

Interrelation between Capital Market Index and Economic Growth by Using Granger Causality Test

Sukmawati Sukamulja

Faculty of Business and Economics, Atma Jaya Yogyakarta University

Jean Cladius Sambotody

Master of Management, Atma Jaya Yogyakarta University

ABSTRACT : *The purpose of this research is to examine the interrelationship between capital market index and economic growth among United-States of America, England and Japan. Capital market and economic growth are both key elements upon what a national economic development relies on. The variables of the study were S&P 100, FTSE 100, Nikkei 225, and GDPs. Quarterly data obtained from official trustful websites were used. The period of the study was from the premier quarter of 1987 to the last quarter of 2016. The findings conclude that there is an interrelation between capital market index and economic growth, but the direction of causality between the two variables is different in each country. A unidirectional causality from capital market index to economic growth has observed in case of United-States of America. Feed-back causality between capital market index and economic growth has seen in England. And a unidirectional causality has examined between capital market index and economic growth in Japan. The result of the present study is hoped to give an acknowledgement about how far capital market contributes on development of nation through a prospering economic growth; and vice-versa.*

Keywords - *Capital market index, economic growth, GDP, unidirectional causality*

I. INTRODUCTION

It is incontestable true that the main goal of every nation is to find a way to obtain and keep a long-term development of national economy. Reference [1] noticed that economic development is regarded as the major goal of national policy in economy. Every nation does not stop seeking a means to surpass from level of undeveloped to level of developed. For those which are already developed, keep a long-run stage of development is their primordial preoccupation. The term developed country could be defined as a situation of a country where economic statement and government structure are strong enough to provide access to resources and economic opportunities. In developed country, the economic statement is strong enough to be self-sustaining.

To evaluate the state of economic development of one country, macroeconomics refers to few factors such as Gross Domestic Product, economic growth, inequality of wealth, inflation, unemployment, economic structure, and demographics. Each factor represents an important indicator to gauge the health of nation. For instance, Gross Domestic Product sums all goods and services that are produced within a country during a specific period of time. Unemployment represents the part of population who is able to work and would work but cannot obtain work.

Many ways were posited by scholars to attain the state of development: growth theory, population theory, economic policy, financial theory, market theory. This present research is focusing about economic growth theory and capital market. By definition, capital market is a market where buyers and sellers meet and engage in trade of financial securities like bonds, stocks, shares. Capital market is place where investors and seekers of funds go and buy/sell securities as shares, debentures and bonds. Capital market is important in economy because it provides facilities for mobilizing and dealings in medium and long term funds [2]. Understanding the term economic growth is also important because economic growth measures the increase in capacity of an economy to produce goods and services from one period to another period. Economic growth helps to observe how much more the economy produces than it did before.

The research is aimed to answer the research problem that could be formulated as follow: how is the interrelation between capital market index and economic growth of United-States of America, of England, and of Japan? This present research is conducted to investigate the manner how capital market index and economic growth are connected and affect one another.

In order to have a good result, the research is fitting on these following points that are considered as the scope of the study: (1) three countries such as United-States of America, England, and Japan. The selection of the countries is based on the fact that these three countries are classified as developed country, therefore

learn from them is worthwhileness. (2) The period of the study is from 1987Q1 to 2016Q4; let a range of 720 observations. (3) The study is about comparing the total return capital market index with the changes of economic growth during the period of study. (4) The economic growth is assessed by the changes of GDP in percentage. (5) The capital market index is represented by the total return of the most liquid stock market index.

Some theoreticians affirm that the movements of stock market index in capital market follow the movement of the condition of economy. Financial development follows economic growth [3]. Meanwhile, other researchers assert that the presence of capital market is inducing the nation's economy to a good way. The capital market institution is critical to the economic growth of any nation [2]. Based on this polemic, this research is worthwhile to do. Thus, counting on the help of Engle-Granger causality test, and Augmented Dickey fuller test for stationarity, this paper is expected to give its part of view between the interrelation between capital market index and economic growth.

