Lead-lag between exchange rates and trade balance: Malaysian evidence

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Abstract

This paper wants to investigate the lead-lag relationship between real effective exchange rate (ER) and trade balance taking Malaysia as a case study. This is to study whether the contrasting theoretical views on exchange rates and trade balance remain true in Malaysia. Rather than assuming the dependent and independent variables based on theory, the paper takes the approach of time series technique that let the data decide which variable is dependent and which is not. The standard time series techniques are applied for the analysis. The paper contributes to validating past literature with updated data on exchange rates and trade balance, further enhancing the economic meaning of each theoretical view based on the results obtained from the study. The major finding is that results confirm each theoretical view, however with a unique time frame parameter and better understanding of the economic landscape. This will help policy makers in having decisive factors in determining effective policies on exchange rate and trade balance for attaining economic growth.

Keywords: lead-lag, exchange rate, trade balance, VECM, VDC

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1. Introduction

The study on exchange rates and trade balance was long discussed over the years, however it remains unresolved as there resides two dominant theoretical views. The first claims that there is no long run relationship between the two, while the other sees the opposite. This was further clouded with past literature that empirically proves that there is a positive relationship instead of negative.

Therefore, the paper aims to address three questions: (i) whether there are any cointegration between exchange rate and trade balance; (ii) which variables are more exogenous than the others; and (iii) will the result change over time. The basis of these questions are (i), the researcher is humbly of the view that the reason of such contradictory theoretical view was due to no clear cointegration between the two variables. As for (ii) it was to address the degree of endogeneity as it will help the policy makers in knowing which variable affects the other. Last but not least (iii) was to address and ensure the consistency of our finding by applying the latest data and future forecasting. Hence, the three questions translate into the contributions of this paper.

From the study, the paper found that both theoretical views despite contradictions were correct and justifiable however identified that each is correct in a specific time frame parameter. The paper also observed a contradictory result in the variables' endogeneity and it was vindicated that it varies due to different economic conditions and timing. Moreover, the paper confirms that both theoretical views remain true with the new data applied to the study in Malaysia.

The rest of the paper will be structured as follows. The second section will briefly review the relevant literature. The third section will discuss the data and methodology employed in the paper, while the fourth section will present the empirical results. The fifth provides discussions and economic interpretation, while the last section concludes.

2. Literature review

Several studies have been conducted on the impact of exchange rates and trade balance. In general, there are two (2) views in this matter where the first opinion states that there is a relationship between exchange rates and trade balance, while the second opinion sees that there was no effect of exchange rates on trade balance.

As for the first view where results from studies have been conducted by some studies Himarios (1985, 1989); Haynes & Stone (1982) have documented a direct connection between exchange rates and trade balance. The paper by Haynes and Stone (1982), who employed level data with import value divided export value (or its inverse) as a regressand, and Himarios (1985), who used exports minus imports, found evidence that devaluation improved the trade balance in most of their samples.

Bahmani-Oskooee (1991) and Arize (1994) also found that currency depreciation/devaluation or in our case exchange rates improves the trade balance in most developing economies. Further Sun & Chiu (2010); Aziz (2008); Ng, Har, & Tan (2008); Bahmani-Oskooee (2001); Onafowora

(2003); and Singh (2002); demonstrated that there is a positive relationship between exchange rate and trade balance as their studies implies that currency depreciation will close the trade gap.

On the other hand, the second perspective views that there is no relationship between Exchange rates and trade balance. Miles (1979) have shown no evidence of a positive and statistically significant relationship between exchange rate and trade balance. Miles finding was based on first differenced data with trade balance scaled by income as a regressand. However, these studies failed to pin down the nature of the exact empirical connection between the variables.

Addressing the matter, studies by Hatemi & Irandoust (2005); Wilson & Tat (2001); Rose (1990) did not manage to notice any relationship between the two variables. From these literatures, it was found that for the Association of the Southeast Asian Nations (ASEAN countries) – Indonesia, Malaysia, the Philippines, Singapore and Thailand - the impact of exchange rate on the trade balance is exaggerated and also that it is the real exchange rate not the nominal exchange rate that affects the trade balance. Moreover, Bahmani-Oskooee (2001) concluded that real exchange rate does not change on its own; it is the nominal exchange rate that is changed first, and that change causes a shift or fluctuations in the real exchange rate. Due to different opinion observed, the relationship of exchange rates and trade balance remains inconclusive.

A study on exchange rates and trade balance in Malaysia was conducted earlier Ng,, Y., Har, Wai-Mun, & Tan, G. (2008), however the data was conducted up to 2006. It is interesting to see if thee any changes on the relationship of exchange rates to trade balance particularly before and after the financial crisis in 2008.

