



Financial Modeling Guidelines

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Introduction

Modeling guidelines help to establish standardization and consistency

Financial modeling is a wonderful opportunity to learn as much as possible about a business. Creating an electronic replica of a business forces us to understand all the nuances of that particular project or company. While it is an amazing learning opportunity, the person building the model needs to remember that it must also serve a larger group of stakeholders. These stakeholders will vary depending on the model to help guide and inform their decision-making processes.

Many of the models that we encounter today are poorly designed, difficult to maintain, and hard to follow. Given their central role in the financial decision-making process, it is critical that these models be built to the highest possible standards. Implementing some detailed Financial Modeling Guidelines is a logical step towards improving these financial tools we are using.

One of the first subjects we will cover in this document is the importance of thoughtful model design. Time invested upfront in the model design process will save considerable amounts of effort on the model build and will lead to a better financial model. An example of a well-designed cover page and dashboard is shown on the next page in Fig 01 – 02. Model design will also consider how the model will be presented so that print layout can be established early in the planning process.

Operational Modeling

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Model Checks

Sales Volume Within Capacity?	Yes
Revolver Within Limit?	No
Balance Sheet Balanced?	Yes

Notes

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Fig 01: Well Designed Model Page

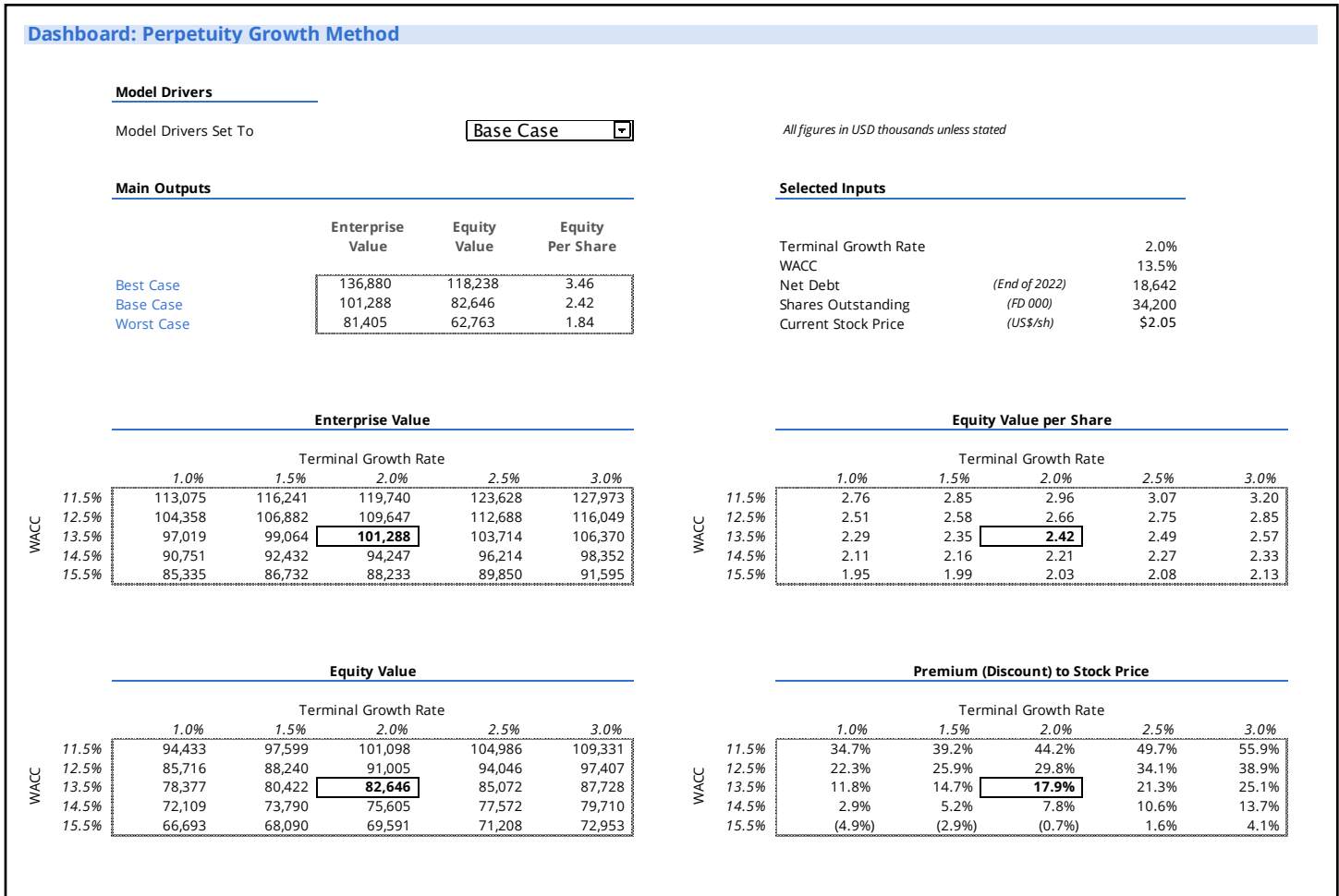


Fig 02: Well Designed Model Page

We think about models in a modular fashion as a series of building blocks

We will also discuss the use of building blocks like dashboards, schedules, and financial statements to design and assemble the model in a modular fashion. Using a modular process will enable us to create a library of these building blocks for future use in other financial models. Also, dividing the model into these small modules or blocks will make the model easier to interpret, print, and present once completed.

Our design process also helps us achieve the right level of detail throughout the model. We begin with the model dashboard or outputs and then solve back through the supporting schedules to the required inputs as illustrated below in Fig 03. By only including the components that support the dashboard, we ensure that the level of detail throughout the model is appropriate to its end objective. This is incredibly important as many models miss the mark in terms of the

appropriate level of detail. In fact, it is common that financial models are either too simplistic or overly complex.

Modeling guidelines help to promote consistency and standardization

These guidelines may resonate with individuals building their own models but also with corporations and institutions. Larger institutions may welcome more consistency and standardization with the models they are using across their teams, mitigating the risk of human error. While we don't expect all of our suggestions will be adopted, this document may serve as a catalyst to stimulate discussions around this subject. Given that financial models continue to be a central part of the decision-making process, it is critically important that they are built to the highest possible standards. With this document, we are pleased to assist by communicating the Financial Modeling Guidelines that we've adopted over the years.



Fig 03: Preferred Model Design Process

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Design: Common Approach

Upfront model design is a critical part of the modeling process

Model design is one of the most critical steps in the model building process. In many ways, it is the most important step between the initiation of the modeling process and final completion. Many model builders will rush through this step or skip it completely and begin the build before they have a clear vision of what they are creating.

A proper design process will help set the level of detail for the model

The model design process sets the landscape for the entire model and will clearly identify to the model builder how each piece fits into the larger picture. Also, this upfront process helps the team understand which elements are critical and which may be less important. If done properly, the process will provide the team with insights needed to set the right level of detail for the model. This is critically important since it is common for models to either be too simple or overly complex.

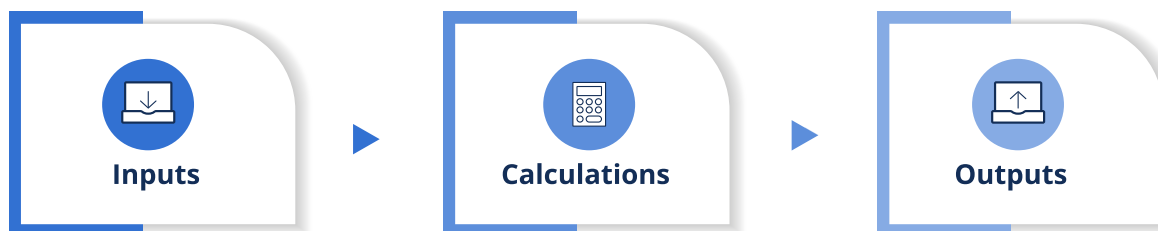


Fig 04: Common Model Design Process

A common error is to start the model design with the inputs

Another mistake that is often made is beginning the design from the wrong starting point. It is quite common to start with the model inputs, as shown below in Fig 04. Once the inputs have been selected, calculations are thought through sequentially until the designer progresses all the way through to the outputs. Although progressing from inputs to outputs is quite common and makes intuitive sense, we prefer to design our models in the reverse order.

We begin by defining exactly what we need the model to do for us

We begin the process by asking ourselves a number of questions. What is the model needed for? What decision are we trying to make that it may help us with? What questions do we have that it could answer? These types of questions define what we need the model to do and what it will ultimately provide for us. This helps to set the main goal and objective of the model.

We then progress to the dashboard and decide what needs to be presented

Once clarity has been formed around what the model needs to do, we turn our thoughts to imagining how it will be presented. Would we like to see a graph comparing our cash flow forecast with our budget? Or are we interested in the intrinsic valuation for an acquisition target we are considering? Asking these questions helps us envision the types of tables, charts, graphs, and performance indicators that will be needed. Essentially, we start the process by designing what we refer to as the dashboard of the model. The dashboard is a page or set of pages that shows the audience important model variables. This includes important outputs but sometimes also critical inputs. Understanding the final dashboard helps us back solve for what is needed to get to that dashboard.

Design: Preferred Approach

We work backward through all the components to arrive at the inputs

So we essentially start the process with the dashboard, as shown below in Fig 05. Designing the dashboard can be as simple as sketching on paper or jotting down ideas on a whiteboard. Once the dashboard is clearly defined, we move backward to solve for the outputs needed for the exhibits in the dashboard. The process continues backward through the model. Eventually, this process leads us all the way back to the inputs completing this initial stage of the design process. This method allows us to start with a clear objective for the model. It also ensures that we only include the components that are absolutely necessary for the completion of that objective.



Fig 05: Preferred Model Design Process

Building Blocks

We've shown a more detailed diagram of a simple cash flow model

In the previous example in Fig 05, we shared a simplified schematic for a design process. This was just meant to illustrate the importance of starting from the end and solving backward. In Fig 06 to the right, we've shown a more detailed design process that may be used for a simple cash flow model. The model is needed to show a forecast of free cash flow for a business with annual proforma estimates. Similar to the previous example in Fig 05, we begin with the model outputs and solve back to the inputs. To be specific, we have started with the dashboard and progressed back to the inputs and the drivers.

We often refer to the various components of a model as building blocks

As indicated by the title of Fig 06 on the right, we often refer to the various parts of a model as building blocks. A building block could include many types of modules like model schedules, financial statements, or dashboards. It is useful to think about models in a modular fashion made up of a series of these building blocks. As we will see in our discussions later, each one of these building blocks will have a defined purpose within the model.

Using a modular system allows us to save building blocks to use again

There are a couple of advantages to designing and constructing using these building blocks. The first is that this modular type of building breaks the model up into blocks of a reasonable size. This helps to focus on one block at a time and also assists with model printing which we will discuss later. Another important advantage to this modular system is that the blocks will likely be used in many types of models. For instance, many models require a working capital schedule so this building block can be reused again in those models.



Fig 06: Building Blocks

Level of Detail

Many models are either too simplistic or overly complex

This backward design process also helps us calibrate the right level of detail for the model. Getting the right level of detail is one of the places where many model builders miss the mark. Essentially, they either design a model which is too simplistic or overly complex. Models which are too complex are becoming more common since data is so easily available today. The default for many model builders is to include all available data in the model they are designing. This leads to models with too much detail making them hard to read and difficult to maintain.

We add complexity only where needed to get to the model outputs

By beginning with a clear vision of the dashboard or end goal, we include only the details that are needed to get to meet that objective. As we move back through the model, we focus on the elements which will have a meaningful impact on the critical model outputs. There may be elements of the model which do not have a significant impact on the key model outputs. These elements can often be replaced with rough estimates or simplifications. This helps keep the model lean and maintains the focus on the most critical elements. In the end, this process helps

us to achieve the optimal level of detail for each part of the model. We end up with a model that has adequate complexity for the crucial elements but clean simplicity for the less important ones.

Model Drivers

We need to evaluate the relative importance of the model inputs

The initial design process takes us from the dashboard and outputs all the way back to the inputs. Through this initial step, we've been able to see which calculations are important or critical to the model output. This gives us insight into the relative importance of the various inputs. This is where we need to focus our attention next.

Model drivers are volatile and have a significant impact on model outputs

While a model may have hundreds of inputs, there may only be a few which are truly material to the model output. We often refer to these as drivers since their values really drive and influence the model output. There are a couple of common characteristics of a driver that makes them stand out from other inputs. First, they are inputs that have a significant impact on the model output. And second, they are relatively volatile and have a wide range between their minimum and maximum values.

Tax rate may only be considered as a driver in unstable jurisdictions

Let's consider a couple of examples. Should a company's tax rate be considered as a driver? It may be obvious that the tax rate has a significant impact on the model output. However, we would need to consider the likelihood of a significant change in the tax rate. This may depend on the jurisdiction where the company is operating. If it is relatively stable, we may not consider this to be a driver since it is unlikely to change much. However, we may consider the tax rate to be a driver for a company in an area with a high degree of political and fiscal uncertainty.

Only the main commodity prices may be considered as drivers

Another interesting example may be the commodity price for a natural resource company. Commodity prices are often volatile, so they may meet our second criterion. But, then we need to consider whether it has a significant impact on the model's outputs. The gold price may be a driver for a mining company with revenue generated primarily from gold sales. But, if only a small amount of its revenue was from silver sales, we may not consider the silver price to be a driver.

Identifying the drivers requires detailed knowledge of the business

As illustrated by these examples, it may not be obvious which inputs to consider as drivers. In many cases, sound knowledge of the business may be needed to determine the drivers for a project or company. This is an important part of the model design process. We need to remember that modeling is not just an exercise in trying to get the right numbers. It's an opportunity to learn about a business. By asking these questions early in the design process, we enable ourselves to learn so much about the underlying business.

We isolate the drivers so that we can test how the model reacts to them

The reason that we are identifying these drivers is so that we can test how the model reacts to changes in them. We know that their movements are material to the model outputs and that there is a reasonably good chance that they may change. Thus, it makes sense to test how the model will react to movements in these drivers. After all, these drivers could make the difference between the success or failure of the project or company.

Start by considering the minimum and maximum levels for drivers

There are a few ways to test drivers in a financial model. One of the most common ways is to create a range of values for them. This may start with thinking about the base case (most likely) as well as the best case and worst case. We've shown this below in Fig 07 using the examples of the gold price and the tax rate. This will allow us to evaluate the range of model outputs given a best-case or worst-case scenario for these drivers.

Only the model drivers need to be tested in this way with switches

Having the ability to move these critical drivers between the best and worst-case allows us to see the range of possible outputs for the model. While we could test the range of all model inputs in this manner, it is only critically important for these drivers. Testing only the drivers in this manner allows us to focus our attention on the most important inputs that truly have a significant impact on the model outputs. We always need to pay close attention to the right level of detail for a model. This will help those using the model focus on the elements of the model that are the most important. Other inputs may fluctuate, but over smaller ranges and with less overall impact on the model outputs.

All figures in USD thousands unless stated

		2023F	2024F	2025F	2026F	2027F
Driver Switch	Base Case ▾					
Gold Price	(US\$/oz)	1,800	1,700	1,600	1,500	1,500
Best Case	(US\$/oz)	2,000	1,900	1,800	1,700	1,700
Base Case	(US\$/oz)	1,800	1,700	1,600	1,500	1,500
Worst Case	(US\$/oz)	1,400	1,300	1,300	1,200	1,200
Tax Rate		25.0%	25.0%	25.0%	25.0%	25.0%
Best Case		20.0%	20.0%	20.0%	20.0%	20.0%
Base Case		25.0%	25.0%	25.0%	25.0%	25.0%
Worst Case		30.0%	30.0%	30.0%	30.0%	30.0%

Fig 07: Model Drivers

A driver status indicator is recommended when all drivers are connected

In the previous image in Fig 07, we showed a schedule that had all drivers connected to one driver switch. This is quite common in financial modeling as it allows all the drivers to be quickly moved in lock-step throughout the model. In cases where the driver switches are connected, it often makes sense to include an indicator showing 'Driver Status' as shown below in Fig 08. This Driver Status Indicator can be shown throughout the model, so it is always clear to the audience which set of drivers is active.



Model Drivers Set To: Base Case

Fig 08: Driver Status Indicator

Model Inputs

Inputs should be grouped together so they are easy to find and update

We can certainly appreciate the importance of discerning between the drivers and the other inputs to a model. Drivers will need to be separated and selected with switches so that we can test how the model outputs react as they move. The other inputs are less critical to the model outputs, so they do not generally need to be moved with switches. However, they should be grouped together into a consolidated section of the model so it is easy to locate and update them.

Each input should only ever be entered into a model once

It may be obvious to note that inputs should only ever be entered once into a model. If we needed to enter the tax rate into a model, we should only have to do this in one place. All other locations where the tax rate occurs should be connected back to the original input. One topic that gets debated relatively frequently in financial modeling circles is how to connect the occurrences of tax rate together in the model.

There are two ways to connect multiple instances of the same variable

There are two schools of thought on this. One is to connect the occurrences in series as shown below on the left in Fig 09. In this example, each occurrence of tax rate is connected to the next closest one. The other approach is to connect all occurrences back to the original source as shown below on the right in Fig 10. Connecting all the instances of the tax rate in series, as shown below on the left in Fig 09 means that any one connection is closer than it would have been if we had linked back to the original source. While connecting in series may be marginally easier

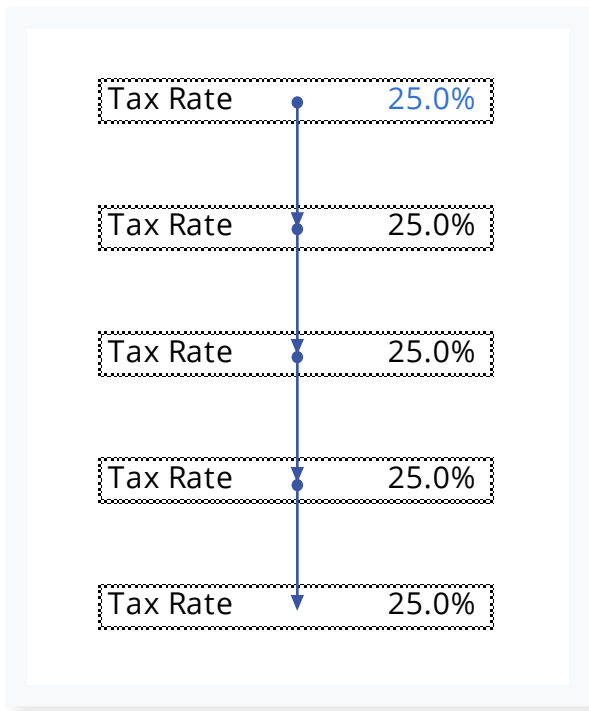


Fig 09: Connecting in Series

to audit, most of the instances of tax rate have dependencies that will make deletions difficult.

We avoid linking multiple instances in series to avoid dependencies

For this reason, our preference would be to link all instances of tax rate directly to the original entry at the top of the tab, as shown below on the right in Fig 10. In this example, the instance of tax rate at the top is the input. However, this top entry could be linked over to another tab. In this case, we would link directly to the top entry and then link that top entry over to another tab. This structure minimizes dependencies and the amount of linking between tabs.

