Flexible Budgets, Variance Analysis and Management Control

Measuring yield, mix and quantity effects

- Managers sometimes make trade-offs between price and efficiency variances.
- So far analysis of variances focused on a single input.
- The yield and mix variances calculated in this section provide additional insight into the effect that yield and mix factors have on operating income.

Measuring yield, mix and quantity effects: an illustration

- Aliya Ltd makes cider.
- To produce cider of the desired consistency, colour and taste, Aliya mixes three types of. apples grown in three different regions: Golden Delicious from Brittany, British Coxes from Kent, and Jonagold from Italy.
- Aliya's production standards require 1.6 tonnes of apples to produce 1 tonne of cider, with 50% of the apples being Golden Delicious, 30% British Coxes, and 20% Jonagold. The direct materials input standards to produce 1 tonne of cider are:

0.80 (50% of 1.6) tonne of Golden Delicious at €70 per tonne	€56.00
0.48 (30% of 1.6) tonne of British Coxes at €80 per tonne	38.40
0.32 (20% of 1.6) tonne of Jonagold at €90 per tonne	28.80
Total standard cost of 1.6 tonnes of apples4	€123.20

- Budgeted cost per tonne of apples is €123.20 ÷ 1.6 tonnes = €77.

Measuring yield, mix and quantity effects: an illustration

- Because Aliya uses fresh apples to make cider, no stocks of apples are kept. Purchases are made as needed, so all price variances relate to apples purchased and used. Actual results for June 2005 show that a total of 6 500 tonnes of apples were used to produce 4 000 tonnes of cider:

9250	tonnes of Golden Delicious at actual cost of €70 per tonne	€227 500	
2275	tonnes of British Coxes at actual cost of €82 per tonne	186 550	
975	tonnes of Jonagold at actual cost of €96 per tonne	93 600	
6500	tonnes of apples	507 650	
Standard cost of 4000 tonnes of cider at €123.20 per tonne		492 800	
Total variance to be explained		€14850	U

- Given the standard ratio of 1.6 tonnes of apples to 1 tonne of cider, 6400 tonnes of apples should be used to produce 4000 tonnes of cider. At the standard mix, the quantities of each type of apple required are:

Golden Delicious	0.50 x 6400	=	3200 tonnes
British Coxes	0.30 x 6400	=	1920 tonnes
Jonagold	0.20 x 6400	=	1280 tonnes

Measuring yield, mix and quantity effects: an illustration

- The direct materials price and efficiency variances are calculated separately for each input material and then added together:

	Actual costs incurred (Actual inputs x Actual prices) (1)		**Actual inputs x Budgeted prices (2)**		**Flexible budget (Budgeted inputs allowed for actual outputs achieved x Budgeted prices) (3)**	
Golden Delicious	3250x70	=227 500	3250x70	=227 500	3200x70	=224 000
British Coxes	2275x82	=186 550	2275x80	=182 000	1920x80	=153 600
Jonagold	975x96	=93 600	975x90	=87 750	1280x90	=115 200
		€507 605		€497 250		€492 800
			€ 10 400 U*		€4 550 U	
			Total price variance		Total efficiency variance	
				€14 850 U		
				Total flexible-budget variance		

*U=unfavourable effect on operating profit

- This analysis may be sufficient **when the three direct materials used are not substitutes**. In this case, no managerial no discretion is permitted regarding the substitution of materials inputs.
- Example: there is often a specified mix of parts needed for the assembly of cars, radios and washing machines.
- Thus, the price and efficiency variances individually calculated for each material typically provide the information necessary for decisions.

Measuring yield, mix and quantity effects: an illustration

	Actual costs incurred (Actual inputs x Actual prices) (1)		Actual inputs x Budgeted prices (2)		Flexible budget (Budgeted inputs allowed for actual outputs achieved x Budgeted prices) (3)	
Golden Delicious	3250x70	=227 500	3250x70	=227 500	3200x70	=224 000
British Coxes	2275x82	=186 550	2275x80	=182 000	1920x80	=153 600
Jonagold	975x96	=93 600	975x90	=87 750	1280x90	=115 200
		€507 605		€497 250		€492 800
			€ 10 400 U*		€4 550 U	
			Total price variance		Total efficiency variance	
				€14 850 U		
				Total flexible-budget variance		

*U=unfavourable effect on operating profit

- But when direct material are substitutes managerial decisions affect the yield and mix of direct materials!
- Efficiency variance should be analyzed in yield and mix variance.

Measuring yield, mix and quantity effects: an illustration

- Let express figures considering yield and mix.

Actual inputs x Budgeted prices (2)		Flexible budget (Budgeted inputs allowed for actual outputs achieved x Budgeted prices) (3)	
3250x70	=227 500	3200x70	=224 000
2275x80	=182 000	1920x80	=153 600
975x90	=87 750	1280x90	=115 200
	€497 250		€492 800

€4 550 U
Total efficiency variance

	(Actual total quantity of all inputs used x Actual input mix) x Budgeted prices (1)	(Actual total quantity of all inputs used x Budgeted input mix) x Budgeted prices (2)	Flexible budget (Budgeted total quantity of all inputs allowed for actual output achieved x Budgeted input mix) x Budgeted prices (3)
Golden Delicious	6500 x 0.50 x 70 = 227 500	6500 x 0.50 x70 = 227 500	6400 x 0.50 x70 = 224 000
British Coxes	6500 x 0.35 x 80 = 182 000	6500 x 0.30 x 80 = 156 000	6400 x 0.30 x 80 = 153 600
Jonagold	6500 x 0.15 x 90 = 87 750	6500 x 0.20 x 90 = 117 000	6400 x 0.20 x 90 = 115 200
	€497 250	€500 500	€492 800

€ 3250 F* (Total mix variance) | €7 700 U (Total yield variance)

€4 450 U
Total efficiency variance

*F= favourable effect on operating profit; U=unfavourable effect on operating profit.

