

INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATION & MANAGEMENT

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CONTENTS

Sr. No.	TITLE & NAME OF THE AUTHOR (S)	Page No.
1.	ELECTRONIC HEALTH RECORD SYSTEM - BENEFITS AND CHALLENGES: A LITERATURE REVIEW <i>SHEETAL JOHAR & Dr. BASANNA PATAGUNDI</i>	1
2.	OMNICHANNEL RETAILING: IMPACT OF FACEBOOK ON RETAIL BUSINESS DYNAMICS <i>MUGESHKANNAN REGURAMAN, Dr. S. GANAPATHY & A. THANGAM</i>	4
3.	ROLE OF TOURISM IN SUSTAINABLE DEVELOPMENT & WELL BEING OF SOCIETY <i>CHIKAI GHOSH</i>	9
4.	THE IMPACT OF DIGITIZATION IN FUTURE VISION <i>Dr. R. LEELAVATHY</i>	16
5.	REGIONAL VARIATIONS IN LITERACY RATES - A PROFILE OF ANDHRA PRADESH <i>K. MAHESWARA RAO</i>	19
6.	CUSTOMER SATISFACTION WITH LIFE INSURANCE COMPANY: A CASE STUDY OF SHIMLA DISTRICT OF HIMACHAL PRADESH <i>NIVEDITA & Dr. RASHMI CHAUDHARY</i>	22
7.	MARKETING STRATEGIES OF DAIRY CO-OPERATIVE SOCIETIES IN KERALA: WITH SPECIAL REFERENCE TO MILMA ERNAKULAM DISTRICT <i>EAPEN RAJU & Dr. PRAKASH C</i>	27
8.	FINANCING SMALL AND MEDIUM SCALE ENTERPRISES BY MICROFINANCE BANKS IN SOKOTO STATE, NIGERIA <i>Dr. MUSTAPHA NAMAKKA TUKUR & ABDULRAHMAN BALA SANI</i>	31
9.	THE DYNAMICS RETURN OF CLEAN AND RENEWABLE ENERGY SECTOR AND ITS RESPONSE ON THE BUSINESS CYCLE AFTER THE KYOTO PROTOCOL <i>BAGUS SUNDORO, NOER AZAM ACHSANI & Dr. TONY IRAWAN</i>	36
10.	DIGITAL FINANCE: A CATALYST TO FINANCIAL SERVICES <i>ANUBHUTI</i>	42
	REQUEST FOR FEEDBACK & DISCLAIMER	44

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THE DYNAMICS RETURN OF CLEAN AND RENEWABLE ENERGY SECTOR AND ITS RESPONSE ON THE BUSINESS CYCLE AFTER THE KYOTO PROTOCOL

BAGUS SUNDORO
STUDENT
SCHOOL OF BUSINESS
BOGOR AGRICULTURAL UNIVERSITY
BOGOR

NOER AZAM ACHSANI
PROFESSOR
SCHOOL OF BUSINESS
BOGOR AGRICULTURAL UNIVERSITY
BOGOR

Dr. TONY IRAWAN
LECTURER
DEPARTMENT OF ECONOMICS
BOGOR AGRICULTURAL UNIVERSITY
BOGOR

ABSTRACT

The purpose of this study is to analyze the world energy consumption and the impact of the world economy to the clean and renewable energy stock return. This study used historical secondary data from The World Bank and from United States of America's stock market. The methodology in this study consists of energy mix analysis, growth analysis, correlation analysis, different test, and event study analysis. The result showed that after the Kyoto Protocol, the portion of clean and renewable energy in the energy mix has increased 1.47% within 11 years. Clean and renewable energy is not affected by the global financial crisis of 2008. China is the fastest growth of clean and renewable energy consumption in the world. S&P Global Clean Energy Index has a modest positive correlation with S&P Global Oil Index, negative correlation with S&P 500, and negative correlation with GDP per capita. There is a difference between the average S & P Clean index before the crisis and after the crisis. The average S&P Clean index before the crisis was higher than after the crisis. There is no significant difference of average abnormal return before and after the Conference of Parties (COP) 21st in Paris.

KEYWORDS

kyoto protocol, clean and renewable energy, macro economy.

