NEXUS BETWEEN GDP GROWTH RATE AND TEA EXPORT IN INDIA

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Abstract: The paper establishes the nexus between Indian tea export and GDP growth rate during 1951-52-2013-14 and prescribed some policies relating to export management of tea. The model of semi-log linear trend line states that Indian tea export significantly increases at the rate of 6.43% per year during the study period of 1951-52-2013-14. Even this trend line has significant exponential relationship with time. Double log linear model between GDP growth rate and tea export showed that one percent increase in tea export of India led to 0.625% increase in GDP growth rate per year significantly during the specified period. The residual tests confirmed that it has serial correlation and ARCH errors. Even they are related exponentially significantly. Granger causality test proved that causality is uni-directional. Johansen co-integration test showed that GDP growth rate and tea export is co-integrated in the order of C(1).The VAR model is stable and divergent which were shown by unit root circle test and impulse response functions respectively. Even VAR residual test confirmed that the residuals are not multivariate normal. VEC model showed that error correction process is quick and significant. VEC model is stable which is confirmed by unit root circle test. But ARIMA (1,1,1) model of tea export states that it is stationary and stable which has no ARCH errors but has GARCH errors. Therefore, minimization of tea export volatility might be better option for getting good fit model between tea export and GDP growth rate.

The paper highlighted some of export management policies of tea export in India such as ,[i] to improve productivity and quality,[ii] to improve tea variety and packaging,[iii] to improve labour intensity,[iv] to reduce cost of production in comparison to Indonesia,[v] to reduce gap between auction price and retail price,[vi] to train labourers for plantation and processing,[vii] to improve R & D ,[viii] Tea Board should be given more power to [a] approve inspection agency,[b] approve tea taster,[c] cancel permanent licensing,[ix] to liberalise export licensing system of tea,[x] to emphasis more on FTA on tea export with ASEAN,SAARC,BRICS blocs, and [xi] to fit India tea export with WTO labour standard rules.

Key words: tea export, GDP growth rate, co-integration, causality, VAR, VECM, export management of tea
JEL—C32, E61, F14, F62.

Introduction: Tea is the oldest and the most widely consumed beverage in the world after water. It is estimated that there are over 2,000 different types of tea .Being a tropical crop, tea is produced chiefly in the developing countries of South Asia, Africa, and Latin America. In South Asia tea is cultivated in India, Sri Lanka, China, Indonesia, Turkey, and Bangladesh. In Africa tea is chiefly cultivated in Kenya and to a small extent in Malawi, Rwanda, and Tanzania. In Latin America, Argentina is the only significant producer of tea. Historically India has played a dominant role in global tea trade. Even today, despite a fluctuating share in world exports, India is a key source for tea as well as providing the largest market.

Indian tea export occupies an important place to step up GDP significantly. India produces about 30% of world tea and exports about 13.35% in the world market. India's competitors are China, Kenya, Indonesia and Sri Lanka. India can take advantage from the world's excess demand for tea amounting to 87 million Kg. India has a long historical background of tea production and export since British imperial period which is to be nourished carefully in the multilateral trading regimes. In this liberalized economic environment, institutional arrangements and State intervention move towards removal of tariff barriers. So the survival depends on maintaining export competitiveness. This focus on attaining export competitiveness intensified in the new liberal trade environment following formation of WTO and signing of various multilateral trade agreements. Thus it became imperative for the Indian tea industry to be price competitive both in domestic and foreign markets.

Therefore, this paper brings light into the nexus between tea export and growth rates of GDP in India during 1951-52-2013-14 .Based on this result, some policies will be prescribed for betterment of India's tea export in the offing.

Literature review: There are many economic literatures in which export and import induced GDP growth rate but a few studies have been done on the nexus between tea export and GDP growth rate in India. Mithamia and Muturi(2015) studied that there is a direct relationship with tea export earnings ,real exchange rate, tea price, exports of goods and services and agricultural value addition using cointegration and VAR models in Kenya during 1980-2011.Alkheteab and Sultan (2015) found that there exists a long run cointegration relationship between agricultural export of India and REER, demand for agricultural products, agricultural production and India's per capita income which Granger cause agricultural

exports in the short run as well as in the long run. Kiptui (2007) showed a long run relationship between Kenya's tea export with REER during 1995-2004 using ARDL approach of cointegration and VAR models. Maity and Ghosh(2015) verified policy changes in the relationship between tea export and trade openness during 1992-93-2011-12 in India using Phillips Perron Non –Parametric Test.

