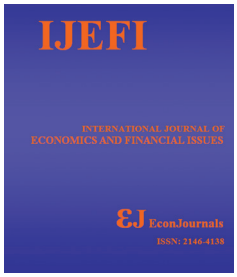

International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2016, 6(1), 118-131.

An Empirical Analysis of the Prominent Roles of Taxations in the Synchronicity on Boost of Maritime Industry in Singapore

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ABSTRACT

This research examines the causal nexuses of the taxations and financial elements in the synchronistic policy that Singapore has applied to radically boost its maritime and offshore fields to develop its economic growths (EGs) and make Singapore to be a remarkable country in the world in term of ships building volumes, the numbers of ship registries, and the numbers of deadweight in thousands tons arriving at ports nowadays. There are several factors relating to the EGs and increased numbers of vessels arriving at ports for instant those are the volumes of import and export merchandises, prices of petrochemical and refined oils, services, etc. In this research, it is aimed at decipher the real effectiveness, the interferences, and the prominent roles of corporate tax (TAX) when it is employed together with the domestic credit to private sector (CRE_X1), the real interest rate (RRATE_X2), and the listed stock companies (STOCK_CO) in one synchronous-financial model during the 1980-2014 period by using the co-integration and vector error correction models for Granger causality tests, and based on the empirical findings, policymakers could find some interesting issues to their developing plans, hopefully.

Keywords: Maritime and Offshore Industry, Economic Growth, Co-integration, Granger Causality Tests, Singapore
JEL Classifications: C1, C2

1. INTRODUCTION

The concerns of how to use the governmental roles and financial elements as the significant engines to maximum boost effectively the economic growths (EGs) are not the new issues but have been long debated and discussed through several decades by several economic round tables, seminars and research. The biggest concerns of many governments are directly addressed to the key topic of how to harmonically and catalytically glue the different and separate powers of each financial elements into one unified power, in order to significantly boost the EGs and create the key major products, to change and develop their own countries. In many cases, it seems that the financial policies have been processed after some decades but the final results are still far away between what the expectations and what the real outcomes are. In certain countries, ironically some critical cases are recorded that the governmental roles and policies were applicable, but went wrongly and created the internal-friction-tools which were deserved to some personal-gained-groups, or some powerfully controlled-domestic-business-groups instead of giving all benefits to the whole nation. Thus the critically hung on questionnaires are, how those ideal policies could effectively be public, reasonably applied and not only create enough jobs, but also reserve the profitably social and economic symmetries for all people, fairly treat to all other developing industrial fields as the key challenge for the future, as Singaporean government has successfully done? The findings of those critical concerns will be helpful to the other developing industries to play the key role in their countries is expected.

Since 1966, Singapore has early recognized its own heavy obstacles and shortages of unnatural sources but richness of multi-nationalities with paradoxical cultures, gaps of languages and knowledge; shortages and weakness in financial systems; its competitiveness is eroded and much behind other countries hence its strategy has to create the new environmental activities to increase EGs, staying competitiveness in the areas of existing strength through the restructuring roles and engines policies to boost its maritime and offshore ship building and a home sea-port

hub as seen today. Feridun and Sissoko (2011) from 1976 to 2002 investigated to Singapore's causal nexuses of foreign direct investment, policies, finance and EGs have been extensively investigated in their paper to analyze the outstanding policies between Singapore and other countries as well.

There are great studies to the roles of taxes in EGs but not many researches precisely analyze the specific activities of all joined variables in the selected regressions models to decipher the hypothesis of how and what the prominent roles of taxes and every variables when they will interactively act together in one synchronicity to boost Singapore's EGs and maritime and offshore fields.

This research is aimed at analysis, deciphering through the modules of co-integration and causal analysis to break down the critically prominent role of all joined variables that have been applied, and whether this long-term equilibrium of roles and engines could be continuously existed, successfully keep its EGs in qualitative and quantitative terms in the future or not, if the same methods are intentionally applied. The remainder of this paper is organized to be divided into: Section (2) briefly reviews all the literatures on the causal nexuses of taxations and other policies on the EGs, section (3) presents all data and applied methodologies, section (4) will critically analyze and decipher the causal nexuses of restructuring tax systems and other financial elements on the increased volumes of deadweight in thousands tons of vessels arriving Singapore ports, and the empirical results finding then ending by how the policies are implemented as well and conclusion in section (5).

2. LITERATURE REVIEWS

2.1. Will Governmental Roles Act as Significant Catalytic Process to Support EGs?

Finkelstein (2007) saying that in a fully salient tax system, some individuals are aware of actual tax rates as an important issue to make the economic decisions, and in a less salient tax system, some individuals do not directly observe the actual tax when making economic decisions, instead, the form a belief about the tax. Esin Cakan (2013) proved the stock market and economy are closely linked as empirical findings in the UK and the US which have established stock markets and are usually regarded as being financial market based economies. The governmental engines are important in financial policies despite their inherent fragility, financial institutions underpin economic prosperity, and finance systems help mobilize and pool saving, provide payment services that facilitate the exchange of goods and services, produce and process information about investors and investment projects to enable efficient allocation of funds, monitor investment and exert corporate governance after these funds are allocated. And if finance would play an important role for the economic development, the government could also help diversity, transform and manage risk regarding to the investment activities. Using aggregate U.S time series date over 1963-2004 period for tax policy on growth rates included regional dummy variables, Barry W. Poulson et al. (2008) conducted a regression analysis of the relationship between taxes and EG to explore the impact of policy variables. Their study reveals that the convergence implies a negative relationship between growth rates may be due to the differences in initial levels of income per capita, and revealed states with lower initial levels of income per capita experienced higher rates of EG, and tax policies were significant determinants of differential growth rates in the states.

Wilterdink (2013) determined that it is very simple, state should cut taxes to boost EG or people will move to lower-tax states, and companies will relocate their business to lower-tax states too. Romer and David (2007) made in detailed investigation of the impact of changes in the level of taxation on economic activity and effects of tax changes by observing omitted variables bias to avoid resulting in inaccurate estimates of the macroeconomic effects of tax changes in the postwar United States. They found most significant tax changes have a dominant motivation that fits fairly clearly into one of four categories: Counteracting other influences on the economy, paying for increases in government spending (or lowering taxes in conjunction with reduction in spending), addressing an inherited budget deficit, and promoting long-run growth. Engen and Skinner (1996) after doing all econometric analysis, finally extracted the lessons for policy that tax policy does affect EG, saying that tax reforms are sometimes touted as having strong macro EG effects and, there is enough evidence linking taxation and output growth to make the reasonable inference that beneficial changes in tax policy can have modest effects on output growth. Same result, Ferede and Dahlby (2012) examined the impact of the Canadian provincial governments' tax rates on EG using panel date covering the period 1977-2006, finding that a higher provincial statutory corporate income tax rate is associated with lower private investment and slower EG.

Engen and Skinner (1992) using a sample of 107 countries during the period 1970-1985 to investigate the effect of government expenditures and taxation on GPD growth rates, finding strong and negative effects of both government spending and taxation on output growth, and the implied behavior parameters from the model suggest that the allocation of factor inputs are sensitive to intra-sectoral tax distortions and finally, is concluded the evidence from the empirical record appears to point towards an important role of fiscal policy in affecting output growth. Seeing the viewpoint of trade policy and EG, Rodriguez and Rodrik (1999), examined on the fragility of the coefficients on the openness indicators are particularly sensitive to controls for these other policy and institutional variables, and are skeptical that there is a strong negative relationship in the data between trade barriers and EG, at least for level of trade restriction observed in practice, and there are two major issues are being concerned as, firstly in cross-national work, it might be productive to look for contingent relationship between trade policy and growth, and secondly there is much to be learned from micro-econometric analysis of plant level data-bets.

Widmaln (2001) using the econometric regression model, ending that economic theory predicts that different taxes have different growth effects and that, ceteris paribus, progressive tax is bad for EG. Demirguc-Kunt (2008) viewing the differences of why the EG levels of each country and how the intervention of government into the financial systems and legal and information infrastructure. Bell (2002) saying that dating back to the rise of the modern

environmental movement in the late 1960s, business initially saw environmental obligations as an "added cost, "and were very reluctant to go "beyond compliance" while often actively campaigning to minimize environmental regulation." Same opinion, Hossein Jalilian, et al. (2006) when using an econometric model and Cobb-Douglas' modeling with the joined variables of output level, level of productivity, stock of capital, stock of labor, to test the hypothesis that the efficiency and quality of regulation affects the economic performance of an economy, found that the role of an effective regulatory regime in promoting EG and developing country is clearly shown through the provision of a regulatory regime that promotes rather than constrains EG and is an important part of good governance, and there are good a priori grounds for assuming that better regulation leads to more repaid EG and the empirical results are consistent with the view that "good" regulations is associated with higher EG in lower-income economies.

