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Impacts of Exchange Rate Fluctuations toward Export and Import Performance in Selected OIC Member Countries

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Abstract

Background – The issue of trade integration has been taking place since every nation agrees to integrate into the global system. In response to such condition, several macroeconomic policies have been carried out to generate maximum gains from this international integration. Lately, the issue emerges of whether exports or imports in developed and developing countries have not been in violation of their international budget constraints. Another issue is whether the existence of trade imbalances is considered as a short-run phenomenon or whether it would remain sustainable in the long run. Similarly, this has implied that the existence of a well-functioning economy due to deficits incurred is considered as temporary phenomena balanced by future surpluses. Subsequently, the stability of trade balance is heavily influenced by the existing stability of

exchange rate. Economic theory suggests that misalignment in the real exchange rates of nations as well as their departure from long-run equilibrium rates, negatively affects economic growth, and subsequently transmitted to the decrease in trade volume. Hence, exchange rate stability is a pre-requisite variable triggering the engine of growth in exports and imports matters. Supposed the trade balance in OIC member countries are similar, in the sense that originally they are trading with the same items and patterns of goods and services, it implies to expose a probability such as asymmetric shock which emerged across member countries. The asymmetric shocks exhibit the important factor to further analyze within selected OIC member countries since an expected disturbance might affect one country's national output differently and therefore might threaten the stability of exports and imports toward some selected OIC member countries.

Problem – The paper attempts to focus on three main issues to empirically investigate the impacts of exchange rate fluctuation onto imports and exports performance in selected OIC member countries. In that regards, this study elaborates three research questions, namely (1) are the imports and exports in the selected OIC member countries co-integrated?, (2) does exchange rate fluctuation have a significant impact toward exports and import performance in the selected OIC member countries?, (3) does the existence of shocks on exports and imports variables generate possibilities of crisis in the selected OIC member countries?

Design/methodology/approach – This study employs several econometric approaches to estimate precisely any possible relationship among observed variables such as import, export, and nominal exchange rate variables, spanning from the period of 1970:M1-2009:M4 from selected five OIC member nations. Vector Error Correction Model (VECM) is employed to address the relationship among the observed variables and access some dynamic responses to trade performances as shown by exchange rate shocks.

Findings – The findings show the existence of co-integrating relationship between exports and imports in selected OIC member nations. It implies that OIC countries would be sustainable in the long run and are not in violation of their international budget constraints. The identification of asymmetric shocks indicates OIC member nations are not having the same patterns as trading partners. Nevertheless, OIC countries have symmetric shocks so that trade integration can be established and can reduce trade cost transaction and

maximize the benefit of being trading partners. Lastly, we find that exchange rate fluctuation is not heavily affected by the volume of both imports and exports. Conversely, the performance of exports and imports are not hinged largely on exchange rate fluctuations. The endurance from exchange rate shocks indicate that selected OIC member nations are successful in maintaining the economy to work properly and manage the potential vulnerability of exchange rate fluctuation.

Conclusion – This paper ends up with some policy recommendations, including that the selected OIC member nations can exhibit and foster a greater economic cooperation, particularly in trade policy. It also recommends strengthening the level of economic development among Islamic countries, and strengthening the economic structures which ultimately can share benefits and avoid trade imbalances. Given that trade integration has become an important issue, each of the OIC countries should be preparing to enhance their technological capabilities and productive capacities.

Key Words: *Imports, Exports, Exchange Rate Fluctuation, Co-integration Test, VECM and Logit Approach, and OIC Member Countries*

JEL: F13, G01

Introduction

Macroeconomic stability has become a crucial component in the current global system, particularly in the face of global challenges and competition. Moreover, the increase in economic integration has been forcing many countries over the globe to tie up their national policies into global policies, including on the issue of exchange rate stability. Masrom and Yusop (2006) argue that the goal of regional integration is to promote greater macroeconomic coordination, and reduce the degree of macroeconomic volatility, in particular exchange rate fluctuation.

Exchange rate stability helps to significantly reduce the potential loss in resource allocation, and relative price uncertainty (Kempe and Teng, 2000). The other fact is that the European Union (EU) is a single example model of maintaining

exchange rate stability through economic integration so that trade and investment between members is promoted tremendously (Ariccia, 1999). Ahmed (2001) argues that exchange rate stability would be maintained as long as money supply increases in the same proportion as the increase in money demand.

In addition, the context of the combined effects of the exchange rate policy on the trade balance remains an unresolved issue in any empirical research in the area of international economics. According to Mundell-Fleming model and rules that for small open economy, if exchange rate fluctuation exists, for example an exchange rate appreciation, theoretically such condition would hurt export and conversely promote import. However, that rule stands to appear distinct on practical aspect by taking note of Singapore trade behavior in response to exchange rate. The finding of an empirical research by Abeyasinghe and Yeok (1998), in general, suggests that the higher the imported input content, the less would be the impact of exchange rate fluctuation on exports.

It also suggests that exchange rate fluctuation had no change effect on re-exports. On the other hand, service exports which are relatively less intensive in imported inputs are considered as the most affected variable by exchange rate fluctuation. Irandoust and Ericsson (2004) find the evidence to shed light on the policy implications of a long-term relationship between imports and exports. The relationship can be investigated from its convergence or econometrically being called as its co-integration, which later suggests the co-existence of co-integrating vector between exports and imports, implying that a country is not in violation of her international budget constraints and any trade imbalances are only a short-run phenomena, so that the equilibrium instituted in the long run are sustainable. In brief, the correlation between exchange rate fluctuation and trade balances are proven as the sustainability of trade is indicated by how strong its currency fluctuation is and how far the existence of a productivity gap is.

Concerning the above examination, the study attempts to figure out the effect of exchange rate fluctuation on exports and imports in several selected countries which are members of the Organization of Islamic Cooperation (OIC). OIC was established in 1969, aimed at ensuring and protecting the interest of the Muslim world in the spirit of promoting international peace and harmony around the globe. The OIC Charter also set the aim to “Strengthen intra Islamic economic and trade cooperation, in order to achieve economic integration leading to the establishment of an Islamic common market”.

In the light of this noble vision, several framework agreements had been formulated, for instance the Framework Agreement on Trade Preferential System of Organization of Islamic Cooperation (TPSOIC) which entered into force in the autumn 2002. Subsequently, to strengthen the former agreement, (The Standing Committee for Economic and Commercial Cooperation of the Organization of Islamic Cooperation (COMCEC) established the Trade Negotiating Committee (TNC) in 2003, and finally the Protocol on the Preferential Tariff Scheme (PRETAS) was instituted. All the above frameworks are made available to reduce any restrictions in tariff among members to ultimately promote trade and growth. The present paper is concerned with the relationship between exchange rate and the growth of exports and imports.

