COST ACCOUNTING AND QUANTITATIVE ANALYSIS

Foundation stage
June 2001

MARKING SCHEME

Question 1

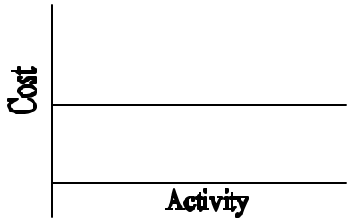
(a) Fixed Cost: remain constant over wide ranges of activity for a specified time period. Examples of fixed costs include depreciation of the factory building, supervisors' salaries, and leasing charges for cars used by the sales force.

Variable Cost: vary in direct proportion to the volume of activity, for example doubling the activity will double the total variable cost. Total variable costs are linear in relation to activity and the gradient of the line, which is the variable cost per unit. Examples of short-term variable manufacturing include piecework labour, direct materials and energy to operate the machines. Examples of non-manufacturing variable costs include sales commissions, which fluctuate with sales value, and petrol, which fluctuates with the number of miles travelled.

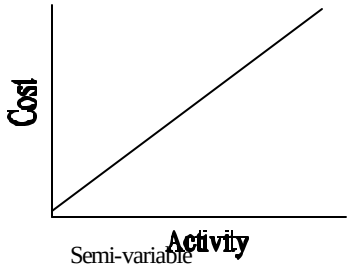
Semi-Fixed: within a given time period, semi-fixed costs are fixed within specified activity levels, but they eventually increase or decrease by a constant amount at various critical activity levels. Otherwise known as 'step costs', examples of which could include costs such as supervisor salaries, which become semi-fixed over large ranges of activity or long-time scales.

Semi-Variable: include a fixed and variable component. For instance, the cost of maintenance can be considered semi-variable, consisting of planned maintenance that is undertaken whatever the level of activity, and a variable element that is directly related to the level of activity. Other examples could include utility costs such as electricity, water, or telephones, which consist of a standing charge plus metered unit charge.

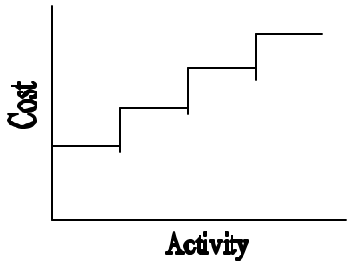
Fixed Costs



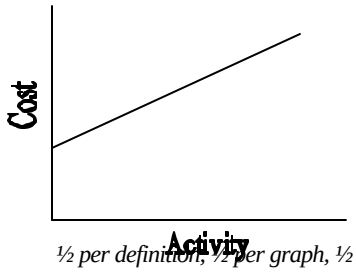
Variable Costs



Semi-Fixed



Semi-variable



½ per definition, ½ per graph, ½ per pair of examples
(6)

(b) (i)

	X	Y	X^2	XY	Y^2
Monday	25	8.6	625	215	73.96
Tuesday	21	8.3	441	174.3	68.89
Wednesday	28	9.2	784	257.6	84.64
Thursday	22	8.5	484	187	72.25
Friday	25	8.8	625	220	77.44
Saturday	23	8.5	529	195.5	72.25
S	144	51.9	3,488	1,249.4	449.43
	½	*½*	*1*	*1*	

Total costs given by $y = a + bx$

a fixed cost
b variable cost per unit
x number of units

$$b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2} \quad b = \frac{6 \times 1{,}249.4 - (144 \times 51.9)}{6 \times 3{,}488 - 144^2} \quad b = \frac{22.8}{192} \quad = 0.11875 \qquad 2$$

$$a = \frac{\sum y}{n} - \frac{b\sum x}{n} \qquad a = \frac{51.9}{6} - \frac{0.11875 \times 144}{6} \qquad = 5.8 \qquad 2$$

Daily fixed cost is £5,800
Variable cost per unit is £118.75

(ii) Current unit cost:

Average cost per unit using 6 day data = £51,900 / 144 = £360.42 per unit

Alternatively: Average production per day = 144 / 6 = 24 per day
Cost per day based on fixed and variable cost information (calculated above) = £5,800 + (£118.75 x 24)
= £8,650 per day (/ 24 units)
= £360.42 per unit

1

Cost per settee following increase in production:

Daily fixed costs from £5,800 to £6,300 (increase of £500)
Variable cost £118.75 per settee

