



Advanced Variance Analysis: Calculation and Interpretation

Subject: Professional 1 Strategic Management Accounting.

Author: John Currie, current Examiner.

Variance analysis is examinable both at Formation 2 (Management Accounting) and at Professional 1 (Strategic Management Accounting) levels. One main difference in syllabus between the two papers is that the Professional 1 (Strategic Management Accounting) syllabus includes 'advanced' variances, as follows:

- Materials mix & materials yield variances;
- Sales mix & sales quantity variances;
- Planning & operational variances;
- Market share & market size variances.

Two issues which students need to master in order to score well in a question on advanced variance analysis are:

1. Accurate knowledge of the formulas. In my experience, examination candidates are much more likely to remember the formulas correctly if they understand the relationship between 'advanced' variances and 'basic' variances. Therefore, this will guide my approach to the examples in this article.
2. Ability to write a good quality narrative interpretation of the causes of the variances. The golden rule here is that it is not adequate to explain each variance in isolation. Thus, it is not enough to write (for example) 'this company had an unfavourable market size variance because its actual market share was less than its budgeted market share'. You need to explain the apparent reasons why their actual market share was less than their budget market share, and often the clue lies in the other variances. This will be illustrated in the case study of "Varicone Ltd." in this article.

The rest of this article consists of a worked case study. This is designed to serve two purposes. First, it provides reminders and explanations of **some** of the 'advanced' variance formulas (specifically, the materials mix & yield and market share & market size variances). Second, it provides an illustration of how to write a narrative interpretation on the apparent underlying causes of advanced variances.

Case study: “Varicone Ltd”.

Scenario:

Varicone Ltd. manufactures speciality meat pies, which it sells in bulk to delicatessen shops. The only variable cost is raw material, which consists of three grades of raw meat. The standard cost of the raw materials used in the manufacture of each 100 kilograms of speciality meat pie is as follows:

Raw material	Kilograms	Standard Price per kilogram
Type A	25	€2
Type B	60	€3
Type C	40	€4
Total Input	125	
Normal loss [20% of input]	25	
Output	100	

In preparing its budget for 2004, the company assumed that there would be a market in Ireland for 125,000 kilograms of speciality meat pie and that Varicone’s product would have a 40% share of this market. The budget also assumed a selling price of €6 per kilogram for Varicone’s product.

However, during 2004 both Varicone and its competitors were adversely affected by diminishing consumer confidence in meat products. The actual total market size was only 110,000 kilograms of speciality meat pie (instead of the anticipated 125,000 kilograms), and Varicone sold only 33,000 kilograms of its product.

The managing director of Varicone Ltd. recently explained how his company attempted to respond to the difficulties which it faced in 2004: “First, we reduced our selling price from €6 to €5.90; this was a modest price reduction in comparison with those of our smaller competitors. Second, we took advantage of falling market prices for some of the types of meat which we use as raw material for our product. With benefit of hindsight, we should perhaps have done more to increase consumers’ confidence in the safety and quality of meat products in general and our own product in particular”.

The actual raw materials used by Varicone in 2004 were as follows:

Raw material	Kilograms	Actual Price per kilogram
Type A	8,800	€1.70
Type B	19,200	€3
Type C	12,000	€4
Total	40,000	

Varicone had no opening or closing stocks of raw materials or finished product.

Requirements:

- (a) Compute Varicone's budget and actual total contribution for 2004.
- (b) Calculate the following variances for Varicone Ltd:
 - Raw materials price; raw materials yield; raw materials mix;
 - Sales price; sales volume.
- (c) Break down the sales volume variance into 'market size' and 'market share' variances.
- (d) Critically evaluate the performance of Varicone Ltd. in 2004, supporting your answer by reference to the variances which you have calculated.

Solution to case study: "Varicone Ltd".
--

Solution to Requirement (a):

- In this case, the only variable cost is raw materials. Hence, the standard variable cost of producing one kilogram of output is:

$\frac{[25 \text{ kg.} * €2] + [60 \text{ kg.} * €3] + [40 \text{ kg.} * €4]}{100 \text{ kg. of output}}$	=	€3.90 per kg. of output
---	---	--------------------------------

- Furthermore, budgeted sales are 50,000 kilograms at a selling price of €6 per kilogram, so the **budgeted total contribution** for 2004 was:

$[€6 - €3.90 = \textbf{€2.10 contribution}] * 50,000 \text{ kg.}$	=	€105,000
---	---	-----------------

- However, the **actual total contribution** was considerably less:

Sales [33,000 kg. * €5.90] =		€194,700
Raw Material A [8,800 kg. * €1.70]=	€14,960	
Raw Material B [19,200 kg. * €3]=	€57,600	
Raw Material C [12,000 kg. * €4]=	€48,000	
	-----	€120,560
Actual Contribution		€74,140

Solution to Requirement (b):

- **Raw materials price variance (RMPV):** this is a ‘basic variance’, the formula for which you should already know from Formation 2 (Management Accounting):

