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# IDR and YEN Currency with Structural Model

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## ABSTRACT

This research aims to investigate a simple algorithm modeling, how the algorithm implementation and development into the structural model in the form of multivariate time series data using Eviews. 2 basic instruments are in use are vector auto regressive (VAR) and vector error correction (VEC) which will be developed into a structural vector auto regressive (SVAR) and structural vector error correction (SVEC). In this study used a variable currency IDR (Indonesia) and YEN (Japan) during the period 2004-2014, which convert into USD. Modeling of basic instruments that created and continue to shape innovative structures, can result in that the VAR model and SVAR be implemented on the stationary, while the VEC and SVEC models can be implemented in the data that are non-stationary.

**Keywords:** Currency, VAR, SVAR, VEC, SVEC

## I. INTRODUCTION

In knowing and making a value of forecasting (forecasting), can be made a cornerstone in the decisions to increase or investment, Hadi, Y.S (2003). If, at the present time there are various kinds of software (software), which offers various facilities to do forecasting, such as Eviews, Stata, Matlab However, the use of software such software requires knowledge in the field of statistics that are strong enough from its users so that they get results forecasting can believe in and trust bias. With the presence of some of these limitations, giving the idea to create a software that provides forecasting results automatically, so that someone with no knowledge of statistics are in, especially in the field of analysis or financial time series is able to operate it.

This study will build an automatic multivariate forecasting large scale models with assisted software Eviews. Modeling time series using econometric approach. Sims, C, A. (1980) developed a vector auto regressive (VAR) is most often used to predict the data stationary. VAR has developed so as to build the vector error correction (VEC), structural vector auto regression (SVAR) and structural vector error correction (SVEC) to interpret the contemporary relationship between variables. In Granger (1981) explains the concept of cointegration to find linear relationships between variables in the data nonstationary. This concept is then used to interpret the contemporary relationship variables. According to Halim, et al. [5] The model building will be constructed using Eviews software, which is a continuation of the univariate time series forecasting package automatically.

## II. METHODS AND MATERIAL

### 1. Research Method

Basically adaptations are not much different. The first step that should be done is to test the stationarity of data. According to Harris and Sallis (2003) the data is entered into the package in doing tested Automatic Dickey Fuller (ADF) test for each variable. In concept, the ADF test data test stationary if the mean, variance, covariance of time series is constant for all the period and has no periodic fluctuations. Furthermore, if the data is stationary, then the data will be modeled by using a VAR that can be repaired with svar. However, if the data is not stationary, the nonstationary model that will be used to model it. In Luetkepohl (2005), Brooks (2008) explains in detail how nonstationer model to be used is VEC or SVEC, but here the authors ignore it to get the difference results from structural models that SVAR and SVEC proposal.

## 2. Model for Data Nonstationary

In multivariate data, nonstationerity can occur at variable or only on a part of the variable exists. When the whole nonstationary variables, the modeling can be handled with models Vector Error Correction (VEC) or Structural Vector Error Correction (SVEC). However, if only some of the variables are stationary, there are two options for modeling variables like this. Both of these options is the first, modeling the first combined stationary and non-stationary variables in the VAR model, SVAR followed by a VEC models and SVEC. In the data required nonstationary cointegration test between variables. In Harris and Sallis, (2003) said that cointegration tests done using procedures Johannsen. When the variables in the data are not cointegrated, then the package will give a warning and stop modeling. However, if these requirements are met by the VEC modeling can be done.

## 3. Analysis Structural VAR

In Granger test model (1981), explains that the structural test is needed to determine causality (mutual influence) between variables. This test is the widely used model of Granger-causality test, where the test can see causal relationships in the data. The assumption in this test, if there is a causal relationship, the model in the proposal to meet the continuation of the selection of the VAR model. The weakness of the VAR model is not able to capture the movement of deterministic time series data. Therefore, Stuctural Vector Auto Regressive (SVAR) was built to analyze the movement of a deterministic model of VAR. Two types svar which can be estimated by the addition of a barrier on the matrix A or B is (a) Model A: B is defined as IN, (b) Model B: A is defined as IN with a minimum number of delimiters for the identification of models A and B is N ( N-1) / 2.

## 4. Structural Vector Error Correction Model

SVEC model is built because the information contained in the cointegration properties of the variable does not identify restrictions (limits) on the structural shock. In this SVEC model B is assumed to be used. In the SVEC model of necessary limitation as N (N-1) / 2). Flow modeling multivariate time series is complete. Resume of the impulse response and variance decomposition are not in further review by the authors of the study.

# III. RESULTS AND DISCUSSION

## Hasil Penelitian dan Pembahasan

Here are the results for the ADF test against the currency variables IDR and YEN.

