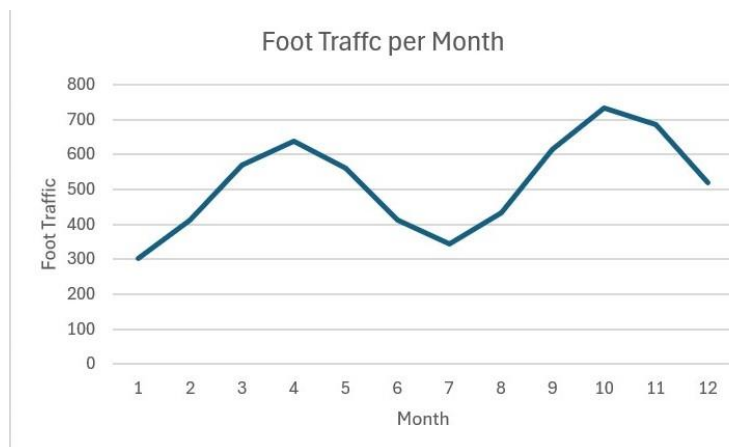


Module 08 – Scheduling Problem

Exploratory Data Analysis

In this section, you should perform some data analysis on the data provided to you. Please format your findings in a visually pleasing way and please be sure to include these cuts:

- *Make a table (similar to the textbook example) showing the temporary agency data*
- *Run summary statistics on the sample of Full-Time employee salaries. Record the Mean to use in our model*
- *Make a line graph showing foot traffic over the next 12 months. Call out any seasonality or trend you may see.*



The foot traffic data shows a clear seasonal trend, peaking around the 4th and 11th months, likely to reflect higher traffic in spring and late fall, with a noticeable dip in midsummer.

Model Formulation

Write the formulation of the model into here prior to implementing it in your Excel model. Be explicit with the definition of the decision variables, objective function, and constraints.

MIN: $27,366X_1 + 37,236X_2 + 23,226X_3 + 42,081X_4 + 30,279X_5 + 35,421X_6$

Constraints:

Month 1: $0X_1 + 0X_2 + 0X_3 + 0X_4 + 0X_5 + 1X_6 + 1X_7 = 302$

Month 2: $0X_1 + 0X_2 + 0X_3 + 1X_4 + 0X_5 + 1X_6 + 1X_7 = 413$

Month 3: $0X_1 + 0X_2 + 0X_3 + 1X_4 + 0X_5 + 0X_6 + 1X_7 = 570$

Month 4: $0X_1 + 0X_2 + 0X_3 + 1X_4 + 0X_5 + 0X_6 + 1X_7 = 638$

Month 5: $0X_1 + 0X_2 + 1X_3 + 0X_4 + 0X_5 + 0X_6 + 1X_7 = 560$

Month 6: $0X_1 + 0X_2 + 1X_3 + 0X_4 + 0X_5 + 0X_6 + 1X_7 = 413$

Month 7: $0X_1 + 0X_2 + 0X_3 + 0X_4 + 1X_5 + 0X_6 + 1X_7 = 344$

Month 8: $0X_1 + 0X_2 + 0X_3 + 0X_4 + 1X_5 + 0X_6 + 1X_7 = 434$

Month 9: $0X_1 + 0X_2 + 0X_3 + 0X_4 + 1X_5 + 0X_6 + 1X_7 = 616$

Month 10: $1X_1 + 1X_2 + 0X_3 + 0X_4 + 0X_5 + 0X_6 + 1X_7 = 735$

Month 11: $1X_1 + 1X_2 + 0X_3 + 0X_4 + 0X_5 + 0X_6 + 1X_7 = 687$

Month 12: $0X_1 + 1X_2 + 0X_3 + 0X_4 + 0X_5 + 1X_6 + 1X_7 = 521$

Model Optimized for Min Costs to Cover Store Foot Traffic

Implement your formulation into Excel and be sure to make it neat. This section should include:

- A screenshot of your optimized final model (formatted nicely, of course)
- A text explanation of what your model is recommending

Agency	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Workers Schedule	Wages per Worker
FizzPop Factory	0	0	0	0	0	0	0	0	0	1	1	0	175	\$ 27,366.00
Whisker Licks	0	0	0	0	0	0	0	0	0	1	1	1	0	\$ 37,236.00
Magic Munchies	0	0	0	0	1	1	0	0	0	0	0	0	0	\$ 23,336.00
Snap & Crackle Sweets	0	1	1	1	0	0	0	0	0	0	0	0	78	\$ 42,081.00
Caramel Carousel	0	0	0	0	0	0	1	1	1	0	0	0	56	\$ 30,279.00
Gumdrop Grotto	1	1	0	0	0	0	0	0	0	0	0	1	0	\$ 35,421.00
Full Time	1	1	1	1	1	1	1	1	1	1	1	1	560	\$ 112,751.97
Available	560	638	638	638	560	560	616	616	616	735	735	560		
Required	302	413	570	638	560	413	344	434	616	735	687	521	Total	\$72,908,092.80

The model recommends using a combination of full-time and agency workers to meet monthly staffing needs while minimizing costs, resulting in a total wage expense of \$72,908,092.80.

Model with Stipulation

Please copy the tab of your original model before continuing with the next part to avoid messing up your original solution.

Please do both of the following:

1. Unfortunately, leadership wishes to have a reduction in workforce. While the monthly salary for full time employees is cheaper than temporary workers, there are other costs associated with full time employees that they wish to cut. Add a constraint to your model that takes your first model's recommended number of full-time employees and constrains it to be only 80% of it. Add a text explanation of the change in the optimal value as well as any other changes noticed between the models.

Workers Schedule	Wages per Worker
175	\$ 27,366.00
0	\$ 37,236.00
0	\$ 23,336.00
78	\$ 42,081.00
56	\$ 30,279.00
0	\$ 35,421.00
560	\$ 112,751.97
Total	\$72,908,092.80

Original

Workers Schedule	Wages per Worker
175	\$ 21,892.80
0	\$ 29,788.80
0	\$ 18,668.80
78	\$ 33,664.80
56	\$ 24,223.20
0	\$ 28,336.80
560	\$ 90,201.57
Total	\$58,326,474.24

80% Stipulation

Based off this stipulation, the total decreased roughly by 14.5 million.

2. *Alternatively, leadership would like to see what the average monthly salary for an employee would need to be to cut out all temporary workers as they believe that will help negate excess spending. Convert your model (or do the math out yourself) to figure out what monthly salary you would need to pay your full-time employees to only have full-time workers at the same optimal cost as the original model.*

Taking costs of 72,908,092.80 and dividing it by how many full-time employees [560] and then multiplying that by months [12]: $72,908,092.80 / 560 * 12 = 10,850$ for every full-time employee.

3. *Considering trends and seasonality of this business, what would you recommend leadership to do? Feel free to play with the model and recommend something else.*

Given the seasonal trends, leadership should plan for higher inventory and staffing in peak months while reducing costs in slower periods to optimize profitability and efficiency. Also hiring more temporary workers during busy months is better than cutting full-time workers' pay down.