Prajnan, Vol. XLIV, No. 1, 2015-16

Can Stock Market Development Boost Economic Growth and Trade Openness? Cointegration, Granger Causality and Forecast Error Variance Decomposition Tests for ARF Countries

Rudra P Pradhan
Danish B Zaki
Debaleena Chatterjee
Ranapratap Maradona
Saurav Dash

Received: 12-5-2014

Accepted: 3-10-2015

Many studies investigate relationships between economic growth in specific economies and the depth in the stock market, or between its growth rate and its trade openness (exports plus imports). Advancing on earlier work, this paper uses panel cointegration and causality tests applied to ASEAN Regional Forum (ARF) countries over the period 1960-2012. The countries included in this analysis are Brunei, Burma, Cambodia, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand, Vietnam, Australia, Canada, China, India, Japan, New Zealand, Korean Republic, Russian Federation, the United States, Papua New Guinea, Mongolia, Pakistan, East Timor, Bangladesh, and Sri Lanka. Our novel panel-data estimation procedure offers more robust estimates by utilizing variations between countries as well as variation over time. We identify important long-run causal links among the variables and show their implications for economic policy.

Keywords: Stock Market Development, Economic Growth, Trade Openness, Panel Granger Causality Test, ARF Countries

JEL Classification: O43, O16, E44, E31

Rudra P Pradhan (rudrap@vgsom.iitkgp.ernet.in), Danish B Zaki (danishbzaki@gmail.com), Debaleena Chatterjee (debaliena@gmail.com), Ranapratap Maradona (ranapratapmba@gmail.com) and Saurav Dash (saurav.stat@gmail.com) are with the Vinod Gupta School of Management, Indian Institute of Technology Kharagpur, West Bengal, India.

We thank the Editor and the anonymous referees for their comments and suggestions.

Section I
Introduction

Finance is an engine of economic growth (McKinnon, 1973; Gurley and Shaw, 1955; Schumpeter and Opie, 1934). The relationship between financial development[1] and economic growth is important and intriguing at the same time (Samargandi *et al.*, 2015; Peia and Roszbach, 2014). The existing theoretical literature suggests that financial development not only increases the supply of capital but it also improves the allocation of financial resources. Put differently, financial development boosts economic growth through direct as well as indirect channels (Anwar and Cooray, 2012).

The role of financial development on economic growth is highlighted in the theories of financial structure. These theories[2] cover bank-based, stock market-based, bond market-based, financial service-based, law and finance-based theories (Pradhan *et al.*, 2013; Kose *et al.*, 2010; Hermes and Lensink, 2003; Levine, 2005, 1997).

Following the seminal work by Schumpeter (1934), there has been a large body of literature showing a causal relationship between financial development and economic growth (Levine, 2005). The common inference is that countries with well-developed financial systems, e. g., large banks, growing stock markets, and other active financial markets, have high promise on future economic growth (Pradhan *et al.*, 2014; Gochoco-Bautista *et al.*, 2014; Jedidia, 2014; Uddin *et al.*, 2013; Yang and Yi, 2008).

This paper is specifically designed to throw new lights on the linkages between stock market development[3] and economic growth. Precisely, we highlight two prominent variables: trade openness and the development of the stock market. We advance four specific measures of stock market development and report results for each of them.

It has long been recognized that openness to trade has an important bearing on economic growth. The relationship between the two has drawn a great deal of interest from academicians and policymakers since the 1950s. Despite the

1. Financial development is usually defined as a process that marks improvements in the quantity, quality and efficiency of financial intermediary services (Chaiechi, 2012). It is represented by many different ways like bank, stock market, bond market, and so forth. However, in this study, we particularly focus on stock markets only.
2. Each theory specifically emphasizes a particular aspect on the process of achieving high economic growth.
3. Stock market development impacts on the economy in the following ways: (1) it helps in saving mobilization, thereby increasing the savings rate, thus facilitating higher capital formation and economic growth; (2) it reduces investment risks owing to the ease with which equities are traded. This therefore, implies that stock market development plays a key role in economic performance (see, for instance, Ngare *et al.*, 2014).

proliferation of a bourgeoning literature on this topic the findings failed to pin down the nature of the exact relationship between the two series. However, the research produced two strands to better visualize the trade openness-growth relationship: trade openness-led growth of growth-led trade openness hypothesis (Shahbaz, 2012; Wang *et al.*, 2004; Liu *et al.*, 1997). The reflection is that, like financial development, trade openness is another engine of economic growth.[4]

Besides, the case for supporting stock market development for the sake of fostering economic growth is propounded in a litany of articles using different measures of stock market development (Pradhan *et al.*, 2013; Cheng, 2012; Kar *et al.*, 2011; Hou and Cheng, 2010; Nowbusting and Odit, 2009; Arestis *et al.*, 2001; Henry, 2000; Rousseau and Wachtel, 2000; Enisan and Olufisayo, 2009; Shahbaz *et al.*, 2008; Deb and Mukherjee, 2008; Nieuwerburgh *et al.*, 2006; El-Wassal, 2005; Singh, 1997; Atje and Jovanovic, 1993; Bosworth, 1975). Of course, stock market development itself may be linked to trade openness. Thus, stock market development may affect economic growth both directly through the usual expenditure channels and indirectly through its effect on openness to trade (exports plus imports).

Endogenous growth theory as articulated by Levine and Zervos (1996) and others stresses that stock market development is key in fostering long-run economic growth since it facilitates efficient inter-temporal allocation of resources, capital accumulation, and technological innovation. Levine (1991) in particular underscores the beneficial effects on investment and growth from the existence of sound stock market development. However, as Barro and Sala-i-Martin (1995) assert, the development of these markets is endogenous since they are a regular part of the process of economic growth. Thus, while stock market development may lead to economic growth, the latter may itself lead to further stock market development. Similarly, stock market development can also be linked to trade openness.

Since the concept of stock market development is fairly broad, we focus here on the development in the particular stock market indicators. Thus, in this paper we explore the causal relationships between economic growth, trade openness, and stock market indicators. Contrary to previous work, the paper focuses on the nature of the causal link among these three variables by using panel cointegration and causality tests on a sample of ASEAN[5] Regional Forum (ARF) countries over the period 1960-2012. The countries include in this analysis are Brunei, Burma, Cambodia, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand, Vietnam, Australia, Canada, China, India, Japan, New

4. Trade openness affects economic growth by adopting advance technology and know-how from the technologically advanced countries which enhances the total factor productivity (see, for instance, Yanikkaya, 2003; Grossman and Helpman, 1991).

