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The Enterprise Risk Management of Foreign Exchange Exposures: Evidence from Taiwanese Hospitality Industry

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Abstract

For this paper, I use the ARIMA model to study the relationship between business performance and exchange rate fluctuations. Through this model, the empirical results shows that the influences of foreign exchange rate fluctuations on the tourist hotel business performance are significant and different across currencies and firms. Furthermore, according to the framework of Kim (2013) we employ the modern portfolio theory proposed by Markowitz (1952) to give an optimal foreign exchange allocation for each tourist hotel company's financial decision-makers, which will avoid the risk of exchange rate fluctuations expose and reduce losses due to the fluctuations of exchange rates, and complete the construction of enterprise risk management system (ERM).

Keywords: Foreign exchange exposures, Modern portfolio theory, Enterprise risk management.

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Contents

1. Introduction

Tourism industry has named the no-smokestack industry. The revenue generates from the tourism industry will increase as the growth of inbounds and the time period that they stay. As the economic viewpoint, tourism will create value from catering, hotels, aviation, transport and many other related industries. It also helps to revitalize the tourism industry association actives, the economic benefits, not only to create a tourism value, it also increases consumption and further boosts the economy, increases employment opportunities.

In 2013, Japanese Prime Minister Shinzo Abe implemented a policy combining fiscal expansion, "quantitative easing", and structural reform in the hope of revitalizing Japan's domestic economy. Indeed, this is so-called — Abenomics--- results in a significant growth in Japan's domestic economy. Accordingly, the impact of exchange rates on some industry becomes even more obvious and important, especially in the tourism industry while the Japanese yen is depreciated in order to stimulate the economy fast. The impact of exchange rates on the part of the industry becomes even more obvious and important, especially in the tourism industry by the Japanese yen depreciated under the influence of the economy back to temperature very fast.

Implementing quantitative easing policy that caused the depreciation of Japanese yen increases Japan's foreign trade and also successfully lead the economy back to situation. Surprisingly, the tourism industry has gained the most benefits of all. This paper, therefore, wants to study the case and examine if the situation could as well apply to the tourism industry in Taiwan.

Oh (2005) addressed the causal relations between tourism growth and economic expansion for the Korean economy. He employed the Granger causality test and found that the Korean tourism industry is economic-driven. Kim *et al.* (2006) examined the relationship between tourism expansion and economic development in Taiwan. They found a bi-directional causality between them. In other words, in Taiwan, tourism expansion and economic development reinforce each other. Min (2013) used panel data approach to test the tourism-led economic growth hypothesis. He found that the tourism-led growth hypothesis is more strongly supported when the time-specific effects are eliminated, which will cause a biased estimate in the Granger causality test.

According to the data of the World Tourism Organization in April 2015 announcement, the number of international tourist visited in Taiwan in 2012 was estimated about 9.9 million, ranked as the world's 31 and created revenues about $ 14.7 billion. In 2014, Taiwan inbound tourists grew 23.6%, ranking the 2nd place of the world's top 50 tourist destinations, only less than the Japan's growth rate of 29.4%. Tourism revenue has growth 18.9%, ranking the 4th place in the world's top 50 tourism revenue areas. Gradually, Taiwan's tourism has been recognized considerable potential. Chen and Zan (2009) have showed that the tourism industry greatly contributed to the Taiwanese economy that is, Taiwan is tourism-led economic.

Taiwan authority has opened the Chinese group tourists to Taiwan since the summer of 2008. In order to push up the number of tourists, Taiwan government implements many projects to develop the tourism industry, such as Doubling Tourist Arrivals Plan (DTAP) introduced in 2002 and "Challenge 2008", Taiwan's 2015-2018 Tourism Action Plan, Mid-term Plan for Construction of Major Scenic Sites (2012-2015), Project Vanguard for Excellence in Tourism, Tour Taiwan and Experience the Centennial, etc. According to Taiwan Tourism Bureau, these plans are proposed to deepen of the "Time for Taiwan" core promotional program, and, to use "quality, uniqueness, intelligence, and sustainability" as strategies toward the goals of "development of international tourism, enhancement of domestic travel quality, and increased foreign-exchange revenues" to bring Taiwan's new tourism allure to the attention of the world[1]. On the other hand, Portnov and Li (2013) suggested that in order to achieve a greater stability in the number of inbound tourist arrivals, Taiwan should diversify sources of their inbound tourism, by giving priority to neighboring countries with relatively larger, more productive, and more steadily growing economies, such as China, Malaysia, Thailand, or the other emerging countries in South-Eastern Asia.

According to the Taiwan Tourism Bureau, the inbound number of tourists was 2,624,037 in 2000, 9,910,204 in 2014, growing about 3.8 times and over 10 million in the end of 2015. This tendency shows the visibility and attractiveness of international tourism in traveling to Taiwan, which significantly increase the number of attentions. Moreover, Taiwan's foreign exchange earnings generated by tourism was from $3,738 million in 2000 to $14,615 million in 2014 and its share in total GDP also reach 2.76% from 1.13%. It shows that Taiwan tourism industry earns a huge of foreign exchange earnings. Thus, the fluctuations in exchange rates for Taiwan's tourism industry is also an important factor for Taiwan's overall economic development. The recent ten-year annual revenues generate from tourism, foreign exchange and domestic tourism are shown in the Figure 1. The highest line is the tourism revenue (in red) which grows rapidly in 2009 due to the effect of opening of Chinese tourists to visit Taiwan. And the lowest line is the domestic tourism revenue (in purple) which attains the maximum (331 billion of NT dollars) in 2011 and declines in the following years. The foreign exchange earnings (in green) smoothly increases in years.

[1] http://admin.taiwan.net.tw/public/public_en.aspx?no=6.

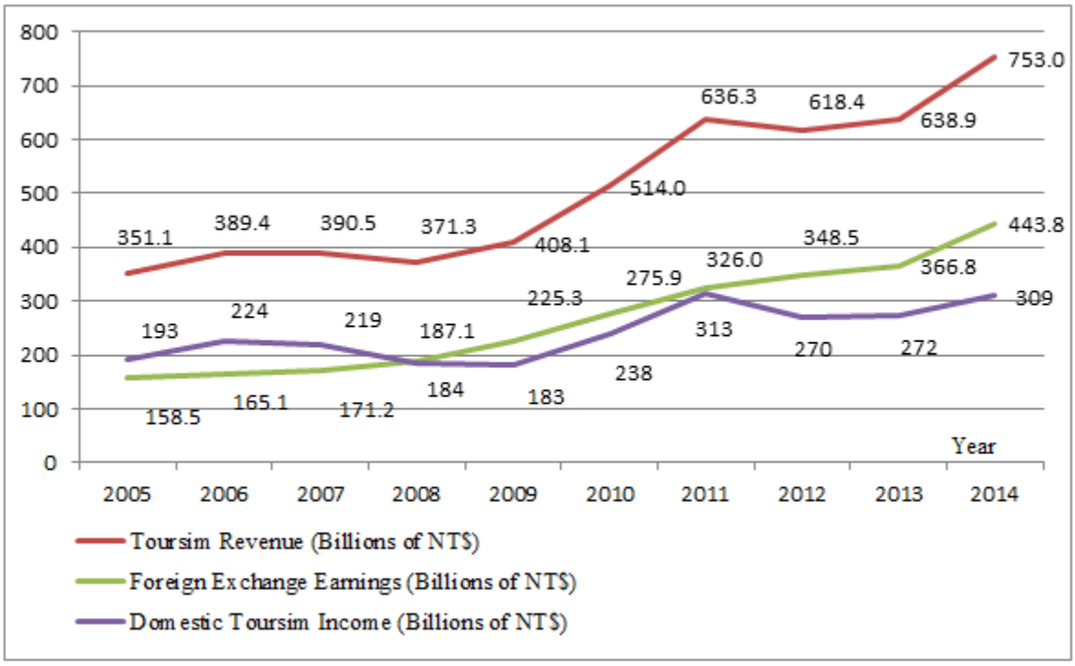

Figure-1. Taiwan annual revenues generate from tourism, foreign exchange, and domestic tourism
Source: Tourism Bureau, M.O.T.C., Republic of China (Taiwan)

Taiwan's tourism revenues have increased in recent years, the tourism industry plays an important role in the tourism industry, resulting in a huge source of foreign exchange earnings. Among the tourists, the number of Chinese tourists accounted for the largest cases, followed by Japanese, European and the United States. Bilateral trade between Taiwan and China, Japan, Europe and the United States, respectively is not only very close, but also represents the effect of the changes in exchange rates. The number of tourists traveling to Taiwan contributes the foreign exchange earnings.

On the other hand, Pritamani *et al.* (2005) divided the U.S. companies into five categories and found that neither exporters nor multinational firms were the most affected by changes in exchange rates. The firms that suffered most from exchange rate fluctuations were wholly domestic U.S. companies facing foreign competition. Taiwan's hotel industry has the same situation. Based on the above point of view, we mainly discuss Taiwan's hotel industry for exposure to foreign exchange fluctuations and corporate risk management. Through our study, it suggests the hedging strategies to the decision-makers of firms and then to enhance Taiwan's hotel industry's risk management.

