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The impact of exchange rate and exchange rate volatility on tourism demand using disaggregated data

Imamboccus Rookayyah¹ | Boopen Seetanah¹  | Robin Nunkoo^{2,3,4,5,6}  | Zameelah Khan Jaffur¹

¹Department of Finance and Accounting, University of Mauritius, Reduit, Mauritius

²Department of Management, University of Mauritius, Reduit, Mauritius

³School of Tourism and Hospitality, University of Johannesburg, Johannesburg, South Africa

⁴Department of Hospitality Management, College of Hotel and Tourism Management, Kyung Hee University, Seoul, South Korea

⁵Griffith Institute for Tourism, Griffith University, Gold Coast, Australia

⁶Department of Marketing, Copenhagen Business School, Frederiksberg, Denmark

Correspondence

Robin Nunkoo, Department of Management, University of Mauritius, Reduit, Mauritius.
Email: r.nunkoo@uom.ac.mu

Abstract

The present study investigates the impacts of exchange rate and exchange rate volatility on inbound tourism demand in Mauritius, using annual data covering the period 1999–2019 and a panel autoregressive distributed lag model. In particular, we consider 17 major tourism markets for Mauritius. The sample is further divided into Eurozone (7 countries) and non-Eurozone (10 countries) for additional insights. The results show that in the long run, both the exchange rate and its volatility have negative and significant impacts on tourism demand across the three samples considered, while income in the home country has a positive and significant effect on tourism demand. On the other hand, relative price is found to have a significant and negative effect on tourism demand only for the overall sample of 17 countries, while for both the Eurozone and non-Eurozone, the impact is insignificant. The empirical results suggest that policymakers should give consideration to stronger monetary and fiscal regulations to increase tourism demand.

KEYWORDS

exchange rate, exchange rate volatility, Mauritius, panel ARDL, tourism demand

1 | INTRODUCTION

Tourism is one of the key drivers of economic growth, especially in developing countries, due to its positive economic consequences (see, for instance, Lin et al., 2019; Nunkoo et al., 2020; Pablo-Romero & Molina, 2013 and Zurub et al., 2015). From 2015 to 2019, the tourism industry contributed to more than 10% of the global GDP. As a result of the COVID-19 pandemic, this share decreased to 5.3% in 2020, due to ongoing mobility restrictions, and then increased to 6.1% in 2021. In terms of employment, 333 million jobs, representing 1 in 10 of all jobs, were supported by the sector in 2019. The loss of 62 million jobs in 2020 caused a decline of 18.6% in employment by the sector which was then increased by 21.7% (to 289.5 million) in 2021. The tourism sector supported 1 in every 11 jobs globally in 2021.

During recent decades, there has been a growing amount of literature on the determinants of tourism demand (Brida & Scuderi, 2012; Peng et al., 2015; Song et al., 2010; and Witt & Witt, 1995). Several variables have been identified as potential factors influencing tourism demand and have been among the most researched determinants such as the income of the tourists, the cost of the destination country, tourism infrastructure, level of development of the destination country, travel distance, and investment (Adeola & Evans, 2020; Barman & Nath, 2019; Dincer et al., 2014; Forsyth et al., 2014; Gani & Clemes, 2017; Pai et al., 2023 and Tavares & Leitão, 2017).

The exchange rate is another important factor that has a significant influence on tourism demand (Croes & Vanegas, 2005; De Vita, 2014; De Vita & Kyaw, 2013 and Sharma & Pal, 2020). Theoretically, exchange rates can affect the cost of travel for tourists and

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subsequently, tourism demand. More specifically, an appreciation of the currency of a country makes the cost of travel to that particular country more expensive for tourists coming from countries with weaker currencies. Conversely, when a country's currency depreciates, the cost of travel to the latter becomes cheaper for tourists from countries with stronger currencies and more people can afford to travel to that country (De Vita & Kyaw, 2013; Karimi et al., 2019; Patsouratis et al., 2005; Reinhart & Rogoff, 2004; Tang et al., 2016; Thompson & Thompson, 2010). On the other hand, exchange rate volatility refers to the degree of fluctuations or movements in the value of a country's currency in relation to other currencies over a certain period of time. In other words, it measures the variability or uncertainty associated with the exchange rate of a country. The tourism literature has often linked exchange rate volatility to risks associated with the destination country (see Jena & Dash, 2020). Exchange rate volatility can create uncertainty for tourists and tourism-related businesses. From a theoretical perspective, when exchange rates are volatile, it can be difficult for tourists to budget for their travel expenses, as prices can fluctuate rapidly. This can lead to a decrease in tourism demand, as potential tourists may be hesitant to travel when they are uncertain about the cost. Thus, a highly volatile exchange rate creates an environment of uncertainty which adversely influences tourism demand.