Total direct materials yield variance

	(Actual total quantity of all inputs used x Actual input mix) x Budgeted prices (1)	(Actual total quantity of all inputs used x Budgeted input mix) x Budgeted prices (2)	Flexible budget (Budgeted total quantity of all inputs allowed for actual output achieved x Budgeted input mix) x Budgeted prices (3)
Golden Delicious	6500 x 0.50 x 70 = 227 500	6500 x 0.50 x70 = 227 500	6400 x 0.50 x70 = 224 000
British Coxes	6500 x 0.35 x 80 = 182 000	6500 x 0.30 x 80 = 156 000	6400 x 0.30 x 80 = 153 600
Jonagold	6500 x 0.15 x 90 = 87 750	6500 x 0.20 x 90 = 117 000	6400 x 0.20 x 90 = 115 200
	€497 250	€500 500	€492 800
		€ 3250 F* Total mix variance	€7 700 U Total yield variance
		€4 450 U Total efficiency variance	

*F= favourable effect on operating profit; U=unfavourable effect on operating profit.

- Compare columns 3 and 2.
- The difference in costs between the two columns is the total direct materials yield variance, due solely to differences in actual and budgeted total input quantity used. The total direct materials yield variance is the sum of the direct materials yield variances for each input.

Total direct materials yield variance

- The total direct materials yield variance is the sum of the direct materials yield variances for each input:

$$\text{Direct materials yield variance for each input} = \left(\text{Actual total quantity of all direct materials inputs used} - \text{Budgeted total quantity of all direct materials inputs allowed for actual output achieved}\right) \times \text{Budgeted direct materials input mix percentage} \times \text{Budgeted price of direct materials input}$$

- The direct materials yield variances are:

Golden Delicious	(6500-6400) x 0.50 x €70 = 100 x 0.50 x €70	=	€3500 U
British Coxes	(6500-6400) x 0.30 x €80 = 100 x 0.30 x €80	=	2400 U
Jonagold	(6500-6400) x 0.20 x €90 = 100 x 0.20 x €90	=	1800 U
Total direct materials yield variance			€7700 U

Total direct materials mix variance

	(Actual total quantity of all inputs used x Actual input mix) x Budgeted prices (1)	(Actual total quantity of all inputs used x Budgeted input mix) x Budgeted prices (2)	Flexible budget (Budgeted total quantity of all inputs allowed for actual output achieved x Budgeted input mix) x Budgeted prices (3)
Golden Delicious	6500 x 0.50 x 70 = 227 500	6500 x 0.50 x70 = 227 500	6400 x 0.50 x70 = 224 000
British Coxes	6500 x 0.35 x 80 = 182 000	6500 x 0.30 x 80 = 156 000	6400 x 0.30 x 80 = 153 600
Jonagold	6500 x 0.15 x 90 = 87 750	6500 x 0.20 x 90 = 117 000	6400 x 0.20 x 90 = 115 200
	€497 250	€500 500	€492 800
		€ 3250 F* Total mix variance	€7 700 U Total yield variance
			€4 450 U Total efficiency variance

*F= favourable effect on operating profit; U=unfavourable effect on operating profit.

- Compare columns 1 and 2.
- The difference in costs between the two columns is the total direct materials mix variance, attributable solely to differences in the mix of inputs used. The total direct materials mix variance is the sum of the direct materials mix variances for each input.

Total direct materials mix variance

- The total direct materials yield variance is the sum of the direct materials yield variances for each input:

Direct materials mix variance for each input	=	(Actual direct materials input mix percentage	-	Budgeted direct materials input mix percentage)	x	Actual total quantity of all direct materials inputs used	x	Budgeted price of direct materials input

- The direct materials mix variances are:

Golden Delicious	(0.50-0.50) x 6500 x €70 = 0 x 6500 x €70	=	€ 0
British Coxes	(0.35-0.30) x 6500 x €80 = 0.05 x 6500 x €80	=	26 000 U
Jonagold	(0.15-0.20) x 6500 x €90 = (-0.05) x 6500 x €90	=	29 250 U
Total direct materials mix variance			€3 250 U

Direct manufacturing labour yield and mix variances

- Direct manufacturing labour variances are calculated in much the same way as direct materials variances.
- Aliya has three grades of direct manufacturing labour: Grade 1, Grade 2 and Grade 3.
- Budgeted costs for June 2005 follow:

3000	hours of Grade 3 labour at € 24 per hour	€72 000
2100	hours of Grade 2 labour at € 16 per hour	33 600
900	hours of Grade 1 labour at € 12 per hour	10 800
6000	total hours	€116 400

- Actual results for June 2005 show that the work was completed in 5 900 hours:

3245	hours of Grade 3 labour at €23 per hour	€74 635	
1770	hours of Grade 2 labour at €18 per hour	31 860	
885	hours of Grade 1 labour at €13 per hour	15 505	
5900	total hours	€118 000	
Budgeted costs		116 400	
Total direct manufacturing labour variance to be explained		€1 600	U

Direct manufacturing labour yield and mix variances

- The direct manufacturing labour price and efficiency variances for each employee category and in total are:

	Actual costs incurred (Actual inputs x Actual prices) (1)		**Actual input x Budgeted prices (2)**		**Flexible budget (Budgeted inputs allowed for actual outputs achieved x Budgeted prices) (3)**	
Grade 3 labour	3245x€23	=€74 635	3245x€24	=€77 880	3000x€24	=€72 000
Grade 2 labour	1770x€18	=31 860	1770x€16	=28 320	2100x€16	=33 600
Grade 1 labour	885x€13	=11 505	885x€12	=10 620	900x€12	=10 800
		€118 000		€116 820		€116 400
			€ 1180 U*		€420 U	
			Total price variance		Total efficiency variance	
				€1600 U		
				Total flexible-budget variance		

