# APPLICATION OF VECM TO MEASURE TOURISM ECONOMIC IMPACT ON SAO TOME AND PRINCIPE INTEGRATING MACROECONOMIC VARIABLES

## Aplicação da VECM para Medir o Impacto Econômico do Turismo em São Tomé e Príncipe Integrando Variáveis Macroeconômicas

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**RESUMO**

Esta pesquisa quantitativa visa analisar a relação de longo prazo e a causalidade entre o desenvolvimento econômico, o turismo e outras variáveis macroeconômicas no contexto de São Tomé e Príncipe [STP]. Primeiro, aplica-se o teste de raiz da unidade Dickey e Fuller [ADF] e Phillips e Perron [PP], seguido pelo teste de cointegração Johansen e o Modelo de Correção de Erros Vetoriais [VECM]. Produto interno bruto [PIB], receitas de turismo [TR], investimento estrangeiro direto [FDI], taxa de desemprego [UR] e inflação [INF] são as variáveis utilizadas no modelo econométrico de 1993 a 2019. Os resultados indicam uma relação positiva de longo prazo entre o PIB e as variáveis explicativas TR e FDI. Também indica uma relação negativa de longo prazo entre o PIB e as variáveis INF e UR. Em termos de causalidade de curto prazo, os resultados revelam uma causalidade unidirecional que vai do PIB ao IDE e INF e causalidade bidirecional entre TR e INF. Além disso, sugere uma causalidade unidirecional de longo prazo de todas as variáveis independentes para o PIB. Este é o primeiro estudo quantitativo que apresenta uma nova perspectiva do turismo no contexto do STP, aplicando o VECM e integrando diversas variáveis macroeconômicas.

**PALAVRAS-CHAVE**

Turismo; Crescimento Econômico; Indicadores Macroeconômicos.

**ABSTRACT**

This quantitative research aims to analyze the long-run relationship and causality between economic development, tourism, and other macroeconomic variables in the context of Sao Tome and Principe [STP]. First, the Augmented Dickey and Fuller [ADF] and Phillips and Perron [PP] unit root test is applied, followed by the Johansen cointegration test and the Vector Error Correction Model [VECM]. Gross domestic product [GDP], tourism receipts [TR], foreign direct investment [FDI], Unemployment rate [UR], and Inflation [INF] are the variables used in the econometric model from 1993 to 2019. The findings indicate a positive long-run relationship between GDP and the explanatory variables TR and FDI. It also indicates a negative long-run relationship between GDP and the variables INF and UR. In terms of short-run causality, the results reveal a unidirectional causality running from GDP to FDI and INF and bidirectional causality between TR and INF. Furthermore, it suggests a long-run unidirectional causality from

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all independent variables to GDP. This is the first quantitative study that presents a new perspective of tourism in the context of STP by applying the VECM and integrating several macroeconomic variables.

**KEYWORDS**

Tourism; Economic Growth; Macroeconomic Indicators.

**INTRODUCTION**

Tourism is a social practice that emerged in the 19th century after profound changes occurred in societies, from industrialization to the establishment of the labor society. However, it only solidified and expanded later after the Second World War due to the modernization of labor laws, which gave entitlement to paid leave to most European workers, allowing the economically disadvantaged social classes to start traveling (Barretto, 2006). Nowadays, tourism is a crucial economic sector for several countries due to its fast growth and economic impact, including the potential for job-creating and income-generating (Aynalem et al., 2016; Milutinović & Stanišić, 2019). The continuous rise in the number of travelers in recent years and the amount of money spent by travelers in tourism destinations are some of the indicators that demonstrate this sector's strength.



The World Travel & Tourism Council [WTTC] reported that the contribution of the travel and tourism sector to GDP in 2019 before the Covid 19 pandemic was 10.3% (WTTC, 2022a). The pandemic caused by Covid-19 has abruptly altered world markets and affected economic activity. Accordingly, the tourism sector suffered a sudden decline (De Conto et al., 2020; Gullo, 2020). Consequently, tourism contribution to GDP fell to 5.3% in 2020, a decline of -50.4% and a loss of almost US$4.9 trillion. Afterward, in 2021 the total tourism contribution to the world economy stood at 6.1% of global GDP, and 18.2 million jobs were recovered compared to the loss of 62 million jobs in 2020 (WTTC, 2022a).

There are both positive and negative impacts resulting from tourism. For instance, it contributes to GDP and job opportunities, more foreign exchange earnings, tax revenues, and opportunities for economic diversification. Among the negative impacts resulting from tourism development, there are increases in real estate prices, increases in prices of goods and services, inflationary pressures, and outflows when foreign firms do not reinvest profits back into the host country (Nicely & Palakurthi, 2012). However, the negative effects of tourism can be avoided or mitigated through planning.

Due to its economic contribution tourism has become an essential tool in several countries' economic development, especially the small islands challenged by their small market, high transportation cost, resource scarcity, and income volatility (Schubert et al., 2011). The United Nations Conference on Trade and Development [UNCTAD] recognized the particular challenges faced by the small island developing states. Accordingly, UNCTAD has taken action in view of improving the capacity of small island developing states to obtain new economic opportunities meanwhile avoiding marginalization due to globalization (UN, 2006).

