Best Practices for Financial Modeling

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GEORGE MASON UNIVERSITY

University Business Consulting

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Using our **experience in higher education**, **project management, analytics, and strategic planning**, we work alongside our Mason clients to devise solutions that **support them in reaching their goals** across the university.

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Agenda

- What is a financial model?
- Best practices for financial modeling
- Structuring your inputs
- Structuring your outputs
- Building your model
- Recap
- Questions & Answers

What is a Financial Model?

A financial model is a tool that lets you make explainable estimates about revenues and/or expenses, generally over multiple years and, as needed, under multiple conditions.

Driven by clear assumptions and logical calculations

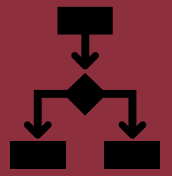
Explainable Estimates

Spans three to five years

Multiple Years

Categorized as high, medium, low, for example

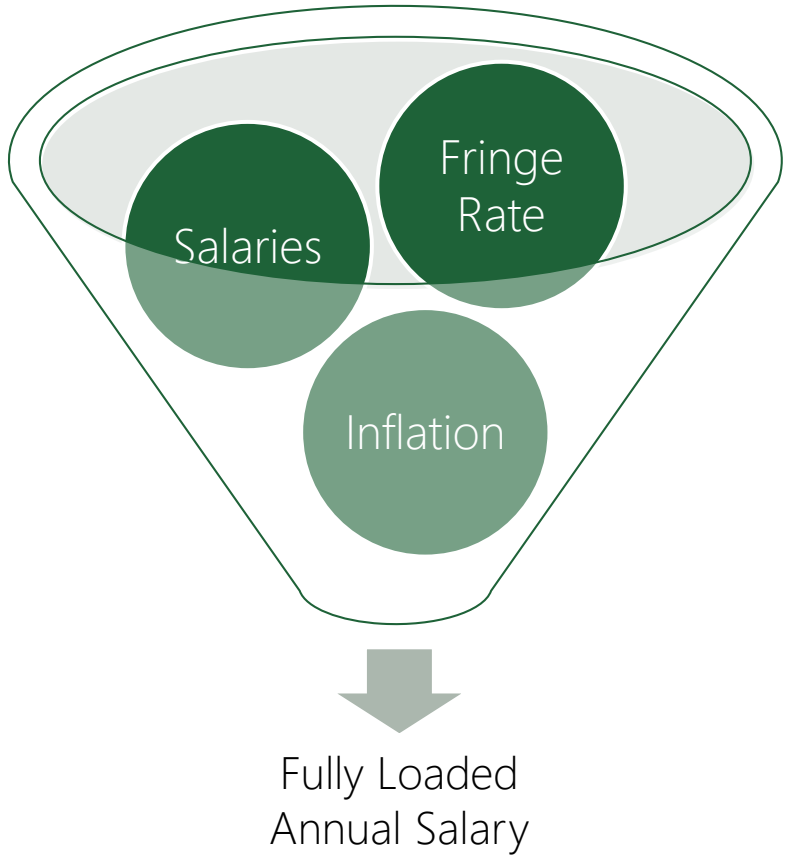
Multiple Conditions



General Terms in this Presentation

A few general terms:

- **Assumptions** (versus "Global Assumptions") are estimates that drive Inputs.
- **Inputs** drive calculations. These can include salary and fringe, inflation, rents and space acquisition costs, overhead rates, and of course, revenues. Inputs drive Outputs.
- **Outputs** show the results of those calculations. These can include fully loaded annual salary ((salary + fringe) x inflation), indirect cost recoveries (grant revenue x overhead rate), etc.



Best Practices for Financial Modeling

- State your model's "rules" clearly and explicitly.
- Consider your inputs carefully.
- Rely on conservative assumptions.
- Use assumption tables for your inputs.
- Keep any original data intact.
- Use formulas for **all** your outputs.
- Use a consistent approach to building the parts of your model.
- Conduct periodic reality checks.
- Use notes and labels freely.
- Create a simple, at-a-glance summary.

