



MASTER OF SCIENCE (MSc) IN INTERNATIONAL SHIPPING, FINANCE & MANAGEMENT

Financial and Management Accounting
Part B: Management Accounting
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Exercise 1 Service costs and period costs

XYZ is a shipping firm. Its main activity is to ship goods with its own vessels and hiring out vessels to charter firms. On December 31st, 20X2, it presents the following information:

	<i>in 000s of €</i>
<u>Revenues and gains</u>	
Freight revenues	220,000
Time Charter revenues	100,000
Interest revenues	3,000
<u>Expenses and losses</u>	
Vessel repair expenses	13,000
Vessel depreciation	48,000
Vessel fuel expenses	18,000
Crew salaries	39,000
Insurance expense	8,000
Salaries of administrative staff	16,000
Salaries of selling staff	12,000
Loss from sale of vessels	6,000
Management fees	3,000
Electricity expense	2,000
Telecommunication expense	1,000
Interest expense	28,000
Tax expense	5,000

Additional information

Expenses that are direct to vessels are charged to the production activity exclusively. Salaries of administrative and selling staff are exclusively charged to the administration and selling activity, respectively. Management fees are exclusively charged to administration activity. Rest operating expenses are allocated to the three activities according to the following rates: Production: 50%, Administration: 30%, Selling: 20%.

Prepare an income statement with operating expenses classified in activities.

Exercise 2 Cost flow, product costs and period costs

ABC is a manufacturing firm. At the end of the fiscal year 20X2, it presents the following data (*in 000s of €*).

Raw materials – Beginning Inventory:	200
Raw materials – Purchases:	1,200
Raw materials – Ending Inventory:	300
Semi-finished goods (work-in-progress) – Beginning Inventory:	700
Semi-finished goods (work-in-progress) – Ending Inventory:	100
Finished goods – Beginning Inventory:	400
Finished goods – Ending Inventory:	500
Direct labor for production:	800
Indirect labor for production:	250

Indirect raw materials for production:	450
Electricity for the production process:	50
Administration expenses:	350
Rent costs for the production department:	200
Maintenance costs for production machines:	150
Selling expenses:	550
Depreciation for production machines:	150
Fuel costs for production machines:	50
Interest expense	10
Tax expense	390
Sales revenue:	6,000

Required: Calculate the gross profit and net income before taxes for ABC.

Exercise 3 Estimating cost behavior

You are provided with some data for ABC firm. The data refer to the electricity cost and the machine hours (MH) for January to July. ABC assumes that MH are the cost driver for the electricity cost.

Required:

1. Estimate the electricity cost function with the high-low method.
2. Estimate the electricity cost function with OLS regression.
3. The last 3 columns tabulate the residuals and their squares after the regression, and the variance of electricity cost. Calculate R^2 .
4. Suppose that the estimated activity for the next month is 90MH. What is the forecasted electricity cost with each method? What are potential caveats in these forecasts?

You are given that: $\hat{b} = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$, $\hat{a} = \bar{y} - \hat{b} \bar{x}$, $R^2 = 1 - \frac{\sum e^2}{\text{Var}(y)}$

	Month	Activity in MH (X)	Electricity cost (Y)	X ²	Y ²	X*Y	e	e ²	(Y _i - \bar{Y}) ²
1	January	56	79	3,136	6,241	4,424	2.19	4.80	24
2	February	71	85	5,041	7,225	6,035	-3.19	10.20	1
3	March	50	74	2,500	5,476	3,700	1.74	3.04	97
4	April	65	82	4,225	6,724	5,330	-1.64	2.69	3
5	May	73	91	5,329	8,281	6,643	1.29	1.66	51
6	June	80	98	6,400	9,604	7,840	2.98	8.85	200
7	July	62	78	3,844	6,084	4,836	-3.36	11.31	34
	Total	457	587	30,475	49,635	38,808	205.86	42.56	411
	Mean ($\Sigma X/n$; $\Sigma Y/n$)	65,29	83,86						

Exercise 4 Non-linear costs – learning curves

Assume that you study a product that requires direct labor. The cost per direct labor hour (DLH) is €10. The first unit requires 100 DLH, but there are significant learning effects.

