

The Effects Of Accounting Depreciation On Companies' Net Earnings.

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Abstract

This article is set to demonstrate depreciation practices as required by GAAP and IFRS. The purpose of the article is to model accounting depreciation using Excel and how this model could be integrated into tax modeling when taking into account tax losses and accelerated depreciation as concessions offered to corporations by governments in many jurisdictions. This article was written in preparation for my upcoming Ph.D. thesis for a better understanding of operational financial engineering.

Introduction:

Essentially, the cost of fixed assets is going to be allocated over their useful lives as they generate economic benefits over that time. Depreciation expenses should always be recorded in the same place as the economic benefit it generated. This allocation is always going to be done, irrespective of when cash actually gets physically sent over to an equipment supplier. In this sense, the depreciation expense is a great example of the matching principle. Let's move forward now with this little example so that we can understand exactly what it means to allocate over useful life and show an example of what we mean by the matching principle. Suppose that a company purchases a piece of equipment at a certain moment in time. The payment goes to the equipment supplier at that particular moment in time. But what we need to do now is calculate the depreciation expense. What we're doing is calculating this over its useful life as we actually generate economic benefits from that equipment. And this is a great example of the matching principle because essentially what we're doing is matching the economic benefit correctly to the use of the asset (Financial modeling and valuation analysis, 2020). Advanced Operational Modeling (Corporate Finance Institute Canada).

Purpose of the study

The purpose of the article is to model accounting depreciation using Excel and how this model could be integrated into tax modeling when taking into account tax losses and accelerated depreciation as concessions offered to corporations by governments in many jurisdictions.

Significance of the study

The significance of the study was to demonstrate how changes in different assumptions such as capital expenditures, the blended tax rate, the accounting depreciation rate, and concessions granted by many jurisdictions around the world to deplete tax basis could affect companies earnings before taxes.

Literature Review:

So now we've covered and discussed some of the theory with regard to depreciation, but now we need to think about the depreciation model. And we need to consider two parts of depreciation in order to model it correctly. The first part that we need to

consider is the existing assets, essentially the assets that the company already owns. What we're going to do is assume 100% depreciation in the first year for these assets since they're already owned by the company. The next part for us to consider is the new assets, meaning the assets the company is expected to buy at some point in the future. What we need to do with these is consider the timing of these asset purchases very carefully, meaning we need to have an understanding of when each occurs. The company tends to buy new assets. The other thing that we want to always remember is that land has an infinite useful life and is thus appreciated over time. Let's focus our attention now on the new assets, and as we move forward, we're going to think about how we're going to model these new assets. We need to consider this. You mentioned previously exactly when the company might purchase these assets within each So what we need to think about is the exact timing of these asset purchases, which could depend on the company's capital budgeting preferences. Some companies like to purchase assets at the beginning of the year and put them to use right away. Other companies may do this through asset purchases mid-year, so we need to think about this and get to know the company's preferences. It's so important to understand the company's preferences because these preferences are going to impact the timing of the purchases, which is going to have an effect on our depreciation calculations. Let's look through a couple of illustrations now. Let's suppose there's a company that purchases its assets at the start of the year and puts them into use right away. We're going to be able to allocate a full year's worth of depreciation expense in the first year since they're going to be using the assets for the entirety of that first year. We may also encounter companies that purchase their assets in the middle of the year. In this case, we're going to only allocate half a year's worth of depreciation for the company in the first year, or 50% of the depreciation expense in that first year. In fact, this assumption of 50% depreciation in the first year is very common for any company that purchases equipment evenly throughout the year. On average, it means they're purchasing in the middle of the year. So the default is often to set this assumption to 50% unless there's a compelling reason. Reason why we should deviate from 50%.

Let's turn our attention to the depreciation schedule. And as we remember, there are always going to be three parts to each of our schedules or building blocks in the models that we put together. First up, we're

going to need a few things that will enter the schedule. In fact, there are many things we need in the opening, Property, plant, and equipment, or PPE balance, we need a CapEx forecast, and we also need the first-year allocation that we just discussed. We also need the useful lives of both the existing assets and the new assets that we expect the company to purchase. Next, we're going to get into the central section of the schedule where we're performing all of our calculations. We won't get into a lot of details about these calculations here. We'll save that for the overview of the model in the buildup of the model. But one takeaway here is that we're definitely going to need to have a clear section for the existing assets. And one for the new assets. Finally, we're going to have a section at the bottom of the depreciation schedule where some figures are going to exit. The main one that we're after is the company's total depreciation expense. This will flow next to the company's income state. We've covered some of the theory behind depreciation and gone over a quick overview of the depreciation schedule. What we're going to do now is proceed with the model. This is where a lot of the hard work is going to get done. We're going to dive in and get started.