Methodology and Data: To relate Indian tea export and GDP growth rate, semi-log and double log linear models have been used. Non-linear model was also used to analyse trend value of tea export and its relation to growth rate. ARIMA(1,1,1) model explains the stationarity of tea export and GARCH (1,1)model showed its volatility. Granger model (1969) was used to show causality between growth and tea export. Residual tests for serial correlation, heteroscedasticity and normality were also done. Johansen cointegration and VAR models (1991,1996) have been used to show the relationship between tea export and GDP growth rate in India during 1951-52-2013-14.Unit root circle test, impulse response functions, Doornik Hansen normality test were also conducted. VEC model was also used to show the character and speed of error correction process. The data of tea export in India during the specified period were collected from Tea Board of India and GDP growth rates were collected from the Planning Commission of India.

Observations from Econometric models: The estimates of semi-log linear model showed that tea export in India has been increasing at the rate of 6.43% per year during 1951-52-2013-14 which is significant at 5% level.

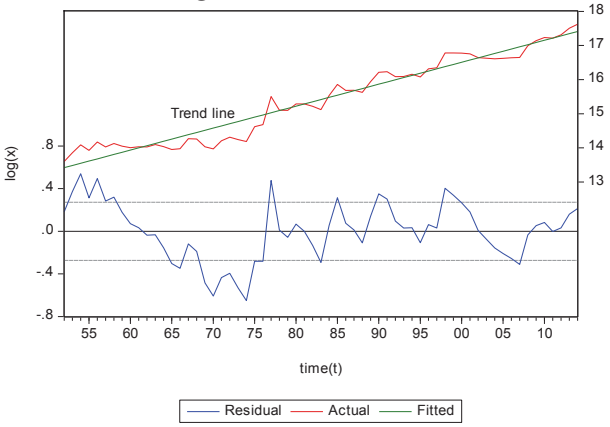
Log(x)=13.35603+0.06436t

(191.942)*(34.0427)*

R^2=0.9499 , F=1158.908 ,DW=0.501 , x=tea exports of India (in 'ooo Rupees,) t-time, *=significant at 5% level.

In Fig.-1, the estimated linear trend line is shown by green line and the actual line is plotted by red line and the residual line is shown by blue line.

Fig 1: Linear trend line



Source-Computed by author

On the other hand, the GDP growth rate of India has been increasing at the rate of 3.69% per year during the period which is significant with low R^2 whose estimated regression is shown below.

Log(g)=-0.20608+0.036961t

(-0.36353) (2.3997)*

R^2=0.086 , F=5.758* ,DW=2.011 where g=growth rate of GDP of India , *=significant at 5%

ARIMA (1,1,1) model claims that tea export series is stationary where both AR(1) and MA(1) are convergent since they are less than one and the t values of the coefficients are significant at 10% level. The estimated model is as follows.

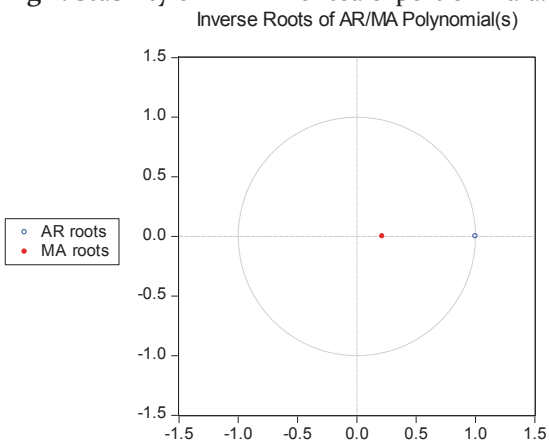
$\text{Log}(x_t)=413.1649+0.99984\log(x_{t-1})+\varepsilon_t-0.215876\varepsilon_{t-1}$

(0.00988) (59.3026)* (-1.67367)*

R^2=0.974 ,F=1139.333*,DW=1.9049 ,AR root=1,MA root=0.22 , *=significant at 10%

The stability of the model is verified by the unit root circle where both lie in the circle.

