# DOES EXCHANGE RATE VOLATILITY AFFECT TOURIST ARRIVAL IN INDIA: A QUANTILE REGRESSION APPROACH

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**Abstract.** In this study, we examine the degree and structure of the impact of exchange rate change and volatility on tourist arrival in India by using Quantile Regression Analysis (QRA) during January 1990 to March 2015. The study made the use of inbound tourist arrival as the dependent variable and world GDP per capita, nominal Indian Rupee/US Dollar exchange rate and exchange rate volatility as the independent variable. We have studied the impact of exchange rate on tourist arrival in the world and top 10 counties context. As far as impact of exchange rate change is concerned, the results are contrasted with both the measures of tourist arrival. In the case of total tourist arrival in India, the impact is positive which means deprecation (appreciation) of domestic currency has a positive (negative) in normal to bad phases of tourist arrivals. But in case of top ten countries, deprecation (appreciation) of domestic currency, the impacts tourist arrival at extreme good and bad phases negatively (positively). However, for these top ten countries, the per capita income of the respective countries is much more important as it has a strong positive impact on all conditions of tourist arrival. Similar impact is observed for exchange rate volatility too. Further, the impact of exchange rate both change and volatility is found asymmetric at different condition of tourist arrival from top ten countries. So, the same tourism policy may not work in all the situations. Thus, the policy makers should come out with suitable tourism policy appropriate for different conditions of tourist arrival.

**JEL Classifications:** C32, L83, O40, F41
**Key Words:**Tourist arrivals, exchange rate volatility,Quantile regression analysis,India

## I. Introduction

In a globalized world, the exchange rate has become an extremely important macroeconomic variable holding potential to influence the whole economic activity of a country. It is one of the variables through which global shocks get transmitted across the borders with a potential to affect the other macroeconomic variables of the economy. Since the collapse of the Bretton-woods system in 1973, most of the countries in the world moved from fixed to floating exchange rate system. Economic uncertainty created by floating exchange rates has surprised and disappointed many economists, businessmen and policy makers which is beyond their expectations. The Central Banks take measures to ensure that exchange rate volatility remains under control as a highly volatile currency has a negative effect on the economy. Therefore, it is not only a concern for financial market participants, but also for policy makers to discern the impact of exchange rate volatility on different sectors of the economy.

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As one of the important industries of the tertiary sector, the tourism industry has been developing rapidly in recent decades and contributing greatly to economic growth, especially in tourism intensive countries. Tourism has grown faster than world trade for the past five years (UNWTO, 2017). The tourism has become the world's fourth largest export industry after fuels, chemicals and food (Tugcu, 2014; Balli, Curry & Balli, 2015). Specifically, in terms of world trade, tourism is the largest service industry, accounts for 7% of world's total merchandise and service exports and contributing about 10% to the global Gross Domestic Product (GDP) [UNWTO], 2017). In the world, one in 10 jobs is created by the tourism sector (World Travel and Tourism Council). The importance of the tourism sector are many. First, tourism creates jobs and hence stimulates earnings (Lee & Chang, 2008). Second; tourism significantly contributes to foreign exchange reserves, which help in bringing new technologies for production process (McKinnon, 1964). Third, tourism stimulates investments in new infrastructure, human capital and increases competition (Blake, Sinclair, & Campos, 2006; Lemmetyinen and Go, 2009). Fourth, tourism generates positive economic externalities (Punia, 1994; Andriotis, 2002; Weng & Wang, 2004; Croes, 2006). Fifth, tourist consumption can contribute to the balance of payments, production and employment through foreign exchange earnings and can also represent an important income source for the whole national economy (Balaguer & Cantavella-Jordá, 2002). Thus, tourism has been emerging as a major avenue for growth, development, and foreign exchange earnings for both developed and developing countries.

The relationship between tourist arrival and economic growth and economic growth led tourist arrival is documented in the literature. Few researchers highlight the impact of exchange rate volatility on tourist arrivals (Webber (2001), Chang et.al (2009), Yap (2012), Santana Gallego (2010). But all these studies have shown the total effects of tourist arrival. The best of our knowledge, none of the studies address how tourist arrival behaves if exchange rate volatility is more or less. In addition to that, none of these studies taken the top counties who are looking as a tourist destination. There is scope for the inclusion of exchange rate volatility as an additional variable in the tourist arrival equation to reflect 'uncertainty avoidance' in the travel destination decision, rather than as a proxy for living costs.

The exchange rate volatility (i.e. INR/USD) is critical for the development of the tourism sector as it directly affects foreign tourist arrival. The volatility in exchange rate makes tourist arrival less attractive because it affects a tourist's decision to travel to the destination country. This is the case not only for individual tourists changing their holiday plans, but also tour operators perceiving exchange rate volatility as an element of risk associated with their business. In reaction to this, they may redirect tourist to other destinations that enjoy relative stable exchange rates.

A decrease in inbound tourism demand will reduce domestic job opportunities, decrease tourism revenues, and lead to adverse impacts on the economy. Hence, it remains a challenge for the government to maintain a relatively stable exchange rate. Thus, it is essential on the part of the policy makers to understand the nature of the impact of exchange rate volatility on tourist arrival. Besides this, to the best of our knowledge, no studies have been carried out as far as emerging countries like India is concerned. Further, studies are confined to estimating the average impact, and also short and long–

term impact of exchange rate on tourist arrival. No study has done yet relating to the impact of exchange rate on tourist arrival conditional on the different state of the arrival of tourist which corresponds to the quantile of the distribution of the dependent variable. Also, the study investigates whether the impact of exchange rate has homogeneous impact at the good state and bad state of the inbound tourist.

The study has three-fold contributions to the literature on exchange rate and tourist arrivals. First, we study the degree and structure of the impact of exchange rate change and volatility across the distribution of tourist arrival in the Indian context using the novel quantile regression analysis methodology. Second, the study tries to find out the nature of the impact whether the impact is symmetric across the distribution of tourist arrival. Finally, we examine the conditional impact taking the income level of the respective countries as a conditioning variable in the context of total arrivals of tourist and arrival of tourist from best ten countries.

The objectives of this paper are many folds. First, the study examines the impact of exchange rate change and volatility on arrival of tourist conditional on the different state represented by the quantile of the distribution of arrival of tourist, thereby going beyond the study of the average impact which is a snapshot of the whole distribution. Second, the study investigates whether the impact is symmetric across the distribution of the tourist arrival. Third, the impact is examined after controlling for other potential variables which impact the arrival of tourist such as inflation and income level of the respective countries. The study is conducted in two sets of data on tourist arrival (1) Total tourist arrivals from the World (2) Top 10 counties source countries of tourist).

The significance of tourism in Indian economy is relatively low (Aramberri, 2004, Narayan, Rajendran, Sai & Gopalan, 2009). For instance, just 6.7% of GDP originates in this sector in 2014. This implies that there is a large untapped potential in Indian tourism industry. In fact, UNWTO (2015) noted that India recorded the strongest growth in international tourist arrivals during the last decade. Developing nations need financial capital to fund their development.

