# Comparing Model Of Air Pollution Index Using Generalized Autoregressive Conditional Heteroskedasticity Family (Garch)

Nurul Asyikin Zamrus[1], Mohd Hirzie Mohd Rodzhan [2,*] and Nurul Najihah Mohamad[3]

## NURUL ASYIKIN BINTI ZAMRUS

International Islamic University Malaysia

**4 - 5 AUGUST 2021**

# CONTENTS

# Introduction

1. In environmental study, the interpretation of time series models for Air Pollution Indexs (API ) include:

-separation (or filtering) of noise from signals

-prediction of future values of a series or the population data

2. Time series forecasting is vital in the study of environmental issues in which because it is lead will effect the health of people.

# Objectives

1. To develop univariate API model using INGARCH (1,1) , NBINGARCH (1,1) and INARCH (1,0) model.

2. To compare the best model using AIC and BIC for integer value data.

# Literiture Review

| Author | Comparison Model Method | Data Specification |
|---|---|---|
| Wang and Lu (2006), Ibrahim, et al. (2009), Kurt and Oktay(2010). | • ARIMA | • Multivariate and Continues data |
| Rahman, Hisyam Lee, Talib Latif (2014). | • ARIMA, ANN, FTS | • Univariates and Integer Values of yearly data. |
| Hong Zhenf , et al. (2017) | • Hybrid-Garch, ARIMA, SVM(Support Vector Machine). | • Multivariate and Continues data |
| Suling Zhu , et al. (2017) | • S-ARIMA (seasonal ARIMA) | • Multivariate and daily Continues data |
| H. Maleki , et al. (2019) | • ANN | • Multivariate and Continues data |
| Current (2021) | • INGARCH, NBINGARCH, INARCH | • Univariates and Integer Values of daily data |

# Methadology

## Fitted GARCH family model

Using augmented dickey fuler (ADF) test to find the best order for the model.

Using Lagrange multiplier (LM) to test for the volatility.

## Comparing Model

INGARCH (1,1)

NBINGARCH (1,1)

INARCH (1,0)

# Data Description

1. Retrieving from open source data of Statistic Department Malaysia. (Department of Statistics Malaysia, 2019)
2. Collecting daily data in January 2019 until June 2019 for Air Pollution Index.
3. The data collect for Sarawak and Peneng.

| Location | Number of Location |
|---|---|
| Sarawak | 6 |
| Peneng | 2 |
| TOTAL | 8 |

Table 1: Summary data location collected for Air Pollution Index.

# Results and Discussions

| LOCATION | PARAMETER | MODEL | | |
|---|---|---|---|---|
| | | INGARCH(1,1) | NBINGARCH (1,1) | INARCH (1,0) |
| Limbang | α | 0.0003 | 0.0003 | - |
| | β | 0.7140 | 0.7140 | 0.7210 |
| | AIC | 1399.0710 | 1243.7300 | 1397.1000 |
| | BIC | 1408.6300 | 1256.4800 | 1403.4750 |
| Samarahan | α | 0.3000 | 0.3000 | - |
| | β | 0.5000 | 0.5000 | 0.6400 |
| | AIC | 1286.3800 | 1251.5800 | 1292.4600 |
| | BIC | 1295.9400 | 1264.3300 | 1298.8300 |
| Kimanis | α | 0.0002 | 0.0002 | - |
| | β | 0.8900 | 0.8900 | 0.8800 |
| | AIC | 1252.21 | 1243.73 | 1250.8800 |
| | BIC | 1261.77 | 1256.48 | 1257.2600 |

# Comparison Performance

1. From the result, showed that INARCH (1,1) model for Seberang Perai, Balik Pulau, ILP Miri and Bintulu has the lowest AIC and BIC.
2. Besides, NBINGARCH (1,1) model has the lowest AIC and BIC for Limbang, Kapit, Kimanis and Samarahan.
3. Its show that NBINGARCH (1,1) and INARCH (1,0) model outperformed INGARCH (1,1) model.

# Conclusion

1. NBINGARCH (1,1) and INARCH (1,0) model was capable of treating modelling for index values of API.
2. NBINGARCH (1,1) and INARCH (1,0) proved to be a flexible and intelligent comparison method that is a useful and effective tool for GARCH family model using integer value.

# THANK YOU