The small island developing states face special disadvantages associated with their size, remoteness, insularity, etc. (Schubert et al., 2011). Thus, tourism has been a factor of great importance for developing small island states, a source of income and jobs for these countries' development, and Sao Tome and Principe [STP] is no exception. STP is a lower and middle-income small group of islands among the world's least developed countries [LDC] located in the Gulf of Guinea. Historically, agriculture has been the basis of the country's economy. Nonetheless, the local production is small, making STP dependent on imports to supply domestic demand and dependent on international aid (Loureiro & Ferreira, 2014).



With the rise of economic challenges, tourism emerges as a tool for the economic development of STP. In recent years, tourism has been gaining more significance for STP's Government due to its contribution to the economy. As reported by STP's General Direction for Tourism, between 2010 and 2016, the number of tourists visiting the destination went from 8 thousand to 29 thousand, an increase of 263%, whose economic contribution represents 14% of the national GDP (DGTH, 2018). Later, in 2019 tourism contribution to STP's GDP reached 14.4%, contributing to 13.5% of total employment (WTTC, 2022b). Meanwhile, the tourism contribution to the global GDP in 2019 was 10.3%, creating 330 million jobs, which means 10.6% of total employment (WTTC, 2022a). However, due to the pandemic in 2020, the contribution of tourism to STP's GDP decreased to 6.1% likewise its contribution to employment fell to 10.2% [a decline of -26%]. These results are consistent with the decrease of around 50% of tourism contribution to the global economy, due covid pandemic (WTTC, 2022b).

As reported by WTTC (2022a), despite the recent decline in tourism globally, the tourism sector is slowly recovering. The revenue generated from tourism and related activities still contributes to strengthening the local economy of many countries. The government of STP highlighted tourism as a crucial factor in the country's development, meanwhile, there is a lack of studies to

quantify the economic impacts of tourism in this country's context.

**LITERATURE REVIEW**

The literature review seeks to build a strong theoretical base for this study, thus creating a scientific framework for achieving the proposed objectives. It represents an important step and foundation when undertaking a research project (Pare et al., 2015). Therefore, considering this study objective, research related to tourism and economic growth, integrating macroeconomic variables inflation, FDI, and unemployment.

**Tourism and Economic Growth -** Tourism is an economic activity since most tourist choices impact the economy, such as the choice of where to visit, where to eat, where to host, etc. Thus, tourism sector activities can affect a country's economic performance (Selimi et al., 2017). This industry has become an important tool for both developing and developed countries due to its positive economic impacts (Cárdenas-García et al., 2015). Therefore, the importance of tourism activity and the analysis of its impact has aroused the interest of a growing number of scientific studies (Balaguer & Cantavella-Jordá, 2002; Bassil et al., 2015; Oh, 2005). There is an extensive literature devoted to tourism's economic impact and its results support the existence of a positive effect of tourism on economic growth (Bassil et al., 2015; Bento, 2016; Dritsakis, 2004; Rasethuntsa, 2022).



Several authors have used econometric techniques to investigate the links between tourism and economic growth, also known as the tourism-led growth hypothesis [TLGH] (Bassil et al., 2015; Suryandaru, 2020; Zuo & Huang, 2017). Balaguer and Cantavella-Jordà (2002) carried out pioneering research. They applied a three-variable model [international tourism, gross domestic product, and the real effective exchange rate] to test the TLGH for Spain in the period between 1975 and 1997. The econometric study showed a long-run stable relationship between tourism expansion and economic growth, which means that international tourism's earnings affect Spain's economic growth. Afterward, Dritsakis (2004) tested the TLGH for the case of Greece between 1960 and 2000 using the Multivariate Auto-Regressive [VAR] model.

The findings revealed a cointegration relationship among the variables, and the Granger causality results indicated a granger causality between tourism, exchange rate, and economic growth. The results also indicated that tourism revenue and exchange rate positively impact economic growth. Eugenio-Martín et al. (2004) applied the Arellano-Bond dynamic panel data

to analyze how tourism impacted Latin American countries' economic growth from 1985 to 1998. The least-square (LS) panel data was applied to analyze the factors influencing the number of tourists' arrival in a destination country and achieve the research objectives. The data suggested a positive relationship between tourism and economic growth in low-and middle-income countries but not in more developed countries. Besides, it was also found that life expectancy, GDP per capita, level of education, and infrastructure affect the choice of a tourist destination more than the price of the services and goods in the tourist destination. Kum et al. (2015) used both the dynamic ordinary least square [DOLS] and Fully modified ordinary least squares [FMOLS] to measure the economic impact of tourism on the N-11 [Pakistan, Egypt, Turkey, Indonesia, Vietnam, Bangladesh, Iran, South Korea, Mexico, Philippines, and Nigeria]. The output suggested a long-run relationship between tourism arrivals and GDP growth.

The studies above described showed the relationship between tourism and economic development, and the findings indicate that tourism can contribute to economic growth.

**Tourism and unemployment -** The service sector growth has been greatly contributing to employment, particularly in the tourism sector, which has an enormous potential to create jobs (Dayananda & Leelavathi, 2016). Accordingly, a rise in employment can greatly affect economic growth and reduce poverty (Dayananda & Leelavathi, 2016; Hampton et al., 2018).



