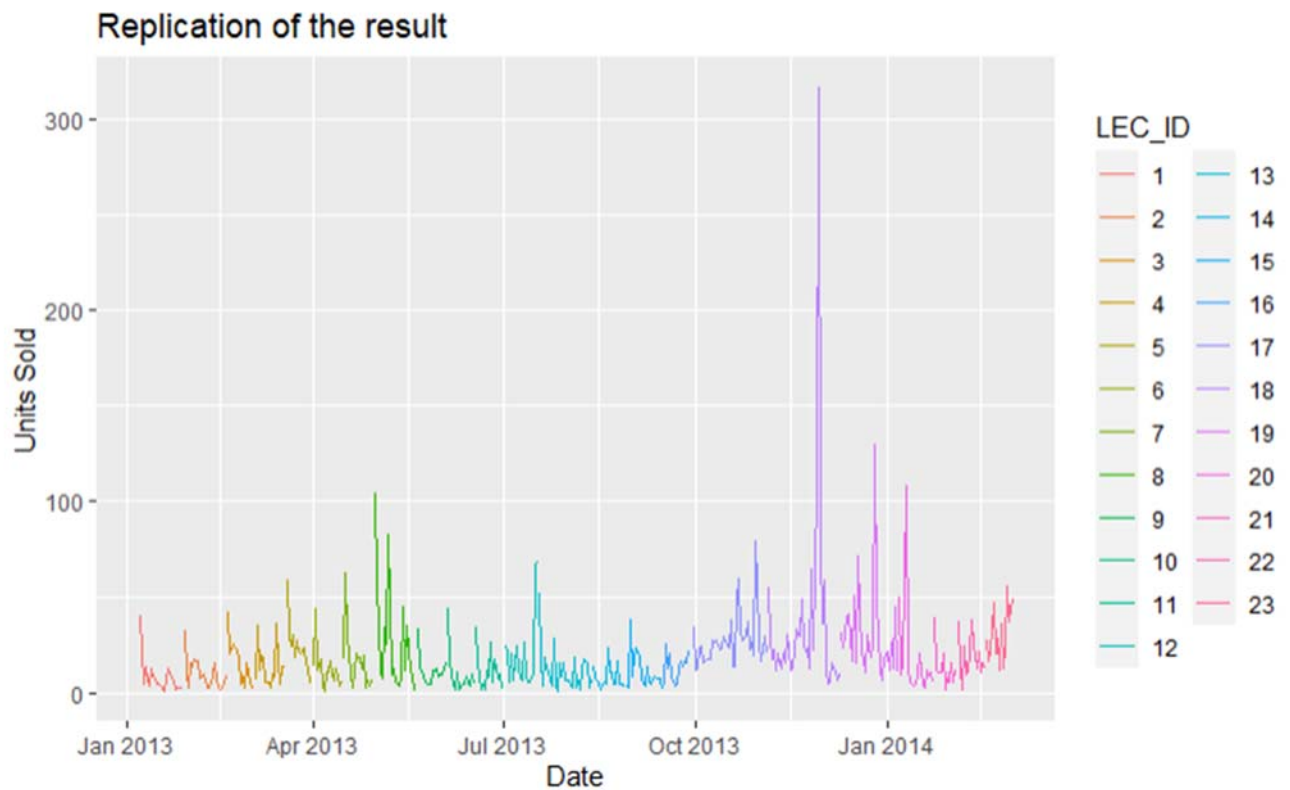


Yichen Wang 260761601

Part 1: Outsourcing business model (50 points)

The higher-level question is: How many shirts should Veizenburg order for the upcoming collection?
For now, only consider the outsourcing option—when all the products are made in Ukraine. To determine that, complete the following:

1. Replicate the Tableau visual in case Exhibit 2 (preferably in Tableau; if you are not familiar with Tableau, you can consider other options).



This plot is generated by R studio, file attached in the submission.

2. Prepare a demand forecast for the upcoming LEC.

period	season	unit	Demand bar	Seasonal Factor	Estimate Seasonal factor	Forecast	Trend T	21.75
1	1	173	174.37	0.992143144	1.32	230.5662967	Level L0	152.62
2	1	238	196.12	1.213542729	1.119427434	259.3259283		
3	1	269	217.87	1.234681232	0.68016692	288.0855599		
4	1	443	239.62	1.848760538	1.282361652	316.8451914		
5	2	311	261.37	1.189884072		292.5847484		
6	2	500	283.12	1.766035603		316.9322951		
7	2	281	304.87	0.921704333		341.2798417		
8	2	196	326.62	0.600085727		365.6273884		
9	3	302	348.37	0.866894394		236.9497498		
10	3	310	370.12	0.837566195		251.7433803		
11	3	186	391.87	0.474647204		266.5370108		
12	3	224	413.62	0.541559886		281.3306413		
13	4	339	435.37	0.778648046		558.3017922		
14	4	594	457.12	1.299439972		586.1931582		
15	4	563	478.87	1.175684424		614.0845241		
16	4	939	500.62	1.875674164		641.97589		
17	1	696	522.37	1.33238892		690.7204016		
18	1	402	544.12	0.738807616		719.4800332		
19	1	315	565.87	0.556664958		748.2396647		
20	1	434	587.62	0.738572547		776.9992963		
21	2		609.37			682.1454953		

