EFFECTS OF THE CONSUMER PRICE INDEX ON THE VOLATILITY OF FOREIGN VISITORS TO VIETNAM

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ABSTRACT

Vietnam tourism is one of the key economic sectors that has contributed a considerable share (4.13%) to GDP of the country in 2012. With many beautiful landscapes, diverse cultures, long history, *etc.* Vietnam has been rated as a fully potential destination for foreign visitors. However, high inflation in the host country resulted in expensive tourism expenses may affect the volatility of foreign visitors to Vietnam. The paper examined the effects of the 1, 2, 3, 4, 5 and 6 month lagged consumer price indices (CPI) as exogenous (X) variables on the volatility of foreign visitors to Vietnam, using the GARCH(1,1)-X models. The results showed that the volatility of foreign visitors to Vietnam is characterized by a heteroscedastic process and the volatility is positively influenced by the lagged CPI. The findings are important implications for policy makers, tourism enterprises and investors in Vietnam tourism industry.

Keywords: CPI, GARCH-X, foreign visitors, volatility, Vietnam tourism.

Ảnh hưởng của chỉ số giá tiêu dùng đến sự biến động của du khách quốc tế đến Việt Nam

TÓM TẮT

Du lịch là một trong những lĩnh vực kinh tế mũi nhọn của Việt Nam, đã đóng góp một phần đáng kể (4,13%) vào tổng thu nhập quốc nội (GPD) năm 2012. Với nhiều phong cảnh đẹp, nền văn hóa đa dạng, truyền thống lịch sử lâu đời…, Việt Nam được đánh giá là điểm đến đầy tiềm năng cho du khách nước ngoài. Tuy nhiên, lạm phát cao mà nó gây ra chi tiêu du lịch đắt đỏ có thể ảnh hưởng đến sự bốc hơi của du khách nước ngoài tới Việt Nam. Bài viết này đã xem xét ảnh hưởng của độ trễ thời gian của chỉ số bán lẻ (CPI) từ 1 đến 6 tháng liền kề trước đó như là các biến ngoại sinh (X) đến sự bốc hơi của du khách nước ngoài đến Việt Nam qua việc sử dụng mô hình GARCH(1,1)-X. Kết quả ước lượng đã chỉ ra rằng sự bốc hơi của du khách nước ngoài đến Việt Nam tuân theo quy trình có phương sai thay đổi và chịu ảnh hưởng đồng biến với các biến trễ CPI. Kết quả tìm thấy là những ngụ ý quan trọng cho các nhà lập chính sách, các doanh nghiệp du lịch và các nhà đầu tư trong ngành du lịch Việt Nam.

Từ khóa: CPI, GARCH-X, du khách nước ngoài, sự biến động, du lịch Việt Nam.

1. INTRODUCTION

Today, tourism development is increasingly becoming a popular socioeconomic phenomenon and indispensable need of many countries around the world, especially in developed countries. In Vietnam, tourism sector plays an important role in national income. According to Vietnam General Statistics Office, the tourism sector contributed a considerable share (4.13%) to the GDP in 2012. Vietnam's diversities of natural environment, geography, history and culture have created a great potential for the tourism industry. Recognizing this, the Government has paid attention to the development of tourism industry. The Central Resolution IX defined tourism as one of the key economic sectors and The Decision No.

97/2002/QD-TTg of the Prime Minister approved the Vietnam Tourism Development Strategy 2001-2010 that gradually makes the country become a tourism hub of the region. As a result, number of foreign visitors to the country increased dramatically from around 1,351,300 in 1995 to 6,847,678 in 2012. However, Vietnam tourism development has not matched its potentials, while the neighbour countries i.e., Thailand recorded over 22 million foreign visitors with a growth rate of 22% in 2012 and the figures for Cambodia also reached 3.6 million and 24%, respectively (Xuan Than, 2013).

