



CAPACITY CORNER >

NOT EXCITED ABOUT EXCEL?

LET'S WORK ON THAT



BY STAN FITTERMAN

Excel is everywhere you look. Its popularity lies in its ability to provide users with enormous capacity to do quantitative analysis combined with its intuitive interface that lets you see what happens to the data as you manipulate them. In Florida, many local government SHIP administrators use the Excel based tracking sheets developed by the Florida Housing Coalition to aggregate the information needed to complete their SHIP annual report. In addition to data organization and basic arithmetic, Excel contains a collection of supplied functions to answer statistical, engineering and financial needs. Excel's features make it a very handy tool for managing and implementing affordable housing programs, but if the user isn't careful, the program's design can lead to some costly mistakes. This article provides a discussion of some famous Excel errors as well as some tips on how to avoid Excel problems in your own work.

THE MOST DANGEROUS SOFTWARE ON THE PLANET?

In a recent article, Forbes contributor Tim Worstal declared that Excel based models used in financial markets have become so complex and handled in "such a slapdash manner that no one is really on top of it anymore". Author James Kwal takes it a step further, "anyone can create an Excel spreadsheet, badly". He continues "because it's so easy to use, the creation of even important spreadsheets is not restricted to people who understand programming and do it in a methodical, well-documented way."

While the analytical potential of Excel can seem limitless, the spreadsheets that people create with it come with some notable restrictions. For example, in Excel there is not an easy way to show where your data come from. Excel doesn't have the ability to show an audit trail – that is the user cannot identify cells whose value was changed, nor is it possible to see a history of what numbers were in a cell

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prior to the current value. As a result, numbers can be accidentally overtyped without the user even realizing it.

MATH ERRORS AREN'T NEW

While math errors are as old as, well, math, some have led to catastrophic events. The Quebec Bridge, connecting the south shore of the St. Lawrence River to the river's north shore, was originally designed for a 1600 foot span. The span was later lengthened to 1800 feet, enabling the pilings to be built for a lower cost closer to the riverbank. Unfortunately, there was no recalculation of assumed weights for the bridge given the longer span. On August 29, 1907, the bridge collapsed killing 75 workers.

In 1999, NASA's Mars orbiter crashed into the Red Planet. An investigation revealed that program engineers forgot to convert from English to metric measurements.

More recently, Excel spreadsheet problems have been front and center in some high profile news stories. In 2010, two Harvard economists, Carmen Reinhart and Kenneth Rogoff, circulated a paper demonstrating that once a country's debt exceeds 90 percent of gross domestic product, economic growth drops off sharply. This research was widely cited in policy debates over the U.S. deficit. Subsequent researchers had trouble replicating Reinhart and Rogoff's results. Eventually, the authors allowed researchers at the University of Massachusetts (UMass) to review their original spreadsheet. In an article published in 2013, the three UMass researchers found that the original research omitted some data, and, in creating the formula to calculate average economic growth rates, Reinhart and Rogoff left off several rows of data in their spreadsheet. In other words, an Excel formula error led to conclusions that may not have been supported by the data.¹

In 2012, JPMorgan lost tens of billions of dollars in the now infamous "London Whale" case. An internal investigation of the loss found that an Excel model understated the risk of the investments. According to the report, JPMorgan's Chief Investment Office needed a new value-at-risk model for the portfolio and assigned a

"London-based quantitative expert, mathematician and model developer" to design it. This new model "operated through a series of Excel spreadsheets which had to be completed manually by a process of copying and pasting data from one spreadsheet to another." This lack of automation resulted in substantial room for human error -not copying all of the required rows, copying too many rows, overwriting formulas when pasting, etc. The report found other problems in the model as well, including a formula error that, after subtracting an old rate from a new one, divided by their sum instead of their average. The report states that this error "likely had the effect of muting volatility by a factor of two and of lowering the value at risk." In other words, a lack of automation combined with formula errors in an Excel spreadsheet contributed to the loss of billions of investor dollars.

