

# Co-movement in Asset Market: Does Global Financial Cycle Works? Empirical Evidence in Indonesia

Sri Andaiyani and Saadah Yuliana

Faculty of Economics, Universitas Sriwijaya, Palembang, Indonesia

Keywords: global financial cycle, risk aversion, asset, stock

Abstract: The movement of global financial risk is more volatile and procyclical during US unconventional monetary policy. Indonesia, as one of the important EMEs in the world, also received higher capital inflows. Asset markets of home country is more vulnerable to global risk aversion movement. Therefore, this study attempts to analyze the impact of global financial cycle on asset markets in Indonesia using Vector Autoregressive model (VAR). The empirical findings of this study are twofold. First, Global financial cycle has a significant effect on stock and exchange rate markets. This result is consistent with Indonesia as an open capital account country that remain vulnerable to the global financial cycle. Second, robustness check reveals strong evidence that co-movement in Indonesian's asset markets is affected by global financial cycle as proxy the VIX index.

## 1 INTRODUCTION

After financial crisis 2008, the central bank of the United States, known as the Federal Reserve or the Fed, injected the unprecedented amount of liquidity through large-scale asset purchases (LSAPs). Fluctuations in global financial condition related to unconventional monetary policy in the United States also made investors switched to other investment assets in the emerging market economies (EMEs) such as bond markets and stock markets. In EMEs, Stock price and bond price have increased during the economic recovery in advanced economies. The ability of financial institutions to keep the effects of risk in global markets determine the performance of the financial institution. If the financial institution in a country can control the global risk arising from the developed countries, the financial market conditions in developing countries will be better. The financial market risks consist of movements in interest rates, stock price index, commodity price index, or the exchange rate. This is supported by a statement from Fratzscher et al (2013) that the global externality effects of monetary policy decisions in developed countries do affect the developing countries.

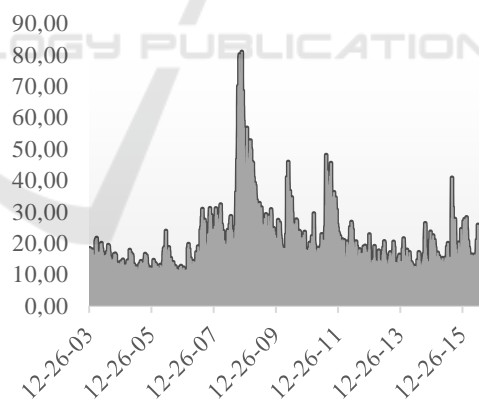


Figure 1: Global financial cycle (VIX Index)  
Source: CBOE VIX index, Datastream

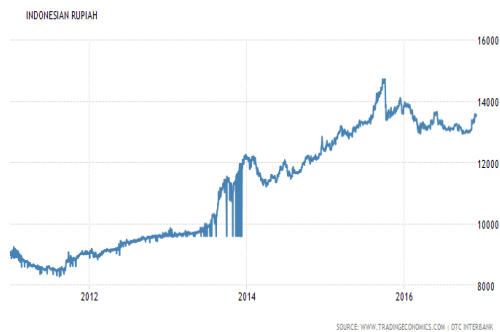
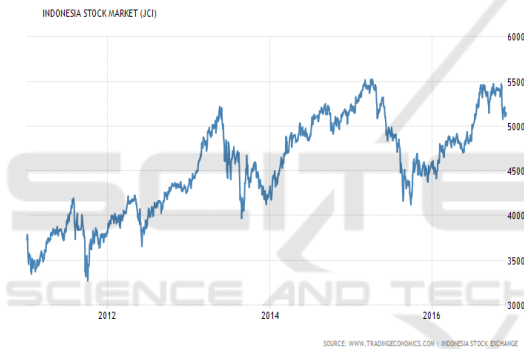
Movement of global financial risk is more volatile and procyclical (figure 1). Asset markets of home countries are more vulnerable to sudden rise in global risk aversion. According to Rey (2015), there is two global factor that drives the movements in capital flows and asset prices across EMEs. The first is the global financial cycle that reflects both aggregate volatility of asset markets and degree of risk aversion of markets. The second set of global

factors is US monetary policy that has a significant effect on cross-border credit flows. A tightening of US monetary policy leads to increase global risk aversion, a fall in cross-border lending and a fall in asset prices at the global level (Miranda-Agrippino and Rey, 2015).

