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**LIST OF ABBREVIATIONS**

CE: CO2 Emission

EGS: Export of goods and services

ICP: Inflation, consumer price

IQR: Interquartile Range

ITE: International Tourism Expenditure

ITE: International tourism expenditure

MP: Methane Policy

NOE: Nitrous oxide emissions

QTM: Quadratic Trend Model

TG: Tourism Growth

TP: Tourism Policy

# **Introduction:**

1. **Brazil**

Brazil is the largest nation in South America and a developing nation. Due to the country's vast cultural and biological diversity, tourism is one of Brazil's most important economic industries (Santana 2000). Ecotourism is cited as a determining element for tourism when 14% of international tourists visit Brazil and the country was valued at $4.2 billion in 2000. (Oliveira 2002).

According to the OECD Library (2020), the tourism sector in Brazil supported 2,1 million jobs in 2018, or 2.5% of all occupations. Consequently, it contributed approximately 3.1% of the nation's GDP. In addition, with the new Argentina-Brazil air route policy, the route consolidates approximately 200 flights per week connecting various tourist sites, resulting in a 30% increase in flight frequency.

1. **New Zealand**

The island nation of NZ is located in the southwestern Pacific Ocean. Due to its advantageous geographical location, most visitors to NZ come to view the country's natural scenery.

In 2012, the tourist industry represented 7.7% of NZ's gross domestic product and 9.5% of full-time equivalent employment (Jaforullah 2015). Consequently, it became the country's top export region in 2010, accounting for 18% of export earnings (Chair, Bestwick, and Malloy 2019). In addition, the success of NZ's '100% Pure' marketing campaign in 1999 and the film The Lord of the Rings has helped boost NZ's standing in the tourism business and made it a potential tourist destination with attractive natural landscape (Insch 2020).

1. **Data Collection**

By consulting World Bank Data, a reputable source, our team was able to successfully collect a vast array of secondary data on tourism growth in Brazil and NZ from 1997 to 2017 for nine variables. We replace missing data by retrieving the most recent year's data.

|  |  |  |
| --- | --- | --- |
| **No.** | **Variable name** | **Unit** |
| 1 | International tourism expenditure | % of total import |
| 2 | GDP per capita growth rate | annual % |
| 3 | Foreign direct investment, net inflow | % of GDP |
| 4 | Adjusted net national income | annual % growth |
| 5 | Tourism policy | International tourist, number of arrivals |
| 6 | CO2 emissions from transport | % of total fuel combustion |
| 7 | Methane emissions | % change from 1990 |
| 8 | Nitrous oxide emissions | % change from 1990 |
| 9 | Inflation, consumer prices | annual % |

Table 1: Variables list

We will examine some missing information:

Both countries lack data for variable methane emissions from 2012 to 2017, so we use the data from 2011 instead.

Similarly, since there are some data missing for the years 1997 to 2000 for NZ's international tourism expenditures, we use data from 2001.

# **II. Descriptive Statistics:**

|  | **Brazil** | **NZ** |
| --- | --- | --- |
| **Mean** | 7.07 | 7.58 |
| **Median** | 7.40 | 7.56 |
| **Max** | 9.85 | 8.34 |
| **Min** | 4.49 | 6.88 |
| **Standard Deviation** | 1.64 | 0.40 |
| **Coefficient of Variation** | 0.23 | 0.05 |
| **Q1** | 6.02 | 7.26 |
| **Q3** | 8.37 | 7.81 |
| **IQR** | 2.35 | 0.55 |

|  | **Upper Limit** | **Comparison** | **Max** | **Lower Limit** | **Comparison** | **Min** | **Outliers** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Brazil** | 11.89 | > | 9.85 | 2.50 | < | 4.49 | No |
| **New Zealand** | 8.64 | > | 8.34 | 6.44 | < | 6.88 | No |

Table 2**:** Table of descriptive statistics for ITE of Brazil and New Zealand from 1997 to 2017

## **Measure of central tendency**

Since data are represented as multiple values, mode cannot be used to calculate central tendency (Statistics Canada n.d). According to table 1, NZ ranks higher than Brazil in terms of Mean and Median. In this situation, the median is the appropriate measure of central tendency, as it accounts for two-fifths of the observed data set. Additionally, the median is less likely to be influenced by outliers or skewed data (S. Manikandan et al, 2011). During the examined period, 50% of NZ’s ITE experienced a growth rate of 7.58 %, compared to 7.07% for Brazil. In contrast, Brazil recorded the highest rate of TG in 2017 at 9.85%, while NZ’s highest rate in 2016 was only 8.35%.

## **Measure of variation**

There are 5 measures of variation, but IQR would be the optimal measure of variation because it accounts for 50% of data points that fall between the first and third quartiles and is less sensitive to outliers because it is not dependent on all values (Jim Frost el al). In table 1, Brazil's IQR is 2.35%, while NZ rate is 0.55%, indicating that NZ data points are closer to the median.

