



Quantrix & Excel: 3 Key Differences

A QUANTRIX WHITE PAPER



	Income Statement		
	Actuals	Forecast	
	Year0	Year1	Year2
Revenue	1,000	1,100	1,210
COGS	500	550	666
Gross Profit	500	550	545
Operating Expenses			
SG&A	250	275	303

Function... = + - * / ^ .. : :: ()

- 1. Revenue:Year[THIS] = Revenue:Year[PREV] * (1 + Statement Cases::Revenue:Year[THIS])
- 2. Item = Revenue * 'Income Statement Cases': Revenue, Total Oper Exp, Gross Profit, EBIT, Income, D&A'

Abstract

This whitepaper is designed to educate spreadsheet users about three key conceptual and practical differences between Quantrix Modeler and Excel.

A better understanding of what sets Quantrix and traditional spreadsheets apart will help financial and quantitative modeling professionals evaluate the impact Quantrix Modeler can have on their modeling success.

This paper examines the following:

- Quantrix matrices compared to worksheets,
- Quantrix items compared to spreadsheet rows and columns, and
- Quantrix formulas compared to spreadsheet cell-based formulas.

The Problem

Spreadsheet software has been commercially available for more than 25 years and is an appropriate solution for many tasks commonly performed by the financial and data modeling community.

However, the spreadsheet has its limitations when creating more complex models that employ multiple dimensions, formulas, and immense data sets.

Complex spreadsheets become inherently inflexible and prone to error as they grow – thus undermining confidence in the data and insight they produce.

Today's businesses, government agencies, non-profit organizations, and academic institutions require a tool that enables more efficient and scalable modeling while being intuitive to the user.

"If I could sum up the difference between Quantrix and Excel I would say that the former is algebra and the latter arithmetic! We get further and faster with algebra rather than arithmetic."

Ajith Prasad, National University of Singapore

Quantrix Matrix compared to the Worksheet

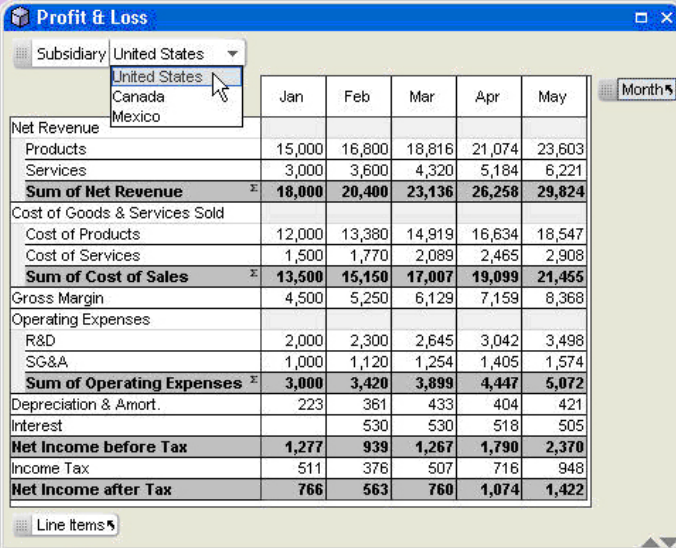
Quantrix models consist of multi-dimensional matrices. Spreadsheets, by contrast, are two-dimensional worksheets that come in workbooks. While matrices have features in common with worksheets, there are important differences.

It may be helpful to first define what a dimension is in practical terms.

Take, for example, a Profit & Loss (P&L) budget. When building a P&L budget by month for one year, one dimension would be represented by month and a second dimension would be a P&L line item such as Revenue, Expenses, Profit, etc.

Other typical dimensions in a business model could include Business Unit, Subsidiary, Product, Channel, Region, Scenario, or Case.

In the simplest case, there is a two-dimensional model Month x P&L Line Item. It is relatively easy to create this model in one Worksheet. However, if the business has multiple subsidiaries, it may be necessary to prepare this budget by subsidiary as well. With the introduction of subsidiary, the model has now expanded to three dimensions: Month x P&L Line Item x Subsidiary.



