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DOES ASYMMETRIC INFORMATION INFLUENCE FOREIGN DIRECT INVESTMENT?

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Abstract: The study investigates the link between asymmetric information through market micro-structures and Foreign Direct Investment (FDI) using daily stock prices of listed companies from ASEAN+3 countries. Asymmetric information in the stock market is measured using liquidity and illiquidity measures of *Amivest* and *Amihud*, respectively. The findings from static panel regression analysis reveal that *Amivest* has a positive relationship while *Amihud* has a negative relationship with FDI. This relationship infers that high stock liquidity reduces price movement, increases transparency, decreases asymmetric information and ultimately encourages FDI, Conjecture has an inverse asymmetric information-FDI relationship. The findings show the importance of policymakers and industry players in stimulating market transparency to welcome foreign investment in the economy.

Keyword: Capital flows, foreign direct investment, asymmetric information, market microstructure, stock liquidity.

Introduction

The role of foreign direct investment (FDI) and both its direct and indirect effects on economic growth have been highlighted by past studies (Tchorek *et al.,* 2017; Hannan, 2018; Mat Nor *et al.,* 2021). Theoretically, FDI inflows may directly encourage growth if they steer the economy towards an increase in investment rates while indirectly, they may promote growth via investments with positive spillovers that enhance capital and labour productivity in the host economy. Several mechanisms directly link FDI to economic growth such as competition, training, linkages and demonstration channels (Hassan, 2005). For example, while the competition channel shows that competition helps raise efficiency, investment (in human and physical capital) and productivity, FDI via training channels hypothesise that FDI promotes an increase in training of labour and management.

Further, FDI accompanied by technology transfers with parent firms develops linkage channels between foreign and host countries. Finally, through demonstrative channels, firms in the recipient countries can imitate the sophisticated technologies adopted by foreign companies.

Besides the real economic sector, the financial sector is another channel that allows the FDI-economic growth relationship to exist. Research has shown the positive impact of FDI on stock market development (Koptyug *et al.,* 2020; Vo, 2021). Further analysing the stock market development, the information asymmetry has been acknowledged as one of the main factors that affect capital flows (Yousefinejad *et al.,* 2018).

Asymmetric information refers to the variance in the access to information between a seller and buyer that creates a disparity of control in a financial transaction (Razin *et al.,* 1998). The fact that asymmetric information has a significant influence in developing countries (even if the capital returns in those countries are high) has been addressed in a few studies (De Wet, 2004; Barbaroux, 2014; Yaacob *et al.,* 2017; Mohd. Nor *et al.,* 2021). However,

research on this issue involving Association of Southeast Asian Nations (ASEAN) countries is still limited.

This study aims to examine the relationship between asymmetric information and FDI for ASEAN + 3 countries. It attempts to address the puzzle of whether or not capital flows create asymmetric information? The answer to this puzzle is vital to policymakers because it contributes to filling in the gap in the literature on capital inflows. This study measures asymmetric information using a micro-structure approach.[1]

A market micro structure proxies of information asymmetry are linked with market liquidity and adverse selection is linked between asymmetric information and market liquidity (Amihud & Mendelson, 1986; Eleswarapu & Reinganum, 1993). Notwithstanding few studies have adopted the market microstructure approach towards capturing asymmetric information, the literature gap that this study aims to fill in are threefold, namely, in terms of capital flow concepts, sample countries and asymmetric information measures.

While most research tested the asymmetric information-capital flow relationship via Foreign Portfolio investment (FPI), this study explores a similar relationship in the case of FDIs for Asean + 3 countries using the *Amihud* and *Amivest* approach.

The remainder of this paper is structured as follows. The following section discusses the literature reviews related to this study. Then, the data and variables adopted in the regression and the specification of the model are explained. The findings and results are described in the next section, followed by the concluding remarks in the final section.

Related Past Studies

This study categorises the literature into three categories: Foreign direct investment (FDI), asymmetric information using market micro structures and other factors affecting FDI.

Foreign Direct Investment

Foreign direct investment (FDI) also known as foreign capital inflow has become one of the most important sources of the economy. It has been classified as the key to the globalisation of a country and one of the main features of recent globalisation in the capital market in developing and developed countries (Becker *et al.,* 2017; Zhang & Gregoriou, 2020). Kirabaeva and Razin (2010) classified capital flows into three types: Foreign Direct Investment (FDI), Foreign Portfolio Investment (FPI) and Debt Capital flows with equity-like features (FDI and FPI) are presumed to be more stable and less prone to reversals than debt-based.

Although FDI and FPI share common features in terms of being equity-based, they differ in the sense of investment types. While FPI is traded as financial securities such as a bonds, stocks and derivatives, FDI involves investment in real estate and production activities (Neely, 1999; Yaacob *et al.,* 2017). Among the equity flows, FDI yields more benefits than FPI because it comes with more direct control of management and stimulating employment, economic growth and technology transfer (Goldstein & Razin, 2006; Del Giudice *et al.,* 2017).

FDI refers to the investment made by a company in another country in another country. It can be transferred in two ways either:

(1) By expanding operation in an existing business in an overseas company through a joint venture or merger contract or

[1] The Market Microstructure Working Group of the National Bureau of Economic Research (NBER) defines the market micro-structure as a theoretical, empirical and experimental research on the economics of securities markets, including the role of information in the price discovery process, the definition, measurement, control and determinants of liquidity and transaction cost and their implication for the efficiency, welfare and regulation of alternative trading mechanisms and market structure.

