

**Jeremy Williams**

## **Assignment – EXCEL AND VBA PROGRAMMING DETAILS AND USAGE**

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This document explains the usage and details of a programming assignment in Excel and VBA.

The program was created based on An Application of Merton Model to calculate the Expected Loss and Economic Capital.

- 1) To Begin the User must click on the Excel file to open the program.

```
Private Sub Workbook_Open()  
Sheets("JW").Select  
Sheet2.Cells.Clear  
BeginSimForm.Show  
End Sub
```

This will open the file selection sheet named “JW”, Clear all cells in sheet named “Begin” and Start by showing the BeginSimForm. See picture below.



Once the BeginSimForm has been loaded, the User will have a choice to select two buttons, “Click Here to Begin” or “Click Here to Close”

Click Here to Begin has to following code:

```
Private Sub BeginSim_Click()  
Unload Me  
Sheet2.Cells.Clear  
NumberSimForm.Show  
End Sub
```

If the User chooses the Click Here to Begin button then The BeginSimForm will be unloaded, cells will be cleared in sheet named “Begin” and it will display the NumberSimForm.

If the “Click Here to Close” button has been selected then the User will asked if they are sure they would like to leave.

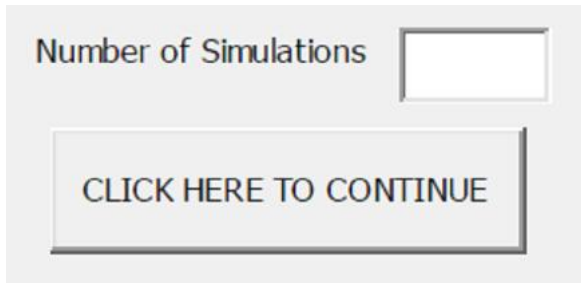
If the User selects YES then the active workbook will be saved, the application will close and Excel program will be shut down. If the User selects NO then the BeginSimForm will be display again.

“Click Here to Close” has to following code:

```
Private Sub CloseSim_Click()  
Dim Closeanswer As Integer  
Closeanswer = MsgBox("Are you sure you want to leave?", vbYesNo + vbQuestion, "Closing  
Application")  
If Closeanswer = vbYes Then  
    ActiveWorkbook.Save  
    Application.Quit  
If Closeanswer = vbNo Then  
    Unload BeginSimForm  
    BeginSimForm.Show  
End If  
End If  
End Sub
```

2) In order for the program to continue the User must select the “Click Here to Begin” Button.

Once the User has selected the “Click Here to Begin” Button, the NumberSimForm is displayed See picture below.



At this moment the User will have to enter the required number of simulations and click the “Click Here To Continue” button.

Now there are a few factors that need to be put in place for this program to run properly.

The input box for the number of simulations must only be allow to put numbers in it and the number 10 is the required number of simulations for this program.

First the User will be allowed to enter only numbers and invalid keys will be locked not to allow entry any other characters, letters or symbols in the input box using the following VBA codes.

### **Option Explicit**

```
Private Sub UserForm_QueryClose(Cancel As Integer, CloseMode As Integer)  
    If CloseMode = 0 Then Cancel = True  
End Sub
```

```

Private Sub OnlyNumbers()
If TypeName(Me.ActiveControl) = "TextBox" Then
    With Me.ActiveControl
        If Not IsNumeric(.Value) And .Value <> vbNullString Then
            MsgBox "Sorry, only numbers allowed!"
            .Value = vbNullString
        End If
    End With
End If
End Sub

Private Sub NumberSim_KeyPress(ByVal KeyAscii As MSForms.ReturnInteger)
Select Case KeyAscii
    Case 48 To 57
    Case Else
        KeyAscii = 0
        MsgBox "Only numbers allowed!"
End Select

End Sub

Private Sub NumberSim_Change()
OnlyNumbers
End Sub

```

The “Click Here to Continue” Button has the following VBA code:

```

Private Sub NumberSimOk_Click()
If NumberSim.Value <> 10 Then
    NumberSimForm.NumberSim = ""
    MsgBox prompt:="Only 10 simulations are allowed at this time!", Buttons:=vbCritical,
Title:="Invalid Entry"
End If
If NumberSim.Value = 10 Then
    Unload Me
    EnterDataForm.Show
End If
End Sub

```

- 3) In order for the program to continue the User must select the “Click Here to Continue” Button with the number “10” inside the input box for the number of simulations.

