Emerging market equities and US policy uncertainty: evidence from Malaysia based on ARDL

Gadhoum, Anouar and Masih, Mansur

INCEIF, Malaysia, Business School, Universiti Kuala Lumpur, Kuala Lumpur, Malaysia

15 November 2018

Emerging market equities and US policy uncertainty: evidence from Malaysia based on ARDL

Anouar Gadhoum[1] and Mansur Masih[2]

Abstract:

'*When Wall Street sneezes, the world catches pneumonia. And when America recovers, the planet has a spring in its step'* – this metaphor appeared to be an accurate description of the global economy for decades. This paper examines the short and the long-term impact of the influential global factor (US Policy Uncertainty) on the emerging markets' stocks using Malaysia as a case study. The study applies the 'Auto-Regressive Distributed Lag' (ARDL) technique, which has taken care of a major limitation of the conventional co-integration tests, in that they suffer from the pre-test biases. Based on the above rigorous methodology, the developed world disturbances appear to have limited impact on the Malaysian stock markets in the long run. This finding is plausible and has strong policy implications on portfolio investing and diversifications by investing in the emerging equity markets as the Bursa-Malaysia could function as a hedge against negative shocks in advanced economies.

Keywords: US policy uncertainty, emerging equity markets, ARDL, Malaysia.

[1] INCEIF, Lorong Universiti A, 59100 Kuala Lumpur, Malaysia.

2 **Corresponding author**, Senior Professor, UniKL Business School, 50300, Kuala Lumpur, Malaysia.

Email: mansurmasih@unikl.edu.my

Introduction:

Based on recent economic forecasts, emerging countries are anticipated to exhibit exceptionally high economic growth rates over the next 50 years. This will result jointly growing larger than the G-6 in US dollar terms (Wilson & Purushothaman, 2003). The conglomerate emerging countries cover more than 28% of the world's landmass with more than half of the world's population and run increasingly as global market economies (Frank & Frank, 2010).

These emerging economies' share in world GDP and global exports are expected to grow from 14% to 21.6% and from 12.4% to 20.1% respectively (at the same time, the US export share is anticipated to decline from 25 to 22%). The sustainability of these emerging economies' impressive growth path is subject to further structural and institutional reforms and financial liberalization, foreign investment inflows and international competition.

As global investors persistently pursue attractive asset classes to allocate their portfolios on alternative style investing, Malaysian capital markets receive increasing international fund inflows. Understanding the functioning of Bursa-Malaysia, its dynamic risk-return properties, potential volatility spillover effects, inter- relationships and reactions to shocks, events or news, relative to leading global mature markets, such as the US, remains a crucial issue for international investors, portfolio managers and policy makers.

This paper examines how economic factors in the US, i.e. the US unconventional economic policy, defined as uncertainty by CBOE VIX – a recognized proxy to risk aversion and the cheap borrowing costs, influence the performance of the Malaysian stock markets. Our analysis is motivated by the fact that Malaysia as an Islamic emergent country is a major recipient of global investment flows and is among the main global consumers of commodities. Therefore, changes in the global economic factors could be a channel through which fluctuations in the world's economic and financial conditions are transmitted to this Asian stock market and affect its economic growth. The recent global spillover and contagion effects induced by the 2007-8 US subprime mortgage financial crisis, illustrate this sort of a dynamic interaction between advanced and emerging capital markets (Berger & Turtle, 2011). Moreover, international investors are especially interested in the Malaysian stock markets' co-movements with these global factors, given that investment, speculation and risk diversification opportunities may arise. Short and long run stock market dynamics can have critical implications for asset valuation, portfolio allocation, efficient diversification, hedging, and risk control. If, for instance, return and volatility spillover effects are seen to spread from one market to another at times of market crashes, adverse events or financial crises, portfolio diversification benefits should be expected to remain limited. In this case, global investors would have to adjust their asset allocation decisions in order to mitigate contagion risks (Aloui et al. 2011; Celik, 2012; Kenourgios et al. 2011; Syriopoulos, 2013; Syriopoulos & Roumpis, 2009).

Below is a graphical representation of the Malaysian stock market indices' movement over the period under consideration.

This study attempts to bridge the topic's gaps and contributes by a range of innovative and fruitful empirical conclusions. The main objectives of this paper are:

- To examine the effect of the US. Economic policy uncertainty on the Malaysian stock markets' returns. The current study also investigates how stock market returns respond to the U.S. economic policy uncertainty shock.
- To access if the Risk Aversion trades have a significant impact on Bursa-Malaysia.
- To understand if favorable leveraging opportunities lead to the movement of capital to the emerging equity markets, driving them up.

This paper tries to investigate if the above factors affect the Malaysian equity markets in the long and short-run. We employ monthly data starting from January 2005 by using the Autoregressive Distributed Lag (ARDL) co-integration. This paper is organized as follows: Section II reviews on the empirical literature related to this topic. The theoretical specification, data and the preference for the ARDL co-integration methodology are explained in section III. The empirical results and discussions are highlighted in section IV. The last section ends with the concluding remarks and policy implications of the paper.

II. Literature Review:

King and Wadhwani, (1990) argue that correlation between financial markets around the world exists since rational market participants observe and analyze price movements in other stock markets. Trade and financial linkage between countries play an important role in explaining international spillovers (Forbes & Chinn, 2004). Many studies have empirically documented international spillovers from the US to other countries. (Ehrmann and Fratzscher, 2009) report that the US monetary policy shocks spill over to other equity markets around the world.