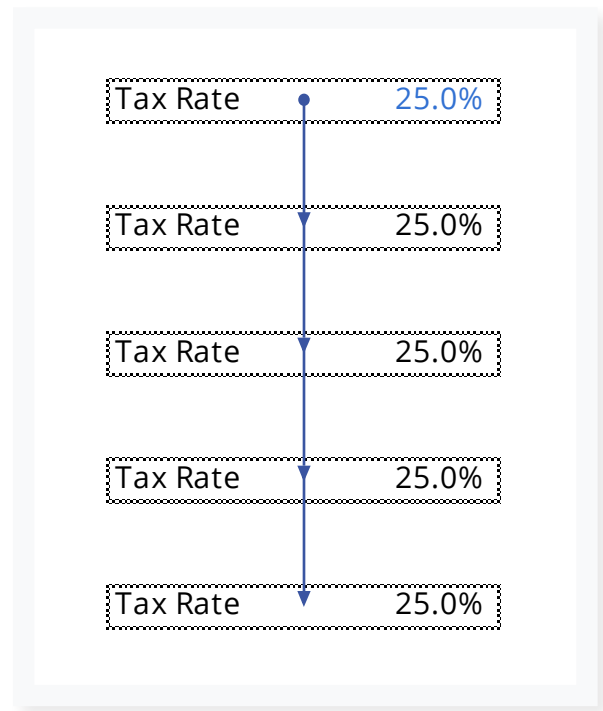


Fig 10: Connecting to Source

Layout & Printing

Models should be properly set up to print or to be saved in PDF format

We've now discussed the model dashboard, the drivers, and the inputs. Before we continue the dialogue into the other building blocks of a model, we need to transition over to a discussion around model printing. We believe that all models should be set up properly for printing. Even if you or your team is striving to reduce the use of paper, the file should be configured to be saved as a formatted file type such as a PDF. This allows users to quickly open the file and save it with a locked in presentation format very quickly. In Fig 11 on next page we have shown an example of a Print Preview for a formatted model.

Model printability is something that often gets overlooked

Model printability often gets overlooked. It is becoming more and more common to utilize models mostly in Excel instead of on paper. However, what is getting lost with the trend away from printing is the model's ability to present results to its audience. We need to remember that models are decision making tools that are often used by

senior leaders within organizations. These executives may not be spending as much time in Excel and may prefer to see a printed copy of the model or view it in a locked in format like PDF.

All schedules within the model should be included in the print

When configuring the print settings for a model, it is important to think about the model in its entirety. It is very common to encounter models that are only configured to print a few key output pages. While this allows the reader to focus on the crucial model outputs, it does not provide full transparency into the calculations within the entire model. In order to be comfortable using the model to help with important decisions, executives need to see and understand all of the calculations in the model. While the most important components of the model may be prioritized to the first pages of the print, all schedules and modules should be included in the printout.

File Print Preview

Print
Print

Page Setup
Page Setup

Zoom
Zoom

Next Page
Next Page

Previous Page
Previous Page

Show Margins
Show Margins

Close Print Preview
Close Print Preview

DCF Valuation Modeling

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Model Checks

Incorrect Date Set for Valuation?	No
Incorrect Date Set for First Cash Flow?	No
Terminal Growth Rate Greater Than or Equal To WACC?	No
Model exceeding operational capacity?	Yes
Unused Tax Losses Remaining? (Levered Schedule)	No
Unused Tax Losses Remaining? (Unlevered Schedule)	No
Two UFCF Methods Different?	No

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Preview: Page 1 of 14
Zoom In ————— + 100%

Fig 11: Print Preview of a Formatted Model

We don't recommend printing in order from inputs to outputs

In Fig 12 to the next page, you may recognize the building blocks or elements from Fig 06 that were presented earlier. When presented previously, we had shown these building blocks organized into a tall stack. Remember that our model design process began with an understanding of the flow of the model. This is where we solved from the dashboard backward through the model to the inputs. This gave us an understanding of the linear flow through the model. Although this was a critical step in the model design process, this does not mean that we recommend printing the model in this order. Although it is relatively common to print financial models in an order that matches this flow, we prefer to reorganize the model to prioritize the elements from a presentation perspective.

We prefer to prioritize the model dashboard, drivers, and inputs

Our preference is to place a focus on the most important elements necessary for the audience to quickly understand the model. These are the outputs and inputs. More specifically, the critical elements would be the model dashboard, the drivers, and the inputs. While these building blocks only represent a small portion of the model, they are the most important elements for decision-makers to understand.

We make sure decision-makers see all outputs and inputs first

As shown in Fig 12, we've given these elements a very high priority in the print order. As indicated, the first two tabs after the cover are outputs and inputs. Essentially, the audience first needs to know what is coming out of the model, then all the inputs that generated those outputs. To be specific, we are presenting the cover page, dashboard, drivers, and inputs on the first few pages of the model. This begins the print with the elements that are critical for most readers. The cover page provides basic information about the project or company. Then, the outputs are presented on the dashboard. Next, the reader is able to see the main drivers and the remaining inputs. Within these first few pages, they have been able to see the outputs and all the inputs that led to those outputs.

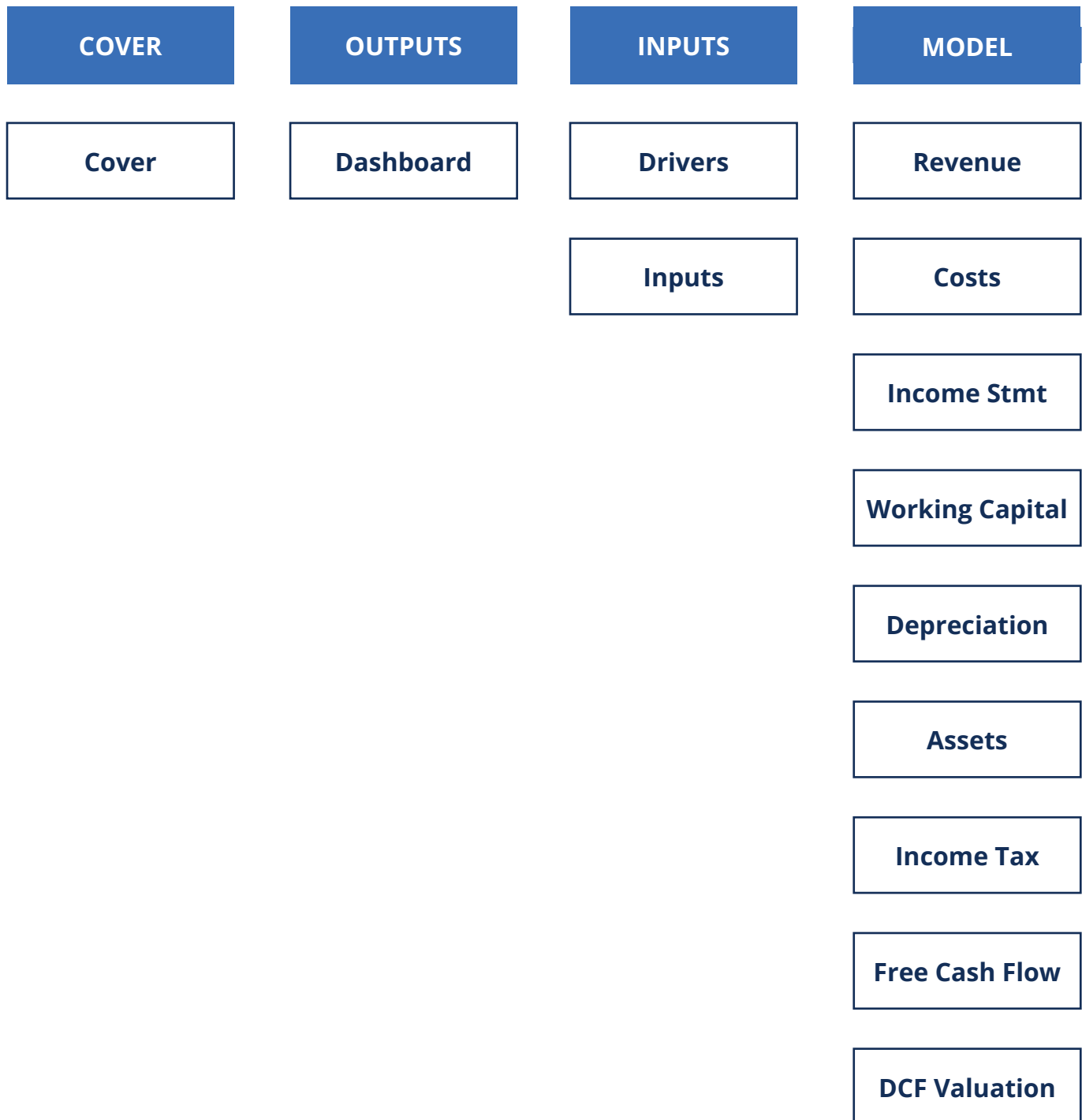
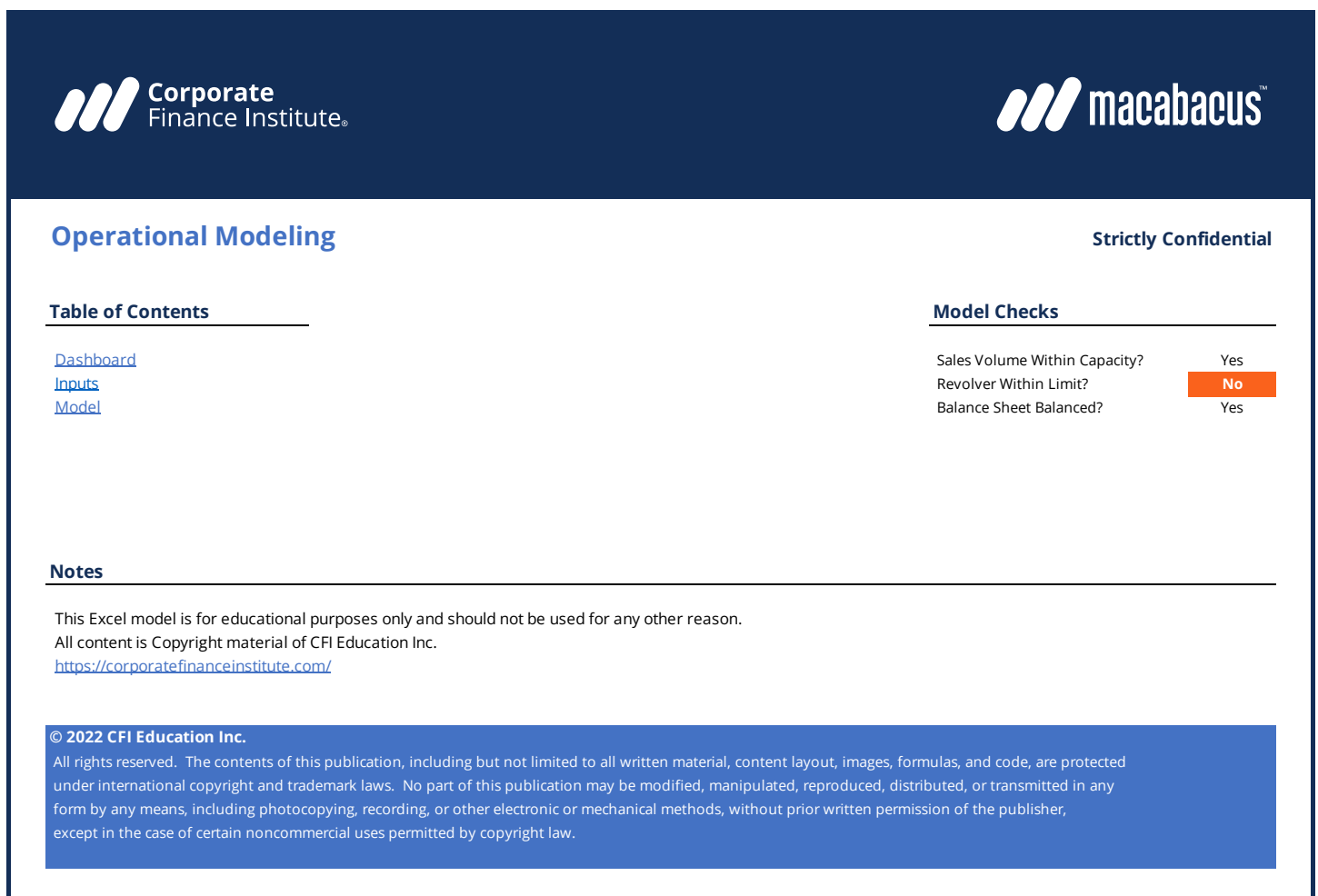




Fig 12: Prioritizing a Model from a Presentation Perspective

It is important to include a cover page at the beginning of every model

Let's look at some examples of the first few pages of a model. The first page of a model should always be a cover page, as shown in the example below in Fig 13. The cover page conveys basic information

about the model, like the name of the underlying project or company. As indicated below, it also includes a table of contents as well as legal disclaimers. Other common elements that can be included are version numbers, dates, and times.



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Sales Volume Within Capacity?	Yes
Revolver Within Limit?	No
Balance Sheet Balanced?	Yes

Notes

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Fig 13: Well Designed Model Page

We recommend including checks which can be summarized on the cover

As shown on the previous page in Fig 13, the cover page is also a great place to include a summary of model checks. Since the cover is highly visible, placing a summary of the checks here will ensure that they are noticed. Later, we will discuss how to add a summary of the alerts to each model tab to ensure they are noticed immediately if tripped. We have shown one of the checks previously just to illustrate how a bold format in a different color can bring attention to the reader. Printing a model that has checks in place but none tripped will help to instill confidence in the audience. They will be able to see that the model designer has diligently included checks that are all inside of their allowable limits.

Printing: Model outputs should be presented near the front of the model

Although it is common to print an output page or conclusion at the end of a presentation, we believe this should be the first item presented after the cover page. Executives are usually most interested in the model outputs, which is why we recommend positioning them right at the beginning of the print. As shown on the next page in Fig 14, we recommend printing the model dashboard immediately after the cover page. This starts the presentation with the conclusion and aligns everyone to the model outputs.

We recommend printing the drivers immediately after the dashboard

The next most important item to print would be the model drivers. Remember that these are the critical model inputs that have a large impact on the outputs. On page 23 in Fig 15, we have shown an example of a page showing the main model drivers. As indicated, the drivers would be presented on the third page in the model print. So, immediately after seeing the dashboard or outputs, the audience is able to see the main drivers that contributed to those outputs. Below the model drivers, we have also included some other inputs, as shown below.

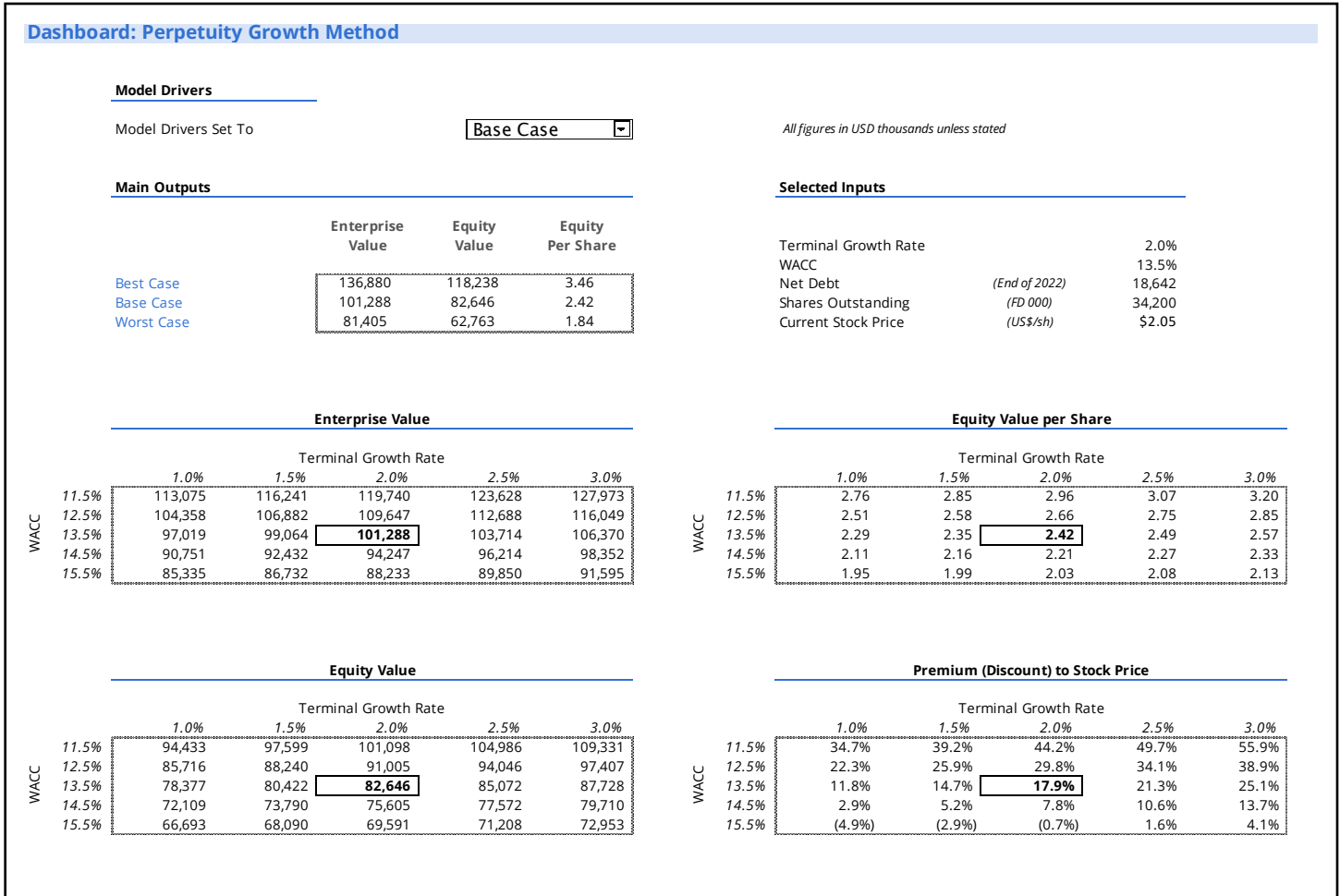


Fig 14: Example of a Dashboard

Drivers			2023F	2024F	2025F	2026F	2027F	Term
<i>All figures in USD thousands unless stated</i>								
Driver Switch	Base Case <input type="button" value="v"/>							
Sales Volume Growth			2.0%	1.0%	1.0%	0.5%	0.5%	0.5%
Best Case			3.0%	2.0%	2.0%	1.5%	1.5%	1.0%
Base Case			2.0%	1.0%	1.0%	0.5%	0.5%	0.5%
Worst Case			1.0%	1.0%	0.5%	0.5%	0.5%	0.5%
Pricing Increases			3.0%	1.0%	1.0%	1.0%	0.5%	0.5%
Best Case			3.5%	2.0%	2.0%	2.0%	1.5%	0.8%
Base Case			3.0%	1.0%	1.0%	1.0%	0.5%	0.5%
Worst Case			1.0%	1.0%	0.5%	0.5%	0.5%	0.5%
Capital Expenditure			4,550	4,700	4,850	5,000	5,125	5,300
Best Case			4,000	4,300	4,400	4,600	4,800	4,900
Base Case			4,550	4,700	4,850	5,000	5,125	5,300
Worst Case			5,000	5,200	5,400	5,500	5,600	5,800
Inflation Rate			3.5%	3.0%	3.0%	2.5%	2.5%	1.5%
Working Capital ' 								
Accounts Receivable	(Days)		45	45	45	45	45	45
Accounts Payable	(Days)		25	25	25	25	25	25
Inventory	(Days)		40	40	40	40	40	40

We have assumed working capital amounts per day in terminal year are equal to the previous year. ⁽¹⁾

Fig 15: Example of Model Drivers

Weighted Average Cost of Capital

All figures in USD thousands unless stated

Name	Region	Debt	Equity	Average	Debt/	Debt/	Levered	Unlevered
				Tax Rate ¹	Equity	Capital	Beta ²	Beta ³
Surge Batteries Inc.	North America	63,702	375,499	31.5%	17.0%	14.5%	0.85	0.76
Future Energy Co.	North America	43,422	311,425	32.2%	13.9%	12.2%	1.01	0.92
Clean Green Ltd.	Europe	26,211	131,996	31.9%	19.9%	16.6%	1.34	1.18
Full Power Solutions Ltd.	Europe	15,109	95,746	33.0%	15.8%	13.6%	0.99	0.90
Earthcor Power Inc.	North America	22,676	666,541	30.2%	3.4%	3.3%	0.88	0.86
Average				31.8%	14.0%	12.0%	1.01	0.92
Median				31.9%	15.8%	13.6%	0.99	0.90

Risk Premium for Equity

Risk Premium (Levered)	4.5%
Average Unlevered Beta	0.92
Levered Beta ⁴	1.06
Risk Premium for Equity	4.7%

Cost of Equity

Risk Free Rate	2.4%
Risk Premium for Equity	4.7%
Risk Premium for Country	-
Risk Premium for Company Specific	8.0%
Cost of Equity	15.1%

Capital Structure

		Current	Target
Total Debt	19,102	13.2%	15.0%
Market Capitalization	126,120	86.8%	85.0%
Total Capitalization	145,222	100.0%	100.0%
Debt / Equity		15.1%	17.6%

Cost of Debt

Pre-Tax Cost of Debt	5.2%
Tax Rate	20.0%
After-Tax Cost of Debt	4.2%

Weighted Average Cost of Capital

	Weight	Cost
Debt Capital	15.0%	4.2%
Equity Capital	85.0%	15.1%
Weighted Average Cost of Capital		13.5%

Tax Rate is a 5-Year Average. ⁽¹⁾

Levered beta is based on 5-year monthly data. ⁽²⁾

Unlevered Beta = Levered Beta / (1 + (1 - Tax Rate) × Debt-to-Equity) ⁽³⁾

Levered Beta = Unlevered Beta × (1 + (1 - Tax rate) × (Debt-to-Equity)) ⁽⁴⁾

Fig 16: Example of Model Inputs

We present the remaining inputs after the model drivers

The next schedule that we recommend printing would be the remaining model inputs, as shown on the previous page in Fig 16. In this example, we have shown the inputs used to calculate the weighted average cost of capital (WACC) for a company. Essentially, these are all the remaining inputs to the model that didn't meet our criteria of being drivers. So, we present the most critical inputs first, which are the drivers, followed by the less important inputs. This means that the audience has now seen all the inputs required in the model.