Fig 2: Stability of ARIMA of tea export of India.



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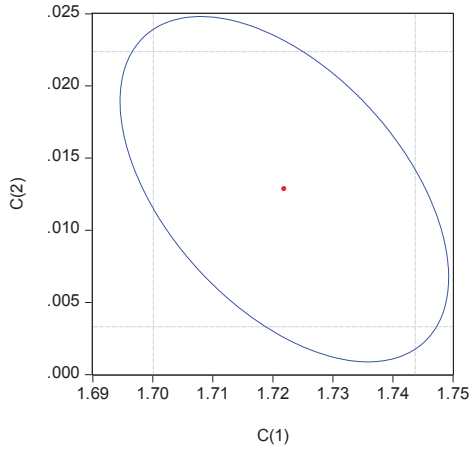
Since the nature of Indian tea export is nonlinear then we can fit an exponential trend line during the specified period whose estimate is given below,

$$logx = e^{1.7219+t^{0.012846}}$$

R^2=0.7670, DW=0.127, the t values of constants are 157.89, 2.6945 which are significant at 1% level.

The diagnostic test for coefficient is verified by confidence ellipse which is significant at confidence limit of ±0.05% and it is shown in Fig-3.

Fig 3: Confidence ellipse



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The log variable of tea export in India during 1951-52-2013-14 was observed as too much volatile which was verified by GARCH(1,1) model .In the model the null hypothesis is rejected since z statistics of α and β are insignificant even R^2 is spurious with low SC and AIC.It is also non-stationary because α+β>1.

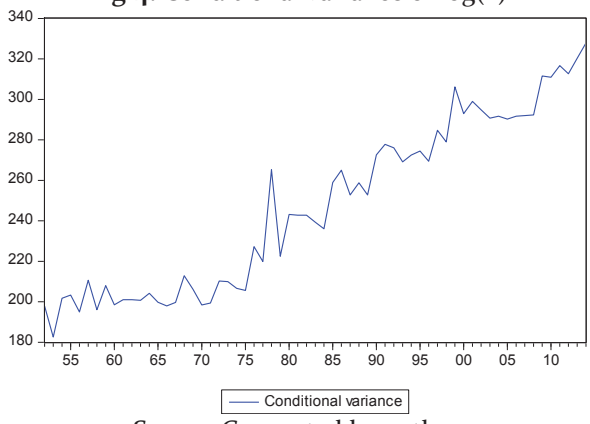
σ_t^2=-33.6388+1.68829ε_{t-1}^2-0.4865σ_{t-1}^2

(-0.00255) (0.0166) (-0.00549)

R^2=-164.82, SC=8.50, AIC=8.39, DW=0.000169

The variability was shown by conditional variance given below.

Fig-4: Conditional variance of log(x)



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On the other hand, India's GDP growth increases at the rate 3.69% per year during 1951-52-2013-14 which is significant at 5% level although R^2 is very low.

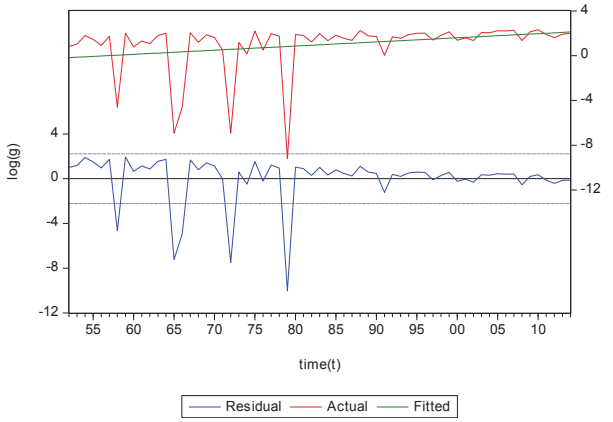
Log(g)=-0.20608+0.0369t

(-0.3635) (2.399)*

R^2=0.086, F=5.758*, DW=2.011, g=GDP growth rate,*=significant at 5% level

This estimated trend line of growth rate of GDP is shown in Fig-5.