## **Box and whiskers plot**

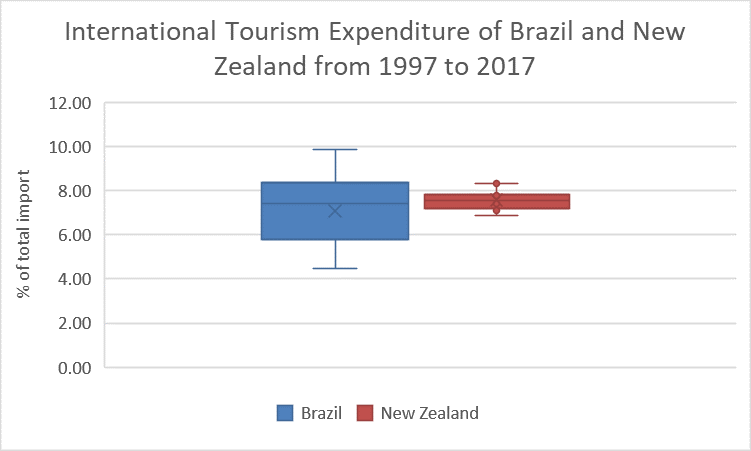


Figure 1: Brazil and NZ’s box and whiskers plot international tourism expenditure from 1997 to 2017.

Box and whisker plots are appropriate for displaying the mean, median, IQR, and quartiles of each country's tourism growth (TG) rate. Figure 1 indicates that Brazil's data has a left-skewed distribution, whereas NZ’s data has a right-skewed distribution.

The figure also reveals that Brazil's tourism growth rate datas are highly dispersed, whereas those for NZ are clustered around the median. According to the box plot, the tourism industry in Brazil experienced a growth rate of 2.35% between the first and third quartiles, which accounts for 50% of the data. In contrast, NZ’s box plot growth rate was significantly lower, reaching only 0.55%.

# **III. Multiple Regression**

## **Brazil**

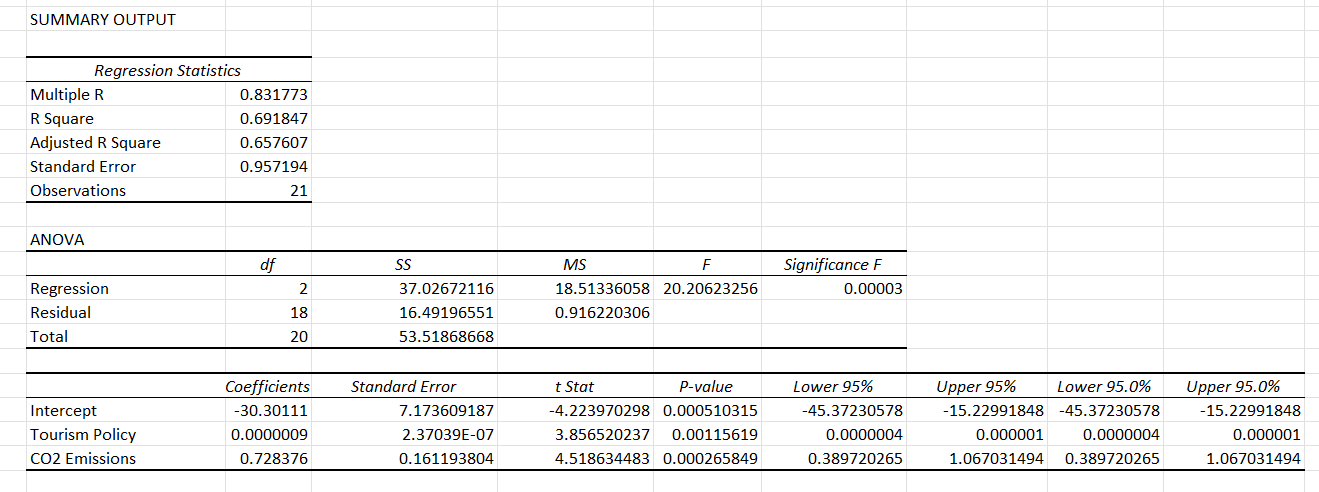
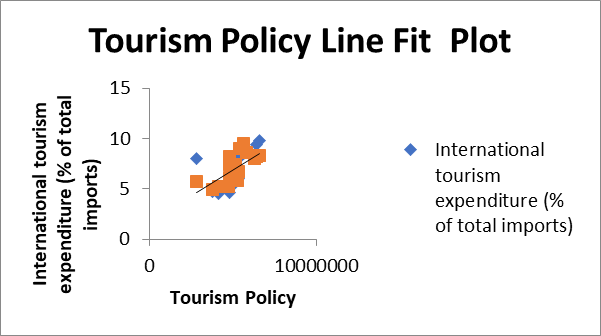


Figure 2: Brazil’s multiple regression

Since backward elimination is a statistical method used to find the simplest model that explains the data, the usage of backward elimination is suitable here (Simplilearn 2022) . After using it, we ended up with the final model, which included 2variables that are at 5% level of significance: TP, and CE.