Many audience members will only need to see the outputs and the inputs

At this point, we've now printed the most important parts of the model from a presentation perspective. The audience has seen a cover page, the dashboard showing model outputs, the main drivers, and other model inputs. Effectively, everyone has now seen the model outputs and every input that led to those outputs. Many of the audience members would not require any more information at this point in time. They know what is flowing through the model and what it is saying to assist them with their decision. If they were comfortable with the model building abilities of the team and the internal model review process, then they likely would not need to see the remaining schedules.

The major model calculations are contained in the remaining schedules

The remaining schedules contain all the major calculations in the model. While these schedules are arguably the most important part of the model from a computation perspective, they are not necessarily the most important elements to present first to the audience. The audience first needs to know the key insight coming out of the model and which variables contributed to that insight. For those that need to dig deeper and understand the calculations, we always recommend including all the remaining model schedules.

The remaining model schedules act like an appendix in many ways

An example of one of these remaining model schedules is shown on the next page in Fig 17. In this case, we've included a revenue schedule, which is where the revenue estimates are being calculated in the model. Although it has not been shown below, this may be followed by other schedules dedicated to costs, working capital, or depreciation. In many ways, these remaining schedules are like an appendix. These are intended for those who are curious about the various methods used for the calculations in the model.

Revenue Schedule		2020A	2021A	2022A	2023F	2024F	2025F	2026F	2027F	Term
<i>All figures in USD thousands unless stated</i>										
<i>Model Running: Base Case Drivers</i>										
Days in Period	365	365	365	365	365	365	365	365	365	365
Plant Capacity	1,500									
OPERATIONS										
Sales Volume Growth			2.0%	2.1%	2.0%	1.0%	1.0%	0.5%	0.5%	0.5%
Sales Volume	(Units/Day)	1,374	1,401	1,430	1,459	1,473	1,488	1,495	1,503	1,510
Plant Capacity	(Units/Day)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Operational Efficiency		91.6%	93.4%	95.3%	97.2%	98.2%	99.2%	99.7%	100.2%	100.7%
VOLUME										
Days in Period		365	365	365	365	365	365	365	365	365
Sales Volume	(Units/Day)	1,374	1,401	1,430	1,459	1,473	1,488	1,495	1,503	1,510
Sales Volume	(Units)	501,510	511,365	521,950	532,389	537,713	543,090	545,805	548,534	551,277
PRICING										
Pricing Increases			1.7%	2.1%	3.0%	1.0%	1.0%	1.0%	0.5%	0.5%
Unit Price	(USD/Unit)	102.86	104.61	106.81	110.01	111.11	112.23	113.35	113.91	114.48
REVENUE										
Sales Volume	(Units)	501,510	511,365	521,950	532,389	537,713	543,090	545,805	548,534	551,277
Sales Price	(USD/Unit)	102.86	104.61	106.81	110.01	111.11	112.23	113.35	113.91	114.48
Revenue		51,585	53,494	55,749	58,570	59,748	60,949	61,866	62,486	63,113
Operational Capacity Exceeded?		No	No	No	No	No	No	No	Yes	Yes

Fig 17: Example of a Revenue Schedule

A driver interacts more with the dashboard of a car than the engine

If we think about the first four pages printed as being like the dashboard of an automobile, then these remaining schedules would be the engine. It's fair to say that people would regularly interact with the dashboard of an automobile but would not look under the hood to check the engine as often. In this sense, we need to make sure that the first few pages of the dashboard have all the elements that the driver would need. The remaining schedules under the hood are where the real work is done through detailed calculations.

The remaining schedules are often printed to match the model flow

These remaining schedules are often printed in an order that matches the flow of information in the model. This would be the default unless there was a compelling reason to deviate from this order matching the model flow. For instance, a company's financial statements may be a part of these remaining schedules. When we feel that this should be prioritized ahead of the other schedules, we may move them to be positioned next in the print ahead of other schedules that may be showing revenue or costs.

All pages should include a title at the top and clearly marked units

Now that we have positioned the high priority pages to the front of the model, we should pause to think about some important features to include on each page of the printout. In Fig 18 on the next page, we have shown an example of a dashboard. As indicated, all pages should have clear titles at the top indicating exactly what information is being presented. We've also included a global units marker at the top left, indicating that all figures are in USD millions.

Excel has very intuitive settings to include many features as custom footers

Making use of Excel's custom footer functionality can also work really well. This feature was used in Fig 18. As you can see, we are showing the model name, number of pages, and a corporate logo in the footer. Other common elements to include in the footer would be the exact file name, file path, or the print date and time. The custom footer settings are quite easy to use in Excel and also update dynamically as changes are made to the workbook. These features can be found in the Page Setup dialog box by using the shortcut ALT PPS. Custom footer settings are in the Header/Footer tab.

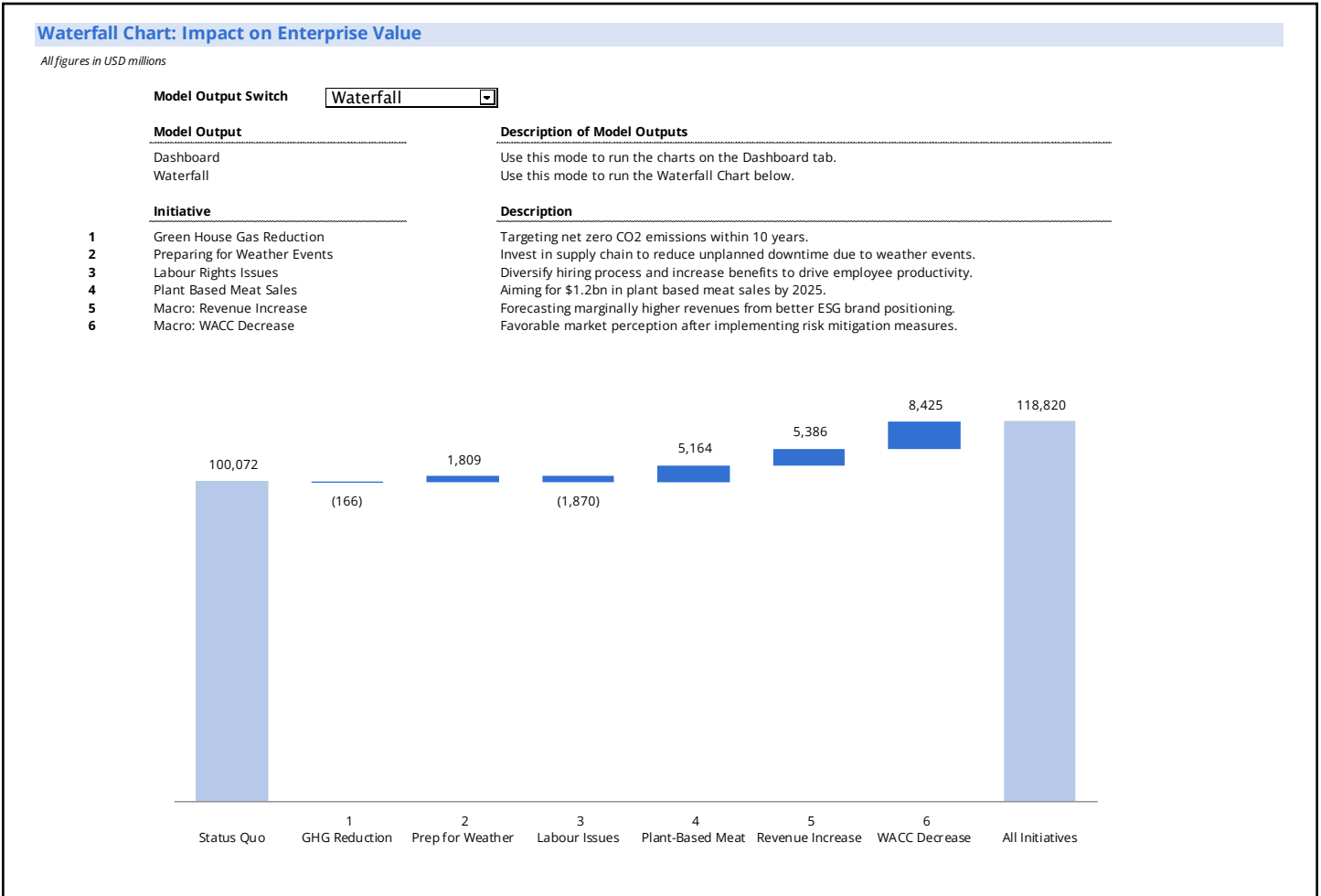


Fig 18: Example of a Dashboard

It is important to understand how to print a tall stack of schedules

In the following section, we will be discussing model structure. In particular, we will explain our preference for stacking the schedules on top of one another within one tab or worksheet. Knowing that this is where our discussion will be heading, it may be important now to address how a tall stack of schedules might be printed.

Individual pages should always be separated by at least one row

Without going into all the details of print settings here, we should highlight the importance of individually selecting each page in a tall stack of schedules. An example of such a stack of schedules is shown just ahead in Fig 21. If you look closely, you can see a break of at least one row between every page. Including these breaks is critical to allow us to control the print settings for each page or schedule.

Using the Smart Print Area tool from Macabacus can save a lot of time

This requires individually selecting each page down through the stack, which can be quite time consuming. Macabacus has a great feature that expedites this process called Smart Print Area, which is shown below in Fig 19. This feature can be executed quickly using the default shortcut CTRL ALT SHIFT B. It allows us to quickly define the first print area using 'Set as print area.' Then, as we progress down through the model, we can select 'Add to print area.' This intuitive function enables us to set up the print areas very quickly for our models and saves an incredible amount of time.

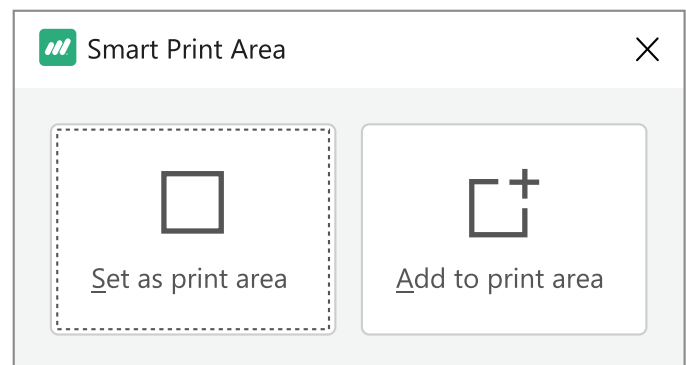


Fig 19: Smart Print Area from Macabacus

Stacking Schedules

Models can be organized with each schedule on a worksheet

As we have discussed, financial models are made up of schedules or building blocks. These schedules can be assembled together in two general ways. The first way is shown below in Fig 20. As indicated, the schedules can be placed side by side, with each one on its own tab or worksheet. One reason many people like this structure is that it is easy to see all the tabs at the bottom of the file. In fact, the tabs appear as a button and act like a table of contents which facilitates navigation. Essentially, a user can see all the tabs at the bottom of a file and easily click on one to quickly navigate into that schedule.

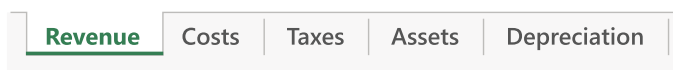


Fig 20: Schedules Positioned Across Many Tabs

This structure often leads to errors and is difficult to check

Although these models can be easy to navigate, they have other more important disadvantages. First, their structure requires a lot of linking between tabs or worksheets. One issue with this is that it is easier to make errors when connecting from one tab to another. This is why we often

find more linking errors in these types of models. Second, these models are more difficult to follow and check. Often, more advanced model review techniques are needed in order to follow links across from one tab to another.

Navigation can become difficult with a large number of tabs

Another reason why this structure is not preferred is that it leads to models with a very large number of tabs or worksheets. This not only increases the amount of inter linking between tabs, but navigation also becomes more difficult. In many cases, all the tabs may not be visible at the bottom of the Excel interface, and horizontal scrolling may be needed to see them. At this point, the tabs no longer work very well as a table of contents, leading to challenges with model navigation.

Stack the schedules to link the model quickly with fewer errors

We prefer stacking the schedules on top of one another, as shown in Fig 21. In this diagram, we are showing five pages or stacked schedules within a single tab. A model with this structure is preferred since it is much easier to connect and check. Stacked schedules can be easily connected by simply linking directly upwards or downwards within the tab.

Aligning Columns

Stack schedules with their periods aligned and use the keyboard

It is also important to align the columns with schedule stacking. Each period should be in its own dedicated column, so schedules are stacked with their respective periods aligned. This is illustrated in Fig 22 and 23 on the next page, where 2023 data is in the same column for both figures. This ensures consistency and further facilitates connecting the schedules. Using the keyboard, we can be sure to stay in the same column by simply using the up or down arrows to avoid linking to the wrong period. This allows the schedules to be connected quickly with fewer linking errors.

Show All Precedents using Macabacus helps with model auditing

The blue arrows on the next page show the precedents from the COGS line in the Income Statement. A standard version of Excel can only trace one precedent at a time. We have used the Show All Precedents feature below from Macabacus, which is very helpful for formula auditing.

A model with stacked schedules is much easier to check

A model with stacked schedules is also much easier to check since most of the links are within the same worksheet. In Fig 23, we've shown the cost of goods sold (COGS) line on the Income Statement linked directly upwards to a Cost Summary in Fig 22. This clearly illustrates the alignment in the model and the consistency between periods and columns. This makes it easy for us to check the model since we are expecting vertical arrows, as shown in the example, when we trace precedents or dependents.

Fig 21: Stacking the Schedules

All figures in USD thousands unless stated

		2022A	2023F	2024F	2025F	2026F	2027F
COST SUMMARY							
Variable Costs	(USD/Unit)	12.39	12.76	12.95	13.11	13.25	13.39
Fixed Costs	(USD/Unit)	42.76	42.63	42.63	42.63	42.63	42.63
Total Costs	(USD/Unit)	55.15	55.40	55.59	55.74	55.89	56.02
Variable Costs		6,568	6,989	7,200	7,374	7,537	7,688
Fixed Costs		22,668	23,348	23,698	23,983	24,246	24,489
Total Costs		29,236	30,337	30,898	31,356	31,783	32,177

Fig 22: Cost Summary

All figures in USD thousands unless stated

		2022A	2023F	2024F	2025F	2026F	2027F
Revenue		52,185	56,428	58,134	59,537	60,854	62,077
COGS		29,236	30,337	30,898	31,356	31,783	32,177
Gross Profit		22,949	26,091	27,235	28,181	29,071	29,900

Fig 23: Selected Income Statement Items

Freezing Panes

It is common to use the freeze panes option to display periods

When using a model with a tall stack of schedules, it can be helpful to use the freeze panes option in the View section of the Excel ribbon. While many model builders like to have the periods displayed in the frozen panes, we prefer to display the periods at the top of each schedule. This allows us to use the frozen panes for other purposes.



Fig 24: Freezing Panes Showing Model Alerts

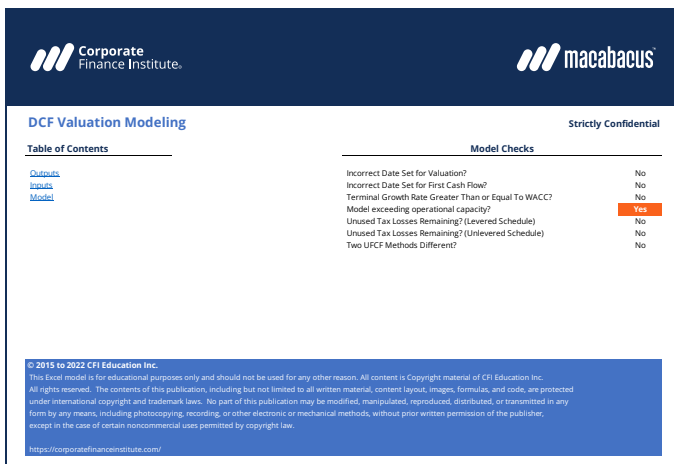
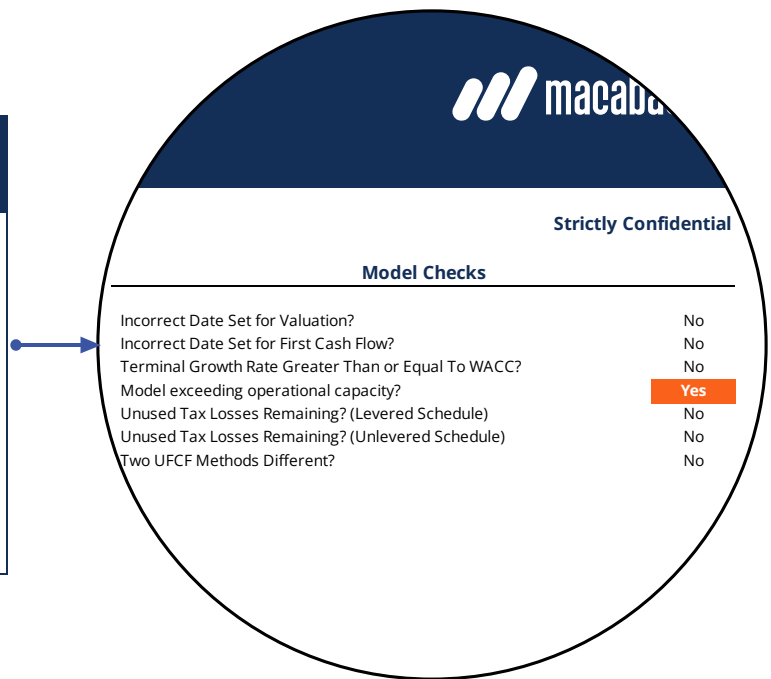


Fig 25: Example of a Cover Page

We prefer placing logos and model checks into the frozen panes

In Fig 24 to the left, we have shown how frozen panes can be used for corporate logos for branding purposes. More importantly, the frozen panes are a perfect spot to place a summary of the model checks so that they are always within view. The frozen panes can have a 'Check Model' alert indicating that at least one of the model checks has been tripped. We would then know to move to the cover page to review the checks to see which one had been tripped. In Fig 25 below, we have shown a cover page with model checks summary.



