Cointegration of Macroeconomics Variables and Dow Jones Industrial Average Index on the Composite Stock Price Index In 2015-2019

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ARTICLE INFO	ABSTRACT
	This research examines the cointegration of macroeconomic variables and the Dow Jones Industrial Average Index toward IHSG. The Sampling data used is non probability sampling techniques by using historical monthly data from January 2015 to December 2019. The method used in this study are Augmented Dickey-Fuller Test for stationarity test, Johansen Test for Cointegration, and Error Correction Model for short-term relationships with eviews 10. The findings showed that DJIA Index not cointegrated with IHSG because investors are more responsive to global market and domestic sentiment. Exchange rates not cointegrated with the IHSG because exchange rate and IHSG movements do not always had a negative relationship. Interest rates are not cointegrated with IHSG because most of the sectors in the IDX affected by external sentiment than interest rates. Meanwhile, inflation have a cointegration relationship but does not have a short-term relationship with IHSG because inflation is generally known as a continuous increase in the price of goods as a whole. Crude oil have a cointegration relationship but does not have a short-term relationship with IHDG, which implies that an increase or decrease in crude oil in the short term can not affect IHSG.

Introduction

The amalgamation of economies of all countries worldwide is global economic growth. One way of measuring economic growth is through domestic revenues. The long-term macroeconomic problem is economic growth. In the last several years up to 2019, the structural changes in the global economy continued to grow. In macroeconomic management, this creates complexity. The pattern of capital inflows will be altered by an insecure international economy followed by increased uncertainty on global financial markets.

The direction of economic growth in developed countries compared to developing countries in 2015-2016 is not one-way. This is because of various factors, such as population and workforce growth, technological advances and accumulation of capital. Capital market is one of the usual means of investment. The existence of the capital market also often serves to measure economic growth and support the

economy of the country by looking at the conditions of a country's business. The declaration is backed by several studies, including Lisnawati and Budiyanti (2011) which indicate that economic growth is significantly affected by the capital market.
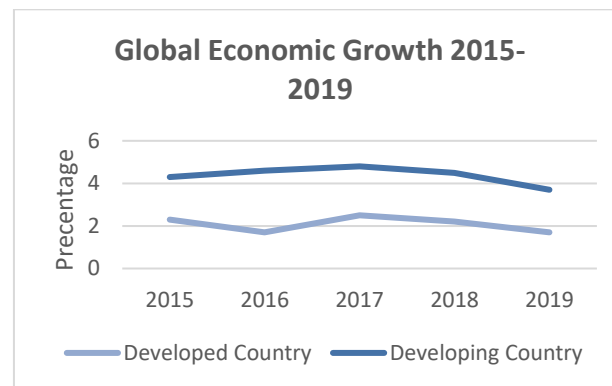
Source: WEO IMF October 2019, Bloomberg

Figure 1 Global Economic Growth 2015-2019

The capital market share held by foreign investors in Indonesia by 2019 is up to 51.46% and the rest is the share of the ownership of domestic investors (CNN Indonesia 2019). Increases KFLN's position from 2015-2019. This is demonstrated by the inflow of foreign capital into Indonesia, including foreign direct investment and portfolio investment. The United States is one of the industrialized countries that invest in Indonesia. Due to several existing collaborations, Indonesia and the United States are closely related. Examples of cooperation between Indonesia and the United States are international trade and foreign investment. Trade between Indonesia and the US reached USD 30 billion in 2019 (Kementrian Luar Negeri, 2019). According to information on foreign investment, the USA invested in the Indonesian capital market US$ 6.254.911,3 (BKPM, 2019).
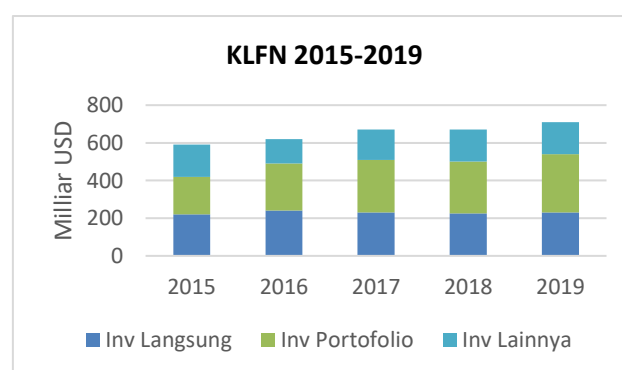
Source: Bank Indonesia 2019, compiled by the author

