

# Flexible Budgets, Variance Analysis and Management Control

# Static budgets and flexible budgets

- A **static budget** is a budget that is based on one level of output; it is not adjusted or altered after it is set, regardless of ensuing changes in actual output (or actual revenue and cost drivers).
- A **flexible budget** is adjusted in accordance with ensuing changes in actual output (or actual revenue and cost drivers).
- A flexible budget is calculated at the end of the period when the actual output is known.
- A static budget is developed at the start of the budget period based on the planned output level for the period.
- A flexible budget enables managers to calculate a richer set of variances than does a static budget.
- A **favourable variance** - denoted **F** in the exhibits - is a variance that increases operating income relative to the budgeted amount.
- An **unfavourable variance** - denoted **U** - is a variance that decreases operating income relative to the budgeted amount.

# Example of static budgets and flexible budgets

- The costing system at Sofiya Company includes both manufacturing costs and marketing costs. There are direct and indirect costs in each category:

	Direct costs	Indirect costs
Manufacturing	Direct materials (variable)	Variable manufacturing overhead
	Direct manufacturing labour (variable)	Fixed manufacturing overhead
Marketing	Direct marketing labour (variable)	Variable marketing overhead
	Fixed marketing overhead	

- The cost driver for direct materials, direct manufacturing labour and variable manufacturing overhead is the number of units manufactured.
- The cost driver for direct marketing labour and variable marketing overhead is the number of units sold.
- The revenue driver is the number of units sold. The relevant range for the €180 selling price per jacket and for the cost drivers in both manufacturing and marketing is from 8 000 to 16 000 units.
- All costs at Sofiya are either driven by output units or are fixed. This is a simplifying assumption to highlight the basic approach to flexible budgeting.

## Example of static budgets and flexible budgets

- The actual results and the static-budget amounts of Sofiya for April 2005 are as follows:

	Actual results	Static-budget amounts
Units sold	10 000	12 000
Revenues	€ 1 850 000	€ 2 160 000
Variable costs	1 120 000	1 188 000
Fixed costs	705 000	710 000
Operating profit	25 000	262 000

- The next slide presents the Level 0 and Level 1 variance analyses for April 2005.

# Example of static budgets and flexible budgets

- Level 0 gives the least-detailed comparison of the actual and budgeted operating profit. The unfavourable variance of €237 000 is simply the result of subtracting the budgeted operating profit of €262 000 from the actual operating profit of €25 000:
- Static-budget variance = Actual results - Static-budget amount of operating profit = €25 000 - €262 000 = €237 000 U\* (\*U = unfavourable effect on operating profit).
- This variance is often called a static-budget variance because the number used for the budgeted amount (€262 000) is taken from a static budget.**

## Static-budget-based variance analysis for Sofiya for April 2005

### Level 0 analysis

Actual operating profit	€ 25 000
Budgeted operating profit	262 000
Static-budget variance of operating profit	237 000 U*

### Level 1 analysis

	Actual results (1)	Static-budget variances (2) = (1) - (3)		Static budget (3)
Units sold	10 000	2 000	U	12 000
Revenues	€1 850 000	€310 000	U	€2 160 000
Variable costs	1 120 000	68 000	F	1 188 000
Contribution margin	730 000	242 000	U	972 000
Fixed costs	705 000	5 000	F	710 000
Operating profit	€25 000	€237 000	U	€262 000
		€ 237 000 U		
		Total static-budget variance		

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

# Example of static budgets and flexible budgets

- Level 1 analysis provides managers with more detailed information on the static-budget variance of operating profit of €237 000 U.
- The additional information added in Level 1 pertains to revenues, variable costs and fixed costs.
- The budgeted contribution margin percentage of 45.0% ( $€972\,000 \div €2\,160\,000$ ) decreases to 39.5% ( $€730\,000 \div €1\,850\,000$ ) for the actual results.

## Static-budget-based variance analysis for Sofiya for April 2005

### Level 0 analysis

Actual operating profit	€ 25 000
Budgeted operating profit	262 000
Static-budget variance of operating profit	237 000 U*

### Level 1 analysis

	Actual results (1)	Static-budget variances (2) = (1) – (3)		Static budget (3)
Units sold	10 000	2 000	U	12 000
Revenues	€1 850 000	€310 000	U	€2 160 000
Variable costs	1 120 000	68 000	F	1 188 000
Contribution margin	730 000	242 000	U	972 000
Fixed costs	705 000	5 000	F	710 000
Operating profit	€25 000	€237 000	U	€262 000
		€ 237 000 U		
		Total static-budget variance		

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

# Steps in developing a flexible budget

- **Step 1: Determine the budgeted selling price per unit, the budgeted variable costs per unit, and the budgeted fixed costs.**
  - In the case of Sofiya Company, each output unit (a jacket) has a budgeted selling price of €180.
  - The budgeted variable cost is €99 per jacket. Column 2 has a breakdown of this €99 amount. The budgeted fixed costs total €710 000 (€276 000 manufacturing and €434 000 marketing).
- **Step 2: Determine the actual quantity of the revenue driver.**
  - Sofiya's revenue driver is the number of units sold. In April 2005, Sofiya sold 10 000 jackets.
- **Step 3: Determine the flexible budget for revenue based on the budgeted unit revenue and the actual quantity of the revenue driver**
  - Flexible-budget revenues =  $€180 \times 10\,000 = €1\,800\,000$
- **Step 4: Determine the actual quantity of the cost driver(s)**
  - Sofiya's cost driver for manufacturing costs is units produced. The cost driver for marketing costs is units sold. In April 2005, Sofiya produced and sold 10 000 jackets.

## Steps in developing a flexible budget

- **Step 5: Determine the flexible budget for costs based on the budgeted unit variable costs and fixed costs and the actual quantity of the cost driver(s)**

Flexible-budget variable costs

Manufacturing	=	€88 x 10 000	=	€880 000
Marketing	=	€11 x 10 000	=	110 000
				€990 000

Flexible-budget fixed costs

Manufacturing	=	€276 000
Marketing	=	434 000
		€710 000

These five steps enable Sofiya to move to a Level 2 variance analysis, which helps them better explore reasons for the €237 000 unfavourable static-budget variance of operating profit. Exhibit 15.2 shows the flexible budget for 10 000 units (column 3) as well as the actual results for 10 000 units (column 4).