Reckoning on the power and aggressive actions of local government to boost the EGs specifically, Bandow (1997) concluded that trade restrictions alone were costing these countries between four and ten percent of their GDP and countries that improved their policies–Brazil, Colombia, and South Korea–significantly improved their employment and output, Sri Lanka changed governments, and economic policies, in 1977; the resulting liberalization had dramatic economic results. A 1993 Bank review of the adjustment experience of 18 developing countries, boom, crisis, and adjustment, found that good policies, especially freer trade and macroeconomic stability, were important for economic success and the East Asian economic powerhouses of today–Hong Kong, Japan, Singapore, South Korea, Taiwan–were much poorer than such Latin American countries as Argentina after World War II. Of the many differences between them, the most important is the economic road taken. Latin America firmly embraced the dirigisme model. East Asia chose various forms of capitalism, and the real answer is less government. That is, when it comes to development, the state's role in society is to provide the legal framework and physical security for private economic activity, not to act as an agent of economic change itself.

Standing on economic view, economic-online UK claims economic stability enables other macro-economic objectives to be achieved, such as stable prices and stable and sustainable growth and policies to promote stability are selected as fiscal stabilizers; floating exchange rates; flexible labor markets; monetary policy and policies to promote sustainable growth are technology policy; reducing red-tape and de-regulation; providing incentives; tax reform; increasing competitiveness and contestability; new markets; infrastructure. The governmental roles and engines not only create the chances for big companies or state groups who not only could possibly be promised to contribute more their incomes to nation, but also provide new opportunities for the middle and private sectors too as well. Talking about the role of government in supporting to corporate, Bell (2002) posited that in selecting policy instruments to advance sustainable enterprise, it is important to recognize that business vary widely regarding their knowledge of, and commitment to, sustainability, governments need to be aware of these differences and devise appropriate ways of dealing with business that are at different points along the curve. Discerning the roles of government, Reinert (1999) offers three crystalline roles, firstly as a provider of institutions in the widest sense ("establishing the rules of the game"/"providing an even playing field"), secondly as a provider of income distribution and as an "insurance company" (preventing evil/"sharing the pie"); and thirdly as a provider of EG (promoting happiness/"increasing the size of the pie"), and with mentioning to the internal conflict of local regulations. One research is released by OECD on the role of government via tax reforming, pointing the growth-oriented tax systems seek not only to minimize the distortions of market signals by the tax system, but also to create as few obstacles as possible to investment, innovation, entrepreneurship and other drivers of EG (OECD, 2010:1).

With higher taxes comes slower growth. The more the government consumes of the economy, the less scope there is for the private sector. Yamarik Steven (1999) found that an increase in tax progressivity through time reduced the transitional growth rates while maintaining the same steady-state growth rate. The high-tax option is not only uncomfortable for individuals but also lowers the horizon of future prosperity. William C. Barrett (2009) asserted that tax, as a cost variable in deciding investment location, has a direct impact on locating manufacturing and research and a corresponding direct impact on EG and employment. A higher tax rate negatively affects share values, which in turn negatively affects retirement accounts and pensions and the ability to fund healthcare reform.

2.2. The Causal Nexuses of Singapore's Roles and Engines to EGs, Maritime and Offshore Growths

The key drivers of EGs in Singapore are derived from sea port facilities, maritime and offshore services and new building, financial and banking systems besides tourists and business services, petroleum refineries, and import and exports, etc. which are seen to really play the crucial key roles. The relationship between Singapore's roles to maritime and offshore growths have been radically discerned through its financial systems, tax reforms including corporate taxes, personal income taxes, tariffs of port services, and the remarkable numbers of registered shipping companies have been cordially and attractively deployed by Maritime and Port Authority (MPA) of Singapore and their affiliated companies. The numbers of shipping firms will contribute to the accomplishing of Singapore's global maritime aspiration to become a leading in maritime industry. The Ministry of Trade and Industry of Singapore clearly stated that they have identified specific recommendations to strengthen Singapore's economic competitiveness and capabilities through adjustments in the tax systems; for companies and business, lower taxes and other proposed changes would encourage new investments, promote local enterprises, reduce business costs and enhance competitiveness, and the cut in corporate tax rates would result in a significant tax savings for small and medium enterprises (www.mti.gov.sg).

Verifying the financial systems is impacted to time series of EG, Giri and Mohapatra (2012) using vector autoregressive (VAR), Johansen (1998) and Johansen and Juselius (1990) using vector

error correction model (VECM) models to test the EG, gross domestic product (GDP), gross domestic capital formation by private sector to GDP and finance development in India, found that all the data series to be non-stationary in levels and stationary in first differences, and a long run equilibrium relationship exist among variable of financial development and EGs for Indian economy. Qayyum et al. (2012) when examined an empirical relationship between financial development and EG while incorporating the inflation rate effect on financial development, highlighted present evidence in using panel data of low income countries, applying panel causality analysis, unit root test, for heterogenous panel data, reported that the direct finance is significantly positively related to EG, but the indirect finance does not have an impact to EG, Guariglia and Poncet (2009) using key data of financial intermediary development and distortions, measure of real per capita GDP growth and its components in Mainland China with annual data for the period 1989-2003, utilized the VAR approach, conclude that there are indeed circumstances under which financial distortions do not represent to growth in China after all.

Through reviewing various historical literature, Alex William Trew (2005, revised 2006) having a bit of points of view when using the historical literature surveyed briefly, strongly suggests that current theories of finance and growth do not depict adequately the experiences of countries going through industrial revolution. A potentially more fruitful avenue for research will be established the historical experience of industrialization, asymmetric information and intermediation, and then construct a growth theory founded in microeconomics that more faithfully reflects it.

3. DATA COLLECTIONS AND METHODOLOGIES

3.1. Data Collections

This research will employ the time series data of Singapore from 1980- 2014 period for the numbers of deadweight (DWT) in thousands tons of vessels arriving Singapore ports, such as bulk carrier (BULKCA), container ships (CTNSHIP), oil tankers (OILTNK), general cargo (GNCAR), other ships (OTHRSHIP), total ships (TTNSHIPS). The corporate tax rates (TAX) and other financial elements such as domestic credit to private sector (CRE_X1), real interest rate (RRATE_X2), listed stock companies (STOCK_CO); etc. as the independent, single, and separate factors will be applied together as the joined variables in one synchronized method. Fisher, R. A (1973) saying that the observational data in particular, in cases where we can observe the occurrence of various possible contributory causes of a phenomenon,but cannot control them thus data are obtained and abstracted from the sources of MPA, PSA International Pte Ltd (formerly as Port of Singapore Authority); Maritime Fund Incentive (MPI); Incentive Maritime Committee; Singapore Registry Company; Inland Revenue Authority of Singapore; Singapore Authority Annual Account, Singapore Department of Statistic, Annual Economic Survey of Singapore 2000, Singapore; UNCTAD, World Bank and International Monetary Fund, and Singapore Stock Exchange, and the financial data as money supply growth; bank credit to private sectors; lending interest rate; real interest rate; stock market capitalization in US$ billion, and stock listed companies to be used in the causality analysis and testing as well to see how they work together in one synchronicity.

3.2. Methodologies

3.2.1. Unit root tests

Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests are used to assess the order of co-integration of the variables and uniform outcomes of both tests are necessary for the final conclusion about the stationary properties of each series, and usually all variables are tested with a linear trend and/or intercept or more. For the lag order and critical value of ADF test, Cheung, Y.W and Lai, K.S (1995) found that the lag order in addition to the sample size, can affect the finite-sample behavior of the ADF test. The time series econometric analysis is deployed and investigated the stationary properties of the variables, and a stationary-series fluctuates around a constant long-run mean and this implies that the series has a finite variance which does not depend on time, on the other hand, non-stationary series have no tendency to return to a long run deterministic path and the variances of the series are time dependent. Non stationary series suffers permanent effects from random shocks and thus the series follow a random walk and the economic time-series are typically described as non-stationary processes. If the unit root tests find that a series contain one unit root, the appropriate route in this case is to transform the data by differencing the variables prior to their inclusion in the regression model, but this incurs a loss of important long-run information.