Total cost for 30 settees = £6,300 + 30 x £118.75 = £9,862.50
Therefore, cost per settee = £9,862.50 / 30 = £328.75

2

Percentage decrease in unit cost = ((360.42 – 328.75) / 360.42) x 100
= 8.8% decrease

1

Variable cost/unit remains the same but fixed costs increase by £500.
The total cost per settee has fallen however because total overheads are "spread" over more units of production. *2*

(13)

(c) Correlation coefficient:

NB Need a Y^2 column to calculate the correlation coefficient (shown in table as part (b) (i) of answer). *1*

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{(n\sum x^2 - (\sum x)^2)}\sqrt{(n\sum y^2 - (\sum y)^2}}$$

$$r = \frac{6 \times 1{,}249.4 - (144 \times 51.9)}{\sqrt{(6 \times 3{,}488 - 144^2)}\sqrt{(6 \times 449.43 - 51.9^{2)}}}$$

$$r = \frac{22.8}{\sqrt{192}\sqrt{2.97}} \qquad r = \frac{22.8}{23.88} \qquad r = 0.95 \qquad 3$$

The data is a good predictor of cost as r is close to +1
However, although there appears to be a relationship between the independent and dependent variable, it is not possible to conclude that the relationship is causal. *2*

(6)

(25)

Question 2

(a) Effective hourly rate:

	Weeks	Days	Hours		
Annual paid	52	260	2,080		
Less:					
Annual Leave	5	25	200		
Sickness		3	24		
Training		2	16		
Effective hours			1,840		
					2
Annual salary:	£23,000 plus 12% oncosts		=	£25,760	*½*
Effective hourly rate:	£25,760 / 1,840 hours		=	£14 / hour	*½*
					(3)

(b) (i), (ii) **Contract Account for Bovis NHS Trust**

	£		£	
Materials	468,000	Materials on site	121,000	
Direct Wages	238,000	WIP	45,000	*½*
		Cost of work certified	671,900	*½*
Site Foreman	28,000			
Machine depn	15,000			
Machine hire	77,000			
Overheads	11,900			
	837,900		837,900	

Profit and Loss for year ended 31 March 2001

Cost of work certified	671,900	Value of work certified	902,500	
Profit taken	146,047			
Profit not taken	84,553			
	902,500		902,500	

Balances at 31 March 2001

WIP	45,000			*½*
Materials on site	121,000	Profit not taken	84,553	*½*

Direct wages: 17,000 x £14/hr = £238,000 *1*

Machinery Depreciation:
Net book value £200,000. Depreciate at 10% for 9 months (1 July to 31 March) = £15,000 *1*

Overheads:
Charged at £0.70 per direct labour hour = 17,000 hrs x £0.70 = £11,900 *1*

Attributable profit:
Notional profit: Value of work certified – cost of work certified
£902,500 – £671,900 = £230,600

Proportion of way through contract:

Value of work certified / contract value = £902,500 / £1,675,000 = 54%

Therefore the proportion of profit to be shown on the P&L is:

2/3 x £230,600 x 95% = £146,047 *2*

1 mark for layout and presentation
(8)

Contract Account for Catlan Prison

	£		£	
Materials	185,000	Materials on site	92,000	
Direct Wages	77,000	WIP	42,000	½
		Cost of work certified	199,850	½
Site Foreman	20,500			
Machine depn	22,500			
Machine hire	25,000			
Overheads	3,850			
	333,850		333,850	

Profit and Loss for year ended 31 March 2001

Cost of work certified	199,850	Value of work certified	190,000	
		Loss reported	9,850	
	199,850		199,850	

Balances at 31 March 2001

WIP	42,000	½
Materials on site	92,000	½

Direct wages: 5,500 hours x £14/hr = £77,000

Machinery Depreciation:
Net book value £450,000. Depreciate at 10% for 6 months (1 October to 31 March) = £22,500 *1*

Overheads:
Charged at £0.70 per direct labour hour = 5,500 hrs x £0.70 = £3,850 *1*

Attributable loss:
Notional loss: Value of work certified – cost of work certified
£190,000 – £199,850 = £9,850 *1*

1 mark for layout of presentation
(6)

(iii) Reported profit should be less than notional profit to account for the prudence concept. For Bovis, the notional profit should be reduced by 1/3 to account for the uncertainty due to being only part way through the contract, and should be reduced by a further 5% due to the retention. When a loss is made (as with Catlan), the full value of the loss should be reported no matter how complete or incomplete the contract is.

