The Impacts of Interest Rates and Taxations on Boosting Maritime Industry in Singapore

- Cointegration & Causal Nexuses –

Supervisor: ***Professor Ki-Hwan Lee, PhD.***

By

Vu, Duc Cong

A dissertation submitted to Graduate School of Korea Maritime and Ocean University in partial completion of the requirement for the degree of

DOCTOR OF PHILOSOPHY

Department of Shipping Management
Korea Maritime and Ocean University

August, 2016

Approval Page

This dissertation which is an original work undertaken by Vu, Duc Cong in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Business Administration at the Department of Shipping Management, is in accordance with the regulations governing the preparation and presentation of dissertation at the Graduate School in the Korea Maritime and Ocean University, Republic of Korea.

Approved by the Dissertation Committee:

Professor Shin, Han-Won
Chairman

Professor Lee, Jae-Min
Member

Professor Ryoo, Dong-Keun
Member

Professor Yi, Myeong-Cheol
Member

Professor Lee, Ki-Hwan
Member

Graduate School of Korea Maritime and Ocean University
Department of Shipping Management

June 2016

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Acknowledgement

The dissertation is done with the utmost helps of the following individuals that without their valuable helps, I would never have had the encouragements and patience enough to implement and complete it. The precious helps, from different ways and minds that have indirectly or directly contributed to this research and always keep me in everyday stretching and searching for the new information, data and figures to adjust, modify and enrich my research.

***Firstly**, my thanks are heartily offered to Korea Maritime and Ocean University* (KMOU) where I luckily received the fulltime PhD. scholarship.

***Secondly,** my deep thanks is specially offered to Prof. Ki-Hwan Lee, PhD.* my supervisor who always has patiently listened to my ideas, hearteningly offered the significant chances to deal with excited econometric topics, dedicatedly advised to keep me writing, growing and continual going on the right tracks.

***Thirdly,** my sincere thanks are directly submitted to all of Professors* who are working in department of Shipping Management and other departments such as *Prof. Seong-Cheol Cho; Prof. Jae-Bong Kim; Prof. Gil-Soo Kim; Prof. Han-Won Shin; Prof. Dong-Keun Ryoo; Prof. Sang-Gap Park; Prof. Sih-Hwa Kim* who had spent their valuable times to transfer the outstanding knowledge and guided me a lot in making strategies and brainstorming.

My great appreciations are also addressed *to Dr. Myung- Hee Kim* who has spent her busy and valuable time to translate the Abstract in English into Korean language and, to the administrative section *(Ms. Kang)* of shipping management where I could get the supports whenever I needed.

And to my beloved family whom I always get the injected powers from, whenever I lost my confidentialities.

None of this would surely be possible without the utmost helps from my beloved Korea Maritime and Ocean University, from all of above Professors, from administrative department and my family.

Please kindly allow me to offer my special thanks to each of you.

Abbreviations and Variables

Akaike Information Criterion	= AIC
Augmented Dickey-Fuller	= ADF
Autoregressive Model	= AR
Breusch- Godfrey	= BG
Breusch- Pagan- Godfrey	= BPG
Bulk Carrier	= BULKCA
Container ship	= CTNSHIP
Corporate Tax Rates	= TAX
Deadweight	= DWT
Domestic Credit to Private Sector	= CRE_X1
Economic Growth	= EG
Error Correction Term	= ECT
Financial Elements	= FE
Forward Freight Agreement	= FFA
General Cargo	= GNCAR
Global Seaborne Trade	= WST
International Finance Corporation	= IFC
Listed Stock Companies	= STOCK_CO
London Interbank Offered Rate	= LIBOR, Libor
Maritime Industry	= MI
Oil Tankers	= OILTNK
Other Ships	= OTHRSHIP
Real Interest Rates	= RRATE_X2
Phillip-Perrons	= PP
Schwarz Bayesian Criterion	= SBC
Ship Finance	= SF
Vector Autoregressive	= VAR
Vector Error Correction Model	= VECM
World Gross Domestic Product	= WGDP
World Bank Group	= WGB
World Merchant Fleets	= WMF
World Trade	= WT

<한글초록>

제목 : 세금과 금리가 싱가포르의 해양산업 발전에 미치는 영향 분석
- *공적분 및 인과관계 분석* -

국제적인 해양산업 분야는 모든 해양산업 연구자, 선박금융취급자, 은행, 금융기관, CEO, CFO, 보험회사, 해운회사뿐 아니라 오일 및 가스회사들에게도 확실히 흥미진진한 분야이다. Stopford (2009) 는 Columbus, Diaz 그리고 Magellan의 대항해와 슈퍼탱커, 컨테이너와 특수선 등을 이끌었던 선구적인 사람들이 세계의 해로를 열었다고 판단했다. 해마다 세계 인구의 각 개인 당 1톤의 화물을 수송해내는 이 분야보다 더 흥미로운 산업은 없을 것이다. 지난 20세기에 해상을 통한 운송은 더욱 중요하게 여겨졌다. 예를 들어 2004년 상선은 미화 4,260억 달러에 달하는 수익을 올렸고, 2005년 해운산업은 160개국 간에 70억 톤의 화물을 수송해낸 것으로 보고되고 있다. 해운회사는 동-서 또는 아시아 지역을 기본으로 국제적 산업이고 약 123만명의 선원을 고용하고 있다. 더불어 항만산업과도 밀접하게 관계되고 있는데, 선박의 크기가 대형화되면서 새로운 현대화된 항만시설 건설에도 영향을 미치고 있다.

선박금융(SF), 세계해상물동량(WST), 세계 GDP(WGDP), 리보금리(LIBOR), 법인세(TAX) 그리고 민간부문에 대한 신용(CRE-X1), 실질이자율(RRATE_X2), 상장회사(STOCK_CO)와 같은 재무요소들은 선주, 금융기관, 은행, 은행의 위험 관리자, 그리고 해사관련 연구자들에게 매우 흥미진진한 이슈들이다. 지난 20세기와 비교하여 오늘날의 특수화된 컨테이너, 오일 탱커, LPG, LNG, 살화물선 등 국제적 선박건조와 해상수송의 괄목할만한 발전은 생산성과 글로벌하게 사업을 영위하는데 있어서 매우 중요한 것으로 판단된다. 선박투자자들은 통상 막대한 자본을 요구한다. 그리고 항상 적절한 자금조달의 원천을 찾기도 한다.

이 연구는 1980년부터 2015년까지 수집된 WST, WGDP, LIBOR 그리고 세계선대에 법인세율과 LIBOR 금리가 어떠한 영향을 미쳤는지를 실증 분석하였다. 즉 분리된 개별 변수들이 통합된 모형에서 어떻게 장단기적으로 균형관계를 갖는지를 분석하고 있다.

본 연구는 싱가포르의 사례연구로 1980년부터 2015년까지 싱가포르의 TAX, CRE_X1, RRATE_X2, STOCK_CO 등 중요한 요소들을 정부가 어떻게 유용하게 적용할 수 있는지를 보여준다. 그리고 오늘날 가장 바쁜 허브항만 중 하나가 되기 위해 해양산업에 활력을 불어넣기 위해 그것의 경제성장을 증가하기 위한 매력적인 환경을 조성하는데 세금의 역할과 다른 경제요소들이 어떻게 적용되는지도 보여준다.

Abstract

The international maritime and offshore fields are visible and really fascinating environments to all maritime researchers, shipping financiers, bankers, financial institutions, chief executive officers (CEOs), chief of finance officers (CFOs), insurance companies, shipping companies, Oil & Gas companies as well. As Stopford (2009) reckons the epic voyages of Columbus, Diaz and Magellan opened the maritime highways of the world, and the same pioneering spirit brought supertankers, container-ships, and the complex fleet of specialized ships which each year transport a ton of cargo for every person in the world, no business is more exciting. The transportation by sea is getting more important than last 20th century, for instant, in 2004 the merchant shipping was with turnover about US$ 426 billion and in 2005, shipping industry transported 7.0 billion tons of cargoes between 160 countries. It is seen the world wild shipping companies which businesses are based in the West, East or Asian regions and employ about 1.23 million seafarers, work closely with port organizations and also impact to the development of building new modernization port facilities.

Ship finances (SF), global seaborne trade (WST), world gross domestic product (WGDP), the London Interbank Offered Rate (LIBOR), corporate taxes (TAX) and other related financial elements (FE) such as domestic credit to private sector (CRE_X1), the real interest rates (RRATE_X2), the listed-stock companies (STOCK_CO) are really the fascinating issues to the ship-owners, financial institutes, bankers, banking risk managers and maritime researchers. The remarkable developments of global ship building and sea transportation are important and significantly created more productivities and businesses to the world economy today compared to last 20th century, special in the containerization, oil tankers, liquefied petroleum gas (LPG), liquefied natural gas (LNG), dry bulk carriers and others. The ship investors normally require the large amount of capital and always seek for the suitable financial sources.

The research is firstly aimed at empirical analysis the global distinguished and prominent impacts of ***Libor's interest rates*** on the ***WST, WGDP, LIBOR and the world merchant fleets (WMF)*** during the 1980-2015 period to see how the activities of long run and short run equilibrium relationships of those separate variables are in one synchronous models. Libor is chosen as representative symbol for other financial organizations because it is generally considered by most of loan transactions and world financial institutes when dealing with bank's interest rates.

The research then continually analyzes to ***Singapore case study,*** a specific symbol of Singapore's prominent impacts of TAX, CRE_X1, RRATE_X2 and STOCK_CO during the 1980-2015 period to see how the government significantly applies *the roles of tax rates and other financial elements* to create the attractively environmental activities to increase its EG to boost maritime industry and becomes one of the busiest world class sea-port hub as seen today.

Chapter 1. Introduction

1.1. Research Background and Objectives

As globally statistical recorded, there is over 90% of world trade (WT) is carried by the international maritime fleets (WMF) with low and decreasing ocean freight costs and from this, global seaborne trade (WST) is expectedly to be expanded continually to bring the benefits for international consumers. There are recorded as more than 50,000 merchant ships which are registered in over 160 nations and trading internationally and transporting every kind of cargoes. In maritime industrial fields, most of the shipping companies, the cargo owners, the ship builders, the port authorities are very concerned to seek for the healthy, returned, and stable sources of cash flows and how to successfully establish the regularly profitable chatter routines in order to have the high yield returns of gigantic amounts invested into their building fleets, into develop their modern ports to attract cargoes by offering the advanced cargo handling facilities to the vessels.

