Australian Journal of Basic and Applied Sciences, 6(12): 429-435, 2012
ISSN 1991-8178

Granger Causality Relationship between Mining Exports and GDP Growth in Iran

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Abstract: This paper investigates the causality relationship between miningexports, industrialexports,imports and economic growth for Iran using Cointegration, Error Correction Model, and Granger causality.The annual time series used for the estimation cover the time period 1959 – 2008. Using Augmented Dickey-Fuller (ADF) stationarity test, the variable proved to be integrated of the order one I(1) at first difference. Johansen and Juselius Cointegration test was used to determine the presence or otherwise of a cointegrating vector in the variables. Both Trace and Maximum Eigenvalue indicated no cointegration at 5% level of significance pointing to the fact that the variables have a long-run relationship. The paper finds thatminingexportsand imports is linked to economic growth. In other words, the growth inmining exports sectors Granger causes economic growth which, in turn, promotes the growth of Iran. The result suggests policy prescription that the government of Iran should put emphasis on promoting growth and development of export industries by ensuring increased productivity in such sector.

Key words: Exports,Economic growth, Mining Exports, Cointegration, Error Correction Model, Granger Causality, Iran.

INTRODUCTION

Export of goods and services is an important source of foreign exchange reserves and canreduce balance of payments problems, and creates employment opportunities.Iran is an oil based country and its oil is an important component of country's exports.

In the early 21st century the service sector constituted the largest percentage of gross domestic product (GDP), followed by industry (mining and manufacturing) and agriculture. In 2008 GDP was estimated at $382.3 billion ($842 billion by PPP (International Financial Statistics, 2009).Iran's goods and services trade growth momentum of 11.3 percent, in real (constant 2000 U.S. dollars) terms, over the 2005–07 periods could not be maintained in 2008. Real growth of trade in goods and services slowed to 3 percent. This was a result of a decline in the real growth rate of imports to 6.4 percent from 14.3 percent over the 2005-07 periods, and a contraction of real exports by 2.5 percent after they had grown by 7.2 percent in the 2007-07 period (World Trade Indicators, 2009).

Mining production contributed only 0.7% of the country's GDP in 2008. Although the petroleum industry provides the majority of revenue.Mining sectorinclude coal,iron ore, copper, lead, zinc, chromium, barite, salt, gypsum, molybdenum, strontium, silica, uranium,and gold. The government owns 90% of all mines and related large industries in Iran and is seekingforeign investment to development of the mining sector. The sector accounts for 3% of thecountry's exports PPP (International Financial Statistics, 2009).

2. Review of Literature:

In theoretical growth model, exports are considered as an engine of growth. First, exports being a component of GDP, the increase of exports directly increase GDP. An increase in exports means:Increase in employment in export sector industries which, in turn, increase income and GDP, reallocating resources from less productive sectors to exports industry and enhancing capacity utilization exports growth promotes GDP growth (Ben-David and Loewy, 1998).

Ricardo's theory of comparative advantage explains that countries should specialize in the production of commodities that they are most efficient at producing in relation to other countries, and trade those commodities with the rest of the world. It is possible to say that a country can export its commodities and consequently raise foreign currency, with which it can import the other commodities in need. This trade theory has given birth to a new direction for economic policy, namely the Export-led Growth (ELG) hypothesis (Zuniga, 2000).

From the early 1960, policy makers and researchers had a great interest in relationship between export and economic growth. Their main reason and motivation is that they want to know if a country should increase its export to lead to a more economic growth or they should stimulate economic growth from the outset to lead to more export.

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Some analysts believe that the causality direction is from export to economic growth which expressed as Export-Led Growth (ELG) hypothesis (Balassa 1978, Edwards 1998). The export development and free entry and exit are considered as the key causes of economic growth. For example, firms can take advantage of more efficient allocation of resources, scale economies and encouraging creativity and innovation caused by foreign competition (Helpman and Krugman 1985).

Moreover, export can cause more import of intermediate goods which leads to increase of capital accumulation and output growth. Also, there are various studies which support Growth-Led Export (GLE) in a way that the causality direction is from economic growth to export growth. Regarding to the Growth-Led Export hypothesis, export development is set off through benefits of efficiency caused by increase in interior work force's skill levels and technology advancement (Bhagwati 1988). Two above approaches do not overlap. Therefore the third possibility is that there is a feedback relationship between export and economic growth. At last (as the fourth possibility) it is possible that there is no relationship or just a simple contemporaneous relation between these two variables.