Figure 2 The Position of KLFN 2015-2019

Investors are invest on the Indonesian Capital Market. The Indonesia Stock Exchange shall provide investors with information on movements in stock prices to support investment activities. The Composite Stock Price Index is an index that displays

information on all shares listed and is often used as a reference for assessing bearish or bullish market conditions (Mahdi, 2010). Global economic conditions and policies are factors that can affect the stock index. Changes in different macroeconomic variables are often associated with capital market fluctuations (Tandelilin, 2010). Macroeconomic changes, such as exchange rate changes, interest rates, and inflation, will have an impact on the performance of the capital market. In addition, foreign exchange indicators can also influence capital market performance.

The US stock index, which is often the target of investors, is the Dow Jones Industrial Average Index (Ahmad, 2021). The co-movement between several capital market countries caused changes that will affect other countries indexes, including the Composite Stock Price Index, in the Dow Jones Industrial Average index. Research to support the long-term relationship between the Dow Jones Industrial Average Index and the Composite Stock Price Index for 2005-2018 shows this (Natsir et al., 2019). The long-term relationship between the industrial average Dow Jones index and the Composite Stock Price Index is also supported by the research Yanuar (2013);Nurwulandari & Fuadi (2013); Wibowo (2012); dan Octavia & Wijaya (2020). But that goes against Ghiffari et al. (2018).

The exchange rate is the macroeconomics which may affect the Composite Stock Price Index. The currency will affect the price of commodities as the dollar is the worldwide benchmark (Kumar & Patel, 2019). The currency will affect share prices. Investors tend to try to lower the risks of investment. A number of studies, including Natsir et al. (2019); Juliodinata et al. (2019); Mahdi (2010); and Adesanmi et al. (2017) have supported co-integration among exchange rate and the Composite Stock price index. However, Mukhlis et al. (2018) and Abidin et al.(2013) admit that the exchange rate and the Composite Stock Pricing Index are not integrated.

Inflation increases can affect the Composite Stock Price Index as well as they cause the price of goods to grow, which will also increase production costs for the company and then decreases corporate profit to impact shareholder dividends Inflation increases (Natsir et al., 2019). There are several studies, namely Juliodinata et al. (2019) ; Adesanmi et al. (2017); and Rini & Raja (2016) which demonstrate the co-integrity of both. This is contrary to research by Yanuar (2013), which says inflation is not co-integrated into the Composite Stock Prize Index.

In the Composite Stock Price Index, high-interest rates will also weaken. This is because people prefer to invest in banks instead of investing in the capital market when interest rates are high. Mahdi (2010) and Mukhlis et al. (2018) research indicated the failure to co-integrate interest rates and Composite Stock Price Index. In contrast to the research carried out by Juliodinata et al. (2019) ; Adesanmi et al. (2017); and Rini & Raja (2016) indicating that the Composite Stock Price Index is coincided with interest rates.

The crude oil price will affect the Composite Stock Price Index as it increases the cost of production by companies so that the prices of products are also higher and people hesitate to invest in the event that the price of oil increases (Adam *et al.*, 2015). According to Darmawan *et al.* (2020) and Adam *et al.* (2015), the composite stock price index and oil prices are being integrated. Oil prices are, however, not co-incorporated to the Composite Stock Prize Index on the basis of Hersugondo *et al.* (2015).

Based on the phenomenon that indicates that fluctuating economic growth shows different direction of movement, in which economic growth in developed economies and economic growth in developing countries. In addition to the close relations between the United States and Indonesia, in particular in the financial sector, the question arises as to whether the two nations are co-integrated. The aim of this study is therefore to establish the long-term (cointegration) and short-term links between the Dow Jones industrial average index and macroeconomic variables, specifically exchange rates, inflation, interest rates and the Composite Stock Price Index crude oil prices in 2015-2019. Investors and government can therefore consider policies to be implemented on the capital market. Cointegration can be a factor in detecting the economic problems of a country. Capital market co-integration is also important to know how the free market economy works, (Veerappa, 2016).