Indonesia, as one of the important EMEs in the world, has received higher capital flows since the global financial crisis. Capital inflows could have a significant effect on asset prices, including property prices (Falianty, 2016). Nevertheless, there are no empirical studies of the spillover effect from the global financial cycle to Indonesian’s asset markets. Therefore, this research attempts to analyze the effect of the global financial cycle on asset markets in Indonesia. In this study, the Indonesian asset markets financial markets, comprising the exchange rate market, the stock market, and the bond market are considered.



Figure 2: Asset Markets in Indonesia  
Source: Datastream



Recent studies on global financial cycle argued that global financial risk may have the impact on asset markets. Miranda-Agrippino and Rey (2015), Banerje, Devereux and Lambardo (2016) and Rey (2015) argued that global financial factor explains the important role of the variance of a large cross-section of returns of risky asset price around the world. Other studies that global risk sentiment has a significant effect on fragile five asset markets. When market sentiment deteriorates, equity prices fall and local currencies depreciate, while LC government bond yields and sovereign CDS prices increase (Yildirim, 2016).

One of the contributions of this study is to give more information about the transmission of the global financial cycle to Indonesian’s asset markets. The transmission of global financial cycle provides an overview of investor’s sentiment in asset markets. Besides, I employ data frequency using weekly and monthly data to see whether the global financial cycle has a deferent impact or not on asset markets. An important question in this study is whether this increased co-movement of global financial risk provides evidence of contagion. Defining contagion as a significant increase in cross-country co-movement of asset returns (Dungey and Gajurel, 2014).

## 2 LITERATURE REVIEW

Blanchard et al. (2010) explain that an increase in global financial risk was an important channel through which the crisis was propagated to emerging economies. The empirical studies from Longstaff et al. (2011) suggest that global factors explain a large fraction of the variation in the international interest

rate. The recent study by Yildirim (2016) also shows that global financial risk factors have hit the asset markets in the emerging fragile five countries. Global financial risk aversion has sharply increased, the exchange rate of local currencies depreciated, government bond yield and country risk premium also increased significantly, but stock prices decreased.

Recent studies have investigated the effects of the global financial cycle to asset markets and macroeconomic conditions. Using two analytical approaches – turning-point analysis and frequency-based filters, Drehmann, Borio and Tsatsaronis (2012) find that global financial cycles are best captured by combinations of credit and property prices, while equity prices do not fit the picture well.

The theory that explains the transmission of the global financial cycle to asset market in EMEs country is international investor risk appetite due to market imperfections or the behavior of international investors. Information asymmetries make investors more uncertain about the actual economic fundamentals of a country (Dungey and Gajurel, 2014). Falianty (2016) discuss the impact of capital flows on the property market and the impact of macroprudential policies represented by Loan to Value (LTV) regulation on the property market in Indonesia. She finds the significance of GDP to Property Price Index (PPI). Capital flows (CF) and LTV regulation have not significantly affected the property price index, even for CF have the marginally significant effect to PPI.

Yildirim (2016) provides theoretical framework between global financial risk, capital inflows, and EMEs asset prices. The result finds that global financial risks depend on the strength of a country's macroeconomic conditions. In other words, these impacts vary across asset classes and countries. Some researchers focus on the risk-taking channel of monetary policy to explain these links. In this case, Bruno and Shin (2015) build the model by focusing on the functioning of this channel via the banking sector. The model suggests that movement in US unconventional monetary policy are transmitted internationally via shifts in global risk aversion, which drive the asset prices in EMEs by affecting leverage of financial intermediaries, bank lending, and thereby, portfolio inflows into their economies.

Other studies from Lizarazo (2013) develops a model for small open economies taking into account risk-averse international investors with decreasing absolute risk-aversion preferences, which is consistent with the typical features of investors in EM financial markets. The model provides a

possible mechanism to explain the links between investors' characteristics (risk aversion and wealth), capital inflows to EMs, and EM asset prices, notably sovereign risk premiums and bond prices. Based on the mechanism, as international investors become more risk-averse, sovereign CDS prices move higher while capital inflows to EMs and their bond prices decrease (Yuldirim, 2016).

