Appendix

MATLAB Code for Salary and Pension Calculations

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%% Salary and Pension calculations for Man vs. Woman faculty at King's University College
% Last Updated: May 9, 2021 by Aaron Cecala

% Manuscript Name: "It's Not Just a Pay Gap: Modelling the Gender Wage and
% Pension Gap at a Post-Secondary Institution in Canada"

% Manuscript Authors: Tracy Smith-Carrier, Marcie Penner, Aaron Cecala,
% Carol Agocs

% Journal Name: Canadian Journal of Higher Education

%% Closes all figures, variables and previous text in Command Window
close all
clearvars;
clc;

%% Initial Salary Numbers based on most recent King's Salary Tables
BaseSalary_F = 89430;  % Base Salary for Female Faculty (Note: should be the same as male)
   BaseSalary_F_refresh = BaseSalary_F;
BaseSalary_M = 89430;  % Base Salary for Male Faculty (Note: should be the same as female)
   BaseSalary_M_refresh = BaseSalary_M;
Initial_Salary_Diff = BaseSalary_M - BaseSalary_F; % Difference between Male and Female Base Salaries
Percent_Female2Male_Base = 100*(BaseSalary_F/BaseSalary_M); % Female base salary as a percentage of male
base salary
PTR_Assistant = 2506;  % Amount given for each year of prior experience for Assistant Prof Rank
   PTR_Assistant_refresh = PTR_Assistant;
PTR_Associate = 2637;  % Amount given for each year of prior experience for Associate Prof Rank
   PTR_Associate_refresh = PTR_Associate;
PTR_Full = 2770;       % Amount given for each year of prior experience for Full Prof Rank
   PTR_Full_refresh = PTR_Full;

%% Rates of Salary Increase and Retirement Savings
r = .01;                % Multiplyer of Base Salary which equals % raise/year on Base Salary and PTR_Associate
RS_Rate_University = .13;   % Percentage of base salary that university contributes to Retirement account
RS_Rate_Individual = .09;   % Percentage of base salary that individual contributes to Retirement account
Avg_Lifespan_M = 21.1;     % Based on average lifespan of Males and Females in Ontario, Canada (STATSCAN 2020)
Avg_Lifespan_F = 21.1;     % Based on average lifespan of Males and Females in Ontario, Canada (STATSCAN 2020)

%% Years of Service Information

Total_Years = 29;                % Assumed Total Years of Service beyond starting year (e.g. 29 +starting year = 30
years total)
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Years_Exp_Given_M = [3.5];            % Years given to Male Faculty member at the beginning of their career
Years_Exp_Given_F = 0;                % Years given to Female Faculty member at the beginning of their career
Associate_Professor_Year = 7;         % Year at which both sexes are in their first year as a tenured professor
Full_Professor_Year_M = [31 18 18];   % Year at which Male Faculty member becomes a full professor
Full_Professor_Year_F = [31 18 31];   % Year at which Female Faculty member becomes a full professor

% Displays Initial Conditions in MATLAB Command Window
disp('INITIAL CONDITIONS')
disp('    ')
disp('Salary Information: Constants')
disp(['Starting Salary Female: $',num2str(BaseSalary_F)])
disp(['Starting Salary Male: $',num2str(BaseSalary_M)])
disp(['PTR Assistant equals: ', num2str(PTR_Assistant)])
disp(['PTR Associate equals: ', num2str(PTR_Associate)])
disp(['PTR Full equals: ', num2str(PTR_Full)])
disp(['Total Years of Career for both sexes: ',num2str(Total_Years)])
disp([num2str(r*100),'% raise is given to base salary each year'])
disp('    ')
disp('Salary Information: Assumptions')
disp(['Number of years experience given to Male at start: ', num2str(Years_Exp_Given_M)])
disp(['Number of years experience given to Female at start: ', num2str(Years_Exp_Given_F)])
disp(['Year both sexes make tenure/promote to Associate PTR: ', num2str(Associate_Professor_Year)])
disp(['Year that Female makes it to full professor: ', num2str(Full_Professor_Year_F)])
disp(['Year that Male makes it to full professor: ', num2str(Full_Professor_Year_M)])
disp('    ')
disp('Pension Information: Assumptions')
disp(['Total number of years of retirement Male: ', num2str(Avg_Lifespan_M)])
disp(['Total number of years of retirement Female: ', num2str(Avg_Lifespan_F)])

