Life Cycle Dynamic Programming with Marital Status, Children and Savings

This is the example vignette for function: **snw_vfi_main_bisec_vec** from the **PrjOptiSNW Package.** This function solves for policy function with vectorized bisection. Value function during COVIDless year.

Test SNW_VFI_MAIN_BISECT_VEC Defaults

Call the function with defaults.

```
mp_param = snw_mp_param('default_docdense');
[V_VFI,ap_VFI,cons_VFI] = snw_vfi_main_bisec_vec(mp_param);
```

```
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:83 of 82, time-this-age:9.6616
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:82 of 82, time-this-age:6.0665
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:81 of 82, time-this-age:6.0938
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:80 of 82, time-this-age:6.1322
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:79 of 82, time-this-age:5.731
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:78 of 82, time-this-age:5.9587
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:77 of 82, time-this-age:6.0286
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:76 of 82, time-this-age:6.0378
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:75 of 82, time-this-age:5.7227
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:74 of 82, time-this-age:6.0347
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:73 of 82, time-this-age:6.0197
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:72 of 82, time-this-age:6.0294
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:71 of 82, time-this-age:5.7663
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:70 of 82, time-this-age:5.7878
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:69 of 82, time-this-age:5.9087
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:68 of 82, time-this-age:5.9625
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:67 of 82, time-this-age:5.9427
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:66 of 82, time-this-age:5.526
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:65 of 82, time-this-age:5.9574
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:64 of 82, time-this-age:5.9754
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:63 of 82, time-this-age:5.9528
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:62 of 82, time-this-age:5.7483
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:61 of 82, time-this-age:6.0225
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:60 of 82, time-this-age:6.091
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:59 of 82, time-this-age:6.0448
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:58 of 82, time-this-age:6.0445
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:57 of 82, time-this-age:5.5331
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:56 of 82, time-this-age:6.0133
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:55 of 82, time-this-age:5.9281
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:54 of 82, time-this-age:5.9348
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:53 of 82, time-this-age:5.576
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:52 of 82, time-this-age:5.9723
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:51 of 82, time-this-age:6.1292
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:50 of 82, time-this-age:5.983
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:49 of 82, time-this-age:5.8518
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:48 of 82, time-this-age:5.6741
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:47 of 82, time-this-age:6.0199
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:46 of 82, time-this-age:6.0128
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:45 of 82, time-this-age:6.2299
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:44 of 82, time-this-age:5.8858
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:43 of 82, time-this-age:6.0074
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:42 of 82, time-this-age:6.1082
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:41 of 82, time-this-age:6.1896
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:40 of 82, time-this-age:5.9484
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:39 of 82, time-this-age:5.7184
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:38 of 82, time-this-age:6.0237
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:37 of 82, time-this-age:6.0886
```

```
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:36 of 82, time-this-age:5.9999
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:35 of 82, time-this-age:5.8859
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:34 of 82, time-this-age:6.089
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:33 of 82, time-this-age:6.0487
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:32 of 82, time-this-age:5.972
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:31 of 82, time-this-age:6.0053
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:30 of 82, time-this-age:5.671
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:29 of 82, time-this-age:5.8975
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:28 of 82, time-this-age:6.0471
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:27 of 82, time-this-age:6.0284
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:26 of 82, time-this-age:6.03
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:25 of 82, time-this-age:6.0227
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:24 of 82, time-this-age:5.9344
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:23 of 82, time-this-age:6.0962
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:22 of 82, time-this-age:6.1112
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:21 of 82, time-this-age:5.6128
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:20 of 82, time-this-age:6.0994
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:19 of 82, time-this-age:5.9906
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:18 of 82, time-this-age:5.9374
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:17 of 82, time-this-age:5.9326
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:16 of 82, time-this-age:5.6032
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:15 of 82, time-this-age:6.0086
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:14 of 82, time-this-age:6.0024
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:13 of 82, time-this-age:6.0767
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:12 of 82, time-this-age:5.8031
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:11 of 82, time-this-age:6.012
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:10 of 82, time-this-age:6.0142
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:9 of 82, time-this-age:5.9887
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:8 of 82, time-this-age:6.0433
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:7 of 82, time-this-age:5.5764
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:6 of 82, time-this-age:5.9101
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:5 of 82, time-this-age:5.9695
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:4 of 82, time-this-age:5.9063
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:3 of 82, time-this-age:5.7645
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:2 of 82, time-this-age:5.8967
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:1 of 82, time-this-age:6.0414
Completed SNW_VFI_MAIN_BISEC_VEC;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_base;time=497.621
```

Define Parameters

Define the matrix dimensions names and dimension vector values. Policy and Value Functions share the same ND dimensional structure.

```matlab
% Grids:
age_grid = 18:100;
agrid = mp_param('agrid')';
eta_H_grid = mp_param('eta_H_grid')';
eta_S_grid = mp_param('eta_S_grid')';
ar_st_eta_HS_grid = string(cellstr([num2str(eta_H_grid', 'hz=%3.2f;'), num2str(eta_S_grid', 'wz
edu_grid = [0,1];
marry_grid = [0,1];
kids_grid = (1:1:mp_param('n_kidsgrid'))';
% NaN(n_jgrid,n_agrid,n_etagrid,n_educgrid,n_marriedgrid,n_kidsgrid);
cl_mp_datasetdesc = {};
cl_mp_datasetdesc{1} = containers.Map({'name', 'labval'}, {'age', age_grid});
cl_mp_datasetdesc{2} = containers.Map({'name', 'labval'}, {'savings', agrid});
cl_mp_datasetdesc{3} = containers.Map({'name', 'labval'}, {'eta', 1:length(eta_H_grid)});
cl_mp_datasetdesc{4} = containers.Map({'name', 'labval'}, {'edu', edu_grid});
cl_mp_datasetdesc{5} = containers.Map({'name', 'labval'}, {'marry', marry_grid});
```

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```
cl_mp_datasetdesc{6} = containers.Map({'name', 'labval'}, {'kids', kids_grid});
```

Analyze Savings and Shocks

First, analyze Savings Levels and Shocks, Aggregate Over All Others, and do various other calculations.

```
% Generate some Data
mp_support_graph = containers.Map('KeyType', 'char', 'ValueType', 'any');
mp_support_graph('cl_st_xtitle') = {'Savings States, a'};
mp_support_graph('st_legend_loc') = 'eastoutside';
mp_support_graph('bl_graph_logy') = true; % do not log
mp_support_graph('it_legend_select') = 21; % how many shock legends to show
mp_support_graph('cl_colors') = 'jet';
```

MEAN(VAL(A,Z)), MEAN(AP(A,Z)), MEAN(C(A,Z))

Tabulate value and policies along savings and shocks:

```
% Set
% NaN(n_jgrid,n_agrid,n_etagrid,n_educgrid,n_marriedgrid,n_kidsgrid);
ar_permute = [1,4,5,6,3,2];
% Value Function
tb_az_v = ff_summ_nd_array("MEAN(VAL(A,Z))", V_VFI, true, ["mean"], 4, 1, cl_mp_datasetdesc, ar
```

```
xxx  MEAN(VAL(A,Z))  xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    group    savings     mean_eta_1    mean_eta_2    mean_eta_3    mean_eta_4    mean_eta_5    mean_eta_6    mean_

    _____    _____   _____    _____    _____    _____    _____    _____    _____

      1            0      -121.95      -119.04       -115.79       -112.34       -108.82       -105.33       -101
      2     0.00051498    -121.79      -118.9        -115.66       -112.23       -108.72       -105.24       -101
      3     0.0041199     -120.77      -117.99       -114.85       -111.49       -108.07       -104.65       -101
      4     0.013905      -118.46      -115.89       -112.94       -109.77       -106.5        -103.24       -100
      5     0.032959      -115.01      -112.69       -110         -107.08       -104.04       -100.99        -97.
      6     0.064373      -110.86      -108.8        -106.37       -103.71       -100.93        -98.126        -95.
```

```
% Aprime Choice
tb_az_ap = ff_summ_nd_array("MEAN(AP(A,Z))", ap_VFI, true, ["mean"], 4, 1, cl_mp_datasetdesc, a
```

```
xxx  MEAN(AP(A,Z))  xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    group    savings     mean_eta_1    mean_eta_2    mean_eta_3    mean_eta_4    mean_eta_5    mean_eta_6    mean_

    _____    _____   _____    _____    _____    _____    _____    _____    _____

      1            0           0             0             0             0             0             0        6.640
      2     0.00051498        0             0             0        3.2355e-07    8.8303e-07    1.3402e-06    1.685
      3     0.0041199    2.3328e-05    4.6809e-05    7.1592e-05    8.2019e-05    8.3298e-05    7.997e-05     7.448
      4     0.013905     0.0013551     0.0014087     0.0014521     0.0014783     0.0014876     0.0014875     0.00
      5     0.032959     0.0056972     0.0058797     0.0060165     0.0060906     0.0061057     0.0060871     0.00
      6     0.064373     0.0156        0.015941      0.016146      0.016236      0.016247      0.016208      0.0
```