Throughout the discussion, three issues are elaborated in the analysis. First, whether the concerned variables (exchange rate, exports, and imports) are co-integrated; secondly, what are the impacts of exchange rate fluctuation towards exports and imports performance in the selected OIC members countries; and thirdly, whether the probability of crisis emerges in the case of exports and imports imbalances. Finally, the study adopts a research paper done by Ruzita and Zarinah (2009), which uses a subset of five of the 17 TPSOIC signatories, because of data constraints and these countries are located in different regions thereby seemingly representing the regions. The regions are South East Asia (Malaysia), South Asia (Pakistan), Middle Eastern (Jordan and UEA), and Europe (Turkey). The diversity in their economic structure and trade indicate the prospect of economic integration among OIC member countries. Following the above introduction, a brief literature review of the OIC economy is given. The next section describes the methodology and data used in this study, combining with the analysis and discussion of the findings, and the last section provides a conclusion.

Background

The current global economic situation has posed a tremendous challenge to every country in terms of maintaining competitiveness in international trade, which shows an increasing trend of restrictions and limitations. Several initiatives have been introduced, including those of the framework in accelerating the process of economic integration and regionalization. In addition, Choudhury (1996) argues that economic integration and the rise of market power is being realized as the instrument of economic power. It resides institutional functions integrating

dominant decisions in view of shared returns from a well-coordinated direction of change by design. The OIC was consciously established to enable promoting economic participation among Islamic countries, in particular encouraging their volume of trade and investment by intensively transacting within and among the member countries. Economically, according to the 2001 World Classifications which looked at their GDP per capita, a few notes can be considered.

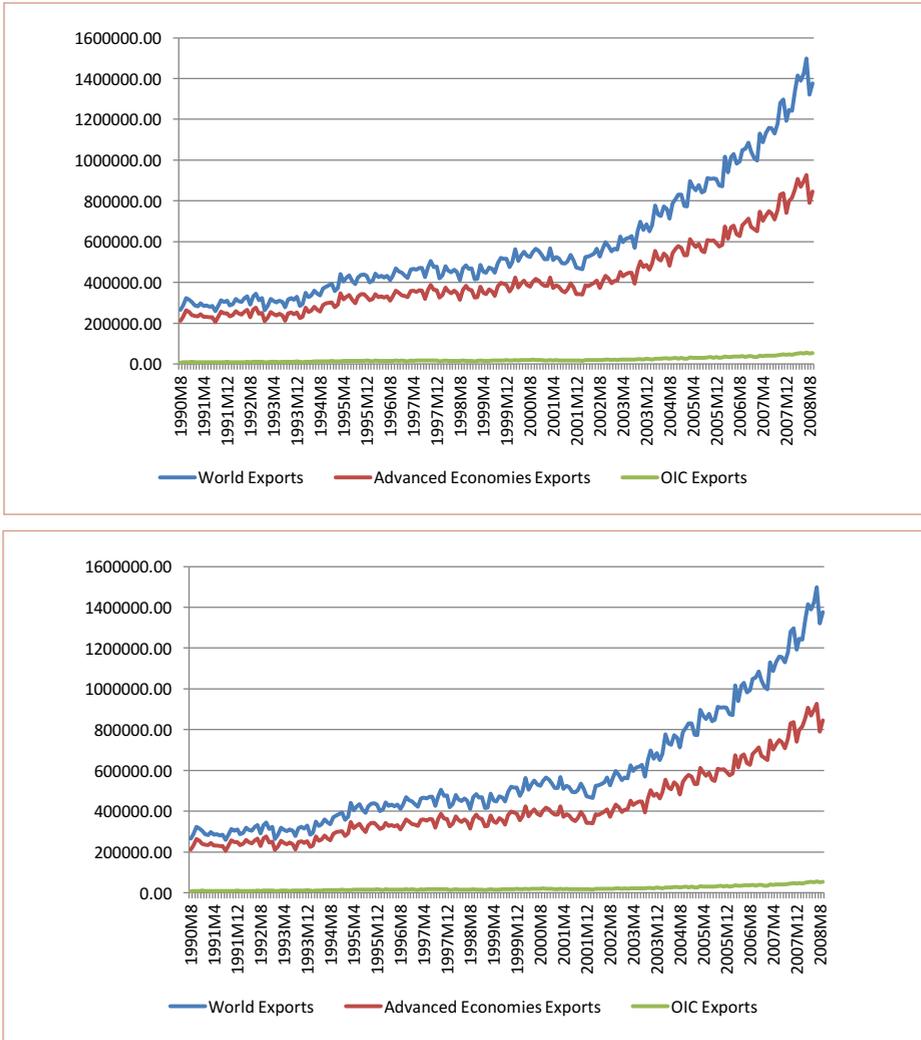
Firstly, almost all of the examined OIC member countries are in the low-income group; eight countries are categorized as lower middle-income; and only two countries are classified in the upper-middle income group. Secondly, the agricultural (raw input production) sector still dominates the economic structure of the selected OIC member countries and in fact, is a higher contributor to GDP as compared to the manufacturing sector.

A study by Tang and Mohammad (2005) reveals that only 9 out of 27 selected OIC member countries show a co-integrating relationship between their exports and imports. Therefore, the majority of OIC countries are still facing violation of their international budget constraints and indicating to some extent that there is co-existence of “bad policy” in macroeconomic policies. This implies the presence of severe shocks in the long run, especially because of the lack of productivity or technological element in their exported and imported products. Figures 1 below shows the export and import performances of the selected OIC countries compared with world trade and advanced economies trade. Overall, the portion of OIC’s trade is small, less than 10%. Accelerating the frameworks in trade tariff policy among members could be the potential market booster within OIC members. Given the bright prospect of OIC’s trade performance, the share can be increased to a significant portion in the future.

Given the severe productivity gap in the OIC countries, fluctuation of both exchange rate and interest rate abroad is inevitable. Consequently, for developing countries, exports would fall under these compound effects, and investment as a given function of interest rate would do so. Conversely, imports and savings would increase as the influence of interest rate and exchange rate jointly.

In addition, the increase in saving gap could be due to a shortfall in productive capacity domestically. For an export-oriented economy, the wide saving gap also adversely tells us of an external sector disequilibrium. Thus, the net effect of these movements ultimately is increasing the amount of debt.

