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Relationship between Exchange Rate and Stock Prices: Empirical Evidence from Cambodia

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Abstract: ***This empirical study attempts to investigate the relationship between exchange rate and stock pricesof Cambodia security exchange (CSX) by adopting monthly data of stock prices and exchange rate from 2015-2018. In this research, the author employed the unit root test, cointegration by Johansen and granger causality test for finding the relationship between two variables. The results illustrated two variables are stationary in the first different I (1). Exchange rate and stock prices have no relationship in the short-run (P-value 0.21>0.05), but in the long-run they are associated with significant 99%. Granger causality test revealed that stock prices and exchange ratesare independence.***

Keywords: Stock price, Exchange rate, Cointegration, Granger causality

1. Introduction

Stock market plays a vital role in economic development. Therein, it helps rising capital for business, mobilizing saving for investment, helps companies to expand and grow, creates investment opportunities for small investors and the stock market, helps government to raise fund for development activities through issues of bonds by an investor who buys bonds will be lending money to the government which is more secure and sometimes enjoys tax benefits also.Cambodia security exchange (CSX) was established in 2012 with the basic purpose of archiving high economic growth by facilitating flows of capital, investment, and reallocation of the capital based on the capital market mechanism. CSX has been capitalized by both parties in which Cambodia ministry of finance and economy (MFE) owns 55% of registered capital and South Korean exchange (KRX) the remaining 45 %. The changing or fluctuating of stock prices in stock exchange indicates about economic situation of one country. Meanwhile, investors believe that country's economy will be grown up when the stock market has been rising and make them confident to invest in those of stocks,and then it will lead more interest to other investors, especially foreign investors who are always interested.

There are various factors that impact stock price such as interest rate, exchange rate, domestic product enterprise performance, dividends, the stock price of another country, etc. (Kurihara, 2016: p. 376). The relationship between stock prices and exchange rates has preoccupied the minds of economists since they both play important roles in influencing the development of the country's economy (Erdal Demihan, 2009). These two variables have become interdependent because of rising international diversification, cross-market return correlations, gradual abolishment of capital inflow barriers and foreign exchange restrictions or the adoption of more flexible exchange rate arrangements in emerging and transition countries. These changes have increased the variety of investment opportunities as well as the volatility of exchange rates and risk of investment decisions andportfolio diversification process. Thus, understanding this relationship will help domestic as well as international investors for hedging and diversifying their portfolio.In the stock market, the exchange rate is a very crucial factor for foreign investors because of every changing of exchange rate impact to their investment. The stock can be increased when one domestic currency decrease or stock can be felled when one domestic currency decreases. Stock price and exchange rate have a positive and negative relationship by a real interest rate and an inflationary disturbance (Wu, 2000). According to real interest rate disturbance when the interest raises capital inflow increases and the exchange rate falls. However, since higher of real interest rate reduces the present value of future cash flows, the stock price will decline, in negative relationship inflationary disturbance explain, when inflation increases the exchange rate because of higher inflation expectations, investors will demand higher risk premium and higher rate return, as a result, the stock price will decrease.

Due exchange rate plays important role in economic, especially in stock exchange or security exchange, therefore, this research has objective to investigate the relationship between exchange rate of Cambodia currency per US dollar and stock price in Cambodia security exchange. The study will investigate the long-run, short-run and impact of two variables to each other.

2. Literature Review

The relationship between stock prices and exchange rates has been studied by numerous authors in a variety of situations and evidences: Hwang (2016)investigated the relationship between stock price and exchange rate by using cointegration and Granger causality. The result foundthat domestic currency devaluation has a negative short-run effect on stock prices.Bhuvaneshwari and Ramya (2017) studied the cointegration and causality between stock prices and exchange rate in India from 2006 to 2015. Augmented Dickey-Fuller (ADF) and Phillips-Peron (PP) unit root tests are applied to test stationary of data and the data was found stationary at first difference. According to Johansen's cointegration test identified that the variable are not