### 3 THEORETICAL FRAMEWORK

Since financial crisis, asset markets in the world have become increasingly integrated with large portfolio flows. But Global banks, namely asset managers, have an important role in the process of internationalization. This study follows theoretical model from Miranda-Agrippino and Rey (2015). They explain a theoretical framework in international asset pricing where the risk premium depends on the wealth distribution between leveraged global banks and asset managers that have more fund. It can help to interpret the data in the best way.

Miranda-Agrippino and Rey (2015) assume that there are two types of investors: global banks and asset managers. Global banks are affected entities that fund themselves in dollars because they operate in the global capital markets. They can borrow at a rate of US risk-free rate and a lever to buy risky assets in dollars. Investors are risk neutral with constraints Value-at-Risk (VaR) and will then be imposed the rules. Risk neutrality is an extreme assumption that might justify the fact that investors benefit from a guarantee, either because they are a universal bank that is part of the guarantee scheme, or because the risk of failure is greater.

Asset managers hold a portfolio of regional assets which are non-tradable assets in the financial markets. It can occur due to asymmetric information. Miranda-Agrippino and Rey (2015) stated that any global bank will maximize expected yields to be obtained from a portfolio of risky assets held by the constraints Value-at-Risk. Risk values define the upper limit predicted the number of banks suffered losses in the portfolio. Another research from Adrian and Shin (2014) shows the value of risk is taken out of proportion to the standard deviation of the bank's portfolio risk. Global banks choose portfolio as follows;

$$\begin{aligned} \max_{x_t^B} E_t(x_t^{B'} R_{t+1}) \\ s.t \text{ Va } R_t \leq w_t^B \end{aligned}$$

$R_t$  states vector of excess return of all risky assets traded in the world. Risky assets are all tradable securities such as equities and corporate bonds. Portfolio securities of global bank portfolios expressed  $x_t^B$  and  $w_t^B$  is the equity of the bank.

$$VaR_t = \alpha w_t^B (Var_t(x_t^B R_{t+1}))^{\frac{1}{2}}$$

By following Lagrangian optimization problems of literature Miranda-Agrippino and Rey (2015) sought its First Order Conditions of the obtained solution to asset demand is

$$x_t^B = \frac{1}{\alpha \lambda_t} [Var_t(R_{t+1})]^{-1} E_t(R_{t+1}). \quad (1)$$

Equation (1) shows the average portfolio allocation of the investor.  $\lambda_t$  is a Lagrange multiplier symbol. VaR constraint has the same role as risk-averse. Furthermore, asset managers are average standard variance of investor. They have the same access to the assets traded by global banks. The owners of assets are also invested in local assets (regional) that were not traded. Asset managers chooses their portfolio of risky assets by maximizing:

$$\max_{x_t^I} E_t(x_t^I R_{t+1} + y_t^I R_{t+1}^N) - \frac{\sigma}{2} Var_t(x_t^I R_{t+1} + y_t^I R_{t+1}^N),$$

$x_t^I$  indicate the vector of portfolio weights of the asset managers in tradable risky assets. While  $y_t^I$  as a fraction of their wealth that is invested by asset managers in their regional assets. Vector of excess returns on investments that are not traded expressed by  $R_t^N$ , and  $w_t^I$  I is an equity of asset manager. Therefore, the selection of optimal portfolio in risky securities that can be traded at risk for asset managers, namely:

$$x_t^I = \frac{1}{\sigma} [Var_t(R_{t+1})]^{-1} [E_t(R_{t+1}) - \sigma Cov_t(R_{t+1}, R_{t+1}^N) y_t^I]. \quad (2)$$

## 4 METHODOLOGY AND DATASET

### 4.1 Empirical Method

Some literatures employ a Vector Autoregressive (VAR) model to test the effects of global financial cycle on asset markets in EMEs. Yildirim (2016)

employs VAR model especially Structural VAR (SVAR) to analyze the impact of global financial shock on fragile five asset markets. On the other hand, VAR model can capture the dynamic interaction between monetary policy, risk aversion and uncertainty, leverage and credit flows (Rey, 2015; Akinci, 2013).

Following previous empirical model, this study also employs VAR model to analyze the effects of global financial cycle on Indonesia's asset market using daily data. This estimation techniques preceded by several standard measures such as stationary test or stationary stochastic process (Ajija et.al, 2011) and determination of the optimal lag with lag order selection criteria. Sims (1980) states that if there is a simultaneous relationship between variables observed, the variables should be treated equally, no more endogenous and exogenous variables. The VAR is used to prove an economic theory or to find theoretical foundations from a shock (Bilmeier and Bonatot, 2002).