The sources of SF loans are the large required funds which normally are derived from joint stock limited companies, from the individuals who own and control it (individuals are legally shared) or from the various sources such as share capitals (issuing of ordinary shares), public issuing of debenture stocks, from funds are raised the loans, sales and lease-back, sales to another flag, etc. and also from saving taxations. The ship investors normally require the financial sources sometimes account for up to 80% of the costs of operation of a bulk carrier from the bankers who always like to get the predictable earnings, transparent corporate accounts, consistent growth and high yields of those borrowers. However there are no many shipping companies who are fully qualified with the bankers' critical requirements. Each of new building vessel could cost more than thirty to few hundreds millions US dollars and its time life is utilized around 15 economic years, thus the ship investors are much concerned on how they could fully utilize their profitably operating fleets which are depended on the regularly routine chatters and combined full trading volumes of cargoes on boards. The crucial issues that the ship investors, bankers, and port operators may expect to see if are there any interactional causal nexuses between the WGDP to the WST, to the WMF, to the Libor's interest rates and vice versa? How the prominent impacts of TAX to CRE_X1, to RRATE_X2, to STOCK_CO and vice versa? Are all of these separate factors endogenously or exogenously impacted each other in short run or long run equilibrium relationships ? In case of WST is increased then would this be the real reason to the increasing WMF, and then transforming to the volatilities of interest rates? If they are, so how do they work and would the same circumstances be seen in TAX and other FE, too?

The dissertation will critically analyze the internally causal nexuses of SF loans to WST, WGDP, LIBOR and WMF in the world for the time series 1980-2015 and 1986 and 2015 periods, and also analyze the case study of maritime Singapore when it is dealt with the prominent roles of taxations and other FE by using autoregressive (AR) models, vector error correction model

(VECM), and employ the Granger causality and econometric methods tests through 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), and the different variables of the corporate tax rates (TAX), domestic credit to private sector (CRE_X1), real interest rate (RRATE_X2), listed stock companies (STOCK_CO); etc. as the dependent, independent, single, and separate factors respectively that will be together applied as the joined variables in one synchronic model, to see how those will significantly boost its MI. The reason of why Singapore's case study is chosen because Singapore is a small country in ASEAN countries but she is well known as one of the 2nd busiest world hub-port and is a global financial center where all of the world famous and giant shipping companies, international banks and institutes are already registered *under Singapore companies with their own daily operated offices such as Maersk Lines, Mitsui & Co, Mitsubishi-Tokyo Bank, HSBC, etc.*

1.2. Scopes and Data of Research

The data are obtained and abstracted from the sources of Maritime Port Authority of Singapore (MPA), PSA International Pte. Ltd (formerly as Port of Singapore Authority), Maritime Fund Incentive (MFI), Incentive Maritime Committee (IMC), Singapore Registry Company (SRC), Inland Revenue Authority of Singapore (IRAS), Singapore Authority Annual Account (SAAA), Singapore Department of Statistic (SDS), Annual Economic Survey of Singapore 2000, Singapore; UNCTAD, World Bank (WB) and International Monetary Fund (IMF), and Singapore Stock Exchange (SGX), 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.

All the Singapore's data of numbers of vessels arrivals in thousands of deadweights to Singapore's ports, etc. are firstly obtained from the sources of Singapore, and also from UNCTAD but finally applied data is based on UNCTAD's. Other financial data such as real interest rates, domestic credit to private sector, stock companies, etc. are on Singapore's sources.

1.3. Methodologies and Structures

The empirical analysis of those issues is ingeniously deciphered by Johansen and Juselius (1990) cointegrating equations, vector error correction model (VECM) and Granger causality tests to verify in details what are the short-run equilibrium relationship and what are the long-run equilibrium relationship together with the internally causal nexuses of the separate jointed variables in the selected synchronous models, and if the findings which are resulted from plausible deciphers would be satisfied and contributed anything to the future strategies of the ship-owners, port

authorities, bankers, etc. are sincerely expected. Other issue is in case of those causal analyses can successfully prove how the critically prominent roles of each joined variables in the synchronous model are, and consistently assert these long-term and short-term equilibriums could be continuously existed, then would these also be successfully kept its EG and significances in terms of qualitative and quantitative issues in the future or not, if the same methods are internationally applied.

The remainder of this research is divided into: section (2) briefly reviews all the literature reviews on the Johansen co-integrating equations, VECM in long run and short run and, Granger causality tests, causal nexuses of taxes and other policies on the EG, section (3) presents all data and applied methodologies, section (4) will critically analyze and the empirical finding then ending by how those factors are dealt and impacted with and conclusion in section (5).

All the contents of this dissertation are mostly derived from two (2) researches that have been publicly posted on the European (*International Journal of Energy Economics and Policy*) and U.S.A University/England/India international financial journals (*Global Journals Inc. US*) with its article "*An Empirical Analysis of the Prominent Roles of Taxations in the Synchronicity on Boost of Maritime Industry in Singapore*" [Vol.6, No.1, 2016. ISSN: 2146-4553], and "*An Empirical Analysis of the Impacts of LIBOR Changes on the Volumes of Global Seaborne Trade and the Growth of World Gross Domestic Product – Cointegration and Causal Nexuses*" [Vol.16, Issue 3, 2016, Version 1.0. ISSN: 2321-3418]

Chapter 2. Literature Reviews

2.1. The Critical Roles and Relations of SF, WMF, WST, WGDP and Libor

2.1.1.The Important Roles of SF to MI.

For maritime industry (MI) the requirement of SF is the crucial condition and is related to its capital costs in their sizes because a container ship represents an initial capital outlay of more than US$ 80 million while others like LNG tankers or new technological designs are cost more. The SF is prominently playing the crucial roles that are contributed to this critical industry. It could be stated as shipyard credits, leasing agreement, and special national funds set up for shipping or ship building development. Tsomocos, et al., (2011) in the study of Minsky's financial instability hypothesis and the leverage cycle, by linear modeling of financial institutions and banks for fund raising, saying that in the initial period banks choose not to invest any capital in the risky project, and the same holds for the intermediate period when a bad state realizes, however once expectations are updated upwards, say, the economy moves to the good state in the intermediate period, then bank starts investing into more risker projects. The meaning that when expectations are boosted and financial institutions find it profitable, the creditors are willing to provide with funds and bank portfolios consists of relatively risker projects. Currey (2004), in his note exploration on ongoing Marco-level changes at the WB, denoted that the World Bank Group (WBG) funding to support the private sector has increased dramatically, both in absolute terms and relative to overall spending, and in 2013, the International Finance Corporation (IFC) accounted for 35% of WBG commitments, compared with 18% in 2009 and only 13% in 2000.

Wijnbergen (1988) applied the general equilibrium models through financial variables of revenue, expenditure, relative prices, interest, and data of OECD and LIBOR etc. for period 1979-1982, and 1982 onwards to test for the debt neutrality, fiscal deficits, interest rates, and the global effects on the inter-temporal and intra-temporal trade of various fiscal policy measure and interventions in commodity trade, showing that almost all of the increase in real interest rates can be ascribed to the pressure on world saving exerted by increased fiscal expenditure and the fact that increase was deficit financed, and an increase in the world interest rate to restore global current account balance. In the crisis period the ship-owner should be much care of margin conditions and cost of capital when getting the loan from financial institutions due to as Coffey et al., (2009) empirically analyzed the data of LIBOR and other currencies for supplying dollars in their studying of capital constraints, counterparty risk and deviation from covered interest rate parity (CIP) by using linear regression model, saying that the proxy for margin conditions and cost of capital are significant determinants of the basic, especially during the crisis period. As Gratsos (2013), the cost efficiency of shipping is related to the dry bulk shipping's cost efficiency improved about 33% over the last 31 years through larger, more cost efficient ships, and the average size of the fleet grew from 35,500 DWT in 1981 to 70,600 DWT in 2012, in order to improve cost efficiency, ship sizes are constantly increasing, all ship categories suffer bracket creep and parcel trade in bigger bulk

carriers improves cost competitiveness, the smaller, more flexible ships attain a measure of cost efficiency by reducing the ballast leg (triangulation). Regarding to the loan supplying to the maritime fleets, Heiberg (2012) proved in his research that bank commitments are probably in the region of US$ 400 to US$450 billion, as an aggregate value of the world fleet including specialized ships such as chemical tankers, gas tankers, and offshore units and bit is likely that this is shrinking because some banks wish to reduce exposure, and also over the next couple of years loan repayment will probably be in the range of US$ 70 billion per annum of which US$ 40 billion is likely to be committed by the banks to the new business, and however export credit agencies are expected to be part of the funding equation, although the will probably have a greater impact on the offshore side than the shipping side. Between 2010 and 2012, increased financial constraints was highlighted as one of the most significant changes to the business by 40% of the shipping respondents and overcapacity of supply was also highlighted by shipping respondents and London was selected as the financial center best to meet the needs by 40% of shipping respondents with New York and Singapore joint second. There are 36% of shipping respondents are using or considering new sources of finance, and structured finance was most favored (26%) , new private equity (23%), and export credit (20%), (www.shippingresearch.worldpress.com).

Concerning to the bank's strategies for ship financing, as Stopford (2009), the shipping has distinctive characteristics which make financing different from other asset-based industries such as real estate and aircraft whereas bankers like predictable earnings, well-defined corporate structures, high levels of disclosure and well-defined ownership whilst investors look for consistent growth and high yields, however many shipping companies do not meet those criteria. Providing finances to the borrowers there are always high risks are occurred even though the banks normally play a critical role in international trade by providing trade finance products that reduce the risk of exporting, however to the situation of surplus new shipbuilding when the market are down, the high risk are still the crucial issues and seriously concerned. In the KMPG's research (2011) it was asserted that German banks have taken a leading role in the financing of global shipping, even in the recent years of the crisis German banks have provided equity interim financing up to 10% loan financing for ordered ships and working capital financing and financing of operation cost (OPEX), the fundamentally finance changed shipping financing conditions require action by shipping companies and they must develop individual tailored solutions to secure new capital and to fund new builds.

Niepmann, et al., (2014) employed double residual estimator into linear regression testing models with all jointed variables of documentary collection (DC), letter of credit (LC), expected profits from cash in advance, open account, destination country risk, transaction size, log GDP per capita, log financial development, long distance, and log exports denoted that increasing in the cost of trade finance that may come from increased due diligence requirement and new rules on capital and leverage have the potential to impact real economic activity not only in the United Stated but also abroad, and policymakers have interpreted the low usage of trade finance for shipments to less-developed economies as evidence of a gap in the provision of trade finance by commercial banks.

The sources of SF and other relevant expenditures of shipping activities are the crucial issues, and for most ship investors forecasting is not optional, as Stopford (2009) reckons, it is how they can earn so the better they anticipate the future, the more profit they can make and in order to do so.

2.1.2. The Causal Nexuses between WST and WGDP

Stopford (2009) also proposes the ship investors should have the accurate forecasting model through the forecasting steps of economic assumptions, the WST, the average haul, the ship demand, the ship productivity, the shipping supply, the balance of supply and demand, and the freight rates by employing linear regression relationship models. For instant, employing the linear relationship regression model for testing the moving together in a linear way between ST and GDP from 1995-2005, based on the actual result of 1982-1995, Martin predicted that there were occurred the casual nexuses between two variables of ST and GDP with the result of R^2 = 99%, whereas R^2 = 98.9% in cargo trade, and R^2=94.3% in oil trade.