(Awad & Goodwin, 1998) shows that long-term yield and output of other countries and output are affected by the US monetary policy shocks; similar findings are reported in other studies (Chinn & Frankel, 2004; Ehrmann et al, 2011).

In particular, due to the size of the US economy, any shock to the US economy and financial markets can spill over to other countries' financial markets (Bayoumi & Swiston, 2007; Ehrmann & Fratzscher, 2005; Goldberg & Leonard, 2003).

Moreover, studies such as (Bansal et al, 2005; Dzielinski, 2011; Ozoguz, 2009) have documented the impact of uncertainty related to the economy and other policies on the performance of the stock markets. Paster and Veronesi (2011) associate the decreased stock prices to the increase in government policy uncertainty. Furthermore, negative stock returns are associated with increased changes in economic policy uncertainty in the United States (Sum, 2012a), Europe (Sum, 2012b), and five ASEAN countries (Sum, 2012c).

Among studies that have a main focus on markets across the world, there have been some notable studies, which consider the impact of various global factors on the BRICS' equity markets (Brazil, Russia, India, China, and south Africa). Hammoudeh et al. (2013) have examined the interrelationship between these five conglomerate emerging markets' equity indices, and their relationship with the International Country Risk Guide (ICRG)'s three countries risk rating factors (economic, financial and political), the S&P500 index and the West Texas Intermediate (WTI) oil price. At the same line, Ono (2011) has examined the systemic impact of oil prices on the stock market returns for (Brazil, Russia, India and China) and finds that an appreciation in oil prices pull up the stock market indices for all these countries except Brazil.

The financial interdependences of the preceded four emerging markets with the U.S market had been examined by Aloui et al. (2011) who provide strong evidence of time-varying dependence between them. This dependency is stronger for the commodity-price dependent markets than for the finished product export-oriented markets of these emerging countries. Moreover, they observe high levels of dependence persistence for all market pairs during both bullish and bearish markets. Dimitriou et al. (2013), however, find an increasing co-movement between (Brazil, India, Russia, China and South Africa) and the U.S market during the post-crisis period (from early 2009 onwards), implying that the dependence is larger in bullish than in bearish markets.

In a wider study, the dynamic conditional correlations between the U.S. and ten emerging stock markets, (i.e., the five BRICS markets, South Korea, Thailand, Philippines, Taiwan, and Malaysia) had been examined by Hwang et al. (2013). They show that different patterns of the U.S. financial crisis spillovers exist among emerging economies. Zhang et al. (2013) showed that the recent global financial crisis has changed the conditional correlations between the developed (U.S. and Europe) markets and some of the emerging stock markets.

The preceded mentioned studies bring up a notable dimension on my subject which contributes to the existing literature by making a humble attempt at examining the long and the short run relationship between the Malaysian stock market and the policy uncertainty in the US, risk aversion and the interest rates. This modest study examines whether the metaphor – of the '*US sneezing*' used earlier stands true or otherwise.

III. Underpinnings, Data and Methodology:

1) Underpinnings based on the above literature:

During the US unconventional monetary policy, when the interest rate policy is cut down to or near zero, investors find avenues to borrow cheap and place their funds in emerging markets equities, which offer considerable higher returns. However, the economy must recover and the unconventional situation returns to its conventional situation (such as Taper Tantrum). As a consequence, the migrated funds to emerging markets quickly find its way back, whereby this leads to a negative impact on these stock markets. Also the emerging equity markets also impact each other as the money flows at most times move in tandem and times are substitutive (due to relative strength of the economies).

Through this study we would like to examine if the equity markets in the emerging Muslim country (Bursa Malaysia stock exchange), interest/borrowing cost (proxied by 1-month US LIBOR) patterns, risk-off trades (risk aversion - proxied by the VIX index) and the policy uncertainty in the US (proxied by the US policy uncertainty index) have a long- term relationship.

2) Data:

The monthly return data over ten years starting from January 2005 pertaining to the study has been collected from two different sources. Data of economic policy uncertainty index in United States and CBOE- VIX is obtained from the Economic Policy Uncertainty Index website www.policyuncertainty.com constructed by Baker, Bloom, and Davis (2012) and the CBOE website www.cboe.com respectively. While, the data on the stock market indices of Malaysia

(FTSE BURSA MALAYSIA KLCI) and the 1-month Libor are obtained from the Thomson Reuters *DATA-STREAM* database.

3) Methodology:

This study employs a time series technique, in particular, Autoregressive Distributed Lag (ARDL) co-integration method, in order to find empirical evidence of the nature of relations between the Malaysian equity market and the factors as indicated in the introductory paragraphs.

This method has been selected over traditional regression method for the following reasons:

- Stock markets indices like most other finance variables are non-stationary. This would entail that performing an ordinary regression on the variables will render the results misleading as when statistical tests like t-ratios and F-statistics are not statistically valid when applied to non-stationary variables. Performing regressions on the differenced form of these variables will solve the above problem, however this would lead to an even graver mistake. When variables are regressed in their differenced form, the long-term trend is effectively removed. Thus, the regression only captures short term, cyclical or seasonal effects. Under this situation, the regression is not really testing long-term (theoretical) relationships.
- Under traditional regression, the endogeneity and exogeneity of variables is pre-determined by the researcher, usually on the basis of theory. As per my literature review, there is notable absence of established theories apart from probably risk aversion. Co-integration techniques are advantageous in a way that it does not presume endogeneity or exogeneity of variables. The data determines which variables are exogenous, and which ones are endogenous.

