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Future Spot Rate: The Implications in Indonesia

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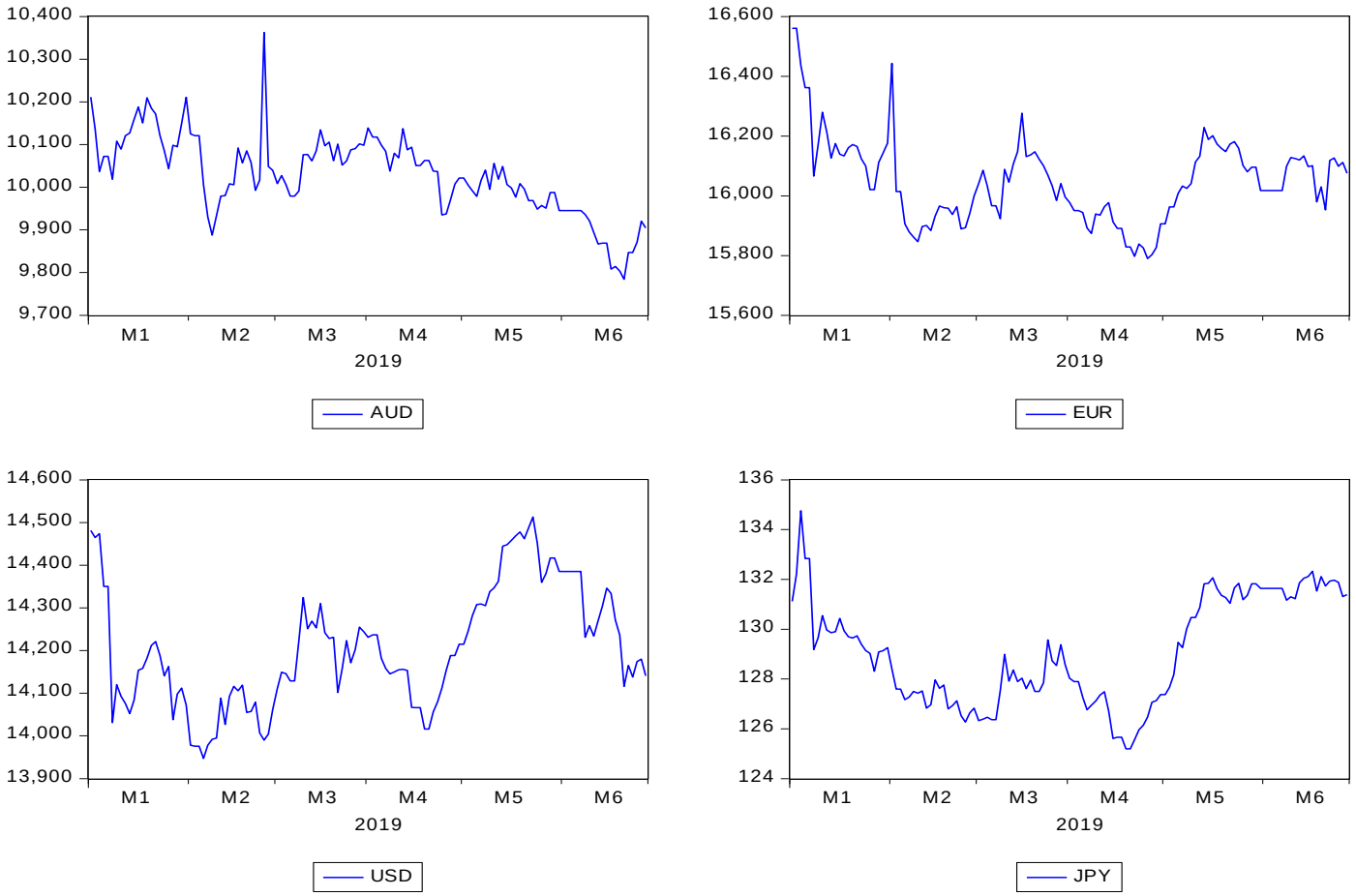
Abstract. Investors, multinational companies and governments require a rate forecasting to make informed decisions about the hedging of debts and receivables, funding and short-term investments, capital budgeting and long-term financing. The process of making forecasting from market indicators, known as market-based forecasting, is usually developed based on spot rates and forward rates. The current spot rate can be used as forecasting, as the exchange rate reflects the market estimate of the spot rate in a short period of time. The forward rate is used in forecasting, as the exchange rate reflects the market estimate of the spot rate at the end of the forecasting period. Based on the research conducted by Chiang (1986) of the samples used, empirical evidence indicates spot rates and forward rates are significant as predictors of future spots. Empirical evidence suggests that spot rates provide better forecasting results compared to forward rates. The research uses regression models for market-based forecasting methods. The variables used in this study are spot rates, forward rates and future spots. The samples used are from Bank Indonesia for spot rates in January – March 2019 and future spot in April – June 2019, and from Jakarta Futures exchange for forward rates in January – March 2019. The Stochastic and Chow Test models are selected and their use has been evaluated using quality and precise testing measures. Based on the sample period used, empirical evidence suggests that spot rates and forward rates are significant in predicting future spots for EUR, JPY and AUD currencies. Current spot rates provide better forecasting results in predicting Future spot compared to the forward rate. Both the F_t and S_t coefficient are sensitive to new information from the variation of the coefficient and time, it can increase the forecasting of the equation to each currency exchange rate used. The study states that variables from time series should be effectively utilized and utilized in predicting currency exchange rates, as this research demonstrates the absence of dependence on time series Can be concluded that foreign exchange rates in each country follow a pattern that is not stationary. The spot Euro exchange rate turns out to be statistically more accurate with an error rate of 0.004144% forecasting with the value of regression coefficient of Euro exchange rate is a Future Spot = 21.504,88 – 0.341229Spot + e_{t+1}.