Required:

1. Assume a CLM with 80% learning curve every time the quantity of units produced doubles. Calculate the total DL cost for a forecasted production of 4 units.
2. Assume a ILM with 80% learning curve every time the quantity of units produced doubles. Calculate the total DL cost for a forecasted production of 4 units.
3. Assume that you have the DLH cost and the number of units. What is the estimation equation for a CLM? What is the estimation equation for a ILM?

You are given that $k = pX^q$ and that $m = pX^q$

Exercise 5 Non-linear costs – sticky costs

You study a cost that has a fixed component of €10,000 and a variable component of €5/unit. The current activity level is 2,200 units but the next two years (Year 2 and Year 3, respectively) the activity level changes as follows.

Year	Units
1 (current year)	2,200
2	3,000
3	2,800

The cost is considered as “sticky” by 20% (in changes – not log changes).

Required: Find the total forecasted cost for Year 2 and Year 3.

Exercise 6 Master budget

Manufacturing firm ABC produces the product X. ABC has the following data for the next year 20X1:

Year: 20X1
Forecasted Sales (in units) 120,000

The selling price of X is €40. The credit policy of ABC is as follows: 60% of sales revenues is collected in cash in the year that sales took place. The remaining 40% is collected next year. Accounts Receivable on the Balance Sheet of 31/12/20X0 was equal to €1,800,000.

Required: Prepare a Sales Budget and a Cash Receipts Schedule.

At the end of each year, ABC would like the ending inventory of finished products being equal to 20% of the sales (in units) of the next year. The forecasted sales (in units) for 20X2 are 150,000. At the end of 20X0, the finished products were 24,000 units.

Required: Prepare a Production Budget

To produce X, ABC uses a raw material called Y. Production requirements suggest that 1 unit of X requires 5 units of Y. Moreover, ABC wants an ending inventory of raw materials equal to 50,000 units. The beginning inventory of Y is 20,000 units.

The price of Y is €2 per unit. ABC pays 50% of the purchase cost in cash and 50% in the quarter year following. At the end of 2022 20X0, “Accounts Payable” had a balance of €500,000.

Required: Prepare a Raw Materials Budget and Cash Payment Schedule for raw materials purchases.

ABC has estimated that 1 unit of X requires 0.5 direct labor hours (DLH). The cost of each hour is €16.

Required: Prepare a Direct Labor Budget.

General Manufacturing Overheads are a mixed cost. For the variable part, ABC uses an overhead rate equal to €5/DLH. The fixed part is estimated to €819,000 per year.

Required: Prepare a manufacturing overheads budget and calculate the manufacturing OH per DLH.

A standard policy of ABC is to retain zero beginning and ending inventories of work in progress.

Required: Prepare an ending inventory budget.

At the end of 20X0, the value of finished products was equal to €592,000.

Required: Prepare a Cost of Goods Produced Budget and a Cost of Goods Sold Budget.

SGA Expenses consist of variable and fixed costs. The variable part is estimated as €1,80/unit. The fixed cost is €400,000 per year.

Required: Prepare an SGA Budget.

The following information is available for ABC:

§ Beginning cash balance was €770,000,

§ Direct labor cost is paid in cash. Manufacturing OH are paid in cash but they include €80,000 depreciation costs. SGA expenses are paid in cash, but they include €60,000 depreciation costs.

§ The firm will acquire an equipment of €260,000 and the cash payments for the current year will be €140,000.

§ A cash dividend of €32,000 will be distributed.

§ The ending cash balance of the year should be at least €2,000,000.

§ ABC has an agreement with a local bank to receive loans that are multiples of €100,000 (e.g., €100,000, 200,000, 300,000, etc.) at the beginning of each year. The annual interest rate is 10%. The borrowed capital and the accrued interest will be paid in the next year.

