Some hints on MS Excel

Financial Modeling Best Practice

To accompany

Financial Modeling, 3rd Edition

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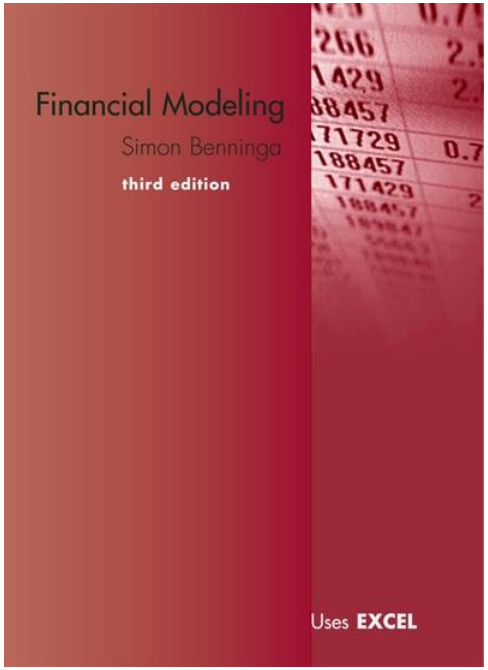


Put critical variables in one place

	A	B	C
1	**Black-Scholes Option-Pricing Formula**		
2	S	50	Current stock price
3	X	45	Exercise price
4	r	4.00%	Risk-free rate of interest
5	T	0.75	Time to maturity of option (in years)
6	Sigma	30%	Stock volatility, σ
7			
8	d_1	0.6509	<-- (LN(S/X)+(r+0.5*sigma^2)*T)/(sigma*SQRT(T))
9	d_2	0.3911	<-- d_1-sigma*SQRT(T)
10			
11	$N(d_1)$	0.7424	<-- Uses formula NormSDist(d_1)
12	$N(d_2)$	0.6521	<-- Uses formula NormSDist(d_2)
13			
14	Call price	8.64	<-- S*N(d_1)-X*exp(-r*T)*N(d_2)
15	Put price	2.31	<-- call price - S + X*Exp(-r*T): by Put-Call parity
16		2.31	<-- X*exp(-r*T)*N(-d_2) - S*N(-d_1): direct formula

Most of the time: Critical variable should be at the top left-hand corner

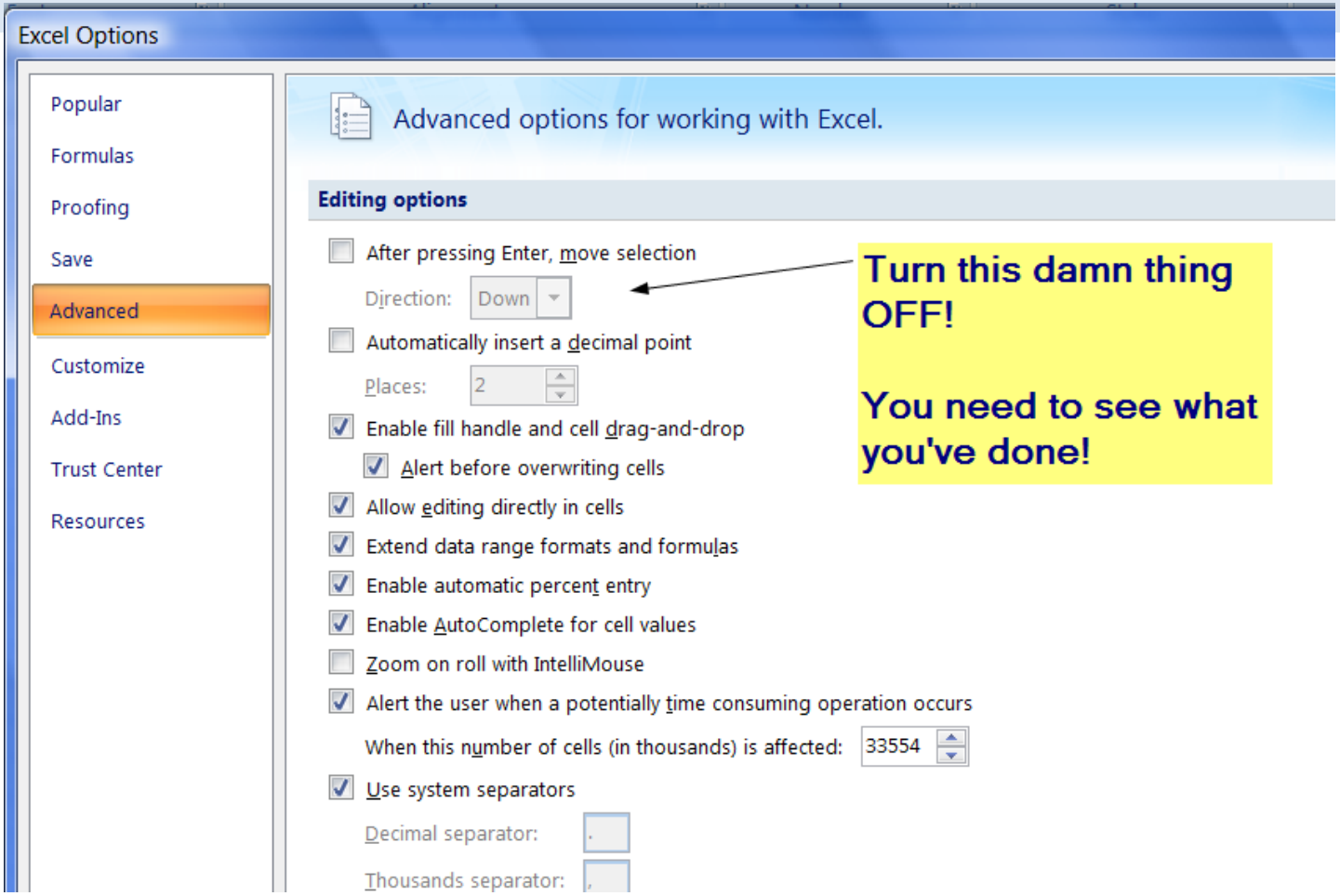
Never never never use a number if you can use a formula

