Which market is the driver of the Asian stock markets ?

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Abstract: The study aims to investigate whether the Asian stock markets are integrated or not and if they are integrated which market is the driver of the Asian stock markets. The findings of this paper are valuable for investors, traders and policy makers as this will enable them to make decisions related to their portfolio diversification, risk management and asset allocation . The paper applies a range of standard multivariate time series techniques and finds a strong financial integration between the indices under study. The interesting finding is that Thailand is the most leading country in Southeast Asia followed by Japan, China, Singapore, United States and finally Malaysia. Hence investors could gain potential long-run benefits from diversifying their investment portfolios internationally to reduce the associated systematic risks across countries. In addition, it enables policy makers attain a more stable financial system.

Keywords: Leading Asian stock market, VECM, VDC, Malaysia

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1. INTRODUCTION

Overtime there has been a growing Interest in stock market linkages, most of which are explained in accordance with the financial theory. The theory of efficient market hypothesis developed by Eugene Fama is one of the most significant contributions to the finance theory. It suggests that unsystematic risk is diversifiable, hence only focuses on quantifying systematic risk in order to reduce market risk and provide investors with the highest return possible. Therefore, an understanding of the stock market linkages is especially important for the investors, policy makers and academicians.

There are various reasons explaining the co-movements of stock markets across countries, globalization being the main reason has led to an increase in financial integration, capital movements, expansion and development of trade and the creation of various liberalization reforms leading to an economic expansion and creating and enhancing unique political ties which directly or indirectly influence their stock prices.

Henceforth, the interest in the cointegration of the Asian stock markets escalated globally and especially in the aftermath of the Asian crisis in 1997-1998. The Asian crisis led to a stock market crash which caused a massive panic of financial contagion and loss of paper wealth. It was then followed by the infamous financial crisis of 2008-2009 which highlighted the importance of investigating the co-movements of stock markets and their lead-lag effects especially to investors seeking to diversify their portfolios, and countries aiming for a more stable financial and real sector. Diversification could be sought by creating a diverse environment in which capital flows locally and internationally, hence, minimizing the magnitude of loss as local markets tend to be affected more by its own country's economy. In addition, cross-border linkages increase the productivity of local markets, stimulate trading and improve overall liquidity of the stock market, lowering its cost of capital and increasing its efficiency.

Furthermore, an understanding of the effect of geographic factors is crucial in finance. According to Patev et al.,(2006), it is argued that after a stock market crisis there is less evidence of stock market linkages, hence this is seen as an opportunity to diversify internationally due to lack of integration of stock prices. With this interesting finding and

the emergence of a dual financial market, the research paper was motivated to examine the interdependence among the Japanese and Malaysia's stock market; the Japanese market serving as a developed market whereas Malaysia is an emerging market with a dual financial sector. The long-run co-integration will be tested to examine the extent to which these markets are financially integrated and investors ability to influence international asset allocation and portfolio diversification. Despite the existing vast literature examining the inter-connectivity among international stock markets, compared to other papers, this paper originality stems from the idea that only a few papers examine the inter-connectivity among developed and emerging markets and especially not the co-integration of a developed Asian and emerging Asian market with a dual financial system.

The increase in economic interdependence among countries and especially among those with close geographical proximity has widened inter-regional trade and investments. It has been argued that an expansion of trade inter-regionally are one of the efficient ways in creating integration as this stimulates competition, hence the same could be applied to inter-regional investments. Kearney and Lucey (2004) argues that an integration among countries could exist with the creation of an economic and financial system cooperation, this is due to the expansion of trade in different financial assets, commodities and services. Consequently, the element of trade was taken into account as the Japanese market is a part of ASEAN, a developed economy and is Malaysia's 3rd major exporter and 4th main importer. Malaysia's highest five import partners[1] are China 16.9% of total imports, Singapore (13%), Japan (10%), United States (8%) and Thailand (6%). In terms of exports, its main export partner is Singapore of 14% of total exports, followed by China (13%), Japan (12%), U.S. (9%) and Thailand (5%) therefore, as it would be seen later these countries stock indices were taken as the main variables of the study.

