2020 Full States EV and EC of One Check

This is the example vignette for function: **snw_evuvw20_jaeemk** from the **PrjOptiSNW Package.** 2020 integrated over VU and VW. Average C or V given unemployment probabilities.

Test SNW_EVUVW20_JAEEMK Defaults

Call the function with defaults.

```
clear all;
st_solu_type = 'bisec_vec';

% Solve the VFI Problem and get Value Function
mp_params = snw_mp_param('default_docdense');
mp_params('beta') = 0.95;
mp_controls = snw_mp_control('default_test');

% set Unemployment Related Variables
xi=0.5; % Proportional reduction in income due to unemployment (xi=0 refers to 0 labor income;
b=0; % Unemployment insurance replacement rate (b=0 refers to no UI benefits; b=1 refers to 100
TR=100/58056; % Value of a welfare check (can receive multiple checks). TO DO: Update with alte

mp_params('xi') = xi;
mp_params('b') = b;
mp_params('TR') = TR;

% Solve for Unemployment Values
mp_controls('bl_print_vfi') = false;
mp_controls('bl_print_ds') = false;
mp_controls('bl_print_ds_verbose') = false;
mp_controls('bl_print_precompute') = false;
mp_controls('bl_print_precompute_verbose') = false;
mp_controls('bl_print_a4chk') = false;
mp_controls('bl_print_a4chk_verbose') = false;
mp_controls('bl_print_evuvw20_jaeemk') = false;
mp_controls('bl_print_evuvw20_jaeemk_verbose') = false;
```

Solve the model:

```
%% A. Solve VFI
% 2. Solve VFI and Distributon
% Solve the Model to get V working and unemployed
% solved with calibrated regular a2
[V_ss,ap_ss,cons_ss,mp_valpol_more_ss] = snw_vfi_main_bisec_vec(mp_params, mp_controls);
```

```
Completed SNW_VFI_MAIN_BISEC_VEC;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=523.3967
----------------------------------------
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
CONTAINER NAME: mp_outcomes ND Array (Matrix etc)
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
```

	i	idx	ndim	numel	rowN	colN	sum	mean	std	coefvari
V_VFI	1	1	6	4.37e+07	83	5.265e+05	-1.2728e+08	-2.9126	20.655	-7.0915

ap_VFI	2	2	6	4.37e+07	83	5.265e+05	1.3962e+09	31.95	36.423	1.14
cons_VFI	3	3	6	4.37e+07	83	5.265e+05	2.3374e+08	5.3487	8.4439	1.5787

xxx TABLE:V_VFI xxxxxxxxxxxxxxxxxx

	c1	c2	c3	c4	c5	c526496	c526497	c526498	c526499	c52650
r1	-274.81	-274.42	-271.94	-266.29	-257.26	14.439	14.533	14.626	14.718	14.80
r2	-265.29	-264.9	-262.43	-256.84	-248.12	14.494	14.585	14.674	14.763	14.8
r3	-255.77	-255.38	-252.93	-247.53	-239.24	14.55	14.636	14.723	14.808	14.89
r4	-246.16	-245.8	-243.52	-238.46	-230.68	14.606	14.689	14.772	14.853	14.93
r5	-237.48	-237.14	-235.01	-230.26	-222.92	14.654	14.734	14.813	14.891	14.9
r79	-9.6662	-9.655	-9.5783	-9.3823	-9.0457	2.4698	2.4801	2.4898	2.4989	2.507
r80	-8.7031	-8.6919	-8.6152	-8.4192	-8.0826	2.253	2.261	2.2685	2.2755	2.282
r81	-7.5138	-7.5026	-7.4258	-7.2298	-6.8933	1.9749	1.9803	1.9855	1.9904	1.99
r82	-5.9155	-5.9043	-5.8275	-5.6315	-5.295	1.582	1.5851	1.588	1.5907	1.593
r83	-3.5892	-3.578	-3.5012	-3.3052	-2.9687	0.97904	0.98004	0.98097	0.98185	0.9826

xxx TABLE:ap_VFI xxxxxxxxxxxxxxxxxx

	c1	c2	c3	c4	c5	c526496	c526497	c526498	c526499	c526500
r1	0	0	0.00051498	0.0066578	0.021589	112.13	117.66	123.39	129.3	135.72
r2	0	0	0.00051498	0.0057684	0.020245	112.16	117.7	123.42	129.34	135.75
r3	0	0	0.00020768	0.0041456	0.018539	112.19	117.72	123.45	129.36	135.77
r4	0	0	0.00010346	0.0041199	0.018307	112.85	118.38	124.11	130.02	136.44
r5	0	0	5.2907e-06	0.0041199	0.018091	113.53	119.06	124.78	130.7	137.11
r79	0	0	0	0	0	81.091	85.373	89.342	93.265	97.358
r80	0	0	0	0	0	76.137	79.759	83.442	86.995	90.589
r81	0	0	0	0	0	67.958	70.652	73.689	77.006	81.091
r82	0	0	0	0	0	50.126	53.467	56.319	57.902	60.587
r83	0	0	0	0	0	0	0	0	0	0

xxx TABLE:cons_VFI xxxxxxxxxxxxxxxxxx

	c1	c2	c3	c4	c5	c526496	c526497	c526498	c526499	c
r1	0.036717	0.037251	0.040477	0.044486	0.049324	12.272	12.557	12.851	13.152	1
r2	0.036717	0.037251	0.040477	0.045375	0.050668	12.508	12.794	13.089	13.391	1
r3	0.036717	0.037251	0.040784	0.046998	0.052374	12.762	13.05	13.345	13.646	1
r4	0.038144	0.038678	0.042314	0.048449	0.054031	13.008	13.297	13.593	13.891	1
r5	0.039534	0.040068	0.043802	0.049839	0.055635	13.245	13.534	13.83	14.125	1
r79	0.2179	0.21844	0.22216	0.23228	0.25197	35.858	37.4	39.448	41.74	4
r80	0.2179	0.21844	0.22216	0.23228	0.25197	40.785	42.986	45.321	47.983	5
r81	0.2179	0.21844	0.22216	0.23228	0.25197	48.942	52.071	55.052	57.95	6
r82	0.2179	0.21844	0.22216	0.23228	0.25197	66.755	69.238	72.404	77.036	8
r83	0.2179	0.21844	0.22216	0.23228	0.25197	116.87	122.69	128.71	134.92	1

```
% COVID year tax
mp_params('a2_covidyr') = mp_params('a2_covidyr_manna_heaven');
% 2020 V and C same as V_SS and cons_ss if tax the same
if (mp_params('a2_covidyr') == mp_params('a2'))
    % mana from heaven
    V_ss_2020 = V_ss;
    cons_ss_2020 = cons_ss;
else
    % change xi and b to for people without unemployment shock
    % solving for employed but 2020 tax results
    % a2_covidyr > a2, we increased tax in 2020 to pay for covid and other
    % costs resolve for both employed and unemployed
    xi = mp_params('xi');
    b = mp_params('b');
```

```
    mp_params('xi') = 1;
    mp_params('b') = 0;
    [V_ss_2020,~,cons_ss_2020,~] = snw_vfi_main_bisec_vec(mp_params, mp_controls, V_ss);
    mp_params('xi') = xi;
    mp_params('b') = b;
end

% Solve unemployment, with three input parameters, auto will use a2_covidyr
% as tax, similar for employed call above
[V_unemp_2020,~,cons_unemp_2020] = snw_vfi_main_bisec_vec(mp_params, mp_controls, V_ss);
```

```
Completed SNW_VFI_MAIN_BISEC_VEC 1 Period Unemp Shock;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time
----------------------------------------
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
CONTAINER NAME: mp_outcomes ND Array (Matrix etc)
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
                i    idx    ndim      numel      rowN       colN          sum          mean       std      coefvari
                _    ___    ____    ________     ____    _________    ___________    ________   _______    ________

    V_VFI       1     1      6      4.37e+07      83     5.265e+05    -1.4885e+08    -3.4063    21.649    -6.3556
    ap_VFI      2     2      6      4.37e+07      83     5.265e+05       1.36e+09     31.122    36.291     1.1661
    cons_VFI    3     3      6      4.37e+07      83     5.265e+05     2.2982e+08     5.2591    8.4465     1.6061

xxx TABLE:V_VFI xxxxxxxxxxxxxxxxxx
              c1         c2         c3         c4         c5        c526496    c526497    c526498    c526499    c52650
           _______    _______    _______    _______    _______    _______    _______    _______    _______    ______

    r1     -301.27    -299.77    -291.24    -277.82    -265.42     14.357     14.455     14.551     14.646      14.7
    r2     -291.76    -290.26    -281.72     -268.3    -256.02     14.413     14.507       14.6     14.692     14.78
    r3     -282.23    -280.74     -272.2    -258.78    -246.76     14.469      14.56     14.649     14.737     14.82
    r4     -271.61    -270.22    -262.26    -249.53    -238.04     14.522     14.609     14.695      14.78     14.86
    r5     -262.02    -260.72    -253.26    -241.16    -230.13     14.567      14.65     14.733     14.815     14.89
    r79    -9.6662     -9.655    -9.5783    -9.3823    -9.0457     2.4678     2.4783     2.4882     2.4974     2.506
    r80    -8.7031    -8.6919    -8.6152    -8.4192    -8.0826     2.2515     2.2596     2.2673     2.2745     2.281
    r81    -7.5138    -7.5026    -7.4258    -7.2298    -6.8933     1.9738     1.9794     1.9847     1.9896     1.994
    r82    -5.9155    -5.9043    -5.8275    -5.6315     -5.295     1.5815     1.5846     1.5875     1.5903     1.592
    r83    -3.5892     -3.578    -3.5012    -3.3052    -2.9687    0.97886    0.97987    0.98082    0.98171    0.9825

xxx TABLE:ap_VFI xxxxxxxxxxxxxxxxxx
           c1    c2    c3    c4       c5        c526496    c526497    c526498    c526499    c526500
           __    __    __    __    _________    _______    _______    _______    _______    _______

    r1     0     0     0     0     0.0083625    107.54     113.08     118.81     124.74     130.85
    r2     0     0     0     0     0.0074731    107.44     112.98     118.71     124.63     130.75
    r3     0     0     0     0     0.0058503    107.32     112.87      118.6     124.52     130.63
    r4     0     0     0     0     0.0049981    107.53     113.08     118.81     124.72     130.84
    r5     0     0     0     0      0.004174    107.75      113.3     119.02     124.94     131.06
    r79    0     0     0     0             0    80.458     84.335     88.305     92.228     96.321
    r80    0     0     0     0             0    75.113     78.735     82.418     85.971     90.439
    r81    0     0     0     0             0    66.945     69.639     72.676     76.669     81.091
    r82    0     0     0     0             0    50.126     53.467     55.315     56.953     60.587
    r83    0     0     0     0             0         0          0          0          0          0

xxx TABLE:cons_VFI xxxxxxxxxxxxxxxxxx
              c1          c2          c3          c4          c5        c526496    c526497    c526498    c526499    c
           ________    ________    ________    ________    ________    _______    _______    _______    _______    _

    r1     0.018623    0.019158    0.022901    0.033062    0.044486     11.996     12.272     12.557     12.851    1
    r2     0.018623    0.019158    0.022901    0.033062    0.045375      12.23     12.508     12.794     13.089    1
    r3     0.018623    0.019158    0.022901    0.033062    0.046998     12.483     12.762      13.05     13.345    1
    r4     0.019354    0.019888    0.023632    0.033792    0.048579     12.728     13.008     13.297     13.593    1
    r5     0.020066    0.020601    0.024344    0.034504    0.050114     12.963     13.245     13.534      13.83    1
    r79      0.2179     0.21844     0.22216     0.23228     0.25197     35.453       37.4     39.448      41.74    4
```