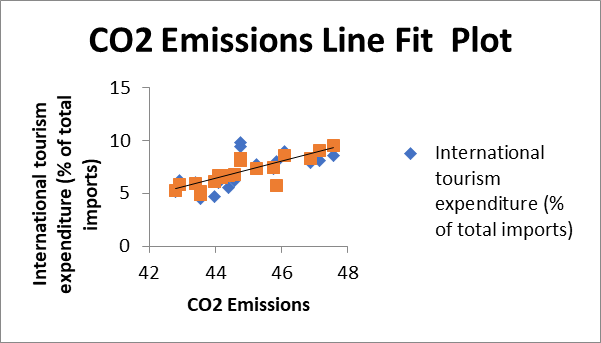


Figure 3: Line Fit Plots for Brazil’s ITE.

Based on Figure 3, since both of the fit plots have points that clustered around a line running from the bottom left to the top right of the chart area, it can be said that both TP and CE have a good relationship with ITE.

**1. Regression equation**

y = b0 + b1x1 + b2x2

ITE =

## **2. Interpretation of regression coefficients**

b0= -30.301: The estimated average ITE is -30.3011 % when the values of ME, CE, NOE are 0

b1 = : The average ITE increases with % for each 1% increase in TP.

b2= 0.728: The average ITE increases by 0.7284% for each 1% of CE.

## **3. Interpretation of the coefficient of determination**

R2= 0.83177 shows that 83.177% of ITE variation from 1997-2017 can be explained by TP, and CE, while the other 16.823% can be explained by other factors that are excluded from this research.

Since Brazil’s coefficient of determination is high (83.177%), it means that TP, and CE have a big influence on Brazil’s ITE.

## **New Zealand**

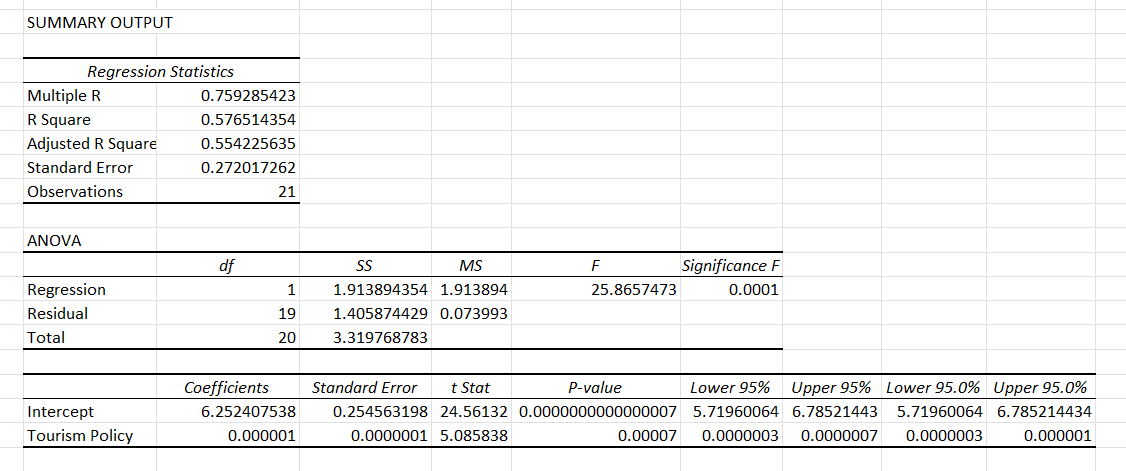
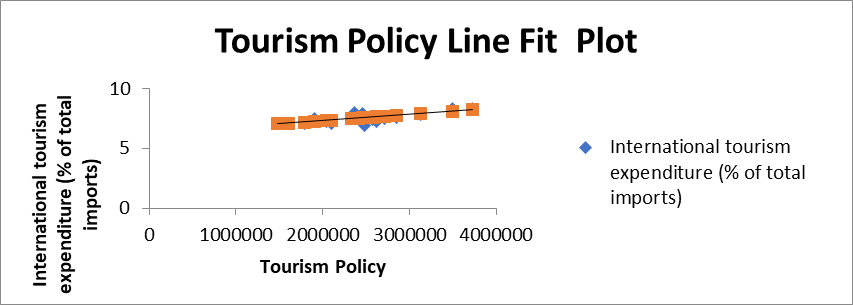


Figure 4: NZ’s multiple regression.

Since backward elimination is used to remove features that do not have a significant effect on the dependent variable or predict the output, it will be used here (Javatpoint n.d.). Through the usage of backward elimination, we will end up with the final model, which included 1variable that is at 5% level of significance: TP.

Figure 5: Line Fit Plots for NZ’s ITE.

Based on figure 5, it can be seen that TP has a positive relationship with ITE, meaning that as the value of TP increases, the value of the ITE will also increase.

**1. Regression equation**

y = b0 + b1x1

ITE = 6.252 + ​​ (TP)

## **2. Interpretation of regression coefficients**

b0= 6.252: The estimated value for ITE is 6.2524% when the values of TP are 0

b1= : The average ITE increases by % for each 1% of TP.