5. ASEAN stands for Association of South-East Asian Nations.

Zealand, Korean Republic, Russian Federation, the United States, Papua New Guinea, Mongolia, Pakistan, East Timor, Bangladesh, and Sri Lanka. Our novel panel-data estimation method allows for more robust estimates by utilizing variations between countries as well as variation over time. We find interesting and relevant causal links among the variables deriving uniquely from our innovations.

The remainder of this paper is organized as follows: Section II describes the theoretical foundations and literature review. Section III describes our indicators of stock market development and the data source used in the analysis. Section IV delineates our empirical estimation strategy. Section V describes the empirical results. The final section contains a summary and the policy implications of our results.

Section II
The Theoretical Framework

Researchers and policy makers have paid increased attention to the relationship between stock market development and economic growth (Carp, 2012). However, the outcomes are more or less controversial in two aspects. First, the nature of relationships; some of them identified a positive correlation between the variables (Beck and Levine, 2004; Levine and Zervos, 1998; Harris, 1997) and others have negative or no correlation between the two (Pradhan *et al.*, 2013; Carp, 2012; Hassapis and Kalyvitis, 2002; Garcia and Lin, 1999; King and Levine, 1993; Bhide, 1993; Shleifer and Vishny, 1986; Stiglitz, 1994). Second, the direction of causality; some of them identified the "supply-leading" hypothesis (the impact from stock market development to economic growth) and others have identified either the "demand-following" hypothesis (the impact from economic growth to stock market development) or feedback hypothesis (the presence of both "supply-leading" and "demand-following" hypotheses). The paper basically re-looks the direction of causality between stock market development and economic growth in presence of openness to trade.

Coming to the latter approach, Kolapo and Adaramola (2012), Colombage (2009), Enisan and Olufisayo (2009), Nieuwerburgh *et al*. (2006) and Tsouma (2009) support the validity of a "supply-leading" view, where unidirectional causality from stock market development to economic growth is present. By contrast, Kar *et al*. (2011), Panopoulou (2009), Liu and Sinclair (2008), Odhiambo (2008) Ang and McKibbin (2007), Liang and Teng (2006), and Dritsaki and Dritsaki-Bargiota (2005) present evidence in support of a "demand-following" hypothesis, where unidirectional causality from economic growth to stock market development is present. Furthermore, Cheng (2012), Hou and Cheng (2010), Rashid (2008), Darrat *et al*. (2006), Caporale *et al*. (2004), Hassapis and Kalyvitis (2002), Wongbangpo and Sharma (2002), Huang et al. (2000), Muradoglu *et al*. (2000), Masih and Masih (1999), and Nishat and

Saghir (1991) demonstrate that causation runs in both directions simultaneously. In sum, the existing literature does not provide a definitive answer as to the direction of causality.

The literature on the correlation between trade openness and economic growth is also vast (Menyah *et al.*, 2014; Shahbaz, 2012). However, empirical work on the causal link between the two variables is not as abundant. Some studies report a "supply-leading" link between trade openness and economic growth (see, for instance, Hye and Lau, 2015; Bojanic, 2012; Yavari and Mohseni, 2012; Kumar and Pacheco, 2012; Muhammad *et al.*, 2012; Jenkins and Katircioglu, 2010; Varamini and Kalash, 2010; Awokuse, 2008), while others report either "demand-following", "feedback", or no significant causality relation between the two (Nasreen and Anwar, 2014; Sakyia, 2014; Niroomand *et al.*, 2014; Teng and Chea, 2013; Tekin, 2012; Shahbaz, 2012; Bajwa and Siddiqi, 2011; Gries *et al.*, 2011; Vlastou, 2010; Liu *et al.*, 2009; Awokuse, 2008; Konya, 2006; Tsen, 2006; Din, 2004; Dritsakis and Adamopoulos, 2004; Yanikkaya, 2003; Harrison and Hanson, 1999; Liu *et al.*, 1997; Xu, 1996; Reizman *et al.*, 1996; Levine *et al.*, 1992).

As is evident, the diverse and sometimes conflicting empirical evidence is present in both country-specific and cross-country studies that examine the direction of causality between these variables (i.e., stock market development-growth nexus and trade openness-growth nexus). The explanations for this disturbing irregularity in results are rooted in differences in methodological approaches, and time periods of different studies (Beck and Levine, 2004; Khan and Senhadji, 2001 for a general discussion of how empirical studies can generate non-uniform results).

Although the goal of this study is similar to those of previous studies, the econometric methodology employed is novel in one significant direction: we conduct panel Granger causality tests, rather than simple univariate time series analysis. Panel methods allow for more robust estimates by utilizing variations between countries as well variations over time. In addition, by employing a panel Vector Autoregressive (VAR) model, we are able to examine whether the three variables are cointegrated.

In the next section, the research questions and proposed hypotheses, as identified by the literature review, are discussed.

Section III
Variables Used and Data Structure

Stock market development means a process that marks improvements in the quantity, quality, and efficiency of financial services has evolved to make monetary aggregates measured in this study prominent in relation to national

income (GDP). This process involves the interaction of many activities and consequently cannot be captured by a single measure (Rousseau and Wachtel, 2000; Enisan and Olufisayo, 2009; Levine and Zervos, 1996). Our study utilizes four explicit proxy measures for stock market development: Market Capitalization (MAC), Traded Stock (TRA), Turnover Ratio (TUR), and Number of Listed Companies (NLC). Each of these variables is formed as ratios of Gross Domestic Product (GDP). The details of the variable definitions are available in Table 1.