Figure 1. Export and Import Performances in Selected OIC Member Countries, World Trade, and Advanced Economies Trade During 1990:8 – 2008:9



Basically, every single country expects to reach a surplus trade balance from any financial flows and international trade transactions. It principally adopts the mercantilist's behavior which has been implemented over the last decades. These range from protective trade, selective imports and exports, exports subsidies, capital inflows, fiscal policies and resource mobilization as deemed significant to achieve what mercantilist's goal of maintaining balance of payment surpluses.

To strengthen that objective, they evolve a package of several integrated elements, namely monetary policy governed by interest rate, exchange rate mechanisms, and trade policy ruled out by protective to liberal trade utilizing surveillance tool. The concept of investing in bullions and exporting such rich commodities is deemed as one basic principle of mercantilists thought.

In current global economy, for instance, developed countries are selling gold bullion to developing countries, such that developing countries are investing and diverting the investment activities from real sector into speculative stocks. Because gold is global commodity, which carries vulnerable speculative and counter-productive tendencies, when developing countries want to sell to developed countries, this could cause an increase in money supply.

In turn, it puts up pressure on global price and interest rate. In brief, every international trade transaction which ties up with commodities, categorized as low imported input and increasing domestic content of manufacturing exports, any fluctuation imposed in exchange rate would not hurt exports and encourage imports. In other words, a country will be resilient to any fluctuations when the exchange rate policies become increasingly intertwined with trade policies.

Ultimately, it is justifiable that the Mundell - Fleming model is deemed as a weak version in our theoretical point of view. Exchange rate appreciation would not have to be detrimental to exports, meanwhile depreciation would have somewhat favored exports.

Under the above pre-requisite, first, the imported contents of exports could have been relatively large so that appreciation would not affect exports. Second, external demand could be rising as a country is able to differentiate her products and the power of penetration in the global market is quite strong. Thirdly, a country could have been raising her productivity level. Fourthly, a country is able to execute market policies so that it could have countered the negative effect of currency appreciation.

Therefore, such four preconditions are captured into a brief conclusion whereby a country, in particular OIC member, which could have met the above requirements might have been confident to justify any fluctuations in exchange rate, whether currency appreciation or depreciation, are deemed not to be of significance in changing and affecting its export as well as import performances.

Previous Studies

Adebisi (2007) seeks to investigate whether monetary aggregates M1 and M2 have useful information for forecasting inflation by using mean absolute percentage errors. From the inflation equation, the paper reveals that monetary aggregate (M2), treasury bill rate, deposit rate, and exchange rates are significant in the equation.

Hasan (2009) examines economic performance of the OIC member countries and analyzes the prospect of Islamic common market by analyzing trade data within a gravity model framework. The results suggest that trade creation for OIC member countries are expanded if all impediments to trade and business can be eliminated. Moreover, there are a number of policy parameters which if followed will lead to more trade among member countries.

Duasa(2008) finds the importance of nominal exchange rate shock to fluctuation of import prices in a case of Malaysia after the crisis period. This implies that a small open economy like Malaysia is highly susceptible to external shock, particularly in exchange rates.

Duasa (2009) attempts to analyze the long-run equilibrium relationship between real exchange rate and trade balance, imports, and exports demand by cointegrating tests assuming asymmetric adjustment. The results reflect the evidence of persistence of trade balance deficit in the case of Malaysia which is probably due to policies to defend an overvalued exchange rate by protectionist trade policies or capital controls. The shock of exchange rate on import demand is likely to be temporary in nature.

Hye (2010) investigates the correlation between exports and imports in Pakistan by using the variance decomposing analysis. The results indicate that imports cannot cause exports but conversely exports effectively cause imports.

Ariccia (1999) tests the relationship between exchange rate uncertainty and trade with data from western European countries. There was evidence of a small but significant negative effect of bilateral volatility on trade. This occurs due to difficulty hedge against exchange rate risk when the time horizon becomes longer. Therefore, the export activity which requires large investments should be more sensitive to exchange rate volatility.

Broda, et. al. (2003) investigate the impact of exchange rate volatility on trade. The paper suggests that deeper bilateral trading relations dampen real exchange rate volatility and are much more likely to lead to a currency union.

Data and Methodology

Data

The analysis is conducted using quarterly data series for the period of first quarter 1970 to fourth quarter 2009. We employed several variables to capture the effect of exchange rate fluctuations due to export and import growth. The nominal exchange rate is proxy in national currency against US dollar (EXR), the amount of exports in million US dollars (EXP), and the amount of imports in million US dollars (IMP) are used to further investigate their relationship.

The exchange market pressure (EMP) which depicts the crisis occurring as overwhelmingly fluctuations on exchange rate is also listed as our concerned variable. All data are expressed in logarithmic forms, with the exception of nominal exchange rate and exchange market pressure, taken from International Financial Statistics. Malaysia, Pakistan, United Arab Emirates, Jordan, and Turkey are some selected of OIC member countries under consideration which are capable of representing all OIC member countries.

Estimation Model

Investigation is focused on the directional relation between the existing exchange rate fluctuations, export and import growth, and also their probability of leading to a crisis. The crisis in this context may take form of currency crisis. Therefore, outline is given on whether economies of the selected OIC member countries have been in violation of their international budgets and whether such condition leads to a currency crisis. Thus, our empirical model is as follows:

$$\text{Crises}_t = \beta_0 + \beta_1 \text{EXP}_t + \text{IMP}_t + \varepsilon_t$$

Definition of Currency Crisis

Kaminsky, et. al. (1997, 2003) note: “A crisis is defined as a situation in which an attack on the currency leads to a sharp depreciation of the currency, large decline in international reserve or of a combination of the two. A crisis so defined includes both successful and unsuccessful attacks on the currency.” Thus, the currency crisis is more specifically defined as the unusual behavior of Exchange Market Pressure (EMP). In addition, Goldstein, Kaminsky and Reinhart (1998) and Kusuma (2008) further define EMP as weighted average of exchange rate changes (δ_{et}) and rate of change of the reserve (δR_t). Therefore, EMP is formulated as follows.

$$EMP_t = \delta_{et} - \left[\frac{\sigma_{\delta_{et}}}{\sigma_{\delta R}} \right] \times \delta R_t$$

$$\text{Where, } \delta_{et} = \frac{e_t - e_{t-1}}{e_{t-1}} \quad \text{and} \quad \delta R_t = \frac{R_t - R_{t-1}}{R_{t-1}}$$