Fig 5: Trend line of growth rate of GDP



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The double log linear model states that one percent increase in exports of tea per year in India led to 0.6255% increase in GDP growth rate per year during 1951-52-2013-14 which is significant. The estimated line is shown below.

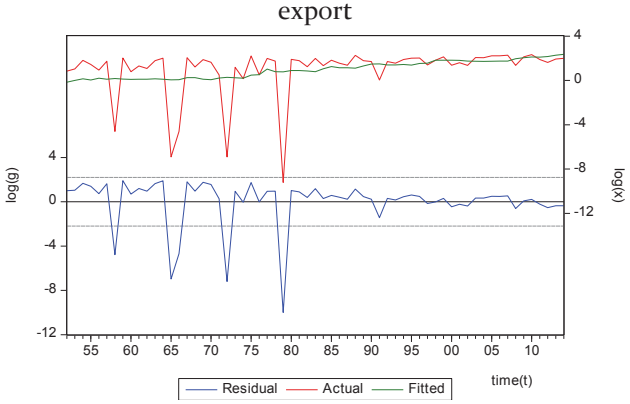
Log(g)=-8.66672+0.6255log(x)

(-2.4318)* (2.714)*

R^2=0.1077, F=7.366*, DW=2.04, *=significant at 5% level.

In Fig-6, the estimated trend line is shown by the green line.

Fig 6: Relationship between GDP growth and tea export



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The relationship between Indian tea export and GDP growth rate is non-linear which is estimated as below and found statistically significant.

$$\log(g) = e^{-2.70836+x^{0.13346+ut}}$$

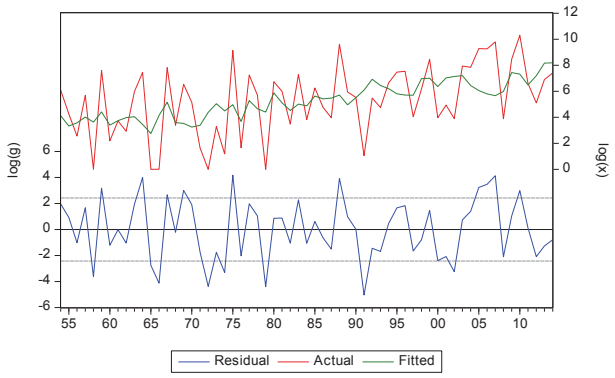
Where U_t=-0.20523U_{t-1} – 0.10253U_{t-2}

(-1.550) (-0.778)

R^2=0.251043, F=0.3686*, DW=1.99, AR roots = -0.10±30i, t values of C(1)=-2.576* and C(2)=16.22* are significant.

This estimated equation is plotted in the Fig-7 below where green line is the estimated trend line.

Fig 7: Non-linear relation



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The Breusch –Godfrey residual test for serial correlation LM test asserts that it has serial correlation problem since nR^2=1.481987 whose Chi-Square value is 0.4766 which is not significant.

Even, it has ARCH error because residual heteroscedasticity test proved that nR^2=0.03497 whose Chi-Square value is 0.85 and F=0.0338 both which are insignificant .The estimated equation is given below.

$\varepsilon_t^2 = 4.6186 + 0.023757\varepsilon_{t-1}^2$

(2.219)* (0.1840)

R^2=0.00056, F=0.0338, DW=1.99, *=significant

Granger causality test assures that Indian tea export and GDP growth rate during 1951-52-2013-14 have uni-directional causality as shown below where Ho= rejection of the hypothesis.

Table 1: Causality test, Lag-1

Null Hypothesis:	Obs	F-Statistic	Prob.
X does not Granger Cause G	62	13.5046	0.0005
G does not Granger Cause X		0.31262	0.5782

Source-Computed by author

Moreover, Johansen cointegration test showed that both Trace statistic and Max Eigen Statistic have two cointegrating equations and they are cointegrated in the order of C(1).

In Table-2, it is shown in details.

