

**Personal Ethics Statement Concerning Telfer School Assignments**

**Group Assignment:**

By signing this Statement, I am attesting to the fact that I have reviewed not only my own work, but the work of my colleagues, in its entirety.

I attest to the fact that my own work in this project meets all of the rules of quotation and referencing in use at the Telfer School of Management at the University of Ottawa, as well as adheres to the fraud policies as outlined in the Academic Regulations in the University's Undergraduate Studies Calendar. I further attest that I have knowledge of and have respected the "Beware of Plagiarism" brochure found on the Telfer School of Management's doc-depot site. To the best of my knowledge, I also believe that each of my group colleagues has also met the rules of quotation and referencing aforementioned in this Statement.

I understand that if my group assignment is submitted without a signed copy of this Personal Ethics Statement from each group member, it will be interpreted by the Telfer School that the missing student(s) signature is confirmation of non-participation of the aforementioned student(s) in the required work.

Irina P                      September 29, 2011  
Signature                      Date

Prikazchikova    Irina                      5641228  
Last Name (print), First Name (print)    Student Number

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Signature Date

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Last Name (print), First Name (print) Student Number

**ADM 3301 C  
ASSIGNMENT # 1  
FORECASTING**

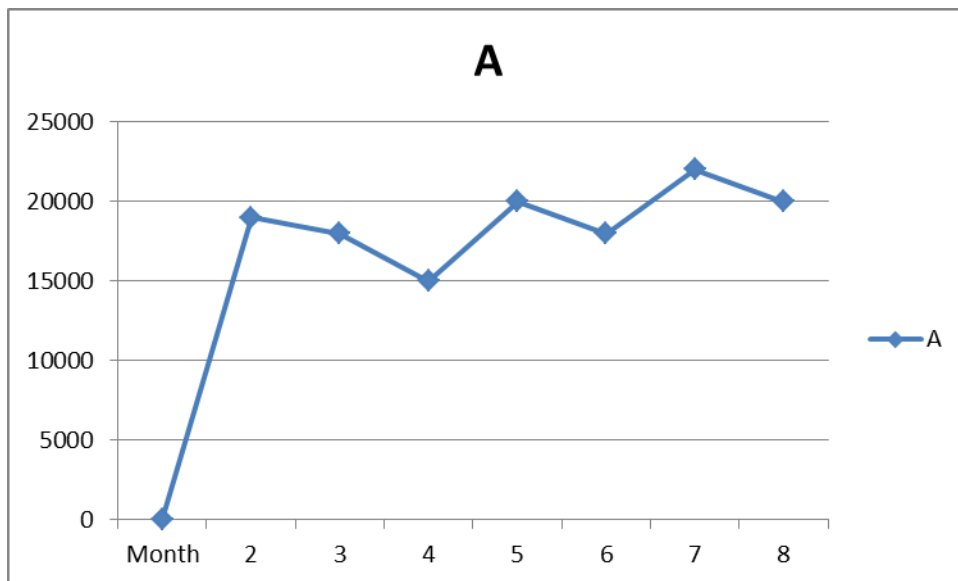
Prepared by: Irina Prikazchikova, 5641228  
Max Charbonneau, 5596848  
Prepared for: Professor Rim Jaber  
TA: Victory Nkweti Khan

**Question #1**

**A can opener manufacturer has had monthly sales for a seven-month period as follows:**

<b>Month</b>	<b>Sales (000 units)</b>
<b>Feb.</b>	<b>19</b>
<b>Mar.</b>	<b>18</b>
<b>Apr.</b>	<b>15</b>
<b>May</b>	<b>20</b>
<b>Jun.</b>	<b>18</b>
<b>Jul.</b>	<b>22</b>
<b>Aug.</b>	<b>20</b>

**a) The plot of the monthly data:**



**Forecast Methods:**

**1) A linear trend equation. (use of Excel's regression)**

$$A_t = \alpha + \beta_t \text{ OR } Y_i = a + bX_i$$

$$F_9 = a + bt = 16357.14 + 500(9) = 20857.14$$

2) **A five-month moving average.**

$$n = 5$$

$$F_6 = [A_5 + A_4 + A_3 + A_2 + A_1]/5$$

$$F_6 = [18000 + 20000 + 15000 + 18000 + 19000]/5 = 90000/5 = 18000$$

$$F_7 = [A_6 + A_5 + A_4 + A_3 + A_2]/5$$

$$F_7 = [22000 + 18000 + 20000 + 15000 + 18000]/5 = 93000/5 = 18600$$

$$F_8 = [A_7 + A_6 + A_5 + A_4 + A_3]/5$$

$$F_8 = [20000 + 22000 + 18000 + 20000 + 15000]/5 = 95000/5 = 19000$$

3) **Exponential smoothing with a smoothing constant equal to 0.10, assuming a March forecast of 19(000).**