The formulas above show the reserve and the exchange rate fluctuation; each of them is positively associated with Exchange Market Pressure (EMP). Thus, an economy will justifiably experience a crisis if EMP exceeds the average plus deviation standard of particular threshold, setting the threshold as m . If EMP entails the average index of EMP and δ_{EMP} shows deviation standard from EMP index, hence formally currency crisis is said to occur within a couple periods of time. The study uses 1.5 as M measurement and it follows Garcia's (1999) threshold set to further gauge the EMP crisis. Therefore, the crises can be defined as:

$$\text{Crises}_t = \begin{cases} 1, & \text{if } EMP > \mu_{EMP} + M\delta_{EMP} \\ 0, & \text{if } EMP > \mu_{EMP} + M\delta_{EMP} \end{cases}$$

Hypothesis and Research Model

In order to elaborate the effect of exchange rate fluctuation toward export and import performance, the paper states several hypotheses as follows:

Hypothesis I:

“Exports and imports in the selected OIC member countries are co-integrated, thus it is argued no violation of their international budget constraints and the presence of trade imbalance is only a short run-run phenomenon, whereas in the long-run, the trade balance is sustainable.” The co-integration between exports

and imports imply the making of adequate policies among those countries as shown by the presence of deficits or imbalances trade are temporary phenomena and would be ruled out by following surpluses. It structurally indicates an effective policy has been designed to enable exports and imports play around an equilibrium point in the long run. Hence, it is also argued that those countries can minimize the presence of combination of both inside and outside lags in their international trade.

Hypothesis II

“The exchange rate fluctuation has no effects on exports and imports composition in international transactions. Generally speaking, an exchange rate appreciation would not hurt exports and still encourage imports.” Therefore, those countries under consideration have been immune upon any exchange rate fluctuation as they have been successful to utilize the lower imported input as raw material resources used for promoting exports.

Hypothesis III

“The assumption of successful policies to keep away from international budget constraints leads to the view that any shocks occurrence will have no larger effects on crisis due to export and import fluctuations.” The minimum lags between the shocks and their effectiveness in balancing the economies will therefore minimize the probability of any economic crises. In other words, probability of crises would be smaller since fluctuation around natural rates of exports and imports in the countries under analysis are of evidence.

Model Analysis

To investigate further on whether the selected OIC member countries are free from trade imbalances and crisis due to exchange rate fluctuation, several approaches are used, as follows:

A. VAR Approach

The paper uses VAR approach as the exports and imports will demonstrate the causal nexus relationships among non-structured variables. Additionally, all variables are treated as endogenous variables. As generally accepted, VAR approach enables to differentiate between exogenous and endogenous variables and its ability to capture dynamic movement as one or more variables are reached in response to a movement from other variables (Gujarati, Damodar, 2009).

As the variables are considered as endogenous ones. Hence the expressions below:

$$\begin{aligned} EXR_t &= a_{10} + a_{11}EXP_{1t-p} + a_{12}IMP_{2t-p} + a_{13}EXR_{3t-p} + \varepsilon_{1t} \\ EXP_t &= a_{20} + a_{21}EXP_{1t-p} + a_{22}IMP_{2t-p} + a_{23}EXR_{3t-p} + \varepsilon_{2t} \\ IMP_t &= a_{30} + a_{31}EXP_{1t-p} + a_{32}IMP_{2t-p} + a_{33}EXR_{3t-p} + \varepsilon_{3t} \end{aligned}$$

Or being expressed in the form of matrices as follows:

$$\begin{bmatrix} \mathbf{1} & \mathbf{a}_{11} & \mathbf{a}_{12} & \mathbf{a}_{13} \\ \mathbf{a}_{21} & \mathbf{1} & \mathbf{a}_{22} & \mathbf{a}_{23} \\ \mathbf{a}_{31} & \mathbf{a}_{32} & \mathbf{1} & \mathbf{a}_{33} \end{bmatrix} \begin{bmatrix} EXR_t \\ EXP_t \\ IMP_t \end{bmatrix} = \begin{bmatrix} a_{10} \\ a_{20} \\ a_{30} \end{bmatrix} + \begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{13} & \beta_{14} & \beta_{15} \\ \beta_{21} & \beta_{22} & \beta_{23} & \beta_{24} & \beta_{25} \\ \beta_{31} & \beta_{32} & \beta_{33} & \beta_{34} & \beta_{35} \end{bmatrix} \begin{bmatrix} EXR_{t-1} \\ EXP_{t-1} \\ IMP_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \end{bmatrix}$$

$$\text{Or } B_{xt} = \tau_0 + \tau_t X_{t-1} + \varepsilon_{t-1}$$

In addition, if the variables have unit roots, then we can exploit that there may exist co-movement in their behavior and possibilities that they will trend together toward a long run equilibrium state (Ghali, 2004; Kwiatkowski, 1991). Then, using the greater representation theorem, we may posit the following testing relationships that constitute a VEC model for exchange rate fluctuation (Jalil, et. al., 2009), as follows:

$$\Delta Z_t = \tau_1 \Delta Z_{t-1} + \tau_2 \Delta Z_{t-2} + \dots + \tau_{l-1} \Delta Z_{t-l-1} + \pi Z_{t-l} + \mu + \sigma_t$$

Where ΔZ_t contains the growth rate of the variables. The τ 's are estimable parameters. Δ is a difference operator, σ is a vector of impulses which represent the unanticipated movements in Z_t and π is the long run parameter matrix. Then using the saved residuals from the estimation of the long run equilibrium relationship, we can estimate the error correcting as follows:

$$\begin{aligned}\Delta EXR_t &= a_1 + a_{EXR}l_{t-1} + \sum_{i=1} a_{11}(i)\Delta EXR_{t-1} + \sum_{i=1} a_{12}(i)\Delta EXP_{t-1} + \sum_{i=1} a_{13}(i)\Delta IMP_{t-1} + \varepsilon EXR_t \\ \Delta EXP_t &= a_2 + a_{EXP}l_{t-1} + \sum_{i=1} a_{21}(i)\Delta EXR_{t-1} + \sum_{i=1} a_{22}(i)\Delta EXP_{t-1} + \sum_{i=1} a_{23}(i)\Delta IMP_{t-1} + \varepsilon EXP_t \\ \Delta IMP_t &= a_3 + a_{IMP}l_{t-1} + \sum_{i=1} a_{31}(i)\Delta EXR_{t-1} + \sum_{i=1} a_{32}(i)\Delta EXP_{t-1} + \sum_{i=1} a_{33}(i)\Delta IMP_{t-1} + \varepsilon IMP_t\end{aligned}$$

The above equations represent VAR in first differences which are constituted by l_{t-1} . And l_{t-1} is the value of the residual which estimates the deviation from long run equilibrium in period (t-1). The $a_{11} \dots a_{55}$ are constituting the parameter and restriction that all $a_{jk}(i)=0$ can be checked using *F-test*. In addition a_{EXR} , a_{EXP} , a_{IMP} are the speed of adjustment coefficients and particular interest in that they have important implication for the dynamics of the system. Their restriction can be conducted by using t-test. Asymptotic theory indicator a_{EXR} and so on converge to a *t*-distribution as sample size increases (Ender, 1995).