II. LITERATURE REVIEW AND PRVIOUS RESEARCH

Capital market and economic growth have been usually seen correlated each other. Some theories state that a well-managed and organized structure of capital market pushes economy to growth. On the one hand, capital markets have vital role on economic growth. Reference [4] stated that lack of long-term investment capital is the major constraint to market growth and development. Capital market is using by companies and government to raise funds for their operations (activities, development projects). On the other hand, the growth of GDP is systematically increases economic growth that raises the stock market returns. An increasing of the capacity of an economy to produce goods and services gives rise to an increasing of a well-process of capital market. So theoretically, capital market and economic growth are interrelated each other. But sometimes, theoretical and real economy reveals a disconnected pattern. Real economy could meet some factors that could cause an unmatched with what theories predicted.

Recently, discussing topic about capital market and economic growth has pulled much attention of researchers. Some found out that there is a feed-back interrelation between capital market and economic growth. Some met that there is no mutual relationship between capital market and economic growth. Some concluded that the direction of the interrelation is from capital market to economic growth. Meanwhile, others observed that the direction of interrelation is from economic growth to capital market. Here are, on these following paragraphs, some findings of previous researchers related to the topic of the study.

One of the most important researches related with the topic has been done by [5]. They used Engle-Granger co-integration test method, Augmented Dickey-Fuller approach, and E-views 5 software to do An Empirical Study on The Relationship between Stock Index and The National Economy: The Case of China. Their study employed monthly data of GDP to evaluate the performance of Chinese economics; Shanghai Securities Exchanged Index (SHSECI) and Shenzhen Securities Exchange Index (SZSECI) as a representative of Chinese stock prices from 1995 to 2005 i.e. 132 observations, their data were obtained from China Economic Information Network. The result of their research indicated that there is no relationship between Chinese GDP and Chinese stock index because E-views 5 revealed that both SHECI and SZECI are not co-integrated with chines GDP.

Using regression analysis to measure the relationship between economic growths, measured by GDP growth rate; and stock market indicators such as size of market (SIZE), liquidity of market (LIQ), stock market all-share index (ASI), market capitalization (MKTCAP), sector index by Bahrain Bourse (SECINDEX). Reference [6] investigated economic growth and stock market development in Bahrain. They used times series data collected for a period of 25 years (1990-2014) from different sources: World Bank for economic indicators and Bahrain Bourse for the stock market indicators. They concluded that firstly, stock market indicators have substantial influence on economic growth in Bahrain. Secondly, economic growth does cause development of the stock market development. Thus, their research has presented evidence implicating symbiotic relationship between the growth of the stock market and the health of the economy in the Kingdom of Bahrain.

Based on time series quarterly data spanning from the first quarter of 1995 to last quarter of 2008 comprising 56 data points, [7] examined the impact of macroeconomic indicators on Indian capital markets. They used regression analysis and error correction mechanism to find the significant impact of macroeconomic indicators which are inflation rate; exchange rate of INR against USD and interest rate of treasury bills to Indian capital markets which are BSE Sensex and S&P CNX Nifty. Their research concluded that there is co-integration between macro-economic variables and Indian stock indices which is indicative of a long-run relationship.

Reference [3] examined the correlations between capital market development and economic growth, the case of Romania. Using quarterly data 2000:1 to 2006:2 of market capitalization, number of listed shares, trading volume and GDP, regression function revealed that the capital market development is positively correlated with economic growth, but the strong effect is from economic growth to capital market.

Furthermore, [8] examined the correlation between capital market development and economic growth in Romania by using a regression model. Based on quarterly data during 2000-2009 on GDP supplied by the national institute of statistics, and BET data provided by the website of Bucharest Stock Exchange, [8] found out that capital market development and economic growth are positively correlated, i.e. capital market affects economic growth and economic growth affects capital market development, but the strongest link is from economic growth to capital market, concluding that financial development depends on economic growth.

According to [9], capital market has no significance impact on economy growth of Nigeria. Reference [9] researched the impact of capital market on the growth of the Nigerian economy under democratic rule. Reference [9] employed multiple regression econometric procedure and Dick-Fuller test to verify the stationary of variables. Variables of their study are market capitalization, share index, total value of stock, and growth GDP. The result of their study states that market capitalization and share index have positive effects on GDP but the effects are not significant; and total value of stock has negative effect on GDP but the effect is also not significant. Hence [8] concluded that capital market has no significant impact on economic growth of Nigeria.

