

calculating variances

■ Standard costing variance analysis questions are a common feature of CAT Paper 7 exams. This is the first in a series of three articles which consider the calculation of variances, the causes of variances, and how managers should react to variances. This article considers variance calculations and highlights some lessons that should be learnt from common mistakes made in the exam room. The second article starts on page 58.

The term 'standard' refers to predetermined, estimated unit costs and revenues. A standard cost is often described as a 'budget for an individual unit of production'. The primary use of standards is in the calculation of variances. Variances are used in the control of costs and revenues, and to stimulate improved performance. They are calculated by comparing actual costs and revenues with standard costs and revenues.

EXAMPLE 1

McDermott plc is a manufacturer of beds. It uses a system of standard absorption costing and variances to monitor performance of managers and departments. A standard cost card for one of its models, the Dreamer, is given below.

	£ per unit	£ per unit
Selling price		250.00
Direct material:		
Wood: 12m @ £1.50 per m	18.00	
Fabric: 6m ² @ £2.00 per m ²	12.00	
Direct labour: 4 hours @ £6.00 per hour	24.00	
Variable overhead: 4 hours @ £15.00	60.00	
Fixed overhead: 4 hours @ £10.00	<u>40.00</u>	
		<u>154.00</u>
Profit		96.00

Budgeted production and sales are 1,000 Dreamers per month.

Actual results for the manufacture and sale of Dreamers for the most recent month are as follows:

Sales: 1,200 units @ £240 each
Production: 1,300 units
Wood 16,000m @ £1.40 per m
Fabric 7,800m² @ £2.10 per m²

Direct labour: 5,000 hours @ £7.00 per hour
Variable overhead: 5,000 hours @ £15.10 per hour
Fixed overhead: £54,600.

There was no opening stock.

TERMINOLOGY

Throughout this article the term ‘adverse variance’ (Adv) describes a situation where actual results are worse than standard and have a detrimental effect on profit (costs are higher or revenues lower), ‘favourable’ (Fav) describes the opposite situation. Many candidates omit these signs and thus lose half of the marks available for calculation. In practice, and in the exam, variances are little use without a sign. Some candidates use negative signs or brackets for adverse variances, and no signs for favourable variances. This causes marking problems, because it becomes difficult to tell the difference between a favourable variance and one without a sign.

Lesson 1

Always clearly label variances as either adverse or favourable. These labels will represent 50% of the marks available for variance calculations.

VARIABLE COST VARIANCES

The direct labour variance is usually the simplest variance to calculate. Actual direct labour cost was £35,000 (5,000 hours x £7.00). This needs to be compared with the standard cost. A very common error in candidates' calculations is to make the following comparison:

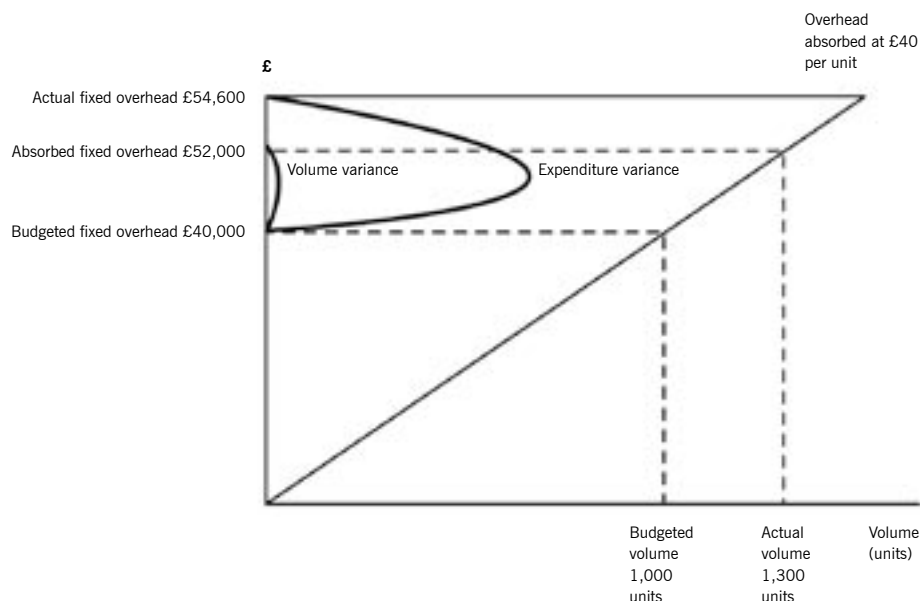
Actual hours x actual rate
= 5,000 hours x £7.00 = £35,000
>£11,000 Adv labour variance

Budgeted hours x standard rate
= 1,000 units x 4 hours x £6.00 = £24,000

This is not a sensible comparison. Actual costs relate to producing 1,300 units. Budgeted figures relate to producing 1,000 units. It is important to compare like with like. If labour is a variable cost then we would expect the extra 300 units to require extra labour hours.

