



# **Investigating Pricing Strategies of Hotel Rooms in City Centre: A Case Study**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Authors LCYS and MA designed the study, managed methodology and performed the statistical analysis. Authors NYM and MM wrote the first draft of the manuscript and managed the literature searches. Author ZMY reviewed the discussion and conclusion. All authors read and approved the final manuscript.*

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## **ABSTRACT**

In this article, the pricing strategies among hotel rooms dwelling in the city centre are investigated. A sample of 25 hotels with star ratings from 2 to 4 are selected, all situated in the heart of Georgetown, Penang. The primary data is collected, in which hotel room prices were observed for December 2018 through online travel operator, agoda.com platform. A comparative study of four forecasting methods, i.e. simple moving average, adaptive response rate exponential smoothing and multiplicative decomposition method were used to investigate the patterns of pricing strategies for these hotel rooms, with their accuracies being measured. The findings revealed that the average pricing of the room is at its peak before the public holiday, with the seasonal pattern being present, in which the prices are higher on Fridays weekly. Room prices for a hotel with higher star rating were also observed to be more sensitive to holiday effects as opposed to the hotel with a lower star rating.

**Keywords:** Hotel pricing model; forecasting; service industry.

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## 1. INTRODUCTION

The city centre is the prime location for many activities in a country. In recent years, urban tourism has gained attraction in the literature due to its versatility in coping with the decline of demand for traditional urban-industrial activities [1]. Its multifunctional entities [2] such as business and cultural activities, accessibility to transportation hubs, paired with exciting scheduled programs throughout the year are among reasons why many local and international tourists prefer to stay in hotels that are located in the heart of the city centre.

In Malaysia, Georgetown is known as among the most popular urban destination in the country due to its strategic location as the city centre of Penang Island, as well as labelled as the UNESCO world's heritage site that is rich in culture and history, including gastronomy [3,4,5,6]. Its streets are lined with colonial-era buildings and Chinese temples, added to the historical value of this site. Said [7] reported that the number of tourist arrivals to this city is increasing every year. Thus the need to have sufficient supply of accommodation is a must for this bustling city. Hotels are the most common mode of supply for accommodation in the heart of Georgetown.

Among issues that are normally related to the study of hotel industry is its supply chain management [8,9,10], tourism management [11,12,13], and hotel room pricing [14,15,16] to select only a few. Though Tan [17] argued that accommodation costs are among the most significant part of travel expenses, and hotel-type accommodation is still the foremost common type of stay. As price is a critical variable for profit generation in the hotel industry, hotel managers will need to encourage or limit demand accordingly, standardize existing room, and strategize room pricing. The rise of online tour company such as in agoda.com, booking.com, encourages hotels to implement dynamic pricing policies, changing their respective costs over time based on the demand and competitive pressure [18].

In the hospitality business, yield management ends up in wide varied room rates for constant hotel room betting on the time of the day, week, or year. Guest could experience similar levels of service throughout two hotel stays, however, their satisfaction levels may well be totally different based on the room rate. According to [19], having paid a rack rate, the buyer could also be less happy with the level of service received

than if they booked the room earlier with a cheaper price.

In this study, the aim is to investigate the pricing behaviour of hotel rooms in Georgetown, Penang. Online travel operator, agoda.com was used as this platform is commonly sought after by travellers. Thanangthanakij et al. [20] proposed the use of agoda.com as this website provides more detail of hotel information, assists users to book suitable hotel rooms, and has a feedback system that allows users to review their stay. Some forecasting methods were used to assist with our analysis.

## 2. ROOM PRICING TREND AMONG PENANG HOTELS

We selected 25 hotels that are located inside the city centre of Georgetown, Penang in this study. To ease the investigation, the pricing for room type - the *double deluxe room* was considered for the duration of one month (1 – 31 December 2018) from Agoda.com. The list of sample hotels is shown in Table 1.

We illustrated the average hotel room pricing in Fig. 1.