# Steps in developing a flexible budget

Flexible-budget data for Sofiya for April 2005

Line item (1)	Budgeted cost amount per unit (2)	Flexible budget amount (10 000) (3)	Actual results for 10 000 units (4)
Revenue	€180	€1 800 000	€1 850 000
Variable costs			
Direct materials	60	600 000	688 200
Direct manufacturing labour	16	160 000	198 000
Direct marketing labour	6	60 000	57 600
Variable manufacturing overhead	12	120 000	130 500
Variable marketing overhead	5	50 000	45 700
Total variable costs	99	990 000	1 120 000
Contribution margin	€81	810 000	730 000
Fixed costs			
Manufacturing overhead		276 000	285 000
Marketing overhead	-	434 000	420 000
Total fixed costs	-	710 000	705 000
Total costs	-	1 700 000	1 825 000
Operating profit		€100 000	€25 000

# Flexible-budget variances and sales-volume variances

- The **flexible-budget variance** is the difference between the actual results and the flexible-budget amount for the actual levels of the revenue and cost drivers.
- The **sales-volume variance** is the difference between the flexible-budget amount and the static-budget amount; unit selling prices, unit variable costs and fixed costs are held constant.
- Knowing these variances helps managers better explain the static-budget variance of €237 000 U.

Level 1	Static-budget variance €237 000 U	
Level 2	Flexible-budget variance €75 000 U	Sales-volume variance € 162 000 U

	Actual results (1)	Flexible-budget variances (2) = (1)-(3)	Flexible Budget (3)	Sales-volume variances (4) = (3)-(5)	Static budget (5)
Units sold	10 000	0	10 000	2 000 U	12 000
Revenues	€1 850 000	€50 000 F*	€1 800 000	€360 000 U	€2 160 000
Variable costs	1 120 000	130 000 U	990 000	198 000 F	1 188 000
Contribution margin	730 000	80 000 U	810 000	162 000 U	972 000
Fixed costs	705 000	5 000 F	710 000	0	710 000
Operating profit	€25 000	€75 000 U	€100 000	€162 000 U	€262 000
	€75 000 U			€162 000 U	
	Total flexible-budget variance			Total sales-volume variance	
	€237 000 U				
	Total static-budget variance				

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

# Sales-volume variance

- The flexible-budget amounts in column 3 and the static-budget amount in column 5 are **both** calculated using the **budgeted** selling prices and budgeted costs.
- This variance is labelled the '**sales-volume variance**' because in many contexts the number of units sold is both the revenue driver and the cost driver.
- In our example, this sales-volume variance in operating profit arises solely because it sold 10 000 units, which was 2 000 less than the budgeted 12 000 units.

Level 1	Static-budget variance €237 000 U	
Level 2	Flexible-budget variance €75 000 U	Sales-volume variance € 162 000 U

	Actual results (1)	Flexible-budget variances (2) = (1)-(3)	Flexible Budget (3)	Sales-volume variances (4) = (3)-(5)	Static budget (5)
Units sold	10 000	0	10 000	2 000 U	12 000
Revenues	€1 850 000	€50 000 F*	€1 800 000	€360 000 U	€2 160 000
Variable costs	1 120 000	130 000 U	990 000	198 000 F	1 188 000
Contribution margin	730 000	80 000 U	810 000	162 000 U	972 000
Fixed costs	705 000	5 000 F	710 000	0	710 000
Operating profit	€25 000	€75 000 U	€100 000	€162 000 U	€262 000
		€75 000 U		€162 000 U	
		Total flexible-budget variance		Total sales-volume variance	
		€237 000 U			
		Total static-budget variance			

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

# Flexible-budget variance

- The first three columns compare the actual results with the flexible-budget amounts.
- Flexible-budget variances are reported in column 2.
- The flexible-budget variance pertaining to revenues is often called a selling-price variance because it arises solely from differences between the actual selling price and the budgeted selling price:

$$\text{Selling-price Variance} = \left( \frac{\text{Actual selling price} - \text{Budgeted selling price}}{\text{selling price} - \text{selling price}} \right) \times \text{Actual units sold}$$

Level 1	Static-budget variance €237 000 U	
Level 2	Flexible-budget variance €75 000 U	Sales-volume variance € 162 000 U

	Actual results (1)	Flexible-budget variances (2) = (1)-(3)	Flexible Budget (3)	Sales-volume variances (4) = (3)-(5)	Static budget (5)
Units sold	10 000	0	10 000	2 000 U	12 000
Revenues	€1 850 000	€50 000 F*	€1 800 000	€360 000 U	€2 160 000
Variable costs	1 120 000	130 000 U	990 000	198 000 F	1 188 000
Contribution margin	730 000	80 000 U	810 000	162 000 U	972 000
Fixed costs	705 000	5 000 F	710 000	0	710 000
Operating profit	€25 000	€75 000 U	€100 000	€162 000 U	€262 000
		€75 000 U		€162 000 U	
		Total flexible-budget variance		Total sales-volume variance	
		€237 000 U			
		Total static-budget variance			

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

## Exercise 15.11      Flexible budget

Abulafia Sri manufactures tyres for the Formula 1 motor racing circuit. For August 2005, Abulafia budgeted to manufacture and sell 3000 tyres at a variable cost of €74 per tyre and a total fixed cost of €54 000. The budgeted selling price was €110 per tyre. Actual results in August 2005 were 2800 tyres manufactured and sold at a selling price of €112 per tyre. The actual total variable costs were €229 600, and the actual total fixed costs were €50 000.

### **Required:**

1. Prepare a performance report that uses a flexible budget and a static budget.
2. Comment on the results in requirement



## Exercise 15.11 Flexible budget

The key information items are:

	Actual	Budgeted
Units	2,800	3,000
Unit selling price	€ 112	€ 40
Unit variable cost	€ 82	€ 74
Fixed costs	€ 50,000	€ 54,000

The total static-budget variance in operating income is €20,000 U. There is both an unfavourable total flexible-budget variance (€12,800) and an unfavourable sales-volume variance (€7,200).

