**QF 627 Programming and Computational Finance**

**HWS0102 : MATLAB Basics**

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**Q1.**

**<funP.m>**

function [P]=funP(PV, r, t)

P=(r/12\*PV)/(1-(1+r/12)^(-12\*t));

End

**<Pushbutton Callback in HDBLoanCalculator.m>**

function pushbutton1\_Callback(hObject, eventdata, handles)

PV=str2num(handles.edit\_LoanAmount.String);

t=str2num(handles.edit\_RepaymentPeriod.String);

r=str2num(handles.edit\_InterestRateOfLoan.String)/100;

P=funP(PV, r, t);

handles.edit\_MonthlyInstallment.String=num2str(ceil(P));

**Q2.**

**<MATLAB function>**

function Incometax(bi, mi, xi, x)

if x>xi(end)

i=length(xi)

else

c=find(xi>x);

i=c(1)-1;

end

if i==0

y=0

else

y=bi(i)+mi(i)/100\*(x-xi(i))

end

end

**<MATLAB script>**

>> bi=[0, 200, 550, 3350, 7950, 13950, 21150, 28750, 36550, 44550];

>> mi=[2.0, 3.5, 7.0, 11.5, 15.0, 18.0, 19.0, 19.5, 20.0, 22.0];

>> xi=[20000, 30000, 40000, 80000, 120000, 160000, 200000, 240000, 280000, 320000];

>> x=400000;

>> Incometax(bi, mi, xi, x)

**Q3.**

year = 2017;

o={'+','-','\*','/',''};

for o1 = o

for o2 = o

for o3 = o

for o4 = o

for o5 = o

for o6 = o

for o7 = o

for o8 = o

s=['1', o1{1}, ...

'2', o2{1}, ...

'3', o3{1}, ...

'4', o4{1}, ...

'5', o5{1}, ...

'6', o6{1}, ...

'7', o7{1}, ...

'8', o8{1}, '9'];

if eval(s)==year

disp([s, '=', num2str(year)])

end

end

end

end

end

end

end

end

end

disp(‘Done!’)

end

**Q4**

**Matlab M-file function**

function Sudoku(s)

c=strfind(s,'0');

if isempty(c)

disp(s);

else

i = c(1)-1;

excluded\_numbers =[];

for j = 1:81

if same\_row(i,j-1)|| same\_col(i,j-1)|| same\_block(i,j-1)

excluded\_numbers = unique([excluded\_numbers, s(j)]);

end

end

numbers = setdiff(['123456789'], excluded\_numbers);

for m = numbers

Sudoku([s(1:i), m, s(i+2:81)]);

end

end

end

function [a] = same\_row(i,j)

a = floor((i)/9)==floor((j)/9);

end

function [a] = same\_col(i, j)

a = mod(i, 9)==mod(j, 9);

end

function [a] =same\_block(i, j)

a = floor(i/27)== floor(j/27) && floor(mod(i,9)/3)==floor(mod(j,9)/3);

end

**M-file for script**

>> s=['390060807' '020030050' '000005096' ...

'900502400' '000000000' '003907002' ...

'810600000' '030050080' '502090043'];

>> Sudoku(s)

**Q5**

**Matlab M-file for the class**

classdef Calloption

properties

S0;

K;

T;

r;

sigma;

end

methods

function obj=Calloption(S0, K, T, r, sigma)

obj.S0 = S0;

obj.K = K;

obj.T = T;

obj.r = r;

obj.sigma = sigma;

end

function [value2]=value(obj)

d1 = ((log(obj.S0 / obj.K) + (obj.r+ 0.5 \* obj.sigma^ 2) \* obj.T)/(obj.sigma\* sqrt(obj.T)));

d2 = ((log(obj.S0 / obj.K) + (obj.r-0.5 \* obj.sigma^ 2) \* obj.T)/(obj.sigma\* sqrt(obj.T)));

value2 = (obj.S0 \* normcdf(d1, 0.0, 1.0)-obj.K\* exp(-obj.r\* obj.T) \* normcdf(d2, 0.0, 1.0));

end

function [vega2]=vega(obj)

d1 = ((log(obj.S0 / obj.K) + (obj.r+ 0.5 \* obj.sigma^ 2) \* obj.T)/(obj.sigma\* sqrt(obj.T)));

vega2= obj.S0\* normcdf(d1, 0.0, 1.0) \* sqrt(obj.T);

end

function [os]=imp\_vol(obj, C0, sigma\_est, it)

if nargin==3

it=100;

elseif nargin==2

sigma\_est=0.2;

it=100;

end

option = Calloption(obj.S0, obj.K, obj.T, obj.r, sigma\_est);

for i = range(it)

option.sigma = option.sigma-(option.value()-C0) / option.vega();

os=option.sigma;

end

end

end

end

**M-file script**

>> a = Calloption(100, 105, 1, 0.05, 0.2)

>> a.value()

>> a.vega()

>> a.imp\_vol(a.value)