

Using Volume, Price and Mix Analysis to Better Understand Changes Between Sales Periods

As president or CEO of your company, do you really know what is driving monthly sales changes from period to period, or in comparison to a monthly budget? Is there anyone within your company that can explain the sales changes you are experiencing? Can your sales manager tell you what is happening? Can your CFO or controller help you?

Changes in sales from month-to-month, year-to-year or any other time period should not be a mystery, but oftentimes it is just that. Companies go to great lengths to develop an annual, calendared sales budget but when the actual results flow in monthly, many firms are at a loss to explain what is happening from that budget. You know the issues; sales are higher but know for a fact there have been no sales price increases, sales of the ABC widget are through the roof but profits just aren't there, and on and on.

Assuming the reader has limited access to sophisticated sales reporting means, the example in this article will utilize only an Excel workbook to lay out a methodology that just may help you get a grasp on understanding changes in sales. Using the mathematical formulas laid out in the example below, some sense may be made of this "mystery".

XYZ Sales Corporation
 Sales Analysis
 Period 1 vs. Period 2

- Base - Period 1					- Current - Period 2					Total Sales \$ Change
Product	Mix %	Quantity	Selling Price	Sales \$	Product	Mix %	Quantity	Selling Price	Sales \$	
ABC	0.55556	50	\$ 1.20	\$ 60.00	ABC	0.54545	60	\$ 1.10	\$ 66.00	\$ 24.00
DEF	<u>0.44444</u>	40	\$ 0.80	\$ <u>32.00</u>	DEF	<u>0.45455</u>	50	\$ 1.00	\$ 50.00	
Total	1	90		\$ 92.00		1	110		\$ 116.00	

The example used here is that the XYZ Sales Corp. sells only two products. Obviously if this were the case you would not need any formal tools for analysis but the key here will be to understand the "power" of the methodology. I will use a monthly approach to this example but a period in question could be a month, quarter, a year or any other defined time period.

Your company may track sales by market segment, sku, or model but the essence of the analysis will not change. The assumption is that your company knows at least what it is selling and how much (in terms of weight or pieces and by dollar value). The first part of the exercise breaks the periods under study into 1) the base period (which could be the prior month, the budget for that month or the same month from the previous year etc.) and 2) the current period.

In our example, XYZ Sales Corp. realized \$24.00 more worth of sales in the current period compared to the base period. Using volume, price and mix analysis techniques, we will attempt to understand why sales increased by \$24.00. Remember, the \$24.00 could be \$24,000,000 so the analysis would have much more significance!

The first key to understanding sales changes from period to period is in understanding the impact of the change in the *quantity* (volume) sold. In the example, for the current period, XYZ Sales Corp. sold 110 of its products vs. 90 in the Base period, period 1. This difference of +20 multiplied by the average sales price of \$1.0222 (base gross sales dollars of \$92.00 divided by the base gross units sold of 90 = \$1.0222) = \$20.44 (\$1.0222 x 20). Thus, it is now known that of the \$24.00 increase in sales, \$20.44 can be attributed to selling more product in the current period compared to the base period.

Volume

Product	Period 2 Quantity	Period 1 Quantity	Period 1 Sales \$	Period 1 Sales \$/ Period 1 Qty.	Quantity Net	Sales Volume Variance
ABC	60	50	60		10	
DEF	50	40	32		10	
Total	110	90	92	\$ 1.0222 x	20	\$ 20.44

The second key to understanding sales changes from period to period is in understanding the difference in the *price* of what was sold. Again referring to the example on page 1, the average price of Product ABC was \$1.20 each in the base compared to \$1.10 each in the current period. The average price of Product DEF was \$.80 in the base period and \$1.00 each in the current period. This data can be laid out as follows for ease in understanding:

Selling Price

Product	- Current - Pd 2 \$/Unit	- Base - Pd 1 \$/Unit	Net	Current Units	Sales Price Variance
ABC	\$ 1.10	\$ 1.20	\$ (0.10)	60	\$ (6.00)
DEF	\$ 1.00	\$ 0.80	\$ 0.20	50	\$ 10.00
				110	\$ 4.00

Multiplying the net differences in selling prices by the units sold in the current period will render the amount of sales change attributed to selling prices per unit. From the example above, the analysis shows that of the \$24.00 total sales change, \$4.00 is because XYZ Sales Corp. realized a higher selling price per unit of product sold.

It is worth noting here that the example is predicated on analyzing sales at the product or sku unit level (probably the lowest level of detail in any company). If you were to do this analysis at a higher level of detail, perhaps by market segment (where many sku's would be combined), it would be possible for the analysis to show a sales price increase but the increase would be not from realizing higher sales prices per se, but rather because the company sold a "richer" mix of products (sku's) *within* that market segment. Thus, the price analysis could contain a change in price due to a change within a particular market segment. Remember, the more detailed the analysis (i.e. sku vs. market segment) the less apt *mix within* will influence the sales price changes.

The third and final key to understanding sales changes from period to period is in understanding the difference in the *sales mix* of what was sold. The mix referred to here is the mix between the products sold (or market segment or sku's) not the mix within a sales category referred to in the above section in analyzing selling price. Consider the example below:

Sales Mix	- Base -		Current Year		Current Units -			Sales Mix Variance
	Period 1	Period 1	Total	Units @ Base	Current Year	Pd 1 \$ per Unit -	Base \$ per Unit	
Product	Quantity	Mix %	Current Units	Year Mix	Current Units	Year Mix	of \$1.0222	
ABC	50	0.55556		61.1	60	-1.1	\$ 0.18	\$ (0.20)
DEF	40	0.44444		48.9	50	1.1	\$ (0.22)	\$ (0.24)
Total	90	1	110	110	110	0		\$ (0.44)

The attempt here is to compare the current period sales to its sales restated at the base period mix. First, it is necessary to "take apart" the base period sales quantities. In other words, based on the quantities sold in the base period, what is each products % of the total? In our example one can see that Product ABC comprised essentially 55.6% of the total and Product DEF comprised the balance, or roughly 44.4% of the total. Step two, take these factors and multiply them by the *total* quantity sold in the current period. The product of this essentially will be the current years quantities restated for the base mix, by product. Step three, subtract the current year units restated for the base mix from the current years actual mix, by product. Finally, extend these quantities by the Period 1 prices by product less the Base year average selling prices and add the results. The sum will be the amount of sales change related to a change in sales mix. In our example, that amounts to \$(0.44).

Summarizing the example, the total sales change of \$24.00 was attributed to:

Volume	\$20.44
Sales Price (and mix within)	\$4.00
Sales Mix Between Products	\$(0.44)

You would have to agree that even in our simple example, the details of the change really were not that obvious.

Ratcheting the analysis up even further, one can use the same methodology to analyze standard margin by volume, price and mix between products, if your company captures standard costs by sku/part number. Now the CEO can discuss standard profitability with his marketing and sales managers in *addition* to changes in gross sales. Perhaps that should be the subject of the next white paper!