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OECD Business Cycle Method Leading Indicator Analysis of Miscellaneous Industry Sector in Indonesia Stock Exchange

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Abstract:- This research aims to analyze those leading indicator data transformation, leading indicator candidate's selection and its determined of leading indicator candidates. Monthly price of Miscellaneous Industry Index as the reference series. While the proxy of leading indicator candidates in form of several indexes for other sectors at IDX, financial sector and other economic indicators that fills the criteria of Organization for Economic Cooperation and Development (OECD) started during January 2008 - December 2019. OECD business cycle method aims to analyze these leading indicator (LI) that moved ahead from the main index movement. Analysis shows that Nasdaq Composite Index, New York Stock Exchange, German Stock Index, French Stock Market Index, Euro Stoxx 50, Nikkei 225, Shanghai Composite Index, Natural Gas Future Price, BI Rate, US Dollar Exchange Rate, & Money Supply (M2) as the most optimal Composite Leading Indicator with cyclical opposite character from this Miscellaneous Industry Index.

Keywords:- *Reference Series, Leading Indicator, Miscellaneous Industry Sector, OECD.*

I. INTRODUCTION

The movement of stock prices fluctuated, there were times when it moved up and sometimes it moved down. One of the changes in the stock price could be measured by stock index. Likewise, these miscellaneous Industry Index, that included in the Sectoral Index at the IDX that could be used as measured in the changes and price performance of all stocks of each industrial sub-sector within. These Miscellaneous Industry sector consists of miscellaneous Industry sub-sector, textile and garment sub-sector, footwear sub-sector, Cable sub-sector, and electronics sub-sector.

The Miscellaneous Industry Index became one of the sectoral that indicated fell during this global financial crisis in 2008. This shows that the ups and downs of macroeconomic conditions abroad will cause shocks in Indonesia's capital. In 2008, when the global financial crisis occurred causing from the subprime mortgage scandal in the USA, the miscellaneous Industry Index became one of Industrial sectors which also experienced shocks and even placed in the third rank of contributors to the negative movement of Sectoral Index in the end of December 2008.

However, in 2013 these Miscellaneous Industry Index fell again -10% to 1,205.01. Then in 2014 these miscellaneous Industry Index increased from 8% to 1,307.07. In 2015 it fell again to 1,057. Meanwhile, in the period from 2016 to 2018 the miscellaneous Industry Index has been increasing constantly. Meanwhile, in 2019 these miscellaneous Industry Index was fell again from -12% to 1,223 compared in 2018. The declined which occurred in all sectoral index included the miscellaneous Industry index in February 2019 was more or less triggered by the optimism of market players towards negotiations between China and the United States which declined slightly after the chairman of the US trade representative issued a statement which too soon to predicted the results from US-China neg According to these phenomenon of miscellaneous industry index fluctuation which occurred it is necessary to make a forecasting tool which could be used to predicted these movement of miscellaneous Industry Index in the future through analysis of business cycle indicators. One method that could be used to predicted with analyzing economic indicators. These identification of economic indicators consists of three categories, which is leading, lagging and coincident indicators. The use of leading indicators to estimate the direction of movement from miscellaneous Industry Index up forward. While the lagging indicator is used to see which indicators move after these miscellaneous Industry Index movements. Coincident indicator uses to see indicators that move along with these miscellaneous Industry Index.

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Sector	Closing Price	Changed (%)
Mining Industry	877.68	-2.21%
Property Industry	103.49	-2.03%
Miscellaneous Industries	214.94	-0.41%
Consumer Goods Industry	326.84	1.85%
Manufacturing Industry	236.54	6.04%
Trade Industry	148.33	7.66%
Infrastructure Industry	490.35	11.93%
Agricultural Industry	918.77	14.29%
Financial Industry	176.33	16.85%
Basic Industry	134.99	17.95%

Table 1: Comparison of Sectoral Index's during Period January - December 2008
Source: Fusion Media Limited (2020) which reprocessed by researchers

These research purpose were to earn a composite index which moves ahead of the reference series, such as the miscellaneous Industry Index. What needs to emphasized from this research was the result from these leading indicator produced will only provide an overview in the short term at which stage the miscellaneous Industry Index will be placed in the future, namely whether it is in a period of contraction or expansion. Besides that, leading indicators will also provide an early warning system when these miscellaneous industry Index will experience a turning point, for example from the contraction stage to the expansion stage. Meanwhile, the sum of growth in these miscellaneous Industry Index on certain period was not the actual purposed of this research nor the use of leading indicators produced.