The remainder of the paper is organized as follows. Section II briefly discusses the empirical literature on the integration of stock markets, especially Southeast Asian markets. Section III states the main objective of the study. Sections IV and V further discuss the theoretical underpinnings, data and methodology used in the research paper,

[1] Malaysia's profile in the Observatory of Economic Complexity database. Retrieved from: http://atlas.media.mit.edu/en/profile/country/mys/ on 11th November, 2015.

followed by section VI which presents the empirical results and discussions. Lastly, section VII of the paper provides concluding remarks and states the policy implications of the study.

2. LITERATURE REVIEW

Numerous studies had statistically evaluated the integration of international stock markets. In addition, co-integration techniques have been widely used and there is an extensive literature investigating the long-run relationships and co-integration among international stock markets. Some papers found an inter-relationship among developed markets such as Kasa, (1992); Ahlgren and Antell, (2002); Choudhry,(1996), in contrast Malayayali (1998) found that developed markets are not co-integrated except for NYSE market and U.K. stock indices. Additionally, some papers focused solely on the inter-relationships between only emerging markets and concluded that weak integration exists among them, such as Chaudhuri, (1997) and Worthington et al., (2003). In addition, several studies have investigated the correlation between developed and emerging markets, however, there is no consensus on the results as some have found evidence of international stock market integration such as Masih and Masih (1999) , while others found no evidence of an integration such as Climent and Meneu (2003) and Chang(2001).

One important factor to take note of is that developed markets have a different financial landscape of integration as compared to emerging markets, for example, it was found that developed markets, for example the Eurozone provided more benefits than emerging markets, this is due to the availability of cheaper diversifiable opportunities and low cost of capital (Askari et al.,(2005); Martin et al.,(2000)). Therefore, emerging markets has been subject to many studies trying to explain its low integration, for example Gokcen and Ozturkmen (1997), found that Istanbul stock market was not integrated with the developed market during the period of 1989–1993. Another study specified that East Asian countries are specifically less integrated to each other as compared to their integration to the global market (Lee et al. 2007). Kim et al., (2007) suggests that this is mainly because these countries over time showed low correlation among them indicating low capital movements or as found by Yu et al. (2010) it is due to an incomplete process of integration which could be explained due to political, economic or institutional factors.

In case of Islamic stock markets, there are quite a few papers investigating their integration with the global market one of which is Dewandaru et al. (2013). Dewandaru found that over the years Islamic stock integration has been slowly increasing with the global market.

Interestingly, literature that has investigated the integration of East Asian countries, more specifically, southeast countries demonstrated conflicting results. We assume that such contradiction stems from the use of different methodologies. One of the earliest studies on stock integration is by Chung and Liu (1994), in which they investigated Asian stock markets, namely, Japan, U.S., South Korea, Taiwan, Hong Kong and Singapore taking weekly data in local currencies and they found two co-integrating vectors, whereas Defusco et al., (1996) examined weekly data in U.S. dollars for U.S., Korea, Philippine, Taiwan, Malaysia and Thailand and found no co-integration among them. Masih and Masih (1999) used daily data in real U.S. dollars and found integration in OECD and Asian countries however, concluded that there is only one co-integrating vector and seven independent stochastic trends.

Additionally, Sharma and Wongbangpo (2002) found co-integration among Indonesia, Malaysia, Singapore and Thailand by using monthly data denominated in local currencies. Other papers such as Darrat and Zhong (2002) and Jang& Sul, (2002) focused on investigating the integration of United States markets influence on stock markets, while others employed VAR approach using differenced data such as Tan and Tse (2002). Henceforth, with all these different contradicting literature, it's not easy to have a clear idea on what to expect regarding the East Asian stock integration.

3. OBJECTIVE OF THE STUDY

The study was motivated by a few reasons. First, the paper aims at investigating the relationship between Malaysia and the Japanese stock market along with Malaysia's main trading partners while also test their level of integration. Second, is to find if such co-integration exists, its nature and direction as well as their policy implication and hopefully contribute to the existing literature on assessing international integration by using time series technique. Third, it aims at finding portfolio diversification opportunities among southeast countries taking United States into consideration as a

major contributor to the world economy and financial system. Lastly, although some literature has found evidence on international stock market integration, many papers did not explain the different degrees of integration explained by trade. The findings of this paper are aimed to assist policy makers, investors, traders, corporations, academicians and other market participants in each of the country's under study.