Keywords: Spot rate; Forward rate; Future Spot

Introduction

The exchange rate of a country's currency is one of the important indicators in an economy. The exchange rate also has broad implications, both in the domestic and international economic context, considering that almost all countries in the world do foreign exchange transactions, often referred to as foreign currencies (Fama, 1984) (Madura, 2011) (Sarno, et.al, 2012) (Ebiringa, et.al, 2014) (Muchlas, & Alamsyah, 2015) (Ramasamy & Abar, 2015) (Tafa, 2015) (Wang, 2015) (Adisetiawan & Surono, 2016) (Ma, et.al, 2018) (He, et.al, 2018) (Keivan & Safari, 2018) (Caporalea, et.al, 2018) (Sarpong, 2019) (Inouea & Rossib, 2019). A very important issue noted in foreign exchange matters is exchange rates. While it is easy to measure the percentage of exchange rate changes in a currency, it is difficult to explain why the change occurred or predict how the exchange rate will change in the future. To achieve this goal, the concept of equilibrium exchange rate should be understandable, as well as factors affecting the balance of the exchange rate (Lustig, et.al, 2014) (Kowanda, et.al, 2014) (Jayanti, et.al, 2014) (Adisetiawan, 2017) (Adisetiawan, 2018) (Adisetiawan & Atikah, 2018) (He, et.al, 2018). The future spot is an important strategy for the success of international business, as well as to reduce the risk of foreign exchange transactions (Madura, 2011) (Yu, 2013) (Mahapatra & Bhaduri, 2019). The International Monetary Fund (IMF) sets several currency rates to pay for international transactions, such as: US Dollar (USD), Euro (EUR), Japanese Yen (JPY), Australian Dollar (AUD), British Pound (GBP), Hong Kong Dollar (HKD), French Franc (FRF), Belgian Franc (BEF), Swiss Franch (CHF), Italian Lira (ITL), German Mark (DEM), Swedish Krona (SEK), Danish Krone (DKK), Austrian Schiling (ATS), Portuguese Escudo (PTE) and Singapore Dollar (SGD) (Faisal, 2001) (Madura, 2011). Foreign currencies that are often used in Indonesia are four types of foreign currencies, such as: US Dollar (USD), Euro (EUR), Japanese Yen (JPY), Australian Dollar (AUD), because it represents the continent that exists in the world, namely: America, Europe, Asia and Australia, and also Indonesia often conducts international trade with countries on all four continents (Madura, 2011). The four types of currency exchange rates need to be researched behavior to predict future spot.



Graph 1. Fluctuation of US Dollar (USD), Euro (EUR), Japanese Yen (JPY), Australian Dollar (AUD) to Indonesian Rp (IDR)
Source: Bank Indonesia

Graph 1 is defined as the price of one unit of currency US Dollar (USD), Euro (EUR), Japanese Yen (JPY), and Australian Dollar (AUD) in Indonesian Rp (IDR). In the first quarter and II of year 2019 (i.e. January – June 2019) have been strengthened in quarter I, but at the beginning of quarter II, the exchange rate fluctuating to IDR, thereby affecting international financial transactions in Indonesia. The USD/IDR fluctuation is a source of exchange rate for investors, multinational companies and banking circles who are actively involved in foreign exchange transactions (Jayanti, et.al, 2014) (Kowanda, et.al, 2014) (Muchlas & Alamsyah, 2015). The change of economic growth in the United States (US) is a slight impact on the development of the country's currency (USD) on countries in the world, one of which is Indonesia (IDR). The use of euros allows the occurrence of cross-border trading and flow of funds within the Euro zone without the need to do a currency conference rate. European countries participating in a single Euro currency will still be affected by the Euro movement against other currencies such as USD. Furthermore, many companies in the United States (US) and in Asia will still be affected by the Euro-value movement relative to the USD (Madura, 2011) (Mahapatra & Bhaduri, 2019). In addition to American domination (USD) in Asia, it also has a strong Asian regional currency such as Japan (JPY). The strongest currency in Asia has become an alternative option for countries in Asia including Indonesia in forex trading transactions. Japan is the largest exporting country in Asia that often trade with Indonesia, and Indonesia often conducts trade transactions using the Yen currency (Kuncoro, 2001). Forex trading In addition to an interesting USD to be researched is Australia (AUD). Australia has great business potential as its economic growth is quite good and stable. The Australian Dollar is often used as one of the foreign currencies in forex trading transactions, because Australia is involved in the international trade flow and the financial flow with Indonesia. The trading volumes (exports and imports) between the two countries are enormous, so the exchange potential of both Rupiah and AUD is very large (Madura, 2011) (Mahapatra & Bhaduri, 2019).

The forex market is a dynamic market, so prices always change to reflect the changes in supply and demand (Faisal, 2001) (Ebiringa, et.al, 2014) (Jayanti, et.al, 2014) (Ramasamy & Abar, 2015) (Wang, 2015) (Caporalea, et.al, 2018) (Keivan & Safari, 2018) (Ma, et.al, 2018). The foreign exchange according to Kuncoro (2001), Sarno, et.al (2012), Ebiringa, et.al (2014), Jayanti, et.al (2014), Muchlas & Alamsyah (2015), Ramasamy & Abar (2015), Tafa (2015), Wang (2015), Caporalea, et.al (2018), He, et.al (2018) and Sarpong

(2019) is a crucial strategy for the success of international business ventures. Imprecision of forex projections can eliminate the opportunity of profiting from international trade transactions, as most transactions in international business are affected by changes in the exchange rate (Madura, 2011) (Sarpong, 2019) (Mahapatra & Bhaduri, 2019). The process of making forecasting of market indicators, better known as market based-forecasting is usually developed based on spot rates and forward rates. Forecasting can also use spot rates, because the spot rate reflects the market forecast of future spot in the near term (Madura, 2011). According to Fama (1984), Chiang (1986, 1988), Yu (2013), Wang (2015), Keivan & Safari (2018), the forward rate reflects the expected information to determine the upcoming exchange rate. It says that way, because the forward exchange rate is seen as the unbiased as of future spots. While spot rates are said to be the best fortune teller for a future spot, because the spot rate summarizes all relevant information that determines the future spot. According to Chiang (1988), Yu (2013), Wang (2015), Keivan & Safari (2018), many factors influence when forecasting future spots include forward rates and spot rates. The study concentrated its research on the characteristics of the stochastic parameters. Regression analysis shows that the parameters α and β and within the simple market efficiency specification are sensitive to the new information available and that information varies against all sub-samples of the period studied. Research Chiang (1988) states that the parameter nature of the data time series should be effectively utilized in determining future spot predictions. While according to Brzeszczynsky, et al. (2001) case studies in Poland, the development of the money market in Poland can be analyzed from a perspective outside the currency market by the process of changing the form of economic macroeconomics in Poland. In the early 1990 's was characterized by a high monetary force intervention in the mechanism of selling money markets and foreign exchange. The main reason to observe the dynamics of the money market, due to the adjustment of the economic system in Poland against changes in money market mechanisms and the characteristics of administrative restrictions in the 1990-an. Monetary and fiscal policy instruments have been created rules for Set up a system of economic equilibrium for a short period of time from the very high inflation rate (which affects the changes in the price structure and economy in Poland). Thus the study of Brzeszczynsky, et al (2001) uses the spot rate rate, forward rate and the interest rate of the domestic money market and the interest rate of the foreign money market in researching the floating currency and the money market and the capital market in Poland.