$$F_t = \alpha A_{t-1} + (1 - \alpha) F_{t-1}$$

$$\alpha = 0.10$$

$$F_4 = 0.10 * 18000 + (1 - 0.10) 19000 = 18900$$

Month	Sales	Forecast
02	19000	-
03	18000	19000
04	15000	18900
05	20000	18510
06	18000	18659
07	22000	18593.1
08	20000	18933.8
09		19040.4

Sales forecast for September is 19,040.40 units using the Exponential Smoothing Method.

4) **The naïve approach.**

Month	Sales	Forecast
02	19000	19000
03	18000	19000
04	15000	18000
05	20000	15000
06	18000	20000
07	22000	18000
08	20000	22000
09		<b>20000</b>

5) A weighted average using 0.4 for August, 0.4 for July, and 0.20 for June.

$$F_4 = W_1 * A_3 + W_2 * A_2 + W_3 * A_1$$

Month	Sales	Weighed MA
2	19000	-
3	18000	-
4	15000	-
5	20000	17000.0000
6	18000	17600.0000
7	22000	18200.0000
8	20000	20000.0000
9		20400.0000

Monthly Weights

August	0.4
July	0.4
June	0.2

Which method seems most appropriate? Why?

Month	Sales (000)	Weighted Avg	Forecast error	Abs Error
Feb.	19.0	-	-	-
Mar.	18.0	-	-	-
Apr.	15.0	-	-	-
May	20.0	17.0	3.0	3.0
Jun.	18.0	17.6	0.4	0.4
Jul.	22.0	18.2	3.8	3.8
Aug.	20.0	20.0	0.0	0.0
Sept.		20.4	-	-

MAD				1.8
MSE			23.6	
SD= $\sqrt{\text{MSE}}$			4.9	

\*View appendix 1 for full table\*

Since the weighted average has the lowest MAD/MSE and SD (See attached appendix 1.C) it provides us with the most accurate answer of the all the methods.

## Question #2

The following table contains the actual demand, the two sets of forecasts for the eight periods, MAD and MSE:

Period	Demand	Forecasted demand F1	Error F1	Abs Err F1	Forecasted demand F2	Error F2	Abs Err F2
1	68	66	-2	2	66	-2	2
2	75	68	-7	7	68	-7	7
3	70	72	2	2	70	0	0
4	74	71	-3	3	72	-2	2
5	69	72	3	3	74	5	5
6	72	70	-2	2	76	4	4
7	80	71	-9	9	78	-2	2
8	78	74	-4	4	80	2	2

<b>MAD</b>				4			3
<b>MSE</b>			22			13.25	

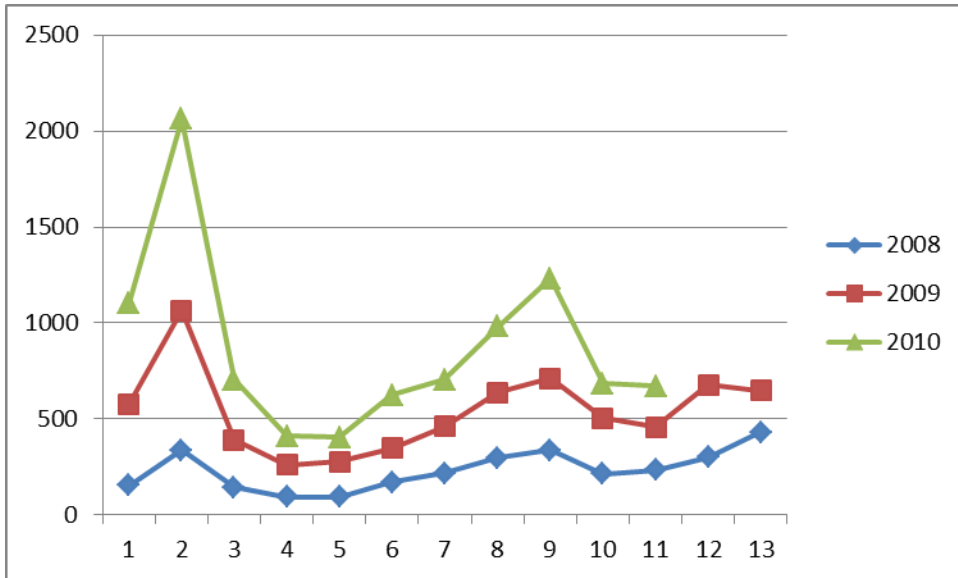
- a) The MAD for F1 = 70.50 and for F2 = 73.00. The more accurate technique is where F1 = 70.50 because it has a lower value comparing to the F2.
- b) The MSE for F1 = 4975.75 and for F2 = 5350.00. The more accurate technique is where F1 = 4975.75 because the found value is lower than for F2.