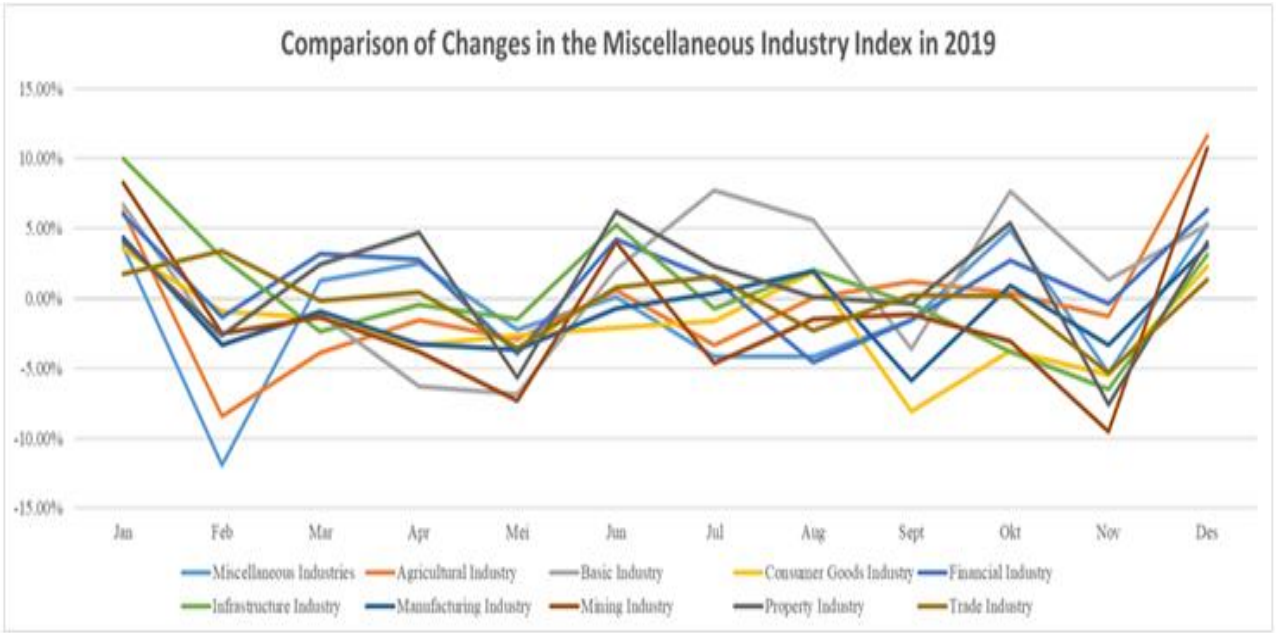

Figure 1. Comparison of Changes in the Miscellaneous Industry Index in 2019
Source: Fusion Media Limited (2020) which reprocessed by researchers

There were several previous researchers which conducted these research that related to business cycle through processing Composite Leading Indicator (CLI) data both in Indonesia and international. Researchers who were carried out these research such as Zhang & Zhuang (2002), Kusuma et al. (2004), Smirnov (2011), Engemann et al. (2011), Marco Galegati (2014), Qoyum et al. (2014), Dovolil (2016), Andrea et al. (2017), Wahyuningsih & Sumantyo (2017), Nasiri et al. (2017), and Asianto (2018).

According to these several existing research, it was found that there was not any research that specifically analyzed regarding these leading indicators for miscellaneous industry index at Indonesia Stock Exchange. Aside from that the topic that related to business cycle still become an interesting to study and leading indicators as part of the Business Cycle Indicator (BCI) type were believed to have an ability as a reliable forecasting tool, so it can be used to predict the direction of movement from miscellaneous industrial index in future notations heading to an agreement (detik.com, 2019).

II. LITERATURE REVIEW

In 1946, Arthur Burns and Wesley Mitchell in their book defined that Business cycles are a type of fluctuation found in aggregate economic activity of nations that organize their work mainly in business enterprises. Every business cycle has two types of turning points, such as peak turning points and trough turning points. These two turning points will be a signal if the cyclical movement of indicator would change from an expansion period into contraction period or conversely. These two turning points only could be found by time series data, in which the deviation from it trends. These stages will come and go all the time in a country's economy.

Ahmad (1996) were explained that Real Business Cycle theory could be described as a model which tried to illustrated the aggregate fluctuations in these business cycle through real shocks in the economy, such as productivity and technology. Another important assumption used in these Real Business Cycle theory is regarding to the neutrality of money in the economy which also applies in the short run, where monetary policy will not affect real variables such as output and the unemployment rate. The Leading indicator itself was related to the real business cycle theory which assumed that prices and wages were flexible even in the short term.

The use of leading indicators was first driven by the National Bureau of Economic Research (NBER) and has been widely used by countries around the world in predicting turning points of the business cycle. The idea in using leading indicators was according to the fact if statistically or the time series data consists of these four components of seasonal factors, cyclical factors, trends and irregular components. This method will separate the cyclic component from the other three components, after which the cyclic component's behavior was analyzed and compared with the reference series. Business cycle research was initially started by Kaminsky, Lizondo and Reinhart in 1998 due to currency crises in several countries. At that time, the International Monetary Fund (IMF) had conducted several early detection analyses by the Markov Swiching method to predict the occurrence of a currency crisis, but the results were deemed inaccurate. The Organization for Economic Cooperation and Development (OECD) then developed a business cycle analysis based on leading indicators to predict the business cycle turning points. This analysis method was finally applied by various countries to predict the macroeconomics. This analysis considered as quite comprehensive, flexible, current and accurate.