A forex market is called efficient when Forex exchange rates always reflect all available and relevant information. In empirical tests the market efficiency is required understanding how a hope is formed. A rational expectation means no systematic mistake in forecasting. Implication, the price change must be random in the sense that the change is unpredictable based on the past reality (Kuncoro, 2001) (Sarno, et.al, 2012) (Yu, 2013) (Wang, 2015) (Tafa, 2015). Spot market efficiency is a random walk hypothesis that is a forecasting model of market efficiency that uses spot rates as a predictor. Forward market efficiency is hypothesized unbiased forward rate model of market efficiency forecasting using forward rate as predictor. The efficiency of the composite market is hypothesized to combine the advantages of a random walk hypothesis with unbiased forward rate hypothesis in other words the market efficiency forecasting model that combines spot rates and forward rates as Independent variables (Kuncoro, 2001) (Ebiringa, et.al, 2014) (Muchlas & Alamsyah, 2015) (Adisetiawan, 2017) (Caporalea, et.al, 2018) (He, et.al, 2018).

Spot Rates

The currency rate follows the random walk process, meaning that the rate expectation of one future period (S_{t+1}) is the same as the spot rate (S_t): (Kuncoro, 2001) (Wang, 2015) (He, et.al, 2018) (Keivan & Safari, 2018) (Sarpong, 2019).

$$S_{t+1} = \alpha + \beta S_t + e_{t+1} \quad (1)$$

Where: S_{t+1} = Future spot (spot rate value in next period); α = constant; β = coefficient; S_t = current spot rate (Cash); e_{t+1} = error

This equation states that when the market is efficient, the current spot rate will reflect all available information. Unexpected changes in the spot rate (S_{t+1}- S_t) are essentially due to random, e_{t+1}, interference, which shake the market between t and $t+1$ periods.

Forward Rate

One alternative to measuring the expectation of a foreign exchange rate is to use the information reflected in the forward rate. The forward rate for a certain future date is usually used as the approximate spot rate in the future. The equation for the future spot rate addiction based on the forward rate is: (Madura, 2011) (Wang, 2015) (He, et.al, 2018) (Keivan & Safari, 2018) (Sarpong, 2019)

$$S_{t+1} = \alpha + \gamma F_t + e_{t+1} \quad (2)$$

Where: S_{t+1} = Future spot; α = constant; γ = coefficient; F_t = forward rate; e_{t+1} = error

The equation is made to test the hypothesis that forward exchange rates are said to be the Predictor Unbias of the future spot rate. To test the hypothesis of market forward efficiency is to test $\alpha = 0$ and $\beta = 1$. The unbiased forward rate hypothesis teaches that forward rates have

been widely used as an unbiased predictive tool for future spot rates.

Future Spot Rate

The future Spot Rate is the value of the Spot rate that will happen in the future, or the rate of exchange rate against the domestic exchange rate that occurs in the next period. To test the Future Spot Rate reflecting market efficiency, observations begin by identifying the characteristics of the various currencies. This hypothesis teaches that future spot rate expectations are the weighted average of the current spot rate in the formula (1) or the spot market efficiency test as well as the forward rate of the formula (2) or the forward market efficiency test and Together the spot rate and the forward exchange rate are used to test the Future Spot on the formula (3) or the composite market efficiency test. Future spot based on composite market efficiency: (Kuncoro, 2001) (Wang, 2015) (He, et.al, 2018) (Keivan & Safari, 2018) (Sarpong, 2019)

$$S_{t+1} = \alpha + \beta S_t + \gamma F_t + e_{t+1} \quad (3)$$

Where: S_{t+1} = Future spot; α = constant; β, γ = coefficient; S_t = Spot Rate (Cash) 3 months ago; F_t = forward rate at 3 months ago; e_{t+1} = error

Hypothesis

Hypotheses in this study are as follows:

H_1: Rate of Spot rate in quarter I year 2019 significantly positively affect Future Spot quarter II year 2019 for each exchange rate of €1, USD $1, ¥100 and AUD $1 against IDR Rp1.

H_2: Forward rate rate at quarter I year 2019 significantly positive against Future Spot quarter II year 2019 for each exchange rate of €1, USD $1, ¥100 and AUD $1 against IDR Rp1.

H_3: Spot rate and Forward rate rates in the quarter I year 2019 jointly influence significantly positive towards Future Spot quarter II year 2019 for each exchange rate of €1, USD $1, ¥100 and AUD $1 against IDR Rp1.

The differences and equations of this research with previous research

This research aims to examine four types of currency exchange rates such as EUR (€), USD ($), Japanese Yen (¥) and AUD ($) against IDR (Rp) using spot and forward rates in quarter I year 2019 to predict future spot in quarter II of year 2019 Can minimize the exchange rate risk. Research Chiang (1986) examines the empirical analysis of forecasting future spot rates through market efficiency approaches using British pound, German Mark, French Franc and Canadian Dollar. The analytical tools used are ARIMA, t-test and F-test. The result is that current spot rates provide better forecasts (accurate) for future spot rate, compared to using current forward rates for long-term forecasting. Research Chiang (1988) examines on placing spot rates and forward rates as predictive tools for upcoming spot rates (future spots) through an approach of stochastic coefficient with research object of British pound (£), French Franc (₣) , German Mark and Canadian Dollar against the US Dollar (USD). The analyzers used are simple and multiple regresis regression, t-test, F-test, constant parameter testing and stochastic testing. The result is the α and β parameters in the simple efficiency specification are sensitive to the latest information obtained and the information varies throughout the period from the samples taken. Brzeszczynsky, et al (2001) examines the short-term dependence between floating currencies, the capital market and the money market case study in Poland, using the currency of the US Dollar (USD) and the Euro (€) against the Polish Dollar (PLN). Analysis tool used using GARCH model. The result is that it is more satisfying (more accurate/significant) to predict the rate of Euro currency against the Polish Dollar (EUR/PLN) compared to forecasting the U.S. Dollar against Polish Dollar (USD/PLN) by using the forward rate In predicting short-term future spots.

The equation of this research with Chiang (1986, 1988) is equally researching spot rates and forward rates for predicting future spots, and using regression analysis tools. The future spot formula used in this study is a replication of Chiang (1986). The study also used the same stochastic coefficient test with Chiang (1988). Meanwhile, the similarity with the research done by Brzeszczynsky, et al. (2001) is to predict the future spot and behavior of foreign exchange against the domestic currency in a short period of time.

