

# 2019 Age, Income, Kids, Marry EV and EC of One Check

This is the example vignette for function: [snw\\_evuvw19\\_jmky](#) from the [PrjOptiSNW Package](#). 2019 integrated over VU and VW

## Test SNW\_EVUVW19\_JMKY Defaults Dense

Set Parameters

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_tiny');
% mp_params = snw_mp_param('default_dense');
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;

% Check Numbers
% n_incgrid=201; % Number of income groups
% n_incgrid_aux=round(0.75*n_incgrid);
% inc_grid1=linspace(0,4,n_incgrid_aux)'; % 4 refers to 4*58056=232224 dollars in 2012USD
% inc_grid=[inc_grid1;linspace(4+((7-4)/(n_incgrid-n_incgrid_aux)),7,n_incgrid-n_incgrid_aux)']
n_incgrid=201; % Number of income groups
inc_grid=linspace(0,7,n_incgrid)';
mp_params('n_incgrid') = n_incgrid;
mp_params('inc_grid') = inc_grid;

% Solve for Unemployment Values
mp_controls('bl_print_vfi') = false;
mp_controls('bl_print_vfi_verbose') = 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;
mp_controls('bl_print_evuvw19_jaeemk') = false;
mp_controls('bl_print_evuvw19_jaeemk_verbose') = false;
```

```
mp_controls('bl_print_evuvw19_jmky') = false;
```

## Solve VFI and Distributon

```
% 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);
```

Completed SNW\_VFI\_MAIN\_BISEC\_VEC;SNW\_MP\_PARAM=default\_docdense;SNW\_MP\_CONTROL=default\_test;time=509.6423

```
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;

% 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
[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=

```
[Phi_true] = snw_ds_main(mp_params, mp_controls, ap_ss, cons_ss, mp_valpol_more_ss);
```

Completed SNW\_DS\_MAIN;SNW\_MP\_PARAM=default\_docdense;SNW\_MP\_CONTROL=default\_test;time=1919.9492

```
% Get Matrixes
cl_st_precompute_list = {'a', ...
    'inc', 'inc_unemp', 'spouse_inc', 'spouse_inc_unemp', 'ref_earn_wageind_grid', ...
    'ap_idx_lower_ss', 'ap_idx_higher_ss', 'ap_idx_lower_weight_ss', ...
    'inc_tot_ygroup_grid'};
mp_controls('bl_print_precompute_verbose') = false;
```

## Pre-Compute Matrixes and YMKY Mass

```
% Pre-compute
[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=392.9394

```
inc_tot_ygroup_grid = mp_precompute_res('inc_tot_ygroup_grid');
% YMKY Mass
[Phi_true_jmky] = snw_evuvw19_jmky_mass(mp_params, mp_controls, Phi_true, inc_tot_ygroup_grid);
```

SNW\_EVUVW19\_JMKY\_MASS Start  
 Completed SNW\_EVUVW19\_JMKY\_MASS;SNW\_MP\_PARAM=default\_docdense;SNW\_MP\_CONTROL=default\_test;time=12.1262

```
-----
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
CONTAINER NAME: mp_outcomes ND Array (Matrix etc)
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

	i	idx	ndim	numel	rowN	colN	sum	mean	std	co
Phi_true	1	1	6	4.37e+07	83	5.265e+05	45.793	1.0479e-06	1.5354e-05	1
Phi_true_jmky	2	2	4	1.6482e+05	82	2010	45.787	0.0002778	0.0011362	