Literature Review

Signalling Theory

The theory of signnalling explains the data on the market, including the capital market (Fahmi, 2012). *Signalling Theory* explains the factors of information that increase prices and fall in the market to influence investors in decision-making (Fahmi, 2012). Investors receive information on whether or not investors will purchase shares in a specific company (Ahmad, 2021). When investors receive negative information, the volume on the capital market will decrease. Signaling Theory will be used as a theoretical basis for determining the long-term (co-integration) relationship between inflation, interest rates, exchange rates and crude oil prices on the Composite Stock Price Index (Ahmad, 2021).

Co-movement Theory

Co-movement Theory among countries will determine the diversification strategy adopted by international investors, particularly capital markets in developing countries (Modi patel & patel, 2010). Joint movements in the international capital market are also influenced by various global factors. Global liberalisation, such as capital control, financial innovation, political and economic integration and the financial crisis are at stake (King & Wadhwani, 1989). A theoretic basis for the determination of the long-term relationship (cointegration) between the Dow Jones Average Industrial index and the Composite Stock Price Index is the co-movement theory.

Composite Stock Price Index

The Composite Stock Price Index is a historical information describing price fluctuations of companies' shares in a specific period listed in the Indonesian Bourse (Anoraga & Pakarti, 2006). The Composite Stock Price Index describes the capital market trend so that we find out if the capital market is strong or weak. One of the investor's references in determining investment strategies will be the Composite Stock Price Index.

Dow Jones Average Industrial Index (DJAI)

The Dow Jones Industrial average index (DJAI) reflects the results of 30 reputable companies in the United States (Natsir *et al.*, 2019). This index is often used by investors as the first index in the world based on company fundamental values to evaluate the status of global capital stock markets (Natsir *et al.*, 2019). The influence behind the Dow Jones average Industrial Index and the Composite Stock Price Index is based on the co-movement theory of capital market interdependence(Hilmy & Isbanah, 2020). The Composite Stock Price Index will also increase when the Dow Jones Average Industrial Index increases. The growing Dow Jones Industrial Average Index shows that the US economy is good and will affect capital flows from the US to Indonesia (Ahmad, 2021). The co-integration of the Dow Jones Average Industrial Index into the Composite Stock Price Index is replied by Natsir *et al.* (2019); Yanuar (2013); dan Nurwulandari & Fuadi (2013). But Ghiffari *et al.* (2018) stated that the two stock indices have no relationship.

H1:   The Composite Stock Price Index has a long-term and a short-term relationship with the Dow Jones Industrial Average index.

Exchange Rate (Currency)

When expressed in another currency, the exchange rate is the nominal value of a currency (Natsir *et al.*, 2019). A decline in the domestic exchange price is known as depreciation while the national exchange rate is known as appreciation of the exchange rate (Cerdasco, 2020). The trade balance has an impact on the currency. If the trade balance is an excess and the foreign exchange reserve rises, then the exchange rate will strengthen a weaker exchange rate, while the trade balance will increase (Natsir *et al.*, 2019). The relationship between the exchange rate and the composite stock price index arises because when rupiah value rises, export-oriented enterprises are encouraged to increase share prices too (Natsir *et al.* 2019). A stronger rupiah is expected to attract international investment in Indonesian shares and increase the Composite Stock Price Index. Research by Natsir *et al.* (2019); Juliodinata *et al.* (2019) ; Mahdi (2010) ; dan Adesanmi *et al.* (2017) show that there is a co-integration between the exchange rate and the Composite Stock Price Index. However the exchange rate with the Composite Stock Preise Index is not jointly integrated by Mukhlis *et al.* (2018) dan Abidin *et al.*(2013).

H2:   The Composite Stock Price Index has a long-ter and a short-term relationship with exchange-rate.

Inflation

Price increases generally and in a continuous period can result in inflation (Ahmad, 2021). Inflation can also be understood when society's money rises, leading to a general price increase. Inflation rates are generally measured by the Consumer Price Index. in which inflation will increase the prices of raw materials. The producers do not dare to raise prices for the consumers in order to increase production costs of the company also while at the same time increasing overall prices (Oktarina et al., 2017). Research by Juliodinata et al. (2019) ; Adesanmi et al. (2017); Rini & Raja (2016) states that there is a cointegration between inflation and the Composite Stock Price Index. However, Yanuar (2013) states that there is no cointegration between inflation and the Composite Stock Price Index.

H3:   The Composite Stock Price Index has a long-ter and a short-term relationship with inflation.