```
% Consumption Choices
tb_az_c = ff_summ_nd_array("MEAN(C(A,Z))", cons_VFI, true, ["mean"], 4, 1, cl_mp_datasetdesc, a
```

```
xxx  MEAN(C(A,Z))  xxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    group    savings     mean_eta_1    mean_eta_2    mean_eta_3    mean_eta_4    mean_eta_5    mean_eta_6    mean_

    _____    _____   _____    _____    _____    _____    _____    _____    _____

      1            0      0.13344      0.13578       0.13828       0.14094       0.14377       0.14679          0
```
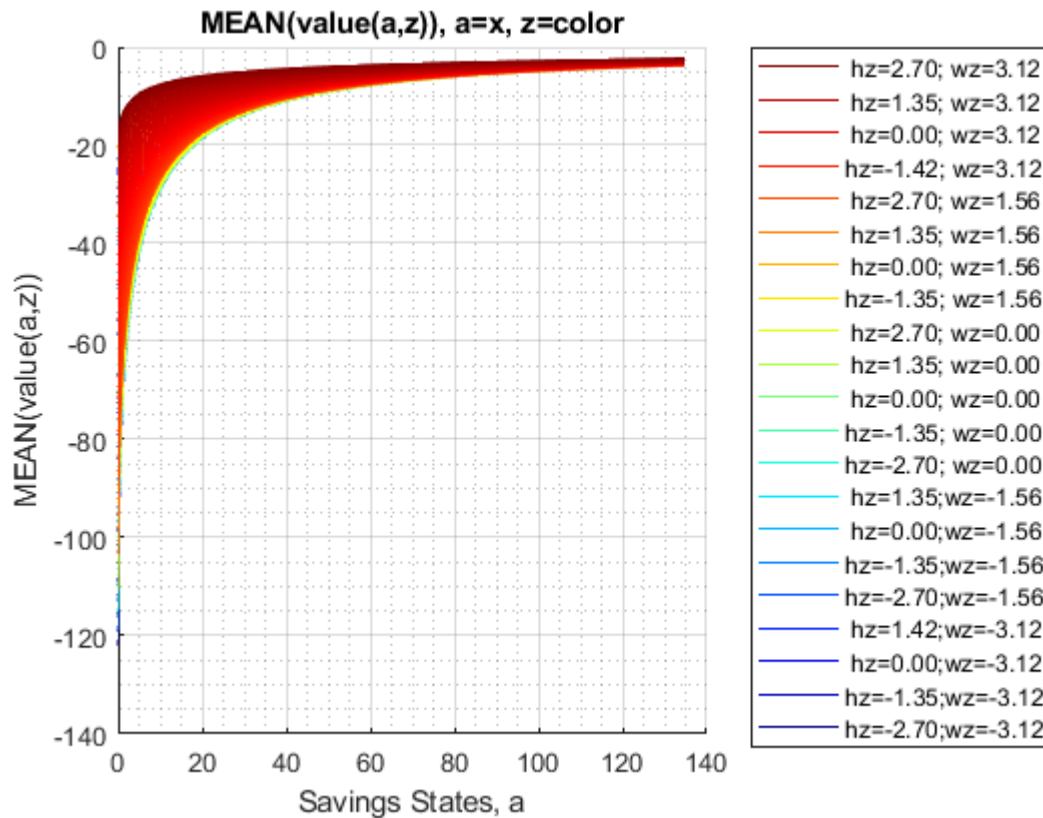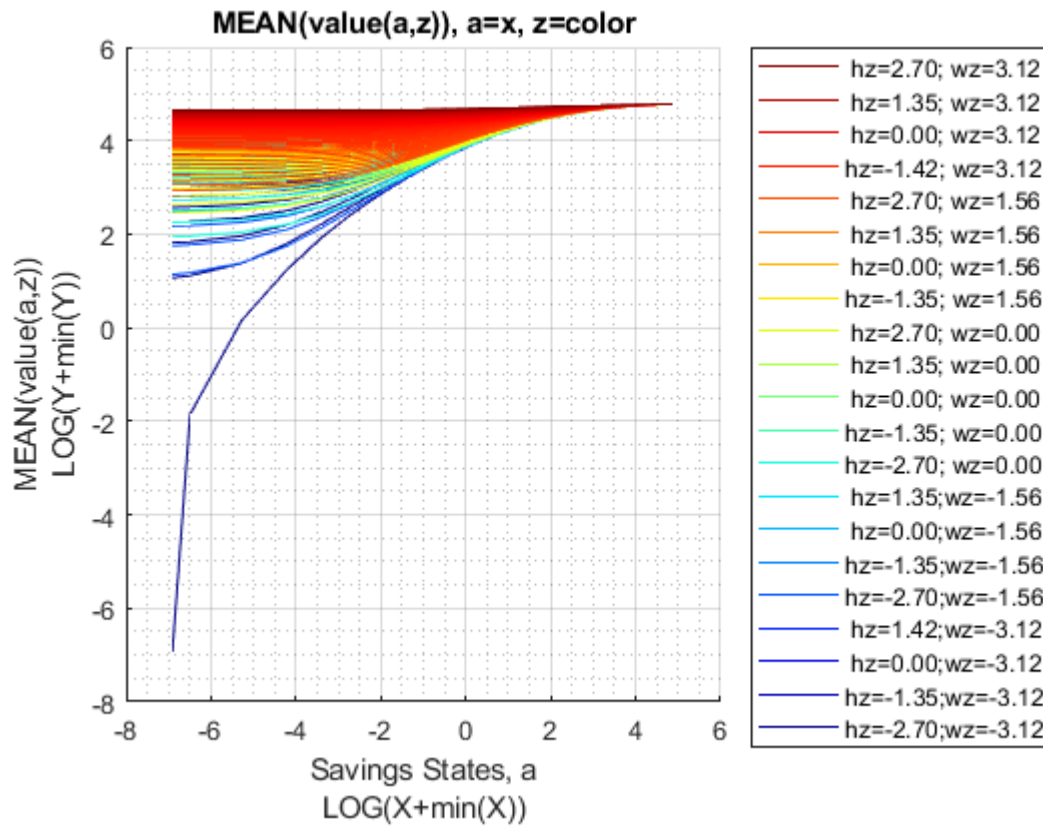
2	0.00051498	0.13397	0.13632	0.13881	0.14147	0.1443	0.14732	0.15
3	0.0041199	0.13768	0.14	0.14247	0.14512	0.14795	0.15097	0.15
4	0.013905	0.14648	0.14877	0.15122	0.15385	0.15667	0.15969	0.16
5	0.032959	0.16186	0.16402	0.16638	0.16896	0.17178	0.17481	0.17
6	0.064373	0.18448	0.18648	0.18877	0.19133	0.19415	0.1972	0.20

Graph Mean Values:

```
mp_support_graph('cl_st_graph_title') = {'MEAN(value(a,z)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(value(a,z))'};
ff_graph_grid((tb_az_v{1:end, 3:end})', ar_st_eta_HS_grid, agrid, mp_support_graph);
```


MEAN(value(a,z)), a=x, z=color

Legend:
- hz=2.70; wz=3.12
- hz=1.35; wz=3.12
- hz=0.00; wz=3.12
- hz=-1.42; wz=3.12
- hz=2.70; wz=1.56
- hz=1.35; wz=1.56
- hz=0.00; wz=1.56
- hz=-1.35; wz=1.56
- hz=2.70; wz=0.00
- hz=1.35; wz=0.00
- hz=0.00; wz=0.00
- hz=-1.35; wz=0.00
- hz=-2.70; wz=0.00
- hz=1.35;wz=-1.56
- hz=0.00;wz=-1.56
- hz=-1.35;wz=-1.56
- hz=-2.70;wz=-1.56
- hz=1.42;wz=-3.12
- hz=0.00;wz=-3.12
- hz=-1.35;wz=-3.12
- hz=-2.70;wz=-3.12

Axis: MEAN(value(a,z)) vs Savings States, a

MEAN(value(a,z)), a=x, z=color

—	hz=2.70; wz=3.12
—	hz=1.35; wz=3.12
—	hz=0.00; wz=3.12
—	hz=-1.42; wz=3.12
—	hz=2.70; wz=1.56
—	hz=1.35; wz=1.56
—	hz=0.00; wz=1.56
—	hz=-1.35; wz=1.56
—	hz=2.70; wz=0.00
—	hz=1.35; wz=0.00
—	hz=0.00; wz=0.00
—	hz=-1.35; wz=0.00
—	hz=-2.70; wz=0.00
—	hz=1.35;wz=-1.56
—	hz=0.00;wz=-1.56
—	hz=-1.35;wz=-1.56
—	hz=-2.70;wz=-1.56
—	hz=1.42;wz=-3.12
—	hz=0.00;wz=-3.12
—	hz=-1.35;wz=-3.12
—	hz=-2.70;wz=-3.12

Axis labels: MEAN(value(a,z)) LOG(Y+min(Y)) (vertical); Savings States, a LOG(X+min(X)) (horizontal)
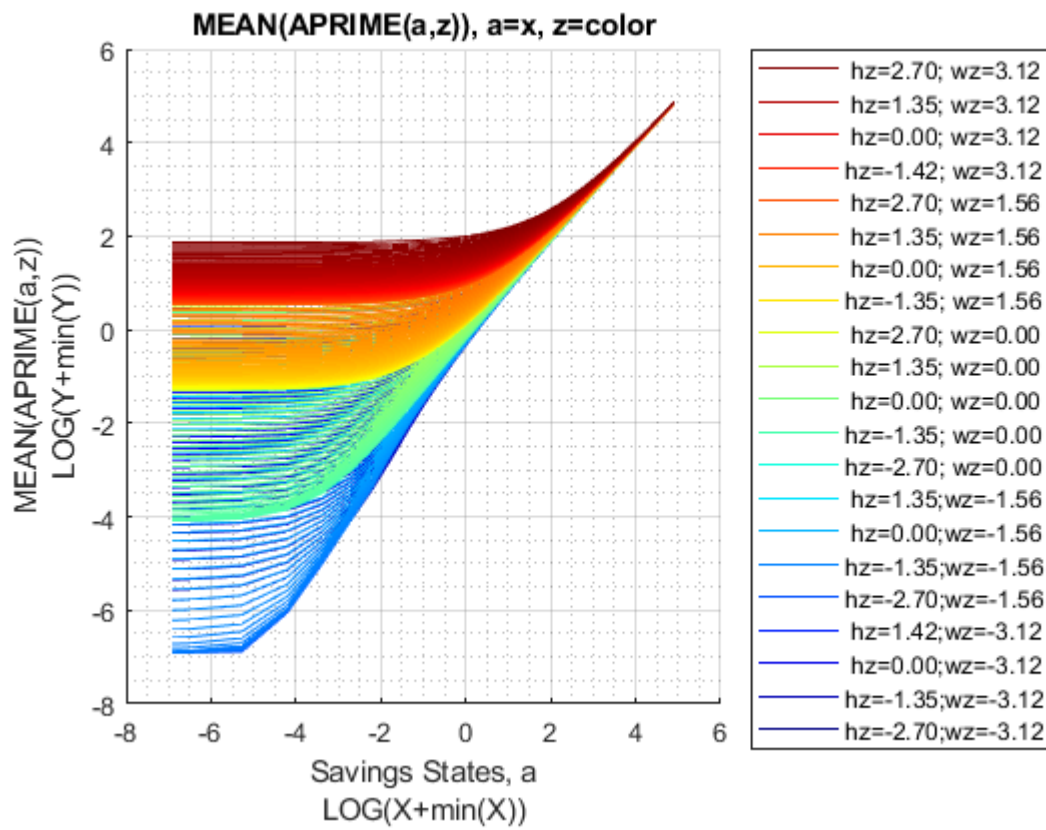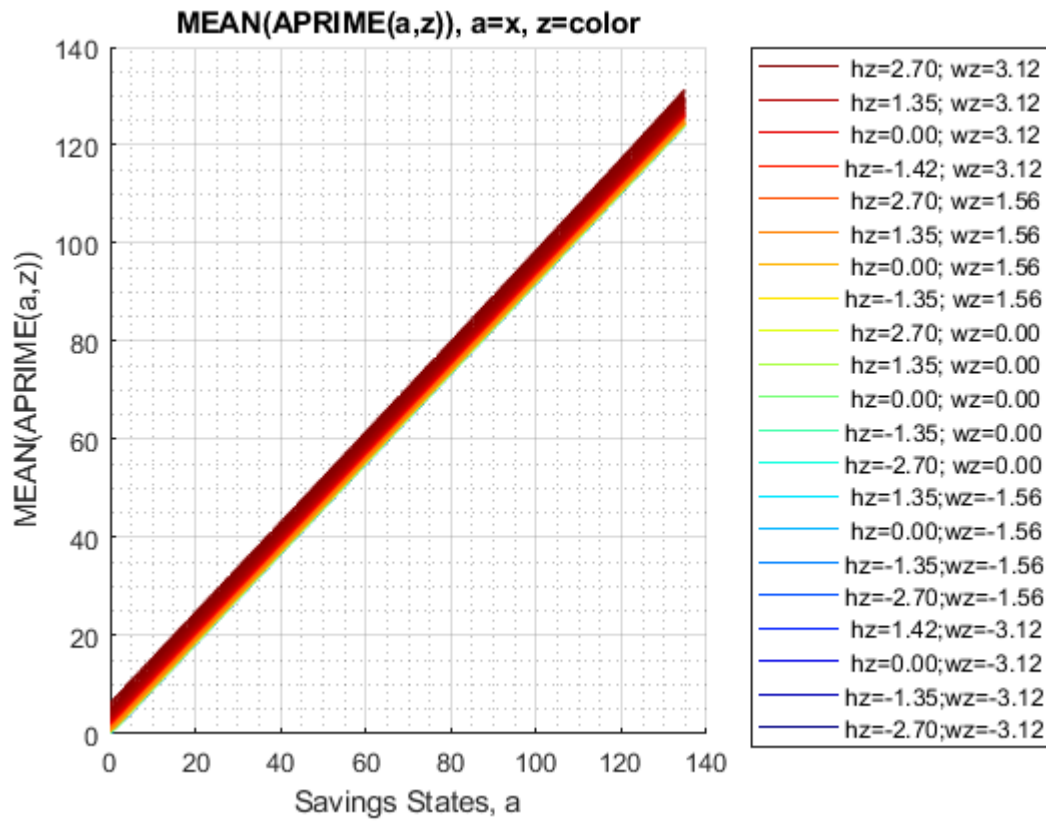
Graph Mean Savings Choices:

```
mp_support_graph('cl_st_graph_title') = {'MEAN(APRIME(a,z)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(APRIME(a,z))'};
ff_graph_grid((tb_az_ap{1:end, 3:end})', ar_st_eta_HS_grid, agrid, mp_support_graph);
```

MEAN(APRIME(a,z)), a=x, z=color

hz=2.70; wz=3.12	
hz=1.35; wz=3.12	
hz=0.00; wz=3.12	
hz=-1.42; wz=3.12	
hz=2.70; wz=1.56	
hz=1.35; wz=1.56	
hz=0.00; wz=1.56	
hz=-1.35; wz=1.56	
hz=2.70; wz=0.00	
hz=1.35; wz=0.00	
hz=0.00; wz=0.00	
hz=-1.35; wz=0.00	
hz=-2.70; wz=0.00	
hz=1.35;wz=-1.56	
hz=0.00;wz=-1.56	
hz=-1.35;wz=-1.56	
hz=-2.70;wz=-1.56	
hz=1.42;wz=-3.12	
hz=0.00;wz=-3.12	
hz=-1.35;wz=-3.12	
hz=-2.70;wz=-3.12	

MEAN(APRIME(a,z)), a=x, z=color

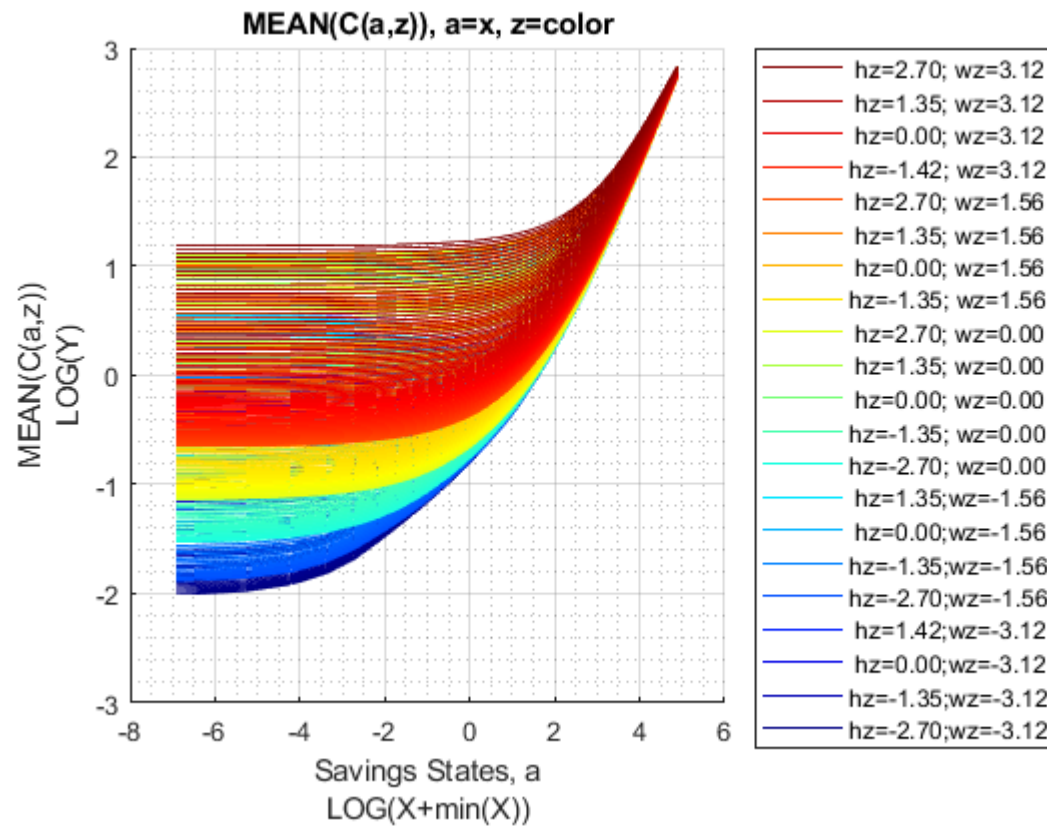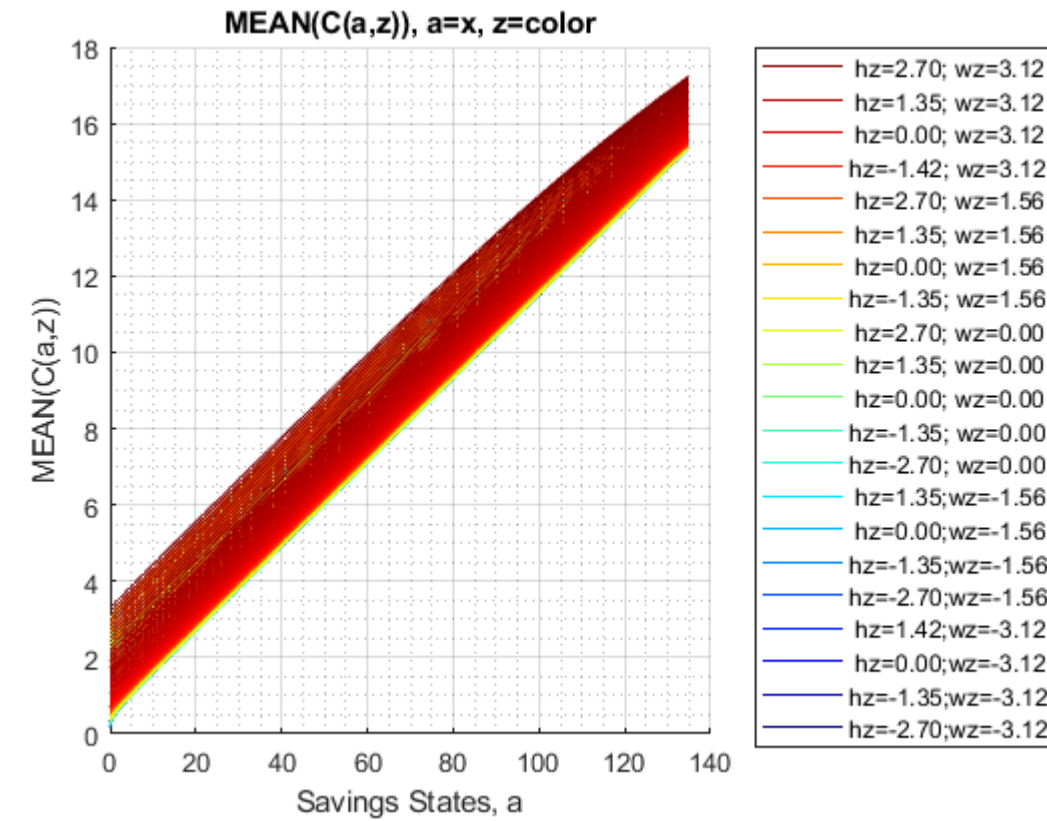|	
hz=2.70; wz=3.12	
hz=1.35; wz=3.12	
hz=0.00; wz=3.12	
hz=-1.42; wz=3.12	
hz=2.70; wz=1.56	
hz=1.35; wz=1.56	
hz=0.00; wz=1.56	
hz=-1.35; wz=1.56	
hz=2.70; wz=0.00	
hz=1.35; wz=0.00	
hz=0.00; wz=0.00	
hz=-1.35; wz=0.00	
hz=-2.70; wz=0.00	
hz=1.35;wz=-1.56	
hz=0.00;wz=-1.56	
hz=-1.35;wz=-1.56	
hz=-2.70;wz=-1.56	
hz=1.42;wz=-3.12	
hz=0.00;wz=-3.12	
hz=-1.35;wz=-3.12	
hz=-2.70;wz=-3.12	

Graph Mean Consumption:

```
mp_support_graph('cl_st_graph_title') = {'MEAN(C(a,z)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(C(a,z))'};
ff_graph_grid((tb_az_c{1:end, 3:end})', ar_st_eta_HS_grid, agrid, mp_support_graph);
```

MEAN(C(a,z)), a=x, z=color

Legend:
- hz=2.70; wz=3.12
- hz=1.35; wz=3.12
- hz=0.00; wz=3.12
- hz=-1.42; wz=3.12
- hz=2.70; wz=1.56
- hz=1.35; wz=1.56
- hz=0.00; wz=1.56
- hz=-1.35; wz=1.56
- hz=2.70; wz=0.00
- hz=1.35; wz=0.00
- hz=0.00; wz=0.00
- hz=-1.35; wz=0.00
- hz=-2.70; wz=0.00
- hz=1.35;wz=-1.56
- hz=0.00;wz=-1.56
- hz=-1.35;wz=-1.56
- hz=-2.70;wz=-1.56
- hz=1.42;wz=-3.12
- hz=0.00;wz=-3.12
- hz=-1.35;wz=-3.12
- hz=-2.70;wz=-3.12

Axis: MEAN(C(a,z)) vs Savings States, a

MEAN(C(a,z)), a=x, z=color

Legend:
- hz=2.70; wz=3.12
- hz=1.35; wz=3.12
- hz=0.00; wz=3.12
- hz=-1.42; wz=3.12
- hz=2.70; wz=1.56
- hz=1.35; wz=1.56
- hz=0.00; wz=1.56
- hz=-1.35; wz=1.56
- hz=2.70; wz=0.00
- hz=1.35; wz=0.00
- hz=0.00; wz=0.00
- hz=-1.35; wz=0.00
- hz=-2.70; wz=0.00
- hz=1.35;wz=-1.56
- hz=0.00;wz=-1.56
- hz=-1.35;wz=-1.56
- hz=-2.70;wz=-1.56
- hz=1.42;wz=-3.12
- hz=0.00;wz=-3.12
- hz=-1.35;wz=-3.12
- hz=-2.70;wz=-3.12

Axis: MEAN(C(a,z)) LOG(Y) vs Savings States, a LOG(X+min(X))

7

Analyze Kids and Marriage and Age

Aggregating over education, savings, and shocks, what are the differential effects of Marriage and Age.

```matlab
% Generate some Data
mp_support_graph = containers.Map('KeyType', 'char', 'ValueType', 'any');
ar_row_grid = [...
    "k0M0", "K1M0", "K2M0", "K3M0", "K4M0", ...
    "k0M1", "K1M1", "K2M1", "K3M1", "K4M1"];
mp_support_graph('cl_st_xtitle') = {'Age'};
mp_support_graph('st_legend_loc') = 'best';
mp_support_graph('bl_graph_logy') = true; % do not log
mp_support_graph('st_rounding') = '6.2f'; % format shock legend
mp_support_graph('cl_scatter_shapes') = {...
    'o', 'd' ,'s', 'x', '*', ...
    'o', 'd', 's', 'x', '*'};
mp_support_graph('cl_colors') = {...
    'red', 'red', 'red', 'red', 'red'...
    'blue', 'blue', 'blue', 'blue', 'blue'};
```

MEAN(VAL(KM,J)), MEAN(AP(KM,J)), MEAN(C(KM,J))

Tabulate value and policies:

```matlab
% Set
% NaN(n_jgrid,n_agrid,n_etagrid,n_educgrid,n_marriedgrid,n_kidsgrid);
ar_permute = [2,3,4,1,6,5];
% Value Function
tb_az_v = ff_summ_nd_array("MEAN(VAL(KM,J))", V_VFI, true, ["mean"], 3, 1, cl_mp_datasetdesc, a
```