A more sensible, and correct, calculation is to compare the actual labour cost with the flexed budget labour cost of producing 1,300 units, as follows:

FIGURE 1: THE FIXED OVERHEAD VOLUME VARIANCE



Actual hours x actual rate
 = 5,000 hours x £7.00 = £35,000
 >£3,800 Adv labour variance

Standard hours for actual production x standard rate
 = 1,300 units x 4 hours x £6.00 = £31,200

Lesson 2

It is important when calculating variable cost variances that figures are based on flexed budget figures, not original budgeted figures.

The total labour variance of £3,800 adverse has two potential causes – either the firm has paid a different hourly rate to standard, or it has used a different amount of hours per unit to standard, or possibly both. If we insert a third line into the analysis we can separate out these two causes.

Actual hours x actual rate
 = 5,000 hours x £7.00 = £35,000
 >£5,000 Adv rate variance

Actual hours x standard rate
 = 5,000 hours x £6.00 = £30,000
 >£1,200 Fav efficiency variance

Standard hours for actual production x standard rate
 = 1,300 units x 4 hours x £6.00 = £31,200

We can now see that the total variance of £3,800 adverse has two causes. First, a rate (or more generally expenditure) variance, caused by paying more per hour than standard. Second, an efficiency variance, caused by making 1,300 units in 5,000 hours rather than the flexed budget 5,200 hours (1,300 units x 4 hours).

TABULAR OR FORMULA APPROACH?

Many textbooks present the above calculation in a 'formula' format rather than the tabular layout adopted above. For example, the labour rate variance calculation is often presented as follows:

(actual rate per hour - standard rate per hour) x actual hours = labour rate variance = (£6.00 - £7.00) x 5,000 hours = £5,000 Adv.

This layout is perfectly valid, probably quicker to use, and would attract full marks in the exam. However, in my experience of marking, I find that

candidates using the formula approach make far more errors than those using a tabular approach.

Lesson 3

Candidates using the tabular approach generally appear to make fewer errors in variance calculations.

THE OTHER VARIABLE COST VARIANCES

In their simplest form, all the other variable cost variances (direct material and variable overhead) follow the same pattern of calculation as direct labour. The calculation for all variable cost variances can be generally laid out as:

Actual usage x actual rate
 > Expenditure variance

Actual usage x standard rate
 > Efficiency variance

Standard usage for actual production x standard rate

Try this approach for yourself for McDermott's other variable costs. Answers are given at the end of this article.

Lesson 4

If you can calculate one set of variable cost variances, you should be able to calculate them all.

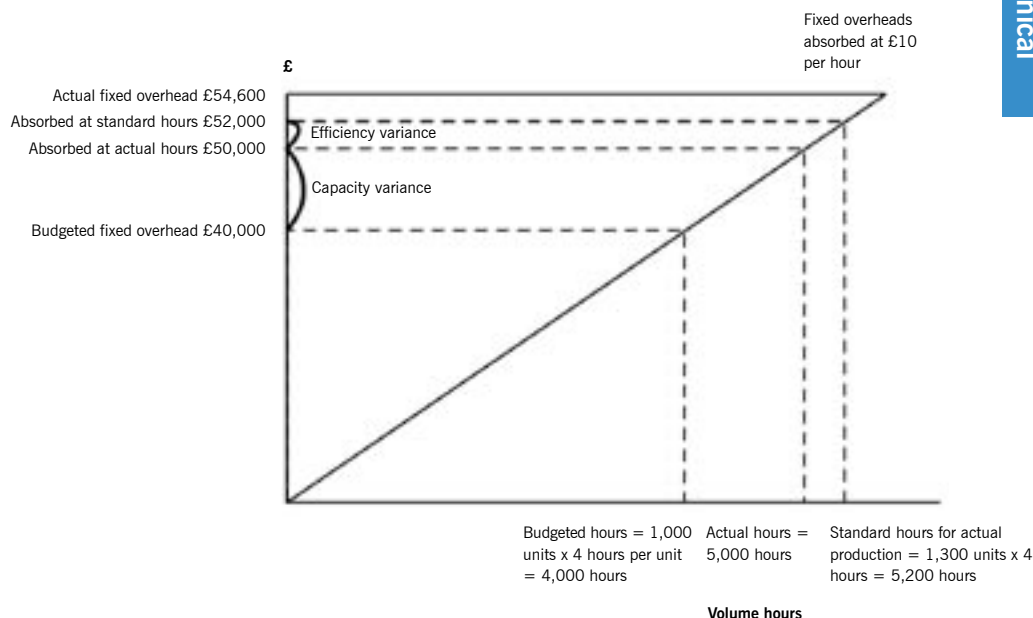
FIXED OVERHEAD VARIANCES

Most candidates have little difficulty in calculating the fixed overhead expenditure variance. This is a simple variance to calculate because, as we are dealing with a fixed cost, we do not need to flex the budget to obtain a sensible like-with-like comparison. In the case of McDermott, the calculation of the fixed overhead expenditure variance is:

Actual fixed overhead expenditure £54,600
 >£14,600 Adverse fixed overhead expenditure variance

Budgeted fixed overhead expenditure
 = 1,000 units x 4 hours x £10.00 = £40,000

**FIGURE 2:
TWO CAUSES
OF VOLUME
VARIANCE**



Quite simply, McDermott has spent £54,600 on fixed overhead when the budget allowance was £40,000, leading to an adverse variance of £14,600.

In contrast to the expenditure variance, the fixed overhead volume variance causes candidates more difficulty than any other. The key to its correct calculation is to appreciate that it is concerned with the under or over absorption of overhead. **Figure 1** demonstrates how the variance occurs. The diagonal line leading from the origin shows overhead being absorbed at £40 per unit. This standard fixed overhead absorption rate is designed to absorb budgeted fixed overhead at the budgeted production level. Hence, if the firm operates at the budgeted production level of 1,000 units, £40,000 of overhead (the budgeted amount) will be absorbed. In this example, the firm has actually produced 1,300 units, and hence absorbed £52,000 (1,300 units x £40 per unit) of overhead, resulting in an over absorption of overhead as compared to budget. The amount of over absorbed overhead will have to be credited to the profit and loss account in the calculation of actual profit, and so it is described as a favourable variance.

It is possible to break the volume variance down into its two causes – capacity and efficiency. This can be done when fixed overheads are absorbed on the basis of labour hours. **Figure 2** illustrates this analysis. This time, the diagonal line through the origin represents fixed overheads being absorbed at a standard fixed overhead absorption rate of £10 per labour hour. If the budgeted 4,000 hours are worked (1,000 units x 4 hours per unit), then budgeted overhead of £40,000 will be absorbed. In this case, McDermott actually works 5,000 hours, leading to an over absorption of £10,000 as compared to budget. This is referred to as a favourable capacity variance, as the firm has operated at above its budgeted capacity and has therefore over absorbed overhead.

The 1,300 units actually produced represent 5,200 standard hours of work (1,300 units x 4 hours per unit). In a standard costing system, finished units are valued at standard cost with the fixed cost element in this case being £52,000 (1,300 units x 4 hours x £10 per hour). This leads to a further over absorption of £2,000. Again, over absorption would be credited to profit and hence is recorded as a favourable variance. This variance has been caused by using less labour than standard to make 1,300 units, and is referred to as an efficiency variance.

The calculation of the fixed overhead variances can be summarised as follows:

Actual overhead =	£54,600	
Budgeted overhead	Expenditure	>£14,600 Adv
1,000 units x 4 hours x £10.00 =	£40,000	
Actual hours @ standard rate per hour	Capacity	>£10,000 Fav
5,000 hours x £10.00 =	£50,000	
Standard overhead for actual production	Efficiency	>£2,000 Fav
1,300 units x 4 hours x £10.00 =	£52,000	

Note that the fixed overhead volume variance can be obtained by summing the capacity and efficiency variance.

Lesson 5

The fixed overhead volume variance (and its subdivision into the capacity and efficiency variance) relate to under or over absorption of overhead as compared to budget.

SALES VARIANCES

Sales variances have two causes – failing to sell the budgeted quantity (the volume variance) and failing to sell at the budgeted price (the price variance).

The volume variance is calculated by comparing budgeted sales units with actual sales units, and extending the difference at the standard profit margin. A common error is to extend the difference at standard price per unit. This is incorrect, because although a decrease in sales units would lead to a loss in sales revenue, at the same time it also leads to a reduction in cost. It is the net of these two figures that must be considered, and hence the sales volume variance is evaluated at the standard profit margin, as demonstrated below.

Budgeted sales units @ standard profit margin	
1,000 units x £96.00	£96,000
	>£19,200 Fav
Actual sales units @ standard profit margin	
1,200 units x £96.00	£115,200

Lesson 6

Sales volume variances should be based on standard profit margin not standard price.