(2) By acquiring at least 10% of ordinary shares of a foreign company (Moran, 2001; Hong *et al.,* 2019)

FDI is a critical element of globalisation as it creates direct, stable and long-lasting links between economies (Kaczmarek, 2017). Also, it can be an essential source for development to help improve the competitive position of both the recipient and investing country. As a result, the recipient country may gain the advantage in terms of technology transfer (Hong *et al.,* 2019) while the host country has the opportunity to enter the international market (Lenaerts & Merlevede, 2016).

A fully efficient market with perfect information does not exist (Lo & MacKinlay, 1988). Traders and investors need time to digest new information, incorporate it into the business models and current theories, map out the implications of those recent developments and decide how to act. These create a "friction" which leads to asymmetric information (Chordia *et al.,* 2008). Informational friction influences trade as well as the direction of capital flows in the market (Bougheas & Falvey, 2011).

Asymmetric Information and FDI

One of the most crucial factors that can explain the behaviour of the foreign capital flows is that of asymmetric information (Hur *et al.,* 2018; Ikeda, 2019) as it drives capital immobility (Gertler & Rogoff, 1990). Asymmetric information is defined as an informational difference between buyer and seller in a financial contract, creating an imbalance of power in the transaction (Razin *et al.,* 1998). Asymmetric information typically occurs when there are informational advantages that borrowers or entrepreneurs have over lenders or investors (Akerlof, 1970). Thus, a country with high levels of asymmetric information regarding investment opportunities or productivity often has more FDI investments than FPI investments as investors can obtain a sizeable marginal benefit from having access to such private information (Kirabaeva & Razin, 2009).

Although research on capital flows is considered abundant, studies on how asymmetric information affects capital flows is still lacking. Goldstein and Razin (2006) noted that asymmetric information is the trade-off between portfolio investments and direct investment via mathematical modelling. Reducing the degree of asymmetric information changes the trade-off between both investments. Direct investors have a greater informational advantage than portfolio investors. If investors expect a liquidity shock (via increasing asymmetric information), they will invest in portfolio investments and vice-versa. Taken together, countries with a higher degree of asymmetric information will attract fewer FDI inflows.

While most empirical research on asymmetric information has adopted the macro-structure data, research that uses a market macro-structure approach on FDI is scant. The examples of market macro-structure measures are the gravity model (Faruqee *et al.,* 2004; Portes & Rey, 2005), opacity index (Goldstein *et al.,* 2010) and International Monetary Fund's (IMF) Special Data (Hashimoto & Wacker, 2012). However, the macro-structure approach has a drawback in that it fails to tap exhaustive information. On the other hand, a market micro-structure offers details on trading and stock returns (Garman, 1976). The market micro-structure can be categorised into four parts:

(1) Information disclosure - market participant transparency in detecting the trading information process

(2) Price discovery and formation - trading determinants' cost

(3) Market micro-structure and design – 'price formation-trading rules' relationship and

(4) Informational issues related to market micro-structure interface with other factors like international finance, asset pricing and corporate financing (Madhavan, 2000)

The existence of a secondary stock market is to provide liquidity to shareholders, aid in price discovery and offer diversification opportunities.

In addition, consumers, labour and private companies may enjoy positive spillovers from external effects of an active stock market due to the increased corporate investment and more socially responsible business with a favourable business climate. Meanwhile, adverse external effects on capital allocation and productivity may cause market mispricing and increased cross-ownership (Koptyug *et al.,* 2020). In short, empirical evidence showed that stock liquidity could positively affect FDI inflows (Kurul, 2017).

Empirical studies have shown that capital inflows are negatively affected by asymmetric information (Koptyug *et al.,* 2020; Malik *et al.,* 2020; Jin *et al.,* 2020). For instance, De Wet (2004) revealed that asymmetric information causes physical and financial market failures in developing countries in the long-run through its influence on capital flows. Optimal investment activities would not go as planned when accurate information is not properly delivered or some information is hidden from those who make decisions (policymakers, industry players and investors). In short, asymmetric information promotes errors in judgement in decision-making, which inversely affects FDI inflows.

Previous researchers came up with several formulas to estimate the asymmetric information in the capital flow. Kerry Cooper *et al.* (1984), Roll (1984) and George *et al.* (1991) are the researchers that took part in the asymmetric information research problem. Today, new research uses their formulas to check the transparency of capital flows. Razin *et al.* (1999) proved the existence of distortion in the domestic capital market. The origin of the distortion was from lack of corporate transparency and it raises the problem of asymmetric information between insiders and outsiders. The insider can overcharge the outsider when multinational subsidiaries shares are traded on the domestic stock market.

Other Factors Affecting FDI

Past literature documented Gross Domestic Product (GDP), inflation, exchange rates, market capitalisation and real interest rates as other factors that affect FDI flows.

Gross Domestic Product (GDP)

GDP is expected to be positively related to FDI (Singhania & Gupta, 2011; Jadhav, 2012; Saleem *et al.,* 2013; Ashrafi & Bagheri, 2019). The GDP measures the level of economic development. Countries with higher GDP growth are more attractive to investors because they can benefit from higher returns and more productive activities.