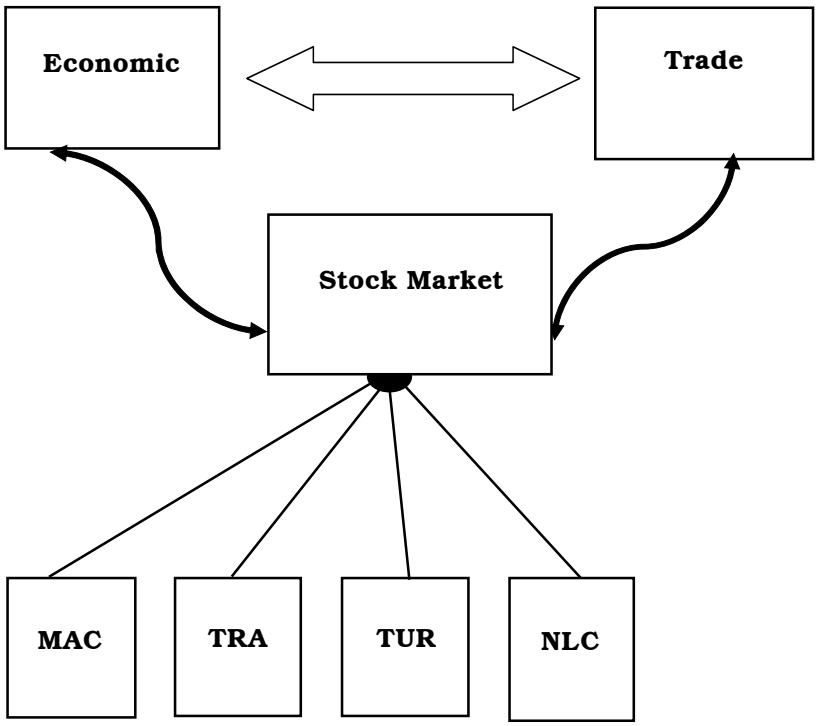
Table 1
Definition of Variables

Variable	*Definition*
MAC	Market Capitalization (in percentage): Value of listed shares as a percentage of gross domestic product.
TRA	Traded Stocks (in percentage): Total value of shares traded on the stock markets as a percentage of gross domestic product.
TUR	Turnover Ratio (in percentage): Value of total shares traded as a percentage of market capitalization.
NLC	Number of Listed Companies (in 10K population): It is an additional measure of stock market size and is measured as number of listed companies per 10K population.
OPE	Trade Openness (in percentage): total volume of trade (both exports and imports) as a percentage of gross domestic product.
GDP	Growth Rate of Per Capita Income (in percentage): Income is defined as GDP. This is our measure of economic growth.

Notes 1: All monetary measures are in real US dollars.
2: All variables above are defined in the World Development Indicators and published by the World Bank.

Data on all these variables are obtained from the World Development Indicators, published by the World Bank. The Figure 1 depicts the conceptual framework of the possible causal patterns between these variables. As is evident, stock market development is represented by one of our four identified indicators. Using all the indicators in the same equation would lead to multicollinearity. In other words, we use each of these indicators separately.

Figure 1
Conceptual Framework of the Possible Causal Patterns Between Economic Growth, Stock Market Development and Trade Openness



We intend to test the following hypotheses:

H_1: Stock market development Granger causes economic growth and vice versa.

H_2: Trade openness Granger-causes economic growth and vice versa.

H_3: Stock market development Granger-causes trade openness and vice versa.

Our empirical analysis is based on a panel 26 ASEAN Regional Forum (ARF) countries[6]: Brunei, Burma, Cambodia, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand, Vietnam, Australia, Canada, China, India, Japan, New Zealand, Korean Republic, Russian Federation, the United States, Papua New Guinea, Mongolia, Pakistan, East Timor, Bangladesh, and Sri Lanka, over the period 1961-2012. The countries are selected on the basis of data availability.

6. The choice of ARF countries are data specific. Bedsides, over the past two decades, ASEAN policymakers have devoted considerable effort to developing their financial markets. So, it is a good time to take stock, to see what has been accomplished, and what remains to be done (see, for instance, Felman *et al.*, 2014; Gray *et al.*, 2014).

The variables used are transformed to their natural logarithm forms for our estimations so that their first differences approach the growth rates. Table 2 provides a summary of the statistics for the variables, while Table 3 shows the correlation matrix.

Table 2
Summary Statistics for the Variables

Variables	*Mean*	*Med*	*Max*	*Min*	*Std*	*Skew*	*Kur*	*JB*
GDP	1.25	1.26	1.49	–0.15	0.12	–5.08	47.9	363.35
MAC	1.57	1.67	2.52	–1.42	0.54	–1.25	5.52	216.30
TRA	1.19	1.39	2.65	–2.01	0.86	–1.15	4.15	114.1
TUR	1.64	1.71	2.70	–0.94	0.56	–1.63	7.54	535.9
NLC	2.75	2.66	3.95	0.90	0.59	–0.24	3.58	9.760
OPE	1.80	1.77	2.66	1.17	0.32	0.52	2.99	18.30

Notes 1 : Med: Median; Max: Maximum; Min: Minimum; Std: Standard Deviation; Skew: Skewness; Kur: Kurtosis; JB: Jarque Bera test statistics.
2 : GDP: Per capita economic growth rate; MAC: Market Capitalization; TRA: Traded Stocks; TUR: Turnover Ratio; NLC: Number of Listed Companies; OPE: Trade Openness.
3 : Values reported here are the natural logs of the variables.

The correlation coefficients in Table 3 suggest that the stock market development indicators (MAC, TRA, TUR, and NLC) are highly correlated to each other and are statistically significant at the 5 per cent level. This means that multicollinearity would be a problem if we were to use them all simultaneously while studying the causal relationships between economic growth, trade openness and stock market development. Hence, we proceed by examining the nexus between economic growth, trade openness and each of the stock market development indicators, separately.

Table 3
The Correlation Matrix

Variables	*GDP*	*MAC*	*TRA*	*TUR*	*NLC*	*OPE*
GDP	1.00	0.08	0.07	0.04	0.02	0.06
MAC		1.00	0.77*	0.33**	0.35**	0.35**
TRA			1.00	0.79*	0.63*	0.02
TUR				1.00	0.62*	–0.20
NLC					1.00	–0.43**
OPE						1.00

Notes 1 : GDP: Per capita economic growth rate; MAC: Market Capitalization; TRA: Traded Stocks; TUR: Turnover Ratio; NLC: Number of Listed Companies; OPE: Trade Openness.
2 : Variables shown above are defined in Table 2.
3 : * indicates statistical level of significance at the 1 per cent level; and
** indicates statistical level of significance at the 5 per cent level.