The formation of leading indicator index for miscellaneous industry sectors in these research used the method that developed by OECD. Basically, the OECD method refers to basic method from the business cycle developed by NBER. To analyze cyclical movements of the OECD method, a growth cycles approach was used, which is a modification from real business cycle theory. The growth cycles approach was recognized to have several advantages compared to the classical cycles approach. The main difference between growth cycles and classical cycles approach lies in the calculation of the expansion period and contraction period. The classical cycles approach estimated the expansion and contraction period based on their absolute values. Meanwhile, the growth cycles approach was discovering these turning point based on the calculation of the long-term trend or in other words the growth cycle was indicated by these reversal of the direction from cycle and its long-term trend.

These business cycle indicators basically a form of indicator commonly used to predict or forecast future economic conditions. There are three categories of indicators that classified based on the type of forecasting produced, such as: 1) leading indicators, which are several economic variables that move ahead from the main economic variables; 2) lagging indicator, which is a series of economic variables that move after the main economic variables changed; and 3) coincident indicator which is a series of economic variables that move along with variable changed.

This research framework consists of four approaches. First, Find out the reference series and indicator proxy series. Second, data normalization needs to process so the data would be free from these influences of noise. Then the data transformed, interpolated and stabilized so it would free from the issue of seasonal patterns difference. Third, proxy data for indicators compared statistically against the reference series of leading indicator data selection. Fourth, leading indicator data was examined by classical assumptions and the Best Subset Regression to get the optimal leading indicator composition".

III. RESEARCH METHODOLOGY

This research used quantitative descriptive method by process of data in form of numbers as a tool to analyze and conduct as research studies, especially regarding what has been researched by (Kasiram, 2008). The variables used in these research consist of the reference series variable and the candidate variable as composite of predecessor indicator (Composite Leading Indicator).

The population under this research was all miscellaneous Industry Index data in Indonesia Stock Exchange which consists of 49 companies in the period of January 2009-December 2019. Sampling technique used in this research was purposive sampling. Sample chosen by OECD method which applied to selected those macroeconomic indicators that will be used as candidates for the Composite Leading Indicator component based on these following criteria: data availability; economic relevance; and fulfillment of statistical criteria.

The leading indicator for these miscellaneous Industry Index used the method that developed by Organization for Economic Cooperation and Development (OECD). This method refers to the basic method from business cycle which developed by The National Bureau of Economic Research (NBER). In OECD method, the approach used is growth cycles approach, which in this case has several advantages compared to classical / traditional cycles. Broadly speaking, the stages that should be done in the OECD method included: determining the reference series and indicator proxies; data transformation; detrending and smoothing; determination of

the reference series turning point; separation of candidate leading indicators (LI); leading indicator results were examined by classical assumptions; and likewise it would be examined by best subset regression (BSR).

IV. RESULT AND DISCUSSION

A. Data Transformation

Determination of turning points in these business cycle methods is very important, because through this it could be identified the cause of a recession or shock. The Busy for Business Cycle 4.1 program with Bry-Boschan method that used to identify turning points from these miscellaneous Industry Index for this period of January 2009 - December 2019. Based on these research results, it could be seen that these miscellaneous Industry Indices consist of three peaks (peaks) and three peaks troughs.

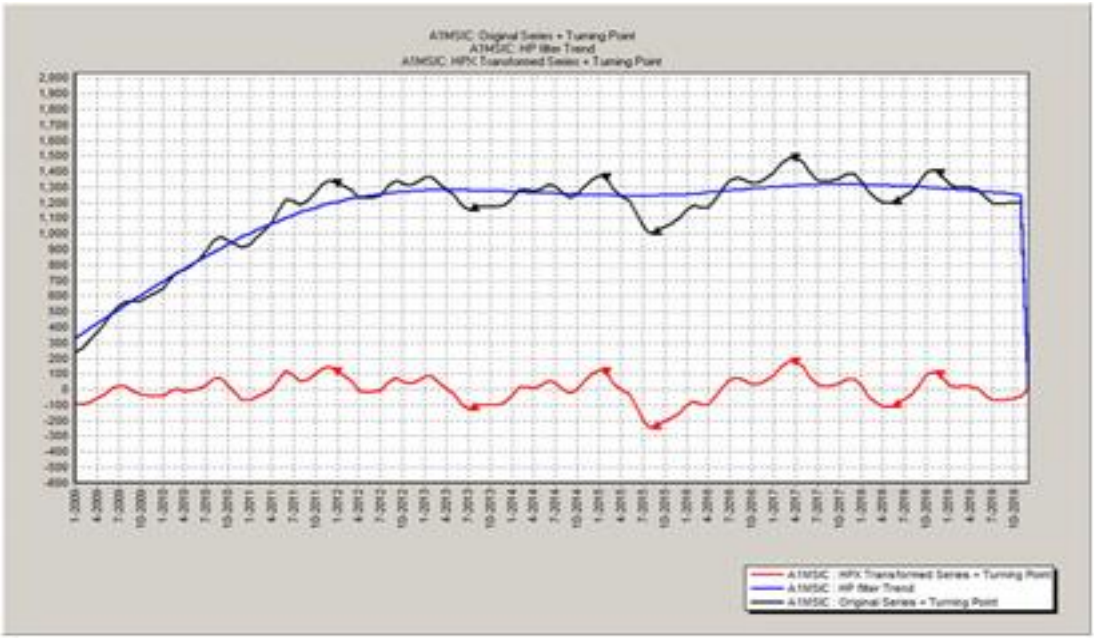

Figure 2. Transformation Results & Turning Points of Miscellaneous Industry Index Reference Series