Volatility is simply defined as a time varying conditional variance of market returns that is not directly observable, it is a measure of the uncertainty of the market returns. High volatility of market is often observed during economic recessions as an economic shock to a certain market often causes increasing volatility in that market (Do et al., 2010). Volatility in tourism is defined as the impact of shocks to the industry leading to periods of relatively large upturns and downturns of activity (Coshall, 2009). Although, there has been remarkable growth, Vietnam tourism industry has faced several challenges over an extended period that might cause the volatility of foreign visitors to Vietnam overtime. Since tourism activities involve both the consumption and purchase of goods and services among the travelers, the exogenous impacts of these activities on the volatility of international tourist arrivals would be reflected in the various macroeconomic variables, especially the official exchange rate and the consumer price index (CPI).

Study on volatility is quite new to tourism industry, so very few applications of using volatility models in tourism fields have been done (Coshall, 2009), while it has been very popular for empirical research in financial sector. Shareef & McAleer (2005) pointed out the presence of volatility in tourism demand while Chan et al. (2005) proved an asymmetric volatility exists in Japanese tourist arrivals to Australia. Kim & Wong (2006) showed that shocks such as economic crises, natural

disasters, deadly disease outbreak and war caused the volatility in tourism demand. Kaewta and Dhevabanchachai (2013) analyzed the volatility of tourist arrivals from 8 markets to Hong Kong in relations to characteristics of tourists. Moreover, Chang & McAleer (2009) found that political issues and a weakened exchange rate were the main factors in determining Korean traveling abroad, while Vanegas & Croes (2000) concluded that tourist's income is an important factor affecting tourist arrivals. Beside that Do et al. (2012) built the ARIMA model for Vietnam outbound tourists and forecast tourist arrivals to Vietnam.

Among macroeconomic variables, the exchange rate could be an exogenous factor concerned by foreign visitors when they travel to other countries. In Vietnam, however, the official exchange rate between Vietnam Dong and US Dollar has been pegged, in which the exchange rate has set and maintained by the government for long time. Therefore, the official exchange rate is not an interest of our study. In recent years, however, Vietnam has been suffered from significant inflation that may cause the volatility of foreign visitors to Vietnam. Up to now, no study has been done on this issue. Since CPI reflects the inflation, the purpose of the paper is to focus on examining whether or not there exists the volatility in foreign visitors to Vietnam and how the CPI impacts on the volatility.

2. METHODOLOGY

2.1. Data collection and processing

Time series data used for analysis in the paper were the monthly foreign visitors to Vietnam and the monthly CPI growths of Vietnam in the period from January 1995 to December 2012. The data were gathered from the monthly reports at the official websites of Vietnam National Administration of Tourism, http://www.vietnamtourism.gov.vn and Vietnam General Statistics Office, http://www.gso.gov.vn.

Following the quantitative approach, monthly growth rate (r_t) of foreign visitors to Vietnam was computed as the percentage of natural logarithmic difference in the monthly foreign visitors.

$$r_t = 100 \times [\ln a_t - \ln a_{t-1}] \qquad (1)$$

where a_t and a_{t-1} are numbers of foreign visitors to Vietnam on the month t and t-1, respectively.

2.2. Model specifications

In our study, we applied the generalized autoregressive conditional heteroscedastic model of order p and q (*Bollerslev, 1986*), namely GARCH(p,q). The model is specified as

$$h_t = \omega + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^{q} \beta_j h_{t-j} \qquad (2)$$

$$\varepsilon_t = \eta_t \sqrt{h_t} \text{ and } \eta_t \sim iid(0,1)$$

where, ω, α and β are estimated parameters, $\omega > 0, \alpha_i \geq 0$ for $i = 1, \dots, p$ and $\beta_j \geq 0$ for $j = 1, \dots, q$ are sufficient conditions to ensure that the conditional variance $h_t > 0,$ and $\sum_{i=1}^{p} \alpha_i + \sum_{j=1}^{q} \beta_j < 1$ for the existence of the second moment.