Ericsson et al (2000) asked for the attention to the distribution of error correction tests for cointegration in the long-run relationship is regarded as a steady-state equilibrium, whereas the short-run relationship is evaluated by the magnitude of the deviation from equilibrium. The order of the lags in the ARDL model are selected using the appropriate selection criteria as Akaike Information Criterion (AIC), developed by Akaike (1973), Schwart Bayesian Criterion and R^2 ensuring that there is no evidence of residual serial correlation, functional form miss-specification, non-normality and heteroscedasticity and the diagnostic tests of the selected models will most likely suggest that the estimated model suffers from the non-normality problem and in this case, (1) the short-run and long-run coefficients of the estimated models will not be valid. The presence of non-normality problem can be attributed to the presence of outliers over the sample period which results from non-recurring, exogenous shocks (such as wars, terrorist attacks, oil price volatility, financial crises, etc.) rather than the normal evolution of the economic data. The result also confirms that the re-estimated models do not suffer from autocorrelation, heteroskedasticity, or model miss-specification problems. The test of the existence of a unit root of the time series Y_t (H_0: $\delta = 0$), for the above 30-34 obs. we can select one of the following three possible forms of the ADF test (Y_t can be either taxes or other designed and selected variables) and other first or second differences included level, trend intercept, and none in test equation of auxiliary regression model as well

$$DYt = \delta Y_{t-1} + \sum_{i=1}^{k} \beta_i Y_{t-1} + \varepsilon_1 \quad (1)$$

$$\Delta Y_t = \alpha_0 + \delta Y_{t-1} + \sum_{i=1}^{k} \beta_i Y_{t-1} + ... + \sum_{i=1}^{k} \delta_{k-1} \Delta Y_{t-i} + \varepsilon_1 \quad (2)$$

$$\Delta Y_t = \alpha_0 + \alpha_1 T + \delta Y_{t-1} + \sum_{i=1}^{k} \beta_i Y_{t-1} + ... + \sum_{i=1}^{k} \delta_{k-1} \Delta Y_{t-i} + \varepsilon_1 \quad (3)$$

$$\Delta(\Delta Y)_t = \alpha_0 + \Delta \sum_{i=1}^{k} \beta_i Y_{t-1} + \nu_1 \quad (4)$$

And

$$\Delta(\Delta Y)_t = \Delta Y_t - \Delta Y_{t-1} \quad (5)$$

With

Where (α_0) and (α_1) are constant, (β_i) and (δ_{k-1}) are the coefficients on a time trend and (k) as the lag order of the AR process, (ε_1) and (υ_1) as white noises. The difference between the three regressions concerns the presence of the deterministic elements (α_0) and (α_1). From the above equations, we will evaluate and examine all of variables based on the plot the data (of each series) then from that, the substituted coefficients, samples adjusted can be selected to find the significant variables in order to observe the graph, to which extent, indicate the presence or not of the deterministic trend regressions.

3.2.2. Granger causality tests

The selected number of lags are usually chosen when using an information criterion, such as the AIC or the Schwarz information criterion. Any particular lagged value of one of the variables is retained in the regression if the cause happens prior to its effect, it is significant according to a t-test, and if the cause has unique information about the future values of its effect and the other lagged values of the variable jointly add explanatory power to the model according to an F-test. The testing are denoted as:

$$\begin{cases} \Delta Y_t = \alpha_0 + \sum_{i=1}^{k} \beta_i Y_{t-1} + \sum_{i=1}^{k} \delta_i X_{t-1} + \varepsilon_t & (6) \\ \Delta X_t = \alpha_1 + \sum_{i=1}^{k} \phi_i X_{t-1} + \sum_{i=1}^{k} \rho_i Y_{t-1} + \nu_t & (7) \end{cases}$$

The Granger's theories are defined the core meanings of causal relationships which will be felt in one of the following cases, if $\delta_i \neq 0$ and gets significant meanings, but ρ_i is negatively significant meanings then the conclusion is concluded the active moving of variable X is just causing of causal moving of Y (uni-directional causality), if δ_i is negatively significant meanings, but $\rho_i \neq 0$ with actively significant meanings then the conclusion is being said the variable X is impacted by the active changing of variable Y (uni-directional causality), if δ_i and ρ_i are all $\neq 0$ but get significant meanings then the conclusion is being told there is occurrence of the internally active causality *vice versa* of both variables of X and Y (bi-directional causality), and if δ_i and ρ_i are all negatively significant meanings then the saying of both variables of X and Y are independent is finally given result. Hiemstra, C. et al (1994) suggest that the research should consider nonlinear theoretical mechanisms and empirical regularities when devising and evaluating models of the joint dynamics stock prices and trading volume Neither this variable internally and directly impacts nor other, but both of variables are all moving and possibly impacted by the external variables

3.2.3. Causal relationship, multicollinearity, and heteroskedasticity

In the selected AR models to verify the existence of all internally significant causalities and the high correlations to all designed variables that are obtained from 1980 to 2014, the paper will analyze if the situation of multicollinearity case is either perfect-multicollinearity, or imperfect-multicollinearity is existed or not through the population regression function (8) and the designed sample regression function (9). The equations (8) and (9) are following depicted with k is lagged length, β_0, β_1, β_2, ...β_n are constants, $\bar{Y}$ as median value, with y_i and x_i are depicted as the difference between Y_i and $\bar{Y}$, can be re-estimated as (10):

$$\Delta Y_i = \beta_0 + \sum_{i=1}^{k} \beta_1 X_{1i} + \sum_{i=1}^{k} \beta_2 X_{2i} + ... + \sum_{i=1}^{k} \beta_n X_{ni} + \varepsilon_i \quad (8)$$

$$\Delta Y_i = \hat{\beta}_0 + \sum_{i=1}^{k} \hat{\beta}_1 X_{1i} + \sum_{i=1}^{k} \hat{\beta}_2 X_{2i} + ... + \sum_{i=1}^{k} \hat{\beta}_n X_{ni} + \hat{\varepsilon}_i \quad (9)$$

And

$$\Delta yi = \sum_{i=1}^{k} \hat{\beta}_1 x_{1i} + \sum_{i=1}^{k} \hat{\beta}_2 x_{2i} + \sum_{i=1}^{k} \hat{\beta}_3 x_{3i} + ... + \sum_{i=1}^{k} \hat{\beta}_n x_{ni} + \hat{\varepsilon}_i \quad (10)$$

To examine these cases could be existed, paper will employ the AR vector equations to check the possibility of heteroskedasticity via the Breusch-Pagan-Godfrey (BPG) to see the action of residual ε_i and then re-estimates the auxiliary residual square of $\hat{\varepsilon}_i^2$ and the possibilities of how the P value, R^2 to be compared with χ_α^2 value of degree of freedom (df) for the null hypothesis of rejecting of H_0 or acceptance of H_1. The BPG test is using the OLS residuals (Johnston, 1984) and the equation of AR vector is redesigned.

$$\Delta Y_i = \beta_0 + \sum_{t-1}^{k} \beta_1 X_{1i} + \sum_{i=1}^{k} \beta_2 X_{2i} + \sum_{i=}^{k} \beta_3 X_{3i} + \sum_{i=1}^{k} \beta_4 X_{4i} + \varepsilon_i \quad (11)$$

The sub-equation with the auxiliary residual square is depicted as

$$\hat{\varepsilon}_i^2 = \alpha_0 + \sum_{i=1}^{k} \alpha_1 X_{1i} + \sum_{i=1}^{k} \alpha_2 X_{2i} + \sum_{i=1}^{k} \alpha_3 X_{3i} + \sum_{i=1}^{k} \alpha_4 X_{4i} + \varepsilon_i \quad (12)$$

3.2.4. Selected AR model

In this paper, the examining of all joined variables is tested on the denoting of equations as firstly AR Model (13) to be tested the independent variable bul carrier (BULKCA) to see its affections by financial systems such as real interest rates (RRATE_X2), domestic credit to private sector (CRE_X1), tax (TAX) and listed stock companies (STOCK_CO). The next equation AR linear

Model (14), will be tested the independent variable containership (CTNSHIP), the AR Model (15) for general cargo (GNCAR), AR Model (16) for oil tanker (OILTNK), and AR Model (17) for other ships (OTHRSHIP) respectively. The selected AR models of each variable are denoted as:

$$\Delta BULKCA = \alpha_0 + \sum_{i=1}^{k} \beta_1 RRATE\_X2 + \sum_{i=1}^{k} \gamma_1 CRE\_X1 + \sum_{i=1}^{k} \varphi_1 TAX + \sum_{i=1}^{k} \lambda_1 STOCK\_CO + \varepsilon_1 \quad (13)$$

$$\Delta CTNSHIP = \alpha_1 + \sum_{i=1}^{k} \beta_2 RRATE\_X2 + \sum_{i=1}^{k} \gamma_2 CRE\_X1 + \sum_{i=1}^{k} \varphi_2 TAX + \sum_{i=1}^{k} \lambda_2 STOCK\_CO + \varepsilon_2 \quad (14)$$

$$\Delta GNCAR = \alpha_2 + \sum_{i=1}^{k} \beta_3 RRATE\_X2 + \sum_{i=1}^{k} \gamma_3 CRE\_X1 + \sum_{i=1}^{k} \varphi_3 TAX + \sum_{i=1}^{k} \lambda_3 STOCK\_CO + \varepsilon_3 \quad (15)$$

$$\Delta OILTNK = \alpha_3 + \sum_{i=1}^{k} \beta_4 RRATE\_X2 + \sum_{i=1}^{k} \gamma_4 CRE\_X1 + \sum_{i=1}^{k} \varphi_4 TAX + \sum_{i=1}^{k} \lambda_4 STOCK\_CO + \varepsilon_4 \quad (16)$$