- Co-integration techniques for the lack of words, embrace the dynamic interaction between variables, whereas traditional regression methods discriminate against interaction between variables. Even though conventional co-integrating procedure has made an important advance on regression analysis, the co-integrating estimates also are subject to a number of limitations (Masih et al, 2008).
- The estimates derived from the co-integrating tests (such as the Johansen test) and the unit root tests (such as, the Augmented Dicky-Fuller, Phillips-Peron, Kwiatkowski-Phillips-Schmidt-Shin etc. which precede the co-integrating tests), are biased. The tests lack power and are biased in favor of accepting the null hypothesis.
- The co-integration tests require the variables to be I(1) but the order of integration of a variable, whether I(1) or I(0), may depend on the number of lags included or whether the intercept and/or the trend are included or excluded in the unit root tests.
- Moreover, the Johansen co-integrating tests have small sample bias and simultaneity bias among the regressions.

To avoid the above limitations of the unit root and co-integration tests, this study uses the Auto Regressive Distributive Lag (ARDL) method (bounds testing approach), proposed by Pesaran-Shin-Smith (2001). This approach also does not require the restriction imposed by co-integration technique that the variables are I(1) or I(0), which is the case with the data in the study.

The existence of long-run relationship among variables is done by constructing an unrestricted error correction model (UECM) with each variable in turn as a dependent variable and then testing whether or not the 'lagged levels of the variables' in each of the error correction equations are statistically significant (i.e., whether the null of 'no long run relationship' is accepted or rejected). The test consists of computing an F-statistic testing the joint significance of the 'lagged levels of the variables' in each of the above error-correction form of the equation. The computed F-statistic is then compared to two asymptotic critical values.

- If the test statistic is above an upper critical value, the null hypothesis of "no ling-run relationship" can be rejected regardless of whether the variables are l(0) or l(1).
- When the test statistic falls below a lower critical value, the null hypothesis of "no long-run relationship" is accepted regardless of whether the variables are l(0) or l(1).
- If the test statistics falls between these bounds, the result is inconclusive.

If all the F-statistics in all equations appears insignificant, it implies the acceptance of the null of "no long-run relationship" among the variables. However, if at least one of the F-statistics in the error-correction equations is significant, the null of "no long-run relationship among variables" is rejected. In such a case, there is a long run relationship among variables.

The exogeneity or endogeneity of the dependent variable is showed by the significance of F-statistic. The dependent variable is endogenous when the F-statistic is significant, and the dependent variable is exogenous (long-run forcing variable) when the F-statistic is otherwise.

After demonstrated of the long run relationship, we can move on to the next stage of the analysis involving the long run coefficients estimation (after selecting the optimum order of the variables through AIC or SBC criteria) and then estimate the associated error correction model in order to estimate the adjustment coefficients of the error-correction term. As the used data is monthly, and considering the variables are equity indices we expect relatively faster adjustment and hence have chosen four for the maximum order of the lags in ARDL model. The error correction version of the ARDL (4, 4, 4, 4) that we have estimated is:

$$\text{DKLSE}= \alpha_0 + \sum_{i=1}^{4} k_i DKLSE_{t-i} + \sum_{i=1}^{4} d_i DLLBR_{t-i} + \sum_{i=1}^{4} v_i DVIX_{t-i} + \sum_{i=1}^{4} u_i DLUSU_{t-i} + \delta_1 LKLSE_{t-i} + \delta_2 LLBR_{t-i} + \delta_3 LVIX_{t-i} + \delta_4 LUSU_{t-i} + \mu_t$$

(e_{t-1}) - lagged error correction term which would be derived from the ECM model would tell us how long it will take to get back to long term equilibrium given a deviation. The coefficient represents proportion of imbalance corrected in each period. The lag structure appropriate to the ECM is determined by Schwarz Bayesian Criteria (SBC), Akaike Information Criteria (AIC), and Adjusted LR Test.

IV. Empirical Results and Discussions:

1. Unit Root Tests:

We begin our empirical testing by determining that the variables used in the study aren't I(2) – Stationary only in the second differenced form and not in the level or first differenced form. In order to proceed with the ARDL technique our variables can be either I(0) or I(1) – stationery in their level form or stationary in their first differenced form. The differenced form, for each variable used, is created by taking the difference of their log forms. For example, DKLSE= $LKLSE_t$–

$LKLSE_{t-1}$. Then, we conducted the Augmented Dickey-Fuller (ADF) the Philips Perron (PP) and the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test on each variable (in both level and differenced form). Below is a summary of the ADF, PP and KPSS tests – for further information, kindly refer to the Appendix.

