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ENTERPRISE RISK MANAGEMENT WITH FOREIGN EXCHANGE EXPOSURES : EVIDENCE FROM TAIWAN TOURISM INDUSTRY

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ABSTRACT

This paper adopts ARIMA model to explore the relationship between business performance and the fluctuation of exchange rate. The empirical results show that the impacts of the fluctuation of foreign exchange rate on the corporate performance of tourism industry are significant and different across currencies and the size of a tourism company. Furthermore, based on the framework of Kim (2013) , a modern portfolio theory proposed by Markowitz (1952) gives an optimal allocation of foreign exchange for a firm's decision-makers, which would avoid exchange rate risk exposure and thus complete the construction of enterprise risk management system (ERM) to reduce losses.

Contribution/ Originality: This study contributes in the existing literature for an empirically study to form a firm-level foreign currencies portfolio which are selected by the factors that have effect on the company's financial performances and then to reduce the foreign exchange exposures.

1. INTRODUCTION

Tourism can be thought as an integral industry that combines public and private sectors. Anderson and Getz (2009) discussed that the public sectors should make the tourism policies to stimulate the development of tourism and promote some non-profit-festivals to attract tourists. Likewise, the private sectors, such as in the field of transportation, communication, leisure, department, etc., should be integrated under the same goals to generate the tourism profit. The more the tourists and the longer they stay, the more revenue generates from the hospitality industry. In Candela and Figini (2012) they developed the tourism economics which is said to be a no-smokestack industry. From the economic point of view, tourism will create value from catering, tourisms, aviation, transportation and many other related industries.

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.

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. Chou (2013) used panel data approach to test the nexus between tourism development and economic growth for 10 Eastern European transition economies in the period 1988-2011. He found that the tourism-led growth hypothesis is more strongly supported in Czech and Poland; economic-oriented tourism development can be found in Cyprus, Latvia and Slovakia; and bidirectional relationship in Estonia and Hungary.

According to the data of the World Tourism Organization the number of international tourist visited in Taiwan in 2012 was estimated 9.91 million, ranked as the world's 31 and created revenues $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. Po and Huang (2008) used 88 cross-sectional countries' data to investigate the nexus between tourism development and economic growth. They found a significantly positive relationship of them when the proportion of tourism receipts in GDP is either less than 4.05% or more than 4.73%, but not when it lies between these two ratios. Moreover, Chen and Song (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 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 programs, and implement "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]. Jucan and Jucan (2013) investigated the economic impact on Romanian tourism industry and 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, or the other emerging countries. As to Taiwan, for example, it indicates that the tourists from China, Malaysia, or the other emerging countries.

According to Taiwan Tourism Bureau, the inbound number of tourists was 2,624,037 in 2000, and 9,910,204 in 2014 and over 10 million in the end of 2015.This tendency shows the visibility and attractiveness of international tourism in traveling to Taiwan. Moreover, Taiwan's foreign exchange earnings generated by tourism was from

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

$3,738 million in 2000 to $14,615 million in 2014, which 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 generated 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. 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.