Hence the aim of the paper is to: (i) humbly trying to test and further prove the relationship between exchange rate and trade balance; (ii) test the degree of endogeneity or exogeneity of variables; and (iii) test the affect between the two variables against the latest data set. The results of these paper will be implemented to guide policy makers in making future decisions.

3. Data and Methodology

The data used was sourced out from International Monetary Fund (IMF) website. The data set was taken on annual basis where it was last updated on 2nd May 2018. Based on theoretical view and previous literatures, four (4) variables was introduced in this study which are Real Exchange Rates (ER), Trade Balance (TB), Foreign GDP (FY) and Local GDP (LY).

Real exchange rates were used rather than the nominal exchange rates as it factors inflation in hand. This will better resemble and capture its reaction to any changes in the economy. Trade balance is accounted for exports of goods in local currency MYR divided by import of good in the same currency. The foreign GDP referred was to United States GDP based on their local currency USD while local GDP is the Malaysian GDP itself.

This study uses the 8 steps methods taught by Prof. Mansur Masih that incorporates Unit Roots testing, Lag order test for VAR, Co-integration test that involves Engel Granger and Johansen approach, Long Run Structure Model (LRSM), Vector Error Correction Model (VECM), Variance Decomposition Analysis, Impulse Response Function and Persistence Profiling. The study will be

conducted based on the data and methods above, and the data will be computed by Microfit software developed by Bahram Pesaran and M. Hashem Pesaran.

4. Empirical results

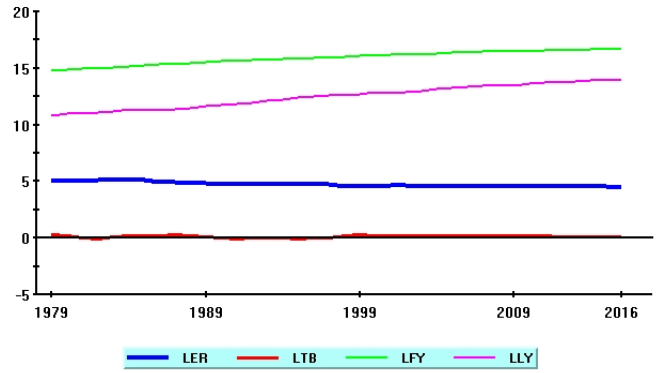
Unit Root tests

This step is necessary for any time series techniques as it is to address whether the variables used are stationary or not. The basis is that unlike normal regression, time series techniques does not assume which variable is dependent and which is independent. For that, the study took the data set and log it to make the variance constant while allowing the mean to continue to change. Next, we took the log form and make the first differenced to make the mean constant. These two steps are necessary in order to ensure that the variables tested are stationary so that any test done can reflect its impact both in short run and long run analysis. For that, we used two tests to test the stationarity of the variables, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP).

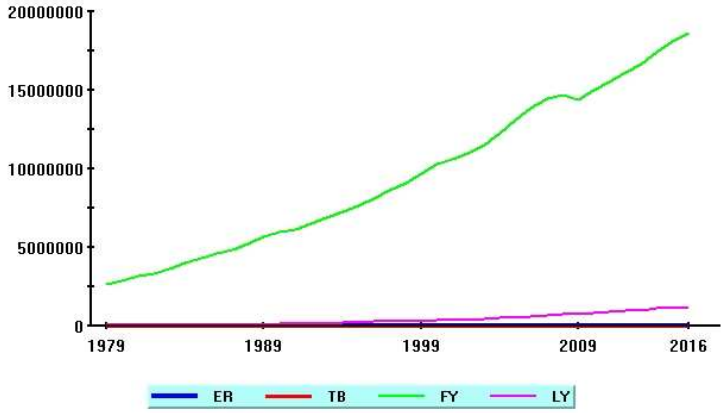
ADF test

	VARIABLE	ADF	VALUE	T-STAT.	C.V.	RESULT
LOG FORM	LER	ADF(1)=AIC	48.1253	- 3.447	- 3.619	Non-Stationary
		ADF(1)=SBC	45.1938	- 3.447	- 2.619	Non-Stationary
	LTB	ADF(1)=AIC	40.0015	- 2.524	- 3.619	Non-Stationary
		ADF(1)=SBC	37.0701	- 2.524	- 3.619	Non-Stationary
	LFY	ADF(1)=SBC	83.6283	- 0.795	- 3.619	Non-Stationary
		ADF(2)=AIC	87.2577	- 0.600	- 3.562	Non-Stationary
	LLY	ADF(1)=AIC	41.9433	- 1.736	- 3.619	Non-Stationary
		ADF(1)=SBC	39.0118	- 1.736	- 3.619	Non-Stationary

The result for ADF test on log form variables shows that we are not able to reject the null that says the variables are non-stationary. For ADF test statistics, we have selected the ADF regression order based on the highest computed value for Akaike Information Criterion (AIC) and Schwarz-Bayes Criterion (SBC). The graph below was plotted using the log form variables, showing the relationship between the variables when the variance is held constant.