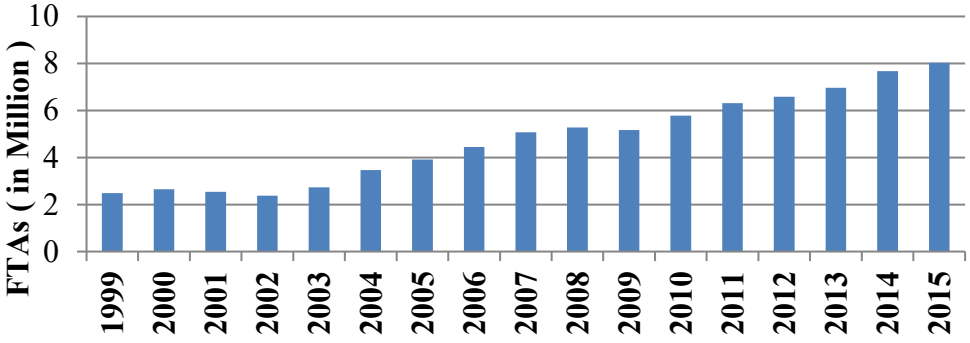
Tourism seems to be a good option to increase the amount of foreign currency needed to deal with this problem. Attention to the tourism policies given during 1990s when Indian economy faces balance of payment crisis. As a remedial measure in this direction, the 'National Action Plan' was formulated in 1992, followed by the 'National Strategy for Promotion of Tourism' in 1996. A further initiative to improve the tourism sector, the ministry of tourism initiated a campaign titled 'Atithi Devo Bhava' in 2009 which is about good behaviour and etiquette while dealing with foreign tourists.

The Indian Government gave the tourism industry a significant push in November 2014, by launching a multi-touch online visa facility through which traveller can apply for a tourist visa from the comfort of their homes and receive it within 72 hours. The outcome of all these efforts, the foreign tourist arrival in India grew from 1.68 million in 1991 to 8.03 million in 2015 (figure 1).

As evident from the figure 1, the foreign tourist arrival in India grew by 400% in 2015 in comparison to arrive in 1999. In the same period, India's share in the world's tourist arrival grew from 0.4% to 0.7% (figure 2). In fact, India is one of the best tourist destinations across the world. In 2015, the top 10 countries looking at India as a tourist destination were United States (15.12%), Bangladesh (14.13%), United Kingdom

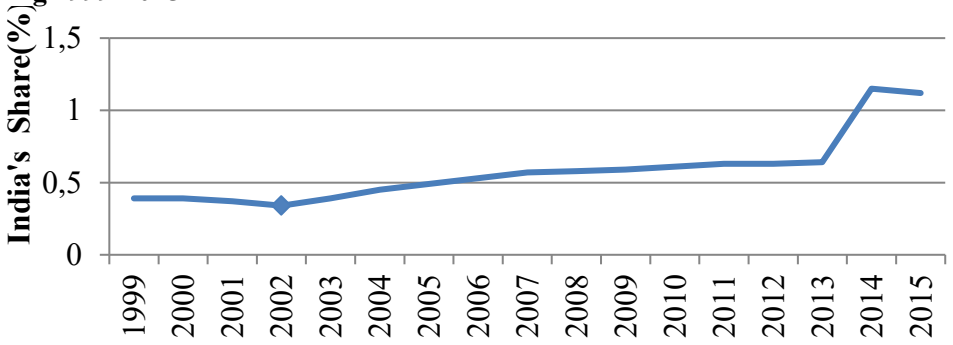
(10.81%), Sri Lanka (3.73%), Canada (3.50%), Malaysia (3.40%), Australia (3.28%), Germany (3.09%), France (2.88%), Japan (2.58%) and others (37.48%). The remaining countries collectively constituted 37.48% (Figure 2).

**Figure 1: Foreign Tourist Arrivals in India during 1999-2015**




***Source:*** Ministry of tourism, India.

**Figure 2: Percentage Share of India in International Tourist Arrival in the World during 1999-2015**




**Source:** Ministry of tourism, India.

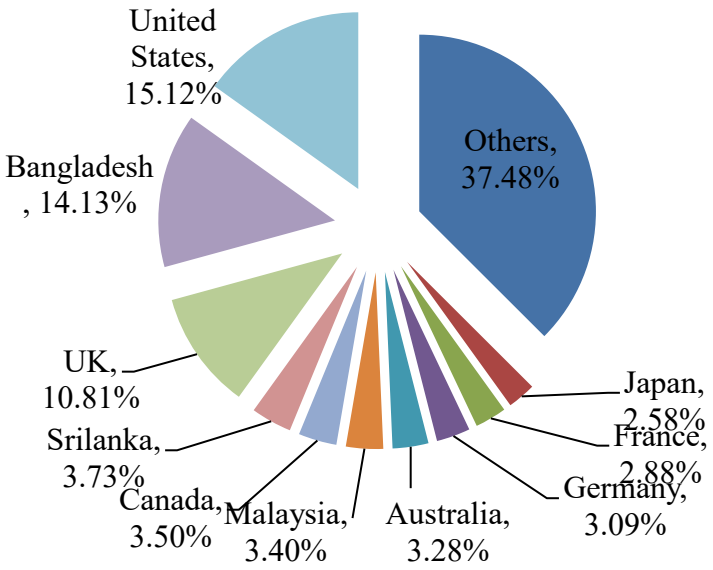
Our choice of India as an empirical attempt is motivated by the fact that the India is one of the fastest growing Asian economies, which implies that its tourism industry can be expected to grow faster in the years to come (Ohlan, 2016a). Another distinctive feature of India is that it has recorded double-digit growth in international tourism receipts, a compound annual growth rate of 11.23% during 2005–2014 (Ohlan, 2017).

Given this backdrop, the study has four-fold objectives. First, is to find out how exchange rate changes and volatility impact across the conditional distribution of tourist arrival. Second, is to investigate whether the impact across the conditional distribution is symmetric or not. Third, is to investigate whether the income level of the concerned country has any impact on tourist arrivals or not. Finally, we hope that the conclusion of this paper will stimulate scholars to conduct further research, which would be beneficial to policy makers.

The paper is organized as follows. Section II of Literature Review summarizes the theoretical and empirical findings related to the topics. Section III, outlines the nature and sources of data and variables used. Section IV, presents the model specifications and

methodology used in the study. Section V, highlights the empirical findings and finally, the Conclusion section offers the concluding remarks followed by some policy implications.

**Figure 3: Percentage Share of Top 10 Countries for FTAs with India in 2015**




***Source:*** Data compiled by the authors from Government of India (2015).

## I. Review of Literature

Tourism literature mainly argues that exchange rate volatility signals the risk associated with a destination country, which may cause tourist to refrain from visiting the destination and/or cancel their trips. The important studies on the relationship between tourist arrival and exchange rate change and volatility in literature related to our study are discussed as follows. The summary of selected review of literature is presented in appendix Table A2.