### VAR Model

The specification of the VAR model in reduced form is,

$$A_0 X_t = A(L) X_{t-1} + B \varepsilon_t$$

Where  $X_t$  is a vector with all variables;  $A_0$  is a contemporaneous relation among variables;  $A(L)$  is a finite-order matrix polynomial with the lag operator  $L$ ;  $\varepsilon_t$  is a vector of structural disturbance; and  $B$  is a non-zero diagonal matrix. Basically, there are several ways to place restrictions on the VAR model, such as long run restriction, impact, and sign restriction. This restriction helps to identify the models and to insert the basic theory into the model.

### 4.2 Dataset

To investigate the response of Indonesian's asset prices to global financial risk shocks, this study focuses on daily data from January 2, 2006 to October 30, 2016. Using daily data can capture the spillovers of external financial shocks on Indonesian asset markets because high frequency daily data give more information and more precise analysis. However, lower data frequencies, like those of weekly and monthly, are used in the literature as follows Yilidrim (2016).

The data were obtained from Thomson Reuters DataStream. The unit of measurement of the data used is quite varied. Asset markets in this study are divided to three markets. It includes exchange rate

market, bond market and stock market. For exchange rate market, I use Indonesian rupiah to US dollar. Then, I use 10-year government bond yield to capture the effect of global financial cycle to bond market. For stock market, I employ Indonesian Stock Exchange (IDX). Moreover, the VIX index is used to proxy global financial cycle. All variables are measured in logarithms except for the government bond yields., which is expressed in percentages.

## 5 EMPIRICAL RESULT

In this section, empirical result will be discussed. The testing procedure conducted to test the data stationarity is Augmented Dickey-Fuller test (ADF). From stationary testing, the results obtained indicate that all variables are stationary at first difference except VIX index. Furthermore, the estimated VAR model followed by determining optimal lag length in model. Determination of the optimal lag length is important in modeling the VAR. If the optimal lag entered is too short, it could not explain the dynamism of the whole model. The test results of lag length in the VAR is 2.

Table 2: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.170125	28.15859	30.81507	0.1021
At most 1	0.121005	19.47533	24.25202	0.1891
At most 2	0.094104	14.92338	17.14769	0.1024
At most 3	0.003401	0.514492	3.841466	0.4732
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

By estimating VAR on daily data, this study indicates that asset markets in Indonesia are affected by global financial cycle. These markets are more vulnerable with capital inflows that related to global financial cycle. A sharp increase in global financial risk during this period decreased stock price and depreciated Indonesian currency. However, global risk aversion does not have effect on government bond yield. Consequently, Indonesia must offer high coupon rates on government bonds to attract investor appetite. As the result, global financial cycle shock has a significant impact on Indonesian's asset markets. Global financial cycle has a positive and significant effect on exchange rate market. It is

Table 1: Unit Root Test

	Level	First Difference
VIX	-3.95401***	-
JAKCOMP	-2.545979	-25.29732***
GbYield	-1.626074	-20.51981***
EXRATE	-0.268953	-31.47800***

Note: The test critical value for 1%, 5%, and 10% significance level are -3.478, -2.882, and -2.578 respectively. \*\*\*, \*\*, \* denote significance at 1%, 5%, 10%, respectively.

Further testing is cointegration test by Johansen cointegration test (Johansen Test of Cointegration) to test whether there is a long-term relationship in the analysis that will use the VAR model. Testing is done by comparing the value of the Max-eigen value statistic with critical value at  $\alpha = 5\%$ . Based on the value of the Max-eigen value statistic on Johansen cointegration test (See Table. 2), it can be concluded that there is no cointegration relationship among the variables in the long term. Furthermore, I estimate the data with VAR model. The analysis of the VAR model in this study can focus on relationship of asset markets variable with VIX index.

relevant with flexible exchange rate regime which is applied in Indonesia. As in countries with more flexible regime in exchange rate, the effect of global financial cycle on exchange rate volatility can be quite large (Ananchotikul and Zhang, 2014). The VAR estimation results may not provide a comprehensive analysis because the evidences that examine a significant relationship among the variables are very limited.

Hence, this study employs the Impulse Response Function (IRF) to examine the impact of shock of innovation variable to other variables. The estimation using the assumptions that each of innovation variables do not correlate with one another, so that a shock effect may be direct.