The tourism sector has a significant contribution to economic growth through the generation of employment opportunities (Aynalem et al., 2016; Milutinović & Stanišić, 2019). An increase in tourism activity increases the need for a qualified workforce to respond to market needs (Guimarães & Silva, J., 2017). Accordingly, there is a rise in employment opportunities in tourist accommodation establishments, the food industry, tour operators, travel agencies, government tourism agencies, handicrafts, souvenir shops, recreation, entertainment arts, etc. which alleviates the unemployment rate (Gelas Lage & Milone, 2001; López, 2019). Therefore, if supported by appropriate regulations, tourism could be a tool for fighting unemployment. Considering that the economic growth resulting from tourism development implies a decrease in the unemployment rate (Rasethuntsa, 2022; Shaari et al., 2018).

The unemployment problem is one of the major dysfunction of the labor market. It occurs when a person actively looking for a job is unable to find a job. It represents individuals who are able to work, but there are no job opportunities for them. (Yi et al., 2020). According to Yi et al., (2020) there are three main types of unemployment: cyclical unemployment, which happens

when the economy suffers a recession, and consumer expenses reduce, leading to a decrease in companies' profit rate. In response, many of them end up laying off employees, leading to many citizens losing their jobs and increasing unemployment rates. The second type is frictional unemployment, which occurs when a worker is unemployed for a period between leaving one job and finding another. The last type is structural unemployment which usually occurs when there is a mismatch between the skill needed for the available job and the skills owned by the unemployed.

Unemployment is one of the most relevant macroeconomic variables (Loría et al., 2017). It is a major issue faced by both developed and developing countries leading to a complex socio-economic problem. However, the increase in tourist arrivals contributes to the growth of other sectors such as food and beverage, hospitality and transportation, trade, agriculture and livestock, handicrafts, etc., which helps to reduce the unemployment rate (Yi et al., 2020). The tourism industry plays a crucial role in reducing unemployment since tourism encourages business operation in the services industry, which creates more job opportunities and afterward decreases the unemployment rate (López, 2019; Schubert, 2012; Yi et al., 2020). In contrast, the rise in unemployment can lead to a decrease in the number of tourist arrivals and, subsequently, a decrease in the demand for goods and services intended for tourists. Accordingly, there is a decrease in tourism contribution to the GDP (López, 2019).



Yi et al. (2020) used the statistical method Ordinary Least Squares [OLS] to estimate the relationship between tourist arrivals and unemployment in Malaysia. The results indicated that the relationship between tourism arrival and unemployment is negative and significant, which means that an increase in tourism arrival encourages a decreased unemployment rate in Malaysia. Likewise, Loría et al. (2017) argue that the total arrival of travelers has benefited the Mexican economy in the sense that it has promoted the economic growth of the sector and reduced the unemployment rate of the total economy. Gričar et al. (2016) investigated tourism-led growth in Slovenia and Montenegro using the variables GDP, tourist arrivals, inflation, and unemployment rates. The empirical results suggested a significantly negative impact of tourist arrival on unemployment, which means an increase in tourism creates jobs and reduces unemployment rates. López (2019) suggested an extension of the different version of Okun's law by instead of using the GDP growth rate, as has been often done, the growth rate of the tourism volume index was employed to analyze the impact of tourism sector growth on the unemployment rate and vice versa. The obtained results gave evidence of a bidirectional

relationship between both variables, such that unemployment decreases tourism sector growth, and growth of the tourism sector alleviates unemployment.

Several researchers investigated the relationship between tourism and unemployment. Since unemployment is a challenge of the labor market that can be alleviated by the tourism sector due to this sector's enormous potential to create jobs.

**Tourism and foreign direct investment -** Tourism development needs infrastructure to satisfy the tourist needs, including transportation, port, airport, roads, hotels, travel agencies, restaurants, etc. They are essential in the production of goods and services (Nawaz & Hassan, 2016). However, despite the need for high infrastructure and equipment investments, the tourism sector's development is less demanding in terms of capital than in most industries (Ravinthirakumaran et al., 2019). This sector is characterized by the predominance of SMEs such as restaurants, hotels, travel agencies, transport services, guide services, etc. (Cunha, 2013). In the last decades, the tourism industry's significant growth in the least developed countries was mainly driven by FDI. The least developed countries find in the FDI a way to obtain the necessary capital for tourism development since capital shortage is one of the biggest challenges these countries encounter (Ravinthirakumaran et al., 2019). In developing countries, FDI is a key factor that improves economic growth since it plays a vital role in enhancing employment levels and increasing exports (Sahraoui et al., 2015).



FDI is a cross-border investment, which means the set-up of productive units in foreign markets. It is a major component of the economy due to its crucial role in economic growth. However, it is important to note that investors are attracted to countries with higher GDP (Siddiqui & Siddiqui, 2019). There is a reasonable amount of research on the relationship between tourism and FDI in both developing and developed countries, especially from an empirical perspective (Ravinthirakumaran et al., 2019; Roudi et al., 2019). Although researchers have achieved conflicting results, in some countries, the results suggested a positive impact of FDI on tourism, while in others, the relationship is unclear (Selimi et al., 2017). Some of the studies confirm the direction of the causality from FDI to tourism (Bezuidenhout & Grater, 2016; Perić & Radić, 2016; Ravinthirakumaran et al., 2019). Others find causality in the opposite direction, which means tourism causes FDI (Chen, 2017; Katircioglu, 2011; Salleh et al., 2011). Meanwhile, some researchers found bidirectional causality between FDI and tourism in both developed and developing countries (Fereidouni & Al-Mulali, 2014; Samimi et al., 2013).