Excel sheet included in the submission. The initial level and trend is obtained via regression in excel shown below:

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.708055908							
R Square	0.501343168							
Adjusted R	0.465724823							
Standard E	106.908462							
Observations	16							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	1	160873.8767	160873.9	14.07542	0.002146			
Residual	14	160011.8694	11429.42					
Total	15	320885.7461						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	152.6152574	71.83346456	2.12457	0.051915	-1.4522	306.6827	-1.4522	306.6827
X Variable	21.75220588	5.797925401	3.751722	0.002146	9.316893	34.18752	9.316893	34.18752
Trend	21.75							
L0	152.62							

The grouping of unit sold is by 21-day basis and is performed by python, shown in the submission and below as well.

```

1 total_unit = []
2 count = 0
3 total = 0
4 for i in range(len(df["Date"])):
5     if count < 21 and i < len(df["Date"])-1:
6         total = total + df["Units_Sold"][i]
7         count = count + 1
8     elif count == 21 and i < len(df["Date"])-1:
9         total_unit.append(total)
10        count = 0
11        total = 0
12        total = total + df["Units_Sold"][i]
13        count = count + 1
14    else:
15        total_unit.append(total)

```

3. How many shirts should be ordered from Ukraine for the upcoming LEC?

According to the forecast, 682 shirts should be ordered from Ukraine for the upcoming LEC for the next 21-day period.

4. Summarize your approach to the “outsourcing” business model; basically, summarize your analyses from the outsourcing section. Comment on the roadmap (what to do), forecasting (how to use data), and optimization (how to find the best decision).

From the regression result, the trend is positive, indicating the business is growing: the trend of 21.75 means every 21 days, there will be an increment of around 22 units sold. For the next 21-day period, it will enter the “Summer” phase. This means that we will change the seasonal factor to 1.119, which the summer season will boost the de-seasonalized prediction by a little. Company should prepare 682 shirts for this season.

Part 2: Near-sourcing business model (25 points)

The higher-level question is: How much benefit can Veizenburg obtain by sourcing from the local production facility? To determine that, complete the following.

5. How should Veizenburg optimally use the local production facility for the upcoming LEC? Contrast the result with that of the outsourcing business model.

Since we do not have the current amount of LEC ordered, the degree of over-stocking cannot be determined. Hence, we will only find the limit between scenarios where only outsourcing is more beneficial, or the introduction of local production will lower the cost.

Inputs		
Anticipate demand		386
Standard deviation		194
Unit costs		\$65
Sales price		\$135
Disposal value		\$0
Inventory holding costs		\$0
Salvage value		\$0
Cost of understocking		\$70
Cost of overstocking		\$65
Outputs		
Optimal cycle service level		0.5185
Optimal lot size		395.01
Expected profits		\$16,583
Expected overstock		81.98
Expected understock		72.97

The above table is the summary of all the information we have got right now. The mean and standard deviation is obtained from the data we were given. The salvage value is considered to be 0 because according to the case study, they will not adopt "Buy 2 Get 1 Free" promotion as it may corrupt brand image. Therefore, the overstocked product will have 0 salvage value. Based on these data we can calculate the optimal lot size of 395, which is much lower than our predicted value due to the risk brought by low salvage value.

Therefore, a better strategy is to buy the forecasted amount from Ukraine in advance and order the missing product from the local factory to reduce the loss brought by overstocking. This is because ordering from local production facilities will result in a \$30 loss in profit, where as overstocking will cause a \$65 loss each unit. Since the local factory could provide next-day delivery, the supply could be promised. Any amount over 682 unit will only cause a \$30 loss in profit, which is still acceptable.

Part 3: Flexibility business model (15 points)

The higher-level question is: How valuable is this alternative to Veizenburg's firm? To determine that, focus on the flexibility alternative alone (i.e., not on flexibility and near-sourcing combined):

6. **"Roadmap": Describe, in nontechnical language, how the flexibility changes Veizenburg's approach to managing the LEC supply and ordering strategy. Comment also on how your approach to forecasting will need to change in order to evaluate this alternative. (No need to calculate for this part)**

The flexibility of factories of Ukraine being able to provide 1000 units per week at the same \$65 price means that the need for overstocking lowers by a great extent. Therefore, the strategy could be changed to order the optimal lot size (394) in the first week, and the difference between forecast demand (682) and optimal lot size (394), which is 288 units, could be ordered in two batches in the next 2 weeks according to the react of the market to reduce the loss from overstocking. There is no need to stock a lot at the beginning stage as the price for latter order remains the same.

Part 4: General Questions (10 points)

7. **Briefly describe how you would ideally evaluate the benefits of near-sourcing and flexibility options? (5-6 sentences)**

Near-sourcing:

- Higher flexibility, could handle emergency situation such as Black Friday, where the inventory could be emptied in one day. By sacrificing part of the profit, the company could lower the inventory even further according to the forecast. If there is inventory holding cost, then it will be more beneficial.

Flexibility option:

- Once-a-week frequency could promise the adequacy of the inventory to some extent, with a much lower cost compared to the near-sourcing option. Veizenburg's firm can even only order the minimum amount (optimal lot size) and add more orders in the later weeks. The only problem is that it cannot be as responsive as near-sourcing approach.