Table 2: Cointegration test

Hypothesized		Trace	0.05	
No. of CE(s)	Eigen value	Statistic	Critical Value	Prob.**
None *	0.301996	28.97620	15.49471	0.0003
At most 1 *	0.116095	7.404342	3.841466	0.0065
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigen value	Statistic	Critical Value	Prob.**
None *	0.301996	21.57186	14.26460	0.0030
At most 1 *	0.116095	7.404342	3.841466	0.0065

Source-Computed by author, *=rejection of null hypothesis

The estimated VAR model using lag1 is given below through equations.

$\log G_t = -9.0239 - 0.028456\log G_{t-1} + 0.65215\log X_{t-1}$

(-2.31)* (-0.2182) (2.5559)*

R^2=0.1053, F=3.475, SC=4.59, AIC=4.49

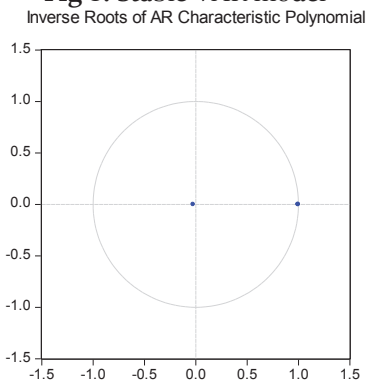
$\log X_t = 0.08405 - 0.004498\log G_{t-1} + 0.99903\log X_{t-1}$

(0.2459) (-0.3933) (44.639)*

R^2=0.974, F=1107.30*, SC=-0.2695, AIC=-0.3724

This VAR model is stable because two roots lie inside the unit root circle which is shown in Fig-8. The values of the two roots are (0.99616,-0.02559).

Fig 8: Stable VAR model



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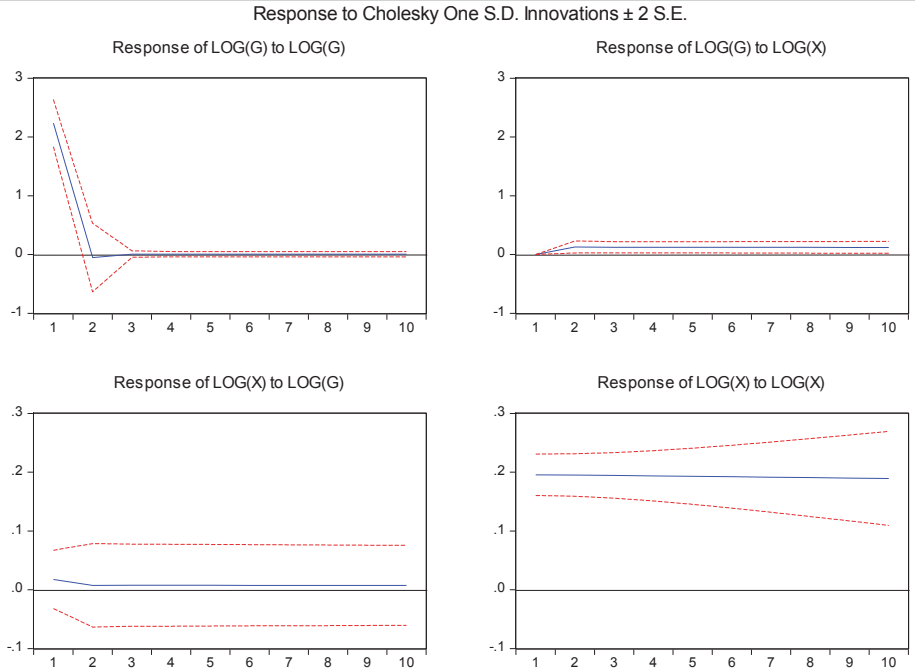
Any exogenous shock would not bring this VAR model back into equilibrium so that it is divergent which is proved by the Impulse Response Functions which do not tend to zero. In Fig-9, impulse response functions are given.

Fig 9: Impulse Response Functions



Source: Computed by author

Doornik-Hansen VAR residual normality test confirmed that component 2 of kurtosis is not significantly distributed but all other components are significant, so that residuals are not normally distributed.

