**Chapter IV**

**Results and Discussion**

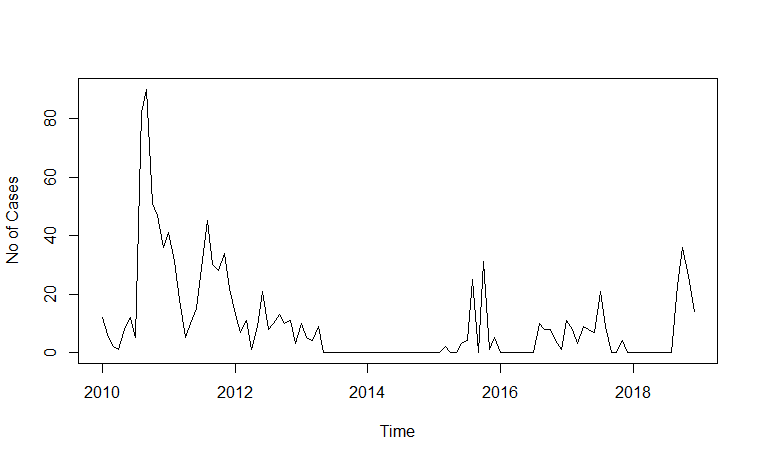
**Problem 1.**

Solano gave the researchers the data from January 2010 – December 2019. According to the RHU, these were the only data they had concerning dengue cases because the people in the community choose to go directly to a hospital rather than in their office. The total dengue cases of 2010 is 352, 2011 is 308, 2012 is 127, 2013 is 28, 2014 is 0, 2015 is 67, 2016 is 31, 2017 is 80 and 2018 is 99. In the year 2010, the month of September got the highest number of dengue cases with 90 cases, August got the second to the highest while 82 while October as the third highest with 51 cases. In 2011, August got the highest number of dengue cases with 45 cases, November got the second to the highest with 34 recorded cases and February, as the third to the highest with 31-recorded cases. While in 2012, June got the highest recorded dengue cases with 21 cases, January and September got the second to the highest with 13 cases. From January to April 2013, January got the highest recorded dengue cases with 10 cases, April got the second highest record dengue cases with 9 cases while, February got the third highest recorded dengue cases with 5 cases. October 2015 got the highest recorded dengue cases with 31 cases, August got the second highest recorded dengue cases with 25 cases while, December got the third highest recorded dengue cases with 5 cases.

In 2016, August got the highest recorded dengue cases with 10 cases while, September and October got the second highest recorded dengue cases with 8 cases. April 2017 got the highest recorded dengue cases with 21 cases; January got the second highest recorded dengue cases with 11 cases while, April and August got the third highest recorded dengue cases with 9 cases. While in 2018, from September to December, October got the highest recorded dengue cases with 36 cases, November got the second highest recorded dengue cases with 26 cases while September got the third highest recorded dengue cases with 23 cases. Since the researchers was given an incomplete data, they have decided to use the data from January 2010 – April 2013 for time series analysis because of the unavailability of data. The computed mean dengue cases for each month from January to December 2010 to 2018 are 352, 308, 127, 28, 0, 67, 31, 87 and 99 cases respectively.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** | **Total** |
| 2010 | 12 | 6 | 2 | 1 | 8 | 12 | 5 | 82 | 90 | 51 | 47 | 36 | 352 |
| 2011 | 41 | 31 | 18 | 5 | 10 | 15 | 29 | 45 | 30 | 28 | 34 | 22 | 308 |
| 2012 | 13 | 7 | 11 | 1 | 9 | 21 | 8 | 10 | 13 | 10 | 11 | 3 | 127 |
| 2013 | 10 | 5 | 4 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28 |
| 2014 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2015 | 0 | 0 | 2 | 0 | 0 | 3 | 4 | 25 | 0 | 31 | 1 | 5 | 67 |
| 2016 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 8 | 8 | 4 | 1 | 31 |
| 2017 | 11 | 8 | 3 | 9 | 8 | 7 | 21 | 9 | 0 | 0 | 4 | 0 | 87 |
| 2018 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 36 | 26 | 14 | 99 |
| Mean | 9.67 | 6.33 | 4.44 | 2.78 | 3.89 | 6.44 | 7.44 | 20.11 | 18.22 | 15.33 | 14.11 | 9 | 122.11 |

**Table 1. The Monthly Dengue Data of Regional Health Unit (RHU), Solano, Nueva** **Vizcaya**



**Figure 1. The Number of Cases per Year**

**Problem 2**

Through backward elimination stepwise time series regression, 11 models were generated. These are models 1 to 11 respectively. Model 2 have significant coefficient estimates with p-values lesser than 0.05. Table 2 shows the models’ coefficient estimates. The coefficient estimates of the models did not change all throughout the process. The process shows that model 2 has 11 terms. The models were able to show varied periodic behaviors of the observed data. All of these models were evaluated for the best-fit model.