***Table 1 : Result for unit root IDR currency***
Null Hypothesis: IND_RUPIAH has a unit root
Lag Length: 18 (Automatic - based on AIC, maxlag=27)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.679174 | 0.0778 |
| Test critical values: | 1% level | -3.432608 | |
| | 5% level | -2.862423 | |
| | 10% level | -2.567285 | |

*MacKinnon (1996) one-sided p-values.
***Source : Proceed by author***

***Table 2 : Result for unit root YEN currency***
Null Hypothesis: JAPAN_YEN has a unit root
Lag Length: 0 (Automatic - based on AIC, maxlag=27)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.546653 | 0.5098 |
| Test critical values: | 1% level | -3.432591 | |
| | 5% level | -2.862416 | |
| | 10% level | -2.567281 | |

*MacKinnon (1996) one-sided p-values.

***Source : Proceed by author***

Note the table 1 above, the value of Prob ADF Test Statistics of 0.0778 <Alpha 0.05 so that we reject the null hypothesis and state that statistically, the IDR currency data is stationary at the level. For table 2 above, the value of Prob ADF Test Statistics is 0.5098> Alpha 0.05 so that we accept the null hypothesis and state that statistically, the YEN currency data is not stationary at the level.

As explained in the previous discussion, that the VAR is only an approach and not equipped with long-term relationship analysis (cointegration), the VAR model is less precise if it is used as a confirmatory model to make future policies. Interpretation of the VAR model is not the main focus in the use of the VAR model approach for a study that is only interested in looking at relationships (not influences). The following is a continuation of the ADF test of the VAR and VEC tests.

*Table 3 : Result for VAR test*
Vector Autoregression Estimates

| | JAPAN_YEN | IND_RUPIAH |
|---|---|---|
| JAPAN_YEN(-1) | 0.981628 | 0.041833 |
| | (0.01935) | (0.01805) |
| | [ 50.7378] | [ 2.31804] |
| JAPAN_YEN(-2) | 0.017135 | -0.041411 |
| | (0.01935) | (0.01805) |
| | [ 0.88567] | [-2.29469] |
| IND_RUPIAH(-1) | -0.040140 | 0.924376 |
| | (0.02070) | (0.01931) |
| | [-1.93906] | [ 47.8712] |
| IND_RUPIAH(-2) | 0.038063 | 0.072720 |
| | (0.02068) | (0.01929) |
| | [ 1.84078] | [ 3.77028] |
| C | 0.010724 | 0.010663 |
| | (0.00531) | (0.00496) |
| | [ 2.01817] | [ 2.15142] |
| R-squared | 0.997730 | 0.996029 |
| Adj. R-squared | 0.997727 | 0.996023 |
| Sum sq. resids | 0.021909 | 0.019063 |
| S.E. equation | 0.002859 | 0.002667 |
| F-statistic | 294644.8 | 168114.6 |
| Log likelihood | 11924.23 | 12111.09 |
| Akaike AIC | -8.875080 | -9.014217 |
| Schwarz SC | -8.864105 | -9.003242 |
| Mean dependent | 1.995729 | 3.984083 |
| S.D. dependent | 0.059960 | 0.042284 |
| Determinant resid covariance (dof adj.) | | 5.78E-11 |
| Determinant resid covariance | | 5.75E-11 |
| Log likelihood | | 24043.37 |
| Akaike information criterion | | -17.89529 |
| Schwarz criterion | | -17.87334 |

***Source : Proceed by author***

*Table 4 : Result for VEC test*
Vector Error Correction Estimates

| Cointegrating Eq: | CointEq1 | |
|---|---|---|
| JAPAN_YEN(-1) | 1.000000 | |
| IND_RUPIAH(-1) | 6.918245 | |
| | (2.34885) | |
| | [ 2.94537] | |
| C | -29.55871 | |
| Error Correction: | D(JAPAN_YEN) | D(IND_RUPIAH) |
| CointEq1 | -0.000371 | -0.000359 |
| | (0.00018) | (0.00017) |
| | [-2.06010] | [-2.13817] |
| D(JAPAN_YEN(-1)) | -0.017201 | 0.041220 |
| | (0.01937) | (0.01807) |
| | [-0.88821] | [ 2.28169] |
| D(JAPAN_YEN(-2)) | -0.021317 | 0.014642 |
| | (0.01936) | (0.01806) |
| | [-1.10101] | [ 0.81067] |
| D(IND_RUPIAH(-1)) | -0.035050 | -0.075364 |
| | (0.02077) | (0.01937) |
| | [-1.68782] | [-3.89033] |
| D(IND_RUPIAH(-2)) | 0.022290 | -0.022239 |
| | (0.02075) | (0.01936) |
| | [ 1.07410] | [-1.14874] |
| C | -2.12E-05 | -6.52E-05 |
| | (5.5E-05) | (5.2E-05) |
| | [-0.38475] | [-1.26599] |
| R-squared | 0.003941 | 0.010524 |
| Adj. R-squared | 0.002082 | 0.008678 |
| Sum sq. resids | 0.021895 | 0.019054 |
| S.E. equation | 0.002859 | 0.002667 |
| F-statistic | 2.119791 | 5.698982 |
| Log likelihood | 11920.12 | 12106.72 |
| Akaike AIC | -8.874578 | -9.013569 |
| Schwarz SC | -8.861404 | -9.000395 |
| Mean dependent | -1.98E-05 | -6.01E-05 |
| S.D. dependent | 0.002862 | 0.002679 |
| Determinant resid covariance (dof adj.) | | 5.78E-11 |
| Determinant resid covariance | | 5.75E-11 |
| Log likelihood | | 24034.78 |
| Akaike information criterion | | -17.89257 |
| Schwarz criterion | | -17.86183 |