Come in and take a look at the depreciation schedule. One of the things that you might notice below on the figure is that right down at the bottom, there are a couple of footnotes that we have here. Let's see exactly what's going on with these footnotes. Just as a reminder, let's read through these footnotes to make sure that we're clear on what they're communicating to us. First of all, in this schedule, the word building up on depreciation is going to calculate depreciation on a straight-line basis. That's good to know. Also, the schedule will assume that all PPP needs are met, so all property, plant, and equipment are depreciable. That means that we wouldn't have any land. To worry about, and we can depreciate everything.

Go. One of the things that we always want to remember about the schedules that we're building is that they generally have three sections. There's a section at the top where we're entering information. In this case, it's the capital expenditure. We also have a little bit of a section over here where we're bringing in some other information that we're going to The central section of this schedule is where we're doing all of our detailed calculations. And in fact, as we're going to see in this schedule, there are some tricky formulas that we're going to need to work through.

Finally, at the bottom, we've got a nice section that's kind of closed off from the other sections, where we're gathering up some figures that we'll need to exit. From the schedule and go on to other parts of our financial model. One of the things that we should take careful note of as we're building up this schedule is that we want to make sure that things are working correctly as we move the inputs. So when we start here and when you start building the section, so the existing asset depreciation, please make sure to test this input from 16 years. And change it to make sure the formulas work as expected. For instance, it might be a great idea to change this figure temporarily to 2.25 years. That way, we can go across and ensure that we're getting one year. Two years and then a quarter year here, so it adds up to 2.25 years. Similarly, we may want to go down here on the new asset depreciation and change this input from 20 years to 2.75 years, let's say. That way, we can see. half a year's worth of depreciation here. Two full years, so now we're at 2.5, and then Then another quarter year, it adds up to 2.75, so it's working correctly. So it's going to be a great idea to adjust these inputs just to check if our schedule is working correctly and if we have our formulas properly configured. Before we forget, let's pop back up here, change this to 16 on existing asset depreciation, and down below, we can change this one back to 20 on new asset depreciation. One of the things to remember about this particular schedule is that there are going to be There are really tricky formulas that come into play in this section of the schedule.

Methodology

Let's look at some of the formulas and the depreciation schedule. Take note that there are some tricky formulas in here, moving down into Excel, and we're going to build up this formula for the CapEx as demonstrated in the figure below. Essentially, what we need to do here is get these CapEx numbers, which are oriented horizontally across the schedule, into a vertical orientation. One way that we could do this is just by linking them up, saying equals, and going up here and connecting to the first one and then going down to the second, third, and fourth sections. If we link up the model that way, it's going to be a fairly manual process, and it's also easy to make mistakes when we're doing those kinds of things. So let's look at a different alternative. Let's delete this for now. If we're using a recent version of Excel, like Office 365, we could make use of the X LOOKUP function. We can type in XL, and in fact, we don't even need to type

anymore. As soon as we see the function name come up, we can hit the Tab key. Yes, well, with the cup function, first of all, it's asking for the lookup value. That's going to be the year 2022, which puts in a comma. Now it's looking here for the look of the array. The lookup array is going to be at the top. And select right across here; effectively, this is where it's going to be looking for this particular year, 2022. Now we can put in a comma. The last thing it asks for here is the return array. The return array is going to be the capital expenditure selected like that; you can just close the bracket now and hit enter. What we'll need to do next with the excellent cup function is pop it into a formula. We're going to hit two. To do that, we need to lock down some cell references. This first cell reference here is free to move downward, and it's fine as is. Let's use the Shift key to highlight this red reference and tap the F4 key. That locks it into place. Now we can move over here and tap this purple cell reference, which is capital expenditures, and hit the F4 key. That will lock it in place. Now that we've completed that formula, you can pop up into this cell through a copy with the control C. Highlight downwards with the Shift key and then do a paste special Alt ES with the down arrow and then hit Enter. We've now copied the famous all the way down through this room.

The X lookup is a great function, and in fact, it was only recently announced by Microsoft, and it is effectively replacing the Hlookup function and the Vlookup function. One thing to keep in mind, though, about this function is that it's not backwards compatible. So if we were going to be sending this schedule or this model, For people who weren't running a recent version of Office or Excel, this function wouldn't work. So let's investigate some other things that we could use here to get these CapEx numbers in a vertical alignment. If we're concerned about backwards compatibility, we might be inclined to use an image lookup or a V lookup function in here, but actually, we're going to recommend a different function. Let's delete the formula that we already have here and investigate a different option that might work.