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1. INTRODUCTION

Energy is needed for human life and plays a central role in the global economy. The most commonly used energy sources are energy sources derived from fossils such as coal, petroleum, and natural gas. For more than 100 years fossil energy has become the main source of energy driving the world economy and industry. Global warming is happening. The temperature of the planet increases from year to year. According to environmental experts, carbon dioxide (CO₂) is the cause that traps heat in the Earth's atmosphere that drives the planet's temperature rise, which we have known as the greenhouse effect. This carbon dioxide is produced from fossil fuel combustion processes such as coal, natural gas and oil plus deforestation due to deforestation, especially in the tropics. The world of the twenty-first century faces a major challenge to managing the economic transformation of carbon-intensive energy into an economy dominated by clean and renewable energy. The reality of global climate change is the occurrence of global warming caused by the increasing of CO₂ emissions levels in the atmosphere drives some countries in the world dramatically cut the amount of fossil fuel consumption.

The Kyoto Protocol is a world-wide meeting of countries to discuss global issues concerning Earth's climate change caused by increasing levels of greenhouse gas emissions. The Kyoto Protocol, initiated by the United Nations Framework Convention on Climate Change (UNFCCC), is the 3rd Conference of Parties (COP) of a series of COPs until the 21st COP in Paris on 2015. The Kyoto Protocol was adopted on 11 December 1997 in Kyoto, Japan. The outcome of the conference is then referred to as the Kyoto Protocol, which is subsequently legally binding for participating countries to reduce carbon dioxide, methane, nitrogen oxide, sulfur hexafluoride, hydro fluoro (HFC), and perfluorocarbon (PFC) emissions. The outcome of the agreement is that developed and developing countries are willing to work together to reduce greenhouse gas emissions. The Kyoto Protocol entered into force in 2005 and ends in 2012. The eight-year extension of the Kyoto Protocol from 2013 to 2020 is a decision set out in the Doha Amendment as a result of the 18th Climate Change Conference in Doha, Qatar in 2012.

Stock price fluctuations indicate the law of supply and demand in the capital market. For investors, the high demand for products produced by a company shows a good prospect for the company's growth in the future so that it also affects the stock price of the company. In terms of stocks traded on the stock exchange, the higher the return generated from a stock then the stock price will be higher. Along with changes in economic patterns and world energy consumption, companies engaged in the field of clean energy and renewable more established to meet the world demand for clean and renewable energy. The index of clean and renewable energy stock prices began to be widely made after the Kyoto Protocol in several major stock exchanges in the World while in the Indonesia Stock Exchange has not been made to date.

British Petroleum (BP) routinely annually releases data and reports on energy including the amount of world energy consumption. Classification of energy is divided into two major groups namely fossil energy (fossil energy) which consists of petroleum (oil), coal (coal), and natural gas (natural gas). The second group is clean and renewable energy, which consists of nuclear, hydro and other renewable energy.

Research on stock prices, stock returns, or stock price indexes of various sectors has been widely done with mixed results. Artha (2014) in the results of his research shows that book value per share (BVS), price to book value (PBV), debt to equity ratio (DER), stock price trends, BI rate, world oil prices, and rupiah exchange rate to the share price of agricultural sector at 1% level. The results of research conducted by Kurniadi (2013) showed that based on REM analysis, only MVARET and Q-TobinRET variables have a significant positive effect on stock returns. EVARET, inflation, exchange rate and dummy crisis have no significant effect on stock

return. Gay Jr. (2008) in his research entitled Effects of Macroeconomic Variables On Stock Market Returns For Four Emerging Economies: Brazil, Russia, India, and China showed that there is no significant influence of macroeconomic variables exchange rate and oil prices to stock returns in four The country.

Kumar (2012) conducted a research entitled The Impact of Macro Economic Fundamentals on Stock Prices Revisited: Evidence from Indian Data. The results show that macroeconomic variables and stock market indices are co-integrated and hence long-term equilibrium relationships exist between them. It is observed that stock prices are positively associated with money supply and industrial production but negatively related to inflation. Short-term exchange rates and interest rates are found to be insignificant in determining stock prices. In the Granger causality sense, macroeconomic variables cause long-term stock prices but not in the short run. There is a two-way causality between production and the price of industrial stocks, whereas the causality of money supply for stock prices, stock prices for inflation and interest rates on stock prices are found.

Barnor (2014) in his research entitled The Effect of Macroeconomic Variables on Stock Market Returns in Ghana (2000-2013) reveals that interest rates and money supply have a significant negative impact on stock market returns. However, exchange rates have a significant positive impact on stock market returns. In addition, the inflation rate did not significantly affect the stock market return in Ghana. Quadir (2012) conducted a research entitled The Effect of Macroeconomic Variables on Stock Returns on Dhaka Stock Exchange and used the Autoregressive Integrated Moving Average (ARIMA) research method. The results show that the influence of treasury bill interest rate and industrial production on stock return is not statistically significant. Although independent variables of both the treasury bill rate and industrial production have been tested in this study, the effects of many macroeconomic variables on stock market indices remain unexplored for different countries.