4. THEORATICAL UNDERPINNINGS

Many papers have discussed the integration of the KLSE and its dynamic linkages among stock markets. According to Bekaert and Harvey(1995), a financial market is completely integrated internationally if its assets provide the same expected return compared to assets in a global market with an identical risk level. This is in line with the law of one price which assumes that identical assets have identical prices domestically and globally. In addition, the efficient market hypothesis which suggests that the market reflects all information, thus eliminating any arbitrage profit opportunities, however, such rigid assumption faces various disapproving arguments, such as those discussed by behaviourist.

Furthermore, the Modern Portfolio Theory developed by Markowitz suggests that investors face a trade-off between risk and expected return, according to the theory, the higher the risk attached to an asset the higher should the expected return of the investments, this is because rational investors will only accept to hold a risky asset if it promises to give higher return than a less risky asset. In addition, the theory also suggests that a specific asset does not get any safer in the long run, as maturity increases the riskier the asset gets, this goes against the arguments which states that stocks become safer by time since its probability to shortfall becomes smaller. However, such argument is criticized as probability to default is considered by some researchers as a poor measurement of the safety of an investment as it doesn't take into consideration the magnitude of losses.

Moreover, in a completely integrated market, risk and return trade-off should be identical. Hence, investing in non-integrated markets presents an arbitrage opportunity for investors. Based on the efficient market hypothesis, this indicates that non-integrated markets has an element of risk uncaptured, resulting in excess return. In our opinion, this might be due

to the underlying economics as major stock markets are highly co-integrated and efficient, whereas non-integrated markets could be present in emerging economies stock markets which could explain the different expected return on assets with identical risk levels. Another possibility could be that many financial systems are dual, providing both Islamic and conventional instruments such as Malaysia, with the notion of Islamic instruments being riskier than its conventional counterpart an element of risk presents itself. With that, one can argue that an arbitrage opportunity presents itself, however, to arbitrage and attempt to beat the market is theorized as impossible since stock markets are assumed to be efficient regardless of their markets since any excess return can only be observed if excess risk was to be taken. As such, we can deduct that stocks are traded at their fair value and any disequilibrium will quickly be adjusted to represent its fair value or an equilibrium stock price.

Nevertheless, the most important question that should be asked is; to what extent is the market financially integrated and what is its nature. As well as, to what extent can investors influence international asset allocation and portfolio diversification.

5. METHODOLOGY AND DATA

5.1 Data

The data used in this study consists of weekly stock indices of the five main export and import partners of Malaysia, consisting of the stock exchange in the United States, Japan, Thailand, Singapore and Hong Kong. Specifically, the indices include the S&P 500 Composite (United States), Nikkei 225 Stock Average (Japan), Kuala Lumpur Stock Exchange (Malaysia), Bangkok S.E.T. (Thailand), Singapore Exchange Index (Singapore) and Hang Seng (Hong Kong), all expressed in terms of local currencies.

The data was obtained from Bloom-berg database and covers the period of January 13, 1995 till December 16, 2015, a period of 20 years. The choice of using weekly indices as opposed to daily indices was to avoid the problem daily stock indices often face which is non-synchronous trading problems. The issue arises as daily data may be influenced by thinly traded stocks showing spurious relationships among these markets (Hung and Cheung,1995).

5.2 Methodology

The study adopts the standard co-integration method along with variance decomposition and vector auto-regressive model (VAR) to determine whether the expected relationships discussed earlier are upheld through the statistical analysis of Malaysia stocks, Japanese stocks, United States, Thailand and Singapore. The use of this methodology allows us to recognize the cumulative effects taking into account the dynamic response path between Malaysia stocks and the other variables.

The relationships between the six stock indices were analyzed using eight econometric tools. At first the data stationarity was tested, as most economic variables are not stationary in their level form, the choice of using an OLS Regression was discarded since the data was found non-stationary in their level form. Secondly, we tested to see if the variables were lagged by using Vector Auto-regressive Model (VAR) to determine the order of lags. Third, the co-integration test was further used to determine if co-integration between the variables exists through the use of Johansen and Engle-Granger residual causality test, in which afterwards, the Long-run Structural Modeling (LRSM) was used to determine the relationship between the variables while holding Malaysia Stock index as as assumed dependent variable. Fourth, the Vector Error Correction Model (VECM) was used to differentiate the leading variables from the followers, followed by Variance Decomposition (VDC) as a ranking tool of the variables relative dependence or independence. Lastly, the Impulse response function (IRF) was used to test and present graphically the dynamic response path of a variable due to a shock in another variable and the impact of a system-wide shock on all variables was then tested using the Persistence Profile (PP) tool.

