

A Study on Performance Measurement of Restaurants Revenue Management From the Perspectives of Revenue, Profit, and Labor Productivity

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Abstract

Despite the large volume of research on hotel revenue management, not much research has been conducted on restaurant revenue management, especially in Japan. In addition, RevPASH (revenue per available seat hour) has been presented in a small number of previous studies on restaurant revenue management performance indexes. Recently, ProPASH (profit per available seat hour) has been presented as a new metric by Heo (2017).

The present study compares RevPASH and ProPASH using simulation data and discusses the two methods from the perspectives of revenue, profit, and labor productivity. The purpose of this study is not to evaluate the performance indexes presented so far, but to clarify the differences in their purpose and usage.

Keywords

ProPASH, RevPASH, Restaurant Revenue (Yield) Management, Hospitality Industry, Hospitality Management

1. Introduction

As indicated by Heo (2017), in terms of restaurant revenue management performance indexes, only RevPASH (revenue per available seat hour; and RevPASM [revenue per available square meter]) has been introduced so far, by Kimes et al. (1998) and Kimes (1999). However, Heo (2017) presented ProPASH (profit per available seat hour; and ProPASM [profit per available square meter]) as a new metric for restaurant revenue management.

This study compares RevPASH and ProPASH as performance indicators for revenue management in restaurants, using simulation data based on previous research. RevPASH focuses on revenue, while ProPASH is a performance indicator that focuses on profit.

Both performance indicators are found to be valid for the management of restaurants. Management that effectively combines both of these indicators is considered necessary.

2. Literature Review

2.1. Restaurant Revenue Management

Regarding revenue management in restaurants, “Kimes et al. (1998) and Kimes (1999) were among the first to directly address the issue of restaurant revenue management (RRM),” as stated by Heo (2017). As also mentioned by Heo (2017), Kimes et al. (1998), Kimes (1999), and others proposed RevPASH as a revenue-focused performance measure.

However, Heo (2017) proposed PropASH and PropASM, which focus on profit.

2.2 Revenue-Focused Restaurant Revenue Management Metric

As regards revenue-focused restaurant revenue management metrics, Yoshioka (2013) showed the computational structure of RevPASH based on Kimes (2009), Rouse et al. (2010), Aoki (2006), The Hotel Association of New York City (2006), Thompson and Sohn (2009), and Kimes and Thompson (2004). This structure is as follows:

$$\begin{aligned}
 \text{RevPASH} &= \frac{\text{Restaurant revenue}}{\text{Number of guests}} * \frac{\text{Number of guests}}{\text{Number of available seats}} * \frac{1}{\text{Operating hours}} \\
 &= \underbrace{\frac{\text{Restaurant revenue}}{\text{Number of guests}}}_{\text{Average amount paid per customer}} * \underbrace{\frac{\text{Number of guests}}{\text{Number of available seats}}}_{\text{Seat turnover}} \\
 &= \frac{\text{Restaurant revenue}}{\text{Number of available seats}} * \frac{1}{\text{Operating hours}} \\
 &= \underbrace{\frac{\text{Restaurant revenue}}{\text{Number of available seats}}}_{\text{Revenue per available seat}} * \frac{1}{\text{Operating hours}}
 \end{aligned}$$

RevPASH is also discussed by Yoshioka (2013), based on Thompson and Sohn (2009) and Kimes and Thompson (2004), as follows:

‘Revenue per available seat hour’ (how much revenue could be earned from a single seat per hour, for example), [is] calculated as the product of the occupancy rate per unit of time (seat occupancy) and the average amount paid per customer, or as the result of dividing the total revenue (food and beverage sales) by the number of available seats per unit of time.

As mentioned above, RevPASH is calculated as the product of the average amount paid per customer and seat occupancy. It is necessary to take seat occupancy into account because the seats are used multiple times during business hours. Seat occupancy is calculated using the formula below.

$$\text{Seat occupancy} = \frac{\text{Number of utilized seats}}{\text{Number of seats available}} / \text{Operating hours.}$$

Here, “operating hours” here do not necessarily have to be literal “hours” and can be adapted to the unit of time used in the analysis. For example, if one wants to analyze seat occupancy in 15-minute

increments or “revenue per available seat hour,” one can use the value of “operating hours” multiplied by 4 (1 hour / 15 minutes).