Capital expenditures using SUMIF;

What we're going to recommend in this case is actually a sum-if function. Let's put in the word sum and open up the bracket. The first thing that we're going to need to select is the range. Let's go up here. And select these years as the range, but in a comma. It is now looking for criteria. For the criteria, we're going to select the year in question, 2022. Next, it asks for the sum range. For the sum range, we're going to select the CaPEX right here and close the bracket. Let's hit enter to see what that is. As we can see, this is pulling down the correct number for CapEx for 2022. 4550 is exactly the number that we were looking for. Let's look into the function to see how it's working. Let's move up into the cell above and hit F2 just to investigate how this function is working. First of all, we're asking it to look for 2022 as the criteria. It's looking across this range in blue for that year. As soon as it finds that year, it's going down. In purple, and it's performing a sum of these numbers. The interesting thing about the way that we're using this function is that it's not actually anything. It's finding 2022 moving down to the purple range where it's supposed to be summed with these numbers, but really it's not. Just using it as a lookup function. So it's looking up to 1022, and it's retrieving 4550 for us. Let's hit enter. So this function is working really nicely. The last thing we need to do in order to complete it is pop into the cell, and we need to lock down some ranges. First of all, this blue range You can select it using the Shift key. Tap F4 once, which locks the cell references. Let's go over now to the purple range. Select it with the Shift key. Tap F4 to lock everything down and hit Enter.

Capex per-year depreciation, Now let's turn our attention over here. We want to understand how much CapEx that is per year. This is going to be pretty straightforward. We just say it equals the amount of capital, and we're going to divide by the number of years expected on the new asset's useful life depreciation, right here in 2022. Hit Enter. What we're going to do now is copy these figures downward, so let's select them using the Shift key to copy Control C. Highlight down with the shift key and a special key called ES, use the down arrow to select formulas, and hit enter. Everything's been copied down perfectly.

2019A	2020A	2021A	2022F	2023F	2024F	2025F	2026F
4,982	5,199	4,400	4,550	4,700	4,850	5,000	5,125

Year	Life
2022F	2.75
2023F	2.75
2024F	2.75
2025F	2.75
2026F	2.75

Year	Capex	Per Yr
2022F	4,550	1,655
2023F	4,700	1,709
2024F	4,850	1,764
2025F	5,000	1,818
2026F	5,125	1,864

Let's head up to the top section of the schedule. Now what we want to do is what we discussed earlier. Let's change the number of years on the existing assets. 2.25 We're also going to change the number of years on the new assets to 2.75. Putting in these smaller amounts for the useful lives will help us because we're going to be able to see if we're using up all of the depreciation within the forecast period. But also, we have fractional components here like 25 and .75, which are going to allow us to see if the scheduler is working correctly. Has. Let's now move up to this section in the model. We need to think about what this profile will look like for this company with a useful life of 2.25 years on its existing assets. Essentially, we should have a full year's worth of depreciation in the first year, always, because the company already owns these assets. In this case, we should also have A full year in the second year, but then in the third year, you should just have 1/4 year's worth of depreciation. So these add up to 2.25. We need to think about how we can put a formula in there or get these numbers to work for us. Let's hop into this cell and delete the 25 and think about the formula that we can put in here. It'll work. What we're going to put in this cell is, in fact,

5

going to equal the full useful life. Minus the sum of the amounts that have already happened right here, and close the brackets so effectively that we're saying $2.25 -$, 2. Let's say that we generally want the model to default to 100% in most years, except that this year we wanted to grab this calculated value of 25%. Essentially, what we want is the minimum between 100% and 25, which is 25. So let's put a function in there to get this working. So let's pop into our formula, hit F2, and make this modification. We're going to go over to the beginning and type in command and open a bracket. We're going to take the minimum of what's been built in here, and now we go to the end and put a comma in and put a one for a 100%, and then you close the bracket, so it's going to take the minimum between one and what's inside those brackets. What we need to do now is just pop in here and do some quick blocking. Let's hit the F2 key to get inside and move across. Over to this blue-saw reference We're going to tap the F4 key. That will lock the F column and the 163 row. Let's go over here, and we're going to do something interesting with this cell reference. Tap the F4 key. three times just to get the reference J column locked, but we want to leave 164 unlocked, which is the beginning of the sum formula

from year 1. Let's hit enter. We've now completed this formula. That was the easy part. Let's pop up into this cell, do a copy, Control C, and highlight all the way across this entire range. And we're going to do a Paste

Special Halt ES. Use the down arrow to get the formulas, and then hit enter. Everything stopped. Let's take a look. We've now built this formula correctly.