The screenshot shows a software window titled "Profit & Loss". At the top left, there is a "Subsidiary" dropdown menu with "United States" selected. Below it, a list shows "United States", "Canada", and "Mexico". To the right of the dropdown is a table with columns for "Jan", "Feb", "Mar", "Apr", and "May". A "Month" dropdown is on the far right. The table contains the following data:

	Jan	Feb	Mar	Apr	May
Net Revenue					
Products	15,000	16,800	18,816	21,074	23,603
Services	3,000	3,600	4,320	5,184	6,221
Sum of Net Revenue	18,000	20,400	23,136	26,258	29,824
Cost of Goods & Services Sold					
Cost of Products	12,000	13,360	14,919	16,634	18,547
Cost of Services	1,500	1,770	2,089	2,465	2,908
Sum of Cost of Sales	13,500	15,150	17,007	19,099	21,455
Gross Margin	4,500	5,250	6,129	7,159	8,368
Operating Expenses					
R&D	2,000	2,300	2,645	3,042	3,498
SG&A	1,000	1,120	1,254	1,405	1,574
Sum of Operating Expenses	3,000	3,420	3,899	4,447	5,072
Depreciation & Amort.	223	361	433	404	421
Interest		530	530	518	505
Net Income before Tax	1,277	939	1,267	1,790	2,370
Income Tax	511	376	507	716	948
Net Income after Tax	766	563	760	1,074	1,422

Illustration 1:

Adding the category, Subsidiary, (top left) creates a multidimensional matrix that is easier to view and manipulate than a spreadsheet.

To accomplish this in a spreadsheet, one typical approach would be to set up the budget for each subsidiary on a separate worksheet.

This is where Quantrix diverges from a spreadsheet. Matrices in Quantrix support more than two dimensions. In fact, Quantrix supports up to 16 dimensions. Therefore, it is unnecessary to take the same design approach as with a spreadsheet. Rather, the third dimension, subsidiary, can be added to the P&L Budget by simply inserting a new category.

The advantages for the financial modeler with this approach are as follows:

- **Economy.** Standard P&L formulas for items like gross profit or EBITDA, which will apply to any subsidiary, are written just *once*.
- **Agility.** It is necessary to add more years or additional line items only *once* (rather than repeating the change in each worksheet in a spreadsheet) and the change will apply to *all* subsidiaries.
- **Insight.** To compare and contrast the subsidiaries, simply move the category tiles in the matrix to get the desired perspective.

Once again, Quantrix matrices are multi-dimensional.

Two-dimensional structures, which must be replicated in a spreadsheet to accommodate extra dimensions, can be managed more efficiently in just one matrix in Quantrix.

"We had multiple dimensions we wanted to analyze, and we were able to chunk down a huge amount of data and do something productive with it."


Steven Bailey, DeLorme Inc.

Quantrix Items and Categories Compared to Spreadsheet Rows and Columns

Most financial and data modeling professionals are used to working with fixed rows and columns in a spreadsheet, e.g. A, B, C, D and 1, 2, 3, 4. Columns are represented by letters and rows by numbers. In Excel, these references cannot be changed. Rather, meaningful row and column labels are defined in cells.

Quantrix uses the term “items” instead of rows and columns because the position of the items is not fixed. With simple drag-and-drop navigation, users can move column items so they are represented as rows, and vice versa. In Quantrix, it is also possible to change the name of an item. Items can have generic labels like A, B, C, 1, 2, 3, or they can have meaningful labels like Revenue, Costs, Profit, 2006, 2007, and 2008.

Items belong to categories in Quantrix and categories are defined by category tiles. Category tiles are moved by drag-and-drop to manipulate the position of the items. A category, and the items belonging to it, can be used elsewhere in a model. In a P&L budget model, for example, there may be category, Year, with items, 2006, 2007 and 2008.



