Using the RLS Macro

Excel Spreadsheet

The first step is to make sure that the Visual Basic Add-in is activated in Excel. Go to File/Options.

Info

RLSmacro

D: » Ufunzi » CH452 » Assignment_1

Compatibility Mode

Convert

Some new features are disabled to prevent problems when working with previous versions of Office. Converting this file will enable these features, but may result in layout changes.

Protect Workbook

Protect Workbook

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Before publishing this file, be aware that it contains:

- Document properties, printer path, author's name and absolute path
- Macros, forms, or ActiveX controls
- Content that cannot be checked for accessibility issues because of the current file type

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There are no previous versions of this file.

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Properties

Size	95.5KB
Title	Add a title
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Related Dates

Last Modified	1/8/2015 10:26 AM
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Author: Stefan Franzen

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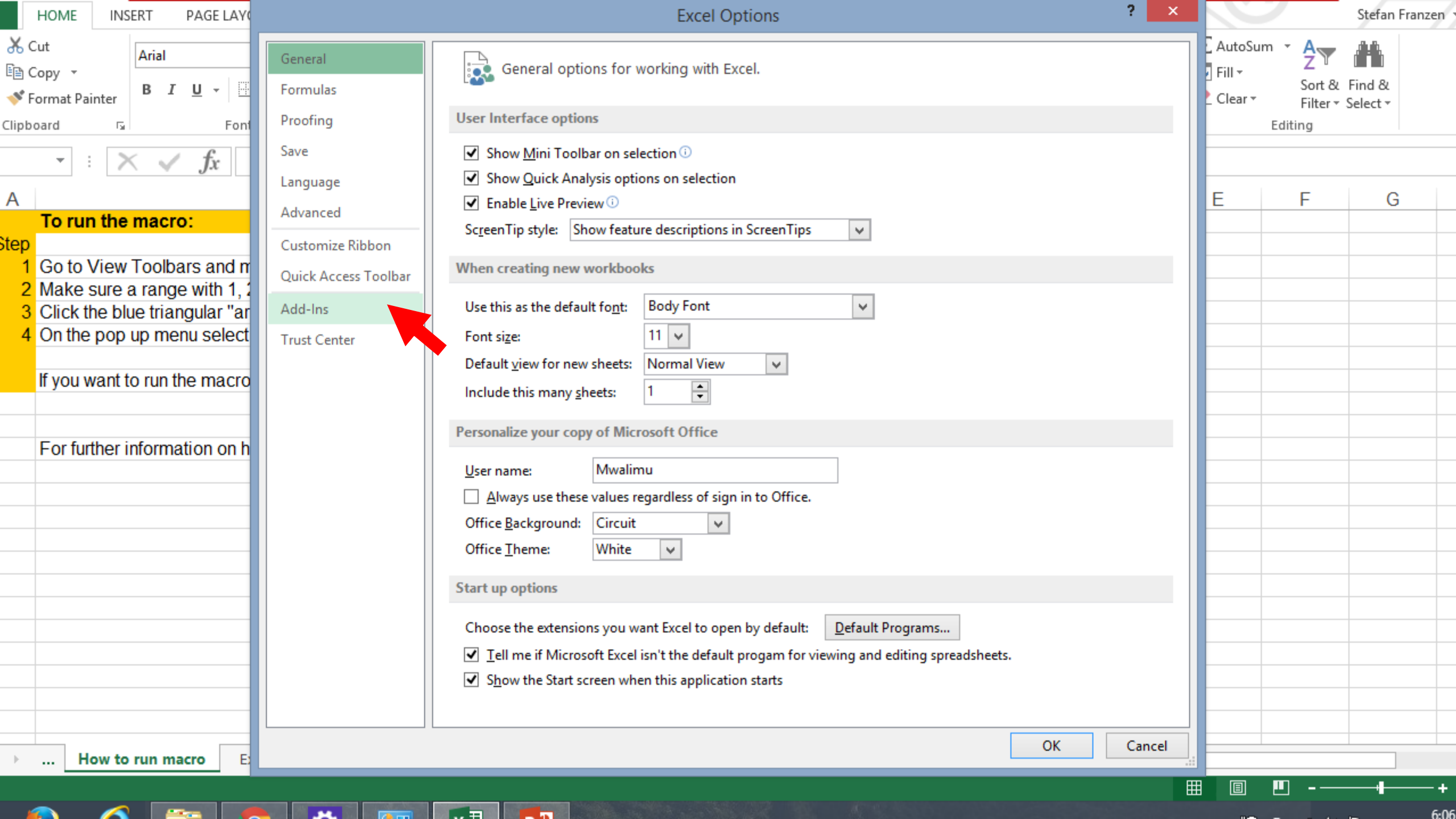
Show All Properties

