Developing Malaysia Business Cycle Clock (MBCC) for A Better Insights on Economic Cycle

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Abstract:

In the rising of digital era, people blended technology into their daily lives and data become the most valuable commodities in existence. Given this phenomenon, how could data engage and interact with the people of digital age. This paper describes the development of Malaysia Business Cycle Clock (MBCC) which is one of the latest innovations by the Department of Statistics, Malaysia in the effort of embracing data visualisation. The MBCC is beyond the traditional presentation of time series on Leading Index and Coincident Index. It provides a new dimension to the users in understanding the movement of the economic cycle visually and interactively. Interactive visualisation is an innovative approach of data dissemination which is in line with the practice of other National Statistical Offices. In this regard, it will uplift statistical expertise and elevate the dynamism of official statistics globally.

Keywords: Business cycle clock; Leading Index; Coincident Index

1. Introduction

In the rising of digital era, people blended technology into their daily lives to allow real-time communication and easy access to information. Information is the lifeblood of any organisation and oxygen to the people. It helps the organisation and people to decide on their daily chores. With the rapid advancement of technology, data become the most valuable commodities in existence. Given this phenomenon, how could data engage and interact with the people of the digital age. This paper describes the development of Malaysia Business Cycle Clock (MBCC) which is one of the latest innovations by the Department of Statistics, Malaysia in the effort of embracing data visualisation. The MBCC is beyond the traditional presentation of time series on Leading Index and Coincident Index. It provides a new dimension to the users in understanding the movement of the economic cycle visually and interactively.

The interactive visualisation is an innovative approach of data dissemination which is in line with the practice of other National Statistical Offices. In this regard, the initiative is materialised based on the best practise by The Business Cycle Tracer (BCT) which was first introduced by the Statistics of Netherlands. BCT was developed with two goals in mind. Primary, it is meant as a tool to support the analysis of the Dutch business cycle. Next to this, the Tracer will aid in the analysis of the macro-economic indicators which Statistics Netherlands publishes every month. The aim is to create a dynamic macro-economic indicators that can visualise the cyclical components clearly and the indicators are easier to interpret.

2. Literature Review

There are various theories regarding the causes and nature of business cycles. Thus, it is not surprising that determining the state of an economy is a much debated issue. Nevertheless, most economists would still agree with the definition given by Burns and Mitchell (1946). The study offers the following definition of the business cycle:

"Business cycles are a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic; in duration business cycles vary from more than one year to ten years or twelve years; they are not divisible into shorter cycles of similar character with amplitudes approximating their own."

The economy cycles work its way through four phases. Ruth, Schouten ant etc (2005) believe that the BCT is a useful tool for the description of the Dutch business cycle. Besides that, it offers a reliable representation of the current state of the business cycle and is able to detect major tuning points in the cycle as they occur. Supported by Cannata (2020), Business Cycle Clock is a visualisation tool provided to convey information about the cyclical situation in different phases of economic activity which visualised using a clock-type graph.

The dissemination is characterised as a procedure of discharging measurements through different medium such as printed and media by Larry Hartke (1997). He described, the effective data dissemination means that statistical agencies should fully identify the potential data users community, effectively request their requirements and after that react expeditiously by giving the clients opportune and reasonable factual information that address those issues as close as could be expected under the circumstances. Thus, it is essential for the produced data to be accessible, timely and relevant.

In line with these motivations, the Department took an initiative to develop the MBCC in order to improve the visualisation of the Malaysia's economic cycle and move towards a better dissemination approach to reach the users.

3. The Methodology of Malaysia Business Cycle Clock

The MBCC is an enrichment of the monthly Malaysian Economic Indicators (MEI) traditionally released to the public since January 2001. MEI is used to monitor the performance of the Malaysian economy so as to assist policymakers, investors, researchers and the public to anticipate future economic direction. However, the findings of MEI are technical and only understood by selected groups. Therefore, DOSM took an initiative in making the MEI more attractive by developing the MBCC which is easier to understand.

According to Abd Latib Talib (2018), the development of MBCC involves three steps which are trend estimation and cyclical extraction, x and y coordinate estimation as well as estimation of "Risk Zone".