Method

The data used in this research includes spot rate data taken from the central exchange rate of Bank Indonesia at quarter I year 2019 (January – March) and forward rate data taken from Jakarta Futures Exchange (JFX) in quarter II year 2019 (January – March). As for the future spot is taken from futures contracts in the JFX in the II quarter (April – June) year 2019. The study uses simple regression analyses with formulas (1), formulas (2) and multiple regression analyses on the formula (3), which are applied on each Euro foreign exchange rate (€), USD ($), Japanese Yen (¥) and AUD ($).

Classic Assumption Test

The classic assumption test in this study is autocorrelation test to test regression model there is a correlation between disruptor fault in t period with disruptor error in previous period ($t-1$). t period is the period in the future, i.e. the Future spot and $t-1$ period is at the time of observation, the spot rate and the forward rate. The autocorrelation test used to detect the presence of autocorrelation is with Durbin Watson (DW) test. The hypotheses to be tested are: (Adisetiawan, R., Yunan Surono, 2016)

H_0: no autocorrelation ($r = 0$)
H_A: There is an autocorrelation ($r \neq 0$).

If, $0 < d < dl$ then reject H_0, it means there is an autocorrelation between disruptor error in t period with disruptor error in previous period ($t - 1$) (Ghozali, 2011).

Table 1. Test DW decision making

Hipotesis null	Decision	If
no positive autocorrelation	reject	$0 < d < dl$
no positive autocorrelation	no decision	$dl \leq d \leq du$
no negative correlation	reject	$4 - dl < d < 4$
no negative correlation	no decision	$4 - du \leq d \leq 4 - dl$
no autocorrelation, positive or negative	not rejected	$du < d < 4 - du$

Source: Ghozali (2006)

Stochastic Test

Data time series generally has random properties or stochastic processes, i.e. a set of random variables arranged in time. The purpose of the stochastic testing is to analyze the probability or the stochastic nature of a data time series itself or in philosophy let the data Speak (Ghozali, 2011) (Adisetiawan, 2017). The process of stochastic testing is to test stationary stochastic process by testing the data chart time series, whether a stationer or a non-stationer. A stochastic process is called a stationer if the mean and variance values are constant all the time, therefore if the time series data is not affected by time invariant. If the data time series is not a stationer, then the value of mean is influenced by time, meaning the fourth movement of foreign exchange rates in the period moves together. The next stochastic test is to see the autocorrelation with a systematic pattern by using the Q statistical test (Test Box Pierce). The Q statistical test is used to see autocorrelation with lag of more than 2. The stochastic test is used to look at the parameters of α_t, β_t and γ_t in efficiency of the market that is sensitive to the latest information and its variation on sub-sample periods. The results of the Q statistical test will be compared with DW test (Ghozali, 2011) (Adisetiawan, 2017). The steps to perform the stochastic test, the autocorrelation function (ACF) is to determine the equation of the spot market efficiency regression, the forward market efficiency regression, the regression of the composite market efficiency, the correlation test (autocorrelation) to test residual persistence in sub-samples of periods, if the number of significant lag is more than 2, it is said to occur autocorrelation, if the number of significant $lag \leq 2$, then it is said there is no autocorrelation, and the result of the test of the Q statistics then compared to Durbin Watson (DW) test.

R^2test

The coefficient of determination (R^2) Essentially measures how far the ability of the model in describing the variation of the dependent variable. The value of R^2 ranges from 0 – 1. The larger the R^2 value, meaning the better the sample regression line matches the data or what percentage can be explained about the dependent variable (Y) by the independent variable (X). In general, time series coefficient usually has a high coefficient of determination value (Ghozali, 2011) (Adisetiawan & Surono, 2016).

t-test

t-tests are used to see the significance of individual independent influences on dependent variables by assuming other variables are constant. Test this by comparing t-tables and t-count with α = 0.05. This test is done by looking at the number of degree of freedom (DF) and comparing the count and t values of the table. If df = 20 is at a degree of significance 0.05 and t-count > t-table; or t-count > 2 (in absolute value); The independent variable is a significant explanatory of the dependent variable. (Ghozali, 2011) (Adisetiawan & Surono, 2016)

F-test

F-test is performed to test the significance of the regression equation model used. This test is done by comparing the F-count and F-table values with α = 0.05. F-test can also be detected with ANOVA test on condition: If the significance level is < 0.05; then the regression equation model used is significant, and if the significance level is > from 0.05; then the regression equation model used does not Significant. (Ghozali, 2011) (Adisetiawan & Surono, 2016)

Chow-test

Chow test is a tool to test test for equality of coefficients (Ghozali, 2011). Based on the calculation of Chow test for each exchange rate €, USD $, ¥, AUD $ in the market efficiency formula: $S_{t+1} = \alpha + \beta S_t + e_{t+1}$; $S_{t+1} = \alpha + \gamma F_t + e_{t+1}$; and $S_{t+1} = \alpha + \beta S_t + \gamma F_t + e_{t+1}$. As for the steps to do the Chow test is: Determining the equation of regression efficiency of spot market with

formula (1), Forward market with formula (2), and composite market with formula (3), rate RSS-Spot, RSS-Forward, and RSSr composite, calculate RSSur = RSS-Spot + RSSForward, calculates the F-count with the formula: $F = \frac{(RSSr - RSSur)/k}{(RSSur)/(n1+n2-2k)}$, as well as comparing the F-count value with the F-table; If F-count > F-table, then H_0 is rejected, meaning the previous period regression model and the period regression model of the observation did differ.

Results

The number of sample rate and the forward rate of quarter I year 2019 and future Spot quarter II year 2019 which is observed from 4 (four) foreign exchange rates are each of 64 data, namely the number of working days for 3 months.