Table 1.a: Summary of the ADF test:

Variable	Test Statistic	Critical Value	Implication
Variables in Level Form			
LVIX	-2.5637	-3.3994	Variable is non-stationary
LKLSE	-3.4219	-3.5193	Variable is non-stationary
LLBR	-3.3493	-3.4436	Variable is non-stationary
LUSU	-1.6126 AIC	-3.5115	Variable is non-stationary
	-1.8932 SBC	-3.5136	
Variables in Differenced Form			
DVIX	-9.2313	-3.4959	Variable is stationary
DKLSE	-9.4653 SBC	-3.3994	Variable is stationary
	-4.6371 AIC	-3.5060	
DLLBR	-4.5374 AIC	-3.5060	Variable is stationary
	-1.6271 SBC	-3.4826	Variable is non- stationary
DLUSU	-9.1387 AIC	-3.5042	Variable is stationary
	-11.0818 SBC	-3.9461	Variable is stationary

Table 1.b: Summary of the PP test:

Variable	Test Statistic	Critical Value	Implication
Variables in Level Form			
LVIX	-2.5329	-3.4451	Variable is non-stationary
LKLSE	-1.9547	-3.5260	Variable is non-stationary
LLBR	-1.5002	-3.5260	Variable is non-stationary
LUSU	-3.4490	-3.5313	Variable is non-stationary
Variables in Differenced Form			
DVIX	-13.5532	-3.5313	Variable is stationary
DKLSE	-9.5257	-3.4451	Variable is stationary
DLLBR	-10.4867	-3.4451	Variable is stationary
DLUSU	-19.2154	-3.4368	Variable is stationary

Table 1.c: Summary of the KPSS test

Variable	Test Statistic	Critical Value	Implication
Variables in Level Form			
LVIX	0.14908	0.13946	Variable is non-stationary
LKLSE	0.063541	0.13946	Variable is stationary
LLBR	0.17592	0.13946	Variable is non-stationary

Variable	Test Statistic	Critical Value	Implication
LUSU	0.15985	0.13946	Variable is non-stationary
Variables in Differenced Form			
DVIX	0.075992	0.13946	Variable is stationary
DKLSE	0.069206	0.13946	Variable is stationary
DLLBR	0.10638	0.13946	Variable is stationary
DLUSU	0.085654	0.13946	Variable is stationary

Relying primarily on the AIC and SBC criteria, the conclusion that can be made from the above results is that all variables being used for this analysis are stationary, I(1), except the LBR which appears non stationary, l(0), in the differenced form (table 1.a). For robustness purposes, I refer, also, to PP and KPSS tests, which both lead to conflicting results as well. The problem obviously appears in KPSS test (table 1.c) where "KLSE" is stationary at the level form.

This is yet another reason for opting the ARDL approach rather than the standard time series approach.

Note that in determining which test statistic to compare with the 95% critical value for the ADF statistic, we have selected the ADF regression order based on the highest computed value for AIC and SBC. In some instances, AIC and SBC give different orders and in that case, we have taken different orders and compared both. This is not an issue as in all cases the implications are consistent.

2. **Selecting the lag length:**

In order to estimate the ARDL regression, selection of the lag length is important. The test runs over 4 lags length of 1,2,3, and 4 for the optimum lags. Referring to AIC and SBC, I find that lag (4) is the optimal order. The table below summarizes my finding.

Table 2: Test Statistics and Choice Criteria for Selecting the Order of the VAR Model

Order	LL	AIC	SBC	Adjusted LR test
4	1178.8*	1110.8*	1053.5	---------
3	1160.4	1108.4	1175.4	31.6363[.011]
2	1067.8	1031.8	1301.9	191.6872[.000]
1	1037.4	1017.4	989.10	305.0203[.717]
0	952.8613	948.8	943.20	390.3377[.000]

3. **Testing long run relationship between the variables:**

F-statistics for each equation:

- F (LKLSE | LLBR, LVIX, LUSU) = 1.7500
- F (LLBR | LKLSE, LVIX, LUSU) = 87.5283
- F (LVIX | LKLSE, LLBR, LUSU) = 4.585

- F (LUSU | LKLSE, LLBR, LVIX) = 2.1585

TABLE 3: F-Statistics for Testing the Existence of Long-Run Relationship

Computed F-Statistic – LLLBR & LVIX	**87.5283 & 4.585**
Critical Values at 5 percent level	Lower; upper 2.604; 3.746

The critical values are taken from Pesaran et al. (2001), unrestricted intercept and trend with eight regressors. * denotes rejecting the null at 5 percent level. The range of the critical value at 1 percent and 10 percent are 3.220-4.411 and 2.290-3.383 respectively.

As per the Table 3, the calculated F-statistics is **higher** than the upper bound critical value of 3.746 and 4.585 at the 5% significance level, for two equations (LLBR and VIX). This implies that the null hypothesis of no co-integrating long-run relationship can be rejected. These results reveal that a long-run relationship exists between Policy Uncertainty in the US, the Risk Aversion (the Interest Rates: LBR) and the Malaysian equity market (KLSE). The evidence of long run relationship rules out the possibility of any spurious relationship existing between the variables. In other words, there is a theoretical relationship existing between the variables.

4. **Estimating long run coefficients:**

The Error Correction Model's representation of the ARDL model is selected using the Akaike Information Criterion. Following tables provide the estimates of the ARDL long run coefficient for the model. As we are trying to understand the impact of the variables on the Malaysian equity market, Table 4 represents the results of Estimated Long-Run Coefficients using the ARDL Approach.