Bezuidenhout and Grater (2016) investigated the existing relationship between tourism and inward FDI in African countries. They concluded that investment in Africa is mostly concentrated in North Africa and some in the sub-Saharan African countries, and most FDI in tourism is allocated in the accommodation sector. In addition, a strong positive relationship was found between tourism and FDI. Perić and Radić's (2016) research results conducted in Croatia argue that FDI in tourism affects the number of international tourist arrivals. Afterward, Chen (2017) explored the interaction between inbound tourism and inward FDI and found a positive correlation between them. He also found that inbound tourism growth has positive spillovers on FDI beyond tourism-related sectors, which means the FDI of other sectors needs to be included when discussing the impacts of tourism development. Ravinthirakumaran et al. (2019) analyzed the causal direction between Sri Lankan tourism and FDI inflows. They argued that there is a unidirectional causal relationship in the direction of FDI to tourism in both the short-run and long-run. This result is consistent with Katircioglu (2011), who concluded that there is unidirectional causality from international tourism growth to net FDI inflows growth in the case of Turkey.



Previous research suggests that FDI plays an important role in the tourism sector's development, especially in developing countries. The FDI stimulates domestic and international investments in the tourism sector and helps enhance employment levels and increase exports.

**Tourism and Inflation -** The entry of tourists into a region increases the demand for goods and services. Meanwhile, there is an increase in currency circulation, boosting the local economy and placing tourism in an important place in economic development (Bassil et al., 2015; Oh, 2005). In addition, tourism is a major source of foreign exchange earnings (Ohlan, 2017). However, despite the positive impacts of the tourism sector development, there are some negative effects, such as inflation. The development of tourism activity or its intensification generally causes a rise in the price of goods and services and leads to a decrease in the currency value (Ksamawan et al., 2019). This inflationary process is due, in part, to the greater purchasing power of tourists compared to that of the local population (Shaari et al., 2018). In this regard, the rapid and inexorable growth of the tourism industry can lead to inflation (Brida et al., 2011; Shaari et al., 2018). Unplanned tourism expansion can be disadvantageous as it may cause inflation due to money spent by the tourist on hotels, restaurants, transportation, clothes, etc. This can result in the aggregate demand escalating and, consequently, inflation (Shaari et al.,

2018). This monetary phenomenon affects income distribution and increases property value (Alam & Reddy, 2016).

Inflation is the process in which the price index is increasing, and money is losing its value (Jesus & Silva, 2010). Inflation can also be described as a rapid increase in prices over months or years measured by some broad index, such as the consumer price index (CPI), that decreases the purchasing power of consumers (Rahim, 2013). It is important to highlight that one of the biggest concerns in a market economy is the behavior of prices and the general increase in the price level, which is the inflation rate, as it might affect the economic dynamics, employment, consumption, savings, and investment (Jesus & Silva, 2010).

A body of empirical research examines the relationship between tourism and inflation (Andrade, 2019; Nanthakumar et al., 2008; Rahim, 2013; Shaari et al., 2018; Siddiqui & Siddiqui, 2019). Motivated by the need for an empirical analysis of the contribution of tourism development, Nanthakumar et al. (2008) examined the contribution of GDP and CPI toward tourism. The results indicate cointegration between the variables, meaning there is a long-run relationship between them. Besides that, a bidirectional causality was also found between CPI and tourist arrivals. Shaari et al. (2018) investigated relationships between tourism inflation in Malaysia. The results suggest that the tourism industry plays a crucial role in determining inflation in both the short and long-run, which means an increase in tourism arrival leads to a rise in inflation. The research conducted by Andrade (2019) on the impact tourism has on economic growth in Cape Verde found a significant positive impact of tourism receipts and inflation on GDP in the long run. Furthermore, the outcome shows unidirectional causality from tourism receipts to GDP but not between tourism and inflation. Meanwhile, Siddiqui and Siddiqui (2019) investigated tourism as a potential factor in inflation in Pakistan. The findings reveal a long-term relationship between FDI, tourism, GDP, inflation exchange rate, and trade openness. The results also concluded that there exists one-way causality from inflation to tourism.



The above-cited studies describe the relationship between tourism and inflation. The results suggest that the development of tourism activity can lead to a rise in the price of goods and services and a decrease in the currency value, which means tourism can affect inflation.

**RESEARCH METHODOLOGY**

This chapter presents the methodology employed to examine the relationship between tourism

and STP's economic development. The choice of the right method is an essential part of the research. In this section, the strategy to analyze the selected variables and the model will be presented. The first step in the econometric analysis consists of the unit root to check whether the variables are stationary or not and their order of integration. Then the Johansen cointegration test is applied since the model's choice depends on its results, followed by the VECM to analyze the long-run relationship between the variables and the causality between them (Asari et al., 2011; Siddiqui & Siddiqui, 2019). The variables were selected according to the literature and previous studies related to tourism and economic development.