The structure of our study is: Methodologies will be discussed in Section II; data collection and their statistical descriptions are in the Section 3. The empirical results and their analysis are shown in the Section 4. The last section is our conclusion.

2. Methodologies

A. Modern Portfolio Theory(MPT)

Modern portfolio theory is proposed by Markowitz in 1952. In the paper, Probability Theory and Linear Algebra method are applied to investigate the correlation between the securities. It put forward the possibility to diversify the main investment risks for this theory is that the risks associated with some other securities regardless of the dispersion of individual investment targets can reduce the risk. In this way, individual company information becomes less important.

The theory is mainly to solve the investor's risk-reward problem and to form a rational combination of its own funds in order to maximize the proceeds. According to the Markowitz's framework, there is a certain special relationship between investment risk and return of a portfolio of financial assets. His assumptions:

1. Assume the market is efficient, investors can learn more of the benefits and risks of financial market changes and their causes.
2. Suppose investors are risk averse and are willing to get a higher rate of return if they must bear a greater risk to get a higher expected return as compensation. Risk is the variability of yields as measured by standard deviation.
3. Investors' choices are based on the expected returns and standard deviations of selected financial assets portfolio. They select portfolios with higher yields or lower risk.
4. The incomes between various financial assets are correlated with the correlation coefficient between each financial asset, it is possible to choose the lowest risk of the portfolio.

And an efficient portfolio, it should be subject to the following conditions: under certain risk (standard deviation), this combination of securities has the highest average reward; and in certain average reward, it has the lowest degree of risk (standard deviation). Therefore, the portfolio should be on the curve of efficient frontier.

According to Huang and Litzenberger (1988); Elton *et al.* (2007) suppose an economy which there are n risky assets with its return and standard deviation R_i and $\sigma_i, i=1,2,\cdots,n$, respectively. Moreover, the covariance between any two assets is $\sigma_{i,j} \equiv Cov(R_i, R_j)$, $i \neq j = 1,2,\cdots,n$. If we denote the portfolio weight on each assets in the portfolio to be W_i, $i=1,2,\cdots,n$, then the expected return of the portfolio is $\mu_P \equiv w' \cdot R$, where

$R \equiv (R_1, R_2, \cdots, R_n)'$ and $w \equiv (w_1, w_2, \cdots, w_n)'$。 And the variance of the portfolio is $\sigma_P^2 \equiv w' \cdot \Sigma \cdot w$, where $\Sigma \equiv Var(R) = (\sigma_{i,j})_{n \times n}$ is the variance-covariance matrix. Hence, in the framework of Markowitz (1952) and Kim (2013) we have to minimize the degree of risk of the portfolio under a pre-specified return, μ_0, and budget constrain. Namely,

$$\min_{w_i} \frac{\sigma_P^2}{2} = \frac{1}{2} w' \cdot \Sigma \cdot w \tag{1}$$

$$s.t. \begin{cases} \mu_P = w' \cdot R \geq \mu_0 \\ J_n' \cdot w = \sum_{i=1}^{n} w_i = 1 \\ 0 \leq w_i \leq 1, i = 1, 2, \cdots, n \end{cases} \tag{2}$$

where, $J_n = (1, 1, \cdots, 1)' \in \Re^n$. Using the Lagrange Multipliers method, the above problem can be transformed as follows:

$$\min_{w_i, \lambda_1, \lambda_2} \ell(w, \lambda_1, \lambda_2) = \frac{1}{2} w' \cdot \Sigma \cdot w + \lambda_1 \cdot (\mu_0 - w' \cdot R) + \lambda_2 \cdot \left(1 - J_n' \cdot w\right). \tag{3}$$

Hence, the F.O.C.is

$$\begin{cases} \frac{\partial \ell}{\partial w} = \Sigma \cdot w_P - \lambda_1 \cdot R - \lambda_2 \cdot J_n = 0 \\ \frac{\partial \ell}{\partial \lambda_1} = \left(\mu_0 - w_P' \cdot R\right) = 0 \\ \frac{\partial \ell}{\partial \lambda_2} = \left(1 - J_n' \cdot w_P\right) = 0 \end{cases} \rightarrow w_P^* = \lambda_1 \cdot \Sigma^{-1} \cdot R + \lambda_2 \cdot \Sigma^{-1} \cdot J_n. \tag{4}$$

And then we have,

$$\begin{cases} \lambda_1 \cdot R' \cdot \Sigma^{-1} \cdot R + \lambda_2 \cdot J_n' \cdot \Sigma^{-1} \cdot R = \mu_0 \\ \lambda_1 \cdot J_n' \cdot \Sigma^{-1} \cdot R + \lambda_2 \cdot J_n' \cdot \Sigma^{-1} \cdot J_n = 1 \end{cases} \rightarrow \begin{cases} \lambda_1 = \frac{\mu_0 \cdot C - B}{AC - B^2} = \frac{C}{D} \cdot \mu_0 - \frac{B}{D} \\ \lambda_2 = \frac{A - \mu_0 \cdot B}{AC - B^2} = \frac{A}{D} - \frac{B}{D} \cdot \mu_0 \end{cases},$$

where, $A \equiv R' \cdot \Sigma^{-1} \cdot R$, $B \equiv J_n' \cdot \Sigma^{-1} \cdot R = R' \cdot \Sigma^{-1} \cdot J_n$, $C \equiv J_n' \cdot \Sigma^{-1} \cdot J_n$, and $D \equiv AC - B^2$. Such that, the optimal wealth allocation portfolio is

$$\begin{aligned} w_P^* &= \lambda_1 \cdot \Sigma^{-1} \cdot R + \lambda_2 \cdot \Sigma^{-1} \cdot J_n \\ &= \left(\frac{C}{D} \cdot \mu_0 - \frac{B}{D}\right) \cdot \Sigma^{-1} \cdot R + \left(\frac{A}{D} - \frac{B}{D} \cdot \mu_0\right) \cdot \Sigma^{-1} \cdot J_n. \end{aligned} \tag{5}$$

The properties of this portfolio are

1. $$\begin{aligned} \mu_P = w_P^{*\prime} \cdot R &= \left(\frac{C}{D} \cdot \mu_0 - \frac{B}{D}\right) \cdot R' \cdot \Sigma^{-1} \cdot R + \left(\frac{A}{D} - \frac{B}{D} \cdot \mu_0\right) \cdot J_n' \cdot \Sigma^{-1} \cdot R \\ &= \left(\frac{C}{D} \cdot \mu_0 - \frac{B}{D}\right) \cdot A + \left(\frac{A}{D} - \frac{B}{D} \cdot \mu_0\right) \cdot B = \frac{AC - B^2}{D} \cdot \mu_0 = \frac{D}{D} \mu_0 = \mu_0. \end{aligned}$$

2. $$\sigma_P^2 = w_P^{*\prime} \cdot \Sigma \cdot w_P^*$$

$$= \left[\left(\frac{C}{D}\mu_0 - \frac{B}{D}\right) \cdot \Sigma^{-1} R + \left(\frac{A}{D} - \frac{B}{D}\mu_0\right) \cdot \Sigma^{-1} J_n\right]' \cdot \Sigma \cdot \left[\left(\frac{C}{D}\mu_0 - \frac{B}{D}\right) \cdot \Sigma^{-1} R + \left(\frac{A}{D} - \frac{B}{D}\mu_0\right) \cdot \Sigma^{-1} J_n\right]$$

$$= \left(\frac{C}{D} \cdot \mu_0 - \frac{B}{D}\right)^2 \cdot R' \cdot \Sigma^{-1} \cdot R + \left(\frac{A}{D} - \frac{B}{D} \cdot \mu_0\right)^2 \cdot J_n' \cdot \Sigma^{-1} \cdot J_n$$

$$+ 2\left(\frac{C}{D} \cdot \mu_0 - \frac{B}{D}\right) \cdot \left(\frac{A}{D} - \frac{B}{D} \cdot \mu_0\right) \cdot R' \cdot \Sigma^{-1} \cdot J_n$$

$$= A \cdot \left(\frac{C}{D} \cdot \mu_0 - \frac{B}{D}\right)^2 + C \cdot \left(\frac{A}{D} - \frac{B}{D} \cdot \mu_0\right)^2 + 2 \cdot B\left(\frac{C}{D} \cdot \mu_0 - \frac{B}{D}\right)\left(\frac{A}{D} - \frac{B}{D} \cdot \mu_0\right)$$

$$= \frac{1}{D}\left(C \cdot \mu_0^2 - 2B \cdot \mu_0 + A\right) = \frac{C}{D} \cdot \left(\mu_0 - \frac{B}{C}\right)^2 + \frac{1}{C} \tag{6}$$

Such that, $\sigma_P^2 \geq \frac{1}{C}$ and the equality holds when $\mu_0 = \frac{B}{C}$.

