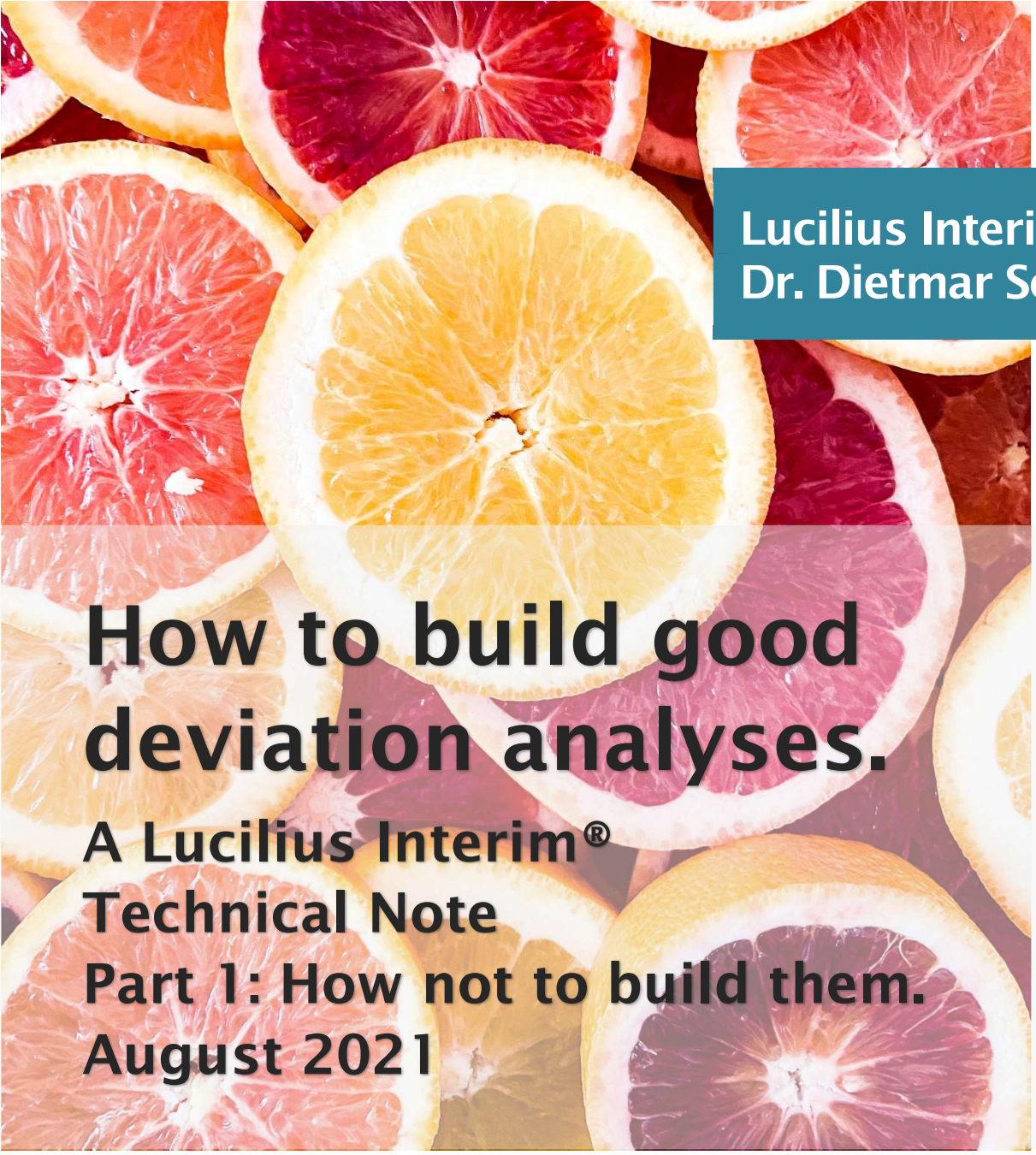

Lucilius Interim
Dr. Dietmar Scheja

How to build good deviation analyses.

A Lucilius Interim® Technical Note
Part 1: How not to build them.
August 2021

When actual revenues deviate from budget or prior year, breaking the deviation down into its components – volume, price, mix – is a powerful way of identifying the most influential drivers and levers for counter action.

But deviation analyses are often set-up in a way that makes their results difficult to communicate and thus reduces their impact. This note suggests a simple, easy to interpret and easy to communicate alternative.