The unfavourable sales-volume variance arises solely because the actual units manufactured and sold were 200 less than the budgeted 3,000 units. The unfavourable static budget of €12,800 in operating income is primarily due to the €8 increase in unit variable costs. This increase in unit variable costs is only partially offset by the €2 increase in selling price and the €4,000 decrease in fixed costs.

Flexible-budget variances  
(price variances and efficiency variances)  
for inputs  
(direct materials and direct labor)

# Price variances and efficiency variances for inputs

- The sources of flexible-budget variance (as regards costs) are the individual differences between actual and budgeted prices or quantities for inputs.
- The next two variances are: price variances and efficiency variances for inputs.
- This information helps managers to better understand past performance and to plan for future performance.
- We call this a Level 3 analysis as it takes a more detailed analysis of the Level 2 variances.
- The relationship of these two variances to those we have already discussed for Sofiya is as follows:

<b>Level 1</b>				Static-budget variance	
<b>Level 2</b>			Flexible-budget variance		Sales-volume variance
<b>Level 3</b>		Price variance		Efficiency variance	

## Price variances and efficiency variances for inputs

- A **price variance** is the difference between the actual price and the budgeted price multiplied by the actual quantity of input in question (such as direct materials purchased or used).
- Price variances are sometimes called input-price variances or rate variances (especially when those variances are for direct labour).
- An **efficiency variance** is the difference between the actual quantity of input used (such as metres of cloth of direct materials) and the budgeted quantity of input that should have been used, multiplied by the budgeted price.
- Efficiency variances are sometimes called input-efficiency variances or usage variances.

# Obtaining budgeted input prices and input quantities

- Two main sources of information about budgeted input prices and budgeted input quantities are:
  - 1. Actual input data from past periods:** most firms have past data on actual input prices and actual input quantities. Past data are typically available at a relatively low cost. The limitations of using this source are: (a) past data include past inefficiencies, and (b) past data do not incorporate any expected changes planned to occur in the budget period.
  - 2. Standards:** a standard is a carefully predetermined amount; it is usually expressed on a per unit basis. Sofiya has developed standard inputs and standard costs for each of its variable-cost items. A standard input is a carefully predetermined quantity of input (such as kilograms of materials or hours of labour time) required for one unit of output. A standard cost is a carefully predetermined cost. Standard costs can relate to units of inputs or units of outputs.

# Price variances and efficiency variances: an illustration

- **Basic data:**
- Consider Sofiya's three direct-cost categories. The actual cost for each of these three categories is:

<b>Direct materials purchased and used</b>		
	Direct materials costs	€688 200
	Square metres of cloth input purchased and used	22 200
	Actual price per metre	€31
<b>Direct manufacturing labour</b>		
	Direct manufacturing labour costs	€198 000
	Manufacturing labour-hours of input	9 000
	Actual price per hour	€22
<b>Direct marketing labour</b>		
	Direct marketing labour costs	€57 600
	Marketing labour-hours of input	2 304
	Actual price per hour	€25

- For simplicity, we assume here that direct materials used is equal to direct materials purchased.

# Price variances and efficiency variances: an illustration

- **Basic data:**
- The actual results and the flexible-budget amounts for each category of direct costs for the 10 000 actual output units in April 2005 are:

	Actual results	Flexible Budget		Flexible-Budget Variances	
Direct materials	€688 200	€600 000	(10 000 x €60)	€88 200	U
Direct manufacturing labour	198 000	160 000	(10 000 x €16)	38 000	U
Direct marketing labour	57 600	60 000	(10 000 x €6)	2 400	F
Total	€943 800	€820 000		€123 800	U

# Price variances and efficiency variances: an illustration

- **Price variances**
- The formula for calculating a price variance is:

Price Variance	=	$\left( \begin{array}{l} \text{Actual} \\ \text{price of input} \end{array} - \begin{array}{l} \text{Budgeted price} \\ \text{of input} \end{array} \right)$	<b>x</b>	Actual quantity of input
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- Price variances for each of Sofiya's three direct-cost categories are:

Direct-cost Category	$\left( \begin{array}{l} \text{Actual} \\ \text{price} \\ \text{of input} \end{array} - \begin{array}{l} \text{Budgeted} \\ \text{price} \\ \text{of input} \end{array} \right)$	x	Actual quantity of input	=	Input-price Variance
Direct materials	(€31 - €30)	x	22 200	=	€22 200 U
Direct manufacturing labour	(€22 - €20)	x	9 000	=	18 000 U
Direct marketing labour	(€25 - €24)	x	2 304	=	2 304 U

- All three price variances are unfavourable (they reduce operating profit) because the actual price of each direct-cost input exceeds the budgeted price; that is, Sofiya incurred more cost per input unit than was budgeted.

# Price variances and efficiency variances: an illustration

- **Price variances**
- Any price variance (favourable or unfavourable) must be interpreted.
- For example, Sofiya's unfavourable direct materials price variance could be due to one or more of the following reasons:
  - Sofiya's purchasing manager negotiated less skilfully than was assumed in the budget.
  - Sofiya's purchasing manager bought in smaller lot sizes than budgeted even though quantity discounts were available for the larger lot sizes.
  - Materials prices unexpectedly increased because of disruptive weather conditions.
  - Budgeted purchase prices for Sofiya's materials were set without careful analysis of the market.

# Price variances and efficiency variances: an illustration

- **Efficiency variances**
- Consider now the efficiency variance.
- Computation of efficiency variances requires measurement of inputs for a given level of output.
- For any actual level of output, the efficiency variance is the difference between the input that was actually used and the input that should have been used to achieve that actual output, holding input price constant:

Efficiency Variance	=	$\left( \text{Actual quantity of input used} - \frac{\text{Budgeted quantity of input allowed for actual output units achieved}}{\text{actual output units achieved}} \right)$	X	Budgeted price of input
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- The idea here is that an organization is inefficient if it uses more inputs than budgeted for the actual output units achieved, and it is efficient if it uses less inputs than budgeted for the actual output units achieved.