Becchetti (2011) conducted a study entitled Stock Market Reaction to the Global Financial Crisis: testing for the Lehman Brother's Event using an event study approach. The results show that Investors rationally assign more value to information on each domain rating than affiliation/non-affiliation with social index FTSE KLD 400. Investors seem to find after the incident that the KLD rating provides original information not captured by traditional financial valuation indicators.

Jayanthi (2009) in her research entitled World Transmission Price and Volatility Shares: Empirical Studies Before and After Crisis Subprime Mortgage revealed results that is on the East Asian market, the variability of volatility return that occurs more due to internal factors. While the variability of European stock return volatility is also influenced by the volatility of other European stock returns. The variability of the volatility of American stock returns is absolutely influenced by internal factors. This research uses Vector Auto Regression (VAR) / Vector Error Correction Model (VECM) and Generalized Autoregressive Conditional Heteroskedasticity (GARCH) combination with VAR using software Eviews.

Mulatsih (2009) conducted a study with the title of Capital Market Reaction Analysis on the Announcement of Right Issue at Jakarta Stock Exchange (BEJ), Observation on Return, Abnormal Return, Security Return Variability and Trading Volume Activity. The study used event analysis method with market adjusted model approach. The results showed that stock returns showed significant differences only for before the moment. This identifies the possibility of right issue information being absorbed in the days before the announcement is published. Abnormal Return and Security Return Variability do not show any significant difference. While Trading Volume Activity shows a significant difference for the period of observation before the time and after the announcement. Based on the result of the research, it can be concluded that the capital market does not react to the announcement of right issue, so the efficiency of Indonesian capital market (Jakarta Stock Exchange) could not be categorized in semi strong form.

Generous (2012) in his research entitled Analysis Effect of macroeconomic variables and World Oil Prices on Energy Stock Price Index using multiple linier regression analysis method. The results of this study are industrial production index variables, inflation, SBI rates, exchange rates and world oil prices jointly affect the changes in IHSE. Partially macroeconomic variables affecting IHSE changes are the SBI rate, exchange rate and world oil price.

Up to now, there has never been any previous research on clean and renewable energy stock price indexes. Therefore, this research becomes the first and since the index of clean and renewable energy stock price is not yet available in Indonesia Stock Exchange, the index used is the stock price index of clean and renewable energy existing in the main stock exchange of United States. In addition, it should be further investigated whether the World energy consumption pattern has changed particularly after the adoption and enactment of the Kyoto Protocol in 2005 and what kind of energy has increased more than other types of energy.

2. RESEARCH METHODS

The type of data used in this study is secondary data in the form of world energy consumption, fossil energy stock price index, clean and renewable energy stock price index, composite stock price index and daily stock price of some clean and renewable energy companies listed on the main stock exchange in the United States as well as US macroeconomic data. There are two clean and renewable energy stock price indexes, namely S & P Global Clean Energy Index and NASDAQ® Clean Edge® Green Energy Index and two fossil energy stock price indexes are S & P Global Oil Index and NYSE ARCA Oil & Gas Index. In addition, there are 5 shares of clean and renewable energy companies have been selected to examine how the impact of the occurrence of important events during the period 2005 to 2016. The important events related to clean and renewable energy is the global economic and financial crisis of 2007 to 2009 and the conference of parties (COP) held annually.

The five sample of the shares was selected based on the purpose random sampling of the company's shares included in the NASDAQ® Clean Edge® Green Energy Index component thus listed on the Nasdaq stock exchange and selected 5 companies with the largest market capitalization and has been listed in the stock market since 2005. For composite index used the Nasdaq Composite Index. While the macroeconomic variables used in this research is the US macroeconomics as one of the world economic power reflecting the world economy condition are unemployment rate, gross domestic product (GDP) per capita, world oil prices and inflation measured from the consumer price index. These data are obtained from valid and competent sources from Yahoo Finance, Google Finance, Nasdaq, Bloomberg, World Bank, International Energy Agency (IEA) websites and other sources. The periods of time to be researched is for 11 years from 2005 to 2015. Quarterly US GDP data is obtained from the official website of the Federal Reserve Bank of St. Louis, Economic research.