However, standing on the different point of views when empirically analyzes the causal effects between the trade volume (seaborne trade) and volatility in the shipping forward freight market of dry bulk vessels of Capesize (172K metric tons DWT), Panamax (74K metric tons DWT) and, Supramax (52K metric tons DWT) by using vector autoregressive (VAR) model, exponential GARCH model, and EGARCH-X model, Alizadeh (2012) denoted that there was no evidence of causality from volume to price changes, and result from the asymmetric conditional volatility models indicate the asymmetric response of forward freight agreement (FFA) price volatility to shocks in the market and there is a positive relationship between trading volume (seaborne) and price volatility only . Also using vector autoregressive modelling, unit root and Granger tests for analysis the causal nexuses of freight rate and dry bulk carriers of Handymax (HM) and Panama (PM) sizes ships to affect to the profits of ship-owners and shipping companies in period from 2000-2009 in the WMF and WST, Bulut (2011) proved the trends of MI, as a key effect of economic globalization is the continuing increase in maritime trade and traffic and in the near future, global port operators are seen to continue to expand to new geographic areas and will maximize the use of technology to create worldwide port networks that can offer consistent levels of services and modes of operation, since capital investment into marine will be high thus only the most powerful enterprises with significant financial resources will remain in these alliances.

2.1. 3. The Activities and Impacts of WMF on WST and WGDP

The MI and maritime merchant fleet which is a subsector of the transport sector - dominate by North America, Europe and Asia - globally accounts for over 70% of transportation requirement of the world, and the roles of WMF to the development of WST, as Selen (2009), trade is a vehicle of growth and maritime transport is instrumental for bridging markets, and maritime transport is a catalyst of world trade and this has been so for thousands of years. The significant contribution of WMF to the WST, between 2010 and 2012 by 40% of the shipping respondents and overcapacity

of supply was also highlighted by shipping respondents as OECD report, the development of global trade is a specific driver of maritime and air freight transport volumes and in which maritime transport is the backbone of international trade with over 80% of world cargo by volume transported by sea, the WST measured in tons loaded grew 4% to 9.2 billion tons in 2013, or 11% above the pre-crisis peak in 2008 (UNTACD), and in ton-miles, maritime transport grew by 4% reaching 46 billion ton-miles; the total amount of goods unloaded (in tons) in developing countries reached 28% above pre-crisis 2008 peak in 2012 while in the developed economies volumes were still 8% below their 2008 peak.

Container volumes continued to grow at all ports except for Hong Kong where traffic feel for the second consecutive year as a result of increasing competition from rival ports in southern China and the Pearl River Delta area and shift in ocean carrier alliances (OECD, 2015. 22,24). The tankers, bulk carriers and container ships are the most important means of maritime transportation and carry billions of tons cargoes and bringing vast improvements in efficiency. For the period 1950 – 2005, Stopford (2009) denoted that the ST had the central place in the twenty first century and grew from 0.55 billion tons to 7.2 billion tons, meant average 4.8% per annum. Det Norske Veritas AS (DNV, 2012) had predicted the trends of oil tanker from 2012-2020 which is depended heavily on oil prices, then 7-8% that is equivalent to 8 to 33 million tons of LNG new building will be able to run on, the bulk carrier will be grown less than 5% per year and still be under pressure for years to come as the result of the current oversupply, the container ship as is "the closets to the consumer" and demand is strongly driven by the GDP developments and, not least, changes in per capita income in regions and large countries and the number of 4,000 - 8,000 TEU vessel will be increased while vessels smaller than 1,000TEU are likely to represent a smaller share of the market in 2020 than they do today. The maritime sector is of critical significance to any economy and is the main means for transporting goods internationally, and many cities rely on their ports as a major source of revenue. Maritime activities are expanding, for example, the European Union's (EU's) maritime regions account for about 40% its GDP. (www.myfinancialintelligence.com).

Huang, et al., (2015) using two models of linear regressions, one for trip generation and one for gravity for trip distribution between exported countries and imported countries to test and found that, it captured up to 72% of variation in trade volumes while the gravity model achieved an accuracy of 84%, and also revealed that socio-economic and demographic indicators that affect import and export containerized trade volumes were identified with R^2 = 79.80%. Corbett (2008) asserted the global goods movement is a critical element in the global freight transportation system that includes ocean and coastal routes, a primary example is containerized short-sea shipping where the shipper or logistics provider has some degree of choice how to move freight between locations.

Talking to the crucial roles of WMF as facilitator of world trade (WT) and WST, Heiberg (2012) critically analyzed that if just compares with 1950s, the WST comprised about 0.5 billion metric tons whereas today it has expanded to about 9 billion metric tons, thus ST has ground about 18-fold while GDP has grown roughly eight or nine-fold in the same period. In value terms, ST

accounts for about 60% of WT, and the value of all of WT today is about US$ 15 trillion, of which US$ 9 trillion by sea. Also as Heiberg, over last 60 years the seaborne container trade has grown from zero (0) to about 1.5 billion metric tons, and in 2010 the global value of seaborne container trade is estimated about US$ 5.6 trillion which is about 60% of the WST. The crucial impacts and diffusion of containerization – adoption and usage - to the firm's fixed cost, Rua (2014) using the econometric models for the period 1956 to 2008, consisted of the adoption year for 145 countries and data on containerized and general cargo trade for 684 ports in 127 countries, empirical investigation and finding that the usage of containerization increases with firm's fixed costs and the size and average income of the container network, and the adoption depends on expected future usage, adoptions costs, and trade with United States, the first and largest user of containerization.

Analyzing the types of cargoes (dry bulk cargo, liquid bulk cargo, and general cargo), types of ships (dry bulk carrier, tanker, LNG/LPG, combined carrier, container, RO/RO, and reefer), trade routes (Mediterranean Sea, Caribbean Sea, etc.), and type and duration of charters (voyage, time, bareboat and contract of affreightment charter) by using the spearman rank correlation coefficient to measure the degree of association between ST (in million ton) and freight rate, Anyanwu (2013) saw that there was a positive association between freight rate and fleet size with the correlation coefficient of 0.660 and this was implied as seaborne volume grows thus, the ship-owners needed to adjust their fleet size to meet the market demand. In MI, containerization is getting more important than decade years in sizes and increased deadweight (DWT) to meet the rapid growth of international trade. Gosasang, et al., (2012) deployed the parameters multilayer perceptrons (MLP) neutral network models, root mean squared error (RMSE), mean absolute error (MAE) together with linear regression models, to test the correlation coefficients of containerization output at four major Thai land ports (Bangkok, Private Wharves along the Chap Pharaya River, Laem Chabang and, Songkhla) for the period 2001-2011, from this Gosasang found that despite of other related factors of industrial production, inflation rate, interest rate, exchange rate, oil prices, etc. the containerization situation now is significantly contributed to the import and export of cargoes in and out Thailand. According to the research of Rodrigue, et al., (2016), as of 200, the ST accounted for 89.6% of global trade in terms of volume and 70.1% in terms of value. Wignall and Wignall (2014) examined and found that the international trade by volume in South Asia, Southeast Asia is transported by sea in three forms of container, dry bulk, and liquid bulk and sea transport has a large cost per ton kilometer advantage over the other modes of transport and will not be eroded significantly over next 20 years.

2.2. Singapore's Case Study

2.2.1. The Governmental Catalytic Roles Process of Support to EG

Nowadays 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 FE into one unified power, in order to significantly boost the EG 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 engines 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 of 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 Singapore's roles to significantly acts as catalytic process to support EG

Reckoning on the power and aggressive actions of local government to boost the EG 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 choses 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 strategies do 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 economic growth (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 economic growth (OECD, 2010:1).

2.2.2. The Prominent Impacts of Taxes and FE to MI

Finkelstein (2007) pointed out 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. 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 strategies 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 to 2004 period for tax policy on growth rates included regional dummy variables, 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, et al., (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 macroeconomic growth 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 , et al., (2012) examined the impact of the Canadian provincial governments' tax rates on economic growth 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 economic growth.

Engen, et al., (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 economic growth, 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 economic growth. Demirguc- Kunt (2008) viewing the differences of why the economic growth 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".

Analyzing the roles of financial elements to boost the EG, Jalilian, et al., (2006) used the econometric model and Cobb-Douglas' modelling 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 economic growth 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 economic growth and the empirical results are consistent with the view that "good" regulations is associated with higher economic growth in lower-income economies.

With higher taxes comes slower growth. The more the government consumes of the economy, the less scope there is for the private sector. Yamarik (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. 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 economic growth 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.

2.2.3. Singapore's Marco Policies to Support and Develop EG

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 EG, staying competitiveness in the areas of existing strength through the restructuring roles and engines policies to boost its peninsula - where each of many tiny products are totally imported, including drinking water - special to maritime & offshore fields to make Singapore to become the one of the world class of ship registries, maritime & offshore new ship buildings and a home sea-port hub as seen today. Feridun, et al., (1976-2002) investigated to Singapore's causal nexuses of foreign direct investment (FDI), policies, finance and EG have been extensively investigated in their paper to analyze the outstanding policies between Singapore and other countries as well.

2.2.4. The Causal Nexuses of Singapore's Policies to EG and Maritime Growth

The key drivers of EG in Singapore are derived from sea port facilities, maritime & offshore industries, services and new building, financial & banking systems besides tourists & business services, petroleum refineries, and import & exports, etc. which are seen to really play the crucial key roles. The relationship between Singapore's roles to maritime growth 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 of Singapore (MPA) 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 MI. The Ministry of Trade and Industry of Singapore (MTI) 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, et al., (2012) using vector autoregressive (VAR), Johansen (1988) and Johansen and Juselius (1990) using vector error correction model (VECM) models to test the EG, gross domestic product (GDP), gross domestic capital formation (GDCF) 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 economic growths for Indian economy.

Qayyum, et al., (2012) when examined an empirical relationship between financial development and economic growth 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 economic growth, Guariglia, et al., (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, 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.

Chapter 3. Data Collections & Research Methodologies

3.1. Data Collections

This dissertation employs the time series from 1980- 2015 period for the numbers of merchant fleets by flag or registration by the type of merchant ships of Singapore such as bulk carrier, container ships, oil tankers, general cargo, other ships, total ships in deadweight tons volumes (DWT) from UNTACD. The data of WGDP and WST from 1980- 2014 period are derived from World Bank (WB), the interest rates of period from 1986-2015 are employed from London Interbank Offered Rate (LIBOR).

Besides the dissertation is also employed the time series data of Singapore from 1980-2014/2015 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 . These data have been carefully checked before being abstracted from the sources of Maritime Port Authority of Singapore (MPA), PSA International Pte Ltd (formerly as Port of Singapore Authority); Maritime Fund Incentive (MPI); Incentive Maritime Committee (IMC); Singapore Registry Company (SRC); Inland Revenue Authority of Singapore (IRAS); Singapore Authority Annual Account, Singapore Department of Statistic, Annual Economic Survey of Singapore 2000, Singapore; UNCTAD, World Bank (WB) and International Monetary Fund (IMF), and Singapore Stock Exchange (SGX), 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.

