Case Problem: Forecasting Food and Beverage Sales

Vintage Restaurant

Student’s Name

Institution

Date

 **Introduction**

Vintage Restaurant is a luxury restaurant located near Fort Myer, Florida. It is owned and operated by Karen Payne. It has been in operation for the last three years and therefore, it is one of the new luxuries hotels in Florida. However, over the last three years, Vintage has established itself as the reputable restaurant as a high quality dining special in the provision of fresh seafood. Through efficient management, Vintage has become one of the best and the fastest growing restaurants located on the island. It is also expected to improve its market share and profitability in the next five years and therefore, it is important for the management to forecast its growth based on its performance. Therefore, the system is needed, which can provide a clear sales forecast of food and beverage per month. This managerial report therefore, provides detailed Vintage Restaurant’s performance for the last financial years. It also presents the analysis Vintage’s sales, including sales forecasts and recommendation to Karen the manager and owner of the restaurant.

**Task 1: Analysis of the sales**

In the last three years, the total sales for both food and beverages are $6,755, 000. The first year, Vintage realizes the total sales of $2, 106, 000 second year $2250, 000.00 and the third year $2,399,000. It is also noted that the lowest sales for the last three years is $110,000 and the highest sales is $ 282,000. Based on sales data of the total sales registered for the previous thirty six (36) months, the Vintage Restaurant’s total sales increased by almost 5% in every year. The average sales, which Vintage can register in a month is $187,640. It is therefore, important to point that Vintage Restaurant’s for a month could be 187,640 monthly and this is based on several market factors. The analysis of the sales also established that in the last thirty three months the monthly sales of several months is $ 235,000. However, the highest sales are registered within the first three months of the year. The data indicates that Vintage Restaurant has total sales of 235 above between January and April. This means that the first four months of the year are pick months, which the restaurant receive many customers compared to the months.

**Table 1: Vintage’s total sales for the last 36 months**

|  |  |  |  |
| --- | --- | --- | --- |
| **Months** | **First Year** | **Second Year** | **Third Year** |
| January  | 242 | 263 | 282 |
| February  | 235 | 238 | 255 |
| March | 232 | 247 | 265 |
| April | 178 | 193 | 205 |
| May | 184 | 193 | 210 |
| June | 140 | 149 | 160 |
| July | 145 | 157 | 166 |
| August | 152 | 161 | 174 |
| September | 110 | 122 | 126 |
| October | 130 | 130 | 148 |
| November | 152 | 167 | 173 |
| December | 206 | 230 | 235 |
| **Total**  | **2106** | **2250** | **2399** |
|  |  |  |  |

Graph: Linear Regression for the total Sales for 36 months

|  |
| --- |
| *Column1* |
|  |  |
| Mean | 187.6388889 |
| Standard Error | 7.860404366 |
| Median | 176 |
| Mode | 235 |
| Standard Deviation | 47.16242619 |
| Sample Variance | 2224.294444 |
| Kurtosis | -1.058360471 |
| Skewness | 0.309909136 |
| Range | 172 |
| Minimum | 110 |
| Maximum | 282 |
| Sum | 6755 |
| Count | 36 |

 **Task 2: Plot Time**

**Descriptive Statistic Analysis of Vintage Restaurant’s Sales for the previous 36 months**

**Graph 1: Time Series Plot**

Examining graph 1, it is indicates some seasonal pattern along the linear trend. The figures indicate that lowest reading occurs during the mid year and that is between May and August. It means that Vintage Restaurant lowest sales of beverage and food are registered during the month of May, June, July and August. The highest reading is therefore, occurs at the beginning and the end of the year. These are the months, which Vintage registers the highest sales of the year. It is also important to point those Vintage Restaurant monthly sales of beverages and food fluctuates. In this case, it means that there are high season and low season during the year and therefore, it is important to factor this fluctuation when designing a system for the company, which can be used for several years.

**Task 3: Sales Forecast for the fourth year**

**Dummy variables**

Month 1= {1if January or 0 otherwise}, Month 2 = {1 if February or 0 otherwise}, Month 3 = {1 if March or 0 otherwise}, Month 4 = {1 if April or 0 otherwise}, Month 5, {1 if May or 0 otherwise}, Month 6 = {1 if June or 0 otherwise}, Month 7 = { 1 if July or 0 otherwise}, Month 8 = {1 if August or 0 otherwise}, Month 9 = (1 if September or 0 otherwise} Month 10 = {1 if October or 0 otherwise}, Month 11 = {1 if November or 0 otherwise}, Month 12 = 1 if December or 0 otherwise}.