Despite that these variables have been found to affect tourism demand, research on the effects of exchange rate and its volatility on tourism demand remains scarce, especially in the case of small island economies (see Akar, 2012; Aktas et al., 2014; Chang & McAleer, 2009; Joun & Kim, 2020 and others). Small islands attract millions of tourists every year due to their particular geographic location as well as their abundance of natural resources and cultural legacy. However, the size of the domestic markets of small islands, limited economic diversification, and geographic isolations confront the islands with a number of challenges and vulnerabilities and represent obstacles to integration into the world economy (see Kim & Hyun, 2024). Additionally, these islands are also affected by natural disasters and continuous climate change which further decrease their income. Nonetheless, island economies can benefit from external sources such as tourism revenues. Several studies have concluded that tourism contributes to economic growth and development, in particular to small developing islands. The sector also generates employment in destination islands. As such, according to Vítová et al. (2019), one of the priorities of small islands should be research on international tourism demand.

Despite the aforementioned facts, a limited number of study investigates the impacts of the exchange rate and its volatility on tourism demand for small economies like Mauritius. The island depends significantly on the tourism sector and remains an open economy while being characterized by its remoteness and other associated vulnerabilities of a typical small island. Thus, this research aims to fill in this gap and to primarily advance the theoretical understanding in this area and offer some foundation for decision-makers. This study contributes to the literature on tourism demand in the following ways.

First, the theoretical contribution of this study relates to the inclusion of both the exchange rate and its volatility in a tourism demand model for Mauritius, which is a country that depends

significantly on the tourism sector. The country is an interesting case study as it is an open economy that is characterized by its remoteness and other associated vulnerabilities of a typical small island. It is among the best performers on the African continent and among small islands.

According to the World Travel and Tourism Council (2016), the critical way to capture the impact of exchange rate on tourism demand is to measure the value of the destination currency vis-à-vis the currency of the visitor's market. In this objective, the study also brings insights from a disaggregated perspective, that is by country of origin since it is believed that origin countries may have a moderating role in the Exchange rate-Tourism demand link. Such an element has been ignored in the literature, particularly in the modeling of exchange rates, exchange rate volatility, and tourism. The sample of origin countries for tourism demand to Mauritius is further broken into two groups namely Euro-Zone and non-Euro zone countries for additional insights given that the Mauritian tourism market is Eurocentric in nature (Tourist arrivals from the Euro-zone represent more than half of international tourist arrivals to Mauritius).

Furthermore, to take into account the dynamic nature of tourism demand and modeling, an element that is frequently overlooked in the literature, this study employs a dynamic data analysis model to assess the effects of conversion rate and exchange rate volatility on tourist inflows to Mauritius. This method, Autoregressive Distributed Lag, allows for the study of both the short- and long-term relationships of the hypothesized link.

2 | LITERATURE REVIEW

There are several studies done to model international tourism demand which is very important to investors and policymakers. According to Song et al., there were 425 articles published between 2017 and the first quarter of 2022 and the number of articles published annually has grown from 44 in 2018 to 68 in 2019, 93 in 2020, 84 in 2021, and 77 in the first quarter of 2022. However, this topic is still elusive since there are multiple intricate factors that cause a change in tourism demand. The quest for a better model to forecast tourism demand has neither been unmitigated nor resolved (Li et al., 2005). Reviews of studies done such as Song and Li (2008) and Stabler et al. (2010) concluded that the most popular tourism determinants are the income of the origin country, the relative price of the destination and the exchange rate between the origin and destination. Furthermore, as research in tourism and hospitality is entwined with the development of the sector and the research must be practical, Song et al. argued that it is unattainable for each econometric article to derive a unique theoretical model. strategy, particularly given the volume of data available.

2.1 | Exchange rate and tourism

2.1.1 | Theoretical review

The tourism industry is an international business by nature and tourists traveling to foreign countries will have to convert funds to the

currency used in the destination country. Hence there is no doubt that unfavorable exchange rates and exchange rate volatility can lead to changes in travel patterns, especially in vacation scheduling. Such an argument has been confirmed by Webber (2001) and the World Travel and Tourism Council (2016). As per the existing theory, the exchange rate affects tourism in two different ways. The first way is during the decision-making process to choose the destination country and the second one is that changes in exchange rate can influence the intended length of stay and expenditure. In fact, the appreciation of a country's currency causes the outbound tourism demand of this country to increase as the residents can make the most out of the strong currency to visit other countries and spend more money in the destination. However, this appreciation will cause a drop in tourist arrivals to the country since it will be considered an expensive destination. Tourists will prefer to travel to other countries especially those traveling for vacations. According to Destinations International (2022): "A weaker currency attracts people to your country and prevents you from travelling." For example, when the Swiss franc appreciated against the euro, the Swiss people traveled to Euro-zone countries. In the case of America, when the dollar appreciates, travel by Americans does not increase but travel to America decreases.