Those separate factors will be applied together as the joined variables in the selected synchronic models.

3.2. Reasearch Methodologies

3.2.1. Cointegration and Unit root tests

As Johansen (1988) and Johansen and Juselius (1990) maximum likelihood method is a procedure for testing co-integration of several, say k, *I*(1) time series to obtain the number of co-integrating vector and this test permits more than one co-integrating relationship so is more generally applicable than the Engle and Granger (1987) test which is based on the Dickey and Fuller (1979) test for unit roots in the residuals from a single (estimated) co-integrating

relationship. It provides two different types likelihood ratio tests, one is trace and other on the max-eigenvalue, and the inferences might be a little bit different. The Johansen and K. Juselius' cointegrating model is given below:

$$\Delta X_t = \sum_{i=1}^{p=1} \Gamma_j \Delta X_{t-1} + \Pi X_{t-1} + \varepsilon_{t,} \ldots \quad (1)$$

In the tests, VECM has information about the short and long- run equilibrium relationship exists and adjustment to change into X_t via the estimated parameters Γ_j and Π whereas X_t is (*2x1*) vector of joint variables respectively, and Δ is stood for symbol of different operators whilst ε_t is stood for (*2x1*) vector of residuals. The expression of ΠX_{t-1} is the ECT and Π can be factored into separate matrices α and β such as $\Pi = (\alpha\beta)'$, where β' is denoted for the vector of cointegrating parameters then α' is for the vector correction coefficient measuring the speed of convergence to the long run steady states. When the multi-variables joint in the linear synchronic model are found to be cointegrated after being run by Johansen-Juselius' tests, they will share a common stochastic trends and will grow proportionally together in long- run relationships. The joint variables are theoretically cointegrated in the linear autoregressive synchronicity just simply denote the existence of internally casual nexuses of variables only, but it fails to show the directions of causal relationships.

To establish the order of integration of the jointly variables, the conventional unit root test as Augmented Dickey-Fuller (ADF) and Phillips-Person (PP) unit root tests, and normally a variable is considered to be integrated of order *d*, is written as *I*(d) is turned out to be stationary after differencing at *d* times, and when being cointegrated, it is order at *1* (Asteriou and Hall, 2007), and could be demoted as below equations for the time series Y_t (H_0: $\delta = \vartheta = 0$):

$$\Delta Y_t = \beta_0 + \vartheta Y_{t-1} + \sum_{i=1}^{p} \lambda_i \Delta Y_{t-i} + \varepsilon_t \quad (2)$$

$$\Delta \boldsymbol{Y_t} = \delta \boldsymbol{Y_{t-1}} + \sum_{\boldsymbol{i=1}}^{\boldsymbol{k}} \boldsymbol{\beta_i Y_{t-1}} + \boldsymbol{\varepsilon_1} \quad (3)$$

$$\Delta Y_t = \alpha_0 + \delta Y_{t-1} + \sum_{i=1}^{k} \beta_i Y_{t-1} + \ldots + \sum_{i=1}^{k} \delta_{k-1} \Delta Y_{t-i} + \varepsilon_1 \quad (4)$$

$$\Delta Y_i = \beta_0 + \sum_{i=1}^{k} \beta_1 X_{1i} + \sum_{i=1}^{k} \beta_2 X_{2i} + \sum_{i=1}^{k} \beta_3 X_{3i} + \sum_{i=1}^{k} \beta_4 X_{4i} + \varepsilon_i \quad (5)$$

$$\Delta Y_t = \alpha_0 + \alpha_1 T + \delta Y_{t-1} + \sum_{i=1}^{k} \beta_i Y_{t-1} + \ldots + \sum_{i=1}^{k} \delta_{k-1} \Delta Y_{t-i} + \varepsilon_1 \quad (6)$$

And $$\boldsymbol{\Delta(\Delta Y)_t = \Delta Y_t - \Delta Y_{t-1}} \quad (7)$$

With $$\Delta(\Delta Y)_t = \alpha_0 + \Delta \sum_{i=1}^{k} \beta_i Y_{t-1} + \nu_1 \quad (8)$$

Where (α_0) and (α_1) are constants, (β_i) and (δ_{k-1}) are the coefficients on a time trend and (k) as the lag order of the autoregressive 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 Granger causality test is defined the core meanings of directions of causal relationships which will be a short run exogeneity as shown by the significance of ΔY_{t-1}, and in the long run exogeneity as shown by the significance of error correction term. The results are then felt in one of the following cases, if $\boldsymbol{\delta_i} \neq 0$ and gets significant meanings, but $\boldsymbol{\rho_i}$ 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 $\boldsymbol{\delta_i}$ is negatively significant meanings, but $\boldsymbol{\rho_i} \neq 0$ 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 $\boldsymbol{\delta_i}$ and $\boldsymbol{\rho_i}$ 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 $\boldsymbol{\delta_i}$ and $\boldsymbol{\rho_i}$ are all negatively significant meanings then the saying of both variables of X and Y are independent is finally given result (Vu, et al., 2016). Hiemstra, 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. The testing are generally denoted as:

$$\begin{cases} \Delta Y_t = \alpha_0 + \sum_{i=1}^{k} \beta_i \Delta Y_{t-1} + \sum_{i=1}^{k} \delta_i \Delta X_{t-1} + \varepsilon_t & (9) \\ \Delta X_t = \alpha_1 + \sum_{i=1}^{k} \phi_i \Delta X_{t-1} + \sum_{i=1}^{k} \rho_i \Delta Y_{t-1} + \nu_t & (10) \end{cases}$$

Where α_0, α_1, β_i, ϕ_i, δ_i and ρ_i are coefficients, ε_t and ν_t are residuals and ΔX_t, ΔY_t are dependent and explanatory variables at t, ΔY_{t-1} and ΔX_{t-1} are variables at one period time. The selected number of lags are usually chosen when using an information criterion, such as the Akaike information criterion (AIC) or Schwarz Bayesian criterion (SBC). 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.

3.2.3. Vector Error Correction Models (VECM)

Ericsson, et al., (2000) asked for the attention to the distribution of EC 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 VECM is just a special case of vector autoregressive (VAR) for variables that are stationary in their differences (i.e., *I*(i)) and VEC can also take into account any cointegrating relationships among the jointly variables. The VECM can avoid the shortcoming of the VAR based model in distinguishing between a long run and short run relationship among the jointly variables. When the joint variables of a VAR are cointegrated, VECM can be then commonly denoted as:

$$\Delta Y_t = \beta_{y0} + \beta_{y1}\Delta Y_{t-1} + ... + \beta_{yp}\Delta Y_{t-p} + \lambda_{y1}\Delta X_{t-1} + ... + \lambda_{yp}\Delta X_{t-p} - \lambda_y(y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + \nu_t^y ....(11)$$

$$\Delta X_t = \beta_{x0} + \beta_{x1}\Delta Y_{t-1} + ... + \beta_{xp}\Delta Y_{t-p} + \lambda_{x1}\Delta X_{t-1} + ... + \lambda_{xp}\Delta X_{t-p} - \lambda_x(y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + \nu_t^x ....(12)$$

$$\Delta Y_t = \sum_{i=1}^{p=1} \beta_i \Delta Y_{t-i} + \sum_{i=1}^{p=1} \alpha_i \Delta X_{t-i} + Z1 * EC1_{t-1} + \varepsilon_{1t} ...(13)$$

$$\Delta X_t = \sum_{i=1}^{p=1} \varphi_i \Delta X_{t-i} + \sum_{i=1}^{p=1} \pi_i \Delta Y_{t-i} + Z2 * EC2_{t-1} + \varepsilon_{2t} ...(14)$$

Where in (11), (12), $y_t = \alpha_0 + \alpha_1 x_1$ is the long run cointegrating relationship between two variables, λ_y and λ_x are the error correction parameters that measure how *y* and *x* react to deviation from long- run equilibrium. If in (13), (14) β_i, φ_i, α_i, and π_i are short run coefficients, Z_1 and Z_2 are EC coefficients whereas $EC1_{t-1}$ & $EC2_{t-1}$ are denoted as the equilibrium error lagged values one period derived from residuals of threshold cointegrating equations regression of joint variable vectors, and same time the procedures of optimum lag length criteria of VAR model based on the AIC or SC are specified as well. When VECM has more than two variables, it is considered to the possibility that more than one cointegrating relationship exit among the joint variables and with VECM we can examine the relationship of this joint variable is weak Granger causality compared with others and vice versa. And when the short run relationship between this variable to other counter variable is found which is based on the normal *F Wald* test of the joint significant coefficients on the lagged terms in the unrestricted models as the null hypothesis and its alternative, then it is considered as weak Granger causality. The long-run equilibrium relationship is tested by the speed of adjustment of coefficients and based on the *t* statistic of the ECTs.

3.2.4. Selected Joint Variables Model

3.2.4.1. For WGPD, LIBOR, WST and WMF

In this paper, the examining of all joint multi-variables is tested on the denoting of co-integration equations by Johansen and Juselius, VECM models and Granger causality in a linear regressive synchronic models are deployed respectively, as:

$$\Delta WST_t = \sum_{i=1}^{k=1} \alpha_i \Delta WST_{t-1} + \sum_{i=1}^{k=1} \beta_i \Delta WGDP_{t-1} + \sum_{i=1}^{k=1} \phi_i \Delta WLIBOR_{t-1} + \sum_{i=1}^{k=1} \gamma_i \Delta WMF_{t-1} + Z1 * EC1_{t-1} + \varepsilon_{1t} \ldots (15)$$

$$\Delta WGDP_t = \sum_{i=1}^{k=1} \lambda_i \Delta WGDP_{t-1} + \sum_{i=1}^{k=1} \varphi_i \Delta WST_{t-1} + \sum_{i=1}^{k=1} \delta_i \Delta WLIBOR_{t-1} + \sum_{i=1}^{k=1} \vartheta_i \Delta WMF_{t-1} + Z2 * EC2_{t-1} + \varepsilon_{2t} \ldots (16)$$

$$\Delta WLIBOR_t = \sum_{i=1}^{k=1} \mu_i \Delta WLIBOR_{t-1} + \sum_{i=1}^{k=1} \nu_i \Delta WST_{t-1} + \sum_{i=1}^{k=1} \varsigma_i \Delta WGDP_{t-1} + \sum_{i=1}^{k=1} \omega_i \Delta WMF_{t-1} + Z3 * EC3_{t-1} + \varepsilon_{3t} \ldots (17)$$

$$\Delta WMF_t = \sum_{i=1}^{k=1} \tau_i \Delta WMF_{t-1} + \sum_{i=1}^{k=1} \xi_i \Delta WST_{t-1} + \sum_{i=1}^{k=1} \psi_i \Delta WGDP_{t-1} + \sum_{i=1}^{k=1} \kappa_i \Delta WLIBOR_{t-1} + Z4 * EC4_{t-1} + \varepsilon_{4t} \ldots (18)$$

When WST, WGDP, WLIR and WMF are denoted for global seaborne trade, world gross domestic product, London Interbank Offered Rate and, world maritime fleet respectively. The symbols of $(\alpha_i),(\beta_i),(\phi_i),(\gamma_i),(\lambda_i),(\varphi_i),(\delta_i),(\vartheta_i),(\mu_i),(\nu_i),(\zeta_i),(\upsilon_i),(\omega_i),(\xi_i),(\psi_i),(\tau_i)$ are depicted for the short run coefficients, and $\varepsilon_{1t}, \varepsilon_{2t}, \varepsilon_{3t}, \varepsilon_{4t}$ stand for the residuals of the joint variables whilst the $EC1_{t-1}$, $EC2_{t-1}$, $EC3_{t-1}$, $EC4_{t-1}$ are derived from the long run cointegration relationship and measure the magnitude of the past disequilibrium and denoted as lagged values of residual co-integrating regression models .