## **3. Interpretation of the coefficient of determination**

R2=0.75929 shows that 75.929% of New Zealand’s tourism growth variation from 1997-2017 can be explained by TP, while the other 24.701% can be explained by other factors that are excluded from this research.

Since New Zealand’s coefficient of determination is high (75.929%), it means that TP has a big influence on New Zealand ITE.

# **IV. Team Regression:**

Looking at the Regression Model from Part 3, it can be seen that both dataset have the same 2 variables, that being TP. Looking at the part above, both of these variables have the same relationship in the 2 databases, with TP having a positive relationship with the ITE in both countries. Not only that, these 2 variables have a bigger influence on NZ’s TG rate (83.177%) than with Brazil’s TG rate (75.929%).

When it comes to Brazil, CE has the highest influence on Brazil's TG, since there is a 83.177% chance that Brazil’s TG increases by 0.7284% for each 1% of IT. As for NZ, TP has the highest influence on NZ’s ITE, mainly because it is the only one.

When it comes to Part 2, it can be seen that NZ's descriptive statistics are mostly higher than that of Brazil. Since median was the most suitable measure for central tendency, it was found out that 50% of NZ's ITE experienced a growth rate of 7.58%, compared to 7.07% for Brazil.

# **V. Time Series Forecasting**

## **1.Line chart**

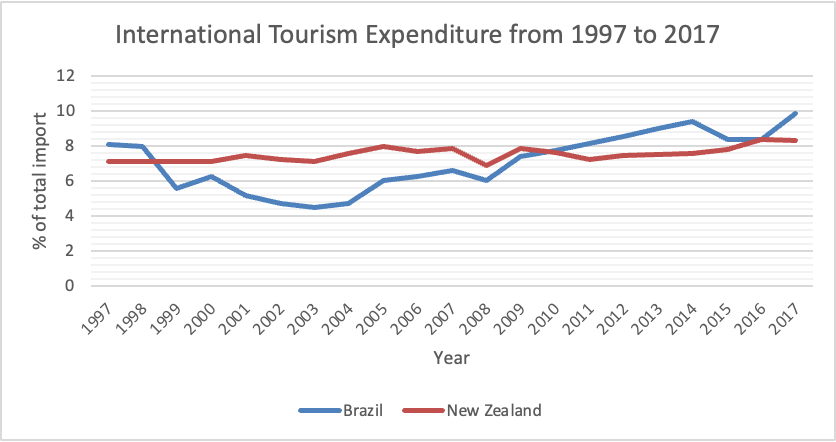
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Figure 6 : Line chart reveals the international tourism expenditure of Brazil and NZ from 1997 to 2017 (% of total import)

From 1997 to 2017, the graph depicts the trend in ITE between Brazil and NZ. Between 1997 and 1999, NZ did not set any records, whilst Brazil's trend remained stable in 1997 and 1998 at 8%, then declined to roughly 6% in 1999. From 2000 to 2008, NZ's trendline was fairly steady, dropping from 7% in 2000 to 6.8% in 2008. During the same time period, Brazil saw tremendous fluctuations with a downward tendency, reaching 6% in 2008, which was less than 1% in 2000.

From 2009 to 2017, ITE in Brazil increased significantly, reaching a peak of 9.8% in 2017. In the meantime, the NZ trendline followed the same path as the preceding era and peaked in 2016 at 8.3%. As for the box and whisker plot, the tourism industry in Brazil experienced a growth rate of 2.35 % between the first and third quartiles. On the other hand, NZ's box plot growth rate was significantly lower, reaching only 0.55 %.

## **2.** **Brazil**

1. **Linear**

Regression output:

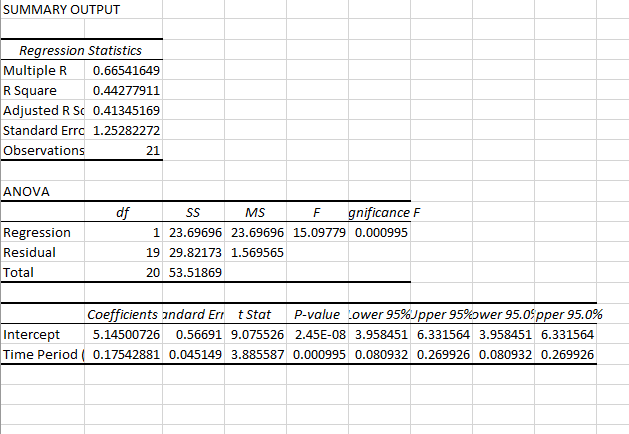


Figure 7: Linear regression output for Brazil’s TG rate (% of total import)

Significance testing:

Confidence level:

: (There is no linear trend)

(There is linear trend)

Since P-value is smaller than , it can be seen that we can reject null hypothesis Ho. Thus, we have confidence that Brazil's TG rate has a linear trend model.

The linear formula and coefficient explaining:

As T increases, Brazil's TG rate is expected to increase 0,175% yearly in the future.