In other research, by using quarterly data of five countries over the period 1957:1 to 2005:2 for the USA; 1957:1 to 2004:4 for Japan; 1970:1 to 2004:4 for France, Germany and the UK, [10] inspected a causal relationship between the stock market and the economy: experience from international financial markets. In order to examine the direction of causality between variables, [10] employed granger causality test. The test revealed a one way direction of causality that is from stock price to GDP; hence [10] concluded that economic activities depend on stock market in a country.

Reference [11] indicated that the development of stock markets is highly important in sustaining a better economic growth. Reference [11] employed ADF unit root testing methodology to study the relationship of stock market development and economic growth. Reference [11] used the size and the liquidity of KSE, FDI and HDI of Pakistan as independent variables; and used GDP per capita as dependent variable. The period of study is from 1986 to 2008. The result of their research confirmed the importance of stock market in sustaining a progress economic growth.

Finally, [12] reported two results on their research about the effect of capital market development on economic growth in Ghana. They employed multiple linear regressions to analyze the quarterly time series data from 199:1 to 2012:4 of variables such as GDP, market capitalization ratio, gross capital formation, development of financial intermediaries, capital market liquidity, foreign direct investment, macro-economy stability and T-bill rate. Their research revealed two results: the positive significance effect of capital market and Foreign Direct Investment on GDP growth, and insignificant effects of gross capital formation, T-bill and macroeconomic stability.

III. RESEARCH METHOD

The study employs time series data. Quarterly data covering the period from 1987 until 2016 is needed for doing the analysis. The period of the study is the three last decades that lets the research obtains 120 rows, 720 observations. Secondary data used on this research are provided by websites such yahoo finance, Google finance and OECD data.

The purpose of the research is to analyze the interrelation between capital market index and economic growth, thus non-probabilistic method of sampling is adopted. Non-probabilistic sampling is more practical for doing the analysis because it is more satisfactorily to attain our objectives.

Variables using for the analysis are represented in table 1. The selection of variables followed the criteria stating that each element which is going to be compared here must be at the same peer. Thus, each capital market index here has chosen by their same liquidity or their level of index, and their importance in nation's economy. The capital market index of United-States of America is represented by Standard & Poor's 100. The capital market index of England is represented by Financial Times Stock Exchange 100. The capital market index of Japan is represented by Nikkei 225 Stock Average. The economic growth of each country is represented by their gross domestic product.

Table 1
Variables and Symbol of Variables

Countries	Variables	Symbols
United-States	S&P 100	\wedge OEX
	Gross Domestic Product USA	GDP _{USA}
England	FTSE 100	\wedge FTSE
	Gross Domestic Product England	GDP _{Eng}
Japan	NIKKEI 225	\wedge N225
	Gross Domestic Product Japan	GDP _{Jap}

Source: finance.yahoo.com

The study uses Granger causality test as the data analysis method. But before proceeding in causality test, checking the stationarity of sequences is the task which is needed to accomplish first. Checking the stationarity of time series data that are going to be used in an analysis is important because if the time series is non-stationary it is not possible to generalize the outcome, the analysis is non-sense, the result could be spurious, and the forecasting might be erroneous. Reference [13] notified that a regression of a non-stationary time series against another non-stationary time series may produce spurious regression.

To check if the sequences are stationary or not, the study employs Augmented Dickey-Fuller test. A Y_t stochastic time series is determined as weak stationary if its mean, variance, and auto covariance (at various lag) remain the same no matter at what point we measure them; that is, they are time invariant [14]. A stationary time series will tend to return to its mean, fluctuate around this mean, and have broadly constant amplitude. Let Y_t is a stochastic process. The stationary testing equation is as follow:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^m \alpha_i \Delta Y_{t-1} + \varepsilon_t \tag{1}$$

Where:

ε_t is a pure white noise error term,

$\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2}), \Delta Y_{t-2} = (Y_{t-2} - Y_{t-3}), \dots$ etc. are the number of lags,

β_1 and β_2 are slope parameters for drift and for trend of (1).

The mechanism of testing stationarity is about to check whether δ is significantly equal to zero or not. Thus, the null hypothesis is that $\delta=0$, i.e there is a unit root, the time series is non-stationary. Meanwhile the alternative hypothesis is that δ is less than zero ($\delta<0$); that is the time series is stationary.