3.2.4.2. The Selected Synchronic Models for Singapore case study.

$$\Delta BULKCA = \alpha_0 + \sum_{i=1}^{k} \beta_1 RRATE\_X2 + \sum_{i=1}^{k} \gamma_1 CRE\_X1 + \sum_{i=1}^{k} \varphi_1 TAX + \sum_{i=1}^{k} \lambda_1 STOCK\_CO + \varepsilon_1 (19)$$

$$\Delta CTNSHIP = \alpha_1 + \sum_{i=1}^{k} \beta_2 RRATE\_X2 + \sum_{i=1}^{k} \gamma_2 CRE\_X1 + \sum_{i=1}^{k} \varphi_2 TAX + \sum_{i=1}^{k} \lambda_2 STOCK\_CO + \varepsilon_2 (20)$$

$$\Delta GNCAR = \alpha_2 + \sum_{i=1}^{k} \beta_3 RRATE\_X2 + \sum_{i=1}^{k} \gamma_3 CRE\_X1 + \sum_{i=1}^{k} \varphi_3 TAX + \sum_{i=1}^{k} \lambda_3 STOCK\_CO + \varepsilon_3 (21)$$

$$\Delta OILTNK = \alpha_3 + \sum_{i=1}^{k} \beta_4 RRATE\_X2 + \sum_{i=1}^{k} \gamma_4 CRE\_X1 + \sum_{i=1}^{k} \varphi_4 TAX + \sum_{i=1}^{k} \lambda_4 STOCK\_CO + \varepsilon_4 (22)$$

$$\Delta OTHRSHIP = \alpha_4 + \sum_{i=1}^{k} \beta_5 RRATE\_X2 + \sum_{i=1}^{k} \gamma_5 CRE\_X1 + \sum_{i=1}^{k} \varphi_5 TAX + \sum_{i=1}^{k} \lambda_5 STOCK\_CO + \varepsilon_5 (23)$$

Where bulk carrier, container ship, general cargo, oil tankers, other ships, domestic credit to private sector, tax, and listed stock companies are respectively stood as (BULKCA), (CTNSHIP), (GNCAR), (OILTNK), (OTHRSHIP), (RRATE_X2), (CRE_X1), (TAX) and (STOCK_CO). The coefficients, residuals are denoted as ($\alpha_0, \alpha_1, \alpha_2, \alpha_3, \alpha_4$) and ($\beta_1, \beta_2, \beta_3, \beta 4, \beta_5$) and ($\gamma_1, \gamma_2, \gamma_3, \gamma_4, \gamma_5$) and ($\varphi_1, \varphi_2, \varphi_3, \varphi_4, \varphi_5$) and ($\lambda_1, \lambda_2, \lambda_3, \lambda_4, \lambda_5$) and, ($\varepsilon_1, \varepsilon_2, \varepsilon_3, \varepsilon_4, \varepsilon_5$) respectively.

Chapter 4. Empirical Findings

4.1. The Impacts of LIBOR, SF, WST, WMF and WGDP

4.1.1. Unit root tests

It is requested by Johansen and Juselius, and Granger that the fundamental condition for cointegration needs each of variables in the joint synchronic model has to be integrated of the same order thus the selected joint variables have to be stationary absolutely. The joint variables WST, WGDP, LIBOR and, WMF for the period 1980-2015 are tested by ADF and PP in the different levels at level, trend and intercept at 1%, 5% and 10% respectively for all above joint variables and, regarding to resid in the selected models with unit root tests that depicted the values of all joint variables are stationary included residual as threshold co-integration is at level, as in table (1):

Table 1- Unit root tests by ADF and PP

Variables	ADF				PP			
	1%	5%	10%	P	1%	5%	10%	P
WST1**	-4.262735	-3.552973	-3.209642	0.0002	-4.262735	-3.552973	-3.209642	0.0000
WGDP*	-4.262735	-3.552973	-3.209642	0.0000	-4.262735	-3.552973	-3.209642	0.0000
LIBOR1**	-4.467895	-3.644963	-3.261452	0.0046	-4.323979	-3.580623	-3.225334	0.0040
WMF1**	-4.252879	-3.548490	-3.207094	0.0000	-4.252879	-3.548490	-3.207094	0.0000
Ɛt***	-3.689194	-2.971853	-2.625121	0.0017	-3.689194	-2.971853	-2.625121	0.0017

(*) At level, trend and intercept, (**) at 1st difference, trend and intercept, (***) Resid at level

4.1.2. Johansen, S. and Juselius, K.'s cointegration tests

As Johansen and Juselius' cointegrating tests request all the joint variables such as WST1, WGDP1, LIBOR1 and WMF1 are at level, or first difference when they are in the trace values and max-eigenvalue tests with the results of null hypothesis H_0 are not cointegrated and the alternatives is H_1. The AIC is generally used to determine the optimum lag length and the number of cointegrating vectors are denoted by r_0 with the trace test is calculated as the null hypothesis H_0: $r_0 \leq r$, and the alternative hypothesis H_1: $r_0 > r$. The max-eigenvalue test is proved the null hypothesis H_0: $r_0 = r$. The Johansen and Juselius' cointegrating tests for all joint variables in three models (*model 2, 3 and, 4*) of rank tests, trace and max-eigenvalue and are presented in table (2).

The below results of table (2) indicate the null hypotheses for trace and max-eigenvalue statistics could be rejected at the 5% level of significance when $r_0 \leq 0$ and $r_0 = 0$, respectively and accept the alternative. In model 2, the results at 5% critical values are very much significant in *none, at most 1, 2* in trace statistic are denoted the rejection of the hypothesis at the 0.05 level thus we can reject the null hypothesis but accept the alternative. The values of null hypotheses in max-eigenvalue of *none, at most* 1, 2 are cointegrated whilst in *at most 3* it is indicated as no

cointegration at the 5% level therefore, it is available to reject hypothesis with the meaning that there are cointegrated equations in the model with the long-run causalities of these joint variables between WST1 to LIBOR1 and WMF1 whilst to WGDP1 is a short- run relationship.

Table 2 - Johansen & Juselius' cointergration results of joint variables in synchronic model

	Unrestriced cointegration Trace			Unrestricted cointegration Max-eigenvalue		
Model 2- Intercept (no trend) in CE, no intercept in VAR						
Cointegration	Eigenvalue	Trace statistic	5% critical value	Eigenvalue	Max-eigen statistic	5% criticcal value
None	0.651151	74.23390	54.07904	0.651151	28.43416	28.58808
At most 1	0.559985	45.79975	35.19275	0.559985	22.16557	22.29962
At most 2	0.473129	23.63417	20.26184	0.473129	17.30158	15.89210
At most 3	0.209066	6.332591	9.164546	0.209066	6.332591	9.164546
Model 3 - Intercept in CE/VAR, no trend in CE/VAR						
None	0.649072	56.92611	47.85613	0.649072	28.27370	27.58434
At most 1	0.503590	28.65241	29.79707	0.503590	18.90952	21.13162
At most 2	0.210171	9.742888	15.49471	0.210171	6.370361	14.26460
At most 3	0.117422	3.373527	3.841466	0.117422	3.372527	3.841466
Model 4 - Intercept and trend in CE- no intercept in VAR						
None	0.681706	82.15314	63.8761	0.681706	30.90904	32.11832
At most 1	0.635778	51.24411	42.91525	0.625778	27.26979	25.82321
At most 2	0.491479	23.97432	25.87211	0.491479	18.25871	19.38704
At most 3	0.190784	5.715614	12.51798	0.190784	5.715614	12.51798

Looking at the results in *model 3*, *model 4* above at 5% critical value are significant at *none, at most 1, 2* hence, it is permited to reject H_0 and accept the alternatives. In another words the obtained results of the joint variables in selected synchronic models are tested by Johansen & Juselius to be cointegrated for WST1, LIBOR1 and WMF1 and it is believed that they share a common stochastic trend and will grow proportionally as moving together in the long run causalities, except the appearance of short run between WST1 and WGDP1.

4.1.3. Granger causality tests

This advantageous test is crystalliferous to indicate the directions of causal relationship of all joint variables as unidirectional or bidirectional causalities. The selected synchronic model with multi-variables are jointed must be initially in stationary before Granger is started, the unit root test resulted variable WGDP at level is significant and stationary and better in AIC (*3.4512*), however in order to have same order in this synchronicity, WGDP is intentionally changed to *1st* difference (WGDP1) as other joint variables with higher *R* square value and more significant than at level (*P: 0.0000, R^2=63.97%*), besides it is assumed that residuals are correlated and not lead to spurious issue is appeared if those are stationary too. The H_0 of test is no causal nexus among the joint variables, and H_1 is the alternative to H_0. The resulted Granger causality tests are seen on the table (3) taking us to the conclusion of long-run relationship between WST1 to WLIR1 for all the times series of the studied period, however it is short-run with WMF1 at lag 3, whilst WGDP1 seems to be short run for all the times when joints with WST1, LIBOR1 and WMF1 variables in the synchronic model. On the contrary, each WGDP1 and WMF1 does not cause WST1, LIBOR1, WMF1, WST1, WGDP1 and LIBOR1 respectively but only appearances the short- run

relationships and weakness, special when WGDP1 joints with WST1, LIBOR1 and WMF1 respectively, and in lag 3 it is seen as weakest

Table 3- Granger causality test

Casual relationship	Lag	WST1			WGDP1			LIBOR1			WMF1		
		WGDP1	*LIBOR1*	*WMF1*	*WST1*	*LIBOR1*	*WMF1*	*WST1*	*WGDP1*	*WMF1*	*WST1*	*WGDP1*	*LIBOR1*
***F* - Stat.**	1	1.008	5.382	12.402	0.475	1.397	0.129	0.817	0.074	2.661	0.001	0.760	1.344
		[0.3231]	[0.0288]	[0.0014]	[0.4956]	[0.2483]	[0.7216]	[0.3744]	[0.7868]	[0.1149]	[0.9672]	[0.3897]	[0.2569]
	2	0.647	7.624	3.564	0.403	0.283	0.168	3.775	3.879	1.026	0.075	0.605	3.364
		[0.5311]	[0.0030]	[0.0418]	[0.6720]	[0.7561]	[0.8459]	[0.0389]	[0.0360]	[0.373]	[0.9279]	[0.5528]	[0.0523]
	3	1.130	6.699	1.788	0.355	0.248	0.126	2.128	1.767	0.764	2.388	0.764	1.641
		[0.3556]	[0.0028]	[0.175]	[0.7858]	[0.8617]	0.9437]	[0.1304]	[0.1876]	[0.5249]	[0.0928]	[0.5249]	[0.2115]

Note: Numbers in [.] are P-values

4.1.4. Vector Error Correction Model (VECM)

The proper VECMs when being run, it should be considered as two critical issues, firstly it is acknowledged if the first difference of the joint variables in the synchronicity exhibit deterministic trend and, secondly it is specified the optimum and criteria lag length of the VAR model. In the selected synchronic model with all joint variables of WST1, WGDP1, LIBOR1 and WMF1, the status of dependent and independent are intentionally reversible firstly by WST1, then turn to WGDP1, LIBOR1 and finally by WMF1 respectively by employing VAR models, error correction mechanism and system equations in table (4). The tests of the realities and responses of each variables in the synchronicity to any deviation of long run equilibrium or short run disequilibrium for the t_{-1} period to other variables are depicted:

Table 4- VECM and error correction terms employed VAR, system eq.