Figure 1: BULKCA has unit root

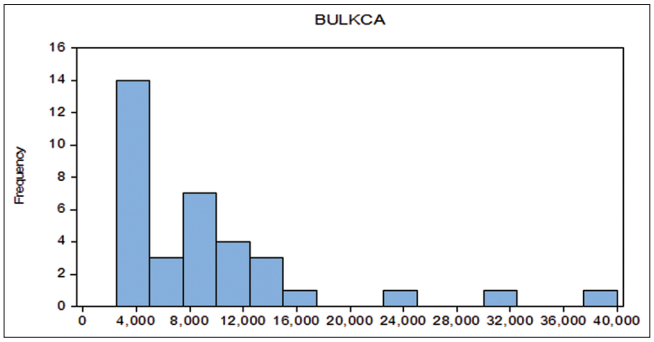
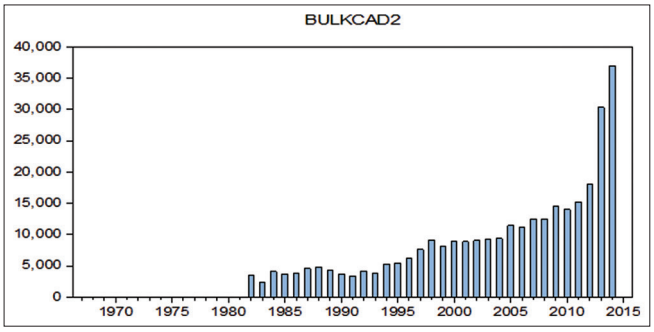


Figure 2: BULKCA is a stationary at 2nd difference



$$\Delta OTHRSHIP = \alpha_4 + \sum_{I=1}^{K} \beta_5 RRATE\_X2 + \sum_{i=1}^{k} \gamma_5 CRE\_X1 + \sum_{i=1}^{k} \varphi_5 TAX + \sum_{i=1}^{k} \lambda_5 STOCK\_CO + \varepsilon_5 \quad (17)$$

4. EMPIRICAL FINDINGS

4.1. ADF and PP Tests for Explanatory Variables

The ADF test in level, intercept for the explanatory variables of the selected AR models, starting gradually from BULKCA (AR Model 13) for the period 1980-2014 to critical value tests which obtained level results at 1%, 5%, and 10% respectively. However result of t-statistic value is much smaller than the other three test critical values, coefficient is not negative, and P value showing the null hypothesis H_0 has an unit root hence the null hypothesis not be rejected. Dealing continuality the test on 1st difference and the test critical valued level results at 1%, 5%, and 10%. The t-Statistic, Prob. value, coefficient is negative but P-value is still not significant thus the requested model caused by unable to reject H_0. Continuous testing at 2nd difference, at trend and BULKCA's results are stated as Figures 1 and 2.

The BULKCA's test at 2nd difference is fully satisfied and the rejection of the null hypothesis of having unit root is workable. Dealing the sameness at 2nd difference with other explanatory variables of CTNSHIP, GNCAR, OTHRSHIP for trend and intercept, except OILTNK at 1st difference, the results are on Table 1.

The PP test critical values at 1%, 5%, and 10% are almost same for all which can see on Table 2.

4.2. ADF and PP Tests for Independent Variables in Other AR Models

The significant values at 1%, 5%, 10% are proceeded for the independent variables RRATE_X2, CRE-X1, TAX, and STOCK_CO at the level and 1st difference as are seen on Table 3.

Test results are same in PP tests for all independent variables on the Table 4.

4.3. Granger Causality Tests

The Equations 6 and 7 are employed to see the causal nexuses between the internal joined-variables and verifying all causalities.

Figure 3: The Granger causality of Model (13)

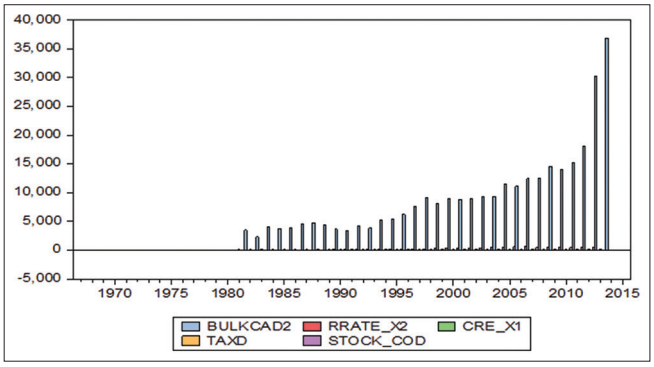


Table 1: ADF test on 1st and 2nd difference for explanatory variables

ADF test at 2nd difference								
Variables	1%	5%	10%	t-statistic	P*	Coefficient	AIC	SIC
BULKCA	−4.273277	−3.557759	−3.212361	−6.263288	0.0001	−1.147246	16.82389	16.96130
CTNSHIP	−4.323979	−3.580623	−3.225334	−7.774645	0.0000	−3.856776	16.99808	17.23597
GNCAR	−4.356068	−3.595026	−3.233456	−8.071879	0.0000	−9.450167	16.54297	16.88169
OILTNK**	−4.473277	−3.557759	−3.212361	−4.430572	0.0069	−0.814131	17.77385	17.91126
OTHRSHIP	−4.356068	−3.595026	−3.233456	−4.219469	0.0135	−4.117565	20.08351	20.42223

*MacKinnon (1996) one-side P values; Constant, Linear Trend. **At 1st difference. ADF: Augmented Dickey-Fuller, AIC: Akaike Information Criterion, SIC: Schwartz Information Criterion

Table 2: PP unit root tests for all explanatory variables

PP unit root test on 2nd difference									
Variables	1%	5%	10%	t-statistic	Adj.t-stat	P*	Coefficient	AIC	SIC
BULKCA	−4.273277	−3.557759	−3.212361	−6.262388	−6.263288	0.0001	−1.147246	16.82389	16.96130
CTNSHIP	−4.273277	−3.557759	−3.212361	−8.187112	−13.75482	0.0000	−1.404256	15.98486	16.12227
GNCAR**	−4.262735	−3.552973	−3.209642	−6.774913	−8.712301	0.0000	−1.214639	15.35479	15.49084
OILTNK	−4.273277	−3.557759	−3.212361	−5.824438	−18.82672	0.0000	−1.085638	17.98224	18.11965
OTHRSHIP	−4.273277	−3.557759	−3.212361	−6.906780	−35.27447	0.0000	−1.243600	18.93480	19.07221

*MacKinnon (1996) one-side P values; Constant, Linear Trend; Spectral OLS AR based on SIC. **At 1st difference. PP: Phillips-Perron, AIC: Akaike Information Criterion, SIC: Schwartz Information Criterion

Table 3: ADF test on level and 1st difference of independent variables

ADF test on 1st difference								
Variables	1%	5%	10%	t-statistic	P*	Coefficient	AIC	SIC
RRATE_X2**	−4.243644	−3.544284	−3.204699	−4.352140	0.0077	−0.743381	4.973944	5.107260
CRE_X1**	−4.374307	−3.603202	−3.238054	−5.551673	0.0007	−2.929036	6.421776	6.958081
TAX	−4.262735	−3.552973	−3.209642	−6.438003	0.0000	−1.154819	3.617024	3.753070
STOCK_CO	−4.323979	−3.580623	−3.225334	−5.439403	0.0007	−1.021531	11.12680	11.17043

*MacKinnon (1996) one-sided P values; Constant, Linear Trend. **Level, Trend and Intercept. ADF: Augmented Dickey-Fuller, AIC: Akaike Information Criterion, SIC: Schwartz Information Criterion

Table 4: PP tests on level and 1st difference of financial variables

PP unit root test on 1st difference									
Variables	1%	5%	10%	t statistic	Adjusted t statistic	P*	Coefficient	AIC	SIC
RRATE_X2**	−4.243644	−3.544284	−3.204699	−4.352140	−4.352140	0.0077	−0.743381	4.973944	5.107260
CRE_X1	−4.273277	−3.557759	−3.212361	−6.555291	−6.555291	0.0000	−1.209887	6.983321	7.100734
TAX	−4.262735	−3.552973	−3.209642	−6.438003	−6.438003	0.0000	−1.154819	3.617024	3.753070
STOCK_CO	−4.323979	−3.580623	−3.225334	−5.439403	−5.439403	0.0007	−1.021531	11.12680	11.26954

*MacKinnon (1996) one-sided P values; Constant, Linear Trend. **Level, Trend and Intercept. PP: Phillips-Perron, AIC: Akaike Information Criterion, SIC: Schwartz Information Criterion

Figure 4: The Granger causality of AR Model (14)