TABLE 4: Results of Estimated Long-Run Coefficients using the ARDL Approach – LKLSE (DEP)

Independent Variable	Coefficient	Standard Error	P-Value
LLBR	1.2004	2.9519	0.685
LUSU	-0.39758	0.47999	0.409
LVIX	0.13644	0.55983	0.808
INPT	3.1266	14.2450	0.8827

Note: * denotes significant at 5 percent level

The above table suggests that the variables in the model are not significant and thus they don't impact on the KLSE. As consequence, the Malaysian equity market (KLSE) is driven by other factors rather than the ones used in this model. As the Malaysian economy is a commodity driven, it could be the case that factors such as oil and other commodity markets drive it.

5. Error Correction Models:

A long run relationship between the variables is indicated by co-integration, however there could be a short-run deviation from the long-run equilibrium. Co-integration does not disclose the process of short-run adjustment to bring about the long-run equilibrium. The error correction model in Table 5 helps to understand this. The 'p' value of the error-correction coefficient indicates if the deviation from equilibrium (represented by the error-correction term) has a significant feedback effect on the dependent variable (KLSE), i.e, If the dependent variable is endogenous or exogenous. The error-correction coefficient being significant confirms the significant long-run co-integrating relationship between the variables. Also the speed of short-run adjustment of the dependent variable to bring about the long-run equilibrium is indicated by the size of the coefficient of the error-correction term. The size of the coefficient of the error-correction term is also indicative of the intensity of the arbitrage activity to bring about the long-run equilibrium.

Table.5.a Results of Error Correction Models – ΔLKLSE (DEP)

Independent Variable	Coefficient	Standard Error	P-Value
ΔLLBR	-6.0254	2.7232	0.029*
ΔLUSU	-0.050253	0.019179	0.010*
ΔLVIX	0.0047818	0.027074	0.860
ecm(-1)	**-0.051766**	.036598	0.16

Note: * denotes significant at 5 percent level

As per the above table, the deviation from equilibrium has no significant feedback effect on the dependent variable (KLSE: Bursa Malaysia) and there is slow speed of convergence to equilibrium. There exists a partial adjustment after a shock indicated by the speed of adjustment, (-0.051), which falls between -1 and 0. In this case, 5.17% (ecm's coefficient) of the previous period's (months) shocks adjust to the short run equilibrium in the current quarter.

Also the 'p' values of the coefficients of the differenced variables indicate if the effects of these variables on the individual dependent variable (KLSE) are significant. The result shows that in ΔLLBR and ΔLUSU are significant in the short run. These indicate that both risk of leveraging and US uncertainty affect the Malaysian stock markets in the **short run**. These results are aligned with the SBC test (table 5.2), which had been run for robustness purposes. However, the SBC test shows that only 2.1% (5.1% in the AIC test) of the previous period's (months) shocks adjust to the short run equilibrium in the current quarter.

Table5.b Results of Error Correction Models – ΔLKLSE (DEP)

Independent Variable	Coefficient	Standard Error	P-Value
ΔLLBR	-7.2850	2.7525	0.009*
ΔLUSU	-0.046804	0.015288	0.003*
ΔLVIX	0.038900	0.020588	0.061
ecm(-1)	**-0.020932**	.033549	0.534

Note: * denotes significant at 5 percent level

6. Variance Decomposition:

Variance decomposition (VDC) helps to ascertain relative endogeneity and exogeneity. VDC decomposes the variance of forecast error of each variable into proportions attributable to shocks from each variable in the system, including its own. The least endogenous variable is thus the variable whose variation is explained mostly by its own past variations.

I first apply orthogonalized VDCs and obtained the following results. Considering the data is on stock market indices, we forecast for a time horizon of 12 (months) i.e. a year.

	LKLSE	LLBR	LUSU	LVIX
LKLSE	-0.01%	0.00%	-0.19%	0.12%
LLBR	0.15%	0.02%	0.63%	-0.02%
LUSU	0.03%	0.00%	-0.24%	-0.10%
LVIX	0.03%	0.00%	0.07%	0.04%

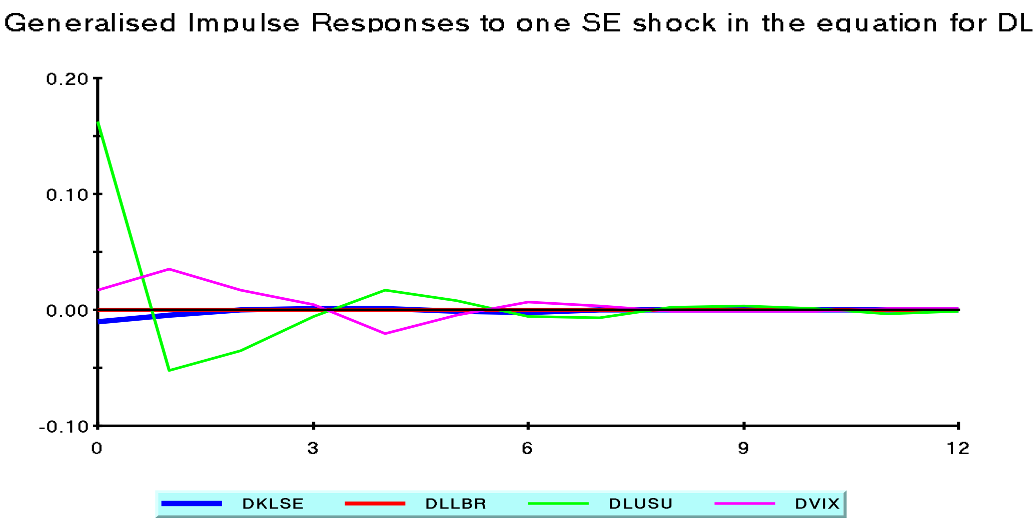
For the above table, rows read as the percentage of the variance of forecast error of each variable into proportions attributable to shocks from all variables (in columns), including its own. The columns read as the percentage in which that variable contributes to other variables in explaining observed changes. The diagonal line of the matrix (highlighted) represents the relative exogeneity. According to these results, the ranking of indices by degree of exogeneity (extent to which variation is explained by its own past variations) is as per the table below:

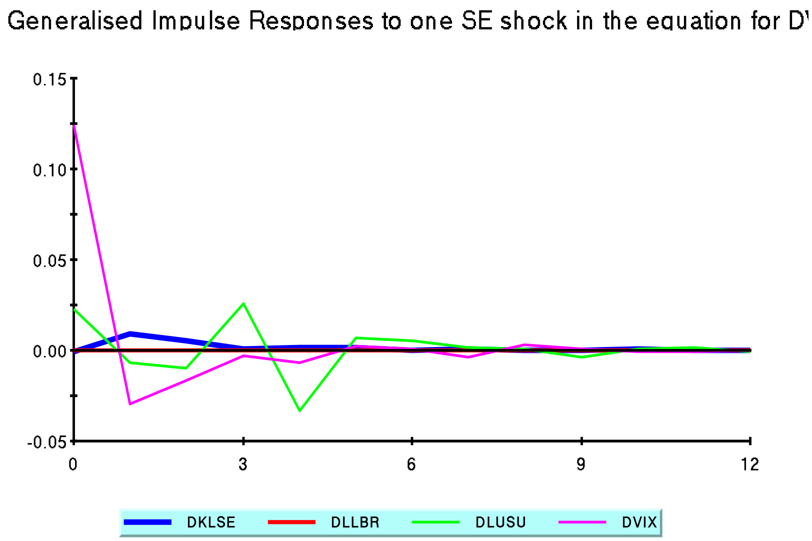
No.	Variable
1	LVIX
2	LLBR
3	LKLSE
4	LUSU

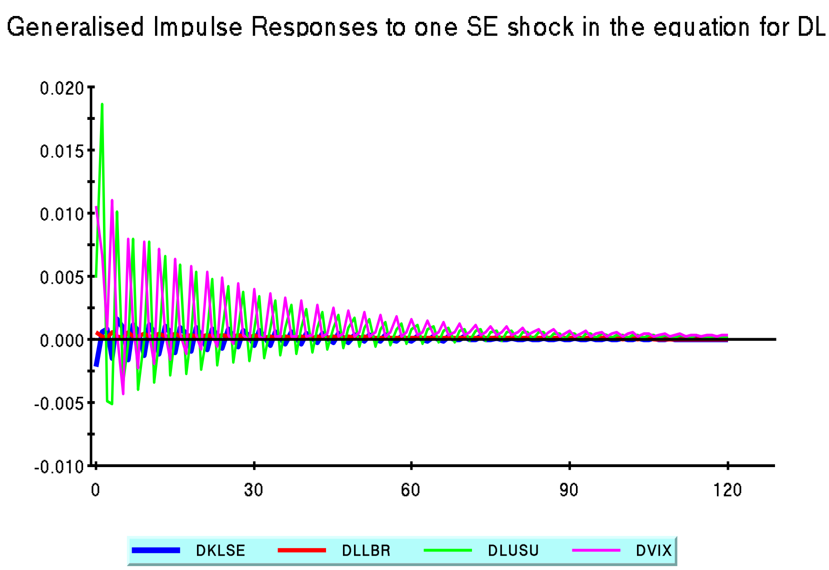
As per the above table, the strongest variable (LVIX) is the most exogenous followed by (LLBR) and the weakest one (LUSU) is the most endogenous. However, this contradicts the VECM's result, which states that "LLBR" is endogenous. The contradiction is a normal result as in the orthogonalized VDCs, the generated numbers are dependent upon the ordering of variables in the VAR. However, these results by themselves may not be reliable as all variables are forced with the same number of lags, which is not the case with ARDL, where the optimum number of lags are assigned to each variable. Thus using the first approach to find relative endogeneity/exogeneity may not be appropriate.

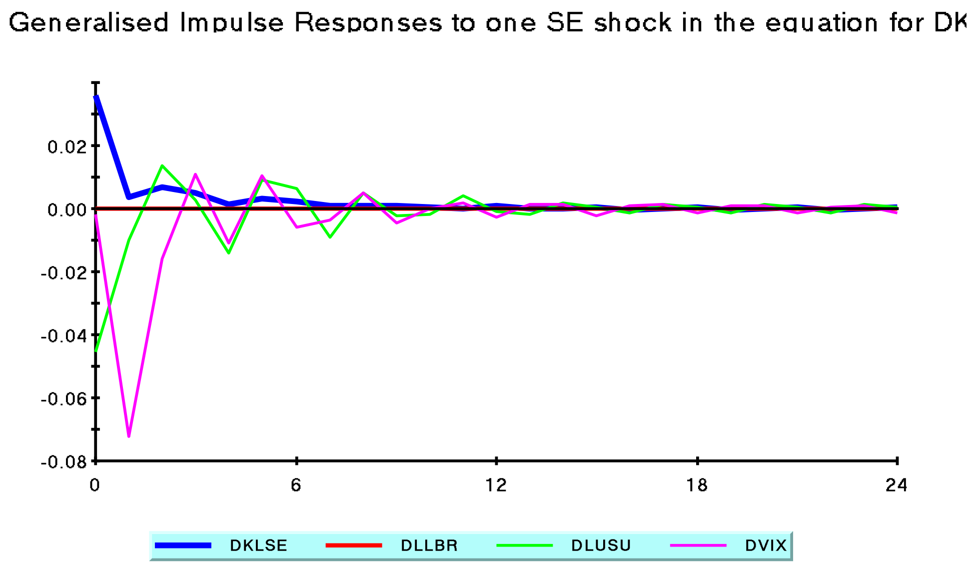
7. Impulse Response:

The impulse response functions (IRFs) essentially produces the same information as the VDCs, except that they can be presented in graphical form. In order to make this exercise meaningful, it is advised to shock the exogenous variables only (KLSE and VIX as per the VECM) and observe the effects on the other variable. As per the graphs below, it is obvious that all variables revert back the equilibrium within a period ranging from eight to ten months. When the Economic policy (USU) and the market Volatility (VIX) in U.S get shocked, the Malaysian equity markets needs a short while (8-10 months) to revert to its equilibrium. However, interest/borrowing cost (LBR) shows a different trend to equilibrium. When the interest/borrowing cost (LBR) gets shocked, Bursa Malaysia as well as the US economic policy are reverberated and take long period to revert to the equilibrium. This is a normal result as both economies Malaysian and US are interest based and the volatility of the equity markets depends strongly on such macro-economic factor. In addition to that, the rational behind the different equilibrium trend of LIBOR is as follow: during the pre-crisis period, the interest rate was high and fluctuated frequently (pre-crisis period), which explains the behaviors of other variables.. In the post-crisis period (after 2009), US followed a quantitative ease program (QE) and wind-down its interest rate to the rock bottom level (near to zero) in a way that LIBOR had been kept stable for a long period. During this period, interest rate policy was stable, which explains the reverting of Bursa Malaysia to equilibrium. This highly reflects my monthly data's selection (Jan -2005 to December- 2015) and links this with the market's behavioral.




Generalised Impulse Responses to one SE shock in the equation for D'
0.15
0.10
0.05
0.00
-0.05
0
3
6
9
12
DKLSE
DLLBR
DLUSU
DVIX


Generalised Impulse Responses to one SE shock in the equation for DL
0.020
0.015
0.010
0.005
0.000
-0.005
-0.010
0
30
60
90
120
DKLSE
DLLBR
DLUSU
DVIX



8. Concluding Remarks and Policy Implications:

Emerging markets play an eminent role in the world economy. Due to the increased economic and financial inclusion, shocks originating from the advanced economies (i.e. US) can have a significant impact on these emerging markets.

Our findings tend to suggest that the Malaysian stock market is not, however, affected in the long run by the policy uncertainty and risk aversion trades in the U.S, which contradicts the metaphor says "*When Wall Street sneezes, the world catches pneumonia. And when America recovers, the planet has a spring in its step*". Moreover, the great diversification strategy of the economy hinders external factors from affecting the Malaysian equity market in the long run. From other side, these findings might be explained by the nature of the Malaysian economy, which is driven by commodity, it could be the case that factors such as oil and other commodity markets drive it.

References:

Aloui, R., Aïssa, M. S. B., & Nguyen, D. K. (2011). Global financial crisis, extreme interdependences, and contagion effects: The role of economic structure?. *Journal of Banking & Finance*, *35*(1), 130-141.

Ammer, J., Vega, C., & Wongswan, J. (2008). Do fundamentals explain the international impact of US interest rates? Evidence at the firm level, *International Finance Discussion Paper,* number 952, October, Board of Governors of the Federal Reserve System, U.S.A..

Ahmad, A. H., Nurazira, M. D. S., & Ainulashikin, M. (2008). Sovereign Credit Ratings and Macroeconomic Variables: An Empirical Analysis on Dynamic Linkages in Malaysia Using Bound Test Approach. *The IUP Journal of Applied Economics*, *7*(6), 29-39.

Al Awad, M., & Goodwin, B. K. (1998). Dynamic linkages among real interest rates in international capital markets. *Journal of International Money and Finance*, *17* (6), 881-907.

Aye, G. C., Balcilar, M., Gupta, R., Kilimani, N., Nakumuryango, A., & Redford, S. (2014). Predicting BRICS stock returns using ARFIMA models. *Applied Financial Economics*, *24*(17), 1159-1166.

Bekiros, S. D. (2013). Contagion, decoupling and the spillover effects of the US financial crisis: Evidence from the BRIC markets. *International Review of Financial Analysis*, *33*, 58-69.

Berger, D., & Turtle, H. J. (2011). Emerging market crises and US equity market returns. *Global Finance Journal*, *22*(1), 32-41.

Bansal, R., Khatchatrian, V., & Yaron, A. (2005). Interpretable asset markets?. *European Economic Review*, *49*(3), 531-560.

Celık, S. (2012). The more contagion effect on emerging markets: The evidence of DCC-GARCH model. *Economic Modelling*, *29*(5), 1946-1959.