Strawberries, Cherries

Richard has recently taken over our favorite fruit stall on the weekly Bornheim produce market from his parents. He swore that he would make sales of at least 33k Euros during the first half

year with him in charge. The time of reckoning has now arrived. Since he knows that he has achieved higher volumes than he had targeted – 24.4k pieces of fruit instead of the targeted 19.5k – he is very disappointed when he sees his half year P&L: Instead of beating this sales target, his actual sales amount to less than 32k Euros. Richard is disappointed; he wants to understand what happened.

Here are the relevant data.

DATA TYPE	BUDGET				ACTUAL				DELTA			
	Net Sales	Volume	Price	Vol Mix	Net Sales	Volume	Price	Vol Mix	Net Sales	Volume	Price	Vol Mix
PRODUCTS	[€]	[pcs]	[€/pc]	%	[€]	[units]	[€/unit]	%	[€]	[units]	[€/unit]	ppt
Apples	5.880	12.000	0,49	62%	9.845	17.900	0,55	73%	3.965	5.900	0,06	12%
Grapefruit	14.750	5.000	2,95	26%	10.150	3.500	2,90	14%	-4.600	-1.500	-0,05	-11%
Mangos	12.375	2.500	4,95	13%	11.850	3.000	3,95	12%	-525	500	-1,00	-1%
Total Fruit	**33.005**	**19.500**	**1,69**	**100%**	**31.845**	**24.400**	**1,31**	**100%**	**-1.160**	**4.900**	**-0,39**	**0%**

Richard looks for an explanation of the Net Sales Delta of -1.160 Euros. It's easy to see that the volume increase of 4.900 pieces in total is overcompensated by a drop of -0,39 € in the average sales price of the fruit he sells. To assess the effect of the drivers, in a first step he looks at the **Deviations** on the aggregate Total Fruit level.

Total Fruit	**33.005**	**19.500**	**1,69**	**100%**	**31.845**	**24.400**	**1,31**	**100%**	**-1.160**	**4.900**	**-0,39**	**0%**

NET SALES DEVIATION	TOTAL D	VOL D	PRICE D	REM'G
Total Fruit	**-1.160**	**8.294**	**-9.454**	**0**

The **Total Sales Deviation** equals the Sales Delta. He then calculates **Volume Deviation = BudgetPrice x VolumeDelta** and sees that the volume increase would have brought him 8.294 Euros of sales above Budget if it had occurred at the budgeted price. But the price was lower than budgeted. Multiplying the **PriceDelta** of -0,39 by **ActualVolume** (24.400 pieces) yields a **Price Deviation** of -9.454 Euros. On the aggregate level investigated here, **Volume Deviation** and **Price Deviation** fully explain the **Total Sales Deviation** of -1.160.

But, of course, the aggregate **Price Deviation** calculated here is not really driven by price only. The aggregate **PriceDelta** of -0,39 is a weighted average, and hence, a composite: It combines the impact of the (pure) price changes for Apples, Grapefruit and Mangos with the impact of their shifting weights in the volume mix.

To split the aggregate **PriceDelta** into (pure) price and mix, many models take a short cut and transfer the mechanics used on the aggregate level to the lower levels of each of the three types of fruit. Richard does the same, and proceeds as follows:

Apples: **AVolDev = ABudgetPrice x AVolDelta**; **APriceDev = AActVol x APriceDelta**

DATA TYPE	BUDGET				ACTUAL				DELTA			
	Net Sales	Volume	Price	Vol Mix	Net Sales	Volume	Price	Vol Mix	Net Sales	Volume	Price	Vol Mix
PRODUCTS	[€]	[pcs]	[€/pc]	%	[€]	[units]	[€/unit]	%	[€]	[units]	[€/unit]	ppt
Apples	5.880	12.000	0,49	62%	9.845	17.900	0,55	73%	3.965	5.900	0,06	12%
Grapefruit	14.750	5.000	2,95	26%	10.150	3.500	2,90	14%	-4.600	-1.500	-0,05	-11%
Mangos	12.375	2.500	4,95	13%	11.850	3.000	3,95	12%	-525	500	-1,00	-1%
Total Fruit	**33.005**	**19.500**	**1,69**	**100%**	**31.845**	**24.400**	**1,31**	**100%**	**-1.160**	**4.900**	**-0,39**	**0%**

NET SALES DEVIATION	TOTAL D	VOL D	PRICE D	REM'G
Total Fruit	**-1.160**	**8.294**	**-9.454**	**0**
Apples	3.965	2.891	1.074	0

Grapefruit: **GVolDev = GBudgetPrice x GVolDelta**; **GPriceDev = GActVol x GPriceDelta**

