MBA6010

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Curry in a Hurry

Quantitative Analysis for Managers - Final Project

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# **Overview**

Curry in a Hurry is a local Indian restaurant in BG in its 3rd year of business. In this project, we solve various problems that are essential to run this business. They are:

1. Optimizing raw material purchasing to minimize cost.
2. Project management to better schedule our tasks for preparing the products we offer.
3. Profit maximization.
4. Forecasting future profits.
5. Creating an investment portfolio to invest the yearly profits.

# **Executive Summary**

1. Minimizing total cost of ingredients

We take the following data points in consideration to determine optimal total cost:

* Minimum amounts required of the different products we offer;
* Total ingredients required to produce that number of products;
* Cost of the ingredients;

The optimal total cost is **$1498.465 on a weekly basis.**

1. Optimizing Profit.

* The amounts of the minimized total cost data from the first sheet and the results from the fifth sheet (project management) form the basis for this calculation;
* Ingredients and wages for staff were used to determine total cost;
* After determining total cost, profit is calculated by a 16% markup;
* We assume 30 days and 4 weeks (per month) of production for this problem.

The optimal profit is **$1112.7512 on a weekly basis**

1. Forecasting

* Based on the data of the previous two years a monthly average was determined
* The trend was used to forecast our profits for 2020

Our predicted profit for 2020 is **$50595.61.**

|  |  |  |
| --- | --- | --- |
| Profit 2018 | Profit 2019 | Predicted profit for 2020 |
| $52051.75 | $51323.68 | **$50595.61** |

1. Investments

* We found the best stocks to investment our profits in, considering return, risk and diversification.

The total return on the stocks over the last year was **$4892.87** and this year is **$4824.43.**

1. Project Management

* This spreadsheet shows the calculation of the optimal production line regarding the time required to perform all the tasks necessary.

The optimal production line (or the critical path) is Boiling, Mashing, Mixing, Making Curry and Garnishing. These tasks have no slack in respect to their starting time for the optimal production line. Cutting, Making Rice and Roasting have some slack.

The optimal production line will take **11 Hours of work a day** to complete all the tasks.

# **Methodology**

Our group decided to use multiple methods to achieve statistical information regarding the business.

1. Linear Programming

Linear programming is a mathematical way to maximize or minimize the functions of the variables. We chose to use ingredient constraints to determine what we can make using limited resources and the amount. The result of the outputs for these product amounts will be the input for our profit maximization.

1. Profit Maximization

Profit Maximization is a set of techniques that help management determine the best way to coordinate the numerous tasks. The purpose of profit maximization for us was to solve for the prices instead for number of the products. The output of profit maximization will help forecast for the 3rd year’s profits. Moreover, it determines how much profit we made in a year to invest in stocks.

1. Forecasting

Forecasting is the process of making predictions for the future based on past and present data. We created dummy data of monthly profits for the first 2 years in order to forecast profits of the 3rd year of business.

1. Investments profits in stocks

The purpose for determining investment is to determine which would be the best for investing in stocks to make money.

1. Project Management

Project Management is important for us to be able to optimize the time, since; multiple steps are involved in making the products served in the restaurant.

# **Detailed Problem Statement**

In this project we are:

1. Calculating the costs incurred for running this business. The total costs include the cost for paying wages to the employees and cost for purchasing raw materials.
2. To calculate the wages of the employees we are using project management to optimize their production times.
3. We are maximizing profits for each month.
4. Using those monthly profits, we are forecasting profits for the upcoming year. Using the monthly profits, we also calculate yearly profits for the years we have been in business.
5. We also plan to invest these yearly profits in stocks.

The following sections explain each of the individual optimizations we have done.

1. Constraint Satisfaction for the ingredients.

The ingredients sheet in our excel document deals with the constraint satisfaction problem for the ingredients for our dishes.

We used the Solver in MS Excel to optimize (minimize) our costs for raw materials needed. It calculates the quantity of raw materials needed to satisfy our minimum product requirements. Once, we have the quantities of each ingredient, we calculate the total cost of purchasing the raw material on a weekly basis.

