

# DYNAMIC LINKAGES BETWEEN INTERNATIONAL TRADE, GROSS FIXED CAPITAL FORMATION, TOTAL LABOR FORCE AND ECONOMIC GROWTH: EMPIRICAL EVIDENCE FROM PAKISTAN\*

Aaqib QAYYUM<sup>1</sup>  
Khalid ZAMAN<sup>2</sup>

**Abstract: Objectives** The objective of the study is to examine the long-run relationship between international trade, gross fixed capital formation, total labor force and economic growth in the context of Pakistan. **Prior Work** Although the positive association between international trade and economic growth has been widely investigated in different economic settings, however, the findings in developing countries are still inconclusive. **Approach** This study analyzed the impact of trade openness on Pakistan's economic growth during a period of 1980 – 2017. The total labor force and gross fixed capital formation are served as control variables in this study. The study employed Johansen cointegration and Granger causality test for robust inferences. **Implications** The results confirm the growth-led trade hypothesis in a given country. The results further show a unidirectional causality running from i) trade openness to gross fixed capital formation and ii) total labor to economic growth. The study proposed a number of policy implications to diffuse trade openness in a given country for long-term sustained growth. **Value** The study has a novel contribution in the existing literature by including labor and capital in the trade-growth modeling to analyze endogenous production function, which is imperative for country's long-term growth.

**Keywords:** International trade; economic growth; labor force participation rate; Gross fixed capital formation; Johansen cointegration; Granger causality; Pakistan.

## 1 Introduction

Trade openness served as a catalyst to promote international trade as it provides ease for the growing economy by providing access to goods market, efficient allocation of resources, improved labor force, technology transmission, and foreign knowledge. It is evident that the countries with open trade policy can outperform in the international market. Developing countries gain more from international trade by the aid of advanced technology transfers (Rivera-Batiz & Romer, 1991). Trade openness has paved a way for the economic prosperity, as they are linked with each other. The countries like Africa, having low performance in international trade because of colonization unlike some oil producing nations like UAE and Saudi Arabia. Openness to trade facilitate FDI due to which foreign country able to invest in the host country by supplementing capital, labor productivity, technology, infrastructure, knowledge and working environment, which ultimately boom the economic activity in the host country. Trade openness is a driving engine that benefits both of the trading countries (Shahbaz, 2012).

---

\* Paper published in Acta Universitatis Danubius. Oeconomica - special issue, 2019

<sup>1</sup> Department of Economics, University of Wah, Quaid Avenue, Wah Cantt, Pakistan. Email author: aaqibqayyum0@gmail.com

<sup>2</sup> Department of Economics, University of Wah, Quaid Avenue, Wah Cantt, Pakistan. Corresponding email address: khalid\_zaman786@yahoo.com

For developing country like Pakistan, which has introduced fast economic regimes resulted in greater imports and hence faced trade balanced worsen. Thus trade openness can be beneficial for a country as well as risky. If trade openness leads to increase in exports then it will be benefitted and might create boom for the economy by earning foreign exchange and foreign investment. Pakistan has not been utilizing its domestic resources in appropriate manner and hence country greatly depends on its foreign resources. Pakistan is facing two types of deficits, trade deficit and domestic budget deficit (Chaudhary & Amin, 2012). Some of the statistics of growth rate of Pakistan are presented here for the ready reference, i.e., Pakistan's GDP averaged of -2.26% from year 1980 until 2017, reaching at the highest of 4.90 in 2003 and least recorded as -8.50 in year 2008. According to the report of World Bank, gross fixed capital formation of Pakistan was 15.21% in 2016, though it fluctuated substantially in the recent years as it increases from 1997 to 2016 with 5.6 %. Trade figure is about 36.59 % in year 1980 as it tends to increase with up years and recorded maximum of 38.91 in the year 1990. The number of studies found a positive relationship between trade openness and growth (see, Dollar & Kraay 2004, Wang et al. 2004, Freund & Bolaky 2008, Das & Paul 2011, Ahmed 2000, Harrison & Hanson 1999 etc.), which need to be examined in this study for developing policy implications for country's sustained growth.

The study has following sections, i.e., section 2 shows the previous literature and their results on international trade and economic growth. Section 3 explained the variable's data and its sources. Section 4 presented the results and discussions. Conclusion and policy measures discussed in section 5.