Column & Row Consistency

A consistent column structure within each worksheet is imperative

As we just discussed, we should always keep the use of columns consistent within a single worksheet. For instance, if a certain column of a worksheet is used to show information for a specific period, then that should be kept consistent through the worksheet from top to bottom. Many model designers will take this a step further to make the structure of all columns across the workbook or file consistent. This means that the information for a certain period would always be found in the same column regardless of which worksheet it was located in. While this is not as important as the consistency within a worksheet, it can help to avoid linking errors and can speed up a model review.

Consistency across rows speeds up the model build and review

We should always strive to have consistent formulas across rows within our models. By this, we mean that the formulas should be identical in a given row all the way across from left to right. This makes the model faster to build and also easier to check. Empty columns between periods should also be avoided. As shown in Fig 26 below, the cells from the year 2022 to 2027 are all contiguous. When we're building the model, we only need to build formulas in for 2022 since we can easily copy them from left to right. When it is time for a team member to do a review, they also only need to review one column. Once the column with 2022 information has been reviewed, they can check for consistency across the rows. This can save enormous amounts of time, enabling them to focus on the structure of a single column instead of checking all columns of the model.

<i>All figures in USD thousands unless stated</i>	2022A	2023F	2024F	2025F	2026F	2027F
Revenue	52,185	56,428	58,134	59,537	60,854	62,077
COGS	29,236	30,337	30,898	31,356	31,783	32,177
Gross Profit	22,949	26,091	27,235	28,181	29,071	29,900

Fig 26: Selected Income Statement Items

Row differences can be checked very quickly using the CTRL \ shortcut

The previous diagram in Fig 26 shows an area highlighted in blue. Let's suppose we have checked the 2022 formulas in the first column. We could select columns across the blue area and check for row differences by selecting F5, Special, Row Differences. If there were differences, then the cursor would move instantly to the cells that were different. If there weren't any differences, then we would see the dialog box shown below in Fig 27. Row differences can also be checked with the keyboard using CTRL \. The shortcut for column differences is CTRL SHIFT \.

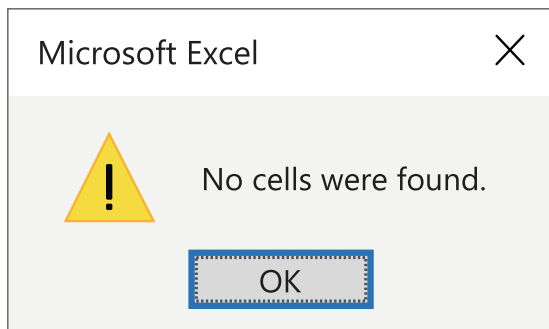


Fig 27: Result With No Row Differences

The visualization features in Excel can help to locate anomalies in a model

Macabacus has a number of visualization features that can greatly assist with model reviews. In Fig 28 on the next page, we have shown an example of one of these visualizations called Formula Flow. To produce this effect, we selected all the cells on the income statement in the next page from 2023 to 2027 and ran the Formula Flow function. We can tell instantly from the uninterrupted horizontal line patterns that there is perfect consistency from left to right over this area. These visualization effects can really help to highlight areas of possible concern in a financial model.

All figures in USD thousands unless stated

	2022A	2023F	2024F	2025F	2026F	2027F
Revenue	52,185	56,428	58,134	59,537	60,854	62,077
COGS	31,368	30,337	30,898	31,356	31,783	32,177
Gross Profit	20,817	26,091	27,235	28,181	29,071	29,900
SG&A	7,708	7,939	8,138	8,300	8,425	8,551
Other	2,026	2,087	2,139	2,182	2,214	2,248
EBITDA	11,083	16,065	16,959	17,699	18,431	19,101
Depreciation	2,907	4,168	4,382	4,600	4,823	5,049
EBIT	8,176	11,897	12,577	13,098	13,609	14,052
Interest	2,448	2,520	2,520	2,520	2,520	2,520
EBT	5,728	9,377	10,057	10,578	11,089	11,532
Current Tax	-	-	132	2,353	2,586	2,793
Deferred Tax	1,577	2,344	2,382	291	186	90
Total Tax	1,577	2,344	2,514	2,645	2,772	2,883
Net Income	4,151	7,033	7,543	7,934	8,316	8,649

Fig 28: Income Statement

Periodicity

Annual models are usually preferred for their simplicity

Another important attribute to consider when discussing model structure is its periodicity. This refers to the frequency of the intervals in the model. As a part of the design process, we need to consider whether to build a monthly, quarterly, or annual model. Annual models are the most simple and are preferred unless there is a compelling reason why a quarterly or monthly model is necessary. For example, quarterly models may be needed by public companies in order to publish financial results on a quarterly basis. Similarly, monthly models may be required for budgeting and financial planning purposes.

Avoid mixing the periodicity across adjacent columns

As you can imagine, some models need to include both quarterly and annual estimates. In order to meet these needs, models are often designed with four quarters across adjacent columns, summing annual results in a fifth column as shown below in Fig 29. Although this structure can be relatively common, it is not generally recommended. The issue with this structure is that the formulas in the fifth annual column will be different than those in the preceding four columns. This prevents formulas from being copied left to right across all columns and increases the time required to build the model. For this reason, it is recommended to avoid mixing the periodicity in tabs. In the example below, we have run the Formula Flow feature from Macabacus, which shows row consistency across the first four columns for revenue and COGS, but an inconsistency in the fifth.

<i>All figures in USD thousands unless stated</i>	Q1	Q2	Q3	Q4	2022
Revenue	13,046	13,046	13,046	13,046	52,185
COGS	7,842	7,842	7,842	7,842	31,368
Gross Profit	5,204	5,204	5,204	5,204	20,817

Fig 29: Quarterly & Annual Calculations

Begin building the model with the most granular periodicity

When quarterly and annual figures are needed, it is best to place these figures in completely separate areas of the model. This can be done inside one worksheet or tab, as shown below in Fig 30. In this example, we have built the logic using the most granular periodicity on the right, which is quarterly. Then, on the left, we have aggregated the amounts up to show the annual figures. This approach provides a clear separation between the quarterly and annual amounts, which is needed to avoid inadvertent copying of the formulas across from one section to another.

Another approach is to have one quarterly and one annual tab

Another approach that also works well involves using a dedicated tab for quarterly figures and another one for annual figures. The tab structure for a model like this may look similar to what is shown below in Fig 31. The first step would be to build the entire model on the Quarterly tab. This follows our earlier guidance that we should always begin the build with the most granular periodicity.

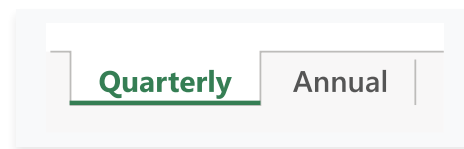


Fig 31: Separate Quarterly and Annual Tabs

	2022		2022				2023			
	2022	2023	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	Q3 2023	Q4 2023
Revenue	53,772	58,204	13,046	13,307	13,573	13,845	14,122	14,404	14,692	14,986
COGS	32,322	34,986	7,842	7,999	8,159	8,322	8,488	8,658	8,831	9,008
Gross Profit	21,450	23,218	5,204	5,308	5,415	5,523	5,633	5,746	5,861	5,978

All figures in USD thousands unless stated

Fig 30: Annual & Quarterly Periodicity

The Quarterly tab would only have consecutive quarterly periods

In this example, the Quarterly tab would only have consecutive quarters without any annual sums. This is where the majority of time will be spent on the model build. With only quarterly estimates, formulas could be easily copied across from left to right, which saves time and ensures consistency. If a different model required monthly estimates, then the model would be built on a Monthly tab. As discussed, the build should always be done in the tab that has the most granular periodicity.

A Quarterly tab can be copied to produce an Annual one

We've shown how such a Quarterly tab would look in Fig 32 below. With only quarterly information, the formulas will be easy to copy from left to right to ensure consistency. Once the build of this tab is complete, then it can be copied to produce an Annual tab, as shown in Fig 33.

	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	Q3 2023	Q4 2023
Revenue	13,046	13,307	13,573	13,845	14,122	14,404	14,692	14,986
COGS	7,842	7,999	8,159	8,322	8,488	8,658	8,831	9,008
Gross Profit	5,204	5,308	5,415	5,523	5,633	5,746	5,861	5,978

All figures in USD thousands unless stated

Fig 32: Quarterly Periodicity

The Annual tab has only formulas since it aggregates information

By copying the Quarterly tab to produce the Annual tab, we ensure that the structure of each tab is identical from top to bottom. One difference between the two tabs in terms of structure is the periodicity. The other difference is that the Annual tab should only include formulas that are aggregating figures from the Quarterly tab. Using SUMIF or SUMIFS functions in the Annual tab for aggregation generally works quite well. On the below in Fig 33, we can see only black font in the Annual tab, indicating that it only has formulas used for aggregation of quarterly results.

Considering periodicity is a part of getting the right level of detail

Separating Quarterly and Annual information either within one tab or across two tabs is highly recommended. Besides being easier and faster to build, it is also less likely to lead to issues with formula consistency. There is considerably more work involved with building a model that shows more than one periodicity, like this example with Quarterly and Annual figures. So, careful consideration is recommended to make sure that the quarterly information is absolutely needed. Similarly, a team would want to make sure that monthly information is needed before beginning the process of building a tab with monthly periodicity. Finding the right level of detail for a model is very important and thinking about the periodicity is a part of this process.

	2022	2023	2024	2025
Revenue	53,772	58,204	63,002	68,195
COGS	32,322	34,986	37,870	40,992
Gross Profit	21,450	23,218	25,132	27,204

All figures in USD thousands unless stated

Fig 33: Annual Periodicity

Modularity & Schedules

All major calculations in a model should be done inside of schedules

We have discussed the recommended design and structure for financial models in quite a bit of detail already. As noted earlier in the design process, building blocks for models can include dashboards, financial statements, or model schedules. While a financial model can include many types of building blocks, it is the model schedules that truly make up the engine of a financial model. The schedules also typically outnumber the dashboards and financial statements by a large margin. In fact, schedules make up the bulk of a typical model and contain all the important calculations that take us from inputs through to outputs.

All schedules should have three main sections to keep things organized

In fact, the primary purpose of a schedule is to perform calculations. Schedules have three main parts, as shown on the next page in Fig 34, which uses an example of a Working Capital Schedule. There is typically a section at the top where figures enter the schedule, then a central section where we calculate, followed by bottom items that exit.

We frequently use borders to separate the items entering and exiting

In Fig 34, we are using the Days in Period, Revenue, and COGS in calculations to determine the line at the bottom labeled as Cash from Working Capital Items. While it's true that we also have some inputs in the middle of this schedule, the main function of the central section is to perform our calculations. As we can see below in Fig 34, we frequently use borders to separate the top items which are entering and the bottom items which are exiting.

Many builders attempt to make financial models too compact

In the previous example, the Cash from Working Capital Items line at the bottom of the Working Capital Schedule may flow into the company's Cash Flow Statement. In an effort to save space, model builders may load all the calculations shown previously in the Working Capital Schedule into one line on the Cash Flow Statement. While they may be making the model more compact by not including an entire Working Capital Schedule, they are creating a model that is less transparent and more difficult to understand.

All figures in USD thousands unless stated

	2022A	2023F	2024F	2025F	2026F		
Days in Period	365	365	365	365	365	ENTER	
Revenue	53,034	56,428	58,134	59,537	60,854		
COGS	29,236	30,337	30,898	31,356	31,783		
AMOUNTS PER DAY							
Accounts Receivable	(Days) 46	45	45	45	45	CALCULATE	
Inventory	(Days) 25	25	25	25	25		
Accounts Payable	(Days) 41	40	40	40	40		
TOTAL AMOUNTS							
Accounts Receivable	6,624	6,957	7,167	7,340	7,503		
Inventory	2,009	2,078	2,116	2,148	2,177		
Accounts Payable	3,319	3,325	3,386	3,436	3,483		
NET WORKING CAPITAL							
Current Assets	8,633	9,035	9,283	9,488	9,680		
Current Liabilities	3,319	3,325	3,386	3,436	3,483		
Net Working Capital	5,314	5,710	5,897	6,052	6,196		
Cash from Working Capital Items							
	(396)	(187)	(154)	(145)		EXIT	

Fig 34: Structure of a Schedule

Schedules provide the space needed to make calculations clear and simple

A better approach is to create a Working Capital Schedule, as shown previously in Fig 34. This schedule is dedicated to performing all the necessary calculations for the working capital items. This approach gives the model builder the required space to break calculations into small formulas and simple steps that others can easily understand. Once all the steps have been shown to arrive at the Cash from Working Capital Items line at the bottom, this line can simply be linked into the company's Cash Flow Statement. This approach to spacing out calculations inside of schedules is critically important in model building.

Navigational Columns

There are a few techniques to help navigate a tall stack of schedules

We understand now that schedules play a critical and prominent role inside of financial models. It is also preferred to stack a number of schedules on top of one another inside a single tab. As discussed previously, this allows for linking within one tab and minimizes the amount of linking across from one tab to another. This makes the model faster to build and also easier to check.

Although this type of stacking is preferred, navigation is one of the challenges that we will face with this type of structure. Thankfully, there are a few techniques that can help to ensure that users can easily locate and navigate to the various schedules within a tall stack.

Many model designers set up navigational columns to locate schedules

The first and most obvious technique which can be used to navigate a tall stack of schedules is the page up and page down buttons on a keyboard. This is generally where many modelers would start in terms of this type of navigation. We can also set up a navigational column on the left side of the model. On the next page in Fig 35 and 36, we have included a navigational column on the left side. The stops for the navigational column are shaded in blue and marked with a white X. This allows users to use the CTRL key with the up/down arrows to travel and stop at each schedule in the model. Setting the navigational column up as Column A is very convenient since one can simply tap the Home button to jump to Column A in order to begin navigating up or down.

Some model builders set up Custom Views to navigate to each schedule

All figures in USD thousands

		2022A	2023F	2024F	2025F	2026F	2027F
x	COST SUMMARY						
Variable Costs	(USD/Unit)	12.39	12.76	12.95	13.11	13.25	13.39
Fixed Costs	(USD/Unit)	42.76	42.63	42.63	42.63	42.63	42.63
Total Costs	(USD/Unit)	55.15	55.40	55.59	55.74	55.89	56.02
Variable Costs		6,568	6,989	7,200	7,374	7,537	7,688
Fixed Costs		22,668	23,348	23,698	23,983	24,246	24,489
Total Costs		29,236	30,337	30,898	31,356	31,783	32,177

Fig 35: Cost Summary

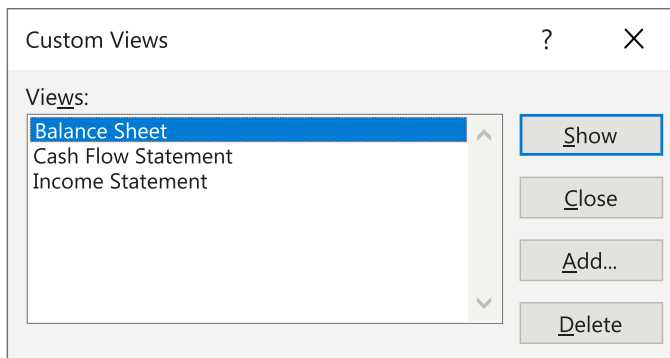
All figures in USD thousands

		2022A	2023F	2024F	2025F	2026F	2027F
x	Revenue	52,185	56,428	58,134	59,537	60,854	62,077
	COGS	31,368	30,337	30,898	31,356	31,783	32,177
	Gross Profit	20,817	26,091	27,235	28,181	29,071	29,900

Fig 36: Gross Profit

Excel also has a feature called Custom Views which can be set up in order to get to the various schedules within a model. Custom Views can be found in the View menu or activated using the ALT WC or ALT VV shortcut. The Custom Views dialogue box is shown in Fig 37 below. As indicated below, we can add a view for one of the financial statements.

Many users are not familiar with Custom Views and may not notice them



There are a few issues with Custom Views to note. First, many users are not familiar with them and may not realize that they have been set up in the model. For this reason, this feature may go unnoticed by many people accessing the model. Although Custom Views are quite fast and efficient to set up and use with the keyboard, they are not as convenient or obvious for those using a mouse.

Custom Views do not adjust properly to row insertions or deletions

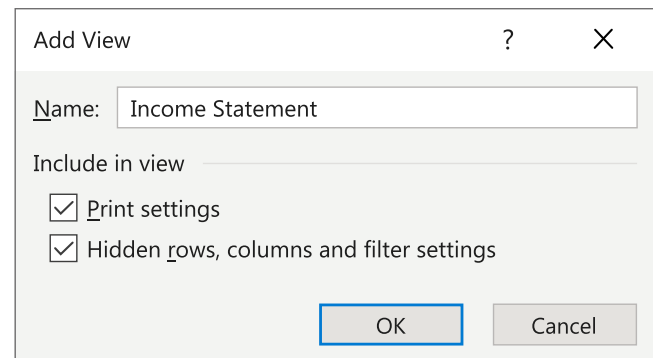


Fig 37: Using Custom Views for Schedules

Another more concerning issue with Custom Views is that they don't adjust to row insertions or deletions. Inserting rows at the top of a tab would move all Custom Views below to improper locations. For this reason, Custom Views do not work very well in a model that is still being built, where rows may be inserted or deleted.

Another issue with Custom Views is that they always sort alphabetically

Another issue with using Custom Views for schedules is that they always list in alphabetical order instead of by their location in the stack. Some users will get around this deficiency by preceding the name of the view with a number. The number would be associated with the order that the schedule occurs in the stack. This approach helps, but it also means adjusting the numbering system when subsequent schedules are added to the stack.

Row Grouping

We prefer to use row grouping together with a navigational column

Our preferred technique for navigation through a tall stack of schedules involves row grouping and a navigational column. We have shown an example on the next page in Fig 38 with some row grouping on the left hand side. We have placed an 'x' in Column A to illustrate the stops in the navigational column. In practice, we would use a space in place of all the 'x' characters as it is invisible but still provides a stop in the navigational column. With all the row grouping expanded, it is easy to navigate up and down through the model using the navigational column.

Collapsing the row groupings provides us with a table of contents to use

In Fig 39 on page next page, we have shown the model with the row groupings collapsed. The key takeaway here is that the headings for each schedule are now acting like a Table of Contents. With the row groupings collapsed, we can see a clear list of all the schedules in the tab, which is very helpful for navigation. Also, with the spaces inserted in the navigational column, we can quickly move to the correct schedule using the CTRL key and the up and down arrows. This allows for quick and efficient navigation to the targeted schedule.