6. EMPIRTICAL RESULTS AND DISCUSSION

6.1 Unit Root Test

Using the following variables; S&P 500 Composite (SP), Nikkei 225 Stock Average (Nikkei), Kuala Lumpur Stock Exchange (KLSE), Bangkok S.E.T. (SET), Singapore Exchange Index (SGX) and Hang Seng (HS). The unit root test was performed by using the Augmented Dickey Fuller test (Table 1), Phillips Perron and reassured by Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests to ensure the stationarity of the variance and mean in their differenced form, but non-stationary in their level logged form, meaning that

the variables have a long-run relationship and a definite trend.

Table 1: Unit Root Test

ADF TEST						
	VARIABLE	ADF	VALUE	T-STAT.	C.V.	RESULT
LOG FORM	LKLSE	ADF(3)=AIC	2,271.9	-2.765	-3.528	Non-Stationary
		DF=SBC	2,262.2	-2.412	-3.453	Non-Stationary
	LNIKKEI	ADF(3)=AIC	2,254.3	-1.728	-2.869	Non-Stationary
		DF=SBC	2,246.7	-1.713	-2.855	Non-Stationary
	LHS	ADF(2)=AIC	2,144.5	-3.200	-3.487	Non-Stationary
		ADF(3)=SBC	2,135.7	-2.943	-3.453	Non-Stationary
	LSGX	ADF(2)=AIC	2,465.8	-2.269	-3.487	Non-Stationary
		ADF(3)=SBC	2,454.7	-2.212	-3.489	Non-Stationary
	LSP	ADF(4)=AIC	2,496.0	-2.449	-3.528	Non-Stationary
		ADF(1)=SBC	2,484.5	-2.483	-3.489	Non-Stationary
	LSET	ADF(4)=AIC	2,071.9	-2.549	-3.528	Non-Stationary
		ADF(4)=SBC	2,054.4	-2.549	-3.528	Non-Stationary

	VARIABLE	ADF	VALUE	T-STAT.	C.V.	RESULT
IST DIFFERENCED FORM	DKLSE	ADF(2)=AIC	2,266.6	-12.966	-3.430	Stationary
		DF=SBC	2,256.8	-32.976	-3.453	Stationary
	DNIKKEI	ADF(2)=AIC	2,251.2	-19.011	-3.487	Stationary
		ADF(1)=SBC	2,241.1	-21.789	-3.489	Stationary
	DHS	DF=SBC	2,092.5	- 32.082	- 3.453	Stationary
		ADF(1)=AIC	2,101.5	- 21.329	- 3.489	Stationary
	DSGX	ADF(5)=AIC	2,462.9	-12.952	-3.471	Stationary
		DF=SBC	2,453.1	-36.356	-3.453	Stationary
	DSP	ADF(5)=AIC	2,492.5	-12.918	-3.471	Stationary
		DF=SBC	2,482.2	-35.837	-3.453	Stationary
	DSET	ADF(3)=AIC	2,067.3	-15.679	-3.510	Stationary
		ADF(2)=SBC	2,053.6	-19.891	-3.489	Stationary

6.2 Vector Auto Regression

After establishing the existence of a long-run relationship, we applied the recursive estimation of co-integrated VAR to determine the order of lags to be used using the vector auto regression (VAR) as suggested by Hansen and Johansen (1998). However, based on two criteria , the

model gave different results for each as it could be observed from Table 2. The AIC (Akaike Information Criterion) recommended an order of two, while SBC (Schwarz Bayesian Criterion) recommended zero lag order , hence we take the highest order (two) since SBC uses a minimum lag approach as it focuses on over-parameters, a problem in which short data-sets usually face, however, in our case with the relatively high number of observations (1073) we don't expect to face such problem.