1. **Quadratic**

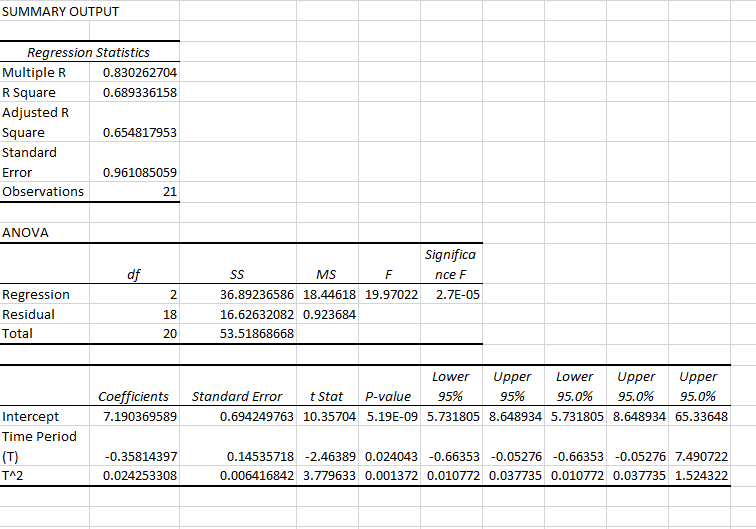


Figure 8**:** Quadratic regression output for Brazilian TG rate (% of total import)

Significance Testing

Confidence level:

: (There is no quadratic trend)

(There is quadratic trend)

From the figure above, we can inform that both P-value for T and are smaller than , which are 0,024 < 0,05 and 0,0013 < 0,05 respectively. Hence, we can conclude that null hypothesis Ho can be rejected, Brazilian tourism growth rate may follow quadratic trend model.

The quadratic formula and coefficient interperting

Brazil tourism growth rate expected to be 7,19 % at original time (T = 0). However, when T change, also change its value. For this reason, we need to apply a deviation rule in order to find Y.

First deviation:

Second deviation:

The second deviation value is 0,048, which means that if T changes by 1 unit, the Brazilian tourism growth will change from to which indicates that Brazil’s TG rate will increase in the future.

1. **Exponential**

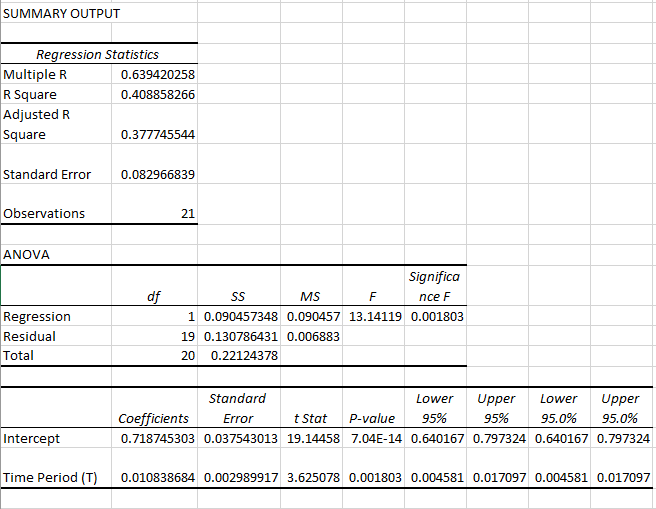


Figure 9: Exponential regression output for Brazil’s tourism growth rate (% of total import)

Significance Testing

Confidence level:

: (There is no exponential trend)

(There is exponential trend)

The p-value for Time Period (T) is smaller than (0,0018 < 0,05). For this reason, we can reject Ho, which means that exponential trend is significant for Brazil’s tourism growth rate.

The exponential formula and coefficient explaining

Linear format:

Non-linear format:

When T = 0, Brazilian tourism growth rate was expected to be 5,23%

As , the Brazil’s tourism growth rate is expected to rise by yearly in the future.

## **3. New Zealand**

1. **Linear**

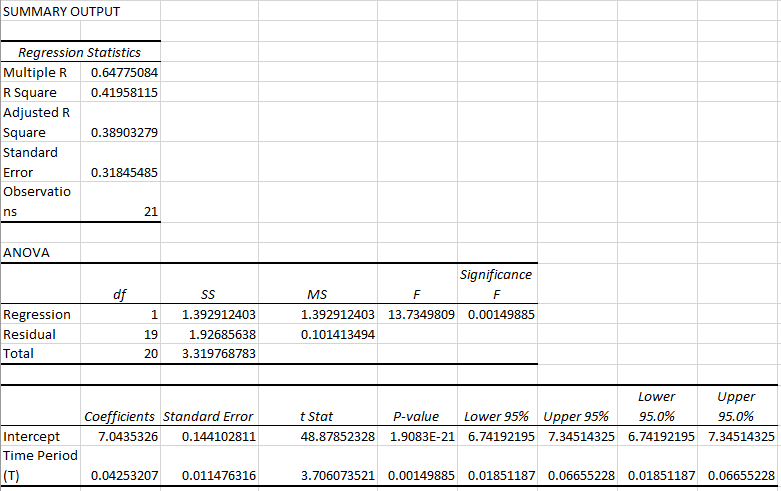


Figure 10: Linear regression output for NZ tourism growth rate (% of total import)

Significance Testing

Confidence level:

: (There is no linear trend)

(There is linear trend)

P-value for Time Period (T) is much smaller than (0,001 < 0,05). Hence, we can conclude that Ho can be rejected, NZ tourism growth rate follows the linear trend model.