```
xxx  MEAN(VAL(KM,J))  xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
```

| group	kids	marry	mean_age_18	mean_age_19	mean_age_20	mean_age_21	mean_age_22	mean_age_23
1	1	0	-38.153	-36.95	-35.802	-34.709	-33.718	-32.818
2	2	0	-45.736	-44.24	-42.778	-41.355	-40.041	-38.825
3	3	0	-49.467	-47.957	-46.467	-45.003	-43.644	-42.382
4	4	0	-53.322	-51.806	-50.292	-48.787	-47.384	-46.072
5	5	0	-56.129	-54.692	-53.245	-51.795	-50.441	-49.173
6	1	1	-26.282	-25.268	-24.319	-23.425	-22.612	-21.872
7	2	1	-30.883	-29.746	-28.66	-27.617	-26.65	-25.755
8	3	1	-33.096	-31.952	-30.853	-29.79	-28.803	-27.886
9	4	1	-35.694	-34.564	-33.469	-32.399	-31.401	-30.469
10	5	1	-37.748	-36.679	-35.641	-34.621	-33.672	-32.788

```matlab
% Aprime Choice
tb_az_ap = ff_summ_nd_array("MEAN(AP(KM,J))", ap_VFI, true, ["mean"], 3, 1, cl_mp_datasetdesc,
```

```
xxx  MEAN(AP(KM,J))  xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
```

group	kids	marry	mean_age_18	mean_age_19	mean_age_20	mean_age_21	mean_age_22	mean_age_23
1	1	0	34.497	34.459	34.419	34.455	34.493	34.531
2	2	0	34.303	34.259	34.213	34.242	34.272	34.302
3	3	0	34.149	34.105	34.058	34.086	34.115	34.143
4	4	0	34.057	34.013	33.967	33.996	34.024	34.053
5	5	0	33.974	33.933	33.889	33.919	33.95	33.981

6	1	1	35.212	35.25	35.288	35.417	35.549	35.682
7	2	1	34.954	34.979	35.003	35.113	35.226	35.339
8	3	1	34.711	34.728	34.743	34.842	34.943	35.045
9	4	1	34.51	34.519	34.527	34.617	34.708	34.801
10	5	1	34.225	34.221	34.216	34.29	34.367	34.444

```
% Consumption Choices
tb_az_c = ff_summ_nd_array("MEAN(C(KM,J))", cons_VFI, true, ["mean"], 3, 1, cl_mp_datasetdesc,
```

```
xxx  MEAN(C(KM,J))  xxxxxxxxxxxxxxxxxxxxxxxxxxxxx
```

| group	kids	marry	mean_age_18	mean_age_19	mean_age_20	mean_age_21	mean_age_22	mean_age_23
1	1	0	2.0602	2.0988	2.1385	2.1805	2.2207	2.2589
2	2	0	2.2548	2.2985	2.3445	2.3938	2.4417	2.4882
3	3	0	2.4085	2.4527	2.4992	2.5498	2.5989	2.6467
4	4	0	2.5011	2.5444	2.5902	2.6404	2.6895	2.7373
5	5	0	2.5841	2.625	2.6684	2.7166	2.7635	2.809
6	1	1	2.6152	2.6754	2.7367	2.8014	2.8634	2.9226
7	2	1	2.678	2.7363	2.7967	2.8619	2.9253	2.9868
8	3	1	2.7864	2.8428	2.9018	2.966	3.0285	3.0891
9	4	1	2.8495	2.9021	2.9575	3.0183	3.0775	3.135
10	5	1	2.9142	2.9626	3.0136	3.0698	3.124	3.1763

Graph Mean Values:

```
mp_support_graph('cl_st_graph_title') = {'MEAN(value(KM,J)), a=age, z=kids+marry'};
mp_support_graph('cl_st_ytitle') = {'MEAN(value(KM,J))'};
ff_graph_grid((tb_az_v{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```