Inflation (INF)

Unlike GDP, past studies have showed that inflation is inversely related to FDI flows. Investors tend to shy away when predicting a bad situation after inflation crises (Kurt & Gungor, 2013; Eissa & Elgammal, 2020). High inflation rates typically come together with economic and monetary volatility (Jenkins & Thomas, 2002; Guseva & Mechik, 2020). It naturally creates additional costs due to a rise in the costs of raw materials and labour for multinational firms and reduces the competitive advantage (Grosse & Trevino, 2005; Ashrafi & Bagheri, 2019). When profit margins decrease, multinational companies tend to exit the domestic market gradually.

Official Exchange Rate (OEX)

With regards to exchange rates, when the host country's currency appreciates, foreign investors gain additional returns simply by converting the profit denominated in local currency to bring it back to their home country (Goldstein *et al.,* 2010; Guseva & Mechik, 2020)[2]. Also, the favourable exchange rate-FDI occurs when currency appreciation reduces the volatility of macroeconomic fundamentals, promoting

[2] Exchange rate defined as a domestic currency price of a foreign currency, matter both in term of their level and their volatility.

FDI inflows (Garg & Dua, 2014) as domestic economic stability is essential in attracting foreign investors.

Market Capitalization (MC)

In terms of market capitalisation, past studies showed that large market size promotes FDI inflows (Tsagkanos *et al.,* 2019; Binatlı & Sohrabji, 2019; Eissa & Elgammal, 2020), conjecturing a positive link between market capitalisation and FDI inflows. This link is because market capitalisation represents the development level of the stock market in which the developed stock market acts as a "sweetener" for foreign investors (Giovanni, 2005; Sakuragawa *et al.,* 2010).

Real Interest Rate (RIR)

Real interest rates via a bank lending channel may produce a negative impact on FDI as it determines the cost of borrowing capital (Hassan *et al.,* 2016; Raff *et al.,* 2018). Increasing the interest rate mirrors economic expansion with higher borrowing costs which triggers inflation at the same time. Hence, its effects on FDI inflows is expected to be similar to the ones for inflation. Nonetheless, there are some empirical studies with positive impact (Ashrafi & Bagheri, 2019).

Islamic Finance (ISLAMIC)

The offering of a wide range of Islamic capital market products (i.e., *sukuk* and *shariah*-compliant stocks and mutual funds and equity-based financing) that influence the financing structure and cost in the host countries may attract FDI to grab the opportunities. For example, Hassan *et al.* (2016) found that market sentiment (via aggregate investor sentiment index) plays a significant positive role in net flows of FDI for the case of Malaysia which is the hub for Islamic investment.

At the same time, Islamic stock markets offer opportunities for worldwide portfolio diversification and hedging strategies, implying the possibilities for portfolio investment and FDI trade-off. Thus, the FDI performance for countries offering Islamic capital markets is still a puzzle.

Methodology

Proposed Conceptual Framework

Based on the discussion mentioned earlier of the literature review of factors affecting FDI, Figure 1 presents the proposed conceptual framework for this study.

Data and Variables

The study analysis ASEAN 5 + 3 countries (i.e., Indonesia, Malaysia, Philippines, Singapore, Thailand, Japan, China and Korea) covering the period 2000 to 2014. Five ASEAN countries are chosen based on the similarities in terms of economic size and trade (Nizam *et al.,* 2020) as well as the five countries were the initial member countries that formed the Association of Southeast Asian Nations before the other five joined them. Meanwhile, FDI data for all countries is in US dollars, collected from the United Nation Conference on Trade and Development (UNTCAD) database. Table 1 summarises the variables and their descriptions.

This study uses *Amihud* and *Amivest* ratios in capturing the asymmetric information in market microstructure. These ratios are calculated daily before being converted to annual data. This research paper believes that these two ratios can comprehensively measure the impact of asymmetric information on FDI as each of them has different properties.

Amihud

Amihud ratio, developed by Amihud (2002) is defined as the daily ratio of the absolute percentage of stock return over the daily stock turnover in dollar volume. The equation of the *Amihud* ratio is as follows:

$$Amihud = ILLIQ_{idt} = \frac{r_{idt}}{Tn_{idt}} \quad (1)$$

where is the illiquidity measure for stock i at time t, denotes the daily stock returns i at time