Figure 2 above consists of actual data (black chart), trend (blue graph), and cycle (red graph) Miscellaneous Industry Index) during the study period 2009 - 2019. The actual data graph is a graph of various industry indices before the transformation using Hodrick- Prescote Filter. Meanwhile, the trend graph is a graph of the trend of the indexes of various industries during the study period, where at the beginning of 2009 to 2011 there was a significant upward trend.

Based on the cycle graph and its turning point, it can be seen that the index reference series for various industries has two long cycles with a cycle duration of 25 months and 33 months respectively, so that the average cycle reaches 29 months as can be seen in Table 4.1. There are seven turning points that can be captured by the cyclical movement of various industry indices, which consist of three troughs and four peaks. The average duration of expansion was 14.33 months and contraction was 9.33 months.

B. Separations of Candidate Components for Composite Leading Indicator

The separation of CLI component candidates use five econometric methods, such as (1) coherence method; (2) mean delay method; (3) cross correlation method; (4) Bry-Boschan turning point analysis; (5) dynamic factor analysis. According to coherence analysis result, it shows that Indonesian FTSE Index (A12FTSEI), the Manufacturing Index (A8MFG) and US Dollar Exchange Rate (H2USD) had the greatest co-movement power against these miscellaneous industry Index reference series (A1MSIC).

The results of mean delay analysis shows that there are 12 variables that have an indication of the leading nature of these miscellaneous industry sector index reference series, which is the Agricultural Index (A3AGRI), the Mining Index (A9MING), the Nikkei 225 Index (D1NKEI), the price of Brent Oil Future (E1BROIL) Natural Gas Future (E3NGAS) price, gold future price (F1GLD), silver future price (F2SLVR), nickel future price (F4NCKL), tin future price (F5TIN), SG X SICOM TSR 20 (G2RUBR), Bank Indonesia Rate (H1BI), Export (JEXIM). The mean delay analysis result also shows that 21 lagging variables on these miscellaneous Industry Sector Index and the remaining 7 variables were coincident to these miscellaneous Industry Sector Index.

The results from these cross-correlation analysis shows that there are 11 variables that are leading to the miscellaneous Industry Sector Index, such as Nasdaq Index (B2NSDQ), Nikkei 225 Index (D1NKEI) and the price of Brent Oil Future

(E1BROIL). These cross-correlation analysis results also show that there are 17 variables that are coincident to these miscellaneous Industry Sector Index and the remaining 12 variables were lagging on it.

A turning point analysis was performed after the data series variable was cleaned from seasonal, irregular and trend elements. These turning points analysis were based on the theory which developed by Bry & Boschan (1971). A negative value indicated that these variable is leading. The positive variable indicates that the variable moves afterward so it is called a lagging variable. Meanwhile, a variable that has zero value (0) indicated that these variable moves simultaneously so that it is called a coincident variable. The purpose of this turning point analysis detection was to analyze the characteristics of the variables through the reversal behavior of the reference series. Thus, those proxy variables could be identified whether it is leading, lagging or coincident.

Best Subsets Regression: A1MSIC versus A9MING; ... M2; J1IPI; J2EXIM
Response is A1MSIC

Vars	R-Sq	R-Sq (adj)	R-Sq (pred)	Mallows Cp	S	A9MING	D1NKEIG	E1BROILB	E2RROBI	E3NGAS	F1GLD	F2SLVR	F4NCKL	F5TIN	G1LCTL	G2RUBR	HUSD	H3M2	J1IPI	J2EXIM
14	89.2	87.8	85.7	14.3	0.34234	X	X	X	X	X	X	X	X	X	X		X	X	X	X

Figure 3. CLI Candidate Variables from Miscellaneous Industry Index

Results from the analysis of common component variance ratio towards series variance shows that all variables have commonality strength of more than 10%. Thus, all variables act as proxy indicators on miscellaneous industry Index business cycle. Idiosyncratic variables were not found so there were no variables removed from these analyses.

Cross correlations analysis with dynamic factor method shows that there has a maximum number in each line that is bolded and underlined. These numbers were located in negative lag, zero lag and positive lag. If the maximum number is in positive lag then it's evidence if that variable were leading. If the maximum number is in negative lag, it's evidence that these variable were lagging. Meanwhile, if the maximum number is in zero lag, it's evidence that the variable was coincident. There are maximum numbers which are positive and some are negative. A negative number indicated that the variable has a cyclical opposite behavior with the cyclic nature of the reference series. If negative number is in a positive lag then these variables were lagging but cyclical opposite to the reference series, for example the BI Rate (H1BI) variable. If a negative number is in a positive lag then the variable was leading but cyclical opposite towards reference series, as for example the money supplies variable (H3M2).