$$\sigma = \sqrt{\text{MSE}} \Rightarrow \text{for F1 } \sigma = \sqrt{4975.75} = 70.5389$$
$$\text{for F2 } \sigma = \sqrt{5350.00} = 73.1437$$

- c) In practice, our MAD and MSE should be minimized and comparing the found outcomes we can see that our MAD is lower for both F1 and F2 than in MSE case. Therefore MAD would be employed to compute a measure of forecast errors and the manager would favour MAD because it has a smaller value which is what he/she are looking for.

**Question #3**

a) Plot of the sales data:



We would recommend the multiplicative decomposition model because we will be able to use the four components from the formula of the model and that will help us to determine the effect on the time series in order to be able to forecast the future.

b) The multiplicative decomposition model:  $A_t = T_t \cdot S_t \cdot C_t \cdot R_t$   
 7 is our center of the thirteen seasonal indices.

Seasonal Indices	
1	1.462249
2	2.599253
3	0.871972
4	0.522028
5	0.517739
6	0.666839
7	0.848531
8	1.14412
9	1.128528
10	0.685308
11	0.657357
12	0.887682
13	1.008394
Intercept	68.8628
Slope	25.2518

See appendix 2 for full work.

**Using the multiplicative decomposition model above, is the forecast of period 1 to 37 performing adequately? Justify your answer.**

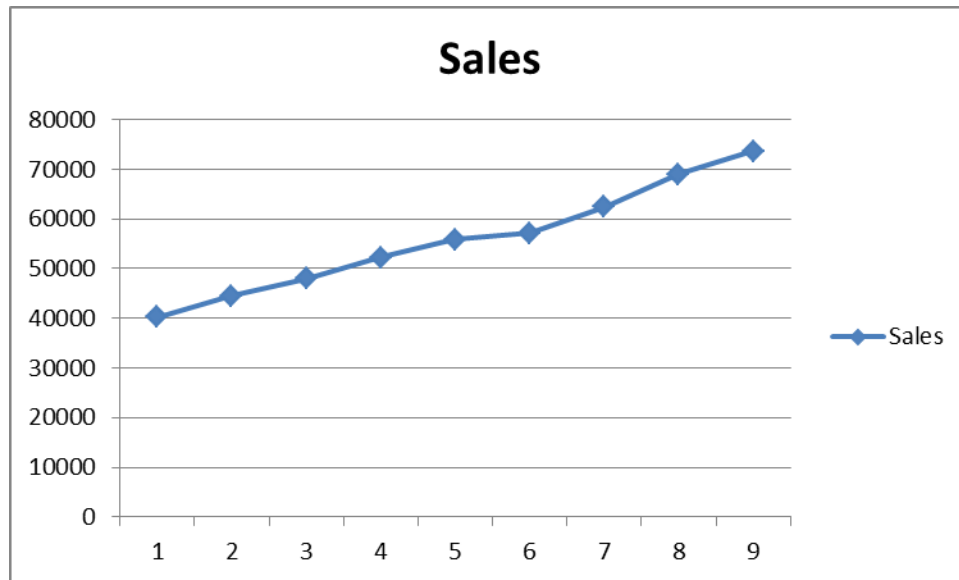
Since we have  $2SD = 90.05533292$ , we know that 95.44% of our data will fall between 90.05533292 and -90.05533292. We only have 1 point that does not fall within that range, we can treat this data point as being an outlier and ignore it, or we can still include it however it simply falls in the 4.56% that is not covered by our range ( $1/37 = 2.7\%$ ).

**Use the multiplicative decomposition model to forecast sales for the rest of year 2010 and 2011 (e.g. forecast for the period 38 to period 52). Show calculation.**

View appendix 3

### Question #4

a) The plot of the data:



The appropriate model would be the Linear Regression Model because from the plot we can see that our sales data is linear.