%% Calculation Loop
% Initialize Values
BaseSalary_F_PlotArray =[];           % female base salary
BaseSalary_M_PlotArray =[];           % male base salary
Salary_F_PlotArray =[];               % female salary
Salary_M_PlotArray =[];               % male salary
Female_Yearly_Loss_PlotArray =[];     % female losses as a function of year
Retirement_Savings_F_PlotArray  =[];  % female Retirement savings as a function of year
Retirement_Savings_M_PlotArray  =[];  % male Retirement savings as a function of year
Percent_Female2Male_Salary_PlotArray = [];  % female to male ratios

if length(Full_Professor_Year_M) == length(Full_Professor_Year_M)
for Years_Male_Given_To_Base = 1:length(Years_Exp_Given_M)
   for scenarios = 1:length(Full_Professor_Year_M)
      % initializes variables for this loop
      Retirement_Savings_F = 0;
      Retirement_Savings_M = 0;
      Female_Yearly_Loss =[];
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```
Female_Yearly_Salary =[];
Male_Yearly_Salary = [];
Percent_Female2Male_Salary =[];

for i = 1:Total_Years
   % Generates salary for male and female as long as under
   % first year of tenure ("Associate_Professor_Year")
   if i < Associate_Professor_Year
   Salary_M = BaseSalary_M + ((i+Years_Exp_Given_M(Years_Male_Given_To_Base)) * PTR_Assistant);
   Salary_F = BaseSalary_F + ((i+Years_Exp_Given_F) * PTR_Assistant);
   Salary_F_PlotArray(scenarios,i) = Salary_F; % female base salary
   Salary_M_PlotArray(scenarios,i) = Salary_M; % male base salary
   end

   % Generates salary for male as long as equal to or over
   % first year of tenure ("Associate_Professor_Year") and less than first
   % year of full professor
   if i >= Associate_Professor_Year && i < Full_Professor_Year_M(scenarios)
   Salary_M = BaseSalary_M + ((i+Years_Exp_Given_M(Years_Male_Given_To_Base)) * PTR_Associate);
   Salary_M_PlotArray(scenarios,i) = Salary_M; % male base salary
   end

   % Generates salary for female as long as equal to or over
   % first year of tenure ("Associate_Professor_Year") and less than first
   % year of full professor
   if i >= Associate_Professor_Year && i < Full_Professor_Year_F(scenarios)
   Salary_F = BaseSalary_F + ((i+Years_Exp_Given_F) * PTR_Associate);
   Salary_F_PlotArray(scenarios,i) = Salary_F; % female base salary
   end

   % Generates salary for male as long as equal to or over
   % first year of full professor
   if i >= Full_Professor_Year_M(scenarios)
    Salary_M = BaseSalary_M + ((i+Years_Exp_Given_M(Years_Male_Given_To_Base)+1) * PTR_Full); % Note
the "+1" is the incentive given to all who make FP
   Salary_M_PlotArray(scenarios,i) = Salary_M; % female base salary
   end

   % Generates salary for female as long as equal to or over
   % first year of full professor
   if i >= Full_Professor_Year_F(scenarios)
   Salary_F = BaseSalary_F + ((i+Years_Exp_Given_F+1) * PTR_Full); % Note the "+1" is the incentive given to
all who make FP
   Salary_F_PlotArray(scenarios,i) = Salary_F; % female base salary
   end

   % Stores data in an array for later calculations
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        Male_Yearly_Salary(i) = round(Salary_M);
        Female_Yearly_Salary(i) = round(Salary_F);
        Female_Yearly_Loss(i) = Salary_M -Salary_F;
         Female_Yearly_Loss_PlotArray(scenarios,i) = Female_Yearly_Loss(i); % Plots female losses as a function of
year
        Percent_Female2Male_Salary(i) = 100*(Salary_F/Salary_M);
        Percent_Female2Male_Salary_PlotArray(scenarios,i) = Percent_Female2Male_Salary(i);

        % Retirement contributions for male and female. DATA NOT USED BELOW
          Retirement_Savings_F = Retirement_Savings_F+(Salary_F*RS_Rate_Individual)+(Salary_F*RS_Rate_Uni-
versity);
       Retirement_Savings_M = Retirement_Savings_M+(Salary_M*RS_Rate_Individual)+(Salary_M*RS_Rate_Uni-
versity);
         Retirement_Savings_F_PlotArray(scenarios,i) = Retirement_Savings_F; % Plots female Retirement savings
as a function of year
          Retirement_Savings_M_PlotArray(scenarios,i) = Retirement_Savings_M; % Plots male Retirement savings
as a function of year