1. Project Management

Project management optimizes the time required for the various steps involved in making the products that are serve in the restaurant. It also highlights the critical path. Critical path is the path that consists of steps that have no slack; they are critical to complete everything in the allotted time.

1. Profit maximization

Profit maximization optimizes our profits based on the total costs on a weekly basis. Total costs consists of cost for purchasing the raw material and cost of paying the wages to the employees. We calculate monthly profit from these weekly profits.

1. Forecasting

Mantek created a C++ code to randomize monthly profits for the time span of 2 years. The code randomly adds profits in the range of -5% (loss of 5%) to 5% to the previous month’s profit. This 2-year dummy data helps us predict the monthly profits for the 3rd year of business.

1. Investing yearly profits in stocks

We invest the yearly profits calculated while forecasting (year 2018 and 2019) in stocks. We try to optimize our investment portfolio by considering return and risk or various stocks. We also try to diversify our portfolio to minimize our overall risks.

# **Results**

Ingredient Constraints:

* The optimal mix of ingredient for onions, tomatoes, ginger & garlic, chicken, lamb, rice, potatoes, and peas is 90.6, 49.4, 79.3, 100, 80, 46, 36.1, and 12.7 pounds purchased per week, respectively.
* In order to minimize the cost incurred for producing food, the company needed to determine the optimal number of dishes to prepare each week. Curry in a Hurry offers a variety of traditional dishes which include Samosa, Veggie Cutlet, Chicken Kabab, Chicken Curry, Lamb Curry, Chicken Biryani, Lamb Biryani, and Veggie Biryani. The optimal mix of these dishes to produce each week is 25, 15, 25, 50, 40, 30, 40, and 22 pounds respectively. This optimal production mix grants the company a weekly minimized cost of $1498.465 per week.

Profit Maximization

* By marking up the total costs incurred to produce each dish by 16% we were able to determine the weekly sales revenue earned by each dish:
  + Samosa- $709.05
  + Veggie Cutlet- $418.035
  + Chicken Kabab- $794.02
  + Chicken Curry- $1649.52
  + Lamb Curry- $1418.912
  + Chicken Biryani- $1013.724
  + Lamb Biryani- $1444.432
  + Veggie Biryani- $619.753
* Summing the total revenue earned from the sale of all dishes and subtracting the total cost of each dish gives the company a weekly net profit of $1112.75.

Forecasting

* Using the maximized weekly profit found in the Profit Maximization sheet, we estimate the total earnings for 2018 to be $52,051.75.
* Using the same forecasting formula for 2019 we estimated the total earnings to be $51,323.68.
* By using the rate of growth (or rather, the lack thereof) between 2018 and 2019 and adding it to the 2019 earnings we estimate the total earnings for 2020 to be $50,595.61.

Investments

* The company wishes to further increase its total wealth by investing the money earned from general business operations in the stock market. With the total amount of investable income of $52,051.75 for 2018 we found the best way to invest those earnings while still meeting the stipulations set by the business owners was to invest $10,410.35 in Stock 1, $15,651.53 in Stock 2, $13,012.94 in Stock 3, $13,012.94 in Stock 4, and $0 in Stock 5.
  + The invested amounts in 2018 would earn a total return of $4892.87 for a percent return of 9.4%.
* With the total amount of investable income of $52,051.75 for 2018 we found the best way to invest those earnings while still meeting the stipulations set by the business owners was to invest $10,264.74 in Stock 1, $15,397.10 in Stock 2, $12,830.92 in Stock 3, $12,830.92 in Stock 4, and $0 in Stock 5.
  + The invested amounts in 2019 would earn a total return of $4824.43 for a percent return of 9.4%.

Project Management

* Critical path is Boiling, Mashing, Mixing, Making Curry, and Garnishing.
  + This means that when employees are performing these production tasks in order to prepare meals for the week there is no slack time and all tasks must be completed as scheduled
  + This line of tasks will take 11 hours of work that day to complete.
* The task with the most slack time is Making Rice, which has a slack time of 5 hours.
  + The only other tasks with any slack time are Cutting and Roasting, but even these tasks only have sack time of one hour.
  + This means the business should always be running at high efficiency and the company must find hard-working and honest employees that can perform these tasks as needed.