Agiomirgianakis George, *et.al* (2014, 2015a,2015b and 2017), found that exchange rate volatility has a negative impact on tourist inflow. On the contrary, Kilic and Bayar (2014) found a positive long-term relationship between the real effective exchange rate volatility, tourism receipts and expenditure. In contrary to both of these, Dincer Mithat Zeki et al. (2015) found no long term relationship between REER volatility and tourism revenues. Thompson and Thompson (2010) found a positive euro effect due to zero exchange rate volatility for Greece. Webber (2001) and Saayman and Saayman (2013) mentioned that the effects of exchange rate volatility on tourist arrivals depends on whether tourists are risk-averse or risk-lovers. From the review of literature which studied the exchange rate volatility and tourist inflows identifies five major determinants such as number of tourist arrivals, exchange rate, World GDP, relative price and exchange rate volatility. Empirical studies have focused on South Africa, Australia,

Greece, Turkey, South Korea, Iceland, UK and Sweden. The estimation techniques used are Johansen Juselious and ARDL cointegration method. Thus, the empirical evidence on this question at the international level remained inconclusive. Although there has been some consistency in the approaches adopted by the studies, there are also considerable variations. First, there are numerous differences in model specifications (e.g. explanatory variables included in the model and their definitions). Second, environmental characteristics (e.g. the data time period, countries of the origin and destination) differs substantially. Third, data characteristics vary in terms of structure, form and time interval. Fourth, estimation method used. The different results obtained, and the different approaches used, make it difficult to draw some general conclusions (Crouch Geoffrey I, 1993). To summarize, the review of literature shows that there is conflicting evidence regarding the relationship between exchange rate volatility and tourist arrival. No clear pattern of results or consistent conclusions emerge from these studies. The differences and inconsistencies in the findings could be a reflection of the fact that there is really no systematic and consistent relation between exchange rate volatility and tourist arrivals. But a close look at the models also shows that they use different methodologies, different estimation techniques, and even different measures of volatility.

The best of our knowledge, none of the studies focus on exchange rate volatility and its impact on tourist inflows in Indian context. In addition to that, none of the studies applied recent time series techniques such quantile regression technique. Again, in this study, we have used exchange rate and exchange rate volatility separately as both have impacted differently on tourist arrivals. In our study, we followed the recent researchers who has given emphasis on World GDP per capita rather than world income as a determinants of tourism demand(Martins, L. F. Er al. (2017), Tugcu, C. T. (2014), De Vita, G., et al. (2016). We consider the World GDP per capita, i.e., the average of World income, as one of our determinants for tourism demand, because it reflects the global economic environment and wealth. Hence, this study is unique and will add to the review of literature.

## II. Nature and Sources of Data and Variables Used

The data used in the model were taken from various sources spanning from January 1990 to March 2015 with total number of observations is 301 and 303 for top 10 countries. There is evidence that an increase in the World's GDP per capita, a depreciation of the national currency, and a decline of relative domestic prices does help boost tourism demand. We have measured tourist arrival of India in two ways (1) tourist arrivals from the whole world (2) tourist arrivals from the top 10 countries. These countries are the United States, Bangladesh, United Kingdom, Sri Lanka, Canada, Malaysia, Australia, Germany, France and Japan. The monthly data on tourist arrivals from the whole world and from the top 10 counties are collected from Ministry of Tourism, which is a publication of Government of India. The arrival of tourists refers to inflows of international visitors to the destination country. In the context of top 10 countries, tourist arrival is calculated as the average of tourist arrivals from these countries. The nominal INR-USD exchange rate and nominal exchange rate of the top ten country data are collected from the International Financial Statistics (IFS) which is a publication of the International Monetary Fund (IMF). The nominal exchange rate better captures the volatility driven uncertainty faced by would be tourists. The nominal

exchange rate of the ten countries is calculated as the average exchange rate of these countries. Prices on the destination relative to prices at home are an important determinant of tourism choices. Relative price is computed as the ratio of India's Consumer Price Index (CPI) with respect to the average of the 10 countries CPI. The CPI data are collected from IFS. It is widely believed that tourist arrivals are affected by their income. Previous studies have used world income which affects tourist arrival. However, recently, researchers are focusing more on World GDP per capita rather than world income (Tugcu, C. T. (2014), De Vita, G., *et al.* (2016), Martins, L. F. Er al. (2017). We have considered the World GDP per capita as one of the determinants for tourist arrival, because it reflects the global economic environment and wealth. We also believe per capita GDP is making more sense than world GDP. For instance, total income (GDP) of India is among the largest but per capita is very low. Similarly, the world level also, the total GDP is not that important, but what matters, is how much is the income of an average citizen that is only captured by per capita. The yearly data of World GDP per capita are collected from the World Data Bank, which is a publication of the World Bank. As world GDP percapita is not available on a monthly/quarterly basis, we are forceful to convert yearly data into monthly data by using quadratic method (through EVIEWS 9). In addition to that, as the objective is to see the exchange rate changes or volatility on tourist arrivals, we believe volatility will be better captured in monthly data rather than quarterly or yearly data. Again, ignoring this variable may lead to model specification bias. Finally, the exchange rate volatility data is not directly available. For exchange rate volatility, we have taken the squared value of log of exchange rate, i.e. log (INR/USD) difference. All variables are expressed in logarithmic form for which coefficients are treated as elasticity coefficient.

## III. Model Specifications and Methodology Used

Monthly data of number of tourists arrive is taken as the dependent variable. But we take detrended monthly tourist data after adjusting for time trend ($t$) and momentum effect ($LTA_{(t-1)}$ through equation (1).

**Table 1: Descriptive statistics of log difference of the variables taken for the analysis of the total tourist (column 2-4) and top ten tourist arrival (column 5-8).**

| | DLTA | DLPCGDP | DLINRUSD | DLWER | DLWPCI | DLWRP | DLWTA |
|---|---|---|---|---|---|---|---|
| Mean | -0.0010 | 0.0012 | 0.0043 | 0.005 | 0.001 | 0.004 | 0.005 |
| Median | -0.0151 | 0.0013 | 0.0007 | 0.003 | 0.001 | 0.004 | 0.006 |
| Maximum | 0.5417 | 0.0026 | 0.1941 | 0.268 | 0.012 | 0.059 | 0.056 |
| Minimum | -0.3786 | -0.0025 | -0.0610 | -0.061 | -0.019 | -0.022 | -0.039 |
| Std. Dev. | 0.1830 | 0.0011 | 0.0219 | 0.028 | 0.002 | 0.009 | 0.008 |
| Skewness | 0.3513 | -1.3165 | 3.9675 | 4.779 | -4.380 | 0.868 | 0.552 |
| Kurtosis | 2.7198 | 5.8107 | 33.4083 | 41.363 | 66.557 | 7.670 | 15.951 |
| Jarque-Bera | 7.1510 | 185.408 | 12345.35 | 19669.1 | 51796.37 | 312.348 | 2125.81 |
| Probability | 0.028** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** |

Notes_ Number of observations is 300, for columns (1) to (3) and 302 for columns (4) to (6). DLTA is the log difference of tourist arrival. DLPCGDP is the log difference of percapita GDP, DLINRUSD is the log difference of INR-USD exchange rate, DLWER is the log difference of weighted average of 10 countries exchange rate. DLWPCI is the log difference of weighted average of percapita GDP of 10 countries. DLWRP is the log difference of weighted relative price. DLWTA is the log difference of weighted average arrival of tourist from top 10 countries. *** and ** indicate the significance level at 5% and 1% level.
***Source:*** Authors Calculation.

$LTA_t = c + LTA_{(t-1)} + t + v_t$ (1)

$LTA_t$ is the log of tourist arrival at time t. t is the time trend and $LTA_{(t-1)}$is tourist arrival at lag 1 proxy for the momentum effect . $v_t$ is the adjusted tourist arrival taken for further study in the paper as the dependent variable. The log difference ($logP_t - logP_{t-1}$) of all the three variables are taken for further study. For exchange rate volatility we have taken the squared value of log of exchange rate i.e. log (INR/USD) difference. The descriptive statistics are presented in table 1.