B. Logit approach

To evaluate the probability of a crisis as the process of financial development takes place, an attempt can be made to employ logit model. Here, p represents independent variables and refers to a study by Matthieu Bussiere and Marcel Fraztzscher (2002) by expressing:

$$\begin{aligned}Ln &= \frac{P_1}{P_0} = Z_1 = C_1 + \beta_{11}L_{11} + \beta_{12}L_{12} + \dots + \beta_p L I_p \\ P_1 &= Prob(Y_{i,t} = 1X) = \frac{e^{(X_{i,t-1}\beta_2)}}{1 + e^{x_{i,t}} + e^{(x_{i,t-1}\beta_2)}} \\ P_0 &= Prob(Y_{i,t} = 0X) = \frac{1}{1 + e^{x_{i,t}} + e^{(x_{i,t-1}\beta_2)}}\end{aligned}$$

where : P_0 and P_1 are probabilities of Normal and Crisis Regimes respectively; $Ln(P_0/P_1)$ is log odd; $C_{1,2}$ represents constant; βI stands for marginal effect of the changes in independent variables $X_{i,t-1}$ for the probability of crisis over the crisis period relative to probability of crisis in tranquil/normal regime.

Hence, a model specification is obtained as follows:

$$Crisis_t = Ln (P_1/P_0) = Z = C_1 + a_1 EXP_t + a_2 IMP_t + E_t$$

Where: $\ln(P_t/P_0)$ = log odd ratio which constitutes currency crisis, a_0 = Constanta of the model, a_1, a_2 = parameters of coefficient, E_t = error term, EXP = exports, IMP = imports

Technique of Analysis

Unit Root Test and Co-integration Test

The commonly used tools are applied here such as Augmented Dickey Fuller (ADF) and Phillips-Perron (1998) or (PP) unit root tests. The estimation procedure takes the following form:

$$\begin{aligned} \text{(ADF-Test)} : \Delta Y_t &= \alpha_0 + \alpha_1 t + \delta_1 Y_{t-1} + \alpha_i \sum_{i=1}^m \Delta Y_{t-1} + \varepsilon_t \\ \text{(PP-Test)} : Y_t &= \beta_0 + \beta_1 t + \delta_2 Y_{t-1} + \varepsilon_t \end{aligned}$$

Where ΔY_t denotes for lag difference of the variables under consideration, m is the number of lags and ε_t is the error term. Based on the critical values of respective statistics, if null hypothesis cannot be rejected, then the time series are non-stationary at the level and therefore need to go through higher order differentiating process to achieve stationer and to find the order of integration. Co-integration test is conducted using a VAR-based approach of Johansen (1988), and Johansen and Juselius (1990). The latter develops two tests statistics to determine the number of co-integrating vector, the trace and the maximal Eigenvalue (M.E) statistics.

The VAR-based approach is classified as a dynamic model since it can generate variance decomposition and impulse response to further examine short run dynamic interactions among the variables. Generally, time series data get stationary in first difference I (1) order of co-integration. Subsequently, the VECM is utilized to identify the long run behavior of the variables and their short run relations so that they can better reflect the relationship among the variables. In addition, in a traditional VAR analysis, Luthepohl and Reimers (1992) show that impulse responses and variance decomposition analysis can be used to obtain information concerning the interactions among variables. The impulse response functions permit inferences on the direction of response of a variable of interest to be a one standard deviation shock in other variables. Meanwhile, variance decompositions indicate the percentage of a variable's forecast error variance attributable to innovations in all variables considered in the system.

Logit Model

Logit model is categorized as a cumulative discrete function which is appropriate to explain dependent variables which constitute qualitative response and characterized as dichotomy. Thus, to further comprehend the logit model, the below expression explains as the cumulative logistic probabilistic:

$$P_i = E(Y_i = 1|X_i) = \beta_1 + \beta_2 X_i = \frac{1}{1 + e^{-(\beta_1 + \beta_2 X_i)}} \text{ or } \frac{1}{1 + e^{-Z_i}}$$

Since logit model is nonlinear model, both in parameters and in variables, therefore, the use of Ordinary Least Square (OLS) to estimate logit parameter is inadequate. Logit, basically, is specified as probability functions and mathematically, it is used to solve odds ratio, which is defined as ratio of happening of an event over unhappening of an event, expressed as follows:

$$\frac{P}{1 - P} = \frac{\frac{1}{1 + e^{-(Z_i)}}}{\frac{e^{-(Z_i)}}{1 + e^{-(Z_i)}}} = \frac{1}{e^{-(Z_i)}} = e^{Z_i} = e^{\beta_1 + \beta_2 X_1}$$

Basically, if the value of P is small, (1-P) is going close to 1, as consequence the odd amounts to zero. In short, the more odds are close to zero, the smaller the probability of the countries under consideration to experience a crisis.

FINDINGS

The unit root tests based on ADF and PP are presented in Table 1, showing in general non-stationary level of all variables in each country. The use of the vector error correction procedure is appropriate, given the evidence that all variables are integrated of order of I or I(1).

Table 1.
Unit Root Test – ADF and PP Tests

COUNTRY	ADF TEST		PP TEST	
	LEVEL	FIRST DIFFERENCE	LEVEL	FIRST DIFFERENCE
MALAYSIA				
EXR	-1.122610	-18.18932***	-1.067126	-18.20129***
EXP	-1.690034	-6.270871***	-1.010750	-39.03468***
IMP	-1.771872	-4.762408***	-1.211455	-38.35118***
JORDAN				
EXR	-0.965747	-6.318538***	-0.779225	-18.69689***
EXP	-2.384492	-7.609847***	-1.463532	-61.43789***
IMP	-1.830854	-5.905620***	-2.069855	-75.54274***
PAKISTAN				
EXR	1.838316	-9.816021***	1.995005	-11.51482***
EXP	-2.265404	-2.265404***	-1.618314	-56.81075***
IMP	-1.648328	-7.084205***	-1.263451	-43.94238***
UEA				
EXR	-1.691702	-12.12720***	-1.563846	-13.86077***
EXP	-3.932394***	-17.14251***	-4.003045***	-17.09015***
IMP	-1.361444	-3.539892***	-2.562205	-27.96819***
TURKEY				
EXR	0.617361	-13.95078***	0.742259	-13.95155***
EXP	-1.305065	-7.907901***	-1.039906	-48.61961***
IMP	-1.658654	-5.801506***	-1.548533	-57.41319***

* ** *** denote significance at better than 10%, 5%, and 1%

Source: Authors' calculation

This is followed by Table 2 which provides the results of the co-integration test, as well as the trace and maximum eigenvalue tests. From the results of the Johansen co-integration tests, the null hypothesis of no-integration is rejected at the 0.05 significance level for four economies namely, Malaysia, Jordan, United Arab Emirates and Turkey. A conclusion can be drawn then, that all variables are co-integrated and there is long run equilibrium. The Table also gives a summary of the overall results.