Required: Prepare a Cash Budget and a Pro-forma Income Statement (in simplified form).

Exercise 7 Flexible budget and spending variances

A hotel business has forecasted that the next year (i.e., 20X4) it will have 130,000 overnight stays (q). The price per staying is €60. The accounting department has estimated that the operating cost can be calculated as follows.

Payroll	$2,000,000+2q$
Food & Beverage	$12q$
General Expenses	$80,000+13q$

At the end of 20X4, the actual results were as follows:

Overnight stays	150,000
Revenues	8,250,000
<u>Costs</u>	
Payroll	2,350,000
Food & Beverage	1,830,000
General Expenses	<u>1,800,000</u>
Total Cost	5,980,000
Operating Income	2,270,000

Required:

1. Prepare a static budget of the operating income.
2. Calculate total variances.
3. Prepare the flexible budget.
4. Calculate the volume variances and the selling price/expenditure variances.
5. Use the operating leverage formula to verify the operating income of the flexible budget.

Exercise 8 Absorption and Marginal Costing

ABC firm has the following data for product X:

Variable Cost per unit

Direct Materials	20
Direct Labor	10
Manufacturing OH	8
SGA Costs per unit sold	5

Fixed Costs

Manufacturing OH	180,000
SGA Costs	150,000

Further Information

Beginning Inventory of Finished Goods (units)	0
Units Produced	12,000

Units Sold	11,250
Selling price per unit	90

Required:

1. Calculate the product cost according to the absorption and the marginal costing. Assume that there are not beginning or ending inventories of work in progress.
2. Prepare and Income Statement with absorption costing and an Income Statement with marginal costing.

Exercise 9 CVP analysis

ABC firm manufactures product X. The following information are available for the last year, 20X2.

1/1-31/12/20X2

	(€)	(€)	(€)
Sales revenues (100.000 units × €10)			1,000,000
Less: <u>Manufacturing Expenses</u>			
Direct materials	200,000		
Direct labor	300,000		
Variable OH	60,000		
Fixed OH	<u>180,000</u>	740,000	
Less: <u>SGA Expenses</u>			
Variable SGA Expenses	40,000		
Fixed SGA Expenses	<u>120,000</u>	<u>160,000</u>	<u>900,000</u>
Operating Income			<u>100,000</u>

Required:

1. Calculate the contribution margin per unit and the break-even point quantity. Verify the profit presented in the P/L statement above.
2. Market research indicates that changing the design of X will boost sales. The new selling price will be €12.5 while the variable cost will increase by €1.50 per unit. Assuming that the rest data remain the same which is the necessary sales volume to give a profit of €200,000?

Exercise 10 Terminating activity

ABC is a merchandise firm. The firm has 3 departments, department A, B and C. The department C presents operating loss and the firm considers its termination. The following information is available for the departments:

	<u>Departments</u>		
	<u>Department A</u>	<u>Department B</u>	<u>Department C</u>
Sales Revenue	254,000	183,000	97,000
Less: Expenses	-213,000	-163,000	-106,000
Profit (Loss)	41,000	20,000	-9,000

The fixed cost of the firm equals €138,000 and is allocated equally across the departments. The fixed cost composition is as follows:

Fixed Cost

Rent expenses	40,000
Depreciation	60,000
Administration Expenses	20,000
Advertising Expenses	<u>18,000</u>
Total	138,000

If Department C is terminated, ABC estimates that the fixed administration expenses will decrease by 20% while the fixed advertising expenses will decrease by 10%.

Required: Should ABC terminate the operation of Department C?