r80	0.2179	0.21844	0.22216	0.23228	0.25197	40.785	42.986	45.321	47.983	
r81	0.2179	0.21844	0.22216	0.23228	0.25197	48.942	52.071	55.052	57.274	5
r82	0.2179	0.21844	0.22216	0.23228	0.25197	65.751	68.234	72.404	76.981	7
r83	0.2179	0.21844	0.22216	0.23228	0.25197	115.87	121.69	127.71	133.93	1

```
%% B. Solve Dist
[Phi_true] = snw_ds_main_vec(mp_params, mp_controls, ap_ss, cons_ss);
```

```
Completed SNW_DS_MAIN_VEC;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=1447.0669
```

Previous code

```
% % Solve the Model to get V working and unemployed
% [V_ss,ap_ss,cons_ss,mp_valpol_more_ss] = snw_vfi_main_bisec_vec(mp_params, mp_controls);
% % Solve unemployment
% [V_unemp,~,cons_unemp,~] = snw_vfi_main_bisec_vec(mp_params, mp_controls, V_ss);
% [Phi_true] = snw_ds_main(mp_params, mp_controls, ap_ss, cons_ss, mp_valpol_more_ss);
```

Precompute

```
inc_VFI = mp_valpol_more_ss('inc_VFI');
spouse_inc_VFI = mp_valpol_more_ss('spouse_inc_VFI');
total_inc_VFI = inc_VFI + spouse_inc_VFI;
% Get Matrixes
cl_st_precompute_list = {'a', ...
    'inc', 'inc_unemp', 'spouse_inc', 'spouse_inc_unemp', 'ref_earn_wageind_grid'};
mp_controls('bl_print_precompute_verbose') = false;
[mp_precompute_res] = snw_hh_precompute(mp_params, mp_controls, cl_st_precompute_list, ap_ss, P
```

```
Wage quintile cutoffs=0.4645     0.71528      1.0335      1.5632
Completed SNW_HH_PRECOMPUTE;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time cost=271.5762
```

Solve for 2020 Evuvw With 0 and 2 Checks

```
% Call Function
welf_checks = 0;
[ev20_jaeemk_check0, ec20_jaeemk_check0] = snw_evuvw20_jaeemk(...
    welf_checks, st_solu_type, mp_params, mp_controls, ...
    V_ss_2020, cons_ss_2020, V_unemp_2020, cons_unemp_2020, mp_precompute_res);
```

```
Completed SNW_A4CHK_WRK_BISEC_VEC;welf_checks=0;TR=0.0017225;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_te
Completed SNW_A4CHK_UNEMP_BISEC_VEC;welf_checks=0;TR=0.0017225;xi=0.5;b=0;SNW_MP_PARAM=default_docdense;SNW_MP_CONTR
Completed SNW_EVUVW20_JAEEMK;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;timeEUEC=8.4846
```

```
% Call Function
welf_checks = 2;
[ev20_jaeemk_check2, ec20_jaeemk_check2] = snw_evuvw20_jaeemk(...
    welf_checks, st_solu_type, mp_params, mp_controls, ...
    V_ss_2020, cons_ss_2020, V_unemp_2020, cons_unemp_2020, mp_precompute_res);
```

```
Completed SNW_A4CHK_WRK_BISEC_VEC;welf_checks=2;TR=0.0017225;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_te
Completed SNW_A4CHK_UNEMP_BISEC_VEC;welf_checks=2;TR=0.0017225;xi=0.5;b=0;SNW_MP_PARAM=default_docdense;SNW_MP_CONTR
Completed SNW_EVUVW20_JAEEMK;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;timeEUEC=8.0571
```

Differences between Checks in Expected Value and Expected Consumption

```
mn_V_U_gain_check = ev20_jaeemk_check2 - ev20_jaeemk_check0;
mn_MPC_U_gain_share_check = (ec20_jaeemk_check2 - ec20_jaeemk_check0)./(welf_checks*mp_params('
```

Param Results Define Frames

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

```
% Grids:
age_grid = 18:100;
agrid = mp_params('agrid')';
eta_H_grid = mp_params('eta_H_grid')';
eta_S_grid = mp_params('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_params('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});
cl_mp_datasetdesc{6} = containers.Map({'name', 'labval'}, {'kids', kids_grid});
```

Analyze Difference in V and C with Check

The difference between V and V with Check, marginal utility gain given the check.

```
% 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(MN_V_GAIN_CHECK(A,Z))

Tabulate value and policies along savings and shocks:

```
% Set
ar_permute = [1,4,5,6,3,2];
% Value Function
st_title = ['MEAN(MN_V_U_GAIN_CHECK(A,Z)), welf_checks=' num2str(welf_checks) ', TR=' num2str(m
tb_az_v = ff_summ_nd_array(st_title, mn_V_U_gain_check, true, ["mean"], 4, 1, cl_mp_datasetdesc
```