Next, considering a riskless asset can be invested, and then the pre-described model will be rewritten as follows:

$$\min_{w_i} \frac{\sigma_P^2}{2} = \frac{1}{2} w' \cdot \Sigma \cdot w \tag{7}$$

$$s.t. \quad \mu_P = \left(1 - w' \cdot J_n\right) \cdot r_f + w' \cdot R \geq \mu_0, \tag{8}$$

where, r_f is the return of the riskless assets. Again, by using the Lagrange Multipliers method, we have to solve the following problem:

$$\min_{w_i, \lambda} \ell\left(w, \lambda_1, \lambda_2\right) = \frac{1}{2} w' \cdot \Sigma \cdot w + \lambda \cdot \left[\mu_0 - w' \cdot R - \left(1 - w' \cdot J_n\right) \cdot r_f\right]. \tag{9}$$

Thus, the F.O.C. is

$$\begin{cases} \ell_w = \Sigma \cdot w - \lambda \cdot \left(R - J_n \cdot r_f\right) = 0 \\ \ell_\lambda = \mu_0 - w' \cdot R - \left(1 - w' \cdot J_n\right) \cdot r_f = 0 \end{cases} \rightarrow w_P^* = \Sigma^{-1} \cdot \left(R - r_f \cdot J_n\right) \cdot \frac{\mu_0 - r_f}{H}, \tag{10}$$

where,

$$H \equiv \left(R - r_f \cdot J_n\right)' \cdot \Sigma^{-1} \cdot \left(R - r_f \cdot J_n\right) = A - 2B \cdot r_f + C \cdot r_f^2 \tag{11}$$

.

The properties of this portfolio are:

1. $$\mu_P = w_P^{*'} \cdot R + \left(1 - w_P{}' \cdot J_n\right) \cdot r_f$$

$$= \left(R - r_f \cdot J_n\right)' \cdot \Sigma^{-1} \frac{\mu_0 - r_f}{H} \cdot R + \left(1 - w_P{}' \cdot J_n\right) \cdot r_f$$

$$= \frac{\mu_0 - r_f}{H} \cdot \left(R - r_f \cdot J_n\right)' \cdot \Sigma^{-1} \cdot \left(R - r_f \cdot J_n\right) + \frac{\left(\mu_0 - r_f\right) \cdot r_f}{H} \cdot \left(R - r_f \cdot J_n\right)' \cdot \Sigma^{-1} \cdot J_n$$

$$+ \left(1 - w_P^{*'} \cdot J_n\right) \cdot r_f. \tag{12}$$

2. $$\sigma_P^2 = w_P^{*'} \cdot \Sigma \cdot w_P^*$$

$$= \left[\left(R - r_f \cdot J_n\right)' \cdot \Sigma^{-1} \frac{\mu_0 - r_f}{H}\right] \cdot \Sigma \cdot \left[\Sigma^{-1} \cdot \left(R - r_f \cdot J_n\right) \cdot \frac{\mu_0 - r_f}{H}\right]$$

$$= \left(\frac{\mu_0 - r_f}{H}\right)^2 \cdot \left(R - r_f \cdot J_n\right)' \cdot \Sigma^{-1} \cdot \left(R - r_f \cdot J_n\right)$$

$$= \left(\frac{\mu_0 - r_f}{H}\right)^2 \cdot \left[R' \Sigma^{-1} R - 2 r_f \cdot R' \Sigma^{-} J_n + r_f^2 \cdot J_n{}' \Sigma^{-1} J_n\right] = \frac{\left(\mu_0 - r_f\right)^2}{H} \tag{13}$$

Hence, $\sigma_P = \frac{\left|\mu_0 - r_f\right|}{\sqrt{H}}$, that is, $\mu_0 = r_f \pm \sqrt{H} \cdot \sigma_P$ (14)

B. Autoregression Integrated Moving Average Models, $ARIMA(p,d,q)$

In Witt and Witt (1992;1995) they use many econometric models to investigate the topics of tourism industries. Empirically, they suggested that the autoregression and moving average models can be implemented to forecast the performance of tourism industries.

Here, we want to investigate the effects of the fluctuations of foreign exchange on the performance of hotel industry. According to Bodie *et al.* (2002) we can use the ROA or ROE, reported in the annual financial statements, to be the measures of the corporate's performance. There are at least two reasons for applying ROA/ROE to proxy the firm's performance. First, since ROA is the return of corporate's total assets, which is defined by the product of profit margin and total asset turnover, so it tells us how effectively a firm uses its assets to generate profits. Therefore, a well-performed firm will have a higher ROA. Second, the definition of ROE is the net profit over the average equity, so that by the DuPont equation, we have

$$ROE = \text{Net Profit Margin} \times \text{Asset Turnover} \times \frac{\text{Asset}}{\text{Equity Ratio}}. \tag{15}$$

Hence, it tells us how efficiently a company is operated. It also provides insights into the firm's use of assets via turnover. That is, a well-performed firm also has a higher ROE. As a result, in our study, we will apply these two measures to be the proxies of the firm's performance and investigate the magnitude of the effects of foreign exchange rate's fluctuations.

First, Dumas (1978); Adler and Bernard (1980) and Hodder (1982) implement the change of foreign exchange rates into the regression models to study the U.S. multinational firm's values. And Jorion (1990) followed their studies and found that the stock returns of U.S. multinational firm are significantly positively correlated to the volatility of the U.S. dollar. Moreover, Bodnar and William (1993) studied the different effects of the fluctuations of foreign exchange rates on the different industries in U.S., Canada and Japan. And in Hamid *et al.* (2013) discussed

the public relations agency (PRA) in the People's Republic of China (PRC) by using importance-performance analysis (IPA).

Moreover, He and Ng (1998) investigated Japan 171 multinational firms there are about 25% firm's stock returns significantly positively correlated to the foreign exchange exposures, themselves. And the effects are increasing as firm's size increases. Moreover, in Fama and Kenneth (1993;1995) they formed six portfolios of the stocks listed on NYSE, AMX, and NASDAQ Stock Market by the firm's size and found that firm's size and BE/ME proxy for sensitivity to risk factors that capture strong common variation in stock returns and will help to explain the average returns and then firm's profitability. And Morelli (2007) found the same effects of firm's size on the UK listed firms' stock returns. Their results showed that the media personnel and travel agents/tour operators were basically satisfied with the PRA's performance, although there is still room for improvement.

On the other hand, Maloney (1990) paid attention on the Australian mining firms. He indicated that the fluctuations of the exchange rates between Australia dollars against to the major currencies will affect the firm's profit. So he suggested that firm should find some strategies to manage the positions of foreign currencies in order to avoid the losses caused by the fluctuations of exchange rates and then reduce the firm's performance.

Bailey *et al.* (1992) and Kim (2013) suggested that multinational enterprise may use the framework of the Modern Portfolio Theory to form their own foreign exchange risk management strategies and to reduce the effect of foreign exchange exposures. Here, we apply the framework of Kim to investigate the effects of foreign exchange exposures on the performance of Taiwan hospitality industry and try to propose some hedging strategies and strengthen their corporate risk management. Therefore, in our regression models, we will impose the changes of exchange rates of several currencies to study the effects of the fluctuations of exchange rates on the performance of Taiwan hospitality firms. Our autoregression moving average model is given as follows:

$$\begin{aligned} Performance_{i,t} &= \alpha_i + \beta_{i,m} \cdot RMRF_t + \sum_{k=1}^{p} \phi_{i,k} \cdot Performance_{i,t-k} \\ &+ \sum_{j=1}^{n} \gamma_{i,j} \cdot \Delta FX_{j,t} + \delta_i \cdot Size_{i,t} + \sum_{s=0}^{q} \theta_s \cdot a_{i,t-s}, \qquad (16) \\ t &= \max(p,q)+1, \max(p,q)+2, \cdots, T_i, \; i = 1, 2, \cdots, N. \end{aligned}$$

Where, $Performance_{i,t}$ represents the i^{th} firm's performance in the t^{th} quarter, and $Performance_{i,t-k}$ is its k^{th} lagged variable. In Sharpe (1964) he defined that $RMRF_t$ is the market portfolio's excess return in the t-th quarter, i.e., $RMRF_t \equiv Rm_t - r_f$, Rm_t is the market portfolio's return and r_f is the rate of return of riskless asset.

Furthermore, as indicated in Smithson and Simkins (2005) although the management of interest rate and foreign exchange rate risks does indeed add value, the effect is larger than would be expected. Such that, let $\Delta FX_{j,t}$ be the percentage change of exchange rate of the j^{th} currency in the t^{th} quarter, which is defined by

$$\Delta FX_{j,t} \equiv \frac{E_{j,t} - E_{j,t-1}}{E_{j,t-1}} \times 100, \qquad (17)$$

where $E_{j,t}$ is the closed price in the end of the quarter in terms of direct quotation. And $Size_{i,t}$ is the size of the i^{th} firm in the t^{th} quarter which is defined as $Size_{i,t} \equiv \ln(Cap_{i,t})$, and $Cap_{i,t}$ is the capitalization of the firm in the t^{th} quarter. $a_{i,t}$ are the white noises.