2.1.2 | Empirical review

The interaction between the exchange rate and tourism demand has been largely discussed in the literature. Early studies from Goldstein and Khan (1985); Magee (1975) and Rhomberg (1973) argued that tourists do not travel to a particular destination only because of its cultural and natural resource attractions, other factors such as the income of the tourists, the cost of living in the destination country and changes in exchange rates also affect the decision of the latter while choosing their destination. The study done by Uysal and Crompton (1984) employed the least squares multiple regression model and concluded that the important factors of tourist arrivals and tourism expenditures in Turkey are the relative prices, income per capita, and exchange rates. Edward Day (1986) was of the view that an appreciation of the dollar encourages outbound tourism demand in the United States while this appreciation causes a decline in inbound tourism demand. The empirical results concluded that the spending of tourists in the United States was inversely related to the effective exchange rate. Var et al. (1990) examined how tourism demand in Turkey is affected by income per capita in the country of origin, the distance between the home country and Turkey, and the exchange rate between both countries. Annual data for the period 1979–1987 were used for 20 countries of origin. For 11 countries, the exchange rate was found to be a significant variable of tourism demand. Matteo and Matteo (1993) also found that the exchange rate is a key determinant of expenditures of inbound tourists to the United States from Canada from 1979 to 1989. Qui and Zhang (1995) concluded that the impact of the exchange rate on tourism demand in Canada varies across countries of origin. Lee et al. (1996) found a positive relationship between the exchange rate of the currency used in the country

of origin vis-à-vis currency used in Korea and inbound tourism expenditure in South Korea. Garín-Muñoz and Amaral (2000) estimated the exchange rate elasticity to be +0.50 for tourism demand to Spain from 17 origin countries over the period 1985 to 1995. Tse (2001) found that real tourism expenditure in Hong Kong is a function of exchange rate, income, and price level. The log-linear single equation model estimated by Lim and McAleer (2001), to investigate how tourism demand to Australia from Singapore is impacted by the income in Singapore, transportation cost, relative price (proxied by exchange rate), and the price at a competing destination, concluded that income of the origin and the exchange rate are significant factors of the dependent variable. Payne and Mervar (2002) estimated an econometric model using data from the first quarter of 1993 to the last quarter of 1999 to study the Croatian case and the results showed that a real effective exchange rate is also a significant factor affecting tourism revenues in Croatia. The system generalized methods of moments estimated by both Glauco and Khine (2013) and Vítová et al. (2019) indicated that in order to be able to attract tourists to a particular country, it is very important to maintain a relatively stable exchange rate.

Doytch and Nguyen (2022) examined the role of UNESCO Heritage sites and some economic variables on the outcome variable. The results concluded that economic growth, a depreciation of the currency used in the destination country, and trade openness are positively related to tourism FDI. Several other recent studies concluded that the exchange rate is an important determinant of tourism demand (see Table A1).

On the other hand, Dritsakakis and Athanasiadis concluded that the exchange rate does not play a significant role in the tourism demand model for Greece. Vanegas and Croes also found the exchange rate to be an insignificant determinant of tourism demand to Aruba from the United States. These findings were supported by other studies such as Baran et al. (2019), Bozkurt et al. (2021) Catalbas (2016), Cheng et al. (2013), Dhaoui et al. (2017), Dogru et al. (2017), Glauco and Khine (2013) and Samirkas and Samirkas (2015).

2.2 | Exchange rate volatility and tourism

2.2.1 | Theoretical review

The main intention of modeling uncertainty in tourism demand is to measure how variations in tourism demand can be affected by shocks. Kim and Wong (2006) argued that unexpected changes in policies, issues relating to health and safety, mega-events, and volatile exchange rates affect tourism demand. Exchange rate volatility shows the risk associated with the destination country and is thus included in the tourism demand function to reflect "uncertainty avoidance" in travel decisions (Jena & Dash, 2020).

As mentioned earlier, tourism is an international business by nature and an appreciation or depreciation of the currency of the origin country affects tourism demand (Chen et al., 2022). However, if such spikes take place too quickly globally, it will cause the industry to

be unstable and it may take a heavy hit. A highly volatile exchange rate creates an environment of uncertainty and thus causes a decrease in tourist inflows in a country facing a volatile exchange rate. However, relatively few studies focused on exchange rate volatility as a determinant of tourism demand.

2.2.2 | Empirical review

Webber (2001) was one of the first to empirically conclude that exchange rate volatility is a significant determinant of tourism demand in the long run since, in 40% of cases, a highly volatile exchange rate may cause the tourist to drop the idea of traveling to a particular destination country. Chang and McAleer (2009) found that exchange rate volatility and international tourism demand in Taiwan are related. Using data from nine origin countries for the period January 1991 to January 2011, Yap (2012) used multivariate conditional volatility regressions and concluded that exchange rate volatility creates spill-over effects on tourism arrivals in Australia though these effects may differ from stronger to weaker depending upon the sending country that creates these tourism inflows into Australia.

Saayman and Saayman (2013) were of the view that if exchange rate volatility is not associated with adverse political conditions, it will have a bigger impact on tourism spending than on tourist arrivals. This was confirmed by the ARDL model. A few more recent studies (see Agiomirgianakis et al., 2015; Aktas et al., 2014; Ergen & Yavuz, 2017; Ogbaba et al., 2016; Sharma et al., 2019 and Wamboye et al., 2020) concluded that there exists a negative relationship between exchange rate volatility and tourism demand while some found an insignificant relationship between the two variables (see Chi, 2020; Demirel et al., 2013; Dincer et al., 2014; Liangju & Xiaoyun, 2018).