**Methodology Used**

**Quantile Regression Model**

The majority of the studies using linear OLS and non-linear regression analyse the conditional mean of the dependent variable. However, more insight could be obtained by studying other aspect of the conditional distribution of the dependent variable. The quintile regression analysis (QRA) since its introduction by Koenker and Bassett (1978) has become a common tool in modelling the degree and the structure of dependence across different quantiles of the conditional distribution of the dependent variable. Compared to a classical linear regression or even non-linear regression methods, the quantile functions provide a more precise and accurate result of the impact of conditional variables on the dependent variable (see, Koenker 2005). Further, the advantage of using QRA lies in its ability to provide information on the average dependence as well as the extreme tail dependence (i.e., upper and lower tails). The QRA by Koenker (2005) may be explained as follows:

Let $y$ (tourist arrival) be a dependent variable that is assumed to be linearly dependent on $x$ (exchange rate). The $\tau^{th}$ conditional quantile function of $y$ is thus specified as follows:

$$Q_y(\tau|x) = inf\{b|F_y(b|x) \geq \tau\} = \sum_k \beta_k(\tau)x_k = x'\beta(\tau) \quad (2)$$

where $F_y(b|x)$ is the conditional distribution function of $y$ given $x$, and the quantile regression (QR) coefficient $\beta(\tau)$ determines the dependence relationship between vector $x$ and the $\tau^{th}$ conditional quantile of $y$. Dependence is unconditional if no exogenous variables are included in $x$, while it is conditional if exogenous variables are added to x. The values of $\beta(\tau)$ for $\tau \in [0,1]$ determine the complete dependence structure of $y$. The dependence of $y$ based on a specific explanatory variable in vector $x$ could be: (a) constant where the values of $\beta(\tau)$ do not change for different values of $\tau$ ; (b) monotonically increasing (decreasing) where $\beta(\tau)$ increases (decreases) with the value of $\tau$ *;* and (c) symmetric (asymmetric) where the value of $\beta(\tau)$ is similar (dissimilar) for low and high quantiles.

The coefficients $\beta(\tau)$ for a given $\tau$ are estimated by minimizing the weighted absolute deviations between $y$ and $x$:

$$\hat{\beta}(\tau) = \arg\min \sum_{t=1}^{T} \left(\tau - 1_{\{y_t < x_t'\beta(\tau)\}}\right) |y_t - x_t'\beta(\tau)| \quad (3)$$

where $1_{\{y_t < x_t'\beta(\tau)\}}$ is the usual indicator function. The solution to this problem is obtained using the linear programming algorithm suggested by Koenker and D'Orey (1987). The standard

errors for the estimated coefficients can be obtained using the pairs bootstrapping procedure proposed by Buchinsky (1995) since this procedure provides standard errors that are asymptotically valid under heteroscedasticity and misspecifications of the QR function. In our estimations, we used quantiles from $10^{th}$ to $90^{th}$ with the increment of 10. Important to mention that the $10^{th}$ and $90^{th}$ quantiles captures the tail risk of exchange rate here i.e., the impact of negative shock (appreciation of INR/USD) and positive shocks (depreciation of INR/USD) on the arrival of tourist. Further, we also would like to mention that we have conditioned our equation with world per capita income as a proxy for income of the foreign countries, so as to capture the impact of their respective income level of the tourist. Thus, the coefficient of exchange rate will capture the impact of change in exchange rate and volatility on the arrival of tourist and the coefficient of world per capita will capture the impact of change in the income level of the countries.

## IV. Empirical Analysis

In the first part of our analysis, we have made a comparative analysis of the results based on OLS and QRA estimation to justify the application of QRA methodology to examine the impact of change in exchange rate and volatility on arrival of tourists in total (World) and from top ten countries. Empirical estimations are done by EVIEWS 9 software. Unconditional and conditional impacts of exchange rate change and volatility on total and top ten tourist arrivals at different quintiles of the distribution of tourist arrival are discussed in the second part. World per capita income and weighted per capita income are taken as control variables. In the third part we discuss results of QRA analysis where the conditional impact of the exchange rate change and volatility on top ten tourist arrivals are estimated taking relative pricing as an additional control variable.

**Table 2: OLS estimated results of the impact of exchange rate change and volatility after controlling for per capita income and relative pricing.**

| **Panel - A: Total tourist arrival** | | |
|---|---|---|
| **Dependent variable - exchange rate change** | Coefficient | Prob. |
| DLINRUSD | 0.554 | 0.261 |
| DLPCGDP | 4.476 | 0.653 |
| C | -0.009 | 0.593 |
| **Dependent variable - exchange rate volatility** | Coefficient | Prob. |
| VOLA | 4.758 | 0.199 |
| DLPCGDP | 3.298 | 0.737 |
| C | -0.007 | 0.648 |
| **Panel - B: Top Ten tourist arrival** | | |
| **Dependent variable - exchange rate change** | Coefficient | Prob. |
| DLWER | -0.024 | 0.103 |
| DLWRP | -0.020 | 0.654 |
| DLWPCI | 2.523 | 0.000*** |
| C | 0.003 | 0.000*** |
| **Dependent variable - exchange rate volatility** | Coefficient | Prob. |
| DLWER2 | -0.171 | 0.034** |
| DLWRP | -0.027 | 0.534 |
| DLWPCI | 2.529 | 0.000*** |
| C | 0.003 | 0.000*** |

***Note*****:** *** and ** indicate the significance level at 5% and 1% level.***Source:*** Authors' Calculation

As evident from the Panel A of table 2, on an average neither change in exchange rate nor volatility impact the total tourist arrival. But the QRA results in table 3 show that the impact of exchange rate change (column 1-3 of Panel A) and volatility (column 1-3 of Panel B) are witnessed when total tourist arrival is at normal to lowest condition corresponding to .60 to .10 quantiles. As far as impact on arrival of tourist from top ten countries are concerned, only exchange rate volatility impact is observed in the OLS results present in the Panel B of table 2. However, as evident from the QRA results both change in exchange rate (column 4-5 of Panel A) and volatility (column 4-5 of Panel B) impact tourist arrival from top ten countries in its extreme good and bad conditions corresponding to .80, .90 and .10, .20 quantities, respectively. This is a vindication of our application of QRA approach to study the impact of exchange rate on tourist arrival.

The conditional quantiles (conditioning on per capita income) of the impact of exchange rate exchange rate change and volatility are presented through panel A and panel B respectively. The unconditional results are presented through table A1 in the appendix. The per capita income of the source countries does not have any impact on tourist arrival in case of total tourist. Whereas, in case of top ten countries, it has a positive impact across all the conditions of the tourist arrival as all the quintiles of the distribution of tourist arrival. As far as impact of exchange rate change is concerned, the results are contrasting in both the measures of tourist arrival. In case of total tourist the impact is positive means deprecation (appreciation) has positive (negative) in normal to bad phases of tourist arrivals. But in case of top ten countries deprecation (appreciation) of currency impacts tourist arrival at extreme good and bad phases negatively (positively). However, for these top ten countries the per capita income of the respective countries is much more important as it has a strong positive impact on all conditions of tourist arrival. Similar impact is observed for exchange rate volatility. Further, we have estimated the exchange rate impact after controlling for both per capita income and relative pricie. The results are presented through table 4. The results are analogous as far as impact of exchange rates is concerned. The relative pricing (WRP) is found impacting tourist arrival negatively in extreme good condition (.90$^{th}$. quantile) only when it is taken as a control variable along with exchange rate volatility.

For better understanding, the results are presented graphically for quintile coefficients with their 95% confidence interval through figure A1 through A4 in appendix. As evident from the figures the impact of exchange rate change and volatility varies across the various conditions of tourist arrival represented through quintiles .10 to .90 which the average models in literatures fail to capture. Therefore, in order to understand whether the impacts of exchange rate is asymmetric across the extreme quintiles we have used symmetric quantile test.