- Don't *hard-wire* numbers!
- You'll get into big trouble!!
  - Bob, what happens if you change the depreciation rate in cell B2?
  - Uh, sir … Nothing seems to happen to the cash flows. But that's clearly wrong …

Save often

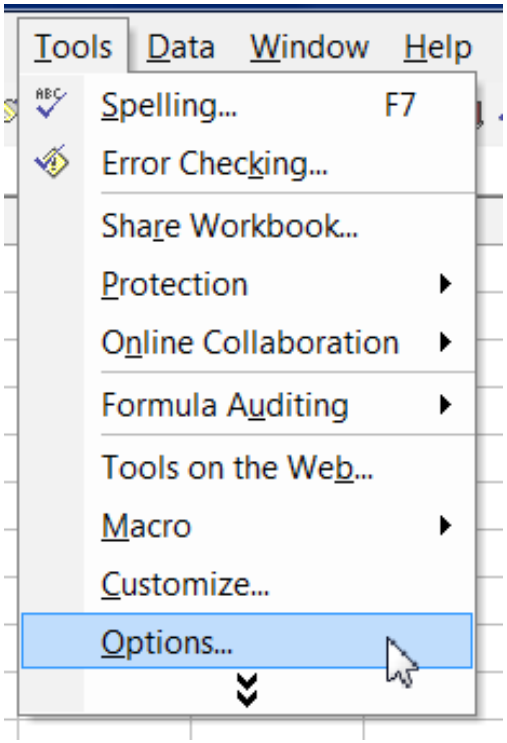
- Like voting in Chicago: “Vote early and vote often”