A summary of the literature points out a mixed nature of results empirically obtained for studies carried out to analyze the impacts of exchange rate and its volatility on tourism demand, both for single country estimations and panel estimations. Moreover, the relatively few studies in the literature have focused mainly on developed country cases with scant evidence from developing economies and particularly island economies which remain mostly tourist-dependent and quite vulnerable given their smallness and open nature. Existing literature has also largely ignored the dynamic nature of tourism in tourism demand modeling as well as the study of short-term impacts. This study thus attempts to supplement the literature by taking into account the above.

3 | DATA AND METHODOLOGY

3.1 | Data description

This study is theoretically and empirically grounded on a classical demand model for international tourism (see Peng et al., 2015; Seetanah et al., 2011 and reviews by Song & Li, 2008; Stabler et al., 2010 and others) and augmented with the two variables namely exchange rate and exchange rate volatility. The conceptual model is

thus specified as (3–1 for the first sample & non-Eurozone and 3–2 for Eurozone):

$$TA_{it} = f(ER_{it}, ERV_{it}, ROOM_{it}, RP_t, INCOME_{it}, DUMMY) \quad (1)$$

$$TA_{it} = f(ER_{it}, ERV_{it}, ROOM_{it}, RP_t, INCOME_{it}) \quad (2)$$

where

- TA_{it} is the number of tourist arrivals to Mauritius from country i for the year t (obtained from Statistics Mauritius);
- ER_{it} is the exchange rate from Mauritian rupees to the currency used in country i in year t (monthly exchange rate was obtained from Bank of Mauritius);
- ERV_{it} is exchange rate volatility calculated using monthly data of ER_{it} and GARCH;
- $ROOM_t$ is a proxy used for tourism infrastructure in Mauritius for the time t and is the number of hotel rooms available in the destination country in year t (obtained from Statistics Mauritius);
- RP_t is the CPI of Mauritius which is a proxy of the relative cost of living in Mauritius (as per Wamboye et al., 2020) and is obtained from Statistics Mauritius;
- $INCOME_{it}$ is the GDP in the origin country i for the year t and is obtained from World Bank; and
- $DUMMY$ is a dummy variable included in the first sample and the non-Euro zone sample accounting for the economic crisis.

All variables have been transformed into natural logarithms since as explained by Layson (1983) and Shahbaz (2010), more efficient results are obtained using the log-linear specification as compared to simple specification.

The common justification for including exchange rate in the tourism demand equation has already been discussed earlier on and relates to the fact that tourists are more aware of exchange rates than prices in the destination country. Adding exchange rate volatility to the existing set of determinants, on the other hand, will measure the uncertainty avoidance in the travel destination decision, that is, whether the tourists tend to choose destinations with a more stable exchange rate. The number of hotel rooms available in Mauritius is used as a proxy for tourism infrastructure in Mauritius. Seetanah et al. (2015) posited that this variable is a reflection of the capacity of the tourism sector and a higher number of hotel rooms also means a greater capacity and it increases the competitive level of the destination country in terms of pricing and service quality. During their stay in Mauritius, the tourists would usually spend money on shopping, accommodation, and food among others, and will take into account the cost of living in the destination country. GDP in the origin country, which is a proxy for income in the home country, is a major determinant of leisure travel. Overseas travel, especially for vocational purposes, is perceived to be a luxury good, and hence the higher the income of prospective tourists, the more likely they are to travel.

Three models are estimated namely: the first model, a balanced panel data of 357 observations for tourist arrivals from 17 major countries, and the second and third models also used panel data

consisting of 126 and 210 observations respectively to study the hypothesized relationship for Eurozone and non-Euro zone countries among the top countries of origin. The 17 countries of origin used in our sample are Australia, Austria, Belgium, France, Germany, Hong Kong, India, Italy, Japan, Kenya, Netherlands, Singapore, South Africa, Spain, Switzerland, the United Kingdom, and the United States. This sample was subsequently then split into two sub-samples: Eurozone and non-Eurozone. Tourist arrivals from the Eurozone represented around 60% of inbound tourism demand to Mauritius. It is thus important to investigate how tourists from these countries react to changes in the determinant variables. It is also crucial to study the behavior of tourists from the non-Euro zone using the economic variables mentioned above to explore the potential of attracting more tourists from these countries.

3.2 | Methodology

Panel estimation techniques have been proven to be a better method in comparison to country-specific time-series econometric methods (see Im et al., 2003; Maddala & Wu, 1999). According to Hsiao (2005), panel data analysis produces more efficient estimates and allows a higher degree of freedom and lesser collinearity among variables. In this study, we employ a panel autoregressive distributed lag (ARDL) model to examine the effects of the exchange rate and its volatility on tourism demand.

3.2.1 | Panel unit root tests

Given the time series dimension of the data set, it is crucial to test the stationary levels of the variables included in the model (see Equations 1 and 2) in the first instance and subsequently cointegration to validate the existence of any long-term relationship. Ignoring the above can lead to spurious results, Levin-Lin-Chu (LLC) is used. The null hypothesis of the tests is that the variable has a unit root.

3.2.2 | Panel co-integration tests

To test the existence of long-run relationships among the variables being investigated, the Kao (1999) Residual Cointegration test and Pedroni test for cointegration are used. The null hypothesis of the test of no cointegration is rejected if the p-value is less or equal to the significance level.

