Final Case Study

Instructions

* ***You must submit your excel document including all of your calculations and analysis as a separate document along with your final report.***

**Description**

Case studies are used to enable you to apply new concepts, use the tools you have mastered, and improve your technical skills you have attained. Through the individual case studies, you will discover for yourself the usefulness of quantitative problem-solving methods, how to apply them in practice, and their benefit to organizational decision-makers.

In this case study, you will act as a consultant for a company that crushes Olives to produce high quality refined Olive oil for sale in the wholesale market. The company is looking for you to make a recommendation on the optimal blend of raw materials required for its next production cycle. You will use decision analysis tools including time series forecasting, linear programming, and cost-profit-volume analysis to make the recommendation and provide analysis on the profitability of the company.

You will be required to submit a written report to management, and to include the spreadsheet models you used to generate price forecasts, optimize the raw material, and a perform the break-even analysis. All analysis should be done using Excel and the various models should be implemented on separate worksheets or in separate workbooks.

**Scenario**

Double Olive Oil. Ltd. is a producer of high-quality Olive oil. The company buys raw Olives directly from large agricultural companies and refines them into Olive oil that it sells in the wholesale market.

The company has a maximum input capacity of 180 short tons of raw Olives every day. The company cannot run at full capacity every day as it is required to shut down or reduce capacity for maintenance periods every year, and it experiences the occasional mechanical problem. The facility is expected to run at 90% capacity over the year (or on average 180 x 90% = 162 short tons per day).

Double Olive Oil is planning to purchase its supply of raw Olives from three primary growers, Supplier A, Supplier B, and Supplier C. Purchase prices will not set until the orders are placed so Double Olive Oil will have to forecast purchase prices for the raw material and sales prices for the refined Olive oil. The contract is written such that Double Olive Oil is only required to commit to 80% of total capacity up front. Any amounts over that can be purchased only as required for the same price. Historical prices for the last 15 years are in the table below (note that year 15 is the most current year).

|  |  |  |
| --- | --- | --- |
| Marketing Year | Olive  Average Price Index  $/short ton | Oil  Average Price Index  $/short ton |
| 1 | 163.7 | 287.8 |
| 2 | 172.4 | 455 |
| 3 | 212 | 642.2 |
| 4 | 220 | 634.2 |
| 5 | 254 | 761.3 |
| 6 | 222 | 702 |
| 7 | 260 | 911 |
| 8 | 337.2 | 1013 |
| 9 | 416 | 1267.3 |
| 10 | 442.8 | 1302 |
| 11 | 451 | 1376 |
| 12 | 472 | 1634 |
| 13 | 479 | 1307.4 |
| 14 | 480 | 1142.4 |
| 15 | 488 | 1304.4 |

Olive oil contains a number of fatty acids, some which are desirable in food products and others that are not. One desirable fatty acid is oleic acid. Double Olive Oil produces high oleic oil for the wholesale market and requires that the oleic acid content be a minimum of 77%. Olive oil also contains trace amounts of iodine. The market requires that that iodine content be a minimum of 0.78% and maximum of 0.88%

The oleic acid and iodine content for the Olives from the three suppliers is given in the table below.

|  |  |  |
| --- | --- | --- |
| Supplier | Oleic Acid | Iodine |
| A | 74% | 0.85% |
| B | 73% | 0.73% |
| C | 79% | 0.92% |

Because the oleic acid and iodine content varies across the three suppliers, so does the price.  It is expected that the cost of supply from the suppliers will be a percentage of the market average price of Olives.

|  |  |
| --- | --- |
| Supplier | Cost as % of Average Market Price of Olive |
| A | 73% |
| B | 80% |
| C | 82% |

The company faces an additional variable production cost of $5/short ton and an estimated fixed cost of $850,000 over the upcoming production period.

The company can later sell the crushed olives (after oil extraction) to livestock industry at 20% of the average market price of olive.

The company is asking you to provide a recommendation on the amount of raw material it should purchase from each supplier to minimize its cost of feedstock.

Management is also looking for an analysis on the profitability of the company in the next production cycle.

**Suggested Approach**

This is a complex problem. The following approach is suggested:

* Use the historical price data set as input to a time series forecast model to generate forecasted prices for the average price of Olives and oil in the next production period. Use standard measures of error to decide between a three-period moving average model or an exponential smoothing model (with α = 0.25).
* Formulate a linear program to minimize the cost of raw Olives.  Use the average price of Olives forecasted from the previous step to determine supplier prices.
* Perform a cost-volume-price analysis (review the handout entitled [Cost-Volume-Profit Analysis](https://courses.yorkvilleu.ca/iSpring/BBA/BUSI_2013/Resources/Cost-Volume-Profit%20Analysis.pdf) for details) using the average cost per short ton average selling price per short ton.
  + You can generate an effective cost per short ton by dividing the total cost of supply (from the linear program) by the total volume (that you assumed in the linear program).
  + You can generate an effective selling price per short ton from the expected percentage yields and the forecasted average price of Olive oil.
  + Because of the way that the contract is written, you can assume that the purchase of raw Olives is a variable cost (you only purchase what you require).

Recall that the cost-volume-price analysis requires you to provide

* an algebraic statement of the revenue function and the cost function, and
* a break-even analysis or chart determining the break-even point

**Management Report**

Prepare a written management report/presentation that includes, at a minimum, the following sections:

* Purpose of the Report
* Description of the Problem
* Methodology (which would include the model formulation)
* Findings or Results
* Recommendations or Conclusions

Be sure to address all relevant points, discuss any assumptions you are making, justify any modeling choices you have made (for example, the choice of time series forecast model), and highlight the following items in your report:

* a forecast of the next production period’s average price index for raw Olives and Olive oil.
* a recommendation for the optimal purchasing strategy from the various suppliers,
* a cost-volume-profit analysis using for the recommended purchase strategy and the forecasted Olive oil sales price,
* a discussion of the risks and uncertainties that are faced by the company, and
* an analysis and opinion on the profitability of the company in the next production period (accounting for the expected profit or loss and the inherent risks/uncertainties.

Remember that you are writing the report from the point of view of a consultant with senior management of Double Olive Oil. Ltd. as the intended audience. (This is not for general public!)

Rubric:

55% analysis:

15% time series analysis.

25% linear programming.

15% cost-volume-profit analysis.

45% report:

15% consistency and homogeneity of the report including introduction and conclusion.

15% error free and correct choice of vocabulary.

15% brief, well developed arguments with proper reference to the resources used in APA format.