Based on Fig. 1, the average hotel room price showed an upward trend where the price rises as the date nearing 31st December. However, when the duration is segmented for the first three weeks (1<sup>st</sup> to 21<sup>st</sup> December 2018), the data showed a seasonal pattern, in which the average prices are higher on every Friday of each week. We use forecasting methods suitable for trended data (moving average and exponential smoothing) and seasonal data (decomposition methods) to further analyse our data, with the accuracy of such methods will be analysed by using error measurements. The subsections that follow show a brief explanation of the considered methods.

### 2.1 Moving Average

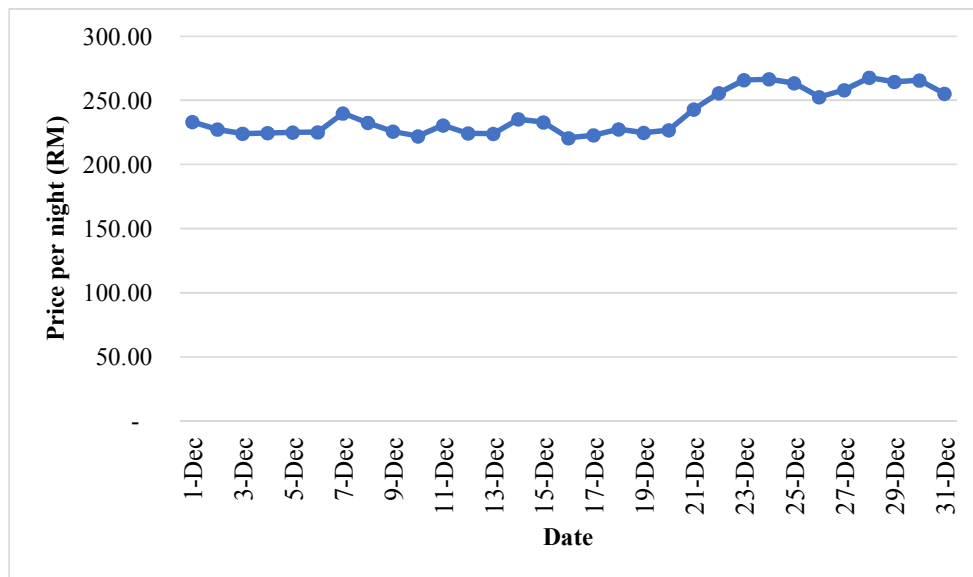
The method of simple moving average focused on the most recent  $k$  observations to forecast value in the next period. The smaller value of  $k$  should be used in the case where only the most recent observations are considered relevant. In this study,  $k = 2$  days is selected.

$$\text{Simple Moving Average} = \frac{\sum(\text{most recent } k \text{ data values})}{k}$$

where  $k$  is the number of periods in the moving average.

**Table 1. List of sample hotels’ name with hotel star rating**

| <b>Hotel Name</b>                      | <b>Hotel Star Rating</b> |
|--|--------------------------|
| 1. Campbell House                      | 4 Star                   |
| 2. Jawi Peranakan Mansion              |                          |
| 3. Le Dream Boutique Hotel             |                          |
| 4. Mango Tree Place - Hideaway         |                          |
| 5. Areca Hotel                         |                          |
| 6. Muntri Mews                         |                          |
| 7. Yeng Keng Hotel                     |                          |
| 8. The Wembley- A St Giles Hotel       |                          |
| 9. Royale Chulan Penang                |                          |
| 10. Hotel Jen                          |                          |
| 1. Nam Keng Hotel                      | 3 Star                   |
| 2. Deluxcious Luxurious Heritage Hotel |                          |
| 3. Palm Mansion Boutique Suites        |                          |
| 4. Chulia Mansion                      |                          |
| 5. MEI Hotel                           |                          |
| 6. Coffee Atelier                      |                          |
| 7. East Indies Mansion                 |                          |
| 8. Reunion Heritage House              |                          |
| 9. Museum Hotel                        |                          |
| 10. The Southern Boutique Hotel        |                          |
| 11. Armenian Street Heritage Hotel     |                          |
| 1. Islander Lodge                      | 2 Star                   |
| 2. Wil House                           |                          |
| 3. 118 Hotel Macalister                |                          |
| 4. ZEN Rooms Kinta Alley               |                          |