MEAN(value(KM,J)), a=age, z=kids+marry

MEAN(value(KM,J)), a=age, z=kids+marry
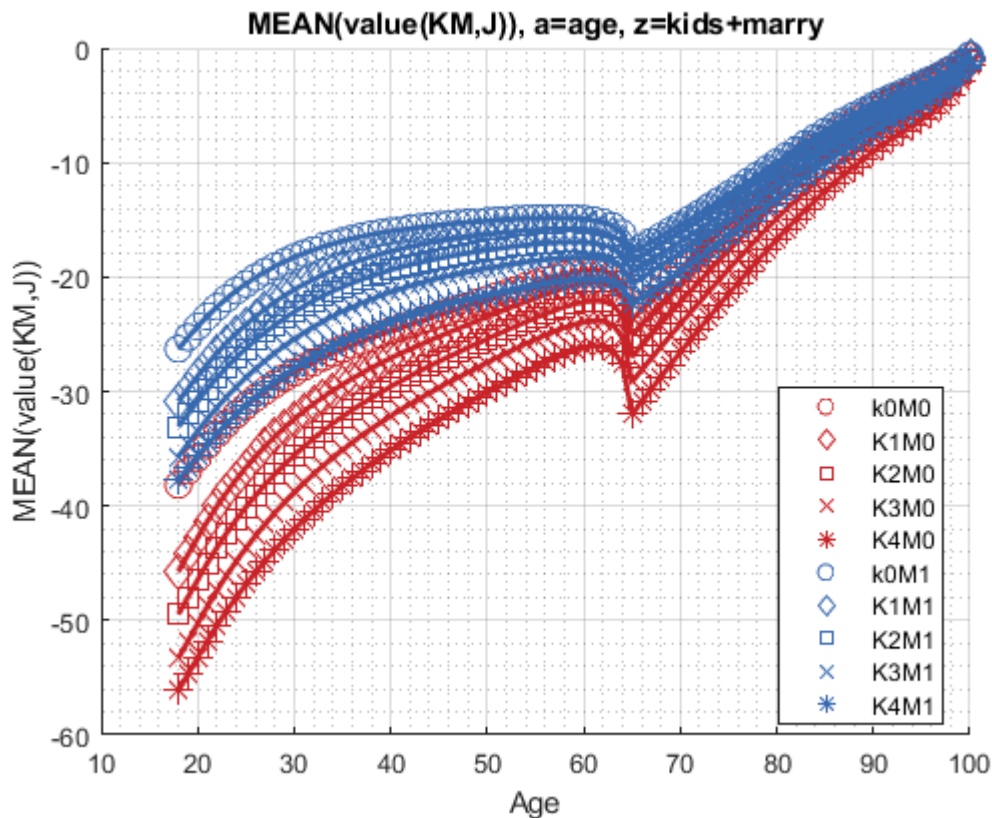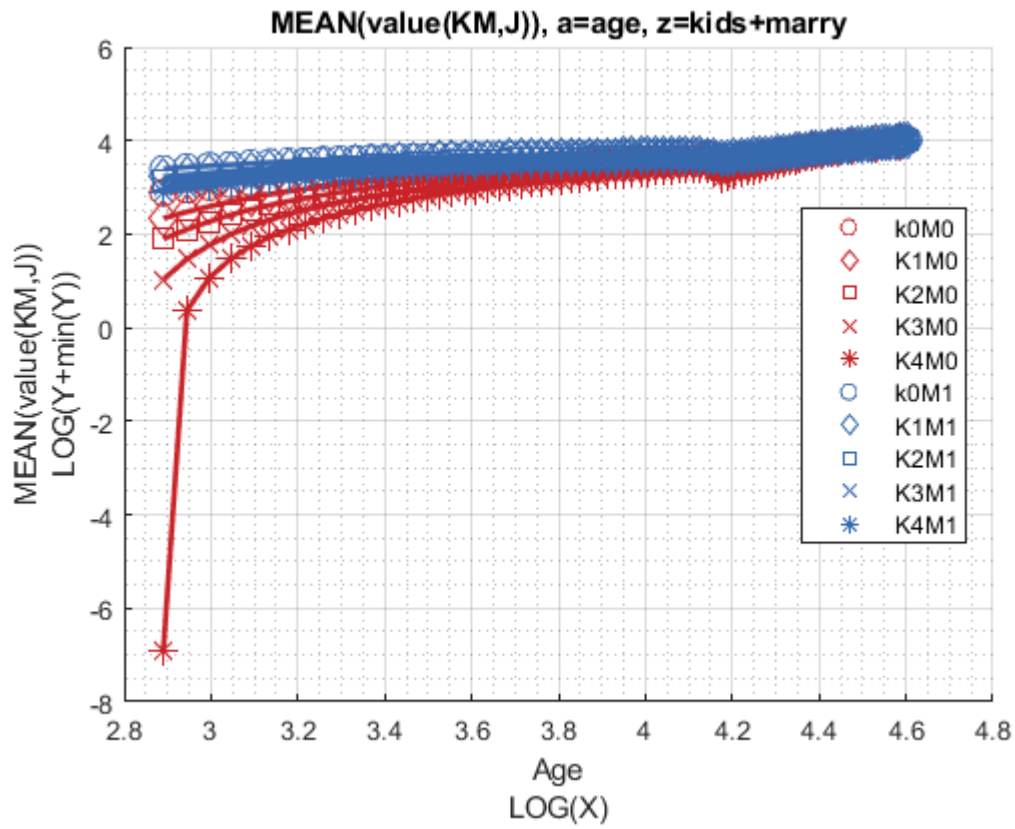
Graph Mean Savings Choices:

```
mp_support_graph('cl_st_graph_title') = {'MEAN(APRIME(KM,J)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(APRIME(KM,J))'};
ff_graph_grid((tb_az_ap{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```
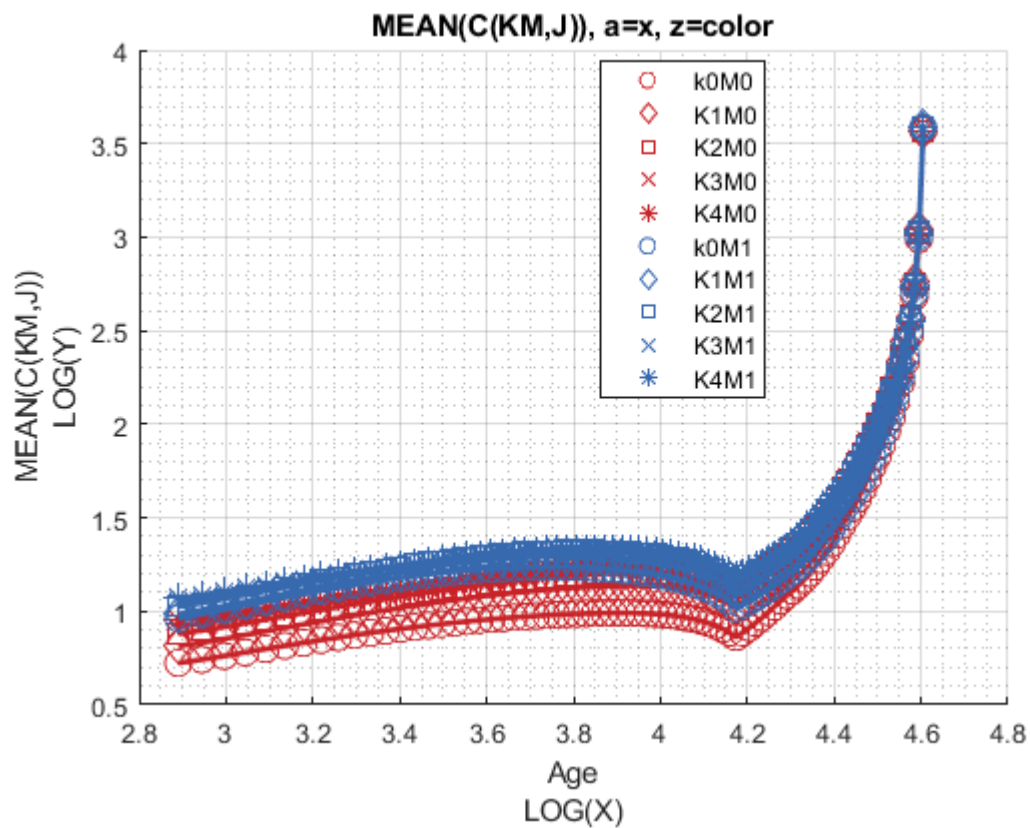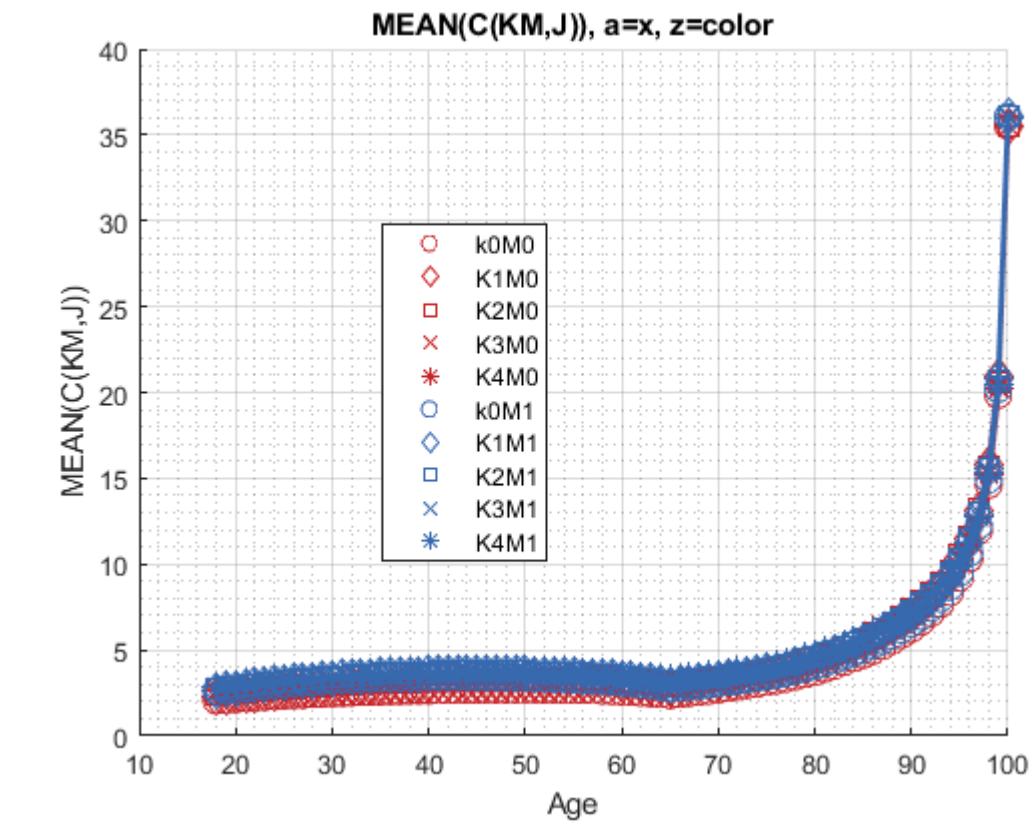
MEAN(APRIME(KM,J)), a=x, z=color

MEAN(APRIME(KM,J)), a=x, z=color
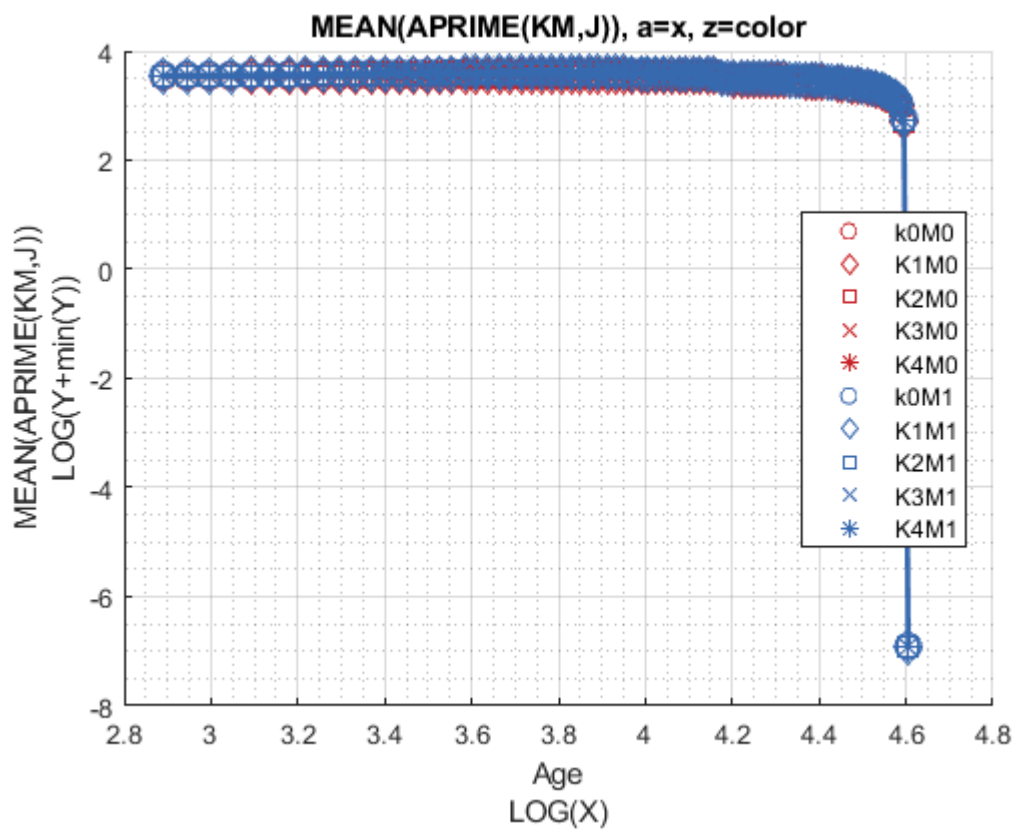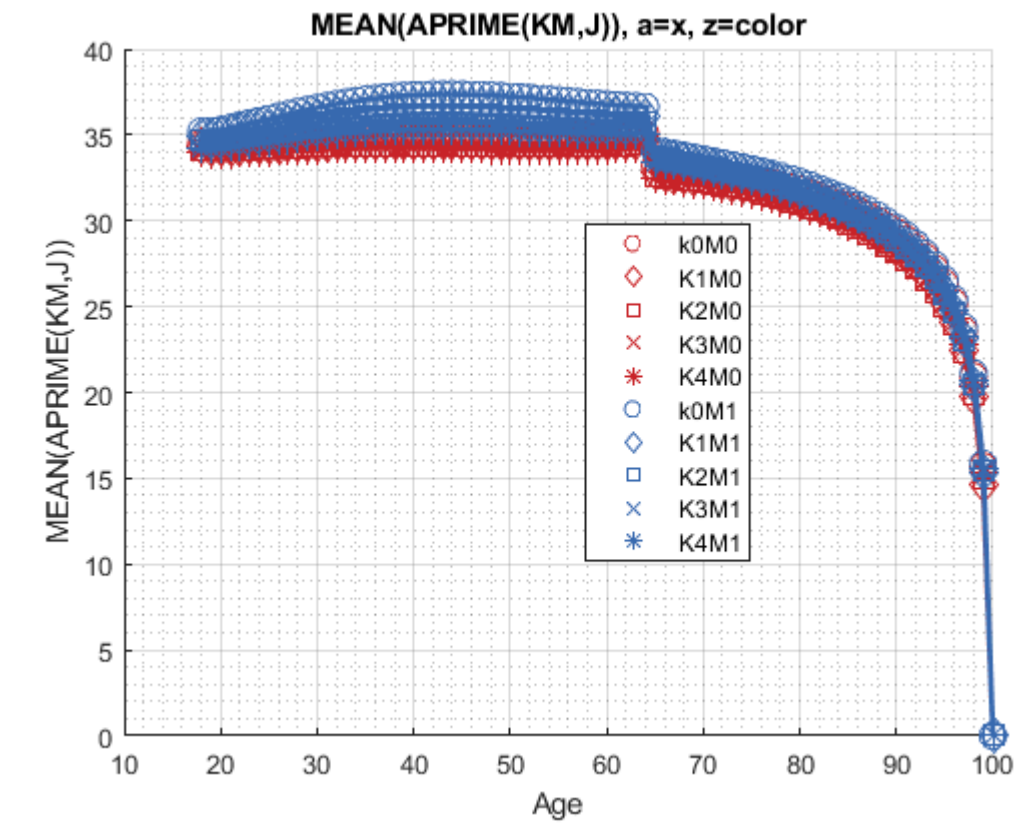
Graph Mean Consumption:

```
mp_support_graph('cl_st_graph_title') = {'MEAN(C(KM,J)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(C(KM,J))'};
ff_graph_grid((tb_az_c{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```


MEAN(C(KM,J)), a=x, z=color

MEAN(C(KM,J)), a=x, z=color

Analyze Education and Marriage and Age

Aggregating over education, savings, and shocks, what are the differential effects of Marriage and Age.

```
% Generate some Data
mp_support_graph = containers.Map('KeyType', 'char', 'ValueType', 'any');
ar_row_grid = ["E0M0", "E1M0", "E0M1", "E1M1"];
mp_support_graph('cl_st_xtitle') = {'Age'};
mp_support_graph('st_legend_loc') = 'best';
mp_support_graph('bl_graph_logy') = true; % do not log
mp_support_graph('st_rounding') = '6.2f'; % format shock legend
mp_support_graph('cl_scatter_shapes') = {'*', 'p', '*','p' };
mp_support_graph('cl_colors') = {'red', 'red', 'blue', 'blue'};
```

MEAN(VAL(EKM,J)), MEAN(AP(EKM,J)), MEAN(C(EKM,J))

Tabulate value and policies:

```
% Set
% NaN(n_jgrid,n_agrid,n_etagrid,n_educgrid,n_marriedgrid,n_kidsgrid);
ar_permute = [2,3,6,1,4,5];
% Value Function
tb_az_v = ff_summ_nd_array("MEAN(VAL(EKM,J))", V_VFI, true, ["mean"], 3, 1, cl_mp_datasetdesc,
```

```
xxx  MEAN(VAL(EKM,J))   xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
```

group	edu	marry	mean_age_18	mean_age_19	mean_age_20	mean_age_21	mean_age_22	mean_age_23
1	0	0	-51.853	-50.513	-49.192	-47.891	-46.665	-45.509
2	1	0	-45.27	-43.745	-42.242	-40.768	-39.426	-38.199
3	0	1	-35.075	-33.966	-32.905	-31.884	-30.931	-30.041
4	1	1	-30.407	-29.317	-28.272	-27.257	-26.324	-25.467

```
% Aprime Choice
tb_az_ap = ff_summ_nd_array("MEAN(AP(EKM,J))", ap_VFI, true, ["mean"], 3, 1, cl_mp_datasetdesc,
```

```
xxx  MEAN(AP(EKM,J))   xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
```

| group	edu	marry	mean_age_18	mean_age_19	mean_age_20	mean_age_21	mean_age_22	mean_age_23
1	0	0	34.297	34.264	34.23	34.24	34.251	34.261
2	1	0	34.094	34.043	33.989	34.039	34.091	34.143
3	0	1	34.773	34.793	34.812	34.883	34.955	35.027
4	1	1	34.672	34.686	34.698	34.828	34.962	35.098

```
% Consumption Choices
tb_az_c = ff_summ_nd_array("MEAN(C(EKM,J))", cons_VFI, true, ["mean"], 3, 1, cl_mp_datasetdesc,
```

```
xxx  MEAN(C(EKM,J))   xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
```

| group	edu	marry	mean_age_18	mean_age_19	mean_age_20	mean_age_21	mean_age_22	mean_age_23
1	0	0	2.2603	2.2935	2.3281	2.3646	2.4003	2.4353
2	1	0	2.4632	2.5143	2.5682	2.6279	2.6854	2.7407
3	0	1	2.623	2.6679	2.714	2.7624	2.8096	2.8557
4	1	1	2.9143	2.9798	3.0485	3.1246	3.1978	3.2682