The linear formula and coefficient explaining:

As T increases by 1 unit (year), the NZ tourism growth (TG) rate is estimated to rise 0,04% yearly in the future.

1. **Quadratic**

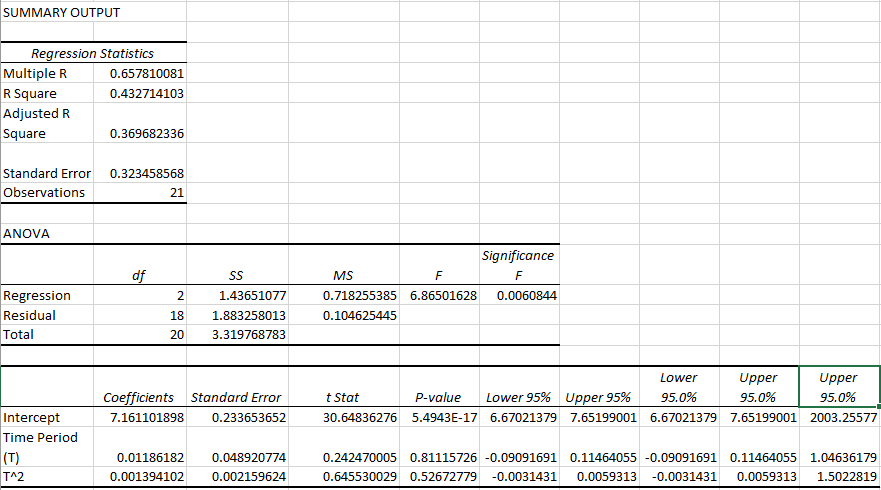


Figure 11: Quadratic regression output for NZ tourism growth rate (% of total import)

Significance testing:

Confidence level:

: (There is no quadratic trend)

(There is quadratic trend)

From the figure above, we can inform that both p-value for T and T^2 are much higher than the confidence level , which are 0,81 > 0,05 and 0,56 > 0,53 respectively. Hence, we cannot reject Ho, the quadratic trend doesn’t occur in NZ’s TG rate.

1. **Exponential**

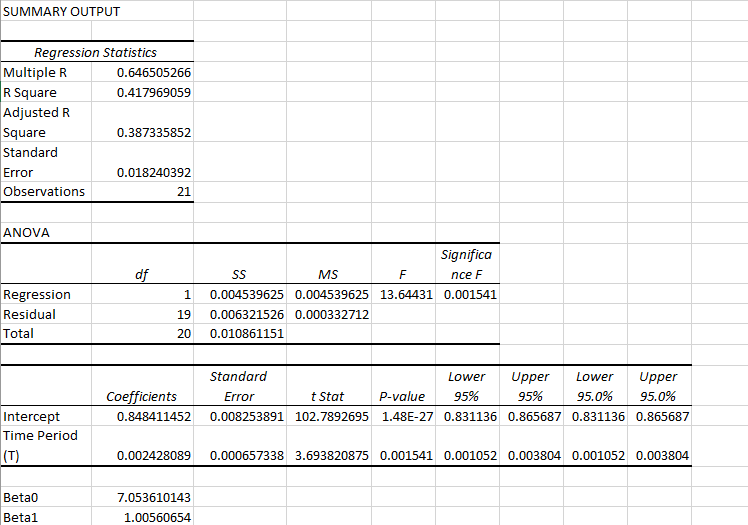


Figure 12: Exponential output for NZ tourism growth rate (% of total import)

Significance Testing:

Confidence level:

: (There is no exponential trend)

(There is exponential trend)

From the figure, we can inform that the P-value for the Time Period is smaller than the confidence level (0,001 < 0,05). Hence,we can reject Ho, the exponential trend model is significant in NZ’s TG rate.

The exponential formula and coefficient interpreting:

Linear format:

Non linear format:

As a result, when T = 0. NZ tourism growth rate was estimated to be 7,05%. In the future, this rate is expected to increase yearly in the future.

## **4. Trend model recommendation**

Mean absolute deviation (MAD) and sum of squared errors (SSE) must be compared to determine which model offers the fewest errors in order to choose an appropriate trend model for future predictions. Since there are no outliers in the dataset, we can compare using both MAD and SSE. In this circumstance, MAD is implemented.

|  |  |  |  |
| --- | --- | --- | --- |
| Countries | Linear | Quadratic | Exponential |
| Brazil | 0,92 | 0,799 | 0,895 |
| New Zealand | 0,244 | #N/A | 0,243 |

Figure 13: Comparison of the mean absolute deviation for the Linear, Quadratic, and Exponential trend models for the tourism growth rates of Brazil and NZ (% of total import) .