The sales price variance evaluates the effect of selling at a non-standard price. It is calculated by comparing actual and standard selling prices and extending the difference at standard price:

Actual sales @ actual price	
1,200 units x £240	£288,000
	>£12,000 Adv
Actual sales @ standard price	
1,200 units x £250	£300,000

MATERIAL STOCKS

In a situation where the level of material purchases is different to material usage, the basis of the calculation of the material price variance may change. If material stocks are valued at standard cost then the price variance will be based on material purchased. If, in the case of McDermott, actual wood purchases had been 18,000m and actual usage 16,000m, then stocks would have risen by 2,000m. The variance calculation would be as follows:

Actual purchases at actual cost	
18,000m x £1.40 =	£25,200
	Price >£1,800 Fav
Actual purchases at standard cost	
18,000m x £1.50 =	£27,000
Actual usage at standard cost	
16,000m x £1.50 =	£24,000
	Usage >£600 Adv
Standard usage at standard cost	
1,300 units x 12m x £1.50 =	£23,400

Lesson 7

When materials purchases are different to raw material usage, and stocks are valued at standard cost, the raw material price variance should be based on units purchased.

IDLE TIME VARIANCES

Sometimes, hours worked by labour may be different to hours paid. This could be due to shortages of materials, machine breakdown, or stoppages in other parts of the business. In these circumstances, the labour efficiency variance should be based on hours worked, rather than hours paid. Assume, in the case of McDermott, that of the 5,000 hours paid for only 4,800 were worked. The remaining hours were idle due to a machine breakdown. The labour variances would then become:

Actual hours paid at actual rate	
5,000 hours x £7.00 =	£35,000
	>£5,000 Adv rate variance
Actual hours paid at standard rate	
5,000 hours x £6.00 =	£30,000
	>£1,200 Adv idle time variance
Actual hours worked at standard rate	
4,800 hours x £6.00 =	£28,800
	>£2,400 Fav efficiency variance
Standard hours for actual production at standard rate	
1,300 units x 4 hours x £6.00 =	£31,200

Basing the efficiency variance on hours worked supports responsibility accounting. The production manager will have control over the number of labour hours worked on production, but is unlikely to have control over hours lost due to machine breakdowns. The idle time variance will usually be considered as non-controllable. It is important to note that other variances based on labour hours (variable and fixed overheads) should also be based on hours worked. The logic here is that overheads are incurred when labour is working, not when it is idle.

Lesson 8

Labour efficiency variances (and overhead variances as appropriate) should be based on hours worked rather than hours paid.

STANDARD MARGINAL COSTING

The above analysis is based on an absorption costing system. Under a marginal costing system, some of the calculations change. A standard marginal cost card for McDermott is given in **Example 2**.

EXAMPLE 2

	£ per unit	£ per unit
Selling price		250.00
Direct material:		
Wood 12 metres @ £1.50 per metre	18.00	
Fabric 6 metres ² @ £2.00 per metre ²	12.00	
Direct labour: 4 hours @ £6.00 per hour	24.00	
Variable overhead: 4 hours @ £15.00	60.00	
		<u>114.00</u>
Contribution		<u>136.00</u>

The first change is that the calculation of the fixed overhead variances becomes much simpler. As fixed overheads are not absorbed into production, no under or over absorption of overhead occurs. As a result, all that remains is the fixed overhead expenditure variance, calculated in exactly the same way as in absorption costing.

Lesson 9

In a marginal costing system, the fixed overhead volume variance (and its subdivision into capacity and efficiency) is no longer required.

The second change is that the sales volume variance is now based upon contribution per unit rather than profit per unit. The calculation is as follows:

Budgeted sales units	
@ standard contribution margin	
1,000 units x £136 =	£136,000
	>£27,200 Fav sales volume

Actual sales units	
@ standard contribution margin	
1,200 units x £136 =	£163,200

Lesson 10

In a marginal costing system, the sales volume variance is based on contribution per unit, not profit per unit.

CONCLUSION

Standard costing variance calculations sometimes appear daunting, but as with most things, they get easier with practice. Candidates need to work on past exam questions to improve the accuracy of their calculations. Marking schemes usually give one mark for the correct variance number, and a further mark if correctly labelled as adverse or favourable. Try marking your own attempts and work out how many extra marks you would have gained by avoiding the mistakes listed above. ■

ANSWERS

Wood

Actual usage at actual cost	
16,000m x £1.40 =	£22,400
	Price >£1,600 Fav

Actual usage at standard cost	
16,000m x £1.50 =	£24,000
	Usage >£600 Adv

Standard usage at standard cost	
1,300 units x 12m x £1.50 =	£23,400

Fabric

Actual usage at actual cost	
7,800m ² x £2.10 =	£16,380
	Price >£780 Adv

Actual usage at standard cost	
7,800m ² x £2.00 =	£15,600
	Usage >£0

Standard usage at standard cost	
1,300 units x 6m ² x £2.00 =	£15,600

Variable overhead

Actual hours at actual rate	
5,000 hours x £15.10 =	£75,500
	Expenditure >£500 Adv

Actual hours at standard rate	
5,000 hours x £15.00 =	£75,000
	Efficiency >£3,000 Fav

Standard hours at standard rate	
1,300 units x 4 hours x £15.00 =	£78,000

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