The Wald test results of the symmetric quantile test are presented through table 5 for top ten countries. The null hypothesis of symmetric impact between .10$^{th}$ and .90$^{th}$ (represent bad and good condition of tourist arrival respectively) is rejected for exchange rate change and volatility at 1% level of significance. That means the impact of exchange rate is different at different condition of tourist arrival from top ten countries. So, the same tourism policy may not work in all the situations. Thus, the policy makers should come out with suitable tourism policy appropriate for different conditions of tourist arrival.

**Table- 3: Panel A: Conditional impact of change in exchange rate on arrival of tourist across the quantiles conditioning world per capita income (WPCI)**

| Quantile | DLINRUSD (Total) | | DLINRUSD (Top Ten) | | PCWI(Total) | | PCWI (Top Ten) | |
|---|---|---|---|---|---|---|---|---|
| | Cond. Coef. | Prob. | Cond. Coef. | Prob. | Coef ficient | Prob. | Coef. | Prob. |
| 0.1 | 1.091 | 0.012** | -0.043 | 0.000*** | 15.019 | 0.391 | 2.055 | 0.000*** |
| 0.2 | 0.788 | 0.098* | -0.051 | 0.000*** | 7.711 | 0.694 | 1.828 | 0.000*** |
| 0.3 | 1.423 | 0.005*** | -0.034 | 0.207 | 3.505 | 0.743 | 1.623 | 0.000*** |
| 0.4 | 0.899 | 0.335 | -0.018 | 0.362 | 9.381 | 0.399 | 1.578 | 0.000*** |
| 0.5 | 1.335 | 0.006*** | -0.006 | 0.475 | 8.011 | 0.484 | 1.685 | 0.000*** |
| 0.6 | 1.112 | 0.027** | -0.008 | 0.356 | 0.933 | 0.953 | 2.016 | 0.000*** |
| 0.7 | 0.811 | 0.119 | -0.010 | 0.179 | -1.458 | 0.939 | 2.336 | 0.000*** |
| 0.8 | 0.382 | 0.449 | -0.014 | 0.058* | -12.362 | 0.516 | 2.409 | 0.000*** |
| 0.9 | -0.250 | 0.552 | -0.022 | 0.004*** | -6.053 | 0.727 | 2.266 | 0.002*** |

Panel B: Conditional impact of exchange rate volatility on arrival of tourist across the quantiles conditioning world per capita income (WPCI)

| Quantile | VOLA (Total) | | VOLA (Top Ten) | | PCWI(Total) | | PCWI (Top Ten) | |
|---|---|---|---|---|---|---|---|---|
| | Cond. Coef. | Prob. | Cond. Coef. | Prob. | Coef. | Prob. | Coef. | Prob. |
| 0.1 | 6.733 | 0.004*** | -0.162 | 0.000*** | 17.685 | 0.257 | 2.157 | 0.000*** |
| 0.2 | 4.405 | 0.147 | -0.192 | 0.000*** | 5.310 | 0.753 | 1.936 | 0.000*** |
| 0.3 | 2.408 | 0.518 | -0.223 | 0.000*** | 6.159 | 0.607 | 1.713 | 0.000*** |
| 0.4 | 7.940 | 0.007*** | -0.244 | 0.000*** | 13.075 | 0.268 | 1.624 | 0.000*** |
| 0.5 | 6.736 | 0.028** | -0.033 | 0.658 | 7.548 | 0.522 | 1.688 | 0.000*** |
| 0.6 | 5.553 | 0.069* | -0.052 | 0.446 | -2.544 | 0.869 | 2.005 | 0.000*** |
| 0.7 | 4.193 | 0.120 | -0.079 | 0.174 | -6.485 | 0.710 | 2.272 | 0.000*** |
| 0.8 | 1.890 | 0.381 | -0.078 | 0.105 | -14.134 | 0.458 | 2.430 | 0.000*** |
| 0.9 | -1.275 | 0.456 | -0.120 | 0.001*** | -5.394 | 0.745 | 2.483 | 0.000*** |

***Note:*** ***, ** and* indicate significance at 1%, 5% and 10% respectively.***Source:*** Authors Calculations.

**Table-4: Panel A: Conditional impact of change in exchange rate on arrival of tourist across the quantiles conditioning world per capita income (WPCI) and relative pricing (WRP)**

| | DLINRUSD | | WPCI | | WRP | |
|---|---|---|---|---|---|---|
| Quantile | Coefficient | Prob. | Coefficient | Prob. | Coefficient | Prob. |
| 0.1 | -0.040 | 0.000*** | 2.040 | 0.000*** | 0.028 | 0.445 |
| 0.2 | -0.047 | 0.000*** | 1.782 | 0.000*** | 0.046 | 0.315 |
| 0.3 | -0.031 | 0.241 | 1.607 | 0.000*** | 0.019 | 0.616 |
| 0.4 | -0.019 | 0.366 | 1.578 | 0.000*** | 0.001 | 0.974 |
| 0.5 | -0.006 | 0.532 | 1.731 | 0.000*** | -0.006 | 0.835 |
| 0.6 | -0.005 | 0.586 | 1.978 | 0.000*** | -0.023 | 0.384 |
| 0.7 | -0.011 | 0.163 | 2.305 | 0.000*** | -0.027 | 0.283 |
| 0.8 | -0.015 | 0.038** | 2.382 | 0.000*** | -0.036 | 0.146 |
| 0.9 | -0.019 | 0.018** | 2.059 | 0.104 | -0.083 | 0.009*** |

**Panel B: Conditional impact of exchange rate volatility on arrival of tourist across the quantiles conditioning world per capita income (WPCI) and relative price (WRP).**

| | VOLA | | WPCI | | WRP | |
|---|---|---|---|---|---|---|
| Quantile | Coefficient | Prob. | Coefficient | Prob. | Coefficient | Prob. |
| 0.1 | -0.168 | 0.000*** | 2.165 | 0.000*** | -0.014 | 0.691 |
| 0.2 | -0.182 | 0.000*** | 1.874 | 0.000*** | 0.036 | 0.627 |
| 0.3 | -0.208 | 0.000*** | 1.678 | 0.000*** | 0.039 | 0.301 |
| 0.4 | -0.244 | 0.000*** | 1.575 | 0.000*** | -0.004 | 0.895 |
| 0.5 | -0.028 | 0.708 | 1.713 | 0.000*** | -0.012 | 0.700 |
| 0.6 | -0.045 | 0.521 | 1.965 | 0.000*** | -0.020 | 0.453 |
| 0.7 | -0.067 | 0.260 | 2.299 | 0.000*** | -0.030 | 0.225 |
| 0.8 | -0.080 | 0.109 | 2.465 | 0.000*** | -0.037 | 0.140 |
| 0.9 | -0.097 | 0.018** | 2.276 | 0.001*** | -0.082 | 0.004*** |

***Note**:* ***, ** and *indicate significance at 1%, 5% and 10% respectively. ***Source:*** Authors Calculations.

**Table 5: Symmetric quantile test between .10 and .90 quintiles of the impact of exchange rate change (**DLINRUSD**) and volatility (**VOLA**).**

| | **Chi-Sq. Statistic** | **Chi-Sq. d.f.** | **Prob.** |
|---|---|---|---|
| DDLTA & DLINRUSD | 31.865 | 4 | 0.000*** |
| DDLTA & VOLA | 33.668 | 4 | 0.000*** |

***Note:*** Wald Chi-Sq. statistic along with their Chi-Sq. d.f. and p-values are presented. *** indicates significance at 1% level. ***Source*****:** Authors Calculations.

