

Thank you so much and it's really fantastic to be back here in Dubai. My name is Danielle Stein Fairhurst and I come over to Dubai a couple of times a year. I am based in Sydney, Australia but I do enjoy coming over here. We run a Financial Modelling Using Excel course here in Dubai which I really enjoy and so we are now on day two of Financial Modelling Using Excel.

What I'm going to be talking about today is reducing the risk of error when you're using financial models and it's a bit of an extract from our financial modelling using Excel training course.

I am a career financial modeller, it's what I do all day every day. I have a book [Using Excel for Business Analysis](#) and the revised edition has just become available. I have published some supplementary content and I wanted to make that available to you because if you're interested in financial modelling you'll be able to have a look at some of the examples. We're going to make the slides that I'm going to talk you through today available to you and also there is a couple of excel files that I'd like to describe or go through with you. It's very hard to talk about Excel without actually showing you the programs so I've got a couple of sample files that I will be showing you. That's probably going to take a week to get those files up so I'm going to show you how to download these files. The URL is www.plumsolutions.com.au/book. Please click on that link and that will take you to the site. Scroll down and go to the first link, 'Supplementary online materials' and you can see there is loads of different content and lots of examples. The two files that I am going to be referring to today are Chapter 4 and Chapter 11, Scenario Tools. If you want to take a moment to download those two files and follow along with me. Just again the URL was www.plumsolutions.com.au/book.

If you can't download them don't worry, just follow along. We will be sending those files along to you at a later date if you registered with this webinar. You will get an email with a recording and a link with all the files as well.

Let's talk about financial modelling. We're going to be talking about financial modelling in the context of using Excel. Probably one of the biggest things that modellers worry about is the

possibility that there could be a mistake in your financial model and it's probably one of the most career damaging things that can happen to a financial modeller. I know there's nothing worse than having that feeling that perhaps your numbers are wrong.

There's basically three types of financial model error that you possibly could find.

Number one is formula error. You could possibly get a dollar sign in the wrong place or the formula's looking at the wrong cell or your links are a bit out of whack, something like that. Formula errors are pretty horrible. It's really embarrassing to get a formula error in your financial model because they're very easy to make but they're very easy to fix. There are certain things that we're going to be going through today, which are going to try to help reduce the possibility of this happening; ways that you can build your model, techniques that you can use as you're building your formulas and structuring your model to try to reduce the possibility of this happening.

Number two is errors in your assumptions or your inputs. That's pretty hard to identify. As a modeller you may not know whether your assumptions are correct or not. Basically all you can do as a modeller is make it very clear what those assumptions are so the person using the model is able to verify for themselves whether those assumptions are correct or not.

Lastly a logic error can also be very difficult to identify. We often find that a logic mistake is very difficult to find. I've got some examples to show you but it's very easy to say this multiplied by this gives you that but then you forgot to take into account something else. Logic errors are the most difficult to find and identify.

What I'm going to be taking you through today is ten strategies that I found really help to reduce the possibility for errors in your financial model. Firstly we are going to talk about some techniques when you're building your financial model.

Number one is using the enter key. While you're actually building the model, get into the habit of using the enter key rather than just clicking somewhere else. Now that might be a little bit difficult to visualise. I'm going to flick over to Excel now and show you what I mean by that. Just go to Chapter 4, the Excel file that I showed you. If you've been able to download that, great. Go to the second tab along which is called figure 4.2 and this is a screen shot of

what it looks like in figure 4.2. What I'm talking about here is that you've finished editing a formula and what I often see people do is they finish and then they just click somewhere else and that is a really poor practice. Normally you should finish editing your formula like that, you might be putting in some dollar signs and you should hit the enter key or you hit the tick here to enter it. The reason that's important is that you're being really deliberate about what goes into your formula or model. What I've seen some people do is they scroll down and then they click somewhere else and what that means is they haven't looked at what they've just entered into the formula. Your first line of defence against errors in your financial model is to finish your formula and hit the enter key. Does it look right, does it look sensible? Be constantly checking as you build those formulas.

Sometimes every now and again, that can happen and that's why we say not to click somewhere else. It is important to use your enter key. That's the first line of defence in errors in your financial model. Always get into the habit of using your enter key.

Secondly, after you use the enter key, look at the formula. That is going to be the easiest way to pick up any mistakes or formula mistakes as you build your model. People are constantly making mistakes so you really need to pick it up yourself. Hit the enter key and look at the formula. Does it look right? Does it look sensible? Be constantly checking the formula as you put it in. I tend to work with an offline calculator next to me and then when I've finished editing the formula, I look at the value and I calculate it manually. Does it look right? That's really going to help you pick it up.

