

Cost Accounting 2

Dr. Sameh Salim

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Chapter 4

1

Analysis of the total variance
of direct materials

Analysis of
Differences
(Variances) of
Direct Costs

2

Analysis of the total variance
of direct labor

Introduction

- ❑ This chapter discusses how to compare the **standard cost of direct materials and wages** to their **actual costs** in order to determine the **variances (Differences)**.
- ❑ Then, these variances will be analyzed to determine their underlying causes, and then reporting on management effectiveness regarding controlling and assessing performance.

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Analysis of the Total Variance of Direct Materials

1/1- Computing the total variance:

- ❑ The total variance (difference) in the cost of direct materials is calculated by comparing

Standard cost



Actual cost

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Because direct materials are 100% variable costs dependent on production volume,



The standard cost and actual cost are determined based on the actual production volume

Total variance of direct materials = Standard cost of direct materials - Actual cost

□ ويتم حساب كلاً من:



□ **Standard Cost** = (Standard Quantity per unit of product × Standard Price per unit of raw material) × Actual production Volume

□ **Actual Cost** = (Actual Quantity per unit of product × Actual Price per unit of raw material) × Actual production Volume

$$SC = SQ \times SP \times AV$$

$$AC = AQ \times AP \times AV$$

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Analysis of the Total Variance of Direct Materials

1/1- Computing the total variance:

- ❑ Whether the product is made from **one or multiple raw materials**, the **preceding equations** are used to calculate the standard and actual costs of direct materials, as well as the total variance (difference) for each raw material.

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Analysis of the Total Variance of Direct Materials

Example (1)

- ❑ Sadat Industrial Company produces **two products X and Y**, whose manufacture requires **two raw materials**, namely **A and B**. The following are the standard and actual costs data for October 2021.

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Analysis of the Total Variance of Direct Materials

Example (1)

First: Standard Data:

Products		Raw material A		Raw material B	
	Volume	Standard Quantity	Standard price	Standard quantity	Standard price
Product X	900	2	2	4.1	3
Product Y	2200	3.2	2	2	3

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Analysis of the Total Variance of Direct Materials

Example (1)

Second: Actual Data:

Products		Raw material A		Raw material B	
	Volume	Actual Quantity	Actual price	Actual quantity	Actual price
Product X	1000	2.1	2	4.1	2.5
Product Y	2000	3	2	2.4	2.5

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Analysis of the Total Variance of Direct Materials

Example (1)

Required:

- ☐ Determine the total variance for direct materials at the level of:
 - ✓ Raw material.
 - ✓ Product.
 - ✓ The firm.

Solution

- ❑ To determine the total variance of direct materials at prior levels, it is necessary to provide the appropriate data. This data can be obtained as follows:

$$SC = SQ \times SP \times AV$$

SC for material (A):

- ❑ for product x = $2 \times 2 \times 1000 = 4000$ pounds
- ❑ for product y = $3.2 \times 2 \times 2000 = 12800$ pounds

Solution

SC for material (B):

- for product x = $4.1 \times 3 \times 1000 = 12300$ pounds
- for product Y = $2 \times 3 \times 2000 = 12000$ pounds

Solution

$$AC = AQ \times AP \times AV$$

AC for Material (A):

- ☐ for product x = $2.1 \times 2 \times 1000 = 4,200$ pounds
- ☐ for product Y = $3 \times 2 \times 2000 = 12,000$ pounds

Solution

AC Material (B):

- ❖ for product x = $4,1 \times 2,5 \times 1000 = 10250$ pounds
- ❖ for product y = $2,4 \times 2,5 \times 2000 = 12,000$ pounds

Solution

- ❑ **Second: Determining the total variance of the direct materials of Sadat Industrial Company using previously prepared data:**