Table 3: Normality test

Component	Skewness	Chi-sq	df	Prob.
1	-2.876161	37.87082	1	0.0000
2	1.046144	10.19914	1	0.0014
Joint		48.06996	2	0.0000
Component	Kurtosis	Chi-sq	df	Prob.
1	11.42696	147.8118	1	0.0000
2	5.566278	0.746431	1	0.3876
Joint		148.5582	2	0.0000

Component	Jarque-Bera	df	Prob.	
1	185.6826	2	0.0000	
2	10.94557	2	0.0042	
Joint	196.6281	4	0.0000	

Source: Computed by author

The estimated VEC Model confirmed that the error corrections of both the changes of tea export and GDP growth rate are significant at 10% level but the speed is very low. The t values of the coefficients of the first equation are significant.

$\Delta logX_t = 514923.3 + 0.347493\Delta logX_{t-1} - 218981.6\Delta logG_{t-1} - 0.0197EC$

(2.129)* (2.775)* (-2.389)* (-1.735)*

R^2=0.183, F=4.28, SC=31.82, AIC=31.68,

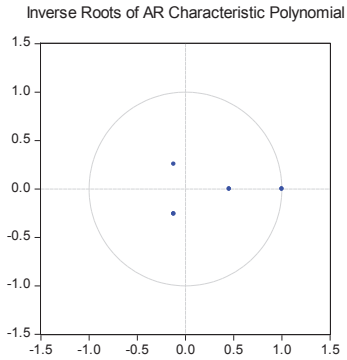
$\Delta logG_t = -0.0391 + 1.78E\text{-}07\Delta logX_{t-1} - 0.0068\Delta logG_{t-1} + 9.22E\text{-}08EC$

(-0.1133) (0.9980) (-0.0524)

R^2=0.5658, F=24.46, SC=4.89, AIC=4.76, *=significant at 5% level.

Although the VECM is stable as had been proved by the unit root circle test where all roots lie inside the circle. It is shown in Fig-10.The roots are (1.0,-0.079678±0.383448i,-0.025758).

Fig 10: Stable VECM



Source: Computed by author

Limitations and Scope of future research: There may be several variables which influence the nexus between GDP growth rate and tea export. Such variables are exchange rate (nominal as well as real),inflation rate, price of tea, trade openness, climate change which should be included in the cointegration and VAR analysis so that broader areas of determinants can be explained and policies would be easy to prescribe and to execute. The causes of volatility of tea export should be explored so that production processes can be modified. Whether labour unrest and problem of electricity and social security of labour are related to volatility of export must be explored for future research .Cointegration between the regional export intensity and agricultural value addition relative to GDP may be analysed in case of tea export.

Policy recommendations: To increase the export competitiveness of tea, the following policies may be considered,

1. Need some transparent price determining mechanism,
2. packaging industry of tea should be upgraded,
3. reforms of bank lending policies on tea industry are necessary,
4. maximum residual limits in non-tariff barriers and social clauses in plantation sector problems should be minimized,
5. forward integration and branded formation should be focal point to increase export,
6. greater market integration with blocs and individual nations in new WTO rules are urgent,
7. make tea industries organized,
8. improvement of labour intensity and productivity are must,
9. reduction of cost of production with respect to Indonesia is needed,
10. reduce the gap between auction price and retail price of tea export,
11. training of labour in plantation and processing are needed, [xii] R and D must be improved.

In context of export management policies, the following are helpful to increase export of Indian tea.

1. export licensing system and fee should be liberalized,
2. export contract registration should be update,
3. cancellation of permanent license is urgent,
4. power to issue directives by licensing authority,
5. power to approve inspection agency,
6. power to approve tea taster,
7. explore the causes of MNC domination in tea market,
8. speed up FTA on tea trade with SAARC, ASEAN, BRICS, EU, and NAFTA,
9. Tea Board must take steps to increase the quality of non-instant and instant tea,
10. diversify the tea quality,
11. Reform the Tea Board.

Conclusion: The paper concludes that Indian tea export and GDP growth rate are cointegrated in the order of C(1) and they are significantly positively correlated although high volatility of tea export during 1951-52-2013-14 was noticed. The package of export management, licensing system, deficiency of tea production and international price competitiveness policies are needed to implement soon. Multivariate analysis of cointegration and VAR may produce new ideas to boost India's tea export in future.