Interest Rate

Interest rates are two-fold financial assets, namely nominal interest rates and real interest rates (Rompas, 2018). The nominal interest rate is the right of a person to earn interest whose calculations do not take the inflation rate into account, while the actual interest rate is calculated by including inflation as a deduction (Rompas, 2018). When interest rate rises, the interest rate for deposit exceeds the anticipated equity return (Oktarina et al., 2017). When the Composite Stock Price Index is down, if investors choose deposits over the capital market. Instead, investors withdraw deposits from banks and invest in the capital market when interest rates drop. Mahdi (2010) and Mukhlis et al. (2018) found that no cointegration exists between interest and the Composite Stock Price. Juliodinata et al. (2019) ; Adesanmi et al. (2017); and Rini and Raja (2016) show that the co-integration of interest rates with the Composite Stock Price Index exists.

H4:   The Composite Stock Price Index has a long-term and a short-termrelationship with interest rate.

Crude Oil Price

When demand and supply of raw oil are present, the price of crude oil is established. The West Texas Intermediate (WTI) is standard used for prices of crude oil (Ahmad, 2021). Prices of crude oil are always on the move. In order for higher oil prices to affect global economic growth or financial markets, oil plays a major role in the economy (He, Wang, & Lai, 2010). As a country of import of oil, price increases affect increased production costs (Yanuar, 2013). The price of the product also increases and people are unwilling to invest (Adam et al., 2015). Cointegration of Composite Stock Price Index

and oil prices support by Adam *et al.* (2015) and Darmawan *et al.* (2020). However, Hersugondo *et al.* (2015) argues that the price of oil does n't have a cointegration with the Composite Stock Price Index.

H5:   The Composite Stock Price Index has a long-term relationship of balance and a short-term relationship of balance with the price of crude oil.

Method

A quantitative approach was chosen in this study, which analyzes the long-term (co-integration) and short-term balanced relationship between the variables studied in the time series analysis. The period of observation shall be fixed for a period of 5 years from 1 January 2015, to 31 January 2019. The study uses secondary data. The population used is the closing price of the Composite Stock Price Index, the monthly closing price of the Dow Jones Industrial Average Index, the rate of exchange, the rate of inflation and the rate of interest, and the price of crude oil with 360 samples with details of 60 samples taken from the monthly closing price of the Composite Stock Price Index, with 60 samples taken from the month. The analysis in this study uses Eviews 10 and data analysis technique used are the root test unit used to test the stationarity of the data, the Johansen Cointegration Test used to measure between long-term variables (cointegration) and the Error Correction Model used to measure between variables in the short term.

Result and Discussion

Data Stationarity Test

The data derived from time series is non-stationary, and it will be difficult to estimate the model because the data has a trend that moves away from its average value (Ghozali & Ratmono, 2013). The Augmented Dickey Fuller root test unit is a method used to test the stationarity of the data. Data to be stationary when the (ADF) t-statistic value is greater than the critical value (ADF>critical value) (Hilmy & Isbanah 2020). In addition, it can be said to be stationary if the probability value is less than 0.05. (5 percent) (Wibowo 2012).

Table 1. Root Test Unit

Augmented Dickey Fuller Test	Variable	Coefficient	Std. Error	t-Statistic	Prob.
Level / I(0)	CSPI(-1)	-0.031637	0.036653	-0.863152	0.3917
	DJAI(-1)	-0.006804	0.027729	-0.245369	0.8071
	EXCHANGE RATE(-1)	-0.171846	0.065975	-2.604709	0.0117
	INFLATION(-1)	-0.078056	0.038166	-2.045194	0.0455
	INTEREST RATE(-1)	-0.035818	0.024498	-1.462071	0.1494
	CRUDE OIL(-1)	-0.138506	0.068075	-2.034598	0.0466

1st Difference / I(1)	D(CSPI(-1))	-0.950745	0.135474	-7.017932	0.0000
	D(DJAI(-1))	-1.190518	0.130165	-9.146195	0.0000
	D(INTERESTRATE(-1))	-0.678060	0.125553	-5.400592	0.0000

Source : Output Eviews10 (data processed)

Based on the table of stationary test results at the level, it shows the probability results of the variables of the Composite Stock Price Index, the Dow Jones Industrial Average Index, and the interest rate> α (0.05), which means that the data is not stationary, and data stationary at the 1st difference level. Therefore it is necessary to carry out more testing at the level of 1st difference or more. Meanwhile, the variable exchange rate, interest rate, and crude oil are stationary at the level as evidenced by probability <α (0.05).