In the tourism economics literature, to measure the impact of tourism on economic development, several researchers used the gross domestic product (GDP) to measure economic growth (Andrade, 2019; Balaguer & Cantavella-Jordá, 2002; Dritsakis, 2004; Gričar et al., 2016; Lee & Brahmasrene, 2013; Roudi et al., 2019). Tourism receipt (TR) is commonly used to measure tourism activity (Andrade, 2019; Balaguer & Cantavella-Jordá, 2002; Dritsakis, 2004; Lee & Brahmasrene, 2013; Roudi et al., 2019). Since tourism is responsible for a large parcel of jobs in several countries, the unemployment rate (UR) was also included in this research (Gričar et al., 2016; López, 2019; Loría et al., 2017; Snieška et al., 2014). The variable Inflation rate (INF) was also considered relevant (Andrade, 2019; Gričar et al., 2016; Snieška et al., 2014). Last but not least, foreign direct investment (FDI) is recognized by several authors as an essential variable in economic growth and tourism development (Lee & Brahmasrene, 2013; Roudi et al., 2019; Snieška et al., 2014).



**Data and Generic Econometric Model -** This research investigates the relationship between tourism and economic growth in STP. The classical linear regression model is formulated with the variable of interest having lnGDP as the dependent variable and the remaining variables as independent to analyze the short-run and long-run association between the variables. All of the variables are in logarithmic form, considering that the log transformation stabilizes the variation of the data (Suryandaru, 2020). The variables GDP, tourism receipts, FDI, inflation, and unemployment have been chosen based on empirical research and conceptual review. Thus, the theoretical model can be written as:

$$\mathrm{lnGDP}_i = \beta_0 + \beta_1 lnTR + \beta_2 lnFDI + \beta_3 lnUR + \beta_4 lnINF + \varepsilon_i$$

$lnGDP_i$ stands for the logarithm of gross domestic product

$lnTR$ stands for the logarithm of tourism receipts

$lnFDI$ stands for the logarithm of foreign direct investment

$lnUR$ stands for the logarithm of the unemployment rate

$lnINF$ stands for the logarithm inflation rate (this research used the consumer price index as the proxy for inflation).

$\beta_0$ $\beta_1$ $\beta_n$ are the parameters to be estimated

$\varepsilon_i$ is the random error term

A Simple Regression model [OLS] can be applied when it is assumed that there is a linear association between a dependent variable and the independent variable (they are stationary in level), which rarely happens with economic variables (Oliveira et al., 2015). Therefore, to avoid spurious regression, the unit root test should be first applied to check whether the variables are stationary or not and determine their order of integration to avoid spurious regression (Asari et al., 2011; Ravinthirakumaran et al., 2019).

**Unit Root Test -** The series is stationary when the variance does not change over time, which means it has no tendency or seasonality (Asari et al., 2011). This unit root test is used to check whether the variables are stationary or not. Therefore, both the Augmented Dickey and Fuller (ADF) unit root test (Dickey & Fuller, 1979; Dickey & Fuller, 1981) and Phillips and Perron (PP) unit root test (Phillips & Perron, 1988) are applied to test the stationarity of the series. Both tests are applied in this study to test the following hypothesis:



$H_0$: time series is not stationary

$H_a$: time series is stationary

If the p-value is higher than 0.05, the null hypothesis for unit root cannot be rejected, which means the data has a unit root; in other words, the variables are not stationary. Otherwise, if the p-value is equal to or lower than 0.05, the null hypothesis for unit root can be rejected, which means the data does not have a unit root; in other words, the data is stationary (Oh, 2005; Ohlan, 2017). The time series is stationary when the mean and variance are constant over time. Otherwise, the series is non-stationary, and the differencing should be applied to the series (Asari et al., 2011). The data can be differentiated more than once, but usually, a differentiation is sufficient (Ohlan, 2017).

When the results indicate that all the variables are integrated of order one I(1), the Johansen cointegration test is applied to check if the series are cointegrated or not, and then the appropriate model is chosen in line with the obtained results (Siddiqui & Siddiqui, 2019).

**Johansen Cointegration Test -** The cointegration test is of paramount importance in time-series

studies in economics since it also makes it possible to study and analyze relationships between economic (non-stationary) variables used in a given model (Silva, 2019). This technique uses two types of tests to determine the number of cointegration vectors: the Maximum Eigenvalue statistic test and the Trace test (Asari et al., 2011). The Johansen cointegration test is the most suitable when the variables are non-stationary and integrated of order one or I(1). This method estimates cointegration or long-run relationships between non-stationary variables through the maximum likelihood procedure (Balaguer & Cantavella-Jordá, 2002). The Johansen cointegration test is employed to test the long-run relationship between the variables and determine the number of cointegrating vectors (Johansen, 1991; Johansen, 1992). This test aims to verify the null hypothesis for cointegration vectors as follows:

$H_0$: r = 0 against $H_a$: r = 1

$H_0$r = 1 against $H_a$: r = 2

$H_0$: r = 2 against $H_a$: r = 3 and so on.

When carrying out the cointegration test of the variables, it is important to note there is no exclusive method for this purpose. However, one of the most used is the Johansen cointegration test which proposes two tests, the trace statistics and the maximum eigenvalue (Silva, 2019). In the case of cointegration presence between the variables under study, a subsequent analysis is performed by estimating a VECM (Thayaparan, 2014).



**Vector Error Correction Model [VECM] -** The existence of the cointegration vector between the variable implies a long-run relationship between the variables. Thus, the VECM is applied to estimate the equilibrium relationships between time series. Subsequently, the time series causal relationships are verified through the Granger causality test (Kum et al., 2015; Ohlan, 2017; Thayaparan, 2014). In order to fill some shortcomings that the initial VAR models presented, particularly when the series are non-stationary, in 1987, the VECM model emerged through Engle and Granger, through which special attention was paid to equilibrium relations (Silva, 2019).