Section IV
Estimation Strategy

To examine the long-run causal relationship between stock market development, trade openness, and economic growth, we deploy Granger Causality (GC) test (Granger, 1988). The GC test is usually performed in many different ways (Clarke and Mirza, 2006). However, in this study, we use the following dynamic panel regressions model using pooled data on the 26 ARF countries.

$$\Delta GDP_{it} = \eta_{1j} + \sum_{k=1}^{p} \alpha_{1ik} \Delta GDP_{it-k} + \sum_{k=1}^{q} \beta_{1ik} \Delta SMD_{it-k} + \sum_{k=1}^{r} \delta_{1ik} \Delta OPE_{it-k} + \lambda_i ECT_{1it-1} + \varepsilon_{1it} \quad (1)$$

$$\Delta SMD_{it} = \eta_{2j} + \sum_{k=1}^{p} \alpha_{2ik} \Delta SMD_{it-k} + \sum_{k=1}^{q} \beta_{2ik} \Delta GDP_{it-k} + \sum_{k=1}^{r} \delta_{2ik} \Delta OPE_{it-k} + \lambda_{2i} ECT_{2it-1} + \varepsilon_{2it} \quad (2)$$

$$\Delta OPE_{it} = \eta_{3j} + \sum_{k=1}^{p} \alpha_{3ik} \Delta OPE_{it-k} + \sum_{k=1}^{q} \beta_{3ik} \Delta SMD_{it-k} + \sum_{k=1}^{r} \delta_{3ik} \Delta GDP_{it-k} + \lambda_{3i} ECT_{3it-1} + \varepsilon_{3it} \quad (3)$$

Where,

Δ is a first-difference operator applied to the variables;

p, q, and r are lag lengths;

i represents country i in the panel (i = 1, 2...., N);

t denotes the year in the panel (t = 1, 2, ..., T);

GDP is the economic growth rate;

SMD is stock development, which has used for four possible indicators: MAC, TRA, TUR, and NLC, as defined earlier;

OPE is the trade openness in the economy;

ECT is error correction term which is derived from the cointegration equation;

ε_{it} is a normally distributed random error term for all i and t with a zero mean and a finite heterogeneous variance.

The involvement of ECT in equations 1-3, depends up on the order of integration and cointegration among these variables. If the variables are I (1) and not cointegrated, then ECT component will be removed in the estimation process and vice versa. Thus, the pre-condition to the estimation process is to check the order of integration and cointegration among the variables. We employ four panel unit root tests[7] and two panel cointegration tests[8] to check for I (1) and cointegration between each stock market development indicator[9], inflation, and per capita economic growth. The discussions on these two techniques are not available here to optimize the length of the paper.

Section V
Empirical Results and Discussion

The empirical results continue in three stages: first, the evidence on the stationarity of the time series variables; second, the evidence of cointegration among them; and third, the direction of Granger Causality between the cointegrated variables.

The estimation process involves examining four different cases, represented by M1-M4. Each case adopts different stock market indicators. Model 1 (M1) describes the causal nexus between economic growth, trade openness, and market capitalization (MAC). Model 2 (M2) deals with causal connection between growth, trade openness, and traded stocks (TRA). Model 3 (M3) explores with causal relation across growth, trade openness, and turnover ratio (TUR). Model 4 (M4) is concerned with the causal nexus between growth, trade openness, and number of listed companies (NLC).

The results are shown in Tables 4-6. They indicate that all the variables are integrated of order one[10] (i.e., they are stationary after the first differencing) [see Table 4] as well as being cointegrated[11] [see Table 5]. To sum up: the existence of I (1) and cointegration among these variables imply the possibility of Granger Causality among them. Hence, we perform a causality test, using a Vector Error Correction Model (VECM) and utilizing equations 1-3, the results of which are shown in Table 5. This Table reports the panel Granger Causality

7. The four panel unit root tests are Levin-Lin-Chu (LLC: Levin *et al.*, 2002), augmented Dickey Fuller (ADF: Maddala and Wu, 1999), Phillips and Perron (Choi, 2001), and Hadri (Hadri, 2000).
8. The two panel cointegration tests are Pedroni (1999) and Westerlund (2007).
9. The stock market development indicators are MAC, TRA, TUR, and NLC. Table 1 gives the detail descriptions about these variables.
10. It is empirically concluded by all four panel unit root tests.
11. It is empirically true by both Pedroni panel cointegration test and Westerlund panel cointegration test.

test results for both the short-run, represented by the significance of the F-statistic, and long-run represented by the significance of lagged error correction term.

Table 4
Results of Panel Unit Roots Test

Variables	*Level*	*LLC*	*ADF*	*PP*	*HR*	*Inferences*
GDP	LD	0.80	19.1	23.9	0.21	
	FD	–21.0*	372.2*	468.9*	5.45*	1[1]
MAC	LE	1.24	11.9	13.7	0.973	
	FD	–17.2*	283.7*	430.8*	4.67*	1[1]
TRA	LE	1.96	27.1	29.0	0.701	
	FD	–12.9*	208.4*	337.2*	7.41*	1[1])
TUR	LE	2.22	20.8	22.4	0.798	
	FD	–14.6*	238.6*	401.8*	7.46*	1[1]
NLC	LE	2.84	11.9	20.3	1.011	
	FD	–9.38*	160.2*	271.7*	13.3*	1[1]
OPE	LE	2.91	10.8	7.76	0.921	
	FD	–11.6*	194.5*	312.3*	7.15*	1[1]

Notes 1 : GDP: Per capita Economic Growth Rate; MAC: Market Capitalization; TRA: Traded Stocks; TUR: Turnover Ratio; NLC: Number of Listed Companies; OPE: Trade Openness.

2 : LD: indicates level data; FD: indicates first difference data;

3 : Levin- Lin- Chu (LLC), Augmented Dickey Fuller (ADF), Phillips and Perron (PP), and Hadri Rao (HR) are test statistics are reported at no intercept and trend.

4 : * indicates statistical significance at 1 per cent; I [1] indicates integrated of order one.

From Table 6, in Models 1-5, when ΔGDP serves as the dependent variable, the error correction term is statistically significant at the one per cent level. This implies that GDP tends to converge to its long run equilibrium path in response to changes in its regressor (i.e. trade openness and stock market indicators). The significance of the ECT_{-1} coefficient in the ΔGDP equation in each of the four models confirms the existence of long run equilibrium between economic growth and its determinants which are trade openness and some measures of stock market development (such as market capitalization, traded stocks, turnover ratio and number of listed companies) [see Table 6]. In other words, we can generally conclude that trade openness and the measures of stock market development Granger-cause economic growth in the long run.

It is contended that the Granger Causality test approach of VECM has some limitations. The Granger Causality test cannot capture the relative strength of causal relationship between the variables beyond the selected time periods.