2.3. Profit-Focused Restaurant Revenue Management Metric

For profit-focused restaurant revenue management, Heo (2017) is a pioneering study. Heo (2017) mentions, “there has been little discussion on how to measure the performance of RM¹ strategies as they apply to restaurants, except Revenue per Available Seat Hour (RevPASH)”.

Further, “RevPASH is an effective and reliable indicator of a restaurant’s performance; however, this metric may not provide the whole picture of a restaurant’s business performance” (Heo, 2017). Moreover, “in restaurants, the contribution margin of each menu item is different and it should be taken into consideration when evaluating restaurants’ performance, because the goal of RRM² is to maximize not just revenue but - in the end - profit” (Heo, 2017).

Then, Heo (2017) proposes ProPASH and ProPASM as new metrics³. ProPASH and ProPASM are calculated as follows:

$$\begin{aligned} \text{ProPASH} &= \frac{\Sigma (\text{MP} - \text{FC})}{\text{Total number of available seats}} \\ \text{(Profit per available seat hour)} & \\ \\ \text{ProPASM} &= \frac{\Sigma (\text{MP} - \text{FC})}{\text{Total available space in square meters}} \\ \text{(Profit per available square meter)} & \end{aligned}$$

* MP: menu price, FC: food cost.

Heo (2017) also discussed the effectiveness of ProPASH by simulating data for a single restaurant and calculating RevPASH and ProPASH per hour for two days using menu data (prices, food cost, number of sales, etc.) in that restaurant.

2.4. Consideration of Reviews of Previous Studies

For ProPASH as introduced by Heo (2017), if one applies the decomposition of the formula by Yoshioka (2013) mentioned above, one obtains the following equation:

$$\begin{aligned} \text{ProPASH} &= \frac{\text{Contribution margin}}{\text{Number of guests}} * \underbrace{\frac{\text{Number of guests}}{\text{Number of available seats}}}_{\text{Seat turnover}} * \frac{1}{\text{Operating hours}} \\ &= \text{Average contribution margin per customer} * \text{Seat occupancy} \\ &= \underbrace{\frac{\text{Contribution margin}}{\text{Number of available seats}}}_{\text{Contribution margin per available seat}} * \frac{1}{\text{Operating hours}} \end{aligned}$$

In the aforementioned studies, RevPASH, ProPASH, and ProPASM have been identified as the indexes for restaurant revenue management. The purpose and use of these indexes need to be clarified because each indicator is considered to have an appropriate purpose and use.

Therefore, the present study attempts to clarify this issue through simulations based on the simulation in Heo (2017) and using costs other than food cost in restaurant management.

3. Data Collection

In this study, the simulation data found in the literature review were used. Due to the difficulty of receiving actual data disclosure from restaurants, the author has chosen to use simulations. In the simulation conducted by Heo (2017), food cost is used. However, in this study, labor cost is also used in the simulation data.

3.1. Food Cost

Brown (2003) used Table 1 for a study on the percentage of food sales and the percentage of food cost, for full-service and fast-service restaurants.

Table 1 2002 Restaurant Food Sales and Costs Survey

Type of Restaurant	Food Sales	Food Cost
Full-service	70-75%	26-40%
Fast-service	90-95%	25-35%

Source: Brown (2003, p.10).

Arduser (2003) also uses Table 2 as a sample of food items.

Table 2 Sample of food items

Item	Popularity*	Cost	Menu Price	Profit Margin	Cost of Food ⁴
Hamburger Plate	36/100	\$0.62	\$5.50	\$4.88	11.3%
Spaghetti Carbonara	15/100	\$1.79	\$6.25	\$4.46	28.6%
Seafood Combo Plate	49/100	\$3.40	\$10.95	\$7.55	31.1%

* 36/100 means 36 hamburger plates were sold out of a total of 100 entrees served in that time period.

Source: Arduser (2003, p. 68) (modified).

Furthermore, Heo (2017) uses Table 3 as a sample menu.