# Price variances and efficiency variances: an illustration

- Efficiency variances**

Direct-cost category	$\left( \begin{array}{l} \text{Actual} \\ \text{input used} \end{array} - \begin{array}{l} \text{Budgeted input} \\ \text{allowed for actual output units} \end{array} \right)$	x	Budgeted price of input	=	Efficiency Variance
Direct materials	$[22\,200 \text{ metres} - (10\,000 \text{ units} \times 2.00 \text{ metres})]$	x	€30	=	€ 66 000 U
	$(22\,200 \text{ metres} - 20\,000 \text{ metres})$	x	€30	=	
Direct manufacturing labour	$[9\,000 \text{ hours} - (10\,000 \text{ units} \times 0.80 \text{ hours})]$	x	€20	=	€20 000 U
	$(9\,000 \text{ hours} - 8\,000 \text{ hours})$	x	€20	=	
Direct marketing labour	$[2\,304 \text{ hours} - (10\,000 \text{ units} \times 0.25 \text{ hours})]$	x	€24	=	€4 704 F
	$(2\,304 \text{ hours} - 2\,500 \text{ hours})$	x	€24	=	

- The two manufacturing efficiency variances (direct materials and direct manufacturing labour) are both unfavourable because more input was used than was budgeted, resulting in a decrease in operating profit.
- The marketing efficiency variance is favourable because less input was used than was budgeted, resulting in an increase in operating profit.

# Price variances and efficiency variances: an illustration

- **Efficiency variances**
- Any efficiency variance (favourable or unfavourable) must be interpreted.
- For example, Sofiya's unfavourable direct manufacturing labour variance could be due to one or more of the following reasons:
  - Sofiya's personnel manager took on underskilled workers.
  - Sofiya's production scheduler inefficiently scheduled work, resulting in more direct manufacturing labour time per jacket.
  - Sofiya's maintenance department did not properly maintain machines, resulting in more direct manufacturing labour time per jacket.
  - Budgeted time standards were set without careful analysis of the operating conditions and the employees' skills.

# Price variances and efficiency variances: an illustration

- Note how the sum of the price variance and the efficiency variance equals the flexible-budget variance:

	Price Variance		+	Efficiency Variance		=	Flexible-Budget Variance	
Direct materials	€ 22 200	U		€ 66 000	U		€88 200	U
Direct manufacturing labour	18 000	U		20 000	U		38 000	U
Direct marketing labour	2 304	U		4 704	F		2 400	F

# Price variances and efficiency variances: an illustration

- Note how the sum of the price variance and the efficiency variance equals the flexible-budget variance:

## Level 3 analysis

Actual costs incurred (Actual input) x Actual price) (1)	Actual input x Budgeted price (2)	Flexible budget (Budgeted input allowed for actual output achieved x Budgeted price) (3)
(22 200 x €31)	(22 200 x €30)	(20 000 x €30)
€688 200	€666 000	€600 000
	€22 200 U*	€66 000 U
	Price variance	Efficiency variance
	€88 200 U	
	Flexible-budget variance	
*F=favourable effect on operating profit; U=unfavourable effect on operating profit		

## Exercise 15.13 Professional labour variances, efficiency comparisons

Sharmila Khan is manager of TaxExperts.co.uk, a firm that provides assistance in the preparation of individual tax returns via the Internet. Because of the highly seasonal nature of her business, Sharmila employs staff on a monthly basis from two accounting placement firms - Professional Assist (PA) and Office Support (OS). In July 2005, TaxExperts.co.uk took on 12 staff members from PA and 10 from OS. PA is the prestige firm in its area. OS is a recently formed firm.

Sharmila budgets the following for July 2005:

	PA staff	OS staff
Budgeted hourly rate	£45	£40
Budgeted time per tax return in hours	0.40	0.50

Actual results for July 2005 were as follows:

	PA staff	OS staff
Actual hourly rate	£48	£42
Actual time per tax return in hours	0.42	0.46
Number of tax returns completed	4608	3600

### Required:

1. Calculate professional labour price and efficiency variances for (a) the 12 PA staff, and (b) the 10 OS staff employed in July 2005.
2. Comment on the efficiency of the PA and OS staff TaxExperts.co.uk employed.
3. What factors other than efficiency might Khan consider in deciding whether to employ staff from PA or OS?

1.

# Exercise 15.13

## Suggested Solution:

	Actual costs incurred (Actual input × Actual price)	Actual input × Budgeted price	Flexible budget (Budgeted input allowed for actual output achieved × Budgeted price)
PA staff	(4,608 × 0.42 × £48) £92,897.28	(4,608 × 0.42 × £45) £87,091.20	(4,608 × 0.40 × £45) £82,944.00
	↑	↑	↑
	£5,806.08 U Price variance		£4,147.20 U Efficiency variance
	↑	£9,953.28 U Flexible-budget variance	
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OS staff	(3,600 × 0.46 × £42) £69,552	(3,600 × 0.46 × £40) £66,240	(3,600 × 0.50 × £40) £72,000
	↑	↑	↑
	£3,312 U Price variance		£5,760 F Efficiency variance
	↑	£2,448 F Flexible-budget variance	

## Exercise 15.13 Professional labour variances, efficiency comparisons

### Suggested Solution:

2.

The PA staff have an unfavourable efficiency variance of £4,147.20, whereas the OS staff have a favourable efficiency variance of £5,760. Note that variances are calculated relative to budgeted amounts. The PA staff average 0.42 hours per return, whereas the OS staff average 0.46 hours per return. Thus, the PA staff work at a relatively faster rate than the OS staff. However, the PA staff are working at a slower rate than budgeted, whereas the OS staff are working at a faster rate than budgeted.

3.

Factors Khan should consider in addition to efficiency when hiring staff are:

- a** Competence of their staff to professionally do the tax work.
- b** Ethical standards of potential staff.
- c** Hourly rates to be paid. The OS staff have a lower rate per hour. The average cost per tax return completed of the two groups of staff members are:

PA staff	£20.16
OS staff	£19.32.

## Exercise 15.14 Comprehensive variance analysis

AKEI is an elite desk manufacturer. At the start of May 2005, the following budgeted unit amounts (based on a standard costing system) related to its manufacture of executive desks (made out of oak):

- Direct materials: 16 square metres of oak per desk at €20 per square metre
- Direct manufacturing labour: 3 hours per desk at €30 per direct manufacturing labour-hour
- Budgeted production for May 2005 was 700 executive desks. There were no opening stocks of direct materials or finished goods on 1 May 2005. Work in progress is minimal.
- Actual results for May 2005 are as follows:

Direct materials purchased (12 640 square metres)	€259120
Direct materials used (11850 square metres)	?
Direct manufacturing labour (2325 hours at €31 per hour)	?