Table 5
Results of Panel Cointegration Test

Test Statistics	*Panel A: Pedroni Test*		*Test Statistics*	*Panel B: Westerlund Test*	
Model 1: GDP, OPE, MAC					
Panel v- Statistics	–0.81	[0.79]	G_t- Statistics	–3.19	[0.01]
Panel ρ- Statistics	–6.45	[0.00]			
Panel PP- Statistics	–8.05	[0.00]	G_a- Statistics	–8.85	[0.00]
Panel ADF- Statistics	–4.52	[0.00]			
Group ρ- Statistics	–3.08	[0.00]	P_t- Statistics	–9.56	[0.00]
Group PP- Statistics	–7.12	[0.00]			
Group ADF- Statistics	–3.82	[0.00]	P_a- Statistics	–3.89	[0.00]
Model 2: GDP, OPE, TRA					
Panel v- Statistics	–0.31	[0.62]	G_t- Statistics	–3.26	[0.01]
Panel ρ- Statistics	–6.23	[0.00]			
Panel PP- Statistics	–8.04	[0.00]	G_a- Statistics	–11.7	[0.00]
Panel ADF- Statistics	–4.46	[0.00]			
Group ρ- Statistics	–2.82	[0.00]	P_t- Statistics	–3.22	[0.00]
Group PP- Statistics	–6.74	[0.00]			
Group ADF- Statistics	–3.19	[0.00]	P_a- Statistics	–10.74	[0.00]
Model 3: GDP, OPE, TUR					
Panel v- Statistics	0.01	[0.49]	G_t- Statistics	–6.08	[0.00]
Panel ρ- Statistics	–4.74	[0.00]			
Panel PP- Statistics	–6.90	[0.00]	G_a- Statistics	–13.7	[0.00]
Panel ADF- Statistics	–5.19	[0.00]			
Group ρ- Statistics	–1.91	[0.02]	P_t- Statistics	–3.12	[0.05]
Group PP- Statistics	–5.90	[0.10]			
Group ADF- Statistics	–3.47	[0.01]	P_a- Statistics	–7.57	[0.00]
Model 4: GDP, OPE, NLC					
Panel v- Statistics	–0.88	[0.81]	G_t- Statistics	–3.23	[0.01]
Panel ρ- Statistics	–5.69	[0.00]			
Panel PP- Statistics	–8.08	[0.00]	G_a- Statistics	–23.4	[0.00]
Panel ADF- Statistics	–5.24	[0.00]			
Group ρ- Statistics	–3.18	[0.00]	P_t- Statistics	–17.5	[0.00]
Group PP- Statistics	–9.34	[0.00]			
Group ADF- Statistics	–7.27	[0.00]	P_a- Statistics	–13.3	[0.00]

Notes 1: GDP: Per Capita Economic Growth Rate; MAC: Market Capitalization; TRA: Traded Stocks; TUR: Turnover Ratio; NLC: Number of Listed Companies; OPE: Trade Openness.

2: Figures in square brackets are probability levels indicating significance.

3: Test statistics are reported at no intercept and trend.

Table 6
Granger Causality Test Results

Dependent Variable	*Independent Variables*			*ECT_{-1} Coefficient*
Model 1: VECM with GDP, OPE, MAC				
	ΔGDP	**ΔOPE**	**ΔMAC**	**ECT_{-1}**
ΔGDP	–	1.24 [0.53]	72.4* [0.00]	–0.68* (-9.70)
ΔOPE	10.9* [0.00]	–	14.5* [0.00]	0.01 (0.50)
ΔMAC	8.57* [0.00]	0.81 [0.67]	–	-0.18 (-0.58)
Model 2: VECM with GDP, OPE, TRA				
	ΔGDP	**ΔOPE**	**ΔTRA**	**ECT_{-1}**
ΔGDP	–	2.95* [0.20]	3.94** [0.05]	–0.71* (-9.63)
ΔOPE	12.9* [0.00]	–	6.78* [0.00]	0.01 (0.35)
ΔTRA	0.21 [0.90]	1.10 [0.58]	–	–0.09 (-0.58)
Model 3: VECM with GDP, OPE, TUR				
	ΔGDP	**ΔOPE**	**ΔTUR**	**ECT_{-1}**
ΔGDP	–	3.55 [0.10]	5.86** [0.05]	–0.69* (-9.16)
ΔOPE	15.0* [0.00]	–	0.72 [0.69]	–0.01 (-0.34)
ΔTUR	0.03 [0.98]	0.03 [3.51]	–	0.01 (0.04)
Model 4: VECM with GDP, OPE, NLC				
	ΔGDP	**ΔOPE**	**ΔNLC**	**ECT_{-1}**
ΔGDP	–	2.24 [0.32]	5.17** [0.05]	–0.72* (-9.38)
ΔOPE	15.9* [0.00]	–	9.11* [0.01]	0.01 (0.05)
ΔNLC	5.45** [0.05]	4.57 [0.10]	–	–0.03 (-0.89)

Notes 1 : GDP: Per Capita Economic Growth Rate; MAC: Market Capitalization; TRA: Traded Stocks; TUR: Turnover Ratio; NLC: Number of Listed Companies; OPE: Trade Openness.
2 : VECM: Vector Error Correction Model; ECT: Error Correction Term.
3 : Values in squared brackets represent probabilities for F-statistics.
4 : Values in parentheses represent *t*-statistics.
5 : * indicates significance at 1 per cent level;
** indicates significance at 5 per cent level.
6 : Basis for the determination of long run causality lies in the significance of the lagged ECT coefficient.

This weakens the reliability of Granger Causality results by the VECM approach. Therefore, we have incorporated the generalized forecast error variance decomposition method using Vector Auto Regression (VAR) to test the strength of the causal relationship between stock market development, trade openness and economic growth in the ARF countries. The variance decomposition approach indicates the magnitude of the predicted error variance for a series accounted for by innovations from each of the independent variable over different time periods beyond the selected time periods (Shahbaz, 2012; Ibrahim, 2005; Pesaran and Shin, 1998; Engle and Granger, 1987). This reflects the proportional contribution in one variable due to innovative stemming effect in other variables. One of the biggest advantages of this approach is that, like orthogonalized forecast error variance decomposition approach, it is insensitive with ordering of the variables because ordering of the variables is uniquely determined by the VAR system. Furthermore, the generalized forecast error variance decomposition approach estimates the simultaneous shock affects between the variables, e.g., it describes the various degrees of shocks caused by stock market development to economic growth and trade openness. The results are not available here due to space constraints and can be available on demand.

Section VI
Conclusion and Policy Implications

The study uses sophisticated panel cointegration and Granger Causality tests to study the shocks of stock market development on trade openness and economic growth. We utilize data applying to some 26 ARF countries over long time periods (1961-2012), to shed light on the true relationship between stock market development, economic growth, and trade openness. We first establish that there is a long-run equilibrium relationship among these variables, but the nature of the causal relationship is complex in that generally trade openness and the measures of stock market development Granger-cause economic growth in the long run. Moreover, we are able to establish existence of reverse causality between economic growth and only one measure of stock market development (market capitalization/traded stocks/turnover ratio/number of listed companies) in the long run. Thus, we are not confident that economic growth always leads to long term development in the stock market and trade openness. The answer depends on which measure of stock market development one can use.