EXISTING ASSET DEPRECIATION	Years
Useful Life: Existing Assets	2.25
PP&E at End of 2021	65,014

Percent of Full Year				
Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
100%	100%	25%	–	–

Formular for existing depreciation equals =MIN (\$F163-SUM(\$J164:J164),1).

We have 2.25 years of useful life on these existing assets and we're getting 2.25 correct. Let's change this to a different number. Like 3.78 for example. So we get three full years and then 78%.

EXISTING ASSET DEPRECIATION	Years
Useful Life: Existing Assets	3.78
PP&E at End of 2021	65,014

Percent of Full Year				
Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
100%	100%	100%	78%	–

It dynamically changes as we change the existing useful life of the asset. Everything seems to be working really well with this.

New Asset Depreciation, full-year percent;

What we want to do now is leverage some of the hard work that we put into this formula. We can do control c and paste special Alt ES in the percent of full-year

depreciation of new assets table. What we can do, just to see how this formula is working as a starting point, is just copy it forward. We're going to go in here, copy with the Control C key, use the shift key to highlight across all TS for paste special down to formulas, and hit enter. Great. Now we've got it copied through all the forecast periods. We can see that this is working correctly because over here we have 2.75 years, and as we can see, we're getting 1/2 full years and then the.75 right here, so it's working well.

NEW ASSET DEPRECIATION
Years

Useful Life: New Assets	2.75
First Year Accounting Depreciation	50%

Percent of Full Year

Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
50%	100%	100%	25%	–

However, now we need to think about how to incorporate this 50% depreciation into the first-year accounting depreciation. Let's do that in the next step. So essentially, we need to know from corporate about this 50%. In fact, we know that we need the value to be 50% in the first year. So we're going to modify this formula that's in cell year 1 of percent of the full year to always be 50% in the first year; otherwise, it's going to revert. The formula that we already have loaded in there—let's go ahead and make that change. The first thing that we want to do is justify the contents of this cell. The way that we can do that using native Excel shortcuts is to go into the cell and tap the Alt key. We want to go up to the home menu up here, so we're going to tap H. Now we can see that we have an option here to say now AL, which is align left, so AL aligns it left. And we're shifting the horizontal alignment for this cell really, really quickly. The reason that we shifted the alignment over to the left is just so we can see the formula a little bit more clearly. Let's hop into the cell. Now I'm going to hit F2. What we're going to do is say that in order to get 50% at the

beginning, We're going to add a little if statement here. We're going to say equals if and Now what we want to do is move around in the spreadsheet. If we try to move the left and right arrows, you'll notice we're moving inside this cell instead of a random spreadsheet. So we tap the F2 key once. Now, when we move the arrows, we're actually moving inside the spreadsheet. So we're going to say if this red cell right here is equal to a blank. So essentially, if it's blank, then we're going to grab 50% from right here. We can hit F4. And lock that cell reference in a comma. Otherwise, we want the formula to revert to this MIN function. We're going to tap the F2 key once more because now we want to move out to the end. And close this bracket. Now that the formula is complete, we can hit enter. Now we just need to pop into the cell, copy, select across control, and shift right. And you pay the special alt ES and hit down for four minutes. We hit enter, and everything's been pasted across perfectly now.

Formular equals =IF(J170="", \$F\$170, MIN(\$F169-SUM(\$J170:J170), 1)

NEW ASSET DEPRECIATION
Years

Useful Life: New Assets	2.75
First Year Accounting Depreciation	50%

Percent of Full Year

Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
50%	100%	100%	25%	–

If we change the useful life of the new asset to 3.75, we see that it automatically updates on the percent of the full year of depreciation as shown below.