When you've finished checking it, check again! Fill in a block of data and then go back, do a bit of a sense check and use a calculator if you can't work it out in your head.

Going back to that example I was showing you before. One of the points of best practice in financial modelling is to have consistent formulas all the way along. I'm going to use my F4 shortcut now. This is something we were doing on our financial modelling course yesterday. So we just go into the formula, go F2 and then I've gone into my F4. Keep hitting my F4, so I'm going to anchor my column A and then go over to this one here, put another dollar sign in there, copy it like that, so I've got consistent formulas all the way across. I'm going to look at it. Does it look right? Does it look sensible? I'm going to use my F2 to check that it's picking

up the right formulas. Then I can do a spot check to make sure the formulas are correct. Check it yourself, check it three times and make sure that it's giving you the result that you expect.

After you've checked it three times, get someone else to check your work. I used to have a bit of a deal going with one of my colleagues. It's really not the most interesting part of financial modelling. It's much more fun to create your own financial models. Checking someone else's model is really not the sexy part of financial modelling. It's a good idea to have someone else check so when you're explaining the model, the structure and the way the formulas have been calculated to someone else it can help you to flush out some of those errors. Once you've checked your work, get someone else to check it before it gets published, before it goes to your manager or off to a client. That's usually a really good idea.

The next one is to document and to validate your assumptions. A financial model is only as good as the assumptions that go into it. You can have a really fantastic model that works really, really well but it's garbage in and garbage out if the assumptions that go into that model are rubbish then the outcome is going to be rubbish as well. You really need to be sure that those assumptions are absolutely correct. Make it very, very clear in the design and layout of your financial model, whatever those assumptions for the model are, that it's very clear for the user to see what those assumptions are.

Next is to document your methodology. This will really flush out any errors, probably mostly logic areas as I said which are quite difficult to pick up. This is an example for a business case that we were working on today in our financial modelling using Excel business case. Part of our assessment with George Washington University is the delegates that were on my training course today, need to create a business case so this is the way we've calculated what we've expected our customers to be.

We take the total population. It's a pet insurance product, so we multiply it by the pet ownership assumptions which gives you your potential market. We then apply a take up rate which gives us the number of customers required so that's an example of what a flow chart for some methodology or the logic of a financial model might be. Now that's something that if you're going to present the financial model to a group, you might create a flow chart that looks like this or you could just use it as part of the documentation, as part of your financial

model. Documenting the methodology is a really good way to identify logic errors and just to make sure that your methodology, the way you're calculating things, is correct.

Next is stress-testing. Stress-testing is something you do once you've finished. Stress-testing should not be confused with scenarios and sensitivity analysis. Stress testing means that we stress the model; we put in some ridiculous inputs. For example, earlier we did a customer take-up rate, if you put your number of customers to zero, obviously that's not going to happen, then you would expect the number of customers at the end to also be zero. If you put your price to zero then your revenue should be zero. If it's not then you'd like to know why. Let's say if you were to double the number of your customers, you would also find that your revenue would double as. Some other examples that you might look at are if you're looking at staff costs; double the head count, you would expect the staff costs to double. If you're doing some escalation or some inflation amounts you could actually change your growth rate to zero so you would then expect your forecasts to remain absolutely flat. Similarly it's not a bad idea to chart or look at your data visually. Often you can do some metrics, some calculations, so look at the cost that is incurred by each customer. Total customer cost, divide it by the number of customers or look at the price per unit and does that remain constant? What does that look like visually?

Let me show you an example here. This is a file that I actually don't have available on the site, so you'll just have to wait for this one. This is a very simple model. We're basically saying we've got forecast number of customers and this is growing. We've got some assumptions here so I can see that we've got some growth. If I want to have a look at any of my named ranges, of course then I can go to my name box here. I can see all of my assumptions behind here so that's all fine in there. That's increasing my core growth so if I wanted to see what my core growth was then I can click on there and I can see that my core growth is one percent. Okay, that's all fine. I can then say number of calls per day and then I can calculate the number of calls per month which will give us the revenue. Now I've got some expenses which look like they're fairly flat. If I wanted to check for the "sensibleness" of my model here to make sure that it's looking reasonable, what I can do is calculate my revenue per customer because I wanted to check that it makes sense, to make sure that there's no anomalies there. I say the

revenue there divided by number of customers. I can then just copy that all the way across and I can see there that it fluctuates a little bit. That one there is down quite low and I just look at that and see does it look right, does it look sensible? I could even go in and see what that looks like visually.