In sum, our findings provide strong evidence supporting the relevance of both stock market development and trade openness to the economic growth of ARF countries. Thus, from our analysis, it seems that countries which adopt sound macroeconomic policies and establish a well-developed stock market (one that is encouraged to grow in size and sophistication) will experience sustainably higher economic growth. Finally, it should be recognized that economic growth itself may have the potential to promote further stock market development and hence bring about additional economic prosperity through an interactive

feedback effect. However, that crucially depends on how one defines the development in this sector.

References

1. Ang, J B and McKibbin (2007), "Financial Liberalization, Financial Sector Development and Growth: Evidence from Malaysia?", *Journal of Development Economics,* Vol. 84, No.1, pp 215-233.
2. Anwar, S and A Cooray (2012), "Financial Development, Political Rights, Civil Liberties and Economic Growth: Evidence from South Asia", *Economic Modelling,* Vol. 29, No. 3, pp 974-981.
3. Arestis, P, P O Demetriades and K B Luintel (2001), "Financial Development and Economic Growth: The Role of Stock Markets", *Journal of Money, Credit and Banking*, Vol. 33, No. 1, pp 16-41.
4. Atje, R and B Jovanovic (1993), "Stock Markets and Development", *European Economic Review,* Vol. 37, Nos. 2-3, pp 632-640.
5. Awokuse, T O (2008), "Trade Openness and Economic Growth: Is Growth Export-Led or Import-Led?", *Applied Economics,* Vol. 40, pp 161-173.
6. Bajwa, S and M W Siddiqi (2011), "Trade Openness and Its Effects on Economic Growth in Selected South Asian Countries: A Panel Data Study", *International Journal of Human and Social Sciences,* Vol. 6, No. 2, pp 138-143.
7. Barro, R J and X Sala-i-Martin (1995), *Economic Growth,* McGraw Hill, New York.
8. Beck, T and R Levine (2004), "Stock Markets, Banks and Growth: Panel Evidence", *Journal of Banking Finance,* Vol. 28, No. 3, pp 423-442.
9. Bhide, A (1993), "The Hidden Costs of Stock Market Liquidity", *Journal of Financial Economics,* Vol. 34, pp 31-51.
10. Bojanic, A N (2012), "The Impact of Financial Development and Trade on the Economic Growth of Bolivia", *Journal of Applied Economics,* Vol. 15, No. 1, pp 51-70.
11. Bosworth, B (1975), "The Stock Market and the Economy", Brookings Papers on *Economic Activity,* Vol. 2, No. 1, pp 257-290.
12. Caporale, G M, P G Howells and A M Soliman (2004), "Stock Market Development and Economic Growth: The Causal Linkage", *Journal of Economic Development,* Vol. 29, No. 1, pp 33-50.
13. Carp, L (2012), "Can Stock Market Development Boost Economic Growth? Empirical Evidence from Emerging Markets in Central and Eastern Europe", *Emerging Markets Queries in Finance and Business,* Vol. 3, No. 1, pp 438-444.
14. Cheng, S (2012), "Substitution or Complementary Effects Between Banking and Stock Markets: Evidence from Financial Openness in Taiwan, *Journal of International Financial Markets, Institutions and Money,* Vol. 22, No. 3, pp 508-520.
15. Choi, I (2001), "Unit Root Tests for Panel Data", *Journal of International Money and Finance,* Vol. 20, No. 2, pp 249-272.
16. Colombage, S R N (2009), "Financial Markets and Economic Performances: Empirical Evidence from Five Industrialized Countries", *Research in International Business and Finance,* Vol. 23, No. 3, pp 339-348.

17. Darrat, A F, K Elkhal and B McCallum (2006), "Finance and Macroeconomic Performance: Some Evidence from Emerging Markets", *Emerging Markets Finance and Trade,* Vol. 42, No. 3, pp 5-28.

18. Deb, S G and J Mukherjee (2008), "Does Stock Market Development Cause Economic Growth? Time Series Analysis for Indian Economy", *International Research Journal of Finance and Economics*, Vo. 21, No. 1, pp 142-149

19. Din, M (2004), "Exports, Imports, and Economic Growth in South Asia: Evidence Using a Multivariate Time-series Framework", *Pakistan Development Review,* Vol. 43, No. 2, pp 105-124.

20. Dritsaki, C and M Dritsaki-bargiota (2005), "The Causal Relationship between Stock, Credit Market and Economic Development: An Empirical Evidence of Greece", *Economic Change and Restructuring,* Vol. 38, No. 1, pp 113-127.

21. Dritsakis, N and A Adamopoulos (2004), "Financial Development and Economic Growth in Greece: An Empirical Investigation with Granger Causality Analysis", *International Economic Journal,* Vol. 18, No. 4, pp 547-559.

22. El-Wassal, K A (2005), "Stock Market Growth: An Analysis of Cointegration and Causality", *Economic Issues,* Vol. 10, No. 1, pp 37-58.

23. Engle, R F and C W J Granger (1987), "Cointegration and Error Correction: Representation, Estimation and Testing", *Econometrica,* Vol. 55, No. 2, pp 251-276.

24. Enisan, A A and A O Olufisayo (2009), "Stock Market Development and Economic Growth: Evidence from Seven sub-Sahara African Countries", *Journal of Economics and Business,* Vol. 61, No. 2, pp 162-171.

25. Garcia, V F and L Liu (1999), "Macroeconomic Determinants of Stock Market Development", *Journal of Applied Economics,* Vol. 11, No. 1, pp 29-59.

26. Gochoco-Bautista, M S, N R Sotocinal and J Wang (2014), "Corporate Investments in Asian Markets: Financial Conditions, Financial Development, and Financial Constraints", *World Development,* Vol. 57, pp 63-78.

27. Gries, T, M Kraft and D Meierrieks (2011), "Financial Deepening, Trade Openness and Economic Growth in Latin America and the Caribbean", *Applied Economics,* Vol. 43, pp 4729-4739.

28. Gurley, J G and E S Shaw (1955), "Financial Aspects of Economic Development", *American Economic Review,* Vol. 45, No. 4, pp 515-538.

29. Harris, R (1997), "Stock Markets and Development: A Re-assessment", *European Economic Review,* Vol. 41, No. 1, pp 139-46.

30. Harrison, A and G Hanson (1999), "Who Gains from Trade Reform? Some Remaining Puzzles", *Journal of Development Economics,* Vol. 59, pp 125-154.