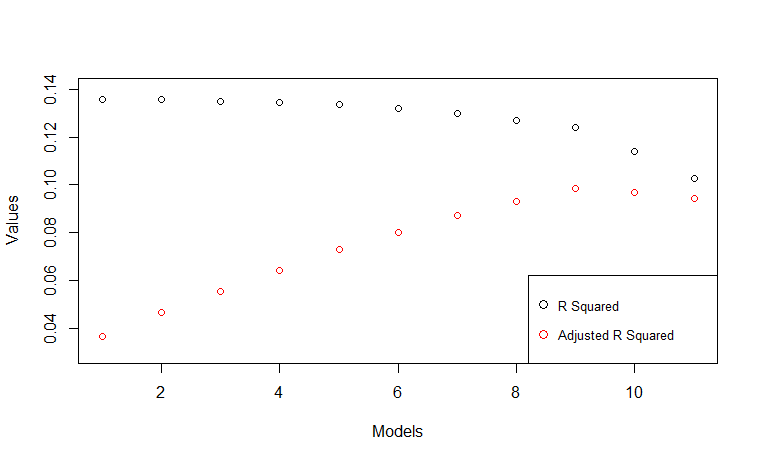
**Table 2. The models’ coefficient estimates.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Model | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  |  |
| 1 | | 10.06 | | 2.36 | | -7.18\* | | -2.23 | | 0.66 | | 0.15 | | 0.96 | | -0.53 | | -0.91 | | -1.23 | | 1.25 | 0.43 |
| 2 | | 10.06 | | 2.36 | | -7.18 | | -2.23 | | 0.66 | |  | | 0.96 | | -0.53 | | -0.91 | | -1.23 | | 1.25 | 0.43 |
| 3 | | 10.06 | | 2.36 | | -7.18 | | -2.23 | | 0.66 | |  | | 0.96 | |  | | -0.91 | | -1.23 | | 1.25 | 0.43 |
| 4 | | 10.06 | | 2.36 | | -7.18 | | -2.23 | | 0.66 | |  | | 0.96 | |  | | -0.91 | | -1.23 | | 1.25 |  |
| 5 | | 10.06 | | 2.36 | | -7.18 | | -2.23 | |  | |  | | 0.96 | |  | | -0.91 | | -1.23 | | 1.25 |  |
| 6 | | 10.06 | | 2.36 | | -7.18 | | -2.23 | |  | |  | | 0.96 | |  | |  | | -1.23 | | 1.25 |  |
| 7 | | 10.06 | | 2.36 | | -7.18 | | -2.23 | |  | |  | |  | |  | |  | | -1.23 | | 1.25 |  |
|  |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 8 | | 10.06 | | 2.36 | | -7.18 | | -2.23 | |  | |  | |  | |  | |  | |  | | 1.25 |  |
| 9 | | 10.06 | | 2.36 | | -7.18 | | -2.23 | |  | |  | |  | |  | |  | |  | |  |  |
| 10 | | 10.06 | | 2.36 | | -7.18 | |  | |  | |  | |  | |  | |  | |  | |  |  |
| 11 | | 10.06 | |  | | -7.18 | |  | |  | |  | |  | |  | |  | |  | |  |  |

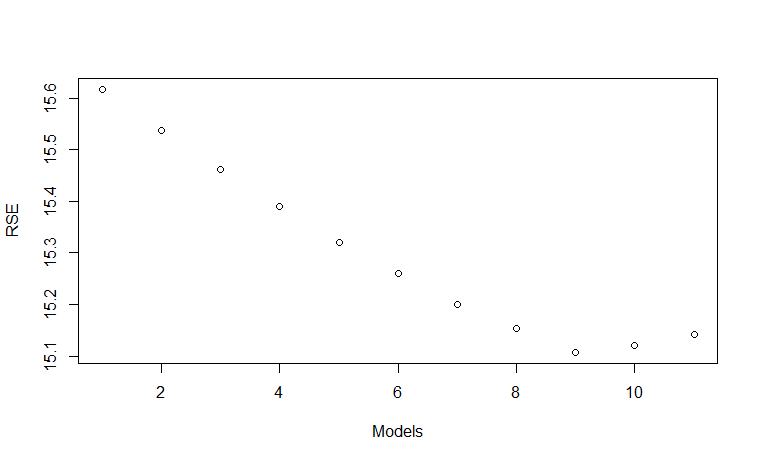
**\*** p-value is less than 0.05.

