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Rethinking and Moving Beyond GDP: A New Measure of Sarawak Economy Panorama

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Abstract

Despite the relatively strong adjustment in the global economy outlook, the Malaysian economy remains uncertain as the ringgit movement lies ambiguously ahead while volatile capital flows, inflationary pressure, and the vulnerable external sector and global trade remain intense. The Sarawak economy, which relies heavily on primary commodities and export earnings from oil-based industries, will soon face a noxious mixture of economic risks following the decrease in commodity prices. Thus, it is essential to develop a well-timed signaling mechanism to estimate the unpredictable economic forces that develop from the complex and multidimensional issues of domestic and global economies. The ideology of indicator construction from the Conference Board will be applied in this study to build a composite leading indicator, called the Sarawak Business Cycle Indicator (SBCI), to trace the cyclical movement of the aggregate economic activity in Sarawak. In this respect, the SBCI, which has demonstrated statistical significance with an average leading power of 3.5 months, is expected to be important in reflecting a notable economic outlook for the State. More importantly, the SBCI will serve as a valuable reference to act as a short-term forecasting tool to provide insight at both the national and state levels.

Keywords: forecasting, business cycle, indicator, turning point analysis

1. Introduction

According to the Department of Statistics Malaysia (2017), the economic growth in Malaysia expanded to 5.9 percent in 2017, driven mainly by private sector demand, with support from the external sector. Among the 13 states in Malaysia, Sarawak has the strongest economic foundation (Regional Economic Development Authority, 2014). Sarawak's most abundant natural resource is the key strength to enhance economic growth, wise fiscal management, and a strong position of liquidity relative to its debt level. The export of primary commodities, such as liquefied natural gas (LNG) and crude petroleum, is the main contributor to the Sarawak economy (Furuoka, 2014). However, the commodity market is likely to extend losses in the face of plunging crude oil prices, threatening the position of the state to remain as the third largest Gross Domestic Product (GDP) contributor in the country.

Because the domestic and global markets are full of uncertainty and are highly dynamic and the comprehensiveness of the Sarawak's GDP as a measure of the economic outlook remains a long-running debate in the business cycle analysis, it is important for Sarawak to keep abreast not only on the latest external development but also predict the possible outcomes that could affect the development of different sectors of the economy. Therefore, the SBCI must be constructed in this scenario in order to provide a clear picture of the outlook of a market for policymakers, the business community, business players, and investors. On the other hand, there is a significant time lag in the reporting and publication of the Sarawak GDP. This lag of the Sarawak GDP series causes delays in policy actions, which in turns prevents the full impact of a policy measure if the degree of foresight is not sufficient to overcome the economic downturn in a timely manner. Hence, in this study, the Auto-Regressive Integrated Moving Average (ARIMA) model will be used to forecast the unavailable data of the Sarawak GDP series in recent years, and this series will act as a means to establish the reference chronology of the Sarawak economy.

Above all, this study moves beyond the GDP as a leading measure of aggregate economic activity as an approach to sustainable economic development in the State. In addition, a reliable forecasting tool that can suit the context of

the Sarawak economy is needed to produce a bottom-line statistic that can encapsulate an insightful bird's-eye view into the economy as well as to alert the policymakers in order to prevent a severe economic crisis that will greatly influence the Sarawak economy. Thus, the main aim of this study is to construct the SBCI in order to trace the cyclical movement of aggregate economic activity in Sarawak via a composite leading indicator approach. This paper consists of five sections. The next section will provide a review of the literature. The subsequent sections cover a brief description of the data and the methodology that will be used in this study as well as the presentation of empirical findings with interpretations, while the last section offers the conclusion.

2. Review of Literature

Recently, extensive research has been done in developed and developing countries, especially Malaysia, to predict and interpret the business cycle. Different studies have applied different reference series and leading indicators for their own countries as well as the periods they examine. Many researchers have asserted that the Composite Leading Indicator (CLI) is the most well-fitted approach in forecasting the turning points of business cycle compared to other approaches. Although a few studies focus on constructing CLI in Malaysia, it is rare for a researcher to build a CLI for the state. By constructing the CLI, we can forecast the economic activities that might occur in a country, but then it does not fully reflect the real economic situation of a state. This is because the economic fluctuation of a state somehow differs from that of the country.

Atabek, Coşar, and Şahinöz (2005); Mohanty, Singh, and Jain (2003); Wong, Abu Mansor, Puah, and Liew (2012); Zhang and Zhuang (2002); Albu (2008); and Bascos-Deveza (2006) exhibit the same characteristics in forecasting the turning points and business cycle by constructing the CLI. While Bordoloi and Rajesh (2007) use a probit model at 3 months and 6 months forecast horizons to predict the business cycle recessions in India. Issler, Notini, Rodrigues, and Soares (2013) use the individual coincident indicator to forecast the economy of Latin American. Sfia (2010) constructed a CLI to forecast the inflation in Tunisia. On the other hand, Yap (2009) completed an analysis on how to improve business cycle indicators in Malaysia by using the coincident index and leading index.