Table 2. Number of sample rates, Forward and Future Spot rates

Variable's		Jan	Feb	Mar	Apr	May	Jun	Number of samples
Rate Spot	EUR	23	20	21				64
	USD	23	20	21				64
	JPY	23	20	21				64
	AUD	23	20	21				64
Rate Forward	EUR	23	20	21				64
	USD	23	20	21				64
	JPY	23	20	21				64
	AUD	23	20	21				64
Future Spot	EUR				23	22	19	64
	USD				23	22	19	64
	JPY				23	22	19	64
	AUD				23	22	19	64

Source: Bank Indonesia and Jakarta Futures Exchange

The results of a descriptive analysis of the spot rate, forward and future spot rates, are as follows:

Table 3. Results of descriptive statistical variables of research

Variable's		N	Mean	Standard Deviation	Minimum	Maximum
Rate Spot	EUR	64	16,082.81	160.3883	15,846.55	16,561.00
	USD	64	14,145.45	122.7369	13,947.00	14,481.00
	JPY	64	128.50	1.7347	126.27	134.76
	AUD	64	10,078.02	77.8350	9,887.46	10,362.59
Rate Forward	EUR	64	16,055.83	141.6803	15,818.20	16,485.20
	USD	64	14,135.39	112.6246	13,922.00	14,450.00
	JPY	64	128,33	1.5947	126,12	133,84
	AUD	64	10,071.46	74.2642	9,890.19	10,240,01
Future Spot	EUR	64	16,016.96	117,3153	15,790.21	16,228.56
	USD	64	14,263.24	131.8695	14,600.00	14,513.00
	JPY	64	129.61	2.4072	125.20	132.33
	AUD	64	9,981.95	85.3092	9,784.51	10,138.90

Source: Processed Data

The minimum and maximum value of each sample range is not too far away, so the sample can be said to be representative of its population. The standard deviation value indicates how far a value is obtained deviates than expected.

The results of the autocorrelation test are as follows:

Table 4. DW-test autocorrelation Result

Exchange rate	Durbin Watson (DW)
EUR	0.317892
USD	0.125565
JPY	0.220371
AUD	0.139278

Source: Processed Data

According to Table 4 the value of DW at the fourth foreign exchange rate is at a condition of $0 < d < dl$, then reject H_0, meaning there is an autocorrelation between disruptor errors in the t period that is in quarter II year 2019 with disruptor error in the period $(t-1)$ in the quarter I year 2019.

Stochastic Test

Table 5. Stochastic test Results

	Kurs Spot				Kurs Forward				Future Spot			
ACF	EUR	USD	JPY	AUD	EUR	USD	JPY	AUD	EUR	USD	JPY	AUD
Lag 1	0.7580	0.7940	0.8660	0.5320	0.7720	0.8410	0.8700	0.7050	0.9250	0.9450	0.9770	0.9020
Lag 2	0.6020	0.6450	0.7540	0.3540	0.6670	0.6360	0.7190	0.5420	0.8650	0.8870	0.9490	0.8410
Lag 3	0.4640	0.4580	0.6110	0.2570	0.5560	0.4740	0.6220	0.4460	0.7730	0.8210	0.9140	0.7480
Lag 4	0.3390	0.3090	0.5380	0.1480	0.4420	0.3500	0.5570	0.2540	0.6990	0.7530	0.8730	0.6830
Lag 5	0.2400	0.1440	0.4800	0.0090	0.4210	0.2400	0.5220	0.1440	0.6220	0.6940	0.8280	0.6310
Lag 6	0.2860	0.1020	0.4600	-0.0320	0.3720	0.1370	0.4800	0.0960	0.5580	0.6280	0.7820	0.5910
Lag 7	0.2910	0.0620	0.4520	-0.1040	0.2760	0.0560	0.4420	0.0200	0.4930	0.5740	0.7280	0.5150
Lag 8	0.2480	0.0240	0.4180	-0.0430	0.2260	0.0280	0.4040	0.0730	0.4360	0.5040	0.6740	0.4460
Lag 9	0.2150	0.0330	0.3910	0.0510	0.2170	0.0290	0.3590	0.1850	0.3630	0.4450	0.6160	0.3400
Lag 10	0.1960	0.0860	0.3690	0.0910	0.1470	0.0390	0.3230	0.1670	0.2980	0.3620	0.5540	0.2890
Lag 11	0.1720	0.1110	0.3350	0.0330	0.1360	0.0770	0.2930	0.1720	0.2120	0.2680	0.4880	0.2520
Lag 12	0.1440	0.1240	0.2790	-0.0270	0.1340	0.1190	0.2710	0.1170	0.1420	0.1700	0.4200	0.2220
Lag 13	0.1430	0.1290	0.2470	0.0080	0.1130	0.1400	0.2480	0.0450	0.0640	0.0750	0.3560	0.2000
Lag 14	0.0770	0.1530	0.2000	-0.0310	0.0990	0.1620	0.2120	-0.0010	0.0010	-0.0160	0.2890	0.1610
Lag 15	0.0490	0.0950	0.1380	0.0360	0.0390	0.1400	0.1630	0.0390	-0.0600	-0.1090	0.2220	0.1220
Lag 16	-0.0210	0.0600	0.0960	-0.0690	-0.0080	0.0800	0.1000	-0.0470	-0.0960	-0.1720	0.1610	0.1000
Lag 17	-0.0860	0.0230	0.0520	-0.0770	-0.1030	0.0270	0.0380	-0.0960	-0.1200	-0.2340	0.1040	0.0690
Lag 18	-0.1050	-0.0090	0.0370	-0.0300	-0.0600	-0.0010	0.0210	-0.0380	-0.1510	-0.2990	0.0500	0.0750
Lag 19	-0.0110	-0.0950	0.0020	-0.0330	-0.0770	-0.0580	-0.0090	-0.0570	-0.1710	-0.3560	0.0020	0.0960
Lag 20	0.0100	-0.1490	-0.0330	-0.0680	-0.1440	-0.1580	-0.0720	-0.1100	-0.1740	-0.4120	-0.0420	0.0850
Lag 21	0.0210	-0.2260	-0.0910	-0.0380	-0.1590	-0.2750	-0.1420	-0.1480	-0.1780	-0.4560	-0.0830	0.0780
Lag 22	-0.0200	-0.3350	-0.1630	-0.1060	-0.2910	-0.3960	-0.2400	-0.2710	-0.1730	-0.4790	-0.1200	0.0430
Lag 23	-0.1250	-0.4000	-0.2180	-0.0980	-0.3290	-0.4500	-0.2780	-0.3070	-0.1860	-0.5030	-0.1540	0.0120
Lag 24	-0.3030	-0.4250	-0.2430	-0.1000	-0.3720	-0.4760	-0.3030	-0.2980	-0.1950	-0.5300	-0.1850	-0.0290
Lag 25	-0.3750	-0.4520	-0.2560	-0.0700	-0.4290	-0.5020	-0.3090	-0.3330	-0.2110	-0.5420	-0.2160	-0.0490
Lag 26	-0.3670	-0.4110	-0.2440	-0.0840	-0.4590	-0.4880	-0.2890	-0.2980	-0.2070	-0.5280	-0.2400	-0.0540
Lag 27	-0.3550	-0.3720	-0.2550	-0.0720	-0.3970	-0.4050	-0.2750	-0.1900	-0.2120	-0.5140	-0.2640	-0.0500
Lag 28	-0.3120	-0.3030	-0.2740	-0.0960	-0.3550	-0.3260	-0.2800	-0.1990	-0.1910	-0.4930	-0.2880	-0.0760

Source: Processed Data

Based on the results of Box Pierce test calculation that each spot exchange rate, forward and future spot rate resulted in 28 lag, from to 28 lag is apparently for spot rates, forward rates and future Forex EUR, JPY and AUD do not occur autocorrelation. This can be seen from the significant number of lag = 2, so it can be said that no autocorrelation occurs. The value of ACF (Autocorrelation Function) in the exchange rate of EUR, JPY and AUD decreased slowly until lag 28 (default), due to spot rate data, forward rate and future Forex currency EUR, JPY and AUD not a stationer then the market efficiency behaviour observed Only in the period of observation time, namely quarter I and quarter II year 2019.