3.2.3 | Panel ARDL

Pesaran et al. and Pesaran and Shin introduced the ARDL approach of cointegration and this has become increasingly popular nowadays in the field of econometric analysis. Recently, the ARDL approach to cointegration has been preferable to other conventional cointegration

approaches. The main advantage of this procedure is that it can be applied irrespective of whether the variables are $I(0)$ or $I(1)$. In addition, the ARDL approach also gives more robust results when the sample size is small. Moreover, a dynamic Error Correction Model (ECM) can be derived from ARDL which integrates the short-run dynamics with the long-run stability without losing the long-run information.

The ARDL procedure involves two stages. In the first stage, the long-run relationship between the variables under investigation is tested, that is the significance of the lagged levels of the variables in the error correction form of the underlying ARDL model is tested (Pesaran, 1997).

The second step of the ARDL procedure is to estimate the long-run and the short-run coefficients and their inferences provided that the long-run relationship between the variables is already established. The ARDL framework takes the following form (all variables in natural logarithm):

$$\begin{aligned} LTA_t = & \gamma + \sum_{i=1}^p \alpha_{1i} D(LTA)_{t-i} + \sum_{i=0}^{q_1} \alpha_{2i} D(LEP)_{t-i} \\ & + \sum_{i=0}^{q_2} \alpha_{3i} D(LERV)_{t-i} + \sum_{i=0}^{q_3} \alpha_{4i} D(LROOM)_{t-i} \\ & + \sum_{i=0}^{q_4} \alpha_{5i} D(LRP)_{t-i} + \sum_{i=0}^{q_5} \alpha_{6i} D(LINCOME)_{t-i} \\ & + \beta_{11} LTA_{t-1} + \beta_{21} LEP_{t-1} + \beta_{31} LERV_{t-1} + \beta_{41} LROOM_{t-1} \\ & + \beta_{51} LRP_{t-1} + \beta_{61} LINCOME_{t-1} + \beta_{71} DUMMY + \varepsilon_t \end{aligned} \quad (3)$$

4 | RESULTS AND ANALYSIS

Table 1 summarizes the results of the panel unit root test at the level and first difference respectively. For the first sample of origin country and Eurozone countries, LTA and LINCOME are integrated in order 1 ($I(1)$) while the other variables are stationary at level ($I(0)$). For the non-Euro zone, all the variables are stationary at level, except for LTA which becomes stationary after taking the first differences. Since for all three samples, there is a mixture of $I(0)$ and $I(1)$ variables, the autoregressive distributed lags estimation technique is the most appropriate framework to be employed (see Pesaran, 1997).

The results of the Panel ARDL cointegration tests are summarized in Table 2. The null hypothesis of no cointegration is rejected at the 10% significance level for all three models. Thus, there exists a long-run relationship among the variables included in our model.

After the confirmation of cointegration, the next step is to estimate the long-run and short-run relationships between the variables. As such, two estimators namely the Pooled Mean Group (PMG) and Dynamic Fixed Effects (DFE) are employed to estimate the panel ARDL model for each sub-sample. Since all the variables are either integrated of order 0 or 1 and the presence of cointegration is confirmed, the long-run and short-run impacts of exchange rate and

TABLE 1 Levin–Lin–Chu unit-root test at level.

Variables	Level				First difference			
	Unadjusted t-stats	Adjusted t-stats	p-Value	Conclusion	Unadjusted t-stats	Adjusted t-stats	p-Value	Conclusion
<i>17 countries</i>								
LTA	−2.6008	0.7232	0.7652	−	−7.2377	−3.4045	0.0003***	I(1)
LER	−9.1664	−6.8032	0.0000***	I(0)	−	−	−	−
LERV	−11.2314	−9.8410	0.0000***	I(0)	−	−	−	−
LROOM	−9.1789	−8.5200	0.0000***	I(0)	−	−	−	−
LRP	−6.3378	−5.8009	0.0000***	I(0)	−	−	−	−
LINCOME	−1.6667	−0.1980	0.4215	−	−9.2667	−5.4609	0.0000***	I(1)
Dummy	−8.8864	−4.8939	0.0000***	I(0)	−	−	−	−
<i>Euro-zone</i>								
LTA	−2.2299	0.9594	0.8313	−	−6.4362	−2.8440	0.0022***	I(1)
LER	−8.4864	−6.2985	0.0000	I(0)	−	−	−	−
LERV	−10.3982	−9.1110	0.0000***	I(0)	−	−	−	−
LROOM	−8.4980	−7.8880	0.0000***	I(0)	−	−	−	−
LRP	−5.8677	−5.3706	0.0000***	I(0)	−	−	−	−
LINCOME	−1.2734	−0.1381	0.4451	−	−9.9810	−6.0791	0.000***	I(1)
Dummy	−8.8864	−4.8939	0.0000***					
<i>Non-Euro-zone</i>								
LTA	−3.1851	−1.0885	0.1382	−	−10.1563	−4.7700	0.0000***	I(1)
LER	−6.9418	−5.0754	0.0000***	I(0)	−	−	−	−
LERV	−46.3653	−47.8827	0.0000***	I(0)	−	−	−	−
LROOM	−10.9708	−10.1834	0.0000***	I(0)	−	−	−	−
LRP	−7.5751	−6.9334	0.0000***	I(0)	−	−	−	−
LINCOME	−4.1048	−3.7126	0.0001***	I(0)	−	−	−	−
Dummy	−5.9491	−1.6893	0.0456**	I(0)	−	−	−	−