Besides, being able to determine the effect and duration of the shock, the IRF approach can also be used to determine how long the shock effect will end. Figure of impulse response will show a response of a variable due to shock from other variables until some period after the shock. If figure of impulse response shows the movement that getting closer to the point of equilibrium (convergence) or return to the previous equilibrium, it means that the response of variable of a shock will disappear, so that the shock does not leave a permanent effect on these variables. Figure 2 presents the response global financial cycle shock on asset prices in Indonesia. It shows the response Indonesian's asset markets variables to a 1-standard deviation increase in global risk aversion (i.e., a 1-standard deviation increase in the VIX). due to more simpler and the result of estimation relatively similar with least square regression model.

Global financial cycle does not have any effect on 10-year government bond yield. Investors are not interested to Indonesian government bond yet. To attract investors' appetite, Indonesia had to offer expensive coupons for its sovereign bonds through *Finance Ministry Regulation No. 91/PMK.010/2016* in May 2016. Moreover, high coupon rates on government bonds also influence Indonesia's corporate bond yields as investors are not interested in corporate bonds that carry a significantly lower coupon rate compared to the government bonds (corporate bonds tend to use the government bond yield as reference).

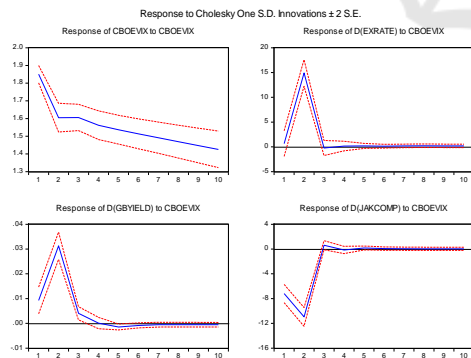


Figure 3: Impulse response function

By contrast, the global financial shock has a positive and significant impact on LC government bond yields in five fragile emerging economies-Brazil, India, Indonesia, South Africa, and Turkey (Yildirim, 2016; Ananchotikul and Zhang, 2014). Historically, the Indonesia Government Bond 10Y reached an all times high of 20.76 in October of

2008 and a record low of 4.99 in February of 2012. The other empirical evidence shows that Indonesian stock markets are affected by the global financial cycle. This finding is consistent with Yildirim (2016), Ananchotikul and Zhang (2014), Chudik and Fratzscher (2011) that global financial risk caused a decline in stock prices. Particularly, the effect of the global factor on stock market volatility is correlated with the financial openness of the country, as measured by total financial liabilities as a percent of GDP. The more exposed a country is to external fund flows, the greater is the volatility spillover deriving from higher global risk aversion to the domestic equity market.

This study clearly appears that an increase in global financial risk is acknowledged by investor sentiment in EMEs especially in Indonesia. This result is consistent with Indonesia as an open capital account country that remains vulnerable to the global financial cycle. In addition, the VIX index as a representative of the global financial cycle tends to boost a tightening monetary policy (Miranda-Agrippino and Rey, 2015).

### Robustness checks

In this part, to have the strong analysis of these findings, I employ the robustness check using the same model but different data frequencies including weekly and monthly data. Yildirim (2016) argued that there is an emerging consensus that data frequency matters in examining the link between financial variables. Therefore, I check whether the difference of data frequency has a similar impact to the empirical result of recent literature.

This study estimates the VAR model with weekly and monthly data to check whether these findings depend on the data frequency or not. The empirical results are similar to the previous result with daily data in this study. These results confirm that the global financial cycle has a significant impact on Indonesian's asset markets. Furthermore, the Indonesian currency has depreciated when the global financial cycle sharply increased.

## 6 CONCLUSION

This empirical results in this study support some literature about the impact of the global financial cycle on co-movement asset markets in EMEs.

By estimating VAR on daily data, this study indicates that asset markets in Indonesia are affected by global financial cycle. These markets are more vulnerable with capital inflows that related to global

financial cycle. A sharp increase in global financial risk during this period decreased stock price and depreciated Indonesian currency. But global risk aversion does not have an effect on government bond yield. Consequently, Indonesia must offer high coupon rates on government bonds to attract investor appetite. In addition, robustness checks in this study are consistent with empirical findings on daily data.