U=unfavourable effect on operating profit

Direct manufacturing labour yield and mix variances

- The direct manufacturing labour price and efficiency variances for each employee category and in total are:

Actual input x Budgeted prices (2)		Flexible budget (Budgeted inputs allowed for actual outputs achieved x Budgeted prices) (3)	
3245x€24	=€77 880	3000x€24	=€72 000
1770x€16	=28 320	2100x€16	=33 600
885x€12	=10 620	900x€12	=10 800
	€116 820		€116 400
		€420 U	
		Total efficiency variance	

	(Actual total quantity of all inputs used x Actual input mix) x Budgeted prices (1)		(Actual total quantity of all inputs used x Budgeted input mix) x Budgeted prices (2)		Flexible budget (Budgeted total quantity of all inputs allowed actual output achieved x Budgeted input mix) x Budgeted prices (3)	
Grade 3 labour	5900x0.55x€24	=€77 880	5900x0.50x€24	=€70 800	6000x0.50x€24	=€72 000
Grade 2 labour	3900x0.30x€16	=28 320	5900x0.35x€16	=33 600	6000x0.35x€16	=33 600
Grade 1 labour	5900x0.15x€12	=10 620	5900x0.15x€12	=10 620	6000x0.15x€12	=10 800
		€116 820		€114 460		€116 400
			€ 2360 U*		€1940 F	
			Total mix variance		Total yield variance	
				€420 U		
				Total efficiency variance		

*F=favourable effect on operating profit; U=unfavourable effect on operating profit

Direct manufacturing labour yield variance

	(Actual total quantity of all inputs used x Actual input mix) x Budgeted prices (1)		(Actual total quantity of all inputs used x Budgeted input mix) x Budgeted prices (2)		Flexible budget (Budgeted total quantity of all inputs allowed actual output achieved x Budgeted input mix) x Budgeted prices (3)	
Grade 3 labour	5900x0.55x€24	=€77 880	5900x0.50x€24	=€70 800	6000x0.50x€24	=€72 000
Grade 2 labour	3900x0.30x€16	=28 320	5900x0.35x€16	=33 600	6000x0.35x€16	=33 600
Grade 1 labour	5900x0.15x€12	=10 620	5900x0.15x€12	=10 620	6000x0.15x€12	=10 800
		€116 820		€114 460		€116 400
			€ 2360 U*		€1940 F	
			Total mix variance		Total yield variance	
			€420 U			
			Total efficiency variance			

*F=favourable effect on operating profit; U=unfavourable effect on operating profit

- Keeping the budgeted input mix unchanged, the total direct manufacturing labour yield variance is the difference between two amounts: (1) the budgeted cost of direct manufacturing labour based on the actual total quantity of all direct manufacturing labour used, and (2) the flexible-budget cost of direct manufacturing labour based on the budgeted total quantity of direct manufacturing labour for the actual output achieved.

Direct manufacturing labour yield variance

- The total direct manufacturing labour yield variance can also be calculated as follows:

$$\text{Direct manufacturing labour yield variance for each input} = \left(\begin{array}{c} \text{Actual total quantity of all direct manufacturing labour inputs used} \\ - \\ \text{Budgeted quantity of all direct manufacturing labour inputs allowed for actual output achieved} \end{array} \right) \times \text{Budgeted direct Manufacturing labour input mix percentage} \times \text{Budgeted price of direct manufacturing labour input}$$

- The direct manufacturing labour yield variances are:

Grade 3 labour	(5900 – 6000) x 0.50 x €24 = (-100) x 0.50 x €24	=	€1 200	F
Grade 2 labour	(5900 – 6000) x 0.35 x €16 = (-100) x 0.35 x €16	=	500	F
Grade 1 labour	(5900 – 6000) x 0.15 x €12 = (-100) x 0.15 x €12	=	180	F
Total direct manufacturing labour yield variance			€1 940	F

Direct manufacturing labour mix variance

	(Actual total quantity of all inputs used x Actual input mix) x Budgeted prices (1)		(Actual total quantity of all inputs used x Budgeted input mix) x Budgeted prices (2)		Flexible budget (Budgeted total quantity of all inputs allowed actual output achieved x Budgeted input mix) x Budgeted prices (3)	
Grade 3 labour	5900x0.55x€24	=€77 880	5900x0.50x€24	=€70 800	6000x0.50x€24	=€72 000
Grade 2 labour	3900x0.30x€16	=28 320	5900x0.35x€16	=33 600	6000x0.35x€16	=33 600
Grade 1 labour	5900x0.15x€12	=10 620	5900x0.15x€12	=10 620	6000x0.15x€12	=10 800
		€116 820		€114 460		€116 400
			€ 2360 U*		€1940 F	
			Total mix variance		Total yield variance	
			€420 U			
			Total efficiency variance			

*F=favourable effect on operating profit; U=unfavourable effect on operating profit

- Taking the actual total quantity of all direct manufacturing labour used as given, the total direct manufacturing labour mix variance is the difference between two amounts: (1) the budgeted cost of inputs in the actual mix of direct manufacturing labour, and (2) the budgeted cost of inputs in the budgeted mix of direct manufacturing labour.