**The forecast value is equivalent to**

F = b0+ (b1month) + (b2month 2) + (b3 month23) + (b4month 4) + (b5 month5) + (b6 month6) + (b7 month7) + (b8month8) + (b9month9) + (b 10month 10) + (b11month 11) + b12t

Note: F is the value of the forecast for the time period of t, b1, b2, b3, b4, b5, b6, b7, b8, b9, b10, and b11.

**Note:** The b12 is the decision variable of the value of sales, t is regarded as the period time while month1, moth2, month3, month4, month5, month6, mpnth7, month8, month9, month10, month11 are regarded as the dummy variable being used for projection.

However, the value of b0, b1, b2, b3, b4, b5, b6, b7, b8, b9, b10, and b11 is likely to be 199.25, 49.86, 29.17, 33.49, -23.53, -20.88, -67.89, --62.58, -57.63, -101.28, -85.63, -58.65 and 1.02 respectively.

**Note**: 199.25 for b0, 49.86 for b1, 29.17 for b2, 33.49 for b3, -23.88 for b4, -67.89 for b5, -62.58 for b6, -57.63 for b7, -101.28 for b8, -85.63 for b9, -58.65 for b10, 1.02 for b11

F= {199.25 +(49.86 month1) + (29.17month2) + (33.49month3) +( -23.53month 4)+ ( -20.88month5) +( -67.89 month 6) + (-62.58month 7)+ ( -57.63month8) + ( -101.28 month 9) + ( -85.63 month 10) + (-58.65 month 11) + (1.02 t). }

In order to get the forecast sales for the next year, this is the fourth year. It is important to substitute: 199.25 for b0, 49.86 for b1, 29.17 for b2, 33.49 for b3, -23.88 for b4, -67.89 for b5, -62.58 for b6, -57.63 for b7, -101.28 for b8, -85.63 for b9, -58.65 for b10, 1.02 for b11

**Therefore, the Forecast for the January of the fourth year will be**

F1= 199.25 +(49.86 X1) + (29.17 X0) + (33.49 X0) +( -23.53 X 0)+ ( -20.88 X 0) +( -67.89 X 0) + (-62.58 X0)+ ( -57.63 X 0) + ( -101.28 X 0) + ( -85.63 X 0) + (-58.65 X 0) + (1.02 X 37)

F1 = 199.25 + 49.86 + 0+0+0+0+0+0+0+0+0+37.74

F1= $286.85.

Vintage Restaurant sales for the January of the fourth year will be = 286.85.

**Therefore, the Forecast for the February of the fourth year will be**

F2= 199.25 +(49.86 X0) + (29.17 X1) + (33.49 X0) +( -23.53 X 0)+ ( -20.88 X 0) +( -67.89 X 0) + (-62.58 X0)+ ( -57.63 X 0) + ( -101.28 X 0) + ( -85.63 X 0) + (-58.65 X 0) + (1.02 X 37)

F2 = 199.25 + 0 + 29.17+0+0+0+0+0+0+0+0+37.74

F2= $266.16

**The sales for February of the fourth year will be $266.16**

Forecast for March

F3= 199.25 +(49.86 X0) + (29.17 X0) + (33.49 X1) +( -23.53 X 0)+ ( -20.88 X 0) +( -67.89 X 0) + (-62.58 X0)+ ( -57.63 X 0) + ( -101.28 X 0) + ( -85.63 X 0) + (-58.65 X 0) + (1.02 X 37)

F3 = 199.25 + 0 + 0+33.49+0+0+0+0+0+0+0+37.74

**F3= $270.48**

The forecast sales for March = **$270.48**

**Forecast for April**

F4= 199.25 +(49.86 X0) + (29.17 X0) + (33.49 X0) +( -23.53 X 1)+ ( -20.88 X 0) +( -67.89 X 0) + (-62.58 X0)+ ( -57.63 X 0) + ( -101.28 X 0) + ( -85.63 X 0) + (-58.65 X 0) + (1.02 X 37)

F4 = 199.25 + 0 + 0+0-23.53+0+0+0+0+0+0+37.74

F4 = 213. 46.

**The forecast for April = $213.46.**

**Forecast for May**

F5= 199.25 +(49.86 X0) + (29.17 X0) + (33.49 X0) +( -23.53 X 0)+ ( -20.88 X 1) +( -67.89 X 0) + (-62.58 X0)+ ( -57.63 X 0) + ( -101.28 X 0) + ( -85.63 X 0) + (-58.65 X 0) + (1.02 X 37)

F5 = 199.25 + 0 + 0+0-0- 20.88+0+0+0+0+0+37.74

F5 = 216.11

The forecast for May = $216.11

**Forecast for June**

F6= 199.25 +(49.86 X0) + (29.17 X0) + (33.49 X0) +( -23.53 X 0)+ ( -20.88 X 0) +( -67.89 X1) + (-62.58 X0)+ ( -57.63 X 0) + ( -101.28 X 0) + ( -85.63 X 0) + (-58.65 X 0) + (1.02 X 37)