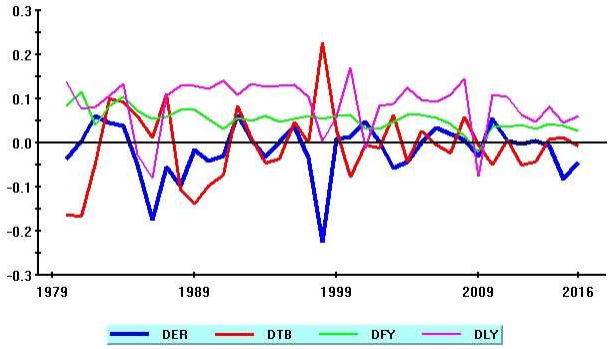
Graph plotted using logged variables



Graph plotted without log and differenced form

	VARIABLE	ADF	VALUE	T-STAT.	C.V.	RESULT
1ST DIFF. FORM	DER	ADF(1)=AIC	41.5253	-4.3167	- 3.582	Stationary
		ADF(1)=SBC	38.6573	-4.3167	- 3.582	Stationary
	DTB	ADF(1)=AIC	35.3777	- 3.886	- 3.582	Stationary
		ADF(1)=SBC	32.5098	- 3.886	- 2.582	Stationary
	DFY	ADF(1)=AIC	84.7393	- 4.307	- 3.582	Stationary
		ADF(1)=SBC	81.8713	- 4.307	- 3.582	Stationary
	DLY	ADF(1)=AIC	41.1480	- 4.312	- 3.582	Stationary
		ADF(1)=SBC	38.2800	- 4.312	- 3.582	Stationary

ADF conducted on differenced form variables



Graph plotted in differenced form

As for the ADF test conducted on differenced form variable, that we are now able to reject the null and say that the variables are stationary. To further enhance our unit root tests findings, we decided to conduct another test through the PP test to confirm our results.

PP test

	VARIABLE	T-STAT.	C.V.	RESULT
LOG FORM	LER	-1.5667	-3.5693	Non-Stationary
	LTB	-2.824	-3.5693	Non-Stationary
	LFY	-1.8776	-3.5693	Non-Stationary
	LLY	-1.3329	-3.5693	Non-Stationary

	VARIABLE	T-STAT.	C.V.	RESULT
1ST DIFF. FORM	DER	-4.4386	-3.5292	Stationary
	DTB	-5.233	-3.5292	Stationary
	DFY	-5.3665	-3.5292	Stationary
	DLY	-5.7308	-3.5292	Stationary

The PP test conducted showed more promising results. The PP test; which tackles both autocorrelation and heteroskedastic issues through the Newey-West method managed to pin point that we are firm in rejecting the null of non-stationary for all the differenced form variables. Now, as all the variables are stationary, we can now move to the second step in determining the order of lags of the Vector auto regression (VAR).

Determining the Order of Lags of the VAR

Before we can carry on to the cointegration test, we must determine order of the VAR which helps us to select how many lags we are going to use for cointegration test. VAR is the test that needs to be done before moving on to the test for cointegration. In VAR the number lags need to be used in this study by choosing the optimum order optimum order given by the highest AIC and SBC value.

Nevertheless, the result of VAR obtained for the optimum order between AIC and SBC showed a contradicting optimum order as shown in below table.

Order	LL	AIC	SBC	LR test	Adjusted LR test
				------	------
6	325.4449	225.4449	153.7455		
5	303.8423	219.8423	159.6148	CHSQ(16)= 43.2052[.000]	8.3623[.937]
4	269.0467	201.0467	152.2911	CHSQ(32)= 112.7965[.000]	21.8316[.912]
3	253.0277	201.0277	163.7440	CHSQ(48)= 144.8344[.000]	28.0325[.991]
2	239.1501	203.1501	177.3384	CHSQ(64)= 172.5895[.000]	33.4044[1.00]
1	229.7718	209.7718	195.4319	CHSQ(80)= 191.3463[.000]	37.0348[1.00]
0	217.9209	213.9209	211.0530	CHSQ(96)= 215.0479[.000]	41.6222[1.00]

AIC=Akaike Information Criterion SBC=Schwarz Bayesian Criterion

As expected, SBC gives lower order (order 0) as compared to AIC (order 6). This difference is due to the AIC tries to solve for autocorrelation while SBC tries to avoid overparameterization. Given this apparent conflict between recommendation of AIC and SBC, we address this in the following manner. First, we checked for serial correlation for each variable and obtained the following result.