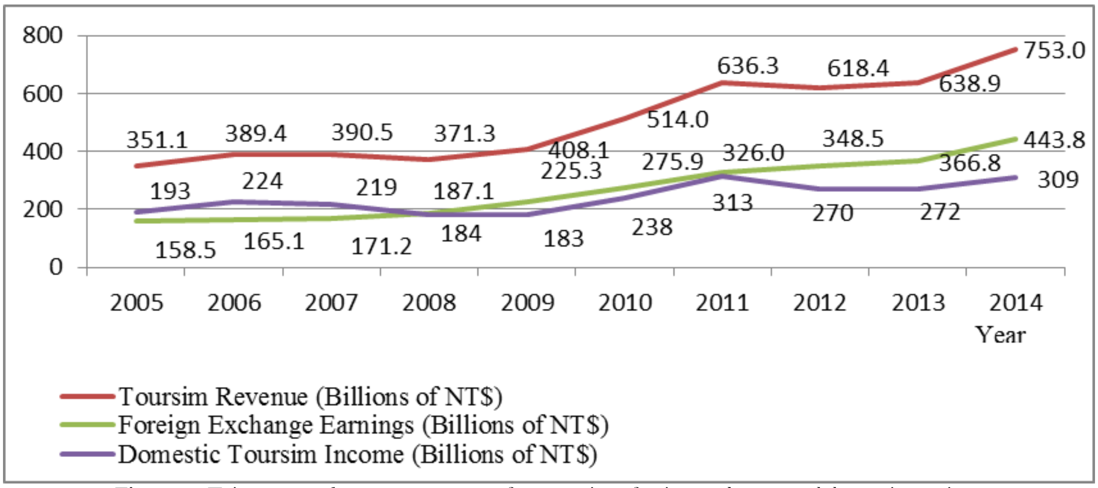

Figure-1. Taiwan annual revenues generate from tourism, foreign exchange, and domestic tourism.
Source: Tourism Bureau, M.O.T.C., Republic of China (Taiwan).

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.

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 tourism industry has the same situation. Based on the above point of view, we mainly discuss Taiwan's tourism 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 tourism industry's risk management.

The structure of this study is as follows: Section 2 is literature review and methodologies will be discussed in Section 3; data collection and its statistical descriptions are in Section 4. The empirical results and analysis are shown in Section 5. The last section is the conclusion.

2. LITERATURE REVIEW

From the 1980s, there are numerous studies to discuss the foreign exchange exposures. The landmark papers, Dumas (1978); Adler and Dumas (1980) and then Hodder (1982) implemented the change of foreign exchange rates into the regression models to study the U.S. multinational firm's values. And Jorion (1990;1991) 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 Gentry (1993) studied the different effects of the fluctuations of foreign exchange rates on the different industries in U.S., Canada and Japan. Schnabel (1989;1994) extended the Adler-Dumas model to a multi-factor model by including several currencies exchange rate movement.

Moreover, He and Ng (1998) studied 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. Morelli (2007) found the same effects of firm's size on the UK listed firms' stock returns. Dominguez and Tesar (2006) examined the relationship between exchange rate movement and firm value. No matter in the firm- or industry-level, they found that the foreign exchange exposure do affect the value of firm. Salifu *et al.* (2007) examined the foreign exchange exposure of Ghanaian listed companies. Their results showed that about 55% companies are exposed to the fluctuation of US dollar and 35% companies are exposed to that of UK pound. And, Jahan (2016) studied the efficiency of using currency derivatives to reduce the effect of currency fluctuations on the performances of the Advanced Chemical Industries (ACI) in Bangladesh.

On the other hand, Maloney (1990) and Koo (1994) paid attention on the Australian mining industry. They indicated that the fluctuations of the exchange rates between Australia dollars against to the major currencies will affect the firm's profit. So they 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. Aggarwal and Harper (2010) investigated the foreign exchange exposures that U.S. domestic companies faced to. Their results showed that the domestic company suffers more foreign exchange exposures than MNEs. They concluded that the MNEs may use more currency derivatives and more trading skills to reduce the foreign exchange exposures than the pure domestic companies. In Addae *et al.* (2014) they found that the foreign exchange rate movement will affect the quality of assets of Ghanaian banks. And, Huy (2016) examined the nexus between foreign exchange rate and stock prices in Vietnam. He found that there is a causal relationship during pre- and post-financial crisis in Vietnam.

In fact, the foreign exchange market in Taiwan is a small, regional market, so some foreign currencies transaction is not warm and the trading volume is small. The liquidities of the other currencies are lower than that of the international major currencies. As Harris (2003) has said that liquidity is the ability to trade large size quickly, at low cost, when you want to trade. Such that a lower liquidity will result to the company when buying foreign currency in order to circumvent the exposure of foreign exchange transactions, it cannot immediately trade at a predetermined price to the required foreign currency position. Hence, the transaction costs and carrying costs of the currencies will increase the cost of risk reduction and then increase the liquidity risk of assets. Here, according to Campbell *et al.* (2010) regression models can be adopt to help the company to find out the effect on its performance causing by the currency's fluctuation. After finding the magnitudes of currency fluctuations which affect to the company's performance, then the framework of the Modern Portfolio Theory, proposed by Bailey *et al.* (1992) and Kim (2013) can be used to form their own foreign exchange risk management strategies and then to reduce the effect of foreign exchange exposures. This study applies the framework of Kim (2013) 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, as the shown in Jorion (1991) I 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 tourism companies.