The first step is to make sure that the Visual Basic Add-in is activated in Excel.
Go to File/Options.
Go to Add-ins


Excel Options
General
Formulas
Proofing
Save
Language
Advanced
Customize Ribbon
Quick Access Toolbar
Add-Ins
Trust Center
General options for working with Excel.
User Interface options
Show Mini Toolbar on selection
Show Quick Analysis options on selection
Enable Live Preview
ScreenTip style: Show feature descriptions in ScreenTips
When creating new workbooks
Use this as the default font: Body Font
Font size: 11
Default view for new sheets: Normal View
Include this many sheets: 1
Personalize your copy of Microsoft Office
User name: Mwalimu
Always use these values regardless of sign in to Office.
Office Background: Circuit
Office Theme: White
Start up options
Choose the extensions you want Excel to open by default: Default Programs...
Tell me if Microsoft Excel isn't the default progam for viewing and editing spreadsheets.
Show the Start screen when this application starts
OK
Cancel
To run the macro:
Step
1 Go to View Toolbars and m
2 Make sure a range with 1, 2
3 Click the blue triangular "ar
4 On the pop up menu select
If you want to run the macro
For further information on h
How to run macro
HOME
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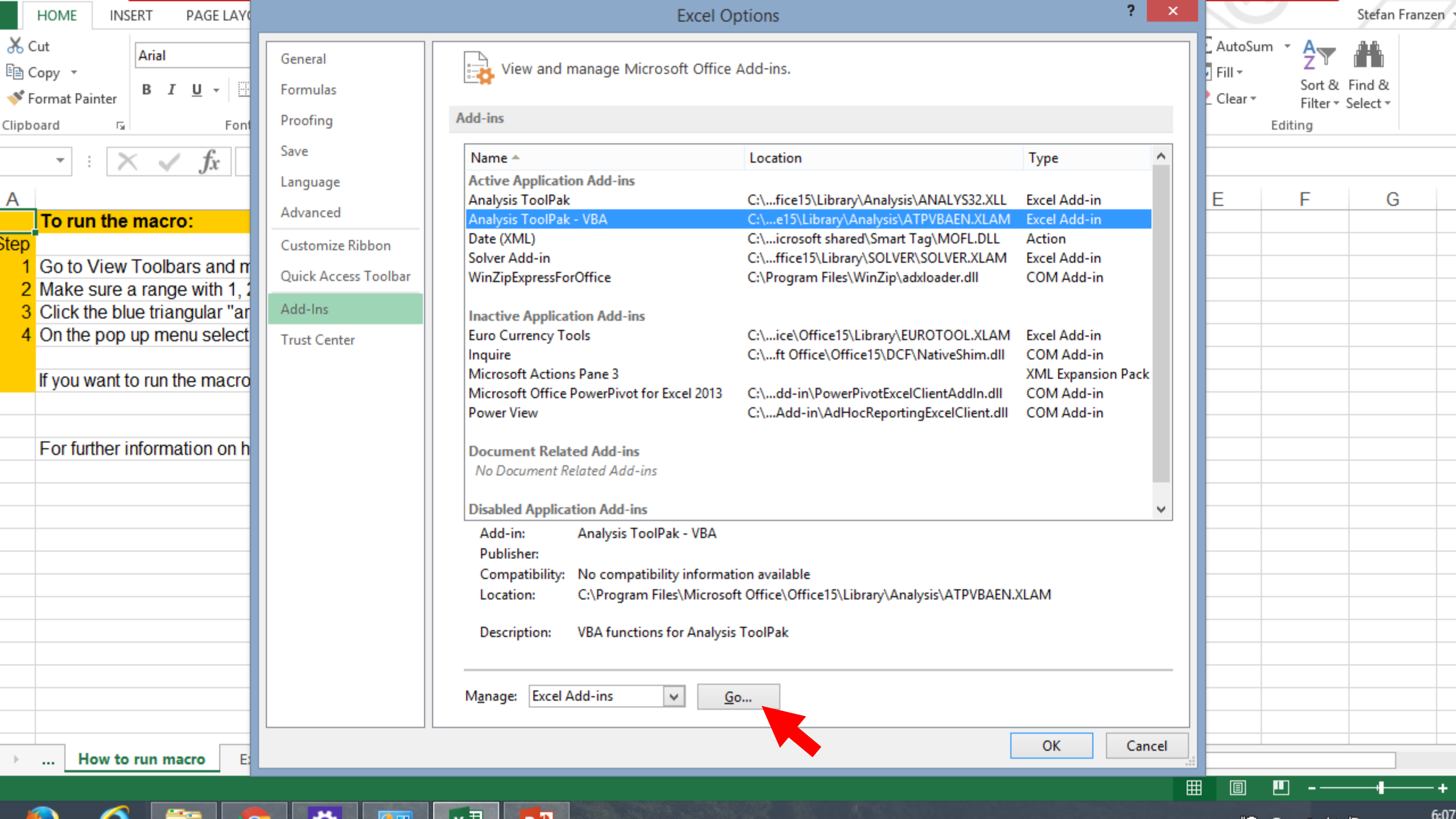
Sort & Filter
Find & Select
Editing
Stefan Franzen