I don't necessarily save these charts but it's just quite nice to see what that looks like visually. We're used to looking at numbers all day, every day, but you really just get a picture of what's going on. I can see a little bit of a blip there but other than that, it's reasonably flat which is what I would expect from this model. If I look at that number there, we see the revenue is quite low, so not sure what is the reason and let's have a look. We're saying number of calls per day. It could be something to do with the number of days in the month because you can see the number of calls per month is quite low there. If I go into my formulas here, go to trace precedents, double click on there and go to my assumptions and that explains it. Look at the number of business days per month and I can see there that's actually got a very low number of days; obviously a number of public holidays in that month so perhaps that's why it's low. This would make sense for you to put that like that and then what I could do is just go in and select data, add a new series, it would be quite interesting to look at the days, just add that in there. See what that looks like – you can see there's a little bit of a blip there. If I click on that now and because I'm using Excel 2013 there's actually a really nice chart type that I can use. If I go into a combo chart you can see there that looks quite nice. Actually I think the number of days is going to look better as a column. If will move those around, change that to a chart and that actually looks quite sensible. I can see that the number of days and the price per unit does actually look quite sensible. I will just leave that there so when we send out a copy of this file, you will have a copy of what I have done here. This is revenue per customer versus days per month and that's really going to explain what the problem is. I always like to change the standard colours and then looking at what is across the X axis there. I am going to go to select data, edit and change the months across the bottom. That explains what's going on in this model as a bit of backup in our financial model. I will save a copy and send that out as part of the webinar.

That's an example of the kind of things that you can do to stress test or to chart, sense check and check that there aren't any mistakes, errors or any underlying anomalies in your financial model.

The next thing is to look at scenarios and sensitivity analysis. I will show you an example of what they are. There are different ways of doing scenarios and sensitivities. We sometimes use these terms interchangeably but basically sensitivity analysis means what if I changed one single input. If I change inflation for example or growth rate or cost per square metre, how does that affect the output of our model? A scenario would be something like that goes up and this goes up but this goes down, so there's a bit of a difference between scenarios and sensitivity analysis.

By applying scenarios and sensitivity analysis it can really help you understand what's going in your financial model and can flush out any inconsistencies.

Going back to the excel files. Go to Chapter 11 Excel File. I just want to show you an example of what a scenario would look like. Let's say for example, we have base case. You can see that the numbers will change, well they should change. Let me have a look and see if my calculations are on. My formulas have dropped off. I will do a very quick VLOOKUP just to fix this up. If I go to best case, what you should see here, quick VLOOKUP. Press F4 to put in my dollar signs and that is now going to be a formula that will change. And then just drag that over and change that to a 3. There we go, now that I have some formulas in there, my scenarios will change. Change that to base case and you can see the numbers are changing. I could have used an IF statement. I could have used a SUMIF formula but I chose VLOOKUP in this particular situation. This is something you can do, an example of a scenario analysis that you can create. It shows you how to create drop down boxes and you can work through some of these examples here. I will send through a copy of the completed versions of these models so you will be able to see the completed formula that I have just built in there. That is an example of a scenario or sensitivity analysis that you could use to check and make sure that there is no problems in your financial models.

Next you should take note of your Excel errors. I know some of these errors strike terror into a modeller's heart. Nobody likes to see these types of errors in their financial models. They're

pretty horrible but we do often see errors like that. Take note of them. Don't ignore them. Don't just suppress them. You can quite easily go in and use an IF ERROR function that will suppress those. Try not to do that. Sometimes it is necessary but generally errors are trying to tell you something. So just take note of the errors. Try to make sure that they're not telling you that something is wrong with it. Don't just ignore them or delete the cell. I would much rather see an error or an error value like this than actually see a number that looks like it could possibly be right but actually it's completely wrong. We always say the only thing worse than finding a mistake in a model is not finding a mistake in a model. In fact the only thing worse than not finding the mistake in your model, is your boss finding the mistake in your model. We want to make sure that something like that doesn't happen.

Some different kinds of errors that you can get are circular references. If you managed to open up the file Chapter 4 you would have noticed there is a warning saying there is a circular reference. That is intentional. That circular reference is in there to demonstrate what a circular reference looks like. Normally if you see a circular reference in a model, you should just stop what you're doing, undo whatever you just did then close without saving. You really can't have a financial model that has a circular reference in it.

If I go over to the next slide, there's a few situations and it's a really common problem with interest in financial statements. Quite often we have a link between the P&L, the cash flow and the balance sheet and when creating the three different financial statements, we often find that the interest amount is an input into the P&L and so whatever is left over, the profitability from the profit and loss statement becomes an input into the cash flow and that in turn drives the loan amounts. Depending on how much profit there is that will drive how much you need to borrow, which will then drive the interest, which will then drive the P&L which will then drive the cash flow, so you end up with this lovely circular reference in interest calculations. Don't ignore that. You need to get around that somehow. I know some modellers enable iterative calculations and if that works for you, great. I generally don't recommend it. I find circular references can be pretty horrible to deal with so I would probably prefer to get around it mathematically. What we often do is we base our interest rate on the

cash balance of the prior month, that's not entirely accurate but it certainly gets around the circular references. Alternatively you can use a macro to get around that problem.