3. METHODOLOGIES

3.1. 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 puts forward the possibility to diversify the main investment risks for this theory that regardless of the dispersion of individual investment targets the risks associated with some other securities can reduce the risk. In this way, individual company information becomes less important.

The theory is mainly to solve an investor's risk-reward problem and to form a rational combination of his/her 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 are based on four conditions:

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.

An efficient portfolio 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) and 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 $\Sigma \equiv Var(R) = (\sigma_{i,j})_{n \times n}$ the variance-covariance matrix is. 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,

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

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

Here, $J_n = (1, 1, \cdots, 1)' \in \Re^n$. 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

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

And then we have,

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

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

(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:

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

(7)

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

(8)

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

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

(9)

Thus, the F.O.C. is

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

where, $H \equiv \left(R - r_f \cdot J_n\right)' \cdot \Sigma^{-1} \cdot \left(R - r_f \cdot J_n\right) = A - 2B \cdot r_f + C \cdot r_f^2$. The properties of this portfolio are:

1. $$\begin{aligned} \mu_P &= w_P^{*\,\prime} \cdot R + \left(1 - w_P{}' \cdot J_n\right) \cdot r_f \\ &= \left(R - r_f \cdot J_n\right)' \cdot \Sigma^{-1} \frac{\mu_0 - r_f}{H} \cdot R + \left(1 - w_P{}' \cdot J_n\right) \cdot r_f \\ &= \frac{\mu_0 - r_f}{H} \cdot \left(R - r_f \cdot J_n\right)' \cdot \Sigma^{-1} \cdot \left(R - r_f \cdot J_n\right) \\ &\quad + \frac{r_f \cdot \left(\mu_0 - r_f\right)}{H} \cdot \left(R - r_f \cdot J_n\right)' \cdot \Sigma^{-1} \cdot J_n + \left(1 - w_P^{*\,\prime} \cdot J_n\right) \cdot r_f . \end{aligned}$$

2. $$\begin{aligned} \sigma_P^2 &= w_P^{*\,\prime} \cdot \Sigma \cdot w_P^* \\ &= \left[\left(R - r_f \cdot J_n\right)' \cdot \Sigma^{-1} \frac{\mu_0 - r_f}{H}\right] \cdot \Sigma \cdot \left[\Sigma^{-1} \cdot \left(R - r_f \cdot J_n\right) \cdot \frac{\mu_0 - r_f}{H}\right] \\ &= \left(\frac{\mu_0 - r_f}{H}\right)^2 \cdot \left(R - r_f \cdot J_n\right)' \cdot \Sigma^{-1} \cdot \left(R - r_f \cdot J_n\right) \\ &= \left(\frac{\mu_0 - r_f}{H}\right)^2 \cdot \left[R'\Sigma^{-1}R - 2r_f \cdot R'\Sigma^{-} J_n + r_f^2 \cdot J_n{}'\Sigma^{-1} J_n\right] \\ &= \frac{\left(\mu_0 - r_f\right)^2}{H} . \end{aligned} \tag{11}$$

Hence, its standard deviation $\sigma_P = \frac{|\ \mu_0 - r_f\ |}{\sqrt{H}}$, that is,

$$\mu_0 = r_f \pm \sqrt{H} \cdot \sigma_P \tag{12}$$

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

In Witt and Witt (1992;1995); Witt *et al.* (2003) and Song and Li (2008) they used 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. This study will focus on the effects of the fluctuations of foreign exchange on the performance of tourism industry.

