

Brynn E. Slicer
Class of 2020
National Security Studies and Economics
A Cross Country Analysis:
Using and Assessing ARIMA as a Forecasting Technique On the Economic Impact of
Terrorist Attacks
Brian Marks, J.D., Ph.D., Economics Department

The main question this research aims to answer is what the economic impact of a terrorist attack is. From this, the research was to assess the ARIMA¹ model as a forecasting tool, to determine the difference between the reported Real GDP² and the forecasted Real GDP. Originally the goal of the research was to compare what specific ARIMA model each country (France, Hungary, Sweden, and the United Kingdom) used, but after each model presented high error terms the course of the research changed. It was found that the ARIMA model was not a useful tool for determining the economic impact of a terrorist attack. The methodology begins with a literature review which has two foci: (1) economic impact of terrorism and methods of measurement and (2) the ARIMA model, its general usefulness and its applications to the study of terrorism. The data chosen is Real GDP from 1995-2017 and terrorist attacks from 1997-2017 for each country. This study uses the automatic ARIMA model for forecasting quarterly GDP for each country. The research also obeys the Box-Jenkins methodology³ to test for seasonality, trend, and cycle, determine if the data is stationary, and check for autocorrelation. After a country experienced a terrorist attack, there will be a forecast of the following quarter. The terrorist attacks are divided into two categories: (1) attack happened within the first two months of the quarter and (2) attack happened within the third month of the quarter. The automatic ARIMA model had an AICc⁴ value of each country (in alphabetical order) equal to 1472.2, 1703.57, 2341.75, 1960, 1697.04 and an RSME⁵ value equal to 541.9939, 1797.53, 52374.67, 6864.969, and 1758.904.

Based on the results of the study, the ARIMA model is not a useful tool for forecasting a country's GDP given a short-term impact of terrorism on an economy. The study can neither accept nor reject the hypothesis that a country's GDP goes down following a terrorist attack due to the results of the forecast. It was found that the forecasted Real GDP was sometimes greater than or less than the reported Real GDP, with little consistency as to when it would be either. It is theorized the results of the forecast to be explained by the public becoming immune to terrorism, given the consistency of terrorist events or countries are proactive in preparing for the repercussions of terrorist attacks and there is less of an impact on an economy⁶. The ARIMA model is based on mathematics, using the previous data to forecast, and does not take into account economic principles³. I will continue my research and evaluate a different type of economic impact of a terrorist attack. With the continued guidance of Dr. Marks, I will perform an event study on the defense and tourism sectors for my Senior Economic Capstone.

¹ ARIMA = Autoregressive integrated moving average

² Real GDP = Real Gross Domestic Product

³ Durka, P., & Pastoreková, S. (2012). ARIMA vs. ARIMAX – which approach is better to analyze and forecast macroeconomic time series? *Proceedings of 30th International Conference Mathematical Methods in Economics*, pages 136-140.

<https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=2ahUKEwiJgtLCovnkAhVLJt8KHYY9Dc4QFjABegQIABAC&url=http%3A%2F%2Fies.fsv.cuni.cz%2Fdefault%2Ffile%2Fdownload%2Fid%2F21584&usg=AOvVaw3ZgNBcjdagGiGJyciDo6JP>

⁴ AICc = Second-order Akaike Information Criterion

⁵ RSME = Root Square Mean Error

⁶ Sandler, T., & Enders, W. (2008). *Economic Consequences of Terrorism In Developed and Developing Countries: An Overview*. Retrieved from https://personal.utdallas.edu/~tms063000/website/Econ_Consequences_ms.pdf