Once this has been done correctly then the “EnterDataForm” Form will be displayed.

See picture below.

Correlation ( Beta )	<input type="text"/>	Probability of Default ( PD )	<input type="text"/>
Portfolio Exposure ( PE ) ( in Euros € )	<input type="text"/>	Autocorrelation ( Phi )	<input type="text"/>
<input type="button" value="Submit"/>		<input type="button" value="Clear"/>	<input type="button" value="Cancel"/>

As before, there are several factors that need to be put in place for this program to run properly.

All input box must only be allow to put numbers (with range values only) in it and all invalid keys will be locked not to allow entry any other characters, letters or symbols using the following VBA codes.

### Option Explicit

```
Private Sub OnlyNumbers()
If TypeName(Me.ActiveControl) = "TextBox" Then
    With Me.ActiveControl
        If Not IsNumeric(.Value) And .Value <> vbNullString Then
            MsgBox prompt:="Sorry, only numbers allowed!", Buttons:=vbCritical, Title:="Invalid Entry"
            .Value = vbNullString
        End If
    End With
End If
End Sub
```

```
Private Sub Beta_Exit(ByVal Cancel As MSForms.ReturnBoolean)
    With Me.Beta
        If .Value < -1 Or .Value > 1 Or .Value = 1 Or .Value = -1 Then
            .Value = ""
            MsgBox prompt:="Number entered must be between (and not equal to) -1 and 1!", Buttons:=vbCritical, Title:="Invalid Entry"
            Cancel = True
        End If
    End With
End Sub
```

```
Private Sub Phi_Exit(ByVal Cancel As MSForms.ReturnBoolean)
    With Me.Phi
        If .Value < -1 Or .Value > 1 Or .Value = 1 Or .Value = -1 Then
            .Value = ""
            MsgBox prompt:="Number entered must be between (and not equal to) -1 and 1!", Buttons:=vbCritical, Title:="Invalid Entry"
            Cancel = True
        End If
    End With
End Sub
```

```
Private Sub PofD_Exit(ByVal Cancel As MSForms.ReturnBoolean)
```

```

With Me.PofD
  If .Value < 0 Or .Value > 1 Or .Value = 0 Or .Value = 1 Then
    .Value = ""
    MsgBox prompt:="Number entered must be between (and not equal to) 0 and 1!",
Buttons:=vbCritical, Title:="Invalid Entry"
    Cancel = True
  End If
End With
End Sub

Private Sub PortfolioExp_Change()
OnlyNumbers
End Sub

```

After the VBA coded factors are in place, there are three command buttons for the User to Select. There are as followed, the “Submit”, “Clear” and “Cancel”

The “Clear” Button has to following code.

```

Private Sub Clear_Click()
Dim answer As Integer
  answer = MsgBox("Are you sure you want to clear all data?", vbYesNo + vbQuestion, "Clear All")
If answer = vbYes Then
  EnterDataForm.Beta = ""
  EnterDataForm.Phi = ""
  EnterDataForm.PofD = ""
  EnterDataForm.PortfolioExp = ""
  Sheets("Begin").Select
  ActiveSheet.Buttons.Visible = True
  Sheet2.Cells.Clear
  'Hide All Forms buttons
  ActiveSheet.Buttons.Visible = False
  Sheets("JW").Select
  Sheet1.Cells.Clear
Else
  'do nothing
End If
End Sub

```

The “Cancel” Button has to following code.