Direct manufacturing labour mix variance

- The total direct manufacturing labour mix variance can also be calculated as follows:

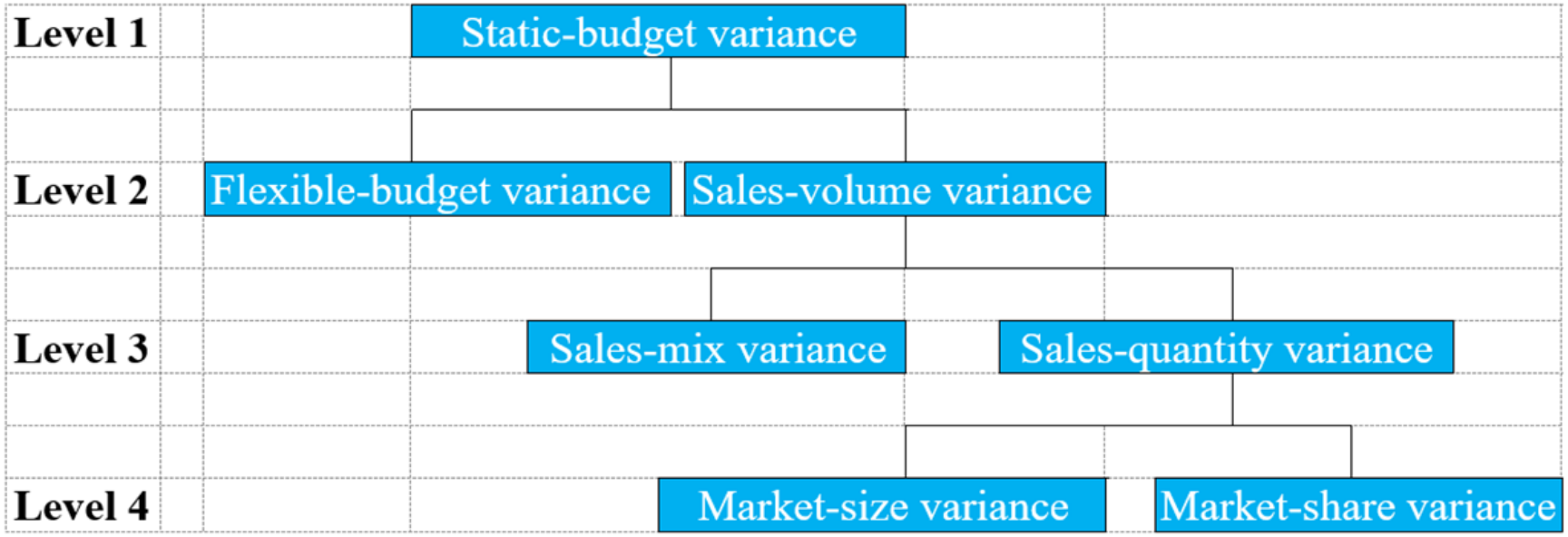
Direct manufacturing labour mix variance for each input	=	(Actual direct manufacturing labour input mix percentage	-	Budgeted direct manufacturing labour input mix percentage)	x	Actual total quantity of all direct manufacturing labour inputs used	x	Budgeted price of direct manufacturing labour input

- The direct manufacturing labour mix variances are:

Grade 3 labour	(0.55 – 0.50) x 5900 x €24 = 0.05 x 5900 x €24	=	€7080	U
Grade 2 labour	(0.30 – 0.35) x 5900 x €16 = (-0.05) x 5900 x €16	=	4720	F
Grade 1 labour	(0.15 – 0.15) x 5900 x €12 = 0 x 5900 x €12	=	0	
Total direct manufacturing labour mix variance			€2360	U

Revenue and sales variances

- We now examine how variances that use revenue information as a key output can be calculated.
- Special attention is paid to companies with multiple products or services.
- The revenue variances we discuss are most frequently called sales variances, in large part because sales are the single largest component of revenue for many companies.



Variance analysis for multiple products

- Example:
- Global Air operates flights between New York and London. It has three classes of service: first class, business class and economy class.
- It is currently examining results for August 2005. Unit volume is measured in terms of a round-trip ticket (one-way tickets are converted into equivalent round-trip tickets). Budgeted and actual results for August 2005 are as follows:

	Budget for August 2005				Actual for August 2005			
	Selling price per unit	Unit volume	Sales Mix	Revenue	Selling price per unit	Unit volume	Sales mix	Revenue
First class	€3200	1 000	5 %	€3 200 000	€2 600	2 400	10%	€6 240 000
Business class	2400	3 000	15 %	7 200 000	1 600	6 000	25%	9 600 000
Economy class	900	16 000	80 %	14 400 000	700	15 600	65%	10 920 000
Total		20 000	100 %	€24 800 000		24 000	100%	€26 760 000

Variance analysis for multiple products

- In July 2005, Pan Air, a major competitor of Global, went bankrupt. It was acquired by Easy Travel, a low-cost economy travel operator.
- Pan Air had a sizable presence in the first- and business-class markets. Easy Travel immediately offered deep price discounts for all classes of travel.
- Its reputation among first-class and business-class travellers, however, was poor. Global Air dropped all its fares in late July (after its budget was prepared) to meet the new competition.

Static-budget variance

- The static-budget variance for revenues is the difference between the actual revenues and the budgeted revenues from the static budget.

Static-budget variance of revenues	=	Actual results	-	Static-budget amount

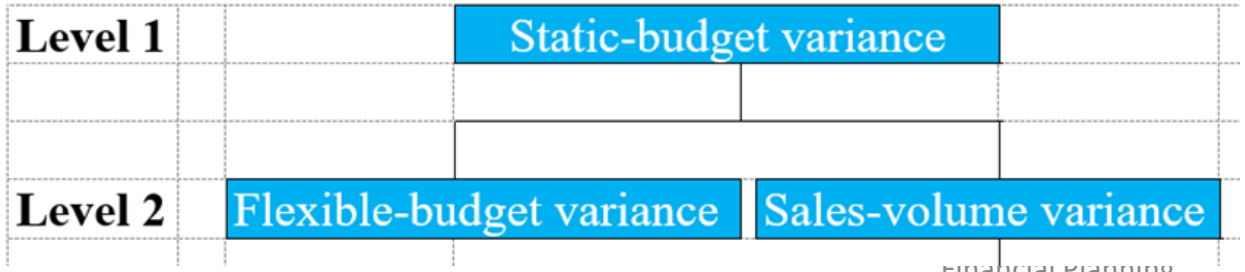
First class	=€6 240 000	-	€3 200 000	=	€3 040 000	F
Business class	=€9 600 000	-	€7 200 000	=	€2 400 000	F
Economy class	=€10 920 000	-	€14 400 000	=	€3 480 000	U
Total					€1 960 000	F

Flexible-budget and sales-volume variance

- The flexible-budget variance for revenues is the difference between the actual revenues and the flexible-budget amount for the actual unit volume of sales.