## VI. Conclusions and Policy Implications

The tourism sector contributes to the economic development of the country in the form of employment generation, foreign exchange earnings and subsequently economic growth of the country. But the exchange rate is a major stumbling block in this regard. Tourism literature mainly argues that exchange rate volatility signals risk associated with a destination, which may cause tourists to refrain from visiting the destination and/or cancel their trips. In this study the effect of exchange rate change and volatility on tourist arrivals is examined at the total level and for top ten source countries which is often overlooked by empirical researchers. The study examines the impact of exchange rate change and volatility on the inbound tourist arrivals in India, during January 1990 to March 2015 by using Quantile Regression Approach. As far as impact of exchange rate change is concerned, the results are contrasted with both the measures of tourist arrival. In case of total tourist, the impact is positive means deprecation (appreciation) has positive (negative) in normal to bad phases of tourist arrivals. But in case of top ten countries deprecation (appreciation) of currency impacts tourist arrival at extreme good and bad phases negatively (positively). However, for these top ten countries the per capita income of the respective countries is much more important as it has a strong positive impact on all conditions of tourist arrival. Similar impact is observed for exchange rate volatility. Hence, policy intervention to stabilize the exchange rate is required in order to make tourism sector more attractive when the tourist arrival is at its lowest. However, income level of the foreign country is not a barrier as far as tourist arrival is concerned. Further, the impact of exchange rate both change and volatility is found asymmetric at different condition of tourist arrival from top ten countries. So, the same tourism policy may not work in all the situations. Thus, the policy makers should come out with a suitable tourism policy appropriate for different conditions of tourist arrival.

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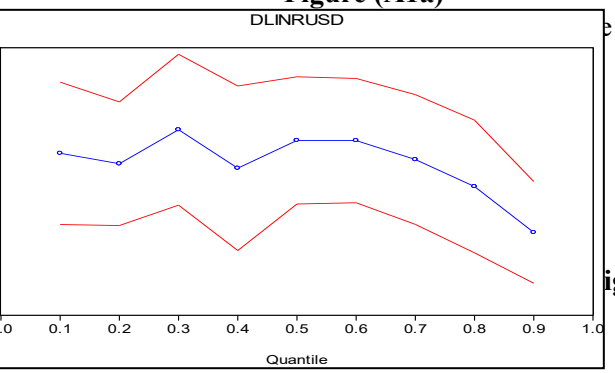
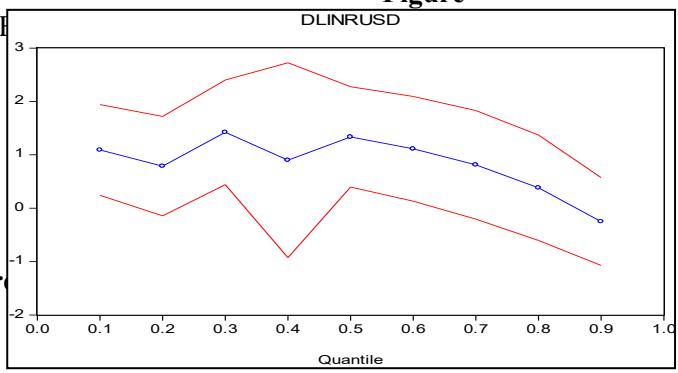
Appendix on line at the journal Website: https://www.usc.gal/economet/eaat.htm

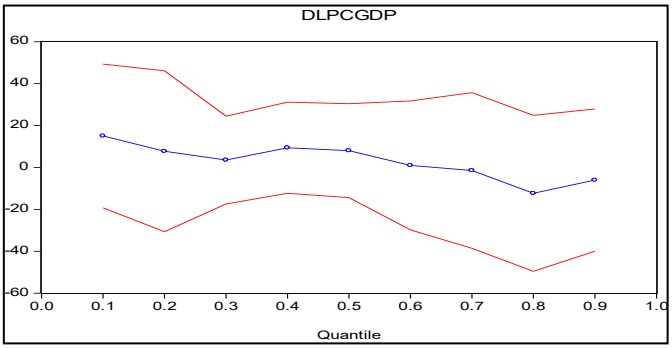
## Appendix

**Figure (A1a)**



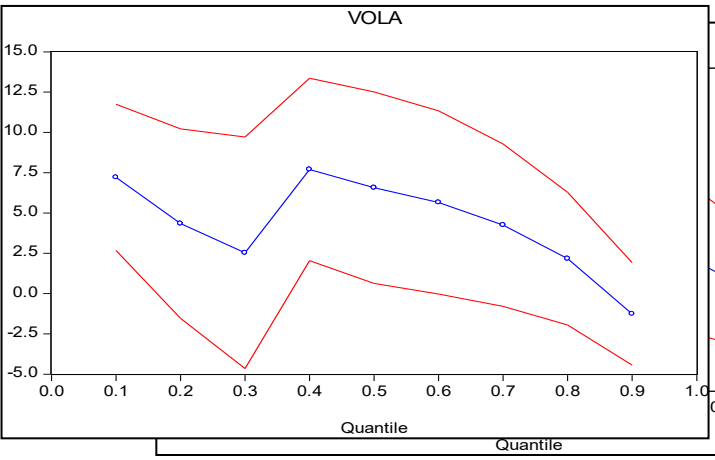

**Figure**




***Note:*** **Figure A1** (A) and Figure 3 (B) present unconditional and conditional respectively the degree and structure of the impact of change in exchange rate on tourist arrival across quantiles (blue line) and their respective 95% confidence interval (red line). Figure 3 (C) presents conditional degree and structure of the impact of world per-capita income on tourist arrival across quantiles.
***Source:*** Authors' Calculations.

**Figure (A2a)**

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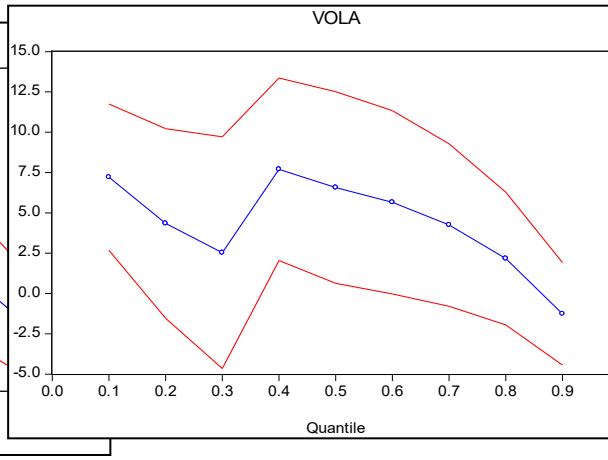
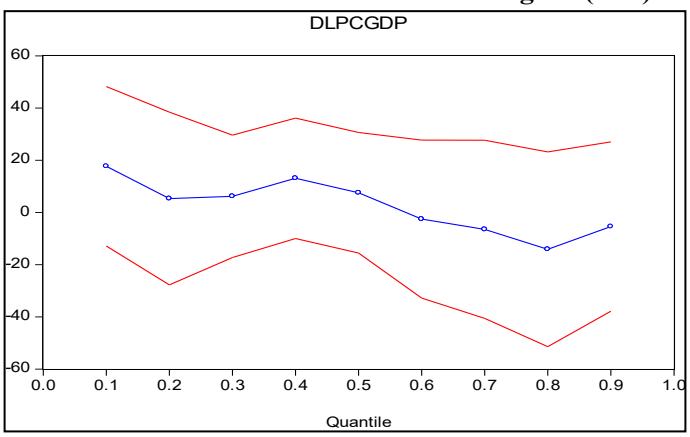
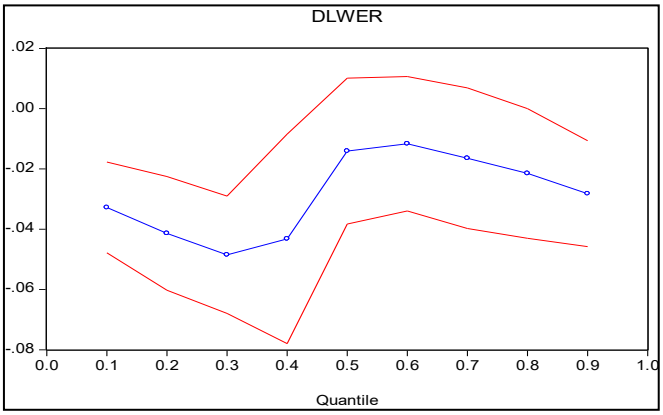