**Fig. 1. Average room prices of 25 hotels in Georgetown, Penang during December 2018**

**2.2 Exponential Smoothing**

We follow Trigg & Leach [21] for the use of adaptive response rate exponential smoothing (ARRES) as follows:

$$F_{t+1} = \alpha_t Y_t + (1 - \alpha_t) F_t$$

$$\alpha_t = \frac{E_t}{AE_t}$$

$$E_t = \beta e_t + (1 - \beta) E_{t-1}, 0 < \beta < 1$$

$$AE_t = \beta |e_t| + (1 - \beta) AE_{t-1}$$

$$e_t = y_t - F_t$$

where

$F_t$  = forecast value at time  $t$ ,  $Y_t$  = actual value at time  $t$ ,  $E_t$  = smoothed average error at time  $t$ ,  $AE_t$  = smoothed absolute error at time  $t$ , and  $\alpha_t$  = smoothing constant at time  $t$ .

The value of  $\alpha$  increased when the forecasts go out of control so that more weight is put to the recent data, and vice versa.

### 2.3 Decomposition Method

We followed Haobin, Ming, & Quan [22], where the decomposition methods are based on an analysis of the individual components of a time series. The strength of each component is estimated separately and then substituted into a model that explains the behaviour of the time series. The basic idea behind these models is to decompose the time series into several factors: Trend (Tr), Seasonal (Sn), Cycle (Cl), Irregular (I), which are time series components. In general, the model is

$$y_t = f(\text{Tr}_t, \text{Sn}_t, \text{Cl}_t, I_t),$$

and the forecast model is

$$\hat{y}_t = f(\text{forecast for Tr}_t, \text{Sn}_t, \text{Cl}_t),$$

where

$y_t$  = Value of the time series at time  $t$ ,  $\text{Tr}_t$  = Trend component at time  $t$ ,  $\text{Sn}_t$  = Seasonal component at time  $t$ ,  $\text{Cl}_t$  = Cyclical component at time  $t$ , and  $I_t$  = Irregular component at time  $t$ .

The multiplicative decomposition model is expressed as the product of the four components of a time series [23]:

$$y_t = \text{Tr}_t \cdot \text{Sn}_t \cdot \text{Cl}_t \cdot I_t,$$

Whereas the additive decomposition model is expressed as the total of the four components of a time series:

$$y_t = \text{Tr}_t + \text{Sn}_t + \text{Cl}_t + I_t.$$

The accuracy of the methods was determined by using several measurements of error, i.e. mean absolute deviation, mean square error and mean absolute percentage error. The method that produces the lowest error measurements were chosen.

## 3. RESULTS AND DISCUSSION

### 3.1 Room Pricing Strategy (1 – 31 December 2018)

Table 2 shows the error measurements between the models in Section 2, with ARRES method, provides the lowest value for all error measurements, implicating that this model is superior in accuracy.

Subsequently, Fig. 2 showed a similar trend between the actual and forecasted values, with their relationship is significantly close over the period under study. Later, we will use this model to determine the trend of average hotel room pricing for 1 – 31 December 2018.

Table 3 and Fig. 3 presented detail forecasted errors. A positive value of forecast error represents the actual value of the hotel room price that is higher than the forecasted value, i.e., the room price is overpriced, as the listed price is higher than expected price. Conversely, the negative value represents the actual value of room price that is lower than the forecasted value, i.e., under-priced.