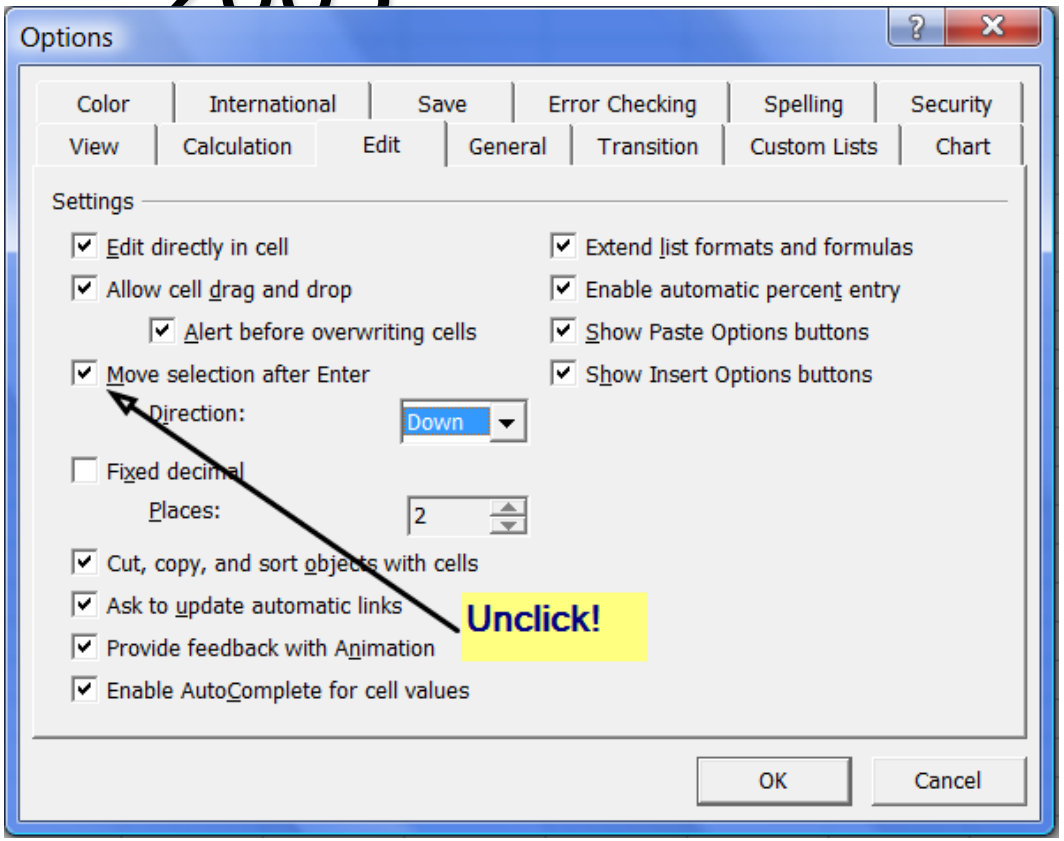
Turn off auto “jump down”



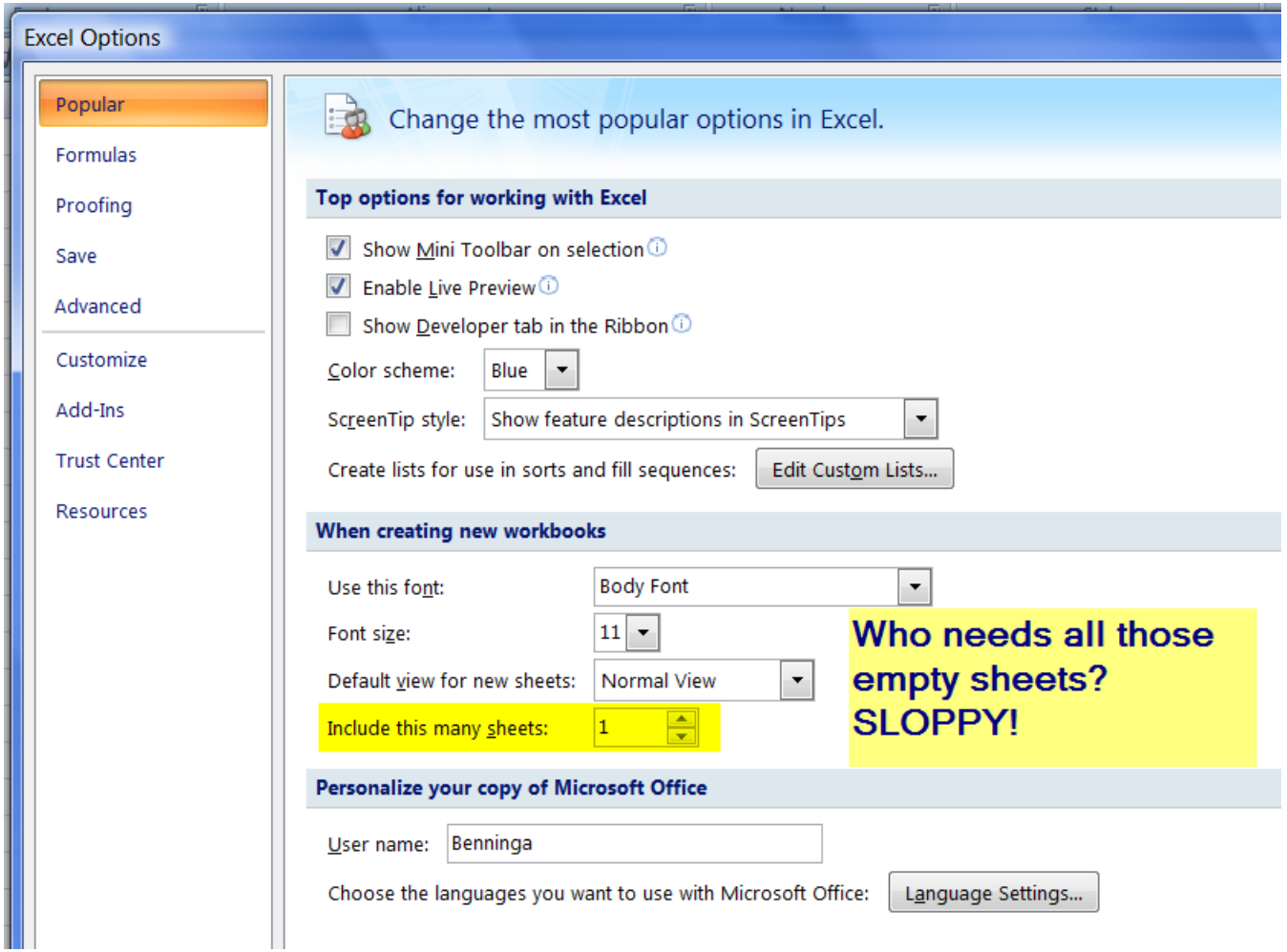
This is the Excel 2007 version—Excel 2003 on next slide