R^2-test

Table 6. R^2 test Results

	R^2		
	Spot	Forward	Composite
EUR	0.217635	0.208508	0.233588
USD	0.089792	0.076004	0.089796
JPY	0.432038	0.402268	0.436202
AUD	0.017449	0.027156	0.027636

Source: Processed Data

Based on the results of the coefficient of determination of determination, it appears that 4 (four) foreign exchange rates of R^2 close to 0 or R^2 = 0, meaning that the variation of Future Spot can be

explained by variations of the Spot rate variable, forward rate, and the spot rate and the forward rate are limited.

t-test hypothesis for the forex market efficiency

Table 7. Result t-test; Hypothesis for the forex market efficiency

		Spot			Forward			Composite		
		Coefficient	t-value	Significance	Coefficient	t-value	Significance	Coefficient	t-value	Significance
EUR	α	21,504.88	16.27283	0.0000	22,087.66	14.70374	0.0000	22,306.44	14.88805	0.0000
	β	-0.341229	-4.15294	0.0001				-0.205679	-1.412875	0.1628
	γ				-0.37810	-4.04141	0.0001	-0.185700	-1.126840	0.2642
USD	α	18,817.36	10.21838	0.0000	18,826.10	9.31727	0.0000	18,831.41	9.314175	0.0000
	β	-0.321949	-2.47311	0.0161				-0.316647	-0.961430	0.3401
	γ				-0.32280	-2.25829	0.0275	-0.006301	-0.017555	0.9861
JPY	α	246.8233	14.46006	0.0000	252.4755	13.27268	0.0000	251.7137	13.51163	0.0000
	β	-0.912125	-6.86748	0.0000				-0.688276	-1.916120	0.0600
	γ				-0.957379	-6.459518	0.0000	-0.262254	-0.671196	0.5046
AUD	α	8,522.854	6.129065	0.0000	8,075.415	5.572102	0.0000	7,986.850	5.161330	0.0000
	β	0.144780	1.049311	0.2981				0.033966	0.173410	0.8629
	γ				0.189300	1.315557	0.1932	0.164106	0.799401	0.4272

Source: Processed Data

Based on Table 7, to test spot market efficiency in the formula (1), forward market efficiency in the formula (2) and the efficiency of the composite market in the formula (3), by comparing the value of significance (α = 0.05); Then: the spot market's efficiency hypothesis on the formula (1), can not be rejected at a degree of significance 5% for foreign exchange rates EUR, USD and JPY, meaning the spot rate is a significant explanatory for the future spot. For the AUD exchange rate is not significant and efficiency of spot market is rejected meaning spot rate is not a significant explanatory for future spot. The calculation of forward market efficiency in the formula (2), can not be rejected at a degree of significance 5% for foreign exchange rates EUR, USD and JPY means that the forward rate is a significant explanatory for the future spot. For AUD exchange rate is not significant and forward market efficiency is rejected means forward rate is not a significant explanatory for future spot. The hypothesis of the composite market efficiency in the formula (3), rejected/insignificant at a degree of significance of 5% for all foreign exchange rates i.e. EUR, USD, JPY and AUD, meaning spot rates and the Foward exchange rates are not a significant explanatory for future spots.

F-test hypothesis of the precision Model of currency market regression

Table 8. Result Test-F, Precision model of currency market regression

		F-value	Significance
Euro	Spot	17.24687	0.000102
	Forward	16.33303	0.000149
	Composite	9.295842	0.000299
USD	Spot	6.116290	0.016149
	Forward	5.099853	0.027457
	Composite	3.008989	0.056718
JPY	Spot	47.16229	0.000000
	Forward	41.72538	0.000000
	Composite	23.59740	0.000000
AUD	Spot	1.101054	0.298108
	Forward	1.730689	0.193167
	Composite	0.866843	0.425388

Source: Processed Data

While the value of F-table with a degree of significance 0.05 for Spot and Forward F(1.62) is 4.00, for composite F(2.61) is 3,153. Empirical evidence suggests that: H_0 spot market efficiency in the formula

(1), cannot be rejected at a degree of significance of 5% for foreign exchange rates EUR, USD and JPY, meaning that the regression equation model in the formula (1) is significantly used to predict The future spot on the exchange rate of EUR, USD and JPY. For the AUD exchange rate is not significant, it means that the regression equation model in the formula (1) cannot be used to predict future spot. H_0 forward market efficiency in the formula (2), can not be rejected at a degree of significance 5% for foreign exchange rates EUR, USD and JPY, meaning the regression equation model in the formula (2) is used significantly to predict the future spot at the rate of EUR, USD and JPY. For the AUD exchange rate is not significant, meaning the regression equation model in the formula (2) can not be used to predict the future spot. H_0 composite market efficiency in the formula (3), can not be rejected at a degree of significance of 5% for foreign exchange rates EUR and JPY, meaning the regression equation model in the formula (3) is significantly used for the exchange rate of EUR and JPY. For the USD and AUD exchange rate is not significant, it means that the regression equation model in the formula (3) can not be used to predict future spot.