(3)

(c) (i) No specialist:

Possible outcome	Effect on contract £	Probability	Expected value £
On time	0	0.25	0
One month delay	(250,000)	0.25	(62,500)
Two months delay	(500,000)	0.25	(125,000)
Three months delay	(750,000)	0.25	(187,500)
Total expected value		1.00	(375,000)

1 ½

Specialist

Possible outcome	Effect on contract £	Probability	Expected value £
On time	(200,000)	0.50	(100,000)
One month delay	(450,000)	0.25	(112,500)
Two months delay	(700,000)	0.25	(175,000)
Total expected value		1.00	(387,500)

1 ½

Not hiring the specialist gives the lowest expected loss / cost (by £12,500), so the company should proceed on this basis.

(ii) Other considerations:

How reliable are the probabilities?
Availability of labour, machinery etc past planned completion date.
Potential loss of reputation through late completion of contract, (loss of future business).

Attitude to risk:

- Worst case scenario at present is 3 months late and lose £750,000; worst case scenario with consultant is 2 months late and lose £700,000 (including fee).
- Best case scenario at present is no loss at all (only 25% chance); best case scenario with consultant is to lose £200,000 (fee). *(2)*

(5)

(25)

Question 3

(a) Budgeting concerns identifying future costs and income based on the best available assumptions about prices and activity (production or sales volumes). Budgets tend to be set for departments, and departmental managers are held responsible for achieving those budgets. Flexible budgets are 'flexed' in year to reflect actual activity (production or sales). If activity increases, the flexed budget is likely to increase.

Standard costing is also concerned with establishing in advance anticipated costs or prices, but the focus is on units of production rather than departments. A standard product cost is a detailed breakdown of all the elements of cost which contribute to the total cost of producing that product.

1 mark each for description of flexible budgeting and standard costing (2)

(b) **Variance calculations**

Materials Variances - Plastic

Plastic total cost variance	(SC – AC)			
(£2.10 x 5,500 units) – £10,450		=	£1,100	(F)
Plastic price variance	(SP – AP) x AQ			
(£3.50 – £3.80) x 2,750 kg		=	£(825)	(A)
Plastic usage variance	(SQ – AQ) x SP			
[(5,500 units x 0.6 kg) – 2,750 kg] x £3.50		=	£1,925	(F)

Materials Variances – Wood

Wood total cost variance	(SC – AC)			
(£10.80 x 5,500 units) – £63,250		=	£(3,850)	(A)
Wood price variance	(SP – AP) x AQ			
(£4.50 – £4.60) x 13,750 kg		=	£(1,375)	(A)
Wood usage variance	(SQ – AQ) x SP			
[(5,500 units x 2.4 kg) – 13,750 kg] x £4.50		=	£(2,475)	(A)

Labour Variances

Total labour cost variance	(SC – AC)			
(£15.50 x 5,500 units) – £85,800		=	£(550)	(A)
Labour rate variance	(SR – AR) x AH			

(£7.75 – £7.50) x 11,440 hrs = £2,860 (F)

Labour efficiency variance (SH – AH) x SR

[(5,500 units x 2.0 hrs) – 11,440 hrs] x £7.75 = £(3,410) (A)

1 mark for each variance

Sales Margin Variances

Standard Contribution:

	5,000 units of sales	**£/unit**
	£	
Sales	250,000	50.00
Variable materials and labour	142,000	
Variable overheads	23,000	
Total variable costs	(165,000)	(33.00)
Contribution	85,000	17.00

Actual contribution (based on standard unit costs) is £17 – £0.50 (decrease in selling price) = £16.50

Total sales margin variance (AC – SC)

The difference between the actual contribution (AC) and the standard contribution (SC) – both based on standard unit costs.

(£16.50 x 5,500 units) – £85,000 = £5,750 (F)

Sales margin price variance (AM – SM) x AV

The difference between the actual contribution margin (AM) and the standard contribution margin (SM) – both based on standard unit costs, multiplied by the actual sales volume (AV).

(£16.50 – £17) x 5,500 units = £(2,750) (A)

Sales margin volume variance (AV – SV) x SM

The difference between the actual sales volume (AV) and the standard volume (SV) multiplied by the standard contribution margin (SM).