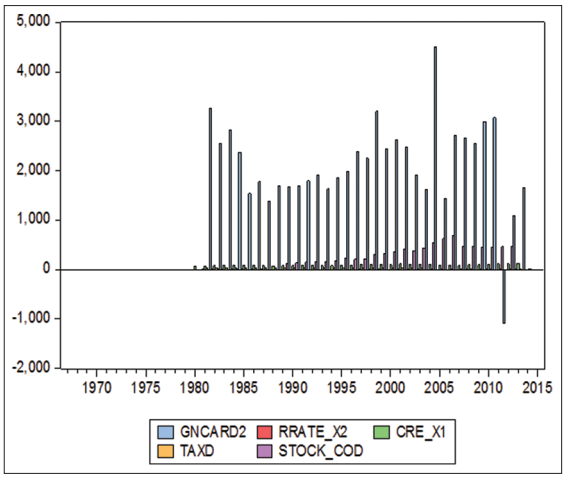
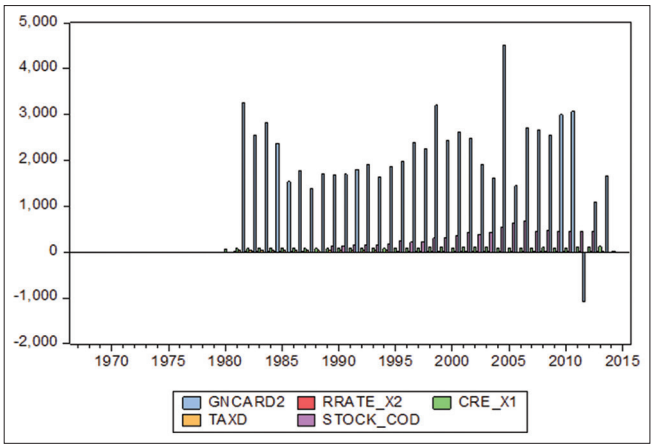


Figure 5: The Granger causality of AR Model (15)



The null hypothesis of H_0, as case of no granger causality and alternative H_1 is negative. The obtained results that have accessed from joined variables as shown on the Table 5. In this Table 5, it is seen the P values of TAXES in BULKCA Model (13), in CTNSHIP Model (14), in OILNK Model (16) and in OTHRSHIP Model (17) are different with Zero and significant which less than 5% whilst

Table 5: Causal relationship of jointly explanatory variables in the selected VAR Models

Causal relationship of joined variables of selected VAR models									
	Obtained values					Last recorded Q/Ty in DWT			Remark
Variables	P value	t statistic	Coefficient	R^2	Adjusted R^2	2012	2013	2014	
BULKCAD2									
TAXD	0.0015	−3.598262	−450.0955	0.873674	0.852619	23,293	30,099	37,600	Increased 38% (14/12)
RRATE_X2	0.9184	−0.103545	−16.66038						
CRE_X1	0.0823	1.813436	85.32111						
STOCK_COD	0.9903	0.012243	0.046058						
CTNSHIPD2									
TAXD	0.0044	−3.145684	−410.6447	0.772385	0.734449	12,887	15,579	19,094	Increased 32.5% (14/12)
RRATE_X2	0.9486	−0.065151	−10.91258						
CRE_X1	0.1700	1.414673	69.28862						
STOCK_COD	0.3507	−0.951821	−3.72748						
GNCARD									
TAXD	0.6490	0.460903	32.14826	0.193444	0.059018	33,469	35,653	36,496	Increased 9% (14/12)
RRATE_X2	0.1021	1.699793	152.1249						
CRE_X1	0.2532	−1.170683	−30.63669						
STOCK_COD	0.2059	1.300145	2.720500						
OILTNKD2									
TAXD	0.0034	−3.230827	−1093.360	0.834799	0.808367	1,007	1,333	1,607	Increased 37.3% (14/12)
RRATE_X2	0.3134	1.028872	436.4437						
CRE_X1	0.8274	−0.220279	−27.34087						
STOCK_COD	0.4486	0.769877	7.815294						
OTHRSHIPD2									
TAXD	0.0016	−3.551330	−2257.713	0.835449	0.808024	9,585	8,989	8,990	Decreased 6% (14/12)
RRATE_X2	0.5852	0.553297	451.3281						
CRE_X1	0.4613	0.748730	178.5903						
STOC_COD	0.9276	−0.091862	−1.751958						

VAR: Vector autoregressive

Table 6: Granger causality test for model (13)

AR model	Lagged	Granger causality tests	F statistic	P
BULKCA AR model (13)	1	BULKCAD2 causes CRE_X1	6.81447	0.014
		RRATE_X2 causes CRE_X1	4.36680	0.0452
	2	TAXD causes RRATE_X2	3.72535	0.0378
		CRE_X1 causes STOCK_COD	4.37266	0.0258
	3	CRE_X1 causes STOCK_CO	4.34604	0.0191
	4	CRE_X1 causes STOCK_COD	3.37243	0.0422
	6	BULKCAD2 causes TAXD	2.92727	0.0458
	7	BULKCAD2 causes TAXD	3.30663	0.0377
		RRATE_X2 causes CRE_X1	3.35317	0.0320
		RRATE_X2 causes STOCK_COD	25.7225	0.0111
		CRE_X1 causes STOCK_COD	31.0591	0.0085

Figure 6: Granger causality test for AR Model (16)

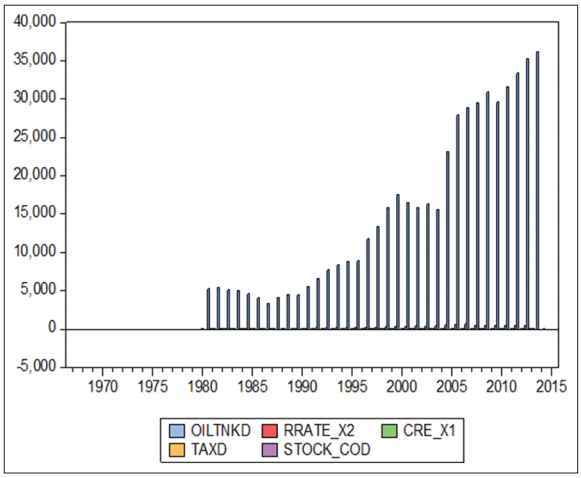


Figure 7: Granger causality test for AR Model (17)

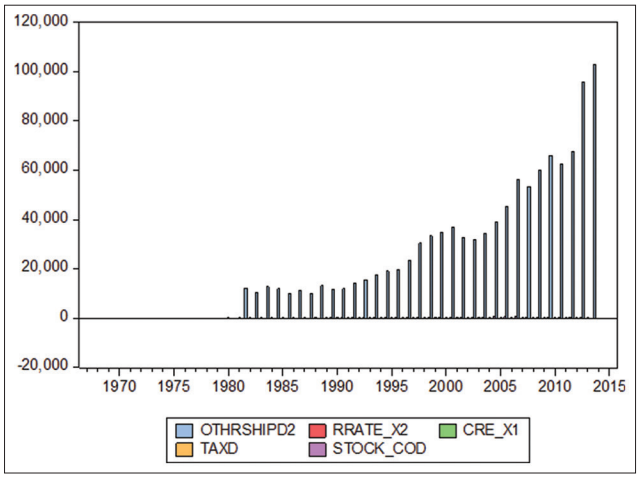


Table 7: Granger causality of AR model (14)

AR model	Lagged	Granger causality tests	F statistic	P
CTNSHIP AR model (14)	1	CTNSHIPD2 causes CRE_X1	7.26834	0.0117
		RRATE_X2 causes CRE_X1	4.36680	0.0452
	2	CTNSHIPD2 causes CRE_X1	3.64188	0.0409
		TAXD causes RRAE_X2	3.72535	0.0378
		CRE_X1 causes STOCK_COD	4.37266	0.0258
	3	STOCK_COD causes CTNSHIPD2	6.59658	0.0041
		CRE_X1 causes STOCK_COD	4.34604	0.0191
	4	STOCK_COD causes CTNSHIPD2	6.73637	0.0044
		CRE_X1 causes CTNSHIPD2	5.36340	0.0046
		CRE_X1 causes STOCK_COD	3.37249	0.0422
	5	CRE_X1 causes CTNSHIPD2	4.43587	0.0100
		CTNSHIPD2 causes CRE_X1	5.65475	0.0034
		STOCK_COD causes CTNSHIPD2	3.77001	0.0405
		CRE_X1 causes STOCK_COD	3.68843	0.0430
	6	CRE_X1 causes CTNSHIPD2	4.31758	0.0130
		CTNSHIPD2 causes CRE_X1	4.38738	0.0122
	7	CRE_X1causes CTNSHIPD2	7.58990	0.0025
		RRATE_X2 causes CRE_X1	3.35317	0.0320
		RRATE_X2 causes STOCK_COD	31.0591	0.0085
		CRE_X1 causes STOCK_COD	4.31758	0.0130

Table 8: Granger causality of AR Model (15)

AR Model	Lagged	Granger causality tests	F statistic	P
GNCAR AR Model (15)	2	GNCAR causes STOCK_COD	4.53940	0.024
		TAXD causes RRATE_X2	3.72535	0.038
		CRE_X1 causes STOCK_COD	4.37266	0.0258
	3	CRE_X1 causes STOCK_COD	4.34604	0.0191
		GNCAR causes STOCK_COD	3.43164	0.0424
	4	TAXD causes CRE_X1	2.47673	0.0771
		CRE_X1 causes STOCK_COD	3.37243	0.0422
	5	GNCAR causes STOCK_COD	3.64399	0.0444
		CRE_X1 causes STOCK_COD	3.68843	0.0430
	7	CRE_X1 causes STOCK_COD	31.0591	0.0085
		GNCAR causes CRE_X1	3.15877	0.0450
		RRATE_X2 causes CRE_X1	3.35317	0.0320
		RRATE_X2 causes STOCK_COD	25.7225	0.0111