Variables	LM (P Value)	Implication at 10% significance level
DER	3.0155[.082]	No serial correlation
DTB	2.4346[.119]	No serial correlation
DFY	0.086102[.769]	No serial correlation
DLY	3.0253[.082]	No serial correlation

Based on the results, serial correlation does not exist in any of the four (4) variables. Hence, if we opted for a lower order of lags, the effects of serial correlation may be encountered. However, if a higher order of the lag is taken, it leads to the disadvantages of risking overparameterization. For this paper, we have taken 38 observations and then the higher VAR order of 1 was chosen as shown in the below table.

Order	AIC	SBC	p-Value	C.V.
1	209.772	195.432	[1.00]	5%

Co-integration test

As we have successfully determined the lag order, it is important to know and test whether there is cointegration between the variables. This cointegration test reflects the theoretical view whether or not there is relationship between exchange rate and trade balance. Cointegration means that the variables are moving together along the long run. For that, we have conducted two (2) approaches, which are: (i) Engle Granger (E-G) approach; and (ii) Johansen approach.

Engle Granger approach

For Engle Granger, we have to first to assume an OLS regression based on theories and empirical studies presented in the literature review part earlier. Based on the study we assumed that:

$$LTB = \propto + \beta_1 LER + \beta_{12} LFY + \beta_3 LLY + \varepsilon$$

The result obtained from E-G is displayed as below, where a we compare the critical value to the test statistic of the AIC and SBC.

LTB	Test Statistic	DF critical value at 95%
ADF(1)=AIC	- 2.467	- 4.457
ADF(1)=SBC		

However, based on the result it shows that there is no cointegration between the variables as we failed to reject the null of no cointegration as the test statistic are both smaller than the critical value. Since this does not align with the literature studies before, we felt that it is best to proceed with the Johansen approach as E-G only assume one cointegration. This means that if there are more than one cointegration vector, E-G approach will not capture it in the results due to the assumption.

Johansen approach

In contrast to E-G, Johansen approach is able to identify more than one cointegration in a group of variables. This method test through two layers of test namely the Eigen-Value and the trace test. Based on our result, the eigen value did not manage to identify any cointegrations. The result was based on the test statistic computed on the nulls, where the test statistic value was lower than the critical value, hence we failed to reject the null of no cointegration.

Cointegration LR Test Based on Maximal Eigenvalue of the Stochastic Matrix

Null	Alternative	Statistic	95% Critical Value	90% Critical Value	Result
r = 0	r = 1	21.879	25.420	23.100	0 cointegration
r<= 1	r = 2	11.948	19.220	17.180	
r<= 2	r = 3	6.632	12.390	10.550	

Table: Eigenvalue results

Moving to the trace test, the result was different. At 90% of confidence level, the resulted for one cointegration in our model.

Cointegration LR Test Based on Trace of the Stochastic Matrix

Null	Alternative	Statistic	95% Critical Value	90% Critical Value	Result
r = 0	r = 1	40.460	42.340	39.340	1 cointegration
r<= 1	r = 2	18.580	25.770	23.080	
r<= 2	r = 3	6.6323	12.39	10.55	

Table: Trace test results

Since we have found our cointegration, we now move to test the coefficients on its theoretical value via Long Runs Structural Model.

Long Run Structural Model (LRSM)

This step will estimate theoretically meaningful cointegrating relations. we impose on those long-run relations and then test the over-identifying restrictions according to theories and information of the economies under review. In other words, this step will test the coefficients of variables in

the cointegration equations against theoretical expectation. This LRSM step also can test the coefficients of variables whether they are statistically significant or not.

In this study, we want to see the impact of real exchange rates on trade balance. In other words, our focused variable in this paper is LTB. Thus, we first normalized LTB (i.e. normalizing restriction of unity) at the 'exactly identifying' stage as shown in panel (Panel A). Next, we imposed restriction of zero on the other variable at the 'over identifying' stage (Panel B, Panel C, Panel D and Panel E). By calculating the t-ratios manually, we found that only none of the variables were significant. To verify the significance of these variables, we applied over-identifying restrictions as in Panel B, Panel C, Panel D, and Panel E.