According to Bodie *et al.* (2002) and Muriithi *et al.* (2016) 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

$$ROE = \text{Net Profit Margin} \times \text{Asset Turnover} \times \frac{\text{Asset}}{\text{Equity Ratio}} . \tag{13}$$

As a result, 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. Hence, by the multi-factor model in Jorion (1991) and Bartram (2008) the autoregression moving average model is given as follows:

$$Performance_{i,t} = \alpha_i + \beta_{i,m} \cdot RMRF_t + \sum_{k=1}^{p} \phi_{i,k} \cdot Performance_{i,t-k}$$
$$+ \sum_{j=1}^{n} \gamma_{i,j} \cdot \Delta FX_{j,t} + \delta_i \cdot Size_{i,t} + \sum_{s=0}^{q} \theta_s \cdot a_{i,t-s}, \quad (14)$$
$$t = \max(p,q)+1, \max(p,q)+2, \cdots, T_i, \; i = 1, 2, \cdots, N.$$

Here, $Performance_{i,t}$ 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., $RMRF_t \equiv Rm_t - r_f$, and 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. And by the definition of Muller and Verschoor (2006) let $\Delta FX_{j,t}$ be the percentage change of exchange rate of the j-th currency in the t-th quarter, that is

$$\Delta FX_{j,t} \equiv \frac{E_{j,t} - E_{j,t-1}}{E_{j,t-1}} \times 100, \quad (15)$$

where $E_{j,t}$ is the closed price in the end of the quarter in terms of direct quotation. 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. Such that, let $Size_{i,t}$ denote 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. $a_{i,t}$ is the white noises.

4. DATA and EMPIRICAL RESULTS ANALYSIS

4.1. Data and Descriptive Statistics

This paper selected twelve tourism companies listed on Taiwan Stock Exchange (TWSE), and downloaded their quarterly ROA, ROE and capitalization from Taiwan Economic Journal (TEJ). They are Tourism Holiday Garden(2702), The Ambassador Tourism Ltd. (2704), The Leofoo Development Co., Ltd.(2705), First Tourism Company Ltd.(2706), Formosa International Tourisms Corporation(2707), Farglory Tourism Co., Ltd.(2712), Pleasant Tourisms International Inc.(2718), Chateau International Development Co., Ltd.(2722), FX Tourisms Group Inc.(2724-F), Janfusun Fancyworld Corp.(5701), The Landis Taipei Tourism Co., Ltd.(5703), and Tourism 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 Tourism	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 Tourisms	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 Tourism	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 Tourisms	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 Tourisms 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 Tourism Ltd. (2704) has the lowest volatility of ROA and ROE. On the other hand, Chateau International Development Co., Ltd. (2722) and the FX Tourisms 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, the foreign exchange rates were collected from 2000 to 2015 through the website[2] of the Central Bank of Taiwan. The equation (15) calculates the quarterly and monthly percentage change of exchange rates for the currencies against to the NT dollars (*NTD*). Table 2 shows the descriptive statistics of the monthly change of foreign exchange rates.

[2] http://www.cbc.gov.tw/content.asp?mp=1&CuItem=36599.

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.

In Table 2, the lowest percentage change (0.96%) of the exchange rate is the Singapore dollar against to NT dollar, and the highest percentage change (3.11%) of the exchange rate is the Indonesian rupiah against to NT dollar. Indonesian rupiah has a maximum appreciation (20.70%) and minimum depreciation (13.56%) against to NT dollar. Moreover, the coefficient of variation 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. $CV \equiv \frac{\sigma}{\mu}$. It shows the extent of volatility in relation to the mean of the population and measures the multiple of risk to reward. For comparison between data sets with different units or widely different means, this paper uses the coefficient of variation instead of the standard deviation. Scheel (1978) proposed that the coefficient of variation can also be a measure of relative risk in the elementary risk and insurance. 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 Table 2, China yuan (CNY) and Singapore dollar (SGD) have lower coefficient of variation, 6.8804and 8.3299, respectively, and Great British pound and Korean won have higher coefficient of variation. Both Great British pound and Korean won are either high-risk or low-return.

4.2. 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. 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.,

$$D_1ROA_t \equiv ROA_t - ROA_{t-1} \text{ and } D_1ROE_t \equiv ROE_t - ROE_{t-1}. \quad (16)$$

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.

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 Tourism	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 Tourisms	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).

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) investigated the nexus between exchange rate volatility and manufacturing trade using a sample spanning 18 countries in Africa. They found that exchange rate volatility has an adverse effect on the real manufacturing trade of the Africa countries. As shown in Kelilume (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 the effects of the fluctuations of exchange rates on the firm's performance is the main purpose of this study.

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 Tourism	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 Tourisms	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).