1	2	A	B,C	D	E	F	G	H	I	J	K	L
1												
2	X	Profit Summary										
3		<i>All figures in USD thousands unless stated</i>										
4						2020A	2021A	2022A	2023F	2024F		
5												
6		Revenue				48,318	50,380	53,034	56,428	58,134		
7												
8												
9		Gross Profit				19,834	20,569	20,817	26,091	27,235		
10		Gross Profit Margin				41.0%	40.8%	39.3%	46.2%	46.8%		
11												
12		EBITDA				12,193	11,996	11,083	16,065	16,959		
13		EBITDA Margin				25.2%	23.8%	20.9%	28.5%	29.2%		
14												
15		EBIT				9,233	9,193	8,176	11,897	12,577		
16		EBIT Margin				19.1%	18.2%	15.4%	21.1%	21.6%		
17												
18												
19	X	Revenue Schedule										
20		<i>All figures in USD thousands unless stated</i>										
21						2020A	2021A	2022A	2023F	2024F		
22												
23		Days in Period				365	365	365	365	365		
24												

Fig 38: Expanded Row Grouping

1	2	A	B,C	D	E	F	G	H	I	J	K	L
1												
2		Profit Summary										
18	+	Revenue Schedule										
19												
61	+	Cost Schedule										
62												
108	+	Income Statement										
109												
138	+											

Fig 39: Collapsed Row Grouping

Custom Views

Row grouping can be expanded or collapsed with the mouse or keyboard

Once we arrive at the targeted schedule, a row grouping can be expanded with the mouse by using the +/- icons shown down the left hand side below in Fig 40. The row groupings can also be collapsed or expanded by clicking on the 1 or 2 in the top left corner of Fig 40 below. These numbers refer to the row grouping levels. Groupings can also be expanded or collapsed by selecting across them and using the Show/Hide Detail function in the Data Menu (ALT AJ and ALT AH). Although this works with the keyboard, it involves a few keystrokes and may involve more keystrokes when multiple groupings are being expanded or collapsed together.

We often use Custom Views to expand or collapse all row groupings

This is where we often make use of the Custom Views feature, which we discussed earlier. As shown below in Fig 40, we can program a 'Collapse Row Grouping' in as a Custom View. First, we collapse all the row groupings, navigate to cell A1, and set the Zoom to our preferred level. We set the Zoom level since Custom Views record Zoom settings as well as positions. Next, we open the Custom Views dialogue box (ALT WC or ALT VV) and program the view as 'Collapse Row Grouping.'

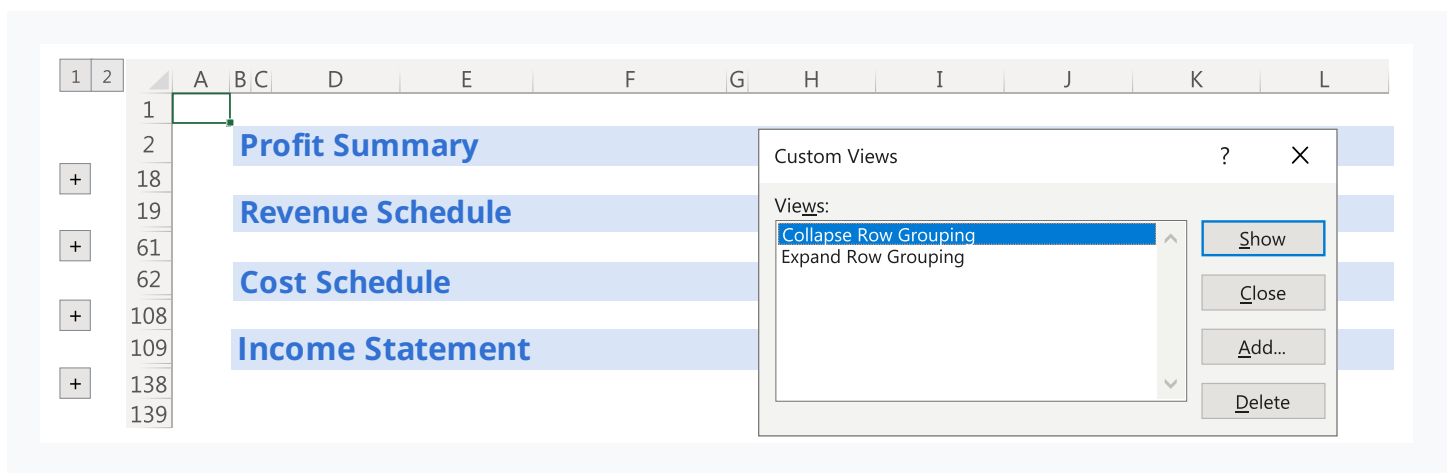


Fig 40: Collapsed Row Grouping as a Custom View

More Custom Views may be needed for other tabs in the model

Next, we could follow a similar procedure to program an 'Expand Row Grouping' Custom View as shown below in Fig 41. With these two Custom Views set, we can now quickly hit ALT WC or ALT VV then use the arrows to select our preferred view.

This is a very efficient way to expand and collapse all row groupings. One important point to remember is that these Custom Views have only been set for one tab, which is the Model tab in this case. If similar Custom Views were needed in other tabs, then they would need to be set with appropriate names.

	A	B	C	D	E	F	G	H	I	J	K	L
1												
2		Profit Summary										
3		<i>All figures in USD thousands unless stated</i>										
4												024F
5												
6		Revenue										134
7												
8												
9		Gross Profit										235
10		Gross Profit Margin										5.8%
11												
12		EBITDA										959
13		EBITDA Margin					25.2%	23.8%	20.9%	28.5%		29.2%
14												
15		EBIT					9,233	9,193	8,176	11,897		12,577
16		EBIT Margin					19.1%	18.2%	15.4%	21.1%		21.6%
17												
18												

Fig 41: Collapsed Row Grouping as a Custom View

Adding Indents

Further subcategorization within each schedule is recommended

We just had a detailed discussion about some of the techniques used to locate schedules nested in a tall stack. Given that schedules play such a dominant role in financial models, we should make sure that they are divided into clear sections that are easy to navigate to. Earlier, we discussed the idea that every schedule should be divided into three main sections. Starting from the top, we have a section to **enter** amounts, then we **calculate**, and finally, the figures will **exit**. All schedules should follow this general structure from top to bottom. However, it is useful to have some further subcategorization within each schedule.

The format of cells can be changed to produce visual indents

One way to achieve this additional subcategorization is by creating visual indents. There are two common ways to do this. The first technique is to change the format of the cells containing the labels to include indents. This can be done by going into the Alignment Tab in the Format Cells dialogue box (CTRL 1) and changing the default Text Alignment Indent from zero to a higher number.

Adjusting formats to indent can be time consuming without Macabacus

This produces a result similar to what is shown in Fig 42 on the next page. In this example, the indents have been applied to the 'Total Amount' and 'Margin' labels in Column B. Macabacus can greatly expedite this process since it has a dedicated shortcut for the Left Indent Cycle (CTRL SHIFT I). This enables us to quickly insert indents using cell formatting. However, those who are not using Macabacus may find it difficult to navigate to the settings required for these indents. Even when using the keyboard, navigating to these settings can be difficult.

We can also use little columns to produce indents in models

As discussed, the settings for adding indents into the format of cells can be difficult to get to. While using this approach produces a visual indent, it does not help us physically navigate to the various headings shown on page 52 in Fig 43, like Gross Profit or EBITDA. To solve this, we can use a different approach using little columns. In Fig 43, we've placed the bold headings like Gross Profit, EBITDA, and EBIT in Column B. The secondary labels like Total Amount and Margin have been placed in Column C.

A	B	C	D	E	F	G	H	I	J
Profit Summary									
<i>All figures in USD thousands unless stated</i>									
					2020A	2021A	2022A	2023F	2024F
Revenue					48,318	50,380	53,034	56,428	58,134
Gross Profit									
Total Amount					19,834	20,569	20,817	26,091	27,235
Margin					41.0%	40.8%	39.3%	46.2%	46.8%
EBITDA									
Total Amount					12,193	11,996	11,083	16,065	16,959
Margin					25.2%	23.8%	20.9%	28.5%	29.2%
EBIT									
Total Amount					9,233	9,193	8,176	11,897	12,577
Margin					19.1%	18.2%	15.4%	21.1%	21.6%

Fig 42: Indents using the Format Cells dialogue box

This type of indenting is quick and provides another navigational column

When we compare the diagram above in Fig 42 to the one on the next page in Fig 43, the visual result is almost identical. However, the approach shown on Fig 43 can be really quick to key in since no modification to formatting is required.

Also, an added benefit to the approach shown on the next page is that we have turned Column B into a second navigational column. This allows us to navigate quickly to the Profit Summary using Column A, then navigate to the subsections of the Profit Summary using Column B.

	A	B	C	D	E	F	G	H	I	J	K
Profit Summary											
<i>All figures in USD thousands unless stated</i>											
							2020A	2021A	2022A	2023F	2024F
Revenue							48,318	50,380	53,034	56,428	58,134
Gross Profit											
Total Amount							19,834	20,569	20,817	26,091	27,235
Margin							41.0%	40.8%	39.3%	46.2%	46.8%
EBITDA											
Total Amount							12,193	11,996	11,083	16,065	16,959
Margin							25.2%	23.8%	20.9%	28.5%	29.2%
EBIT											
Total Amount							9,233	9,193	8,176	11,897	12,577
Margin							19.1%	18.2%	15.4%	21.1%	21.6%

Fig 43: Indents using little columns

Indenting with little columns can be preferred for speed and simplicity

Although either of these indenting techniques can work in a model, some have a slight preference for the technique we just discussed, which uses

little columns. This technique is fast and simple and does not introduce formatting that may not be understood by others. By keeping things simple, we can ensure that our models can be built quickly and are easy to understand.

Consistent Labeling

Clear labeling is necessary for every row in a financial model

We've now discussed how indents can help to divide schedules up into clear and defined sections. If we elect to use mini columns for indenting, then we get the added benefit of a navigation column within our schedules. Another important topic that often gets overlooked is the importance of clear labeling for the various rows within a schedule.

It is not always practical to use identical labels for all linked figures

Let's now turn our attention to the two diagrams below and on the next page. In Fig 44, we have

highlighted Total Costs in blue. We have also shaded COGS in blue in Fig 45. In a perfect world, these labels would be identical since they are linked together. The word 'Total' is needed in the first instance below to indicate that the Total Costs are the sum of the Variable and Fixed Costs. In the second instance below, we have used the label Cost of Goods Sold, or COGS, as this nomenclature is common on an income statement. While it may seem prudent to use identical labels for all linked figures, we recognize that this is not always practical in all places in a financial model. For this reason, we recommend giving the model designer some flexibility with regards to labeling, provided it is clear and easy for others to understand.

<i>All figures in USD thousands unless stated</i>		2022A	2023F	2024F	2025F	2026F	2027F
COST SUMMARY							
Variable Costs	<i>(USD/Unit)</i>	12.39	12.76	12.95	13.11	13.25	13.39
Fixed Costs	<i>(USD/Unit)</i>	42.76	42.63	42.63	42.63	42.63	42.63
Total Costs	<i>(USD/Unit)</i>	55.15	55.40	55.59	55.74	55.89	56.02
Variable Costs		6,568	6,989	7,200	7,374	7,537	7,688
Fixed Costs		22,668	23,348	23,698	23,983	24,246	24,489
Total Costs		29,236	30,337	30,898	31,356	31,783	32,177

Fig 44: Cost Summary

All figures in USD thousands unless stated

	2022A	2023F	2024F	2025F	2026F	2027F
Revenue	52,185	56,428	58,134	59,537	60,854	62,077
COGS	29,236	30,337	30,898	31,356	31,783	32,177
Gross Profit	22,949	26,091	27,235	28,181	29,071	29,900

Fig 45: Selected Income Statement Items

Capitalization

Capitalization seems trivial, but it can have a big impact on the formatting

Another aspect of labeling, which seems trivial but warrants a discussion, is that of capitalization.

Our view on model formatting is that small discrepancies can make a big difference in financial models. Even small inconsistencies on something like capitalization can multiply over hundreds of cells to produce a result that is visually unappealing. For this reason, we feel that some consideration on this subject is warranted.

Case Cycle	Case Cycle
1 Sentence case	Cycle through sentence, title upper, and lower case styles for text in selected cells
2 Title Case	
3 UPPER CASE	Shortcut: Alt Shift C
4 lower case	

Fig 46: Capitalization Formats

There are four types of capital conventions to consider for models

There are four types of capitalization conventions to consider, as listed in the previous image Fig 46. The screenshot in Fig 46 was taken from the Macabacus section of the Excel ribbon showing the Case Cycle function. We will discuss this function later. But, for now let's consider each of these four types of capitalization that are listed.

Lower case formatting looks incomplete and unprofessional

We would not advise using lower case format in financial models. An example of some income statement items with lower case format is shown below in Fig 47. This format makes the model appear as though the formatting has not been

completed or reviewed. In many ways, it looks incomplete and unprofessional. For these reasons, we always avoid lower case formatting in models.

Using upper case to separate sections of a schedule can be quite effective

The next example on the following page in Fig 48 of a Working Capital Schedule shows a couple types of capitalization. First, we have used upper case and bold to clearly define three sections within the schedule. This makes it obvious to a reader that there are clear differences between each of these three sections. We find that using upper case to highlight parts of a schedule like this can be quite effective.

All figures in USD thousands unless stated

	2022A	2023F	2024F	2025F	2026F	2027F
revenue	52,185	56,428	58,134	59,537	60,854	62,077
cost of goods sold	29,236	30,337	30,898	31,356	31,783	32,177
gross profit	22,949	26,091	27,235	28,181	29,071	29,900

Fig 47: Selected Income Statement Items

All figures in USD thousands unless stated

		2022A	2023F	2024F	2025F	2026F	2027F
Days in Period		365	365	365	365	365	365
Revenue		52,185	56,428	58,134	59,537	60,854	62,077
COGS		29,236	30,337	30,898	31,356	31,783	32,177
AMOUNTS PER DAY							
Accounts Receivable	(Days)	46	45	45	45	45	45
Inventory	(Days)	25	25	25	25	25	25
Accounts Payable	(Days)	41	40	40	40	40	40
TOTAL AMOUNTS							
Accounts Receivable		6,624	6,957	7,167	7,340	7,503	7,653
Inventory		2,009	2,078	2,116	2,148	2,177	2,204
Accounts Payable		3,319	3,325	3,386	3,436	3,483	3,526
NET WORKING CAPITAL							
Current Assets		8,633	9,035	9,283	9,488	9,680	9,857
Current Liabilities		3,319	3,325	3,386	3,436	3,483	3,526
Net Working Capital		5,314	5,710	5,897	6,052	6,196	6,331
Cash From Working Capital Items			(396)	(187)	(154)	(145)	(135)

Fig 48: Working Capital Schedule

Decide between sentence case and title case and avoid mixing them

In Fig 48, we are also using title case, which puts a capital letter at the beginning of every word in each label. Alternatively, we could have used sentence case, which only places a capital letter on the first word of each text string. Our view on title case and sentence case is that either of them work well in financial models. However, it is quite common for model builders to mix these two formats since they are quite similar. Although this is easy to overlook, it is something that we feel should be kept consistent in financial models.

It is difficult to spot the differences between sentence and title case

It is very easy to identify lower case and upper case formats in financial models. However, it can be difficult to spot the differences between sentence and title case since they are so similar.

Case Cycle	Case Cycle
1 Sentence case	Cycle through sentence, title upper, and lower case styles for text in selected cells Shortcut: Alt Shift C
2 Title Case	
3 UPPER CASE	
4 lower case	

Fig 49: Macabacus Case Cycle Function

Even when differences are identified, it can be quite tedious to make these types of formatting changes in models. This is where we find the Case Cycle feature in Macabacus to be very helpful.

The Case Cycle function in Macabacus can save enormous amounts of time

As shown again below in Fig 49, the Case Cycle function in Macabacus rotates through sentence, title, upper and lower case using the ALT SHIFT C shortcut. This allows us to select large portions of a financial model and quickly change the format with regard to capitalization. Without this function, we would be forced to make changes manually or by using text functions like UPPER, LOWER and PROPER which are more time consuming. Also, we are not aware of a function in Excel that converts text strings to sentence case. Overall, this Macabacus function saves enormous amounts of time and helps to ensure our models are consistent.

Transparency

Always break large formulas up into a series of small, simple steps

As we've discussed, we recommend that calculations should be done inside schedules in a financial model. What is wonderful about using schedules for detailed calculations is that they provide the room required to complete these computations, which are often quite complex. Many model builders make the error of trying to construct financial models which are too compact. In an attempt to use fewer rows in the worksheet, they end up building long, complex formulas. The problem with this approach is that the models become difficult for others to understand.

Components left inside cells will not be visible when the model is printed

Let's look at the Revolver Schedule below in Fig 50 as an example. There is a relatively complex formula in the Additions (Repayments) line, which is not easy to understand. We can see that there are a few components being added together inside the MIN function below, but we would need to navigate to all these rows to check them. Also, if we printed this model, we would not be able to see the components inside this cell to understand it. This type of structure may be compact, but it is not very transparent.

All figures in USD thousands unless stated

	2022A	2023F	2024F	2025F	2026F	2027F
Revolver						
Beginning		-	3,134	2,042	-	-
Additions (Repayments)		=-MIN(J271+J280+J286+J290+J293+J296,J308)				
Ending	-	3,134	2,042	-	-	-
Interest Rate		7.8%	7.8%	7.8%	7.8%	7.8%
Interest Expense		122	202	80	-	-

Fig 50: Revolver Schedule

Positioning Precedents

We should prioritize transparency over many other design characteristics

Instead of aiming for the model to be compact, model builders should prioritize the transparency

of the model. We need to remember that models are decision making tools. In order to have confidence that the model can help with an important decision, the audience must be able to see into its working components. This is why transparency must be prioritized over other model design characteristics.

All figures in USD thousands unless stated

	2022A	2023F	2024F	2025F	2026F	2027F
Cash Available For Revolver						
Beginning Cash Balance	11,195	-	-	-	449	31,193
Cash From Operations	7,732	8,741	10,210	11,417	11,417	13,678
Cash From Investing	(18,264)	(3,725)	(3,024)	(5,326)	(5,326)	(5,645)
Issuance Of Long-Term Debt	-	-	-	-	-	(20,000)
Change In Common Stock	-	-	-	-	30,000	-
Dividends	(3,796)	(3,924)	(4,694)	(5,348)	(5,348)	(6,687)
Subtotal	(3,134)	1,092	2,491	31,193	31,193	12,539
Revolver						
Beginning	-	3,134	2,042	-	-	-
Additions (Repayments)	3,134	(1,092)	(2,042)	=-MIN(L328,L332)	-	-
Ending	-	3,134	2,042	-	-	-
Interest Rate	7.8%	7.8%	7.8%	7.8%	7.8%	7.8%
Interest Expense	122	202	80	-	-	-

Fig 51: Revolver Schedule

Model Transparency: Why is it important for all to see

In order to ensure that everyone can see into all parts of a model, large formulas should be broken down into small components. Please refer to Fig 51 on the previous page to see the Revolver Schedule from the last example with an improved structure. In the top section of this schedule in Fig 51, labeled as Cash Available for Revolver, we have shown all the figures and how they add to a subtotal. Each one of these line items will show up clearly in a print. This layout is much easier to understand since we can see that the deficit of \$3.1 million in fiscal 2023 will be drawn as an addition to the revolver. Similarly, the excess of \$1.1 million in the fiscal 2024 can repay a portion of the revolver balance.

We should try to print the precedents on every page of the financial model

A great way to make sure that a model has good transparency is to always print the precedents. When we review a model and look at each page, we ideally would want to be able to see all the precedent cells in print. Having them printed in close proximity makes the model so much easier to understand. Also, positioning precedent cells close by will help others understand the model during a peer-review process. In the example

above, we are showing all the precedent cells adding to a subtotal which then feeds into the revolver line labeled as Additions (Repayments).

Our team should be comfortable using the model to make decisions

Given the importance of model transparency, we have also provided Fig 52 on the next page. As you can see, we have navigated into one cell and hit the F2 key to display the formula. We are printing the precedents since we can clearly see every cell which is contributing to the accounts receivable balance in 2023. Following our guidelines for printing precedents will use more rows in your financial models. But, the advantage to pursuing this approach is that you will produce models that are truly transparent and easier for others to understand. We should always be striving to create an environment that makes our team more comfortable with using the model to inform their decisions.