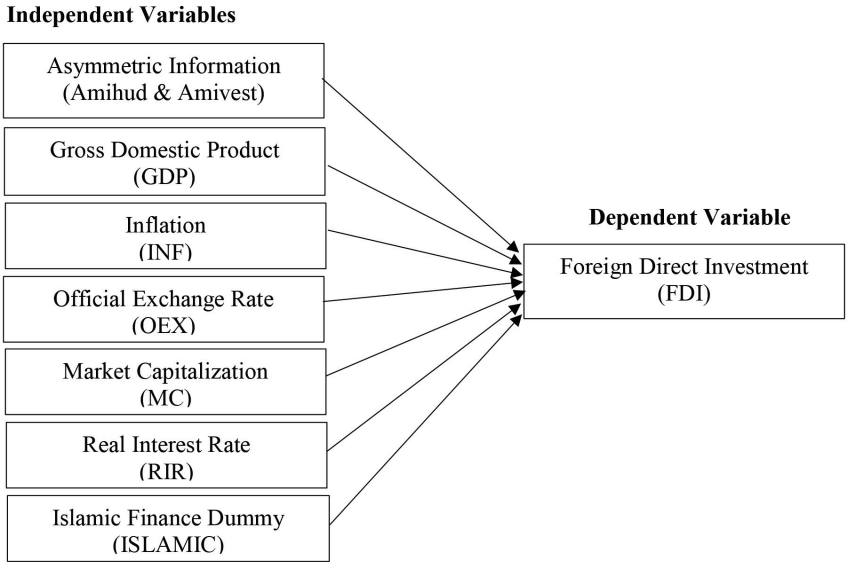

Figure 1: Proposed conceptual framework

Table 1: Variable descriptions, indicators and sources

Mnemonic	Variable	Description	Sources	Indicators
FDI	Foreign Direct Investment	An investment made by a company in another country	UNTCAD	Capital inflows
AMIVEST/ AMIHUD	Asymmetric Information	Informational difference between buyer and seller in a financial contract that creates an imbalance of power in that transaction	Data stream	Asymmetric information
GDP	Gross Domestic Product	Level of economic development	World Bank	Economic growth
INF	Inflation	Continuously increasing in the price level	World Bank	Macroeconomic stability
MC	Stock Market Capitalization	Development level of the stock market (% of GDP)	World Bank	Market size
OEX	Official Exchange Rate	Currency value of a country	World Bank	Macroeconomic stability
RIR	Real Interest Rate	Rate of interest an investor or lender will receive	World Bank	Macroeconomic stability
IF	Islamic Finance	"1" if the country has Islamic Capital Market "0" if the country does not have Islamic Capital Market	Authors	Economic growth

t and refers to the turnover for stock *i* at time *t*. The higher the value of illiquidity means the market is less liquid and higher asymmetric information problem.

As *Amihud* stands for illiquidity, the larger value of *Amihud* means a greater degree of asymmetric information. This interpretation is because illiquidity leads to higher price movement and low transparency, leading to high asymmetric information. *Amihud* measure excludes days with zero returns. Thus, it does not include information trading but captures noise trading.

Since its establishment, many recent studies have adopted the *Amihud* ratio to measure stock liquidity (Zhao *et al.,* 2016; Shih & Su, 2016; Chen & Sherif, 2016; Chen *et al.,* 2016; Lim *et al.,* 2017; Dahiya *et al.,* 2017; Fong *et al.,* 2017; Lu-Andrews & Glascock, 2017; Drienko *et al.,* 2018; Ahn *et al.,* 2018; Hur *et al.,* 2018; Li *et al.,* 2018; Lobanova *et al.,* 2019; Będowska-Sójka, 2019; Ikeda, 2019; Alhomaidi *et al.,* 2019; De la O González & Jareño, 2019; Gurgul & Syrek, 2019; Kim *et al.,* 2019; Gakhar & Kundlia, 2019; Holden & Nam, 2019; Liu *et al.,* 2020), bond liquidity (Mahomed *et al.,* 2018; Nguyen & Dang, 2019), mutual fund liquidity (Brito *et al.,* 2017; Rahman *et al.,* 2017; Marshall *et al.,* 2018), short sale liquidity (Zhang & Ikeda, 2017) and cryptocurrency liquidity (Kyriazis & Prassa, 2019; Zhang & Gregoriou, 2020).

Amivest

Unlike the *Amihud* ratio, the *Amivest* ratio which has been developed earlier by Cooper *et al.* (1985) is a measure for liquidity using the absolute percentage price changes and volume. The *Amivest* ratio is defined as asset turnover over the daily absolute percentage of stock return and it also excludes the days with zero return. The equation of the *Amivest* ratio is expressed as follows:

$$Amivest = LR_{it} = \frac{Tn_{it}}{r_{it}} = \frac{\sum_{i=1}^{N} P_i \times Q_i}{r_t} \quad (2)$$

where is the liquidity ratio for stock *i* at time *t*, refers to daily turnover for stock *i* at time *t* and denotes the return of the stock *i* at time *t*. The liquidity ratio compares the turnover to the changes of absolute price in the time given.

A high value of Amivest ratio represents high stock market liquidity and low prices impact. Low stock price changes lead to a high liquidity ratio, implying a low degree of adverse selection, a high degree of transparency and conjecturing a low level of asymmetric information. Although not as much as the *Amihud* ratio, some modern studies adopted *Amivest* to test stock market liquidity (Marshall *et al.,* 2013; Bouraoui *et al.,* 2013; Hung *et al.,* 2015; Mohd *et al.,* 2018) and commodity liquidity (Marshall *et al.,* 2012).

Hypothesis Testing

In analysing the asymmetric information-FDI relationship, some macroeconomic factors were considered as control variables. In addition to the two market microstructure measures, the current model incorporates Islamic finance as a dummy variable, in which 1 refers to a country with well-developed Islamic finance and 0 for the economy, which embraces mainstream finance. The selection of control variables is based on previous studies by Goldstein *et al.,* 2010; Filbert and Soumare, 2015; Kurul, 2017; Kaczmarek, 2017; Ashrafi and Bagheri, 2019; Binatlı and Sohrabji, 2019; Eissa and Elgammal, 2020 and, Guseva and Mechik, 2020.

