Hedging Performance of Indonesia Exchange Rate

By:
Eneng Nur Hasanah
Fakultas Ekonomi dan Bisnis-Manajemen, Universitas Islam Bandung (Unisba)
E-mail: **enengnurhasanah@gmail.com**

ABSTRACT

The fluctuation of exchange rate very given the impact to the situation of Indonesia economic, it will give impact to the economics of Indonesia, with the case, this paper examines the hedging ratio performance by using The Constant Conditional Correlation (CCC) of Bivariate Generalized Autoregressive Conditional Heteroscedasticity (BGARCH). The result of hedging ratio performance of Indonesia exchange rate is very low, it means that Indonesia almost never mitigate Rupiah (IDR).

Keywords: *Exchange Rate, CCC, BGARCH, Hedging Performance*

I. INTRODUCTION

1.1. Background

The fluctuation of exchange rate in Indonesia highly depend on the economic condition in the world. Some fluctuation of exchange rate should give impact for Indonesia economics. For example, when crisis on 1997/1998, which value IDR to USD increase very high. The economics of Indonesia threatened bankrupt when the price become much higher than before and some company default.

The fluctuation of exchange rate very given the impact to the situation of Indonesia economic, some import commodities become higher than it contributes to the increasing of inflation in the domestic economic.

Because of the high impact of the fluctuation of exchange rate to a country especially in Indonesia, some economist suggests hedging. Hedging is used to secure the portfolio value of the asset from the market fluctuation. The fluctuation can be the foreign exchange rate, the market oil price, the market of gold price, and so on which have effect for international market. Hedging is buying a contract include the forward exchange or commodities which the value should be increasing and the losing from the contract or the commodities value.

1.2. Problem Identification

In Indonesia, the hedging not popular as in developing market in the world. It shown when the Central Bank of Indonesia (BI) encourage the companies in Indonesia to hedging of the company’s asset from exchange rate fluctuation. It happens because, the exchange rate fluctuation very depends on fundamental factor, technical and how the government (on BI authority) stance this happening.

1.3. Problem Formulation

Because of the hedging in Indonesia still on the popular issue, this paper should show how hedging performance of Indonesia exchange rate (IDX) to the USD fluctuation (SGX) with CCC BGARCH method than measuring the hedging performance.

II. LITERATURE REVIEW

To explain the actual hedging behavior from the various economic agents, some scientist developed the hedging model to solving the problem. From the evaluation, the hedging behavior shown the total lack of reasonable of positive model, Collins (1997).

Yaganti and Kamaiah (2012) investigate the hedging effectiveness of commodity price future market in India. They calculate the optimal hedge ratio using Ordinary Least Square (OLS) regression and Error Correction Model (ECM). The result of this paper shown that only 40% of hedging contract are suitable for hedging. Then there is much difference between two methods (OLS and ECM), for far and nearby maturity periods hedging is more affective, which has some important implication for hedging strategy.

Lee and Chien (2010) using hedging performance to investigate the impact of stock market liquidity on hedging performance. They use the regression model by including stock market liquidity. From the empirical result shown that the market liquidity information useful for predicting the optimal hedge ratio and enhance the hedging performance during the bear market.

Hutson and Laing (2014) using a sample of 953 US firm over the period 1999-2006 to examine the relation between operational hedging, financial hedging, and foreign exchange exposure. They use Jorion's two factor model to estimate the foreign exchange exposure coefficient to each firm, They find that when exchange rate volatility is high–as the effectiveness of financial hedging diminishes.

Hou and Li (2013) assess the hedging performance of the newly established CSI 300 stock index futures. From this paper, DCC model is better with short hedging horizon and CCC model is better for long hedging horizon. By comparing the time-varying BGARCH hedging model, the CCC-GARCH model is better than DCC for the most hedging horizon of in-sample hedging effectiveness.

III. RESEARCH METHOD

On this paper, the data that used are Indonesia daily exchange rate (IDR) and daily USD swap for IDR. The data for USD swap for IDR is a new issue, it begins from 2 October 2013. So, with the data that used is from 2 October 2013 until 30 April 2014, same with IDR exchange rate.

The methodology in this paper is The Constant Conditional Correlation (CCC) Bivariate GARCH (BGARCH), than it would be evaluated using hedging performance measurement.