Note: ***, **, * shows 1%, 5%, and 10% of significance level.

exchange rate volatility on tourism demand are subsequently estimated using the ARDL approach. Based on the Akaike Information Criterion (AIC), a lag length of 1 has been selected. After estimating the model using both the PMG and DFE estimators, the Hausman test is used for the selection of the most plausible model. According to the results presented in Table 3, the PMG is the best one. For brevity, we only report and discuss the results from the PMG estimator.

Table 4 presents the results of the long-run relationships between tourism and the other explanatory variables. As can be observed, the exchange rate has a negative and significant impact on the dependent variable for all the 3 samples while the coefficient for exchange rate volatility is negative and significant only for the first sample and non-Euro zone countries. The results are further discussed in the paragraphs that follow.

For the first aggregate sample of origin countries, an increase of 1% in the exchange rate would imply an estimated decrease of 1.08% in the tourist arrivals from these countries in the long run with all other conditions remaining constant. For Eurozone and non-Eurozone countries, if the Mauritian rupee appreciates by 1% vis-à-vis the

currencies used in the origin countries, tourist arrivals would decrease by 0.78% and 0.63% respectively. These findings are in line with Joun and Kim (2020), Nisthar and Nufile (2019) and Yap (2011) and theoretical findings (see Akar, 2012; and Webber, 2001) which conclude that an appreciation of the currency in the destination country causes a decline in tourism demand since the appreciation will cause the country to be an expensive destination.

Exchange rate volatility has a significant negative impact on tourist arrivals to Mauritius from the 17 countries of origin and the non-Euro zone countries. The coefficient of exchange rate volatility states that a 1% improvement in the variable will cause a decline of 0.28% in tourism demand from the 17 countries of origin and 0.09% from the non-Euro zone countries, in the long run, keeping all other variables constant. The empirical results are consistent with the findings of Aktas et al. (2014), Sharma et al. (2019), and Wamboye et al. (2020) and tourism literature. Exchange rate volatility indicates the risk associated with a destination and a higher risk may cause tourists to refrain from visiting a particular country or even cancel a planned trip. However, exchange rate volatility has a positive and significant impact

TABLE 2 Panel ARDL cointegration.

	17 countries		Eurozone		Non-euro zone	
	Statistics	p-Value	Statistics	p-Value	Statistics	p-Value
<i>Kao test for cointegration</i>						
Modified Dickey-Fuller t	0.3219	0.3737	1.8640	0.0312**	-2.2799	0.0113**
Dickey-Fuller t	-0.3574	0.3604	2.3458	0.0095***	-3.4592	0.0003***
Augmented Dickey-Fuller t	-1.1074	0.1341	1.5285	0.0632*	-3.1919	0.0007***
Unadjusted modified Dickey-Fuller t	-1.3904	0.0822*	-0.1968	0.4220	-4.2716	0.0000***
Unadjusted Dickey-Fuller	-1.5532	0.0602*	-0.0703	0.4720	-4.2562	0.0000***
<i>Pedroni test for cointegration</i>						
Modified Phillips-Perron t	4.1285	0.0000***	1.9691	0.0245**	3.5983	0.0002***
Phillips-Perron t	-0.8192	0.2063	-1.5791	0.0572*	-2.2396	0.0126**
Augmented Dickey-Fuller t	-0.7392	0.2299	-1.1354	0.1281	-2.1805	0.0146**

Note: ***, **, * shows 1%, 5% and 10% of significance level.

TABLE 3 Hausman test results to select model between PMG and DFE.

	17 countries	Euro-zone	Non-euro zone
Chi ² (6)	0.05	0.01	0.03
p-values	1.000	1.00	1.000
Decision	Cannot reject H ₀ of homogeneity		
Which model is good?	PMG	PMG	PMG

TABLE 4 Long-run estimates from the Panel ARDL model.

Variable	Coefficient	Standard error	Probability
<i>17 countries</i>			
LER	-1.0858	0.2250	0.000***
LERV	-0.2769	0.7223	0.000***
LROOM	1.3235	0.8906	0.137
LRP	-1.6201	0.5231	0.002***
LINCOME	2.0933	0.6089	0.001***
DUMMY	-1.0401	0.2201	0.000***
<i>Euro-zone</i>			
LER	-0.7849	0.3465	0.023**
LERV	0.0876	0.0454	0.053*
LROOM	0.6267	0.9925	0.528
LRP	-0.5220	0.5487	0.341
LINCOME	2.3961	1.2433	0.054*
<i>Non-Euro-zone</i>			
LER	-0.6258	0.1029	0.0000***
LERV	-0.0908	0.0429	0.034**
LROOM	-0.1281	0.4756	0.788
LRP	-0.0353	0.2610	0.892
LINCOME	0.7912	0.6578	0.000***
DUMMY	-0.2808	0.3475	0.000***

Note: ***, **, * shows 1%, 5%, and 10% of significance level.

on tourist arrivals from origin countries in the Eurozone sample. This can be explained by the fact that the majority of tourist arrivals to Mauritius are from the Eurozone and hence mouth to mouth marketing and the variety of attractions in Mauritius may prompt the tourist to choose the destination despite exchange rate fluctuations. Another possible explanation is that the period used to conduct the study is too small for Eurozone tourists to factor into their decisions (see Opstad et al., 2021).