The screenshot displays three overlapping windows from the Quantrix software interface, each showing a financial statement for three subsidiaries: United States, Canada, and Mexico. The 'Balance Sheet' window shows Current Assets with Cash and Cash Equivalents totaling 5,000. The 'Profit & Loss' window shows Net Revenue of 15,000 for Products. The 'Cash Flow Projections' window shows a Total Working Capital of 0, Operating Cash Flow of -11, and Net Cash Flow of -11. A tooltip is visible over the 'Cash Flow Projections' window, listing linked categories: Profit & Loss, Balance Sheet, and Capex Worksheet.

	United States	Canada	Mexico
Assets			
Current Assets			
Cash & Cash Equivalents			
Cash	5,000		
Sum of Cash & Cash Equiv ²	5,000	0	0
Other Assets			
Inv			
Off			
Su			
Sum			
Net Revenue			
Products	15,000		
Services	0		
Liabilities			
Debt			
Equity			
Working Capital			
Total Working Capital	0	0	0
Cap Ex	-1,000	-1,000	-1,000
Purchase/Sale of Assets			
Total Purchase/Sale of Assets	-1,000	-1,000	-1,000
Operating Cash Flow	-11	-911	-911
Debt			
Equity			
Total Financing	0	0	0
Net Cash Flow	-11	-911	-911
Beginning Cash			
Ending Cash			
DCF			
Period			
Discount Factor			
Discounted Oper. Cash Flow	0	0	0

Illustration 2:

Linking categories such as Year automatically extends the model rather than manually creating new worksheets.

This model may also require the creation of a Balance Sheet and a Cash Flow statement in separate matrices. In this case, it may be desirable to model the Balance Sheet and Cash Flow for the same years as the P&L.

Instead of creating new Year categories in the Balance Sheet and Cash Flow matrices, simply link the Year category and all its items from the P&L matrix to the two new matrices. This automatically creates the required years.

The powerful capability of linking a dimension, such as Year, from one section of a model to another is not possible in Excel and is important to consider when building models in Quantrix.

In addition to eliminating the replication of labels in new matrices, there are other benefits:

- **Simplicity.** Formulas are much simpler, because they are able to cross reference the proper items. For example, the first line of the cash flow may be Net Profit. Net Profit comes from the P&L. So, in the Cash Flow, only one formula is required that says "Net Profit = P&L::Net Profit". This formula will automatically return the proper figure for each Year from the P&L matrix.
- **Automation.** When making changes to the linked category in one matrix, the same change will automatically update the other matrices. In the previous example, if the P&L budget model is extended to 2009 by adding a new item, it will automatically appear in the Balance Sheet and Cash Flow matrices. Existing formulas will automatically apply to the new year – there is no need to manually copy and paste.

In summary, when setting up multiple matrices in a Quantrix model, remember that common categories, such as Year can be linked across matrices to greatly simplify logic and model maintenance on an on-going basis.

"In a traditional spreadsheet, a model involving a lot of data and several scenarios often becomes complicated and hard to follow because of the limitations of the structure and the cell reference syntax.

In Quantrix, a complex model can have a simple structure."

Philip Turner, Turner Analysis & Advisory

Quantrix Formulas Compared to Spreadsheet Cell-based Formulas

A common practice developed by spreadsheet users is writing formulas in cells by clicking on the cell and hitting the equals (=) key. When that formula is needed in other cells, the original formula is copied and pasted into the new cells.

In Quantrix, formulas are not written in cells. Instead, they are written in a separate formula section just below the matrix. They are also written to refer to the item or category for which the formula should calculate.