Solution

1- Total variance at the level of the raw material:

$$TV = SC - AC$$

The total variance of the raw material (A):

$$\diamond \text{ for product X} = 4000 - 4200 = (-200)$$

$$\diamond \text{ for product Y} = 12800 - 12000 = +800$$

$$\text{Variance of material A} = V \text{ Product X} + V \text{ Product Y}$$

$$= (-200) + (800) = (+600) \text{ Favorable}$$

Solution

The total variance of the raw material (B):

$$\text{❖ } V \text{ for product X} = 12,300 - 10250 = + 2050$$

$$\text{❖ } V \text{ for product Y} = 12,000 - 12,000 = \text{zero}$$

$$\begin{aligned} \text{Variance of Material B} &= V \text{ of Product X} + V \text{ of Product Y} \\ &= + 2050 + \text{zero} = + 2050 \text{ Favorable} \end{aligned}$$

Total variance for direct raw materials

$$\begin{aligned} &= V \text{ for material (A)} + V \text{ for material (B)} \\ &= + 600 + 2050 = + 2650 \text{ Favorable} \end{aligned}$$

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Analysis of the Total Variance of Direct Materials

1/2-Binary analysis of the total variance of direct raw materials:

The total variance, according to this analysis, occurs for two primary reasons:

- 1- the variance between **the standard and the actual quantity** used for the actual production volume, which called **quantity variance**.
- 2- The variance between **the standard and the actual price** of a unit of the raw material, which known as **price variance**.

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Analysis of the Total Variance of Direct Materials

1/2-Binary analysis of the total variance of direct raw materials:

□ **Quantity Variance (QV)** = (Standard Quantity of actual production – Actual quantity) × Standard Price.

□ **Price variance (PV)** = (Standard Price - Actual Price) × Actual Quantity for actual production

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Analysis of the Total Variance of Direct Materials

Using the previous example's data, the total variance can be analyzed according to the binary analysis to:

1- Quantity Variance (QV) = (SQ - AQ) × SP

- QV for raw material (A):

- **For product X** = $((2 \times 1000) - (2,1 \times 1000)) \times 2 = (2000 - 2100) \times 2 = -100 \times 2 = (-200)$ unfavorable.

- **For product Y** = $((3,2 \times 2000) - (3 \times 2000)) \times 2 = (6400 - 6000) \times 2 = 400 \times 2 = + 800$ Favorable

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Analysis of the Total Variance of Direct Materials

- QV of raw material (B):

- **For product X** = $((4,1 \times 1000) - (4,1 \times 1000)) \times 3 = (4100 - 4100) \times 3$
= zero

- **For product Y** = $((2 \times 2000) - (2,4 \times 2000)) \times 3 = (4000 - 4800) \times 3 =$
 $-800 \times 3 = (-2400)$ unfavorable.

The total quantity variance of the raw material at the enterprise level is calculated by the sum of quantity variance of the material for all products of the firm that uses this material, as follows:

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Analysis of the Total Variance of Direct Materials

Total Quantity Variance of the raw material = the quantity variance of product X + The quantity variance of the product Y

- **for the raw material (A)** = $-200 + 800 = +600$ Favorable
- **For the raw material (B)** = $\text{zero} + (-2400) = (-2400)$ unfavorable.

Quantity Variance at the enterprise level = Total Variance of material (A) + Total Variance for material (B)

$$= +600 - 2400 = (-1800) \text{ unfavorable.}$$

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Analysis of the Total Variance of Direct Materials

2- Price Variance (PV):

Price Variance (PV) = (SP - AP) × AQ of actual production

PV for the raw material (A):

- **for product x** = $(2-2) \times (2 \times 1000) = \text{zero} \times 2000 = \text{zero}$
- **for product y** = $(2-2) \times (3 \times 2000) = \text{zero} \times 6000 = \text{zero}$

PV for raw material (B):

- **for product x** = $(3-2.5) \times (4.1 \times 1000) = 0.5 \times 4100 = +2050$
- **for product y** = $(3-2.5) \times (2.4 \times 2000) = 0.5 \times 4800 = +2400$

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Analysis of the Total Variance of Direct Materials

2- Price Variance (PV):

□ The total price variance at the enterprise level for the raw material is determined by the sum of the price variance of the material for all products.