VECM/EC	WST1			WGDP1			LIBOR1			WMF1		
	WGDP1	*LIBOR1*	*WMF1*	*WST1*	*LIBOR1*	*WMF1*	*WST1*	*WGDP1*	*WMF1*	*WST1*	*WGDP1*	*LIBOR1*
Coef.	-0.000296	-0.000291	13.392490	-169.6712	-0.463085	21315.68	-268.2309	-0.743843	33697.67	0.000130	3.62E-07	3.56E-07
t-Stat	-2.852080	-4.411540	0.434410	-1.726730	-4.411540	0.434410	-1.726730	-2.852080	0.434410	1.726730	2.852080	4.411540
Prob.	0.1035			0.0115			0.0004			0.6500		
R^2	50.35%			61.83%			68.97%			37.93%		
DW	2.0035			2.1462			1.7284			2.0821		
Result*	Joint variables WGDP1, LIBOR1, WMF1 have weak relationships to WST1			Joint variables WGDP1, LIBOR1, WMF1 have reasonable relationships to WST1			Joint variables WGDP1, LIBOR1, WMF1 have strong relationships to WST1			Joint variables WGDP1, LIBOR1 and WMF1 are negative to WST1		

From the above resulted on table (4), it is affirmatively asserted to express the long- run relationship between cointegrated variables such as WLIR1 and WST1, WGDP1 and WMF1 is strong, and is the real better selected model. This frankly refuses debates or justifications of WST strongly led growth hypothesis of WGDP, Libor interest rates and WMF as well. It is clearly shown there is no long run relationship from WST, WGDP and Libor to WMF. Standing on the reality and also theory, we can acknowledge how the financial roles and powers of Libor interest rate are strongly affected to global seaborne trade, to merchant fleets and creates the better development of world GDP for all the times. The important equations of having the accurate appraisals on the causal relationships of every variables in the synchronicity when they are in the long run exogenity or short run exogeneity to others by viewing the disturbances of residual error correlation. The statuses of these are tested by Wald, Breusch-Godfrey at lag (2), Breusch-Pagan-Godfrey, and histogram to determine as if any disturbing activities of residual error if short run and long run relationships are derived from the cointegration and VECM tests are in table (5)

Table 5- Residual errors equations in long-run and short-run relationships tests

Residual error tests		WST1			WGDP1			LIBOR1			WMF1		
		WGDP1	*LIBOR1*	*WMF1*	*WST1*	*LIBOR1*	*WMF1*	*WST1*	*WGPD1*	*WMF1*	*WST1*	*WGDP1*	*LIBOR1*
Wald	χ 2	0.7995	5.9482	9.6127	0.7826	6.4503	0.1326	9.4254	3.7396	0.5916	0.0690	0.2918	3.1192
	Pro.	0.6705	0.0511	0.0082	0.6762	0.0397	0.9358	0.0090	0.1541	0.7439	0.9661	0.8642	0.2102
Breusch-Godfrey (lag2)	Obs*R2	0.553365			0.80413			2.4053			1.4766		
	P(χ 2)	0.7583			0.6689			0.3004			0.4779		
Breusch-Pagan-Godfrey	Obs*R2	8.595803			16.07091			10.81975			10.74824		
	P(χ 2)	0.7370			0.1880			0.5444			0.5506		
Histogram	J.B	2.729			1.664			0.689			30.066		
	Pro.	0.2555			0.4351			0.7083			0.0000		

As the residual unit root test is early asserted that it is stationary thus the spurious is not concerned in this synchronic model. Then in above table (5) only the activities of residuals in the cointegrated joint variables are concerned and proactively detected in Wald tests which are strongly determined the prominent functions long run relationships of world merchant fleets to global seaborne trade as χ^2 (9.6127) and *P-value* (0.0082), and the roles of world merchant fleets to global seaborne trade, the Libor interest rates to world GDP and global seaborne trade to Libor as χ^2 and *P-values* (as 9.6127, 0.0082; 6.4503, 0.0397; 9.4254, 0.0090) respectively, and beyond these case are depicted as short run relationships. The BG running at lag 2 showing that there is no serial correlation in those selected synchronic models thus null hypothesis is rejected and models are acceptable. Incorporating with the BG is BPG and histogram normality are employed to determine the disturbances of heteroskedascity and none normal distribution of joint variables in the VAR models, if any. The obtained results from the above tests are declined the disturbances of heteroskedascity activities whereas denote only the synchronic model in which joint variables such

as WST, WGPD and Libor interest rate to world merchant fleets is none normal distribution (JB=30.066) which is really not desirable.

4.2. The Impacts of Taxation Rates - Singapore case study

4.2.1. Unit root tests

ADF test in level, intercept for the explanatory variables of the selected AR models, starting gradually from BULKCA 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 test hence the null hypothesis is not be rejected.

Figure 1 - BULKCA has unit root

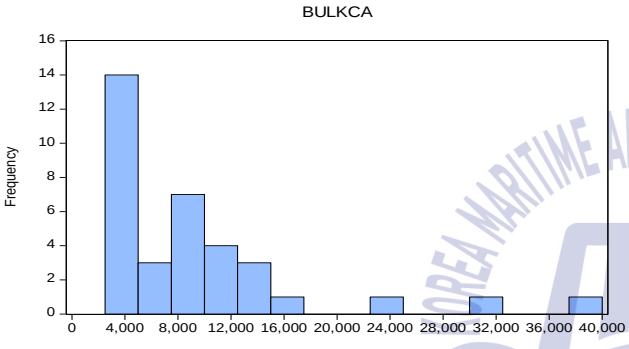
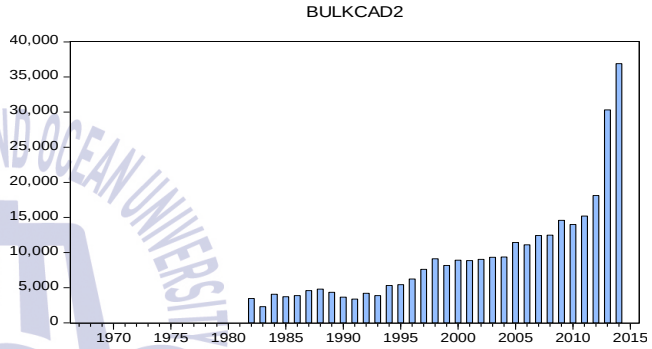


Figure 2 - BULKCA is at 2nd differences



Dealing continuality the tests 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) above. 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 (6)

Table 6- ADF tests for 1st and 2nd differences of explanatory variables

Augmented Dickey-Fuller Test at 2nd Difference								
Variables	**1%**	**5%**	**10%**	**t-Statistic**	**Prob***	**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								

The PP test critical values at 1%, 5% and 10% are almost same for all can see on table (7)

Table 7 - PP unit root tests for all explanatory variables

Phillips-Perron Unit Root Test on 2nd Difference									
Variables	**1%**	**5%**	**10%**	**t-Statistic**	**Adj.t-Stat**	**Prob***	**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									

4.2.2. 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 (8).

Table 8 - ADF test on level and at 1st difference of independent variables

Augmented Dickey-Fuller Test on 1st Difference								
Variables	**1%**	**5%**	**10%**	**t-Statistic**	**Prob***	**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								

Test results are same in PP tests for all independent variables on the table (9)

Table 9 - PP tests on level and 1st difference of financial variables

Phillips-Perron Unit Root Test on 1st Difference									
Variables	**1%**	**5%**	**10%**	**t-Statistic**	**Adj.t-Stat**	**Prob***	**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									

4.2.3. Granger causality tests of Singapore case study

The causal nexuses between the internal joint variables and verifying all causalities. The null hypothesis of H_0 as no Granger causality and alternative H_1 is negative. The obtained results that have accessed from joint variables as shown on the table (10). In this table, it is seen the P values of TAXES in the BULKCA Model (19), in the CTNSHIP Model (20), in the OILNK Model (22) and in the OTHRSHIP Model (23) are different with Zero and significant which less than 5% whilst in the GENCAR Model (21) is different with Zero but not significant. Seeing results in R-square and Adjust R to set square of variable 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 (23) OTHRSHIP where the P value of TAX is much significant whilst the record volume is being against shown as decreasing 6% (2014/2012).