Cheng, H. F., Gutierrez, M., Mahajan, A., Shachmurove, Y., & Shahrokhi, M. (2007). A future global economy to be built by BRICs. *Global Finance Journal*, *18*(2), 143-156.

Chkili, W., & Nguyen, D. K. (2014). Exchange rate movements and stock market returns in a regime-switching environment: Evidence for BRICS countries. *Research in International Business and Finance*, *31*, 46-56.

Chinn, M., & Frankel, J. A. (2007). Will the euro eventually surpass the dollar as leading international reserve currency?. In *G7 Current account imbalances: sustainability and adjustment,* 283-338,. Chicago, University of Chicago Press.

Cooper, I., & Priestley, R. (2009). Time-varying risk premiums and the output gap. *Review of Financial Studies*, *22*(7), 2801-2833.

De Vries, G. J., Erumban, A. A., Timmer, M. P., Voskoboynikov, I., & Wu, H. X. (2012). Deconstructing the BRICs: Structural transformation and aggregate productivity growth. *Journal of Comparative Economics*, *40*(2), 211-227.

Dimitriou, D., Kenourgios, D., & Simos, T. (2013). Global financial crisis and emerging stock market contagion: A multivariate FIAPARCH–DCC approach, .*International Review of Financial Analysis*, *30*, 46-56.

Dzielinski, M. (2011). Measuring economic uncertainty and its impact on the stock market. *Finance Research Letters*, *9*(3), 167-175.

Ehrmann, M., & Fratzscher, M. (2006). Global financial transmission of monetary policy shocks*. *Oxford Bulletin of Economics and Statistics*, *71*(6), 739-759.

Forbes, K. J., & Chinn, M. D. (2004). A decomposition of global linkages in financial markets over time. *Review of Economics and Statistics*, *86*(3), 705-722.

Frank, W. P., & Frank, E. C. (2010). International business challenge: can the BRIC countries take world economic leadership away from the traditional leadership in the near future. *International Journal of Arts and Sciences*, *3*(13), 46-54.

Hammoudeh, S., Sari, R., Uzunkaya, M., & Liu, T. (2013). The dynamics of BRICS's country risk ratings and domestic stock markets, US stock market and oil price. *Mathematics and Computers in Simulation*, *94*, 277-294.

Hausman, J., & Wongswan, J. (2011). Global asset prices and FOMC announcements. *Journal of International Money and Finance*, *30*(3), 547-571.

Hwang, E., Min, H. G., Kim, B. H., & Kim, H. (2013). Determinants of stock market comovements among US and emerging economies during the US financial crisis. *Economic Modelling*, *35*, 338-348.

Kenourgios, D., Samitas, A., & Paltalidis, N. (2011). Financial crises and stock market contagion in a multivariate time-varying asymmetric framework. *Journal of International Financial Markets, Institutions and Money*, *21*(1), 92-106.

King, M. A., & Wadhwani, S. (1990). Transmission of volatility between stock markets. *Review of Financial studies*, *3*(1), 5-33.

Manamperi, N. (2014). The short and long-run dynamics between inflation and economic growth in BRICS. *Applied Economics Letters*, *21*(2), 140-145.

Masih, M., & Algahtani, I. (2008). Estimation of long-run demand for money: An application of long-run structural modelling to Saudi Arabia. *Economia Internazionale/International Economics*, *61*(1), 81-99.

Menzly, L., Santos, T., & Veronesi, P. (2004). Understanding predictability. *Journal of Political Economy*, *112*(1), 1-47.

Ono, S. (2011). Oil price shocks and stock markets in BRICs. *The European Journal of Comparative Economics*, *8*(1), 29-45.

Ozoguz, A. (2009). Good times or bad times? Investors' uncertainty and stock returns. *Review of Financial Studies*, *22*(11), 4377-4422.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289-326.

Pradhan, R. P., Dasgupta, P. R. A. T. E. E. K., & Samadhan, B. (2013). Finance development and economic growth in BRICS: A panel data analysis. *Journal of Quantitative Economics*, *11*(1&2), 308-322.

Sarwar, G. (2012). Is VIX an investor fear gauge in BRIC equity markets?. *Journal of Multinational Financial Management*, *22*(3), 55-65.

Sum, V. (2012). Economic policy uncertainty and stock market performance: evidence from the European Union, Croatia, Norway, Russia, Switzerland, Turkey and Ukraine. *Journal of Money, Investment and Banking*, *25*, 99-104.

Syriopoulos, T., & Roumpis, E. (2009). Asset allocation and value at risk in shipping equity portfolios. *Maritime Policy & Management*, *36*(1), 57-78.

Syriopoulos, T., Makram, B., & Boubaker, A. (2013). Stock market volatility spillovers and portfolio hedging: BRICS and the financial crisis. *International Review of Financial Analysis*, *39*, 7-18.

Wongswan, J. (2006). Transmission of information across international equity markets. *Review of Financial Studies*, *19*(4), 1157-1189.

Wilson, D. & Purushothaman, R. (2003). Dreaming with BRICs: The Path to 2050, *Global Economics Paper number* 99, Goldman Sachs, New York. October.

Zhang, B., Li, X., & Yu, H. (2013). Has recent financial crisis changed permanently the correlations between BRICS and developed stock markets?. *The North American Journal of Economics and Finance*, *26*, 725-738.