        % Incremental Raise to BaseSalaries and PTRs at the END of each year
        BaseSalary_F = BaseSalary_F*(1+r);   % Increments Female Base Salary by r% each iteration of the loop (i.e.
each year)
         BaseSalary_M = BaseSalary_M*(1+r);   % Increments Male Base Salary by r% each iteration of the loop (i.e.
each year)
          PTR_Associate = PTR_Associate*(1+r); % Increments PTR_Associate by r% each iteration of the loop (i.e.
each year)
        PTR_Assistant = PTR_Associate*0.95;  % 95% of PTR_Associate
        PTR_Full = PTR_Associate*1.05;       % 105% of PTR_Full

        BaseSalary_F_PlotArray(scenarios,i) =BaseSalary_F; % female base salary
        BaseSalary_M_PlotArray(scenarios,i) =BaseSalary_M; % male base salary

      end

%% Numerical Calculations Using a Number of the items generated from the if/end loop above.
      Male_Total_Salary_Earned_LifeTime = sum(Male_Yearly_Salary);
      Female_Total_Salary_Earned_LifeTime = sum(Female_Yearly_Salary);
      FemaleTotal_Retirement_PercentMale_temp = round(Retirement_Savings_F);
      MaleTotal_Retirement_PercentMale_temp = round(Retirement_Savings_M);
      RetirementDiff_Career_PercentMale_temp = round(Retirement_Savings_M -  Retirement_Savings_F);
      SalaryDiff_Career_PercentMale_temp = round(Salary_M - Salary_F);
      FemaleTotal_Yearly_Salarly_Losses_PercentMale_temp = round(sum(Female_Yearly_Loss(1,:)));
         Total_Female_Dollar_Loss_Over_Career_PercentMale_temp = round(RetirementDiff_Career_PercentMale_
temp+sum(Female_Yearly_Loss(1,:)));
         Last_3_Avg_Salary_M_temp = round(mean([Male_Yearly_Salary(Total_Years-2) Male_Yearly_Salary(Total_
Years-1) Male_Yearly_Salary(Total_Years)]));
         Last_3_Avg_Salary_F_temp = round(mean([Female_Yearly_Salary(Total_Years-2) Female_Yearly_Salary(To-
tal_Years-1) Female_Yearly_Salary(Total_Years)]));
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        Difference_Last_3_Avg_Salary_temp = Last_3_Avg_Salary_M_temp - Last_3_Avg_Salary_F_temp;

        Male_Pension_Per_Year_temp = round((0.02*Last_3_Avg_Salary_M_temp)*Total_Years);
         Male_Stuff =(0.02*Last_3_Avg_Salary_M_temp); % this is the first part of the annuity calc which is to find the
"maximum".
        %Given that we do not know what the CRA max will be in 30 years we cannot use this.

        Female_Pension_Per_Year_temp = round((0.02*Last_3_Avg_Salary_F_temp)*Total_Years);
        Female_Stuff = (0.02*Last_3_Avg_Salary_F_temp);% this is the first part of the annuity calc which is to find the
"maximum".
        %Given that we do not know what the CRA max will be in 30 years we cannot use this.

        Total_Male_Pension_temp = round(Male_Pension_Per_Year_temp*Avg_Lifespan_M);
        Total_Female_Pension_temp = round(Female_Pension_Per_Year_temp*Avg_Lifespan_F);
        Difference_Total_Pension_temp = Total_Male_Pension_temp -Total_Female_Pension_temp;
       Total_Losses_Combined_temp = Difference_Total_Pension_temp+FemaleTotal_Yearly_Salarly_Losses_Percent-
Male_temp;