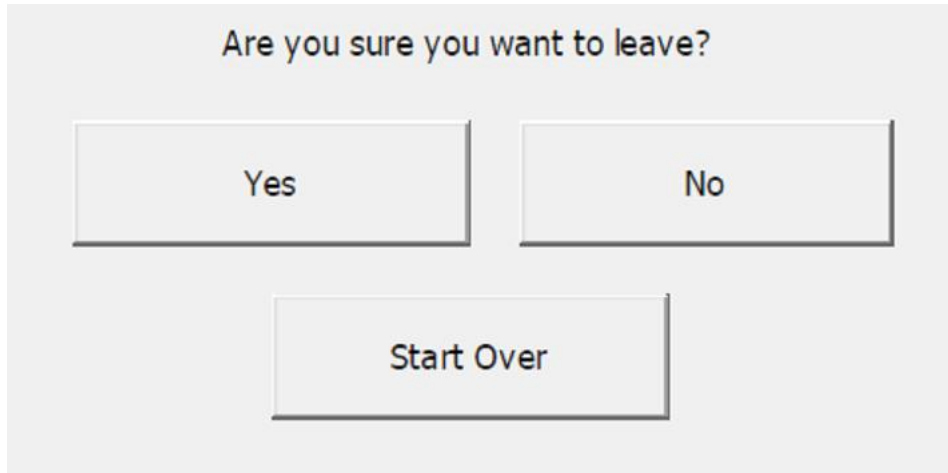
```

Private Sub Cancel_Click()
Unload Me
Unload CancelSimForm
CancelSimForm.Show
End Sub

```

If the User selects this button then the “CancelSimForm” Form will be displayed.

See picture below.



Once the “CancelSimForm” Form has been displayed, the User will have to select one of followed command buttons, “YES”, “NO” or “Start Over”.

If the User selects “YES” then the program will select sheet name “JW”, save all data in active Workbook and then Excel Application/Program will be closed.

The “YES” Button has to following code.

```
Private Sub EndYes_Click()  
Sheets("JW").Select  
ActiveWorkbook.Save  
Application.Quit  
End Sub
```

If the User selects “NO” then the “CancelSimForm” Form will be unloaded and the “EnterDataForm” Form will be displayed again as before.

The “NO” Button has to following code.

```
Private Sub EndNo_Click()  
Unload Me  
Unload EnterDataForm  
EnterDataForm.Show  
End Sub
```

If the User selects “START OVER” then a message box will be displayed to ask the User if they are sure they would like to start over. If the User selects “YES” then the “CancelSimForm” Form will be unloaded, sheet named “JW” will be selected

The “START OVER” Button has to following code.

```

Private Sub EndStartOver_Click()
Dim Endstartanswer As Integer
Endstartanswer = MsgBox("Are you sure you want to start over?", vbYesNo + vbQuestion, "Start Over")
If Endstartanswer = vbYes Then
    Unload Me
    Sheets("JW").Select
    Unload BeginSimForm
    BeginSimForm.Show
Else
    'do nothing
End If
End Sub

```

- 4) Now, in order for the program to continue the User must select the “Submit” Button on “EnterDataForm” Form with the correct number values.

Once this has been done correctly then the “EnterDataForm” Form will be unloaded, the Simulation will begin and the Expect Loss and The Economic Capital will be calculated on the Sheet name “Begin”.

See a picture example below.

Simulations	e	x	c	$c-b*x/\sqrt{1-b^2}$	Prob. Mora	LGD	EL								
1	-0.23428083	-0.23428083	1.644853627	2.357637806	0.990804186	0.65	3220.114	Phi	0.95	Percentile	ES				
2	0.51334243	0.513342431	1.644853627	0.083042687	0.533091201	0.29	772.9822	PD	0.95	99%	3390.332	3399.996			
3	1.30320268	1.303202679	1.644853627	-2.320055716	0.010168932	0.25	12.71116	Beta	0.95	99.50%	3395.164	3399.996			
4	-0.07006723	-0.07006723	1.644853627	1.85802862	0.968417525	0.68	3292.62	PE	€	5,000.00	99.90%	3399.03	3399.996		
5	-1.01015201	-1.01015201	1.644853627	4.718175394	0.99999881	0.68	3399.996								
6	0.98124881	0.981248814	1.644853627	-1.340532031	0.090036219	0.1	45.01811	Show EL Chart		Media History	1399.739				
7	0.58413341	0.584133411	1.644853627	-0.132334261	0.447359954	0.27	603.9359			Capital	2000.257				
8	-0.89538693	-0.89538693	1.644853627	4.36901009	0.999993759	0.53	2649.983								
9	1.86219766	1.86219766	1.644853627	-4.020761567	2.90051E-05	0.18	0.026105	Enter New Values		Refresh Data					
10	2.35739666	2.35739666	1.644853627	-5.527372296	1.62531E-08	0.2	1.63E-05								

The User will then have a choice to select three common buttons “Show EL Chart”, “Enter New Values” “Refresh Data” and “Close”

If the User selects “Close” then the “CancelSimForm” Form will be displayed.