**Table 3. The Fit Indices of the Models**

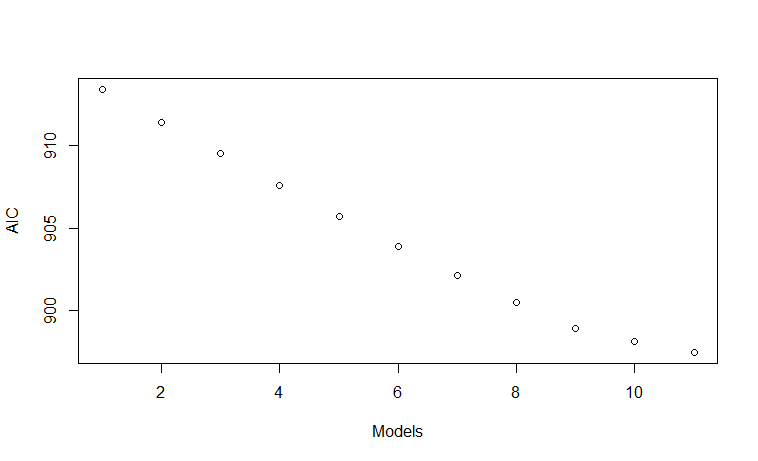
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Models** |  |  |  |  |
| 1 | 0.14 | 0.04 | 15.62 | 913. 42 |
| 2 | 0.14 | 0.05 | 15.54 | 911.42 |
| 3 | 0.14 | 0.06 | 15.46 | 909.49 |
| 4 | 0.13 | 0.06 | 15.39 | 907.58 |
| 5 | 0.13 | 0.07 | 15.32 | 905.69 |
| 6 | 0.13 | 0.08 | 15.26 | 903.90 |
| 7 | 0.13 | 0.09 | 15.20 | 902.13 |
| 8 | 0.13 | 0.09 | 15.15 | 900.50 |
| 9 | 0.12 | 0.10 | 15.11 | 898.89 |
| 10 | 0.11 | 0.10 | 15.12 | 898.11 |
| 11 | 0.10 | 0.09 | 15.14 | 897.45 |



**Figure 2. The R squared and adjusted R squared values of the models.**



**Figure 3. The RSE values of the models.**



**Figure 4. The AIC values of the models.**

The best-fit model is model 9. It has 6 terms: the mean term, the first harmonic, the second harmonic and the cosine term of the fifth harmonic – accounting to the 12-, 6-, and 2.4-month periods respectively – all of which are significant having p-values lesser than 0.05. Moreover, model 9 has the highest and the lowest RSE among the models having significant terms. Although some models have higher values and lower RSE values than that of model 9, the differences are negligible. Model 9 has the best AIC among all the models suggesting it to be the best-fit model and is parsimonious.

**Chapter IV**

**SUMMARY, FINDINGS, CONCLUSION AND RECCOMENDATION**

**Summary**

In this study, the researchers wish to determine the peak occurrence of dengue cases in Solano by describing and modelling it.

The researchers are to describe and model the periodic monthly frequency distribution of dengue cases in Solano, to choose the best-fit model among the models and to describe the periodic monthly frequency distribution of dengue cases in Solano using the best-fit model.

This study used exploratory design because we want to address a problem that has not been studied clearly, intended to establish priorities and to achieve a better understanding of the problem. This study was conducted during the second semester of S.Y. 2017 – 2018 at Nueva Vizcaya State University Bayombong, Nueva Vizcaya. The data was gathered at Regional Health Unit, Solano, Nueva Vizcaya last February 15, 2019. After the gathering of data, the researchers input the data in software R to analyse and to determine the peak season of dengue cases to know which is/are the best-fit model. The researchers then come up with the best-fit model among the models, and determine the monthly frequency distribution of the dengue cases in the Solano, Nueva Vizcaya.

**Findings**

In the study conducted, the researchers has chosen the best fit model among the models to describe the periodic monthly frequency distribution of dengue cases.

**Conclusion**

The researchers concluded that\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ but due to the incomplete data gathered this is not yet inevitable to use.

**Recommendation**

The researchers recommend that RHU should gather more data or information for this study to have a better and reliable model. This study will also give the future researchers an encouragement to continue this study and find complete data.

Having the positive feedback of the evaluators, we, the researchers highly recommends that this study should be acknowledge as a source of information for the next studies related.