Total Price Variance of raw material = Price Variance of product X + Price Variance of product Y

Total Price Variance of material (A) = zero + zero = zero

Total Price Variance of material (B) = 2050 + 2400 = + 4450 Favorable.

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Analysis of the Total Variance of Direct Materials

2- Price Variance (PV):

□ price variance at the enterprise level = Total price variance of material (A) + Total price variance of material (B)

= 0 + 4450 = 4450 Favorable.

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Analysis of the Total Variance of Direct Materials

Total variance = Quantity Variance + Price Variance

- **For the raw material (A) = + 600 + zero = +600 Favorable.**
- **For the raw material (B) = -2400 + 4450 = + 2050 Favorable**

Total variance at the enterprise level = +2650 Favorable

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Analysis of the Total Variance of Direct Materials

Level 3 Analysis

	Actual Costs Incurred (Actual Input Quantity × Actual Price) (1)	Actual Input Quantity × Budgeted Price (2)	Flexible Budget (Budgeted Input Quantity Allowed for Actual Output × Budgeted Price) (3)
Direct Materials	(22,200 sq. yds. × \$28/sq. yd.) \$621,600	(22,200 sq. yds. × \$30/sq. yd.) \$666,000	(10,000 units × 2 sq. yds./unit × \$30/sq. yd.) \$600,000
Level 3		\$44,400 F	\$66,000 U
		Price variance	Efficiency variance

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Analysis of the Total Variance of Direct Materials

1/3-Triple analysis of the total variance of direct raw material cost:

- ❑ Additional analysis of the total variance can be undertaken to precisely establish the source of this variance, a technique known as triple analysis.
- ❑ In this analysis, the quantity variance is identical to that in the binary analysis.

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Analysis of the Total Variance of Direct Materials

1/3-Triple analysis of the total variance of direct raw material cost:

□ The price variance is analyzed into:

- 1) **Net Price Variance (NPV)** = (Standard Price - Actual Price) × Standard Quantity of the actual production.
- 2) **Mixed Price Variance (MPV)** = (Standard Quantity - Actual Quantity) × (Actual Price – Standard Price)

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Analysis of the Total Variance of Direct Materials

1/3-Triple analysis of the total variance of direct raw material cost:

- In the previous example, the total variance can be analyzed according to the triple analysis as follows:

1- Quantity Variance:

- It can be computed in the same way as in the binary analysis.

$$QV = (-1800) \text{ unfavorable}$$

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Analysis of the Total Variance of Direct Materials

1/3-Triple analysis of the total variance of direct raw material cost:

2- Net Price Variance:

$$\text{NPV} = (\text{SP} - \text{AP}) \times \text{SQ of AV}$$

NPV for raw material (A):

- **Product X** = $(2-2) \times (2 \times 1000) = \text{zero}$
- **Product Y** = $(2-2) \times (3.2 \times 2000) = \text{zero}$

NPV for raw material (B):

- **product X** = $(3-2.5) \times (4,1 \times 1000) = 0.5 \times 4100 = + 2050$
- **product Y** = $(3-2.5) \times (2 \times 2000) = 0.5 \times 4000 = + 2000$

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Analysis of the Total Variance of Direct Materials

1/3-Triple analysis of the total variance of direct raw material cost:

Total NPV of raw material = NPV of product X + NPV of product Y

➤ **Total NPV of material (A) = zero + zero + = zero**

➤ **Total NPV of material (B) = 2050 + 2000 = + 4050**

Total NPV for raw materials = NPV of raw material (A) + NPV of raw material (B)

= 0 + 4050 = + 4050 Favorable

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Analysis of the Total Variance of Direct Materials

1/3-Triple analysis of the total variance of direct raw material cost:

3- Mixed price variance:

$$\text{MPV} = (\text{SQ} - \text{AQ}) \times (\text{AP} - \text{SP})$$

• **MPV for Raw Material (A):**

➤ **product X** = $((2 \times 1000) - (2,1 \times 1000)) \times (2-2) = \text{zero}$

➤ **product Y** = $((3.2 \times 2000) - (3 \times 2000)) \times (2-2) = \text{zero}$