Stating Your Rules

Your "rules" should include:

Category	Examples Include:
General Parameters	• Whether calculations are based on the fiscal / academic / calendar year. • When your model starts and how long it runs.
Major Constraints	• The limitations of the model itself (e.g., data sources). • The outside conditions that impact the model (e.g., COVID).
Important Definitions	• What specific terms are you using that aren't immediately obvious?
Global Assumptions	• How rates for inflation / fringe / overhead may change over time. • How revenues (e.g., state and federal appropriations) may change over time.
Data Sources	• Where did your data come from?
Instructions	• Which cell the user should use for data entry / updates. • How to add new rows / formulas to a worksheet. • When possible, how to make larger changes to the model.

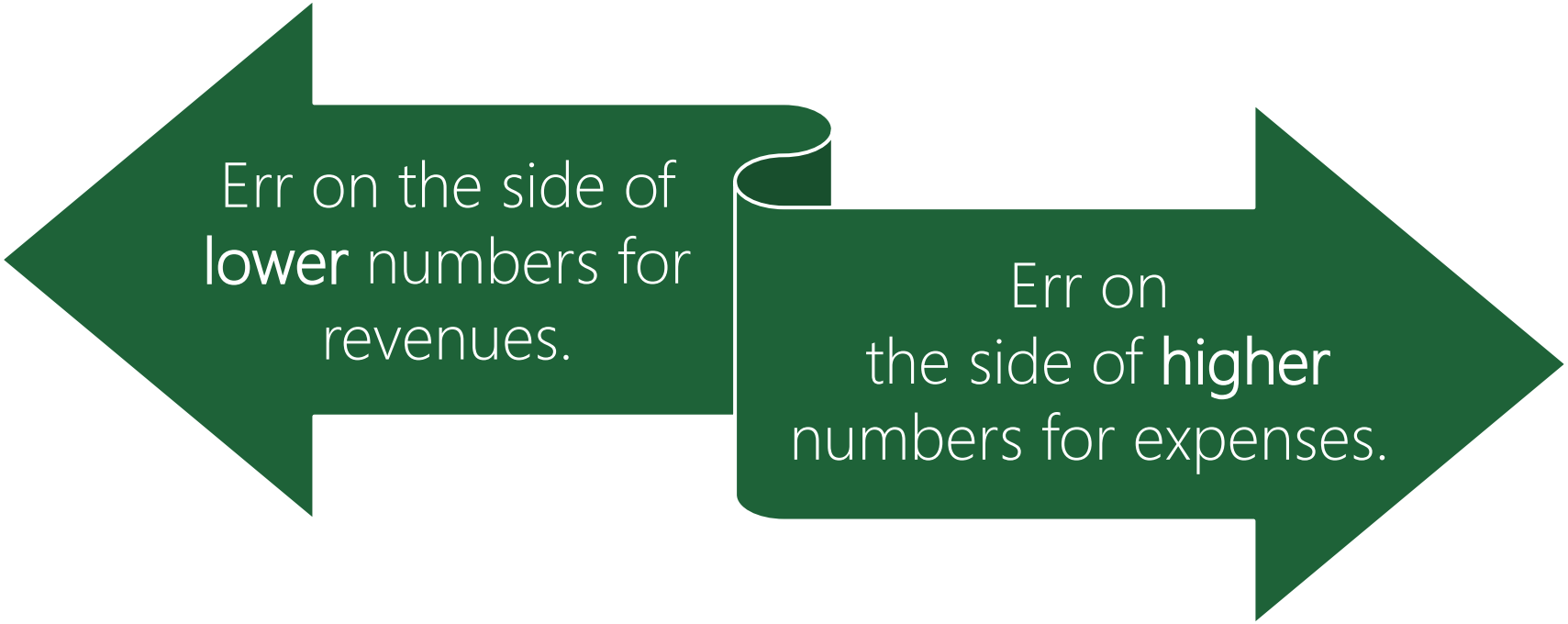
Considering Your Inputs

Think broadly and carefully about the costs and revenues you will include in your model and how they will change over time. Some examples are given below:

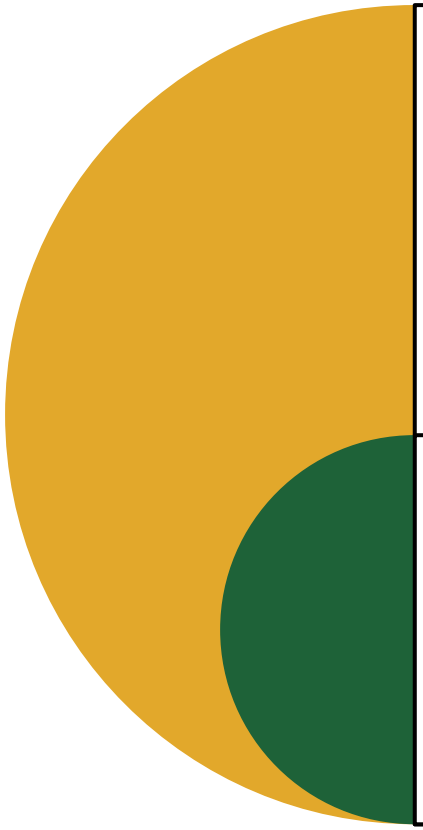
Personnel Costs	Operating and Administrative Costs	Capital Costs	Revenues
• Usually the largest (non-capital) cost category. • Factor in salary, fringe, bonuses, AND inflation.	• All the costs of running your organization: supplies, telecomm, marketing, rent, small equipment, etc.	• Major equipment (e.g., servers) • Space acquisition, construction, and renovation.	• Grants (direct costs and indirect costs / overhead) • Gifts / Philanthropy • Recharge Rates • Other Fundraising (e.g., events, merchandise)

Making Conservative Assumptions

Be conservative (but reasonable) in your assumptions



Using Assumption Tables for Inputs



It makes it easier for the model builder to:	• Construct formulas—and copy and paste them too. • Make changes to those formulas.
It makes it easier for the model user to:	• Understand the details. • Question (and accept) your assumptions. • Understand the results of your calculations.

Using Assumption Tables for Inputs

Example inflation factors on an assumption table:

		0	1	2	3	4
		Inflation Factors				
		FY23	FY24	FY25	FY26	FY27
Salary Inflation Rate	10.00%	1.00	1.10	1.21	1.33	1.46
Scientific Supply Inflation Rate	12.00%	1.00	1.12	1.25	1.40	1.57
General Inflation Rate	8.00%	1.00	1.08	1.17	1.26	1.36

Using Assumption Tables for Inputs

Example assumption table (in blue below) for salary calculations:

Estimated Expenses			Model Year	FY23	FY24	FY25	FY26	FY27	Total
			Year Start	7/1/22	7/1/23	7/1/24	7/1/25	7/1/26	
			Year End	6/30/23	6/30/24	6/30/25	6/30/26	6/30/27	
Salary Expenses	**Start Date**	**Base Salary**	**Percent Effort**						
Position 1	7/1/22	$ 150,000	100.00%	$ 150,000	$ 154,500	$ 159,135	$ 163,909	$ 168,826	**$ 796,370**
Position 2	7/1/22	$ 150,000	50.00%	$ 75,000	$ 77,250	$ 79,568	$ 81,955	$ 84,413	**$ 398,185**
Position 3	7/1/23	$ 125,000	100.00%	$ -	$ 128,750	$ 132,613	$ 136,591	$ 140,689	**$ 538,642**
Position 4	7/1/23	$ 125,000	50.00%	$ -	$ 64,375	$ 66,306	$ 68,295	$ 70,344	**$ 269,321**
Position 5	7/1/24	$ 100,000	100.00%	$ -	$ -	$ 106,090	$ 109,273	$ 112,551	**$ 327,914**
Position 6	7/1/24	$ 100,000	50.00%	$ -	$ -	$ 53,045	$ 54,636	$ 56,275	**$ 163,957**
Position 7	7/1/25	$ 75,000	100.00%	$ -	$ -	$ -	$ 81,955	$ 84,413	**$ 166,368**
Position 8	7/1/25	$ 75,000	50.00%	$ -	$ -	$ -	$ 40,977	$ 42,207	**$ 83,184**
Position 9	7/1/26	$ 50,000	100.00%	$ -	$ -	$ -	$ -	$ 56,275	**$ 56,275**
Position 10	7/1/26	$ 50,000	50.00%	$ -	$ -	$ -	$ -	$ 28,138	**$ 28,138**
			Subtotal, Salary Expenses	***$ 225,000***	***$ 424,875***	***$ 596,756***	***$ 737,591***	***$ 844,132***	***$ 2,828,354***

Using Assumption Tables for Inputs

Where should your assumptions go?

- One option is to list all (numerical) assumptions on one sheet and reference that sheet; this can make is easier to make updates.
- Another approach is to keep the assumptions in the part of the model to which they apply; this can make it easier for your audience to understand your model.
- It's OK to display your assumptions in multiple places in the model, as long as each assumption is only entered in one place in the model.

Keep Original Data Intact

If you are using a data set to help develop inputs, like general ledger data to help with expense estimates, keep the data in its original state.

- Create "Raw Data" tabs to house such data in its original form so that you can always reference it.
- If you have to manipulate the data in any way, such as by creating a new column to sum up other columns, make sure to label or color code which columns you created and which are original.
- If the data requires a lot of manipulation, you should consider creating a working tab from the "Raw Data" tab.
- Be sure to document where the data came from and how to update it, if appropriate.

Using Formulas for Outputs

Use formulas for all your outputs.

- It can be hard to understand where one typed-in (or "hard-coded") number came from.
- It's almost impossible to understand where ten typed-in numbers came from—and very difficult to update them all.

Using Formulas for Outputs

Make your formulas clear and transparent.

- Anyone looking at the model should be able to do two things:
  - Identify where each input for the formula originates.
  - Understand why each input belongs in the formula.
- Anyone updating the model should be able to do those things plus:
  - Know how to change each input to produce an updated output.

Using Formulas for Outputs

If you only remember one thing:

"Never, ever, EVER hardcode an output!"

(Unless you absolutely have to….)

Using Formulas for Outputs

Never hardcode an output!

Estimated Expenses				Model Year	FY23	FY24	FY25	FY26	FY27	Total
Salary Exp										
Position 1										796,370
Position 2										398,185
Position 3										538,642
Position 4										269,321
Position 5										327,914
Position 6										163,957
Position 7										166,368
Position 8										83,184
Position 9		7/1/26	$	50,000	100.00%	$ -	$ -	$ -	$ -	$ 56,275	$ 56,275
Position 10		7/1/26	$	50,000	50.00%	$ -	$ -	$ -	$ -	$ 28,138	$ 28,138
				Subtotal, Salary Expenses	*$ 225,000*	*$ 424,875*	*$ 596,756*	*$ 737,591*	*$ 844,132*	*$ 2,828,354*

Why can't I just…	Because…
Type the base salary as part of the formula?	It makes this number invisible; you must examine the formula to answer a simple question: how much are we paying this person?
Type the percent effort or the inflation factor into the formula?	You will have a lot of typing to do if these numbers change.
Type "6/12" if I know someone will only work half a year in Year 1?	You will need to adjust any time the start date changes – plus you will need to do the math anyway.