3. Data

This paper selected 12 hospitality companies listed on Taiwan Stock Exchange (TWSE), and downloaded their quarterly ROA, ROE and capitalization from Taiwan Economic Journal (TEJ). They are Hotel Holiday Garden (2702), The Ambassador Hotel Ltd. (2704), The Leofoo Development Co., Ltd. (2705), First Hotel Company Ltd. (2706), Formosa International Hotels Corporation (2707), Farglory Hotel Co., Ltd. (2712), Pleasant Hotels International Inc. (2718), Chateau International Development Co., Ltd. (2722), FX Hotels Group Inc. (2724-F), Janfusun Fancyworld Corp. (5701), The Landis Taipei Hotel Co., Ltd. (5703), and Hotel Royal Chihpen (5704). Period is from 2000Q1 to 2015Q3 and sum to 489 firm-quarters. Table 1 shows the descriptive statistics of the firm's ROA and ROE, respectively.

Table-1. (A). Descriptive statistics of ROA.

ROA (%)	Obs.	Mean	Std. dev.	Max	Min	Median
2702 HG	63	0.661	0.820	2.94	-1.43	0.740
2704 AMBH	63	0.641	0.565	1.47	-1.29	0.740
2705 Leofoo	32	-0.136	1.298	5.40	-5.03	-0.225
2706 First Hotel	32	1.398	1.105	7.28	0.54	1.160
2707 GFRT	63	4.392	1.195	7.55	1.27	4.360
2712 FGH	11	1.383	1.244	3.68	-0.12	0.870
2718 PH	25	0.944	0.873	2.40	-1.20	0.840
2722 Chateau	21	2.732	2.632	8.38	-0.60	2.380
2724 FX Hotels	21	1.179	1.770	5.74	-2.45	1.550
5701 JFS	32	-1.462	1.341	1.73	-5.76	-1.470
5703 Landis Taipei	63	0.419	1.724	3.20	-8.97	0.740
5704 Chihpen Royal	63	1.040	1.381	3.62	-3.49	1.210

Source: Taiwan Economic Journal (TEJ).

Table-1(B). Descriptive statistics of ROE.

ROE (%)	Obs.	Mean	Std. dev.	Max	Min	Median
2702 HG	63	0.804	1.276	3.77	-2.97	0.940
2704 AMBH	63	0.704	0.956	2.18	-2.96	0.880
2705 Leofoo	32	-0.415	2.565	11.04	-9.90	-0.695
2706 First Hotel	32	1.668	1.339	8.71	0.67	1.390
2707 GFRT	63	6.645	2.205	11.13	1.50	6.700
2712 FGH	11	1.794	1.782	4.81	-0.44	1.100
2718 PH	25	1.220	1.109	2.99	-1.62	1.160
2722 Chateau	21	3.313	3.335	11.24	-0.68	3.060
2724 FX Hotels	21	1.418	3.958	6.96	-8.83	2.210
5701 JFS	32	-3.217	2.462	2.47	-11.24	-3.300
5703 Landis Taipei	63	0.612	2.338	4.48	-11.76	1.040
5704 Chihpen Royal	63	1.192	1.581	4.19	-3.83	1.300

Source: Taiwan Economic Journal (TEJ).

In Table 1, we may find that the Formosa International Hotels Corporation (2707) has the highest ROA and ROE, however, Janfusun Fancyworld Corp. (5701) has the lowest ROA and ROE. And except of Janfusun Fancyworld Corp. and the Leofoo Development Co., Ltd. (2705), the others are well-performed since they all have a positive average ROA or ROE. Moreover, the Ambassador Hotel Ltd. (2704) has the lowest volatility of ROA and ROE. On the other hand, Chateau International Development Co., Ltd. (2722) and the FX Hotels Group Inc. (2724-F) have the highest volatility of ROA and ROE, respectively. It may result from the shortest listing data of these two companies.

Next, we collect the foreign exchange rates from the website of the Central Bank of Taiwan. The data period is from 2000 to 2015. And then calculate the quarterly and monthly percentage change of exchange rates for the currencies against to the NT dollars (*NTD*) according to the Equation (13). Table 2 shows the descriptive statistics of the monthly change of foreign exchange rates.

Table-2. Descriptive statistics of the monthly change of exchange rates.

Monthly Change (%)	Mean	Std. dev.	Max	Min	Median	CV
USD	0.0280	1.1865	3.3313	-3.5798	0.0232	42.3750
JPY	-0.0353	2.3233	8.8309	-6.0498	-0.2280	-65.8159
GBP	0.0135	1.9269	5.7608	-8.0517	0.0901	142.7333
CNY	0.1664	1.1449	3.0715	-3.4686	0.1749	6.8804
EUR	0.1016	2.2251	7.1016	-5.2660	0.2209	21.9006
HKD	0.0294	1.1841	3.3179	-3.5798	0.0205	40.2755
KRW	0.0170	1.8737	6.7195	-12.3726	0.2496	110.2176
CAD	0.0940	1.8282	5.0170	-8.6264	0.0351	19.4489
SGD	0.1155	0.9621	3.0253	-3.4506	0.1384	8.3299
AUD	0.1074	2.6040	6.9746	-13.5568	0.2725	24.2458
IDR	-0.3005	3.1096	20.7023	-13.5534	-0.2083	-10.3481
THB	0.0602	1.2869	3.6022	-4.5300	0.0806	21.3771
MYR	-0.0366	1.2266	3.0689	-4.0603	-0.0825	-33.5137
PHP	-0.0412	1.5530	4.3555	-4.5580	-0.1633	-37.6942

Source: Central Bank of Taiwan. http://www.cbc.gov.tw/content.asp?mp=1&CuItem=36599.

In Table 2, the lowest percentage change (0.96%) of the exchange rate is the Singapore dollar exchange rate against to NT dollar and has the highest percentage change (3.11%) of the exchange rate is the Indonesian rupiah exchange rate against to NT dollar. Since Indonesian rupiah has a maximum appreciation (20.70%) and minimum depreciation (13.56%) against to NT dollar.

Moreover, the coefficient of variation, a nominal measurement, is also reported in Table 2. The standard deviation of data describes the dispersion of the data away from the mean, in contrast, the coefficient of variation is the multiple of the standard deviation to the mean, i.e., $CV \equiv \frac{\sigma}{\mu}$. For comparison between data sets with different units or widely different means, we may use the coefficient of variation instead of the standard deviation. And, as described in Scheel (1978) the coefficient of variation can also be a measure of relative risk in the elementary risk and insurance. Such that, an asset with lower value of coefficient of variation means either a lower-risk asset among that of the same return or a higher-return asset among that of same level of risk. As shown in the Table 2, China yuan (CNY) and Singapore dollar (SGD) has lower coefficient of variation, 6.8804 and 8.3299, respectively, and Great British pound and Korean won has higher coefficient of variation. It means that both Great British pound and Korean won are either high-risk or low-return.

3.1. Empirical Results and Analysis

First, we have to test whether the series of performance is stationary or not. That is, we should test the null hypothesis that it has a unit root. In Tsay (2005) he indicated that the fundamental time series analysis is stationarity. A time series y_t is said to be *strictly stationary* if the joint distribution of $\left(y_{t_1}, y_{t_2}, \cdots, y_{t_k}\right)'$ is identical to that of $\left(y_{t_1+s}, y_{t_2+s}, \cdots, y_{t_k+s}\right)'$ for all *k*, where *s* is an arbitrary positive integer. In other words, strict stationarity requires that the joint distribution of $\left(y_{t_1}, y_{t_2}, \cdots, y_{t_k}\right)'$ is *invariant* under time shift.

Table-3. The stationarity test results of company's performances.

	Series	Obs.	ADF test statistic	*p*-value	Stationarity
2702 HG	ROA	56	-1.539	0.5140	Non-stationary
	ΔROA_t	61	-14.607	0.0000	Stationary
2704 AMBH	ROA	56	-2.884	0.0472	Stationary
2705 Leofoo	ROA	56	-2.158	0.2217	Non-stationary
	ΔROA_t	61	-12.592	0.0000	Stationary
2706 First Hotel	ROA	56	-2.312	0.1683	Non-stationary
	ΔROA_t	61	-17.520	0.0000	Stationary
2707 GFRT	ROA	56	-2.640	0.0849	Non-stationary
	ΔROA_t	61	-12.541	0.0000	Stationary
2712 FGH	ΔROA_t	9	-3.466	0.0089	Stationary
2718 PH	ROA	18	-1.651	0.4567	Non-stationary
	ΔROA_t	23	-9.001	0.0000	Stationary
2722 Chateau	ROA	14	-1.810	0.3755	Non-stationary
	ΔROA_t	19	-5.904	0.0000	Stationary
2724 FX Hotels	ROA	14	0.025	0.9606	Non-stationary
	ΔROA_t	19	-5.816	0.0000	Stationary
5701 JFS	ROA	56	-1.476	0.5452	Non-stationary
	ΔROA_t	61	-11.789	0.0000	Stationary
5703 Landis Taipei	ROA	56	-1.977	0.2967	Non-stationary
	ΔROA_t	61	-10.758	0.0000	Stationary
5704 Chihpen Royal	ROA	56	-1.421	0.5722	Non-stationary
	ΔROA_t	61	-17.149	0.0000	Stationary

Source: Taiwan Economic Journal (TEJ).