3.1. Trend estimation and cyclical extraction

Trend is the gradual shifting or movements including the overall upward or downward pattern of the time series over a long period of time. In economic time series, this is typically due to influence such as population growth, price inflation and general economic development. In MEI growth cycle analysis, the long-term trend of economic time series is estimated using Hodrick-Prescott (HP) filter. Thus, the development of MBCC will also use the HP filter to estimate the long-term trend of the selected MBCC components.

Let y_t denotes an observable time series. HP filter decomposes y_t into non-stationary trend, g_t and a cyclical component, c_t that is:

$$y_t = g_t + c_t \text{ for t = 1,.......,T.} \tag{a}$$

The growth component should be smooth, thus the HP filter (1997) is to minimise

$$\sum_t^T c_t^2 + \lambda \sum_t^T [(g_t - g_{t-1}) - (g_{t-1} - g_{t-2})]^2 \qquad \text{(b)}$$

Where the λ is positive. If $\lambda \to 0$, the trend will approximate the actual series y_t and if $\lambda \to \infty$ the trend will become linear. Hence, the development of MBCC will apply a greater value of λ in estimating the long-term trend of the selected components.

The cyclical components are estimated by dividing the trend components (T) which are estimated in equation (a) and (b) to the equation (c).

$$Z_t = TC_t * I'_t \qquad \text{(c)}$$

Thus, the remaining components of the respective time series are the cyclical (C) and irregular (I) as in equation (d).

$$Z_t = C_t * I_t \qquad \text{(d)}$$

While the irregular components will be analysed together in the cyclical analysis.

3.2. The estimation of x-coordinate and y-coordinate

The interface of MBCC is a coordinate system. The x-coordinate representing the direction change while, the y-coordinate is the distance to its long-term trend which measures the state of the selected components. The x-coordinate is calculated based on the movement from point A to point B. Meanwhile, the y-coordinate is calculated based on point B and point C which is the period-to-period change of the selected components as in Figure 1.

Figure 1: The illustration of calculation x-coordinate and y-coordinate
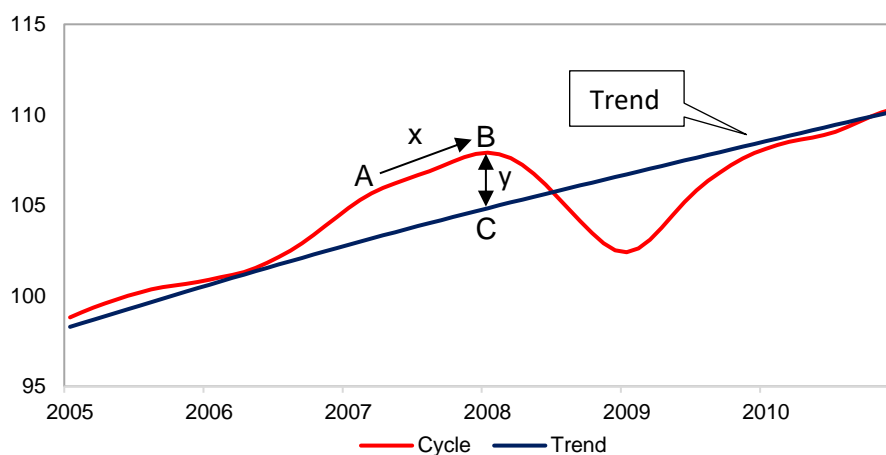
The indicators are placed in the diagram according to the coordinates resulting from their cycle. As the cycle of an indicator develops, it will follow an anti-clockwise path through the diagram, moving from quadrant to quadrant as it moves through the phases of the cycle.

In developing the MBCC, it is important to determine whether the cycle is above or below the long-term trend and whether it is increasing or decreasing. The MBCC portrays a visualisation of the cycle divided into four quadrants which can be distinguished accordingly as illustrated in Figure 2.