Don't ignore Excel errors and certainly don't ignore circular references because that means Excel is calculating on itself somehow.

If I can just go to the Chapter 4 and go back over to the circular reference. Here is a very simple example. You can see that a circular reference is at the bottom here to say that B11 and you can see that I've included B11 on itself. That's an example of a very simple circular reference. Usually they are a lot more complicated than that. They say that something is calculating on itself. I could have found that circular reference if I had gone to error checking, circular references and you can see here that it will take me directly to the circular reference.

The next one is looking at some error checks. A good financial modeller will always to look for opportunities to include error checks in your financial model. Checks will identify errors in the inputs. They are generally not going to help you particularly when you're building your financial model but an error check will help the user of a financial model. If somebody were to enter a result that were invalid or they misuse the model or it's not adding up for whatever reason the error check will identify it. It doesn't help if you're not using good modelling practice. Error checks are not a substitute for good financial modelling practice. I will show you an example of error checks.

Go back to the Chapter 4 file. Here's an example of an error check. If you go to figure 4.11 tab and you can see here that we've got some printing here. This total here, you can see at the bottom there is 34,100 and this total here is 140,085 and so that's the total there. This number here should be the same as the other so I've just used a simple error check to say if the total of all of those does not equal that, give me an error, otherwise give me a zero. For example, if someone were to enter something incorrectly, it will automatically pick up and give us an error.

Something else you can do is you can put error checks right throughout the model. It can be quite hard to identify those so what we often do is have an error check page and I just hide that at the back of the model and then after the model has been in use for a couple of weeks,

months or even a couple of years, when the model comes back to me, I can just unhide this particular sheet and I can see a list of all the different error checks in the model and just use a simple COUNT to say if there is an error there and you can click and see the link back to where your error check is. That's something you should get into the habit of using within your financial models.

Those are the ten strategies that you can use for reducing the risk of error in your financial models.

In summary,

1. Get into the habit of using your enter key, don't click somewhere else.
2. Check your work so when you've finished editing your formula, check it and then check it again.
3. Make sure you sense check
4. Once you've checked it three times have somebody else check it.
5. Validate those assumptions and make sure it's very clear what assumptions you have used, so if there are any mistakes in the assumptions, it's very clear and easy to see.
6. You should document your methodology. Make it very clear the methodology that has been used. Don't make it so the person reviewing your model has to get inside the workings and the calculations that you have done. Make it very clear what the methodology is and the way that you've calculated things.
7. Stress testing – go in and make sure that model is working properly by putting in some crazy numbers and crazy inputs that can identify if something is wrong.
8. Sensitivities and scenario analysis can flush out any problems that are in your model.
9. Take note of the errors in your financial model, don't ignore them.
10. Always look for opportunities to build error checks into your model.

That is what I wanted to go over today in the webinar. If there is any questions please type it into your little box on your screen and I will take those questions now.

QUESTIONS

Col has a suggestion. Col recommends that you feed the results of the error check page, so the overall status, back to the top left of every sheet so that the status of the model integrity is always visible. That's a really good suggestion and not a bad idea to implement.

Umar has got a question about becoming a certified financial modeller. We do have financial modelling using Excel which is a certified course. It is actually running again in October, I think. We would love to see you there. We would be able to provide you with some more information on that if you would like to get in touch.

Col has got a comment on using data validation to prevent errors occurring. Data validation, I didn't really talk about that but using the drop down box like we did with the scenario analysis will stop people from entering incorrect inputs. That is true but it won't help you when you're building the model but it will certainly help users. That's a really good idea.

Paul has made the suggestion of using ROUND for error checks. That's true because Excel actually truncates for 14 decimal places so quite often when you calculate something one way and then you calculate something the other way it can be point zero, zero, zero something out and it will give you a false error. So a rounding formula would work. What I often use is an ABS or ABSOLUTE value. So the absolute value of one cell minus the other. If that's greater than 1 for example, give me the error otherwise not. That's a good point, thank you.

Umar's got another question about the modelling course, so we might get back to that one separately if that is okay?

Are there any other questions?

We will leave it there for today. We will make all this available to you. I hoped you enjoyed the webinar. It has been fantastic being here again and I hope to see you all again soon.

Thank you so much.