The VECM was found to be the most suitable model since it integrates short-run and long-run analyses (Asari et al., 2011). It is applied to check whether there is a long-run relationship between the variables (Ohlan, 2017). In accordance with the procedures presented in previous studies, when cointegration is found between the variables, the VECM can be estimated to obtain relevant and complementary information on the dynamics of the variables toward long-

term equilibrium besides acquiring information on the behavior of the variables in the short term (Silva, 2019). The VECM is applied when the variables are cointegrated (there is a long-term equilibrium relationship between them). Then the causality test is then applied to check whether there are causal long-run or short-run links between variables (Asari et al., 2011).

**The Causality test based on VECM -** With the identification of cointegrating vectors between the studied variables, a VAR model with error correction can be written, and the causal relationships between the series understudy can be analyzed. The Granger causality is based on the VECM and is used to examine the causality between the variables (Peng & Wu, 2020). The Granger causality test assumes that the time series must be stationary; that is, they develop in time randomly, around a constant average (Cavalheiro et al., 2019). According to Granger, causality occurs when one variable x causes another variable y (Granger, 1969).

This test plays an indispensable role in the analysis of econometric analyses. The Granger causality test is applied to analyze the interactions between the variables in a given model and points out the direction of causality between them, which could be unidirectional or bidirectional (Peng & Wu, 2020). The Granger causality implies a correlation between the present values of one variable and the past values of other variables. In short, causality is used to determine the level of predictability of variables. If, for example, variable y values can be predicted, at present, by reinforcing the use of the past values of variable x (Granger, 1969; Ohlan, 2017). The hypothesis is below described:



$H_0$: x does not Granger-cause y

$H_a$: x Granger-cause y

**RESULTS**

In order to measure the impact of tourism on the economic development of STP, the data previously described in the methodology are analyzed through an econometric model. The first step is to check the stationarity of the series and define their order of integration using the Augmented Dickey-Fuller and Phillips and Perron test. Then the Johansen test is applied, followed by the VECM. The statistical software program used to analyze the data is STATA 14.

**Unit Root Test Results -** As previously mentioned, the first step after logarithm transformation is the unit root test to check whether the variables are stationary and to identify their integration

order. To establish the order of integration of the series, the ADF Augmented Dickey and Fuller (ADF) unit root test (Dickey & Fuller, 1979, 1981) and Phillips and Perron (PP) unit root test (Phillips & Perron, 1988) are used to test the stationarity of the series. The ADF and PP tests were applied to test the null hypothesis for unit root and to check the order of integration of the variables. Table 1 presents the unit root test results of the variables.

The ADF and PP unit root results for all the variables reported in Table 1 indicate that, in level, the variables lnGDP, lnITR, lnINF, lnFDI, and lnUR are non-stationary since the absolute value of the test statistic is smaller than the critical value at 1%, 5%, and 10%. Besides, the p-value is higher than 0.05, meaning it is not statistically significant. Therefore, the null hypothesis for unit root can not be rejected (the series are non-stationary). Since all variables were found to be non-stationary in level, then the first difference expressed as ΔlnGDP, ΔlnITR, ΔlnFDI, ΔlnINF, and EXPΔln were taken, and the ADF and PP tests were again applied. As reported in Table 1, at first difference, the absolute value of the test statistic is higher than the critical value at 1%. In addition to that, the p-value is smaller than 0.05 (statistically significant). In other words, there is less than a 5% probability that the results are random. The null hypothesis for unit root can be rejected. As indicated by the ADF and PP test results, all the variables are stationary at the first difference, then integrated of order 1, denoted by I (1). In short, the ADF and PP unit root test reveals that there is a presence of unit root in the logarithm form of the variable in level. However, the variables were found to be stationary after the first difference of the series was taken.



**Table 1**. Augmented Dickey-Fuller and Phillips-Perron unit root test results

| Variables | ADF test | PP test | Result |
|---|---|---|---|
| | t-statistic (P-value) | t-statistic(P-value) | |
| lnGDP | 0.438 (0.9829) | 0.403 (0.9816) | Non-stationary |
| lnITR | 0.175 (0.9414) | 0.200 (0.9386) | Non-stationary |
| lnINF | 1.959 (0.3050) | 1.508 (0.5297) | Non-stationary |
| lnFDI | 2.586 (0.0960) | 2.312 (0.1683) | Non-stationary |
| lnUR | 1.179 (0.6824) | 1.004 (0.7520) | Non-stationary |
| ΔlnGDP | 5.419 (0.0000) * | 5.415 (0.0000) * | Stationary I(1) |
| ΔlnITR | 4.524 (0.0002) * | 4.516 (0.0002) * | Stationary I(1) |
| ΔlnINF | 5.111 (0.0000) * | 5.113 (0.0000) * | Stationary I(1) |
| ΔlnlFDI | 6.148 (0.0000) * | 6.118 (0.0000) * | Stationary I(1) |
| ΔlnUR | 3.810 (0.0028) * | 3.753 (0.0034) * | Stationary I(1) |