• **MPV for Raw Material (B):**

➤ **product X** = $((4.1 \times 1000) - (4.1 \times 1000)) \times (2.5-3) = \text{zero}$

➤ **product Y** = $((2 \times 2000) - (2.4 \times 2000)) \times (2.5-3) = + 400$

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Analysis of the Total Variance of Direct Materials

1/3-Triple analysis of the total variance of direct raw material cost:

$$\begin{aligned}\square \text{Total MPV for raw materials} &= \text{MPV of material (A)} + \text{MPV of} \\ &\quad \text{Material (B)} \\ &= 0 + 400 = + 400 \text{ Favorable}\end{aligned}$$

Total price variance is determined at the level of raw materials and at the level of the firm through determining the total net price variance and the total mixed price variance as follows:

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Analysis of the Total Variance of Direct Materials

1/3-Triple analysis of the total variance of direct raw material cost:

□ Total price variance of the raw material = net price variance + mixed price variance:

□ Total price variance of material A = zero + zero = **zero**

□ The total price variance of material B = 4050 + 400 = **4450 Favorable**

Total price variance = Total price variance of material (A) + total price variance of material (B)

= 0 + 4450 = **+ 4450 Favorable**

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Analysis of the Total Variance of Direct Materials

1/4- preparing a report on the variances of the cost of direct materials:

- ☐ After identifying and analysing the variances of the direct material, a report must be submitted to the administrative authority.
- ☐ This report also includes the causes for variances and recommendations for addressing them.
- ☐ The following report summarizes and analyses the variances for Sadat Industrial Company for October 2020 (example No. 1), based on the triple analysis:

Sadat Industrial Company
A summary of variance analysis report of direct materials
Period: October 2020

	Raw material A				Raw material B				Total variance
	Quantity variance	Net price variance	Mixed price variance	Total variance	Quantity variance	Net price variance	Mixed price variance	Total variance	
Product X	- 200	0	0	- 200	0	+ 2050	0	+ 2050	+ 1850
Product Y	<u>±</u> <u>800</u>	<u>0</u>	<u>0</u>	<u>±</u> <u>800</u>	<u>-</u> <u>2400</u>	<u>±</u> <u>2000</u>	<u>±</u> <u>400</u>	<u>0</u>	<u>±</u> <u>800</u>
Total	+ 600	0	0	+ 600	- 2400	+ 4050	+ 400	+ 2050	+ 2650

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Analysis of the Total Variance of Direct Materials

1/5- Factors that contribute to the occurrence of raw material variances:

❑ These reasons pertain to both quantity and price variances. The following are the most significant reasons:

1/5/1- The quantity variance:

It may occur, whether it is favorable or not, due to one or more of the following reasons:

1. Poor quality of raw materials.
2. Stopping machinery repeatedly and causing material damage consequently.
3. lack of skilled workers or their negligence.

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Analysis of the Total Variance of Direct Materials

1/5- Factors that contribute to the occurrence of raw material variances:

- 4. Errors in production methods and stages.**
- 5. Damage to the material during handling and operation.**
- 6. The standard quantity's inaccuracy.**

❑ After determining the causes of the quantity variance, the management must take the necessary corrective measures, such as searching for another supplier.

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Analysis of the Total Variance of Direct Materials

1/5- Factors that contribute to the occurrence of raw material variances:

1/5/2- Price Variance:

Price variance may arise for one or more of the following causes, whether it is favorable or not, and whether it is reflected in the net price variance or the mixed variance:

1. **Unexpected price fluctuations.**
2. **Increased prices by increasing customs, altering the pound's exchange rate, or imposing additional obligations, such as sales tax.**

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Analysis of the Total Variance of Direct Materials

1/5- Factors that contribute to the occurrence of raw material variances:

3. Obtaining or losing the trade discount or quantity discount.
4. High or low cost of transportation and storage of raw materials.
5. The standard price's inaccuracy

❑ following determining the causes of the price variance, the management must take the necessary corrective measures, such as searching for alternative means and places for transportation and storage.

The End
Thank You

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