The next task after testing the stationarity is to check the causality between couple of variables. To find out whether a couple of variables were interrelated between them, the research employs Granger causality test. The Granger causality test assumes that the information relevant to the prediction of the respective variables, gross domestic product and capital market index, is contained solely in the time series data on these variables. To check the causality between capital index and economic growth, the study based on these following equations of regression revealed by [13]:

$$GDP_t = \sum_{i=0}^n \alpha_i CM_{t-i} + \sum_{j=0}^n \beta_j GDP_{t-j} + u_{1t} \tag{2}$$

$$CM_t = \sum_{i=0}^n \lambda_i CM_{t-i} + \sum_{j=0}^n \delta_j GDP_{t-j} + u_{2t} \tag{3}$$

Assume that the terms u_{1t} and u_{2t} are uncorrelated.

Equation (2) presumes that current gross domestic product (GDP_t) relies on the past values of GDP itself (GDP_{t-j}) and on the past values of capital market index (CM_{t-i}). And equation (3) affirms that the current value of capital market index (CM_t) depends on the past value of capital market index (CM_{t-i}) and gross domestic product (GDP_{t-j}).

The causality between capital market index and economic growth depends on the value of slope parameters α_i in equation (2) and δ_j in equation (3). If $\sum_{i=0}^n \alpha_i \neq 0$, the test concludes that gross domestic product is granger caused by capital market index, and vice-versa. If $\sum_{j=0}^n \delta_j \neq 0$, the test concludes that capital market index is granger caused by gross domestic product, and inversely.

IV. RESULTS AND ANALYSIS

4.1. Result

In order to have a surely data and a good result, here are some steps which the research has done. The first step was to pull each data (\wedge OEX, \wedge FTSE 100, \wedge N225, GDP_{usa}, GDP_{England}, GDP_{Japan}) from their respective resources (Yahoo finance, Google finance, OECD data). Then the next step is to import those data into excel 2010 for proceeding the refining. By the help of excel 2010, the calculation of the total return capital market index of each variables is getting easy, and also, excel 2010 arrays data to be quarterly ordered. The next step is to bring the raw data from excel to e-views 8. Software e-views 8 operate the stationary test and the causality test of data. And the last step is to display the results in tables so that the reading and the interpretation of the results are simple. Here are tables presenting the results from e-views.

Table 2: Result of Augmented Dickey-Fuller Test (Levels)

Variables	t-Statistic	McKinnon Test Critical Values			Prob.	Meaning
		1% level	5% level	10% level		
S&P 100	-11.35654	-3.487550	-2.886509	-2.580163	0.0000	Stationary
GDP _{USA}	-17.76759	-3.486551	-2.886074	-2.579931	0.0000	Stationary
FTSE 100	-9.512099	-3.488063	-2.886732	-2.580281	0.0000	Stationary
GDP _{England}	-15.41500	-3.486551	-2.886074	-2.579931	0.0000	Stationary
N225	-13.78641	-3.487046	-2.886290	-2.580046	0.0000	Stationary
GDP _{Japan}	-13.53974	-3.487046	-2.886290	-2.580046	0.0000	Stationary

Source: Eview 8

Table 3: Pairwise Granger Causality Tests (Automatic Lag: Lag 2)

Null Hypothesis (H ₀)	Obs	F-Stat	Prob.	Meaning
S&P 100 does not Granger Cause GDP_{USA}	118	3.05864	0.0509	H₀ Not Supported
GDP _{USA} does not Granger Cause S&P 100		0.62665	0.5362	H ₀ Supported
FTSE 100 does not Granger Cause GDP_{England}	118	3.04929	0.0513	H₀ Not Supported
GDP_{England} does not Granger Cause FTSE 100		2.88863	0.0598	H₀ Not Supported
N225 does not Granger Cause GDP_{Japan}	118	2.96483	0.0556	H₀ Not Supported
GDP _{Japan} does not Granger Cause N225		0.72115	0.4884	H ₀ Supported