All figures in USD thousands unless stated

	2022A	2023F	2024F	2025F	2026F	2027F
Days in Period	365	365	365	365	365	365
Revenue	52,185	56,428	58,134	59,537	60,854	62,077
COGS	29,236	30,337	30,898	31,356	31,783	32,177
AMOUNTS PER DAY						
Accounts Receivable (Days)	46	45	45	45	45	45
Inventory (Days)	25	25	25	25	25	25
Accounts Payable (Days)	41	40	40	40	40	40
TOTAL AMOUNTS						
Accounts Receivable	6,624	$=(1250/1\$244)*1245$		7,340	7,503	7,653
Inventory	2,009	2,078	2,116	2,148	2,177	2,204
Accounts Payable	3,319	3,325	3,386	3,436	3,483	3,526
NET WORKING CAPITAL						
Current Assets	8,633	9,035	9,283	9,488	9,680	9,857
Current Liabilities	3,319	3,325	3,386	3,436	3,483	3,526
Net Working Capital	5,314	5,710	5,897	6,052	6,196	6,331

Fig 52: Working Capital Schedule

Corkscrews

Corkscrews are great structures to track balances changes over time

Within model schedules, there are a few common structures that work really well and should be used as standard practice. One such structure is a corkscrew, as shown in Fig 53 below using an example of property, plant & equipment (PP&E). These structures are typically referred to as corkscrews (or roll-forwards) since information flows from left to right following a corkscrew pattern. They generally start on the left side of a model with an ending balance. The ending balance from this starting period then flows directly into the beginning balance for the next period. Looking below, we start with beginning PP&E, add capital expenditure, subtract

depreciation, then sum all the components to arrive at the ending PP&E balance.

A sum function is often used at the bottom of a corkscrew

A number of additions or subtractions may be performed within the period to arrive at an ending balance. However, one common consistency is that the ending balance is usually just the sum of the additions or subtractions above it. In the below example, the ending balance then flows directly into the beginning balance of the next period. As the information flows top-to-bottom and left-to-right, it follows a corkscrew pattern.

All figures in USD thousands unless stated

	2022A	2023F	2024F	2025F	2026F	2027F
Property Plant & Equipment						
Beginning	65,231	65,286	65,191	64,933	64,504	64,504
Capital Expenditure		4,223	4,286	4,338	4,385	4,429
Accounting Depreciation		(4,168)	(4,381)	(4,596)	(4,814)	(5,035)
Ending	65,231	65,286	65,191	64,933	64,504	63,898

Fig 53: Property, Plant & Equipment Corkscrew

Corkscrews are regularly used to model and track debt balances

Corkscrews are a great way to track any balance that is changing over time from one period into the next. Debt schedules in financial models are often built using corkscrews. In Fig 54 below, we've shown an example of a Long Term Debt corkscrew. Generally, one corkscrew would be used for each piece of debt in a model. For instance, a company with long-term debt, mezzanine debt, and a revolver would likely have three separate corkscrews to track the balances for each piece of debt.

Corkscrews are often used to track changes in equity as well

Equity schedules also use corkscrews to track their balances. A company with two types of equity may actually use three corkscrews in its equity schedules. There could be one corkscrew for preferred equity, one for the common equity, and a third one to track retained earnings. In Fig 55 on the next page, we have shown an example of a retained earnings corkscrew. This example starts with the beginning retained earnings balance; we add net income and subtract dividends to arrive at the ending balance for retained earnings. Laying out all the components into a corkscrew like this makes the model easy to follow on the computer and in printed format.

All figures in USD thousands unless stated

	2022A	2023F	2024F	2025F	2026F	2027F
Long Term Debt						
Beginning		110,000	100,000	90,000	80,000	70,000
Additions (Repayments)		(10,000)	(10,000)	(10,000)	(10,000)	(10,000)
Ending	110,000	100,000	90,000	80,000	70,000	60,000
Interest Rate		6.2%	6.2%	6.2%	6.2%	6.2%
Interest Expense		6,510	5,890	5,270	4,650	4,030

Fig 54: Long Term Debt Corkscrew

These formations are used in many other places in financial models

Another example of a schedule that often uses corkscrews is a tax schedule where a pool of tax losses may need to be tracked over time as changes occur. Also, natural resource companies

will often use corkscrews to keep track of their reserves or resources. We have shown an example of a Reserve Corkscrew in Fig 56 below. This schedule shows consistent depletion over time due to production as well as some expected reserve additions over the next two years.

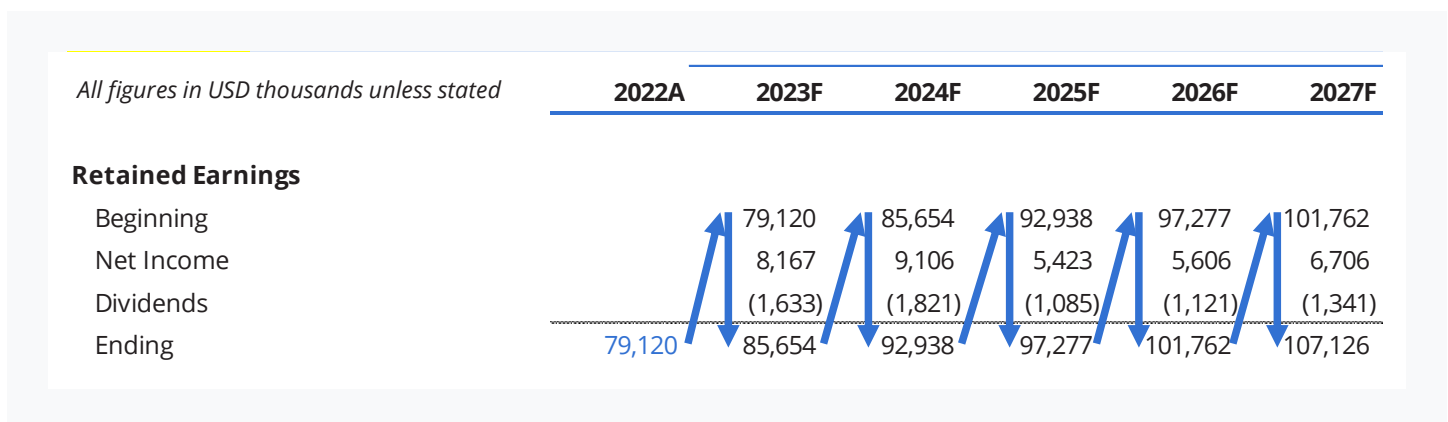


Fig 55: Retained Earnings Corkscrew

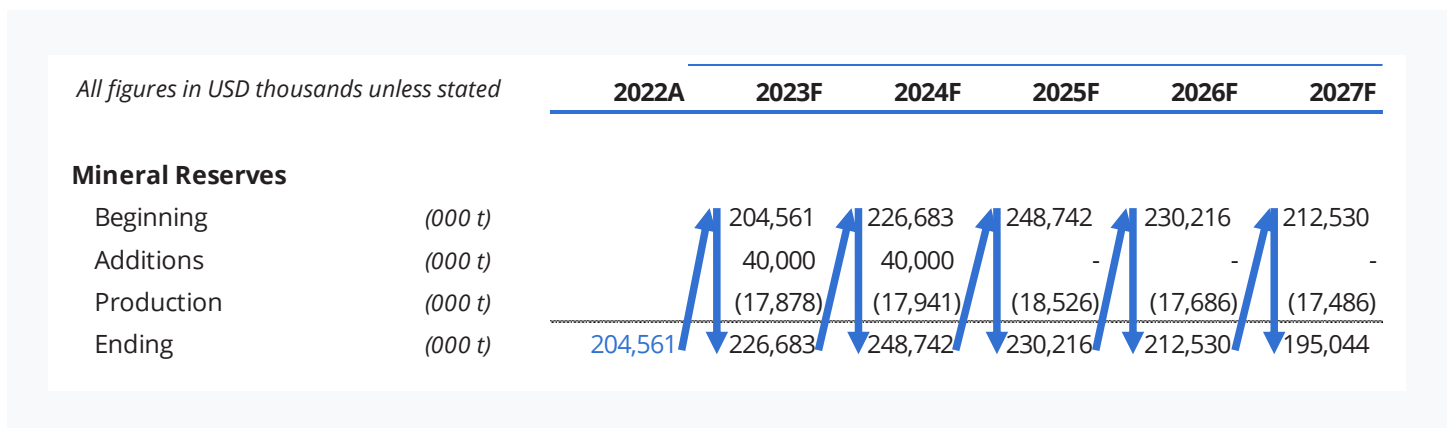


Fig 56: Mineral Reserve Corkscrew

Waterfalls

Waterfall formations are often used in depreciation schedules

Another common formation that is used in financial modeling is a waterfall. These are easy to spot in models as they are organized in a triangular structure. In Fig 57 on the next page, it is easy to spot the triangular formation since we have shaded it in grey. These formations are often used in depreciation schedules as shown in this example.

Time periods are shown on both a horizontal and vertical axis

Without stating the obvious, financial models usually have time periods shown from left to right across columns. In a waterfall schedule, the time periods are shown from left to right and also from top to bottom. We can see this below in the grey shaded waterfall with years extending down the left side and also years across the top. In this sense, the waterfall forms a matrix with periods on both the horizontal and the vertical axis. This matrix is then divided into two triangles, with the top triangle in grey being used for calculated values. These values, which are in a triangular formation, are often referred to as a waterfall.

Each time period is given its own dedicated row in a waterfall

Waterfalls are helpful in this case as they allow us to calculate the depreciation for new assets that are expected to go into service in future periods. In the first row in Fig 57, we are showing the depreciation for new assets expected to go into service in 2023. In the subsequent row, we show depreciation for assets beginning service in 2024. And so on, as we progress downwards through the waterfall.

Waterfalls use more space but make the model easier to follow

This structure is helpful since it clearly shows when a group of assets goes into service. It also shows how much depreciation is expected for that group of assets in every future period. Essentially, each period of capital investment is given its own dedicated row in the model. One disadvantage of using a waterfall structure is that they can use a lot of rows in a model that extends for many periods. However, a big advantage of waterfall formations is that they are well spaced out and very clear. Essentially, they make the model easier to understand and follow.

All figures in USD thousands unless stated

	2022A	2023F	2024F	2025F	2026F	2027F	
NEW ASSET DEPRECIATION							
Useful Life in Years		20.00					
First Year Depreciation		50%					
Year	Capex	Per Yr	2023F	2024F	2025F	2026F	2027F
2023F	4,223	211	106	211	211	211	211
2024F	4,286	214	-	107	214	214	214
2025F	4,338	217	-	-	108	217	217
2026F	4,385	219	-	-	-	110	219
2027F	4,429	221	-	-	-	-	111
New Asset Depreciation			106	318	534	752	972

Fig 57: Depreciation Waterfall

All figures in USD thousands unless stated

	2022A	2023F	2024F	2025F	2026F	2027F
Long Term Debt						
Beginning		110,000	100,000	90,000	80,000	70,000
Additions (Repayments)		(10,000)	(10,000)	(10,000)	(10,000)	(10,000)
Ending	110,000	100,000	90,000	80,000	70,000	60,000
Interest Rate		6.2%	6.2%	6.2%	6.2%	6.2%
Interest Expense		6,510	5,890	5,270	4,650	4,030

Fig 58: Long Term Debt Corkscrew

Debt & Equity Schedules

Corkscrews are used extensively when modeling debt and equity

Some of these structures we've discussed, like corkscrews and waterfalls, are common in model schedules. In fact, corkscrews are used extensively in debt and equity schedules. If a company only has equity in its capital structure, then the debt schedules could be omitted unless the company was considering debt financing in the future.

The capital structure is one of the most difficult parts of the model to build

The models for mature companies with more complex capital structures can have multiple schedules for the company's debt and its equity. Levered buyout (LBO) models can have even more complex capital structures. In fact, the capital structure can be one of the most difficult parts of a financial model to build. Using schedules that provide the space necessary for detailed debt and equity calculations is highly recommended in all cases. Within these schedules, it is best to use a corkscrew to track each piece of capital individually. As a reminder, an example of a Long-Term Debt corkscrew is shown on the previously in Fig 58. Using a consistent structure with corkscrews will help to simplify and track the various pieces of debt and equity for the company.

The financial statements should just link to schedules or to each other

Keeping the complex calculations limited to the schedules means that we should not need to perform calculations within the financial statements. For example, we would not calculate the company's revenue on the top line of the income statement. We would build a Revenue Schedule and then link the resulting revenue into the income statement. This limits the calculations to the schedules and means that the company's financial statements are primarily just links.

Balancing the financial statements is easier if they are just links

Only putting links in the financial statements makes them easier to connect and balance. Anyone that has had the experience of trying to link and balance a company's financial statements might agree that it is not always easy. Adding complex calculations into the financial statements will make this process even more difficult. Limiting the statements to just links will greatly simplify this process.

Financial Statements

Companies often have flexibility to present their statements in any order

A company's financial statements include the income statement, cash flow statement, and the balance sheet. Companies do not always present these statements in the same order. In fact, the governing bodies in many jurisdictions around the world often give the companies the flexibility to present the financial statements in any order, provided that all the statements are included.

They will often lead with a statement that highlights a valuable attribute

We often find that companies may follow an order that highlights their most valuable attributes. For example, a company with high quality assets may present its balance sheet first. Similarly, a company with an impressive level of profitability may lead with its income statement.

Selecting the best order involves balancing model flow and presentation

When planning the structure of a financial model, a decision will need to be made regarding the order of the financial statements. When planning this order, we may need to balance what is best from a presentation perspective with what makes sense in terms of flow for the model.

Many model designers will match the order in which the statements have been presented by the company, which can be the best solution in many cases. However, one downside to this approach may be that the model components don't always flow from top-to-bottom.

The blue arrows below show the top to bottom flow with the statements

When prioritizing top to bottom flow in a financial model, it may be best to start with the income statement, then the cash flow statement, followed by the balance sheet. This order is shown in Fig 59 on the next page. The blue arrows illustrate how this order provides a good flow from the top to bottom. The income statement always ends with net income, which flows directly to the beginning of the cash flow statement. The bottom of the cash flow statement will show the company's end of period cash balance, which flows directly down into the top of the balance sheet.

This order is sometimes preferred to prioritize the top to bottom flow

While this order does not achieve perfect top to bottom flow in all places, it is often preferred unless there is a compelling reason to change from this order. As discussed earlier, matching the order in which a company presents its financial statements may be a good reason to deviate from this order.

Even a small error in the statements can prevent them from balancing

Having the financial statements in an order for smooth top-to-bottom flow provides a good structure for a financial model. However, even with this structure, linking and balancing the financial statements can prove to be quite difficult. In fact, many people struggle to correctly balance a company's financial statements. Even just one small error in the statements can easily prevent the balance sheet from balancing.

Following our recommendations can help to balance a financial model

To help with this process, we recommend avoiding calculations on the financial statements as discussed earlier. This limits the statements to only links and will facilitate the process of connecting and balancing them. This, together with a structure that provides sound top-to-bottom flow, will help professionals through this more difficult part of the model building process.

All figures in USD thousands unless stated

	2022A	2023F	2024F	2025F	2026F	2027F
INCOME STATEMENT						
Net Interest Expense		520	566	517	617	999
Net Income		7,033	7,907	7,934	8,316	8,649
CASH FLOW STATEMENT						
Net Income		7,033	7,907	7,934	8,316	8,649
Ending Cash Balance		1,846	4,422	1,380	4,504	1,571
BALANCE SHEET						
Cash		1,846	4,422	1,380	4,504	1,571
Liabilities & Shareholders' Equity		65,753	69,878	72,468	75,309	77,695

Fig 59: Simplified Financial Statements to Illustrate Flow

Circularity

Modeling community members often have polarized views on circularity

Another element that can make financial statements difficult to connect and balance is that they are often circular. Circularity is a subject in financial modeling that is quite complex and often debated. Members of the modeling community often have polarized views with respect to circularity. Some avoid circularity since it requires more advanced modeling and Excel skills and can lead to errors. Others will advocate that it is necessary in order to make the models as accurate as possible.

We prefer to discuss possible circularity issues and how to address them

We like to take a more balanced approach and understand the benefits as well as the risks associated with model circularity. We strive to provide our learners with a clear understanding of how circular models work. We also discuss the issues that can arise and how to address them if they occur. Before we dive into a discussion on circularity, it is important to understand where it often occurs in financial models.

The most common circular loops are from cash balances and revolvers

In Fig 60 on the next page, we have shown the two most common circular paths that occur in financial models. As indicated, there can be a circular loop that flows through a company's cash schedule and another loop through the revolver. Let's start by walking through the loop that flows through the cash schedule.

We have used grey shading to highlight the nodes on the cash loop

In Fig 60, we have highlighted the loop through the cash schedule in the column showing the information for 2024. We have also highlighted the nodes or stops along the circular loop with grey shading to make its path clear. A company that has a cash balance will earn interest income, which lowers its net interest expense and has a positive effect on net income. Net income flows into the cash flow statement, increases the change in cash, and leads to a higher ending cash balance. The higher ending cash balance has a positive impact on the interest income calculation. This is due to the fact that interest income is calculated based on the average of the beginning and ending balance multiplied by the interest rate. The higher interest income lowers net interest expense, which flows back up to the income statement to begin the loop again. In this example, cash leads to incrementally more cash as the model cycles through the iterations.

All figures in USD thousands unless stated

	2022A	2023F	2024F	2025F	2026F	2027F
		CASH			REVOLVER	
INCOME STATEMENT						
Net Interest Expense	27	202	76	70	117	
Net Income	7,033	7,543	7,934	8,316	8,649	
CASH FLOW STATEMENT						
Net Income	7,033	7,543	7,934	8,316	8,649	
Change in Cash	(11,195)	-	449	2,510	(1,254)	
Change in Cash Excluding Revolver	(3,134)	1,092	2,491	(2,541)	1,059	
REVOLVER SCHEDULE						
Beginning	-	3,134	2,042	-	2,541	
Additions (Repayments)	3,134	(1,092)	(2,042)	2,541	(1,059)	
Ending	-	3,134	2,042	-	2,541	1,482
Interest Rate	7.8%	7.8%	7.8%	7.8%	7.8%	7.8%
Interest Expense	122	202	80	99	157	
CASH SCHEDULE						
Beginning	11,195	-	-	449	2,959	
Change in Cash	(11,195)	-	449	2,510	(1,254)	
Ending	11,195	-	449	2,959	1,705	
Interest Rate	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%
Interest Income	95	-	4	29	40	
NET INTEREST EXPENSE						
Interest Expense	122	202	80	99	157	
Interest Income	95	-	4	29	40	
Net Interest Expense	27	202	76	70	117	

Fig 60: Condensed Model Showing Two Common Circular Paths

Drawing on the revolver leads to incrementally more need to draw

Let's bring up Fig 60 again to now walk through the circular loop involving the revolver. A company that is drawing on its revolver will be paying incrementally more net interest expense. The higher net interest expense will result in lower net income, which flows into the cash flow statement. As it progresses through the cash flow statement, it will change the line labeled as Change in Cash Excluding Revolver. The Change in Cash Excluding Revolver line then dictates how much may be added or repaid on the revolver and influences the ending revolver balance. This impacts the interest expense since it is calculated based on the average of the beginning and ending balance multiplied by the interest rate. The higher interest expense increases the net interest expense and circles back up to the income statement. Thus, as the company draws on its revolver, it causes the need to draw more on the revolver. The process is thus circular or depends on itself.

Circularity is needed in models to make them as accurate as possible

This means that a model with a schedule for cash and another schedule for its revolver will have two circular loops. This will hold true provided

that the model is using an average of beginning and end balances to calculate the interest amounts. The reason model builders prefer to use an average of beginning and ending balances is that this makes financial models more accurate. So, in order for our models to be as accurate as possible, they will need to be circular.