Meanwhile, in developed countries, most research done by Kholodilin and Siliverstovs (2005); Fukuda and Onodera (2001); and Fichtner, Rüffer, and Schnatz (2009) investigate the ability and properties of CLI and determine whether the CLI is a good indicator to forecast the business cycle during the dynamic change of economy. Furthermore, the research performed by Bierbaumer-Polly (2010); Bandholz (2005); den Reijer (2006); Vesselinov (2012); Kholodilin and Siliverstovs (2005); Fichtner, Rüffer, and Schnatz (2009); and Kľúčik & Haluška (2008) use the Organisation for Economic Co-operation and Development (OECD) CLI approach to forecast the turning points and business cycle. However, Matkowski (2002) conducted a different approach to introduce a set of composite indicators of business activity for Poland based on the qualitative data collected from business and consumer surveys. In addition, Bodart, Kholodilin, and Shadman-Mehta (2005) used the regime-switching and Logit models to identify and forecast the turning points of the Belgian business cycle.

3. Data Description and Methodology

3.1 Data Description

In this study, the selection of a reference series comprises the beginning stage in order to identify a suitable measurement for the business cycle. The condition of a reference series must show a strong correlation with economic growth and must offer an uninterrupted series over a long period (Zhang & Zhuang, 2002). Therefore, in this study, the Sarawak real gross domestic product (RGDP) has been selected as that which can best mirror the real economic activity for the case of Sarawak. The monthly basis of consumer price index (CPI) and yearly basis of GDP were extracted from 2000 to 2016 in the Sarawak Planning Unit (SPU). Furthermore, we have applied the ARIMA model to obtain a complete set of yearly data regarding Sarawak's GDP. In order to get a higher frequency within the series, the Gandolfo (1981) interpolation method has been used in this study, and thus the ratio of GDP to CPI was computed to obtain the real GDP for Sarawak from 2001 to 2016.

More than 15 data series have been collected from different sources, such as the Census and Economic Information Center (CEIC), Sarawak facts and figures, and Department of Statistics Malaysia (DOSM) for empirical examination. In order to fulfill the goal of building a CLI to reflect the cyclical fluctuations in the Sarawak economy, only those component series with leading characteristics will be chosen to construct the SBCI. Then, the correlation analysis will be adopted to show the degree of association between the reference series and component series. The series that are highly correlated with reference series will be chosen, as they present an important interrelationship with the business cycle. Thus, six chosen component series (crude oil price, crude palm oil, electricity consumption, pepper price, share price, and total capital investment) then constitute the composite index for the construction of SBCI.

3.2 Methodology

In this study, the autoregressive integrated moving average (ARIMA) model will be employed to forecast the missing data for Sarawak's GDP in the recent few years, so that we can get a complete set of data for our reference series. The ARIMA model is a generalization of an autoregressive moving average (ARMA) model proposed by Box and Jenkins (1970). These models are used in some cases when the data show proof of non-stationary and when an initial differencing step can be applied to eliminate the non-stationarity. The model is basically referred as an ARIMA (p,d,q) model where p, d, and q are integers greater than or equal to zero and represent to the order of the autoregressive, integrated, and moving average parts of the model respectively. After fitting the real GDP data into an ARIMA models, the models efficiencies will be evaluated using the Mean Squared Errors (MSE) and the model that provides the least MSE will be selected as the most efficient model to forecast the Sarawak GDP.

As for the construction of the SBCI, component series that potentially form the indicator series of SBCI will be subjected to lead/lag structure analysis and the best combination that provide the most leading attributes will be undergoing a systematic aggregation process suggested by The Conference Board (2000). The composite index will be transformed into a growth cycle after the construction of the SBCI. In this study, the growth cycles setting is more preferable than the classical cycle, because we are intended to examine the growth rate of the Sarawak business cycle rather than the business cycle in its level form. Zarnowitz and Moore (1986) suggested four major steps in dating the turning points of a business cycle. First of all, the Census X-12 and TRAMO/Seats methods will be adapted to the seasonal adjustment of each component indicator in this study. It will be affected by the irregular components and may cover the underlying direction of the series if we do not remove the seasonal fluctuation of economic activity.