cointegrated and granger causality found the variables bidirectional causality between variables.Dimitrova (2005) reveals that an increase in stock prices leads to a decrease in exchange rate while a weak association exists between exchange rate and stock price, depreciation of the currency may lead decrease the stock market to decline. Suriani et al. (2015) determined the impact of exchange rate on stock market in Pakistan and the finding indicates that two variables have no relationship and independence to each other. Keung et al. (2013) stock indices and exchange rate no cointegration relationship in long-run and short-run in Karachi stock exchange of Pakistan. Subayyal and Shah (2011) testing the existence and direction of causality between stock market index (KSE) and exchange rate in the post-floating exchange rate regime and vibrant stock market performance of Pakistan. The Engel-Granger and VAR test show that the bidirectional causality exists between the variables. Moussa (2019) applied cointegration test and VECM model on association of stock prices and exchange rate and the results show that there are two-way causality and a long-term relationship between the stock market and the exchange rate of each country.Tugurt (2017)uses the autoregressive distributed lag (ARDL) model and the Error Correction Model (ECM) in order to investigate the existence of a long-run equilibrium relationship between the variables. The evidence reveals that there is a strong long-run counteraction. The robustness of the ARDL bounds test cointegration was confirmed using the newly-developed combined cointegration, which also provided the same evidence for a strong long-run relationship. The Granger causality test results indicate long-run bidirectional causality between stock prices and real exchange rates, and also a unidirectional causality from the real exchange rates to the stock prices in the short-run. Ali and Sun (2017) found the stock price and foreign exchange rate have a long-run negative relation that leads from exchange rate to stock price and a short run unidirectional causal linkage running from stock price to exchange rate in India.

Moreover, many scholars and researchers examined the relationship between stock prices and exchange rates as a group countries, such as, Walters (2013) has researched the cointegration between stock prices and exchange rates in Asia- Pacific countries such as New Zealand, Hong Kong, Japan, Australia, South Korea, Thailand, and Indonesia showed that Dickey-Fuller unit root test for all the countries stationary in the first difference I (1), Engel-Granger test demonstrated no long-run relationship between two variables. Muhammed and Rasheed (2002) apply Granger and bivariate cointegration tests to examine the association between stock price and exchange rate for Pakistan, India, Sri Langka and Bangladesh by using monthly data. The results indicate stock price and exchange rate do not exhibit a long-run relation in Pakistan and India while a long-run relation exists for Bangladesh and Sri Lanka and no short-run causality for any four countries. Muhammad n.d.shows no short-run association between two variables for all four countries. In the long-run no relationship between stock prices and exchange rates for Pakistan and India as well. However, for Bangladesh and Sri Lanka there appear to be a bi-directional causality between these two financial variables.

The literature reviews above investigated the relationship between exchange rates and stock prices by using similar methodologies of Cointegration by Johansen, ECM, VECM, VAR, Granger causality test and so on. These instruments only tell the readers about short-run and long-run relationship and causality of two variables whether they are bidirectional, unidirectional or independence, but it doesn't reveal the marginal effect of the association between two variables whether how much that they impact to each other.To measure the marginal effect of variables scholars can apply another methodology, for example linear regression or multi linear regression model is a popular method that always has been used to find out the effect between dependent and independent variables.

3. Data and Methodology

In this research, the author employs time series as monthly data of stock prices and exchange rate to investigate the relationship between stock prices and exchange rate in Cambodia. The author collected daily data of CSX stock prices and exchange rate dollar per riel (Cambodian currency) from 2015 to 2018, then, converted from daily data to monthly data by using Microsoft Excel.

Cointegration by Johansen, error correction model (ECM) and Engel Granger causality have been applied for investigating the relationship between two variables, but before going to check those instruments, unit root test by Augmented Dickey-Fuller (ADF) is required.

3.1 Unit Root

Three-level equations of unit root at the level I (0), the first difference I (1) and the second difference I (2) show as below:

$$\Delta_{Y_t} = \alpha + \gamma Y_{t-1} + \varepsilon_t \text{Level with intercept only}$$

$$\Delta_{Y_t} = \alpha + \beta_t + \gamma Y_{t-1} + \varepsilon_t \text{ Level with Trent and Intercept}$$

$$\Delta_{Y_t} = \gamma Y_{t-1} + \varepsilon_t \text{ No trent and Intercept}$$

$\Delta_{Y_t} = Y_t - Y_{t-1}$that $Y_t$variable of t and α, β is a coefficient, t is the time trend and ε_t *is the erro or residual*.

The hypothesis of Unit Root

Null Hypothesis:$H_0 : \gamma = 0$non-stationary or got unit root

Alternative: $H_1 : \gamma \neq 0$ stationary

The hypothesis of unit root, when P-value is greater than 0.05 it means that accepted the null hypothesis or got unit root and we can say that it rejected alternative hypothesis. The data stationary when P-value smaller than 0.05 (P-value< 0.05). Moreover, the variable has unit root or not depend on comparing the value of ADF and Critical value, if ADF < critical value means that the variables got unit root.

3.2 Cointegration

Cointegration by Johansen uses to test the long-run relationship between stock price and exchange rate by comparing the statistic number of Trace test and Max test with critical value, if Trace test and Max test greater than the critical value it reveals that two variables have a long-run

relationship, ifit is smaller means that two variables no relationship.