The most used model that can be referred to in the literatures is the GARCH(1,1), given by

$$\varepsilon_t \mid F_{t-1} \sim N(0; h_t), \text{ with } h_t = \omega + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 h_{t-1}$$

where $\omega > 0, \alpha_1 \geq 0, \beta_1 \geq 0$ and $\alpha_1 + \beta_1 < 1$.

As seen in (2) that a positive shock ($\varepsilon_t > 0$) has the same impact as a negative shock ($\varepsilon_t < 0$) on the conditional variance (h_t). To deal with an asymmetric volatility, Glosten, Jagannathan and Runkle (1993) proposed the GJR model for h_t as

$$h_t = \omega + \sum_{i=1}^{p}(\alpha_i + \gamma_i I(\varepsilon_{t-i} < 0))\varepsilon_{t-i}^2 + \sum_{j=1}^{s}\beta_j h_{t-j} \qquad (3)$$

The γ in (3) reflects the asymmetric effect and I_t is an indicator function, it equals 1 if $\varepsilon_{t-i} < 0$ (bad news) and zero, otherwise.

As given in (3), positive and negative shocks with the same magnitude have different impacts on the conditional variance (h_t). In reality, people often react with stronger manner to negative shocks than to the positive ones with the same magnitude, so we expect the

estimated sign of γ is positive. In other words, the effect of positive shocks ($\varepsilon_{t-i} > 0$) on the volatility is $\alpha\varepsilon_{t-i}^2$, however when $\varepsilon_{t-i} < 0$, the total effect of shocks to the volatility is $(\alpha + \gamma)\varepsilon_{t-i}^2$. Similar to the selection for the symmetric GARCH(1,1) model in the study, the GJR(1,1) specification was employed. The GJR(1,1) model is asymmetric if γ is positive and significant different from zero.

Effects of exogenous variables (X) on the volatility of economic and financial time series can be measured by including them in the variance equation of GARCH model (*Do, McAleer and Sriboonchitta, 2009*). Such model can be written as the GARCH-X model. In our study, variance equation of the growth rate of foreign visitors to Vietnam was specified as

$$h_t = \omega + \alpha\varepsilon_{t-1}^2 + \beta h_{t-1} + \rho X \qquad (4)$$

In (4), we employed lagged CPI as an exogenous variable (*X*) and included them in the volatility of the growth rate of foreign visitors to Vietnam, in which parameter ρ captures effect of the CPI on h_t.

3. RESULTS AND DISCUSSIONS

3.1. Unit root test

Commonly, original economic time series are non-stationary, however, when we took the difference of these time series they usually become stationary. In order to form a statistically adequate model, the time series used in the GARCH model were assumed to be stationary.

Figure 1 shows that the monthly series of foreign visitors to Vietnam from January 1995 to December 2012 were not stable and had an upward trend. This suggested that the series is non-stationary. However, when we took the first difference of this series, it has unclear trend and revolves around a mean value, revealing manifestations of a stationary time series (Figure 2).