This conclusion is consistent with the fact that the Indonesian financial market is still strongly affected by foreign financial markets, so if there is a shock in the global financial market, that will easily cause panic among domestic investors. Bank Indonesia, as policymakers, send clear signals to stand ready to supply the foreign exchange and at the same time buy the bonds that foreign investors wish to unwind, and thus avoiding herding behavior and contagion of escalating capital reversals. Moreover, the intervention is a way to bring about the objective of monetary stability to be consistent with maintaining financial system stability. By stabilizing the foreign exchange market and government bond market, the intervention helps in stabilizing the overall financial markets.

Further research may extend this analysis by giving more information about stance domestic monetary policy that relates to global financial risk aversion. To get more specific description associated with the problem, the analysis of the data can also be directed to the semi-quantitative method (a blend of quantitative and qualitative methods), so that the statistical facts can be synchronized with the behavioral aspects.

## REFERENCES

- Ajija et al. 2011. "Cara Cerdas Menguasai Eviews". Salemba Empat
- Bilmeier and Bonatot. 2002. Exchange Rate Pass-Through and Monetary Policy in Croatia. IMF Working Paper WP/02/109.
- Ananchotikul, N., Zhang, L., 2014. Portfolio flows, global risk aversion, and asset prices in emerging markets. IMF Working Paper WP/14/156 (August).
- Akinci, Ö., 2013. Global financial conditions, country spreads, and macroeconomic fluctuations in emerging countries. *J. Int. Econ.* 91 (2), 358–371.
- Banerjee, R, Michael B. Devereux dan Giovanni Lombardo. 2016. Self-oriented monetary policy, global financial markets and excess volatility of international capital flows. *Journal of International Money and Finance* 68 (2016) 275–297
- Blanchard, O.J., Das, M., Faruqee, H., 2010. The initial impact of the crisis on emerging market countries. *Brookings Papers on Economic Activity* 41 (1), 263–323.
- Bowman, D., Londono, J.M., Sapriza, H., 2015. US unconventional monetary policy and transmission to emerging market economies. *J. Int. Money Finance.* 55, 27–59.
- Dungey, Mardi, & Gajurel. 2015. [Contagion and banking crisis – International evidence for 2007–2009](#). *Journal of Banking & Finance.* Vol. 60 (C) Pages 271-283.
- Chudik, A., Fratzscher, M., 2011. Identifying the global transmission of the 2007–09 financial crisis in a GVAR model. *Eur. Econ. Rev.* 55, 325–339.
- Drehmann, M, C Borio and K Tsatsaronis. 2012. Characterizing the financial cycle: don't lose sight of the medium term, BIS Working Papers No 380.
- Ebeke, C., Kyobe, A., 2015. Global financial spillovers to emerging market sovereign bond markets. IMF Working Paper WP/15/141.
- Falianty, Telisa. 2016. Capital Flows, Macro Prudential Policy, and Property Sector, IJABER, Vol. 14, No. 10 (2016): 6935-6958.
- Fratzscher, M., Lo Duca, M., Straub, R., 2013. On the international spillovers of US quantitative easing. ECB Working Paper No. 1557.
- Longstaff, F.A., Pan, J., Pedersen, L.H., Singleton, K.J., 2011. How sovereign is sovereign credit risk? *American Economic Journal: Macroeconomics* 3 (2), 75–103.
- Lizarazo, S.V., 2013. Default risk and risk averse international investors. *J. Int. Econ.* 89 (2), 317–330. <http://dx.doi.org/10.1016/j.jinteco.2012.08.006>.
- Miranda-Agrippino, Silvia dan Rey H. 2015. World Asset Markets and The Global Financial Cycle. NBER working paper series.
- Narayan, P.K., Ahmed, H.A., Narayan, S., 2015. Do momentum-based trading strategies work in the commodity futures markets? *J. Futur. Mark.* 35, 868–891.
- Rey, Hélène. 2015. Dilemma not Trilemma: The global Financial Cycle and Monetary Policy Independence. NBER Working Paper No. 21162
- Setiawan, Budi. 2018. LASSO Technique Application in Stock Market Modelling: An Empirical Evidence in Indonesia. <https://doi.org/10.29259/sijdeb.v2i1.%25p>
- Yildirim, Zekeriya. 2016. Global financial conditions and asset markets: Evidence from fragile emerging economies. *Economic Modelling* 57 (2016) 208–22