```
xxx   MEAN(MN_V_U_GAIN_CHECK(A,Z)), welf_checks=2, TR=0.0017225   xxxxxxxxxxxxxxxxxxxxxxxxxxx
    group     savings      mean_eta_1    mean_eta_2    mean_eta_3    mean_eta_4    mean_eta_5    mean_eta_6    mean_
    _____    __________    __________    __________    __________    __________    __________    __________    _____
```

1	0	1.7799	1.5892	1.4186	1.2663	1.1303	1.0091	0.
2	0.00051498	1.7463	1.561	1.3951	1.2466	1.1138	0.99527	0.
3	0.0041199	1.2806	1.1656	1.0586	0.96002	0.86971	0.78739	0.
4	0.013905	0.80413	0.74652	0.69063	0.63731	0.58715	0.54037	0.
5	0.032959	0.49946	0.47014	0.43986	0.40984	0.38099	0.35375	0.
6	0.064373	0.33366	0.31704	0.29894	0.2803	0.26191	0.2443	0.

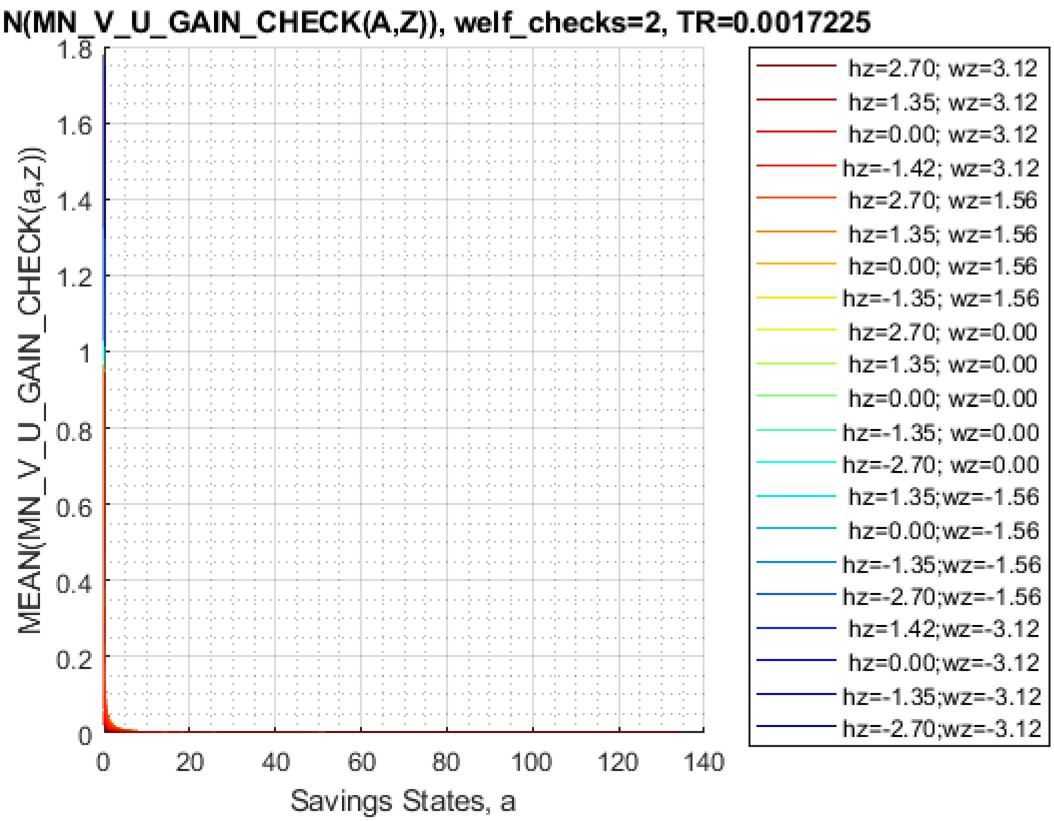
```
% Consumption
st_title = ['MEAN(MN_MPC_U_GAIN_CHECK(A,Z)), welf_checks=' num2str(welf_checks) ', TR=' num2str
tb_az_c = ff_summ_nd_array(st_title, mn_MPC_U_gain_share_check, true, ["mean"], 4, 1, cl_mp_dat
```

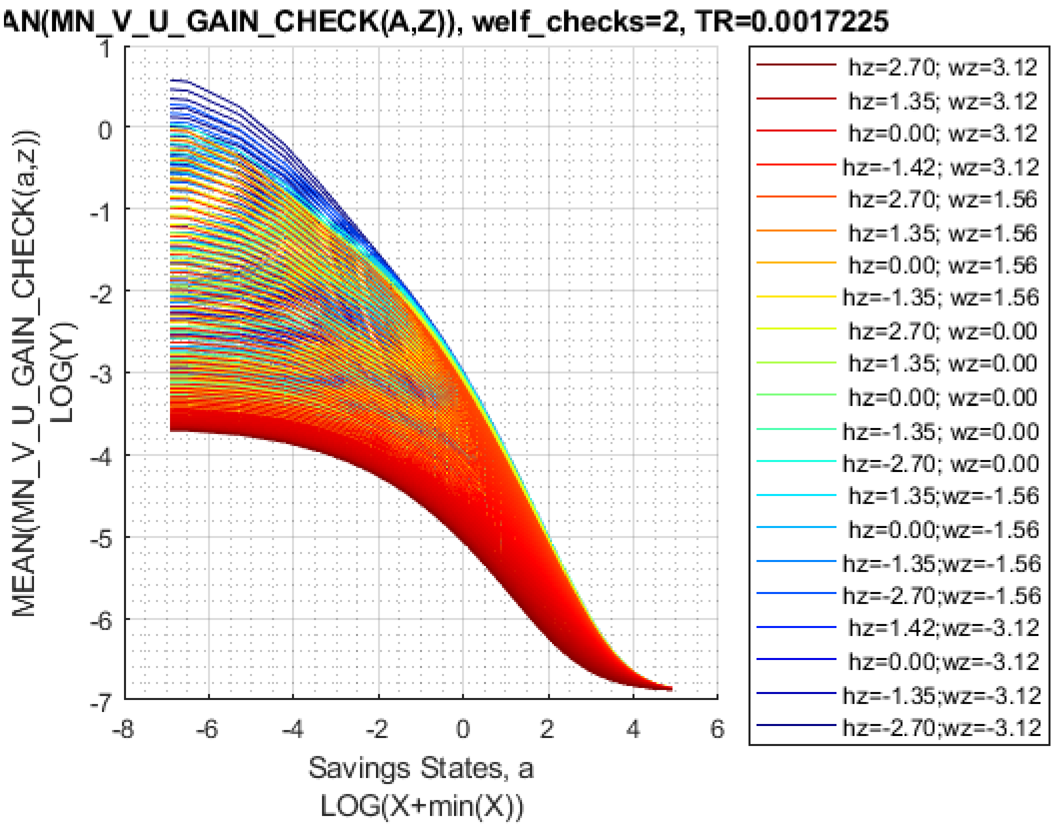
xxx MEAN(MN_MPC_U_GAIN_CHECK(A,Z)), welf_checks=2, TR=0.0017225 xxxxxxxxxxxxxxxxxxxxxxxxxx

group	savings	mean_eta_1	mean_eta_2	mean_eta_3	mean_eta_4	mean_eta_5	mean_eta_6	mean_
1	0	0.99875	0.99698	0.99542	0.99457	0.99452	0.99473	0.99
2	0.00051498	0.99851	0.99643	0.99458	0.99357	0.99352	0.99376	0.99
3	0.0041199	0.92261	0.91882	0.91795	0.91762	0.91756	0.91777	0.91
4	0.013905	0.85138	0.85048	0.84937	0.84947	0.85029	0.8514	0.85
5	0.032959	0.73681	0.73547	0.73742	0.74144	0.74546	0.7495	0.75
6	0.064373	0.65304	0.65266	0.65308	0.65432	0.65708	0.66013	0.6

Graph Mean Values:

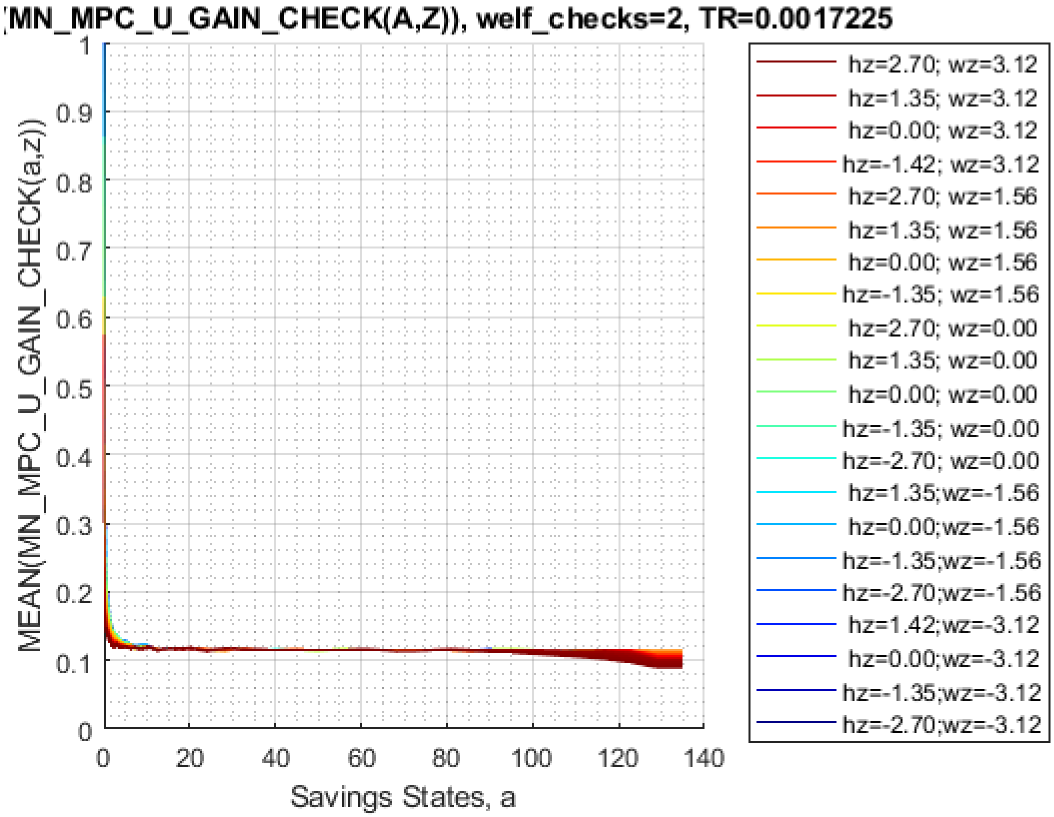
```
st_title = ['MEAN(MN\_V\_U\_GAIN\_CHECK(A,Z)), welf\_checks=' num2str(welf_checks) ', TR=' num2
mp_support_graph('cl_st_graph_title') = {st_title};
mp_support_graph('cl_st_ytitle') = {'MEAN(MN\_V\_U\_GAIN\_CHECK(a,z))'};
ff_graph_grid((tb_az_v{1:end, 3:end})', ar_st_eta_HS_grid, agrid, mp_support_graph);
```

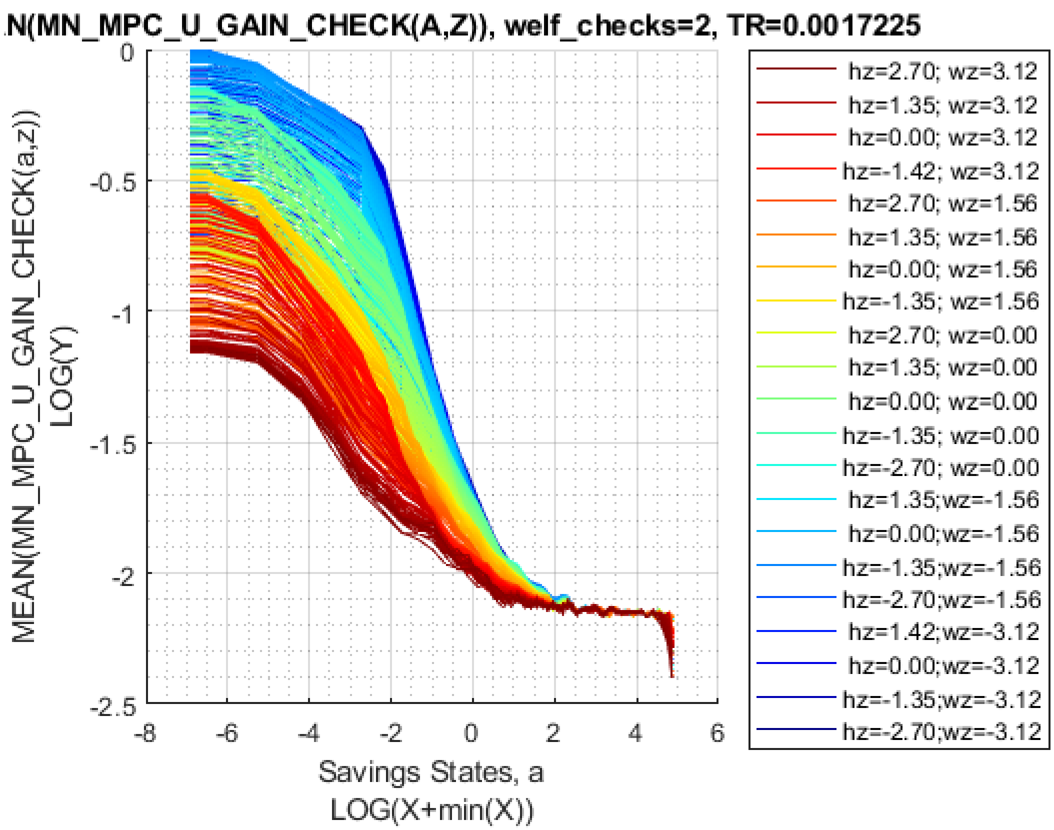




Graph Mean Consumption (MPC: Share of Check Consumed):

```
st_title = ['MEAN(MN\_MPC\_U\_GAIN\_CHECK(A,Z)), welf\_checks=' num2str(welf_checks) ', TR=' nu
mp_support_graph('cl_st_graph_title') = {st_title};
mp_support_graph('cl_st_ytitle') = {'MEAN(MN\_MPC\_U\_GAIN\_CHECK(a,z))'};
ff_graph_grid((tb_az_c{1:end, 3:end})', ar_st_eta_HS_grid, agrid, mp_support_graph);
```





Analyze Marginal Value and MPC over Y(a,eta), Conditional On Kids, Marry, Age, Education

Income is generated by savings and shocks, what are the income levels generated by all the shock and savings points conditional on kids, marital status, age and educational levels. Plot on the Y axis MPC, and plot on the X axis income levels, use colors to first distinguish between different a levels, then use colors to distinguish between different eta levles.

Set Up date, Select Age 38, unmarried, no kids, lower education:

```
% NaN(n_jgrid,n_agrid,n_etagrid,n_educgrid,n_marriedgrid,n_kidsgrid);
% 38 year old, unmarried, no kids, lower educated
% Only Household Head Shock Matters so select up to 'n_eta_H_grid'
mn_total_inc_jemk = total_inc_VFI(20,:,1:mp_params('n_eta_H_grid'),1,1,1);
mn_V_W_gain_check_use = ev20_jaeemk_check2 - ev20_jaeemk_check0;
mn_C_W_gain_check_use = ec20_jaeemk_check2 - ec20_jaeemk_check0;
```

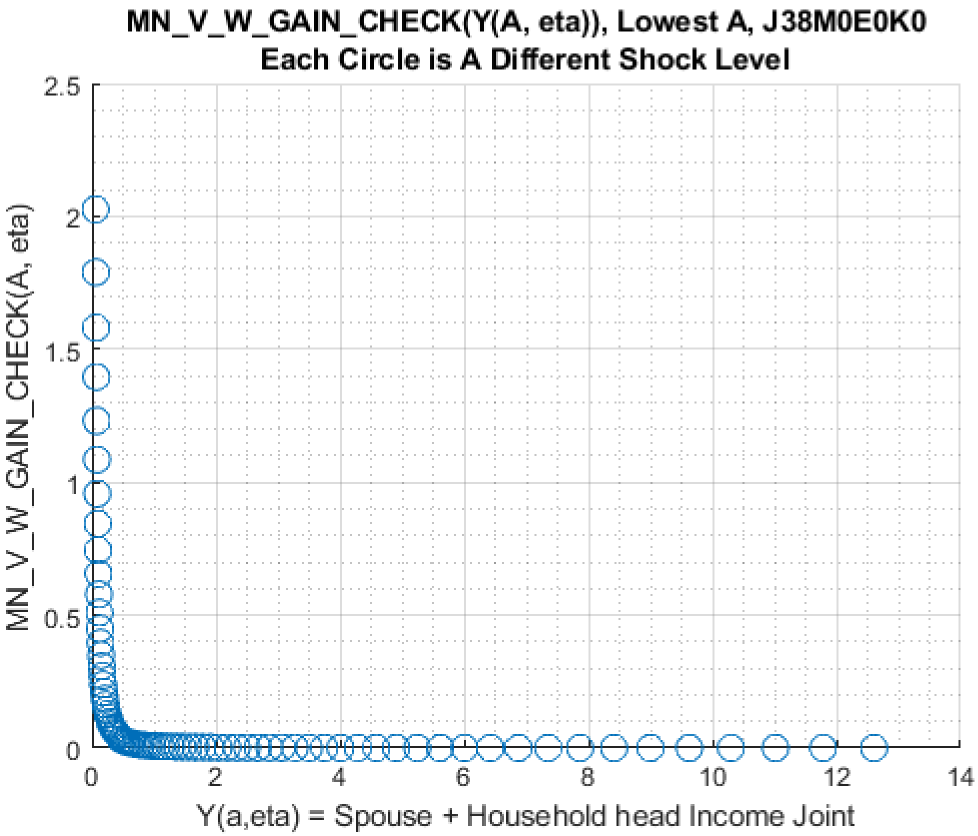
Select Age, Education, Marital, Kids Count:s

```
% Selections
it_age = 21; % +18
it_marital = 1; % 1 = unmarried
it_kids = 1; % 1 = kids is zero
it_educ = 1; % 1 = lower education
% Select: NaN(n_jgrid,n_agrid,n_etagrid,n_educgrid,n_marriedgrid,n_kidsgrid);
mn_C_W_gain_check_jemk = mn_C_W_gain_check_use(it_age, :, 1:mp_params('n_eta_H_grid'), it_educ,
mn_V_W_gain_check_jemk = mn_V_W_gain_check_use(it_age, :, 1:mp_params('n_eta_H_grid'), it_educ,
% Reshape, so shock is the first dim, a is the second
mt_total_inc_jemk = permute(mn_total_inc_jemk,[3,2,1]);
mt_C_W_gain_check_jemk = permute(mn_C_W_gain_check_jemk,[3,2,1]);
mt_C_W_gain_check_jemk(mt_C_W_gain_check_jemk<=1e-10) = 1e-10;
mt_V_W_gain_check_jemk = permute(mn_V_W_gain_check_jemk,[3,2,1]);
mt_V_W_gain_check_jemk(mt_V_W_gain_check_jemk<=1e-10) = 1e-10;
% Generate meshed a and shock grid
[mt_eta_H, mt_a] = ndgrid(eta_H_grid(1:mp_params('n_eta_H_grid')), agrid);
```

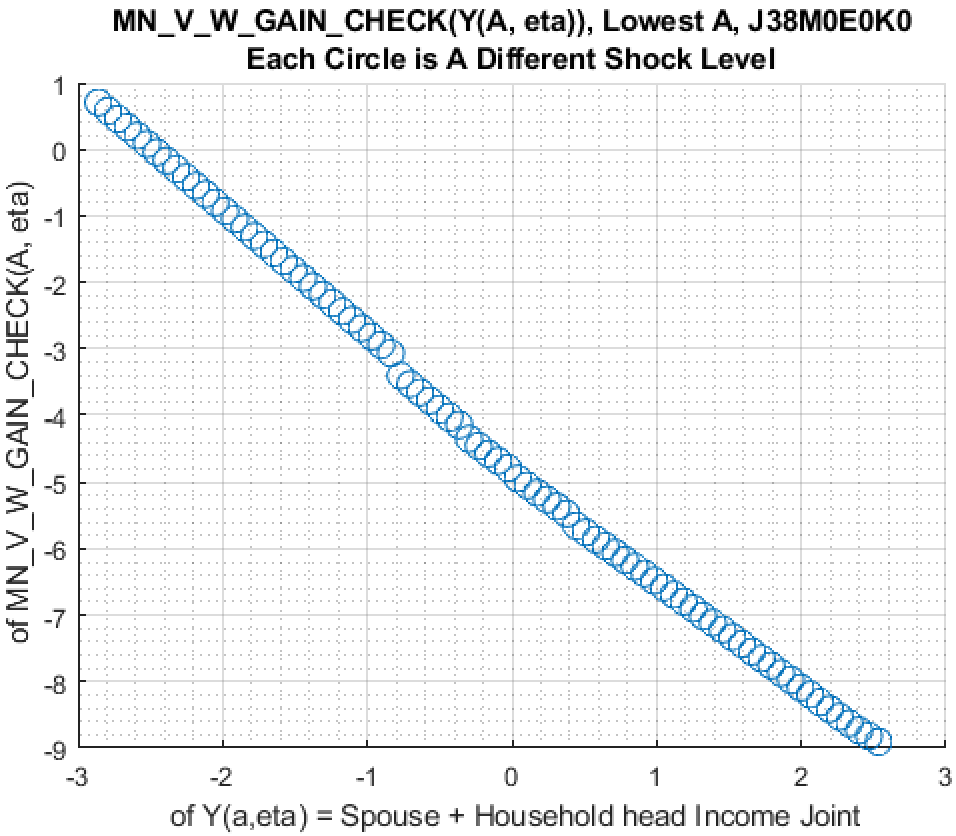
Marginal Value Gains, Color as Shock, Conditional on Age, Marital, Kids, and Education

How do shocks and a impact marginal value. First plot one asset level, variation comes only from increasingly higher shocks:

```
figure();
it_a = 1;
scatter((mt_total_inc_jemk(:,it_a)), (mt_V_W_gain_check_jemk(:,it_a)), 100);
title({'MN\_V\_W\_GAIN\_CHECK(Y(A, eta)), Lowest A, J38M0E0K0', ...
    'Each Circle is A Different Shock Level'});
xlabel('Y(a,eta) = Spouse + Household head Income Joint');
ylabel('MN\_V\_W\_GAIN\_CHECK(A, eta)');
grid on;
grid minor;
```

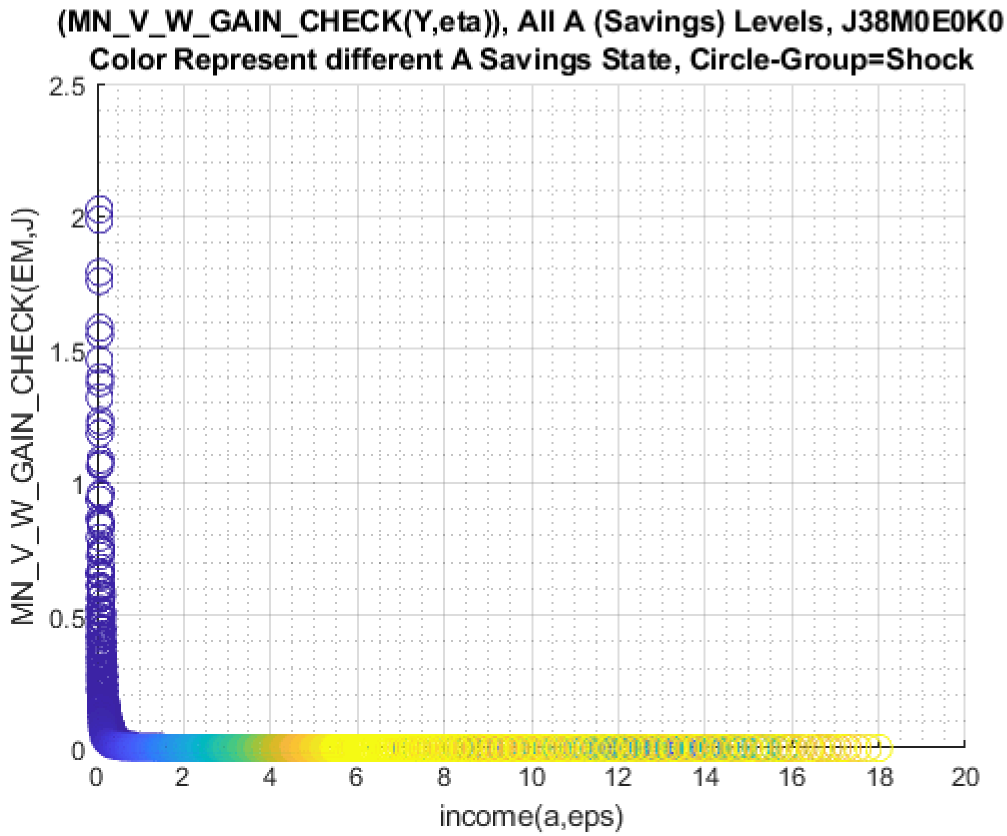