F6 = 199.25 - 67.89+37.74

F6 = 169.10

The forecast for June = $169.10

**Forecast for July**

F7= 199.25 +(49.86 X0) + (29.17 X0) + (33.49 X0) +( -23.53 X 0)+ ( -20.88 X 0) +( -67.89 X0) + (-62.58 X1)+ ( -57.63 X 0) + ( -101.28 X 0) + ( -85.63 X 0) + (-58.65 X 0) + (1.02 X 37)

F7 = 199.25 - 62.58+37.74

F7 = 174.16

The forecast for July = $174.16

 **Forecast for August**

F8= 199.25 +(49.86 X0) + (29.17 X0) + (33.49 X0) +( -23.53 X 0)+ ( -20.88 X 0) +( -67.89 X0) + (-62.58 X0)+ ( -57.63 X 1) + ( -101.28 X 0) + ( -85.63 X 0) + (-58.65 X 0) + (1.02 X 37)

F8 = 199.25 – 57.63+37.74

F8 = 179.36

The forecast for August = $179.36

**Forecast for September**

F9= 199.25 +(49.86 X0) + (29.17 X0) + (33.49 X0) +( -23.53 X 0)+ ( -20.88 X 0) +( -67.89 X0) + (-62.58 X0)+ ( -57.63 X 0) + ( -101.28 X 1) + ( -85.63 X 0) + (-58.65 X 0) + (1.02 X 37)

F9 = 199.25 – 101.28+37.74

F9 = 135.71

**The forecast for September = $135.71**

**Forecast for October**

F10= 199.25 +(49.86 X0) + (29.17 X0) + (33.49 X0) +( -23.53 X 0)+ ( -20.88 X 0) +( -67.89 X0) + (-62.58 X0)+ ( -57.63 X 0) + ( -101.28 X 0) + ( -85.63 X 1) + (-58.65 X 0) + (1.02 X 37)

F10 = 199.25 – 85.65+37.74

F10 = 151.34

**The forecast for October = $151.34**

**Forecast for November**

F11= 199.25 +(49.86 X0) + (29.17 X0) + (33.49 X0) +( -23.53 X 0)+ ( -20.88 X 0) +( -67.89 X0) + (-62.58 X0)+ ( -57.63 X 0) + ( -101.28 X 0) + ( -85.63 X 0) + (-58.65 X 1) + (1.02 X 37)

F11 = 199.25 –58.65+37.74

F11 = **178.34**

The forecast for November = $**178.34**

**Forecast for December**

F11= 199.25 +(49.86 X0) + (29.17 X0) + (33.49 X0) +( -23.53 X 0)+ ( -20.88 X 0) +( -67.89 X0) + (-62.58 X0)+ ( -57.63 X 0) + ( -101.28 X 0) + ( -85.63 X 0) + (-58.65 X 0) + (1.02 X 37)

F11 = 199.25 +37.74

F11 = **237.02.**

The forecast for November = $**237.02**

**The forecast for the fourth year is as listed below:**

|  |  |
| --- | --- |
| **Forecast**  | **Value of sales for both food and beverage**  |
| F1 | 286.85 |
| F2 | 266.16 |
| F3 | 270.48 |
| F4 | 213.46 |
| F5 | 216.11 |
| F6 | 169.10 |
| F7 | 174.16  |
| F8 | 179.36 |
| F9 | 135.71 |
| F10 | 151.34 |
| F11 | 178.34 |
| F12 | 237.02 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|   |  |  |  |  | **Vintage Restaurant**  |  |  |  |  |  |  |  |
|  |  |  |  |  | **Sales Forecasts** |  |  |  |  |  |  |  |  |
| **Period**  | **Year**  | **Sales**  | **M1** | **M2** | **M3** | **M4**  | **M5**  | **M5** | **M 6** | **M7** | **M8** | **M9** | **M10** | **M11** | **Forecast**  |
| 1 | 1st Year January | 242 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 250 |
| 2 | 1st Year Feb | 235 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 230 |
| 3 | 1st Year March | 232 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 235 |
| 4 | 1st Year April | 178 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 179 |
| 5 | 1st Year May  | 184 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 183 |
| 6 | 1st Year June | 140 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |  | 0 | 0 | 0 | 0 | 137 |
| 7 | 1st Year July | 145 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 143 |
| 8 | 1st Year August | 152 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 150 |
| 9 | 1st Year September | 110 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 107 |
| 10 | 1st Year October  | 130 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 123 |
| 11 | 1st Year November | 152 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 107 |
| 12 | 1st Year December | 206 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 151 |
| 13 | 2nd Year January | 263 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 211 |
| 14 | 2nd Year February  | 238 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 262 |
| 15 | 2nd Year March | 247 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 248 |
| 16 | 2nd Year April | 193 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 192 |
| 17 | 2nd Year May | 193 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 195 |
| 18 | 2nd Year June | 149 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 149 |
| 19 | 2nd Year July | 157 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 156 |
| 20 | 2nd Year August | 161 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 162 |
| 21 | 2nd Year September | 122 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 119 |
| 22 | 2nd Year October | 130 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 136 |
| 23 | 2nd Year November | 167 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 164 |
| 24 | 2nd Year December | 230 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 223 |
| 25 | 3rd Year January  | 282 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 274 |
| 26 | 3rd Year February | 255 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 254 |
| 27 | 3rd Year March | 265 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 260 |
| 28 | 3rd Year April | 205 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 204 |
| 29 | 3rd Year May | 210 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 207 |
| 30 | 3rd Year June | 160 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 161 |
| 31 | 3rd Year July | 166 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 168 |
| 32 | 3rd Year August | 174 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 174 |
| 33 | 3rd Year September | 126 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 131 |
| 34 | 3rd Year October | 148 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 148 |
| 35 | 3rd Year November | 173 | 0 |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 176 |
| 36 | 3rd Year December | 235 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 235 |