Exercise 11 Special order

ABC firm produces the product X with the following data:

Normal price (€)	50
Annual volume (units)	2,500
<u>Manufacturing cost:</u>	
Variable per unit (€)	20
Fixed (annual) (€)	75,000
<u>SGA Expenses</u>	
Variable per unit (sales commissions) (€)	6
Fixed (annual) (€)	15,000

The firm receives a special order for 500 units. The price that the customer is willing to pay is €45. The manufacturing variable cost will be unchanged while sales commissions will be lower by 1/3. Fixed cost will be the same. The normal production level will not be affected because the firm has excess capacity.

Required

1. Should the firm accept the special order?
2. How would you change your answer if the firm operates at full capacity?

Exercise 12 Production mix

ABC firm manufactures 3 types of products, X, Y, and Z. ABC has a constrain in machine hours, that is, available machine hours per week is 148. The following data is also available:

Product type	<u>X</u>	<u>Y</u>	<u>Z</u>
Selling price/unit (€)	50	40	46
Variable cost (€)	20	16	24
Weekly demand	25	20	30
Required machine hours	4	3	4

Required: Determine the efficient production mix.

Exercise 13 Negotiated transfer prices

In the following 4 cases assume that Department A produces a product that may be sold either to Department B of the same entity or to external customers. The managers of the two departments can decide whether they will make the internal transfer and negotiate the transfer price. Each case is independent to the others.

Case:	1	2	3	4
<u>Department A</u>				
Maximum capacity (in units)	50,000	50,000	50,000	50,000
Units that are sold to external customers	40,000	40,000	45,000	50,000
Selling price to external customers (€)	104	104	104	104
Variable manufacturing cost per unit (€)	63	63	63	63
SGA variable cost per unit if the product is sold to external customers (€)	5	5	5	5
Fixed cost (manufacturing and SGA) per unit. The allocation has been made to the current production volume.	25	25	25	25
Additional design cost (Case 3) (€)	-	-	18,000	-
<u>Department B</u>				
Required units	10,000	15,000	15,000	10,000

Purchase price from external supplier (€)	93	95	100	μ/δ
Variable cost per unit (further process) (€)	4	4	4	4
Fixed cost per unit (allocated) (€)	10	10	10	10
Selling price to external customers (€)	150	150	150	150

Required: For each of the following independent cases, determine the range of the acceptable transfer price.

Case 1: Department B asks for 10,000 units of the current type of product. If the negotiation is not fruitful, what is the total loss for the entity?

Case 2: Department B asks for 15,000 units of the current type of product.

Case 3: Department B asks for 15,000 units of the current product with a slight modification in its design. The modification cost equals 18,000 (fixed).

Case 4: Department B asks for 10,000 units of a new product type. Department A has estimated that this new product type has a variable manufacturing cost 80 per unit and entail an increase in the fixed cost by 20%. Moreover, current sales to external customers will decrease by 15% due to capacity constrains.

Exercise 14 Cost based transferred prices

HPL company process crude oil and converts it into gasoline. The entity has 3 departments:

- Department A purchases crude oil and transports it to Department B.
- Department B process the crude oil and converts it into gasoline. The conversion ratio is as follows:

2lt. of crude oil → 1 lt. of gasoline

The gasoline is delivered to Department C.

- Department C fills barrels with gasoline and sells them.

Further information about current costs and relevant data is provided below:

<u>Department A (Purchase and transport)</u>	
Variable cost per lt. of crude oil.	0.7
Fixed Cost	3,000
<u>Department B (Conversion to gasoline)</u>	
Variable cost per lt. of gasoline	0.08
Fixed cost	5,000
<u>Department C (Filling and sale)</u>	
Variable cost per barrel of gasoline	0.1
Fixed cost	4,000
Selling price per barrel (€)	120
Net volume of gasoline per barrel (in lt.)	40

Required:

- Prepare a static budget for HP if the forecasted level of activity is 100,000 lt. of crude oil.
- For this level of activity, calculate the results of each department if they use variable cost-based transfer prices.
- For this level of activity, calculate the results of each department if they use full cost-based transfer prices.
- For this level of activity, calculate the results of each department if they use market-based transfer prices. The market price of crude oil is €0.9/lt. while the market price for gasoline is €2.4/lt.
- HPL concludes that cost-based transfer prices are problematic. Therefore, it proposes the following solution to the three departments: a transfer price based on the full cost with a markup of 10%. Surprisingly, Department A presents an increase in its variable and fixed cost. The revised cost data for Department A are:

<u>Department A (purchase and deliver)</u>	
Variable cost per lt. of crude oil	0.8
Fixed cost	15,000

What are the potential concerns in this solution?