```
figure();
it_shock = 1;
scatter(log(mt_total_inc_jemk(:,it_a)), log(mt_V_W_gain_check_jemk(:,it_a)), 100);
title({'MN\_V\_W\_GAIN\_CHECK(Y(A, eta)), Lowest A, J38M0E0K0', ...
    'Each Circle is A Different Shock Level'});
xlabel(' of Y(a,eta) = Spouse + Household head Income Joint');
ylabel(' of MN\_V\_W\_GAIN\_CHECK(A, eta)');
grid on;
grid minor;
```

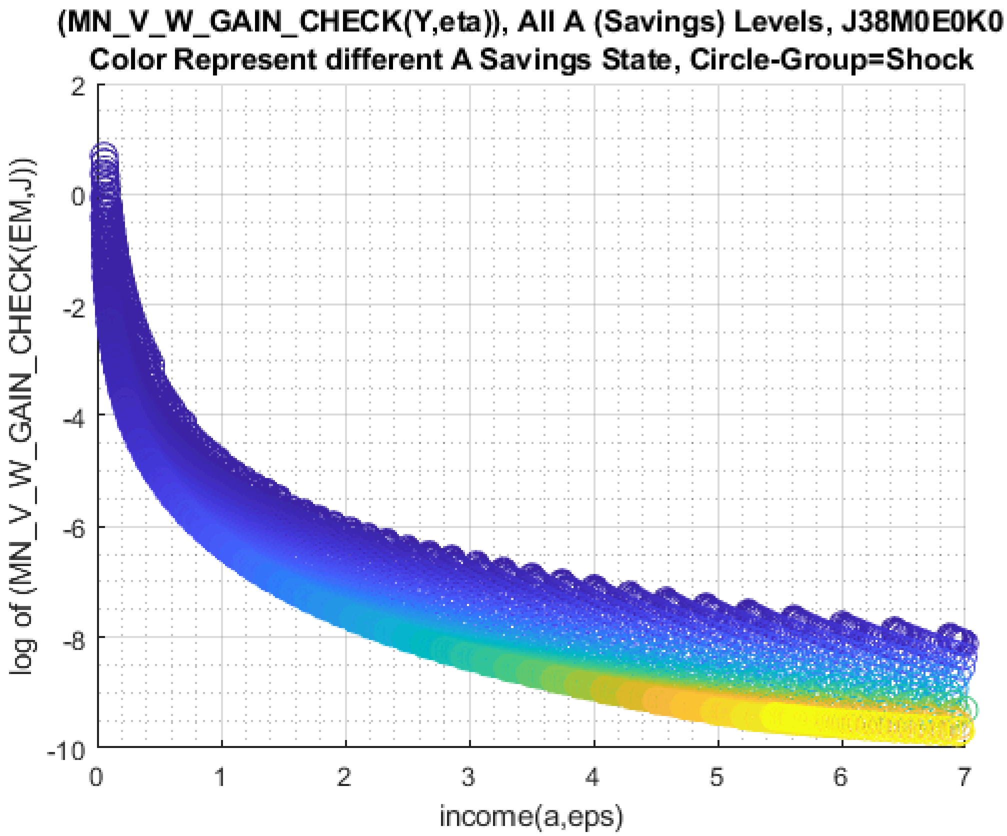


Plot all asset levels:

```
figure();
scatter((mt_total_inc_jemk(:)), (mt_V_W_gain_check_jemk(:)), 100, mt_a(:));
title({'(MN\_V\_W\_GAIN\_CHECK(Y,eta)), All A (Savings) Levels, J38M0E0K0', ...
    'Color Represent different A Savings State, Circle-Group=Shock'});
xlabel('income(a,eps)');
ylabel('MN\_V\_W\_GAIN\_CHECK(EM,J)');
grid on;
grid minor;
```



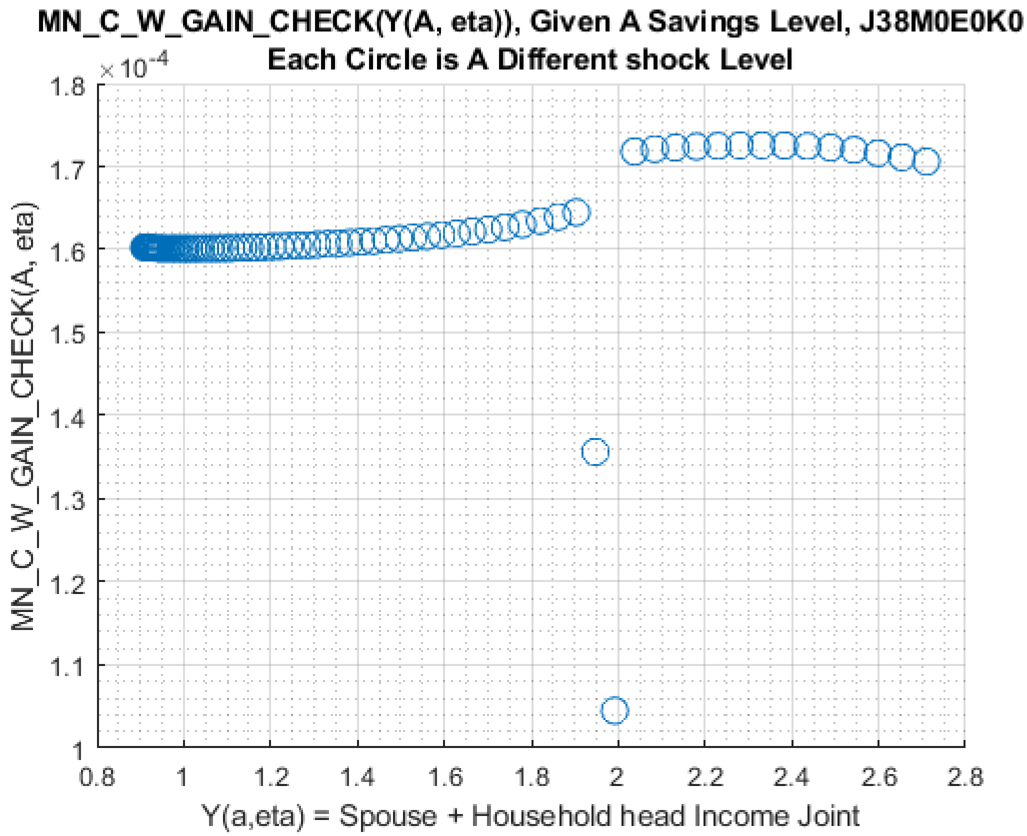

```
figure();
scatter((mt_total_inc_jemk(:)), log(mt_V_W_gain_check_jemk(:)), 100, mt_a(:));
title({'(MN\_V\_W\_GAIN\_CHECK(Y,eta)), All A (Savings) Levels, J38M0E0K0', ...
    'Color Represent different A Savings State, Circle-Group=Shock'});
xlabel('income(a,eps)');
ylabel('log of (MN\_V\_W\_GAIN\_CHECK(EM,J))');
xlim([0,7]);
grid on;
grid minor;
```



Marginal Consumption Gains, Color as Shock, Conditional on Age, Marital, Kids, and Education

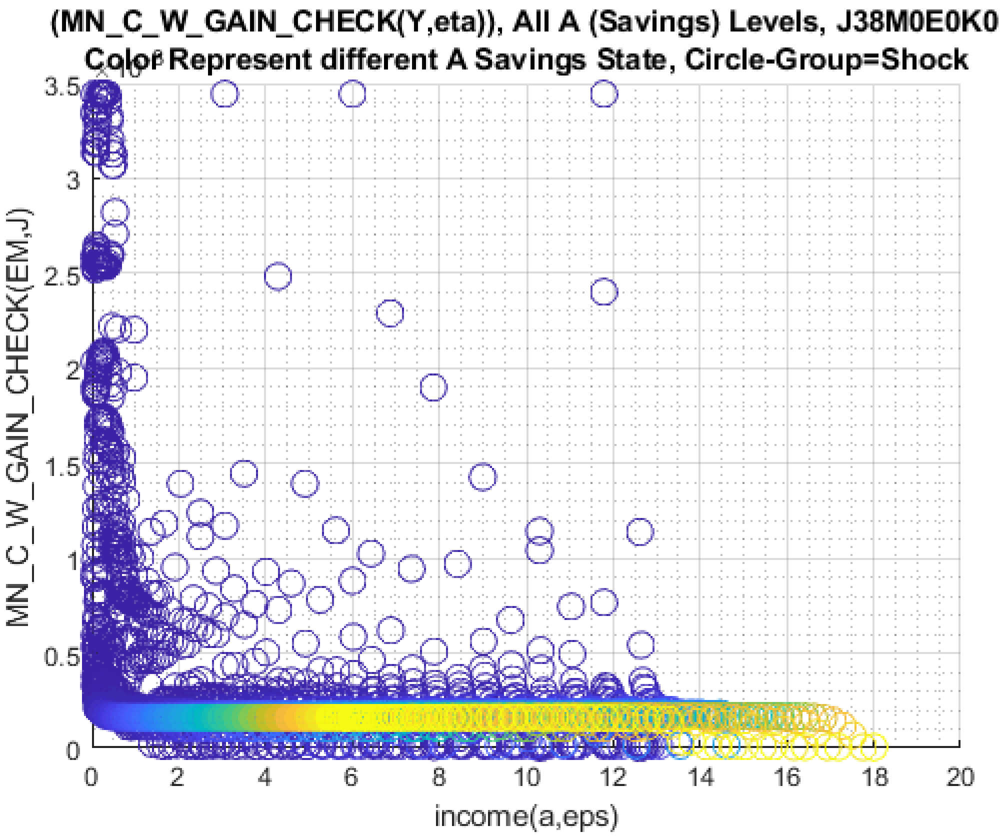
How do shocks and a impact marginal value. First plot one asset level, variation comes only from increasingly higher shocks:

```
figure();
it_a = 50;
scatter(log(mt_total_inc_jemk(:,it_a)), mt_C_W_gain_check_jemk(:,it_a), 100);
title({'MN\_C\_W\_GAIN\_CHECK(Y(A, eta)), Given A Savings Level, J38M0E0K0', ...
    'Each Circle is A Different shock Level'});
xlabel('Y(a,eta) = Spouse + Household head Income Joint');
ylabel('MN\_C\_W\_GAIN\_CHECK(A, eta)');
grid on;
grid minor;
```

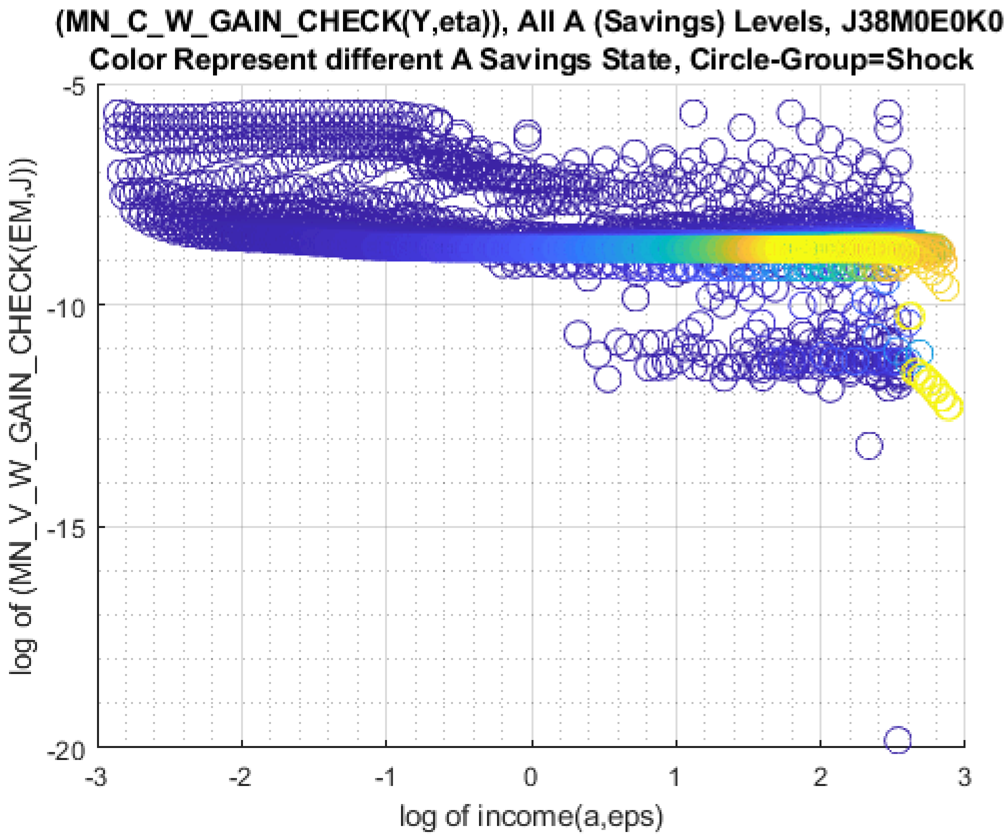


Plot all asset levels:

```
figure();
scatter((mt_total_inc_jemk(:)), (mt_C_W_gain_check_jemk(:)), 100, mt_a(:));
title({'(MN\_C\_W\_GAIN\_CHECK(Y,eta)), All A (Savings) Levels, J38M0E0K0', ...
    'Color Represent different A Savings State, Circle-Group=Shock'});
xlabel('income(a,eps)');
ylabel('MN\_C\_W\_GAIN\_CHECK(EM,J)');
grid on;
grid minor;
```




```
figure();
scatter(log(mt_total_inc_jemk(:)), log(mt_C_W_gain_check_jemk(:)), 100, mt_a(:));
title({'(MN\_C\_W\_GAIN\_CHECK(Y,eta)), All A (Savings) Levels, J38M0E0K0', ...
    'Color Represent different A Savings State, Circle-Group=Shock'});
xlabel('log of income(a,eps)');
ylabel('log of (MN\_V\_W\_GAIN\_CHECK(EM,J))');
grid on;
grid minor;
```



Analyze Kids 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 = [...
    "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:

```
% Set
% NaN(n_jgrid,n_agrid,n_etagrid,n_educgrid,n_marriedgrid,n_kidsgrid);
ar_permute = [2,3,4,1,6,5];
```

```
% Value Function
st_title = ['MEAN(MN_V_U_GAIN_CHECK(KM,J)), welf_checks=' num2str(welf_checks) ', TR=' num2str(
tb_az_v = ff_summ_nd_array(st_title, mn_V_U_gain_check, true, ["mean"], 3, 1, cl_mp_datasetdesc
```

xxx MEAN(MN_V_U_GAIN_CHECK(KM,J)), welf_checks=2, TR=0.0017225 xxxxxxxxxxxxxxxxxxxxxxxxxxx

group	kids	marry	mean_age_18	mean_age_19	mean_age_20	mean_age_21	mean_age_22	mean_age_23
1	1	0	0.038521	0.037547	0.036373	0.033138	0.030444	0.028185
2	2	0	0.05341	0.052108	0.050487	0.045932	0.042132	0.038937
3	3	0	0.063385	0.062078	0.06036	0.05494	0.050421	0.046624
4	4	0	0.072378	0.070987	0.069103	0.062915	0.057756	0.053423
5	5	0	0.079908	0.078513	0.076557	0.069742	0.064064	0.059298
6	1	1	0.012602	0.012065	0.011549	0.010425	0.0094851	0.0086941
7	2	1	0.016779	0.016071	0.015392	0.013893	0.012636	0.011578
8	3	1	0.02027	0.019455	0.018664	0.016853	0.015336	0.014061
9	4	1	0.024225	0.023287	0.02236	0.020204	0.018398	0.016876
10	5	1	0.029524	0.028486	0.027439	0.024819	0.02263	0.020789

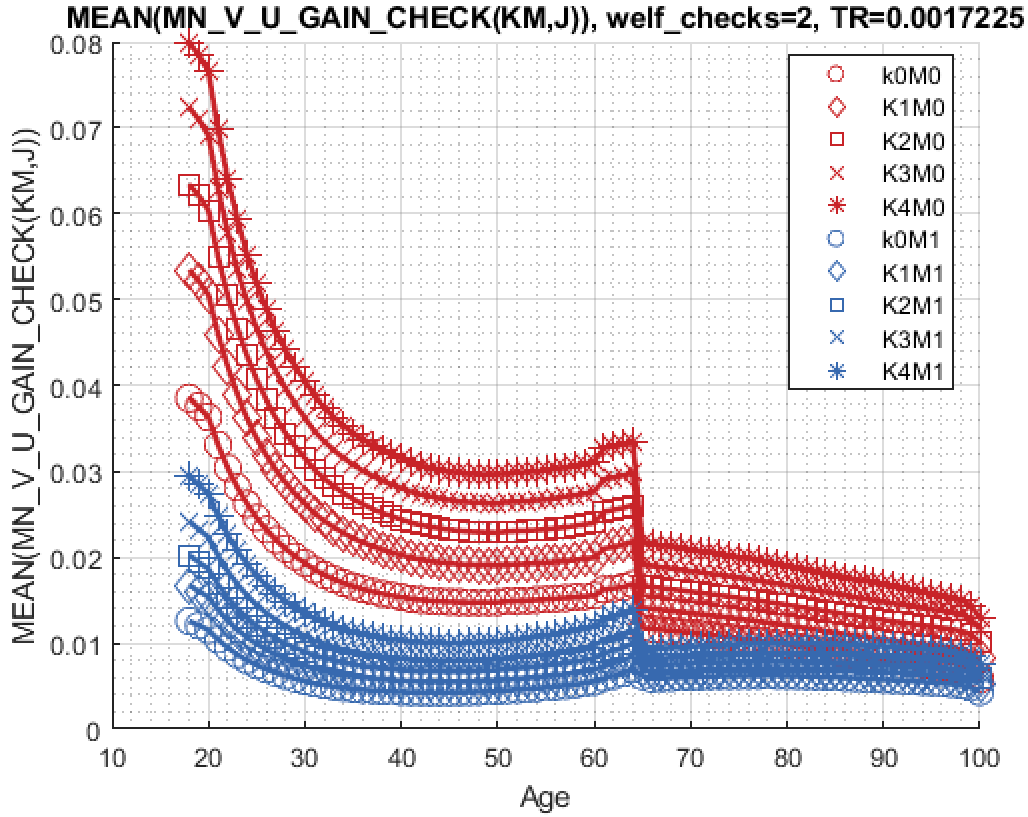
```
% Consumption Function
st_title = ['MEAN(MN_MPC_U_GAIN_CHECK(KM,J)), welf_checks=' num2str(welf_checks) ', TR=' num2st
tb_az_c = ff_summ_nd_array(st_title, mn_MPC_U_gain_share_check, true, ["mean"], 3, 1, cl_mp_dat
```

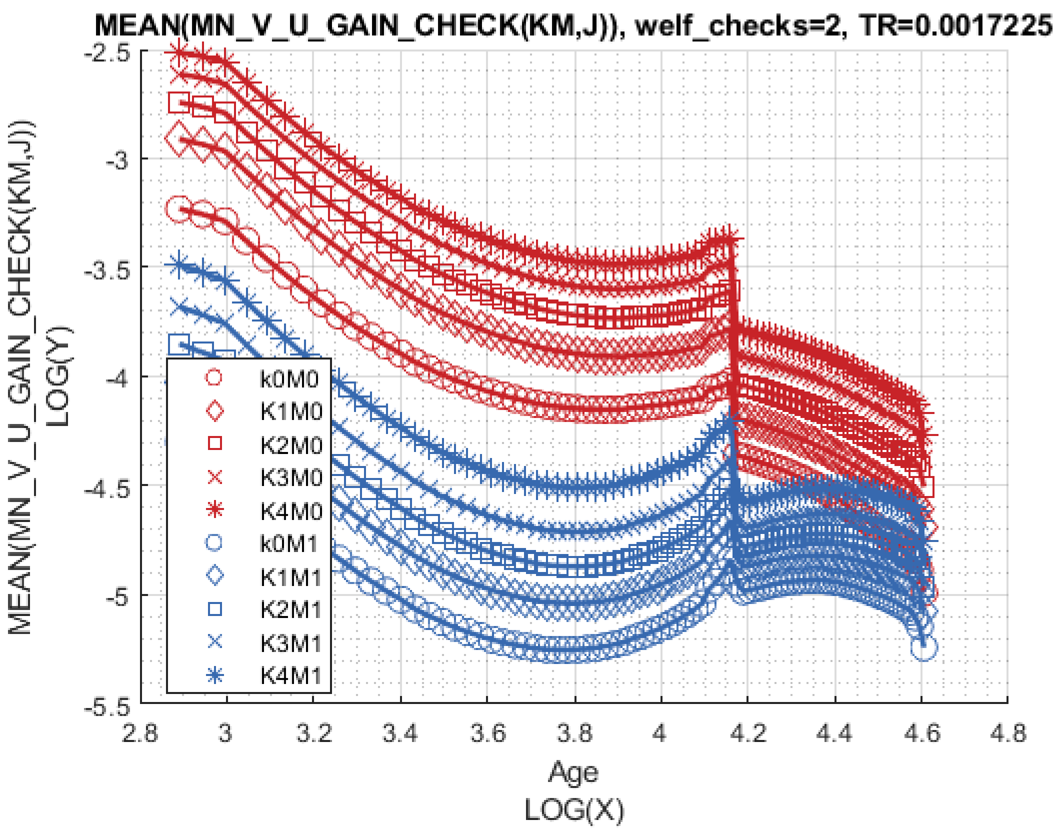
xxx MEAN(MN_MPC_U_GAIN_CHECK(KM,J)), welf_checks=2, TR=0.0017225 xxxxxxxxxxxxxxxxxxxxxxxxxxx

group	kids	marry	mean_age_18	mean_age_19	mean_age_20	mean_age_21	mean_age_22	mean_age_23
1	1	0	0.08473	0.090523	0.10389	0.10174	0.099813	0.09806
2	2	0	0.092218	0.098831	0.11367	0.11201	0.11015	0.10846
3	3	0	0.1021	0.11001	0.12659	0.12367	0.12143	0.11972
4	4	0	0.10668	0.11447	0.13204	0.12929	0.12652	0.12473
5	5	0	0.11273	0.11986	0.13778	0.13469	0.13217	0.12887
6	1	1	0.11128	0.1152	0.12146	0.1198	0.11906	0.11801
7	2	1	0.11215	0.11651	0.1231	0.12179	0.12075	0.11977
8	3	1	0.11764	0.12253	0.13117	0.1281	0.12731	0.12672
9	4	1	0.11935	0.12502	0.13186	0.13059	0.1313	0.12843
10	5	1	0.12647	0.1319	0.14032	0.13889	0.13523	0.13356

Graph Mean Values:

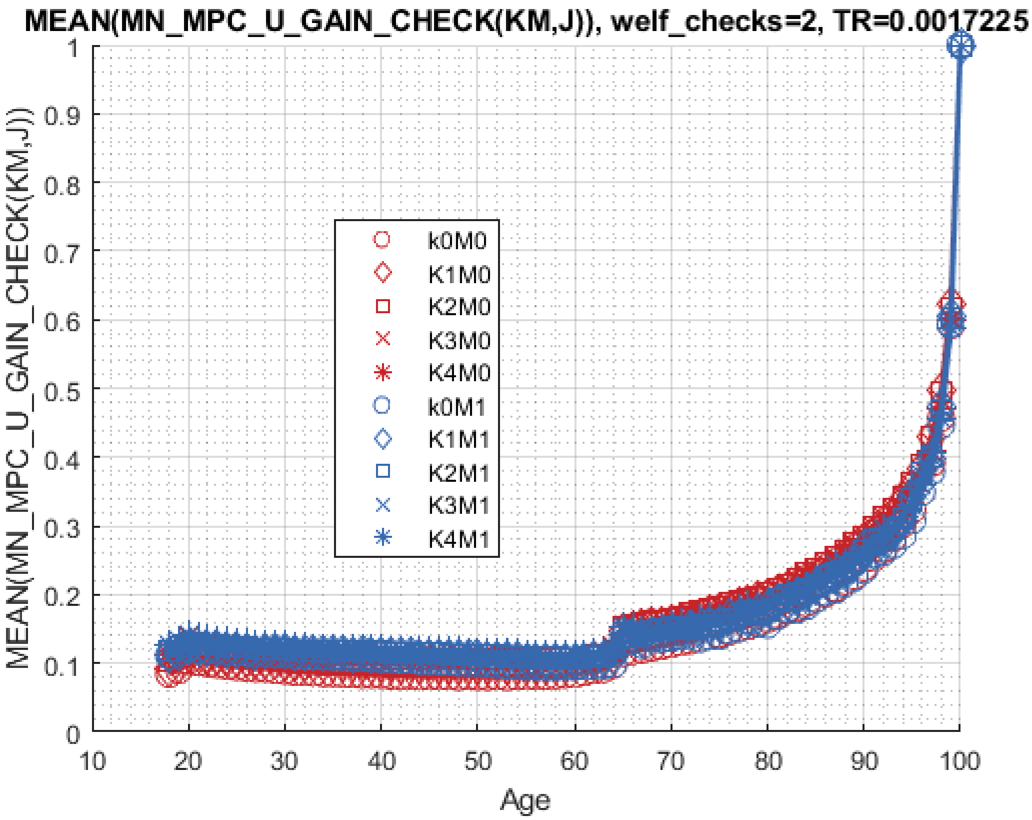
```
st_title = ['MEAN(MN\_V\_U\_GAIN\_CHECK(KM,J)), welf\_checks=' num2str(welf_checks) ', TR=' num
mp_support_graph('cl_st_graph_title') = {st_title};
mp_support_graph('cl_st_ytitle') = {'MEAN(MN\_V\_U\_GAIN\_CHECK(KM,J))'};
ff_graph_grid((tb_az_v{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```