ENERGY GROWTH AND ENERGY MIX

Fossil energy consumption data as well as clean and renewable energy is processed by using Microsoft Excel to analyze the world's energy mix and distribution patterns of energy consumption per region. Furthermore, the analysis of growth of energy consumption, especially clean energy and renewable world and per regional using Microsoft excel.

STATISTICAL DESCRIPTIVE ANALYSIS

Descriptive analysis is used to describe the characteristics of stock return in the form of descriptive statistic such as standard deviation, mean value, skewness, kurtosis, maximum value, and minimum value. The stock return value of each stock price index is calculated by using the formula:

$$R = \frac{P_1 - P_0}{P_0} \quad (1)$$

Where R is stock return, P1 is stock market price at the end of day, and P0 is stock market price at the beginning of day.

CORRELATION ANALYSIS

Correlation analysis was conducted to find out how the correlation between fossil energy consumption with clean energy and the correlation of both with GDP per capita and correlation between clean and renewable energy stock price index, fossil energy stock price index and composite stock price index. The formula of Pearson correlation coefficient value:

$$r = \frac{N\sum xy - (\sum x)(\sum y)}{\sqrt{[N\sum x^2 - (\sum x)^2][N\sum y^2 - (\sum y)^2]}} \quad (2)$$

Where N is number of pairs of scores, $\sum xy$ is sum of the items of paired scores, $\sum x$ is sum of x scores, $\sum y$ is sum of y scores, $\sum x^2$ is sum of squared x scores, and $\sum y^2$ is sum of squared y scores.

DIFFERENT TEST

Paired-sample T tests were conducted to determine whether there is a difference in the average net and renewable energy stock price index before and after the global economic and financial crisis. The cut off used as a boundary between before and after the global economic and financial crisis was 1st January 2008.

EVENT STUDY

The next method of research is event study with the steps of data processing as follows: Calculates actual return during the estimation period and event period. Return of shares is income received from investments in shares consisting of capital gains (lose) plus dividends for companies that distribute them. Calculates market returns daily. Market return is the profit level of all shares listed in the capital market. Market return is represented by the composite index (NCI). NCI shows the stock price index listed on the Nasdaq capital market that can be formulated as follows:

$$Rmt = \frac{NCIt - NCI_{t-1}}{NCI_{t-1}} \quad (3)$$

Where Rmt = market return at time t. NCI t = Nasdaq Composite Index at time t. NCI t - 1 = Nasdaq Composite Index at time t - 1. Calculates the expected return (return) during the event period.

$$E(Ri) = \alpha_i + \beta_i * Rmt \quad (4)$$

Where E (Ri) = expected return, α_i = coefficient of constant, and β = slope coefficient which is the beta of the stock i. Rm = market return of the market index during the period of the incident. The coefficient of alpha and beta is obtained from the calculation of time series regression equation from daily stock return with market return during the estimation period with dependent variable in the equation is daily stock return and independent variable is market return. Calculating the abnormal return of each share during the period of abnormal return is the difference between the actual return that occurs with the expected return.

$$ARit = Rit - E(Rit) \quad (5)$$

Where ARit = abnormal return of stock i at time t. Rit = stock return i at time t. E (Rit) = expected return of stock i at time t. Calculates the average abnormal return of all shares during the period of the event (event period). An abnormal return test is not performed for each of the securities, but is done in aggregate by testing the average abnormal return of all securities cross-sectioned for each day of the event period.

$$AARt = \frac{\sum_{i=1}^n ARit}{n} \quad (6)$$

Where AARt = average abnormal return of all shares at time t and ARit = abnormal return of stock i at time t. n = number of shares. The last is calculates cumulative average abnormal return (CAAR) which is the average abnormal return accumulation.

3. RESULTS AND DISCUSSION**ENERGY MIX WORLD**

The share of petroleum consumption in energy mix for 11 years decreased while coal and gas were relatively stable. The share of nuclear energy in energy mix also decreases while hydro is relatively stable. Only other clean and renewable energies are increasing. During the period of 2005 - 2015, there was a decrease in the portion of fossil energy and on the other side the increase of clean and renewable energy portion but the second portion, change was still very small at 1.47% for 11 years. Within the fossil energy group there is a decrease in the share of consumption in petroleum and is replaced by an increase in the share of coal and natural gas. While in the clean and renewable energy group, nuclear energy has decreased sharply, especially starting in 2011 due to the Fukushima incident and the radiation issues that are harmful to life. Water energy (hydropower) is relatively stable and slightly increased every year. The decline in the nuclear portion was replaced by an increase in the share of clean and other renewable energy consumption, which reached 2.02% for 11 years.