Table 4 indicates that the income of the tourists exerts a positive and significant impact on tourism demand in the long run in all models. In other words, an increase in the income of the tourists spurs tourist arrivals to Mauritius. This is in line with the works of Mohebi and Abdul Rahim (2010) and Xie and Villace (2020). Tourism infrastructure in Mauritius, proxied by the number of hotel rooms available, has a positive and insignificant impact on tourism demand from the first two samples while for non-Euro zone countries, the coefficient is negative but insignificant. The coefficient of relative price (which is proxied by the Consumer Price Index of Mauritius) is negative for all three models. The impact of the variable is significant for the 17 origin countries and insignificant for the other 2 samples. The results are consistent with Eilat and Einav (2004) and Seetanah et al. (2015) who argued that tourists are less sensitive to prices when they travel to less developed countries as the price level is low. The dummy variable for economic crisis has a negative and significant impact on tourism demand from the 17 countries and non-Euro zone countries (see Göçer & Gormus, 2010; Kusni et al., 2013 and Tavares, 2020).

TABLE 5 Short-run estimates from the Panel ARDL model.

Variable	Coefficient	Standard error	Probability
<i>17 countries</i>			
D(LER)	−0.1249	0.1218	0.305
D(LERV)	−0.0060	0.0245	0.806
D(LROOM)	0.3003	0.4913	0.541
D(LRP)	−1.0532	0.5544	0.057*
D(LINCOME)	2.1665	0.8898	0.015**
D(DUMMY)	−0.0897	0.0617	0.146
C	−9.5107	3.2501	0.003***
ECT	−0.1635	0.0562	0.004***
<i>Euro-zone</i>			
D(LER)	−0.4567	0.2666	0.087*
D(LERV)	0.0247	0.0017	0.000***
D(LROOM)	−0.3198	0.3327	0.337
D(LRP)	−1.8912	1.0931	0.084*
D(LINCOME)	3.9400	1.1112	0.000***
C	−14.6596	6.5558	0.025**
ECT	−0.2401	0.1072	0.025**
<i>Non-Euro-zone</i>			
D(LER)	0.0563	0.1291	0.662
D(LERV)	0.1807	0.0223	0.417
D(LROOM)	0.4067	0.5206	0.435
D(LRP)	0.5051	0.5607	0.368
D(LINCOME)	0.6795	0.4511	0.132
D(DUMMY)	−0.0940	0.0371	0.011**
C	−6.4094	1.3800	0.000***
ECT	−0.4497	0.8622	0.000***

Note: ***, **, * shows 1%, 5% and 10% of significance level.

In the short run, the results show that the exchange rate has a negative and significant impact, only for the Eurozone countries. For the 17 countries of origin and the non-Euro zone countries, the coefficient of exchange rate is insignificant. This could be explained by the fact that tourists coming to Mauritius from these samples were mostly on inclusive (package) tours which are paid in advance according to Orhan et al. (1998) and hence a change in exchange rate does not affect tourism demand.

For exchange rate volatility, the coefficient is negative and non-significant for the 17 countries of origin. However, it has a positive and significant impact on tourism demand from Euro-zone countries while the positive impact for the non-Euro zone is insignificant in the short run. As explained by Webber (2001), the impact of exchange rate volatility on tourism demand is dependent on whether the tourists are risk-averse or risk-lovers. In the short run, it can be observed that tourists traveling to Mauritius from Euro and non-Euro zones are risk-seeking as exchange rate volatility has a positive impact on the dependent variable.

As depicted in Table 5, the coefficient of D(LINCOME) is positive and significant for the first 2 models while for the non-Euro zone, the

positive coefficient of D(LINCOME) is not significant. This result confirms the findings of Lelwala and Gunaratne (2008) and Xie and Villace (2020). Relative price is found to affect tourism demand from the 17 countries and Eurozone countries negatively and significantly in the short run while for the non-Euro zone, the impact is positive and non-significant. The positive impact can be explained by the fact that tourism in Mauritius tends to be a high-quality service instead of a more expensive destination (see Leitão, 2009; Surugiu et al., 2011).

The error correction term has a negative sign and is statistically significant at a 5% level for all models. This implies that tourism demand in Mauritius adjusts to changes in the explanatory variables and it also confirms the presence of a long-run equilibrium relationship between the variables. The coefficient of the error correction term implies that for the panel of 17 origin countries, 16% of the disequilibrium is eliminated in 1 year while 24% and 45%, for Euro and non-Euro zones respectively, of the disequilibrium is eliminated. That is, provided there are no further shocks, it will take approximately 6 years for the sample of 17 countries to revert to its equilibrium level, 4 years for the Eurozone, and 2 years for the non-Eurozone.