Flexible-budget variance of revenues	=	Actual results	-	Flexible-budget Amount

First class	=€6 240 000	-	(€3200 x 2400)			
	=€6 240 000	-	€7 680 000	=	€1 440 000	U
Business class	=€9 600 000	-	(€2400 x 6000)			
	=€9 600 000	-	€14 400 000	=	€4 800 000	U
Economy class	=€10 920 000	-	(€900x15 600)	=		
	=€10 920 000	-	€14 040 000	=	€3 120 000	U
Total					€9 360 000	U

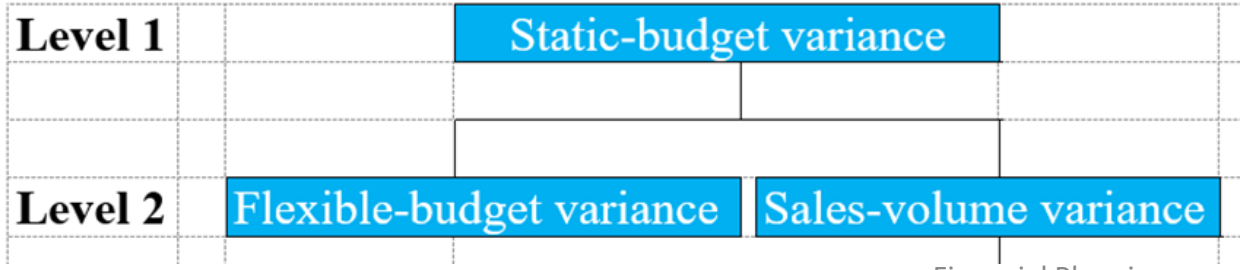


Flexible-budget and sales-volume variance

- The sales-volume variance shows the effect of the difference between the actual and budgeted quantity of the variable used to 'flex' the flexible budget.

Sales-volume variance of revenues	=	(Actual sales quantity in units - Budgeted sales quantity in units)	x	Budgeted selling price per unit	

First class	= (2400 – 1000)	x	€3200	=	€4 480 000	F
Business class	= (6000 – 3000)	x	€2400	=	€7 200 000	F
Economy class	= (15 600 – 16 000)	x	€900	=	€360 000	U
Total					€11 320 000	F

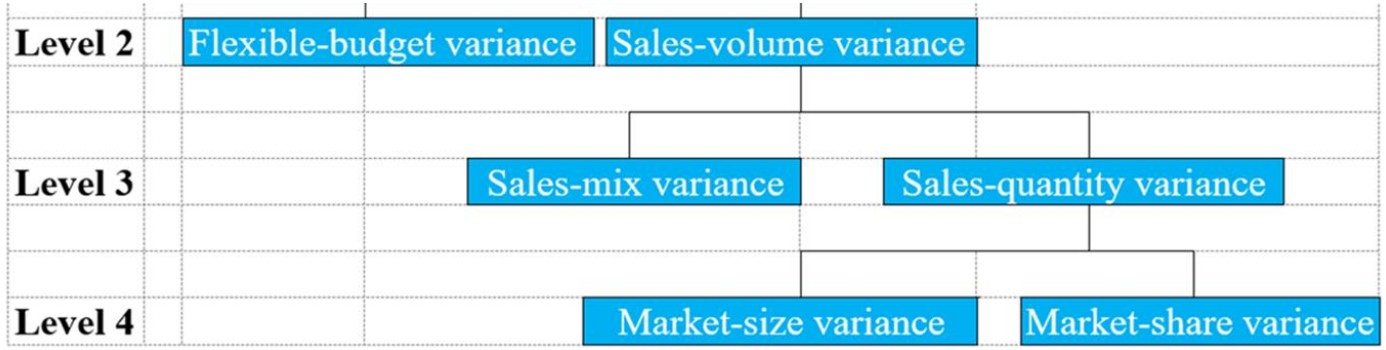


Sales-mix variance

- The sales-mix variance is the difference between two amounts: (1) the budgeted amount for the actual sales mix, and (2) the budgeted amount if the budgeted sales mix had been unchanged.

$$\text{Sales-mix variance of revenues} = \text{Actual units of all products sold} \times \left(\text{Actual sales-mix percentage} - \text{Budgeted sales-mix percentage}\right) \times \text{Budgeted selling price per unit}$$

First class	= 24 000 x (0.10 – 0.05)	x	€3200	=	€3 840 000 F
Business class	= 24 000 x (0.25 – 0.15)	x	€2400	=	€5 760 000 F
Economy class	= 24 000 x (0.65 – 0.80)	x	€900	=	€3 240 000 U
Total					€6 360 000 F