From the table above, it is informed that Brazil's TG rate follows the quadratic trend model for future predictions since it accounts for the smallest errors, which is 0,799. While NZ tourism growth rate follows an exponential trend model with MAD of 0,243.

## **5. Future predictions for Brazil and New Zealand’s tourism growth rate in 2023, 2024 and 2025**

Based on the preceding discussions and findings, the quadratic and exponential model have been selected for future forecasting. Part 2 reveals that the Brazil and NZ tourism growth rate is anticipated to rise in the near future, according to the coefficient interpretation conducted in section 3.

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Time Period** | **Predicted Brazilian Tourism Growth Rate (% of total import)** | **Predicted New Zealand's Tourism Growth Rate (% of total import)** |
| 2023 | 27 | 15.201 | 8.203 |
| 2024 | 28 | 16.177 | 8.249 |
| 2025 | 29 | 17.201 | 8.295 |

Figure 14**:** Future prediction of Brazilian and New Zealand tourism growth rate in 2023, 2024 and 2025 (% of total import)

The trend for Brazilian tourism growth will continue to increase over the next three years, from 15.2% in 2023 to 17.2% in 2025, according to the analyzed table. Following NZ, tourism growth rate of these countries is expected to rise from 8,20% in 2023 to nearly 8,3% in 2025.

# **VI. Conclusion:**

## **Comparison:**

Based on our findings which led us to the discussion above, It can be said that ICP and EGS have an impact on CE in Brazil and NZ. Additionally, the number of CE’s countries increases as natural resources are used more frequently. While oil and the production of hydropower both continue to account for the majority of the nation's primary energy demand, Brazil intends to replace petroleum with ethanol . Furthermore, because of the giant population number and the crowded metropolitan environment, Brazil has trouble growing its manufacturing sector. It amply demonstrates the reason why Brazil continues to trail behind NZ in terms of lowering emissions in order to lessen the effects of global warming and achieve more sustainable growth when findings from part 4 are taken into consideration.

## **Suggestions:**

We indicated in part 4 that the expansion of production and resource use has led to an increase in CE, making it a serious issue for nations attempting to attain sustainable economic growth, a solution that manages those aspects in the two nations is necessary. To minimise pollution, both governments may employ four main strategies: taxes to increase the cost of alternatives, subsidies of alternatives, legislation to prohibit particulate pollutants, and pollution permits.

The SDG Summit, which took place in September 2019, brought together heads of state and government at the UN headquarters in New York to follow and carefully evaluate the implementation of the 17 Sustainable Development Goals and the 2030 Agenda for Sustainable Development (SDGs). Adoption of the Political Declaration, the major message of which is to act in response to climate emergencies, marked the summit's conclusion. According to 22 pertinent studies, emission reduction strategies must be incorporated into the economic growth plans of various countries in order to achieve both economic growth and climatic and environmental sustainability (SDGS 2019).

The reduction of pollution will result from altered industry structures. The amount of secondary industries, especially in the energy-intensive sector, will decline as the economy develops, but energy consumption will rise, reducing pollution. The development of technology will make it possible to use resources efficiently and require less energy. As a result, technical level has a significant impact on pollution and energy intensity (Chen, Xu, et.al 2019).

## **Extra Variable:**

The largest country in South America and a developing country, Brazil. The nation's urbanisation has increased since the 1990s, utilising 14% of the increasingly total population, the country is classified as “urban". In 2020, 86,9% of NZ lived in many main cities and around the big four cities. Compared to Brazil, NZ has a far lower rate of urbanisation.

Metropolitan areas are playing a bigger role in many countries' energy consumption and CE as urbanisation accelerates. Unquestionably, the effect of urbanisation on the consumption of fossil fuel energy has changed and elevated carbon levels in the atmosphere, causing warming. Climate change and global warming are results of this process (Sigeze, Manga, et.al 2018).

Urbanisation is a dynamic phenomena that transfers rural areas' social and economic potential—which is based on an agrarian economy—to urban areas (industrial economic base). Urbanisation and high urban densities, however, were projected in recent decades due to economic globalisation; many rising nations are currently going through economic transformation, which ultimately causes the physical rise of metropolitan areas. However, the rapid urbanisation of recent decades has raised the possibility of increased energy consumption as well as significant environmental issues (Ahmed, Wang, and Ali 2019).

Urbanisation is a quantitative factor. Urban population growth has a very favourable impact on CE. Increases in road and air travel as well as higher energy consumption are caused by urban residents' higher income and spending, respectively. Urbanisation increases CE, but after it reaches a certain level, it has a negative effect on CE. This relationship between urbanisation and CE is nonlinear.