Table 9: Granger test for AR model (16)

AR model	Lagged	Granger causality tests	F statistic	P
OILTNKD model (16)	1	OILTNKD causes CRE_X1	5.67939	0.0239
		TAXD causes OILTNKD	8.33480	0.0071
		STOCK_COD causes OILTNKD	9.48265	0.0050
		RRATE_X2 causes CRE_X1	4.36680	0.0452
	2	TAXD causes RRATE_X2	3.72535	0.0378
		CRE_X1 causes STOCK_COD	4.37266	0.0258
		TAXD causes OILTNKD	3.96979	0.0308
	3	OILTNKD causes STOCK_COD	5.86609	0.0061
		CRE_X1 causes STOCK_COD	4.34604	0.0191
	4	OILTNKD causes CRE_X1	2.91909	0.0472
		OILTNKD causes STOCK_COD	3.46568	0.0064
		CRE_X1 causes STOCK_COD	2.37243	0.0042
	5	CRE_X1 causes STOCK_COD	3.68843	0.0430
	7	RRATE_X2 causes CRE_X1	3.35317	0.0320
		RRATE_X2 causes STOCK_COD	25.7225	0.0111
		CRE_X1 causes STOCK_COD	31.0591	0.0085

in GENCAR Model (15) is different with Zero but not significant. Seeing result in R^2 and Adjust R to set square of GENCAR, it is detected as no significant and based on the last records of DWT for comparison between 2012/2014, only increased 9%. The critical result of also falling in the Model (17) OTHRSHIP where the P value of TAX is much significant whilst the record volume is being against shown as decreasing 6% (2014/2012).

In other hands, whilst the P values of jointly variables RRATE_X2, STOCK_CO in BULKCA Model (14) are not significant and high

that can create a suspicion of perfect multi-collinearity is occurred. These suspicious cases are captured on CTNSHIP Model (15) for RRATE_X2 and on OILTNK Model (17) for CRE_X1, and on OTHRSHIP Model (18) for STOCK_CO as well. To verify again the causal nexuses, the Granger causality tests of all jointed variables of BULKCA Model (14) are depicted as Table 6 and Figure 3.

The same results are seen as same when doing the procedures of Granger causality tests to CTNSHIP Model (14), GNCAR Model (15), OILTNK Model (16) and OTHRSHIP Model (17), the obtained results are denoted on the Tables 7-10 and illustrated Figures 4-7 respectively.

Reckoning the Granger causality tests via pairwise, it is recognized that when it is depended on the selected numbers of lags criteria as max to k = 7, the results are changed respectively. The observation of the values of the F statistic and P, in the OILTNK (Table 9) and OTHRSHIP (Table 10) are rather same, special to the lagged k = 7, the results are seen in the variables RRATE_X2, CRE_X1 and STOCK_CO when using methods. Through the tests, we can find that neither this variable internally and directly impacts nor other, but both of variables are all moving and possibly impacted by the external variable together with their case of bi-directional causality as defined by Granger.

4.4. Multicollinearity Tests

In the selected AR model all the times whenever there exists a high correlation between any two independently joined variables, there are several major reasons and some of them are derived from the SRF which is not the desirable one when data is obtained, or in each characteristic of jointly single variable has its own internally invisible features. Mansfield, E (1983) depicts that regression analysis like any tool and should not be blindly applied because multicollinearity is a situation in which two or more of the independent variables are very high correlated. The problem is whenever the mulitcollinearity is arisen, it will make a significant variable becoming insignificant by increasing of its standard error and not only the perfect but also the imperfect multicollinearity too, as proved which is based on the results of P values and ‖t‖ values in the Table 5. Viewing the Table 5, the results of P values of jointly variables RRATE_X2, STOCK_COD in AR Model (13); the variables RRATE_X2 and STOCK_COD in AR Model (14); the variables CRE_X1 and STOCK_COD in AR Model (15); the variables CRE_X1 and STOCK_COD in AR Model (16); the variables RRATE_X2 and STOCK_COD in AR Model (17), are quite high whilst the results of ‖t‖ are small, but the R^2 values > 0.8 in AR Model (13), AR Model (16) and (17) thus the correlation of joined independent variables test will be employed to see the interactional impacts of these joined variables if the phenomenon of the perfect or imperfect multi-collinearity could be possibly arisen.

As Table 11, the correlative values between TAXD and STOCK_COD in all selected AR models are quite high, and figure of STOCK_COD is negative which is forced to think that the disturbing multi-collinearity is arisen when all separate variables are joined. The same result of TAXD, CRE_X1 is negative but positive between STOCK_COD and CRE_X1 is affirmative. In order to reduction the interactional activities of critical joined variables, the above F statistic value is employed to detect the disturbance of multi-collinearity, and H_0 is denoted as existent hypothesis, while the alternative H_1 is negative. The tests are denoted as bellow:

The Table 12 is shown that in the selected AR Models (13), (14), (15), (16), and (17), the most of dual variables in each separate single model is active with both of P values are high significant

Table 10: Granger test for AR model (17)

AR model	Lagged	Granger causality tests	F statistic	P
OTHRSHIPD2 model (17)	1	OTHRSHIPD2 causes CRE_X1	7.82910	0.0092
		STOCK_COD causes OTHRSHIPD2	5.12718	0.0329
		RRATE_X2 causes CRE_X1	4.36680	0.0452
		TAXD causes CRE_X1	0.03665	0.0845
	2	TAXD causes RRATE_X2	3.72536	0.0378
		CRE_X1 causes STOCK_COD	4.37266	0.0258
	3	CRE_X1 causes STOCK_COD	4.34604	0.0191
	4	CRE_X1 causes STOCK_COD	3.37243	0.0422
	5	CRE_X1 causes STOCK_COD	3.68843	0.0430
	7	CRE_X1 causes OTHRSHIPD2	3.57409	0.0341
		RRATE_X2 causes CRE_X1	3.35317	0.0320
		RARETE_X2 causes STOCK_COD	25.7225	0.0111
		CRE_X1 causes STOCK_COD	31.0591	0.0085

Table 11: Correlation of joined independent variables of selected AR models

Correlation test of jointed independent variables of AR models				
	TAXD	RRATE_X2	CRE_X1	STOCK_COD
BULKCAD2/CTNSHIPD2/GNCARD2/OILTNKD2/OTHRSHIPD2				
TAXD	1.000000	0.254101	−0.639708	−0.913923
RRATE_X2	0.254101	1.000000	0.360382	−0.176917
CRE_X1	−0.639708	0.360382	1.000000	0.584017
STOCK_COD	−0.91392	-0.176917	0.584017	1.000000

Table 12: Paired joined variables activity tests

Dependent variable	Jointed variables	P©	P	R^2	Remark
BULKCAD2	TAXD	0.0000	0.0000	0.566774	Significant
	RRATE_X2	0.0001	0.7384	0.003774	
	CRE_X1	0.0000	0.0000	0.618203	Significant
	STOCK_COD	0.0012	0.0000	0.692208	
CTNSHIPD2	TAXD	0.0000	0.0000	0.644447	Significant
	RRATE_X2	0.0030	0.7080	0.000475	
	CRE_X1	0.0000	0.0000	0.589943	Significant
	STOCK_COD	0.7618	0.0000	0.538027	
GNCARD2	TAXD	0.0038	0.6601	0.006319	
	RRATE_X2	0.0000	0.2390	0.045898	
	CRE_X1	0.0265	0.6064	0.008955	
	STOCK_COD	0.0000	0.7145	0.005038	
OILTNKD	TAXD	0.0000	0.0000	0.829709	Significant
	RRATE_X2	0.0001	0.4232	0.020804	
	CRE_X1	0.0007	0.0000	0.483522	Significant
	STOCK_COD	0.1135	0.0000	0.738374	
OTHRSHIPD2	TAXD	0.0000	0.0000	0.731121	Significant
	RRATE_X2	0.0001	0.6645	0.006353	
	CRE_X1	0.0001	0.0000	0.575437	Significant
	STOCK_COD	0.0394	0.0000	0.671995	