Auto “jump down” in Excel 2003



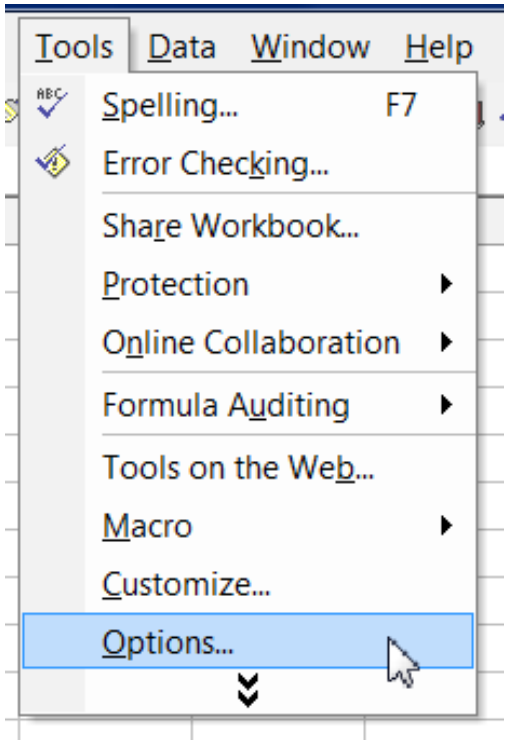


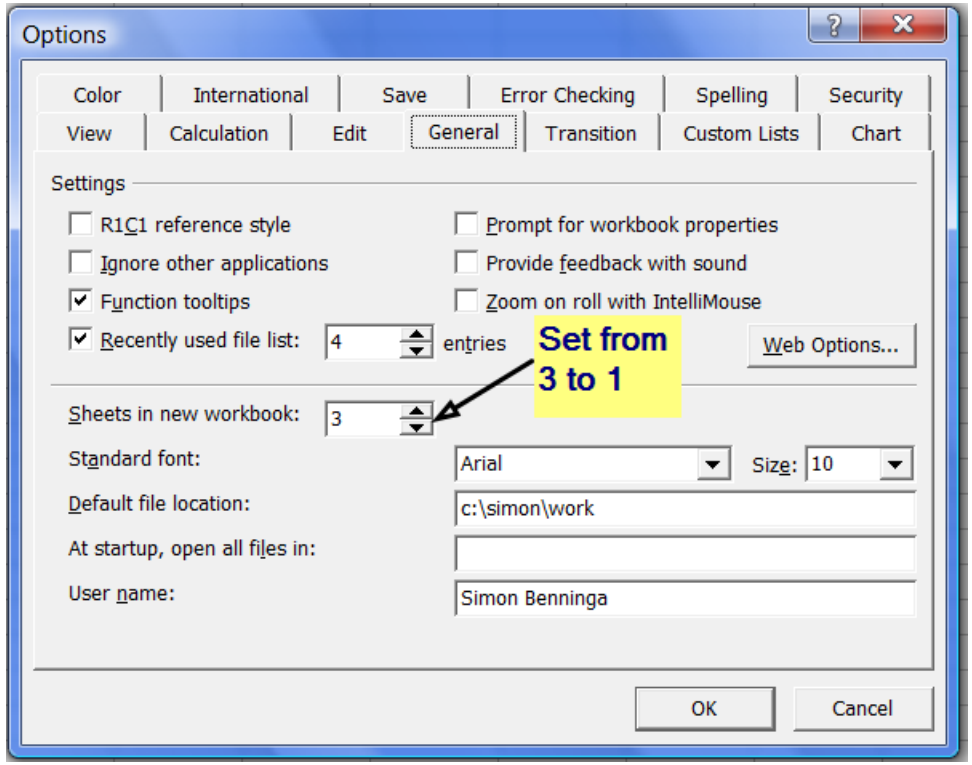
Make your default one Excel sheet



Excel 2007

In Excel 2003: Tools|Options|General





Excel 2003

Point to cells, don't write cell references

	A	B	C	D	E	F	G	H
1	McDONALD'S--DAILY STOCK PRICES, 29 Dec 89 - 31 Dec 99							
2	Date	Stock price						
3	29-Dec-89	8.50				Computing the frequency distribution of MCD		
4	2-Jan-90	8.59	1.059%	<-- =B4/B3-1		Largest daily return	=max(C4:C2531	
5	3-Jan-90	8.50	-1.048%	<-- =B5/B4-1		Smallest daily return	MAX(**number1**, [number2], ...) 531)	
6	4-Jan-90	8.34	-1.882%					
7	5-Jan-90	8.19	-1.799%			Bin	How many?	Percentage
8	8-Jan-90	8.34	1.832%			-10.08%	0	0.000%
9	9-Jan-90	8.28	-0.719%			-9.38%	1	0.040%
10	10-Jan-90	8.13	-1.812%			-8.68%	0	0.000%
11	11-Jan-90	8.07	-0.738%			-7.99%	1	0.040%
12	12-Jan-90	7.91	-1.983%			-7.29%	0	0.000%
13	15-Jan-90	7.82	-1.138%			-6.59%	1	0.040%
14	16-Jan-90	7.91	1.151%			-5.89%	1	0.040%
15	17-Jan-90	7.91	0.000%			-5.19%	1	0.040%