Chow Test

Table 9. Chow Test Result

		EUR	USD	JPY	AUD	n	k	df
RSS	Spot	678,360.23	997,171.25	207.300558	450,494.44	64	2	
	Forward	686,272.97	1,012,276.52	218.165092	446,043.62	64	2	
Total		1,364,633.21	2,009,447.77	425.465649	896,538.06			124
RSSr	Composite	664,526.89	997,166.21	205.771049	445,823.84	64	3	
F-count		-31.808248	-31.233186	-32.014489	-31.169097			

Source: Processed Data

F-table or F (2.124) is 3.07. The results in table 9 above, can be concluded as follows:

1. EUR exchange rate

   S_{t+1} = 21,504.88 – (0.341229)S_t + e_{t+1}

   S_{t+1} = 22,087.66 – (0.3781)F_t + e_{t+1}

   S_{t+1} = 22,306.44 – (0.205679)S_t – (0.1857)F_t + e_{t+1}

   A regression test appears that the nominal coefficient of each coefficients of the α, β and γ is different, but significantly no different. This can be evidenced in the following calculation results:

   RSSur = RSS(Spot) + RSS(forward)

   = 678360.233873859 + 686272.971686937 = 1364633.2055608

   $F - count = \frac{(664526.892862006 - 1364633.2055608)/2}{(1364633.2055608)/124}$ = -31.808248

   Due to the F-count < F-table, then the H_0 accepted means that the regression model of spot market efficiency, forward market efficiency and the regression model of composite market efficiency is the same (the same economic subject).

2. USD exchange rate

   S_{t+1} = 18,817.36 – (0.321949)S_t + e_{t+1}

   S_{t+1} = 18,826.16 – (0.3228)F_t + e_{t+1}

   S_{t+1} = 18,831.41 – (0.316647)S_t – (0.006301)F_t + e_{t+1}

   In spot market efficiency, forward and composite USD exchange rate resulted in the regression coefficient above, but because the USD exchange rate is not significant in t-test and F-test then statistically the USD rate is unpredictable.

3. JPY exchange rate

   S_{t+1} = 246.8233 – (0.912125)S_t + e_{t+1}

   S_{t+1} = 252.4755 – (0.957379)F_t + e_{t+1}

   S_{t+1} = 251.7137 – (0.688276)S_t – (0.262257)F_t + e_{t+1}

   A regression test appears that the nominal value in each coefficient of α, β and γ differs, but is significantly no different. This can be evidenced in the following calculation results:

   RSSr(RSS3) = 205.771049272068

   RSSur = RSS(Spot) + RSS(forward)

   = 207.300557726977 + 218.165091552779 = 425.465649279756

   $F - count = \frac{(205.771049272068 - 425.465649279756)/2}{(425.465649279756)/124}$ = -32.014488651516

   Due to the F-count < F-table, then H_0 is accepted meaning: that the regression model of spot market efficiency, forward market efficiency and the regression model of composite market efficiency is the same (the same economic subject).

4. AUD exchange rate

S_{t+1} = 8,522.854 + (0.14478)S_t + e_{t+1}
S_{t+1} = 8,075.415 + (0.1893)F_t + e_{t+1}
S_{t+1} = 7,986.85 + (0.033966)S_t + (0.164106)F_t + e_{t+1}
In spot market efficiency, the AUD forward and composite exchange rate resulted in the regression coefficient above, but because the AUD exchange rate was insignificant in t-test and F-test then statistically the AUD's exchange rate is unpredictable.

The result of a regression estimate for the efficiency hypothesis on the forex market and the market-efficiency hypothesis testing at the same time showed that on spot market efficiency or one hypothesis (H_1) failed to be rejected for the EUR, USD, and JPY exchange rates. As for the exchange rate of AUD hypothesis one (H_1) is rejected at a degree of significance 5%; Because only one exchange rate rejects the hypothesis one (H_1), that is the AUD exchange rate, hence the conclusion of this study to hypotheses one is H_1 failed to be rejected. It shows that the spot rate rate in quarter I year 2019 affects positively and significantly against future spot quarter II year 2019 as Euro, USD and JPY. The results of the calculation of the regression estimate for the efficiency hypothesis on the foreign exchange market and the market efficiency hypothesis test simultaneously shows that the forward market efficiency or the hypothesis two (H_2) failed to be rejected for the EUR, USD, and JPY exchange rates. While at AUD the exchange rate hypothesis two (H_2) was rejected at a degree of significance 5%; Because only one exchange rate rejects the hypotheses two (H_2), the AUD exchange rate, the conclusion of this study for the hypotheses two is H_2 failed to be rejected. It shows that the spot rate rate in quarter I year 2019 affects positively and significantly against future spot quarter II year 2019. The results of the regression estimate for the efficiency hypothesis on the forex market and the market's hypothesized hypothesis testing simultaneously shows that the efficiency of the composite market or the hypothesis three is rejected on all foreign exchange rates studied, i.e. EUR, USD, JPY and AUD. This indicates that the spot rate and forward rate are jointly in the quarter I year 2019 does not positively and significantly affect the future spot quarter II of 2019. The results of this research turned out to support research Chiang (1986). The sample period used is spot rate and forward rate quarterly I and future Spot quarter II, empirical evidence shows that both the spot rate and the current forward rate (current spot rates and current forward rates) are significant in forecasting the exchange rate Future spot rate. A general conclusion that can be withdrawn from this study and the Research Chiang (1986) is that there is no empirical evidence that counteracts the market efficiency hypothesis applied to the spot market and the forward market.

Forecasting performance evaluation

The results of the test hypothesis on the estimation of market efficiency regression that spot EUR, USD, and JPY quarter I influence positively and significantly to predict future spot quarter II year 2019. t-test result is a regression coefficient of the spot market efficiency in the formula (1) for the EUR, USD and JPY rates are as follows:

1. EUR exchange rate: Future Spot = 21,504.88 – (0.341229)Spot + e_{t+1}
   If the spot value = 0, then the forecasting value for the Euro spot rate in quarter II year 2019 is €1 = Rp. 21,504.88
2. USD: Future Spot = 18,817.36 – (0.321949)Spot + e_{t+1}
   If the spot value = 0, then the forecasting value for USD spot rate in quarter II year 2019 is US $1 = Rp. 18,817.36
3. JPY: Future Spot = 246,8233 – (0.912125)Spot + e_{t+1}
   If the spot value = 0, then the forecasting value for the JPY spot rate in quarter II year 2019 is ¥1 = Rp. 246,8233

Different currency value forecasting capability for each currency. To view accurate forecasting results for each foreign exchange rate, a forecasting performance test is required. Testing the forecasting performance is by comparing forecasting results with forecasting realization values, the measurement of forecasting errors required. The forecasting error is calculated in absolute terms as a percentage of the realization value of the foreign exchange rate (Madura, 2011). According to Madura (2011), the measurement of forecasting errors is as follows:

$$\text{Forecasting error} = \frac{(\text{value of forecast} - \text{value of realization})}{\text{Value of realization}}$$

Table 10. Forecasting performance

	Value of forecast	Value of realization	Forecasting error	percent
EUR	15,854.21	15,977.86	4×10^{-5}	0.004144
USD	14,155.21	14,231.00	8×10^{-5}	0.007659
JPY	127.22	128.03	2×10^{-4}	0.019496

Source: Processed Data

Based on Table 10, it is revealed that the most small EUR exchange rate error between JPY and AUD exchange rate, it can be said that the prediction of EUR exchange rate is more accurate with error presentation 0.004144%.