Actual production in May 2005 is 750 executive desk units. The purchase price for oak wood remained unchanged throughout May 2005.

### Required:

1. Prepare a detailed flexible-budget variance analysis for May 2005 covering direct materials and direct manufacturing labour.
2. Give two explanations for each of the variances you calculate in requirement 1.

# Exercise 15.14

## Suggested Solution:

1.

Direct materials	Actual costs incurred (Actual input × Actual price)	Actual input × Budgeted price	Flexible budget (Budgeted input allowed for actual output achieved × Budgeted price)
Purchase	(12,640 × €20.50) €259,120	(12,640 × €20) €252,800	
	↑ _____ ↑ €5,806.08 U Price variance		
Usage		(750 × 15.8 × €20) €237,000	(750 × 16 × €20) €240,000
		↑ _____ ↑ €3,000 F Efficiency variance	
Direct Manufacturing Labour	(750 × 3.1 × €31.00) €72,075	(750 × 3.1 × €30.00) €69,750	(750 × 3.0 × €30.00) €67,500
	↑ _____ ↑ €2,325 U Price variance		
		↑ _____ ↑ €2,250 U Efficiency variance	

# Exercise 15.14 Comprehensive variance analysis

## Suggested Solution:

2.

Direct materials price variance (€6,320 U, due to actual price of €20.50 exceeding budgeted price of €20.00.)

- Standard wrongly (unrealistically) set.
- Poor price negotiation.
- Purchase of higher-quality wood.
- Materials price unexpectedly increased due to external shocks (e.g. a natural disaster in major forest areas).
- Purchased in smaller lot sizes than budgeted and did not get quantity discounts.
- Change in supplier when lower-priced supplier went out of business.

Direct materials efficiency variance (€3,000 F, due to actual usage of 15.8 square metres per desk, compared to budgeted 16.0 square metres).

- Standard wrongly (unrealistically) set.
- Increased skills of workers.
- Use of more automated machinery (e.g. laser cutting).
- Workers did more extensive planning and scheduling for materials usage.
- Economies of scale in production.

# Exercise 15.14 Comprehensive variance analysis

## Suggested Solution:

2.

Direct manufacturing labour price variance (€2,325 U, due to actual rate of €31.00 compared to budgeted €30.00).

- Standard wrongly (unrealistically) set.
- Use of higher-skill mix than budgeted.
- Poor negotiations with labour.
- Overtime may have been necessary to produce the extra 50 desks more than budgeted.
- Unexpected labour shortage due to external factors.

Direct manufacturing labour efficiency variance (€2,250 U, due to actual time being 3.1 hours compared to budgeted 3.0 hours per desk).

- Standard wrongly (unrealistically) set.
- Labour may be less efficient at higher output levels due to tiredness.
- Scheduler assigned less skilled workers to desk production.
- Machine breakdowns required more use of labour.
- Lower-quality wood purchased requiring more labour input to finish desks.

## Exercise 15.15 Flexible budget

The budgeted prices for direct materials, direct manufacturing labour and direct marketing (distribution) labour per attaché case are €40, €8 and €12, respectively. The chairman is pleased with the following performance report:

	Actual costs	Static budget	Variance	
Direct materials	€364 000	€400 000	€36 000	F
Direct manufacturing labour	78 000	80 000	2 000	F
Direct marketing (distribution) labour	110 000	120 000	10 000	F

### Required:

- Actual output was 8800 attached cases. Is the chairman's pleasure justified? Prepare a revised performance report that uses a flexible budget and a static budget. Assume all three direct costs items are variable costs.

# Exercise 15.15 Flexible budget

## Suggested Solution:

1.

The existing performance report is a Level 1 analysis, based on a static budget. It makes no adjustment for changes in output levels. The budgeted output level is 10,000 units – direct materials of €400,000 in the static budget ÷ budgeted direct materials cost per attaché case of €40.

The following is a Level 2 analysis that presents a flexible-budget variance and a sales-volume variance of each direct-cost category:

	<b>Actual results</b> (1)	<b>Flexible-budget variances</b> (2) = (1) – (3)	<b>Flexible budget</b> (3)	<b>Sales-volume variances</b> (4) = (3) – (5)	<b>Static budget</b> (5)
Output units	<u>8,800</u>	<u>0</u>	<u>8,800</u>	<u>1,200 U</u>	<u>10,000</u>
Direct materials	€364,000	€12,000 U	€352,000	€48,000 F	€400,000
Direct manufacturing labour	78,000	7,600 U	70,400	9,600 F	80,000
Direct marketing labour	<u>110,000</u>	<u>4,400 U</u>	<u>105,600</u>	<u>14,400 F</u>	<u>120,000</u>
Total direct costs	<u>€552,000</u>	<u>€24,000 U</u>	<u>€528,000</u>	<u>€72,000 F</u>	<u>€600,000</u>
	↑	€24,000 U	↑	€72,000 F	↑
		Flexible-budget variance		Sales-volume variance	
	↑	€48,000 F			↑
		Static-budget variance			

# Exercise 15.15 Flexible budget

## Suggested Solution:

The Level 1 analysis shows total direct costs have a €48,000 favourable variance. However, the Level 2 analysis reveals that this favourable variance is due to the reduction in output of 1,200 units from the budgeted 10,000 units. Once this reduction in output is taken into account (via a flexible budget), the flexible-budget variance shows each direct-cost category to have an unfavourable variance indicating less efficient use of each direct-cost item than was budgeted.

Each direct-cost category has an actual unit variable cost that exceeds its budgeted unit cost:

	Actual	Budgeted
Units	8,800	10,000
Direct materials	€41.35	€40
Direct manufacturing labour	€ 8.86	€ 8
Direct marketing labour	€12.50	€12

Analysis of price and efficiency variances for each cost category could assist in further identifying the causes of these more aggregated (Level 2) variances.

## Exercise 15.16      Price and efficiency variances

Ched Ltd manufactures Cheddar cheese pies. For January 2005, it budgeted to purchase and use 15 000 kg of Cheddar cheese at £0.89 per kg; budgeted output was 60 000 pies. Actual purchase and use for January 2005 was 16000 kg at £0.82 per kg; actual output was 60 800 pies.