Table 13: Revised jointed variables after being multicollinearity retested

	Obtained values							
	Variables	P value	t statistic	Coefficient	R^2	Adjusted R^2	F statistic	P (F statistic)
BULKCAD2	TAXD	0.0143	−2.612306	−303.6015	0.78948	0.76693	35.00142	0.000000
	RRATE_X2	0.2187	−1.258202	−317.4508				
	CRE_X1	0.0009	3.707972	250.8705				
CTNSHIPD2	TAXD	0.0008	−3.816926	−415.1218	0.772344	0.74503	28.27168	0.000000
	CRE_X1	0.0539	2.022837	66.97869				
	STOCK_COD	0.3256	−1.002643	−3.776331				
GNCARD2	RRATE_X2	0.0287	2.321436	173.8389	0.186305	0.08866	1.908014	0.154124
	CRE_X1	0.0922	−1.751102	−37.38352				
	STOCK_COD	0.1130	1.642416	1.928158				
OILTNKD	TAX	0.0007	−3.866783	−1050.465	0.834478	0.81538	43.69297	0.000000
	RRATE_X2	0.2176	1.263489	370.0236				
	STOCK_COD	0.4168	0.825181	8.13665				
OTHERSHIPD2	TAX	0.0001	−3.551330	−1822.337	0.828373	0.80998	45.04801	0.000000
	RRATE_X2	0.6972	0.553297	−342.7046				
	CRE_X1	0.0146	0.748730	608.7145				

with R^2 are not so high – except the pairs of variables TAXD and OILTNKD, and STOCK_COD and OILTNKD in OILTNKD model, the TAXD and OTHRSHIP2, the STOCK_COD and OTHRSHIPDS in OTHRSHIPD2 model. From these values, the finding is proved that the disturbing multi-collinearity is arisen however most of the cases are imperfect and not serious disturbance to the models except the high R^2 above. For the above higher R^2 cases, again the retest to be proceed with the auxiliary AR are re-employed, the hypothesis H_0 is stated as having multi-collinearity, and alternative H_1 is negative. The results of OILTNKD model and OTHRSHIPD2 model with STOCK_COD2 and TAXD, as seen when $\bar{I}_j$ = 966.96302434-24.7432418436* TAXD; P values is zero; R^2 = 0.8635256, where $\bar{I}_j$ (stated for STOCK_COD), n = 30 with Obs. is k = 5, then the value of $F_j > F_\alpha$ (k-2, n-k+1), the final value F_j = 54.730059, whilst $F_j > F_{(0.05)}$ (3,26)= 2.975, and VIFj = 7.3273815, thus the acceptance of the perfect multi-collinearity and rejected H_0 is reasserted. Again, the revised joined variables in the AR models is restated as Table 13 after multi-collinearity tests are proceeded without the presence of variable STOCK_CODs in the AR Models (13) and (17).

The values of revised AR Models (13), (14), (16), (17) clearly proved the significantly aggressive roles of tax on the increased volumes of bulk carrier, containership, oil tanker and other ships arriving to Singapore ports whilst the negative significance of general cargo is on the other side where R^2, F statistic and P (F statistic) are so much insignificant. In the revised GENCAR AR Model (15), the TAXD variable (0.1901), RRATE_X2 (0.0550), and CRE_X1 (0.1045) are insignificant but is not reasonable to take TAXD variable away. Heckman J.J (1981) saying that, the omitted variables determining choices are increasingly less correlated as the time span between choices widens, and misspecification of the heterogeneity process gives rise to an erroneous estimate of the impact of the true effect of the past employment on the current employment probabilities. The reason of after being tested to take the Tax variable away, the obtained P values of others joined variables are surprisingly arisen up, for instant the variable RRATE_X2 will be 15.36%, and variable CRE_X1 is 32.90% whilst in previous revised models, their P-values are still lower, even though in case of TAXD and CRE_X1 (second higher P value) are all taken away same or different timing. So it is decided to leave TAXD as it is.

Table 14: Heteroskedasticity-Pagan Godfrey test

Heteroskedasticity test: Breusch-Pagan-Godfrey							
Dependent variable	**Jointed variables**	**t statistic**	**P**	**F statistic**	**P (F (2,29))**	**P-χ^2 (2)**	**Obs*R²**
BULKCAD2	TAXD	0.879100	0.3866	7.417329	0.0025	0.0045	10.82954
	CRE_X1	3.422245	0.0019				
CTNSHIPD2	TAXD	0.055717	0.9559	8.172097	0.0015	0.0031	11.53431
	CRE_X1	3.109854	0.0042				
GNCARD2	TAXD	−0.359667	0.7218	1.132729	0.3528 F (3,28)	0.3256 P-χ^2 (3)	3.46332
	RRATE_X2	−0.667081	0.5102				
	CRE_X1	0.694096	0.4933				
OILTNKD	TAXD	−0.024928	0.9803	0.001781	0.9982 F (2,30)	0.9980	0.003919
	RRATE_X2	0.059104	0.9533				
OTHRSHIPD2	TAXD	0.455069	0.6524	4.992770	0.0137	0.0166	8.196302
	CRE_X1	2.673239	0.0122				

Table 15: Logarithm coversion in Heteroskedasticity-Pagan-Godfrey tests

Heteroskedasticity test: Breusch-Pagan-Godfrey-Logarithm converted							
Dependent variable	**Jointed variables**	**t statistic**	**P**	**F statistic**	**P (F (2,29)**	**P-χ^2 (2)**	**Obs*R²**
LOG (BULKCAD2)	LOG (TAXD)	0.760391	0.4532	0.296155	0.7459	0.7260	0.64502
	LOG (CRE_X1)	0.600879	0.5526				
LOG (CTNSHIPD2)	LOG (TAXD)	−0.611421	0.5457	0.290998	0.7497	0.7299	0.629568
	LOG (CRE_X1)	−0.749322	0.4597				
GNCARD2	TAXD	−0.359667	0.7218	1.132729	0.3528 F (3,28)	0.3256 P-χ^2(3)	3.46332
	RRATE_X2	−0.667081	0.5102				
	CRE_X1	0.694096	0.4933				
OILTNKD	TAXD	−0.024928	0.9803	0.001781	0.9982 F (2,30)	0.9980	0.003919
	RRATE_X2	0.059104	0.9533				
LOG (OTHRSHIPD2)	LOG (TAXD)	−1.312188	0.1997	1.660828	0.2075	0.1931	3.288600
	LOG (CRE_X1)	−1.818937	0.0793				

4.5. Hemoscedascity and Heteroskedasticity

The detection of this case is proceeded by BPG serial test, and depended on the P-value which can prove if the case of the internally self-correlations on multiple correlations of sufficient magnitude could have the potential adversely affect regression estimations in the model. The null hypothesis H_0 of residuals are not heteroskedasticity, or residuals are homoscedasticity, and alternative H_1 is negative and reject is stated as usually.

Mendenhall et al (1981) has shown that the cell counts ni should not be too small in order that the chi-square distribution provide an adequate approximation to the distribution of $\chi 2$, Mill, R. L (1977) saying that obviously, determining the degree of freedom (df) is an all-important step in using the chisquare distribution and determined directly from sample size n, thus the results P-χ^2 (2) on Table 14 above for BULKCAD2, CTNSHIPD2, and OTHRSHIPD2 are lesser than 5% thus we are unable to reject the H_0 of not heteroskedasticity in these models but accepted this. Seeing the P-χ^2 (3) in the GNCARD2 and P-χ^2 (2) in OILTNKD are bigger than 5% thus the null hypothesis H_0 of non heteroskedasticity in these are rejected, we then have the conclusion of the above revised AR Models (13), (14), and (17) have the disturbances of heteroskedasticity, whilst the revised AR Models (15) and (16) are homoscedasticity.

The logarithm (Log) is employed to convert and calculate all joined variables in the above revised AR models (13), (14) and (17) then the removal of those heteroskedasticity cases from the selected AR models are proceeded as seen on the following Table 14. In AR models LOG (BULKCAD2), LOG (CTNSHIPD2), and LOG (OTHRSHIPD2) having the values of P-χ^2(2) is 0.7260, Obs*R² is 0.64502; 0.7299, Obs*R² is 0.629568; and 0.1931, Obs*R² is 3.288600 respectively and these values are all bigger than 5% expected thus the null hypothesis of H_0 is rejected.

The revised AR Models (14) after being tested, analyzed, and deciphered and found are now could be restated as AR Model (13a)

LOG(BULKCAD2)=8.82089551313−1.64246373414*LOG (TAXD)+1.20046884981*LOG (CRE_X1) (13a)

Based on the empirical findings of AR model (13a), obtained data, it is possibly determined that the prominent role of tax is certainly proved when it is reduced 1.64% per year, then is resulted to the volume of domestic credit to private sectors will be increased up to 1.20%, and the number of bulk carrier would be hit up 8.821 thousands DWT respectively. And the empirical analysis are denoted as same for LOG (CNTSHIPD2) of AR Model (14a), GNCARD2 of AR Model (15a), OILTNKD of AR Model (16a), and LOG (OTHRSHIPD2) of AR Model (17a) are respectively as below:

LOG(CNTSHIPD2)=7.66917966889−2.69982966476*LOG (TAXD)+1.99162090725*LOG (CRE_X1) (14a)

GNCARD2=6205.95984343+164.018437262*RRATE_X2−36.8601808687*CRE_X1−50.6704806155*TAXD (15a)

OILTNKD=48502.478183−1294.55112158*TAXD+479.417999208*RRATE (16a)

LOG (OTHRSHIPD2)=10.9347305432−1.94814574573*LOG (TAXD)+1.23255486537*LOG (CRE_X1) (17a)

5. CONCLUSION

It is said that in one country, the more percentages of interest rates of bank loans, supplied credit to private sectors, and even though the tax tariffs are gradually cut off or declined, the more individual and corporate businesses are aggressively active and increased. However how the interactively causal nexuses of those different and separate variables are connected and joined into one uniqueness, and impacted each others are still be wondered. It could be seen how the strong powerful policies of Singapore's financial elements are, on boosting the EGs and maritime and offshore fields which have been proved when all the joined variables in one synchronicity is applied.