Table 3 *Menu (in a restaurant with 100 seats)*

Menu Item	MP	FC	CM (\$)	CM (%)
Salad	\$15	\$3	\$12	80%
Soup	\$10	\$5	\$5	50%
Grilled Beef	\$35	\$15	\$20	57%
Chicken Pasta	\$25	\$8	\$17	68%
French Crepe	\$10	\$3	\$7	70%
Ice Cream	\$10	\$5	\$5	50%
Coffee	\$5	\$1	\$4	80%
Average	\$15.7	\$5.7	\$10.0	65%

Note: MP: menu price; FP: food cost; CM: contribution margin.
Source: Heo (2017, p.2)

3.2. Labor Cost

In the management of a restaurant, emphasis is placed on labor costs. One example is the FL Cost Ratio (Ratio of Food and Labor Cost) index. Regarding the FL cost ratio, Kao Professional Services⁵ states that "FL cost is the sum of food and labor costs, and FL ratio is the ratio of FL cost to the sales of a restaurant." Thus, the FL ratio can be calculated as "FL ratio = (food cost + labor cost) / sales."

The webpage also advocates that "the FL ratio should always be less than 60%" and the breakdown should be "Food 35% + Labor 25%."

3.3. Parameter Values

Therefore, in this study, the author uses the values in Tables 2 and 3 for the cost of ingredients and assumes that 25% of the revenue is used for labor costs. For the number of sales of each item, a random value is used. However, to clarify the difference between RevPASH and ProPASH, the number of sales was set to be constant, at \$4,500 per hour of revenue.

The data used are shown in Tables 4-6. Note that the restaurant is assumed to be able to seat 100 people.

Table 4 *Simulation parameters (menu prices, food costs, and contribution margins)*

Menu Item	Menu Price	Food Cost	Contribution Margin (\$)	Contribution Margin (%)
Salad	\$15	\$3	\$12	80.00%
Soup	\$10	\$5	\$5	50.00%
Grilled Beef	\$35	\$15	\$20	57.00%
Chicken Pasta	\$25	\$8	\$17	68.00%
Hamburger Plate	\$6	\$1	\$5	83.33%
Spaghetti Carbonara	\$7	\$2	\$5	71.43%
Seafood Combo Plate	\$11	\$4	\$7	63.64%
French Crepe	\$10	\$3	\$7	70.00%
Ice Cream	\$10	\$5	\$5	50.00%
Coffee	\$5	\$1	\$4	80.00%

Source: Heo (2017) and Arduser (2003) (modified).

Table 5 Simulation data (number of sales, revenue, and contributed margins)

Menu Items	Number Sold			Revenue			Contribution Margin (\$)		
	6pm~	7pm~	8pm~	6pm~	7pm~	8pm~	6pm~	7pm~	8pm~
Salad	90	50	20	\$1,350	\$750	\$300	\$1,080	\$600	\$240
Soup	30	35	55	\$300	\$350	\$550	\$150	\$175	\$275
Grilled Beef	10	20	50	\$350	\$700	\$1,750	\$200	\$400	\$1,000
Chicken Pasta	25	20	15	\$625	\$500	\$375	\$425	\$340	\$255
Hamburger Plate	30	30	5	\$180	\$180	\$30	\$150	\$150	\$25
Spaghetti Carbonara	20	10	20	\$140	\$70	\$140	\$100	\$50	\$100
Seafood Combo Plate	15	20	10	\$165	\$220	\$110	\$105	\$140	\$70
French Crepe	50	60	50	\$500	\$600	\$500	\$350	\$420	\$350
Ice Cream	44	68	45	\$440	\$680	\$450	\$220	\$340	\$225
Coffee	90	90	59	\$450	\$450	\$295	\$360	\$360	\$236
Total	-	-	-	\$4,500	\$4,500	\$4,500	\$3,140	\$2,975	\$2,776

	6pm~	7pm~	8pm~
Labor Cost	\$1,125	\$1,125	\$1,125
Revenue - FL Cost	\$2,015	\$1,850	\$1,651

Source: Author

Table 6 Simulation results (RevPASH, ProPASH, and FL cost ratio)

RevPASH			ProPASH			(Revenue - FL Cost) / Available Seats		
6pm~	7pm~	8pm~	6pm~	7pm~	8pm~	6pm~	7pm~	8pm~
\$45.00	\$45.00	\$45.00	\$31.40	\$29.75	\$27.76	\$20.15	\$18.50	\$16.51

Source: Author

4. Discussion

4.1. The usefulness of RevPASH

Revenue is generally considered as representing the size of the business. RevPASH is the metric based on revenue, and it is constant at \$45.00 per hour, as shown in Table 6.