Single country study results are conflicting. Studies such as Sharma et al (1991) found support in favor of export led to economic growth (ELG). On the other hand, other studies such as Yamada (1998), Boltho (1996) found evidences in support of Growth-led Export. Awokuse (2005); Hatemi (2002) found bi-directional causality between exports and economic growth. Shan and Sun (1998) found evidence of one way causality running from manufacturing to exports growth.

Since 1985 (Gupta, 1985, Jung and Marshall, 1985) there has been considerable interest for export-led growth (ELG) using the notion of Granger causality. The survey we provide inGiles and Williams (2000) hereafter denoted as GW, details over seventy such time series studies.While the usefulness of this concept to test the ELG hypothesis has been questioned, and thesensitivity of the causal outcome to certain characteristics of the modeling exercise (e.g., lag order,estimation period, information set) has been considered, there does not appear to have been anexplicit examination of the sensitivity of the ELG causal outcome to the method adopted to deal withnonstationarity issues, including the choice of the deterministic trend degree.

In the nextsection of this paper, we briefly investigate the theoretical and empirical literature regarding to the effect of trade and openness on the economic growth. The econometric methodology and empirical results are discussed in the forth section of this paper. First, the integration order of variable would be examined, based on unit-root tests. Second, we test the long-run relationship between level variables by cointegration tests. Third, by using ECM approach we would empirically evaluate the causality direction among the variables.

3. Econometric Methodology:

3.1. Model Specification:

This paper uses a Vector Auto Regression (VAR) to identify the relationship Gross Domestic Product (Y), miningexports (MINEX) and Industrial exports (INDUSTX) and imports (IM). All values will be in real terms. In addition, they will be expressed in the logarithmic form. Four macroeconomic variables which are built upon the followingaugmented output function.

$$Y = f\,(MINEX, INDUSTX, IM) \qquad (1)$$

3.2. Estimation Technique:

The study employs a three step procedure in order to determine the Causality relationship betweenmining exports, exports, imports and economic growth.

3.2.1. Unit Root Test:

First, the Augmented Dickey Fuller (ADF) tests are used to checkwhether each data series is integrated and has a unit root (1979, 1981). The ADF test is based on the value of t-statistics for the coefficient of the lagged dependent variable compared with special calculated critical values. If the calculated value is greater than the critical value, then we reject the null hypothesis of a unit root; the unit root does not exist, and our variable is stationary (Enders 1995; Gujarati 2003). The ADF test is based on the followingregressions.

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 t + \sum_{i=1}^{n} \alpha_1 \Delta Y_t + \varepsilon_t \qquad (2)$$

WhereYis a time series, t is a linear time trend, Δ is the first difference operator,$_0$ is a constant, n isthe optimum number of logs on the dependent variable and is the random error term.

3.2.2. Cointegration Test:

The results of the integration tests are then pursued by Cointegration tests. The existence oflong-run equilibrium (stationary) relationships among economic variables is referred to in the literatureas cointegration. The Johansen procedure will be employed to examine the question of cointegrationand provide not only an

estimation methodology but also explicit procedures for testing for the numberof cointegrating vectors as well as for restrictions suggested by economic theory in a multivariatesetting. Engel and Granger (1987) pointed out that a linear combination of two or more non-stationaryvariables may be stationary. If such a stationary combination exists, then the non-stationary time seriesare said to be co-integrated. The VARbased cointegration test using the methodology developed inJohansen (1991, 1995) is described below:
Consider a VAR of order p

$$y_t = A_1 y_{t-1} + \cdots + A_p y_{t-p} + Bx_t + \varepsilon_t \quad (3)$$

Where y_t is a k-vector of non-stationary I(1) variable, x_t is a d-vector of deterministic variablesand ε_t is a vector of innovations. If the economic variables are cointegrated, we can proceed to utilizethe Vector Auto-regression (VAR) representation. This VAR can be rewritten as follows:

$$y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma \Delta y_{t-1} + \beta x_t + \varepsilon_t \quad (4)$$

$$\text{where, } \Pi = \sum_{i=1}^{p} A_t - I, \text{ and } \Gamma = -\sum_{j=i+1}^{p} A_t$$

Granger representation theorem asserts that if the coefficient matrix Π has reduced rank r < k,then there exists k x r matrices α and β each with rank r such that Π = αβ and βy_t is I (0). Johansen'smethod is to estimate the Π matrix from an unrestricted VAR and to test the null hypothesis that therestriction implied by the reduced rank of Π can be rejected against the alternative hypothesis that thematrix Π has full rank. Johansen procedure provides two statistics, one is LR test based on thestochastic matrix.