(5,500 units – 5,000 units) x £17	=	£8,500	(F)

1 mark for each sales margin variance
plus 1 mark for the calculation of the actual and standard contributions

(13)

(c) Comment on the results of labour and sales margin variances

Labour variances. The total labour cost incurred to produce 5,500 units of production was £550 more than was budgeted for in total. The average cost per hour of labour involved in the production was £0.25 lower than the standard and this translated into a £2,860 favourable variance. However, the number of hours taken to produce 5,500 units was higher than expected (11,440 hours cf 11,000 hours). This caused a £3,410 adverse efficiency variance which more than cancelled out the favourable rate variance. Possible reasons for the variances:

Rate: Lower than expected pay award, employed a cheaper 'mix' of labour, may have taken on many new staff (who often start on a lower rate), or staff with less experience.

Efficiency: Higher than expected hours worked possibly due to low quality materials (harder to work with), machinery breakdown, staff working more slowly, higher proportion of non productive time, new staff working less efficiently.

Sales margin variances. 500 more products were sold than anticipated, but at a lower price (£49.50 cf £50). The reduction in price may have been a deliberate marketing ploy or customers may have been more successful than anticipated at obtaining discounts. If deliberate, the reduction in price does seem to have caused a significant increase in sales.

The lost contribution due to the price reduction was £2,750, but this was more than offset by the £8,500 increase in contribution due to increased sales volume.

1 mark each for discussion of results, 1 mark each for relevant reasons

(4)

(d) Hypothesis test

(i) H_0: $\mu = 2.0$ hours
H_1: $\mu < 2.0$ hours *1*

Large sample therefore calculate a statistic:

Standard Error = $\frac{s}{\sqrt{n}} = \frac{0.6}{\sqrt{37}} = 0.0986$ *1*

Z statistic = $\frac{m - \bar{x}}{SE} = \frac{2 - 1.8}{0.0986} = 2.027$ *1*

For a one tailed test the critical value at 95% confidence is 1.65 and at the 99% level, the critical value is 2.33 *1*

(4)

(ii) At the 95% level, there is sufficient evidence from the test to reject the null hypothesis in favour of the alternative hypothesis. Hence it could be concluded that the time taken to produce a Barter is indeed now less than 2.0 hours. *½*

At the 99% level, there is not sufficient evidence to reject the null hypothesis, so the conclusion at this level of significance is that the production time assumption should remain at 2.0 hours. *½*

The results are thus conflicting. If it is acceptable to be 95% certain (ie could be wrong 1 in 20) then reject the null hypothesis. If this degree of error is not acceptable, then must not reject. *½*

In order to be more certain of the outcome of the test, need to increase the sample size. *½*

(2)

(25)

Question 4

(a) Semi-variable production overheads split into fixed and variable elements using High / Low method

	Units of Production	Total Cost (£)
	25,800	808,000
	24,500	795,000
Difference	1,300	13,000

Variable cost is £13,000 / 1,300 units = £10 per units *1*
Fixed cost = £808,000 – (25,800 x £10) = £550,000 *1*

(2)

(b) Total variable costs per unit:

	£
Materials	36
Wages	28
Production o/h	10
Total	74

MARGINAL COSTING	Period 1	£	Period 2	£	
Sales	[22,600 x £150]	3,390,000	[26,200 x £150]	3,930,000	*1*
VARIABLE COST OF SALES					
Opening Stock		0	[1,900 x £74]	140,600	
Production	[24,500 x £74]	1,813,000	[25,800 x £74]	1,909,200	*1*
less closing stock	[1,900 x £74]	140,600	[1,500 X £74]	111,000	*1*
Variable cost of production		1,672,400		1,938,800	
CONTRIBUTION		1,717,600		1,991,200	*1*
FIXED COSTS					
Production overheads		550,000		550,000	
Selling overheads		240,000		240,000	
Admin overheads		510,000		510,000	*1*
NET PROFIT		417,600		691,200	

ABSORPTION COSTING	Period 1	£	Period 2	£	
Sales	[22,600 x £150]	3,390,000	[26,200 x £150]	3,930,000	*1*
Cost of sales					
Opening Stock		0	[1,900 x £96]	182,400	
Production - variable	[24,500 x £74]	1,813,000	[25,800 x £74]	1,909,200	*1*
- fixed	[24,500 x £22]	539,000	[25,800 x £22]	567,600	*1*
		2,352,000		2,659,200	
less closing stock	[1,900 x £96]	-182,400	[1,500 x £96]	144,000	*1*
Cost of sales		2,169,600		2,515,200	
Under / over-absorbed overheads	[500 x £22]	11,000	[800 x £22]	-17,600	*1*
Total Production Costs		2,180,600		2,497,600	
Gross Profit		1,209,400		1,432,400	
Selling		240,000		240,000	*½*
Admin		510,000		510,000	*½*
Net Profit		459,400		682,400	