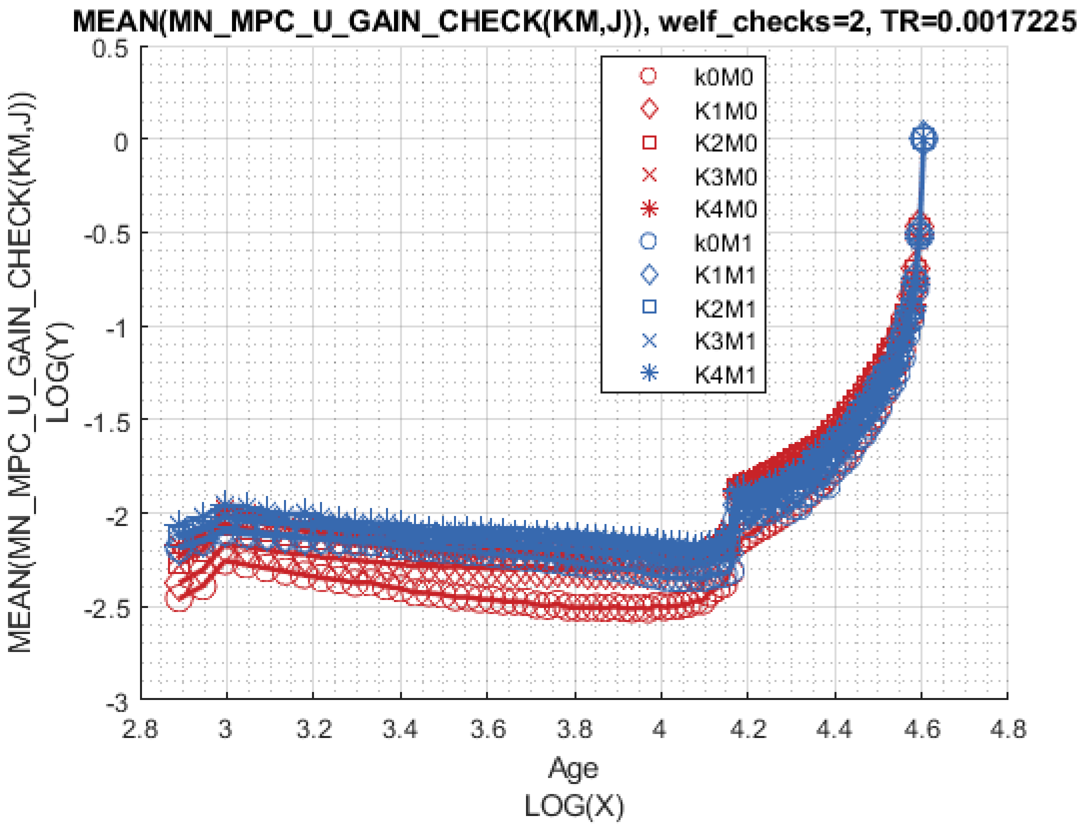




Graph Mean Consumption (***MPC: Share of Check Consumed***):

```
st_title = ['MEAN(MN\_MPC\_U\_GAIN\_CHECK(KM,J)), welf\_checks=' num2str(welf_checks) ', TR=' n
mp_support_graph('cl_st_graph_title') = {st_title};
mp_support_graph('cl_st_ytitle') = {'MEAN(MN\_MPC\_U\_GAIN\_CHECK(KM,J))'};
ff_graph_grid((tb_az_c{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```





Analyze Education and Marriage

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(EM,J)), MEAN(AP(EM,J)), MEAN(C(EM,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
st_title = ['MEAN(MN_V_U_GAIN_CHECK(EM,J)), welf_checks=' num2str(welf_checks) ', TR=' num2str(
tb_az_v = ff_summ_nd_array(st_title, mn_V_U_gain_check, true, ["mean"], 3, 1, cl_mp_datasetdesc
```

```
xxx  MEAN(MN_V_U_GAIN_CHECK(EM,J)), welf_checks=2, TR=0.0017225  xxxxxxxxxxxxxxxxxxxxxxxxxxx
    group    edu    marry    mean_age_18    mean_age_19    mean_age_20    mean_age_21    mean_age_22    mean_age_23
    _____    ___    _____    ___________    ___________    ___________    ___________    ___________    ___________
```

1	0	0	0.062739	0.061743	0.060475	0.056968	0.053854	0.051093
2	1	0	0.060302	0.05875	0.056677	0.049699	0.044073	0.039493
3	0	1	0.021794	0.020986	0.0202	0.018729	0.01744	0.016317
4	1	1	0.019566	0.01876	0.017962	0.015748	0.013954	0.012482

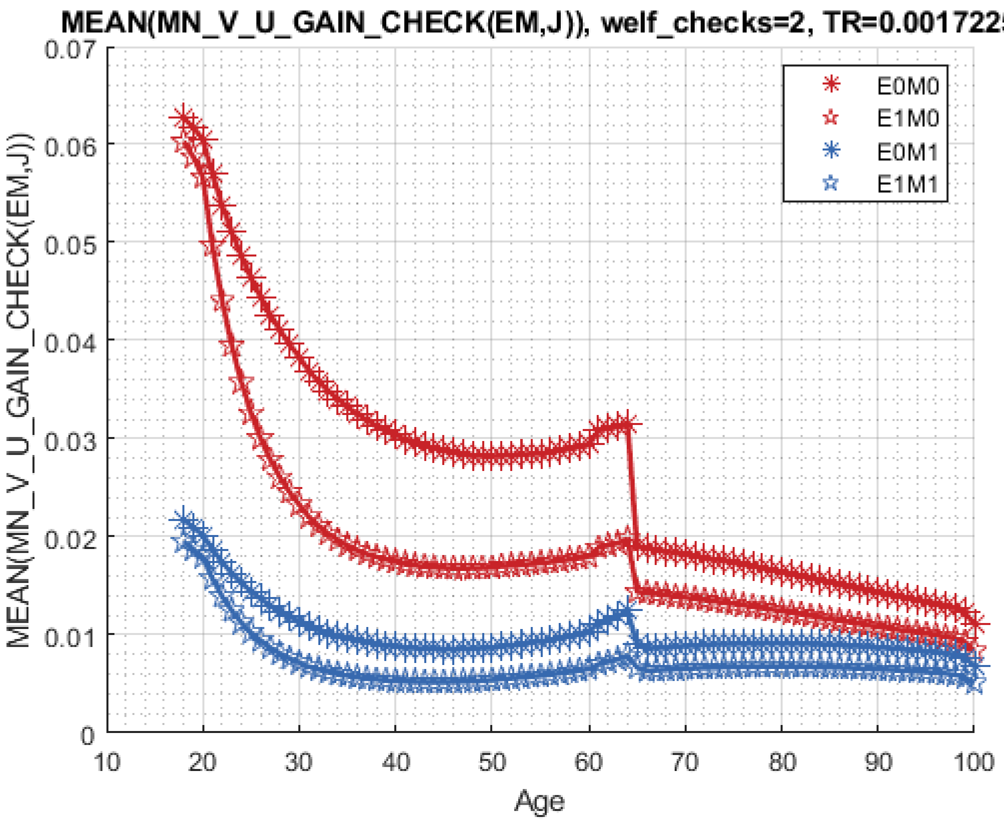
```
% Consumption
st_title = ['MEAN(MN_MPC_U_GAIN_CHECK(EM,J)), welf_checks=' num2str(welf_checks) ', TR=' num2st
tb_az_c = ff_summ_nd_array(st_title, mn_MPC_U_gain_share_check, true, ["mean"], 3, 1, cl_mp_dat
```