## Solve for 2019 Evuvw With 0 and 2 Checks

Zero checks:

```
% Solve ev 19 JAEEMK
welf_checks = 0;
[ev19_jaeemk_check0, ec19_jaeemk_check0, ev20_jaeemk_check0, ec20_jaeemk_check0] = ...
    snw_evuvw19_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\_test;time=12.1262  
 Completed SNW\_A4CHK\_UNEMP\_BISEC\_VEC;welf\_checks=0;TR=0.0017225;xi=0.5;b=0;SNW\_MP\_PARAM=default\_docdense;SNW\_MP\_CONTROL=default\_test;time=12.1262  
 Completed SNW\_EVUVW20\_JAEEMK;SNW\_MP\_PARAM=default\_docdense;SNW\_MP\_CONTROL=default\_test;timeEUEC=8.1717  
 Completed SNW\_EVUVW19\_JAEEMK;SNW\_MP\_PARAM=default\_docdense;SNW\_MP\_CONTROL=default\_test;time=4955.5196

```
% Solve ev 19 JMKY
[ev19_jmky_check0, ec19_jmky_check0] = snw_evuvw19_jmky(...
    mp_params, mp_controls, ...
    ev19_jaeemk_check0, ec19_jaeemk_check0, ...
    Phi_true, Phi_true_jmky, inc_tot_ygroup_grid);
```

Completed SNW\_EVUVW19\_JMKY;SNW\_MP\_PARAM=default\_docdense;SNW\_MP\_CONTROL=default\_test;time=19.7532

```
-----
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
CONTAINER NAME: mp_outcomes ND Array (Matrix etc)
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

	i	idx	ndim	numel	rowN	colN	sum	mean	std
Phi_true	1	1	6	4.37e+07	83	5.265e+05	45.793	1.0479e-06	1.5354e-05
Phi_true_jmky	2	2	4	1.6482e+05	82	2010	45.787	0.0002778	0.0011362
ec19_jaeemk	3	3	6	4.3173e+07	82	5.265e+05	1.9748e+08	4.5742	5.3282
ec19_jmky	4	4	4	1.6482e+05	82	2010	3.4598e+05	2.0992	2.156
ev19_jaeemk	5	5	6	4.3173e+07	82	5.265e+05	-1.2358e+08	-2.8623	20.212
ev19_jmky	6	6	4	1.6482e+05	82	2010	-4.2016e+05	-2.5492	15.7

Two checks:

```
% Solve ev 19 JAEEMK
```

```
welf_checks = 1;
[ev19_jaeemk_check2, ec19_jaeemk_check2, ev20_jaeemk_check2, ec20_jaeemk_check2] = ...
    snw_evuvw19_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=1;TR=0.0017225;SNW\_MP\_PARAM=default\_docdense;SNW\_MP\_CONTROL=default\_test;time=4795.4984  
 Completed SNW\_A4CHK\_UNEMP\_BISEC\_VEC;welf\_checks=1;TR=0.0017225;xi=0.5;b=0;SNW\_MP\_PARAM=default\_docdense;SNW\_MP\_CONTROL=default\_test;time=4795.4984  
 Completed SNW\_EVUVW20\_JAEEMK;SNW\_MP\_PARAM=default\_docdense;SNW\_MP\_CONTROL=default\_test;timeEUEC=7.7724  
 Completed SNW\_EVUVW19\_JAEEMK;SNW\_MP\_PARAM=default\_docdense;SNW\_MP\_CONTROL=default\_test;time=4795.4984

**% Solve ev 19 JMKY**

```
[ev19_jmky_check2, ec19_jmky_check2] = snw_evuvw19_jmky(...
    mp_params, mp_controls, ...
    ev19_jaeemk_check2, ec19_jaeemk_check2, ...
    Phi_true, Phi_true_jmky, inc_tot_ygroup_grid);
```

Completed SNW\_EVUVW19\_JMKY;SNW\_MP\_PARAM=default\_docdense;SNW\_MP\_CONTROL=default\_test;time=20.0896

XX

CONTAINER NAME: mp\_outcomes ND Array (Matrix etc)

XX

	i	idx	ndim	numel	rowN	colN	sum	mean	std
Phi_true	1	1	6	4.37e+07	83	5.265e+05	45.793	1.0479e-06	1.5354e-05
Phi_true_jmky	2	2	4	1.6482e+05	82	2010	45.787	0.0002778	0.0011362
ec19_jaeemk	3	3	6	4.3173e+07	82	5.265e+05	1.975e+08	4.5745	5.3282
ec19_jmky	4	4	4	1.6482e+05	82	2010	3.4602e+05	2.0994	2.156
ev19_jaeemk	5	5	6	4.3173e+07	82	5.265e+05	-1.2325e+08	-2.8547	20.176
ev19_jmky	6	6	4	1.6482e+05	82	2010	-4.1902e+05	-2.5423	15.652

Differences between Checks in Expected Value and Expected Consumption