## **2 Literature Review**

There are numerous literatures available on trade nexus and its impact on emerging economies; similar study has been recovered in which trade growth is analyzed on 75 emerging countries by using quantile regression approach. Dufrenot et al. (2010) found that low income countries have a high impact of trade openness on economic growth as compared to the high income countries. These countries are from African continent. There are some other techniques has been used to find out the impact of trade, for example, Kim et al. (2011) applied instrumental threshold regression to find the trade- income relationship , which turns out to be positive with financial development, infrastructure development and economic development in high earning countries.

Jebran et al. (2018) studied terms of trade and their effect on Pakistan's economic growth, for the time period of 1980 to 2013. Traditional ARDL technique is applied for short-term and long- term analysis. The results indicate the negative impact of terms of trade on country's economic growth. Bresser-Pereira& Nakano (2002) discussed two gap models, savings gap and foreign exchange gap to examine the growth of Latin American nations during 1990's. According to the study, savings gap controls the investment whereas foreign exchange gap restricts the imported goods, raw material into the country. The study concluded that, in order to handle

trade deficit, countries should focus on exports rather than imports. Furthermore, these countries need international aid to increase their economic growth.

Exports leads to economic growth as it will increase investment and productivity. According to the Keynesian theory, exports led growth, as it is a part of national income. Exports assist the country in efficient allocation of resources, increase of labor force, spread of technology, innovation in industry and competitiveness among international markets (Awokuse, 2003). On the other hand, it also leads to gain foreign exchange earnings, through importing of raw material, capital, and technology for the domestic production, which is the key role in economic growth (Boltho, 1996). Most of the previous research had focused on the expansion of exports and contraction of imported goods for the growth of economy. Awokuse, (2008) studied the impact of trade openness on economic growth by taking into account both, export and import to find out their effectiveness. According to the study estimates, exports solely not paved the way for economic growth, but import can also be the engine of growth. This study reviewed economic prosperity in three different countries, Argentina, Colombia, and Peru. The results of the study revealed that impact of imports were stronger then exports. In some cases, there would be reverse causality running from GDP to exports and imports.

Menyahet al. (2014) investigated the relationship between trade and growth of 21 African countries. The study used four main predictors for the analysis by applying panel bootstrapped approach to granger causality. The study revealed that trade and financial development had no significant impact on economic growth. Yucel (2009) explored the impact of trade openness on the economic stability of Turkey. The study employed traditional techniques of Johansen for co-integration and granger causality. The study revealed that there was significant impact of trade openness on the economic stability. Similar literature has been found in which trade shares is used as trade openness in the growth of economy, and this relation is found to be positive in the study of Edwards (1993). The study has explored 30 countries during 1970-82 and revealed strong positive association between the variables. Yanikka (2003) explored positive relationship between trade barriers and economic growth, in developing countries.

Trade liberalization has made great contribution towards growing economy of China and its dramatic expansion in international trade. Sun & Heshmati (2010) proved that global trade has affecting China's economy via market forces. The study used 6-year panel data approach on 36 provinces of China during the period of 2002-2007. The study supports that increasing contribution rate in the global market helps in stimulating China's economic growth. Expanding trade over the globe and high-tech exports proved positive impact of trade on country's economic growth.

On the basis of above literature, it is concluded that impact of trade largely visible in different economic settings, which need to be retrieved in Pakistan's context where high low human capital and inadequate saving and investment profile deteriorate the terms of trade, which negatively impact on country's economic growth.

### 3 Research Methodology

#### 3.1. Data Source

The data is collected from World Development Indicators published by World Bank. The study used the following key variables for estimation, i.e., GDP growth in annual percentage, labor force total, gross fixed capital formation in annual percentage growth, and trade openness as percentage of GDP. Figure 1 shows the plots of level data for ready reference.