The grouping based on its characters has shown that there are 15 variables which are leading to the reference series. Other than that, the 6 variables were coincident to the reference series and 19 variables were lagging to the reference series. There are 5 variables which marked by an asterisk (*) meaning that they are cyclical opposite to the reference series. These cyclical opposite consists of 5 leading variables and 1 lagging variable. Though these variables were stand in the opposite direction to the reference series, they had that consistency so they could be used as index constituent variables.

C. Clasic Assumptions Test

The normality test shows that J-B value was 1.577803 <2 with probability was 0.454344> 0.05. Meaning if the hypothesis H0 which said that these error was normally distributed was accepted. Multicollinearity test by correlation matrix between independent variables shows that multicollinearity did not represents the resulting model. Its because the correlation between independent variables was not that high (above 0.90). The autocorrelation test shows that the Durbin Watson (DW) value was 1,200851, so it could be concluded that these regression models did not have autocorrelation. Heteroscedasticity testing by Glejser test shows that these Prob * R2 value (R-squared) > 0.05, which is 0.5686> 0.05. Thus it could be said if these regression model did not occur the heteroscedasticity. The R-squared value from these data processed results amounted to 0.8898742 or 89%. This shows that these regression equation models would be able to explain the variation of these relations between dependent variable by 89%. And the remaining 11% were relations from other independent variables which had impact on dependent variables but did not included in these models.

D. Best Subsets Regression (BSR)

Best Subset Regression analysis is a regression analysis method used to find out which independent variables will be included in the index. From these Best Subset Regression analysis result, there were several alternative Composite Leading Indicators (CLI) will be obtained. The BSR results show if there is the most optimal candidate index with the largest R-Sq, which is 89.2%. The Mallows Cp value, which is 14.3 (less than 17), met these criteria $\leq (p + 1)$, where p is the sum of all variables (16 variables). Meanwhile, the lowest S value was 0.34234. According to these BSR analysis, there were 14 candidate variables for the Composite Leading Indicator index were also consider as the most optimal against the miscellaneous Industry Index as a reference series, Such as

Mining (A9MING), Nikkei 225 Index (D1NKEI), Brent Oil Future Price (E1BROIL), RBOB Gasoline Future Price (E2RBOB), Natural Gas Future Price (E3NGAS), Gold Future Price (F1GLD), Silver Future Price (F2SLVR), Nickel Future Price (F4NCKL), Tin Future Price (F5TIN), Live Cattle Price (G1LCTL), Rupiah Exchange Rate against US Dollar (H2USD *), M2 - Money Supply (H3M2 *), Industrial Production Index (J1PI) and Exports (J2EXIM).

E. Re-run Test

The results from 14 variables that obtained from BSR analysis above then were re-processed by Busy Program. The reprocessed was carried out on variables which passed the classical assumption test and BSR. This reprocessing stage includes all business cycle analysis processes consisting of log or log transformation, de-trending by Hodrick Prescote Filter, smoothing, cross correlation, coherence, mean delay, turning point, till composing composite leading indicator by dynamic factor model.

The coherence analysis results show that all variables have an average spectrum of at least 0.08 with maximum of 0.33. Thus it could be said that there were 12 variables that strong enough co-movement value against these miscellaneous Industry Index. The results from mean delay analysis shows that there were seven variables which are leading to the miscellaneous Industry Index, such as A9MING, E1BROIL, E2RBOB, E3NGAS, F5TIN, G1LCTL, and J1PI. Meanwhile, the remaining 7 variables were potentially lagging towards these miscellaneous Industry Index. The results from cross-correlation analysis shows that there were four variables which have potential to be leading towards these miscellaneous Industry Index, such as A9MING, F2SLVR, H2USD, and J1PI. And the remaining 9 variables have characteristics of coincident and one variable was lagging towards these miscellaneous Industry Index.

The Next stage was carried out a turning point analysis of these miscellaneous Industry Index. The negative value in the results of these turning point analysis as reference series above indicated that these variable moves ahead of the reference series or known as leading. The positive value in the table shows that the variable moves after these miscellaneous Industry Index reference series so those variable called lagging. Meanwhile, the zero value indicated that the variable moves side by side with these miscellaneous Industry Index reference series so then these variable were coincident. Average lag turning point results show that there were three potential lagging variables, which are E2RBOB, F1GLD and H3M2. Then one variable was coincident, which is J2EXIM. Meanwhile, the remaining 10 potential variables were leading to the miscellaneous Industry Index. This right indicated that most of these variables were potentially leading to these miscellaneous Industry Index. Next, the median lag turning point results shows if there were three variables which had potential to be lagging, which are E2RBOB and H3M2. The remaining 11 potential variables were leading to these miscellaneous Industry Index which shows that the most of potential variables were leading.

