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Chapter 11

Sensitivity Analysis with Data Tables

Let's take a look at data table which is one of the most useful sorts of sensitivity analysis in Excel and they are really handy in certain situations in financial models. So we are going to take a look at how to build a data table and then we can look at the situations where data table is really useful for doing sensitivity analysis in your financial model.

Excel Scenarios Tools

It shows you how to do this in chapter 11 and just to give you a little bit of context here, from a technical perspective, these are the several different methods of doing scenarios and sensitivity analysis. What we are talking about here is the last one which is data tables. This is a situation where you can actually see all of the outcomes in one go.

What a data table does is it says hypothetically what would the output of a formula be or a model be if you were to change the input to this, this, this or this. The first kind of scenario analysis that we talked about was manual scenario analysis where you are doing a drop down box and all the numbers change. For example you say best case, all the numbers change; base case, all the numbers change; worst case, all the numbers change. You are only looking at one scenario at a time and that's most appropriate if you have a whole set of financial statements for example and you

want to see all of the outputs. With a data table however you can see, it is most appropriate if you wanted to see how would a change in pricing affect my profitability for example. You would say if I change my price to this, this, this or this, then this is what my output would be. Instead of having to go in and manually change the inputs, it will show you in one single table hypothetically what the outcome would be. Let's have a look at how they work.

On your practical exercises sheet that you have got, the next tab over is called data tables. This is an interest rate calculator so we have got a loan amount, interest rate and term of the loan. What we are going to do is to test the sensitivity of our interest calculations to changes in interest rates and in the term of the loan. In order to do that firstly we need to calculate the monthly payment. Firstly we need to know what our monthly payments are, to do that we are going to use a PMT function. A PMT function would give you an exact amount of the loan over that term. It will give you the exact amount every year that you would need to pay over that time period in order to pay the loan down to Zero and it will always be the same amount.

You could use an IPMT, if you wanted interest only or you could do a PPMT if you wanted the principal only. But IPMT plus PPMT is going to give you PMT, so in this case we just want to know the total amount so we are going to use PMT function. If you haven't done that before, just go into your function wizard, look for the PMT and it's there. The rate is going to be the interest rate that you put in, now the way that this function works is that it compounds it on the period in which it calculates. What we could do is to do an annual payment amount and then divide it by 12, but that will then compound it at the end of the year.

Most interest calculations are done on a daily amount, what we are going to do is just do it on a monthly amount which will be slightly different. What we will do is basically convert it to a monthly amount. To do that we would say, we would do that on a monthly interest rate. Our rate in this case is 7.5% and we will divide that by 12 which is going to give us our monthly interest rate. The number of periods is 25, that

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is the term of the loan, except that we are doing it on a monthly, so we need to then multiply it by 12 and the present value is going to be the loan amount, which is that amount there. Don't worry about the future value, don't worry about the type and that's going to give us a monthly repayment.

Now because it is a payment, it always gives it to you as a negative amount, so we just need to put a negative at the front if you want to make it into a positive amount like that. We know then if we borrow this amount over that interest rate over that period of time it is going to cost us this much. If we were to change that interest rate from 7.5% to 7%, you can see what it is going to do. If we were going to change it to 6%, you can see what it is going to do. Instead of having to go in and manually type the inputs like that we are going to do the data table that is going to automatically show us all of the hypothetical out comes at once and to do this you need to have a link at the top. You basically need to tell it, where is the outcome, which is the formula you want the outcome that you want to display in the data table.

You will need to link it like that, highlight the whole lot like that. Now this is an array formula, so you are going to get the curly brackets but there is a little tool in Excel which means you don't have to worry about the CONTROL-SHIFT-ENTER which is going to make things a little bit easier. If you are using Excel 2007 or 2010, you need to go into DATA and it is under WHAT IF ANALYSIS and your data table is right there. If you are using Excel 2003, it is just under DATA and then TABLE and once you bring it up, it is exactly the same in all of the versions. It is just finding it is a little bit different.

Go into data table and then what it is asking you is, where is the hard coded value that is in the table. In this case the data that we have is arranged in a column so we need to choose that one there. We are just doing a single variable, a one variable data table, we will do a two variable in a minute. We are just going to do a one variable which is just down in one column. The input in this case is the interest rate, this is the hard coded value that is going to change and it is going to show you

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hypothetically what would be the result of your PMT function, if you were to change the outputs slightly.

It is really a powerful tool and it works in really complex financial models and the only, I guess restrictions is that you need to have the inputs and output with the data table and the inputs on the same page, that's a bit of a restriction there and obviously, you can only show one single output. It is not appropriate if you want to show a full P&L for example, a data table is probably not the best option. You need to choose just one single output to show in your data table. You can have either one or two inputs; in this case we have just done a single input. Let's look at creating one that's got two inputs instead, so just remove it. It is an array formula, so you can't just delete it individually like that. You need to highlight the whole lot and press delete in order to get rid of the data table.

Now you need to just change the design of it a little bit, we need to put the term of the loan across the top, so we are going to say 20 years, 25 year, 30 years and 35 years across the top like that and what we want to show is what would the payment be if we were to change the term of the loan and also the interest rates. In this case the design is changed slightly, so that we have that link there, I know it looks messy but you need to have it otherwise it doesn't work. You highlight the whole lot like that, go to your data table tool, now the row input cell, what it is asking you is where is the hard code number that drives what's in the row which is across the top there. So the term of the loan is 25 and the column input cell again is the interest rate like that. It shows you hypothetically what the outcome would be if those input variables change.

If you don't like the look of that, you can't delete it because it won't work, so what I often do is just pop it into the old white font trick which a little bit naughty but I find that a bit messy, I don't like the look of it like that.

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That is a data table, now that we have created our data table, something that does look really quite nice and this is only going to be available if you are using the later versions of Excel. You can't do it in Excel 2003, so if you are using 2007 or 2010, there is a whole pile of new stuff under the conditional formatting. To do this you just highlight the output of the data table on the home tab go to conditional formatting and under colour scales you can just grab one of those and you can really see the gradual changes in the colours in the data table and that looks quite nice.

So data tables are really useful tools in sensitivity analysis in financial modelling.

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