Using the Trend Progression our linear equation will be:  $F_t = 35797.2222 + 4018.3333t$ . We obtain this formula through the Regression solution from excel.

$$F_t = a + bt$$

$$F_t = 35797.2222 + 4018.3333t$$

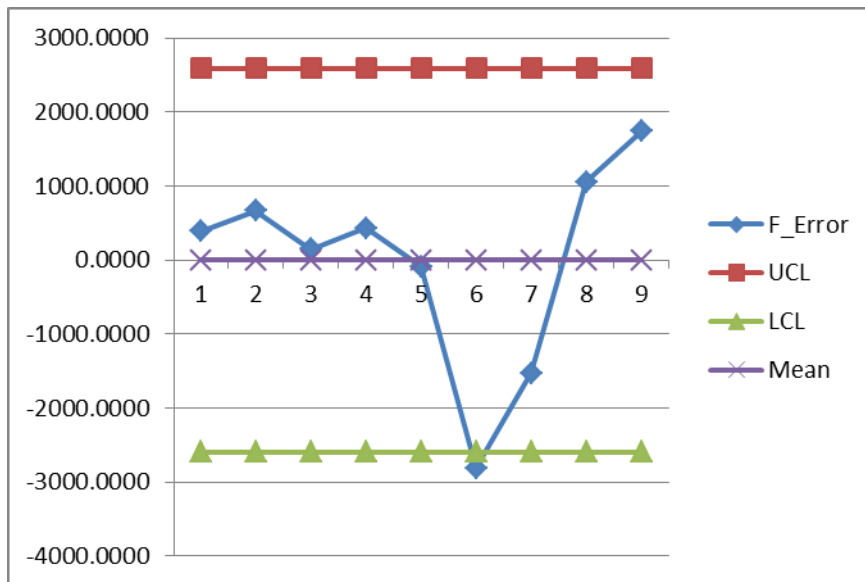
Year	Sales	Forecast	Error, $E_t$	ABS
1	40200	39815.5556	384.4444	384.4444
2	44500	43833.8889	666.1111	666.1111
3	48000	47852.2222	147.7778	147.7778
4	52300	51870.5556	429.4444	429.4444
5	55800	55888.8889	-88.8889	88.8889
6	57100	59907.2222	-2807.2222	2807.2222
7	62400	63925.5556	-1525.5556	1525.5556
8	69000	67943.8889	1056.1111	1056.1111
9	73700	71962.2222	1737.7778	1737.7778

<b>MSE</b>	1683191.3580
<b><math>\sigma</math></b>	1297.3786

$2\sigma$	2594.7573
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	A	B	C	D	E	F	G	H
1	Year	Sales	Forecast	F Error	ABS	UCL	LCL	Mean
2	1	40200	39815.5556	384.4444	384.4444	2594.7573	-2594.7573	0
3	2	44500	43833.8889	666.1111	666.1111	2594.7573	-2594.7573	0
4	3	48000	47852.2222	147.7778	147.7778	2594.7573	-2594.7573	0
5	4	52300	51870.5556	429.4444	429.4444	2594.7573	-2594.7573	0
6	5	55800	55888.8889	-88.8889	88.8889	2594.7573	-2594.7573	0
7	6	57100	59907.2222	-2807.2222	2807.2222	2594.7573	-2594.7573	0
8	7	62400	63925.5556	-1525.5556	1525.5556	2594.7573	-2594.7573	0
9	8	69000	67943.8889	1056.1111	1056.1111	2594.7573	-2594.7573	0
10	9	73700	71962.2222	1737.7778	1737.7778	2594.7573	-2594.7573	0

$2\sigma$  control chart:



A textbook publishing company has compiled data on total annual sales of its business texts for the proceeding nine years:

Year	1	2	3	4	5	6	7	8	9
Sales (000)	40.2	44.5	48.0	52.3	55.8	57.1	62.4	69.0	73.7

- Using the model of part a), forecast textbook sales for each of the next five years.

View appendix 4

- Suppose actual sales for the next five years turn out as follows:

Year	10	11	12	13	14
Sales (000)	77.2	82.1	87.8	90.6	98.9

Calculate the forecast errors for years 10 to 14. Is the forecast process in control? Explain.

The process is not in control. Thanks to the SD we know that 95.44% of our errors should fall within 2594 and -2594. However by looking at the forecasted errors we can observe 2 of the 4 periods are over that amount, and one of them is almost over the limit. We'd recommend using a different forecasting situation.