Table 10 - Causal relationship of jointly explanatory variables in the selected VAR models

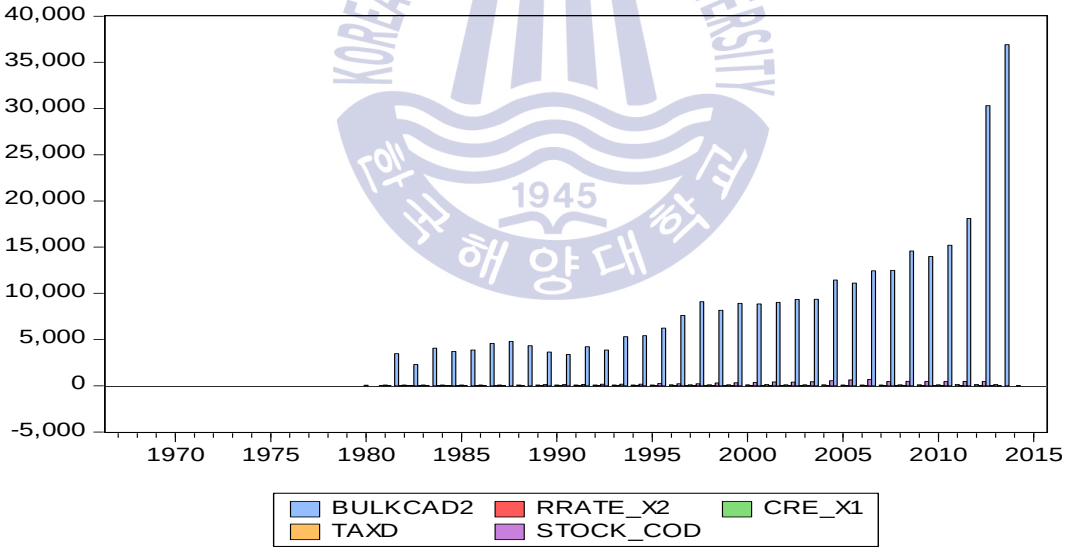
Causal Relationship of Jointed Variables of Selected VAR models										
	Obtained Values						Last Recorded Q/Ty in DWT			Remark
	Variables	P-Value	t-Statistic	Coefficient	R-square	Adj. R^2	2012	2013	2014	
BULKCAD2	TAXD	0.0015	-3.598262	-450.0955	0.873674	0.852619	23,293	30,099	37,600	*Increased 38% (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						
	STOCK_COD	0.9276	-0.091862	-1.751958						

In other hands, whilst the P-values of joint variables RRATE_X2, STOCK_CO in BULKCA Model (19) are not significant and high that can create a suspicion of perfect multicollinearity is occurred. These suspicious cases are captured on the CTNSHIP Model (20) for variable RRATE_X2 and on the OILTNK Model (22) for variable CRE_X1, and on the OTHRSHIP Model (23) for variable STOCK_CO as well. To verify again the causal nexuses, the Granger causality tests of all jointed variables of the BULKCA model (19) are depicted as table (11) and figure (3) bellows:

Table 11 - Granger causality test of AR model (19)

AR Model	Lagged	Granger Causality Tests	F-Statistic	Prob.
BULKCA AR Model (19)	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 3 - The Granger causality of AR model (19)



The same results are seen as same when doing the procedures of Granger causality tests to the CTNSHIP Model (20), the GNCAR Model (21), the OILTNK Model (22) and the OTHRSHIP Model (23), the obtained results are denoted on the tables (11, 12, 13, 14) and illustrated figures (3,4,5,6) respectively.

Table 12 - Granger causality of AR model (20)

AR Model	Lagged	Granger Causality Tests	F-Statistic	Prob.
CTNSHIP AR Model (20)	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

Figure 4 - The Granger causality of AR model (20)

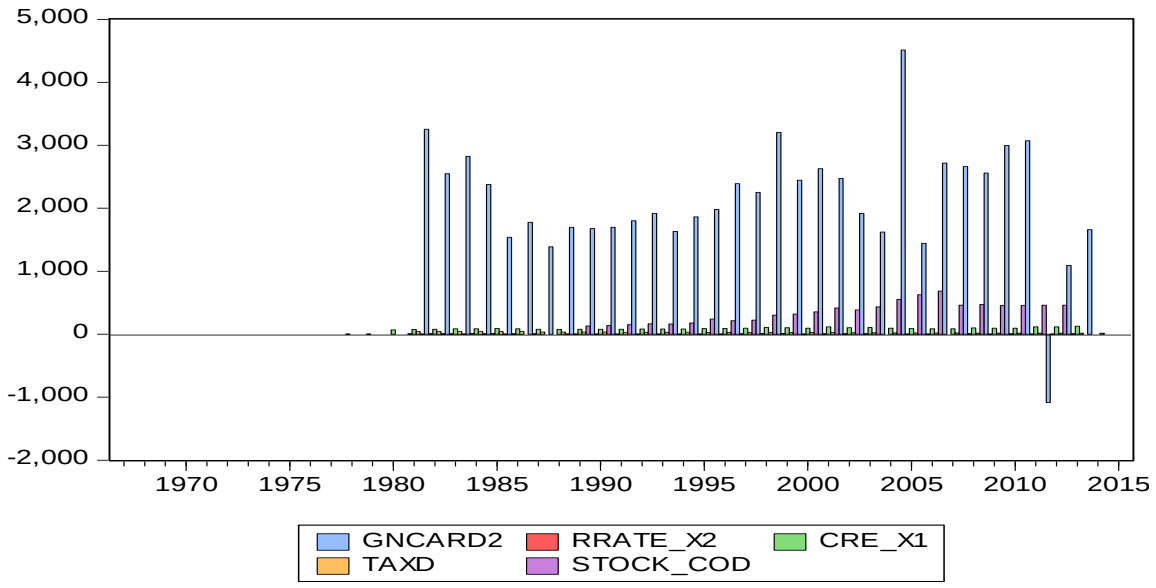


Table 13 - Granger causality of AR model (21)

AR Model	Lagged	Granger Causality Tests	F-Statistic	Prob.
GNCAR AR Model (21)	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

Figure 5- The Granger causality of AR model (21)

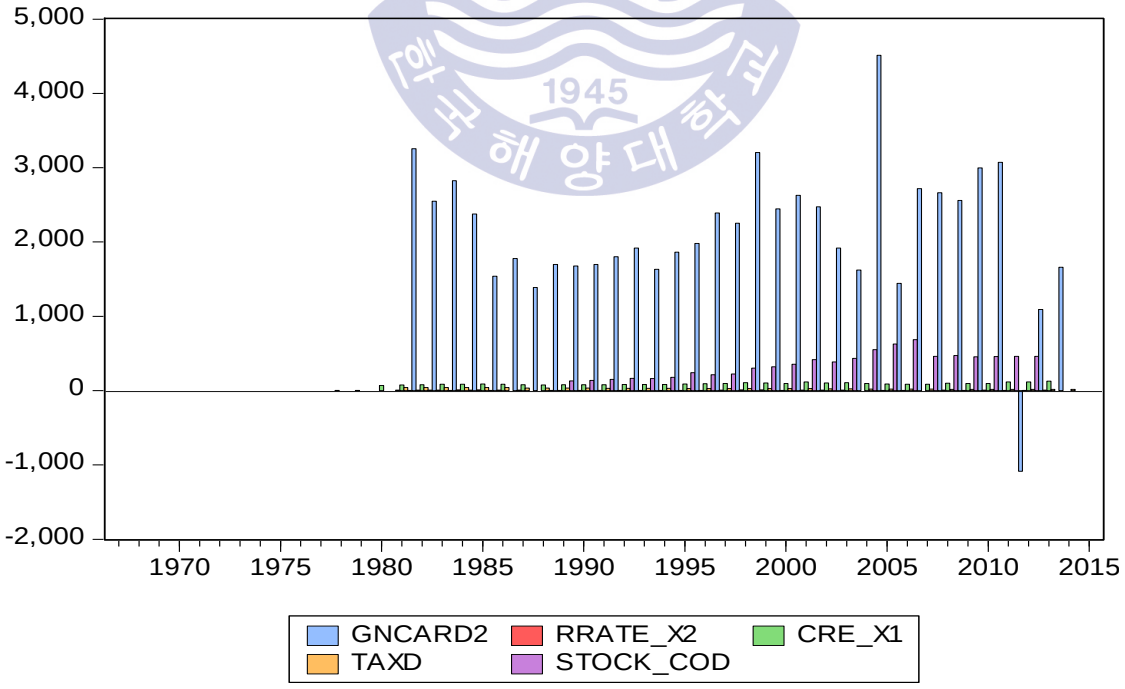


Table 14 - Granger causality of AR model (22)

AR Model	Lagged	Granger Causality Tests	F-Statistic	Prob.
OILTNKD Model (22)	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

Figure 6 - The Granger causality of AR model (22)

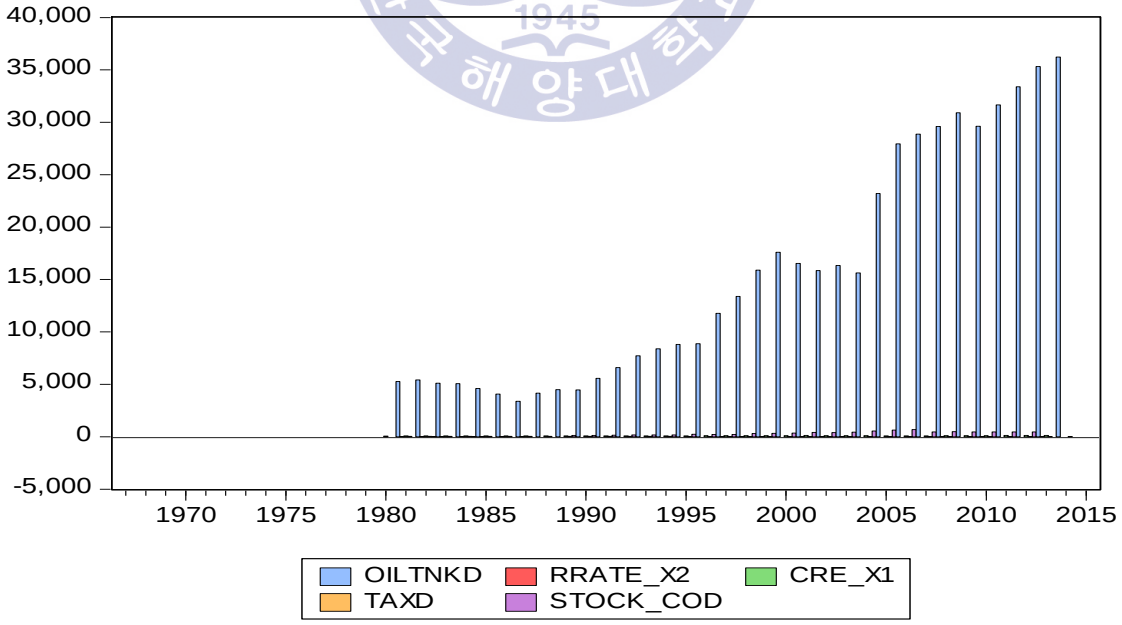
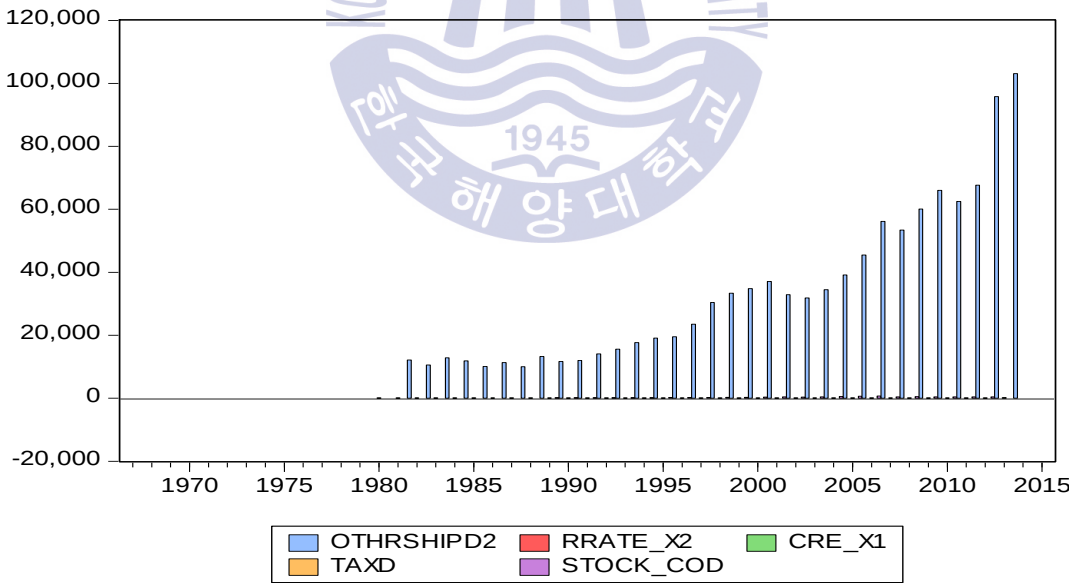


Table 15 - Granger causality of AR model (23)

AR Model	Lagged	Granger Causality Tests	F-Statistic	Prob.
OTHRSHIPD2 Model (23)	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

Figure 7 - The Granger causality of AR model (23)



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 Prob., in the OILTNK (table 13) and OTHRSHIP (table 14) 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.