Table-3(B). The stationarity test results of company's ROE.

	Series	Obs.	ADF test statistic	*p*-value	Stationarity
2702 HG	ROE	56	-1.604	0.4814	Non-stationary
	ΔROE_t	61	-15.323	0.0000	Stationary
2704 AMBH	ROE	56	-2.993	0.0356	Stationary
2705 Leofoo	ROE	25	-2.061	0.2604	Non-stationary
	ΔROE_t	30	-8.296	0.0000	Stationary
2706 First Hotel	ROE	25	-2.441	0.1306	Non-stationary
	ΔROE_t	30	-13.890	0.0000	Stationary
2707 GFRT	ROE	56	-1.808	0.3764	Non-stationary
	ΔROE_t	61	-11.738	0.0000	Stationary
2712 FGH	ΔROE_t	9	-3.501	0.0080	Stationary
2718 PH	ROE	18	-1.689	0.4365	Non-stationary
	ΔROE_t	23	-8.826	0.0000	Stationary
2722 Chateau	ROE	14	-2.132	0.2320	Non-stationary
	ΔROE_t	19	-6.034	0.0000	Stationary
2724 FX Hotels	ROE	14	0.394	0.9813	Non-stationary
	ΔROE_t	19	-7.304	0.0000	Stationary
5701 JFS	ROE	25	-2.505	0.1143	Non-stationary
	ΔROE_t	30	-8.123	0.0000	Stationary
5703 Landis Taipei	ROE	56	-1.942	0.3124	Non-stationary
	ΔROE_t	61	-10.652	0.0000	Stationary
5704 Chihpen Royal	ROE	56	-1.332	0.6146	Non-stationary
	ΔROE_t	61	-17.278	0.000	Stationary

Source: Taiwan Economic Journal (TEJ).

And a time series y_t is *weakly stationary* if both the mean of y_t and $Cov(y_t, y_{t-s})$ are *time-invariant*, where s is an arbitrary integer. In the Table 3, we show the Augmented Dicky-Fuller test results. As shown in Table 3, we can find that almost all the ROA/ROE series are non-stationary except the Ambassador's ROA/ROE.

On the other hand, according to Hurvich and Tsai (1989) there will be biased estimates resulting from a non-stationary series. Such that, applying Wei (2006) we take the first-ordered difference on the series, i.e.,

$$D_1ROA_t \equiv ROA_t - ROA_{t-1} \text{ and } D_1ROE_t \equiv ROE_t - ROE_{t-1}. \quad (18)$$

And then, we test the unit-root-test again to verify its stationarity. The Augmented Dicky-Fuller test results are also shown in Table 3. After differencing the series, all of them are stationary.

Next, Patro *et al.* (2002) found the significant currency risk exposures in country equity index returns by using the GARCH model. And, Polodoo *et al.* (2016) discussed the nexus between exchange rate volatility and manufacturing trade. They found that exchange rate volatility has an adverse effect on the real manufacturing trade of the Africa countries. As shown in the study of Ikechukwu (2016), he applied the dynamic panel regression approach to investigate the effects of exchange rate volatility on firm performance by examining 20 companies listing in Nigerian Stock Exchange. It revealed that exchange rate volatility has significant negative impacts on the ROAs, ATRs. Here, that effects of the fluctuations of exchange rates on the firm's performance is the main purpose of this study. Therefore, as the work in Kim (2012) the autoregression moving average (ARIMA) model can be specified as follows:

$$D_1Performance_{i,t} = \alpha_i + \beta_{i,m} \cdot RMRF_t + \sum_{k=1}^{p} \phi_{i,k} \cdot D_1Performance_{i,t-k} + \sum_{j=1}^{n} \gamma_{i,j} \cdot \Delta FX_{j,t} + \delta_i \cdot Size_{i,t} + \sum_{s=0}^{q} \theta_s \cdot a_{i,t-s}, \quad (19)$$

$$t = \max(p, q)+1, \max(p, q)+2, \cdots, T_i, \; i = 1, 2, \cdots, N.$$

Here, $D_1Performance_{i,t}$ represents the first-ordered difference of the i^{th} firm's performance in the t^{th} quarter, and $D_1Performance_{i,t-k}$ is its k^{th} lagged variable. Use the STATA13 to find the regression results and show in the Table 4. Model I regresses D_1ROA on all exchange fluctuations, lagged variables and the control variables. Model II regresses D_1ROA on all variables but selected by eliminating higher p-value explanatory variables.

Table-4. Regression on ROA.

Company	**Hotel Holiday Garden (2702)**		**The Leofoo Development Co., Ltd. (2705)**		**Formosa International Hotels Corporation (2707)**	
Variables	**Model I**	**Model II**	**Model I**	**Model II**	**Model I**	**Model II**
Const.	10.31 (7.59)	0.10 (0.09)	106.98 (81.09)	101.70** (47.14)	23.71 (16.21)	-0.06 (0.14)
RMRF	0.01 (0.01)		-0.05 (0.07)		-0.01 (0.02)	
USD	0.14 (0.14)		0.15 (0.33)		0.10 (0.20)	
JPY	0.03 (0.03)		-0.01 (0.09)		-0.05 (0.05)	
CNY	-0.09 (0.14)		-0.38 (0.36)		-0.21 (0.21)	
EUR	-0.05 (0.05)		0.09 (0.13)		-0.00 (0.08)	
KRW	0.02 (0.04)		0.28* (0.14)	0.20** (0.08)	0.04 (0.07)	
GBP	0.03 (0.05)		-0.12 (0.17)		-0.03 (0.08)	
SGD	0.05 (0.14)		0.51 (0.62)	0.41* (0.21)	0.06 (0.21)	
AUD	-0.04 (0.04)	-0.04* (0.02)	-0.21 (0.19)	-0.20** (0.07)	0.06 (0.06)	0.09*** (0.03)
IDR	0.03 (0.03)	0.05** (0.02)	0.01 (0.13)		-0.09* (0.05)	-0.07** (0.03)
THB	0.05 (0.06)		0.22 (0.20)		-0.00 (010)	
MYR	-0.03 (0.07)		-0.17 (0.21)		-0.01 (0.11)	
PHP	-0.04 (0.06)		-0.07 (0.18)		0.09 (0.09)	
Lag1	-0.83*** (0.18)	0.67*** (0.13)	-0.91** (0.33)	-0.76*** (0.18)	-0.69*** (0.15)	-0.57*** (0.12)
Lag2	-0.63*** (0.20)	-0.49*** (0.14)	-0.34 (0.34)	-0.35** (0.17)	-0.80*** (0.16)	-0.67*** (0.12)
Lag 3	-0.45** (0.19)	-0.45*** (0.11)	0.01 (0.33)		-0.51*** (0.15)	-0.35*** (0.11)
Lag4	0.01 (0.15)		-0.04 (0.25)		-0.13 (0.15)	
SIZE	-0.53 (0.36)		-4.70 (3.57)	-4.48** (2.08)	-1.06 (0.73)	
Adj. R^2	0.46	0.51	0.03	0.32	0.38	0.44
Obs.	59	58	32	32	58	58

Source: Taiwan Economic Journal (TEJ).

The regression model is given above.

$$D_1ROA_{i,t} = \alpha_i + \beta_{i,m} \cdot RMRF_t + \sum_{k=1}^{p} \phi_{i,k} \cdot D_1ROA_{i,t-k} + \sum_{j=1}^{n} \gamma_{i,j} \cdot \Delta FX_{j,t} + \delta_i \cdot Size_{i,t} + a_{i,t} . \quad (20)$$

Model I regresses $D_1ROA_{,t} \equiv ROA_{,t} - ROA_{,t-1}$ on all exchange fluctuations, lagged variables and the control variables. And Model II regresses D_1ROA on all variables but selected by eliminating higher p-value explanatory variables. The values in the parentheses are standard error of the estimates. And *, ** and *** stand for 10%, 5% and 1% level of significance, respectively.

Table-4. Regression on ROA (Continued).