Table 2.
Co-integration Tests – Trace and Maximum Eigenvalue Tests

HO	TRACE TEST					MAXIMUM EIGENVALUE TEST				
	MAL	JOR	PAS	UEA	TUR	MAL	JOR	PAS	UEA	TUR
r=0	31.56	51.24**	47.67**	85.73**	66.55**	17.48	37.62**	33.72**	35.62**	65.26**
r<1	14.08	13.62	13.95	20.47**	30.92**	7.84	12.58	12.24	28.53**	18.41**
r<2	6.24	1.04	1.71	2.06	2.39	6.24	1.04	1.71	2.39	2.06

Note: Mal (Malaysia), Jor (Jordan), UAE (United Arab Emirates), Tur (Turkey)
** denotes significant at 5%

Source: Authors' calculation

Apart from the above interpretation, Table 2 also suggests the evidences about co-integration of all countries, except Malaysia at 5 % level of significance. In other words, their exports and imports are co-integrated having tested using the Johansen-Juselius test. Therefore, all countries except Malaysia suggest that they are not in violation from their long run sustainable international budget constraints and trade imbalances, and any case of violation that may occur is only a short run phenomenon.

In terms of trade policies, seemingly the majority of the concerned countries have shown “good policy” so that they could have managed their trade moving away from technological shocks or the existence of a productivity gap. In the case of Malaysia, as it does not pose co-integrated of her international trade, it might have an essential picture for re-designing and re-evaluation of current and future macro-policies aiming at achieving the trade balance.

Following Granger (1988), spotlight is on the possibility of causal relationship resulting from co-integration between or among the variables. Investigation can be made on unidirectional or bidirectional causality between EXP, Ln IMP, and Ln EXP. The co-integrated variables necessitate inclusion of the error-correction term as an added channel through which Granger causality can be generated. Hence, the ECM generates better short-run forecast and provides the short run dynamics necessary to obtain long-term equilibrium.

From the econometrics point of view, the error-correction term measures the speed of adjustments to establish long run equilibrium. Table 3 reveals findings from Granger and ECM estimation for several selected OIC member countries mentioned above. Each of them shows a different causal relationship in respect of exchange rate fluctuations and the degree of changes on exports and imports. Country analysis is given in the following: Passages for the Malaysia case, long-run equilibrium between variables is not found as there is no co-integration found in the system.

Thus, by comparing F -statistic value with its critical value, the presence of short-run causality is of evidence. The results indicate that there are two unidirectional relationships from Ln IMP to EXR, and Ln EXP to EXR.

Therefore, conclusion can be drawn that disequilibrium in the short-run on EXR could be caused by the shocks on imports and exports. In other words, the absence of co-integration relationship in Malaysia seemingly has been confirmed by the Granger test estimations which show clearly that imports and exports variables are greatly important in bringing the high pressure on any exchange rate fluctuations.

Additionally, it is argued, that stability in exchange rate becomes dependent on the amount of imports and exports sustainability. It perhaps establishes a situation in which an exchange rate appreciation would hurt exports and encourage imports, and *vice versa*. Such condition may be adequate to explain why Malaysia's exports and imports are not co-integrated, and this leads to violation of her international budget constraints, and could corroborate presumption of the existence productivity gap in the economy.

Therefore, it suggests for establishing "good policy" by intertwining precisely such particular policies, that is, between exchange rate policies and trade policies.

Table 3.
Results of Error-Correction/Causality

DEPENDENT VARIABLE	CAUSAL VARIABLE	F-STATISTIC	CONSTANT (T-STATISTIC)	ERROR CORRECTION TERM (T-STATISTIC)
EXR (Malaysia)	Ln IMP (Malaysia)	0.63426	-	-
EXR (Jordan)	Ln IMP (Jordan)	1.24697	-0.000794	-0.002742
EXR (Pakistan)	Ln IMP (Pakistan)	1.98389	0.068754*	-0.002673***
EXR (UEA)	Ln IMP (UEA)	0.43638	-0.000964***	-0.008559**
EXR (Turkey)	Ln IMP (Turkey)	1.25531	0.002289***	-0.003919
Ln IMP (Malaysia)	EXR (Malaysia)	2.74683**	-	-
Ln IMP (Jordan)	EXR (Jordan)	0.80307	0.010386*	-0.012909*
Ln IMP (Pakistan)	EXR (Pakistan)	0.81916	0.012530*	0.000359**
Ln IMP (UEA)	EXR (UEA)	3.46366*	0.012435**	-0.112744*
Ln IMP (Turkey)	EXR (Turkey)	0.98914	0.010230*	0.013355**
Ln EXP (Malaysia)	Ln IMP (Malaysia)	1.35386	-	-
Ln EXP (Jordan)	Ln IMP (Jordan)	4.87678*	0.010320**	-0.090225**
Ln EXP (Pakistan)	Ln IMP (Pakistan)	3.60271**	0.010850*	-0.058095***
Ln EXP (UEA)	Ln IMP (UEA)	2.97761**	0.004899	-0.206340*
Ln EXP (Turkey)	Ln IMP (Turkey)	5.20809*	0.007295**	-0.122474*
Ln IMP (Malaysia)	Ln EXP (Malaysia)	1.00904	-	-
Ln IMP (Jordan)	Ln EXP (Jordan)	3.21807**	0.010311**	0.132836**
Ln IMP (Pakistan)	Ln EXP (Pakistan)	1.68208	0.011750*	0.069035**
Ln IMP (UEA)	Ln EXP (UEA)	2.61596***	0.011056**	0.093124
Ln IMP (Turkey)	Ln EXP (Turkey)	19.2920*	0.008673**	0.103001*
Ln EXP (Malaysia)	EXR (Malaysia)	2.36997*	-	-
Ln EXP (Jordan)	EXR (Jordan)	0.94295	0.009654**	-0.016915
Ln EXP (Pakistan)	EXR (Pakistan)	0.82960	0.010957*	-0.023202**
Ln EXP (UEA)	EXR (UEA)	2.40089***	0.003846	-0.116292*
Ln EXP (Turkey)	EXR (Turkey)	0.70139	0.005884	-0.015995**
EXR (Malaysia)	Ln EXP (Malaysia)	1.27052	-	-
EXR (Jordan)	Ln EXP (Jordan)	2.55971*	-0.000515	-0.004318
EXR (Pakistan)	Ln EXP (Pakistan)	1.69490	0.070499*	0.114935***
EXR (UEA)	Ln EXP (UEA)	1.62091	-0.001179**	-0.006880***
EXR (Turkey)	Ln EXP (Turkey)	0.70655	0.002255***	0.004656