The first step is to make sure that the Visual Basic Add-in is activated in Excel.
Go to File/Options.
Go to Add-ins.
If the VBA Analysis Toolkit is under the Active category then you should be fine.
If not then select it and press Go at Excel Add-ins near the bottom of the menu.


Excel Options
General
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Customize Ribbon
Quick Access Toolbar
Add-Ins
Trust Center
View and manage Microsoft Office Add-ins.
Add-ins
Name
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Active Application Add-ins
Analysis ToolPak
C:\...fice15\Library\Analysis\ANALYS32.XLL
Excel Add-in
Analysis ToolPak - VBA
C:\...e15\Library\Analysis\ATPVBAEN.XLAM
Excel Add-in
Date (XML)
C:\...icrosoft shared\Smart Tag\MOFL.DLL
Action
Solver Add-in
C:\...ffice15\Library\SOLVER\SOLVER.XLAM
Excel Add-in
WinZipExpressForOffice
C:\Program Files\WinZip\adxloader.dll
COM Add-in
Inactive Application Add-ins
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Excel Add-in
Inquire
C:\...ft Office\Office15\DCF\NativeShim.dll
COM Add-in
Microsoft Actions Pane 3
XML Expansion Pack
Microsoft Office PowerPivot for Excel 2013
C:\...dd-in\PowerPivotExcelClientAddIn.dll
COM Add-in
Power View
C:\...Add-in\AdHocReportingExcelClient.dll
COM Add-in
Document Related Add-ins
No Document Related Add-ins
Disabled Application Add-ins
Add-in: Analysis ToolPak - VBA
Publisher:
Compatibility: No compatibility information available
Location: C:\Program Files\Microsoft Office\Office15\Library\Analysis\ATPVBAEN.XLAM
Description: VBA functions for Analysis ToolPak
Manage: Excel Add-ins
Go...
OK
Cancel
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Go to File/Options.
Go to Add-ins.
If the VBA Analysis Toolkit is under the Active category then you should be fine.
If not then select it and press Go at Excel Add-ins near the bottom of the menu.
A submenu will pop up with selections for which Add-ins to activate using the Check boxes. Click OK. This procedure activates the Add-in.

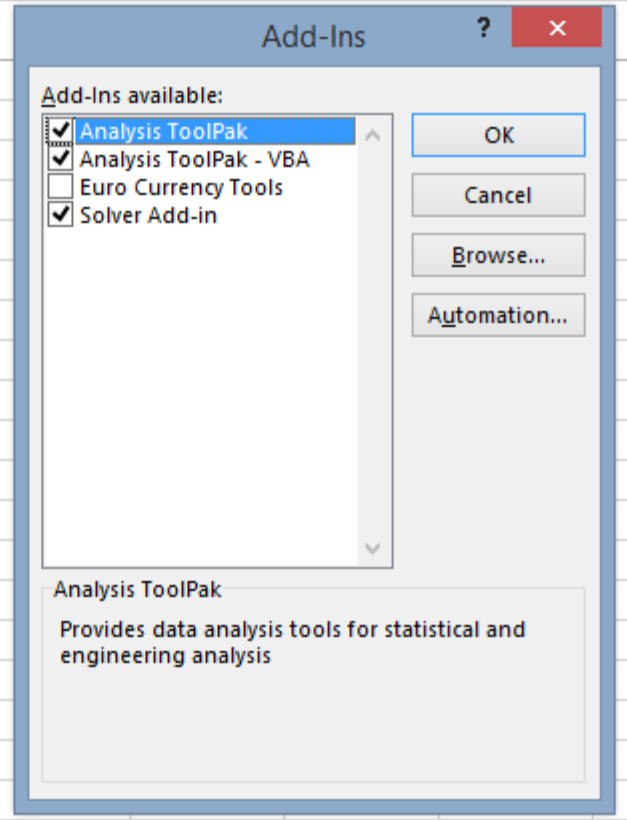
Now you are ready to run the Macro.

HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW Stefan Franzen

Cut Copy Format Painter | Arial 10 | Wrap Text | General | Conditional Formatting | Format as Table | Cell Styles | Insert Delete Format | AutoSum Fill Clear | Sort & Filter | Find & Select

Clipboard Font Alignment Number Styles Cells Editing

Step	To run the macro:
1	Go to View Toolbars and make sure the Visual Basic toolbar is visible
2	Make sure a range with 1, 2 or 3 contiguous columns is selected (numbers only)
3	Click the blue triangular "arrow" icon on the Visual Basic toolbar
4	On the pop up menu select **RLSmacro** and run
	If you want to run the macro on data in a different workbook, just make sure this .xls file is open too (or export the macro)
	For further information on how to install, export or import macros, make buttons etc. see **Excel for Chemists by J.Billo**



... How to run macro | Explanation (2D) or (3D) | Explanation (1D) | RLS(2D)1 | Sample data

HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW ACROBAT

What does the macro do:

in the 2D case

1 A new worksheet is created for all the output, it is named RLS(2D)#. The index # increases every time you rerun the macro

2 The first pop up menu asks for the confidence level (99 or 99.9 are recommended)
3 The 2nd pop up menu asks whether the model is **Y= mX + b** or : **Y=mX (no intercept)**
4 The 3rd pop up suggests a maximum number of lines to be considered. If the macro is too slow you can reduce this number.
5 The macro picks two points of the set and draws a line through them
6 It calculates the (squared) residuals from this line
7 It calculates the median of all squared residuals for this line
8 It moves on to the next data pair to repeat steps 5-7
9 After all lines (up to the maximum) have been examined, the one with the Lowest Median Square residual is selected. This is the LMS line
10 A robust value for sigma is calculated from 1.483*(1+5/n)*[root median square residual] =RmedSE
11 All residuals are studentized using the robust value for sigma as a denominator
12 All points for which the absolute studentized residual is too big (larger than t-critical) are rejected (Marked in red)
13 The LINEST function is used to perform a (Reweighted) Least Squares regression on the remaining points
14 The LMS and the RLS fit and the studentized RLS residuals are calcluated using the (reweighted) standard error of the estimate (RRMSE)

Output

[A column: X values], [B column Y-values], [C: LMS fit], [D: RLS fit], [E: RLS residuals], [F, LMS residuals] (both E and F studentized)
G1:I2: LMS slope and intercept and the RMedSE (Root median square error)
H4:I9 : LINEST output for Reweighted LS regression, incl. standard error of estimate, RRMSE: Reweighted root mean square error
The columns K,L,M,N contain the same information as A,B,C,F but sorted by the latter
(The columns P to S are not important, they are intermediary results in search for the best line)

Graphs

The first graph shows the data and both the LMS and RLS line fit
The second graph shows the studentized LMS and RLS residuals.