Furthermore, formulas in a spreadsheet have no reference to the left of the equals (=) sign. This is due to the fact that the left-hand side of the formula is always the cell reference itself. Writing formulas in this manner is not particularly intuitive. If a user were to stand at a white board and explain how to calculate Current Assets in a Balance Sheet, she would likely write it like this:

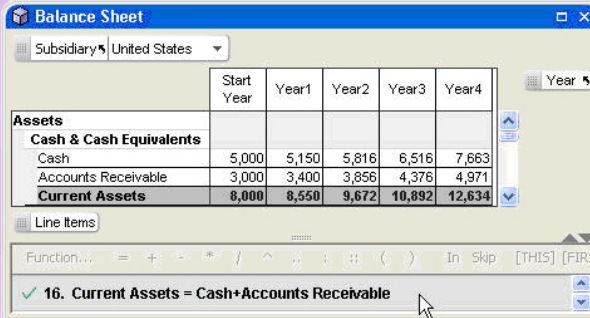
$$\text{Current Assets} = \text{Cash} + \text{Accounts Receivable}$$

Rather than this:

$$= \text{Cash} + \text{Accounts Receivable}$$

Or, if Cash and Accounts Receivable are in cells B2 and B3, almost certainly not like this:

$$= B2 + B3$$



	Start Year	Year1	Year2	Year3	Year4
Assets					
Cash & Cash Equivalents					
Cash	5,000	5,150	5,816	6,516	7,663
Accounts Receivable	3,000	3,400	3,856	4,376	4,971
Current Assets	8,000	8,550	9,672	10,892	12,634

Line Items

Function... = + - * / ^ % : ; () In Skip [THIS] [FIR]

✓ 16. Current Assets = Cash+Accounts Receivable

Illustration 3:

Formulas are written outside the cell – and in the way people think of them.

Formulas in Quantrix are written the way that the human brain intuitively conceives and expresses them. If Current Assets equal the sum of Cash and Accounts Receivable, then the Quantrix formula will be written like this:

$$\text{Current Assets} = \text{Cash} + \text{Accounts Receivable}$$

Again, the Quantrix formula is not written in the cell. It is written to refer to an item or category (in this case an item called Current Assets). This feature allows the formula to apply to all instances of Current Assets or, for example, to all periods in a Balance Sheet. Quantrix users gain important benefits writing formulas this way:

- **Efficiency.** Users maintain far fewer formulas than with spreadsheets. In the Balance Sheet example above, if the user were to develop a five-year plan by month, there would be 60 instances of "Current Assets". In spreadsheets, there will be 60 formulas. In Quantrix, there is only one.
- **Scalability.** In spreadsheets, it is necessary to copy and paste formulas to new cells to extend the model to future years. In Quantrix, the formulas will apply and update automatically. There are no new formulas and no manual steps.
- **Confidence.** If the calculation of Current Assets is modified to include Short-term Investments, that formula change must be carefully copied and pasted by hand to all the other cells in a spreadsheet. In Quantrix, only one formula is modified. The validation is performed on only one formula which eliminates a major source of errors.
- **Transparency.** The Quantrix formula is written in real words and is therefore transparent, easy to understand, and self-documenting.

To recap, writing formulas in Quantrix is more efficient and transparent.

It is not necessary to write formulas in cells and manually copy and paste to other related cells. Rather, formulas are written once to apply to items or categories, which greatly simplify the logic and validation of the model.

"Quantrix will automatically apply the formula across the third dimension without you having to re-do a lot of existing work.

That is dramatic."

Kyle G. Lundstedt, VaRisk, Inc

Conclusion

This paper has examined three important differentiators between Quantrix Modeler and Excel.

While appropriate for simpler financial modeling tasks, spreadsheets quickly encounter limitations as complexity and dimensionality increase.

Quantrix is designed as an easy-to-use tool to address complex business and quantitative modeling challenges. It is a departure from the traditional spreadsheet paradigm and offers a new perspective in approaching modeling tasks.

Quantrix Modeler offers important benefits including modeling agility, simplicity, transparency, and automation to deliver greater confidence and business insight for financial and quantitative modeling professionals.

For more information, visit www.quantrix.com.