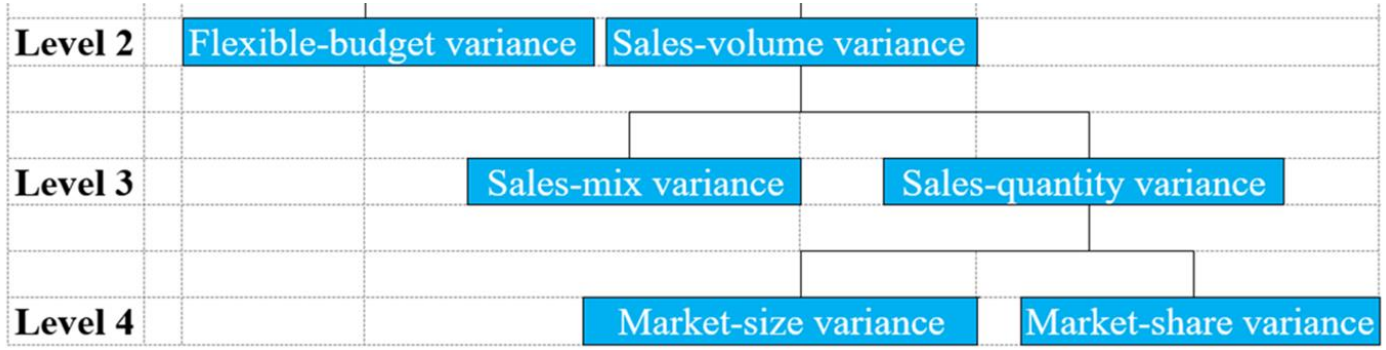


Sales-quantity variance

- The sales-quantity variance is the difference between two amounts: (1) the budgeted amount based on actual quantities sold of all products and the budgeted mix, and (2) the amount in the static budget (which is based on the budgeted quantities to be sold of all products and the budgeted mix).

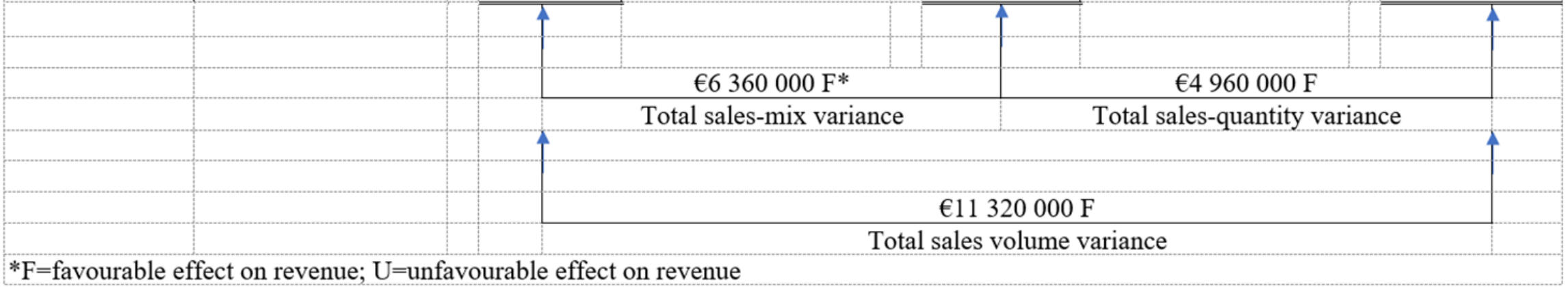
Sales-quantity variance of revenues	=	(	Actual units of all products sold	-	Budgeted units of all products sold	)	x Budgeted sales-mix percentage	x Budgeted selling price per unit

First class	= (24 000 – 20 000)	x	0.05 x €3200	=	€640 000 F
Business class	= (24 000 – 20 000)	x	0.15 x €2400	=	€1 440 000 F
Economy class	= (24 000 – 20 000)	x	0.80 x €900	=	€2 880 000 F
Total					€4 960 000 F



Sales-quantity variance and sales-mix variance

	Flexible budget (Actual units of all products sold x Actual sales mix x Budgeted selling price per unit)			**Actual units of all products sold x Budgeted sales mix x Budgeted selling price per unit**			**Static budget (Budgeted units of all products sold x Budgeted sales mix x Budgeted selling price per unit)**		
First class	24 000 x 0.10 x €3200	=	€7 680 000	(24 000 x 0.05 x €3200)	=	€3 840 000	(20 000 x 0.05 x €3200)	=	€3 200 000
Business class	24 000 x 0.25 x €2400	=	€14 400 000	(24 000 x 0.15 x €2400)	=	€8 640 000	(20 000 x 0.15 x €2 400)	=	€7 200 000
Economy class	24 000 x 0.65 x €900	=	€14 040 000	(24 000 x 0.80 x €900)	=	€17 280 000	(20 000 x 0.80 x €900)	=	€14 400 000
			€36 120 000			€29 760 000			€24 800 000



*F=favourable effect on revenue; U=unfavourable effect on revenue

Market-size and market-share variances

- Sales depend on overall market demand as well as the company's ability to maintain its share of the market.
- Assume that the budgeted unit sales of 20 000 units (round-trip tickets) came from a management estimate of a 50% market share on the New York to London route in August 2005 and an industry sales forecast by the Travel Information Group (TIG) of 40 000 round-trip tickets for the route. In September, TIG reported the following:

	Budgeted industry volume for August 2005	Actual industry volume for August 2005
First class	1 500	3 000
Business class	6 000	9 000
Economy class	32 500	38 000
Total	40 000	50 000

- Global Air's actual market share was 48% of unit volume (24 000 ÷ 50000) in contrast to its budgeted share of 50%. TIG noted that Easy Travel was highly successful in generating economy travel but had been unsuccessful in attracting first-and business-class travellers. In contrast, it noted Global Air's great success in expanding its first- and business-class presence.