WORLD ENERGY CONSUMPTION DISTRIBUTION PATTERN

The pattern of distribution of world energy consumption over the 11 years period (2005 - 2015) shows that the region or countries with the largest amount of energy consumption are countries in Europe and Eurasia followed by China, US and Asia Pacific countries. Europe and Eurasia are areas with the largest amount of energy consumption for both fossil energy and clean and renewable energy. The amount of consumption of fossil energy groups of US and Eurasian countries of Europe decreased while the rest of the world increased. For clean and renewable energy groups in all regions of the World has increased. China is the fastest country in increasing the amount of clean and renewable energy consumption. The Eurasian and Eurasian regions are listed as the region with the largest clean renewable energy consumption in the World followed by the United States and China over the period 2005-2015. Since 2005, the number of clean renewable energy consumption in China has always increased until starting in 2014 could exceed US. China's clean and renewable energy consumption in 2014 and 2015 is larger than the US and is the second largest in the world after Europe Eurasia. The main driver of increased clean energy consumption and renewable energy in China is the use of hydro energy as a large-scale power plant in various regions in China.

GROWTH OF CLEAN AND RENEWABLE ENERGY CONSUMPTION

Almost all types of energy experienced a negative growth (decrease) in consumption in 2009. This happens because in 2008 and 2009 there was a global economic and financial crisis that was preceded by the financial crisis in the United States. The global economic crisis that occurred in 2008 actually began in the United States economic crisis as a result of subprime mortgage (subprime mortgage) which then spread to other countries around the world, including Indonesia. This shows the dominance of US Dollar currency and the influence of US economic condition on the world economy. One interesting thing is only the other clean and renewable energy was not affected by the crisis and still experiencing increased growth. Other clean and renewable energy (other than hydro and nuclear) include wind energy, solar energy, geothermal energy and biomass.

Especially for nuclear energy, both from the amount of consumption each year and from the portion in the energy mix looks declining. In terms of growth, nuclear energy experienced a sharp decline in 2011 and 2012. This is due to the impact of the explosion of nuclear reactor explosion in Fukushima. The Fukushima Daiichi nuclear disaster is a barrage of device failures, nuclear leakage and radioactive material release at the Fukushima Nuclear Power Plant I, caused by the Tohoku earthquake and tsunami of March 11, 2011. This nuclear disaster was the worst nuclear disaster since the Chernobyl disaster of 1986.

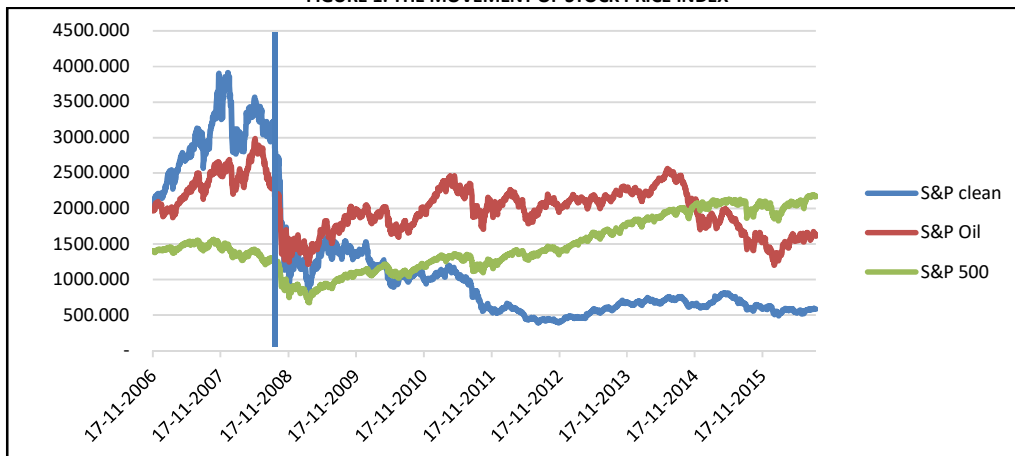
In the fossil energy group, the decline in coal consumption growth was replaced by increasing growth in the consumption of petroleum and natural gas. As for the clean and renewable energy groups, the decline in growth in nuclear and hydro consumption is replaced by an increase in the growth of other clean and renewable energy consumption. Seen in more detail per region, it turns out that only China that experienced positive growths for 11 years means that the amount of clean and renewable energy consumption in China is always increasing every year. The high growth of clean and renewable energy consumption in China can be seen from the average growth of 13.49% per year. Followed by Middle East 7.09% and Africa 3.51%. While the United States and Europe Eurasia relatively stable with an average growth rate of 1.76% and 1.87%.