Company	**First Hotel Company Ltd. (2706)**		**Pleasant Hotels International Inc. (2718)**		**Chateau International Development Co., Ltd. (2722)**	
Variables	**Model I**	**Model II**	**Model I**	**Model II**	**Model I**	**Model II**
Const.	-8.17 (15.86)	-14.17*	37.34 (58.01)	0.71*** (0.12)	-1957** (542.5)	0.29 (0.85)
RMRF	0.01 (0.01)		-0.12 (0.10)	-0.06** (0.03)	3.33*** (0.79)	
USD	0.06 (0.05)		1.54 (1.07)	0.66*** (0.15)	-13.15** (4.20)	
JPY	0.01 (0.01)		-0.30 (0.12)		3.14*** (0.76)	
CNY	-0.05 (0.06)		-1.36 (0.72)	-0.78*** (0.14)	12.03** (3.78)	
EUR	0.00 (0.02)		-0.29 (0.20)	-0.16*** (0.04)	7.60** (1.96)	
KRW	-0.00 (0.02)		0.23 (0.23)		-5.31** (1.49)	
GBP	-0.02 (0.03)		-0.26 (0.38)		-6.44*** (1.50)	
SGD	-0.05 (0.07)		-0.66 (0.43)	-0.66** (0.11)	1.41 (0.74)	1.89** (0.85)
AUD	-0.01 (0.02)		0.21 (0.13)	0.13** (0.05)	-4.36*** (0.91)	-0.58* (0.29)
IDR	0.03 (0.02)		0.20 (0.08)	0.22*** (0.03)	0.59* (0.24)	
THB	0.00 (0.04)		0.58 (0.32)	0.55*** (0.12)	-13.42*** (3.22)	
MYR	-0.02 (0.03)		-0.06 (0.16)		3.75** (0.96)	
PHP	-0.04 (0.03)	-0.04*** (0.01)	-1.06 (0.43)		18.45** (4.82)	
Lag1	-1.05*** (0.22)	-1.21*** (0.14)	-1.90 (0.46)	-1.46*** (0.10)		
Lag2	-0.28 (0.24)		-1.46 (0.44)	-1.13*** (0.12)		
Lag 3	-0.47 (0.27)		-0.98 (0.63)	-0.44*** (0.10)		
Lag4	0.34*** (0.10)	-0.30*** (0.07)	-0.22 (0.25)			
SIZE	0.41 (0.72)	0.67* (0.34)	-1.80 (2.85)		92.79** (25.69)	
Adj. R^2	0.81	0.82	0.84	0.93	0.78	0.16
Obs.	32	32	20	20	20	20

Source: Taiwan Economic Journal (TEJ).

In the Table 4, we can find that almost all estimates of the lagged variables are significant and negative, such as, Leofoo Development Co., Ltd. (2705), Formosa International Hotels Corporation (2707), Janfusun Fancyworld Corp. (5701), The Landis Taipei Hotel Co., Ltd. (5703), and Hotel Royal Chihpen (5704). It implies that those D_1ROA are mean-reverting. As the estimates of third-lagged variables are also significant, then we can conclude that there is a seasonal effect on the company's ROA.

Moreover, some estimates of *SIZE* are significant in Table 4. When it is positive, such as that in Chateau International Development Co., Ltd. (2722), the company may increase its own assets to increase its D_1ROA, so to its ROA, too. Since it can operate efficiently its assets to generate more profit and then to be a well-performed company. On the other hand, when the estimate of *SIZE* is negative, such as those in Leofoo Development Co., Ltd. (2705) and FX Hotels Group Inc. (2724-F), the company may dispose some of its idle assets or non-performed assets to reduce the inefficient effect of these assets. As a result, the company's ROA will be improved.

Table-4. Regression on ROA (Continued).

Company	**Janfusun Fancyworld Corp. (5701)**		**The Landis Taipei Hotel Co., Ltd. (5703)**		**Hotel Royal Chihpen (5704)**	
Variables	**Model I**	**Model II**	**Model I**	**Model II**	**Model I**	**Model II**
Const.	29.91 (30.30)	-0.12 (0.18)	55.80 (50.46)	0.13 (0.17)	32.16* (19.05)	0.00 (0.12)
RMRF	0.04 (0.05)		0.06 (0.03)	0.07*** (0.02)	0.05** (0.02)	0.03** (0.01)
USD	-0.24 (0.31)		0.10 (0.24)		0.07 (0.17)	
JPY	-0.01 (0.08)		-0.11 (0.08)		0.07 (0.05)	
CNY	0.38 (0.36)		0.10 (0.27)		0.22 (0.19)	0.22*** (0.07)
EUR	0.03 (0.12)		-0.11 (0.10)	-0.12* (0.07)	0.01 (0.07)	
KRW	0.08 (0.12)	0.10* (0.05)	0.07 (0.09)		0.27*** (0.07)	0.17*** (0.04)
GBP	-0.24 (0.15)	-0.16** (0.06)	0.00 (0.10)		-0.09 (0.07)	
SGD	0.29 (0.37)		-0.05 (0.24)		-0.31* (0.18)	-0.29*** (0.09)
AUD	-0.10 (0.12)		0.22** (0.09)	0.20*** (0.06)	0.02 (0.06)	
IDR	0.08 (0.11)		-0.02 (0.06)		-0.01 (0.04)	
THB	-0.21 (0.18)		-0.12 (0.12)	-0.20** (0.08)	0.00 (0.09)	
MYR	0.06 (0.17)		-0.17 (0.13)		0.04 (0.10)	
PHP	0.06 (0.15)		-0.02 (0.10)		-0.10 (0.07)	
Lag1	-0.65** (0.28)	-0.64*** (0.16)	-0.77*** (0.12)	-0.77*** (0.09)	-1.08*** (0.15)	-0.99*** (0.09)
Lag2	-0.31 (0.36)	-0.31* (0.16)	-0.32** (0.14)	-0.35*** (0.09)	-0.83*** (0.18)	-0.66*** (0.12)
Lag 3	0.09 (0.37)		0.01 (0.13)		-0.71*** (0.19)	-0.56*** (0.09)
Lag4	0.14 (0.26)		-0.07 (0.11)		-0.11 (0.16)	
SIZE	-1.35 (1.36)		-2.68 (2.41)		-1.58* (0.93)	
Adj. R^2	0.07	0.39	0.59	0.63	0.75	0.76
Obs.	32	32	58	58	58	59

Source: Taiwan Economic Journal (TEJ).

Next, Table 4 shows significant effects on the performances of Taiwan tourism industry due to the fluctuations of foreign exchange rates. The changes of foreign exchange rates have significant impacts on the D1ROAs. Some are positive and some are negative. And the same currency has different impact on different companies. Such as the Singapore dollar has positive effect on the D1ROA of Leofoo Development Co., Ltd. (2705), Chateau International Development Co., Ltd. (2722), and on the ROA of Ambassador Hotel Ltd. (2704), but negative effect on that of Pleasant Hotels International Inc. (2718) and Hotel Royal Chihpen (5704). Moreover, the Australian dollar has positive effect on the D1ROA of Formosa International Hotels Corporation (2707), Pleasant Hotels International Inc. (2718), and Landis Taipei Hotel Co., Ltd. (5703), and on the ROA of Ambassador Hotel Ltd. (2704), but negative effect on that of Chateau International Development Co., Ltd. (2722). And the Korean won has a positive effect on the D1ROA of Leofoo Development Co., Ltd. (2705), Janfusun Fancyworld Corp. (5701), and Hotel Royal Chihpen (5704), and then on those company's ROA , too.

Furthermore, the number of significant variables and the component of significant variables are different to each company. For example, the significant variables of the Pleasant's D_1ROA are the change of *USD*, *CNY*, *EUR*, *SGD*, *AUD*, *IDR*, *THB*, however, that of the Chateau's D1ROA are only the changes of Singapore dollar and Australia dollar. As a result, the portfolio of currencies should be different for each company.

Table-5. Regression on ROE.

The regression model is given as follows:

$$D_1ROE_{i,t} = \alpha_i + \beta_{i,m} \cdot RMRF_t + \sum_{k=1}^{p} \phi_{i,k} \cdot D_1ROE_{i,t-k} + \sum_{j=1}^{n} \gamma_{i,j} \cdot \Delta FX_{j,t} + \delta_i \cdot Size_{i,t} + a_{i,t} \,. \qquad (21)$$

Model I regresses $D_1ROE_{\cdot,t} \equiv ROE_{\cdot,t} - ROE_{\cdot,t-1}$ on all exchange fluctuations, lagged variables and the control variables. And Model II regresses D_1ROE on all variables but selected by eliminating higher p-value explanatory variables. The values in the parentheses are standard error of the estimates. And *, ** and *** stand for 10%, 5% and 1% level of significance, respectively.