31. Hassapis, C and S Kalyvitis (2002), "Investigating the Links between Growth and Stock Price Changes with Empirical Evidence from the G7 Economies", *Quarterly Review of Economics and Finance,* Vol. 42, No. 3, pp 543-575.

32. Henry, P B (2000), "Stock Market Liberalization, Economic Reform and Emerging Market Equity Prices", *Journal of Finance,* Vol. 55, No. 2, pp 529-564.

33. Hermes, N and R Lensink (2003), "Foreign Investment, Financial Development, and Economic Growth", *Journal of Development Studies,* Vol. 40, pp 42-163.

34. Hou, H and S Y Cheng (2010), "The Roles of Stock Market in the Finance-Growth Nexus: Time Series Cointegration and Causality Evidence from Taiwan", *Applied Financial Economics,* Vol. 20, No. 12, pp 975-981.

35. Huang, B, C Yang and J W Hu (2000), "Causality and Cointegration of Stock Markets among the United States, Japan, and the South China Growth Triangle", *International Review of Financial Analysis,* Vol. 9, No. 3, pp 281-297.

36. Hye, Q M A and W Lau (2015), "Trade Openness and Economic Growth: Empirical Evidence from India", *Journal of Business Economics and Management,* Vol. 16, No. 1, pp 188-205.

37. Ibrahim, M H (2005), "Sectoral Effects of Monetary Policy: Evidence from Malaysia", *Asian Economic Journal,* Vol. 19, No. 1, pp 83-102.

38. Jedidia, K B, T Boujelbene and K Helali (2014), "Financial Development and Economic Growth: New Evidence from Tunisia", *Journal of Policy Modelling,* Vol. 36, pp 883-898.

39. Jenkins, H P and S T Katircioglu (2010), "The Bounds Test Approach for Cointegration and Causality between Financial Development, International Trade and Economic Growth: The Case of Cyprus", *Applied Economics,* Vol. 42, pp 1699-1707.

40. Kar, M, S Nazlioglu and H Agir (2011), "Financial Development and Economic Growth Nexus in the MENA Countries: Bootstrap Panel Granger Causality Analysis", *Economic Modelling,* Vol. 28, Nos. 1-2, pp 685-693.

41. Khan, M S and A S Senhadji (2001), "Threshold Effects in the Relationship between Inflation and Growth", *IMF Staff Papers,* Vol. 48, No. 1, pp 1-21.

42. King, R and R Levine (1993), "Finance and Growth: Schumpeter Might be Right", *The Quarterly Journal of Economics,* Vo. 108, No. 3, pp 717-737.

43. Kolapo, F T and A O Adaramola (2012), "The Impact of the Nigerian Capital Market on Economic Growth (1990-2010)", *International Journal of Developing Societies,* Vol. 1, No. 1, pp 11-19.

44. Konya, L (2006), "Exports and Growth: Granger Causality Analysis on OECD Countries with A Panel Data Approach", *Economic Modelling,* Vol. 23, No. 6, pp 978-992.

45. Kose, M A; E S Prasad; K Rogoff and S Wei (2010), "Financial Globalization and Economic Policies", In: Rodrik, D. and Rosenzweig, M. (Eds.), *Handbook of Development Economics,* Vol. 5, Elsevier B. V., pp 4283-4359.

46. Kumar, S and G Pacheco (2012), "What Determines the Long Run Growth Rate in Kenya?", *Journal of Policy Modeling,* Vol. 34, No. 2, pp 705-718.

47. Levine, A; C F Lin and C S Chu (2002), "Unit Root Tests in Panel Data: Asymptotic and Finite Sample Properties", *Journal of Econometrics,* Vo. 108, No. 1, pp 1-24.

48. Levine, R (1991), "Stock Markets, Growth, and Tax Policy", *Journal of Finance,* Vol. 46, No. 4, pp 1445-1465.

49. Levine, R (1997), "Financial Development and Economic Growth: Views and Agenda", *Journal of Economic Literature,* Vol. 35, No. 20, pp 688-726.

50. Levine, R (2005), Finance and Growth: Theory and Evidence, In P. Aghion and S. Durlauf (Eds.), Handbook of Economic Growth, pp 865-934. Elsevier Science, Amsterdam.

51. Levine, R and S Zervos (1996), "Stock Market Development and Long-Run Growth", *World Bank Economic Review,* Vol. 10, No. 2, pp 323-339.

52. Levine, R and S Zervos (1998), "Stock Markets, Banks and Economic Growth", *American Economic Review,* Vol. 88, No. 3, pp 537-558.

53. Liang, Q and J Teng (2006), "Financial Development and Economic Growth: Evidence from China", *China Economic Review,* Vol. 17, No. 4, pp 395-411.

54. Liu, X and P Sinclair (2008), "Does the Linkage between Stock Market Performance and Economic Growth Vary across Greater China", *Applied Economics Letters,* Vol. 15, No. 7, pp 505-508.

55. Liu, X; C Shu and P Sinclair (2009), "Trade, Foreign Direct Investment and Economic Growth in Asian Economies", *Applied Economics,* Vol. 41, pp 1603-1612.

56. Liu, X; H Song and P Romilly (1997), "An Empirical Investigation of the Causal Relationship between Openness and Economic Growth in China", *Applied Economics,* Vol. 29, pp 1679-1686.

57. Masih, A M M and R Masih (1999), "Are Asian Stock Market Fluctuations Due Mainly to Intra-Regional Contagion Effects? Evidence Based on Asian Emerging Stock Markets", *Pacific Basin Finance Journal,* Vol. 7, Nos. 3-4, pp 251-282.

58. McKinnon, R I (1973), *Money and Capital in Economic Development,* Brookings Institution Press, Washington DC.

59. Muhammad, S D; A Hussain and S Ali (2012), "The Causal Relationship between Openness and Economic Growth: Empirical Evidence in Case of Pakistan", *Pakistan Journal of Commerce and Social Sciences,* Vol. 6, No. 2, pp 382-391.

60. Muradoglu, G; F Taskin and I Bigan (2000), "Causality Between Stock Returns and Macroeconomic Variables in Emerging Markets", *Russian and East European Finance and Trade,* Vol. 36, No. 6, pp 33-53.

61. Nieuwerburgh, S V; F Buelens and L Cuyvers (2006), "Stock Market Development and Economic Growth in Belgium", *Explorations in Economic History,* Vol. 43, No. 1, pp 13-38.

62. Niroomand, F; M Hajilee and O A Al Nasser (2014), "Financial Market Development and Trade Openness: Evidence from Emerging Economies", *Applied Economics,* Vol. 46, No. 13, pp 1490-1498.