### Required:

1. Calculate the flexible-budget variance.
2. Calculate the price and efficiency variances.
3. Comment on the results in requirements 1 and 2.

# Exercise 15.16

## Suggested Solution:

1.  
The key information items are:

	Actual	Budgeted
Output units (pies)	60,800	60,000
Input units	16,000	15,000
Cost per input unit	£0.82	£0.89

Ched Ltd budgets to obtain four cheddar cheese pies from every kg of cheddar cheese. The flexible-budget variance is £408F.

2.

	Actual results (1)	Flexible- budget variances (2) = (1) – (3)	Flexible budget (3)	Sales- volume variances (4) = (3) – (5)	Static budget (5)
Cheddar cheese costs	£13,120 <sup>a</sup>	£408 F	£13,528 <sup>b</sup>	£178 U	£13,350 <sup>c</sup>

<sup>a</sup>  $16,000 \times £0.82 = £13,120$

<sup>b</sup>  $60,800 \times 0.25 \times £0.89 = £13,528$

<sup>c</sup>  $60,000 \times 0.25 \times £0.89 = £13,350$

3.

The favourable flexible-budget variance of £408 has two offsetting components:

- Favourable price variance of £1,120 – Reflects the £0.82 actual purchase cost being lower than the £0.89 budgeted purchase cost per kg [**16.000 x (0.82-0.89) = £1.120**]
- Unfavourable efficiency variance of £712 – Reflects the actual materials yield of 3.80 pies per kg of cheddar cheese ( $60,800 \div 16,000 = 3.80$ ) being less than the budgeted yield of 4.00 ( $60,000 \div 15,000 = 4.00$ ) [**(16.000 – 60.800 x 0.25) x 0.82 = £ 712**].

One explanation is that Ched purchased lower-quality cheddar cheese at a lower cost per kg.

# Flexible-budget Variances (Price Variances and Efficiency Variances) for Inputs (Overhead Costs )

# Flexible-budget variances for overhead costs

- This lecture focuses on understanding flexible-budget variances for overhead costs and their causes.
- Overhead costs are those that are not directly related to the production of goods or services but are necessary for the operation of a business.
- Examples of overhead costs: rent, utilities, insurance, legal fees, office supplies, advertising, payroll, and accounting fees.
- Assume the following Sofiya Company summary information for April 2005:

Overhead category	Actual results	Flexible-budget Amount (for 10 000 output units)	Static-budget Amount (for 12 000 output units)
Variable manufacturing overhead	€130 500	€120 000	€ 144 000
Fixed manufacturing overhead	285 000	276 000	276 000
Variable marketing overhead	45 700	50 000	60 000
Fixed marketing overhead	420 000	434 000	434 000

# Developing budgeted variable-overhead rates

- Step 1: Identify the costs to include in the variable-overhead cost pool(s)
  - Sofiya groups all of its variable manufacturing overhead costs in a single cost pool. Costs in this pool include energy, engineering support, indirect materials and indirect manufacturing labour.
- Step 2: Select the cost allocation base(s)
  - Sofiya's operating managers believe that machine-hours are an important driver of variable manufacturing overhead costs and decided to use this measure as the cost allocation base.
- Step 3: Estimate the budgeted variable-overhead rate(s)
  - Several approaches can be used in this step. One approach is to adjust the past actual variable-overhead cost rate per unit of the allocation base - for example, an adjustment to take into account expected inflation. A second approach is to use standard costing.
  - Assume that Sofiya uses the standard costing approach to develop its April 2005 budgeted variable-overhead cost rate of €30 per machine-hour and also its budgeted machine-hour rate of 0.40 hours per actual output unit. These input amounts are used to calculate the budgeted variable manufacturing overhead rate per unit:

Budgeted inputs allowed per output unit	x	Budgeted costs per input unit	=	0.40 X €30
			=	€12 per output unit

# Variable-overhead cost variances

- In order to illustrate how the budgeted variable manufacturing overhead rate is used in computing Sofiya's variable manufacturing overhead cost variances. The following data are for April 2005:

Cost item/allocation base		Actual results	Flexible-budget amount (for 10 000 output units)	Static-budget amount (for 12 000 output units)
1.	Variable manufacturing overhead	€130 500	€120 000	€ 144 000
2.	Variable manufacturing overhead costs per machine-hour [(1) ÷ (5)]	29	30	30
3.	Variable manufacturing overhead costs per output unit [(1) ÷ (4)]	13.05	12	12
4.	Output units (jackets)	10 000	10 000	12 000
5.	Machine-hours	4 500	4 000	4 800

# Static-budget and flexible-budget analyses

- The Level 1 static-budget variance for variable manufacturing overhead cost is:

$$\begin{aligned}
 \text{Variable-overhead static-budget variance} &= \text{Actual results} - \text{Static-budget Amount} = € 130\,500 - €144\,000 \\
 &= € 13\,500
 \end{aligned}$$

<b>Level 1 analysis</b>				
	<b>Actual results (1)</b>	<b>Static-budget variances (2) = (1) – (3)</b>		<b>Static budget (3)</b>
Cost driver: Number of units manufactured	10 000	2 000	U	12 000
Variable manufacturing overhead				
	€130 500			€144 000
		€ 13 500 F		
		Total static-budget variance		

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

# Static-budget and flexible-budget analyses

Additional insight can be gained by moving to the Level 2 flexible-budget analysis

The variable manufacturing overhead sales-volume variance arises solely because the actual number of output units sold by Sofiya differs from the budgeted number of output units sold:

Variable-overhead sales-volume variance	=	Flexible-budget Amount	-	Static-budget Amount
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The variable manufacturing overhead flexible-budget variance arises because Sofiya's actual variable manufacturing overhead cost differs from that budgeted for the actual output units sold:

Variable-overhead sales-volume variance	=	Actual results	-	Flexible-budget Amount
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## Level 2 analysis

	Actual results (1)	Flexible-budget variance (2) = (1)-(3)	Flexible Budget (3)	Sales-volume variance (4) = (3)-(5)	Static budget (5)
Cost driver:					
Number of units manufactured	10 000	-	10 000	2000 U	12 000
Variable manufacturing overhead	€ 130 500		(0.40 x 10 000 x €30) €120 000		(0.40 x 12 000 x €30) €144 000
		€10 500 U		€24 000 F	
		Flexible-budget variance		Sales-volume variance	
			€13 500 F		
			Static-budget variance		