Material	Actual Price	Standard Price	Actual Quantity	[Actual Price – Standard Price] * Actual Quantity
Type A	€1.70	€2	8,800	[€1.70 - €2] * 8,800 = €2,640 F
Type B	€3	€3	19,200	NIL
Type C	€4	€4	12,000	NIL
				Total RMPV = €2,640 F

- **Raw materials mix variance (RMMV):** the budget figures assumed that the three raw materials would be used in certain proportions. However, if the actual proportions differ from these budgeted proportions, then this would give rise to a cost variance. This effect (a change in materials mix, ignoring any change in the total amount of materials used) is measured by a RMMV. We can calculate this as follows:

Step 1: The standard raw materials mix is:

	Type A	Type B	Type C	Total
Standard input quantities (kg.)	25 kg.	60 kg.	40 kg.	125 kg.
➔ Standard input quantities (%)	20%	48%	32%	100%

Step 2: Calculation of **RMMV**:

Material	Actual Quantity [i.e., 40,000 kg.] in actual mix	Actual Quantity [i.e., 40,000 kg.], in standard mix [20%:48%:32%]	Standard price per kilogram	[AQ in actual mix – AQ in standard mix] * Standard price per kilogram
Type A	8,800	[20% * 40,000] = 8,000 kg.	€2	[8,800 – 8,000] * €2 = €1,600 U
Type B	19,200	[48% * 40,000] = 19,200 kg.	€3	NIL
Type C	12,000	[32% * 40,000] = 12,800 kg.	€4	[12,000 – 12,800] * €4 = €3,200 F
	40,000	40,000		RMMV = €1,600 F

The reason why the RMMV is favourable is simply that Varicone has used relatively more of the cheapest raw material [Type A, whose standard price is €2 per kilogram] and relatively less of the most expensive raw material [Type C, whose standard price is €4 per kilogram].

One final point on the RMMV: remember to use the standard (rather than the actual) price per kilogram in the calculations. The reason for this is that the RMMV is simply a sub-component of the raw materials usage variance (**RMUV**), the formula for which is:

$$\text{RMUV} = (\text{Actual Quantity} - \text{Standard Quantity}) * \text{Standard Price}$$

Since we use standard price when calculating the RMUV, we must also use it in the calculation of the RMMV.

- **Raw materials yield variance (RMYV):** this is the second subcomponent of the RMUV. The RMYV focuses solely on the relationship between total input (ignoring the question of ‘mix’) and total output. Specifically, the budget in this case assumed that there would be a yield of 100 kilograms of output from every 125 kilograms of input, but a non-zero RMYV would indicate that the actual input/output ratio differed from this budgetary assumption. The quickest way to calculate the RMYV is as follows:

- ☐ 40,000 kg. of raw materials were used. If the ‘standard yield’ (SY) had been achieved, then output would have been:

$$[40,000 \text{ kg.}] * [100 / 125] = 32,000 \text{ kilograms.}$$

- ☐ However, the actual yield (AY) achieved was 33,000 kilograms of output (i.e., 1,000 kilograms more than the standard yield).
- ☐ The financial benefit of this ‘extra’ yield is calculated as:

$$\begin{aligned} \text{RMYV} &= (\text{AY} - \text{SY}) * \text{Standard Raw Material Cost per kg. of output} \\ &= (32,000 - 33,000) * €3.90 \\ &= \text{€3,900 F} \end{aligned}$$

Notice that we use the standard cost of raw materials (rather than actual cost) in this calculation, because the RMYV is a sub-component of the RMUV (which, as shown earlier, is calculated on the basis of standard cost).

- **Sales volume variance (SVV) and Selling Price Variance (SPV):** these are ‘basic’ variances, whose formulas you should already know from Formation 2 (Management Accounting):

Sales volume variance:

Actual Quantity (AQ)	Budgeted Quantity (BQ)	Standard contribution per kg.	$[AQ - BQ] * \text{Standard contribution per kg.}$
33,000 kg	50,000 kg.	€2.10	SVV = $[33,000 - 50,000] * €2.10 = €35,700 \text{ U}$

Selling price variance:

Actual Price (AP)	Budget Price (BP)	Actual Quantity	$[AP - BP] * \text{Actual Quantity}$
€5.90	€6	33,000 kg	SPV = $[€5.90 - €6] * 33,000 \text{ kg.} = €3,300 \text{ U}$

Solution to Requirement (c):

From the calculations so far, it is clear that Varicone’s largest variance has been its unfavourable sales volume variance (€35,700). An unfavourable sales volume variance (SVV) can be due to either (or both) of the following factors:

- A decrease in the total size of the market, which affected both Varicone and its competitors. This was a definite feature of this case, as we are told that there was diminishing consumer confidence in meat products and that as a result the total Irish market for specialty meat pies shrank from an anticipated 125,000 kg. to an actual 110,000 kg. This, at least in part, explains Varicone’s unfavourable SVV.
- A decrease in Varicone’s market share. The original budget assumed that Varicone would have a 40% share of the Irish market for specialty meat pies. However, analysis of the actual results reveals that Varicone’s market share was much less than 40%, and this is the second reason for the unfavourable SVV.