The two asymmetric information using market microstructure models in this study are as follows:

$$lnFDI_{it} = \alpha_i + \beta_1 AMIVEST_{i,t} + \beta_2 GDP_{i,t} + \beta_3 INF_{it} + \beta_4 MC_{i,t} + \beta_5 OEX_{i,t} + \beta_6 RIR_{i,t} + \beta_7 ISLAMIC + \varepsilon_{i,t} \quad (3)$$

$$lnFDI_{it} = \alpha_i + \beta_1 AMIHUD_{i,t} + \beta_2 GDP_{i,t} + \beta_3 INF_{it} + \beta_4 MC_{i,t} + \beta_5 OEX_{i,t} + \beta_6 RIR_{i,t} + \beta_7 ISLAMIC + \varepsilon_{i,t} \quad (4)$$

where:

FDI	: Foreign Direct Investment
AMIVEST	: Asymmetric Information (liquidity of the stock market)
AMIHUD	: Asymmetric Information (illiquidity of the stock market)
GDP	: Gross Domestic Product
MC	: Market Capitalization
RIR	: Real Interest Rate
INF	: Inflation
ISLAMIC	: Dummy variable which takes a value of 1 if the country offers Islamic capital market and 0 if the country does not offer Islamic capital market
OEX	: Official Exchange Rate

The estimations involve two steps: (i) Calculating the asymmetric information using *AMIHUD* and *AMIVEST* approaches and (ii) Running the static panel regression analysis.

Findings and Discussion

Descriptive Analysis

Figures 2 and 3 present the scatter plot of the asymmetric information level for each company in every ASEAN 5+3 economy using *Amihud* and *Amivest* ratios. The y-axis represents the level of asymmetric information and the x-axis represents the average of asymmetric information across years. Both measures show a pretty similar pattern for each country. The figures show some of the countries have clustered patterns and some of them show scattered patterns.

For both measures, Japan, China and Korea show a clustered pattern of asymmetric information, implying the asymmetric information levels for these three countries are not too much different from one company to another. While South Korea and Japan do not have a severe asymmetric information issue, China seems to have the worst asymmetric information levels. The other five countries have a scattered pattern, showing that some companies have high asymmetrical information levels and some have a low level of asymmetrical information. The trends across the years for each country are illustrated in Figures 4 and 5.

From Figure 4, the Philippines shows the highest level of *Amihud* among other countries, followed by Singapore, China and Malaysia. These four countries show some fluctuations from 2008 to 2010 due to the global financial crisis.

Indonesia, Japan and South Korea have the bottom three *Amihud* ratio*s,* indicating that their stock markets have high transparency and less asymmetric information. From Figure 5, South Korea leads in which it has the highest level of *Amivest*, implying the highest transparency and stock liquidity. The asymmetric information issue is the least in the South Korean stock market, followed by Thailand, Indonesia and Japan.

Meanwhile, the most severe problem of asymmetric information is seen in the Philippines, followed by China, Malaysia and Singapore. Against this background, both

measures show that South Korea has the lowest level of asymmetric information while the Philippines has the highest.

With regards to descriptive statistics and correlation matrix, Tables 2 and 3 illustrate the findings. In general, the multicollinearity issue is not a serious problem as all values are less than 0.8. There are three competing estimations for the static panel regression: Pooled OLS, fixed effect model and random effect model. In finding the best specification of the static panel regression model, three tests are conducted:

(i) Poolability F-test
(ii) Breusch-Pagan LM test
(iii) Hausman's specification test

The Likelihood Ratio Test shows that the P-value obtained is less than 0.05, so the null hypothesis is rejected. This finding suggests that the model should run based on panel data as compared to a pooled data. Next, according to the Hausman Test, P-value is higher than 0.05.

The null hypothesis cannot be rejected, leading us to conclude that the best specification for this study is the random effect model (as shown in Table 4). Finally, we also apply the white robust standard error to overcome the problem of Heteroscedasticity - where all its random variables have the same finite variances.