The CPI is a statistical estimate constructed using the prices of a sample of representative items whose prices are collected
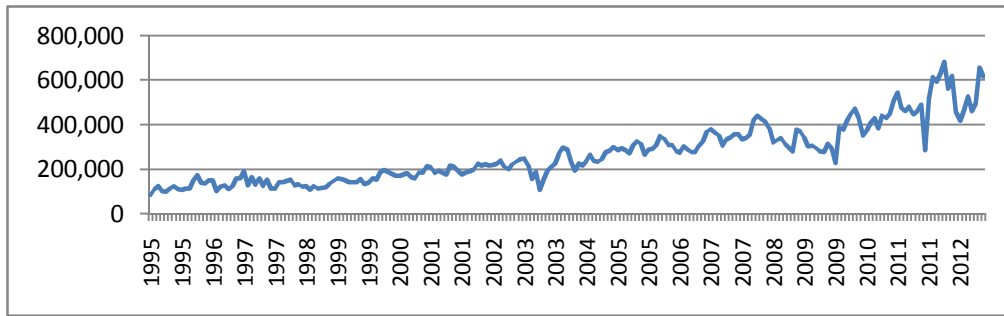
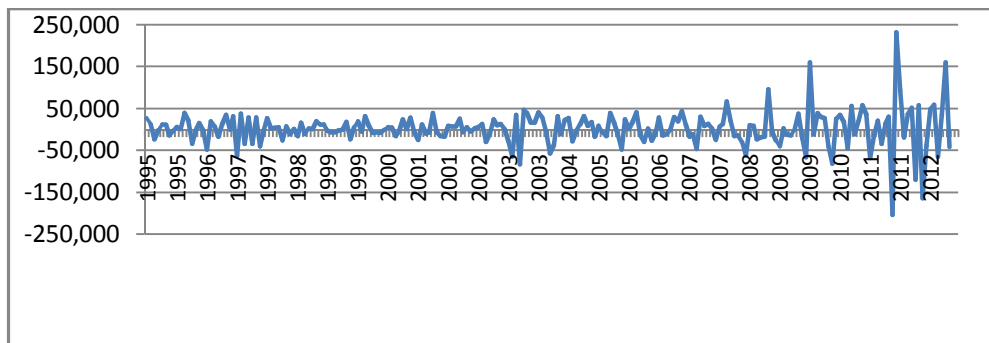**Figure 1. Number of monthly foreign visitors to Vietnam, 1995-2012**

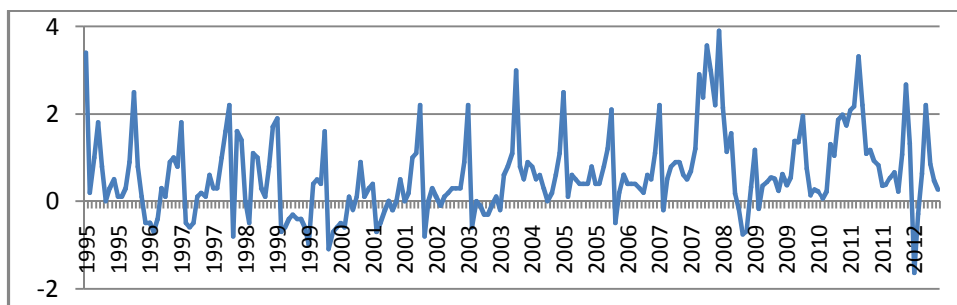**Figure 2. Monthly changes in number of foreign visitors to Vietnam, 1995-2012**

Figure 3. Monthly growths of the reported CPI, 1995-2012

periodically. In Vietnam, the index is usually computed monthly. Figure 3 shows the series of the monthly reported CPI from January 1995 to December 2012. Obviously, it had also unclear trend and revolved around a certain mean value. This can be seen as manifestations of a stationary time series.

To evaluate effect of the CPI on the volatility of foreign visitor growth rates to Vietnam using GARCH model, we first had checked whether the sampled time series data were stationary or non-stationary. Two common unit root test methods, namely Augmented Dickey-Fuller (ADF) and

Perron-Phillips (PP) were employed. Results of the tests were obtained using the Eviews 7 package (Table 1). It indicated that the null hypothesis of the presence of a unit root in the foreign visitor (FVISIT) series could not be rejected, so nonstationarity existeds in this series. However, the ADF and PP tests showed that the null hypothesis of a unit root in the first difference of foreign visitor (DFVISIT) series and the monthly reported CPI series was rejected at 1% and 5% levels of significance, respectively. Thus, the DFVISIT and CPI series are stationary.