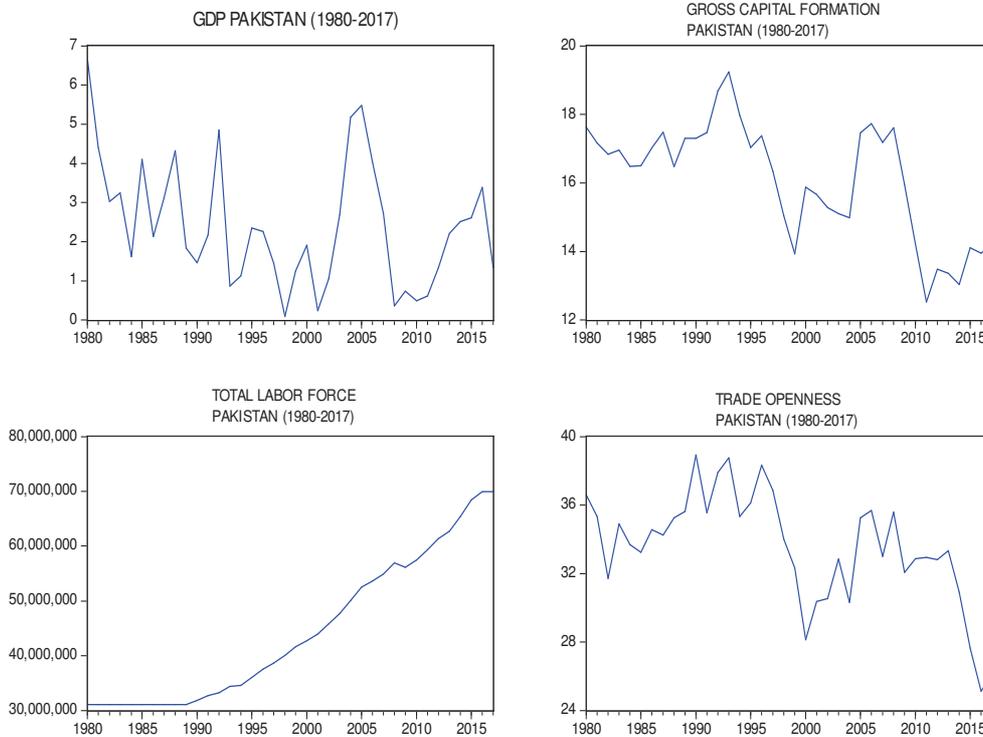


Figure 1 - Plots of Level Data  
Source: World Bank (2017)

#### 3.2. Model Specification

The study used the following equation to analyze the impact of trade openness (denoted by TD), gross fixed capital formation (denoted by GFC), and total labor force (denoted by LF) on Pakistan’s economic growth (denoted by GDP), i.e.,

$$GDP_t = \alpha + \beta_1 TD_t + \beta_2 GFC_t + \beta_3 LF_t + \varepsilon \quad (1)$$

where: GDP shows gross domestic product, TD shows trade openness, GFC shows gross fixed capital formation, LF shows total labor force, ‘t’ shows time period, and  $\varepsilon$  is error term.

#### 3.3. Empirical Techniques

##### 3.3.1. Unit Root Test

The first step in empirical analysis is to check if the variables are stationary or not. To check unit root, the data analyzed at level and its first difference. The study used ADF unit root test and analyzed the order of integration among the variables. The variable that is significant at level, we considered its order of integration is zero, i.e., I(0) variable, while one whom significant at their first difference, considered first

degree order of integration, i.e., I(1) variable. Thus, the order of integration is important to select the appropriate econometric technique for robust inferences. .

### 3.3.2. Johansen Cointegration Test and Granger Causality

The Johansen cointegration test been applied on the data set for the time period 1980-2017, as this test is used when all the variables are differenced stationary and their order of integration is I(1) series. This technique has 3 main steps; first we have to check the stationarity of variables by unit root test, after checking it, the 2<sup>nd</sup> step is to selecting the appropriate lag order selection, which is deem important in cointegration test. The selection of lag is according to the AIC and SBC criteria. Then apply the Johansen cointegration test, which shows the significant trace and max Eigen-value that confirmed the number of cointegrating equations.

### 3.3.3. Granger Causality Test

Finally, Granger causality testis used to analyze the cause-effect relationship between the stated variables. The following alternative hypothesis is used to analyze the casual relationships among the studied variables, i.e.,

H1: The studied variables have bidirectional causality among the variables.

H2: The unidirectional causality running from one variable to another.

H3: The reverse causality exists among the variables, and

H4: There is no cause-effect relationship among the studied variables.

The significant F-statistics confirmed one of the four alternative hypotheses among the variables.