Therefore, like the work in Kim (2012) the following autoregression moving average (ARIMA) model:

$$D_1 Performance_{i,t} = \alpha_i + \beta_{i,m} \cdot RMRF_t + \sum_{k=1}^{p} \phi_{i,k} \cdot D_1 Performance_{i,t-k}$$

$$+ \sum_{j=1}^{n} \gamma_{i,j} \cdot \Delta FX_{j,t} + \delta_i \cdot Size_{i,t} + \sum_{s=0}^{q} \theta_s \cdot a_{i,t-s} \quad , \tag{17}$$

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

Here, $D_1 Performance_{i,t}$ represents the first-ordered difference of the *i*-th firm's performance in the *t*-th quarter, and $D_1 Performance_{i,t-k}$ is its *k*-th lagged variable. Use the STATA13 to find the regression results and shown 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.

The regression model is given as follows:

$$D_1ROA_{i,t} = \alpha_i + \beta_{i,m} \cdot RMRF_t + \sum_{k=1}^{p} \phi_{i,k} \cdot D_1ROA_{i,t-k} + \sum_{j=1}^{n} \gamma_{i,j} \cdot \Delta FX_{j,t} + \delta_i \cdot Size_{i,t} + a_{i,t} \quad . \tag{18}$$

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

Company	**Tourism Holiday Garden (2702)**		**The Leofoo Development Co., Ltd. (2705)**		**Formosa International Tourisms 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).

Table-4. Regression on ROA (Continued).

Company	First Tourism Company Ltd. (2706)		Pleasant Tourisms 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 Table 4, almost all estimates of the lagged variables are significant and negative, such as, Leofoo Development Co., Ltd. (2705), Formosa International Tourisms Corporation (2707), Janfusun Fancyworld Corp. (5701), The Landis Taipei Tourism Co., Ltd. (5703), and Tourism 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.

Table-4. Regression on ROA (Continued).

Company	Janfusun Fancyworld Corp. (5701)		The Landis Taipei Tourism Co., Ltd. (5703)		Tourism 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).

Moreover, some estimates of $SIZE$ are significant in Table 4. If it is positive, such as Chateau International Development Co., Ltd. (2722), then the company may increase its own assets to increase its D_1ROA, so to its ROA. Hence, it can operate efficiently by its assets to generate profit and then to be a well-performed company. If the estimate of $SIZE$ is negative, such as those in Leofoo Development Co., Ltd. (2705) and FX Tourisms Group Inc. (2724-F), then 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.

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 D_1ROAs. Some are positive and some are negative. The same currency has different impact on different companies. For example, Singapore dollar has positive effect on the D_1ROA of Leofoo Development Co., Ltd. (2705), Chateau International

Development Co., Ltd. (2722), and on the ROA of Ambassador Tourism Ltd. (2704), but negative effect on that of Pleasant Tourisms International Inc.(2718) and Tourism Royal Chihpen (5704). Moreover, the Australian dollar has positive effect on the D_1ROA of Formosa International Tourisms Corporation (2707), Pleasant Tourisms International Inc. (2718), and Landis Taipei Tourism Co., Ltd. (5703), and on the ROA of Ambassador Tourism Ltd. (2704), but negative effect on that of Chateau International Development Co., Ltd. (2722). And the Korean won has a positive effect on the D_1ROA of Leofoo Development Co., Ltd. (2705), Janfusun Fancyworld Corp. (5701), Tourism Royal Chihpen (5704), and then on those company's ROA.

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 D_1ROA are only the changes of Singapore dollar and Australia dollar. As a result, the portfolio of currencies should be different for each company.

Next, to discuss the impact of foreign exchange fluctuation on ROE, the regression model is given as follows:

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

(19)

Model I regresses $D_1ROE_t \equiv ROE_t - ROE_{t-1}$ on all exchange fluctuations, lagged variables and the control variables. 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.

Table-5. Regression on ROE.

Company	Tourism Holiday Garden (2702)		The Leofoo Development Co., Ltd. (2705)		Formosa International Tourisms 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		-1.36**	-0.68**	-0.01	

	(0.11)		(0.56)	(0.29)	(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 Tourism Company Ltd. (2706)**		**Pleasant Tourisms 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).

Table-5. Regression on ROE (Continued).