16	18-Jan-90	7.94	0.379%			-4.49%	3	0.119%
17	19-Jan-90	7.85	-1.134%			-3.80%	11	0.435%
18	22-Jan-90	7.63	-2.803%			-3.10%	36	1.424%
19	23-Jan-90	7.76	1.704%			-2.40%	68	2.690%
20	24-Jan-90	7.63	-1.675%			-1.70%	138	5.459%
21	25-Jan-90	7.60	-0.393%			-1.00%	337	13.331%

I'm pointing at the cells for the **Max** function.

Put things in adjacent columns

	A	B	C
1	**PRICING THE AUGUST 2006 QQQQ OPTIONS**		
2	Current d	28-Jul-06	
3	Option e:	18-Aug-06	
4			
5	S	37.11	
6	X	37	
7	T	0.06	<-- =(B3-B2)/365
8	Interest	5.00%	
9	Sigma	20.66%	
10			
11	Call price	0.8447	<-- =BSCall(B5,B6,B7,B8,B9)
12	Put price	0.6284	<-- =BSPut(B5,B6,B7,B8,B9)
13			
14	Actual prices		
15	Call	0.75	
16	Put	0.55	

BAD

	A	B	C
1	**PRICING THE AUGUST 2006 QQQQ OPTIONS**		
2	Current date		28-Jul-06
3	Option expiration date		18-Aug-06
4			
5	S	37.11	
6	X	37	
7	T	0.06	<-- =(C3-C2)/365
8	Interest	5.00%	
9	Sigma	20.66%	
10			
11	Call price	0.8447	<-- =BSCall(B5,B6,B7,B8,B9)
12	Put price	0.6284	<-- =BSPut(B5,B6,B7,B8,B9)
13			
14	Actual prices		
15	Call	0.75	
16	Put	0.55	

BAD

Much better!