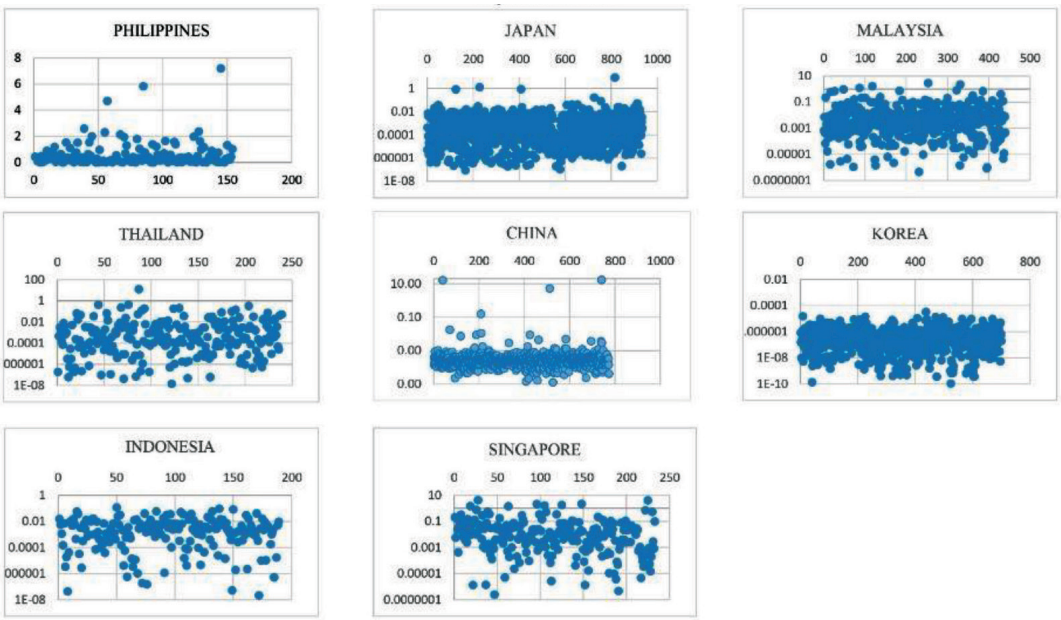

Figure 2: *Amihud*

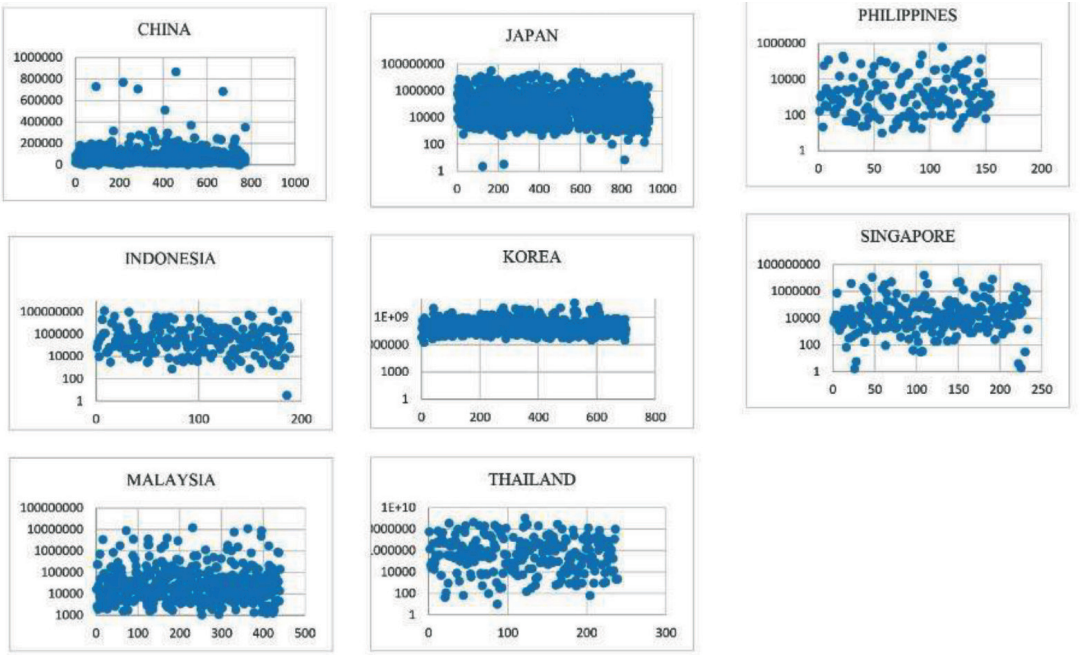

Figure 3: *Amivest*

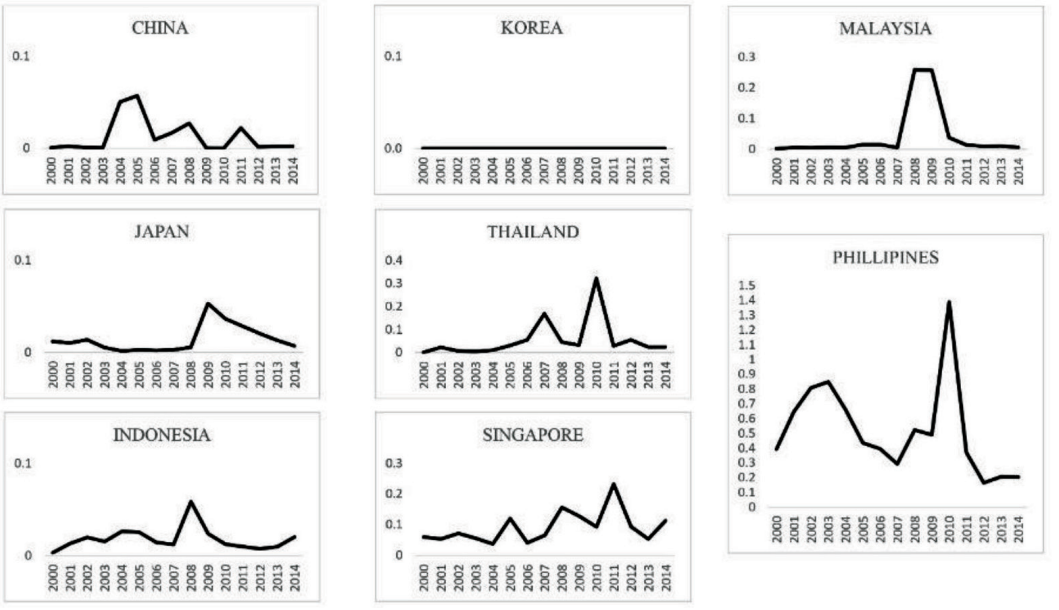

Figure 4: The trend of *Amihud*

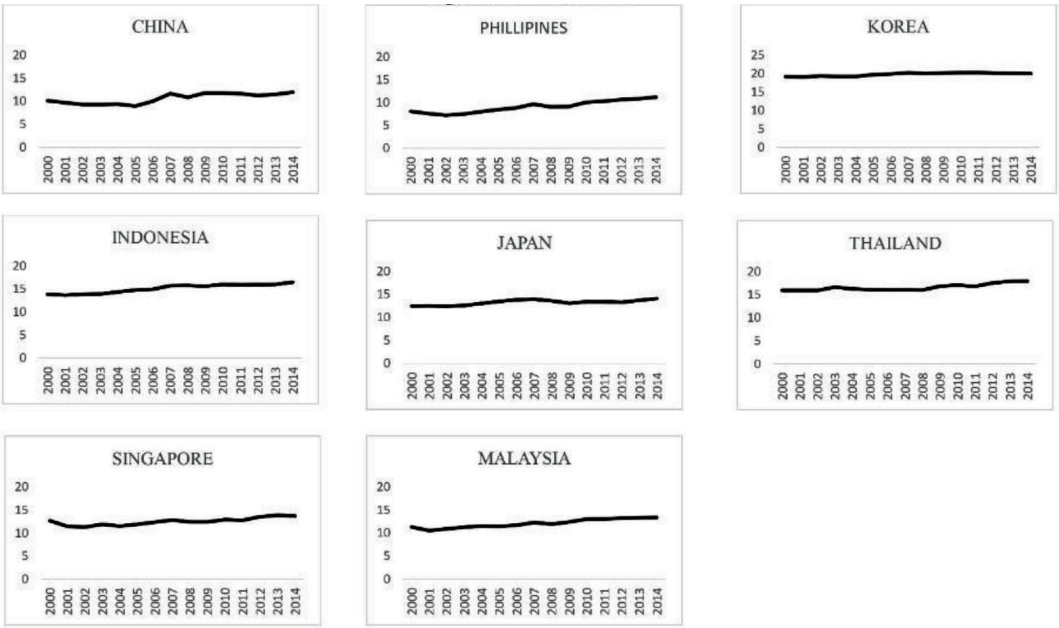

Figure 5: The trend of *Amivest*

Table 2: Descriptive statistic

	LN_FDI	AMIVEST	AMIHUD	GDP	INFL	ER	MC_GDP	RIR	ISLAMIC
Mean	8.250238	13.63778	0.094692	8.825645	2.977742	1358.629	4.234820	3.390488	0.250000
Median	9.109520	13.14671	0.015001	8.655821	2.674945	42.70313	4.237827	3.598536	0.000000
Maximum	11.76368	20.30690	1.389411	10.93817	13.10942	11865.21	5.702361	12.32241	1.000000
Minimum	-9.473603	7.221314	2.91E-07	6.617650	-1.346719	1.249676	2.662608	-3.903257	0.000000
Std. Dev.	4.064825	3.339121	0.202784	1.296782	2.690725	3143.208	0.687791	2.824514	0.434828
Skewness	-3.427179	0.381675	3.590872	0.065363	1.216576	2.257414	-0.020747	0.065036	1.154701
Kurtosis	14.55347	2.454757	18.49911	1.677707	5.263015	6.300634	2.518654	4.147995	2.333333
Jarque-Bera	902.3249	4.399967	1459.000	8.827739	55.20735	156.3893	1.167081	6.674061	28.88889
Probability	0.000000	0.110805	0.000000	0.012108	0.000000	0.000000	0.557920	0.035542	0.000001
Sum	990.0285	1636.534	11.36306	1059.077	357.3291	163035.5	508.1785	406.8586	30.00000
Sum Sq. Dev.	1966.214	1326.818	4.893462	200.1156	861.5603	1.18E+09	56.29365	949.3675	22.50000
Observations	120	120	120	120	120	120	120	120	120