In general, it is observed that the coefficients of exchange rate in the long-run models are bigger than the short-run ones. That is tourism demand is more sensitive to exchange rates in the long run.

5 | CONCLUSION

5.1 | Discussion

This study aims to contribute to discussions on how Mauritius could attract tourist arrivals upon the re-opening of borders after the outbreak of the Covid-19 pandemic. There are several factors affecting the demand for tourism in a country. This paper, therefore, investigates the impacts of exchange rate and exchange rate volatility, together with other main determinants of tourism, on tourism demand in Mauritius. Annual data for Mauritius's top 17 countries of origin was used for the period 1999 to 2019. The sample selection was based on the availability of data from the main origins.

5.2 | Theoretic contribution

The theoretical contribution of this study is the inclusion of both the exchange rate and its volatility in a tourism demand model for Mauritius, which is a country that depends significantly on the tourism sector. Additionally, the study offers findings derived from a disaggregated perspective, namely by country of origin. since it is believed that origin countries may have a moderating role in the Exchange rate-tourism demand link. The sample of origin countries for tourism demand to Mauritius is further broken into two groups namely Euro-Zone and non-Euro zone countries. Furthermore, a dynamic data analysis model is used to analyze the impacts of conversion rate and exchange rate volatility on tourist inflows to Mauritius. This method,

Autoregressive Distributed Lag, allows for the study of both the short- and long-term relationships of the hypothesized link.

5.3 | Managerial implications

The empirical results indicate that in the long run exchange rate has a significant negative impact on tourism demand for all the samples. The coefficients of the variable imply that with a one percentage point appreciation of the Mauritian Rupee, tourism demand in the country will decrease by around 0.63%–1.09% per year. In instances where exchange rate volatility is significant in the long run, a 1% increase in the variable causes a decline in traffic of tourists to Mauritius by 0.09%–0.28% annually. Income, on the other hand, impacts tourism demand positively and significantly as per existing theories for all the samples. The coefficient of relative price is not significant for Euro and non-Euro zones as Mauritius is less developed than most of the origin countries in the sample. The sub-prime crisis which hit the economic growth worldwide also cut back the dependent variable in the long run.

The statistically significant and negative coefficient of the error correction term (ECT) further substantiates the long-run equilibrium relationship among variables. The negative coefficient of ECT implies that the speed of adjustment towards long-run equilibrium is 16–45% per annum if there is any short-run deviation. To sum up, the study supports the existing theory that the income of tourists encourages tourism demand in the country while exchange rate and exchange rate volatility have negative impacts on the tourism industry.

The implications of the study are interesting as the significant impact of both the exchange rate and its volatility suggests that there is a need for stronger monetary and fiscal regulations. The devaluation of the Mauritian rupee will help to attract tourist arrivals to Mauritius. However, if the policymakers are too abusive to use this tool, it will have a negative impact on the economy and will cause inflation. The inflation in turn would cause a decline in tourism demand.

5.4 | Limitations and further research

Notwithstanding this study provides useful information for tourism policymakers, the results should be treated with caution. The limitation of this study is that annual data was used while tourism literature has suggested using higher frequency data such as monthly or weekly for a more accurate result. Depending on the availability of higher-frequency data, this study can be replicated. Also, other determinants of tourism demand can be included in the set of determinants used in this study and the time series used can be extended to a longer period depending on data availability.

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DATA AVAILABILITY STATEMENT

Research data are not shared.

ORCID

Boopen Seetanah  <https://orcid.org/0000-0001-5024-3084>

Robin Nunkoo  <https://orcid.org/0000-0002-3583-9717>

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APPENDIX A

TABLE A1 Studies concluding that exchange rate is a significant determinant of tourism demand.

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|--------------------------------------|------------------------------------|
| 1. Payne and Mervar (2002) | 19. Gan (2015) |
| 2. Croes and Vanegas (2005) | 20. Abedtalas and Toprak (2015) |
| 3. Patsouratis et al. (2005) | 21. Borhan and Zainudin (2016) |
| 4. Archibald and LaCorbinière (2008) | 22. Chandra and Kumari (2016) |
| 5. Lelwala and Gunaratne (2008) | 23. Ongan et al. (2017) |
| 6. Barrie et al. (2009) | 24. Adeola et al. (2017) |
| 7. Wang (2009) | 25. Akter et al. (2017) |
| 8. Zainudin and Norul (2010) | 26. Cheng et al. (2017) |
| 9. Chaiboonsri et al. (2010) | 27. Tavares and Leitão (2017) |
| 10. Yap (2011) | 28. Fereidouni et al. (2017) |
| 11. Ibrahim and Ibrahim (2011) | 29. Meo et al. (2018) |
| 12. Tang (2011) | 30. Muzindutsi and Manaliyo (2018) |
| 13. Lee (2012) | 31. Nisthar and Nufile (2019) |
| 14. Akar (2012) | 32. Joun and Kim (2020) |
| 15. Corgel et al. (2013) | 33. Athari et al. (2021) |
| 16. Culiuc (2014) | 34. Opstad et al. (2021) |
| 17. Kazuzury (2014) | |
| 18. Falk (2014) | |