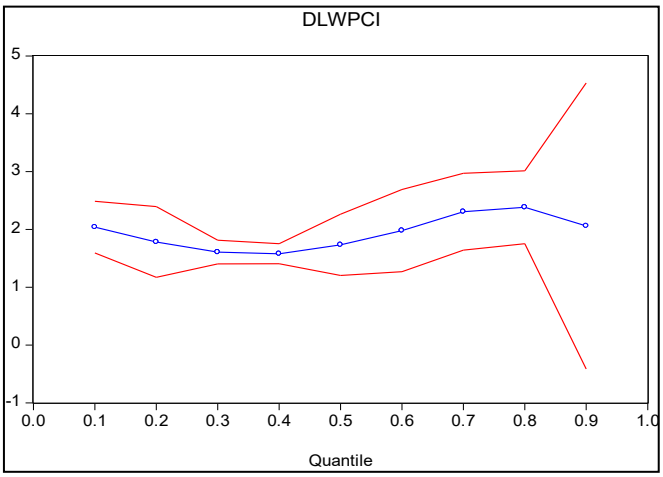

**Figure (A2c)**




***Note:*** **Figure A2** (A) and Figure 4 (B) present unconditional and conditional respectively the degree and structure of the impact of exchange rate volatility on tourist arrival across quantiles (blue line) and their respective 95% confidence interval (red line). Figure 4 (C) presents conditional degree and structure of the impact of world per-capita income on tourist arrival across quantiles.
***Source:*** Authors' calculations.

**Figure (A3a)**

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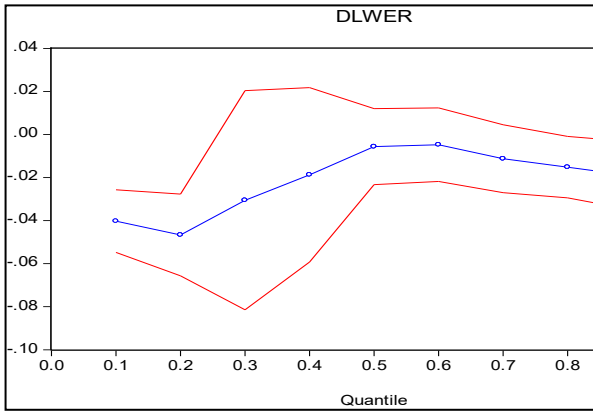
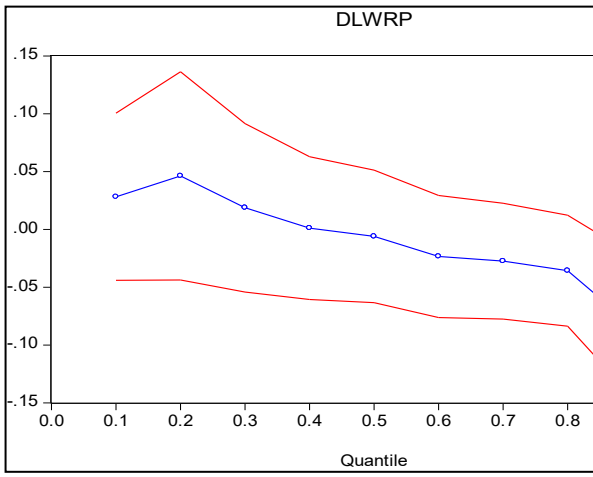
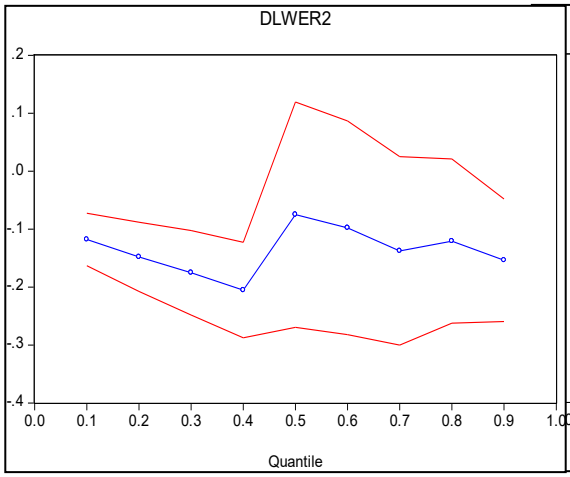



***Note:*** **Figure A3** presents unconditional (left top) and conditional (right top) respectively the degree and structure of the impact of change in exchange rate on tourist arrival across quantiles (blue line) and their respective 95% confidence interval (red line). Left below and right below graphs present conditional degree and structure of the impact of world per-capita income and relative pricing on tourist arrival across quantiles.
***Source:*** Authors' calculations.

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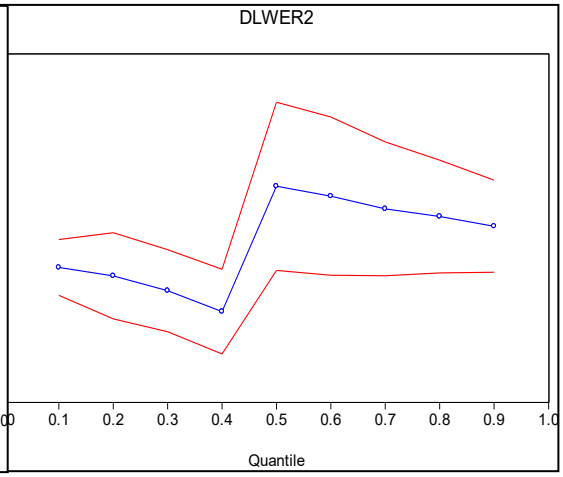
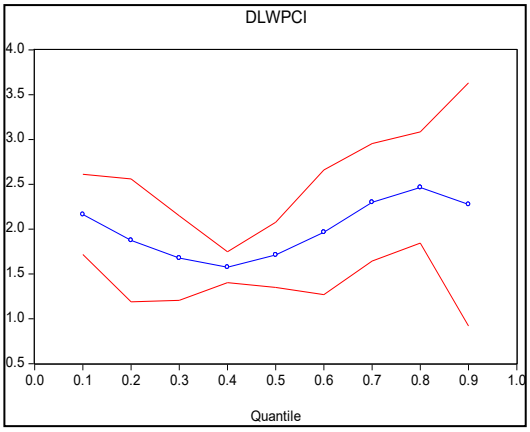