We discuss circularity topics in detail in our financial modeling courses

Managing model circularity is something that we discuss in detail in our courses on financial modeling. In this document, we have covered two of the most common circular loops that appear in financial models. However, there are other circular paths that are required in more advanced financial models. Also, it is important to understand how to properly manage circularity through the use of circuit breakers or formulas that allow the model to self-correct in the event that an error is introduced into one of the circular paths. Finally, an understanding of some common techniques for finding circular loops is helpful. This allows us to be confident when working with a circular model that someone else has designed. These are all topics that we discuss in detail in our courses.

Formatting

Models should be well structured with clean and professional formats

Let's turn our attention now from model circularity over to formatting. While circularity is needed for model accuracy, formatting is critically important in financial models for a number of reasons. When considering formatting, we need to remember that financial models are decision-making tools. In order for someone to be comfortable using the model to make an important decision, they must have confidence in the model and be comfortable with it. One of the primary ways that we can instill confidence in others is by having a format that is well structured, clean, and professional.

A well-formatted model helps to instill confidence in the audience

The format of a model is often the first thing that readers notice. An example of a well-formatted Income Statement is shown on the next page in Fig 61. Before someone considers the amount or magnitude of the figures in the model, they often make an unconscious judgment about the overall look of the model. This is the moment when the formatting matters the most. It helps to ensure that everyone has a good first impression of

the model. A clean and professional format will instill confidence in the audience and make them comfortable with the idea of using the model to inform their decisions.

Great formatting is from the combined impact of many individual factors

In order to achieve the best possible format for a financial model, a number of attributes will need to be considered. Taken individually, these attributes may seem insignificant. But, together, they can have a very large impact on the overall look and feel of the model. Model formatting is something that is often overlooked or rushed in the process of model design. However, it can be the difference between a model that gains significant traction and trust and one that is discarded by the team.

All figures in USD thousands unless stated

	2022A	2023F	2024F	2025F	2026F	2027F
Revenue	52,185	56,428	58,134	59,537	60,854	62,077
COGS	31,368	30,337	30,898	31,356	31,783	32,177
Gross Profit	20,817	26,091	27,235	28,181	29,071	29,900
SG&A	7,708	7,939	8,138	8,300	8,425	8,551
Other	2,026	2,087	2,139	2,182	2,214	2,248
EBITDA	11,083	16,065	16,959	17,699	18,431	19,101
Depreciation	2,907	4,168	4,382	4,600	4,823	5,049
EBIT	8,176	11,897	12,577	13,098	13,609	14,052
Interest	2,448	2,520	2,520	2,520	2,520	2,520
EBT	5,728	9,377	10,057	10,578	11,089	11,532
Current Tax	-	-	132	2,353	2,586	2,793
Deferred Tax	1,577	2,344	2,382	291	186	90
Total Tax	1,577	2,344	2,514	2,645	2,772	2,883
Net Income	4,151	7,033	7,543	7,934	8,316	8,649

Fig 61: Income Statement

Font Types

A clear and professional font type should be used in financial models

One of the formatting choices that model designers often consider early in the process is the font type. The font type can have a significant impact on the look of the model. There are thousands of font types available, and model designers have plenty of choices here. Generally, a font should be selected that has a clean and professional look. We need to remember that the model needs to be clear and instill confidence in the reader. The selection of font type can help in this regard. It is one of the primary formatting choices that can establish the overall aesthetic of the financial model.

Many companies may have brand standards that define the font type

If the model is being designed for a particular company with established branding standards, then the font used in the model should be consistent with those standards. Also, only one font type should ever be used in the model.

All workbooks and building blocks should have the same font type throughout the model. The font colors and sizes can be adjusted in the model to highlight sections or convey key metrics. However, the type of font used should always be kept consistent throughout the model.

A change to the font type should be considered for an entire schedule

In the font section in the home menu in Excel, there are samples that provide an overview of the various fonts. Although these are helpful, they are often not sufficient to gauge the overall impact of a font type change on the look and feel of the model. It can be helpful to select one schedule of the model to view the impact of a change to the font type. For instance, making multiple copies of a particular schedule or page in a model and setting each copy to a different font type can be quite helpful.

Custom Number Formats

Branding standards often do not specify the detailed number formats

Once the font type has been selected, the number formats should be considered. Again, it is important to check whether the model should adhere to defined corporate branding standards. While standards will often set the required font type, they don't always define all aspects of the number formats.

We can define how positives, negatives, zeroes, and text are displayed

In Fig 62 on the next page, we have shown the Format Cells dialogue box, which can be accessed using the CTRL 1 shortcut. As shown in Fig 62, we have navigated down the left-hand side to the Custom Category. There is a long syntax that has been keyed into the Type box. This is where we can control the formatting that Excel is using for numbers. With these settings, we can define the way Excel displays positives, negatives, zeroes, and text. Setting this syntax up is referred to as Custom Number Formatting.

We recommend avoiding currency symbols to avoid a busy looking model

A decision that will need to be made regarding Custom Number Formatting is whether or not to display currency symbols in the number formats. In the examples on page 78 in Fig 63 and 64, we have shown two options. The first one is a currency format, which places a dollar sign at the beginning of each number. The only difference with the second format is that it omits the dollar sign. As you can see, the second option looks cleaner with more white space since it omits the repetitive dollar signs. To make up for the missing dollar signs in Fig 64, the note at the top left has been adjusted to 'All figures in USD thousands unless stated.' This note provides adequate information to the reader about the units without the need to repeat the dollar signs.

Format Cells ? X

Number Alignment Font Border Fill Protection

Category:

- General
- Number
- Currency
- Accounting
- Date
- Time
- Percentage
- Fraction
- Scientific
- Text
- Special
- Custom**

Sample: 520

Type:

[(#,##0_);(#,##0);_('-');_(@_)]

0"F"

#,##0_);(#,##0);-

0.0%

(#,##0%);(#,##0%);_('-')_%;_(@)_%

(#,##0.0%);(#,##0.0%);_('-')_%;_(@)_%

#,##0.0_);(#,##0.0);-

#,##0.00_);(#,##0.00);-

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(#,##0.00);(#,##0.00);_('-');_(@)_

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Delete

Type the number format code, using one of the existing codes as a starting point.

OK Cancel

Fig 62: Custom Number Formatting

All figures in thousands unless stated

	2022A	2023F	2024F	2025F	2026F	2027F
Retained Earnings						
Beginning		\$61,014	\$67,548	\$74,832	\$79,171	\$83,656
Net Income		\$8,167	\$9,106	\$5,423	\$5,606	\$6,706
Dividends		(\$1,633)	(\$1,821)	(\$1,085)	(\$1,121)	(\$1,341)
Ending	\$61,014	\$67,548	\$74,832	\$79,171	\$83,656	\$89,020

Fig 63: Example with Currency Format

All figures in USD thousands unless stated

	2022A	2023F	2024F	2025F	2026F	2027F
Retained Earnings						
Beginning		61,014	67,548	74,832	79,171	83,656
Net Income		8,167	9,106	5,423	5,606	6,706
Dividends		(1,633)	(1,821)	(1,085)	(1,121)	(1,341)
Ending	61,014	67,548	74,832	79,171	83,656	89,020

Fig 64: Example with Number Format

Some model designers use red for negatives to make them stand out more

We also have the ability to control the way negative numbers and zeroes are displayed with custom formats. In Fig 65-67, we have shown a few examples. The first example in Fig 65 shows negatives formatted using a minus sign. This would not be our preference as the negatives are easy to miss with only a minus sign. The formatting in the second example in Fig 66 is slightly better, with the negatives formatted using brackets which are much easier to spot. Although some designers prefer using a red color for negatives, we tend not to do this as we reserve colors to indicate other attributes about the numbers, as we will discuss shortly.

We prefer to use brackets for negatives and simple dashes for zeroes

The third example in Fig 67 shows our preference for formatting for negative numbers and zeroes. As shown, we tend to use brackets for negatives without changing the colour to red. Using brackets for negatives is the preference for financial model designers in many jurisdictions and is also very common in the accounting field. We also like using a dash for zeroes as this makes the model formatting look cleaner and also makes the zeroes easy to spot.

All figures in USD thousands unless stated

	2022A	2023F	2024F	2025F	2026F	2027F
Retained Earnings						
Beginning		61,014	52,847	46,741	48,797	54,403
Net Income		-8,167	-6,106	2,056	5,606	6,706
Dividends		0	0	0	0	0
Ending	61,014	52,847	46,741	48,797	54,403	61,109

Fig 65: Negatives With a Minus Sign

All figures in USD thousands unless stated

	2022A	2023F	2024F	2025F	2026F	2027F
Retained Earnings						
Beginning		61,014	52,847	46,741	48,797	54,403
Net Income		(8,167)	(6,106)	2,056	5,606	6,706
Dividends		0	0	0	0	0
Ending	61,014	52,847	46,741	48,797	54,403	61,109

Fig 66: Negatives With Red Colour and Brackets

All figures in USD thousands unless stated

	2022A	2023F	2024F	2025F	2026F	2027F
Retained Earnings						
Beginning		61,014	52,847	46,741	48,797	54,403
Net Income		(8,167)	(6,106)	2,056	5,606	6,706
Dividends		-	-	-	-	-
Ending	61,014	52,847	46,741	48,797	54,403	61,109

Fig 67: Negatives with Brackets & Dashes for Zeroes

Font Colors

We recommend using blue font for inputs and black for formulas or links

Font colors are often used to communicate information about the contents of a cell. It has become common in most jurisdictions around the world to use blue font for inputs and black font for formulas or links. A model designer that is striving to keep the number of font colors to a minimum should use at least these two colors to help users locate inputs. In order to be consistent with the global financial modeling community, we recommend blue font for inputs and black font for formulas or links.

It is becoming more common to use green font for links to other tabs

Some model designers extend beyond the use of blue and black font and utilize other colors to signify cells with other types of data. It is starting to become more common to use green font to indicate a link to another worksheet. When this is deployed, it means that links within one worksheet are in black font, and links to other worksheets are in green font. This can help show users where data is entering from another worksheet.

Other types of links include workbook links, hyperlinks, and external data

There are other categories of links which can be marked with a different font color. Some of these types of links are listed on page 83 in Fig 68, which shows the Macabacus AutoColor settings. Apart from using green for worksheet links as discussed, there doesn't seem to be a clear convention for the colors of the other types of links. These additional categories of links include workbook links, hyperlinks, and external data. Workbook links are connections to other workbooks or Excel files. A hyperlink could include a link to an external website or a link to another location within the same workbook. There are also links to external data to consider. Examples of external data providers include Capital IQ, Bloomberg, Factset, and PitchBook. Microsoft has also recently added external data types to Excel, which allows users to access a number of different data sources.

Macabacus can AutoColor a selection, sheet, or an entire workbook

It is worth highlighting the Macabacus AutoColor settings, which were shown in Fig 68. Macabacus has the ability to AutoColor a selection, sheet, or an entire workbook using the settings shown on the next page. This is particularly helpful for models that were not colored correctly when built. It is also very valuable for models that were constructed by another team and may not be up to the standards that you are accustomed to. It can also AutoColor on Entry, which is particularly useful when loading actual numbers in as inputs over formulas. One of the most valuable features in the AutoColor list is its ability to locate partial inputs, which we will discuss next.

Partial inputs are very difficult to find using standard Excel tools

Another category of inputs worth mentioning is partial inputs. An example of a partial input is shown on the next page in Fig 69, where we have added 45 to the Net Income in 2024. Examples like these are considered to be inputs, but they are quite difficult to find in models. This is because Excel categorizes anything starting with an equals sign as a formula. Hence these show up as formulas in a search using standard Excel tools.

Partial inputs should always be avoided when building financial models

Partial inputs should be avoided when building financial models since they are difficult for others to locate and will not show up when printed. When models are first built, they often don't contain any partial inputs. These are often added over time by users who are rushed and looking for ways to make quick modifications to a model. This can present problems as these partial inputs are often left behind and can accumulate over time. The AutoColor tool from Macabacus can locate these quickly so that they can be repaired.

AutoColor

- Inputs
- Partial inputs
- Formulas
- Worksheet links
- Workbook links
- Hyperlinks
- External data

Behavior:

- AutoColor on entry
- AutoColor dates
- AutoColor text

External data functions:

BDH	↑	+
BDP		
BDS		-
CIQ		
FDS	↓	

Fig 68: Macabacus AutoColor Settings

All figures in thousands unless stated

	2022A	2023F	2024F	2025F	2026F	2027F
Retained Earnings						
Beginning		\$61,014	\$67,548	\$74,832	\$79,171	\$83,656
Net Income		\$8,167	=J454+45	\$5,423	\$5,606	\$6,706
Dividends		(\$1,633)	(\$1,821)	(\$1,085)	(\$1,121)	(\$1,341)
Ending	\$61,014	\$67,548	\$74,832	\$79,171	\$83,656	\$89,020

Fig 69: Example of a Partial Input

Marking Units

It is a prudent idea to dedicate one column specifically for marking units

Always marking units clearly is very important in financial models. When thinking about the structure of a model, it is prudent to consider whether a units column may be appropriate. An example of a units column is shown below in Fig 70, where we have marked (USD/Unit) for some of the costs. A units column is a single column dedicated for the purpose of marking the units for each row. It is usually a prudent idea to have a units column in any financial model. The units column should also be kept consistent from top to bottom within a worksheet and should also be kept consistent across the various tabs in a file.

We prefer using a global units marker to avoid marking units for each row

In the example below in Fig 70, we marked all units individually for each row. While this makes things very clear, it can also make the model look cluttered and busy. If most of the rows in this model are expected to be in units of (USD 000), then we would use a global units marker, which is preferred in most cases. An example of this is shown on the next page in Fig 71, where we have included the following marker in the top left corner 'All figures in USD thousands unless indicated.' With this marker in place, we only need to use the units column when the units deviate from the global marker.

		2022A	2023F	2024F	2025F	2026F	2027F
COST SUMMARY							
Variable Costs	(USD/Unit)	12.39	12.76	12.95	13.11	13.25	13.39
Fixed Costs	(USD/Unit)	42.76	42.63	42.63	42.63	42.63	42.63
Total Costs	(USD/Unit)	55.15	55.40	55.59	55.74	55.89	56.02
Variable Costs	(USD 000)	6,568	6,989	7,200	7,374	7,537	7,688
Fixed Costs	(USD 000)	22,668	23,348	23,698	23,983	24,246	24,489
Total Costs	(USD 000)	29,236	30,337	30,898	31,356	31,783	32,177

Fig 70: Using a Units Column

All figures in USD thousands unless stated

		2022A	2023F	2024F	2025F	2026F	2027F
COST SUMMARY							
Variable Costs	(USD/Unit)	12.39	12.76	12.95	13.11	13.25	13.39
Fixed Costs	(USD/Unit)	42.76	42.63	42.63	42.63	42.63	42.63
Total Costs	(USD/Unit)	55.15	55.40	55.59	55.74	55.89	56.02
Variable Costs		6,568	6,989	7,200	7,374	7,537	7,688
Fixed Costs		22,668	23,348	23,698	23,983	24,246	24,489
Total Costs		29,236	30,337	30,898	31,356	31,783	32,177

Fig 71: Using a Global Units Marker

Naming

Excel supports both static naming and dynamic naming

There are two types of naming that can be done in Excel: static naming and dynamic naming. Static naming involves modifying the default name of a cell or an array. It is referred to as 'static' since the location of the cell or array is fixed and does not move. By contrast, a dynamic name has at least one component that moves. Dynamic naming can be useful when charting to produce a graph of an expanding range of data. This is a skill that we cover in some of our advanced Excel courses.

It is much more common to find static names in financial models. For this reason, we will focus our discussion here on static naming.

The most common type of static naming involves renaming individual cells

Every cell in a spreadsheet has a default name assigned that is made up of its column and row number. For instance, the cell located in Column A and Row 1 is assigned the name A1. This default naming system works really well as it is easy for someone to locate any cell by referring to the appropriate column and row.

Cells names can be changed from their default column/row format

The names of cells and even the names of arrays can be changed in Excel. As mentioned earlier, this is referred to as static naming. We have shown an example of static naming below in Fig 72. In this example, we have loaded the tax rate of 35% into cell C2. Then, we changed the default name of this cell from C2 to TaxRate by typing 'TaxRate' into the Name Box in the top left corner. Many model designers use static naming like this when building a model.

Static naming makes models easier to build but more difficult to audit

In Fig 73 below, we have shown how the name TaxRate can now be used in a formula. This can make formulas faster to build since we can simply type TaxRate into a formula instead of

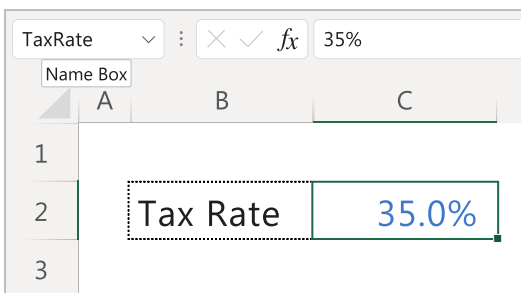


Fig 72: Defining Static Cell Names

locating cell C2 in the correct worksheet. However, the downside to using static names in this way is that the model becomes more difficult to audit. A person checking the model may not know where TaxRate is physically located or how to navigate there to check the figure. This is why static naming can expedite the model build process, but it can make a model review more difficult.

Deleting a defined name can lead to a litany of errors throughout the file

The other issue is that if the name TaxRate is deleted from the file, the formulas that were dependent on it do not revert back to their default cell names. This could result in a litany of errors showing up throughout the model. This is another potential issue that supports the idea of avoiding cell naming in financial models. Our approach to this subject in most cases would be to simply use standard cell references.

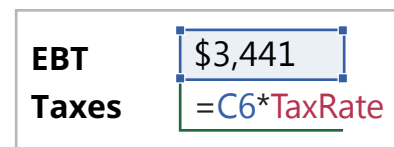


Fig 73: Using Static Names in Formulas

The Name Scrubber lists name dependencies and can unapply names

In the event that someone finds themselves in a model that has a lot of defined names, the Name Scrubber from Macabacus can be very helpful. As shown below in Fig 74, it can locate all names in a model regardless of whether or not they are

hidden. More importantly, it lists any dependent cells in the bottom window. In the example below, we can see that cell C7 is dependent on the cell named TaxRate. The Name Scrubber gives us the option to unapply names, which reverts formulas back to their native cell locations. This can be a very helpful first step towards removing names from a model as a part of a clean-up process.