Based on Table 3, the room was mostly overpriced on 21 December 2018 (Friday), where the actual price is RM17.64 higher than expected. The trend is consistent for the subsequent days in 22<sup>nd</sup>, 23<sup>rd</sup> and 24<sup>th</sup> December 2018 (also overpriced). Such condition suggests the confidence among hoteliers of the higher demand on these days. This is evident due to various contributing effects such as school holiday, weekend and the coming of public holiday on 25<sup>th</sup> December (Christmas Day). Such finding is consistent with Pitubaeva [24] that suggested holiday effect as critical factors that influence pricing decision making in the tourism industry.

**Table 2. Error measurement for four forecasting methods**

| Method                              | MAD    | MSE     | MAPE   |
|-------------------------------------|--------|---------|--------|
| Simple Moving Average               | 6.6097 | 79.4070 | 2.7258 |
| ARRES*                              | 5.7774 | 62.5301 | 2.3998 |
| Additive Decomposition Method       | 8.3733 | 95.5823 | 3.5289 |
| Multiplicative Decomposition Method | 8.3636 | 95.7486 | 3.5232 |

Note: \* shows method with the lowest measurement error

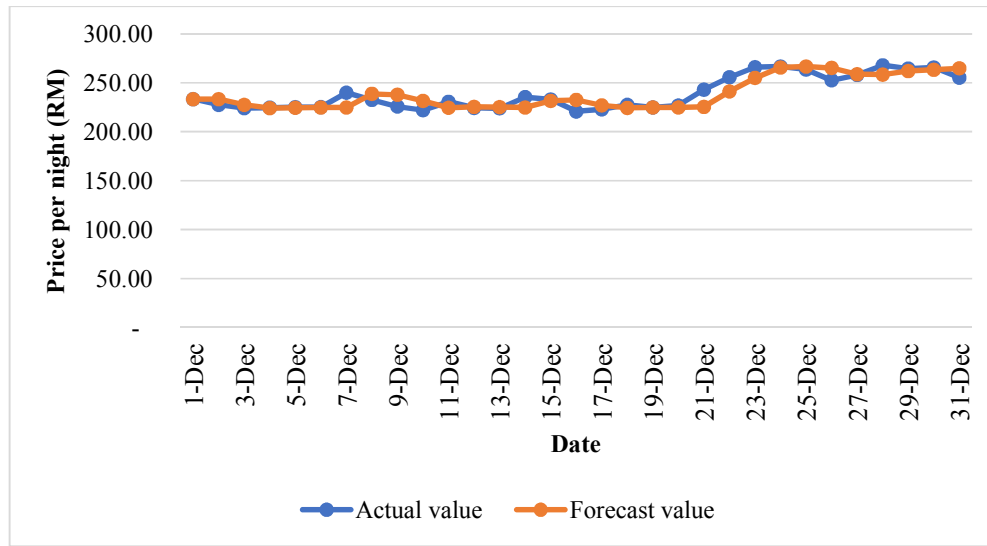
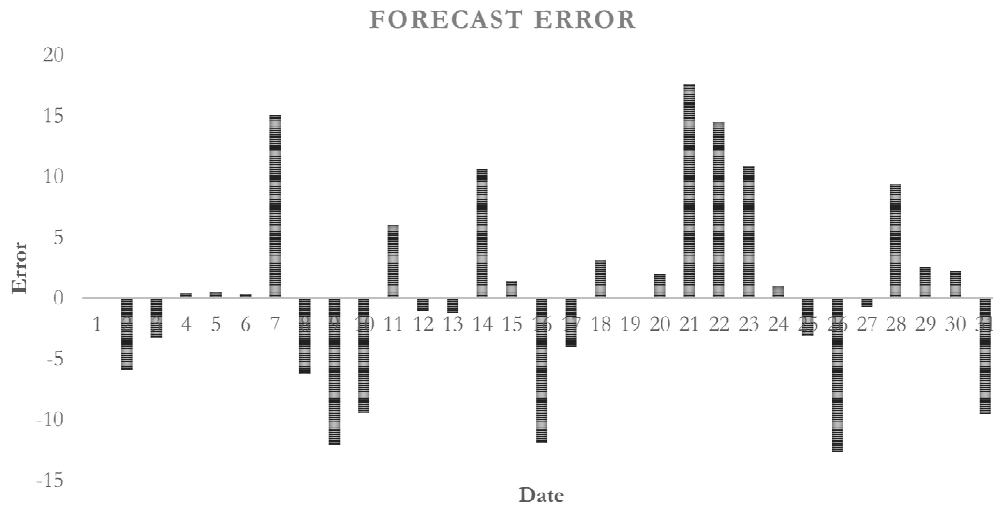