Cointegration Test
The cointegration test is a test to determine whether the variables tested have a long-term balance or a cointegration relationship ([Hilmy & Isbanah, 2020](#)). The cointegration test was conducted with the Johansen Cointegration Test. Data is said to have a long-term relationship using the Johansen test if the trace statistic is a critical value.

Table 2. Johansen Cointegration Test

Variable	Trace Statistic	0.05 Critical Value	Prob.**
{DJAI, CSPI}	7.878608	15.49471	0.4785
{EXCHANGERATE, CSPI}	8.709341	15.49471	0.3930
{INFLATION, CSPI}	15.83036	15.49471	0.0445
{INTEREST RATE, CSPI}	7.023369	15.49471	0.5749
{CRUDE OIL, CSPI}	16.70723	15.49471	0.0327

Source : Output Eviews10 (data processed)

Based on the Johansen Cointegration Test, the Dow Jones Industrial Average index variable does not have a cointegration with the Composite Stock Price Index variable, this is shown by the trace statistic of 7.878608 <from the critical value of 15.49471, so H1 is rejected. Likewise, the exchange rate variable also does not have a cointegration with the Composite Stock Price Index, this is shown by the trace statistic of 8,709341 <of the critical value of 15.49471, so H2 is rejected. Unlike the case with the inflation variable which has a cointegration with the Composite Stock Price Index, this is shown by a trace statistic of 15.83036> of the critical value of 15.49471. The interest rate variable also does not have a cointegration with the Composite Stock Price Index, this is indicated by a trace statistic of 7.023369 <from the critical value of 15.49471, so H4 is rejected. Meanwhile, the crude oil variable has a cointegration with the Composite

Stock Price Index, this is shown by the trace statistic of 16.70723> of the critical value of 15.49471.

The inflation and crude oil variables have a long-term or co-integrated relationship to the Composite Stock Price Index, these variables can be continued at a later stage to find short-term relationships.

Error Correction Model Test
The data seem to have a short-term relationship when the probability value is less than 0.05. (5 percent). Short run equations for the ECM model. The speed of adjustment or the ECT coefficient (-1) shall be shown first. The ECT coefficient value must be negative and significant if the ECM model is to be valid.

Table 3. Error Correction Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLATION)	-87.89528	55.70135	-1.577974	0.1202
D(CRUDE OIL)	0.002443	0.050183	0.048674	0.9614
ECT(-1)	-0.078383	0.059608	-1.314974	0.1939

Sources: Output Eviews10 (data processed)

ECT is significant with a coefficient value of -0.078383. Next is to look at the variable probability of inflation and crude oil. The probability of the inflation variable is 0.1202> from the critical value of 0.05, which indicates that the inflation variable has no short-term relationship with the Composite Stock Price Index. This is the same as the crude oil variable which also does not have a short-term relationship, indicated by a probability value of 0.9614> 0.05 (5%). Because the inflation and crude oil variables do not have a short-term relationship with the Composite Stock Price Index, H3 and H5 are rejected.

Discussion

The Dow Jones Industrial Average Index is not co-integrated with the Composite Stock Price Index. This finding contradicts the theory of co-movement, which describes a joint movement between two or more stock instruments. This finding is in accordance with the research of Ghiffari *et al*. (2018). Since investors react more to global market sentiment and domestic sentiment, there is no cointegration. Domestic opinion arises as a result of the government's policies, which are thought to be more influential in shaping movements. Singapore, Japan, and China are the three countries that most dominate the Indonesian capital market, according to data from BKPM (2019). As a result, investors are reacting not only to sentiment in the United States, but also to global sentiment. The Composite Stock Price Index, is more stable than the Dow Jones industrial average index. The rising Dow Jones industrial average index would have no positive impact on Composite Stock Price Index. However, in practice, the absence of cointegration means that there is space for portfolio diversification, allowing investors to weigh quality factors while making investment decisions.

