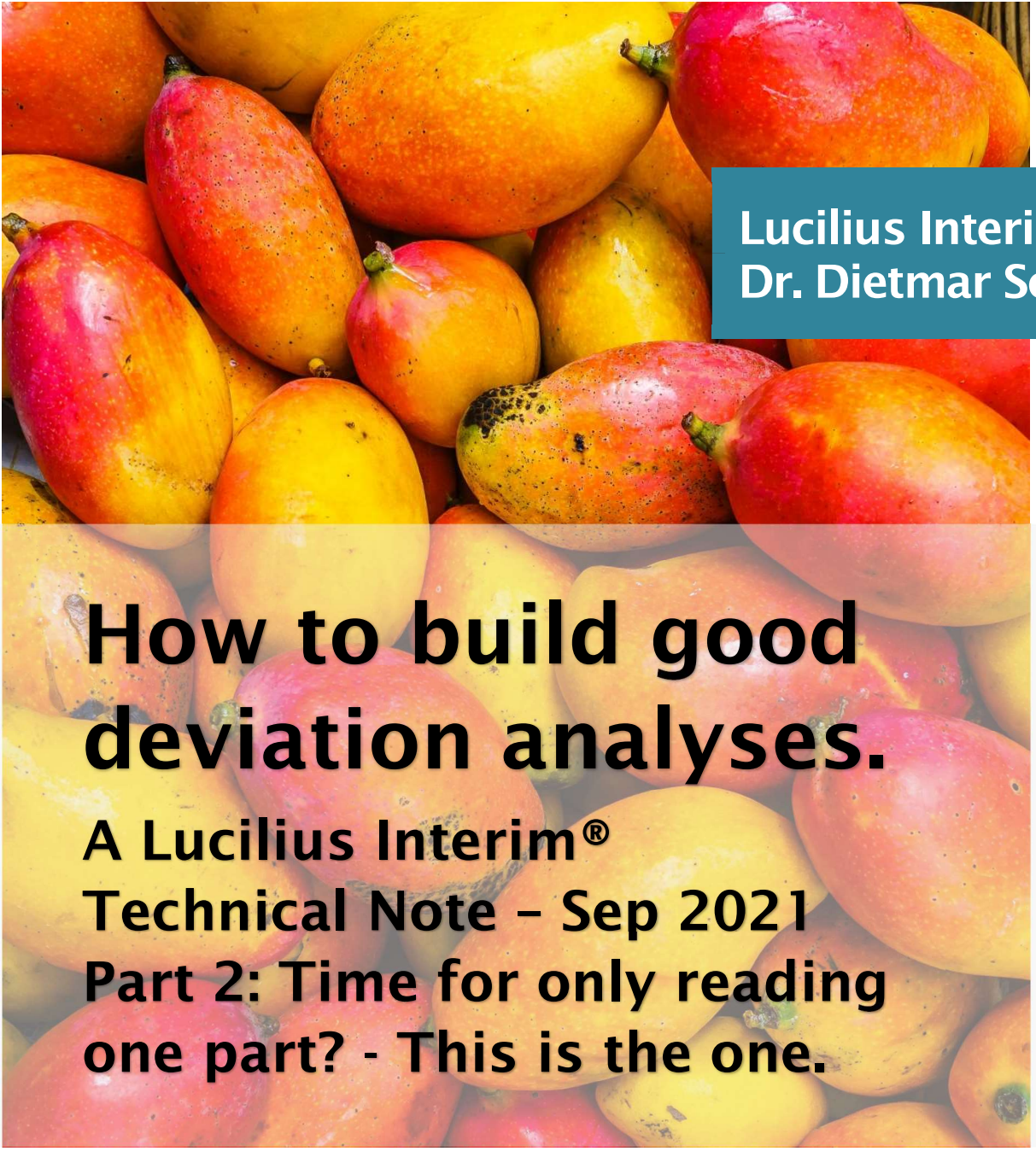

Lucilius Interim
Dr. Dietmar Scheja

How to build good deviation analyses.

A Lucilius Interim® Technical Note – Sep 2021 Part 2: Time for only reading one part? - This is the one.

Deviation Analyses are often set-up in ways that make their results difficult to communicate and thus reduce their impact. This Note suggests a simple, easy to interpret and easy to communicate alternative.

What happened so far. Having taken over the family fruit stall on the Bornheim Produce Market, Richard's sales have fallen short of his hopes and of what he had promised his parents. His attempt to analyze the gap by means of a deviation analysis did not go well – not even he himself was convinced. Nervous about his parents' reaction, he called his friend Lucy for help and instruction. The final moments of Part 1 of this Technical Note saw him sink back and eagerly await Lucy's visit and the guidance it promised...

An angel's kiss in spring

Finally, Saturday afternoon and Lucy have arrived. After a glass of mango juice Lucy reviews Richard's data and his results. "Richard, really…" She shakes her head disapprovingly, as she takes control of his keyboard and starts typing away. "I'm so glad you could come." he whispers, much taken with her energy. "Here's what we do…" Lucy murmurs, already absorbed in the problem in front of her.

Let's see how she proceeds.