Apples	5.880	12.000	0,49	62%	9.845	17.900	0,55	73%	3.965	5.900	0,06	12%
Grapefruit	14.750	5.000	2,95	26%	10.150	3.500	2,90	14%	-4.600	-1.500	-0,05	-11%
Mangos	12.375	2.500	4,95	13%	11.850	3.000	3,95	12%	-525	500	-1,00	-1%
Total Fruit	**33.005**	**19.500**	**1,69**	**100%**	**31.845**	**24.400**	**1,31**	**100%**	**-1.160**	**4.900**	**-0,39**	**0%**

NET SALES DEVIATION	TOTAL D	VOL D	PRICE D	REM'G
Total Fruit	**-1.160**	**8.294**	**-9.454**	**0**
Apples	3.965	2.891	1.074	0
Grapefruit	-4.600	-4.425	-175	0

Mangos: **MVolDev = MBudgetPrice x MVolDelta**; **MPriceDev = MActVol x MPriceDelta**

Apples	5.880	12.000	0,49	62%	9.845	17.900	0,55	73%	3.965	5.900	0,06	12%
Grapefruit	14.750	5.000	2,95	26%	10.150	3.500	2,90	14%	-4.600	-1.500	-0,05	-11%
Mangos	12.375	2.500	4,95	13%	11.850	3.000	3,95	12%	-525	500	-1,00	-1%
Total Fruit	**33.005**	**19.500**	**1,69**	**100%**	**31.845**	**24.400**	**1,31**	**100%**	**-1.160**	**4.900**	**-0,39**	**0%**

NET SALES DEVIATION	TOTAL D	VOL D	PRICE D	REM'G
Total Fruit	**-1.160**	**8.294**	**-9.454**	**0**
Apples	3.965	2.891	1.074	0
Grapefruit	-4.600	-4.425	-175	0
Mangos	-525	2.475	-3.000	0

He finally sums up the deviations calculated for each of the three types of fruit and gets a second line of total deviations for his total assortment:

NET SALES DEVIATION	TOTAL D	VOL D	PRICE D	REM'G
Total Fruit	**-1.160**	**8.294**	**-9.454**	**0**
Apples	3.965	2.891	1.074	0
Grapefruit	-4.600	-4.425	-175	0
Mangos	-525	2.475	-3.000	0
Sum of Fruit	**-1.160**	**941**	**-2.101**	**0**

TOTAL D	VOL D	PRICE D	REM'G
-1.160	**8.294**	**-9.454**	**0**
3.965	2.891	1.074	0
-4.600	-4.425	-175	0
-525	2.475	-3.000	0
-1.160	**941**	**-2.101**	**0**

A dollar and a dime

Comparing the sum of the individual effects (at the bottom of the table) with the calculation on the aggregate level (at the top) reveals the difficulty of this approach: they do not match.

But then: does it matter? Richard knows that the sum -2.101 of the three individual **Price Deviations** is the correct choice because it's free from mix. He also knows that the aggregate **Volume Deviation** of 8.294 is what he wants to use. He inserts the -2.101 instead of the -9.454 into the top line of results. But now **Price** and **Volume** deviations do not explain the **Total Sales Deviation** anymore. Subtracting **VolDev** 8.294 and **PriceDev** -2.101 from **TSalesDev** -1.160 produces a remainder of -7.353 – which must be down to the shift in **Product Mix** he had removed from the **Price Deviations** in the prior step. Et voilà.

NET SALES DEVIATION	TOTAL D	VOL D	PRICE D	MIX D
Total Fruit	**-1.160**	**8.294**	**-2.101**	**-7.353**
Apples			1.074	
Grapefruit			-175	
Mangos			-3.000	

He puts together the above table to present to his super-skeptical parents. Will they be convinced? Richard isn't sure. The result is correct, he knows, but for one, picking the aggregate number for volume and the sum for price and claiming that the resulting remainder is mix does sound a bit dubious. More importantly, if asked to substantiate his findings, he can drill-down only for the price deviation, not for volume and mix. Maybe none of this would matter, if he had good news for his parents - but he doesn't.

Unsure what to do, Richard decides to ask his friend Lucy for advice.

30 seconds later, he receives a text from her saying that she is happy to stop by next Saturday afternoon and show him the ropes. Richard is relieved. He picks a Grapefruit and begins to peel it, carefully, anticipating what is sure to be a highly instructional weekend…

Be sure to learn how Lucy gives guidance to Richard's attempt at deviance, in Part 2 of this Note.

Written in Ratingen
July/August 2021

Credits: Pictures by Rayia Soderberg (p.1) and Hans Vivek (p.4) at Unsplash.com. Excerpts of the Summer Wine lyrics by Lee Hazlewood at Universal Music Publishing Group.