Figure 2: Four situations of the cycle in MBCC
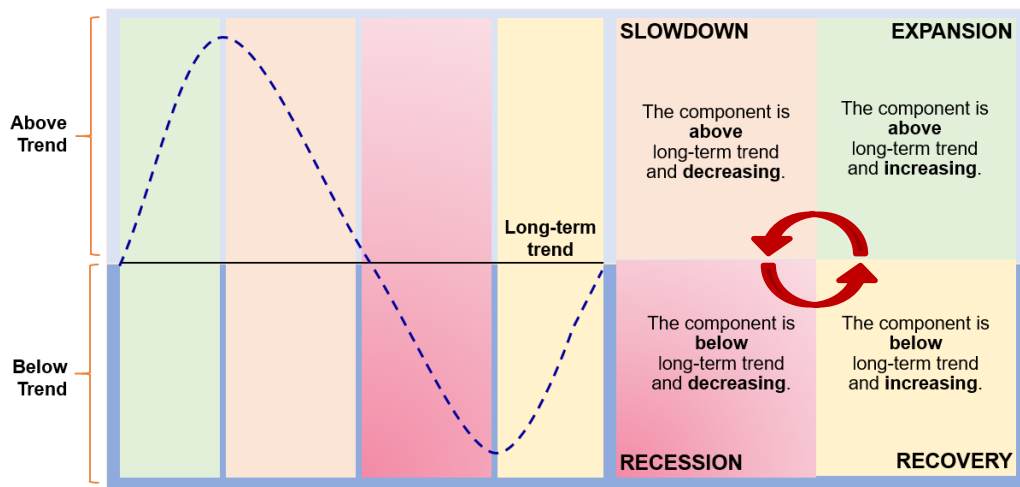
Combining the selected indicators in one system has two important advantages. First, it is possible to analyse the development of an indicator in context, confronting it with other relevant indicators. Second, it is possible to obtain an overview of the current state of the economy.

3.3. The estimation of Risk Zone

The time series data fluctuate along its long-term trend with different amplitude either not deviate further or otherwise. This will absolutely affect the coordinate position in MBCC which indicates the state of the economy. Thus, the movement of the components can be clustered according to the levels of risk of each quadrant as illustrated by Abd Latib Talib (2018) in Figure 3.

Figure 3: Detail Levels of Risk by Quadrant
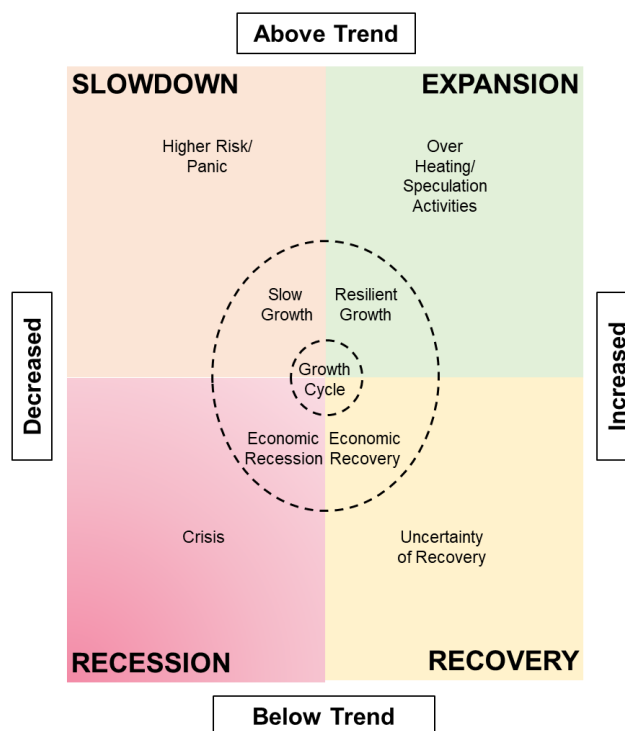
The risk zone was estimated by boxplot using the coordinate of selected components of MBCC. The results are shown in Table 1. Meanwhile, the detail levels of risk zones as in Figure 4.