As in Richard's approach, **Total Sales Deviation** equals the Net Sales Delta; no change here. Lucy also calculates the **Price Deviation** the same way Richard did: **PriceDev = PriceDelta x ActVol**. The difference is in how she approaches the **Volume Deviation**. Taking Apples (hence the A) as an example, instead of **AVolDev = ABudgetPrice x AVolDelta** she writes

AVolDev = ABudgetPrice x ABudgetVol x TVolDelta%

Where **TVolDelta% = (TotalActVol – TotalBudgetVol) / TotalBudgetVol**. So, Lucy replaces **AVolDelta**, the Delta of the Apple Volume itself, by **ABudgetVol x TVolDelta%**, the Apples' Budget Volume times the Percentage Change in the Total Fruit Volume. She interprets, in other words, the Volume Delta of each type of Fruit not as the volume change actually observed for each type, but as the volume change that would have occurred if the volume of each individual type of Fruit had changed at the rate of the aggregate Fruit volume.

(To clarify terminology, 'volume delta' refers to the difference between the budget volume and the actual volume; 'volume deviation' means the portion of the difference between budgeted and actual sales that is driven the volume delta.)

Now let's see how Lucy applies this method to Richards's data. First for Apples:

DATA TYPE	BUDGET				ACTUAL				DELTA			
	Net Sales	Volume	Price	Vol Mix	Net Sales	Volume	Price	Vol Mix	Net Sales	Volume	Price	Volume
PRODUCTS	[€]	[pcs]	[€/pc]	%	[€]	[units]	[€/unit]	%	[€]	[units]	[€/unit]	[%]
Apples	5.880	12.000	0,49	62%	9.845	17.900	0,55	73%	3.965	5.900	0,06	49%
Grapefruit	14.750	5.000	2,95	26%	10.150	3.500	2,90	14%	-4.600	-1.500	-0,05	-30%
Mangos	12.375	2.500	4,95	13%	11.850	3.000	3,95	12%	-525	500	-1,00	20%
Total Fruit	**33.005**	**19.500**	**1,69**	**100%**	**31.845**	**24.400**	**1,31**	**100%**	**-1.160**	**4.900**	**-0,39**	**25%**

NET SALES DEVIATION	TOTAL D	VOL D	PRICE D	MIX D
Total Fruit	**-1.160**	**8.294**	**-9.454**	**0**
Apples	3.965	1.478	1.074	

It is obvious that **Volume Deviation** and **Price Deviation** do not fully explain the **Total Sales Deviation** for Apples. In the example 3.965 – 1.478 – 1.074 yields a remainder of 1.413, the **Mix Deviation** (as we will demonstrate below). So:

NET SALES DEVIATION	TOTAL D	VOL D	PRICE D	MIX D
Total Fruit	**-1.160**	**8.294**	**-9.454**	**0**
Apples	3.965	1.478	1.074	1.413

Same for Grapefruit...

DATA TYPE	BUDGET				ACTUAL				DELTA			
	Net Sales	Volume	Price	Vol Mix	Net Sales	Volume	Price	Vol Mix	Net Sales	Volume	Price	Volume
PRODUCTS	[€]	[pcs]	[€/pc]	%	[€]	[units]	[€/unit]	%	[€]	[units]	[€/unit]	[%]
Apples	5.880	12.000	0,49	62%	9.845	17.900	0,55	73%	3.965	5.900	0,06	49%
Grapefruit	14.750	5.000	2,95	26%	10.150	3.500	2,90	14%	-4.600	-1.500	-0,05	-30%
Mangos	12.375	2.500	4,95	13%	11.850	3.000	3,95	12%	-525	500	-1,00	20%
Total Fruit	**33.005**	**19.500**	**1,69**	**100%**	**31.845**	**24.400**	**1,31**	**100%**	**-1.160**	**4.900**	**-0,39**	**25%**

NET SALES DEVIATION	TOTAL D	VOL D	PRICE D	MIX D
Total Fruit	**-1.160**	**8.294**	**-9.454**	**0**
Apples	3.965	1.478	1.074	1.413
Grapefruit	-4.600	3.706	-175	-8.131

… and for Mangos. Finally, Lucy sums up the results for the three types of Fruit.

DATA TYPE	BUDGET				ACTUAL				DELTA			
	Net Sales	Volume	Price	Vol Mix	Net Sales	Volume	Price	Vol Mix	Net Sales	Volume	Price	Volume
PRODUCTS	[€]	[pcs]	[€/pc]	%	[€]	[units]	[€/unit]	%	[€]	[units]	[€/unit]	[%]
Apples	5.880	12.000	0,49	62%	9.845	17.900	0,55	73%	3.965	5.900	0,06	49%
Grapefruit	14.750	5.000	2,95	26%	10.150	3.500	2,90	14%	-4.600	-1.500	-0,05	-30%
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Total Fruit	**33.005**	**19.500**	**1,69**	**100%**	**31.845**	**24.400**	**1,31**	**100%**	**-1.160**	**4.900**	**-0,39**	**25%**