3.1. The Constant Conditional Correlation (CCC) model

Beginning by Engle (1982) for ARCH model, four years later, Bollerslev (1986) introduced GARCH model. Then, he suggests Bivariate GARCH (BGARCH) Bollerslev (1990) with constant over time which named by The Constant Conditional Correlation

(CCC). Then, in 2002, Engle (2002) proposed the Dynamic Conditional Correlation (DCC) Bivariate GARCH.

The Constant Conditional Correlation (CCC) model used to evaluate the hedging performance of IDR. The CCC model and the conditional H_t can be written as:

$$H_t = \begin{pmatrix} h_{11,t} & h_{12,t} \\ h_{21,t} & h_{22,t} \end{pmatrix} = \begin{pmatrix} \sqrt{h_{11,t}} & 0 \\ 0 & \sqrt{h_{22,t}} \end{pmatrix} \begin{pmatrix} 1 & \rho_{12} \\ \rho 12 & 1 \end{pmatrix} \begin{pmatrix} \sqrt{h_{11,t}} & 0 \\ 0 & \sqrt{h_{22,t}} \end{pmatrix}$$

Where ρ_{12} is the conditional correlation between spot and futures returns and assumed to be constant over time. The individual conditional variances $h_{11,t}$ and $h_{22,t}$ are assumed to follow a standard GARCH (1,1) process (Bollerslev, 1986).

$$h_{ii,t} = \omega_{i0} + \omega_{i1}\varepsilon_i{}^2 h_{ii,t-1}, i = 1, 2$$

Then, the CCC-BGARCH model can be written as:

$$h_{ii,t} = \omega_{i0} + \omega_{i1}\varepsilon^2{}_{i,t-1} + \omega_{i2} I_{i,t-1}\varepsilon^2{}_{i,t-1}, i = 1, 2$$

Where $I_{i,t-1}$ =1 if $\varepsilon_{i,t-1}$ < 0 (i=1.2) and 0 otherwise. When ω_{i3} > 0, previous negative shocks generate higher volatility than positive ones. This asymmetric effect is called the leverage effect.

3.2. The Measure of Hedging Performance

This paper using variance reduction to measure hedging performance. Hou and Li (2013) explain the variance reduction is calculated as the ratio of the variance of return of unhedged position minus variance of return of hedge position over the variance of return of unhedged position.

Denoting ΔS_t as return of the unhedged position and ΔV_H as return of the hedged position, variance reduction can be expressed as:

$$VR = 1 - \frac{Var(\Delta V_H)}{Var(\Delta S_t)}$$

Where $Var(\Delta V_H)$ and $Var(\Delta S_t)$ denote the variances of return of the hedged and unhedged position, respectively. Note that VR = 1 means that the hedge id perfect.

Then, the hedged position can be expressed as:

$$\Delta_k V_H = \Delta_k S_t - \beta_k \Delta_k F_t$$

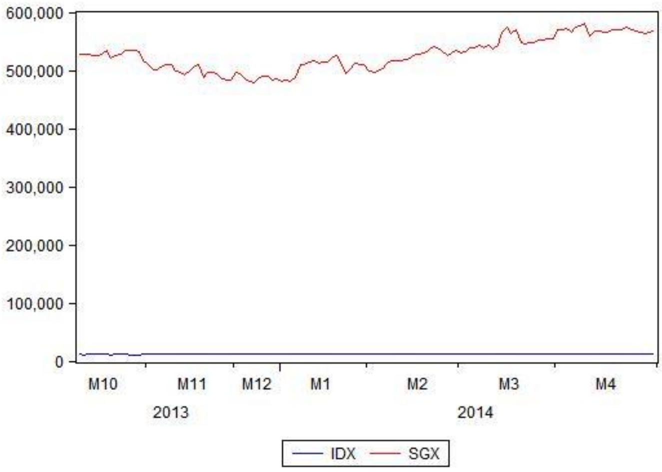
Where $\Delta_k V_H$ denotes return of hedged portfolio for *k*-period hedging horizon. $\Delta_k S_t = S_t - S_{t-k}$ and $\Delta_k F_t = F_t - F_{t-k}$ denoting *k*-period differencing of natural logarithms of spot and futures prices for *k*-period hedging horizon, respectively.