VRBL	PANEL A	PANEL B	PANEL C	PANEL D	PANEL E
LER	-1.3853	0.00	2.6676	-2.3752	-0.39210
	(1.6710)	(*NONE*)	(1.9197)	(1.7165)	(0.59737)
LTB	1.0000	1.0000	1.0000	1.0000	1.0000
	(*NONE*)	(*NONE*)	(*NONE*)	(*NONE*)	(*NONE*)
LFY	-3.0953	-1.9837	0.00	-3.7863	-2.3033
	(1.8125)	(0.81229)	(*NONE*)	(2.2500)	(1.0450)
LLY	0.58329	1.1195	2.3703	-.0000	1.0897
	(0.81233)	(0.61866)	(1.8884)	(*NONE*)	(0.48284)
Trend	0.069440	-0.012069	-0.18138	0.14077	0.00
	(0.10332)	(0.036433)	(0.14731)	(0.082782)	(*NONE*)
CHSQ(1)	NONE	0.95428[.329]	3.2844[.070]	0.38175[.537]	0.58840[.443]

s.e. in parentheses

The results show that only in Panel E where LFY and LLY were found significant, and it was achieved by removing the trend. The result was really interesting as the trend is basically the theoretical element of the model. Nevertheless, we humbly choose to include all variables into our model and choose panel A as the very purpose of the paper is to test the long run relationship of exchange rate and trade balance.

Vector Error Correction Model (VECM)

As we now have the model that we wanted to test, we may now proceed with the test of causality through the VECM. In this test, Microfit will compute which of the variables are endogenous and which are exogenous. The result is analyzed by looking at the p value against the critical value (C.V.). If the p-value is higher than the 5% then the variable is considered exogenous. On the other hand if the value is lower, the variable is taken as endogenous.

ecm1(-1)	Coefficient	Standard Error	T-Ratio [Prob.]	C.V.	Result
dLTB	-0.15744	0.068329	-2.3041[.028]	5%	Endogenous
dLER	0.11417	0.055326	2.0635[.048]	5%	Endogenous
dLFY	0.058015	0.018421	3.1495[.004]	5%	Endogenous
dLLY	0.012421	0.060398	.20566[.838]	5%	Exogenous

Table: VECM results

Based on the result above we found that all of the variables are endogenous except for dLLY which was noted as exogenous. Despite now that we know the endogeneity of the variables, VECM does not specify the degree of each, which bring us the need for the next step.

Variance Decomposition (VDC) Analysis

This step will help researchers to identify the degree of endogeneity and exogeneity of a variable. This was calculated based on the forecasting horizon set for the variables. There are two (2) approaches that can be used for VDC: (i) Orthogonolized; and (ii) Generalized approach. However, in this study we humbly opted for the generalized approach as Orthogonolized is biased to the variables ordering/sequence and that it assume other variables to stay off when a shock is set on a certain variable.

For this study, the model was set at 50 years horizon where each 10-year horizon is tested for endogeneity in this model. Below are the results obtained.

	HORIZON	LTB	LER	LFY	LLY	TOTAL
LTB	10	84.81%	5.48%	10.50%	1.32%	102.11%
LER	10	6.42%	77.99%	23.38%	7.19%	114.99%
LFY	10	44.07%	13.24%	64.15%	2.90%	124.35%
LLY	10	14.99%	15.07%	11.58%	94.78%	136.41%

	HORIZON	LTB	LER	LFY	LLY	TOTAL	SELF-DEP	RANKING
LTB	10	83.06%	5.37%	10.28%	1.29%	100.00%	83.06%	1
LER	10	5.58%	67.83%	20.33%	6.26%	100.00%	67.83%	3
LFY	10	35.44%	10.64%	51.59%	2.33%	100.00%	51.59%	4
LLY	10	10.99%	11.05%	8.49%	69.48%	100.00%	69.48%	2

	HORIZON	LTB	LER	LFY	LLY	TOTAL
LTB	20	82.81%	6.70%	10.73%	0.88%	101.12%
LER	20	6.74%	76.90%	24.49%	6.73%	114.85%
LFY	20	47.16%	14.61%	60.51%	1.63%	123.91%
LLY	20	15.87%	14.79%	10.79%	94.26%	135.71%

	HORIZON	LTB	LER	LFY	LLY	TOTAL	SELF-DEP	RANKING
LTB	20	81.89%	6.63%	10.61%	0.87%	100.00%	81.89%	1
LER	20	5.86%	66.95%	21.32%	5.86%	100.00%	66.95%	3
LFY	20	38.06%	11.79%	48.84%	1.31%	100.00%	48.84%	4
LLY	20	11.70%	10.89%	7.95%	69.46%	100.00%	69.46%	2

	HORIZON	LTB	LER	LFY	LLY	TOTAL
LTB	30	82.08%	7.14%	10.82%	0.72%	100.76%
LER	30	6.94%	76.20%	25.20%	6.43%	114.77%
LFY	30	48.10%	15.03%	59.41%	1.24%	123.78%
LLY	30	16.19%	14.68%	10.52%	94.08%	135.47%