Table 1. Unit root test results on the time series of foreign visitors to Vietnam and CPI

Time series data	t-statistics	
	ADF	PP
FVISIT	1.3945^{ns}	-0.9681^{ns}
DFVISIT	-9.3932^{***}	-26.5621^{***}
CPI	-3.1211^{**}	-8.9930^{***}

Note: ***, ** are significant at 1% and 5% levels, respectively; ^{ns} is non-significant.

3.2. Impacts of the CPI on the volatility ofthe monthly growth rates of foreign visitors to Vietnam

To check whether the time series of the monthly growth rates of foreign visitors to Vietnam is characterized by a heteroscedastic process or not, and whether its volatility is symmetric or asymmetric, the conditional volatility models *i.e.,* GARCH(1,1) and GJR(1,1) were estimated. We assumed that the conditional mean equation of the monthly growth rates of foreign visitors to Vietnam followed the AR(1) process. Then the estimates for AR(1)-GARCH(1,1) and AR(1)-GJR(1,1) models were obtained using the Marquardt optimization algorithm in the Eviews 7 package (Table 2).

Table 2 shows that all the coefficients (ω, α and β) in the variance equation of GARCH(1,1) were positive and significant, and $\alpha + \beta = 0.8157 < 1$, indicating that the volatility of the monthly growth rates of foreign visitors to Vietnam is characterized by a heteroscedastic process.

Meanwhile, the estimates of GJR(1,1) showed that the GARCH effect (β) and the GJR effect (γ) were positive and significant but the ARCH effect (α) was not significant, meaning that the GJR(1,1) model is not adequate and could not be appropriate. Therefore, the GARCH(1,1)-X model was employed to examine effects of the exogenous variables (X) as the different lagged CPI. During the study period, growths of the monthly CPI in Vietnam fluctuated significantly (Figure 3). This might be a reason causing the volatility of the monthly growth rates of foreign visitors to Vietnam. To see how the monthly CPI growths influence volatility of the growth rates of foreign visitors to Vietnam, we introduced the natural logarithmic of some monthly lagged CPI as the exogenous variables (X) in the variance equations. In our study, we assumed that foreign visitors to Vietnam have long memories on effects of the lagged CPI in some previous months, though the 1 month lagged CPI was the best in their memories. Therefore, we introduced up to 6 month lagged

Table 2. Estimates of GARCH(1,1) and GJR(1,1) models
for the monthly growth rates of foreign visitors to Vietnam

	Parameters in the mean equation		Parameters in the variance equation			
	θ_0	θ_1	ω	α	β	γ
GARCH(1,1)	0.5276	-0.2164^{**}	34.4473^{**}	0.1449^{***}	0.6708^{***}	
	(0.465)	(0.013)	(0.021)	(0.005)	(0.000)	
GJR(1,1)	-0.0740	-0.1600^{**}	22.7631^{**}	-0.0258	0.776^{***}	0.2510^{***}
	(0.928)	(0.041)	(0.036)	(0.576)	(0.000)	(0.004)

Note: The numbers in parentheses are p-values.
*, **, *** stand for statistical significance at the 10%, 5%, and 1%, respectively. θ_0, θ_1, ω, α, β, and γ denote the coefficients of the unconditional growth rate, lagged growth rate AR(1), unconditional volatility, ARCH effect, GARCH effect, GJR effect and non-significant, respectively.

Table 3. GARCH (1,1)-X models for growth rate of foreign visitors with the lagged CPI