The data in the yellow box should be considered the **final results (in the format of the =LINEST function)**
The second row of the block contains the standard errors of the first row and should be used for rounding purposes

WARNING:
This software is not suitable for excessively large data sets. Required computer resources scale roughly as N^2 for 2D and N^3 for 3D

Please look at the internal Documentation to understand The macro. It does the whole Job:

1. **Robust fitting**
2. **Eliminate outliers**
3. **Linear Least Squares**
4. **Plotting of data**
5. **Reporting errors**

Caveats | How to run macro | Explanation (2D) or (3D) | Explanation (1D) | Sample data

HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW ACROBAT

1

y this 1D example

x-value
6.41
7.4
7.39
6.89
7.8
7.58
7.12
8.05
8.44
8.17
6.38
6.82
12.45
7.15
7.27
6.53
7.54
6.91
39.14
3.75

Try this 2D example

x value	y value
1	35.0321
2	4.828157
3	3.964325
4	13.987
5	13.123
6	7.18092
7	9.334665
8	10.24184
9	10.52733
10	11.03855
11	12.37946
12	14.50043
13	15.14166
14	14.45154
15	16.29562
16	17.43888
17	19.06823
18	17.99176
19	19.00871
20	21.32343
21	22.57268
22	23.23492
23	24.09326
24	2.0124
25	0.00329

Try this 3D example

x_1-value	x_2-value	y-value
1	80	42
2	80	37
3	75	37
4	62	28
5	62	18
6	62	18
7	62	19
8	62	20
9	58	15
10	58	14
11	58	14
12	58	13
13	58	11
14	58	12
15	50	8
16	50	7
17	50	8
18	50	8
19	50	9
20	56	15
21	70	15

The ranges must be contiguous

Try this parabolic example

x-value	x^2 value	y-value
1	1	15
2	4	2.549485
3	9	3.100704
4	16	3.395578
5	25	3.561249
6	36	3.469572
7	49	3.117056
8	64	2.565289
9	81	1.929964
9	81	1.98661
9	81	1.87803
9	81	2.045759
10	100	0.945925
11	121	-0.09104
11	121	9
11	121	-0.16026
12	144	-1.32283
13	169	-2.81679
14	196	-4.52519
15	225	-6.33759
16	256	-8.67794
16	256	-8.44526
16	256	-8.60122
16	256	12
17	289	-10.8279

Select data. Here I have selected the sample data. You can select any data on any page (even in a different spreadsheet). Just make sure that the RLS Excel sheet is open since it contains the Macro (see next slide).

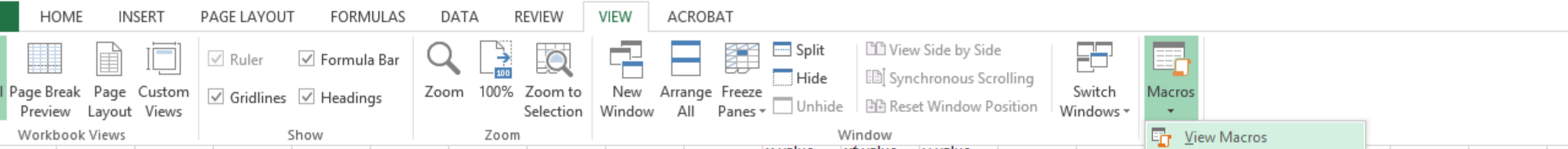
Just select one of the grey ranges and run the macro!
OR select part of it and run again

em: the 1D module takes no more than 1000 points
e 2D and 3D modules can take any number but they get slow for large N.

Caveats | How to run macro | Explanation (2D) or (3D) | Explanation (1D) | Sample data

AVERAGE: 13.67548292 COUNT: 50 SUM: 683.7741461

20:23



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16	256	-8.44526
16	256	-8.60122
16	256	12
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Select the macro: View/Macro

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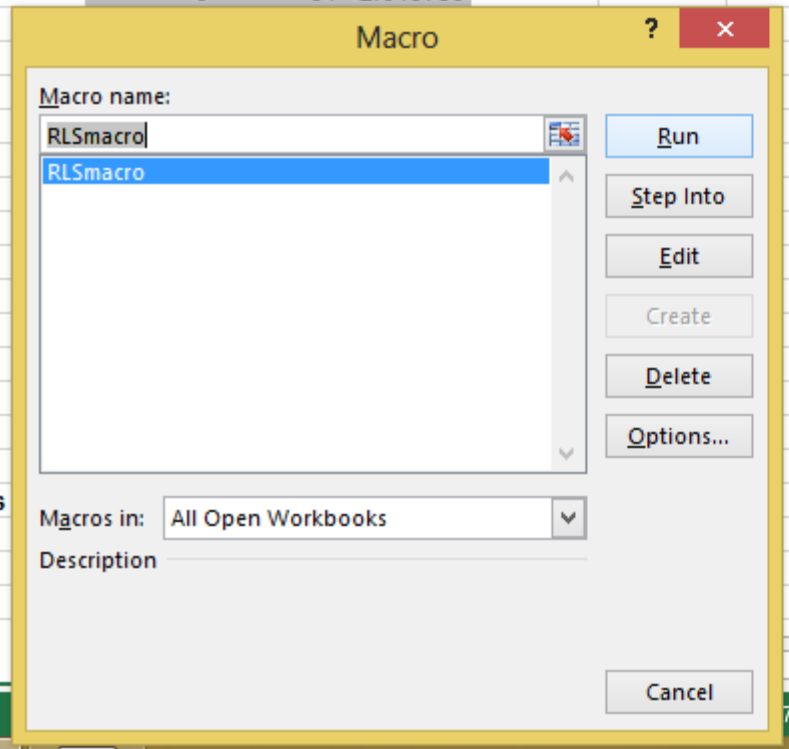
7	49	3.117056
8	64	2.565289
9	81	1.929964
9	81	1.98661
9	81	1.87803
9	81	2.045759