The “Close” Button has to following code.

```

Sub Button7_Click()
Dim CloseNow As Integer

```

```

CloseNow = MsgBox("Are you sure you want to leave?", vbYesNo + vbQuestion, "Closing Application")
If CloseNow = vbYes Then
    ActiveWorkbook.Save
    Application.Quit
    If Closeanswer = vbNo Then
        End If
    End If
ActiveWindow.DisplayWorkbookTabs = False
End Sub

```

If the User selects “Refresh Data” then new random numbers will be chosen in column “e” and all other cells will be recalculated.

The “Refresh Data” Button has to following code.

```

Sub Button4_Click()
ActiveWorkbook.Save
ActiveWindow.DisplayWorkbookTabs = False
End Sub

```

If the User selects “Enter New Values” then the “EnterDataForm” Form will be displayed and data will be cleared to enter new data values for recalculation.

The “Enter New Values” Button has to following code.

```

Sub Button6_Click()
Dim NewData As Integer
NewData = MsgBox("Are you sure you want to enter new values?", vbYesNo + vbQuestion, "New Values")
If NewData = vbYes Then
    Sheets("Begin").Select
    ActiveSheet.Buttons.Visible = True
    Sheet2.Cells.Clear
    'Hide All Forms buttons
    ActiveSheet.Buttons.Visible = False
    Sheets("JW").Select
    Sheet1.Cells.Clear
    EnterDataForm.Show
Else
    'do nothing
End If
ActiveWindow.DisplayWorkbookTabs = False
End Sub

```

If the User selects “Show EL Chart” then a message box will be displayed with a “Yes” or “No” question. If the User selects “Yes” then sheet name “EL Chart” will be selected and displayed with a graphical representation of the EL column on sheet name “Begin” with the Expected Loss Values and Economic Capital Value. If the User selects “No” then nothing happens.



The “Show EL Chart” Button has to following code.

```

Sub Button3_Click()
Dim Chartview As Integer
Chartview = MsgBox("Are you sure you want to show the expected loss chart?", vbYesNo +
vbQuestion, "Expected Loss")
If Chartview = vbYes Then
    Sheets("EL Chart").Select
Else
    'do nothing
End If
ActiveWindow.DisplayWorkbookTabs = False
End Sub

```

See below example of the Expected Loss Chart.



Now when the User has displayed the Expected Loss Chart, there will be two command button located on the upper part of the chart. They are the “Refresh Data” button and the “Go Back” button.

If the User selects “Refresh Data” button then new random numbers will be chosen in column “e”, all other cells will be recalculated, the Expected Loss Chart sheet reminds open and a new graphical representation will be displayed with every click of this button.

The “Refresh Data” Button on the EL Chart has to following code.

```

Sub Button5_Click()

```

```
ActiveWorkbook.Save  
ActiveWindow.DisplayWorkbookTabs = False  
End Sub
```

If the User selects “Go Back” button then sheet name “Begin” will be selected with all of the unchanged data in each cell.

The “Go Back” Button on the EL Chart has to following code.

```
Sub Button2_Click()  
Sheets("Begin").Select  
ActiveWindow.DisplayWorkbookTabs = False  
End Sub
```

- 5) In order for the program to function in the right way, particular VBA coding is used for better flow and usage.

- a) **Hidden Sheet Tabs** – All sheet tabs are hidden using the following code:

```
Sub Name()  
ActiveWindow.DisplayWorkbookTabs = False  
End Sub
```

- b) **Disable the Close [X] button** - All userform and message box close [x] are disable using the following code:

```
Private Sub UserForm_QueryClose(Cancel As Integer, CloseMode As Integer)  
    If CloseMode = 0 Then Cancel = True  
End Sub
```