3.2.3. VAR and Granger-Causality:

The traditional Granger causality test uses the simple F-test statistics. Several studies such as Chow (1987), Darat (1996) have used the traditional (F-test) to test for causality. The use of a simple traditional Granger causality has been identified by several studies (such as Engle and Granger, 1987; Toda and Yamamoto, 1995) as not sufficient if variables are I (1) and cointegrated. If time series included in the analysis are I(1) and cointegrated, the traditional Granger causality test should not be used, and proper statistical inference can be obtained by analysing the causality relationship on the basis of the error correction model (ECM). Many economic time-series are I (1), and when they are cointegrated, the simple F-test statistic does not have a standard distribution. If the variables are I (1) and cointegrated, Granger causality should be done in the ECM and expressed as:

$$Y_t = \sum_{i=1}^{m} \alpha_{1i} \Delta Y_{t-i} + \sum_{i=1}^{n} \beta_{1i} \Delta MINENX_{t-i} + \sum_{i=1}^{q} \gamma_{1i} \Delta INDUSTX_{t-i} + \sum_{i=1}^{r} \delta_{1i} \Delta IM_{t-i} + \lambda ECM_{t-i} + \varepsilon_t \quad (5)$$

$$MINENX_t = \sum_{i=1}^{m} \alpha_{2i} \Delta Y_{t-i} + \sum_{i=1}^{n} \beta_{2i} \Delta MINENX_{t-i} + \sum_{i=1}^{q} \gamma_{2i} \Delta INDUSTX_{t-i} + \sum_{i=1}^{r} 2 \Delta IM_{t-i} + \lambda ECM_{t-i} + \varepsilon_t \quad (6)$$

$$INDUSTX_t = \sum_{i=1}^{m} \alpha_{3i} \Delta Y_{t-i} + \sum_{i=1}^{n} \beta_{3i} \Delta MINENX_{t-i} + \sum_{i=1}^{q} \gamma_{3i} \Delta INDUSTX_{t-i} + \sum_{i=1}^{r} \delta_{3i} \Delta IM_{t-i} + \lambda ECM_{t-i} + \varepsilon_t \quad (7)$$

$$IM_t = \sum_{i=1}^{m} \alpha_{4i} \Delta Y_{t-i} + \sum_{i=1}^{n} \beta_{4i} \Delta MINENX_{t-i} + \sum_{i=1}^{q} \gamma_{4i} \Delta INDUSTX_{t-i} + \sum_{i=1}^{r} \delta_{4i} \Delta IM_{t-i} + \lambda ECM_{t-i} + \varepsilon_t \quad (8)$$

Where Y, MINEX, INDUSTX and IM are stationary processes, ECM represents one period lagged error correction term captured from the co-integrated regression from (5, 6, 7 and 8). α, β, γ, δ and λ are coefficient and ε_t is error term. The null hypothesis that MINEX, INDUSTX and IM does not Granger cause Y is rejected not only if Σβ, Σγ, Σδ and Σλ are jointly significant but also if the coefficient of $ECM_{t-i}$is significant (Miller and Russek, 2001). But in the Error Correction Model, the causality inference is obtained through the significance of λ. That is, the null hypothesis that MINEX, INDUSTX and IMPORTS does not Granger cause Y is rejected if Σ λ is statistically significant even if Σβ, Σγ and Σ δ are not jointly significant.

3.3. Data:

In this study, we use the annual time series data for Iran for the period from 1959 to 2008, collected from the International Financial Statistics published by Central Bank Iran. The data comprise Gross Domestic Product (GDP), miningexports (MINEX),industrial exports(INDUSTX) and imports (IM). All values will be in real terms. To obtain the real GDP, miningexports, industrialexports and imports, the GDP deflator will be used to deflate all this variables.

4. Empirical Analysis:

4.1. Unit Root Test:

The Result from table 4.1 provides strong evidence of non stationarity in levels. This can be seen by comparing the observed values (in absolute terms) of the ADF test statistics with the critical values (also in absolute terms) of the test statistics at the 1%and 5% 10level of significance. Therefore, the null hypothesis is accepted and it is sufficient to conclude that there is a presence of unit root in the variables at levels and all the variables were differenced one.