Once you have viewed the macro in the window (shown below) you can select it. Then click Run.



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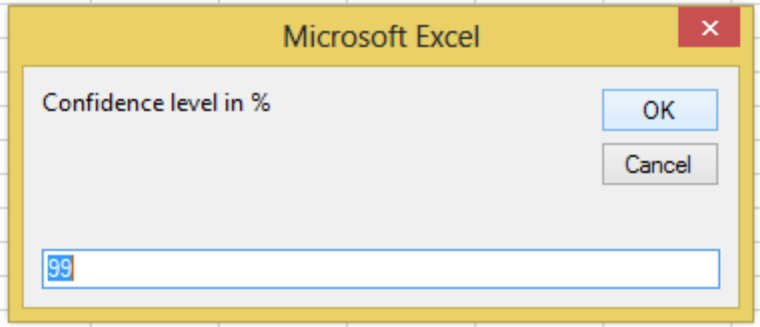
... How to run macro | Explanation (2D) or (3D) | Explanation (1D) | RLS(2D)1

7741461

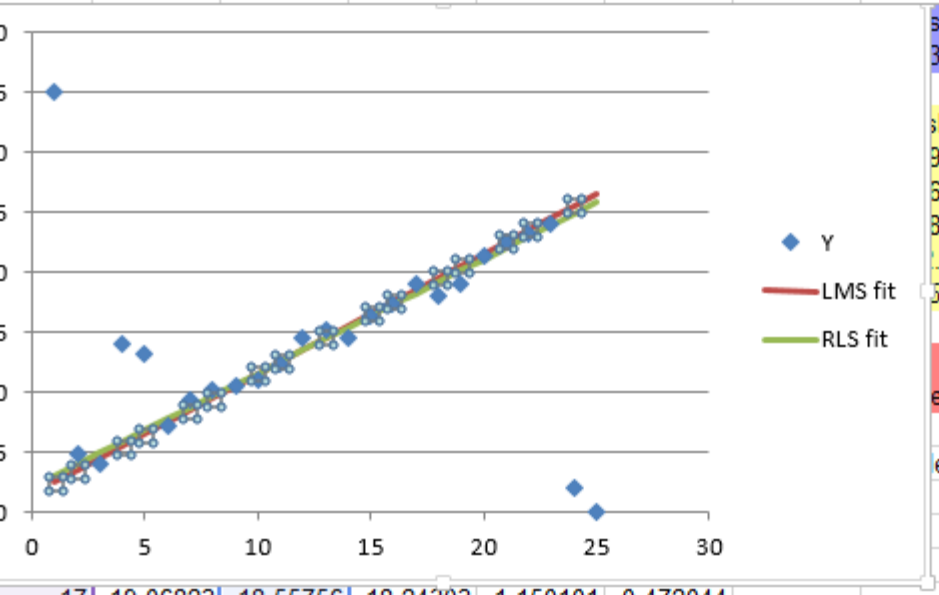
20:32



Pay attention to the appearance of several questions. These may be on another spreadsheet since the Macro automatically creates a new sheet. You may accept the defaults. Just click OK for each of the parameters.

HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW ACROBAT DESIGN FORMAT

=SERIES('RLS(2D)2'!$C$1,'RLS(2D)2'!$A$2:$A$26,'RLS(2D)2'!$C$2:$C$26,2)



RMedSE 1.081825

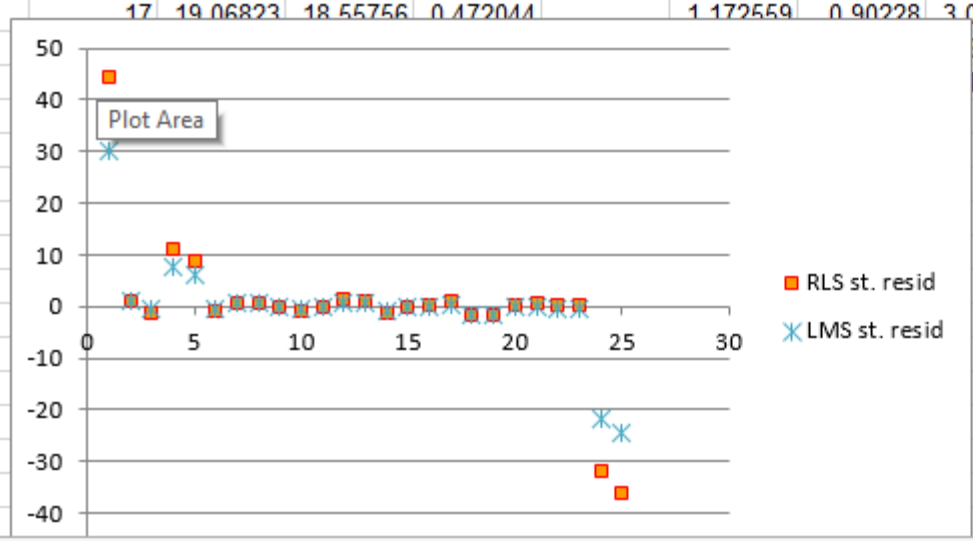
RLS intercept 2.105828 0.384844 0.717498 RRMSE 18 9.266472

5 ed points

ence level (%) 99

17	19.06823	18.55756	18.24303	1.150101	0.472044
18	17.99176	19.56134	19.19228	-1.67321	-1.45087
19	19.00871	20.56512	20.14153	-1.57884	-1.43869
20	21.32343	21.5689	21.09078	0.324258	-0.2269
21	22.57268	22.57268	22.04002	0.742377	0
22	23.23492	23.57646	22.98927	0.342364	-0.31571
23	24.09326	24.58024	23.93852	0.215675	-0.45014
24	2.0124	25.58401	24.88776	-31.8821	-21.7888
25	0.00329	26.58779	25.83701	-36.0053	-24.5738

25	0.00329	26.58779	-24.5738	618.4492	-30.2039	65.23604	1			
24	2.0124	25.58401	-21.7888	300.6269	-15.5339	50.56599	2			
18	17.99176	19.56134	-1.45087	116.0685	-7.01503	42.04713	3			
19	19.00871	20.56512	-1.43869	82.75347	-5.47728	40.50938	4			
14	14.45154	15.54622	-1.01189	56.87783	-4.28291	39.31501	6			
3	3.964325	4.504649	-0.49946	45.96255	-3.54147	38.57357	7			
10	11.03855	11.5311	-0.4553	43.59456	-3.0631	38.0952	8			
23	24.09326	24.58024	-0.45014	33.55649	-2.66595	37.69805	9			
22	23.23492	23.57646	-0.31571	29.58268	-2.26526	37.29736	10			
6	7.18092	7.515987	-0.30972	25.09561	-1.86652	36.89862	11			
15	16.29562	16.55	-0.23514	20.30069	-1.65754	36.68964	12			
20	21.32343	21.5689	-0.2269	19.72179	-1.17288	36.20498	15			
11	12.37946	12.53488	-0.14367	18.18324	-0.99774	36.02984	16			
16	17.43888	17.55378	-0.10621	17.99094	-1.00237	36.03447	17			
9	10.52733	10.52733	0	6.938852	0.588191	3.651776	28			
21	22.57268	22.57268	0	1.190224	0.901302	3.025554	29			
17	19.06823	18.55756	0.472044	1.172559	0.90228	3.023597	30			
						084458	130			
						493311	176			



The output appears on a separate spreadsheet.

... Explanation (2D) or (3D) | Explanation (1D) | RLS(2D)1 | RLS(2D)2 | Sample data

AVERAGE: 200.5599748 COUNT: 13 SUM: 2005.599748

20:41