The next step was to evaluated these cycle lengths of each series. Results from this analysis show that time distance from peak to peak or trough to trough in the table above was called cycle spanning. Meanwhile, time distance from peak to through or trough to peak to be called phase spanning. If these two phases spanning were added, it will become one cycle spanning. These analysis result were shows that there were no significant difference between cycle spanning and the number of phase spanning in each of research variables.

Moving to next step was analyzed those common component variance ratio towards variance series. These common component variance analysis results shows if all variables have ratio above 10% so it could be said that all variables met the requirement to strengthen the commonality and also it was found that there were no idiosyncratic variables occurred Therefore, There's no variables were removed from these analysis.

Further step was to carried out these cross correlation analyses by dynamic factor model method contained in these Busy Program. These analysis results shows that the bolded and underlined variables were on negative lag, zero lag and positive lag side. The maximum number located in positive log were indicated that the variable was leading, which are A9MING, D1NKEI, E1BROIL, E2RBOB, E3NGAS, F1GLD, F2SLVR, F5TIN, H2USD, H3M2, J1PI, and J2EXIM. There are only two variables placed in negative log, which is F4NCKL and G1LCTL that indicated both are lagging. There were maximum numbers which have positive and negative values. A negative value was indicated that variable has cyclical opposite behavior with cyclical character of the reference series, such as these miscellaneous Industry Index. From the positive log side, there are 4 leading variables which are cyclical opposite to the reference series, such as A9MING, D1NKEI, E1BROIL, and F2SLVR.

Another further step was indexing, which is grouping towards its character of each variable against the reference series. These analysis results were indicating that there were six variables which are leading to the reference series, such as the Nikkei 225 Index (D1NKEI), Brent Oil Future Price (E1BROIL), RBOB Gasoline Future Price (E2RBOB), Tin Future Price (F5TIN), Live Cattle Price (G1LCTL) and Industrial Production Index (J1PI). A variable that marked with an asterisk (*) was indicated that its cyclical opposite to the reference series. Though these variable were in the opposite direction, but it still has consistency so still can have used as an index building variable. Alongside with that, there were four variables which are consider as coincident to the reference series, such as the Natural Gas Future Price (E3NGAS) variable, Gold Future Price (F1GLD), Money Supply (H3M2) and Exports (J2EXIM). Meanwhile, the other four variables that were lagging, such as Mining Index (A9MING), Silver Future Price (F2SLVR), Nickel Future Price (F4NCKL) and Rupiah Exchange Rate against US Dollar (H2USD).

Leading	Coincident	Lagging
D1NKEI*	E3NGAS	A9MING*
E1BROIL	F1GLD	F2SLVR*
E2RBOB	H3M2	F4NCKL
F5TIN	J2EXIM	H2USD
G1LCTL*		
J1IPI		
6	4	4

Table 2. Re-run Variable Nature Index Against the Reference Series

Each leading, coincident and lagging index that has been processed into composite index by the Busy Program. The results from these Composite Leading Indicator (CLI) then compared with the reference series. The results from CLI graphics towards common component of the miscellaneous Industry Sector Index (A1MSIC) as reference series was shown that the red graphics was the Composite Leading Indicator (CLI) chart proposed by the Busy Program as composite index of six leading variables. The CLI graphic consists of the original series index and the results of the turning point analysis. In these figure, it could be seen that CLI graphics moves ahead of the reference series graph which is the miscellaneous industry Index in which colored blue.