## 4 Results and Discussion

To estimate the results, the foremost step is to find the stationary of variables whether they are stationary or not. For this purpose we would like to choose ADF unit root test ,which found that all the selected variables have an order of integration i.e., I(1), except GDP, which is stationary at level. Table 1 shows the ADF unit root estimates for ready reference.

**Table 1: ADF Unit Root Test Estimates**

Variables	At Level	1 <sup>st</sup> Difference	Decision
GDP	-4.304 (0.001)	-7.631 (0.000)	I(0)
Gross Fixed Capital Formation	-2.368 (0.388)	-5.368 (0.000)	I(1)
Labor Force	-2.402 (0.372)	-4.027 (0.016)	I(1)
Trade Openness	-2.513 (0.320)	-7.738 (0.000)	I(1)

*Note: small bracket shows probability values*

The above table of unit root estimates indicates that except GDP, all the mention variables are stationary at first difference. The variables are checked individually at level by using ADF test except GDP, none of the variables shows significant results, i.e., stationary at level. So we check them at 1<sup>st</sup> difference, which give stationary results at I(1). Although, all variables do not confirm the first

difference stationary, however, we used Johansen cointegration test due to its wide applicability in econometric testing and for robust inferences.

To check the behavior of residuals we applied autocorrelation and heteroskedasticity which gives information about the white noise error term. By using Breusch-Godfrey test for autocorrelation, Table 2 shows that Obs. R-squared value and prob. Chi-square are insignificant, which is the indication of no heteroskedasticity and no autocorrelation exists among the residuals.

**Table 2: Diagnostic Tests**

Serial Correlation Test		Heteroskedasticity Test	
F-statistic	0.093	F-statistic	1.880
Obs. R-squared	0.229	Obs. R-squared	5.407
Prob. F (2,32)	0.910	Prob. F (2,32)	0.151
Prob. Chi-square	0.891	Prob. Chi-square	0.144

*Note: Residuals of the variables are said to be free from Heteroskedasticity and autocorrelation*

Before doing further assessment for Johanson cointegration, there are some steps which should be followed: 1<sup>st</sup> step is to scrutinizing the variables for stationarity test, 2<sup>nd</sup> step is to selecting the lag order, this step is very important as if the lag is not properly selected then the results would be biased. For this purpose, two popular criteria has been applied, AIC and SBC criterion. After selecting the maximum lag order we will proceed to check for cointegration. In this study our lag order is 2. The results of Johanson cointegration test are presented in Table 3 and Table 4 for ready reference.

**Table 3: Trace Statistics Test**

No. of CE(s)	Trace Stat.	Critical Value at 5%	Prob. Value	5% Significance
None*	115.632	47.856	0.000	YES
At most 1*	49.664	29.797	0.000	YES
At most 2*	22.317	15.494	0.004	YES
At most 3	0.011	3.841	0.915	-

*Note: \* shows the significant level at 0.05 %; rejecting null hypothesis of no cointegration*

The results of trace statistics show that there are three cointegrating equations, which is significant at 5 % level. After that, we analyzed Maximum Eigenvalue Test in Table 4.

**Table 4: Max-Eigenvalue Test**

No. of Co-integrating Equations	Max-Eigenvalue Statistic	Critical Value at 5%	Probability. Value	5% Significance
None*	65.968	27.584	0.000	YES

At most 1 <sup>*</sup>	27.346	21.131	0.005	YES
At most 2 <sup>*</sup>	22.306	14.264	0.002	YES
At most 3	0.011	3.841	0.915	-

**Note:** <sup>\*</sup> shows the significant level at 0.05 %; rejecting null hypothesis of no cointegration

Table 4 shows the Maximum Eigen values, which further confirmed that there are 3 co-integrated vectors. This recommends that there has been a long-run relationship among the variables and there are three common trends. Thus the two tests confirmed the relationship among GDP, Gross fixed capital formation, aggregate labor force and trade openness for Pakistan and they tends to move together in long-run form 1980 to 2017.

The long-run relationship has been established through cointegration equations, underlying Table 5 shows the normalized cointegrating coefficients, which indicate the *a priori* expectation between the variables. On the basis of trace and Eigen value tests we have obtained 3 co-integrating equations but we have select only one cointegrating equation having desired results.