Table 4.1: Augmented Dickey-Fuller Stationary Test Results.

Variable	Constant No Trend	Critical Value 1%	Critical Value 5%	Constant Trend	Critical Value 1%	Critical Value 5%
LY	-1.439542	-3.577723	-2.925169	-2.283943	-4.165756	-3.508508
LMINEX	-2.028368	-3.577723	-2.925169	-2.582609	-4.161144	-3.506374
LINDUSTX	-2.333882	-3.577723	-2.925169	-2.063485	-4.161144	-3.506374
LIM	-1.950575	-3.577723	-2.925169	-1.995754	-4.165756	-3.508508
ΔLY	-3.626675**	-3.577723	-2.925169	-3.625823**	-4.165756	-3.508508
ΔLMINEX	-10.07858**	-3.577723	-2.925169	-10.22180**	-4.165756	-3.508508
ΔLINDUSTX	-6.051311**	-3.577723	-2.925169	-6.157339**	-4.165756	-3.508508
ΔLIM	-4.57723**	-3.577723	-2.925169	-4.693563**	-4.165756	-3.508508
The number inside brackets denotes the appropriate lag lengths which are chosen using Schwarz Criterion. ** Denotes for 1% significance level						

Source: Author's Estimation using Eviews 7.1

4.2. Cointegration Test Result:

Having confirmed the stationarity of the variables at I (1), we proceed to examine the presence or no presence of cointegration among the variables. The next step is to test whether the stationary variables are cointegrated or not. Two criterion, Trace statistics and Eigen value are used for cointegration test at 5% level of significance.

We started the cointegration analysis by employing the Johansen andJuselius cointegration test.The Result from table 4.1 and 4.2 shows that there are three cointegrating equation for GDP, mining exports, industrial exports and imports. When a cointegration relationship is present, it means that miningexports, Industrial exports, imports and economic growth share a common trend and long-run equilibrium as suggested.

Table 4.2: Unrestricted Cointegration Rank Test (Trace).

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.615267	85.50184	55.24578	0.000
At most 1*	0.398755	42.51757	35.01090	0.0066
At most 2*	0.276498	19.62367	18.39771	0.0336
At most 3*	0.106340	5.059332	3.841466	0.0245
Trace test indicates no cointegration enq(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values				

Table 4.3: Unrestricted Cointegration Rank Test (Maximum Eigenvalue).

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.615267	42.98427	30.81507	0.0010
At most 1	0.398755	22.89390	24.25202	0.0748
At most 2	0.276498	14.56433	17.14769	0.1144
At most 3*	0.106340	5.059332	3.841466	0.0245
Max-Eigenvalue test indicates no cointegration enq(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values				

GDP, mining exports, industrial exports and imports are stationary over the period 1959- 2008.These variables share a common trend and move together over the long run. Results of cointegrating equation show that there is positive relationship for export and economic growth.

$$LGDP = 0.0401629483714*LMINEX + 0.191287847879*LINDUSTX + 0.801993836889*LIM \quad (9)$$

The equation 9 shows that if there is 4 percent, 19 percent and 8 percent change in real Gross Domestic Product due to 1 percent change in real mining exports, real industrial exports and real imports. These results are significant at 5 percent level of significance. There is positive relationship between mining exports, industrial exports and imports and Gross Domestic Product. The next step is to check the optimal lag length, for this purpose the Akaike information and Schwarz information criteria is used. Optimal lag length is turned to be one.

Granger Causality in Table 4.4 shows Granger causality between mining exports, industrial exports,importsand economic growth. F- Statisticassociated with all four variables.From the result of the first equation, it could be noted that the null hypothesis that economic growth Granger causes mining exports is Accepted, implying that causality is running from economic growth to mining exports (DLY→DLMINEX). In the second equation, there is no causality exist between economic growth and industrial exports and in the third, bidirectional Causality is running from economic growth to imports (DLY↔DLIM). In the fourth, there is no causality running from industrial exports to mining exports. For the fifth equation, there existed no statistically discernible relationship between imports and mining exports. We lastly saw industrial exports and imports having uni-directional causality (DLMINEX →DLIM).