Conclusion and Policy Implications

This research aims to test the influence of spot rate and forward rate in predicting future spot. Future spot predictions are made so that investors and international economic actors can anticipate fluctuations in the foreign exchange rates in this study EUR, USD, JPY and AUD against the domestic currency of IDR, so that in transaction can minimize Risk of exchange rates. In this research, it is proven that spot rates and exchange rates forward positively and significantly affect the future spot for foreign exchange rates EUR, USD and JPY and AUD against IDR with the following result:

1. Result determination (R^2) that the value of R^2 is approaching 0 for all exchange rates (EUR, USD, JPY and AUD) on all market efficiencies (spot, forward and composite); This means that Future Spot variations can be explained by variations of spot rate variables, forward or spot rates and the forward rate with a limited rate. In general, the spot market efficiency model, forward market efficiency and the precise composite market efficiency for the short-term data in this study is quarterly for daily time series data.
2. Predicting the value of foreign exchange rates should be done in a short time period. This is done so that investors can minimize the exchange rate risk, because fluctuations in currency rates are affected by the event and the latest information about the supply and demand of forex rates of EUR, USD, JPY and AUD against IDR on a random basis. The forex financial market for the quarter I and quarter II of 2019 is apparently an efficient market and included in the weakly efficiency market.
3. Statistical empirical evidence suggests that spot rates and forward rates can be used to predict a future spot in a short period of time. The best predictors are the spot rate for the EUR, JPY and AUD rates. The USD rate should not be used in foreign exchange transactions in 2019 because significantly the USD rate is inefficient and continues to decline against the IDR exchange rate.
4. Forecasting performance appraisal results in that the rate of EUR empirically is more accurate than the exchange rate of JPY and AUD with an error rate of 0.004144%, and the value of a regression coefficient of EUR exchange rate is: *Future Spot* = 21.504,88 – 0.341229Spot + e_{t+1}.

Policy implications

Based on the results of a regression estimate for the currency prediction hypothesis based on market efficiency in the Forex market (t-test) and the simultaneous testing of market estimation hypothesis (F-test) proved that to predict future spot of investors and perpetrators International economies can use spot rates or forward rates as predictors for short term in the year 2019 for the next quarter. The reason is because the movement of foreign exchange rate against IDR Rp1 occurs every day, even in one day forex fluctuations against IDR often occur. Empirically it is proven that spot rates are the best predictors in predicting future spots. In addition to using spot rates and forward rates as predictors, investors and international economic actors should also pay attention to the disruptor factor ($e + 1$), meaning the latest information affecting exchange rate fluctuations should be anticipated. Currency rates that should be used in the years 2019 are EUR, JPY and AUD. The EUR exchange rate empirically proved to be more accurate compared to the exchange rate of JPY and AUD, because the rate of error in predicting the spot rate of EUR is 0.004144%. The Australian Dollar should not be used in this year 2019, because the statistically unpredictable AUD rates, so that investors can experience the risk of losses resulting from a decrease in the exchange rate of AUD/IDR. Policy implications can be utilized by:

a. Government, if the government wants to borrow money, then the government has access to borrow on several different currencies. If the government wants to consider investing in foreign projects, the government can use the spot rate as a predictor (spot market efficiency), because the spot rate is shown to provide better prediction results (accurate). The exchange rate used should be the EUR exchange rate, as the Euro exchange rate gives better forecast results with an error rate of 0.004144%. AUD rates should not be used first for the year 2019, because empirically the AUD exchange rate is inefficient and the fluctuation tends to decline against the IDR.
b. Companies, multinational company/MNC or companies that have inter-state transactions need to predict foreign exchange rates because the company's operating activities are affected by exchange rate changes. The benefit of the company's foreign exchange rate is: (1) The decision for hedging decision. Hedging decisions can be used over debts and receivables in foreign currency units. It can be done by adjusting the pricing policy to hedge against exposure transactions such as futures hedging, forward hedging, money market hedging and currency option hedging; and (2) the impact of the exchange rate on the company's local sales. Historical Data

can be used to assess how local sales are affected by exchange rates.

c. Investors, the exchange rate difference between one currency and another, leads to individual investors as well as corporate investors and a country investor wants to invest funds to maximize their wealth. Usually these investors invest in the form of stocks or international funds that are the stock portfolios of various countries. Investors can also develop their business in various countries by utilizing the uniqueness and characteristics of the country. The existence of foreign exchange forecasting causes investors to choose the type of currency exchange that want to be invested in order to obtain maximum profit.

Theoretical implications

Research Chiang (1986) generates that for the sample period used, empirical evidence suggests that both spot and forward rates nowadays are significant in forecasting future spot rate. This research resulted in the simultaneous testing of the market efficiency test consistent with the results of a regression estimate for the efficiency hypothesis of the foreign exchange market that there is no empirical evidence that counteracts the market efficiency hypothesis applied On the spot market and forward market. Furthermore Chiang (1988) researched about placing the spot rate and the forward exchange rate as a predictive tool for future spots through the Stokhastik approach resulted in that of the parameter of the stokhastic characteristic tested through regression analysis produce that the α and β parameters in the simple efficiency specification are sensitive to the latest information obtained and the information varies throughout the period from the samples taken. The study resulted that from the Chow test it appears that the nominal value of each coefficient of α, β, and γ are different, but significantly no different. Box Pierce's stokhastic test results that α_t, β_t, and γ_t in market efficiency are sensitive to the latest information affecting the movement of foreign exchange rates and variations on the period subsamples. Empirical evidence suggests that a consistent Box Pierce test results do not occur autocorrelation. Brzeszczynsky, et al (2001), the result was that it was more satisfying (more accurate/significant) to forecast the currency rate of EUR against the Polish Dollar (PLN) compared to forecasting the U.S. Dollar against the Polish Dollar with Using the spot rate in predicting short-term future spots. In this study, the spot rate could explain the future movement of spot in a short period of Time (quarterly). The best predictors are the spot rate for the exchange rate of EUR, JPY and AUD. Forecasting performance Assessment results in that the Euro exchange rate is empirically more accurate than the USD and JPY rates with an error rate of 0.004144%.

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