	HORIZON	LTB	LER	LFY	LLY	TOTAL	SELF-DEP	RANKING
LTB	30	81.46%	7.09%	10.73%	0.71%	100.00%	81.46%	1
LER	30	6.04%	66.39%	21.96%	5.61%	100.00%	66.39%	3
LFY	30	38.86%	12.14%	47.99%	1.00%	100.00%	47.99%	4
LLY	30	11.95%	10.84%	7.76%	69.45%	100.00%	69.45%	2

	HORIZON	LTB	LER	LFY	LLY	TOTAL
LTB	40	81.71%	7.37%	10.86%	0.64%	100.57%
LER	40	7.04%	75.84%	25.56%	6.28%	114.72%
LFY	40	48.55%	15.23%	58.87%	1.06%	123.71%
LLY	40	16.35%	14.63%	10.37%	93.99%	135.34%

	HORIZON	LTB	LER	LFY	LLY	TOTAL	SELF-DEP	RANKING
LTB	40	81.24%	7.33%	10.80%	0.63%	100.00%	81.24%	1
LER	40	6.13%	66.11%	22.28%	5.48%	100.00%	66.11%	3
LFY	40	39.25%	12.31%	47.59%	0.85%	100.00%	47.59%	4
LLY	40	12.08%	10.81%	7.66%	69.45%	100.00%	69.45%	2

	HORIZON	LTB	LER	LFY	LLY	TOTAL
LTB	50	81.48%	7.51%	10.88%	0.59%	100.46%
LER	50	7.10%	75.63%	25.78%	6.19%	114.70%
LFY	50	48.82%	15.35%	58.56%	0.95%	123.67%
LLY	50	16.44%	14.60%	10.29%	93.94%	135.27%

	HORIZON	LTB	LER	LFY	LLY	TOTAL	SELF-DEP	RANKING
LTB	50	81.11%	7.47%	10.83%	0.59%	100.00%	81.11%	1
LER	50	6.19%	65.94%	22.48%	5.40%	100.00%	65.94%	3
LFY	50	39.47%	12.41%	47.35%	0.76%	100.00%	47.35%	4
LLY	50	12.16%	10.79%	7.61%	69.44%	100.00%	69.44%	2

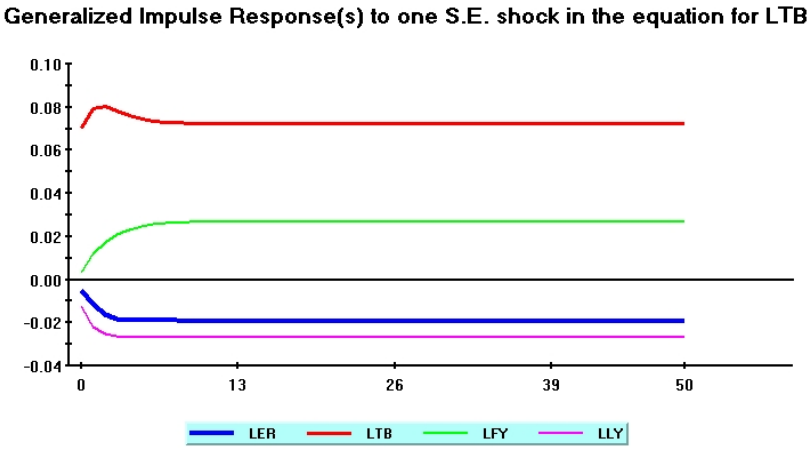
Based on the result the degree of endogeneity can be summarized as below:

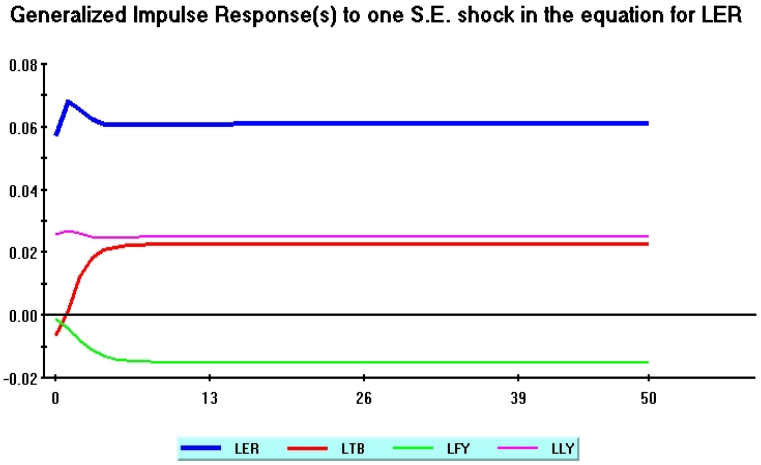
Exogenous	LTB	LLY	LER	LFY	Endogenous

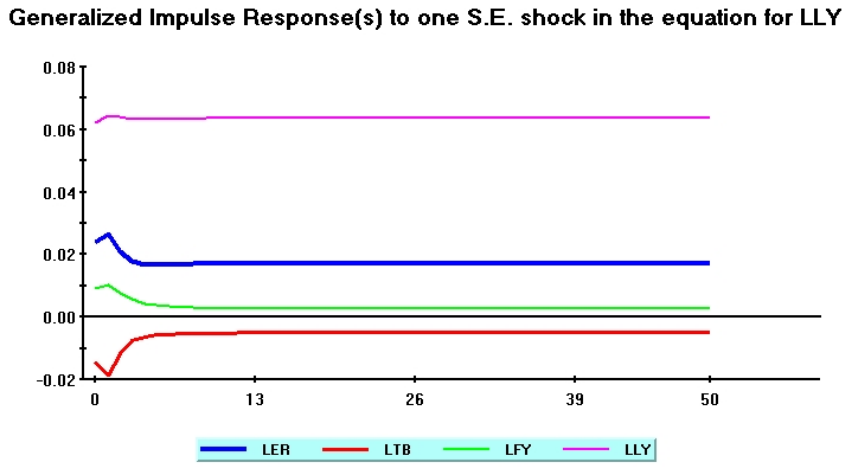
It is important to note that based on the VECM results, VDC gives a different result and detail.

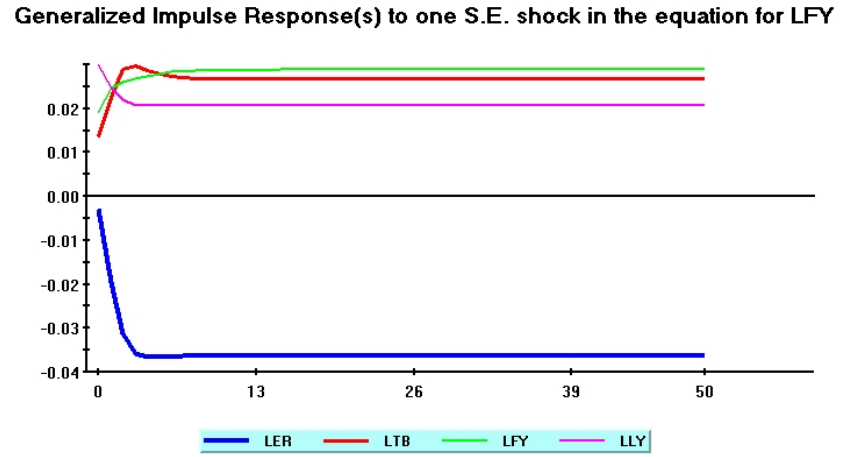
Impulse Response Function (IRF)

To better understand the results tabulated in VDC, IRF generates the same result and information as VDC but presented in graphical output. This provides better understanding on the impact and relationship between each variable particularly exchange rate and the trade balance. It is important to note that IRF is only tested for shocks on specific variables. For a system wide shock, we have to go for the Persistence Profile test. Below are the IRF results of each variable.



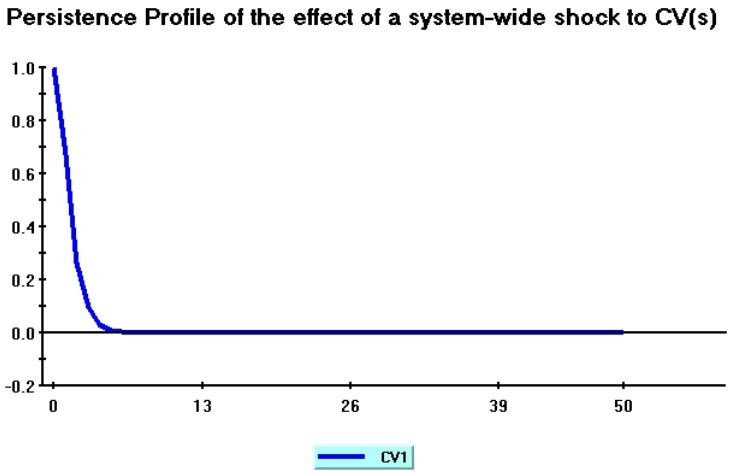






Persistence Profile

The persistence profile helps us to forecast when an entire cointegrating equation is shocked and indicates the time it would take for the relationship to get back to equilibrium. In contrast to IRF, the shock implied in this test is system wide. The graph below represents the persistence profile of the variables in this paper.