As above empirical finding and based on the AR Model (13) and its equations, it could be asserted that Singapore's corporate tax tariffs plays their significantly prominent roles in term of creating the increased volumes of bulk carrier, container ships, general cargo, oil tanker, and other ships. If the taxation is reduced 1.64% per year, then the volume of domestic credit to private sectors will be increased up to 1.20%, and the number of Bulk Carrier would be hit up 8.821 thousands DWT respectively. The different circumstances are denoted as same for AR Model (14), (15), (16) and (17) respectively in their own cases. The Singapore government really did well its strategic changes to development the EGs and maritime and offshore fields and makes their country today becomes the 2nd world busiest ports. Singapore's value lessons should be the ones that all of developing countries would study.

The study is taking the time series period from 1980 to 2014 (34 years), analysis only the EGs through the volumes of ship building, the numbers of ship registers, and the numbers of deadweight in thousands ton arriving at Singapore port nowadays, then is focused on analysis, decipher the activities and prominent roles of taxation when it is applied together with other different, separate and endogenous factors of financial elements as the joined variables in one synchronized model. As Maddala, G.S (1983), pointed out some mechanical formulations endogenizing dummy variables result in models that are not entirely satisfactory thus there are the limited dependent and qualitative variables in the econometric models, and as Restuccia, Diego and Rogerson, Richard (2007) indicate the distortions and aggregate output with heterogeneous in total factor productivity establishments are quite large, and Yu Yu (2009) assert that a fleet of ships transferring a single commodity from a set of supplier ports to a set of consumer ports, the demands at consumer ports are uncertain, and the objective of the problem is to find the schedule for each ship, so that the consumer demands are satisfied and the total travelling cost is minimized, and The other financial elements such as volumes of import and export merchandizes, services fees, prices of petrochemical and refined oils, etc. that could seriously impact to the Singapore's EGS have not been examined thus the findings could highly possible be limited.

However, based on the above findings, it could be affirmed that the governmental policies are played the real-key roles of significant impacts on support and boosting the development of EGs and maritime and offshore fields. The critical point is, those strategies are not only being effective "policies and rules" as the economical banner but also being the important factor for the development of the maritime industry in Singapore, and also stay closer with all the needs of domestic and foreign companies to monitor, adjust continuously its critically financial and policies time to time.

REFERENCES

Akaike, H. (1973), Information theory as an extension of the maxium likehood principle. In: Petrov, B.N., Csaki, F., editors. 2nd International Symposium on Information Theory. Budapest: Akademiai Kiado. p267-281.

Alex William Trew (2005, revised 2006), Finance and Growth: A Critical Survey, Center For Dynamic Macroeconomic Analysis. Working Paper CDMA05/07, University of St. Andrews.

Bandow, D. (1997), The Role of Government: Promoting Development or Getting out of the Way, Research Reports. Vol. LXIV. No.15, American Institute for Economic Research. p85-88.

Barry W. Poulson et al (2008), State Income Taxes and Economic Growth. Cato Journal, Vol.28, No.1 (Winter 20008) © Cato Institute. All rights reserved.

Bell, V.J.D. (2002), The Role of Government in Advancing Corporate Sustainability,A Background Paper Prepared by the Sustainable Enterprise Academy, York University Under Contract to Environment Canada for the G8 Environmental Futures Forum (EFF) in Vancouver.

Cheung, Yin-Wong and Lai, Kon S. (1995), Lag Order and Critical Values of The Augmented Dickey-Fuller Test, Journal of Business & Economic Statistics, Vol 13, No.3, pp.277-280.

Cakan, Esin (2013), Non-linear Causality between Stock Return and Inflation Uncertainty: Evidence from The US and The UK, International Business & Economics Research Journal, Vol.12, No.1, pp.63-70.

Demirguc-Kunt, A. (2008), Finance and Economic Development: The Role of Government, Development Research Department, World Bank.

Engen, E.M., Skinner, J. (1992), Fiscal Policy and Economic Growth. Working Paper No.4223, National Bureau of Economic Research.

Engen, E.M., Skinner, J. (1996), Taxation and economic growth. National Tax Journal, 49(4), 617-642.

Ericsson, Neil R. and Mackinnon, James G. (2000), Distribution of Error Correction Tests For Cointegration, Econometrics Journal, Vol.5, pp. 285-318.

Ferede, E., Dahlby, B. (2012), The impact of tax cuts on economic growth: Evidence from the Canadian provinces. National Tax Journal, 65(3), 563-594.

Feridun, M., Sissoko, Y. (2011), Impact of FDI on Economic Development: A Causality Analysis for Singapore, 1976-2002. Available from: http://www.ijesar.org/docs/volume4_issue1/fdi_singapore.pdf.

Finkelstein, A. (2007), E-ZTAX: Tax Salience and Tax Rates, Working Paper 12924, National Bureau of Economic Research.

Fisher, Ronald A. (1973), Statistical Methods for Research Workers (14th ed.), Hafner Publishing Comapany: NY.

Giri, A.K, Mohapatra, G. (2012), Financial development and economic growth: Evidence from Indian company. International Journal of Applied Research & Studies, 2, 1-17.

Guariglia, A., Poncet, S. (2009), Could Financial Distortions be no Impediment to Economic Growth After all? Evidence from China,

School of Economics, University of Nottingham.
Heckman, James J. (1981), Heterogeneity and State Dependence, in Sherwin Rosen (ed.), Studies in Labor Markets, University of Chicago Press, pp.91-140.
Hiemstra, Craig and Jones, Jonathan D. (1994), Testing for Linear and Nonlinear Granger Causality in the Stock Price-Volume Relation, Journal of Finance, Vol, XLIX, No.5, pp.1639-1664.
Hossein Jalilian et al. (Mar 20, 2006), The Impact of Regulation on Economic Growth in Developing Countries: A Cross-country Analysis.
Johansen, S., (1988), Statistical analysis of cointegration vectors. Journal of Economic Dynamics and Control, 12, 231-254.
Johansen, S., Juselius, K. (1990), Maximum likelihood estimation and inference on cointegration with applications to the demand for money. Oxford Bulletin of Economics and Statistic, 52, 169-209.
Maddala, G.S (1983), Limited Dependent and Qualitative Variables in Econometrics, Cambridge University Press.
Mansfiled, Edwin (1983), Statistics for Business and Economics- Methods and Application, (2nded.).W.W Norton & Company, Inc.
Mendenhall, William, et al. (1981), Mathematical Statistic with Applications (2nd ed), Duxbury Press, Boston, Massachusetts.
Mill, Richard L. (1977), Statistics for Applied Economics and Business, McGraw-Hill.
Johnston, J. (1984), Econometric Methods. 3rd ed. New York: McGraw-Hill Book Company.
Qayyum, A., Siddiqui, R., Hanif, M.N. (2012), Financial development and economic growth: Evidence from heterogeneous panel data of low income countries. Finance Research, 1(1), 15-26.
Reinert, E.S. (1999), The role of the state in economic growth. Journal of Economic Studies, 26(4/5), 268-326.
Rodriguez, F., Rodrik, D. (1999), Trade Policy and Economic Growth: A Skeptic's Guide to The Cross-National Evidence, Working Paper No. 7081, National Bureau of Economic Research.
Romer, C., David, R.H. (2007), The Macroeconomic Effects of Tax Changes: Estimates based on A New Measure of Fiscal Shocks, Working paper 13264, National Bureau of Economic Research.
Trew, A.W. (2006), Finance and Growth: A Critical Survey, Center For Dynamic Macroeconomic Analysis. Working Paper CDMA05/07, University of St. Andrews.
Widmaln, F. (2001), Tax structure and growth: Are some taxes better than others? Public Choice, 107(3), 199-219.
William C. Barrett (2009), Tax Policy Should Encourage U.S Investment and Growth, Tax Analysts 2009, pp. 16-18.
Wilterdink, B. (2013), It's Very Simple, States Should Cut Taxes to Boost Economic Growth, Forbes (November).Available from: http://www.forbes.com/sites/realspin/2013/11/22.
Yamarik, S. (1999), Nonlinear Tax Structures and Endogenous Growth, Department of Economics. The University of Akron.
Yu, Y. (2009), Stochastic Ship Fleet Routing with Inventory Limits, Thesis of Doctor of Philosophy, University of Edinburgh.
And websites
http://app.sts.singstat.gov.sg; www.bdi.re.kr; www.busanpa.com/service; www.cbpp.org;
www.data.worldbank.org;www.economiconline.co.uk,;www.epi.org;www.kca.or.kr;www.nber.org; www.mpa.com.sg;www.mas.gov.sg;www.mti.gove.sg;www.oecd_olibary.org;
www.portdalian.cn; www.psa.gov.sge; www.singstat.gov.sg;www.untacdstat.unctad.org