*, **, *** denote significance at better than 1%, 5%, and 10%

Source: Authors' Calculation

Probably, the most interesting case is found for Jordan, whereby the results indicate the presence of two bidirectional relationship in the system, namely from Ln EXP to Ln IMP, *vice versa*, and from Ln EXP to EXR, and the respective *t*-values which are significant at 5% on Ln IMP and Ln EXP variables. Thus, there is also evidence from Granger tests that there is a causal short-run relationship between Ln EXP to Ln IMP, and Ln EXP to EXR, that means the presence of shocks on Ln EXP, Ln IMP in the short-run would cause the disequilibrium on Ln IMP and EXR variables. Similarly, any shocks that occurred on EXR and Ln IMP would encourage disequilibrium on Ln EXP variable. Moreover, the significant error correction term on Ln IMP to EXR, Ln EXP to Ln IMP, Ln IMP to Ln EXP, Ln EXP to EXR, and EXR to Ln EXP indicates that about 1,3%, 9%, 13,3%, 1,7%, and 0,4% of disequilibrium is corrected each year by an adjustment mechanism in EXR and Ln IMP, an increase in Ln EXP, a decline in EXR and Ln EXP to bring the long run equilibrium between Ln IMP and EXR, Ln EXP and Ln IMP, Ln IMP and Ln EXP, Ln EXP and EXR, and EXR and Ln EXP.

The co-integrated series has confirmed the evidence that Jordan can sustain her international budget because its imports and exports are significantly present in the long run relationship even though they also convey the long-run equilibrium between EXR, Ln IMP, and Ln EXP. In summary, the evidence suggests that Jordan is able to intertwine her exchange rate policies toward trade policies so that Jordan is not in violation of her international budget constraints. In terms of the presence of exchange rate fluctuations, the results suggest that the Jordan economy is capable of absorbing any fluctuations that occurred.

It means an exchange rate appreciation would not hurt exports and encourage imports. Generally speaking, fluctuation in EXR can maintain her trade balance in the long-term since Jordan is able to combine imported outputs to then be used as inputs to encourage exports. It signs the evidence that productivity gap in Jordan has been well-managed and optimally reduced.

The findings for Pakistan show only a unidirectional causality from Ln EXP to Ln IMP that is portended by the significance of the *F*-statistic. Even though only showing a short-run causality, the results describe the significant error correction-term in almost all variables. In other words, any disequilibrium in the short-run would be corrected each year by the changes in EXR, Ln IMP, and Ln EXP to bring it toward its long-term equilibrium among the observed variables.

According to Granger causality, the disequilibrium is ascribed from Ln EXP which then affects Ln IMP. Such condition delivers a message that Pakistan is able to enhance her trade to maintain future surpluses in her account. It simply means that Pakistan takes some strategic policies to reduce negative effects of exchange rate fluctuation on trade. Thus, the sustainability of her trade balance is shown by existence of the co-integrated time series and long run equilibrium in the system between EXR and Ln IMP, EXR and Ln EXP.

In the case of UEA, the results suggest the long-run bidirectional causality between Ln EXP and Ln IMP, Ln IMP and Ln EXP, as reflected by the coefficient of the error-correction terms and the respective t -values which is significant at 10%. Therefore, such causalities confirm the evidence of no-violation in trade balance of her international budget constraints. On the other hand, the effect in exchange rate fluctuation is precisely well clarified since the significant error-correction term indicates that any shocks on EXR would create disequilibrium in the system, but will be corrected each year by adjustment mechanism in Ln EXP and Ln IMP to bring back to their long equilibrium.

In other words, any fluctuations in exchange rate affect export and import as a short phenomenon and tend to reverse on the stable trend in the long-term. Therefore, exports and imports of UEA have been immune towards any exchange rate fluctuations and tend to achieve its equilibrium in the long-run.

Lastly, the results reveal long-run bidirectional causality between Ln IMP and Ln EXP, as reflected by the significant either coefficient of error-correction term or the respective t -value. The case in point is Turkey, though the EXR's coefficient of error-correction term is not significant, the results provided by Granger and ECM have enough to capture on the close correlation between exports and imports in the economy. It also indicates to some extent the changes in imports value that would be followed by exports, and vice versa. The ECM shows positive sign at describing the long run causality from Ln IMP to Ln EXP, and conversely conveys negative sign on the causal relation from Ln EXP to Ln IMP.

Therefore, Turkey's economy does not regard exchange rate fluctuation as primary barrier in stipulating trade balance policies and it strengthens the presumption that Turkey's economy is able to transform import commodities as input to promote her exports. The technological shocks or technological gap in trade balance is successfully eliminated.

Variance Decomposition

To further assess dynamic interaction among exchange rate fluctuations and the value of imports and exports, exercise through variance decomposition (VDC) can be conducted, by allowing access error vector variance among variables, in order to determine how much a single variable is innovating.. For that reason, this particular study only looks at the VDC among the selected OIC member countries under consideration, in the sense of obtaining the exact conclusion on analyzing both exports and imports vector variance against exchange rate fluctuation or innovations through VAR system.

Table 4 figures out the variation in exchange rate variable as largely contributed by the innovation by exchange rate itself, whilst export and import variables contributed less than 10% in almost all the observed countries. Hence, the results indicate that every nation must be able to overcome and manage their exchange rate once it gets fluctuating. It confirms the prior findings that a country which is classified to have the co-integration on their exports and imports is moving the right way, since such condition has removed the possibilities of exacerbating the environment in which trade policies are closely related with exchange rate fluctuation. These findings indicate that countries should continue to implement policies that would maintain their trade balance sustainably and ensure the macroeconomic policies are effective to bring exports and imports back into equilibrium in the long-run.