Source: Eviews 8

4.2. Analysis

Table 2 shows the result of the augmented Dickey-Fuller test for variables. As it shown, all variables were stationary at levels because all value of t-statistics of each variables are significantly negative compared with McKinnon Test Critical values at levels I(0). For instance, for S&P 100 the value of its t-statistic -11.35654 exceeds McKinnon Test Critical values which are -3.487550, -2.886509 and -2.580163 respectively at 1%, 5% 10% level of significance, so this implies that S&P 100 is stationary at levels. Similarly, the Augmented Dickey-Fuller stationarity test for GDP_{USA} reveals a t-statistic at -17.76759 which also exceeds McKinnon Test Critical values -3.486551 at 1% level, -2.886074 at 5% level and -2.57993 at 10% level so this implies that GDP_{USA} is stationary at levels I(0). Likewise, the Augmented Dickey-Fuller stationarity test for FTSE 100 reveals a t-statistic at -9.512099 that too exceeds McKinnon Test Critical values which are -3.488063, -2.886732 and -2.580281 respectively at 1%, 5% and 10% of significance and this implies that FTSE 100 is stationary at level I(0). Furthermore, the Augmented Dickey-Fuller stationarity test for GDP_{England} reveals a t-statistic at -15.41500 exceeds McKinnon Test Critical values -3.486551, -2.886074 and -2.579931 respectively at 1%, 5% 10% level of significance so this implies that GDP_{England} is stationary at level I(0). Alike, the Augmented Dickey-Fuller stationarity test for N225 reveals a t-statistic at -13.78641 which exceeds the McKinnon Test Critical values -3.487046 at 1% level, -2.886290 at 5% level and -2.580046 at 10% level so this implies that N225 is stationary at level I(0). Furthermore, the Augmented Dickey-Fuller stationarity test for GDP_{Japan} reveals a t-statistic at -13.53974 which is higher than McKinnon Test Critical values -3.487046, -2.886290 and -2.580046 respectively at 1%, 5% 10% level of significance so this implies that GDP_{Japan} is stationary at level I(0).

Table 3 summarizes the result of granger causality test that have been achieving by e-views 8. From the table, the study concludes that (a) S&P 100 granger causes GDP_{USA}; (b) GDP_{USA} does not granger cause S&P 100; (c) FTSE 100 granger causes GDP_{England}; (d) GDP_{England} granger causes FTSE 100; (e) N225 granger causes GDP_{Japan} and (f) GDP_{Japan} does not granger cause N225 (f). It is concluding like that because (a) the probability 0.0509 of the null hypothesis (H_0 : S&P 100 does not granger cause GDP_{USA}) is lower than 0.1 (threshold of acceptance rate), so the null hypothesis is not supported. (b) The value of the probability 0.5362 of null hypothesis (H_0 : GDP_{USA} does not granger cause S&P 100) is higher than 0.1, so the null hypothesis is supported. (c) The value of the probability 0.0513 of the null hypothesis (H_0 : FTSE 100 does not granger cause GDP_{England}) is lower than 0.1, so the null hypothesis is not supported. (d) The value of the probability 0.0598 of the null hypothesis (H_0 : GDP_{England} does not granger cause FTSE 100) is lower than 0.1, so the null hypothesis is not supported. (e) The value of the probability 0.0556 of the null hypothesis (H_0 : N225 does not granger cause GDP_{Japan}) is lower than 0.1, so the null hypothesis is not supported. (f) The value of the probability 0.4884 of the null hypothesis (H_0 : GDP_{Japan} does not granger cause N225) is higher than 0.1, so the null hypothesis is supported.

The findings of the research imply that there is a unidirectional causality between capital market index of USA and GDP of USA. The causality is from S&P 100 to GDP_{USA}. That is to say, the capital market index S&P 100 impacts the gross domestic product of USA which also pushes the economic growth of USA. But economic growth of USA, via GDP, does not influence capital market index of United-States.

The findings of the research indicate also that there is a bilateral causality between capital market index of England and GDP of England. The capital market of England which is proxy by FTSE 100 here is influenced by the change of gross domestic product of England. Vice-versa, the economic growth of England, via GDP of England, is connected with the variation of capital market index of England. This findings support the Mittal (2011) [7], and Yadirichukwu and Chigbu (2014) [15] researchs.