Attributed to the special events of the world economic and financial crisis in 2008 and 2009, it turns out that only a small part of the region experienced negative growth for North America, Eurasia and the Middle East. While the US, China, Central and South America, Africa, and Asia Pacific continue to experience positive growths. Thus, the consumption of renewable clean energy in most areas of the World is not entirely affected by the global economic and financial crisis.

THE MOVEMENT OF CLEAN AND RENEWABLE ENERGY STOCK PRICE INDEX

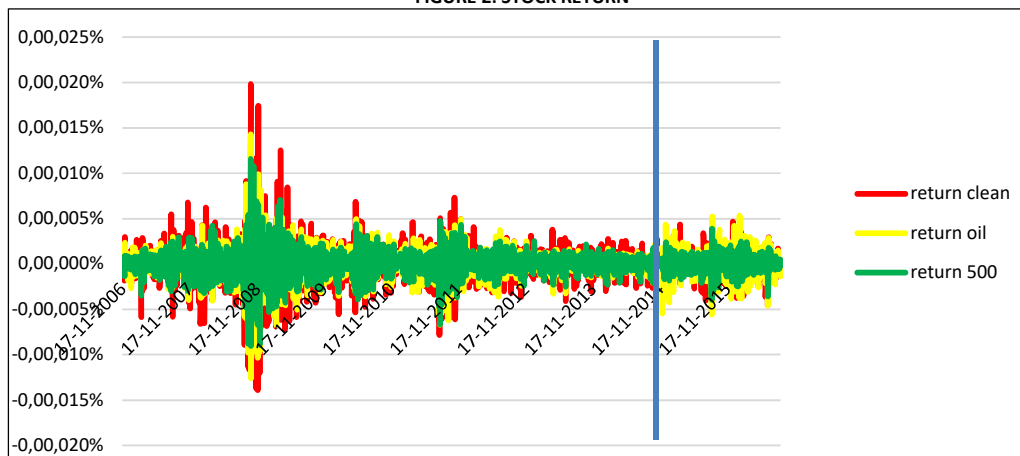
From the chart of the stock price index movement shows that the global economic and financial crisis in 2009 is very influential on the index of fossil energy stock price and clean renewable energy stock price index. Before the crisis, the clean energy stock price index was higher than fossil energy but after the crisis became lower. Even to this day, this two stock price indexes have not been able to return as before the global economic crisis especially for clean energy index.

FIGURE 1: THE MOVEMENT OF STOCK PRICE INDEX



Judging from the stock return, it is seen that the return index of fossil energy stock price and clean renewable energy stock price index fluctuated compared with the composite stock price index of S & P 500. Seen in 2008 and 2009 there are significant fluctuations that allegedly occurred abnormal return as result of the global financial crisis.

FIGURE 2: STOCK RETURN



CORRELATION OF CLEAN AND RENEWABLE ENERGY STOCK PRICE INDEX

The correlation analysis between clean energy stock price index, fossil energy and composite stock price index is done to see the relationship between the three. In addition, correlation analysis for t and t-1 is also considered because the movement of stock price index on this day is sometimes influenced by something that happened on the previous day.

TABLE 1: CORRELATION OF t AND t – 1 INDEX

Return of stock price index	Clean (t)	Clean (t – 1)	Fossil (t)	Fossil (t – 1)	S&P 500	S&P 500 (t – 1)
Clean (t)	1	.145**	.495**	.091**	.440**	.155**
Clean (t – 1)		1	.344**	.495**	.239**	.440**
Fossil (t)			1	.081**	.780**	.113**
Fossil (t – 1)				1	-.105**	.780**
S&P 500					1	-.107**
S&P 500 (t – 1)						1

The magnitude of correlation between S & P Global Clean Energy Index with S & P Global Oil Index is 0.495 means there is a quite strong positive relationship. While Pearson correlation value between S & P Global Clean Energy Index with S & P 500 is 0.440 means there is a quite strong positive relationship. Finally, the relationship between S & P Global Oil Index and S & P 500 has Pearson 0.780 correlation (close to 1) meaning that there is a very strong relationship between the two.

The correlation between clean and renewable energy stock price index with some macroeconomic indicators shows that the strongest correlation is between the index of stock price of renewable energy and the consumer price index (CPI) that is equal to 0.525. As for the macroeconomic indicators of GDP per capita and world oil prices are very weak or almost no correlation and the level of unemployment is negatively correlated with a strong enough.