Fig. 2. Actual versus the forecasted value of hotel room prices by using ARRES method

Table 3. Actual value, forecast value and forecast error of ARRES from 1<sup>st</sup> to 31<sup>st</sup> December 2018

| Date   | Day       | Actual value | Forecast value | Forecast error |
|--------|-----------|--------------|----------------|----------------|
| 1-Dec  | Saturday  | 233.25       | 233.25         | 0              |
| 2-Dec  | Sunday    | 227.42       | 233.25         | (5.83)         |
| 3-Dec  | Monday    | 224.12       | 227.42         | (3.30)         |
| 4-Dec  | Tuesday   | 224.60       | 224.12         | 0.48           |
| 5-Dec  | Wednesday | 225.04       | 224.49         | 0.56           |
| 6-Dec  | Thursday  | 225.17       | 224.72         | 0.45           |
| 7-Dec  | Friday    | 239.90       | 224.77         | 15.13          |
| 8-Dec  | Saturday  | 232.57       | 238.73         | (6.17)         |
| 9-Dec  | Sunday    | 225.79       | 237.85         | (12.06)        |
| 10-Dec | Monday    | 222.04       | 231.49         | (9.44)         |
| 11-Dec | Tuesday   | 230.54       | 224.48         | 6.06           |
| 12-Dec | Wednesday | 224.36       | 225.36         | (1.00)         |
| 13-Dec | Thursday  | 224.00       | 225.14         | (1.14)         |
| 14-Dec | Friday    | 235.39       | 224.74         | 10.65          |
| 15-Dec | Saturday  | 232.96       | 231.48         | 1.48           |
| 16-Dec | Sunday    | 220.63       | 232.50         | (11.87)        |
| 17-Dec | Monday    | 222.83       | 226.87         | (4.03)         |
| 18-Dec | Tuesday   | 227.50       | 224.33         | 3.17           |
| 19-Dec | Wednesday | 224.80       | 224.80         | (0.00)         |
| 20-Dec | Thursday  | 226.79       | 224.80         | 1.99           |
| 21-Dec | Friday    | 243.00       | 225.36         | 17.64          |
| 22-Dec | Saturday  | 255.70       | 241.17         | 14.52          |
| 23-Dec | Sunday    | 265.90       | 255.03         | 10.87          |
| 24-Dec | Monday    | 266.63       | 265.62         | 1.00           |
| 25-Dec | Tuesday   | 263.48       | 266.60         | (3.12)         |
| 26-Dec | Wednesday | 252.59       | 265.22         | (12.63)        |
| 27-Dec | Thursday  | 258.05       | 258.73         | (0.68)         |
| 28-Dec | Friday    | 267.80       | 258.36         | 9.44           |
| 29-Dec | Saturday  | 264.52       | 261.97         | 2.55           |
| 30-Dec | Sunday    | 265.59       | 263.31         | 2.29           |
| 31-Dec | Monday    | 255.26       | 264.79         | (9.53)         |



**Fig. 3. Illustration of the forecasted room pricing**

Further analysis showed the room is under-priced mostly on 26<sup>th</sup> December 2018, which is just the following day after the public holiday, with its actual price is RM12.63 less than the expected price on a particular day. This is followed by 9<sup>th</sup> December (RM12.06) and 16<sup>th</sup> December (RM11.87). Readers should note that 9<sup>th</sup> and 16<sup>th</sup> December are both falls on Sunday. Such a situation indicates the behaviour of hoteliers that perceive low demand after public holidays and weekends. Such behaviour can be capitalized by customers in making a decision to increase their competitive advantage on the pricing strategy.