Table 1: Results of Estimated Risk Zone

Coordinate	Mean	Quartile 1 (25%)	Quartile 2/ Median (50%)	Quartile 3 (75%)
X	0.2	±0.4	±0.2	±0.7
Y	0.1	±1.0	±0.1	±1.3

Figure 4: Detail Levels of Risk Zone in MBCC
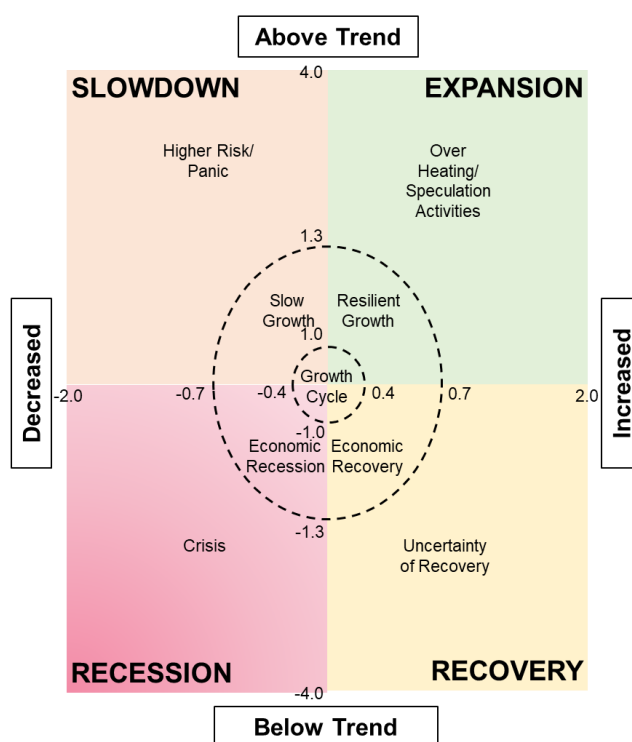
**4. The Development of Interactive Malaysia Business Cycle Clock**

The MBCC visualisation contains Composite of Leading Index (LI) and Coincident Index (CI) as well as its components. The LI measures the direction of overall economic activity for the future. Currently, this index is capable in providing an early signal of economic direction in an average of four to six months ahead. The seven components of the LI are Real Money Supply, M1, Bursa Malaysia Industrial Index, Real Imports of Semi Conductors, Real Imports of Other Basic Precious & Other Non-ferrous Metals, Number of Housing Units Approved, Number of New Companies Registered and Expected Sales Value in Manufacturing sector.

Meanwhile, the CI is a comprehensive measure of current economic performance. It is also a reflection of the monthly Gross Domestic Product. The six components of the CI are Total Employment in Manufacturing sector, Real Salaries & Wages in Manufacturing sector, Industrial Production Index, Real Contributions in Employees Provident Fund (EPF), Capacity Utilisation in Manufacturing sector and Volume Index of Retail Trade.

To ensure the reliability of statistics released, the selection of each components is in accordance with the guidelines stated in the Business Cycle Indicators Handbook namely, conformity to business cycle, consistent timing, economic significance, statistical adequacy, smoothness and promptness.

The MBCC visualisation can be illustrated in Figure 5.