Company	Janfusun Fancyworld Corp. (5701)		The Landis Taipei Tourism Co., Ltd. (5703)		Tourism 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).

In Table 5, Model I regresses D_1ROE on all exchange fluctuations, lagged variables and the control variables. Model II regresses D_1ROE 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 tourism industry's ROE, too. And, D_1ROE of First Tourism Company Ltd. (2706) and Pleasant Tourisms 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 Tourism 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 Table 4, which the portfolio of currencies should be different for each company.

As to performances of the Ambassador Tourism (2704), according to the unit-root tests [Table-3 (A) and (B).], they are already stationary. Such that, the regression model is given as follows:

$$y_{2704,t} = \alpha_{2704} + \beta_{2704,m} \cdot RMRF_t + \sum_{k=1}^{p} \phi_{2704,k} \cdot y_{2704,t-k} + \sum_{j=1}^{n} \gamma_{2704,j} \cdot \Delta FX_{j,t}$$

$$+ \delta_{\mathbf{i}} \cdot Size_{2704,t} + a_{2704,t}.$$

(20)

The dependent variable $y_{2704,t}$ represents the performance of the Ambassador Tourism, that is, ROA_{2704} or ROE_{2704}. Model I regresses $y_{2704,t}$ on all exchange fluctuations, lagged variables and the control variables. Model II regresses $y_{2704,t}$ on all variables but selected by eliminating higher *p*-value explanatory variables. Regression results are shown in Table 6. The values in the parentheses are standard error of the estimates. And *, ** and *** stand for 10%, 5% and 1% level of significance, respectively.

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

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			0.01	

	(0.04)			(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).

In Table 6, EUR and MYR are negatively affect to the performances while SGD has positive effect to the performances. It is different to the other company.

Next, since the foreign trade of Taiwan is mainly denominated in US dollars, and Taiwanese dollar was pegged to the dollar exchange rate for a long time, therefore, enterprises might have a greater proportion of dollar holdings. Furthermore, due to the opening of Chinese tourists to Taiwan, it results in the tourism industry to increase its Chinese yuan transaction needs, and thus ROA/ROE reflect the effect from the change of Chinese yuan. In additional, Taiwan is also the first choice for Japanese and Korean tourists traveling abroad, so accommodation of the Korean won and the Japanese yen in trading volume should not be underestimated.

As shown in Table 7, major tourisms aggregated by Taiwan's Tourism Bureau in 2012 showed that the Japanese and Korean inbounds were over 1/5 of guests in the half of the tourisms. For example, Pleasant Tourism located closed to the Taoyuan International Airport, and most Chinese tourists stay at the tourism in order to conveniently entry and exit. Both Jang and Chen (2008) and Chen *et al.* (2011) employed the modern portfolio theory to investigate the mixes 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-7. Distribution of guests' sources in 2012.

Tourism / Region	Royal Tourism	Pleasant Tourisms (Taoyuan)	Ambassador Tourism	Landis Taipei Tourism	Formosa International Tourisms	Leofoo Westin Tourism	Holiday Garden Tourism	Farglory Tourism
Domestic	55.2	18.0	34.0	24.2	21.3	9.7	61.2	94.9
Oversea Chinese	0.0	7.7	1.9	6.4	0.0	0.0	1.0	0.0
Mainland	6.35	56.35	13.29	11.08	11.5	19.4	22.45	3.9
North American	4.7	0.3	6.9	10.3	8.4	20.8	0.8	0.2
Japan	21.9	2.1	29.9	29.9	36.7	17.3	7.0	0.1
Asian (exclusive Japanese)	5.0	9.2	8.2	8.4	15.3	25.9	6.5	0.5
European	2.5	0.3	3.8	7.5	4.7	4.3	0.5	0.1
Australia	0.3	0.0	0.4	1.8	0.9	1.4	0.5	0.0
Others	4.1	6.1	1.6	0.4	1.2	1.2	0.0	0.3
Total (%)	100	100	100	100	100	100	100	100

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

Kim (2013) discussed of foreign exchange position and make recommendations in Table 8. As the results in Table 4, 5, and 6, a portfolio of currencies that has significant impacts on the company's ROA/ ROE can be formed. Markowitz (1952) proposed the Modern portfolio theory that based on the weighted each company the average cost of capital (WACC), and along with the calculation of Matlab programs for foreign exchange positions, an optimum allocation of currencies can reach the lowest degree of risk under a pre-specified rate of return constraint.