 **Monthly Sales Forecast for the Fourth Year**

1. The forecast for the month of January = $286
2. Forecast for February = $266
3. Forecast for March = $270
4. Forecast for April = $213
5. Forecast for May = $216.11
6. Forecast for June = $169.10
7. Forecast for July = $174.16
8. Forecast for August = $179.36
9. Forecast for September = $135.71
10. Forecast for October = $151.34
11. Forecast for November = $178.34
12. Forecast for December = $237.02

**Therefore, the projected sales for the four years are as listed below:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No** | **Months** | **First Year** | **Second Year** | **Third Year** | **Fourth Year** |
| 1 | January  | 242 | 263 | 282 | 286 |
|  | February | 235 | 238 | 255 | 266 |
|  | March | 232 | 247 | 265 | 270 |
|  | April | 178 | 193 | 205 | 213. |
|  | May | 184 | 193 | 210 | 216.11 |
|  | June | 140 | 149 | 160 | 169.10 |
|  | July | 145 | 157 | 166 | 174.16 |
|  | August | 152 | 161 | 174 | 179.36 |
|  | September | 110 | 122 | 126 | 135.71 |
|  | October | 130 | 130 | 148 | 151.34 |
|  | November | 152 | 167 | 173 | 178.34 |
|  | December | 206 | 230 | 235 | 237.02 |

 ***Table 2: Projected sales for four years***

**Task 4: Model Illustration to Karen**

The dummy variable is applied using two different values 1 and 0, which represent the month, which is to be obtained. In this case, the forecast value is represented by binary variable.

**Task 5: Forecast Error Calculation**

Actual Sales for January $ 295,000

Forecast sales $ 286, 850

The forecast Error is the different between the actual sales and forecast sales

$295,000 – $286,850

$8,150

And therefore the forecast Error = $8150X100/$295000

 **2.76%.**

However, the tabulation established error of 2.76%, which is very small or ineligible and therefore, the forecast sales can be considered valid and therefore, accepted. Karen does not need to be worried about the error. It can be assumed that the forecast model is extremely good and therefore, Vintage Restaurant will make the forecast sales in the fourth year of its operation.

It is also essential to point that the forecast error could be as a result of estimation of the cost of sales, time and calculation. However, this error could be avoided with proper analysis of the data and accurate recording of the information capture. Serious attentive on the figures captured would be required so that future error could be avoided. Most importantly, the model is good and can be used anytime with computer.

**Recommendation**

It is important to point that Vintage Restaurant’s sales over the last three years is steady and therefore, it is expected to continue improving. The sales analysis for the last 36 months also indicates a systematic trend with a linear pattern. This means that the sales are seasonal and this could affect the financial performance of the hotel and therefore, it requires effective strategies to improve its market performance. It is recommended for the restaurant to invest in marketing since, the sales improvement is minimal. It is established that Vintage sales increases approximately 2.5% annually. This could be improved if the company invests in marketing strategies to bring more customers to the restaurant. It is also recommended for Karen to update the system monthly. This will ensure that the all the sales are properly captured in the system for the purpose of calculation.

**Conclusion**

Karen should not be worried about the error encountered at the end. It can be assumed that the model she used is extremely good. This is because of the minimal value of the error, which does not make much change. However, she must update the sales data monthly for her to be able to understand the pattern of the past sales. This will enable her to have a better prediction of any future sales of the company. The analysis derived could be easily updated monthly if any case computer software or application is used to conduct the analysis. However, the uncertainty can be removed when accuracy is kept. The estimation or approximation of data should be done efficiently to avoid any error on the sales.