```
mn_V_U_gain_check = ev19_jmky_check2 - ev19_jmky_check0;
mn_MPC_U_gain_share_check = (ec19_jmky_check2 - ec19_jmky_check0)./(welf_checks*mp_params('TR'));
```

## Dense 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 = 18:99;
marry_grid = [0,1];
kids_grid = (1:1:mp_params('n_kidsgrid'))';
inc_grid = mp_params('inc_grid');
cl_mp_datasetdesc = {};
cl_mp_datasetdesc{1} = containers.Map({'name', 'labval'}, {'age', age_grid});
cl_mp_datasetdesc{2} = containers.Map({'name', 'labval'}, {'marry', marry_grid});
cl_mp_datasetdesc{3} = containers.Map({'name', 'labval'}, {'kids', kids_grid});
cl_mp_datasetdesc{4} = containers.Map({'name', 'labval'}, {'ylower', inc_grid});
```

## 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 37, 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_V_W_gain_check_use = ev19_jmky_check2 - ev19_jmky_check0;
mn_C_W_gain_check_use = ec19_jmky_check2 - ec19_jmky_check0;
```

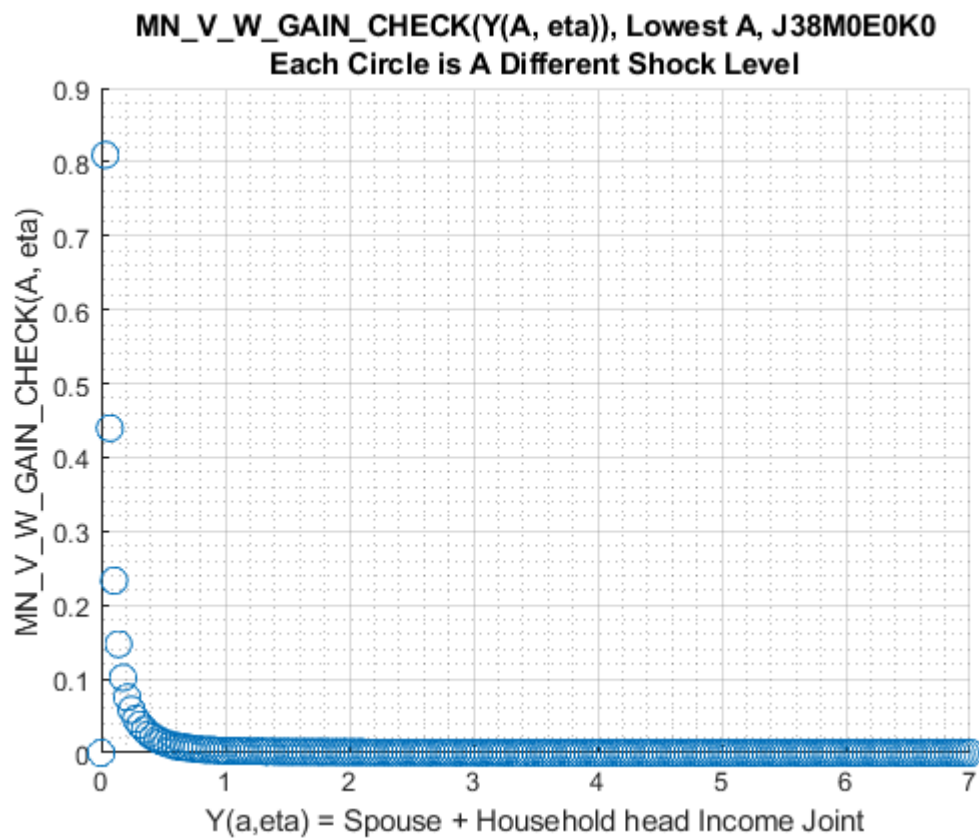
Select Age, Education, Marital, Kids Count:s