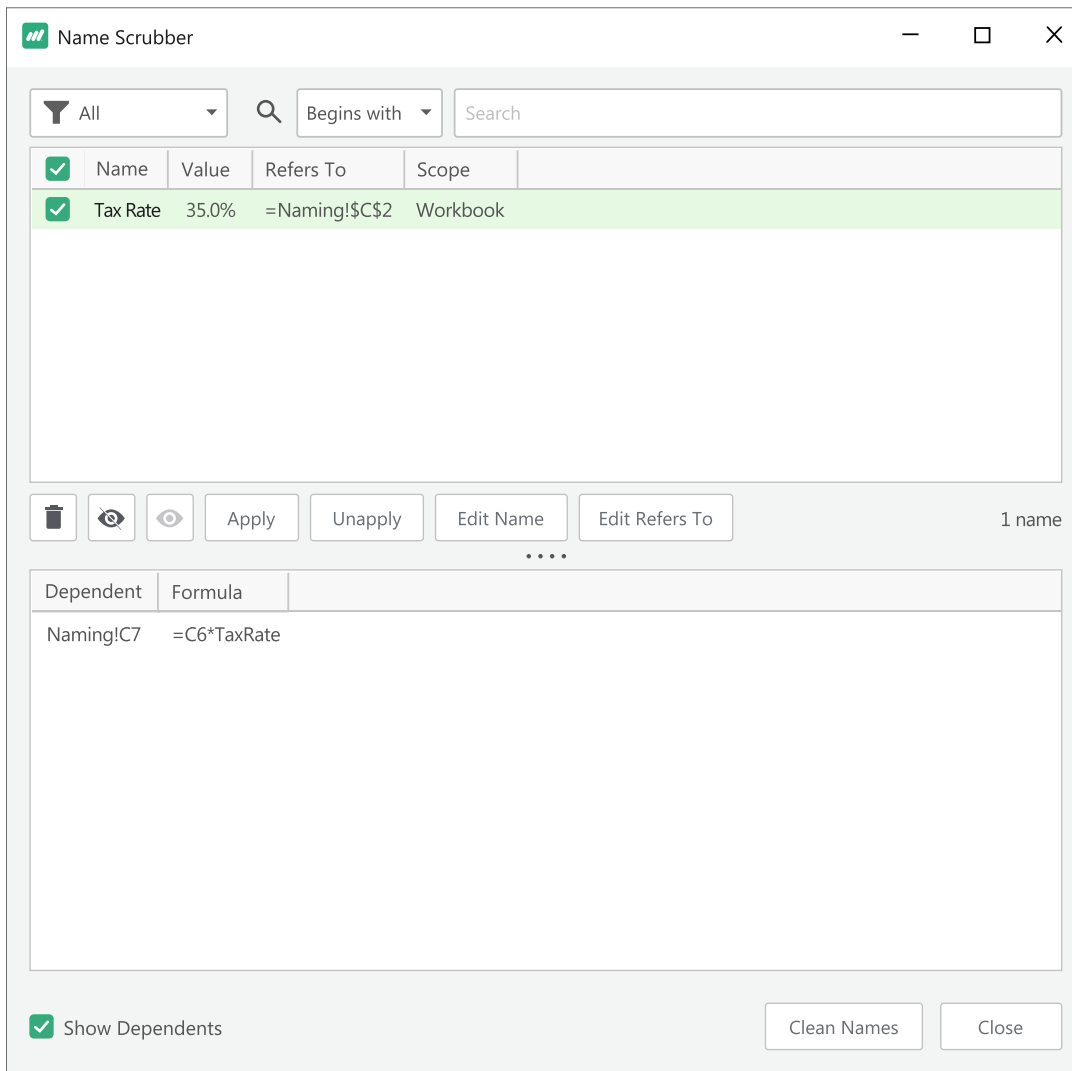


Fig 74: Macabacus Name Scrubber

Macros

Macros can often be avoided by understanding everything that Excel can do

A document on modeling guidelines would not be complete without a discussion on the use of macros. In many cases, we find that model builders use macros for things that can be done using standard features that already exist in Excel or in a robust add-in like Macabacus. In this sense, macros can sometimes be indicative of a model builder that doesn't know about all the tools and features that are available without writing code.

There are times when macros are needed to go beyond what is possible

However, there are times when we are truly limited by the functionality of the software. In these cases, we may need to add some code to complete something beyond the abilities of the software. This is where we are open to the use of macros if they are well written and properly documented. For example, we have built macro-enabled M&A models that contemplate the acquisition of multiple targets. With the click of a button, the model iterates through various scenarios and updates an analysis showing outputs like IRR and accretion/dilution for each scenario.

Excel is evolving more quickly, and many new features have been added

So, we believe that there are some legitimate use cases for macros. And for this reason, we don't categorically discourage them. We do encourage model designers to explore everything that is available in a modern version of Excel. Often, the functionality that they are looking for exists with a standard version of the software or by installing an add-in like Macabacus. Also, Excel has been evolving in recent years, and there are many features that some users wouldn't yet be aware of.

Protection

There are many ways to protect the integrity of a financial model

Designing, building, and reviewing a financial model requires a considerable investment of time and effort. Once the model has been completed and reviewed, it is very important to protect its integrity. There are a number of ways to add protection to a financial model, which we will discuss.

The entire workbook can be protected with a required password

The first way to add protection in Excel is by protecting the entire file or workbook with a password. This means that the file can not be opened at all without the password. The setting

to access this functionality is shown below in Fig 75. From the Excel interface, the user would click File, Info, Protect Workbook, then Encrypt with Password. This setting can also be accessed with the keyboard by clicking ALT FIP to get into File Information.

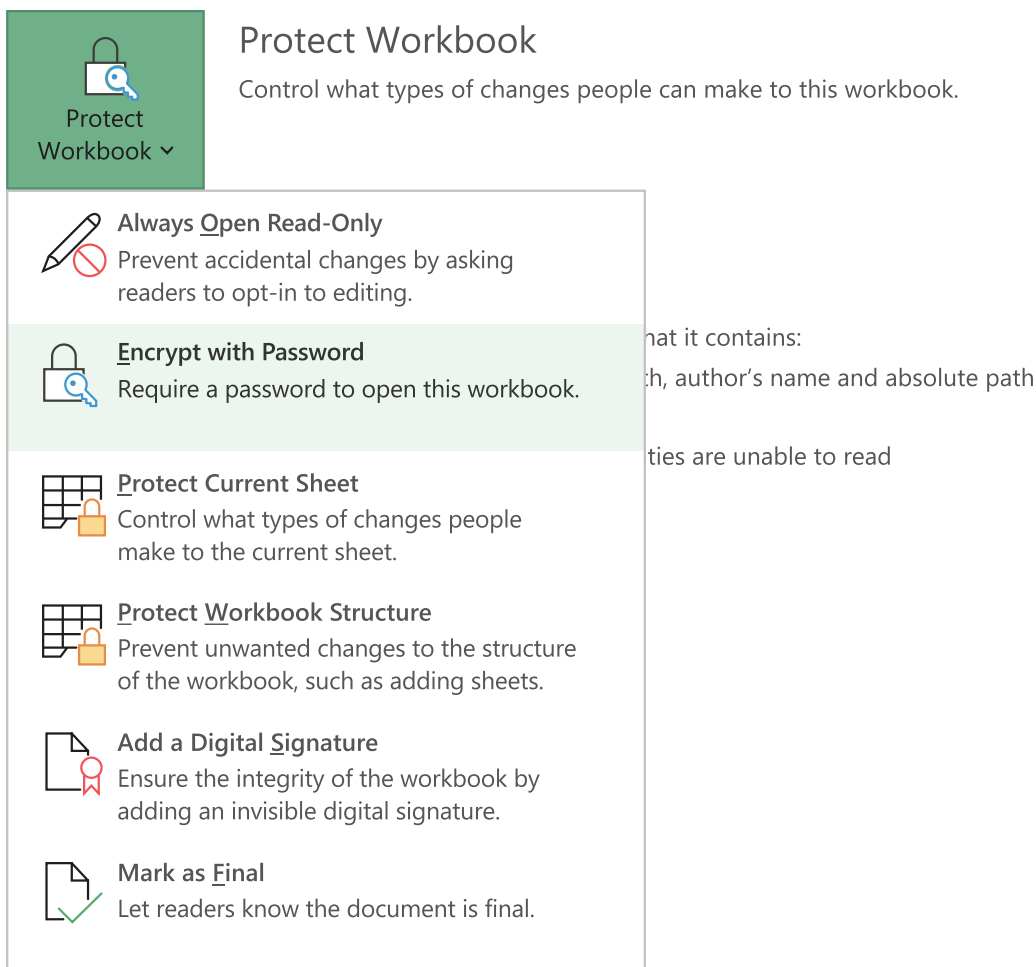


Fig 75: Protecting the Workbook

It is more common to control file access with shared drive settings

While protecting the workbook may seem attractive, it is becoming less common these days for a couple of reasons. First, file access can now be easily controlled with cloud storage. Files can be moved into certain folders that have restricted access. The access to these folders can be controlled through shared drive settings. This is quite convenient as it is relatively easy to manage who has access to those folders and remove access to certain individuals if necessary. The other reason that workbook protection is not as common is that passwords can get lost. Once a password is lost, even company administrators will not be able to open the file.

The structure of a financial model can also be protected with a password

The next level of protection that could be applied is to the structure of a workbook. The settings for this type of protection can be found in the Review section of the Excel ribbon, as shown in the first image on the right in Fig 76. By clicking the 'Protect Workbook' icon, we are able to protect the structure of the workbook. The user will then be prompted for a password to protect the structure of the file, as shown in the second image in Fig 76.

A protected file structure prevents users from deleting tabs or worksheets

This type of protection can be particularly useful since it protects the structure of a workbook. This means that a user without the password cannot delete, rename, or move existing tabs or worksheets in the model. This can be seen clearly in Fig 77 on the next page, where many of the tab options are disabled or greyed out. With this type of protection in place, users are also not able to insert any new sheets. Without the ability to create or delete worksheets, the structure of the model is protected. This can be particularly useful for Cover pages, which often contain legal disclaimers. With the model structure protected, users would not be able to delete the Cover page and its important legal disclaimers without the password.

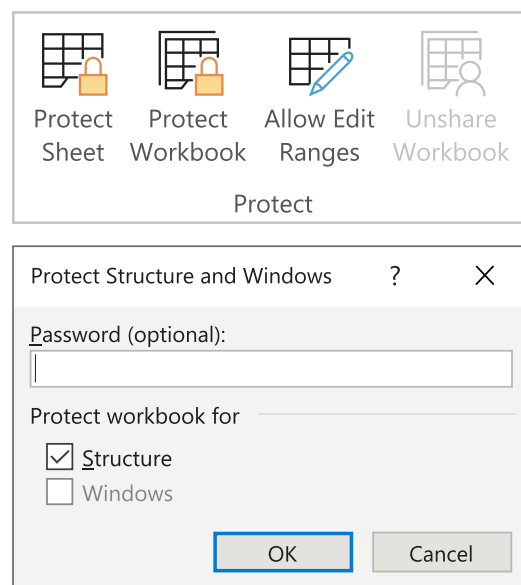


Fig 76: Protecting File Structure

Protecting cells with formulas or links can be particularly useful

The final level of protection that could be considered is protection to individual cells. This can be particularly useful but requires more consideration and time to set up. Below in Fig 78, we have shown an excerpt from a revenue schedule. As discussed earlier in this document, the inputs are shown in blue font with black font indicating a formula or a link within the worksheet. Once this model has been thoroughly reviewed, it may be prudent to limit access to only the inputs that have blue font.

A couple of steps are required for this type of protection

In order to do this, a couple of steps are required. First, we need to lock the appropriate cells in the worksheet. We can do this in the Format Cells dialogue box (CTRL 1) as shown on the next page in Fig 79. This is where we can control the protection attributes for a given cell.

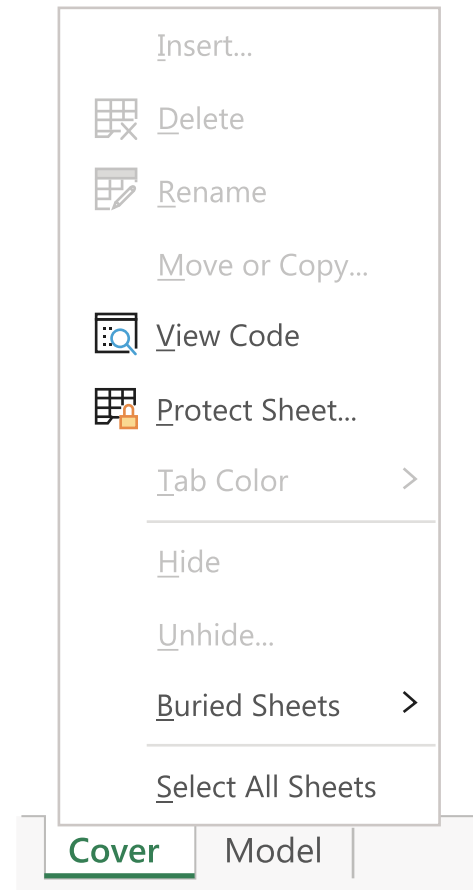


Fig 77: Disabled Worksheet Options

Revenue Schedule		2019A	2020A	2021A	2022F	2023F	2024F	2025F	2026F
<i>All figures in USD thousands unless stated</i>									
OPERATIONS									
Sales Volume Growth			2.0%	2.1%	2.0%	2.0%	2.0%	2.0%	2.0%
Sales Volume	<i>(Units/Day)</i>	1,374	1,401	1,430	1,459	1,488	1,518	1,548	1,579
Plant Capacity	<i>(Units/Day)</i>	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Operational Efficiency		91.6%	93.4%	95.3%	97.2%	99.2%	101.2%	103.2%	105.3%

Fig 78: Revenue Schedule with Inputs Shown in Blue Font

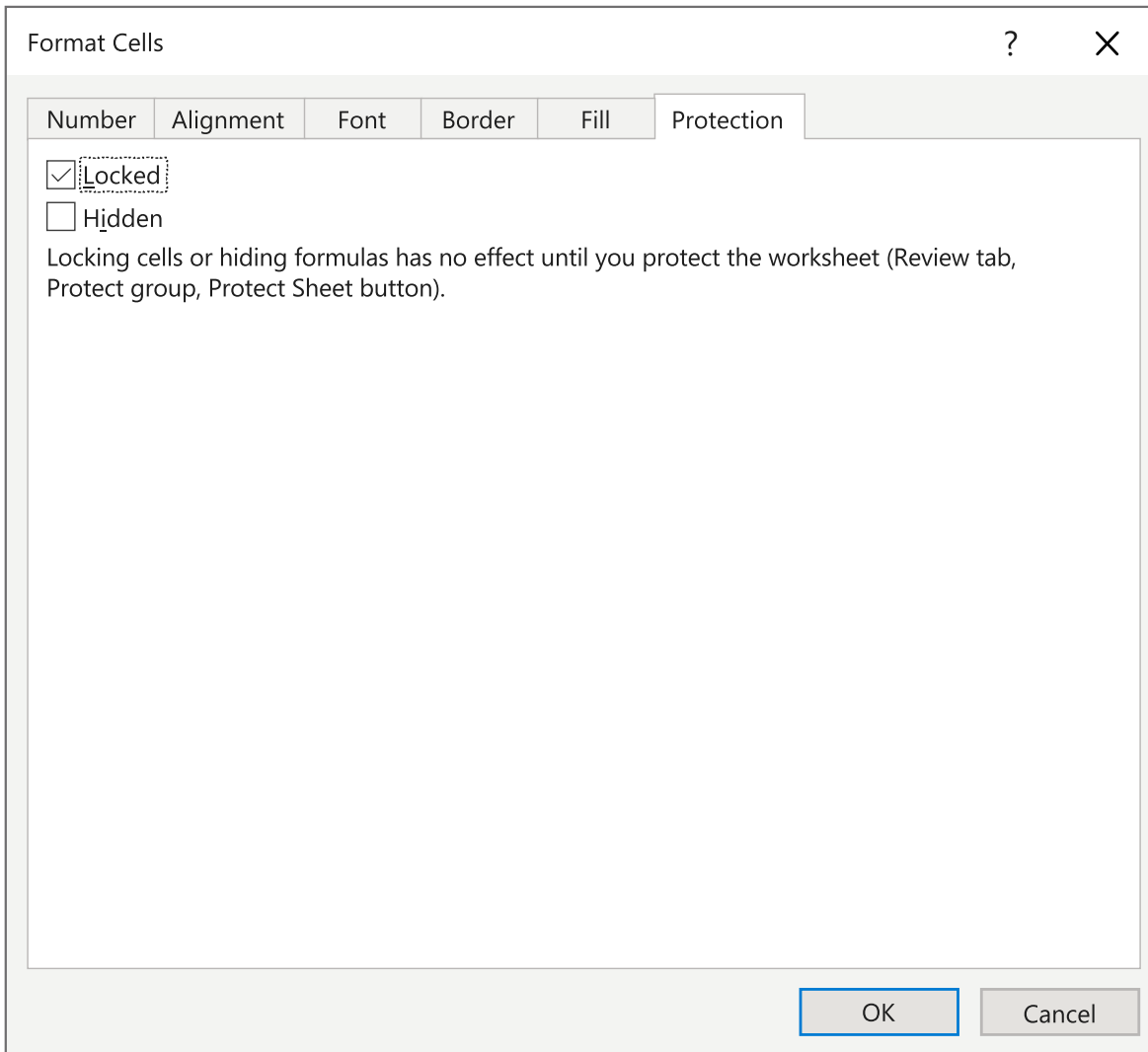


Fig 79: Locking Cells in the Protection tab

With the cell attributes set, we can now select a password to lock them

Now that locked or unlocked attributes have been set for the appropriate cells, we can activate the protection and select a password. This can be done by clicking into the Review section of the Excel ribbon and selecting Protect Sheet, as shown in the first image on the right in Fig 80. This brings up the dialogue box shown in the second image below, where we can select a password to complete the protection of the cells.

We protect the logic of the model by only unlocking cells with inputs

As indicated in the second image in Fig 80, there are many options available. As shown in this example, we have unchecked most of the options, only allowing the user to select cells without a password. In this case, all other options will require the user to have a password. This means that a user that does not have the password will only be able to modify model inputs. This will prevent them from changing any cells with formulas or links. This effectively will protect the logic and functionality of the financial model by only allowing them to modify its inputs.

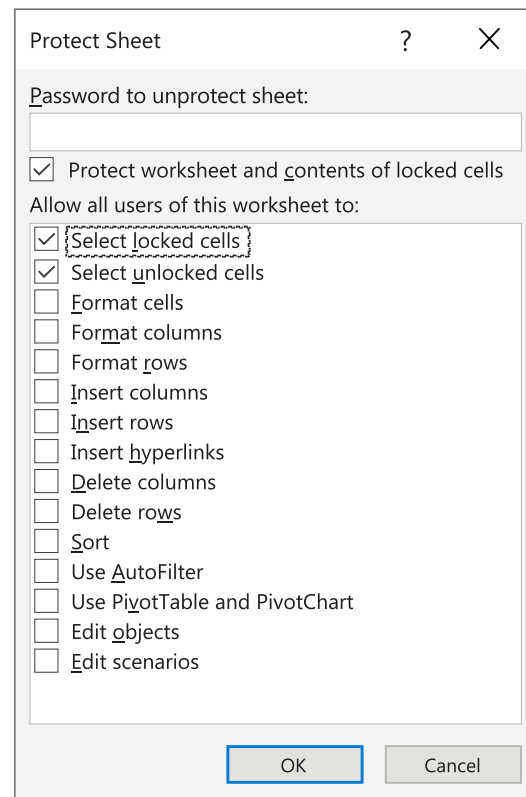
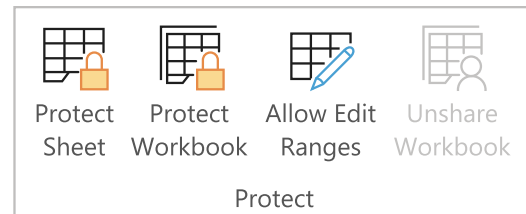


Fig 80: Protecting Sheet Structure

More Resources

Check out more of our resources to take you Financial Modeling skills to the next level:

CFI YouTube channel: <https://www.youtube.com/c/Corporatefinanceinstitute-CFI>

Macabacus YouTube channel: <https://www.youtube.com/c/Macabacus-by-CFI>

Macabacus Help Center: <https://macabacus.com/help>

Certifications and pre-designed curriculums

If you'd rather select a pre-designed curriculum, a CFI certification may be for you. Our prestigious certifications are globally-recognized and designed to provide students with practical skills that seamlessly transfer to real-world scenarios.



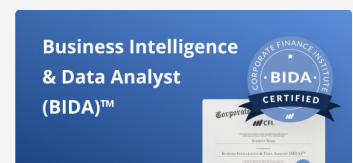
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