**Table 5: Normalized Cointegrating Coefficients**

GDP	GCF	LF	TD
1	-4.052	-7.500	2.181
S.E	0.574	5.4E-08	0.255

The results are normalized on GDP, the sign of coefficients are to be changed so that we can obtain normal interpretations. The equation is given below:

$$GDP = -4.052 GCF -7.500LF +2.181 TD$$

The results show that trade openness has a positive relationship with GDP; while gross fixed capital formation and total labor force have a negative impact on Pakistan’s GDP. The results imply that due to large saving and investment gap in a country, the gross fixed capital formation shows a negative sign on country’s economic growth, which need to balance by appropriate economic policies. The labor market condition is highly volatile due to low human capital ability, thus it needs strong policy inducement to improve human capital ability by hands-on-training, entrepreneurship abilities, and education. Trade benefit the growth of the economy, the country with open trade policy has greater economic opportunities. The results show a positive impact of trade openness on Pakistan’s economic growth, which is linked with some previous studies, i.e., Asfaw (2015), Zarra-Nezhad et al. (2014), Brueckner & Lederman (2015), etc. There are some contrary studies that show a negative impact of trade openness across different countries, i.e., Vlastou (2010), Polat et al. (2015), Were (2015), etc.

The most important thing in the short-run result is the value of ECM, which can determine the speed of adjustment. Its value should be negative and significant. The test of “vector error correction estimates” shows that the CointEq1 has negative and significant value which is the indication that there is a long-run relationship between the studied variables. Table6 shows the speed of adjustment which come back to the equilibrium after some time period.

**Table 6: Speed of Adjustment (CointEq1)**

CointEq1	D(GDP(-1))	D(GCF(-1))	D(LF(-1))	D(TD(-2))
-1.0603 (0.0513)*	0.2168 (0.6576)	0.3472 (0.5925)	1.29E-06 (0.0704)	0.7495 (0.0047)*
S.E	0.4781	0.6328	6.57E-07	0.2200

*Note: \*0.05% significance level, prob. values in brackets*

Granger causality test results are shown in the Table 7 for ready reference. The results confirmed the unidirectional causality running from economic growth to trade openness to support growth led tourism hypothesis, while this relationship is not other way around. Labor force Granger cause economic growth, while trade openness Granger cause gross fixed capital formation. Thus this analysis gives certain policy implications in a given country.

**Table 7: Granger Causality Estimates**

Independent Variables				
Dependent Variables	GDP	GCF	LF	TD
GDP	-	2.720 (0.605)	4.687 (0.320)	11.764 (0.019)
GCF	3.107 (0.540)	-	4.352 (0.360)	3.098 (0.541)
LF	14.824 (0.005)	1.585 (0.811)	-	7.826 (0.098)
TD	4.400 (0.354)	18.623 (0.000)	10.246 (0.036)	-

*Note: small bracket shows probability values*

## 5 Conclusions

The interaction between international trade and economic growth has been a great discussion in the existing literature. The relationship between trade openness and economic growth found to be positive or even negative in number of previous studies. The mixed results of these studies might be of different time frame work, political situation and country specific physiognomies. This study has explored the interaction between international trade and Pakistan's economic growth, over the time period of 1980- 2017. The results confirmed the long run relationship between trade openness and country's economic growth. The growth-led trade hypothesis confirmed in a given country context that argued that economic growth promotes international trade. The study suggested some short-term, medium and the long-term policy implications for a given country, i.e.

- Pakistan's government required sound market regulations to improve labor force participation rate that translates into high economic growth.
- Hands-on-training and enrolment in vocational institutes would helpful to build human capital formation in a country.

- Develop sound financial market to regulate financial and trade activities is imperative for long-term growth.
- Government needs to provide more stable investment that attracts foreign investors to promote country's economic growth.
- Pakistan should remove trade restrictions and implement such policies to attract FDI inflows in the economy.
- Pakistan's government needs to adjust its balance of payments to reduce trade deficit and promote export oriented activities for broad based growth.