1 mark for presentation
(12)

(c) Reconciliation of Marginal costing profits with Absorption Costing Profits:

		Period 1		Period 2	
Marginal Costing Profit		417,600		691,200	
Change in stock (units)	Incr 1,900		Decr 400		
Fixed production overheads	£22 / unit	41,800	£22 / unit	(8,800)	*2*
Absorption Costing Profit		459,400		682,400	

Marginal costing approaches charge variable production expenses to products and treat all fixed costs as period costs (including fixed production overheads). Thus, all fixed costs are charged to the period in which they were incurred. *1*

Absorption costing approaches absorb fixed production overheads into products rather than treating them as period costs. Thus, if stocks build up, an element of fixed production overhead is carried forward as an unexpired cost into the following production period. This means that less fixed production overhead is charged to the period than under marginal costing and the absorption costing profit is thus higher (period 1 of this example). When stocks decrease, more fixed production overhead costs are charged to the period than under marginal costing, so the profit is lower (period 2). *1*

(4)

(d) Normal Distribution

(i) Percentage increase in sales due to marketing campaign

(26,200 – 22,600) / 22,600 = 15.93% *1*

(ii) $Z = \frac{m - x}{s} = \frac{15.93 - 12}{4} = \frac{3.93}{4} = 0.9825$ *1*

From the normal distribution the proportion > 0.9825 is 0.1635 or 16.35% *1*

(iii) $Z = \frac{m - x}{s} = \frac{7 - 12}{4} = \frac{-5}{4} = -1.25$ *1*

By symmetry, the proportion < – 1.25 is the same as the proportion > 1.25. *1*

From the normal distribution table this is 0.1056. *1*

The probability that sales will increase by 7% or more is 1 – 0.1056 = 0.8944 or 89.44% *1*

(7)

(25)

Question 5

(a) Present blanket overhead rate = $\frac{\text{Budgeted overhead}}{\text{Budgeted direct wages}} \times 100 = \frac{£2,250,000}{£1,500,000} \times 100$

= 150%
(or £1.50 per £1 of direct wage)

(2)

(b) Job 127

		£	
Direct materials	1,900		½
Direct wages		1,700	½
Production overhead		2,550 (150% x £1,700)	½
		6,150	
Selling Price:		£6,150 + 1/3 of £6,150 = £8,200	
Profit is thus		£2,050	½

(2)

(c) (i)

Individual departmental rates are usually more accurate because different bases of absorption can be used for each department reflecting, for instance, whether a department (and hence its overheads) are more labour or machine intensive. This assumes though, that costing systems record full labour and machine usage job by job.

A blanket rate is simpler and less time consuming and complicated but might use an inappropriate base. For example, if a blanket machine hour rate were used at Tinseltown this would be inappropriate for the finishing department which does not use machines. The actual blanket rate used at the moment is based on labour cost percentage (NOT labour hours). This might be inappropriate if wage rates are quite different (as seems to be the case, looking at the wage costs on Job 127) and a labour hour rate might be better.

1 mark per reasonable point made
3

(ii)

Machining Department

The name of this department suggests that machines are used and the budgeted hours are also heavily weighted (40,000 machine hours cf 10,000 labour hours) so choice of base should be machine hours:

Overhead rate would be $\frac{£ 1,200,000}{40,000 \text{ machine hrs}}$ = £30 per machine hour. *2*

Assembly Department

The department name does not clarify whether hand or machine assembly but the budgeted hours shows many more labour hours than machine hours (50,000 labour hours cf 10,000 machine hours)

Overhead rate would be £ 300,000 / 50,000 lab hrs = £6 per labour hour. *2*

Finishing Department

Although the department name gives no indication whether labour/machine intensive the budgeted hours show only 25,000 labour hours so labour hours is base to use.

