    0.6694
    0.0571    0.6694
    0.0571    0.6694
    0.0571    0.6694
    0.0571    0.6694
      ⋮
      ⋮
```

```
states1ShkDup(:)
```

```
ans = 24×1
    0.0571
    0.0571
    0.0571
    0.0571
    0.0571
    0.0571
    0.0571
    0.0571
    0.0571
    0.0571
      ⋮
      ⋮
```

Generate Choices

Generate Choice Grid, Example: Each individual has minimal protein and maximal protein they can get Generate a evenly set grid of choices for each individual from min to max. Individual min and max choice is a function of some component of their state-space, such as wealth/income level, and choice is the quantity of good to purchase.

```
stateCount = 2;
shockCount = 3;
choiceCount = 4;

% 1. Min and Max Choices for each state
minprot_n = floor(rand(1,stateCount)*10)
```

```
minprot_n = 1×2
     7     7
```

```
maxprot_n = minprot_n + floor(rand(1,stateCount)*10)
```

```
maxprot_n = 1×2
    14    12
```

```
% 2. Choice Ratios, ratios of max-min difference
protChoiceGrid = linspace(0,1,choiceCount)
```

```
protChoiceGrid = 1×4
         0    0.3333    0.6667    1.0000
```

```
% 3. Each column is a different state.
searchMatrix = (protChoiceGrid'*(maxprot_n-minprot_n)+minprot_n(ones(choiceCount,1),:))
```

```
searchMatrix = 4×2
    7.0000    7.0000
    9.3333    8.6667
   11.6667   10.3333
   14.0000   12.0000
```

```
% 4. Each column is a different state, each set of rows is a different shock% for the state. In
searchMatrix = searchMatrix([1:choiceCount]'* ones(1,shockCount), [1:stateCount]' * ones(1,1))
```

```
searchMatrix = 12×2
    7.0000    7.0000
    9.3333    8.6667
   11.6667   10.3333
   14.0000   12.0000
    7.0000    7.0000
    9.3333    8.6667
   11.6667   10.3333
   14.0000   12.0000
    7.0000    7.0000
    9.3333    8.6667
      ⋮
      ⋮
```

```
searchMatrix(:)
```

```
ans = 24×1
    7.0000
    9.3333
   11.6667
   14.0000
    7.0000
    9.3333
   11.6667
   14.0000
    7.0000
    9.3333
```

⋮

Average Utility over Shocks

Average of Shocks, E(value) For each STATE and CHOICE, x number of shocks. Need to average over shocks; The raw value output is: STATES * SHOCKS * CHOICES; Code below turn into various things, see MATLAB CODE STRUCTURE in oneNOTE GCC working notes

```
shockCount = 2;
choiceCount = 3;
stateCount = 4;

% 1. VALUE vector (STATES * SHOCKS * CHOICES by 1), this is generated by utility% evaluation fu
valuesOri = sort(rand(choiceCount*shockCount*stateCount,1))
```

```
valuesOri = 24×1
    0.0296
    0.1141
    0.1472
    0.1514
    0.1826
    0.1936
    0.2526
    0.2911
    0.3257
    0.3352
     ⋮
```

```
% 2. CHOICES by STATES * SHOCKS (ST1 SK1, ST1 SK2; ST2 SK1, etc), each% column are values for c
values = reshape(valuesOri,[choiceCount,shockCount*stateCount])
```

```
values = 3×8
    0.0296    0.1514    0.2526    0.3352    0.5939    0.7065    0.8791    0.9204
    0.1141    0.1826    0.2911    0.3480    0.5992    0.7267    0.9001    0.9508
    0.1472    0.1936    0.3257    0.4578    0.6576    0.7792    0.9018    0.9658
```

```
% 3. SHOCKS by CHOICES * STATES (CH1 ST1, CH1 ST2; CH2 ST1, etc), each% column are two shocks f
values = reshape(values',[shockCount, choiceCount*stateCount])
```

```
values = 2×12
    0.0296    0.2526    0.5939    0.8791    0.1141    0.2911    0.5992    0.9001 ···
    0.1514    0.3352    0.7065    0.9204    0.1826    0.3480    0.7267    0.9508
```

```
% 4. AVG: 1 by CHOICES * STATES (CH1 ST1, CH1 ST2; CH2 ST1, etc), take% average over shocks for
valuesMn = mean(values,1)
```

```
valuesMn = 1×12
    0.0905    0.2939    0.6502    0.8997    0.1483    0.3196    0.6629    0.9254 ···
```

```
% 5. AVG: CHOICES * STATES. From this matrix, one can now pick maximum% utility, and match that
valuesMn = reshape(valuesMn, [stateCount, choiceCount])'
```

```
valuesMn = 3×4
    0.0905    0.2939    0.6502    0.8997
    0.1483    0.3196    0.6629    0.9254
    0.1704    0.3918    0.7184    0.9338
```

Pick Optimal Choice

```
choiceCount = 3;
stateCount = 4;

% 1. Matrix, each column is a state, each row is a choice
randMat = rand(choiceCount,stateCount)
```

```
randMat = 3×4
    0.0733    0.5905    0.1731    0.1795
    0.0550    0.8539    0.1340    0.3175
    0.3232    0.2871    0.9947    0.5683
```

```
% 2. Maximum Value and Maximum Index
[maxVal maxIndex] = max(randMat)
```

```
maxVal = 1×4
    0.3232    0.8539    0.9947    0.5683
maxIndex = 1×4
     3     2     3     3
```

```
% 3. Linear index
linearIdx = maxIndex + ((1:stateCount)-1)*choiceCount
```

```
linearIdx = 1×4
     3     5     9    12
```

```
% 4. Optimal Choices
randMat(linearIdx)
```

```
ans = 1×4
    0.3232    0.8539    0.9947    0.5683
```