***Source : Proceed by author***

In looking at cointegration, it can be done using rank r. Comparing testing of null hypothesis r = 0 with r ≥ 1, whether in the proposed model there is cointegration between variables. By rejecting r = 0, the conclusion does not occur cointegration among data in doing research. However, by looking at the VEC and VAR models in the form, then the series data, if r = 0 then at least some cointegrated series can determine the number of cointegration relationships. The null hypothesis that r ≤ 1 against r ≥ 2 is not followed in this study. This test can proceed further, by hypothesizing that r ≤ 1, and performing further tests with ≤ 2, and r ≥ 3. In Johansen, Soren (1995) uses the value of r as a hypothesis stating that there is a cointegration relationship between Variable.

*Table 5 : Result for SVAR test*
Structural VAR Estimates

Model: Ae = Bu where E[uu']=I
Restriction Type: short-run text form
@e1 = C(1)*@u1
@e2 = C(2)*@e1 + C(3)*@u2
where
@e1 represents JAPAN_YEN residuals
@e2 represents IND_RUPIAH residuals

| | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|
| C(2) | -0.072084 | 0.017945 | -4.017014 | 0.0001 |
| C(1) | 0.002859 | 3.90E-05 | 73.29393 | 0.0000 |
| C(3) | 0.002659 | 3.63E-05 | 73.29393 | 0.0000 |
| Log likelihood | 24038.37 | | | |
| Estimated A matrix: | | | | |
| 1.000000 | 0.000000 | | | |
| 0.072084 | 1.000000 | | | |
| Estimated B matrix: | | | | |
| 0.002859 | 0.000000 | | | |
| 0.000000 | 0.002659 | | | |

***Source : Proceed by author***

*Table 6 : Result for SVEC test*
Vector Error Correction Estimates

| Cointegration Restrictions: | | |
|---|---|---|
| B(1,1)=1,A(2,1)=0 | | |
| Chi-square(1) | 3.839235 | |
| Probability | 0.050066 | |
| Cointegrating Eq: | CointEq1 | |
| JAPAN_YEN(-1) | 1.000000 | |
| IND_RUPIAH(-1) | 2.027928 | |
| | (1.10301) | |
| | [ 1.83854] | |
| C | -10.07519 | |
| Error Correction: | D(JAPAN_YEN) | D(IND_RUPIAH) |
| CointEq1 | -0.001181 | 0.000000 |
| | (0.00049) | (0.00000) |
| | [-2.39021] | [NA] |
| D(JAPAN_YEN(-1)) | -0.016755 | 0.041893 |
| | (0.01936) | (0.01807) |
| | [-0.86565] | [ 2.31900] |
| D(JAPAN_YEN(-2)) | -0.020887 | 0.015271 |
| | (0.01935) | (0.01806) |
| | [-1.07927] | [ 0.84545] |
| D(IND_RUPIAH(-1)) | -0.035126 | -0.075603 |
| | (0.02076) | (0.01938) |
| | [-1.69183] | [-3.90155] |
| D(IND_RUPIAH(-2)) | 0.022243 | -0.022378 |
| | (0.02075) | (0.01937) |
| | [ 1.07202] | [-1.15558] |
| C | -2.12E-05 | -6.52E-05 |
| | (5.5E-05) | (5.2E-05) |
| | [-0.38466] | [-1.26557] |
| R-squared | 0.004253 | 0.009871 |
| Adj. R-squared | 0.002395 | 0.008023 |
| Sum sq. resids | 0.021888 | 0.019067 |
| S.E. equation | 0.002858 | 0.002668 |
| F-statistic | 2.288496 | 5.341357 |
| Log likelihood | 11920.54 | 12105.83 |
| Akaike AIC | -8.874891 | -9.012908 |
| Schwarz SC | -8.861717 | -8.999734 |
| Mean dependent | -1.98E-05 | -6.01E-05 |
| S.D. dependent | 0.002862 | 0.002679 |
| Determinant resid covariance (dof adj.) | | 5.78E-11 |
| Determinant resid covariance | | 5.75E-11 |
| Log likelihood | | 24032.86 |
| Akaike information criterion | | -17.89114 |
| Schwarz criterion | | -17.86040 |

***Source : Proceed by author***

If seen in table 5 and 6, the value of the relationship between the currency variables IDR and YEN is very significant. This provides evidence that, with data from the IDR and YEN currency variables, which are stationary, make the structural form and model proposed to be significant. On the contrary, if the IDR currency variable is not stationary, the structural model proposed may not yield significant results.

## IV. CONCLUSION

From the studies that have been done, the authors argue that, the model in the proposal can be made in the guide in analyzing the variables associated with the economy. This model looks better, if the test data before the proposed model in do stationarity. This may provide clarity that, the relationship between the initial step test and the subsequent test can give better results.

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