Market-size variance

- The market-size variance is the difference between two amounts:' (1) the budgeted amount based on the actual market size in units and the budgeted market share, and (2) the static-budget amount based on the budgeted market size in units and the budgeted market share.
- The formula and the 2005 amount for Global Air for revenues is:

Market-size variance in revenues	=	$\left(\begin{matrix}\text{Actual market size in units} \\ - \\ \text{Budgeted market size in units}\end{matrix}\right)$	x	Budgeted market share	x	Budgeted average selling price per unit
	=	(50 000 – 40 000) x 0.50 x €1240				
	=	€6 200 000 F				

Market-share variance

- The market-share variance is the difference between two amounts: (1) the budgeted amount at budgeted mix based on the actual market size in units and the actual market share, and (2) the budgeted amount at budgeted mix based on actual market size in units and the budgeted market share.
- The formula and the 2005 amounts for Global Air for revenues is:

Market-share variance for revenues	=	Actual market size in units	x	(Actual market share x Budgeted market share)	x	Budgeted average selling price per unit
	=	50 000 x (0.48 – 0.50) x €1240					
	=	€1 240 000 U					

Market-share and market-size variances

Actual market size x Actual market share x Budgeted average selling price per unit	Actual market size x Budgeted market share x Budgeted average selling price per unit	Static budget (Budgeted market size x Budgeted market share x Budgeted average selling price per unit)
50 000 x 0.48* x €1240†	50 000 x 0.50‡ x €1240†	40 000 x 0.50 x €1240†
€29 760 000	€31 000 000	€24 800 000

€1 240 000 U§ — Market-share variance

€6 200 000 F — Market-size variance

€4 960 000 F — Total sales-quantity variance

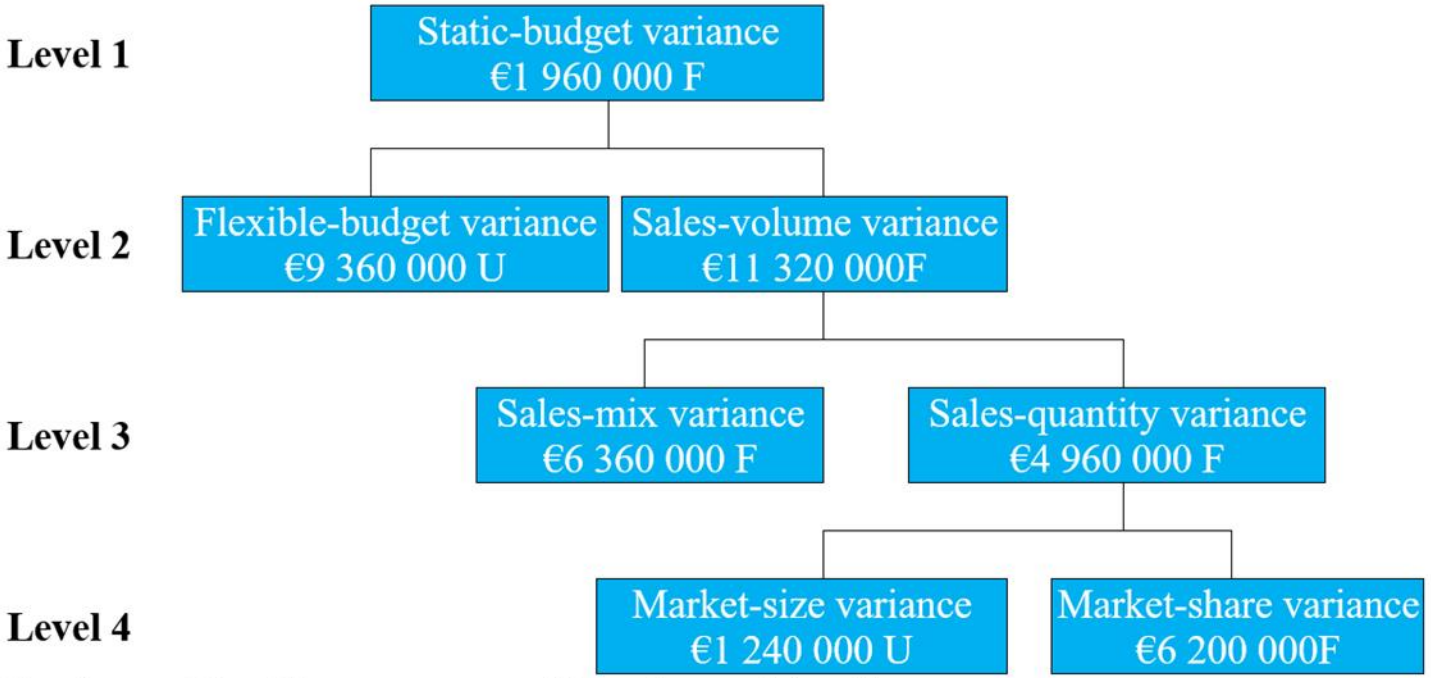
* Actual market share: 24 000 ÷ 50 000 = 0.48.

† Budgeted average selling price per unit = €24 800 000 ÷ 20 000 units = €1240

‡ Budgeted market share: 20 000 ÷ 40 000 = 0.50

§ F= favourable effect on revenue; U=unfavourable effect on revenue

Market-share and market-size variances



F = favourable effect on revenue; U=unfavourable effect on revenue

Exercise 17.13 Variance analysis of revenues, multiple products

The Antwerp Lions play in the Flemish Football League. The Lions play in the Antwerp Stadium (owned and managed by the City of Antwerp), which has a capacity of 30 000 seats (10 000 lower-tier seats and 20 000 upper-tier seats). The Antwerp Stadium charges the Lions a per-ticket charge for use of their facility. All tickets are sold by the Reservation Network, which charges the Lions a reservation fee per ticket. The Lions budgeted net revenue for each type of ticket in 2004 is calculated as follows:

	Lower-tier tickets	Upper-tier tickets
Selling price	€35	€14
Antwerp Stadium fee	10	6
Reservation Network fee	5	3
Net revenue per ticket	20	5

The budgeted and actual average attendance figures per game in the 2004 season are:

	Budgeted seats sold	Actual seats sold
Lower tier	8 000	6 600
Upper tier	12 000	15 400
Total	20 000	22 000

Exercise 17.13 Variance analysis of revenues, multiple products

There was no difference between the budgeted and actual net revenue for lower-tier or upper-tier seats.