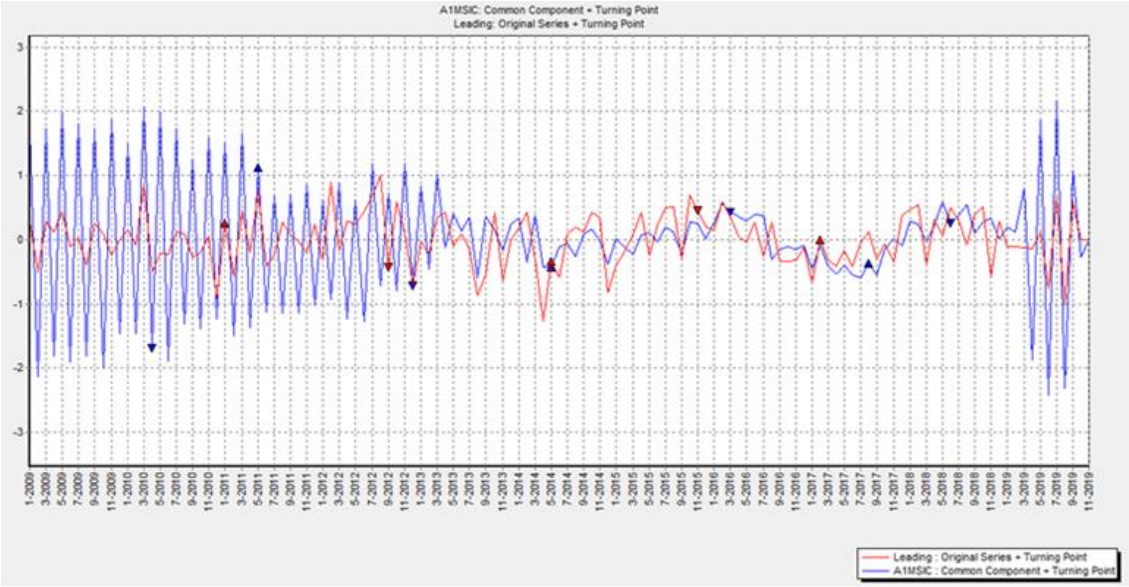

Figure 4. CLI graphics against miscellaneous industry common components index

F. Disscusion

Based on the results of the analysis previously described, the most optimal Composite Leading Indicator (CLI) index consists of six variables, namely the Nikkei 225 Index (D1NKEI), Brent Oil Future Price (E1BROIL), RBOB Gasoline Future Price (E2RBOB), Tin Future Price (F5TIN), Live Cattle Price (G1LCTL), and Industrial Production Index (J1PI). Can be seen in Figure 4.4. above that the CLI movement is quite good following the cyclical movement of various industry index reference series.

In order to be more comparable, the comparison of the turning points between the various industry index reference series and the CLIs formed is presented in Table 4.18. It can be seen that the CLI is able to capture all turning points contained in the various industry index reference series. The lead time averaged 3.4 months for each turning point. The last high point of the various industry index reference series captured by the CLI was in June 2018.

Based on Table figure 4. It can be seen that in 2011 the CLI moved into an expansion position four months before the Miscellaneous Industry Index expansion position. In 2012, CLI moved into a contractionary position three months before the contraction position of the Miscellaneous Industry Index. In April 2014, the turning point of the CLI peak coincided with the turning point of the Miscellaneous Industry Index. Thus, the CLI changed its function to become a coincident in that period. Therefore, in the next research, it is necessary to carry out further evaluation of the indicators forming the CLI, so that their accuracy can be tested again. Then in 2016 the CLI moved into a contractionary position four months before the Miscellaneous Industry Index contraction position. Meanwhile, in 2017, CLI moved into an expansionary position six months before the Miscellaneous Industry Index expansion position.

The Nikkei 225 Index variable is the main index on the Tokyo Stock Exchange (TSE). The Nikkei 225 index is seen as an important barometer for the stock market and the economy in Japan. Some even say that the Nikkei 225 Index is the same as the Dow Jones Index in the United States. This index is the oldest stock index in the Asian region because it has existed since 1950. The analysis shows that the Nikkei 225 Index is a leading indicator that is cyclical opposite to the reference series, namely the Miscellaneous Industry Index on the Indonesia Stock Exchange. This shows that the increase (decrease) in the capital market index in Japan can be used as an early warning system for the decline (increase) in the Miscellaneous Industry Index.

The Brent Oil Future (E1BROIL) variable is a brent oil commodity futures that refers to the Brent Intercontinental Exchange (ICE) index. Brent oil is one of the main energy commodities that are needed by the world. The results of processing brent oil can be used as a source of energy to carry out production activities for industries in the world. Brent oil is a mixture of fifteen types of crude oil originating from the North Sea (Lestari et al., 2018). The current brent oil blend consists of crude oil produced from Brent, Forties (added 2002), Oseberg (added 2002), Ekofisk (added 2007), and the Troll oilfield (added 2018) also known as BFOET Quotation (Imsirovic, 2019). . Brent oil is included in the main trade classification of light sweet crude which serves as the benchmark price for oil purchases worldwide. The level of light sweet (light) is assigned to this commodity because of its relatively low density and sweetness due to its low sulfur content. Brent oil is the leading global price benchmark for Atlantic basin crude. It is even used to determine the price of two thirds of the world's internationally traded supply of crude oil. The results of the analysis show that the Brent Oil Future Price is a leading indicator for the reference series, namely the Miscellaneous Industry Index on the Indonesia Stock Exchange. Thus the increase (decrease) in the price of the Brent Oil Future can be an early warning system for the increase (decrease) in the price of the Miscellaneous Industry Index.

The RBOB variable Gasoline Future Price (E2RBOB) or RBOB gasoline futures contract is a gasoline-fueled commodity futures traded on the New York Mercantile Exchange (NYMEX). RBOB gasoline is a derivative product of refining crude oil which is used as fuel for two-wheeled, three-wheeled and four-wheeled vehicles. . The results of the analysis show that the commodity price of RBOB Gasoline Future Price is a leading indicator for the Miscellaneous Industry Index on the Indonesia Stock Exchange. Thus the increase (decrease) in commodity prices of the RBOB Gasoline Future Price can also be used as an early warning system for the increase (decrease) in the price of the Miscellaneous Industry Index.

