

CHAPTER 3

RESEARCH METHODOLOGY

3.1. Data Sources and Types

3.1.1. Data source

The data source was obtained from the BMKG (Meteorology, Climatology and Geophysics Agency) earthquake catalog website, which is known as www.repogempa.bmkg.go.id. In order to obtain the data, the starting day and ending day, in addition to the starting year and finishing year, were specified. Because the website www.repogempa.bmkg.go.id can only broadcast earthquake data once every two weeks, the information that is displayed is then preserved for as long as five years.

3.1.2. Data Type

The type of data used is secondary data, namely data obtained indirectly in the field or data that other researchers have provided and collected.

3.2. Data analysis method

3.2.1. Literature review

The data source was obtained from the BMKG (Meteorology, Climatology and Geophysics Agency) earthquake catalog website, www.repogempa.bmkg.go.id, by specifying the starting day, ending day, and starting year, as well as the ending year. Because the website www.repogempa.bmkg.go.id can only display earthquake data every two weeks, the data that appears is then retained for up to five years.

3.2.2. *Scalping Data*

The following step is the gathering of magnitude data from the reo-earthquake website, which is performed by a python program that can save data that has been loaded by the browser according to the given date and year, and then all data is recorded in a (.csv) file. After all the data has been collected, it is filtered according to provincial names including the words "Java," "Sumatra," and "Bali." After collecting all the data comprising the names of all the regions in the province, we averaged the magnitude values of the entire provinces, yielding the magnitude values of Java, Sumatra, and Bali.

3.2.3. *Data processing*

Data processing using Double Exponential Smoothing Holt's Method. The steps taken are:

1. Determine the value of the alpha and b beta parameters that trial and error will use.
2. The input data includes the following data:
 - Year
 - Month
 - Sunday
 - Magnitude.
3. Perform the calculation process for:
 - $\text{Level} = \alpha * \text{magnitude} + (1 + \alpha) * (\text{previous level} + \text{previous trend})$
 - $\text{Trend} = \beta * (\text{current level} - \text{previous level}) + (1 - \beta) * \text{previous trend}$
 - $\text{Forecast} = \text{current level} + \text{current trend}$
 - $\text{Error} = \text{current magnitude} - \text{current forecast}$
 - $\text{ABS Error} = \text{abs}(\text{error now})$
 - $\text{Percent Error} = \text{current abs_error} / \text{current forecast} * 100.$

4. The output that appears is:

- $MAPE = \text{average of percent_error } \text{avg}(\text{percent_error})$
- Best Alpha and Beta based on smallest MAPE
- $\text{Similarity} = \text{ABS} \left(\frac{\text{Current Magnitude} - \text{ABS}(\text{Current Magnitude} - \text{Current Forecast})}{\text{Current Magnitude}} \right) * 100.$

3.2.4. *Graphic Plots, Conclusion Withdrawal, Compilation of reports as Final Project*

3.3. Research Methodology



Figure 3.1 Research Design Diagram