However, according to Table 5, the number of sales per menu item is different in each time period. This means that RevPASH does not reflect what items were sold, and more importantly, how many profitable items were sold.

As the title of this paper suggests, revenue management is a business management technique that focuses on revenue. Therefore, as mentioned earlier, RevPASH can be a useful indicator for managing total revenue, which reflects the size of the business, to increase revenue.

4.2. The usefulness of ProPASH

ProPASH, on the other hand, is the metric that focuses on profit. Many companies cite the pursuit of profit as one of their objectives. Further, each menu item exhibits a different food cost percentage of the

menu price and a different contribution margin percentage.

Taking this point into account, ProPASH is a metric based on contributory profit. In other words, ProPASH can be an effective metric for increasing profits⁶.

Furthermore, as mentioned above, the FL cost ratio is important for the management of a restaurant. Table 6 shows the values of ProPASH and $(\text{Revenue} - \text{FL Cost}) / \text{Available Seats}$. Naturally, these two indexes vary with the difference in contribution profit. In other words, ProPASH can be a management indicator for companies that focus on the FL cost ratio in their restaurant management.

4.3. Relationships with labor productivity

Stewart and Johns (1996, p.20) state, "Productivity may broadly be defined as the ratio of output to input." Productivity is generally calculated using the formulas below.

$$\begin{aligned} \text{Labor productivity per person} &= \frac{\text{Value Added}}{\text{Number of Laborers}} \\ \text{and/or} \\ \text{Labor productivity per labor hour} &= \frac{\text{Value Added}}{\text{Number of Labor Hours}} \end{aligned}$$

According to Mizuno (2019, p.8) and Kajiura (2016, p.64), it is clear that Value Added contains some values added by companies. Moreover, according to Kajiura (2016, p.59), Value Added is measured simply as "Revenue - Pre-payment cost (or prior benefit costs)."

The contribution margin (\$) in the simulation data in Table 5 can be considered almost identical to the Value Added in the labor productivity formula. In this simulation, ProPASH can be used as an indicator of labor productivity in the restaurant business.

An improvement of ProPASH is considered to be related to an improvement in labor productivity. Reducing the proportion of pre-payment costs (or prior benefit costs) of a menu item increases the contribution margin (\$), which is nearly identical to Value Added. Clearly, this causes an increase in labor productivity.

5. Conclusion and limitations

5.1. Conclusion

Using simulation data based on previous studies, this study has focused on the comparison of RevPASH and ProPASH as performance indicators for revenue management in restaurants. The results indicate that as their names suggest, RevPASH is effective for management focused on revenue, while ProPASH is effective for management focused on profit, and even labor productivity.

As indicated by Heo (2017), only RevPASH (and RevPASM) has been proposed for restaurant revenue management. However, Heo (2017) proposed ProPASH (and ProPASM) as a new metric for restaurant revenue management. It is believed that management that effectively combines both of these

indicators is required.

5.2. Limitations

In this study, only simulation data are used. The inability to use real data from a restaurant is a limitation of this study. The author believes it is most important to find a company with which to cooperate so that real data can be used in a future study.

Notes

- 1 RM: revenue management
- 2 RRM. restaurant revenue management.
- 3 “Therefore, I propose to apply ProPASH to measure a restaurant’s actual profitability by calculating the total contribution margin of each menu item sold instead of revenue. (Note: Fixed cost is not considered because it should be distributed evenly.)” . Further, “for restaurants, Profit per Available Square Meter (ProPASM) can be calculated by dividing the total profit of each hour by the total available space in square meters” (Heo, 2017).
- 4 This is calculated as “Cost/Menu” and expressed as a percentage.
- 5 <https://pro.kao.com/jp/food-biz-support/management/business-column/010/> (accessed on Nov. 20, 2020)
- 6 Since ProPASH is a profit-based index, calling its use “revenue management” may not be correct. Another term, yield management, may be more appropriate. However, currently, the term "revenue management" has become so common, that this distinction may be trivial.

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