The results of this study support the opinions of several previous researchers. Faizah et al. (2017) explained that the world oil price has an influence on stock prices. Aseleye et al. (2019) stated that the variations that occur in oil shocks affect most of the macroeconomic variables. Likewise, the empirical results of Berk & Aydogan (2012) show that changes in oil prices significantly and rationally affected Turkey's stock market activity during only the third sub-period, which started after bad credit 2008. Cunado et al. (2015) argue that in particular, oil supply shocks have a limited impact, while demand shocks driven by global economic activity have a significant positive effect in the four Asian countries studied, namely Indonesia, India, Korea and Japan. Alena et al. (2017) also found that the sectoral beta index that is most affected by oil price shocks as one of the economic variables is the beta of the agricultural sector, various industries, consumer goods and finance.

Tin Future Price (F5TIN) is a metal futures commodity traded in the largest and oldest metal trading center in the world, namely the London Metal Exchange. LME has become a reference for the price of metals in the world such as aluminum, aluminum alloy, cobalt, copper, lead, molybdenum, nickel, tin, zinc, and others. Tin is one of the metal commodities most often used in daily life and industrial purposes. Its soft, malleable, and shiny nature makes it often used as a mixture of minerals for various industrial uses such as automotive, electricity, food packaging, glass, battery components, and others. Meanwhile, nickel is often used, among others, in the manufacture of stainless steel, automotive frames, wire making, and so on. The results of the analysis show that Tin Future commodity prices are a leading indicator for the Miscellaneous Industry Index on the Indonesia Stock Exchange. Thus the increase (decrease) in the price of Tin Future commodities can be used as an early warning system for the increase (decrease) in the price of the Miscellaneous Industry Index.

The Live Cattle Future Price (G1LCTL) variable is a live cattle commodity futures traded on the main commodity exchange of the Chicago Mercantile Exchange (CME). Live Cattle Future Price was first introduced in 1964. This commodity future is commonly used as a means of hedging and for speculating on the price of animal feed. The analysis shows that the Live Cattle Future Price is a leading indicator that is cyclical opposite to the Miscellaneous Industry Index on the Indonesia Stock Exchange. Thus, the increase (decrease) in the Live Cattle Future Price can be used as an early warning system for the increase (decrease) in the price of the Miscellaneous Industry Index.

The Industrial Production Index (J1PI) variable is an economic indicator that calculates the real production output from the manufacturing, mining and other manufacturing sectors. In Indonesia, the Industrial Production Index is calculated and published by the Central Statistics Agency (BPS), while in the United States it is conducted by the Federal Reserve Board. The results of the analysis show that the Industrial Production Index is a leading indicator that is cyclical opposite to the Miscellaneous Industry Index. The increase (decrease) in the number of Industrial Production Index represents a decrease (increase) in the Miscellaneous Industry Index. The results of this study support the opinion of previous researchers. Among them are Rahman & Arfianto (2016), which states that the Industrial Production Index is one of the Led Economic Indicators that simultaneously affect stock returns.

The use of the OECD method in the early warning analysis supports several previous studies. Zhang & Zhuang (2002) used the OECD method to examine the business cycle in Malaysia and the Philippines and found that the six economic indicators from each country were all leading indicators. Pedersen & Elmer (2002) used the OECD method to prove the relationship between the business cycle and economic growth. Kusuma et al. (2004) used the OECD method to analyze short-term leading indicators of investment in Indonesia with a predictive ability of 1.5 to 4.5 months ahead. Dovolil (2016) uses the OECD method to predict the

S&P 500 stock index during the period 2007 - 2014 and finds that there are three economic indicators in the United States that are leading indicators. Wahyuningsih & Sumantyo (2017) using the OECD method with a reference series of GDP and IHSG found that there are several economic indicator variables that meet the criteria as leading indicators. Asianto (2018) uses the OECD method to analyze the crude oil business cycle. WTI found that CLI has an accuracy of up to 93 percent. Vrana (2018) uses the OECD method to analyze the characteristics of international CLI in Austria, Czech Republic, Germany, Poland, and Slovakia where economies in Europe are open to each other so that their business cycles are related to the business cycles of other European countries.

V. CONCLUSION

This study aims to form a Composite Leading Indicator system for various industry index reference series using available macroeconomic indicator data and refers to the method developed by the OECD, with a view to predicting turning points of various industry index cycles.

After analyzing forty macroeconomic variables available from various sources in accordance with the provisions of the OECD method, the optimal Composite Leading Indicator (CLI) for various industries index consists of six leading indicator variables, namely, Nikkei 225 Index (D1NKEI), Brent Oil Future Price (E1BROIL). RBOB Gasoline Future Price (E2RBOB), Tin Future Price (F5TIN), Live Cattle Price (G1LCTL), and Industrial Production Index (J1PI).

Based on the graph of its cyclic movements during the 2009 - 2019 research period, CLI was able to capture seven turning points in a various industry index consisting of four valleys and three peaks. The turning points of expansion and contraction in the CLI during the study period proved to be moving ahead of the various industry index reference series with an average lead time of 3.4 months, so it can be concluded that CLI is classified as a leading indicator for various industry indices. Thus the CLI formed can be used to predict the future movements of various industry indices in expansion or contraction.

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