Company	**Hotel Holiday Garden (2702)**		**The Leofoo Development Co., Ltd. (2705)**		**Formosa International Hotels Corporation (2707)**	
Variables	**Model I**	**Model II**	**Model I**	**Model II**	**Model I**	**Model II**
Const.	8.39 (10.97)	0.14 (0.13)	550.62 (305.52)	232.88** (110.24)	28.18 (15.24)	0.10 (0.21)
RMRF	0.01 (0.02)		-0.07 (0.21)		-0.03 (0.04)	
USD	0.24 (0.19)		-1.77 (1.44)		0.05 (0.31)	
JPY	0.05 (0.05)	0.08** (0.03)	-0.64* (0.33)	-0.39** (0.14)	-0.12 (0.08)	-0.09* (0.05)
CNY	-0.16 (0.20)		1.37 (1.40)		-0.27 (0.33)	-0.25** (0.11)
EUR	-0.11 (0.08)	-0.07* (0.04)	-0.00 (0.34)		-0.10 (0.13)	
KRW	0.05 (0.06)	0.08* (0.04)	0.47 (0.46)		0.08 (0.11)	
GBP	0.00 (0.07)		-0.19 (0.42)		-0.04 (0.12)	
SGD	0.22 (0.20)		4.02** (1.70)	1.74** (0.62)	0.34 (0.34)	0.39** (0.19)
AUD	-0.00 (0.20)		-0.63 (0.50)		0.06 (0.10)	
IDR	0.02 (0.05)		0.12 (0.28)		-0.13* (0.07)	-0.09* (0.05)
THB	0.11 (0.09)	0.10* (0.06)	-0.52 (0.77)		0.02 (0.16)	
MYR	-0.06 (0.11)		-1.36** (0.56)	-0.68** (0.29)	-0.01 (0.18)	
PHP	-0.11 (0.08)		0.92 (1.24)		0.05 (0.13)	
Lag1	-0.90*** (0.15)	-0.88*** (0.12)	-1.27*** (0.37)	-0.64*** (0.18)	-0.61*** (0.15)	-0.61*** (0.12)
Lag2	-0.67*** (0.19)	-0.58** (0.15)	-0.15 (0.43)		-0.66*** (0.16)	-0.63*** (0.12)
Lag 3	0.41** (0.19)	-0.42*** (0.18)	0.20 (0.33)		-0.49*** (0.16)	-0.46*** (0.12)
Lag4	-0.04 (0.15)		0.33 (0.28)		-0.01 (0.16)	
SIZE	-0.39 (0.57)		-24.32 (13.46)	-10.28** (4.86)	-1.26 (1.13)	
Adj. R^2	0.51	0.54	0.16	0.32	0.30	0.39
Obs.	58	58	27	27	58	58

Source: Taiwan Economic Journal (TEJ).

Table-5. Regression on ROE (Continued).

Company	**First Hotel Company Ltd. (2706)**		**Pleasant Hotels International Inc. (2718)**		**Chateau International Development Co., Ltd. (2722)**	
Variables	**Model I**	**Model II**	**Model I**	**Model II**	**Model I**	**Model II**
Const.	-21.59 (37.72)	0.84** (0.38)	31.69 (89.17)	0.98*** (0.18)	-2289** (737.7)	-0.44 (1.05)
RMRF	0.05* (0.02)	0.05*** (0.01)	-0.15 (0.15)	-0.08* (0.04)	3.87** (1.08)	
USD	0.39** (1.74)	0.12*** (0.04)	1.77 (1.66)	0.85*** (0.21)	-15.42** (5.71)	
JPY	0.04 (0.03)		-0.02 (0.18)		3.60** (1.03)	
CNY	-0.31* (0.16)		-1.61 (1.12)	-1.04*** (0.21)	14.08** (5.14)	
EUR	-0.05 (0.05)		-0.37 (0.31)	-0.24*** (0.06)	8.86** (2.67)	
KRW	-0.04 (0.05)		0.24 (0.35)		-6.07** (2.03)	
GBP	0.01 (0.06)		-0.35 (0.63)		-7.56** (2.03)	
SGD	0.03 (0.14)		-0.76 (0.72)	-0.86*** (0.15)	1.93 (1.00)	2.46** (1.05)
AUD	0.03 (0.05)		0.25 (0.21)	0.16** (0.07)	-5.22*** (1.24)	-0.77** (0.36)
IDR	-0.04 (0.05)		0.27 (0.13)	0.29*** (0.05)	0.77* (0.32)	
THB	0.05 (0.07)		0.77 (0.50)	0.74*** (0.17)	-15.90** (4.38)	
MYR	-0.04 (0.06)		-0.13 (0.25)		4.41** (1.30)	
PHP	-0.08 (0.11)		-1.32 (0.67)	-0.93*** (0.23)	21.70** (6.56)	
Lag1	-1.37*** (0.18)	-2.88*** (0.37)	-1.88 (0.55)	-1.48*** (0.12)		
Lag2	-0.31 (0.21)	-0.82** (0.40)	-1.50 (0.55)	-1.15*** (0.13)		
Lag 3	-0.19 (0.24)		-0.99 (0.80)	-0.44*** (0.11)		
Lag4	0.50** (0.21)	1.86*** (0.36)	-0.21 (0.29)			
SIZE	1.06 (1.74)		-1.51 (4.37)		108.51** (34.93)	
Adj. R^2	0.87	0.85	0.77	0.92	0.74	0.18
Obs.	28	31	20	20	20	20

Source: Taiwan Economic Journal (TEJ).

In Table 5, Model I regresses D1ROE on all exchange fluctuations, lagged variables and the control variables. Model II regresses D1ROE on all variables but selected by eliminating higher *p*-value explanatory variables. We may find that the results in Table 5 are almost the same as in Table 4. There is seasonal effect for Taiwan hotel industry's ROE, too. And the D1ROE of First Hotel Company Ltd. (2706) and Pleasant Hotels International Inc. (2718) are mean-reverting. Moreover, the number of significant variables and the component of significant variables are different to each company. For example, the significant variables of the ROE of Landis Taipei Hotel Co., Ltd. (5703) are the changes of euro, Japan yen, Australia dollar and Malaysian Ringgit, but that of the Chateau International Development Co., Ltd. (2722) are the changes of euro, pound, Chinese yuan, Japan yen, Korean won, Singapore dollar, Australia dollar, Thailand Baht, Malaysian Ringgit, and Philippine peso. Therefore, it supports the results in the Table 4, which the portfolio of currencies should be different for each company.

Table-5. Regression on ROE (Continued).

Company	Janfusun Fancyworld Corp. (5701)		The Landis Taipei Hotel Co., Ltd. (5703)		Hotel Royal Chihpen (5704)	
Variables	**Model I**	**Model II**	**Model I**	**Model II**	**Model I**	**Model II**
Const.	55.72 (141.90)	0.04 (0.42)	70.20 (69.75)	-0.28 (0.23)	39.26* (21.32)	0.02 (0.14)
RMRF	0.09 (0.33)		0.07 (0.04)		0.06** (0.02)	0.04** (0.02)
USD	0.11 (1.45)		0.17 (0.33)		0.04 (0.19)	
JPY	0.12 (0.35)		-0.15 (0.10)	-0.15** (0.06)	0.08 (0.05)	
CNY	0.01 (1.23)		0.11 (0.37)		0.28 (0.21)	0.25*** (0.08)
EUR	0.12 (0.45)		-0.15 (0.14)	-0.25*** (0.09)	0.02 (0.08)	
KRW	0.37 (0.72)		0.08 (0.12)		0.30*** (0.07)	0.18*** (0.05)
GBP	-0.59 (0.43)	-0.31** (0.14)	-0.02 (0.14)		-0.09 (0.08)	
SGD	0.16 (1.00)		-0.09 (0.33)		-0.36* (0.20)	-0.32*** (0.10)
AUD	-0.51 (0.37)	-0.22* (0.11)	0.30** (0.12)	0.39*** (0.07)	0.01 (0.06)	
IDR	0.23 (0.33)		-0.03 (0.08)		-0.01 (0.05)	
THB	-0.42 (0.66)		-0.11 (0.17)		-0.00 (0.10)	
MYR	0.51 (0.48)	0.36* (0.20)	-0.23 (0.18)	-0.24** (0.11)	0.05 (0.11)	
PHP	0.20 (1.13)		-0.03 (0.14)		-0.11 (0.08)	
Lag1	-0.60* (0.31)	-0.75*** (0.17)	-0.76*** (0.13)	-0.75*** (0.09)	-1.09*** (0.14)	-0.99*** (0.09)
Lag2	-0.29 (0.43)	-0.52*** (0.17)	-0.35** (0.15)	-0.42*** (0.09)	-0.83*** (0.19)	-0.66*** (0.12)
Lag 3	0.30 (0.73)		-0.01 (0.13)		-0.73*** (0.19)	-0.56*** (0.09)
Lag4	0.26 (0.48)		-0.08 (0.11)		-0.12 (0.16)	
SIZE	-2.50 (6.39)		-3.37 (3.33)		-1.93* (1.05)	
Adj. R^2	0.04	0.48	0.57	0.61	0.76	0.77
Obs.	27	27	58	58	58	58

Source: Taiwan Economic Journal (TEJ).

Next, we'll analyze the portfolio will be foreign exchange position. Because of our foreign trade is mainly denominated in US dollars, but also long-term focus Taipei currency exchange on the USD/NTD, and therefore may have a greater proportion of dollar holdings. Furthermore, since the Chinese mainland tourists to Taiwan surge trips, so that each of the hotel were increased demand for Chinese yuan transactions, and thus the performance of the reaction in the performance of its ROE or ROA. On the other hand, Taiwan is also the first choice for Japanese and Korean tourists traveling abroad, so accommodation for the Korean won and the Japanese yen in trading volume should not be underestimated. As shown in Table 7, the 2012 tourist's sources distribution for Taiwan major hotels aggregated by the Tourism Bureau, MOTC of Taiwan, the Japanese and Korean inbounds are over 1/5 of guests in the half of the hotels. And as the Pleasant Hotel locates at Taoyuan, closed to the Taoyuan International Airport, such that, most Chinese mainland tourists stay at the hotel in order to entry and exit. Jang and Chen (2008); Chen *et al.* (2011) employed the modern portfolio theory to investigate the mixes of inbounds of Taiwan inbounds. They suggested that the government should take the high-reward/high-volatility option and shift more available resources to attract the Japanese tourists.