TABLE 2: CORRELATION OF CLEAN ENERGY STOCK INDEX AND MACROECONOMICS

		SP clean	GDP per capita	Oil price	Unemployment	CPI
SP clean	Pearson Corr.	1				
	Sig. (2-tailed)					
GDP per capita	Pearson Corr.	-.123	1			
	Sig. (2-tailed)	.469				
Oil price	Pearson Corr.	.169	-.154	1		
	Sig. (2-tailed)	.316	.364			
Unemployment	Pearson Corr.	-.408*	-.791**	.188	1	
	Sig. (2-tailed)	.012	.000	.266		
CPI (consumer price index)	Pearson Corr.	.525**	-.002	.661**	-.184	1
	Sig. (2-tailed)	.001	.991	.000	.276	

DIFFERENT TEST OF STOCK PRICE INDEX BEFORE AND AFTER THE GLOBAL ECONOMIC AND FINANCIAL CRISIS

Using the clean and renewable energy stock price indices S & P Global Clean Energy Index (SP clean) and NASDAQ® Clean Edge® Green Energy Index (N clean) conducted a different test (Paired-sample T Test) to find out whether there is a difference in stock price index before and after the global economic and financial crisis. Cut off used as a boundary between before and after the global economic and financial crisis is January 1, 2008 as it is considered that the economic crisis began in late 2007 or early 2008.

TABLE 3: PAIRED SAMPLES t-TEST S&P CLEAN ENERGY INDEX

Paired Differences					t	df	Sig. (2-tailed)
Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
			Lower	Upper			
285.63447	1296.27836	75.98918	136.07424	435.19470	3.759	290	.000

Null hypotheses in this different test that there is no difference between the average SP Clean index before and after the crisis. The test uses two-tailed test with significance level $\alpha = 5\%$. The level of significance in this case means we take the wrong risk in making the decision to reject the correct hypothesis as much as 5% (5% significance or 0.05 is the standard measure often used in research). From the table above obtained t value is 3,759. The distribution table t is sought at $\alpha = 5\%$: $2 = 2.5\%$ (2-sided test) with degrees of freedom (df) $n-1$ or $291-1 = 290$. With excel obtained results for t table $t_{inv}(0.05, 290)$ Of -1.6501. The testing criteria is H_0 accepted if $-t \leq t \leq t$ arithmetic $\leq t$ table and H_0 is rejected if $-t < t$ arithmetic $< -t$ table or $t > t$ arithmetic $> t$ table. By probability H_0 is accepted if P value $> 0,05$ and H_0 is rejected if P value $< 0,05$.

By comparing t arithmetic with t table and probability obtained t value $> t$ table (3.759 > -1.650) and P value (0,000 $< 0,05$) then H_0 is rejected means that there is a difference between mean of S & P Clean index before Crisis after crisis. Mean Scores on Paired Samples Statistics before the crisis were higher than after the crisis or positive t mean the average S & P Clean index before the crisis was higher than after the crisis.

TABLE 4: PAIRED SAMPLES T-TEST NASDAQ CLEAN ENERGY INDEX

Paired Differences					t	df	Sig. (2-tailed)
Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
			Lower	Upper			
35.86835	118.11632	6.92410	22.24049	49.49621	5.180	290	.000

Null hypothesis in this research that there is no difference between the average Nasdaq Clean index before and after the crisis. The test uses two-tailed test with significance level $\alpha = 5\%$. The level of significance in this case means we take the wrong risk in making the decision to reject the correct hypothesis as much as 5% (5% significance or 0.05 is the standard measure often used in research). From the table above obtained t value is 5,180. The distribution table t is sought at $\alpha = 5\%$: $2 = 2.5\%$ (2-sided test) with degrees of freedom (df) $n-1$ or $291-1 = 290$. With excel obtained results for t table $t_{inv}(0.05, 290)$ Of -1.6501. The test criteria used are H_0 accepted if $-t \leq t$ arithmetic $\leq t$ table or H_0 is rejected if $-t < t$ arithmetic $< -t$ table or $t > t$ arithmetic $> t$ table. By probability H_0 is accepted if P value $> 0,05$ and H_0 is rejected if P value $< 0,05$.

By comparing t arithmetic with t table and probability obtained t value $> t$ table (5,180 $> -1,650$) and P value (0,000 $< 0,05$) then H_0 rejected means that there is difference between mean of index average of Nasdaq Clean Energy Before the crisis after the crisis. Mean Scores on Paired Samples Statistics before the crisis were higher than after the crisis or t positive mean the average Nasdaq Clean Energy index before the crisis was higher than after the crisis.