Thus, we have the hedging performance for *k*-period hedging horizon:

$$VR_k = 1 - \frac{Var\left(\Delta_k V_H\right)}{Var\left(\Delta_k S_t\right)}$$

IV. EMPIRICAL RESULT

This paper reports the hedging performance using The Constant Conditional Correlation (CCC) BGARCH model and hedging performance measurement. The data which used is IDR exchange rate and IDR to USD swap (SGX).



Graph 4.1. IDX and SGX

From the graph, it shown that there is high different value between IDX and SGX. The IDX is under 100.000 point. but SGX above 500.000 point.

Table 4.1. Statistical Descriptive of IDX and SGX

	IDX	**SGX**
Mean	11583.45	526515.9
Median	11574.10	526000.0
Maximum	12180.30	581500.0
Minimum	10570.80	478000.0
Std. Dev.	317.2676	28587.62
Skewness	-0.032612	0.170876
Kurtosis	2.924505	1.942548
Jarque-Bera	0.052257	6.483748
Probability	0.974210	0.039091
Sum	1459515.	66341000
Sum Sq. Dev.	12582343	1.02E+11
Observations	126	126

By using AR(1) to modeling the data to be CCC-BGARCH, the result are:

Table 4.2. CCC-BGARCH Modeling

Sample: 10/14/2013 4/30/2014
Included observations: 126

Total system (balanced) observations 250
Presample covariance: backcast (parameter =0.7)
Convergence achieved after 180 iterations

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	11686.48	170.0820	68.71086	0.0000
C(2)	0.954763	0.018182	52.51072	0.0000
C(3)	528938.0	8840.077	59.83409	0.0000
Variance Equation Coefficients				
C(4)	2948.024	666.0400	4.426197	0.0000
C(5)	1.155532	0.254374	4.542652	0.0000
C(6)	0.068767	0.045849	1.499876	0.1336
C(7)	10043609	2411633.	4.164651	0.0000
C(8)	-0.120132	0.026574	-4.520593	0.0000
C(9)	0.944211	0.023691	39.85498	0.0000
C(10)	-0.218204	0.130903	-1.666916	0.0955

Log likelihood	-2020.980	Schwarz criterion	32.72194
Avg. log likelihood	-8.083920	Hannan-Quinn criter.	32.58760
Akaike info criterion	32.49568		

Equation: IDX = C(1) + [AR(1)=C(2)]

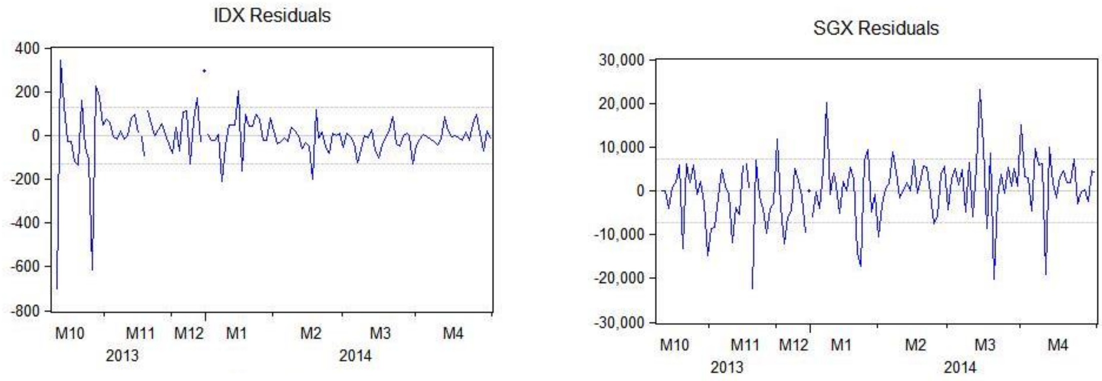
R-squared	0.836907	Mean dependent var	11584.27
Adjusted R-squared	0.835581	S.D. dependent var	318.4107
S.E. of regression	129.1110	Sum squared resid	2050366.
Durbin-Watson stat	1.891915		

Equation: SGX = C(3) + [AR(1)=C(2)]

R-squared	0.937665	Mean dependent var	526500.0
Adjusted R-squared	0.937158	S.D. dependent var	28702.10
S.E. of regression	7195.136	Sum squared resid	6.37E+09
Durbin-Watson stat	1.905385		

Covariance specification: Constant Conditional Correlation
GARCH(i) = M(i) + A1(i)*RESID(i)(-1)^2 + B1(i)*GARCH(i)(-1)
COV(i,j) = R(i,j)*@SQRT(GARCH(i)*GARCH(j))

On the Table 3. The value of R-squared from the data is high which the R-squared for IDX is0.836907 and R-squared for SGX is 0.937665. It means that the model have fitted the data.