Table 2: VAR Order Selection

	Order	Value
AIC	2	15763.5
SBC	0	15689.2

6.3 Co-integration Tests

Having determined our variables status and lag order of two, we further proceed with Engle-Granger and Johansen co-integration tests to determine the integration of the time series variables in the long run, the difference between the two is that the Granger test identifies only one co-integration at most and uses the residual error method whereas Johansen uses the maximum likelihood method, in which it allows to identify the maximum possible co-integrating vectors. Granger causality measures the ability to predict the future value of a time series using previous values of another time series, hence tries to identify predictive causality[2]. Table 3 shows the results for Engle-Granger co-integration test and finds that within all six variables there is a at most one common trend exist, suggesting that at most two of them have a long-term theoretical relationship.[3]

Table 3: Engle-Granger Causality Test

Unit root tests for residuals			
	Statistic	**95% Critical Value**	**Result**
DF	-33.7056	-4.7209	1 co-integration
ADF(1)	-24.0449	-4.7209	1 co-integration
ADF(2)	-18.5983	-4.7209	1 co-integration
ADF(3)	-15.7772	-4.7209	1 co-integration
ADF(4)	-14.0328	-4.7209	1 co integration
ADF(5)	-13.0921	-4.7209	1 co-integration

[2] Diebold, F. X. (1998). *Elements of forecasting*. South-Western College Pub..

[3] A t-statistics higher than the critical value, concludes that all variables have a unit root. Thus , we reject our null hypothesis of no co-integration in between the variables.

Furthermore, the Johansen test estimates all co-integrating vectors between the variables, in our case there are six variables; hence there are five possible co-integrating vectors. However, as it can be observed from Table 4, the Johansen test depicts no co-integrating vectors based on maximal eigenvalue[4], Hannan-Quinn Criterion (HQC) and SBC, whereas, based on AIC there's 4 possible co-integrating vectors and one co-integration based on the trace of stochastic matrix, meaning that there are two or more variables moving together in the long-run.[5] Therefore, we can conclude that at least there is one theoretical long-term relationship among the stock markets, thus, some if not all of the stock market performance are affected by the other to a varying degree.

Table 4: Table 3: Johansen Causality Test

Criteria		Result
Maximal Eigenvalue of the Stochastic Matrix		no co-integration
Trace of the Stochastic Matrix		1 co-integration
Model Selection Criteria: AIC		4 co-integration
Model Selection Criteria: SBC		no co-integration
Model Selection Criteria: HQC		no co-integration

6.3 Long Run Structural Modeling (LRSM)

Having ascertained that the six variables are co-integrated with a maximum four possible patterns or one, we then proceed with testing for a long-run structural Modeling (LRSM). The LRSM test would help in quantifying the meaningful long-run theoretical relationship between the indices by imposing restrictions, allowing us to compare our statistical findings with the theoretical results. Hence the LRSM helps in resolving the issue by comparing the quantified coefficient values to the theoretical expectation. In Table 5, we imposed a normalizing restriction of unity on Malaysia Stock Index (KLSE). The table demonstrates all stock indices have a statistical significant relationship with KLSE , except for Nikkei 225 at a 95% confidence level.

[4] Maximal Eigenvalue and Trace tests look at the hypothesis (null= no co-integrating vectors), thus with a t-statistics lower than the critical value, we fail to reject the null hypothesis for Maximal Eigenvalue.

[5] AIC, SBC and HQC number of co-integrating vectors are obtained by locating the highest co-responding numbers.

Table 5: LRSM Exact Identification

Variable	Coefficient	Standard Error	T-Ratio[6]	Implication
LKLSE (A1)	-	-	-	-
LNIKKEI(A2)	**-0.019739**	**(0.16675)**	**-0.118**	**Variable is insignificant**
LHS (A3)	-0.48282	(0.1229)	-3.928	Variable is significant
LSGX (A4)	-0.76199	(0.31606)	-2.410	Variable is significant
LSP (A5)	0.93522	(0.44034)	2.123	Variable is significant
LSET (A6)	-0.47839	(0.080570)	-5.937	Variable is significant