NEW ASSET DEPRECIATION
Years

Useful Life: New Assets	3.75
First Year Accounting Depreciation	50%

Percent of Full-Year

Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
50%	100%	100%	100%	25%

Data Analysis And Interpretation

What we have for this section is a situation where we're forecasting the years forward here, but we also have the years listed down here vertically, essentially forming a little grid that we can work with. This is often referred to as a waterfall. We'll come back to that term a little bit later, once we get this completed. The first row of this waterfall schedule, as it's called,

is going to be dead simple. In fact, we just want to link up to these percentages that we've already prepared above. We can do a copy, Control, C, select across, and Alt Yes to paste the formulas and hit enter. We're all done with that. First row. What we need to do now is take this pattern of percentages and skew it forward by one period like that, and then in the next row, we need to skew it forward like this by another period. The way that we're going to do that is as follows:

Year	Life	Percent of Full Year				
		2022F	2023F	2024F	2025F	2026F
2022F	3.75	50.0%	100.0%	100.0%	100.0%	25.0%
2023F	3.75					
2024F	3.75					
2025F	3.75					
2026F	3.75					

We can start in this cell right here below 50% and equal the cell to the cell after the depreciation life, then we're going to hit enter, and then it will pull forward a waterfall schedule when we copy that cell across and downwards.

Next, we're simply going to pop up into this cell to copy and then select all the way across and all the way down and do a paste special Alt ES and down to formulas and hit enter. We've now completed this section, and we can see why it's called a waterfall schedule.

Percent of Full Year

Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
50%	100%	100%	100%	25%

Percent of Full Year

Year	Life	2022F	2023F	2024F	2025F	2026F
2022F	3.75	50.0%	100.0%	100.0%	100.0%	25.0%
2023F	3.75	–	50.0%	100.0%	100.0%	100.0%
2024F	3.75	–	–	50.0%	100.0%	100.0%
2025F	3.75	–	–	–	50.0%	100.0%
2026F	3.75	–	–	–	–	50.0%

Effectively, it's like a triangular formation, and it looks a little bit like a waterfall. Let's think about how this schedule is going to work. Let's use this as an example. Suppose we look forward to 2023. We're expecting an asset to come into service. We can see it first goes into service right here in 2023, and it's coming into service with 50% depreciation, meaning we're assuming that the company buys this asset in the middle of the year. This asset is coming in perfectly right here in 2024, again with 50% depreciation in the first year.

The next part of the model is going to be relatively straightforward. If we come down here, what we're going to do is essentially take these per-year amounts. By them through the percentages like 50 in this particular cell right here. So let's key in this formula.

We're going to put equals and pop over here to get the per-year amount. We're going to hit the F4 key, and we're going to keep topping it because we want to get it so that column J is locked, but 182. Now we're going to multiply and go straight up to that percentage of 50%. We can then hit Enter. Next, we're just going to copy things through to pop up here. Control C for copy, highlight across and down Alt ESS, go down to Formulas, and hit enter. Everything's been copied perfectly through that section of the model now. And that created a second waterfall. In fact, you may be getting a little bit more comfortable with that turn. So we've created one waterfall at the top to track the percentages, and then a second waterfall down below to track the total dollar amounts for depreciation.

Amounts for Depreciation

Year	Capex	Per Yr	2022F	2023F	2024F	2025F	2026F
2022F	4,550	1,213	607	1,213	1,213	1,213	303
2023F	4,700	1,253	–	627	1,253	1,253	1,253
2024F	4,850	1,293	–	–	647	1,293	1,293
2025F	5,000	1,333	–	–	–	667	1,333
2026F	5,125	1,367	–	–	–	–	683

Now that we have the waterfall schedules built up, we're just going to complete this last section at the bottom, and we're going to put some relatively simple formulas in here. Let's go into this cell here and think about the depreciation of the existing assets. We're going to put in an =, and we're going to open a bracket and go up and grab the PPE at the end of 2021. While

we're there, let's lock the cell reference down. We're tapping the F4 key to get that done. We're going to divide that by the number of years, in this case, 2.25, and we're also going to walk. Now that's all. For reference, let's close the bracket and now multiply it by the amount of the depreciation here, which is 100%. Let's say that you enter. For this next cell on the new assets, the form is going to be really

straightforward. We're just going to put in a simple sum function, and we're essentially going to add up all of these depreciation amounts above. We can just hit enter. Now that we're down at the bottom, we can just put in a really simple little sum function. We want to add up both the existing and new assets depreciation. Then we can just hit enter. The last part here is really easy. We just select these numbers, hold shift and right arrows, and fill right with control R.

Recommendation and conclusion

This is the standard approach to modeling accounting depreciation. The next article will focus on tax depreciation and tax losses carried forward, as used in several jurisdictions. Depending on the jurisdiction that your company is in, accounting depreciation has a significant negative impact on a company's earnings as the amount is so small that tax depreciation amounts to depleting income before depreciation and amortization. Depending on the jurisdiction the company is in, the company should always consider different concessions granted by governments in order to deplete income before taxes

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