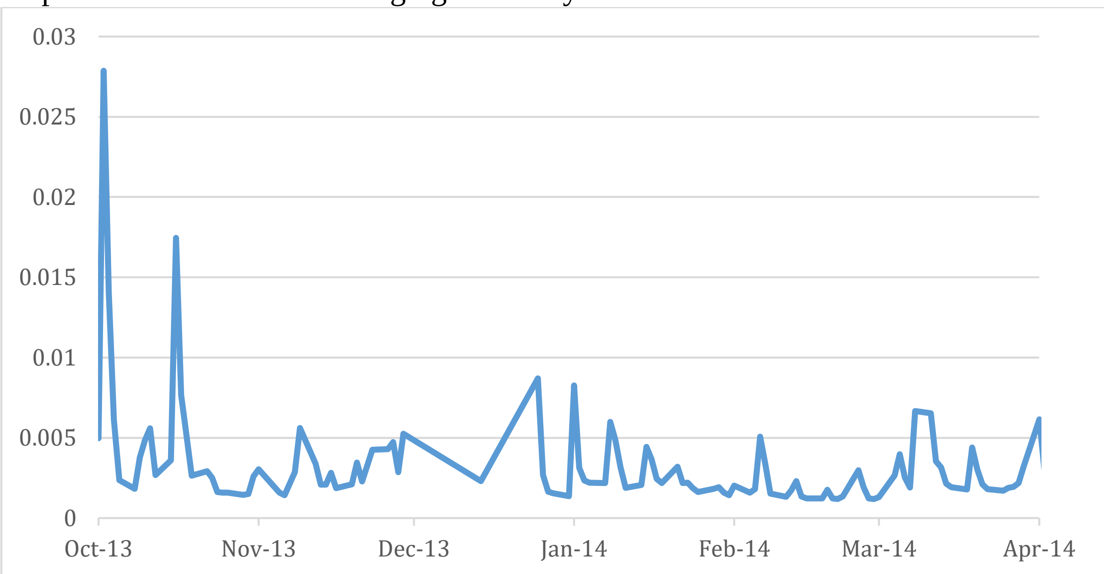
Graph 4.2. IDX and SGX Residuals

On the Graph 4.2, it shown that the residual has good condition, it means that the model fitted with the data. With the fitted model, it would get the covariance from IDX and SGX, then it should measuring the hedging performance for *k*-period hedging horizon equation. The result are:

Table 4.3. Monthly Hedging Ratio

Month	**Hedging Ratio**
October 2013	0.005246
November 2013	0.001871
December 2013	0.002311
January 2014	0.002178
February 2014	0.001218
March 2014	0.001786
April 2014	0.001508

Because of the limited data, the result shown the hedging ratio just from October 2013 until April 2014. The value of hedging ratio very low which under 0.005.



Graph 4.3. Indonesia Hedging Ratio Performance

On Hou and Li (2013) paper, show the hedging ratio value of Chine stock index futures above 0.85, it means that the market of China stock index very liquid. Difference in Indonesia, with the hedging ratio value under 0.005 it shows that Indonesia almost do not mitigate the Rupiah (IDR). It proves the fact that when the Dollar (USD) increase, the price of domestic needed increase too, and in contribute the inflation.

The function of hedging is to decrease the volatility of the market value, on this case the volatility of USD to IDR. Then from this result, it suggests that the Government of Indonesia must concentrate to execute the hedging of IDR, then make the hedging to secure the value of IDR and make the economics to be better.

V. CONCLUSION

Indonesia on of the country which its local economics very depend on foreign exchange rate, one of them is Dollar (USD), with this case, this paper investigates the hedging ratio of Indonesia exchange rate (IDR) using The Constant Conditional Correlation (CCC) Bivariate GARCH (BGARCH) model.

The hedging ratio performance shown that Indonesia almost never do mitigating of IDR, it shown on the result of hedging ratio which very low that is under 0.005. So, from this result, the Government of Indonesia must be concentrate to mitigate the IDR.

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