Table 4.
Variance Decomposition of Exr

PERIOD	EXR					LN EXP					LN IMP				
	MAL	JOR	PAS	UEA	TUR	MAL	JOR	PAS	UEA	TUR	MAL	JOR	PAS	UEA	TUR
2	99.99	99.9	99.8	99.6	99.9	0.004	0.05	0.03	0.15	1.25E-05	0.00	0.02	0.06	0.19	0.01
4	99.95	99.5	99.7	98.8	99.98	0.019	0.24	0.04	0.11	0.00	0.02	0.15	0.16	1.03	0.01
8	99.96	98.8	99.5	96.4	99.87	0.016	0.78	0.05	0.19	0.006	0.02	0.31	0.42	3.33	0.12
12	99.94	98.2	99.2	93.5	99.68	0.013	1.36	0.06	0.84	0.03	0.04	0.33	0.70	5.64	0.28
16	99.88	97.7	98.9	90.3	99.4	0.013	1.99	0.10	1.97	0.10	0.10	0.29	0.97	7.65	0.44
20	99.80	97.0	98.6	87.2	99.1	0.014	2.65	0.16	3.38	0.21	0.18	0.24	1.23	9.33	0.60
24	99.68	96.4	98.2	84.3	98.8	0.019	3.34	0.24	4.87	0.37	0.29	0.20	1.47	10.7	0.74
28	99.55	95.7	97.9	81.7	98.52	0.027	4.06	0.34	6.33	0.58	0.42	0.18	1.70	11.8	0.88
30	99.47	95.3	97.7	80.5	98.33	0.032	4.42	0.40	7.03	0.70	0.49	0.17	1.80	12.3	0.95

Interpretation according to Logit Estimation

Logit regression (logit) analysis is a uni/multivariate technique which allows for estimating the probability of occurrence of an event, by predicting a binary dependent outcome from a set of independent variables. Computing logit estimation can generate specific results on how the magnitudes of the concerned variables trigger the crises in form of probability term. Therefore, the aim of logit is not simply to signify whether the regressors are significant or not, but also to be able to estimate the probability of occurrence of an event. Thus, a more meaningful interpretation is interpreted in terms of odds, which are obtained by taking the antilog of the various slope coefficients. In this case, the probability on onset of crisis by taking computation on exports and imports coefficients of slope variables in the selected OIC member countries could have been estimated. At the end, the results are expected to render the comprehensive description towards crisis occurrence as imports and exports variables are fluctuating. Specifically, as far as the trade policies are concerned, the presence of technological gap by which countries become dependent on exchange rate fluctuation or countries which are no longer capable of maintaining their exports and imports stability, are considered to be severe in their economic stability. Table 5 provides several evidences which are formed by probability term in every country variables.

Table 5.
The Summary of Logit Model Estimations

VARIABLE	PARAMETER				ODDS RATIO			
	MAL	JOR	PAS	TUR	MAL	JOR	PAS	TUR
Ln EXP	0.143	-0.512	0.574	-0.225	0.54	0.37	0.64	0.44
Ln IMP	0.173	-0.717	0.519	-0.295	0.55	0.33	0.63	0.43

Source: Authors' Calculation

Table 5 shows the probability of occurrences in exports and imports fluctuate in signaling crisis. In general, either exports or imports can contribute in forming the crisis probability. On the average, all countries record probability in a wide range between 30-60 percent. For that reason, every single country has taken a certain strategic action to cope with such realities. Conversely, there seems to be close relations between the trade imbalance and the vulnerability of crisis in

establishing macroeconomic policies. Mexico's deep crisis experienced in 1978-1980 was also among good examples of the case in point. Initially, crisis was caused by debt trap, but later this went on to affect her trade balance. The failure of policy in capturing such condition had forced Mexico's economy into severe crises. In other words, the inappropriate trade policies in response to any shocks coming from exports and imports disequilibrium could encourage a higher possibility of a crisis occurring.

Conclusion

This study examines three issues, namely the high correlation between exchange rate policies and trade policies as a single important framework in developing macroeconomic policies; the co-integration between exports and imports variables; and the effects of exchange rate fluctuations on exports and imports. The study focused on probability of crisis occurrences as imports and exports are fluctuating. Five countries are selected from the Organization of Islamic Cooperation (OIC) members, namely Malaysia, Jordan, Pakistan, UEA, and Turkey as the cases in point.

The Augmented Dickey Fuller (ADF) and Phillip Perron (PP) tests are utilized, and in general testify that all variables in all countries observed are stationary in the first difference. There are also evidences of long-run co-integrating relationship between variables in all countries, as the Johansen co-integration test detect at least one co-integrating equation for both the pairs, except for Malaysia.

In addition, the vector auto regressive and logit approaches used are able to bring precise answer to the above issues, namely (1) imports and exports are co-integrated and prevail in all countries observed, except Malaysia. Thus, according to Irandoust and Erricsson (2004), that a country is not in violation of her international budget constraints; that trade imbalances might happen only as a short phenomenon; and macroeconomic policies have been effective to bring exports and imports back into equilibrium in the long-run.

Then, (2) majority of the observed countries, except Malaysia, seem to be resilient with the existence of exchange rate fluctuations. That is because of disequilibrium in exports and imports variables due to exchange rate fluctua-

tion as found as only a short-term phenomenon, but it will reverse back to equilibrium in the long-term. It might be that those countries have successfully transformed their economy by increasing domestic value-addition as the critical leverage in maintaining export competitiveness and calling for further concerted efforts to raise their productivity across sectors in the economy.

Lastly, (3) the study finds some evidence that even though any disequilibrium in exports and imports occurred are short-term phenomenon and will be corrected to its long-term equilibrium, but it remains a worry, specifically in viewing the probability of crisis when imports and exports get shocks along with their movement towards their long-term equilibrium path.

Hence, the logit model has captured such probability of crisis by identifying the odds taken from the antilog of slope coefficients on import and export variables. The results indicate that all countries show wide ranges between 30-60 percent levels of probability. Therefore, the precise exchange rate policies combined with trade policies are extremely important agenda to be constructed to ensure the long-term stability is reliable to grasp.

Finally, the selected OIC member countries must take into consideration the issues of exchange rate fluctuations. The stability and sustainability of imports and exports in terms of pricing and competitiveness are taken into account and hopefully the macroeconomic policies issued represent 'good policy' so that exchange rate policies become increasingly intertwined with trade policies, and ultimately trade between members is promoted and sustained.

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