NET SALES DEVIATION	TOTAL D	VOL D	PRICE D	MIX D
Total Fruit	**-1.160**	**8.294**	**-9.454**	**0**
Apples	3.965	1.478	1.074	1.413
Grapefruit	-4.600	3.706	-175	-8.131
Mangos	-525	3.110	-3.000	-635
Sum of Fruits	**-1.160**	**8.294**	**-2.101**	**-7.353**

For presenting the analysis to his parents, Lucy creates the following Exhibit A:

NET SALES DEVIATION	TOTAL D	VOL D	PRICE D	MIX D
Total Fruit (Sum)	**-1.160**	**8.294**	**-2.101**	**-7.353**
Apples	3.965	1.478	1.074	1.413
Grapefruit	-4.600	3.706	-175	-8.131
Mangos	-525	3.110	-3.000	-635

A consistent, fully additive presentation that is backed by a systematic set of calculations! In particular, Lucy can quantify the contribution of each of the Fruit to the **Mix Effect**. She can drill down for every deviation driver and can specify how much each type of fruit contributes to the overall sales delta. Let's compare the old and the new results.

VERSION	RICHARD GIVES IT A TRY				LUCY IN THE SKY (WITH EXCEL)			
NET SALES DEVIATION	TOTAL D	VOL D	PRICE D	MIX D	TOTAL D	VOL D	PRICE D	MIX D
Total Fruit	**-1.160**	**8.294**	**-2.101**	**-7.353**	**-1.160**	**8.294**	**-2.101**	**-7.353**
Apples	3.965		1.074		3.965	1.478	1.074	1.413
Grapefruit	-4.600		-175		-4.600	3.706	-175	-8.131
Mangos	-525		-3.000		-525	3.110	-3.000	-635

The Total Fruit line matches for both versions, but in the old method we could not break down the volume and mix columns. Although it seems intuitive to calculate the volume deviation for Apples using the change in Apple volume, it is in fact unhelpful: because if the percentage change in Apple volume differs from that of Fruit in total, the volume deviation, thus calculated, contains mix. By basing the individual volume deviations on the percentage change vs Budget of Total Fruit, Lucy can separate volume and mix. Richard is thrilled.

But wait a minute! We're still replacing the aggregate mix deviation, which was 0, with the sum of mixes. Isn't this a slight of hand as well? Would it help if we could show that we can calculate mix deviation independently of the other deviations? Here's how: We have seen that, taking now Mangos as our example, **Volume Deviation** was calculated as:

MVolDev = MBudgetPrice x MBudgetVol x TVolDelta%

MMixDev = MBudgetPrice x MBudgetVol x (MVolDelta% - TVolDelta%)

is the corresponding formula for **Mix Deviation**. In the example: 4,95 x 2.500 x -5% = -635.

DATA TYPE	BUDGET				ACTUAL				DELTA			
	Net Sales	Volume	Price	Vol Mix	Net Sales	Volume	Price	Vol Mix	Net Sales	Volume	Price	Volume
PRODUCTS	[€]	[pcs]	[€/pc]	%	[€]	[units]	[€/unit]	%	[€]	[units]	[€/unit]	[%]
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NET SALES DEVIATION	TOTAL D	VOL D	PRICE D	MIX D
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Apples	3.965	1.478	1.074	1.413
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Sum of Fruits	**-1.160**	**8.294**	**-2.101**	**-7.353**

My eyes grew heavy and my lips they could not speak

"… and this is why, despite the healthy development of volume overall and of the Apples in particular, sales have not fulfilled all your son's hopes. If there are no more questions, we suggest turning to the action steps we propose to take." Lucy beams confidently, after a full and fluently delivered account based on only one chart, Exhibit A.

Looking at his wife, Richard's Pa hesitatingly starts to talk: "So, the Apples have … saved you, right? I mean, I mean…" "… things would have been worse..." his Ma fills in. "A lot worse…" his Pa confirms, "… without the Apples." "So how much did that idea of ours help you? … Richard?" He turns pale. "Young lady?" Lucy, for once unsure of herself, turns to Richard, who turns crimson: "Which idea, Richard?" Her voice has an edge to it. His parents are faster: "We said we should set-up as an Apple expert. Granny vs. Cox. Fresh, clean crispiness the one…" "…mealy autumnal intensity, the other." "Which one has brought more?" Lucy looks as if she had bitten into an uncooked quince: "I'm afraid, we'll need to get back to you on this."

"You've made me look like an idiot!" Lucy fumes when they're alone again. "How could you not tell me?" Her eyes narrow, and only the prospect of being entitled to sanction Richard's misplaced silence in the sternest manner can reconcile her to the ugly scene just now.

Is Richard ready to take their relationship to another level? And can Lucy forgive Richard's blunder?

Be sure to be back for the third and final part of this Lucilius Interim Technical Note, when Lucy and Richard wow his parents and exceed the maximum number of rows in their spreadsheet.

Ratingen, September 2021

Credits: Pictures by Alexander Schimmeck (p.1) and AM-FL (p.5), both at Unsplash.com. Excerpts of the Summer Wine lyrics by Lee Hazlewood at Universal Music Publishing Group.