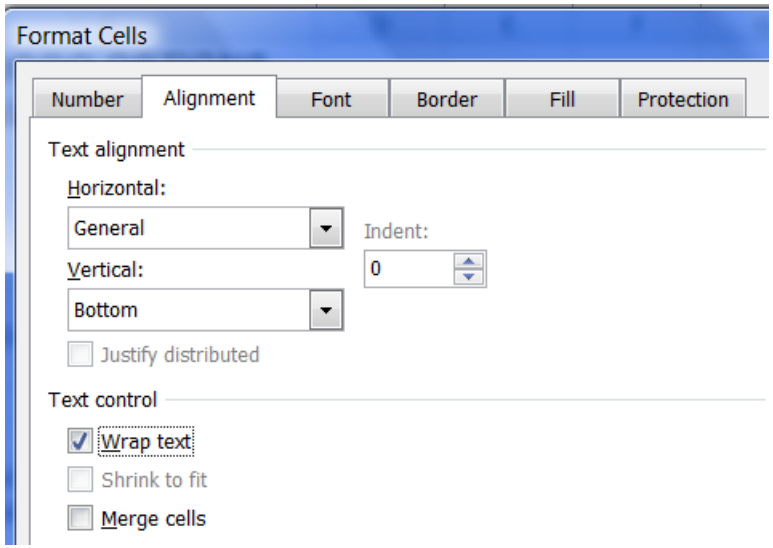
	A	B	C
1	**PRICING THE AUGUST 2006 QQQQ OPTIONS** **Using the historical volatility σ**		
2	Current date	28-Jul-06	
3	Option expiration date	18-Aug-06	
4			
5	S	37.11	
6	X	37	
7	T	0.06	<-- =(B3-B2)/365
8	Interest	5.00%	
9	Sigma	20.66%	
10			
11	Call price	0.8447	<-- =BSCall(B5,B6,B7,B8,B9)
12	Put price	0.6284	<-- =BSPut(B5,B6,B7,B8,B9)
13			
14	Actual prices		
15	Call	0.75	
16	Put	0.55	

Put items in adjacent cells, let cells be wide enough to accommodate text.

Also OK

Cell B2 has been word-wrapped

	A	B	C
1	**PRICING THE AUGUST 2006 QQQQ OPTIONS**		
2	Current date	28-Jul-06	
3	Option expiration date	18-Aug-06	
4			
5	S	37.11	
6	X	37	
7	T	0.06	<-- =(B3-B2)/365
8	Interest	5.00%	
9	Sigma	20.66%	
10			
11	Call price	0.8447	<-- =BSCall(B5,B6,B7,B8,B9)
12	Put price	0.6284	<-- =BSPut(B5,B6,B7,B8,B9)
13			
14	Actual prices		
15	Call	0.75	
16	Put	0.55	



Can also use [Alt]+[Enter] to put in hard return when inside cell (this wraps cell)

Play with your model

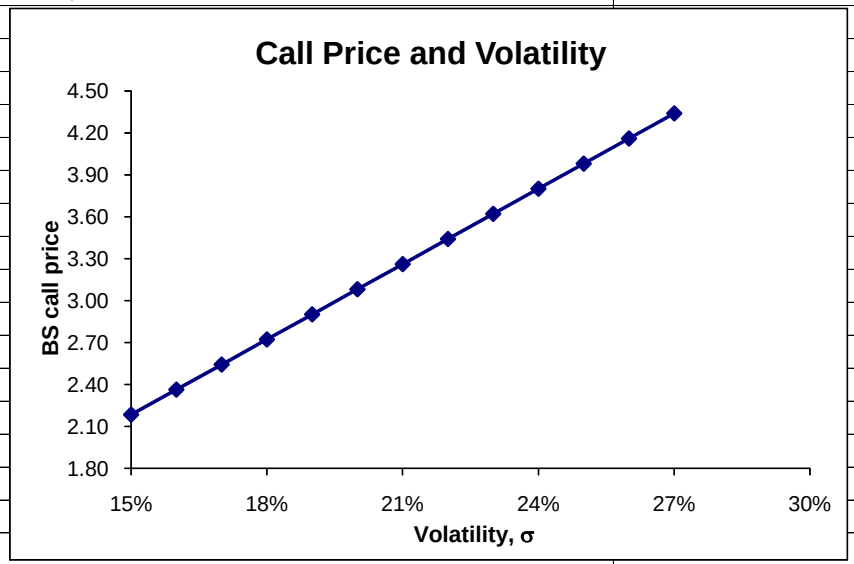
- After you're finished with your model: EXPERIMENT to see what happens with different values
- Can you explain your results?
  - If not, maybe you've made a mistake?
  - OR: Maybe you're about to learn something?

Annotate like mad!

You need to remember what you've done!