Building with a Consistent Approach

- Use a consistent approach to building your formulas.
  - If your first salary calculation is (base salary x time in position x percent effort x inflation), all your other salary calculations should be too.
- Use a consistent approach to building the parts of your model.
  - For example, if you have one worksheet for staff salaries and another for executive salaries, or for rent or renovation costs for different spaces, structure them the same way.
- A consistent approach is essential for scenario building.
  - You want your users to study the operational differences between two scenarios, as shown by your model's outputs, not be distracted by the structural differences between them, as shown by your model's inputs.

Conducting Reality Checks

Adjust your model through periodic reality checks. Some examples:

- Are your proposed salaries realistic given who you are trying to recruit and what's going on in the marketplace?
- If you are adding staff, is your hiring schedule realistic? Do you have space to house your people and for them to interact effectively?
- How likely is it that you will realize your projected revenues?
- Is the growth in revenues and expenses realistic given your history?
- Are revenues and expenses in line with each other and if not, why not?

Using Notes and Labels

- Notes, notes, notes!
  - You won't remember all the decisions you made when building your model unless you write them down.
  - Your users may not understand those decisions—or the related trade-offs—if you don't explain them.
  - The same applies to data sources: you won't remember where they all came from, and others won't be able to make related updates.
- Make sure everything is labeled clearly!
  - Every worksheet should have a clear title.
  - Every section of the worksheet should have a clear heading.
  - Every item in that section should have a clear label.

Creating a Simple Summary Sheet

- Think about what your audience wants/needs to know most and put that front and center.
- Think about the best way to show your summary.
  - Is something like a tradition financial statement the right approach, or will a graphic convey the information more clearly and powerfully?

Estimated Operating Expenses	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Personnel Expenses - Allowable						
Personnel Expenses - Salary	$ 313,169	$ 322,564	$ 332,241	$ 342,208	$ 352,474	$ 1,662,656
Personnel Expenses - Fringe	$ 108,017	$ 111,258	$ 114,596	$ 118,034	$ 121,575	$ 573,479
Personnel Expenses - Other Expenses	$ 25,000	$ -	$ -	$ -	$ -	$ 25,000
Total Estimated Personnel Expenses - Allowable	**$ 446,186**	**$ 433,822**	**$ 446,837**	**$ 460,242**	**$ 474,049**	**$ 2,261,136**
Personnel Expenses - Unallowable						
Personnel Expenses - Salary	$ -	$ -	$ -	$ -	$ -	$ -
Personnel Expenses - Fringe	$ -	$ -	$ -	$ -	$ -	$ -
Personnel Expenses - Other Expenses	$ -	$ -	$ -	$ -	$ -	$ -
Total Estimated Personnel Expenses - Unallowable	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Total Estimated Personnel Expenses	**$ 446,186**	**$ 433,822**	**$ 446,837**	**$ 460,242**	**$ 474,049**	**$ 2,261,136**
Non-Personnel Expenses - Allowable						
Animal Expenses	$ 555,125	$ 1,024,013	$ 1,075,213	$ 1,128,974	$ 1,185,422	$ 4,968,747
Research Operating Expenses	$ 599,640	$ 629,622	$ 661,103	$ 694,158	$ 728,866	$ 3,313,390
Administrative Expenses	$ 185,000	$ 193,500	$ 202,406	$ 211,739	$ 221,518	$ 1,014,163
Subcontract Expenses	$ 25,000	$ 26,250	$ 27,563	$ 28,941	$ 30,388	$ 138,141
Total Estimated Non-Personnel Expenses - Allowable	**$ 1,364,765**	**$ 1,873,385**	**$ 1,966,285**	**$ 2,063,811**	**$ 2,166,194**	**$ 9,434,440**
Non-Personnel Expenses - Unallowable						
Animal Expenses	$ -	$ -	$ -	$ -	$ -	$ -
Research Operating Expenses	$ 121,589	$ 101,796	$ 106,886	$ 112,231	$ 117,842	$ 560,344
Administrative Expenses	$ 47,250	$ 40,744	$ 45,608	$ 43,923	$ 49,261	$ 226,786
Subcontract Expenses	$ 625,000	$ 656,250	$ 689,063	$ 723,516	$ 759,691	$ 3,453,520
Total Estimated Non-Personnel Expenses - Allowable	**$ 793,839**	**$ 798,790**	**$ 841,557**	**$ 879,669**	**$ 926,794**	**$ 4,240,650**
Total Estimated Non-Personnel Expenses	**$ 2,158,604**	**$ 2,672,175**	**$ 2,807,842**	**$ 2,943,480**	**$ 3,092,989**	**$ 13,675,089**
Total Estimated Operating Expenses	**$ 2,604,790**	**$ 3,105,997**	**$ 3,254,678**	**$ 3,403,722**	**$ 3,567,038**	**$ 15,936,225**