Figure 5: The MBCC Visualisation
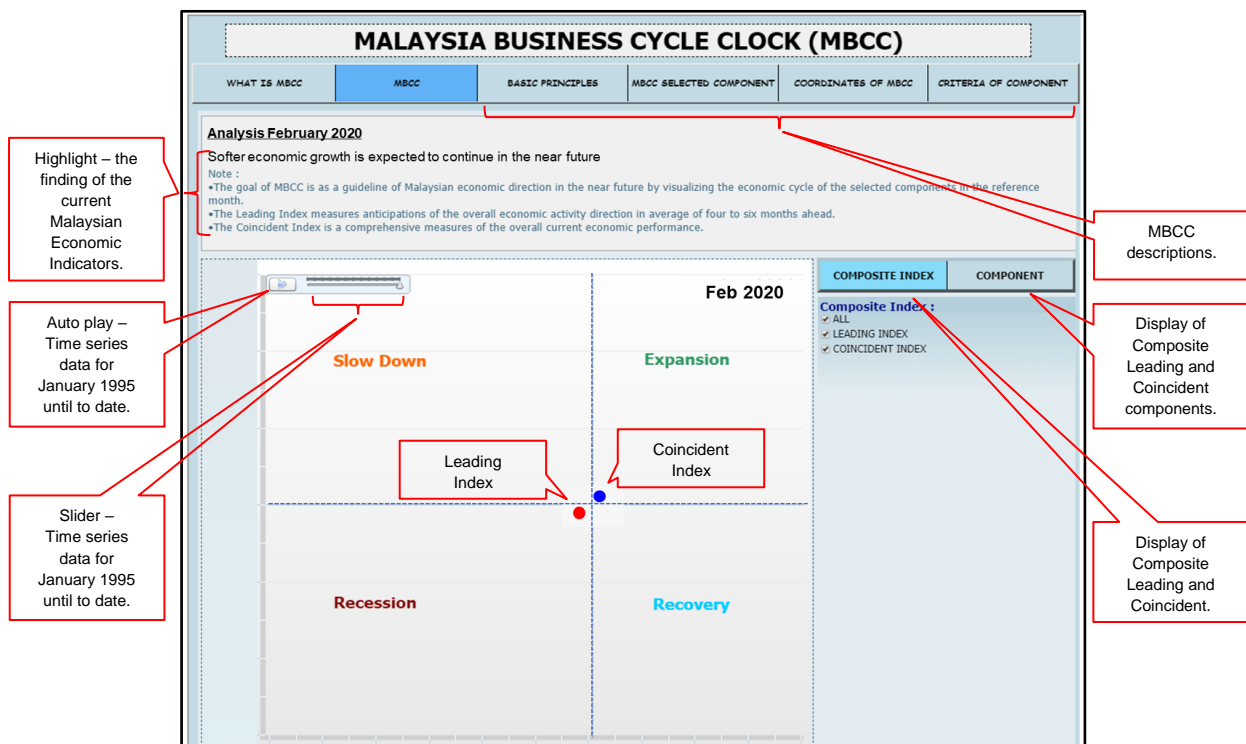
4.1. Hits performance MBCC

The MBCC was launched officially on 5th December 2019. Until April 2020, a total of 3,816 hits are recorded by the interactive MBCC. Within that period, the publication of MEI has recorded 2,286 hits. The MBCC is also publicise through the social media and engagement programmes with business associations and agencies. To ensure that the visual interactive is flexible and in line with new requirements, the MBCC is continuously improved and updated. As such, feedbacks from users are of importance to be used as inputs for future improvement of MBCC.

4.2. Challenges and strategies in MBCC

In ensuring the dissemination of data is reflective to the rapid revolution of technology, improvements need to be emphasised related to the areas as follows:

a) Determination of the theme and design of interactive data visualisation

MBCC interactive visualisation is an improvement from the conventional data dissemination platforms. Several interactive visualisation by other international organisation have also been studied in determining the visualisations theme for MBCC. Once the theme is selected, the challenging task begins to transform the time series data into the coordinate terms. Next, the data preparation to meet the requirements of the visualisation software. This is to make sure the right economy phase is visualised

for each point for each component. To face the challenges, prototype of the dashboards was developed by the technical officers who are responsible and directly involved with the publication of MEI. The IT development team constantly consulted by the technical officer in order to produce the best result.

b) Limited expertise

The software used for the MBCC visualisation is fully customisable and requires specialised expertise. Therefore, knowledge transfer between the MBCC development team and IT maintenance team are important to ensure the continuity support from the expert in maintaining the visualisation especially when it involves migration to the latest version of the software used.

c) Limited availability of infrastructure

The current infrastructure of MBCC needs to be improved to provide smooth access to the general public, especially to accommodate more than 1,000 concurrent users. The devices used are also required to have Adobe Flash support for visualising the interactive content of MBCC. Action is being taken to address this limitation by developing MBCC using the latest infrastructure.

5. Conclusion

DOSM has taken one step ahead to develop an interactive channel to disseminate its statistics and to strengthen the statistics service delivery. The experience of developing MBCC was the revolution in the dissemination of statistics. The interactive application which will help users in searching 'live' data will enhance DOSM's service delivery system and bring the official statistics to a higher level within the community. Continuous effort to enhance DOSM capability in uplifting its statistical expertise and elevating the dynamism of official statistics globally is essential. Given the priority, DOSM keeps improving the data dissemination platforms by leveraging on social media, mobile applications and interactive portal. Regardless of the key role of DOSM to provide official statistics to the stakeholders, the success of official statistical system is also measured by its ability in fulfilling a variety of statistics that are required by the stakeholders, community, businesses and researchers on daily and real time basis.

6. Acknowledgment

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