**Source**: own elaboration. Note: *,**, indicates the rejection of a unit root hypothesis at 1% and 5%, respectively.

**The Johansen Cointegration Results -** After confirming that the variables tested for unit root are integrated in the same order, the cointegration test can be applied. As previously stated, the Johansen cointegration aims to test the null hypothesis of no cointegration against the alternative of cointegrating relationship among the variables. Table 2 squeezes out the outcome of the Johansen cointegration test. The results indicate that the null hypothesis of no cointegration can be rejected at the 5 % significance level since the trace statistic and maximum statistic are greater than the critical value. Likewise, the null hypothesis for 1 cointegrating vector among the five variables is also rejected as the critical value is smaller than the trace statistic and the maximum statistic. The results of both trace statistics and maximum eigenvalue suggest the presence of 2 cointegrated vectors among the time series variables at a 5% significance level. Furthermore, the findings suggest that there is a long-run relationship between the variables, which means that the variables move together closely to achieve the long-run equilibrium.

In summary, the Johansen cointegration indicates that the variables are cointegrated, which means the test results confirm a long-run relationship between them. Then, a long-run model should be applied. The results obtained from this test are used in the VECM, which measures the time series data's long-run relationship and causality.



**Table 2. Johansen cointegration test results (Trace test and MAX-eigenvalue test)**

| **Trace test** | | | |
|---|---|---|---|
| Null Hypothesis | Alternative Hypothesis | Trace Statistic | Critical Value 5% |
| Ho: *r* = 0 | *r ≤ 1* | 142.7956 | 68.52 |
| Ho: *r* = 1 | *r ≤ 2* | 61.0648 | 47.21 |
| Ho: *r* = 2 | *r ≤ 3* | 29.1454* | 29.68 |
| Ho: *r* = 3 | *r ≤ 4* | 10.0151 | 15.41 |
| Ho: *r* = 4 | *r ≤ 5* | 0.8879 | 3.76 |
| **MAX-eigenvalue test** | | | |
| Null Hypothesis | Alternative Hypothesis | Max Statistic | Critical Value 5% |
| Ho: *r* = 0 | *r ≤ 1* | 81.7308 | 33.46 |
| Ho: *r* = 1 | *r ≤ 2* | 31.9194 | 27.07 |
| Ho: *r* = 2 | *r ≤ 3* | 19.1302* | 20.97 |
| Ho: *r* = 3 | *r ≤ 4* | 9.1272 | 14.07 |
| Ho: *r* = 4 | *r ≤ 5* | 0.8879 | 3.76 |

**Source**: own elaboration **Note**: * indicates rejection of a unit root hypothesis at 5% level. ***r*** indicates the number of cointegrating vectors. Both Max-eigenvalue and Trace test indicates 2 cointegrating relationships at 5% significance level.

**The VECM long-run Results -** Following the unit root test (variables are stationary at first difference), subsequently, the Johansen cointegration checked if the variables have a long-run relationship. Since the Johansen cointegration indicates the presence of 2 cointegrated vectors among the time series data, the VECM is applied.

In order to explore the long-term impacts of the independent variables on the dependent variable, Table 3 describes the long-term equation based on the output of the Johansen normalization restriction imposed. This equation served as a basis to derive the ECT (Error Correction Term). The results can be interpreted as follows; in the long-run, a percentage change in lnTR will result in a 0.17 % increase in lnGDP, and a percentage change in lnFDI will result in a 0.22% increase in lnGDP. Besides, a percentage change in lnUR reduces lnGDP by 1.77 %. Meanwhile, the lnINF coefficient shows that a 1% increase in inflation causes a decrease of lnGDP by 0.22%. In short, in the long-run, lnTR and lnFDI positively impact lnGDP, while lnINF and lnUR negatively impact lnGDP. The following equation of normalized cointegration coefficients indicates lnGDP as dependent variables and the other variables (lnTR, lnFDI, lnUR, lnINF) as independent or explanatory variables.



$$ECT_{t-1} = lnGDP_{t-1} - .174lnTR_{t-1} - .218lnFDI_{t-1} + 1.772lnUR_{t-1} + .216lnINF_{t-1} - 17.581$$

When the variable lnGDP normalizes as 1, it takes the form of the dependent variable. The signs of coefficients in the VECM equation change, the positive signs change to negative signs, and vice versa. The adjustment term or ECT is 0.32. It is statistically significant at 1% level, suggesting 32% of the disequilibrium (deviation from long-run equilibrium) between the dependent and the explanatory variables in t-1 period is corrected in t period.

$$lnGDP = 17.581 + .174lnTR_{t-1} + .218lnFDI_{t-1} - 1.77lnUR_{t-1} - .216lnINF_{t-1} - 32\ ECT$$

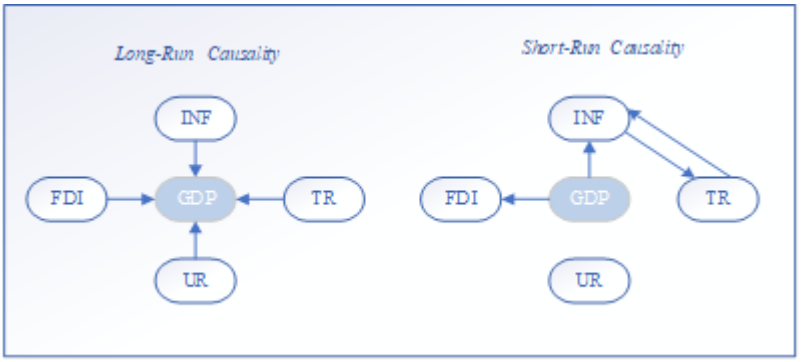
**Table 3. Johansen normalization restriction imposed**

| beta | Coef. | Std. Err. | z | P>z |
|---|---|---|---|---|
| _ce1 | | | | |
| lnGDP | 1 | | | |
| lnTR | -.1746257 | .0549258 | -3.18 | 0.001 |
| lnFDI | -.2187609 | .0126591 | -17.28 | 0.000 |
| lnUR | 1.772079 | .322858 | 5.49 | 0.000 |
| lnINF | .2164757 | .0576836 | 3.75 | 0.000 |
| cons | -17.58101 | | | |