Model with exogenous variable (X)	Parameters in the mean equation		Parameters in the variance equation			
	θ_0	θ_1	ω	α	β	ρ
CPI(-1)	1.041	-0.233***	13.846*	0.124***	0.768***	11.704**
	(0.213)	(0.005)	(0.0821)	(0.001)	(0.000)	(0.037)
CPI(-2)	0.990	-0.221***	14.580*	0.135***	0.748***	13.630**
	(0.252)	(0.010)	(0.100)	(0.001)	(0.000)	(0.015)
CPI(-3)	0.955	-0.223***	16.721*	0.141***	0.735***	12.367**
	(0.267)	(0.010)	(0.068)	(0.003)	(0.000)	(0.032)
CPI(-4)	0.972	-0.197**	18.751**	0.155***	0.705***	14.327**
	(0.239)	(0.028)	(0.047)	(0.003)	(0.000)	(0.015)
CPI(-5)	0.862	-0.198**	18.860*	0.173***	0.691***	15.510***
	(0.292)	(0.031)	(0.051)	(0.004)	(0.000)	(0.008)
CPI(-6)	0.661	-0.200**	19.535*	0.170***	0.689***	14.821**
	(0.432)	(0.033)	(0.056)	(0.004)	(0.000)	(0.017)

Note: The numbers in parentheses are p-values.

*, **, *** stand for statistical significance at the 10%, 5%, and 1%, respectively. $\theta_0, \theta_1, \omega, \alpha, \beta,$ and ρ denote the coefficients of the unconditional mean growth rate, lagged growth rate AR(1), unconditional volatility, ARCH effect, GARCH effect, and the lagged CPI effect, respectively.

CPI in the model to examine whether or not effect of the lagged CPI on the volatility of the monthly growth rates of foreign visitors to Vietnam was long persistent. The estimated results are represented in Table 3.

All of the models confidently explained the volatility of foreign visitors to Vietnam in the study period (Table 3). It is clear that all of unconditional volatility (ω), the ARCH effects (α) and the GARCH effects (β) were positive and significant, making the explanation for the volatility of the monthly growth rates of foreign visitors to Vietnam possible. And the most important thing was that effects of 1, 2, 3, 4, 5 and 6 month lagged CPI in the variance equations were also found to be positive and significant, revealing that effect of the CPI on the volatility of foreign visitors was long persistent and foreign visitors to Vietnam might plan to book tours quite soon, even over six months before, which is important for tourism businesses in Vietnam.

The results revealed that those lagged CPI had positive impacts on the volatility of monthly growth rates of foreign visitors to Vietnam. It

means that an increase in those lagged CPI resulted in a rise of the volatility of the monthly growth rates of foreign visitors to Vietnam. This can be a factor causing risks to Vietnam tourism business. Beside that, the estimates of mean equations showed that the monthly growth rates of foreign visitors to Vietnam was negatively affected by its lag (θ_1). Moreover, the monthly CPI growths directly related to the volatility of the monthly growth rates of foreign visitors to Vietnam, when the CPI of a certain month was high, the purchasing power of Vietnam dong reduced. This leads to higher prices of goods and service, and higher tour cost.

4. CONCLUSIONS

The paper provides an insight on the volatility of foreign visitor growth rates to Vietnam and the exogenous effects of the CPI on the volatility for the ones who involve in this industry such as policy makers, managers, agencies and businesses. It is noteworthy that the volatility of monthly foreign visitor growth rates to Vietnam is characterized by a

heteroscedastic process and the monthly lagged CPI growth is an exogenous factor influencing this volatility. The empirical models show that the exogenous factors (X) such as the lagged CPI from 1 to 6 months have positive and long persistent effects on the volatility of the monthly foreign visitor growth rates to Vietnam. As a result, a high CPI growth in a certain month will lead to a rise in the volatility of foreign visitor growth rates to Vietnam in the following months, this causes risks to Vietnam tourism industry.

The findings on effects of the CPI on the volatility of foreign visitors to Vietnam are basic for forecasting the tourist arrivals to Vietnam in shortrun and in making appropriate tourism plans and programs in the future periods. To control the impacts of the CPI as well as the volatility of foreign visitors on sustainable growth of international tourist arrivals, the Government needs to implement synchronized solutions for a longrun development of Vietnam tourism sector such as keeping the inflation under the control and promoting advertisements on Vietnam tourism in foreign countries, and Vietnam tourism agencies need to provide attractive tourism packages, create tourism market segments and open tourism offices in foreign countries.

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