```
% Selections
it_age = 21; % +18
it_marital = 1; % 1 = unmarried
it_kids = 1; % 1 = kids is zero
% Select: NaN(n_jgrid-1,n_marriedgrid,n_kidsgrid,n_incgrid);
mn_C_W_gain_check_jemk = mn_C_W_gain_check_use(it_age, it_marital, it_kids, :);
mn_V_W_gain_check_jemk = mn_V_W_gain_check_use(it_age, it_marital, it_kids, :);
% Reshape, so shock is the first dim, a is the second
ar_C_W_gain_check_jemk = mn_C_W_gain_check_jemk(:);
ar_V_W_gain_check_jemk = mn_V_W_gain_check_jemk(:);
```

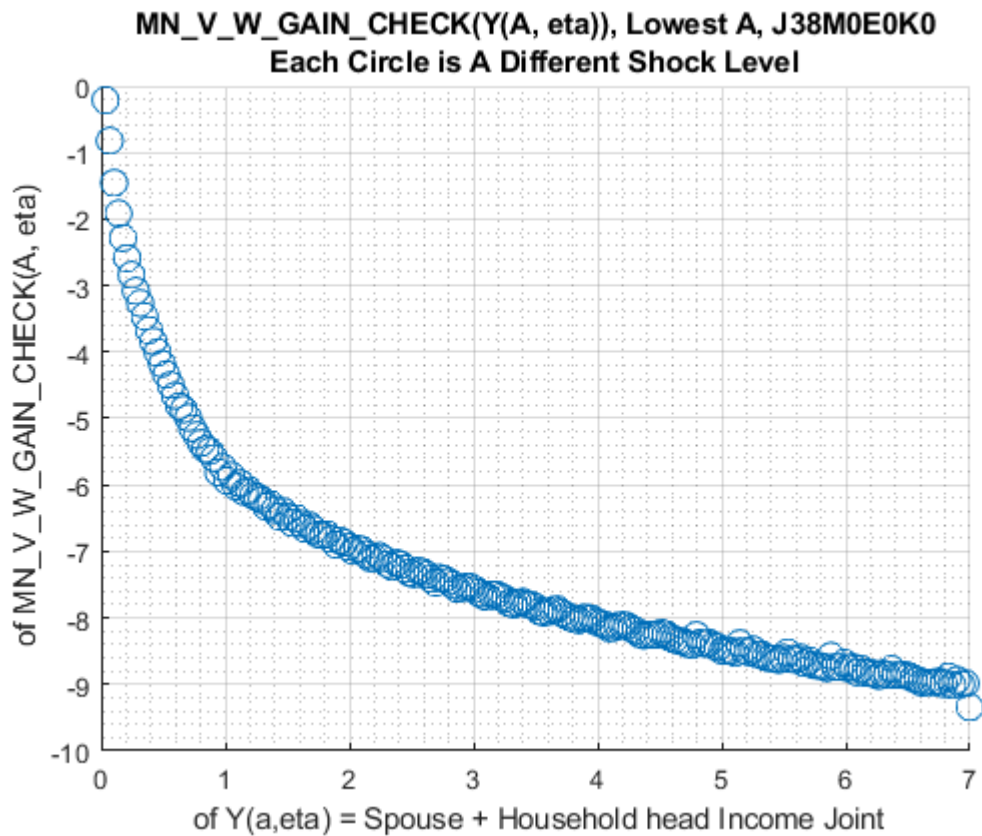
Marginal Value Gains, Color as Shock, Conditional on Age, Marital, Kids, and Education

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