# **VII. Reference**

Andrea Insch (March 2020), ‘The challenges of over-tourism facing New Zealand: Risks and response’, *sciencedirect*, accessed 3 January 2023.<https://www.sciencedirect.com/science/article/abs/pii/S2212571X19301453>

Ciler S, Muge M, et.al (17 Dec 2018), ‘The relationship between tourism, CO2 emissions and economic growth: a case of Mediterranean countries’, *tandonline*, accessed 3 January 2023.<https://www.tandfonline.com/doi/full/10.1080/10941665.2018.1557717?casa_token=h-c2vh34lFQAAAAA%3ARgs8ocaDGB4Vs7Iu_xDlGd7ad6wKxNihiuiu1dy8-mgF8XcokY2B7JU5BR69JPdrFy8qRhv7qj3x41A>

David S, Jenn B, and Kevin M (September 2019),‘Optimising Tourism New Zealand’s future role and contribution to New Zealand’, *the tourism New Zealand report*, accessed 3 January 2023.<https://www.mbie.govt.nz/dmsdocument/6974-the-tourism-new-zealand-report>

Frost, J “Measures of Variability: Range, Interquartile Range, Variance, and Standard Deviation,” accessed 3 January 2023.<https://statisticsbyjim.com/basics/variability-range-interquartile-variance-standard-deviation/>

Javatpoint (n.d.), ‘*What is Backward Elimination?*’, Javatpoint, accessed 3 January 2023.<https://www.javatpoint.com/backward-elimination-in-machine-learning>

Jiandong C, Chong X, et.al (February 2019), ‘Driving factors of CO2 emissions and inequality characteristics in China: A combined decomposition approach’, *sciencedirect*, accessed January 8, 2023.<https://www.sciencedirect.com/science/article/pii/S0140988318304936?casa_token=Gu7hI--mP10AAAAA:Odz1bj0Ujy2kQYDVdi8GUcxW0nBMbHzky-k8CnRiQYQf6wkU3XoTE-0090jZWKnxdTwFY2oL_Dzl>

Jose O (2002), ‘Governmental responses to tourism development: three Brazilian case studies’, *sciencedirect*, accessed 3 January 2023.<https://www.sciencedirect.com/science/article/abs/pii/S0261517702000468>

Manikandan S (2011), ‘Measures of central tendency: Median and mode’, *PubMed Central(PMC),* accessed 3 January 2023.<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3157145/>

Mohammad J (April 2015), ‘International tourism and economic growth in New Zealand’, *Economics Discussion Papers*, accessed 3 January 2023.<https://ourarchive.otago.ac.nz/bitstream/handle/10523/5603/DP_1502.pdf?sequence=1&isAllowed=y>

OECD (n.d), ‘Tourism Trends and Policies 2020 in Brazil’, *iLibrary*, accessed 3 January 2023.<https://www.oecdilibrary.org/sites/222a322een/index.html?itemId=/content/component/222a322e-en>

Santana (1 December 2000), ‘An overview of contemporary tourism development in Brazil’, *International Journal of Contemporary HospitalityManagement,* accessed 3 January 2023.<https://www.emerald.com/insight/content/doi/10.1108/09596110010347310/full/html>

Simplilearn (2022), ‘*What Is Backward Elimination Technique In Machine Learning?*’, Simplilearn, accessed 3 January 2023.<https://www.simplilearn.com/what-is-backward-elimination-technique-in-machine-learningarticle#:~:text=Backward%20elimination%20is%20a%20statistical,that%20are%20not%20statistically%20significant>

STAT Online, ‘9.1 - Linear Relationships’, 9.1 - Linear Relationships, accessed 3 January 2023.<https://online.stat.psu.edu/stat500/book/export/html/587#:~:text=If%20the%20slope%20is%20positive,increases%20the%20other%20variable%20decreases>

Statistics Canada (n.d). “4.4.3 Calculating The Mode.” *4.4.3 Calculating The Mode*, accessed 3 January 2023.www150.statcan.gc.ca/n1/edu/power-pouvoir/ch11/mode/5214873-eng.htm.

Statistique Canada (n.d), “5.6. Scatter Plot”, 5.6 Scatter Plot, accessed 3 January 2023.<https://www150.statcan.gc.ca/n1/edu/power-pouvoir/ch9/scatter-nuages/5214827-eng.htm>

*Sustainable development goals* (2022), Operation Eyesight, accessed January 8, 2023.<https://operationeyesight.com/sustainable-development-goals/?gclid=CjwKCAiA8OmdBhAgEiwAShr404dDDJpQeNH9vUQQdSl0fIjNVmRHjuQ2iNbgWt_R2PyFWLceHWhcshoCQ9YQAvD_BwE>

*Urban population (% of total population) - Brazil* (n.d.) *Data*, world bank data, accessed 3 January 2023.<https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS?locations=BR>

# Zahoor A, Zhaohua W & Sajid A (28 May 2019), ‘Investigating the non-linear relationship between urbanization and CO2 emissions: An empirical analysis’, *Springer*, accessed 3 January 2023.<https://link.springer.com/article/10.1007/s11869-019-00711-x>

*New Zealand* (2023) *Wikipedia*. Wikimedia Foundation. Available at: <https://vi.wikipedia.org/wiki/New_Zealand>