        % Converts Numerical Calculations to Strings for text year display
        FemaleTotal_Retirement_PercentMale = num2str(FemaleTotal_Retirement_PercentMale_temp);
        MaleTotal_Retirement_PercentMale = num2str(MaleTotal_Retirement_PercentMale_temp);
        RetirementDiff_Career_PercentMale = num2str(RetirementDiff_Career_PercentMale_temp);
        SalaryDiff_Career_PercentMale = num2str(SalaryDiff_Career_PercentMale_temp);
       FemaleTotal_Yearly_Salarly_Losses_PercentMale = num2str(FemaleTotal_Yearly_Salarly_Losses_PercentMale_
temp);
        Total_Female_Dollar_Loss_Over_Career_PercentMale = num2str(Total_Female_Dollar_Loss_Over_Career_Per-
centMale_temp);
        Last_3_Avg_Salary_F = num2str(Last_3_Avg_Salary_F_temp);
        Last_3_Avg_Salary_M = num2str(Last_3_Avg_Salary_M_temp);
        Difference_Last_3_Avg_Salary = num2str(Difference_Last_3_Avg_Salary_temp);
        Male_Pension_Per_Year = num2str(Male_Pension_Per_Year_temp);
        Female_Pension_Per_Year = num2str(Female_Pension_Per_Year_temp);
        Total_Male_Pension = num2str(Total_Male_Pension_temp);
        Total_Female_Pension = num2str(Total_Female_Pension_temp);
        Total_Pension_Difference = num2str(Difference_Total_Pension_temp);
        Total_Losses_Combined = num2str(Total_Losses_Combined_temp);
        FemaletoMale_Percent_Salary_Year_1 = num2str(Percent_Female2Male_Salary(1));
        FemaletoMale_Percent_Salary_Year_Last = num2str(Percent_Female2Male_Salary(end));
        Male_Total_Salary_Earned_LifeTime_str= num2str(Male_Total_Salary_Earned_LifeTime);
        Female_Total_Salary_Earned_LifeTime_str = num2str(Female_Total_Salary_Earned_LifeTime);

%% Displays Initial Conditions in the MATLAB Command Window
        disp('      ')
        disp('      ')
    if scenarios == 1
        disp('SCENARIO A: MAN AND WOMAN ARE PROMOTED FROM ASSISTANT TO ASSOCIATE PROFESSOR
AT THE SAME TIME AND STAY AT ASSOCIATE PROFESSOR RANK')
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   elseif scenarios == 2
       disp('SCENARIO B: MAN AND WOMAN ARE PROMOTED FROM ASSISTANT TO ASSOCIATE PROFESSOR
AND FULL PROFESSOR AT THE SAME TIME')
   elseif scenarios == 3
       disp('SCENARIO C: MAN AND WOMAN ARE PROMOTED FROM ASSISTANT TO ASSOCIATE PROFESSOR
AT THE SAME TIME, BUT ONLY MAN PROMOTED TO PROFESSOR RANK')
   else
      disp('NEW SCENARIO, MUST GIVE DESCRIPTION')
   end
%% Displays Calculated Data in MATLAB Command Window
       disp('      ')
       disp('CALCULATED DATA')
       disp('      ')
       disp('Salary')
       disp(['Final Salary Woman: $',num2str(round(Salary_F))])
       disp(['Final Salary Man: $',num2str(round(Salary_M))])
          disp(['Woman Salary to Man Salary as a Percentage in First Working year:',FemaletoMale_Percent_Sala-
ry_Year_1,'%'])
          disp(['Woman Salary to Man Salary as a Percentage in Final Working year:',FemaletoMale_Percent_Sala-
ry_Year_Last,'%'])
       disp(['Difference in 30th year salary equals  $',SalaryDiff_Career_PercentMale])
       disp(['Salary Average of the last 3 years for Woman: $',Last_3_Avg_Salary_F])
       disp(['Salary Average of the last 3 years for Man: $', Last_3_Avg_Salary_M])
       disp(['Difference in last 3 year salary averages equals $',Difference_Last_3_Avg_Salary])
       disp(['Man Total Salary Earned Over Lifetime $',Male_Total_Salary_Earned_LifeTime_str])
       disp(['Woman Total Salary Earned Over Lifetime $',Female_Total_Salary_Earned_LifeTime_str])
       disp(['Total Woman Yearly Salary Losses equals  $',FemaleTotal_Yearly_Salarly_Losses_PercentMale])
       disp('      ')
       disp('Pension Benefits')
       disp(['Man Pension yearly salary: $',Male_Pension_Per_Year])
       disp(['Woman Pension yearly salary: $',Female_Pension_Per_Year])
       disp(['Man Pension earned until death: $',Total_Male_Pension])
       disp(['Woman Pension earned until death: $',Total_Female_Pension])
       disp(['Difference Total Pension at death: $',Total_Pension_Difference])
       disp('      ')
       disp(['Grand Woman Losses (Combined Salary and Pension Losses): $',Total_Losses_Combined])

       BaseSalary_M = BaseSalary_M_refresh;
       BaseSalary_F = BaseSalary_F_refresh;
       Salary_M = [];
       Salary_F = [];
       PTR_Assistant = PTR_Assistant_refresh;
       PTR_Associate = PTR_Associate_refresh;
       PTR_Full = PTR_Full_refresh;

   end
end
```

```
else
   disp('length(Full_Professor_Year_M) is not equal to length(Full_Professor_Year_M)')
end
```