Dynamic Financial Market Integration: A Path to Sustainable Growth

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Abstract. This paper examines the integration between Indonesia and Asia-Australia-Europe-US stock markets. Specifically, this article investigates whether there is a dynamic integration in Indonesia's financial markets to the global. The author uses correlation and regression methods to explore dynamic integration. The author also uses an additive regression method for robustness check. Overall, the author finds that there is a dynamic integration in Indonesia's financial market. Indonesia's financial market has become more globally integrated over the last two decades. The author concludes that there are sustainable growth opportunities along with the integration of Indonesia's and global financial markets.

Keywords: integration, markets, growth

Introduction

When the author studied undergraduate degree two decades ago, the author did not imagine that he would be interconnected around the world. The author recalled that the classmates, seniors, staff, and professors had the same nationalities. At that time, the internet, computers, and mobiles were limited. International mobilities existed but not as much as today. While the pandemic limits our mobilities, international mobilities' growth has been remarkable since two decades ago.

A number of scholars reveal the relationship between financial interconnectedness and economic growth. For instance, Kleimeier and Versteeg (2010) find that the development of project finance is an important driver of economic growth. Van et al. (2019) document that interconnectedness through financial inclusion supports a positive relationship to economic growth. Huang and Wang (2020) also verify a positive relationship between financial networks and long-run economic growth. Furthermore, Nasreen et al. (2020) document that financial development, triggered by global connections, tends to associate with economic growth positively. While Selvarajan and Ab-Rahim (2020) point out that financial integration must be carefully developed to promote economic growth, we can clearly see that financial interconnected is an opportunity to attain sustainable growth.

This paper presents an empirical analysis of financial markets integration. The author examines the integration between Indonesia and Asia-Australia-Europe-US stock markets. A stock index has been considered as one of the essential economic indicators. Classic papers (Gallinger, 1994; Levin and Zervos, 1996, 1998) document the relationship between the stock market and economic activity. Recently, the relationship was reiterated by Ciner (2018) and Das et al. (2019). Therefore, the author argues that it is sensible to examine economic integration through financial markets integration.

The author starts the analysis by

calculating and visualizing the correlation between Indonesia and foreign stock indices. The author follows the procedures suggested by Klemelä (2014) in terms of correlation and visual analyses. The author performs cluster analysis in three different sub-samples to demonstrate the dynamic of financial integration. This sub-sample analysis is inspired by empirical studies performed by Engle and Ng (1993), Thornton and Valente (2012), and Boguth et al. (2016). Then, the author runs the standard OLS regression. However, the OLS approach might not be suitable for non-normal distributions, thus the author needs to deal with this non-normality issue. A feasible solution is to apply non-parametric analysis like the additive model. Indeed, the non-parametric method has been applied in empirical finance research (Aït-Sahalia and Lo, 1998; Fan and Wang, 2012; Li and Zhu, 2014). The non-parametric additive model was developed by Stone (1985) by transforming the explanatory variables into smooth arbitrary functions.

The remaining paper is organized as follows: Section 2 describes the method used to evaluate the dynamic of financial market integration; section 3 discusses the data and presents the empirical results, and section 4 delivers the concluding comments.

Research Methodology

The author would like to assess whether there is a dynamic integration between Indonesia and global financial markets. The author hypothesizes as follows:

H0: There is NO dynamic integration

H1: There is a dynamic integration

Following the correlation and visual analyses by Klemelä (2014), the author calculates the correlation of daily returns between stock indices as follows:

$$Cor(X,Y) = \frac{Cov(X,Y)}{sd(X)sd(Y)} \quad (1)$$

where Cov(X,Y) refers to the covariance of daily indices returns between X and Y, and sd() denotes the standard deviation of daily index returns. Then, the author performs the OLS regression between IHSG and foreign indices returns as follows:

$$IHSG_t = \alpha + \beta_1 N225_t + \beta_2 AORD_t + \beta_3 SP500_t + \beta_4 DAX_t + e_t$$

$$(2)$$

where IHSG refers to the daily returns of Jakarta Composite Index, N225 denotes the daily returns of Japan Nikkei 225 index, AORD IHSG is the daily returns of Australia All Ordinary index, SP500 refers to the daily returns of US S&P500 index, and DAX denotes the daily returns of Germany Stock index.