Equation of Trace Statistic

$$LR_{Tr}(r\backslash k) = T\sum_{i=r+1}^{k}\log(1-\lambda_i)$$

Equation of Max Statistic

$$LR_{max}(r\backslash r+1) = -T\log(1-\lambda_{r+1})$$
$$= LR_{Tr}(r\backslash k) - LR_{Tr}(r+1\backslash k)$$

3.3 Error Correction Model

When the Johansen test has integrated or long-run association then Error Correction Model (ECM) will be employed for short-run relationship.

ECM Equation

$$\Delta X_t = \beta_1 \hat{e}_{t-1} + \sum_{i=1}^{p} \emptyset_i \Delta X_{t-1} + \sum_{j=0}^{q} \delta_j \Delta Y_{t-j} + \varepsilon_{1t}$$

That X_t,Y_t: variables use in (t)
$-\beta_1$: speed of adjustment in the long term
$-\delta_j$: resilience in the short term
$-e\hat{}\_(t-1)$: errorterm$-\varepsilon_{1t}$: errorterm

Hypothesis
$H_0: \beta_1 = 0$no short term relationship
$H_1: \beta_1 \neq 0$ have a relationship in the short term

3.4 Granger Causality

Granger causality test is a statistical hypothesis test for determining whetherone-time series is useful in forecasting another. Its test will explain the causal relationship between two variables. There are four causalities that explained by Granger are:
X granger cause Y
Y granger cause X
X and Y have bidirectional causality or feedback relationship
X and Y independent or non-causality
Granger Equation

$$Y_t = \alpha_1 + \sum_{j=1}^{m} a_j Y_{t-j} + \sum_{j=1}^{n} b_j X_{t-j} + \mu_t$$
$$X_t = \beta_1 + \sum_{j=1}^{m} c_j Y_{t-j} + \sum_{j=1}^{n} d_j X_{t-j} + \varepsilon_t$$

That Y_t and X_t variables test in present (t)
Y_{t-j} and X_{t-j} variables tested in the past$(t-j)$ that$j = 1,2,3 \ldots m$
α_1 and β_1 Constnat
μ_t and ε_t residual
a_j, b_j, c_j, d_j coeffecient in the past that $j = 1, 2, 3 \ldots, m$
Hypothesis:
$H_0: b_j = 0$ (X does not granger cause Y)
H_1: $b\_j \neq 0$ (X granger cause Y)

4. Empirical Results and Discussion

The relationship between exchange rate and stock prices of Cambodia securities exchange (CSX) will illustrate in the statistic by using program Eviews 10 as following:

4.1. Unit Root Test

Unit root test by Augmented Dickey-Fuller for investigating whether variables stationary or not in three points are with intercept, with trend and intercept and without trend and intercept. According to table 4.1 found that the unit root stationary at the first difference I (1), stock price p-value 0.0001, 0.0005, 0.0000, exchange rate p-value 0.0001, 0.0007, 0.0000 respectively (P-value<0.05) and ADF also greater than critical values. The stationary of data at the first difference tells that cointegration by Johansen will be used to determine the long-run relationship of variables.

Table 4.1: Unit root testing at first difference I (1)

With Intercept							
Variable	Lag	ADF Test Statistic	Critical Value			Prob	Status
			1%	5%	10%		
Price	9	-5.3546	-3.5925	-2.9314	-2.6039	0.0001	Stationary
Exchange	9	-5.3522	-3.6394	-2.9511	-2.6143	0.0001	Stationary
With Trend and Intercept							
Variable	Lag	ADF Test Statistic	Critical Value			Prob	Status
			1%	5%	10%		
Price	9	-5.2811	-4.1865	-3.5181	-3.1897	0.0005	Stationary
Exchange	9	-5.2701	-4.2529	-3.5485	-3.2071	0.0007	Stationary
Without Trend and Intercept							
Variable	Lag	ADF Test Statistic	Critical Value			Prob	Status
			1%	5%	10%		
Price	9	-5.3960	-2.6199	-1.9487	-1.6120	0.0000	Stationary
Exchange	9	-5.3572	-2.6347	-1.9510	-1.6109	0.0000	Stationary

Source: Author's calculation using Eviews10

4.2 Cointegration test

To determine the long-run relationship of stock price and exchange rate in this research author employsa cointegration test by Johansen,but before toward this point the lag selection is required.

Vector Auto-regression lag selection or VAR Lag order Selection Criteria
Vector Autoregression or VARLag selection test for choosing the most appropriate lag that is required for running long-run relationship and Granger causality test in the next steps by choosing the smallest of Akaike

information criterion (AIC). According to table 4.2: the appropriate lag in the result is lag 9 AIC=-12.28257, it is the smallest AIC.