Graph Mean Values:

```
mp_support_graph('cl_st_graph_title') = {'MEAN(value(EM,J)), a=age, z=kids+marry'};
mp_support_graph('cl_st_ytitle') = {'MEAN(value(EM,J))'};
ff_graph_grid((tb_az_v{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```

MEAN(value(EM,J)), a=age, z=kids+marry
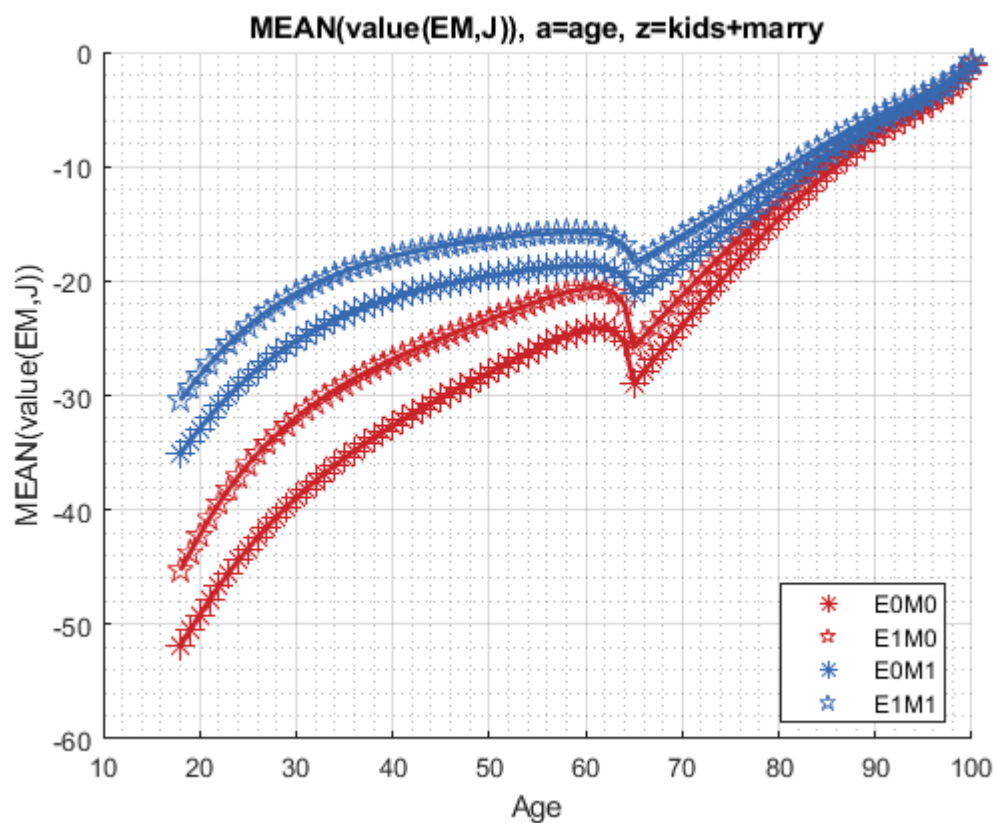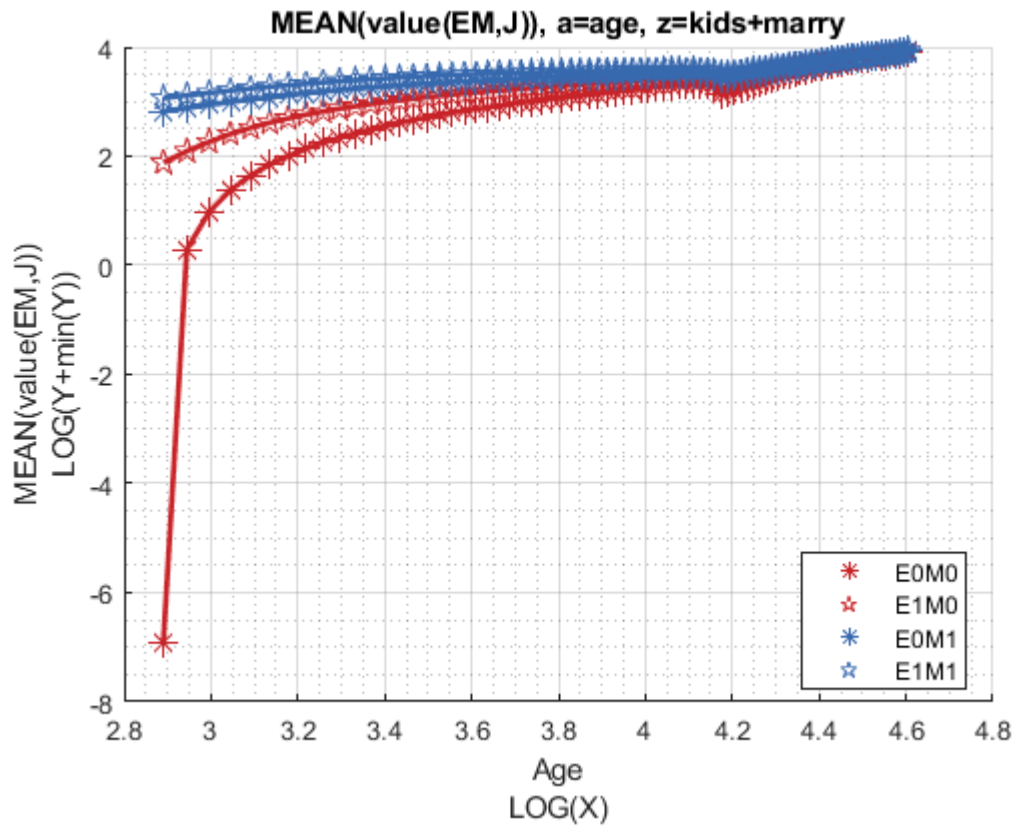
Graph Mean Savings Choices:

```
mp_support_graph('cl_st_graph_title') = {'MEAN(APRIME(EK,J)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(APRIME(EK,J))'};
ff_graph_grid((tb_az_ap{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```

MEAN(APRIME(EK,J)), a=x, z=color

MEAN(APRIME(EK,J)), a=x, z=color
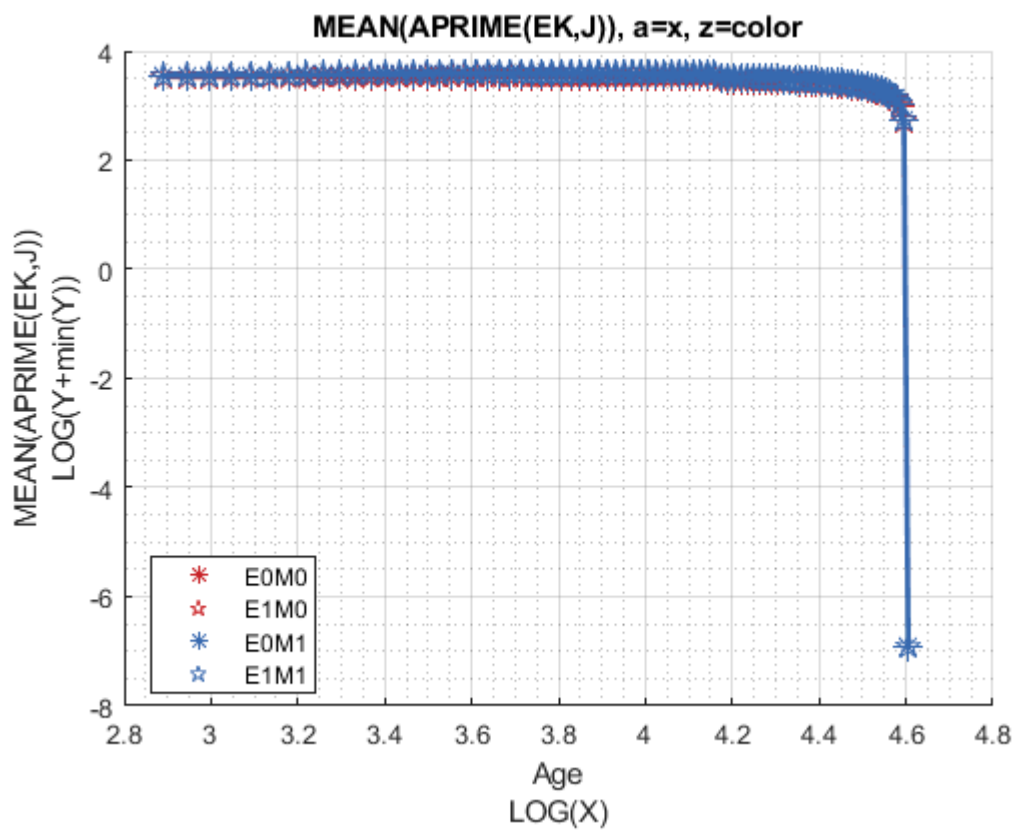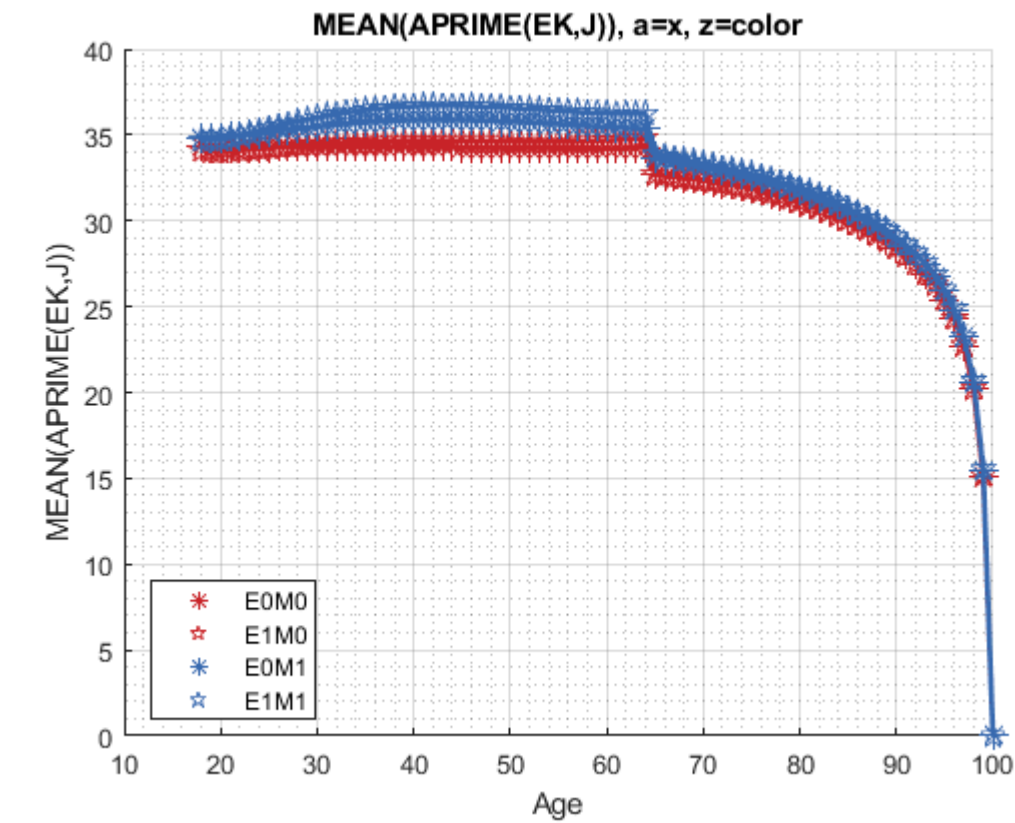
Graph Mean Consumption:

```
mp_support_graph('cl_st_graph_title') = {'MEAN(C(EK,J)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(C(EK,J))'};
ff_graph_grid((tb_az_c{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```