The results of the study show that there is no long-term or integrated relationship between the exchange rate and the Composite Stock Price Index. Due to exchange rate fluctuations, the Composite Stock Price Index does not always have a negative relationship, when the exchange rate increases, it will attract foreign investors to invest in stocks in Indonesia and increase the Composite Stock Price Index. Exchange rate and Composite Stock Price Index are not always had a negative relationship. For example, in March 2015, February 2016, and March 2018, the Composite Stock Price Index experienced a positive relationship, and in June-August 2018, the exchange rate had no effect on the Composite Stock Price Index. Mukhlis *et al.* (2018) and Abidin *et al.* (2013) have found similar results. This means that investors are less responsive to monetary policy to analyze stock prices.

The Composite Stock Price Index and inflation have a long-term relationship. Adesanmi *et al.* (2017) ; Rini & Raja (2016); and Juliodinata *et al.* (2019). have all come to similar conclusions. Inflation has a long-term relationship with the Composite Stock Price Index, which means that as inflation rises, the price of commodities will rise as well, causing the company's manufacturing costs to rise as well, resulting in a decline in income. The amount of dividends distributed to investors would also be reduced. As a result, investors would opt to sell their stocks, causing the Composite Stock Price Index to fall. The absence of a short-term relationship between inflation and the Composite Stock Price Index implies that inflation is an increase in the price of goods as a whole continuously, not in a certain time or in the short term.

The Composite Stock Price Index and interest rates are not cointegrated because there are many sentiments outside the variables studied. In the Indonesia Stock Exchange, there are 9 sectors, based on Hendrayana (2019) financial sector has the highest relationship, then the Miscellaneous Industry sector and the consumption sector. It can be interpreted that the sector will be greatly affected when there is an increase in interest rates because it is directly related. Meanwhile, other sectors, especially trade & services, agriculture, mining, have a very low correlation. These findings are consistent with Mahdi (2010) and Mukhlis *et al.* (2018). This implies that economic factors are less responsive to monetary policy which will affect stock prices and unstable conditions affect the Composite Stock Price Index (Mukhlis *et al.*, 2018).

The price of crude oil has a long-term relationship with the Composite Stock Price Index. This shows that the increase in world oil prices will decrease the Composite Stock Price Index. As an importing country, when the oil price rises, it will be followed by increased production costs, so that the price charged is also more expensive, the people's income will be used up to buy basic goods, people will be reluctant to invest, as a result, the Composite Stock Price Index will decrease. This finding is supported by Darmawan *et al.* (2020) and Adam *et al.* (2015) that the price of crude oil with the Composite Stock Price Index is cointegrated. The price of crude oil does not have a short-term equilibrium relationship which implies that an increase or decrease in the price of government oil in the short term cannot affect the Composite Stock Price Index.

Conclusion

There is no or cointegration and a short-term relationship of the Dow Jones Industrial Average with the Composite Stock Price Index, since investors are more responsive to the global market sentiment. More important than the Dow Jones Industrial Average Index, the Composite Stock Price Index tends to become more stable. There is also no long-term and no short-term relationship with the composite stock price index. The currency variable does not have a long-term relationship. This means that the performance of the capital market has been very well so that it is not sensitive to the feeling of a depreciation in the exchange rate for several periods. In the meantime, inflation has a cointegration but has no short-term relationship with the Composite Stock Price Index. This shows that the Composite Stock Price Index will decrease when inflation increases. Interest rates are also has no co-integration and short-term has no relation between the Composite Stock Price Index because the majority of Indonesian are more affected by outside sentiments than interest rate movements. Trough oil prices have a cointegration and have no short-term relationship with the Composite Stock Price Index in order to bring down the Composite Stock Price Index due to rising crude oil prices.

Inflation and crude oil prices cointegrated with the Composite Stock Price Index indicates that the government can take this into future capital market policies. For example, moving the wheels of the real economy to reduce volatility and maintain capital market performance. High risk and uncertain returns are the result of investment on the capital market. Based on the findings, two variables that have a negative effect on stock prices is inflation and crude oil prices can be considered by consumers. In order to make investors wiser to place their funds within a certain security, and analyze of various factors, which can affect share prices. This also can be minimized by considering different macroeconomic variables that cointegrated into the Composite Price Index. Further research can also use stock index variables of nations such as Singapore, Japan and China and make use of various macroeconomic variables in order to obtain a more complex of the cointegration of macroeconomic variableness with composite stock prices, beside interest rates, inflation, crude oil and exchange rates. The research period should take longer research periods and more data to better understand the dynamic between the macro-economic variables and the Composite Stock Price Index, such as the use of historical information from day to day.

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