Last, the author performs non-parametric analyzes, namely the additive regression model to evaluate financial integration dynamics further. The author extends the equation (s) into the additive model as follows:

$$IHSG_t = \alpha + f_1(N225_t) + f_2(AORD_t) + f_3(SP500_t) + f_4(DAX_t) + e_t$$

$$(3)$$

where f( ) refers to the smooth arbitrary function of the corresponding explanatory variable. The author decides to use scaled t to deal with the heavy-tailed data problem.

Results and Discussions
Data and Empirical Analysis

The author uses Indonesia (^JKSE), Japan (^N225), Australia (^AORD), US S&P500 (^GSPC), and Germany (^GDAXI) indices' daily returns from January 5, 2000, to July 30, 2020. The author sub-classifies them into three periods: i) old decade when the international mobilities tended to be limited, which is from January 2000 to December 2009, ii) recent decade when the international mobilities had been growing remarkably, which is from January 2010 to December 2019, iii) post-pandemic, the period after Covid-19 pandemic, which is from January 2020 to July 2020. The author obtained the data from Yahoo Finance (2020).

Figure 1 shows that the correlation between IHSG and N225 is 0.4162, between IHSG and AORD is 0.4720, between IHSG and SP500 is 0.1451, and between IHSG and DAX is 0.2368. According to Figure 1, we can see that Indonesia's and Australia's financial markets were closely integrated in the past. Figure 2 shows that the correlation between IHSG and N225 is 0.3372, between IHSG and AORD is 0.4279, between IHSG and SP500 is 0.1877 and between IHSG and DAX is 0.2996. According to Figure 2, we can see

that Indonesia's financial market had become slightly more integrated into European and American financial markets, whereas slightly less integrated into Japanese and Australian financial markets. Figure 1 and Figure 2 demonstrate a dynamic shift of financial markets integration from Asia-Pacific to European and American regions (i.e., Japan, Australia, European and American). This indicates the potential for economic growth from global financial integration. There are at least three seminal papers citing that global financial integration tends to lead positive economic growth (Dumas and Uppal, 2001; Bekaert et al., 2005; Bekaert et al., 2007). Dumas and Uppal (2001) conclude that financial market integration is a worthwhile goal to pursue. Bekaert et al. (2005) documents that equity market integration and liberalization, on average, lead to a 1% increase in annual real economic growth. Bekaert et al. (2007) reveal that market integration tends to generate global growth opportunities.

Figure 3 shows that the correlation between IHSG and N225 is 0.5137, between IHSG and AORD is 0.5092, between IHSG and SP500 is 0.4115, and between IHSG and DAX is 0.4110. According to Figure 3, we can see clearly that Indonesia's financial market

Figure 1. Scatterplots and Correlations between IHSG and Foreign Indices from January 2000 to December 2009.
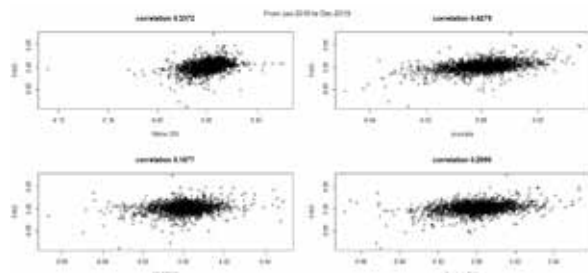
Figure 2. The Scatterplots and Correlations between IHSG and Foreign Indices from January 2009 to December 2019.
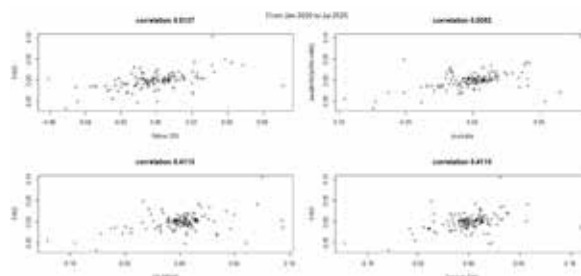