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

Company	2702	2704	2705	2706	2707	2718
USD				0.00		6.35
GBP				62.18		
EUR	20.47	13.79				
JPY	2.32		1.30	2.09	0.00	
KRW	3.84		1.56	30.56		
CNY				0.00	19.47	0.00
AUD	52.35		83.81		74.37	
SGD		84.35	3.84			0.00
IDR	1.73				6.16	7.14
MYR		1.85	9.94	5.17		5.53
THB						0.00
PHP				0.00		7.19
WACC (%)	10.00	12.00	13.50	12.80	9.50	12.60
Portfolio risk (%)	0.431	1.850	0.513	2.501	0.356	0.458

Source: Taiwan Economic Journal (TEJ).

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

Currency	2722	2724	5701	5703	5704	Full
USD	3.27	2.26				0.00
GBP			2.24		34.33	0.29
EUR				6.04		44.14
JPY	0.00	0.00		0.11		0.00
KRW	6.07	0.31	0.76		14.90	0.07
CNY	5.17	4.47			13.80	1.49
AUD	73.79	82.84	85.53	79.93		9.41
SGD	0.00	0.00			0.00	0.00
IDR		5.47			36.97	0.52
MYR		4.66	11.47	13.03		0.64
THB				0.90		0.00
PHP						43.44
WACC(%)	10.60	9.80	13.20	11.50	9.80	12.20
Portfolio risk (%)	0.515	0.481	0.520	0.476	2.062	0.055

Source: Taiwan Economic Journal (TEJ).

The results in Table 8 show the optimal allocation of currencies for each company. Japanese yen, Korean won, Chinese Yuan, Australian dollar and Malaysian Ringgit configuration still play significant roles among those target companies, including Leofoo Development Co., Ltd. (2705), Formosa International Tourisms Corporation (2707), Pleasant Tourisms International Inc. (2718), Chateau International Development Co., Ltd. (2722), FX Tourisms Group Inc. (2724-F), Janfusun Fancyworld Corp. (5701), The Landis Taipei Tourism Co., Ltd. (5703). 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. Tourism Holiday Garden(2702), Leofoo Development Co., Ltd. (2705), First Tourism Company Ltd. (2706), Chateau International Development Co., Ltd. (2722), FX Tourisms Group Inc. (2724-F), Janfusun Fancyworld Corp. (5701), and Landis Taipei Tourism 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 Chinese yuan, Formosa International Tourisms Corporation (2707), Chateau International Development Co., Ltd. (2722), FX Tourisms Group Inc. (2724-F), and Tourism Royal Chihpen (5704) should put the weight ranging from 4.47% to 19.47%.

5. CONCLUSIONS

In recent years, the changes in exchange rates significantly affect a company's performances, such as, ROE, ROA, etc. Faced with the dramatic changes in the international economic environment, many central banks continue to adopt a more aggressive monetary policy, such as, negative interest rates by Bank of Japan, the monetary easing by ECB, and monetary easing by People's Bank of China. Likewise, the gradual recovery of the economy of the United States have taken actions to raise interest rates. The auspices of monetary policy in these countries shows that the currencies flow across countries and international hot money have allowed changes in exchange rates. Under these actions of monetary policies, enterprises in Taiwan need to actively adopt configuration to reduce the negative impact.

Changes in the foreign exchange market in the pastis not as dramatic as 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 formal foreign exchange risk management will better help for future operation, which can significantly reduce the risk of foreign exchange movements.

This study found that tourisms in Taiwan, 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. Enterprises may apply the results to manage the foreign exchange risk exposure they faced to, and then increase the overall capabilities and range of enterprise risk management (ERM). By doing so, companies can increase their profits and reduce the negative impacts of exchange rate changes on corporate performances through foreign exchange operations. More importantly, foreign exchange allocation can be a strategy to reduce the risk of foreign exchange exposure. This study fills the gap of empirical researches for forming firm-level foreign exchange risk management strategy which will have positive impact on the company's financial performances and then to avoid the losses from foreign exchange exposures.

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