**Figure (A4b)**

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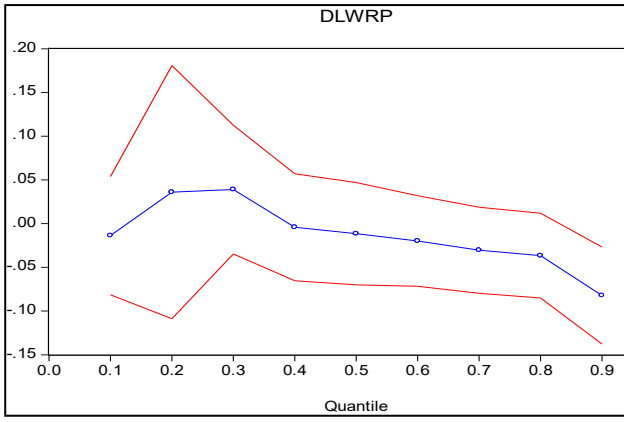


**Figure (A4d)**

***Note:*** **Figure A4** presents unconditional (left top) and conditional (right top) respectively the degree and structure of the impact of exchange rate volatility on tourist arrival across quantiles (blue line) and their respective 95% confidence interval (red line). Left below and right below graphs present conditional degree and structure of the impact of world per-capita income and relative pricing on tourist arrival across quantiles.
***Source:*** Authors' calculations.

**Table- A1**

**Panel A: Unconditional impact of change in exchange rate on arrival of tourist across the quantiles**

| Quantile | Total | | Top Ten | |
|---|---|---|---|---|
| | Coef. of DLINRUSD | Prob. | Coef. of DLINRUSD | Prob. |
| 0.1 | 0.923 | 0.091* | -0.033 | 0.000*** |
| 0.2 | 0.766 | 0.106 | -0.041 | 0.000*** |
| 0.3 | 1.277 | 0.028** | -0.048 | 0.000*** |
| 0.4 | 0.699 | 0.268 | -0.043 | 0.015** |
| 0.5 | 1.116 | 0.023** | -0.014 | 0.255 |
| 0.6 | 1.114 | 0.020** | -0.012 | 0.307 |
| 0.7 | 0.829 | 0.096* | -0.016 | 0.168 |
| 0.8 | 0.425 | 0.403 | -0.021 | 0.051** |
| 0.9 | -0.263 | 0.499 | -0.028 | 0.002*** |

Panel B: Unconditional impact of exchange rate volatility on arrival of tourist across the quantiles.

| Quantile | Total | | Top Ten | |
|---|---|---|---|---|
| | Coef. of VOLA | Prob. | Coef. of VOLA | Prob. |
| 0.1 | 7.213 | 0.002*** | -0.118 | 0.000*** |
| 0.2 | 4.342 | 0.149 | -0.148 | 0.000*** |
| 0.3 | 2.533 | 0.49 | -0.175 | 0.000*** |
| 0.4 | 7.702 | 0.008*** | -0.205 | 0.000*** |
| 0.5 | 6.575 | 0.031** | -0.075 | 0.451 |
| 0.6 | 5.655 | 0.052* | -0.098 | 0.300 |
| 0.7 | 4.246 | 0.099* | -0.138 | 0.098* |
| 0.8 | 2.169 | 0.303 | -0.121 | 0.096* |
| 0.9 | -1.258 | 0.439 | -0.154 | 0.005*** |

***Note:*** ***, ** and indicate significance at 1%, 5% and 10% respectively. ***Source:*** Authors calculations.

## Table A2: Summary of Review of Literature

| Author(s) | Country Studied, Data Span | Covariates | Econometric Method Used | Summary Results |
|---|---|---|---|---|
| Yap Ghialy (2012) | Australia, 1991:M1-2011:M1 | Inbound tourism growth rate and exchange rate returns. | VARMA-GARCH & VARMA-AGARCH | Tourists from Malaysia and New Zealand are relatively more sensitive to currency shocks than Singapore, UK, USA, China, India, Japan, South Korea. Sudden appreciation of the Australian dollar will not have long term negative impacts on Australia's inbound tourism. |
| Agiomirgia-nakis George, *et al.* (2014) | Turkey, 1994-2012 | Tourist arrival, relative price, GDP per capita and exchange rate volatility. | ARDL Cointegration | Negative relationship between exchange rate volatility and tourist inflows into Turkey. |
| Agiomirgia-nakis George *et al.* (2015b) | UK & Sweden, 1990:Q1 - 2012: Q4 | Tourist arrival, relative price, real GDP, volatility. | ARDL Cointegration technique | Negative relationship between exchange rate volatility and tourist flows into the two countries. |

| | | | | |
|---|---|---|---|---|
| Agiomirgia-nakis, George *et al.* (2015a) | Iceland, 1990:Q1 - 2014: Q4 | No. of tourist arrivals, real effective exchange rate, GDP per capita measured in (PPPs) and volatility. | ARDL Cointegration | Negative effect of volatility to tourist arrivals. |
| Agiomirgia nakis George *et al.* (2017) | South Korea, 1990:Q1 - 2015:Q4 | Tourist arrivals, relative price, real domestic product in PPP term, and volatility | ARDL Cointegration | Negative effect of volatility to tourist arrivals. |
| Kilic and Bayar (2014) | Turkey, 1994:M1 - 2013:M8 | Tourism revenue, tourism expenditure and REER volatility | Johansen Juselious Cointegration technique | Positive long-term relationship between the real effective exchange rate volatility, tourism receipts and expenditure. |
| Thompson and Thompson (2010) | Greece, 1974- 2006 | Exchange rate, tourism revenue, tourism expenditure | Error correction model | Positive euro effect due to zero exchange rate volatility for Greece. |
| Webber (2001) | Australia, 1983:Q1 - 1997:Q4 | Exchange rate,real disposable income and substitute prices, relative price | Johansen Cointegration and Engle and Granger procedures. | The exchange rate volatility is likely to cause tourists to abandon holidaying in a particular country in 40% of the cases. Exchange rate volatility was found to be a significant determinant of long-run tourism demand in 50% of estimates. The study mentioned that the effects of exchange rate volatility on tourist arrivals depend on whether tourists are risk-averse or risk-lovers. For risk-averse tourists exchange rate volatility will have a negative effect on the decision to travel which will cause lower the number of arrivals into the country, but it is likely to have a positive impact on risk seeking tourists as it will create opportunities for the maximization of profits and therefore, leads to higher arrivals. |
| Saayman & Saayman (2013) | South Africa, 2003:M1-2010:M12 | Tourism expenditure, real GDP ,relative price, exchange rate volatility | ARDL Cointegration | It is found that increased currency volatility is associated with an increase in on-the-ground expenditure in most of the countries (China, Germany, the USA, and Brazil), while Australian tourists tend to take smaller risks, spending less when volatility increases. In terms of arrivals, most of the countries showed risk aversion behaviour, with the exception of China. Due to the increased currency volatility, arrivals declined. |
| Dincer, M. Z., *et al.* (2015) | Turkey, 2003-2014 | REER, tourism income, tourism expenses, no of foreign tourist arrivals | Johansen Jusilious Cointegration technique | The study found no long-term relationship between REER and tourism revenues and no granger causality relationship is found. |

***Source:*** Compiled by Authors.