References:

1. Dr. Rinalini P. Kakati, Chayanika Senapati, Evaluating Motivators and Hygiene Factors interactive; Business Sciences International Research Journal ISSN 2321 – 3191 Vol 2 Issue 1 (2014), Pg 211-225
2. Alkheteab, Tarek Tawfik and Zafar Ahmed Sultan.,2015,Determinants of India's Agricultural Exports, *European Journal of Business Management*,Vol-7,No-1.
3. Asopa, V.N.,2009,India's Global Tea Trade, Centre for Management in Agriculture, IIM, Ahmedabad, December, *CMA Publication No-235*
4. Bhatt, Viral., 2012, A Global Study Report on Revitalising Indian Tea Export in Russia, submitted to Gujarat Technological University, March.
5. Enders, W., 1995, *Applied Econometric Time Series*, John Wiley & Sons, New York.
6. Ganguly, Arnab., Keya Ghosh and Susmita Biswas.,2010,Tea Export and its impact at the grassroots, *CUTS Briefing No-1/2011*.
7. G.O.I., 2005, Tea Distribution and Export Control order, Ministry of Commerce and Industry.
8. Dr. Jaideep Motwani, Dr. William Mothersell, Application of Lean to Higher Education; Business

Sciences International Research Journal ISSN 2321 – 3191 Vol 2 Issue 1 (2014), Pg 231-234
9. Granger, C.W.J.,1969, Investigating Causal Relations by Econometric Models and Cross-spectral Methods, *Econometrica*, 37(3), 424-438.
10. Johansen,S.,1988,Statistical Analysis of Cointegrating Vectors. *Journal of Economic Dynamics and Control*, Vol. 12,231-254.
11. .....,1991,Estimation of Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models, *Econometrica* 59,Nov,1551-80
12. Devika Swamy, Rajeshwari Chettiar, Communication and Teamwork: the Root of Supply; Business Sciences International Research Journal ISSN 2321 – 3191 Vol 2 Issue 1 (2014), Pg 239-242
13. .....,1994, The role of the constant and linear terms in cointegration analysis of nonstationary variables. *Econometric Reviews*,13, 205-229
14. Johansen S., 1995, *Likelihood-Based Inference in Cointegrated Vector Autoregressive Models.*Oxford University Press.
15. .....,1996, *Likelihood-Based Inference in Cointegrated Vector Autoregressive Models,*2nd edition, Oxford University Press.
16. ..... and K.Juselius.,1990,Maximum likelihood estimation and cointegration with application to the demand of money. *Oxford Bulletin of Economics and Statistics*,52(2),169-210.
17. Juselius,Katarina.,2006,*The Cointegrated VAR Model*, Oxford University Press.
18. Joy D'souza, Nishant Mehta, An Empirical Study on Competency Mapping of Operators; Business Sciences International Research Journal ISSN 2321 – 3191 Vol 2 Issue 1 (2014), Pg 205-210
19. Kiptui,Moses.,2007,Does the Exchange Rate matter for Kenya's Exports? A Bounds Testing Approach, *African Econometric Society Conference*, July.
20. Maity, Shrabanti and Maumita Ghosh.,2015, India's Tea Exports in the scenario of trade openness: An Analysis of trend and structural shift, *American-Eurasian Journal of Scientific Research,*10(1):01-11.
21. Mithamia, Ages Kinya and Willy Muturi.,2015, Determinants of earnings from tea export in Kenya :1980-2011,*Journal of World Economic Research*,4(1),15-22.
22. Joy D'souza, Nishant Mehta, An Empirical Study on Competency Mapping of Operators; Business Sciences International Research Journal ISSN 2321 – 3191 Vol 2 Issue 1 (2014), Pg 199-204
23. Sarkar,Kingshuk.,2014,Changing Institutional Architecture and India's Export Competitiveness in Tea, *NRPPDD,DP NO*-35,GOI,Centre for Indian Development Studies, Thiruvanthapuram.
24. Sivanesan, R.,2013,Tea Industry in India—Analysis of import and export of Tea-International *Journal of Business and Management Invention*.Vol-2,Isuue-8,August,9-15.
25. R.S.Sathya Saminadan, A Study on Return on Search and Criteria for Business; Business Sciences International Research Journal ISSN 2321 – 3191 Vol 2 Issue 1 (2014), Pg 226-230

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