Finally, the findings of the research inform that there is a unidirectional causality between capital market index of Japan and GDP_{Japan}. The direction of granger causality is from Nikkei 225 to gross domestic product of Japan. A changing of Nikkei 225 generates changing to gross domestic product of Japan. And oppositely, a growth of gross domestic product of Japan does not bring a changing of Nikkei 225.

V. CONCLUSION

The study examines the interrelation between capital market index and economic growth among United-States of America, England, and Japan by using granger causality test. Standard and Poor's 100 was used to proxy the capital market index of United-States, Financial Times Stock Exchange 100 stock was used to represent the capital market index of England, Japan Nikkei 225 Stock Average was used to represent the capital market index of Japan, gross domestic product was used as indicator of economic growth of each country. Data were obtained from official websites. A quarterly time series data is used to do this analysis of interrelation. The period of the study is from the first quarter of 1987 until the fourth quarter of 2016.

The augmented Dickey-Fuller test revealed that under the thirty years period of the study all variables were stationary at levels. The software e-views 8 indicate that the t-statistics of all variables were significantly negative and different from zero. Stationary at first test demonstrates how good the system of economics and the effectiveness of financial policy are. It shows for each country mentioned that their economic is prospering.

The granger causality test revealed a unidirectional and bilateral causality. The test of granger causality carried out by e-views 8 showed that there is a unidirectional causality between American capital market index and economic growth, then a bilateral causality between English capital market index and its economic growth, and finally a unidirectional causality between capital market index of Japan and economic growth of Japan. Therefore, the research has found out that there is an interrelation between capital market index and economic growth among United-States, England and Japan.

REFERENCES

- [1] O. M. Oke and S.O. Adeusi, Impact of capital market reforms on economic growth: the Nigerian experience, *Australian Journal of Business and Management Research*, 2(02), 2012, 20-30.
- [2] O. Usman and T. Adejare, Empirical analysis of capital market operations and economy growth in Nigeria 1990 – 2010, *International Journal of Economics and Management Sciences*, 2(5), 2012, 16-26.
- [3] L. O. Brasoveanu, V. Dragota, D. Catamara, and A. Semenescu, Correlations between capital market development and economic growth: The case of Romania, *Journal of Applied Quantitative Methods*, 3(1), 2008, 64-75.

- [4] V. Osei, Does the stock market matter in Ghana? A Granger-causality analysis. *Working Paper*. WP/BOG-2005/13.
- [5] M. Men, and R Li, An empirical study on the relationship between stock index and the national economy: the case of China. *University of International Business & Economics* 2006
- [6] B. K. Asiri and M. A. Abdalla, Economic growth and stock market development in Bahrain, *Journal of Applied Finance & Banking*, 5(2), 2015, 67-80.
- [7] K. P. R. Mittal, Impact of macroeconomic indicators on Indian capital markets, *Journal of Risk Finance*, 12(2), 2011, 84 – 97. <http://dx.doi.org/10.1108/15265941111112811>
- [8] F. Barna and P. Mura, Capital market development and economic growth: the case of Romania, *Annals of the University of Petrosani Economics*, 10(2), 2010, 32-42.
- [9] E. F. Nwaolisa, E. G. Kasi, and E. C. Francis, The impact of capital market on the growth of the Nigeria economy under democratic rule, *Arabian Journal of Business and Management Review*, 3(2), 2013, 53-62.
- [10] G. Duca, The relationship between the stock market and the economy: experience from international financial markets, *Bank of Valletta Review*, No 36, 2007.
- [11] M. S. Nazir, M.M. Nawaz, and U.J. Gilani, Relationship between economic growth and stock market development, *African Journal of Business Management*, 4(16), 2010, 3473-3479.
- [12] E. Acquah-Sam and K. Salami, Effect of capital market development on economic growth in Nigeria, *European Scientific Journal*, 10(07), 2014, 511-534.
- [13] D. N. Gujarati, *Basic econometrics* (Fourth edition, The McGraw-Hill, 2003).
- [14] A. H. Studenmund, *Using econometrics-A practical guide* (Pearson International Edition, Fifth Edition, Pearson Education, Inc. 2006).
- [15] E. Yadirichukwu and E. E. Chigbu, The impact of capital market on economic growth: the Nigerian perspective, *International Journal of Development and Sustainable*, 3(4), 2014, 838-864.