The cyclical extraction and detrending that occur when using the Christiano-Fitzgerald (CF) filter introduced by Christiano and Fitzgerald (2003) will provide the second step of dating the turning points of the business cycle. The CF filter takes the whole time series for the formulation of the filtered series and deals with a greater class of time series when compared to the Baxter and King (BK) filter (Baxter & King, 1999). The third step involves the data smoothing. The irregular series can be smoothened through the simple centered moving average method. Zhang and Zhuang (2002) suggested that the moving average length of seven months is the best choice to settle the spurious cyclical difficulty in the series. Lastly, the Bry and Boschan (BB) procedure (1971) will be used in this study to identify the turning points of the business cycle, starting with the steps of deseasonalized, detrending and smoothing the reference series.

4. Empirical Findings and Interpretation

In response to the limited availability of the Gross Domestic Product (GDP) in the State, we have reckoned the GDP series of Sarawak using the autoregressive integrated moving average (ARIMA) model and interpolated the quarterly series into monthly observations using Gandolfo's (1981) technique to ensure completeness of the selected reference series. The month series of the Sarawak GDP was transformed into real GDP by dividing the normal GDP with the State's consumer price index. Figure 1 illustrated the forecasted real GDP of Sarawak based on ARIMA (2, 2, 2) model.

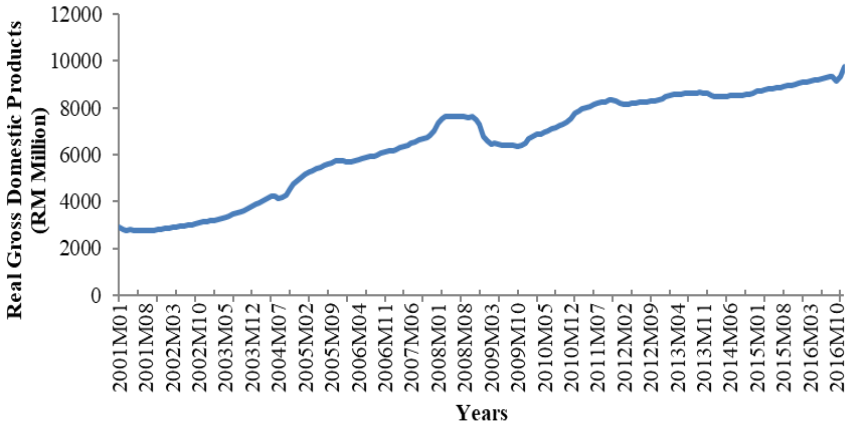

Figure 1. Forecasted real GDP of Sarawak based on ARIMA (2, 2, 2) model

In this case, the ARIMA (2, 2, 2) model was chosen as the most well-fitted and efficient model to forecast the Sarawak GDP based on the minimal out-of-sample forecast evaluation reported by Mean Squared Errors (MSE). In addition, it is found that the ARIMA (2, 2, 2) model is able to established a chronology of the Sarawak economy that is reasonably close to the true representation of the State's economy.

After having a complete Sarawak real GDP in hand, we have resolved the issue of incomplete reference series from 2001 to 2016. The process of reckoning the missing data in the Sarawak real GDP series has enable us to develop a broad reference chronology of the Sarawak economy, and thus enable us to identify the leading profile (leading period) of the constructed Sarawak Business Cycle Indicator (SBCI) via a turning point analysis. The component series of SBCI were selected based on the recursive assessment of the lead-lag structure between the cycles of the indicator series and the reference series. We finally settled down with six component series which consist of share price, global crude oil price, crude palm oil, electricity consumption, pepper price, and the total capital investment in Sarawak. The selected component series were bought into a composite that form the SBCI using the indicator construction procedure proposed by The Conference Board (2000). We visualized the smoothed cyclical fluctuation of the real GDP of Sarawak and the SBCI in Figure 2.