```
figure();
scatter(inc_grid, ar_V_W_gain_check_jemk, 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;
```



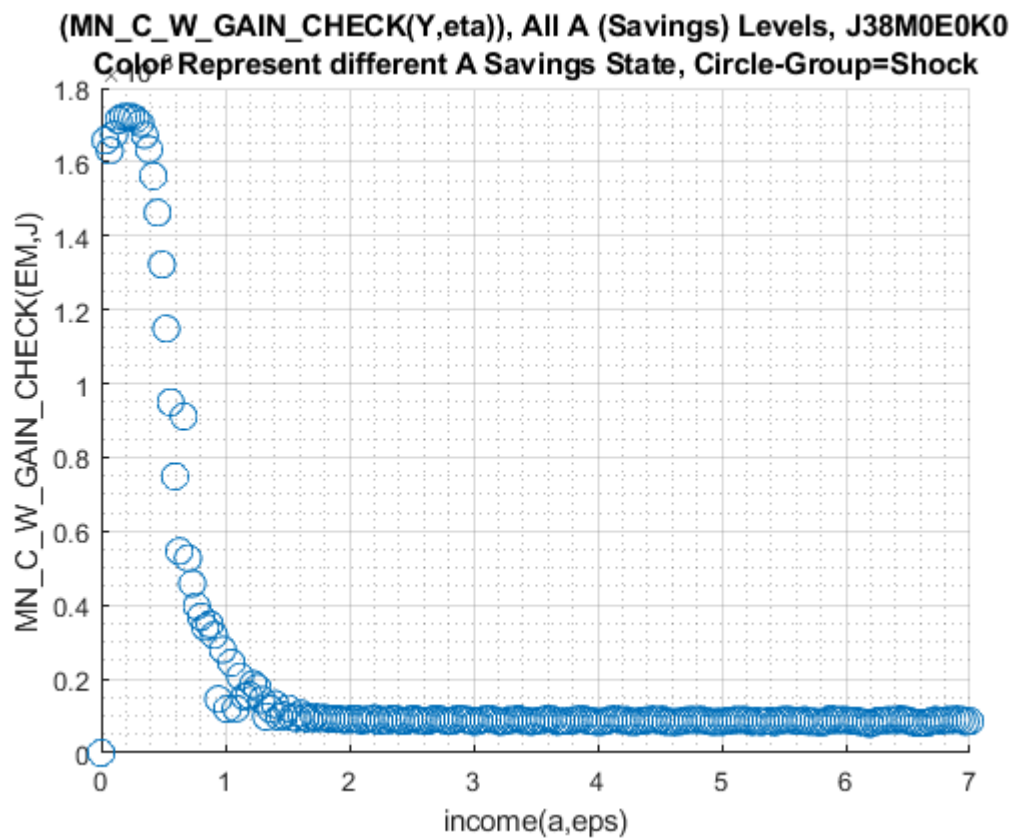
```
figure();
it_shock = 1;
scatter((inc_grid), log(ar_V_W_gain_check_jemk), 100);
title({'MN_V_W_GAIN_CHECK(Y(A, eta)), Lowest A, J38M0E0K0', ...
      'Each Circle is A Different Shock Level'});
xlabel(' of Y(a,eta) = Spouse + Household head Income Joint');
ylabel(' of MN_V_W_GAIN_CHECK(A, eta)');
grid on;
grid minor;
```



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

Plot all asset levels:

```
figure();
scatter(inc_grid, ar_C_W_gain_check_jemk, 100);
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((inc_grid), log(ar_C_W_gain_check_jemk), 100);
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;
```



(MN\_C\_W\_GAIN\_CHECK(Y,eta)), All A (Savings) Levels, J38M0E0K0  
Color Represent different A Savings State, Circle-Group=Shock