Overhead rate would be £ 750,000 / 25,000 lab hrs = £30 per labour hour. *2*

[NB Although it is technically possible to use "labour cost p ercentage" for Assembly and Finishing departments, for reasons mentioned in (c)(i) it is better to use "labour hours". If labour cost percentage is used then half marks should be awarded.] *(6)*

(iii) Revised cost of Job 127 (using individual departmental overhead rates):

	£		
Direct materials	1,900		½
Direct wages	1,700		½
Production overhead:			
Machining dept (40 m.hrs x £30)	1,200		½
Assembly dept (40 lab hrs x £6)	240		½
Finishing dept (10 lab hrs x £30)	300		½
PRODUCTION COST	5,340		
Gross Profit (1/3 of £5,340)	1,780		½
Price of order	7,120		

(3)
(12)

(d) Under/over absorption of overhead

Using original blanket rate (direct wages percentage):

Total overheads absorbed is £1,400,000 x 150%	=	£2,100,000	
Total overheads incurred	=	£2,380,000	
Total under absorption	=	£280,000	*1*

Reasons:

"Actual overhead expenditure for the period was more than had been budgeted for (£2,380,000 – £2,250,000 = £130,000). This means that the predetermined overhead absorption rate had too low a numerator. All being equal, the OAR would have been higher and more overheads would have been absorbed had the real level of overhead expenditure would been known in advance" *1*

Overheads were absorbed at 150% of direct wages cost. The actual direct wages cost was £100,000 lower than the budgeted amount (£1,400,000 compared with £1,500,000), which means that £150,000 (£100,000 x 150%) less overhead was absorbed than should have been. *1*

The £150,000 under absorption due to activity being less than planned, plus the £130,000 under absorption due to expenditure being higher than planned, resulted in the total under absorption of overheads of £280,000.

(3)

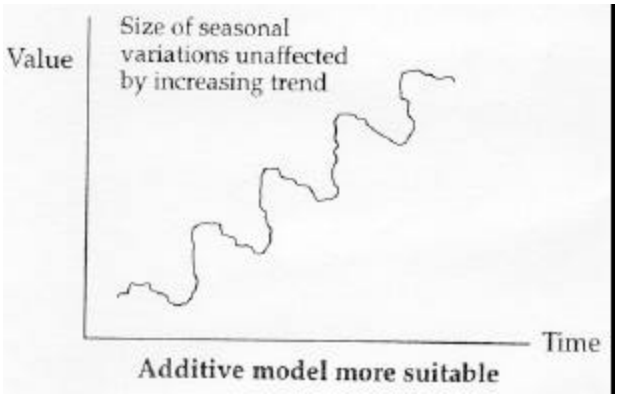
(e) Time-Series analysis decomposition

(i) Four characteristics:

- Long-term trend – the long-term tendency of the whole series to rise or fall.
- Seasonal variations – short-term periodic fluctuations in values due to different circumstances eg sales of cameras may be higher in the summer.
- Cyclical variations – medium-term changes caused by factors which apply for a while, then go away, and then return in a repetitive cycle. The economic cycle (boom, recession, boom...) is an example.
- Random or residual variations – non-recurring random variations, eg fire, change of government, random fluctuations in customer desires.

½ mark per characteristic up to a maximum of 2 marks

(ii) Additive model: where the seasonal variation (difference from the long-term trend line) is stated as an absolute amount (eg number of sales of ice creams in the summer is 100,000 higher than in winter) *1*



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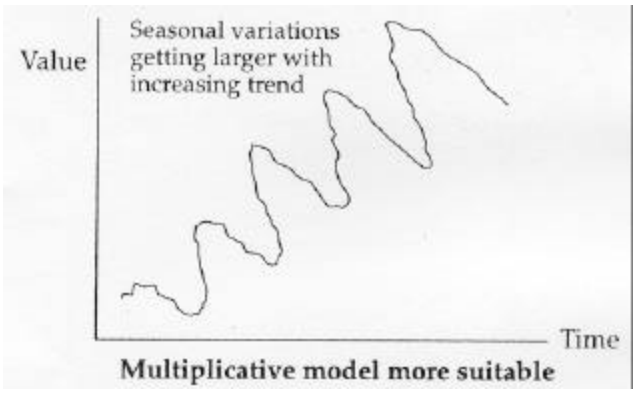
Multiplicative model: more appropriate if the characteristics interact, eg where a higher trend value increases the seasonal variation. The seasonal variation is expressed as a percentage of the trend value rather than an absolute amount (eg the sales of greetings cards are 250% higher in December than in June). *1*



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(6)

(25)