The manager of the Lions was delighted that actual attendance was 10% above budgeted attendance per game, especially given the depressed state of the local economy in the past six months.

Required:

1. Calculate the sales-volume variance for individual 'product' net revenues and total net revenues for the Antwerp Lions in 2004.
2. Calculate the sales-quantity and sales-mix variances for individual 'product' net revenues and total net revenues in 2004.
3. Present a summary of the variances in requirements 1 and 2. Comment on the results.

Exercise 17.13 Variance analysis of revenues, multiple products

Suggested Solution:

1

$$\text{Sales – volume variance of revenue} = \left(\frac{\text{Actual sales}}{\text{Quantity in units}} - \frac{\text{Budgeted sales}}{\text{Quantity in units}}\right) \times \text{Budget net revenue per ticket}$$

Lower tier tickets	=	(6,600 – 8,000) × €20 =	€28,000U
Upper tier tickets	=	(15,400 – 12,000) × €5 =	€17,000F
All tickets			€11,000U

2

$$\text{Budgeted average net revenue per ticket} = \frac{(8{,}000 \times €20) + (12{,}000 \times €5)}{20{,}000}$$

$$= \frac{€160{,}000 + €60{,}000}{20{,}000} = \frac{€220{,}000}{20{,}000}$$

= €11 per unit (seat sold)

Sales-mix percentages:

	Budgeted	Actual
Lower tier	$\frac{8{,}000}{20{,}000} = 0.40$	$\frac{6{,}600}{22{,}000} = 0.30$
Upper tier	$\frac{12{,}000}{20{,}000} = 0.40$	$\frac{15{,}400}{22{,}000} = 0.70$

Solution Exhibit 17.13 presents the sales-volume, sales-quantity and sales-mix variances for lower tier tickets, upper tier tickets and in total for Antwerp Lions in 2011.

Exercise 17.13 Variance analysis of revenues, multiple products

Suggested Solution:

The sales-quantity variances can also be calculated as:

$$\text{Sales-quantity variance of revenues} = \left|\text{Actual units of all tickets sold} - \text{Budgeted units of all tickets sold}\right| \times \text{Budgeted sales-mix percentage} \times \text{Budgeted net revenue per ticket}$$

The sales-mix variance can also be calculated as:

Lower tier tickets	=	(22,000 – 20,000) × 0.40 × €20	= €16,000F
Upper tier tickets	=	(22,000 – 20,000) × 0.60 × €5	= €6,000F
All tickets			€22,000U

Exercise 17.13 Variance analysis of revenues, multiple products

Suggested Solution:

The sales-mix variance can further be calculated as:

$$\text{Sales-quantity variance of revenues} = \left|\text{Actual units of all tickets sold} - \text{Actual sales-mix percentage}\right| \times \text{Budgeted sales-mix percentage} \times \text{Budgeted net revenue per ticket}$$

The sales-mix variance can also be calculated as:

Lower tier tickets	=	22,000 × (0.30 – 0.40)	=	€44,000U
Upper tier tickets	=	22,000 × (0.70 – 0.60)	=	€11,000F
All tickets				€33,000U

3 The Antwerp Lions increased average attendance by 10% per game. However, there was a sizeable shift from lower tier seats (budgeted net revenue of €20 per seat) to upper tier seats (budgeted net revenue of €5 per seat). The net result: the actual revenue was €11,000 below the budgeted net revenue.

Exercise 17.13

Suggested Solution:

	Flexible budget (Actual units of all tickets sold x Actual sales mix) x Budgeted Unit net revenue (1)	**(Actual units of all tickets sold x Budgeted sales mix) x Budgeted unit net revenue (2)**	**Static budget (Budgeted units of all tickets sold x Budgeted sales mix) x Budgeted unit net revenue (3)**
Panel A:			
Lower tier	(22,000 x 0.30[a]) x €20 = 6,600 x €20 = €132,000	(22,000 x 0.40[b]) x €20 = 8,800 x €20 = €176,000	(20,000 x 0.40[b]) x €20 = 8,000 x €20 = €160,000
	€44,000 U — Sales-mix variance	€16,000 F — Sales quantity variance	
		€28,000 U — Sales-volume variance	
Panel B:			
Upper tier	(22,000 x 0.70[c]) x €20 = 15,400 x €5 = €77,000	(22,000 x 0.60[d]) x €20 = 13,200 x €5 = €66,000	(20,000 x 0.60[d]) x €5 = 12,000 x €20 = €60,000
			€132,000
	€11,000 F — Sales-mix variance	€6,000 F — Sales-quantity variance	
		€17,000 F — Sales-volume variance	
Panel C:			
All tickets	€209,000[e]	€242,000[f]	€220,000[g]
	€33,000 U — Sales-mix variance	€22,000 F — Sales-quantity variance	
		€11,000 U — Sales-volume variance	

Note that F = favourable effect on operating profit; U = unfavourable effect on operating profit.

Actual sales mix:

[a]Lower tier = 6,600 ÷22,000 = 30%

[c]Upper tier = 15,400 ÷ 22,000 = 70%

[e]€132,000 + €77,000 = €209,000

Budgeted sales mix:

[b]Lower tier = 8,000 ÷ 20,000 = 40%

[d]Upper tier = 12,000 ÷ 20,000 = 60%

[f]€176,000 + €66,000 = €242,000

[g]€160,000 + €60,000 = €220,000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