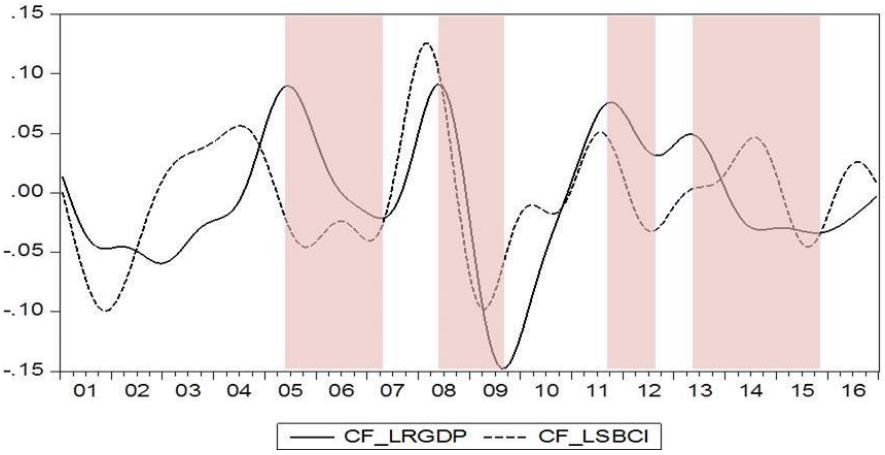

Figure 2. LRGDP versus LSBCI; 2001M1-2016M12

As demonstrated in Figure 2, the shaded areas indicate economic precariousness during the years 2005, 2008, 2011, and 2013. In the main, the movement of the SBCI is relatively consistent with the movement of real GDP of Sarawak, and it is clear that the SBCI moves ahead of the State's real GDP for most of the time. Apart from this, Figure 2 also indicates that the turning points (or significant events) marked by the constructed SBCI have occurred in advance of the economic episodes detected by the State's real GDP. This finding implies that the SBCI has successfully in tracing most of the major critical episodes that happened in Sarawak economy from 2001 to 2016, and the early warning signs of economic turmoil or precursors of a cyclical recession were signaled with some lead times.

In order to establish the leading profile and quantify the lead times contributed by the SBCI, the cyclical movement of the SBCI and the real GDP of Sarawak were subjected to a turning point dating algorithm proposed by Bry and Boschan (1971). The dated turning points were reported in Table 1 and turning point analysis was conducted between the reference chronology given by real GDP of Sarawak and the alternative chronology marked by the SBCI. The amount of lead/lag for each peak and trough as well as the average leading period were computed and jointly reported in Table 1.

As shown in Table 1, eight important episodes, covering four peaks and four troughs of the Sarawak economy were detected across the year of 2001 to 2016. Furthermore, the leading profile developed in the turning point analysis has confirmed the existence of leading ability of the SBCI as visualized in Figure 2. The constructed SBCI not merely traced well the evolving economic condition in Sarawak, but also captured all the significant episodes that have been translated into several critical events in the State such as oil price hikes in 2004, sub-prime mortgage crisis in 2008, sovereign debt crisis in 2011 as well as the incident of falling oil price in 2015. Moreover, the constructed SBCI has an average leading period of 3.5 months, suggesting that it is able to foretell the changing economic condition in Sarawak besides serving as a good monitoring tool to reveal the greater picture of the economic panorama in the state of Sarawak. As a result, the SBCI is deemed to be a useful

short-term forecasting tool to detect economic precariousness in state of Sarawak, and it would be a viable alternative or complement to others forecasting practices in the State rather than overreliance on GDP as the single most comprehensive measure of the overall economic performance.

Table 1. Turning point analysis and the amount of early signals

	Turning Points Dated from:			Amount of Lead/Lag (months)	Important Events
	LMRGDP	LRGDP	LSBCI		
Peak	Nov-2004	June-2005	July-2004	+11	Oil Price Hikes
Trough	Jan-2007	Apr-2007	Jan-2007	+3	
Peak	Mar-2008	May-2008	Feb-2008	+3	Sub-Prime Mortgage Crisis
Trough	May-2009	Aug-2009	Apr-2009	+4	
Peak	Dec-2011	Oct-2011	July-2011	+3	Sovereign Debt Crisis
Trough	Apr-2013	Sep-2012	July-2012	+2	
Peak	Feb-2014	Apr-2013	July-2014	-9	Falling Oil Price
Trough	Dec-2015	Oct-2015	Aug-2015	+2	
Average Leading Period (months)				**+3.5**	

Notes. LMRGDP refer to the Malaysian real GDP, serving as the benchmark series in the present study while LRGDP is the reference series proxied by the real GDP of Sarawak and the LSBCI is the Sarawak Business Cycle Indicator constructed in the present study. The amount of lead/lag (in months) was computed by taking the difference between LSBCI and LRGDP, and the average leading period (in months) was the mean of the leading profile across the period of the study.

5. Conclusion

In a nutshell, by using a set of macroeconomic series, a SBCI was constructed to predict the cyclical movement of Sarawak economy. The newly constructed SBCI has resulted in an average lead time of 3.5 months and works well in tracing the business cycle in Sarawak. With this result, the SBCI can act as a short-term forecasting tool in macroeconomic analysis and policy recommendation. The construction of the SBCI tends to bring awareness to policymakers, the business community, business players, and investors and thus help them to prevent economic vulnerability and to make more effective decisions regarding the economy of Sarawak in the future.

The present study has shown strong potential for the leading indicator approach to serve as a short-term forecasting mechanism to produce a better economic outlook in the State in addition to the publicly available GDP series. The newly constructed SBCI will be a good gauge of the approaching economic precariousness, given its strength to generate a remarkable leading period of policy establishment. The SBCI can be used to complement other economic forecasting practices when recognizing the economic outlook in the State. The predictive outcome from SBCI is subjected to the sensitivity of the chosen variables, in which the forecasting power can be enhanced further with the availability of a longer time series in the future. Furthermore, future study is encouraged to consider a more holistic robustness check to ensure the profundity of the out-of-sample forecast performance.

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