Table 4.2: Lag selection test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	170.7305	NA	2.91E-07	-9.373916	-9.285943	-9.343211
1	219.7013	89.77983	2.40E-08	-11.87229	-11.60837	-11.78018
2	228.7888	15.65063	1.81E-08	-12.15493	-11.71507*	-12.00141*
3	231.5376	4.428711	1.95E-08	-12.08542	-11.46961	-11.87049
4	234.7321	4.791752	2.07E-08	-12.04067	-11.24891	-11.76433
5	242.4878	10.77176*	1.71e-08*	-12.24932	-11.28162	-11.91157
6	244.4297	2.481316	1.97E-08	-12.13498	-10.99133	-11.73582
7	247.8885	4.03533	2.11E-08	-12.10492	-10.78532	-11.64434
8	251.5021	3.814327	2.28E-08	-12.08345	-10.58791	-11.56147
9	259.0863	7.162882	2.01E-08	-12.28257*	-10.61108	-11.69918

Source: Author's calculation using Eviews10

Long Run relationship test

The result in table 4.3 illustrates the long-run relationship between stock price and exchange rate. The two variables have a long-run relationship according to the Trace test and Maximum max test that shows the critical values are smaller than trace statistic and max statistic 6.634897<15.05171and 6.634897<15.05171 significant in 99%.

Table 4.3: Johansen cointegration test between exchange rate and stock price

Trace Test				*Maximum Max Test*		
Hypothesized No. of CE(s)	Statistic	99% Critical Value	Prob.**	Statistic	99% Critical Value	Prob.**
None *	33.06592	19.93711	0.0001	18.01422	18.52001	0.0122
At most 1	15.05171	6.634897	0.0001	15.05171	6.634897	0.0001

Trace test indicates 2 cointegration eqn (s) at the 0.01 levelMax-eigenvalue test indicates 2 cointegration eqn (s) at the 0.01 level

*denotes rejection of the hypothesis at the 0.01 level *denotes rejection of the hypothesis at the 0,01 level

Source: Author's calculation using Eviews10

4.3 Error Correction Model

Table 4.4: Error Correction test

Variable	Coefficient	T-Statistic	Prob
C	-0.003629	-0.623042	0.5367
D(LN_EX)	1.453861	1.350324	0.1843
ECM(-1)	-0.070811	-1.189813	0.241

Source: Author's calculation using Eviews10

The short-run test by error correction model (ECM) shows in the table of 4.4demonstrates two variable stock price and exchange rate have no short–run relationship according to coefficient of ECM (-1) is minus -0.070811, P-value is bigger than 0.05 (0.241>0.05).

4.4 Granger causality test

Table 4.5: Granger causality test

Null Hypothesis:	F-Statistic	Prob.
LN_EX does not Granger Cause LN_PRICE	0.59415	0.7848
LN_PRICE does not Granger Cause LN_EX	2.30591	0.0659

Source: Author's calculation using Eviews10

Table 4.5 shows that stock price and exchange rate have no Granger causality to each other due to P-value 0.78 and 0.06 >0.05. In case of stock price in Cambodia security exchange and exchange rate of Cambodia riel to dollar showed two variables are not causing to each other or we can say two variables are independence neither bidirectional nor unidirectional.

5. Conclusion

The stock market has been playing an important role in economic development, it measures the economy 's situation of one country. The basic theory explains that when the domestic stock market rises, it gives investors' confidence that the country 's economy is also rising, leading to increased interest from foreign investors and demand from domestic currency. Conversely, if the stock market underperformance, confidence falter and foreign investors take their funds back to their own countries.

The relationship between stock prices and exchange rates has been long studied and discussed by many scholars and researches. In this paper, relationship between exchange rate and stock pricesinCambodia security exchange (CSX) has been investigated by perform Augmented Dickey-Fuller (ADF) test to check level of stationary of two variables, cointegration by Johansen for checking long run-relation, error correction model (ECM) for short-run association and granger causality test has been applied to check whether the stock prices and exchange rate are causing to each other or not.The results illustrated that two variables stationary at first difference I (1) with the stock price p-value 0.0001, 0.0005, 0.0000, and exchange rate p-value 0.0001, 0.0007, 0.0000 respectively (P-value<0.05). In the cointegration test, the Trace test and Maximum max test show the critical values are smaller than trace statistic and max statistic 6.634897<15.05171 and 6.634897<15.05171 with significant 99%, mean that stock price and exchange rate have a long-run relationship to each other, but they have no

relationship in the short-run because P-value of ECM is bigger than 0.05 (0.241>0.05). The last is Granger causality test revealed that stock price and exchange rate do not affect each other or they are independence**.**

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