4.2.4. Multicollinearity tests

In the selected AR models 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 once when data is obtained, or in each characteristic of jointed single variable has its own internally invisible features. The problem is whenever the multicollinearity 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 (10).

Viewing the table (10), the results of P-values of jointly variables RRATE_X2, STOCK_COD in AR model (19); the variables RRATE_X2 and STOCK_COD in AR model (20); the variables CRE_X1 and STOCK_COD in AR model (21); the variables CRE_X1 and STOCK_COD in AR model (22); the variables RRATE_X2 and STOCK_COD in AR model (23), are quite high whilst the results of ‖t‖ are small, but the R-squares' values > 0.8 in AR model (19), AR model (22) and (23) 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 multicollinearity could be possibly arisen.

Table 16 - Correlation of jointed 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

As table (16), 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 multicollinearity is arisen when all separate variables are joined. The same result of variable TAXD, variable CRE_X1 are negative but positive between the STOCK_COD and CRE_X1 is affirmative. In order that reducting the interactional activities of critical joined variables, the above F-statistic value is employed to detect the disturbance of multicollinearity, and H_0 is denoted as existent hypothesis, while the alternative H_1 is negative. The tests are denoted as bellow:

Table 17 - Paired jointed variables activity tests

Paired Jointed Variables Actitivty Test					
Dependent Var	Jointed Variables	Prob ©	Prob	R-square	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	

The table (17) is shown that in the selected AR models (19), (20), (21), (22), and (23), the most of dual variables in each separate single model is active with both of P-values are high significant whereas 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 multicollinearity 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 multicollinearity whilst 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 multicollinearity and rejected H_0 is reasserted. Again, the revised joined variables in the AR models is restated as table (13) after multicollinearity tests are proceeded without the presence of variable STOCK_CODs in the AR models (19) and (23).

Table 18 - Revised AR models after being multicollinearity retested

Revised Jointed Variables in the Multicollinearity Test								
Obtained Values								
	Variables	P-Value	t-Statistic	Coefficient	R-square	Adj. 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				

On the table (18) it is seen the values of AR models (19), (20), (22), (23) 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-square, F-statistic and P (F-statistic) are so much insignificant. In the revised GENCAR AR model (21), the TAXD variable (0.1901), the RRATE_X2 (0.0550), and the CRE_X1 (0.1045) are insignificant but is not reasonable to take TAXD variable away. Heckman (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 why is, after being tested to take the Tax variable away, it is seen that the obtained P-values of others joined variables are surprisingly arisen up, for instant the RRATE_X2 will be 15.36%, and the 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.

4.2.5. Homoskedascity and Heteroskedasticity disturbances

The detection of this case is proceeded by BPG serial test, 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.

Table 19 - Heteroskedasticity- Pagan Godfrey tests

Heteroskedasticity Test: Breusch-Pagan-Godfrey							
Dependent Var.	**Jointed Variables**	**t-Statistic**	**Prob**	**F-statistic**	**P (F(2,29)**	**P-Chi²(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-Chi²(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				

On table (19) resulted as Mendenhall et al (1981) has shown that the cell counts n_i should not be too small in order to let the χ^2 distribution providing an adequate approximation to the distribution of χ^2. Mill, R. L (1977) saying that obviously determining the degree of freedom (*df*) is an all-important step in using the chi-square 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% and 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% so the null hypothesis H_0 of non heteroskedasticity in these are rejected, we then could assert the conclusion of the above revised AR models (19), (20), and (23) have the disturbances of heteroskedasticity, but in the revised AR models (21) and (22), they are homoscedasticity. The logarithm (Log) is employed to convert and calculate all joined variables in the revised AR models (19), (20) and (23), the removal of those heteroskedasticity cases from the selected AR models are proceeded as seen on the following table (20). 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

Table 20 - Logarithm conversion in Heteroskedasticity - Pagan Godfrey tests

Heteroskedasticity Test: Breusch-Pagan-Godfrey - Logarithm Converted							
Dependent Var.	**Jointed Variables**	**t-Statistic**	**Prob**	**F-statistic**	**P (F(2,29)**	**P-Chi²(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-Chi²(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				

The revised AR models (20) after being tested, analyzed, and deciphered and found are now could be restated as AR Model (19a)

LOG (BULKCAD2) = 8.82089551313 - 1.64246373414*LOG (TAXD) + 1.20046884981*LOG (CRE_X1). **(19a)**

Based on the empirical findings of AR model (19a), 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 (20a), GNCARD2 of AR model (21a), OILTNKD of AR model (22a), and LOG (OTHRSHIPD2) of AR model (23a) are respectively as below:

LOG (CNTSHIPD2) = 7.66917966889 - 2.69982966476*LOG (TAXD) + 1.99162090725*LOG (CRE_X1) **(20a)**

GNCARD2 = 6205.95984343 + 164.018437262*RRATE_X2 - 36.8601808687*CRE_X1 - 50.6704806155*TAXD **(21a)**

OILTNKD = 48502.478183 - 1294.55112158*TAXD + 479.417999208*RRATE **(22a)**

LOG (OTHRSHIPD2) = 10.9347305432 - 1.94814574573*LOG (TAXD) + 1.23255486537*LOG (CRE_X1) **(23a)**

Chapter 5. Conclusion

5.1. Conclusion

As Stopford (2009), merchant shipping accounts for roughly a third of the total maritime activity and owner-ship is a major commercial issue in the shipping market and besides, the seaborne commodity trades has been felt into short-term and long-term in which short-term volatility as seasonality which has a disproportionate effect on spot market whereas the long-term trends is identified by economic characteristics of the industries which produce and consume the traded commodities. The creditors such as bankers, financial institutions, the banking risk managers, financial policymakers, chief finance officers (CFO) are ready to move and provide financial leverage to ship-owners with high risks and expect to higher returns, however the debates of how to have the accurate appraisals and how to mitigate the risky projects in the current market volatility is still not determined yet and hung on, because the biggest concerns of which the interactional effectiveness and realities between the causal nexuses of global seaborne trade, world GDP, Libor (just standing as one of the representative symbol to other banks) and world merchant fleets in the international maritime transports are, prior to spreading out their sources of finances. This research investigates the causal long run and short run relationships of global seaborne trade, world GPD, Libor interest rates and, world merchant fleets when those are jointly cointegrated in linear regression of the selected synchronic models during the 1980-2015 period. The various cointegration testing approaches are applied and through the empirical findings suggest the existence of the long run and short run causalities of each variables in the ship-finances and maritime fields. The leverage and the findings from the research if could be concerned by the financial organizations, the financial policymakers, ship-owners, seaport authorities, risk managers for their future making financing strategies are sincerely expected.

The first critically findings of prominent impacts of Libor's interest rate on the WST, WGDP, WMF and vice versa, as the finding results that we can see on table No (4) of the synchronic models are crystalline and clearly denoted the causal nexuses of WST are weak relationships to WGDP, LIBOR and WMF whereas WGDP is active and have good and reasonable relationship to WST, LIBOR and WMF but WMF is shown as negative absolutely to WST, WGDP and LIBOR. *The most concerns that we could assert to the causal relationship between LIBOR to WST, WGDP and WMF are very strong and this is significant proved how the prominent roles* and contributions of ship finance loans to the development of maritime transportation, new port facilities and increasing the volumes of maritime fleets as well.

The second critically results after the ***Singapore case study*** being analyzed, it is proved clearly on how the right directions of governmental strategies in a developing country to boost the EG and to boost the maritime & offshore industries. Results on table (10) telling the most prominent impacts of taxations on BULKCA, CTNSHIP, GNCAR, OILTNK, OTHERSHIP but less effectiveness of CRE_X1, RRATE_X2 and STOCK_CO. In AR (19) and AR (22) we can only see uni-direction causalities of the paired variables of BULKCA/CRE_X1 and OILTNK/CRE_X1. Results of bi-directional causalities of AR (20), AR (22) and AR (23) it is seen on paired variables

of CTNSHIP/CRE-X1; OILTNK/TAX; OTHERSHIP/CRE_X1 whilst in AR (21), AR (22) only the paired GENCAR/CRE_X1 and TAX/OILTNK are uni-directional causality to CRE_X1 and no causal tax is found, etc.

As above empirical finding and based on the AR model (19) 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 (20), (21), (22) and (23) respectively in their own cases.

5.2. Recommendations

From those findings, we can see besides the roles of the more percentages of interest rates of bank loans, the supplied credits to private sectors, and even though the tax tariffs are gradually cut off or declined and the interactively causal nexuses of those different and separate variables are connected and joined into one uniqueness, and impacted each others are crystalline. The case study boosting the EG and maritime industry which have been proved when all the joined variables in one synchronicity are applied, is real as the fantastic case indeed. It is proved that Singapore government really does well its strategic changes to develop the EGs and maritime industry 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.

However, based on the above findings, it could be affirmed how the prominent impacts of LIBOR's interest rates on the WST, WGDP and WMF that all of international bankers, CFO and maritime researchers could concern on. And in the Singapore case study, we could see how the governmental policies on ***playing as the real-key roles of significant impacts*** on support and boosting the development of EGs and maritime & 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 & foreign companies to monitor, adjust continuously its critically financial & policies time to time.

5.3. Future Researches

As Maddala (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 and Rogerson (2007) indicate the distortions and aggregate output with heterogeneous in total factor productivity establishments are

quite large, and Yu (2009) asserts 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 & 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 above findings could highly possible be limited, and those would be radically analyzed in the future researches.

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