Table 6: LRSM Over Identification

	PANEL A	PANEL B	PANEL C	PANEL D	PANEL E	PANEL F	PANEL G
Restriction	A1=1	A1=1, A2=0	A1=1, A3=0	A1=1, A4=0	A1=1, A5=0	A1=1, A6=0	A1=1, A2=0, A3=0
CHSQ(1)	NONE	.014[.906]	3.5118[.061]	5.257[.022]	4.731[.030]	4.462[.035]	8.4733[.014]
Implication	-	**Insignificant**	**Insignificant**	Significant	Significant	Significant	Significant

The insignificant relationship in between KLSE and Nikkei triggered our curiosity, since after all the paper was interested in investigating the relationship in between these two indices. Hence, to verify the significance of all indices and the insignificance of Nikkei, the indices coefficients were subjected to over-identifying restrictions by restricting each index at a time and restricting the two insignificant restricting panels (Panel G) in which gave a high p-value suggesting that the restriction was correct, the results derived confirmed earlier findings that only Nikkei has no long run meaningful theoretical relationship with KLSE. Therefore, we conclude that all variables except for Nikkei are significant, allowing us to derive our co-integrating equation which reveals.

$$KLSE - 0.483HS - 0.762SGX + 0.935SP - 0.478SET \rightarrow I(0)$$

6.4 Vector Error Correction Model (VECM)

Furthermore, before attempting to reason the derived co-integration the indices causality must be derived by testing it using vector error correction model (VECM). The co-integration results do not identify exogenous variables from endogenous ones, hence, with the use of VECM we attempt in revealing the extent to which a change in one variable is caused by the change in another variable. The VECM examines the

[6] Derived by dividing the coefficients with the standard deviations of each variable.

significance of the error correction term e_{t-1}, in which provides the co-integrating relationship among the variables in the long term, and demonstrates the impact of each variable on the other variables in the short run. We were thus able to distinguish that all variables are exogenous as presented by Table 6, whereas only one variable (KLSE) was endogenous.

Table 7 : Vector Error Correction Model

Variable	Coefficient	T-Ratio [Prob.]	C.V.	Result
LKLSE	**-.051897**	**-5.3692[0.000]**	**5%**	**Endogenous**
LNIKKEI	-.012246	-1.2384[0.216]	5%	Exogenous
LHS	.8241E-3	.075233[0.940]	5%	Exogenous
LSGX	-.013177	-1.5924[0.112]	5%	Exogenous
LSP	-.011745	-1.4573[0.145]	5%	Exogenous
LSET	-.0030654	-.25693[0.797]	5%	Exogenous

From an investor point of view, this could be translated to mean that when there is a variable-specific shock or a crisis in one of the five stock indices, the indices would get affected independently but will each transmit the shock to KLSE. Thus, KLSE is subject to many stock indices deviations affecting its own stocks performance, whereas the other indices are solely affected by their own shock, thus an investor interested in investing in KLSE should monitor the deviation of the other five indices. In addition, the error correction term coefficients depicts the period it takes for a long term equilibrium to restore, hence representing the proportion by which the short-term imbalances will be corrected, for example, KLSE coefficient of 0.0519 means that when a shock occurs to its index, it will take on average half a week for the index to adjust into long term equilibrium. In addition, the coefficient implies the intensity of arbitrage activity.

6.5 Variance Decomposition (VDC)

Moreover, the VECM distinguishes between short term and long term causality, however, it only shows the relative degree of endogeneity or exogeneity among the variables, hence we proceed with Variance Decomposition (VDC) in which we can conclude the absolute endogeneity or exogeneity among the variables by examining the proportion of the variance explained by its own past. The generalized and orthogonalized approach of VDC were then adopted, there are two main differences between them, firstly, the orthogonalized VDC depends on the particular ordering of the variables but the

generalized VDCs are invariant to the ordering of the variables. Secondly, the orthogonalized VDCs assumes that when a particular variable is shocked, all other variables in the system are held constant but the generalized VDCs does not make such a restrictive assumption.

VDC looks at the variance of the forecast error of each variable into proportions attributable to the shocks from each variable in the system, including its own. Taking 4 different forecast horizon due to the relatively long period of study (20 years), we started by applying the orthogonalized approach and obtained the following results, 1 being the most exogenous to the least.