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

# Variable-overhead efficiency variance

- The variable-overhead efficiency variance measures the efficiency with which the cost allocation base is used. The formula is:

Variable-overhead efficiency variance	=	$\left( \frac{\text{Actual units of variable-overhead cost allocation base used for actual output units achieved}}{\text{Budgeted units of variable-overhead cost allocation base allowed for actual output units achieved}} \right) \times$	Budgeted variable-overhead cost allocation rate
	=	$[4500 - (10\,000 \times 0.40)] \times \text{€}30$	
	=	$(4500 - 4000) \times \text{€}30 = 500 \times \text{€}30$	
	=	$\text{€}15\,000 \text{ U}$	

- Possible causes of this higher-than-budgeted allocation base usage include the following:
  - Workers were less skilful in the use of machines than budgeted.
  - Production scheduler inefficiently scheduled jobs, resulting in higher-than-budgeted machine usage.
  - Machines were not maintained in good operating condition.
  - Budgeted machine time standards were set without careful analysis of the operating conditions.
  - Promised a distributor a rushed delivery, which result.

# Variable-overhead spending variance

- The variable-overhead spending variance is the difference between the actual amount of variable overhead incurred and the budgeted amount allowed for the actual quantity of the variable-overhead allocation base used for the actual output units achieved. The formula for the variable-overhead spending variance is:

Variable-overhead spending variance	=	$\left( \begin{array}{c} \text{Actual} \\ \text{variable-overhead} \\ \text{cost per unit of} \\ \text{cost allocation} \\ \text{base} \end{array} - \begin{array}{c} \text{Budgeted} \\ \text{variable-overhead} \\ \text{cost per unit of} \\ \text{cost allocation} \\ \text{base} \end{array} \right) \times$	$\begin{array}{c} \text{Actual quantity of} \\ \text{variable-overhead} \\ \text{cost allocation base} \\ \text{used for actual} \\ \text{outputs units achieved} \end{array}$
	=	$(€29 - €30) \times 4500$	
	=	$-€1 \times 4500 = €4500 \text{ F}$	

- Two (possible) main causes could explain a variable-overhead spending variance of €4500 F at Sofiya:
  - Cause A. The actual prices of individual items included in variable overhead differ from their budgeted prices - for example, the April 2005 purchase price of energy, indirect materials or indirect manufacturing labour was less than budgeted prices.
  - Cause B. The actual usage of individual items included in variable overhead differs from the budgeted usage - for example, the budgeted usage of energy, indirect materials or indirect manufacturing labour was less than the usage assumed in setting the €30 budgeted variable manufacturing overhead rate per machine-hour.

# Variable-overhead variances

- The following is a summary of the variable manufacturing overhead variances calculated:

<b>Level 1</b>				Static-budget variance €13 500 F	
<b>Level 2</b>			Flexible-budget variance €10 500 U		Sales-volume variance €24 000 F
<b>Level 3</b>		Spending variance €4 500 F		Efficiency variance €15 000 U	

# Developing budgeted fixed-overhead rates

- Fixed-overhead costs are, by definition, a lump sum that does not change in total despite changes in a cost driver. While total fixed costs are frequently included in flexible budgets, they remain the same total amount within the relevant range regardless of the output level chosen to 'flex' the variable costs and revenues.
- Step 1: Identify the costs in the fixed-overhead cost pool(s)
  - This is the numerator of the budgeted rate computation. For Sofiya, fixed manufacturing overhead costs include depreciation, plant-leasing costs, property taxes, plant manager's salary and some administrative costs, all of which are included in a single cost pool. Sofiya's budget is €276 000 for April 2005.
- Step 2: Estimate the budgeted quantity of the allocation base(s)
  - This is the denominator of the budgeted rate computation. It is termed the denominator level. Sofiya uses machine-hours as its allocation base. It budgets to manufacture 12 000 jackets in April 2005. The budgeted number of machine-hours to manufacture 12 000 jackets is 4 800 (12000 x 0.40 budgeted machine-hours per output unit). In manufacturing settings, the denominator level is commonly termed the production denominator level or the production denominator volume.
- Step 3: Calculate the budgeted fixed-overhead rate(s)

Budgeted fixed-overhead rate per unit of allocation base	=	$\frac{\text{Budgeted fixed-overhead costs}}{\text{Budgeted quantity of allocation base units}}$	=	$\frac{\text{€276 000}}{4\,800 \text{ machine-hours}}$
	=	€57.50 per machine-hour		

# Fixed-overhead cost variances

- The Level 1 static-budget variance for Sofiya's fixed manufacturing overhead is €9 000 U:

Fixed-overhead static-budget variance	=	Actual results - Static-budget amount
	=	€285 000-€276 000
	=	€9 000 U

- The static-budget amount for fixed manufacturing overhead is based on 12 000 output units. Given that it is for a fixed cost, this same €276 000 would be the budgeted amount for all output levels in the relevant range. **There is no 'flexing' of fixed costs.**
- The formula for the fixed manufacturing overhead flexible-budget variance is as follows:

Fixed-overhead flexible-budget variance	=	Actual results	-	Flexible-budget amount
	=	€285 000	-	€276 000
	=	€9000 U		

# Fixed-overhead cost variances

- A summary of the Levels 1, 2 and 3 variance analyses for Sofiya's fixed manufacturing overhead in April 2005 is as follows:

<b>Level 1</b>				Static-budget variance €9 000 U	
<b>Level 2</b>			Flexible-budget variance €9 000 U	Sales-volume variance Never a variance	
<b>Level 3</b>		Spending variance €9 000 U		Efficiency variance Never a variance	

# Fixed-overhead cost variances: production-volume variance

- **Production-volume variance:** a variance for fixed-overhead costs. The production-volume variance is the difference between budgeted fixed overhead and the fixed overhead allocated.
- Fixed overhead is allocated based on the budgeted fixed overhead rate times the budgeted quantity of the fixed-overhead allocation base for the actual output units achieved. Other terms for this variance include denominator-level variance and output-level overhead variance.