Creating a Simple Summary Sheet

- If your summary is getting too complicated, consider having two views: a comprehensive summary and a snapshot.

Creating a Summary Sheet

Think about what you think you want to share…

Creating a Simpler Summary Sheet

…then think about what your audience really needs to know.

	A - $1M total per partner over two years	B - $1.50M total per partner over three years	C - $2M total per partner over three years	D - $3M total per partner over three years	E - $3M total per partner over three years	F - $3M total per partner over three years
10 Partners	**Total Investment:** $10M **Platform(s):** 1 **Sites:** 4 **Tumors/wk:** 5 (3000 total) **Tumor Set:** Top 10 **Data Release:** End Year 1 **IT Budget:** $3M	**Total Investment:** $15M **Platform(s):** 1 **Sites:** 5 **Tumors/wk:** 5 (3750 total) **Tumor Set:** Top 10 **Data Release:** End Year 2 **IT Budget:** $3M	**Total Investment:** $20M **Platform(s):** 1 **Sites:** 7 **Tumors/wk:** 5 (5250 total) **Tumor Set:** All **Data Release:** Mid Year 2 **IT Budget:** $3M	**Total Investment:** $30M **Platform(s):** 2 **Sites:** 12 **Tumors/wk:** 5 (9000 total) **Tumor Set:** Top 10 **Data Release:** End Year 2/ Beg Year 3 **IT Budget:** $7.5M	**Total Investment:** $30M **Platform(s):** 3 **Sites:** 12 **Tumors/wk:** 5 (9000 total) **Tumor Set:** Top 10 **Data Release:** Mid Year 2 **IT Budget:** $7.5M	**Total Investment:** $30M **Platform(s):** 3 **Sites:** 12 **Tumors/wk:** 5 (9000 total) **Tumor Set:** Top 10 **Data Release:** Beg Year 2 **IT Budget:** $7.5M
8 Partners	**Total Investment:** $8M **Platform(s):** 1 **Sites:** 4 **Tumors/wk:** 2 (1200 total) **Tumor Set:** Top 4 **Data Release:** End Year 1 **IT Budget:** $2M ($1M Year 1)	**Total Investment:** $12M **Platform(s):** 1 **Sites:** 4 **Tumors/wk:** 5 (3750 total) **Tumor Set:** Top 6 **Data Release:** End Year 2 **IT Budget:** $2.5M	**Total Investment:** $16M **Platform(s):** 1 **Sites:** 5 **Tumors/wk:** 5 (3750 total) **Tumor Set:** All **Data Release:** Mid Year 2 **IT Budget:** $2.5M	**Total Investment:** $24M **Platform(s):**1 **Sites:** 10 **Tumors/wk:** 5 (7500 total) **Tumor Set:** Top 10 **Data Release:** Mid Year 2 **IT Budget:** $7.5M	**Total Investment:** $24M **Platform(s):** 2 **Sites:** 10 **Tumors/wk:** 5 (7500 total) **Tumor Set:** Top 10 **Data Release:** Mid Year 2 **IT Budget:** $7.5M	**Total Investment:** $24M **Platform(s):** 2 **Sites:** 10 **Tumors/wk:** 5 (7500 total) **Tumor Set:** Top 10 **Data Release:** Beg Year 2 **IT Budget:** $7.5M