Table 8 : Orthogonalized VDC approach

Exogeneity Ranking					
	13 Weeks	26 Weeks	52 Weeks	100 Weeks	150 Weeks
KLSE	2	2	5	5	5
NIKKEI	1	1	1	1	1
HS	4	4	3	3	3
SGX	5	5	4	4	4
SP	6	6	6	6	6
SET	3	3	2	2	2

The results found were confusing as the Malaysian stock exchange was found to be second most exogenous, then the second last exogenous at different forecast horizons, due to the limitations discussed earlier we conducted a generalized VDC test to reassure our results and found the following.

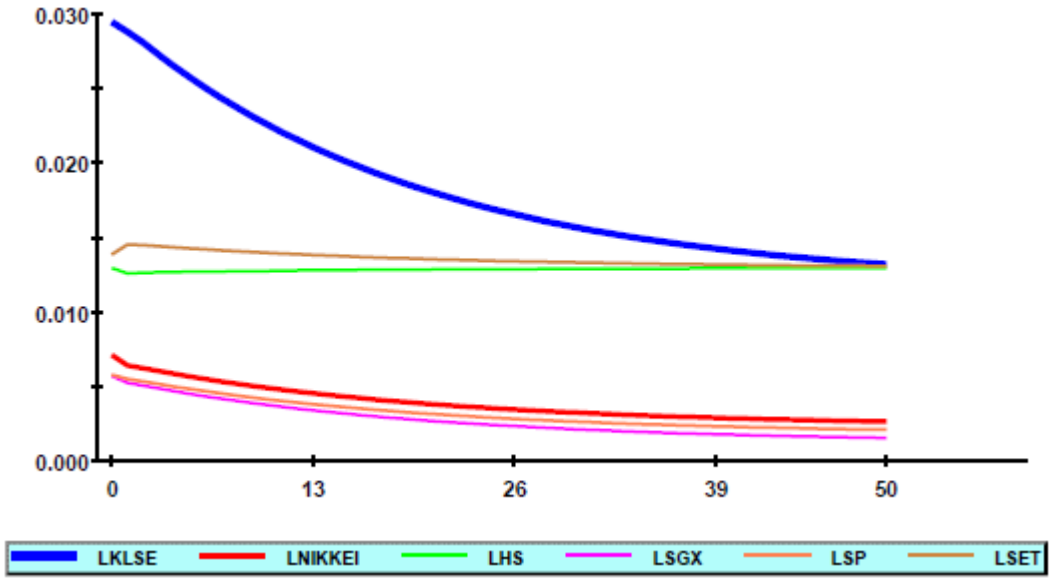
Table 9: Generalized VDC approach

Exogenous Ranking					
	13 Weeks	26 Weeks	52 Weeks	100 Weeks	150 Weeks
KLSE	2	6	6	6	5
NIKKEI	3	2	2	2	6
HS	4	3	3	3	2
SGX	5	4	4	4	3
SP	6	5	5	5	4
SET	1	1	1	1	1

The results found either confirms our VECM findings or have a non-substantial

difference from it. The Malaysian stock exchange was found to be the least exogenous in three out of five forecast horizons, while being second last by one out of the two remaining forecast horizons and interestingly, it ranked second most exogenous by one forecast horizon confirming the orthogonalized ranking for the same forecast period (13 weeks). Notably, the stock index deviation mostly explained by its own shock was Thailand S.E.T. The results obtained contain substantial information for investors wishing to diversify as each exogenous index presents an opportunity to diversify as they are least likely to be affected by the other, in this case, investing in Thailand stock exchange, whereas KLSE endogenous can be explained as its highly correlated to other stock indices, especially United States. Therefore a shock in KLSE would not result in any substantial change in the other stock indices as the Impulse Response figure portrays in Figure 1.

Figure 1: Generalized Impulse Response to one Standard Error shock in KLSE



Similar to the Impulse Response Function (IRF), the persistence profile demonstrates the dynamic response path of the long term relations. It maps the impact of an external shock on the stock indices being studied as well as estimates the time horizon required to restore equilibrium when there is a systematic wide shock rather than a variable-specific shock as it was the case for VDC and IRF.