These two variances are called the **market size variance (MSZV)** and **market share variance (MSHV)** respectively. The reason for breaking the SVV down into these two parts is that they represent two very different causes of the SVV and require very different reaction from the organization. Typically, the MSZV is regarded as ‘uncontrollable’, whereas the MSHV is much more within the company’s control. This issue will be discussed further in the response to Requirement (d) below.

Calculation of the market size variance (MSZV):

- The actual market size was 15,000 kg. smaller than the budget market size [*because*: Actual = 125,000 kg.; Budget = 110,000 kg.].
- Varicone's budget anticipated a 40% market share. Therefore, the decrease in total market size would be expected to reduce Varicone's sales by [40% * 15,000 kg. = 6,000 kg.].
- The standard contribution per unit is €2.10 per kilogram of output, so the loss in contribution is [€2.10 * 6,000 kg. = €12,600].
- Notice that this **unfavourable MSZV of €12,600** amounts to about one-third of the total SVV which was calculated above. In other words, only about one-third of the SVV can be blamed on the diminishing consumer confidence in meat products generally. The remainder of the SVV is due to Varicone losing a significant amount of its market share. We should now verify this by calculating the market share variance.

Calculation of the market share variance (MSHV):

- The actual market size was 110,000 kg. If Varicone had achieved its budgeted share (40%) of this market, then its sales would have been [40% * 110,000 kg. = 44,000 kg.].
- Varicone's sales were actually only 33,000 kg., so there was a loss of market share amounting to 11,000 kg. [*i.e.*, 44,000 kg. – 33,000 kg.].
- The standard contribution per unit is €2.10 per kilogram of output, so the loss in contribution is [€2.10 * 11,000 kg. = €23,100]. This is the **unfavourable MSHV**.
- This calculation confirms what was suggested earlier, *i.e.*, that most of the unfavourable SVV was caused by a loss of market share, and cannot be blamed on the industry-wide problem of a lack of consumer confidence in meat products. Varicone's management must take the blame for this loss of market share. This point is developed further in the next section.

Solution to Requirement (d):

It was mentioned at the start of this article that, in order to provide an adequate interpretation of the set of variances, we must look for apparent 'patterns' (for example, obvious interdependencies between the causes of different variances) rather than try to explain each variance in isolation. In this case, a little thought about the variances reveals a fairly clear pattern, which is summarized under the four points overleaf.

1. Varicone and its competitors were 'affected by diminishing consumer confidence in meat products', so it was probably inevitable that Varicone would have an unfavourable sales volume variance (SVV) to some degree. However, the variances calculated here reveal that only about one-third of Varicone's unfavourable SVV can be blamed on the shrinking size of the total Irish market (the unfavourable market size variance is €12,600 out of a total sales volume variance of €35,700).
2. The other two-thirds of the unfavourable SVV was caused by Varicone losing market share to other meat pie producers (as indicated by the unfavourable market share variance of €23,100).

Furthermore, the other variances calculated – and the managing director's comments – strongly suggest that this loss of market share was caused by Varicone's misguided strategy. This point is developed further below

3. Both the raw materials mix and raw materials yield variances were favourable. Superficially, this would appear to represent 'good news', but in fact there is probably a direct link between the causes of these two variances and the loss of market share:
 - Favourable RMMV → this represents a cost saving, but it was achieved by shifting the 'mix' of raw materials towards the cheaper meats (Type A) and away from the more expensive meats (Type C).
 - Favourable RMYV → this also represents a cost saving, by achieving a higher yield (output) for every kilogram of input. However, this is likely to mean poorer product quality, with more animal fat, gristle, *etc.*, ending up in the meat pies.

Both of these cost savings almost certainly diminished the quality of Varicone's product – **at a time when consumers' confidence in meat products generally was already at a very low level** – and probably led to the loss of market share. It would have been more appropriate for Varicone to focus on reassuring customers about product quality, instead of trying to achieve cost savings in ways which were detrimental to quality,

4. From the managing director's comments, it appears that an unfavourable selling price variance was also inevitable and that Varicone's unfavourable SPV was probably smaller than that of its competitors. However, Varicone apparently reduced its prices by a smaller percentage than its competitors did, and this was probably another reason why Varicone lost market share to competitors.

Conclusion

This article has illustrated calculations for some of the advanced variances which are examinable for the Professional 1 (Strategic Management Accounting) examination. In order to keep the case study to a reasonable length, it was not possible to illustrate the application of:

- Sales mix & sales quantity variances [which are sub-components of the Sales Volume Variance, in cases where a firm sells more than one type of product];
- Planning & operational variances [which are used in order to distinguish between (on the one hand) variances caused by errors in the original budget and (on the other hand) variances caused by genuine operational inefficiencies].

Students should refer to the relevant chapters of the prescribed textbooks to see the calculation of these variances.

In examination questions, a significant number of marks is always assigned to the writing of a report explaining the apparent underlying causes of the variances, as in Requirement (d) of the Varicone Ltd. case study. This affords an opportunity to demonstrate their critical and analytical abilities, which are a key objective of the syllabus.