6 Partners	**Total Investment:** $6M **Platform(s):** 1 **Sites:** 4 **Tumors/wk:** 1 (600 total) **Tumor Set:** Top 4 **Data Release:** End Year 2 **IT Budget:** $2M	**Total Investment:** $9.0M **Platform(s):** 1 **Sites:** 4 **Tumors/wk:** 3 (1800 total) **Tumor Set:** Top 4 **Data Release:** End Year 2 **IT Budget:** $2M	**Total Investment:** $12M **Platform(s):** 1 **Sites:** 5 **Tumors/wk:** 3 (2250 total) **Tumor Set:** All **Data Release:** End Year 2 **IT Budget:** $2M	**Total Investment:** $18M **Platform(s):** 1 **Sites:** 5 **Tumors/wk:** 5 (3750 total) **Tumor Set:** Top 6 **Data Release:** End Year 2 **IT Budget:** $3M	**Total Investment:** $18M **Platform(s):** 1 **Sites:** 5 **Tumors/wk:** 5 (3750 total) **Tumor Set:** Top 10 **Data Release:** End Year 2 **IT Budget:** $3.5M	**Total Investment:** $18M **Platform(s):** 1 **Sites:** 7 **Tumors/wk:** 5 (5250 total) **Tumor Set:** Top 10 **Data Release:** End Year 2 **IT Budget:** $5M
4 Partners	**Total Investment: $4M** **Platform(s): 1** **Sites: 4** **Tumors/wk: 1 (600 total)** **Tumor Set: Top 4** **Data Release: N/A** **IT Budget: NOT VIABLE**	**Total Investment: $6M** **Platform(s): 1** **Sites: 4** **Tumors/wk: 1 (600 total)** **Tumor Set: Top 4** **Data Release: N/A** **IT Budget: NOT VIABLE**	**Total Investment:** $8M **Platform(s):** 1 **Sites:** 4 **Tumors/wk:** 1 (600 total) **Tumor Set:** All **Data Release:** End Year 3 **IT Budget:** $1.5M	**Total Investment:** $12M **Platform(s):** 1 **Sites:** 4 **Tumors/wk:** 1 (600 total) **Tumor Set:** Top 4 **Data Release:** End Year 2 **IT Budget:** $2.5M	**Total Investment:** $12M **Platform(s):** 1 **Sites:** 4 **Tumors/wk:** 5 (3000 total) **Tumor Set:** Top 4 **Data Release:** End Year 2 **IT Budget:** $2.5M	**Total Investment:** $12M **Platform(s):** 1 **Sites:** 5 **Tumors/wk:** 5 (3750 total) **Tumor Set:** Top 10 **Data Release:** End Year 1 **IT Budget:** $3.0M

Recap

- A financial model is a tool that lets you make explainable estimates about revenues and/or expenses, generally over multiple years and, as needed, under multiple conditions.
- Best practices for financial modeling include:
  - Stating your rules clearly and using notes and labels freely.
  - Making conservative assumptions and doing periodic reality checks.
  - Using assumption tables for your inputs and keep your original data intact.
  - Using formulas for your outputs and making them clear and transparent.
  - Using a consistent approach for all parts of your model.
  - Creating a simple summary tailored to your audience.

Questions?

UBC Summer Knowledge Share Series

- Remaining Sessions:
  - *Consulting Project Best Practices*, July 20, 12-1 pm
  - *Successful Facilitation Tips and Tricks*, August 17, 12-1 pm
- Please feel free to forward the invitation
- Today's presentation pdf will be provided to those that signed up
- Feedback form – we'll send one out this week and would welcome your suggestions

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