63. Nishat, M and A Saghir (1991), "The Stock Market and Pakistan Economy – 1964-87", *Savings and Development,* Vol. 15, No. 2, pp 131-146.

64. Nowbusting, B M and M P Odit (2009), "Stock Market Development and Economic Growth: The Case of Mauritius", *International Business and Economic Research Journal,* Vol. 8, No. 1, pp 77-88.

65. Odhiambo, N M (2008), "Financial Development in Kenya: A Dynamic Test of the Finance-led Growth Hypotheses", *Economic Issues,* Vol. 13, No. 2, pp 21-36.

66. Panopoulou, E (2009), "Financial Variables and Euro Area Growth: A Non-parametric Causality Analysis", *Economic Modelling,* Vol. 26, No. 6, pp 1414-1419.

67. Pedroni, P (1999), "Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors", *Oxford Bulletin of Economics and Statistics,* Vol. 61, No. 1, pp 653-670.

68. Peia, O and K Roszbach (2014), "Finance and Growth: Time Series Evidence on Causality", *Journal of Financial Stability* (forthcoming).

69. Pesaran, M H and Y Shin (1998), "Generalized Impulse Response Analysis in Linear Multivariate Models", *Economics Letters*, Vol. 58, No. 1, pp 17-29.

70. Pradhan, R P; M B Arvin; S Bele and S Taneja (2013), "The Impact of Stock Market Development on Inflation and Economic Growth of 16 Asian Countries: A Panel VAR Approach", *Applied Econometrics and International Development,* Vol. 13, No. 1, pp 203-220.

71. Pradhan, R P; M B Arvin; N R Norman and J H Hall (2014), "The Dynamics of Banking Sector and Stock Market Maturity and the Performance of Asian Economies", *Journal of Economic and Administrative Sciences,* Vol. 30, No.1, pp 16-44.

72. Rashid, A (2008), "Macroeconomic Variables and Stock Market Performance: Testing for Dynamic Linkages with a Known Structural Break", *Savings and Development,* Vol. 32, No. 1, pp 77-102.

73. Rousseau, P L and P Wachtel (2000), "Banks, Stock Markets and China's Great Leap Forward", *Emerging Markets Review,* Vol. 8, No. 3, pp. 206-217.

74. Sakyia, D; J Villaverde and A Maza (2014), "Trade Openness, Income Levels, and Economic Growth: The Case of Developing Countries, 1970-2009", *The Journal of International Trade and Economic Development,* (forthcoming).

75. Samargandi, N; J Fidrmuc and S Ghosh (2015), "Is the Relationship between Financial Development and Economic Growth Monotonic?", *Evidence from a Sample of Middle-Income Countries. World Development,* Vol. 68, pp 66-81.

76. Schumpeter, J A (1934), *The Theory of Economic Development.* Harvard University Press, Cambridge.

77. Schumpeter, J A and Opie, R (1934), *The Theory of Economic Development: An Enquiry into Profits, Capital, Credit, Interest, and the Business Cycle.* Harvard University Press, Cambridge.

78. Shahbaz, M (2012), "Does Trade Openness Affect Long Run Growth? Cointegration, Causality and Forecast Error Variance Decomposition Tests for Pakistan", *Economic Modelling,* Vol. 29, No. 6, pp 2325-2339.

79. Shahbaz, M; N Ahmed and L Ali (2008), "Stock Market Development and Economic Growth: ARDL Causality in Pakistan", *International Research Journal of Finance and Economics,* Vol. 14, No. 1, pp 1450-2887.

80. Shleifer, A, and Vishny, R W (1986), "Large Shareholders and Corporate Control", *Journal of Political Economy,* Vol. 96, No. 3, pp 461-88.

81. Singh, A (1997), "Financial Liberalization, Stock Markets and Economic Development", *The Economic Journal.* Vol. 107, No. 442, pp 771-782.

82. Stiglitz, J E (1994), *The Role of the State in Financial Markets,* In Proceedings of the World Bank Annual Conference on Development Economics 1993, Washington, D.C.: World Bank.

83. Tekin, R B (2012), "Development Aid, Openness to Trade and Economic Growth in Least Developed Countries: Bootstrap Panel Granger Causality Analysis", *Social and Behaviorial Sciences,* Vol. 62, pp 716-721.

84. Tsen, W H (2006), "Granger Causality Tests among Openness to International Trade, Human Capital Accumulation and Economic Growth in China: 1952-1999", *International Economic Journal,* Vol. 20, No. 3, pp 285-302.

85. Tsouma, E (2009), "Stock Returns and Economic Activity in Nature and Emerging Markets", *Quarterly Review of Economics and Finance,* Vol. 49, No. 2, pp 668-685.

86. Uddin, G S; B Sjo and M Shahbaz (2013), "The Causal Nexus between Financial Development and Economic Growth in Kenya", *Economic Modelling,* Vol. 35, pp 701-707.

87. Varamini, H and S Kalash (2010), "Foreign Direct Investment Inflows, Economic Growth, and Trade Balances: The Experience of the New Members of the European Union", *Journal of East-West Business,* Vol. 16, pp 4-23.

88. Vlastou, I (2010), "Forcing Africa to Open Up to Trade: Is It Worth It?", *Journal of Developing Areas,* Vol. 44, No. 1, pp 25-39.

89. Westerlund, J (2007), "Testing for Error Correction in Panel Data", *Oxford Bulletin of Economics and Statistics,* Vol. 69, No. 6, pp 709-748.

90. Wongbangpo, P and S C Sharma (2002), "Stock Market and Macroeconomic Fundamental Dynamic Interactions: ASEAN-5 Countries", *Journal of Asian Economics,* Vol. 13, No. 1, pp 27-51.

91. Xu, Z (1996), "On the Causality between Export Growth and GDP Growth: An Empirical Re-Investigation", *Review of International Economics,* Vol. 4, No. 2, pp 172-184.

92. Yang, Y Y and M H Yi (2008), "Does Financial Development Cause Economic Growth? Implication for Policy in Korea", *Journal of Policy Modelling,* Vol. 30, No. 5, pp 827-840.

93. Yanikkaya, H (2003), "Trade Openness and Economic Growth: A Cross-country Empirical Investigation", *Journal of Development Economics,* Vol. 72, pp 57-89.

94. Yavari, K and R Mohseni (2012), "Trade Liberalization and Economic Growth: A Case Study of Iran", *Journal of Economic Policy Reform,* Vol. 15, No. 1, pp 13-23.