Actual costs incurred (1)	Same lump sum regardless of output level (2)	Same lump sum regardless of output level (3)	Allocated (Budgeted input* allowed for actual output achieved x Budgeted rate) (4)
€285 000		(0.40 x 10 000 x €57.50)	
	€276 000	€276 000	€230 000
↑	↑	↑	↑
€9 000 U			€46 000 U
Spending variance	Never a variance		Production-volume variance
↑	↑	↑	↑
	€9 000 U		€46 000 U
	Flexible-budget variance		Production-volume variance
	€ 55 000 U		
	Under or overallocated fixed overhead (Total fixed-overhead variance)		

\*For overhead costs, input refers to units of cost allocation base.  
 †F=favourable effect on operating profit; U=unfavourable effect on operating profit.

## Fixed-overhead cost variances: production-volume variance

- The formula for the production-volume variance, expressed in terms of allocation base units (machine-hours for Sofiya), is:

Production-volume variance	=	Budgeted Fixed Overhead	-	$\left( \begin{array}{l} \text{Fixed overhead allocated using} \\ \text{budgeted input allowed for} \\ \text{actual output units achieved} \end{array} \times \begin{array}{l} \text{Budgeted fixed} \\ \text{overhead rate} \end{array} \right)$
	=	€276 000	-	(0.40 x 10 000 x €57.50)
	=	€276 000	-	(4 000 x €57.50)
	=	€276 000	-	€230 000
	=	€46 000 U		

- The amount used for budgeted fixed overhead will be the same lump sum shown in the static budget and also in any flexible budget within the relevant range. Fixed-over-head costs allocated is the sum of the individual fixed-overhead costs allocated to each of the products manufactured during the accounting period.

## Exercise 16.22

Madetoja Oy's job-costing system has two direct-cost categories: direct materials and direct manufacturing labour. Manufacturing overhead (both variable and fixed) is allocated to products on the basis of standard direct manufacturing labour-hours (DLH). At the beginning of 2005, Madetoja adopted the following standards for its manufacturing costs:

	Input	Cost per output unit
Direct materials	3 kg at €5.00 per kg	€15.00
Direct manufacturing labour	5 hours at €15.00 per hour	75.00
Manufacturing overhead		
Variable	€6.00 per DLH	30.00
Fixed	€8.00 per DLH	40.00
Standard manufacturing cost		
per output unit		€160.00

The denominator level for total manufacturing overhead per month in 2005 is 40 000 direct manufacturing labour-hours. Madetoja's flexible budget for January 2005 was based on this denominator level

## Exercise 16.22

The records for January indicate the following:

Direct materials purchased	25 000 kg at €5.20 per kg
Direct materials used	23100 kg
Direct manufacturing labour	40100 hours at €14.60 per hour
Total actual manufacturing overhead (variable and fixed)	€600 000
Actual production	7800 output units

### Required:

- 1 Prepare a schedule of total standard manufacturing costs for the 7800 output units in January 2005.
- 2 For the month of January 2005, calculate the following variances, indicating whether each is favourable (F) or unfavourable (U):
  - a Direct materials price variance, based on purchases
  - b Direct materials efficiency variance
  - c Direct manufacturing labour price variance
  - d Direct manufacturing labour efficiency variance
  - e Total manufacturing overhead spending variance
  - f Variable manufacturing overhead efficiency variance
  - g Production-volume variance.

## Exercise 16.22

### Suggested Solution:

1.

Total standard production costs are based on 7,800 units of output.

Direct materials, 7,800 × €15.00 (or 7,800 × 3 kg × €5.00 or 23,400 kg × €5.00)	117,000
Direct manufacturing labour, 7,800 × €75.00 (or 7,800 × 5 hours × €15.00 or 39,000 hours × €15.00)	585,000
Manufacturing overhead:	
Variable, 7,800 × €30.00 (or 39,000 hours × €6.00)	234,000
Fixed, 7,800 × €40.00 (or 39,000 hours × €8.00)	<u>312,000</u>
Total	<u><u>1,248,000</u></u>

The following is for later use:

Fixed manufacturing overhead, a lump-sum budget €320,000\*

\*Fixed manufacturing overhead rate =

$$€8.00 = \frac{\text{Budget}}{40,000 \text{ hours}}$$

$$\text{Budget} = 40,000 \text{ hours} \times €8.00 = €320,000$$

# Exercise 16.22

## Suggested Solution:

3-variance analysis	Spending variance	Efficiency variance	Production-volume variance
Total manufacturing overhead	€39,400 U	€6,600 U	€8,000 U

	Actual costs incurred (Actual input × Actual rate)	(Actual input × Budgeted price)		Flexible budget (Budgeted input allowed for actual output achieved × Budgeted price)
		Purchases	Usage	
Direct materials	(25,000 × €5.20) €130,000	(25,000 × €5.00) €125,000	(23,100 × €5.00) €115,500	(23,400 × €5.00) €117,000
	□ €5,000 U □	□ €1,500 F □		
	a. Price variance		b. Efficiency variance	

Direct manufacturing labour	(40,100 × €14.60) €585,460	(40,100 × €15.00) €601,500	(39,000 × €15.00) €585,000
	□ €16,040 F □	□ €16,500 U □	
	c. Price variance		d. Efficiency variance

# Exercise 16.22

## Suggested Solution:

	Actual costs incurred	Actual input × Budgeted rate	Flexible budget (Budgeted input allowed for actual output achieved × Budgeted rate)	Allocated: (Budgeted input allowed for actual output achieved × Budgeted rate)
Variable manufacturing overhead	(not given)	(40,100 × €6.00) €240,600	(39,000 × €6.00) €234,000	
			□ €6,600 U □	
			Efficiency variance	

Fixed manufacturing overhead	(not given)	€320,000	€320,000	(39,000 × €8.00) €312,000
			□	□ €8,000 U* □
			Never a variance	Production-volume variance

Total manufacturing overhead	(given) €600,000	(€240,600 + €320,000) €560,600	(€234,000 + €320,000) €554,000	(€234,000 + €312,000) €546,000
	□ €39,400 U □	€6,600	□ □ €8,000 U □	
	e. Spending variance	f. Efficiency variance	g. Production-volume variance	

\* Denominator level in hours

Production volume in standard hours allowed

Production-volume variance

40,000

39,000

1,000 hours X €8.00 = €8,000 U