Note: All Jarque-Bera values are significant except *Amivest* and market capitalization (MC) variables. However, data non normality is not a serious concern for a large sample size with more than 30 observations

Table 4 shows that *AMIVEST* (Model 2) is positively related to FDI. The positive relationship suggests that high stock liquidity reduces price volatility, increases transparency while decreases asymmetric information, which encourages FDI inflows.

The results support what Mody *et al.* (2002) and Goldstein and Razin (2006) that hypothesised that an increase of information transparency (reduced asymmetric information) in the stock market improves the entry of FDI as a result of portfolio and FDI trade-off investments. For instance, if asymmetric information is high in the stock market, the investors may change their funds from financial portfolio investment to investments in real economic sectors. Against

Table 3: Correlation matrix

	AMIHUD	AMIVEST	GDP	INFL	ER	MC	RIR	ISLAMIC
AMIHUD	1.000000							
AMIVEST	-0.472338	1.000000						
GDP	-0.321347	0.344745	1.000000					
INFL	0.162204	0.059553	-0.483883	1.000000				
ER	-0.163457	0.252954	-0.351369	0.637884	1.000000			
MC	-0.13379	0.047687	0.670984	-0.419787	-0.456306	1.000000		
RIR	0.109494	0.071171	-0.028749	-0.075814	0.099873	-0.06744	1.000000	
ISLAMIC	-0.183117	-0.007965	-0.300176	0.405375	0.630035	-0.061559	-0.074484	1.000000

Note: The correlation matrix is based on a common sample and the number of samples is 120 for each variable