Generally, it could be noted that there is existence of dynamic relationship existing among mining exports, imports and economic growth. However, worthy of note is that Causality ran from economic growth to both mining exports and imports. This means that increase/growth in the economy of Iran by variables which may have been taken note of this study causes increase in the level of mining exports and imports.

Table 4.4: Granger Causality Test Result.

Null Hypothesis:	Obs	F-Statistic	Probability
DLMINEX does not Granger Cause DLY	44	2.00918	0.1146
DLY does not Granger Cause DLMINEX		3.15300	0.0258
DLINDUSTX does not Granger Cause DLY	44	1.97679	0.1196
DLY does not Granger Cause DLINDUSTX		0.77834	0.5468
DLIM does not Granger Cause DLY	44	2.74156	0.0439
DLY does not Granger Cause DLIM		2.63653	0.0503
DLINDUSTX does not Granger Cause DLMINEX	44	2.00191	0.1167
DLMINEX does not Granger Cause DLINDUSTX		0.20434	0.9343
DLIM does not Granger Cause DLMINEX	44	0.36281	0.8334
DLMINEX does not Granger Cause DLIM		2.07356	0.1053
DLIM does not Granger Cause DLINDUSTX	44	1.41713	0.2487
DLINDUSTX does not Granger Cause DLIM		3.98834	0.0091

As discussed above, the series are of I (1) and co-integrated. In order to check the stability of the model, we check the Granger causality through ECM as presented in Table 4.5. The significance of causality is checked by F-value of the model. The results show that GDP does not Granger cause real industrial exports, Imports while it Granger cause real mining exports. The real mining exports Granger cause real GDP. The real Industrial exports Granger cause real imports and does not Granger cause real mining exports. The results of Granger cause through error correction are partially same to the traditional Granger cause.

Table 4.5: Causality Test through Error Correction Model.

Null Hypothesis:	Obs	F-Statistic	probability
DLMINEX does not Granger Cause DLY	45	2.52808	0.0718
DLY does not Granger Cause DLMINEX		2.56674	0.0687
DLINDUSTX does not Granger Cause DLY	45	1.43026	0.2490
DLY does not Granger Cause DLINDUSTX		1.30835	0.2588
DLIM does not Granger Cause DLY	45	3.40132	0.0273
DLY does not Granger Cause DLIM		1.51452	0.2263
DLINDUSTX does not Granger Cause DLMINEX	45	2.39369	0.0835
DLMINEX does not Granger Cause DLINDUSTX		0.67455	0.5730
DLIM does not Granger Cause DLMINEX	45	0.36380	0.7795
DLMINEX does not Granger Cause DLIM		1.54031	0.2198
DLIM does not Granger Cause DLINDUSTX	45	2.11057	0.1150
DLINDUSTX does not Granger Cause DLIM		2.54667	0.0703

5. Conclusions:

This paper investigated the export-led growth hypothesis using the time series data running from 1959 to 2008for Iran. The paper tested the series for Stationarity and found all series are non-stationary at level but stationary at first difference. The Johansen cointegration results found cointegrating relation among the series. The significance of ECM and F-statistics indicates causal and long term relation among the variables.This study has applied the error correction model to investigate the causality between the mining exports, industrial exports, import and real GDP growth. Before testing causality, both Engle-Granger and Johansen approaches were used to investigate the cointegration long-run relationship between these series was found by applying Johansen's cointegration method. Following the detection of the cointegrating relationship between mining exports and real GDP in terms of Johansen approach, an error correction model was set up to investigate long-run causality. The export led growth hypothesis suggests a causal relation between mining exports, imports and economic growth. It implies that all variables in the system have a tendency to quickly revert back to their equilibrium relationship. From these results, we can comfortably say that the Export-led Growth policies will contribute to economic growth and economic growth will also contribute to growth in export in Iran.

Also the results are favourably comparable to those obtained in the literature. Ming exports and importsGranger cause economic growth. This paper lends support to previous findings of Balassa (1988), Sharma et al (1991) and Islam (2007) that export led to economic growth (ELG). The paper suggests some policy prescriptions. As economic growth of Iran is linked to export, the government of Iran should lay greater emphasis on export mobilizing industries for its development. Iran can expand its limited domestic market by exporting moremineral recourses in order to increase economic growth.

REFERENCES

Awokuse, O., 2005."Export led growth and the Japanese economy: Evidence from VAR and acyclic graph", Applied Economic Letters, 12: 849-858.

Balassa, B., 1988."The lessons of East Asian development: an overview", Economic Development and Cultural Change, *Journal of Development Economics*, 36: 273-290.