As the data is based on annual basis, the graph illustrated how that it will take approximately seven (7) years for the variables to return back to equilibrium if it was hit with a system wide shock.

5. Discussions and economic interpretation

Based on the data and results we observed from the tests conducted it is important to know how we benefit from these findings. The paper was based on the gap why there were inconclusive view whether there is a clear relationship between exchange rate and trade balance or not. Referring to previous literatures, two opinions were observed. From the study, we learned that it is hard to find clear cointegration between exchange rate and trade balance as different methods vary from each other in term of results.

Engel Granger test did not manage to capture the cointegration between the two, where in contrast Johansen approach was able to identify one cointegration at 90% confidence level. Thus, we humbly opined that different result maybe first due to the methodology used in identifying cointegration or not. This is proved crucial as cointegration is considered as the key of long run relationship between the variables. Failure to properly capture any relevant cointegration may result to policy makers implementing wrong policies for their country which might be costly.

Our finding in LRSM also worth noticing as the none of the variables in the original model in Panel A was significant. However, it is noted that by removing the trend, LFY and LLY becomes significant. Despite the significance, our initiation was not to drop the trend variable as it holds the long run element in the model. The basis of such choice was to see the impact of exchange rate and trade balance in a long run. Removing the trend denies the very purpose of the research.

From the LRSM results in Panel A, exchange rate holds a negative relationship to the trade balance and local GDP. On the other hand, exchange rate is observed to have a positive relationship with the foreign GDP. We humbly see such finding is in line with the theoretical view that's says when a decrease in exchange rate occurs, the cost of production in Malaysia reduces, and translates into higher volume of export hence the increase in trade balance and the local GDP. Foreign GDP reduces as they are now importing more from Malaysia.

It is important to note on our observation on LRSM panels, the variables became significant when we remove the trend. This gives us the signal that changes in the exchange rate is highly significant to the impact of local and foreign GDP in the short run. This may be due to arbitrage practices amongst traders, increasing the volume of trade despite being insignificant.

The higher significance in the short run may also justify the claim that there are no long run relationship between exchange rate and trade balance. Nevertheless, in long run, the significance level reduces over time. We humbly view that this might because when exchange rate decreases, trade balance increases in the short run. However, in a long run effect, as the time passes by, the higher demand on Malaysian export increases the local GDP as revenue is accumulating. Hence, the increase in demand for the Malaysian market increase the exchange rate, hence reducing the significance of exchange rate to trade balance in the long run.

Another finding was the endogeneity results was contradicting between VECM and VDC. In VECM, LLY or the local GDP was the exogenous variable, while in VDC, LTB or trade balance was the most exogenous one. Since the theoretical view assume that LTB is endogenous, what we have seen in the result might be explained by a time frame factor that made LTB as exogenous instead of endogenous. As the trade balance and local currency is high, the impact will be translated to an increase in exchange rate as explained earlier. However, when the trade balance is low, exchange rate decreases and opens the country for a bigger export opportunity as the cost of production is cheaper now. Hence, in the later scenario, the negative relationship of exchange rate to trade balance prevails.

These findings are of important economic value for policy makers as it confirms with both theoretical views as each are valid in their respective timing. Hence it is important for policy makers to first study their economic landscape in order to implement an effective strategy that involves exchange rate and trade balance as both can give impact to the country's GDP.

6. Conclusion

The paper concludes that despite the contradictory opinions and theoretical views on exchange rate and trade balance, the argument of each is valid. However, the main finding of the paper was that the difference of opinion was due to different approaches used in determining cointegration.

Further, the paper found out the degree of endogeneity differs from a case to another, which further aids to different conclusion in view of exchange rate and trade balance relationship. Moreover, the paper confirms that previous literature remain true even when new set of data is tested on the existing theoretical value.

The paper provides the policy makers with the knowledge that external factors may affect the relationship and the impact of economic variables, reminding them to first understand the economic landscape prior to any policy implication. The paper also showed how a variable can have different degree of endogeneity depending on the economic conditions in the respective time.

The paper humbly sees that other approaches can be used in validating cointegration between variables namely Autoregressive Distribute Lag (ARDL) and non- linearity test (NARDL) as both can highlight symmetric or asymmetric relationship between variables. It has been shown that

several economic and financial variables can generate asymmetries and nonlinearities. These asymmetry findings are important since they indicate that caution should be exercised in interpreting the empirical results that assume symmetry because both bias and mistakes are increasing particularly for the policy makers.

The paper further suggested to include economic variables to the sample, to better capture the economic landscape in the study, and if possible to further include impacts on value-based intermediation theme. Further research may expand this study to the neighboring countries as the study is based on the Malaysian data.

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