Figure 2: Persistence Profile of the effect of a system wide shock to CV(s)

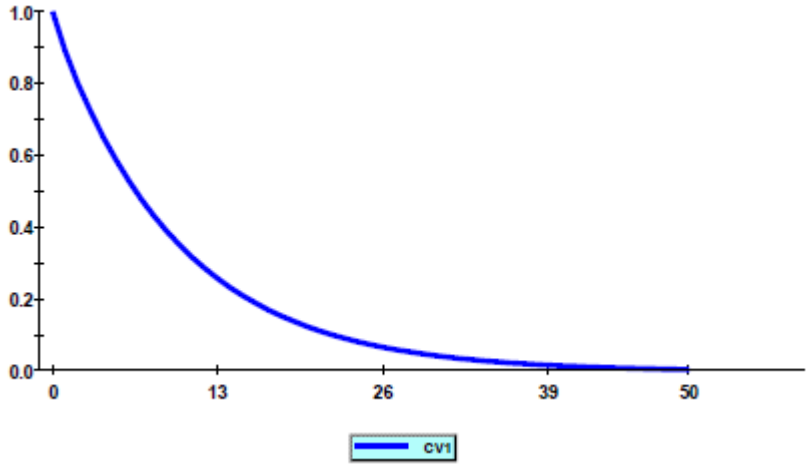


Figure 2 show that if the entire co-integrating equation was to be shocked, it would take 39 weeks for the six stock indices to return to equilibrium.

7. CONCLUSION and POLICY IMPLICATIONS

An integrated stock market suggests that it is highly correlated and therefore presents less portfolio diversification opportunities, as we have established in our paper KLSE is was found to be the only endogenous variable by VECM and the least exogenous variable by VDC , if a shock was to occur in Kuala Lumpur stock exchange, other variable shows an insignificant effect to their stock indices as IPR (figure 1) shows, whereas if a system wide shock was to occur, the stock indices should statistically take 39 weeks to equalize, while KLSE bears the short term adjustments for the long term equilibrium. Therefore, KLSE is highly correlated with its main trading partners and most specifically with Thailand as it was found as the most leading stock index followed by Japan, China, Singapore and United States.

Examining the relationship between the Japanese and Malaysia stock markets, we found that Japan was the second exogenous index, affected by Thailand's shock and its own and transmitting it to KLSE, this was observed when we shocked Nikkei225 and found that KLSE movements were similar to Nikkei's. Thus as we had expected Japan as a developed country had a significant effect on Malaysia however, surprisingly, the United States as a main player in both the world economy and financial system was found the second least leading variable and Thailand was the main leading variable.

These were interesting findings as Thailand is the fifth main export and import partner for Malaysia but was the first leading variable, whereas Japan was the second main import and export partner while also the second leading variable. China and Singapore were the first main import and export partners respectively, however they did not depict any significant role. Hence we can conclude that a country's ranking as trade partner has an insignificant effect on explaining stock market linkages.

Moreover, the paper findings indicate that Malaysian stock market traders who have allocated their investments across Thailand and Japan have greater portfolio benefits in contrast to investing in United States and its local economy. However for arbitragers, investing in U.S. And Malaysia presents and opportunity to exploit the short-run adjustment period for the index to restore to its long-term equilibrium.

The findings of this study has several implications for policy makers of both Malaysia and Japan. In the event of a Local or Asian financial crisis our findings suggests that Malaysia will be the stock index affected the most as it is highly correlated to all its trading partners , hence, Japanese traders and other traders should avoid the KLSE market as it presents additional risk to their investments as compared to Nikkei225. In trying to restore stock market stability, measurements could be taken to try and minimize the 50 days period of adjustments shown by the PP test, in addition, with the findings obtained from this papers, policy makers in Malaysia could set more effective and smart strategies to mitigate the vulnerable position KLSE has to other stock indices. In addition, investors and market plays could employ the findings of this paper in their asset selection in order to obtain the optimum selection of risky assets and minimize their risk while maximizing their return.

Lastly, it is worth to note that the study has its limitations. By including more observation we assume that there could be some interesting results especially that given our long and up to date time horizon. However, we also acknowledge that given a long time horizon, there could be conflicting results such as those observed in VDC, this could be due to the two main crises that occurred and affected Southeast countries. Therefore, examining each period and comparing the analysis could yield to a more specific findings.

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