Balassa, B., 1978. "Export and economic growth-further evidence", *Journal of Development Economics*, 5(2): 181-189.

Ben-David, D. and M.B. Loewy, 1998. "Free trade growth and Convergence", *Journal of Economic Growth*, 3: 143-170.

Bhagwati, J.N., 1988. Poverty and Public Policy World Development, 16(5): 539-55.

Boltho, A., 1992. "Was Japanese growth export led?", Oxford Economic papers, 48: 415-432.

Chow, P., 1987. "Causality between Export Growth and Industrial Development", Empirical Evidence from the NICs. Journal of Development Economics. 26, 55-63. http://dx.doi.org/10.1016/0304-3878(87)90051-4www.ccsenet.org/ijef International Journal of Economics and Finance Vol. 3, No. 6; November 2011 Published by Canadian Center of Science and Education 11.

Darrat, A., 1987. "Are Exports an Engine of Growth?", Another Look at the Evidence, Applied Economics.

Dickey, D., W.A. Fuller, 1979. Distribution of the Estimates for Autoregressive Time Series with a Unit Root. Journal of the American Statistical Association, 74: 427-431.

http://dx.doi.org/10.2307/2286348

Dickey, D., W.A. Fuller, 1981. "Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root", Econometrica, 49: 1057-72.

http://dx.doi.org/10.2307/1912517

Edwards, S., 1998. "Openness, Productivity and Growth", What Do We Really Know? , Economic Journal, 108(447): 383-398.

Enders, W., 2010. Applied Econometric Time Series. (3e). Wiley, NJ.

Engle, R.F. and C.W.J. Granger, 1987. "Co-Integration and Error Correction: Representation, Estimation and Testing. Econometrica", 55(2): 251-276.

Giles, J.A. and C.L. Williams, 2000. "Export-led growth", a survey of empirical literature and some non-causality results, Part 1, *Journal of International Trade and Economic Development,* 9: 265- 341.

Gujarati, D.N., 2003. Basic Econometrics. New York: McGraw-Hill.

Gupta, S., 1985. "Export growth and economic growth revisited", Indian Economic Journal, 32: 52-9.

Hatemi, J.A., 2002. "Export performance and economic growth nexus in Japan: a bootstrap approach", *Japan and World Economy*, 14: 25-33.

Helpman, E., P.R. Krugman, 1985. "Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition and International Economy", Cambridge, MA, MIT Press.

International Financial Statistics, 2009. Published Central Bank Iran.

Islam, M.R., 2007."The Growth of Privatization in Bangladesh", An Overview. Journal of the Asiatic Society-Bangladesh. Dec, also http://www.asiaticsociety.org.bd/journals/Dec_2007, 1-9.

Johansen, S., 1995. Likelihood-based Inference in Cointegrated Vector Autoregressive Models, Oxford, Oxford University Press.

Johansen, S., 1991. "Estimation and Hypothesis testing of Cointegrating vectors in Gaussian Vector Autoregessive Models", Econometrica, 59: 1551-1580.

Jung, Woo, S. and P.J. Marshall, 1985. "Exports, Growth and Causality in Development Countries", Journal of Development Economics, 18: 1-12.

Miller, S.M. and F.S. Russek, 2001. "Co-integretion and Error Correction Models", The Temporal Causality between Government Taxes and Spending, Southern Economic Journal, 57: 221-229.

Shan, J. and F. Sun, 1998. "Export-led growth hypothesis for Australia", an empirical re-examination, *Applied Economic Letters*, 5: 423-428.

Sharma, S.C., N.M. Norris and D.W. Chung, 1991. "Exports and economic growth in industrialized countries", *Applied Economics*, 23: 697-707.

Toda, H.Y. and T. Yamamoto, 1995. "Statistical Inference in Vector Autoregressions with Possibly Integrated Processes", Journal of Econometrics, 66: 225-250.

World Trade Indicators, 2009.

Yamada, H., 1998. "A note on the causality between exports and productivity", an empirical reexamination". Economics Letters, 61: 111-4.

Zuniga, H.C., 2000. "Export-Led Growth in Honduras and the Central American region", Master Thesis, The Department of Agricultural Economics and Agribusiness,Louisiana State University. http://etd.lsu.edu/docs/available/etd-12032004- 70104/unrestricted/Final_Thesis_Document.pdf