Table-6. Regression on Financial Performances of the Ambassador Hotel.

The regression model is given as follows:

$$y_{2704,t} = \alpha_{2704} + \beta_{2704,m} \cdot RMRF_t + \sum_{k=1}^{p} \phi_{2704,k} \cdot y_{2704,t-k} + \sum_{j=1}^{n} \gamma_{2704,j} \cdot \Delta FX_{j,t} + \delta_i \cdot Size_{2704,t} + a_{2704,t} \cdot \quad (22)$$

The dependent variable, y_{2704} represents the performance of the Ambassador Hotel, which is either ROA_{2704} or ROE_{2704}. Model I regresses y_{2704} on all exchange fluctuations, lagged variables and the control variables. And Model II regresses y_{2704} on all variables but selected by eliminating higher p-value explanatory variables. The values in the parentheses are standard error of the estimates. And *, ** and *** stand for 10%, 5% and 1% level of significance, respectively.

Performance	ROA_{2704}			ROE_{2704}	
Variables	**Model I**	**Model II**		**Model I**	**Model II**
Const.	-25.80 (34.26)	0.28** (0.11)		-34.80 (58.29)	0.25* (0.14)
RMRF	0.02 (0.01)	0.15** (0.01)		0.03 (0.02)	0.03*** (0.01)
USD	-0.21** (0.09)			-0.32** (0.15)	
JPY	0.01 (0.02)			0.02 (0.03)	
CNY	0.22** (0.09)			0.34** (0.16)	
EUR	-0.05 (0.03)	-0.05** (0.02)		-0.08 (0.06)	-0.08** (0.03)
KRW	0.01 (0.03)			0.03 (0.05)	
GBP	0.04 (0.03)			0.06 (0.06)	
SGD	0.10 (0.10)	0.14** (0.06)		0.17 (0.17)	0.26** (0.10)
AUD	-0.02 (0.03)			-0.05 (0.05)	
IDR	0.01 (0.02)			0.02 (0.04)	
THB	0.02 (0.04)			0.04 (0.07)	
MYR	-0.11** (0.05)	-0.10*** (0.04)		-0.18** (0.08)	-0.17*** (0.06)
PHP	0.02 (0.04)			0.01 (0.07)	
Lag1	0.20 (0.14)	0.26** (0.12)		0.30** (0.14)	0.32*** (0.11)
Lag2	-0.06 (0.16)			-0.06 (0.15)	
Lag 3	-0.12 (0.14)			-0.10 (0.14)	
Lag4	0.25* (0.14)	0.28** (0.11)		0.24* (0.14)	0.24** (0.11)
SIZE	1.13 (1.48)			1.52 (2.52)	
Adj. R^2	0.27	0.40		0.30	0.36
Obs.	59	59		59	59

Source: Taiwan Economic Journal (TEJ).

Table-7. Distribution of guests' sources in 2012.

Hotel / Region	**Royal Hotel**	**Pleasant Hotels (Taoyuan)**	**Ambassador Hotel**	**Landis Taipei Hotel**	**Formosa International Hotels**	**Leofoo Westin Hotel**	**Holiday Garden Hotel**	**Farglory Hotel**
Domestic	55.16	17.99	33.96	24.15	21.33	9.73	61.24	94.92
Oversea Chinese	0.00	7.65	1.91	6.37	0.00	0.00	0.99	0.00
Mainland	6.35	56.35	13.29	11.08	11.52	19.43	22.45	3.86
North American	4.73	0.29	6.94	10.31	8.42	20.81	0.76	0.20
Japan	21.93	2.09	29.85	29.89	36.67	17.27	7.00	0.10
Asian (exclusive Japanese)	5.00	9.21	8.23	8.39	15.25	25.92	6.54	0.48
European	2.51	0.26	3.77	7.53	4.69	4.33	0.51	0.13
Australia	0.28	0.03	0.41	1.83	0.90	1.35	0.53	0.02
Others	4.05	6.13	1.64	0.44	1.23	1.17	0.00	0.30
Total (%)	100	100	100	100	100	100	100	100

Source: Tourism Bureau, M.O.T.C., Republic of China (Taiwan).

Here, refer to Kim (2013) discussion of foreign exchange position to make recommendations in the following table. According to the analysis results in Table 4, 5, and 6, we can form a portfolio of currencies that have

significant impacts on the company's ROA/ ROE. Using the Modern portfolio theory proposed by Markowitz (1952) based on the weighted each company the average cost of capital (abbreviated as WACC), and calculated by Matlab programs for foreign exchange positions, we may find an optimum allocation of currencies which has the lowest degree of risk under a pre-specified rate of return constraint.

Table-8. Optimal Portfolio of Foreign Currencies for each company.

SEC_id	USD	JPY	GBP	EUR	KRW	SGD	CNY	AUD	IDR	THB	MYR	PHP	Required Return (%)	Portfolio Risk
2702		2.32		20.47	3.84			52.35	1.73	19.28			10.0	0.4305
2704				13.79		84.35					1.85		12.0	1.8498
2705		1.30			1.56	3.84		83.81			9.49		13.5	0.5125
2706	0.00	2.09	62.18		30.56		0.00				5.17	0.00	12.8	2.5007
2707		0.00				0.00	19.47	74.37	6.16				9.5	0.3555
2718	6.35					0.00	0.00	73.79	7.14	0.00	5.53	7.19	12.6	0.4580
2722	3.27	0.00			6.07	0.00	5.17	85.48					10.6	0.5154
2724	2.26	0.00			0.31	0.00	4.47	82.84	5.47		4.66		9.8	0.4807
5701			2.24		0.76			85.53			11.47		13.2	0.5204
5703		0.11		6.04				79.93		0.90	13.03		11.5	0.4757
5704			34.33		14.90	0.00	13.80		36.97				9.8	2.0615
Full	0.00	0.00	0.29	44.14	0.07	0.00	1.49	9.41	0.52	0.00	0.64	43.44	12.2	0.0554

Source: Taiwan Economic Journal (TEJ).

The results in Table 8 show the optimal allocation of currencies for each company. Here, we can find that Japanese yen, Korean won, Chinese Yuan, Australian dollar and Malaysian Ringgit configuration still the majority. Among them, Leofoo Development Co., Ltd. (2705), Formosa International Hotels Corporation (2707), Pleasant Hotels International Inc. (2718), Chateau International Development Co., Ltd. (2722), FX Hotels Group Inc. (2724-F), Janfusun Fancyworld Corp. (5701), The Landis Taipei Hotel Co., Ltd. (5703), in the configuration of the Australian dollar reached 52.35%, 83.81%, 44.37%, 73.79%, 85.48%, 82.84%, 85.53% and 79.93 %, respectively, more than 50% have switched. The Hotel Holiday Garden (2702), The Leofoo Development Co., Ltd. (2705), First Hotel Company Ltd. (2706), Chateau International Development Co., Ltd. (2722), FX Hotels Group Inc. (2724-F), Janfusun Fancyworld Corp. (5701), and Landis Taipei Hotel Co., Ltd. (5703) for the Korean won configuration, respectively, 3.84%, 1.56%, 30.56%, 6.07%, 0.31%, 0.76%, and 14.90. As to the Chinese yuan, Formosa International Hotels Corporation (2707), Chateau International Development Co., Ltd. (2722), FX Hotels Group Inc. (2724-F), and Hotel Royal Chihpen (5704) should put the weight ranging from 4.47% to 19.47%.

4. Conclusions

Recent years, changes in exchange rates will significantly affect the performances of a company, such as, ROE, ROA, etc. Faced with dramatic changes in the international economic environment, as well as central banks continue to adopt a more aggressive monetary policy, such as: Bank of Japan negative interest rates, the ECB's monetary easing, China People's Bank of China monetary easing, and the gradual recovery of the economy of the United States have taken action to raise interest rates and so on. Under the auspices of monetary policy in these countries, it shows once again that the currencies flows across countries and international hot money have allowed changes in exchange rates and more intense. And Taiwanese enterprises face to these monetary policies, foreign exchange positions should be actively managed in order to reduce the impacts suffered.

In the past, the fluctuations in the foreign exchange markets are more stable in today. In addition to monetary policies that attract more investors to the market, the investment of foreign exchange market as well significantly affect the change in exchange rates among countries. Therefore, a positive foreign exchange risk management will better help for future operation, which can significantly reduce the risk of foreign exchange movements.

This study found that Taiwanese hospitality companies, accounting for the largest part of the tourism industry, are subject to have the impacts on their performance and profitability due to the exchange rate fluctuations. Multinational enterprises may apply the results developed here to manage their foreign exchange risk exposure, and then increasing the overall capacity and range of enterprise risk management (ERM). By doing so, corporate can increase their profits and reduce the negative impacts of exchange rate changes on corporate ROE/ROA through foreign exchange operations. More importantly, foreign exchange allocation can be a strategy to reduce the risk of foreign exchange exposure.

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