**3.2 Room Pricing Strategy (1 – 21 December 2018)**

We further segmented the analysis focusing more on the first three weeks of December, due to possible seasonal factor. Do note that the period after 21<sup>st</sup> December is omitted to reduce the influence of public holiday during these durations. The accuracy results are shown in Table 4.

By referring to Table 4, the multiplicative decomposition method had the highest accuracy determined by all error measurements. This indicates that the forecasted value by using this method is nearest to the actual value. The seasonal pattern can be observed clearer in Fig. 4, where seasonal patterns are repeated every week with its highest price on Friday, followed by Saturday. We can see that the lowest price is on every Monday, followed by Sunday. The pattern is summarized further in Table 5.

**3.3 Room Pricing Strategy (Based on Star Rating)**

Fig. 5 illustrates differences in pricing strategies of hotels according to their star ratings. The average room price for a 4-star, 3-star, and 2-star hotel is in the range of RM286.40 – RM359.25, RM187.40 – RM237.27, and RM125.75 – RM152.00, respectively. This indicates that the hotels with higher star rating set their price higher and wider range in comparison to a much lower star rating hotels.

**Table 4. Comparison of error measurement between simple moving average, ARRES, additive and multiplicative decomposition method**

| Method                               | MAD    | MSE     | MAPE   |
|--------------------------------------|--------|---------|--------|
| Simple Moving Average                | 5.7259 | 60.2342 | 2.4837 |
| ARRES                                | 4.5518 | 41.7324 | 1.9701 |
| Additive Decomposition Method        | 1.6291 | 4.2665  | 0.7100 |
| Multiplicative Decomposition Method* | 1.6243 | 4.2640  | 0.7078 |

*Note: \* shows method with the lowest measurement error*

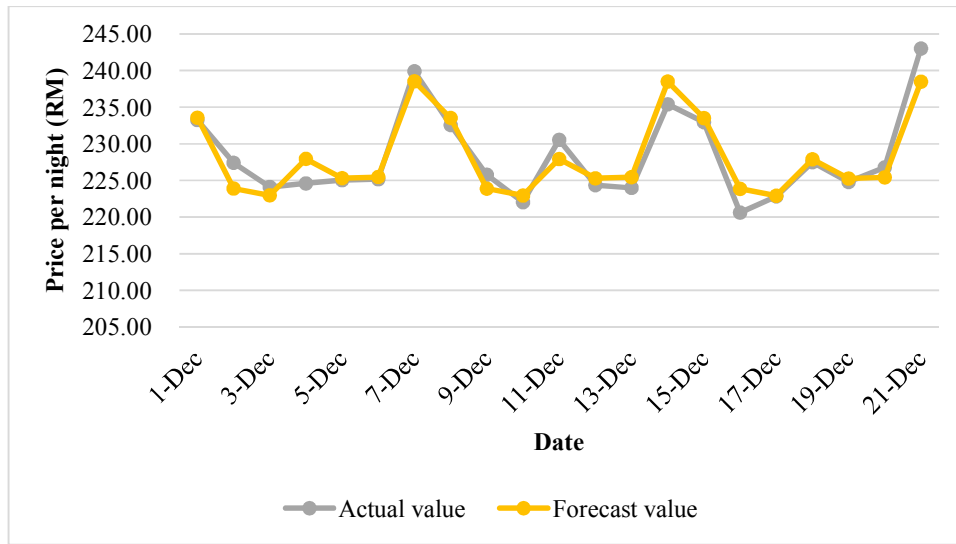


Fig. 4. Comparison of actual and forecast value of hotel room prices by using the Multiplicative Decomposition Method

Table 5. Weekly seasonal pattern of average hotel room price in Georgetown, Penang during 1<sup>st</sup> to 21<sup>st</sup> December 2018

| Day       | Changes in Average Hotel Room Price |
|-----------|-------------------------------------|
| Monday    | -                                   |
| Tuesday   | +                                   |
| Wednesday | -                                   |
| Thursday  | +                                   |
| Friday    | +                                   |
| Saturday  | -                                   |
| Sunday    | -                                   |