Figure 3. The Scatterplots and Correlations between IHSG and Foreign Indices from January 2020 to December 2020.

has become far more integrated with global markets, as represented by four important regions below:

Table 1 presents the result of the OLS regressions, equation (2), between the daily returns of IHSG dependent variable and the daily returns of Japan Nikkei 225, Australia AORD, US S&P500, and Germany DAX independent variables. The asterisk indicates a significant covariate at the *) 10 percent significance level, **) 5 percent significance level, ***) 1 percent significance level. According to Table 1, we can see that Indonesia's financial markets consistently tend to integrate with Japan and Australian financial markets. Two important indicators beyond the statistical significance are the magnitude (i.e., coefficient) and explanatory powers. We can see that the magnitudes increase from 0.1657 to 0.4159 (Japan), and
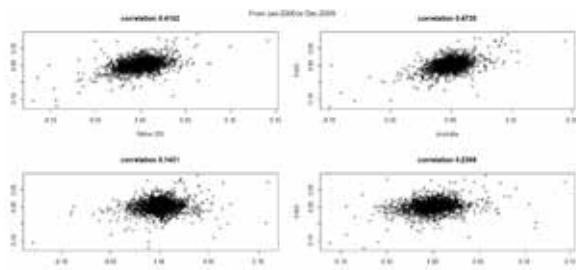
Table 1
OLS regressions equation (2)

Dependent Variable	Return IHSG		
OLS Model From Jan-2000 to Dec-2009			
	Coef	t-Stat	
Intercept	0.0006	1.96	**)
Return Nikkei 225	0.1657	6.83	***)
Return Australia INDEX	0.5012	13.45	***)
Return US SP500	-0.0069	-0.25	
Return German DAX	0.0455	1.95	*)
Adj-R^2		0.24	
OLS Model From Jan-2010 to Dec-2019			
	Coef	t-Stat	
Intercept	0.0003	1.45	
Return Nikkei 225	0.0858	4.61	***)
Return Australia INDEX	0.3834	13.26	***)
Return US SP500	-0.0164	-0.60	
Return German DAX	0.1470	6.57	***)
Adj-R^2		0.22	
OLS Model From Jan-2020 to Jul-2020			
	Coef	t-Stat	
Intercept	-0.0012	-0.81	
Return Nikkei 225	0.4159	3.98	***)
Return Australia INDEX	0.2532	2.85	***)
Return US SP500	0.0839	1.00	
Return German DAX	-0.0902	-0.92	
Adj-R^2		0.34	

Source: Author's calculation

the explanatory powers increase from 0.24 to 0.34. Overall, we can see that Indonesia's financial market has become more globally integrated in the last two decades.

We shall realize that the problem with the standard OLS model is a normality assumption. As indicated by several studies (e.g., Aït-Sahalia and Lo, 1998; Fan and Wang, 2012; Li and Zhu, 2014), it is not uncommon to observe non-normalities in the financial markets. Then, the author draws residual qq plots in Figure 4. According to Figure 5, we can see obviously that both non-constant variance and long tails exist in the residuals. This indicates that a parametric approach does not seem to be a good fit to model our financial data. Therefore, the author performs the non-parametric approach, namely the additive regression model as written in equation (3), to deal with the data issues. The readers could learn more details on the non-parametric methods in Faraway (2016).