EXCEL AND AFFORDABLE HOUSING

So, we don't design bridges or handle billions of dollars in investments, but we do use Excel to make a number of decisions and policy recommendations. When working with home buyers most affordable housing programs use Excel to determine how much of a monthly mortgage payment an applicant can afford, and then use that amount to calculate a maximum mortgage amount for which the applicant can qualify. When evaluating a rental deal, Excel is used almost exclusively to calculate income, expenses, and debt coverage ratios. So how can we minimize, or at least make it more likely we catch, errors in our Excel formulas and spreadsheets?

EXAMPLE 1

	A	B	C	D	E	F	G
1		Monthly Payment					
2		\$456.30					
3							
4							
5							
6							

¹ Reinhart and Rogoff acknowledge the errors but dispute many of the other findings in the UMass study, Reinhart and Rogoff stand behind their original conclusions..

SHOW YOUR WORK

Input errors in Excel formulas are easy to make, but can be hard to find. In designing a spreadsheet, it is best to have a cell for each variable, with the formula referencing each variable. For example, to calculate a monthly payment, the user could just enter the variables into a formula:

The variables for the formula are in the tiny type in the formula bar near the top of the screen. A typo in the interest rate or term would have a different answer but the error would not be easily found by the user.

On the other hand, if the variables are listed on the screen, an input error would be more easily found by the user, or by someone reviewing the spreadsheet for accuracy:

AUTOMATE, AUTOMATE, AUTOMATE

The formula in Example 2 takes advantage of Excel's automation features. One of Excel's best attributes is how it lets you see what happens to your data as you manipulate them. For example, a well-designed rental operating pro forma allows the user to instantly see how an increase in an interest rate affects net operating income. However, some spreadsheet designs rely too much on the user having to change an amount in multiple cells throughout a spreadsheet. The formula in Example 2 could have been written the same as in Example 1, where even though the variables are shown in their own cell, the user still had to manually input each variable:

=PMT(0.05/12,30*12,-85000)

Instead, this formula uses Excel's cell referencing feature:

=PMT(B2/12,C2*12,-A2)²

EXAMPLE 2

	A	B	C	D
	Mortgage Amount	Annual Interest	Term (years)	Monthly Payment
1				
2	\$85,000	5.00%	30	\$456.30
3				
4				
5				
6				
7				

² When calculating a monthly payment, both the annual interest rate and the term must be converted to months. By default, Excel shows payments as a negative number. To show it as a positive number, the formula must contain a "negative" sign in front of the cell that references the principal amount.

In this example, changing the interest rate in cell "B2" automatically changes the rate in the formula, yielding the correct answer for the new rate. By automating this process we have reduced the chances of a data entry error not being caught.

CHECK YOUR WORK

Yes, I know it's boring, and yes I know this isn't Algebra 2, but double checking your formulas (or better yet, having someone else do it), is one of the best ways to catch spreadsheet errors. For example, when you click on a cell that contains the formula for summing rows of numbers, Excel outlines the rows that are included in the total. A simple double check can help you locate any totals that don't include all of the appropriate cells:

Excel is a great tool and your worst enemy all rolled into one. Used correctly it can increase efficiency and provide the data analysis you need to make sound decisions. Used incorrectly, well, let's just say bad things can happen. However, a carefully crafted, automated spreadsheet that clearly shows the data being used in a formula can help you minimize errors.

NEED HELP LEARNING MORE ABOUT USING EXCEL IN MANAGING AND IMPLEMENTING YOUR AFFORDABLE HOUSING PROGRAMS?

The Florida Housing Coalition can provide Webinars or on-site training for you and your staff. Call (850)878-4219 or e-mail Stan Fitterman at fitterman@flhousing.org for more information. [HNN](#)

EXAMPLE 3

	A	B	C	D	E	F	G
2		Amount					
3		1500					
4		2000					
5		3000					
6		5000					
7		18000					
8		26000					
9	Total	=SUM(B4:B8)					