Note: '+' indicates an increase in price as compared to the previous day and '-' indicates a decrease in price as compared to the previous day

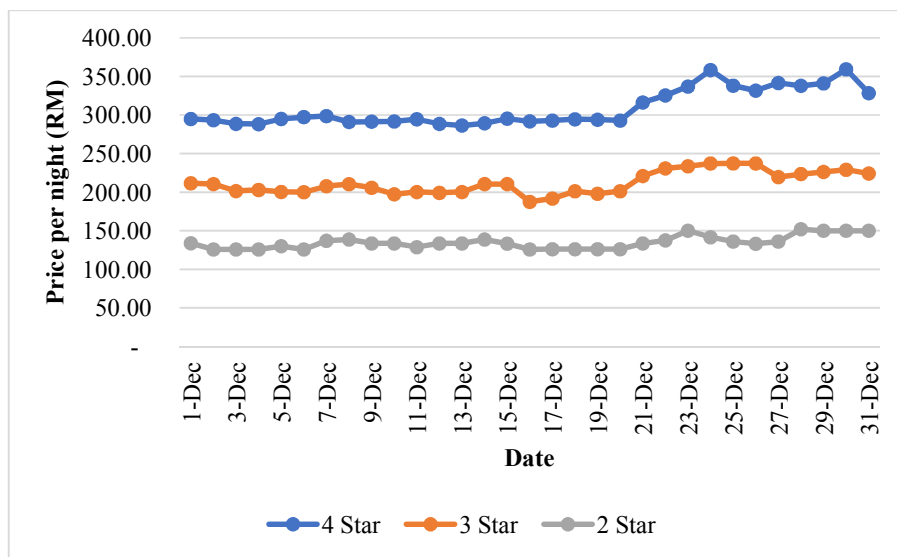


Fig. 5. Comparison of the average room price of 4-star, 3-star and 2-star hotels

In addition, such condition is more pronounced nearing public holiday. Starting from 21<sup>st</sup> December 2018, the average room price of 4-star rating hotels significantly increased compared to the lower star rating hotel. The average price fluctuated after the public holiday until the end of the month. Besides, the increment room price for the 3-star rating hotel is less than a 4-star rating hotel, and more than a 2-star rating hotel. Further observation showed that the 2-star rating hotels do not increase much in their room pricing offering, in fact, they lower the room price on 24<sup>th</sup> December 2018, a day before Christmas Day.

#### 4. CONCLUSION

To conclude, the average room pricing among hotels in Georgetown, Penang showed a seasonal pattern when there is no public holiday. The prices are higher on the days before the weekend (Friday and Saturday) and lower at the start of weekdays (Sunday and Monday) every week. This is reasonable provided that Malaysia is having a weekend on Saturday and Sunday. Thus, the demand for hotel stays will be higher on nights of Friday and Saturday. Besides, the average room pricing is significantly increasing before the public holiday (Christmas Day). This shows the pre-holiday effect. As mentioned by Pitubaeva (2014), public holidays will affect the hotel room price, known as pre-holiday effects and post-holiday effects. Thus, it is suggested that customers should book a room on Monday or Sunday in order to experience similar services at a lower competitive price.

Based on the forecasted error calculated by using forecasting methods of ARRES and multiplicative decomposition method, customers are advised to refrain from booking a hotel room with positive forecast errors since it will cost more (overprice) than the expected price. Conversely, they should book a hotel room on the days with negative forecast errors. We also noted that the higher the star rating of the hotel, the higher the room price charged per night, with the higher overprice condition. The room price of higher star rating hotels is set at a wider range and influenced more by the holiday effects. Thus, in the case of service and luxury provided is not the main concern for customers, they are advised to choose hotels with a lower star rating, as they provide the accommodation with lower costs with a minimal influencer of holiday seasons.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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