The same test was conducted on the return and abnormal return of clean and renewable energy stock price index for S & P and Nasdaq. The overall research shows the same result that there is a significant and significant difference between before and after the global economic and financial crisis where the average before the crisis is greater than the crisis.

EVENT STUDY THE CONFERENCE OF PARTIES TO THE STOCK PRICE INDEX

Event study was conducted to find out how was the reaction of clean and renewable energy stock price index to the implementation of conference of parties (COP) as a commitment of countries improving the quality of the earth's climate. There are 2 COP which will be used in research sample that is 21st COP in Paris and 19th COP in Warsaw. The estimated period of 100 days, the 29-day event period and the date of the incident are the first day of commencement of the COP. COP is usually held for 10 days.

Prior to the Independent Sample T test, the condition must be tested for normality and homogeneity of the data under study. The significance value used is Shapiro Wilk because the number of data samples less than 50 ($n < 50$) turns out to be greater than 0.05 so that the data is normally distributed. The results of the Independent Sample T test show that Levene's Test for equality of variances is $0.636 > 0.01$, assuming the data variance is the same or homogeneous. The test results also show that the significance value (sig (2-tailed) or P value) $0.771 > 0.05$ then the hypothesis H_0 is accepted that there is no significant difference in average abnormal return before and after the implementation of the 21st COP in Paris. As for the 19th COP, P value = 0.448 is also greater than 0.05 so that H_0 is accepted.

Based on the test t-Test: Two-Sample Assuming Equal Variances using Microsoft excel obtained the same results that the value of t arithmetic = - 0.294 and when compared with t table (2.055) then obtained t count $< t$ table. H_0 hypothesis is thus accepted that there is no significant difference of average abnormal return before and after the implementation of the 21st COP in Paris.

4. CONCLUSIONS

Based on the results of this research that has been described before, it can be concluded that during the 2005 - 2015 period or since the Kyoto Protocol was enacted in 2005, the share of world fossil energy consumption has declined and has been replaced by an increase in the portion of clean and renewable energy although still relatively small at 1.47%. The global economic and financial crisis in 2009 has led to a decrease in consumption growth of all energy types except for clean and other renewable energy such as wind energy, solar energy, geothermal energy and biomass. The United States and Europe have reduced the amount of fossil energy consumption where the average growth rate is negative, while China is a country with the highest growth rate of clean and renewable energy consumption in the World.

There is a strong and real positive relationship between S & P Global Clean Energy Index and S & P Global Oil Index. Meanwhile, between S & P Global Clean Energy Index with S & P 500 there is a real negative (opposite) relationship. Between the S & P Global Oil Index and the S & P 500 there is a strong relationship or almost no relationship between the two. There is a strong correlation between the stock price index of renewable energy and renewable energy with the consumer price index (CPI). As for the macroeconomic indicators of GDP per capita and world oil prices are very weak or almost no correlation and the level of unemployment is negatively correlated with a strong enough.

After the Kyoto Protocol, the price index of clean and renewable energy stocks was higher than the fossil energy stock price index until the global economic and financial crisis in 2009. After that, the index of clean and renewable energy stock price was always lower than the fossil energy stock price index up to now. In terms of return, since the Kyoto Protocol the price index of clean and renewable energy stocks appears to be fluctuating compared to the fossil energy stock price index until 2014 when the prices of oil and coal commodities experienced a very sharp decline. Since then the fossil energy stock price return index has become more fluctuating.

There is an average difference between clean and renewable energy stock price indexes before and after the global economic and financial crisis, i.e. the average index before the crisis is significantly greater than after the crisis. There is a difference of stock return and abnormal return of clean and renewable energy stock before and after global economic and financial crisis. There is no significant difference in average abnormal return before and after the implementation of the 21st and 19th COP.

Very high increased of growth in consumption and demand for other clean and renewable energy and resilience to the global economic crisis creates enormous business opportunities for Investors, Private Companies and Government. The availability of renewable energy sources scattered throughout the country allows the Government to meet the electricity needs, especially in remote areas and border areas that have not been reached.

The management of capital market should consider to immediately making stock price index of clean and renewable energy sub sector. For researchers and academics, more research on what type of clean and renewable energy sources, which have the highest demand and the lowest investment cost so that maximal profit is required.

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With sincere regards

Thanking you profoundly

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Sd/-

Co-ordinator

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