Table 2 presents the result of the non-parametric additive regressions, equation (3), between the daily returns of IHSG dependent variable and the daily returns of Japan Nikkei 225, Australia AORD, US S&P500, and Germany DAX independent variables. Note that the author uses scaled t to deal with the heavy-tailed data problem. According to Table 3, we can see that the scaled t additive model works well because the model generates more conservative (lower) explanatory powers and more statistically significant covariates. Overall, Indonesia's financial markets consistently tend to integrate with, again, Japan and Australian financial markets. After the pandemic, there is a substantial shift regarding the integration from European to American financial markets. This indicates a herding behavior between Indonesian and American financial markets due to the Covid-19 pandemic. The author's non-parametric approach reveals that Indonesia's financial markets integrated
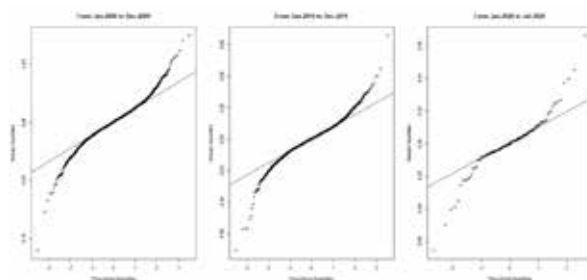

Figure 4. The qq plots of the residuals at the three different sample period.

Table 2
OLS regressions equation (3)

Dependent Variable	Return IHSG		
Additive Model From Jan-2000 to Dec-2009			
	Coef	t-Stat	
Intercept	0.0008	2.84	***)
Return Nikkei 225	0.1691	8.15	***)
Return Australia INDEX	0.4322	13.56	***)
Return US SP500	0.0070	0.30	
Return German DAX	0.0650	3.25	***)
Adj-R^2		0.24	
Additive Model From Jan-2010 to Dec-2019			
	Coef	t-Stat	
Intercept	0.0005	3.05	***)
Return Nikkei 225	0.1008	6.58	***)
Return Australia INDEX	0.3131	13.17	***)
Return US SP500	-0.0171	-0.76	
Return German DAX	0.0999	5.43	***)
Adj-R^2		0.21	
Additive Model From Jan-2020 to Jul-2020			
	Coef	t-Stat	
Intercept	-0.0010	-1.02	
Return Nikkei 225	0.3088	4.51	***)
Return Australia INDEX	0.2209	3.80	***)
Return US SP500	0.1573	2.87	***)
Return German DAX	0.0036	0.06	
Adj-R^2		0.31	

with three (instead of only two as reported in the OLS method) global financial markets (Japan, Australian, and European/American).

Overall, we can conclude that a dynamic integration (alternate hypothesis) in the Indonesian financial markets leads to global markets and sustainable growth. The findings are consistent with other research works in integration and sustainable growth (see Kleimeier and Versteeg, 2010; Van et al., 2019; Huang and Wang, 2020; Nasreen et al., 2020).

Conclusions

International mobility growth has been remarkable since two decades ago which leads to the integration among global financial markets. A number of scholars reveal the relationship between financial interconnectedness and economic growth, and we can clearly see that there is an opportunity to attain economic growth through financial integration. These findings reiterate the sustainable growth opportunities as documented by other scholars (Kleimeier and Versteeg, 2010; Van et al., 2019; Huang and Wang, 2020; Nasreen et al., 2020).

This paper examines the integration between Indonesia and Asia-Australia-Europe-US stock markets. The author starts the analysis by calculating and visualizing

the correlation between Indonesia and foreign stock indices. Then, the author runs the standard OLS regression. Realizing that OLS might not be suitable for non-normal distributions, the author applies a non-parametric approach, namely the additive regression method.

Overall, the author concludes that there has been dynamic integration in Indonesia's financial market. Indonesia's financial market has become more globally integrated over the last two decades. Indonesia's financial markets tend to integrate with Japan and Australian financial markets. After the pandemic, there is a substantial shift regarding the integration from European to American financial markets. Consistent with other empirical findings, the author also concludes that there are sustainable growth opportunities in the integration of Indonesia's financial markets and the global.

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