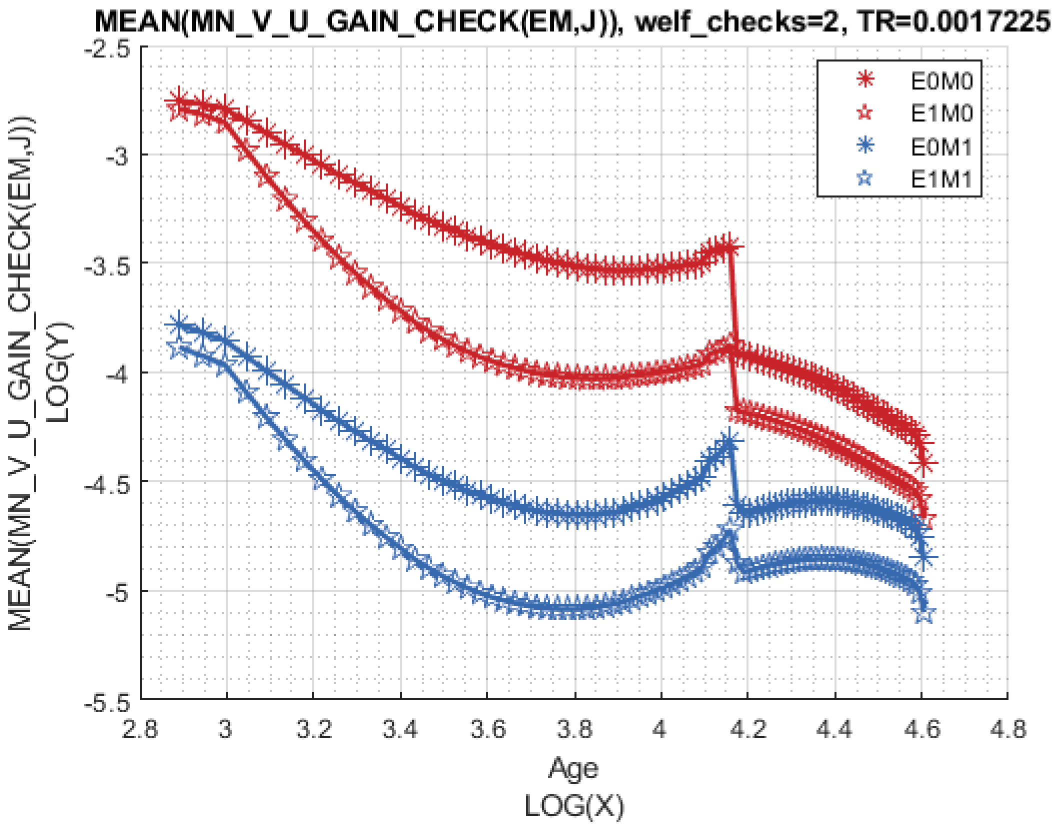
xxx MEAN(MN_MPC_U_GAIN_CHECK(EM,J)), welf_checks=2, TR=0.0017225 xxxxxxxxxxxxxxxxxxxxxxxxxxx

group	edu	marry	mean_age_18	mean_age_19	mean_age_20	mean_age_21	mean_age_22	mean_age_23
1	0	0	0.091561	0.095658	0.10516	0.10456	0.10443	0.10416
2	1	0	0.10782	0.11782	0.14043	0.136	0.1316	0.12778
3	0	1	0.10916	0.11292	0.11733	0.11721	0.11716	0.11661
4	1	1	0.1256	0.13155	0.14183	0.13846	0.1363	0.13399

Graph Mean Values:

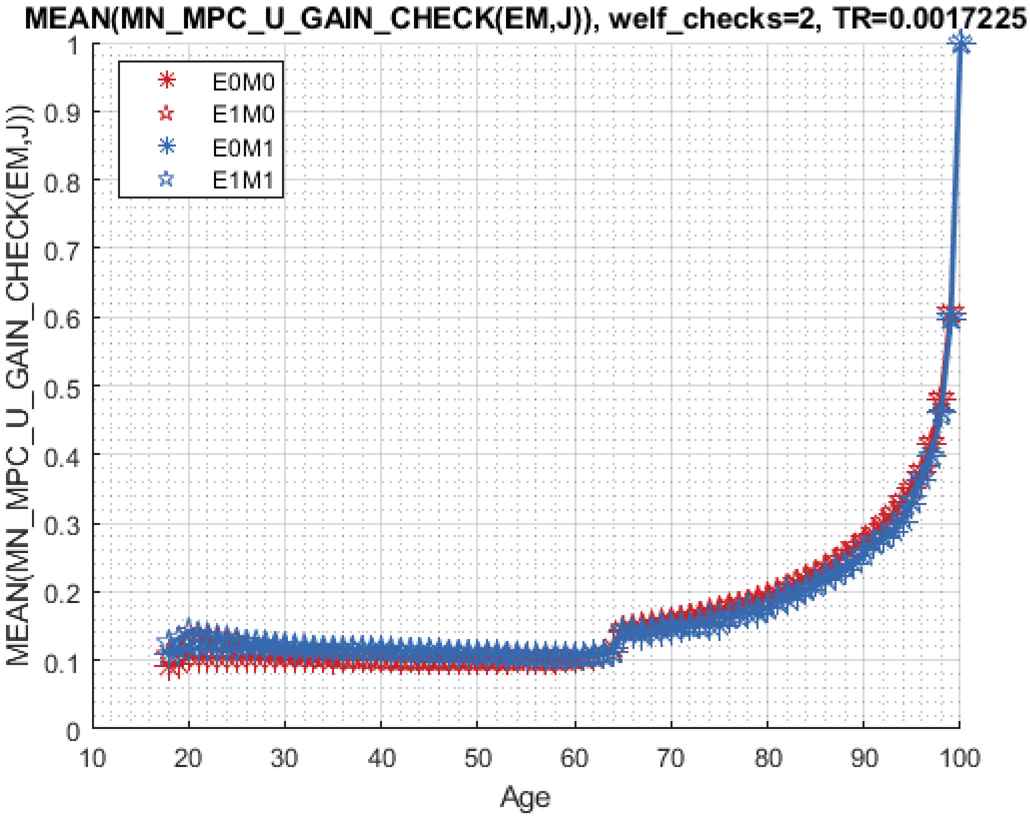
```
st_title = ['MEAN(MN\_V\_U\_GAIN\_CHECK(EM,J)), welf\_checks=' num2str(welf_checks) ', TR=' num
mp_support_graph('cl_st_graph_title') = {st_title};
mp_support_graph('cl_st_ytitle') = {'MEAN(MN\_V\_U\_GAIN\_CHECK(EM,J))'};
ff_graph_grid((tb_az_v{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```

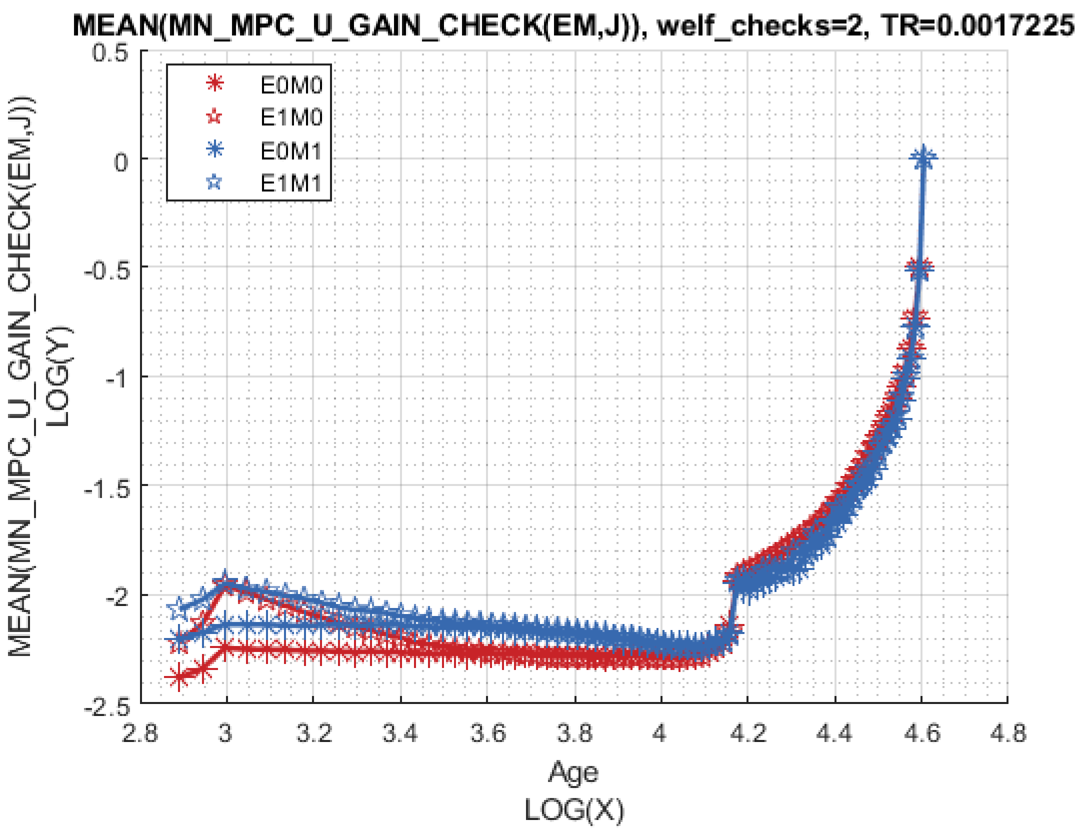




Graph Mean Consumption (***MPC: Share of Check Consumed***):

```
st_title = ['MEAN(MN\_MPC\_U\_GAIN\_CHECK(EM,J)), welf\_checks=' num2str(welf_checks) ', TR=' n
mp_support_graph('cl_st_graph_title') = {st_title};
mp_support_graph('cl_st_ytitle') = {'MEAN(MN\_MPC\_U\_GAIN\_CHECK(EM,J))'};
ff_graph_grid((tb_az_c{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```


MEAN(MN_MPC_U_GAIN_CHECK(EM,J)), welf_checks=2, TR=0.0017225
MEAN(MN_MPC_U_GAIN_CHECK(EM,J))
E0M0
E1M0
E0M1
E1M1
Age
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
10
20
30
40
50
60
70
80
90
100


MEAN(MN_MPC_U_GAIN_CHECK(EM,J)), welf_checks=2, TR=0.0017225
MEAN(MN_MPC_U_GAIN_CHECK(EM,J))
LOG(Y)
E0M0
E1M0
E0M1
E1M1
Age
LOG(X)
0.5
0
-0.5
-1
-1.5
-2
-2.5
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8