## 6 References

1. Ahmed, N. (2000). Export response to trade liberalization in Bangladesh: a cointegration analysis. *Applied Economics*, 32(8), 1077-1084.
2. Asfaw, H. (2015). Trade policy and economic growth in Sub-Saharan Africa: A panel data approach. *American Journal of Trade And Policy*, 2(1), 7-14.
3. Awokuse, T. O. (2008). Trade openness and economic growth: is growth export-led or import-led?. *Applied Economics*, 40(2), 161-173.
4. Awokuse, T. O. (2003). Is the export-led growth hypothesis valid for Canada?. *Canadian Journal of Economics/Revue canadienne d'économique*, 36(1), 126-136.
5. Boltho, A. (1996). Was Japanese growth export-led?. *Oxford Economic Papers*, 48(3), 415-432.
6. Bresser-Pereira, L. C., & Nakano, Y. (2002). Economic growth with foreign savings?. *In Seventh International Post Keynesian Workshop*, Kansas City, Mi (pp. 3-27).
7. Brueckner, M., & Lederman, D. (2015). Trade openness and economic growth: Panel data evidence from Sub-Saharan Africa. *Economica*, 82(s1), 1302-1323.
8. Chaudhary, M. A., & Amin, B. (2012). Impact of Trade Openness on Exports Growth, Imports Growth and Trade Balance of Pakistan. *Forman Journal of Economic Studies*, 8, 63-81.
9. Das, A., & Paul, B. P. (2011). Openness and growth in emerging Asian economies: Evidence from GMM estimations of a dynamic panel. *Economics Bulletin*, 31(3), 2219-28.
10. Dollar, D., & Kraay, A. (2004). Trade, growth, and poverty. *The Economic Journal*, 114(493).
11. Dufrenot, G., Mignon, V., & Tsangarides, C. (2010). The trade-growth nexus in the developing countries: A quantile regression approach. *Review of World Economics*, 146(4), 731-761.
12. Edwards, S. (1993). Openness, trade liberalization, and growth in developing countries. *Journal of economic Literature*, 31(3), 1358-1393.
13. Freund, C., & Bolaky, B. (2008). Trade, regulations, and income. *Journal of development economics*, 87(2), 309-321.
14. Harrison, A., & Hanson, G. (1999). Who gains from trade reform? Some remaining puzzles. *Journal of development Economics*, 59(1), 125-154.
15. Jebran, K., Iqbal, A., Rao, Z. U. R., & Ali, A. (2018). Effects of Terms of Trade on Economic Growth of Pakistan. *Foreign Trade Review*, 0015732516663315.

16. Kim, D. H., Lin, S. C., & Suen, Y. B. (2011). Nonlinearity between trade openness and economic development. *Review of Development Economics*, 15(2), 279-292.
17. Menyah, K., Nazlioglu, S., & Wolde-Rufael, Y. (2014). Financial development, trade openness and economic growth in African countries: New insights from a panel causality approach. *Economic Modelling*, 37, 386-394.
18. Polat, A., Shahbaz, M., Rehman, I. U., & Satti, S. L. (2015). Revisiting linkages between financial development, trade openness and economic growth in South Africa: fresh evidence from combined cointegration test. *Quality & Quantity*, 49(2), 785-803.
19. Rivera-Batiz, L. A., & Romer, P. M. (1991). International trade with endogenous technological change. *European economic review*, 35(4), 971-1001.
20. Shahbaz, M. (2012). Does trade openness affect long run growth? Cointegration, causality and forecast error variance decomposition tests for Pakistan. *Economic Modelling*, 29(6), 2325-2339.
21. Sun, P., & Heshmati, A. (2010). International trade and its effects on economic growth in China. *IZA Discussion Paper No. 5151*.
22. Vlastou, I. (2010). Forcing Africa to open up to trade: is it worth it? *The Journal of Developing Areas*, 44(1), 25-39.
23. Wang, C., Liu, X., & Wei, Y. (2004). Impact of openness on growth in different country groups. *The World Economy*, 27(4), 567-585.
24. Were, M. (2015). Differential effects of trade on economic growth and investment: A cross-country empirical investigation. *Journal of African Trade*, 2(1-2), 71-85.
25. World Bank (2017). World development Indicators, World Bank, Washington D.C.
26. Yanikkaya, H. (2003). Trade openness and economic growth: a cross-country empirical investigation. *Journal of Development economics*, 72(1), 57-89.
27. Yucel, F. (2009). Causal relationships between financial development, trade openness and economic growth: the case of Turkey. *Journal of Social sciences*, 5(1), 33-42.
28. Zarra-Nezhad, M., Hosseinpour, F., & Arman, S. A. (2014). Trade-growth nexus in developing and developed countries: An application of extreme bounds analysis. *Asian Economic and Financial Review*, 4(7), 915-929.