Table 4: Result for random effect model

Variables		Model 1 *(Amihud)*	Model 2 *(Amivest)*
C		6.049219*** (2.509748)	4.070679 (2.641618)
AMIVEST	+		0.138149*** (0.067711)
AMIHUD	-	-3.502654*** (0.952937)	
GDP	+	-0.93168** (0.49141)	-0.890552** (0.510933)
INF	-	0.189751 (0.242343)	0.094296 (0.225447)
ER	+	-0.0000675 (0.000196)	-0.000058 (0.000186)
MC	+	2.681434*** (0.882819)	2.607049*** (0.827808)
RIR	-	-0.107257 (0.183718)	-0.149166 (0.174495)
ISLAMIC	+	-2.838641*** (0.675576)	-2.325722*** (0.585218)
R^2		0.165753	0.152800
Adj-R^2		0.113613	0.099850
SE regression		3.826957	3.856553
F-statistic		3.178976	2.885738
Prob. F-stat		0.004174	0.008257
Number of observations		120	120

Note: Dependent variable is Foreign Direct investment. Figures in parenthesis are standard errors. Asterisks ***, ** and * denotes significant at 1%, 5% and 10%, respectively

this background, our findings offer empirical evidence of an inverse relationship between asymmetric information and FDI.

Similarly, with regards to *AMIHUD* measurement (Model 1), the finding also implies that asymmetric information is negatively

related to FDI. The inverse *AMIHUD*-FDI relationship is as expected as *AMIHUD* is a measure for stock illiquidity.

It suggests that increasing stock illiquidity increases price movement, reduces transparency and increases asymmetric information which lessens the FDI. Our result is consistent with the findings by Klien *et al*. (2002).

This result is because asset of FDI is illiquid in the sense that it is difficult to sell before maturity; thus, causing the investors to reduce the level of their investment in foreign countries if they think that the stock markets abroad have high asymmetric information (Golstein & Razin, 2006).

For both models, *GDP,* market capitalization (*MC_GDP*) and Islamic Finance (*ISLAMIC*) are the significant factors affecting FDI. The negative relationship for *GDP* is unexpected and contradicts the results of most previous studies (Singhania & Gupta, 2011; Jadhav, 2012; Saleem *et al.,* 2013; Ashrafi & Bagheri, 2019). The finding is consistent with Owusu-Manu *et al.* (2019) who found an inverse GDP-FDI relationship for the case of Ghana; nevertheless, they did not provide any justification. Regarding the positive coefficient sign of *MC_GDP*, our results support the studies by Goldstein *et al.* (2010) and, Razin and Serechetapongse (2011).

This result infers that the high development of the stock market plays a significant role in promoting FDI inflows. Finally, the negative coefficient of the *ISLAMIC* dummy reveals that countries with Islamic capital markets (i.e., Malaysia, Indonesia, Thailand, Singapore and Philippines) have lower levels of FDI inflows than countries that solely depend on mainstream capital markets. Perhaps it may be a coincidence that these five countries are also considered developing economies instead of Japan, Korea and China which may have a competitive advantage, especially in terms of technological advancement to strengthen the real economic sector.

In addition, Abdul Karim and Abdul-Rahman (2020) showed evidence that the Islamic stock markets in ASEAN provide opportunities for international portfolio diversification and hedging strategies, conjecturing the existence of a trade-off between portfolio investment and FDI in ASEAN countries offering Islamic capital market.

Conclusion

This study investigates the impact of asymmetric information using market microstructure data on FDI. Analyzing the effects of *Amihud* and *Amivest* ratios on FDI of ASEAN + 3 countries using 15-years panel data reveals that asymmetric information reduces FDI inflows. The findings infer that increasing stock illiquidity encourages price volatility, minimises transparency, increases asymmetric information and finally discourages FDI inflows. The results fill in the gap of the current asymmetric information literature in three aspects namely:

(1) Using more comprehensive asymmetric information measures (*Amihud* and *Amivest*)

(2) Providing empirical evidence for the context of ASEAN + 3 and finally, capturing the FDI performance of the Islamic finance industry

In addition, the findings could also be beneficial to the market players such as the investors and domestic firms for investment portfolio decision making and firms' strategy, respectively.

Finally, the inverse asymmetric information-FDI relationships provide valuable information for the policymakers and regulatory bodies to enforce stringent disclosure and transparency requirements to reduce asymmetric information between firms and potential investors.

Regarding the other factors affecting FDI, our findings also show that economic growth and stock market development are significant determinants. While increasing economic growth can negatively impact FDI, increasing stock market capitalization can positively influence FDI. Taken together, we suggest that foreign direct investors of the ASEAN + 3

countries should analyze the level of asymmetric information, economic output and stock market development before considering putting any commitment of FDI in the host countries.

Future research can expand the proven discoveries by reevaluating the similar issue using different asymmetric information costs under high-frequency trading (HFT). This suggestion is because asymmetric information cost may influence bid-ask spread; thus, the nature of its effect within various industry sectors and market environments can be examined under HFT. Investors' choices of buying and selling depend on diverse transaction costs like processing and exchange fees and liquidity costs.

Price impacts, bid-ask spread and opportunity costs are swayed by features such as investors' expectancy, market dynamics and information asymmetry in the stock market. It is also worth noting that the Islamic finance capital market is considered small or insignificant for the five emerging ASEAN economies.

Hence, Organisation of Islamic Cooperation (OIC) countries and the Middle East and North Africa (MENA) region which have a significant size Islamic capital market should be considered in future studies in assessing the role of Islamic finance towards attracting FDI.

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