**Source**: own elaboration

**The VECM Causality Results -** Figure 1 provides a summarized overview of the long-run and short-run causality direction using the VEC Granger causality test. The outputs indicate that in the long-run, lnTR, lnFDI, lnUR, and lnINF Granger cause lnGDP. Meanwhile, In the short-run, the results reveal a unidirectional causality running from lnGDP to lnFDI, which implies that foreign direct investment inflows, in part, determine the rate of economic development in STP. Furthermore, the results indicate one-way interaction running from lnGDP to lnINF; it suggests that gross domestic product under the period of investigation is a predictor of inflation. The Granger Causality output for lnTR and lnINF indicates a bidirectional relationship between the variables, indicating that tourism is a predictor of inflation and vice versa.

**Figure 1. Long-run and short-run Causality direction**




**Source**: own elaboration



In the long-run, the hypothesis that UR Granger causes GDP cannot be rejected. However, the hypothesis that GDP Granger causes UR is rejected, which means causality runs unidirectional from UR to GDP. These results are also consistent with Gričar et al. (2016). The author observed that tourism growth promotes economic growth and reduces unemployment. Andrade (2019) showed evidence of a long-term unidirectional causality effect of tourism on GDP in the context of Cape Verde. Likewise, this research results indicate the same unidirectional causality. Siddiqui and Siddiqui's (2019) results indicate a long-run causality from FDI, tourism, and inflation to GDP. These results are in line with this research's long-run causality findings.

In regard to the short-run causality, the bidirectional causal relation between INF and tourism receipts supports the understanding that tourist arrival has an effect on inflation and vice-versa. The findings are consistent with Nanthakumar et al's (2008) research on economic-driven tourism growth in Malaysia using a trivariate model with GDP, tourist arrivals, and CPI. The results suggested a bidirectional relationship between CPI and tourist arrivals. Shaari et al.

(2018) noted that the inexorable development of the tourism industry can be damaging as it may cause inflation.

The unidirectional short-run causality running from GDP to inflation is consistent with Thayaparan's (2014) findings, meaning that in the short-run GDP growth rate has an influence on inflation. The one-way short-term causation from GDP to FDI is parallel with Siddiqui and Siddiqui's (2019) findings. This supports the understanding that GDP growth impacts FDI inflows.

**CONCLUSION**

This research aims to measure the economic impact of tourism on the economic development of STP from 1993 to 2019. This study investigates the relationship between tourism economic growth in STP's context, employing rigorous time series analysis and combining several macroeconomic variables. For the empirical testing of the chosen variables, the unit root was first applied, followed by the Johansen cointegration test, and then the Granger causality tests based on the VECM. The variables were found to be stationary at the first difference and have two cointegrating vectors, suggesting that there is at least one long-term balance relationship between time series variables. Then the VECM was applied to check the long-run relationship. The VECM output indicates a positive long-run relationship between the lnGDP and the variables lnTR and ln FDI. Besides, VECM shows a negative relationship between lnGDP and the variables lnINF and lnUR. The findings suggest that unemployment significantly affects the economy of STP. Besides, tourism contributes to the GDP, which means it could be a facilitator for STP's economic development. These results are consistent with the WTTC (2022b) reporting an increase in tourism economic contribution to STP's GDP and employment in 2019.



Regarding the granger causality test, results indicate a unidirectional long-run causality from the explanatory variables to GDP. Furthermore, the output also indicated a bidirectional short-run causality between tourism and inflation which means the past values of tourism contain useful information to predict changes in inflation and vice-versa. A unidirectional short-run causality was found from gross domestic product to inflation, similarly from gross domestic product to foreign direct investment. Tourism strategy plans and policies are essential. Since many tourism development experiences have failed precisely because of the improvisation that partly derives from uncontrolled growth without criteria and rigor. It is necessary to define a national and local strategy to promote tourism development with the participation of all stakeholders. It is

necessary to define a coordination structure capable of offering a quality service: accommodation, catering, entertainment, security, and conservation of the environment.

The results could reveal the policy implications for STP. Since the results suggest that GDP growth cause FDI, the country must strive to increase GDP to attract possible investments to STP. FDI is a crucial factor that improves economic growth in developing countries due to its role in enhancing employment levels and increasing exports (Sahraoui et al., 2015). On the other hand, due to the relationship between inflation and tourism, policy direction toward stabilizing inflation is necessary. Shaari et al. (2018) argue that unplanned tourism development can be may cause inflation considering that the money spent by the tourist on hotels, restaurants, transportation, clothes, etc., can result in the aggregate demand increasing and, consequently, causing inflation (Shaari et al., 2018).

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