Exercise 15 ROI and RI evaluation

ABC firm has three departments, Department A, Department B, and Department C. You have the following information:

	A	B	C
Sales revenues	12,000,000	20,000,000	16,000,000
Invested Capital	3,000,000	10,000,000	4,000,000
Net Operating Profits	600,000	1,800,000	360,000
Required return	15%	18%	12%

Required:

1. Calculate ROI for each department using the Du Pont analysis.
2. Calculate RI for each department.
3. Assume that each department considers a project with a forecasted return of 17%. If the departments use ROI, is the project acceptable? What if they use RI?

Exercise 16 ROI and RI evaluation

Department A presents the following results for the last year:

	Sales revenues	21,000,000
Less:	Variable expenses	-13,400,000
	Contribution margin	7,600,000
Less:	Fixed expenses	-5,920,000
	Operating results	1,680,000
	Invested capital	5,250,000

The manager of the department considers a new line of production with required capital €3,000,000. The new line will increase sales by €9,000,000. The variable cost will be 65% of the extra revenues while fixed cost will increase by €2,520,000.

Required:

1. Calculate ROI for the last year and the ROI if the new line is approved.
2. Assume that the required return is 15% and the department is evaluated with RI. Calculate RI for the last year and the RI if the new line is approved.

Exercise 17 ROI and RI evaluation

Department A manufactures a high-tech smartphone that will be launched in 2024. The department forecasts that the sales volume will be 20,000 units to consumers that are willing to pay any price to €800. You have also the following information for Department A:

	Amounts in €
Fixed production cost	1,600,000
Fixed selling cost	400,000
Variable cost per unit	600
Invested capital	3,200,000

Required:

1. Department A requires a ROI of 25%. What is the minimum selling price?
2. Department A has a required return of 20%. What is the minimum selling price according to the RI formula?
3. If you use the price derived in Q1, what is the RI of the department?

Exercise 18 EVA evaluation

Department A is evaluated with EVA. The results of the department for the years 20X5 and 20X4 are as follows:

	1/1-31/12/20X5	1/1-31/12/20X4
Operating results	6,500,000	5,500,000
Interest expense	<u>1,000,000</u>	<u>900,000</u>
Income before taxes	5,500,000	4,600,000
Tax (25%)	<u>1,375,000</u>	<u>1,150,000</u>
Income after taxes	4,125,000	3,450,000

Moreover, you have the following information:

- In 20X4, the department launched a research project (project Z) that is still under process. Expenditures were €500,000 for 20X4 and €500,000 for 20X5. Consistent with GAAPs, these expenditures were expensed.
- On 31/12/20X3, the department made a commercial of €1,500,000. Consistent with GAAPs, this commercial was expensed. However, the department estimates that the commercial affected the sales in 20X4 and 20X5 (60% and 40%, respectively).
- On 1/1/20X5, the department acquired a machine of €40,000. The accounting depreciation is €10,000 per year for 4 years, but the economic depreciation is estimated to €5,000 per year for 8 years.
- Total assets minus current liabilities are as follows:

<u>31/12/20X4</u>	<u>1/1/20X4</u>
37,000,000	33,500,000
- The interest rate was 5% for both years. The tax rate was 25% (no deferred taxation). The risk-free rate (r_f) was 3%. Equity beta coefficient (beta coef.) was 1.2. The market return (r_m) was 12%. Equity capital was 60% of total capital on average.

Required: Calculate EVA for years 20X4 and 20X5.