Notice the parameter annotations for cells B2:B6

	A	B	C	D
1	**Black-Scholes Option Price is Monotonic in Sigma**			
2	S	45	Current stock price	
3	X	50	Exercise price	
4	T	1	Time to maturity of option (in years)	
5	r	8.00%	Risk-free rate of interest	
6	Sigma	30.00%	Stock volatility	
7				
8	Call price	4.88	<-- =BSCall(B2,B3,B4,B5,B6)	
9				
10	**Data table: Call price as function of volatility σ**			
11		4.8759	<-- =B8, table header	
12	15%	2.1858		
13	16%	2.3646		
14	17%	2.5437		
15	18%	2.7229		
16	19%	2.9023		
17	20%	3.0817		
18	21%	3.2612		
19	22%	3.4407		
20	23%	3.6202		
21	24%	3.7997		
22	25%	3.9792		
23	26%	4.1587		
24	27%	4.3381		
25				
26				
27				
28				



Annotations: use Getformula

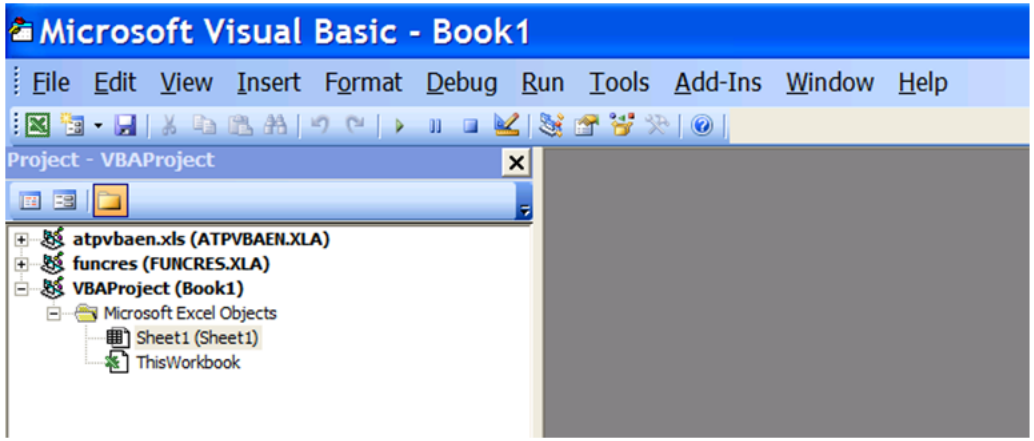
- Getformula is a small VBA program you can add to an Excel notebook
- File on FM3 disk, “Adding Getformula to Your Spreadsheet”

Getformula

Adding Getformula to your spreadsheet

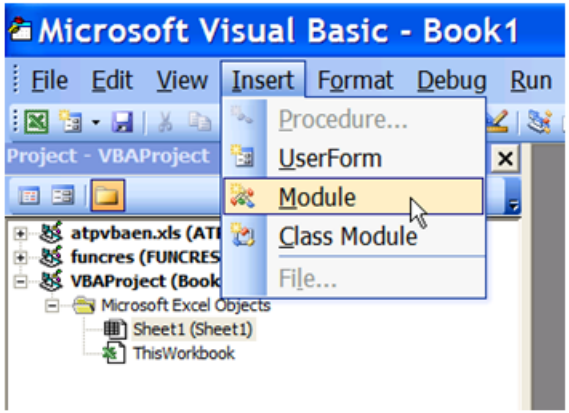
Open the spreadsheet in which you want the formula to work.

Push [Alt]+F11. This will open the VBA editor. The screen will look something like this:



(Depending on all kinds of things, your screen may look different. Don't worry about this.)

Hit **Insert|Module**



Now insert the following text into the Module window (just copy/paste from this document):

```
'Prints out formulas as text
'Thanks to Maja Sliwinski and Beni Czaczkes
Function getformula(r As Range) As String
   Application.Volatile
   If r.HasArray Then
   getformula = "<-- " & " {" & r.FormulaArray & "}"
   Else
   getformula = "<-- " & " " & r.FormulaArray
   End If
```

Less detail is often better than more

- Easy to add details
- Psychologically difficult to delete

Redundance is important

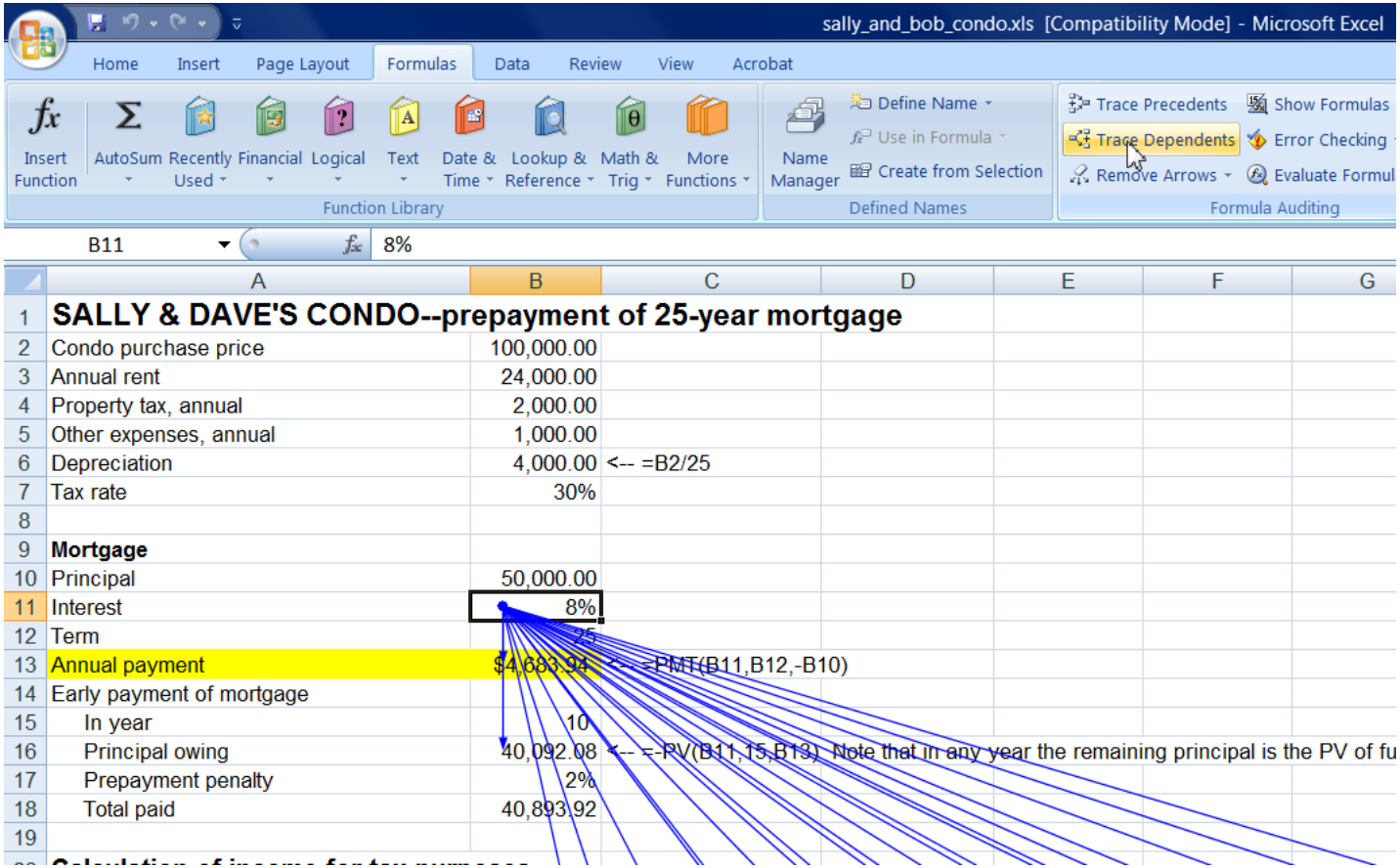
- Check your calculations
- Do things several ways

Same calculation done twice using different methods.

	A	B	C
1	**MORTGAGE EXAMPLE WITH POINTS AND ORIGINATION FEE**		
2	Loan principal	100,000.00	
3	Loan term (years)	1	
4	Quoted interest rate	8%	
5	Discount points	1	
6	Origination fee	0.5%	
7			
8	**Month**	**Cash flow**	
9	0	98,500.00	<-- =B2*(1-B5/100-B6)
10	1	-8,698.84	<-- =PMT(B4/12,B3*12,B2)
11	2	-8,698.84	
12	3	-8,698.84	
13	4	-8,698.84	
14	5	-8,698.84	
15	6	-8,698.84	
16	7	-8,698.84	
17	8	-8,698.84	
18	9	-8,698.84	
19	10	-8,698.84	
20	11	-8,698.84	
21	12	-8,698.84	
22			
23	Monthly IRR	0.9044%	<-- =IRR(B9:B21)
24	EAIR	11.41%	<-- =(1+B23)^12-1
25			
26	Monthly IRR using Excel's **Rate** function	0.9044%	<-- =RATE(12,8698.84,-98500)

Irrelevant cells should be avoided

- Use formula auditing to see what cells are doing!



Numbers may be wrong, but the logic must be right

- Modeling is the art of getting the relationships and the form right
- Numbers are not as important as relations