THE FORECASTING PERFORMANCE OF THE COMPOSITE LEADING INDEX AND COMPOSITE COINCIDENT INDEX IN BUSINESS CYCLES: AN EMPIRICAL STUDY IN MALAYSIA

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ABSTRACT

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This study investigates the forecasting performance and relationship of the Composite Leading Index (CLI) and Composite Coincident Index (CCI) towards the business cycle in Malaysia. It establishes the chronology of cycles over the period of 1972 – 2005 using the Index of Industrial Production (IIP), which it suggests can be regarded as a reference series for the business cycles. Usage and analysis of CLI and CCI can help policy makers, businessmen, investors and manufacturers gauge the short term direction of economic activity and economic performance of Malaysia.

Although the CLI and CCI have been extensively used in most of developed economies such as the U.S. and OECD countries, the CLI and CCI have not gained much attention in many developing economies, mainly due to the lack of high frequency monthly data needed to derive the CLI and CCI. This study uses the CLI and CCI compiled by the Department of Statistics Malaysia. The results indicate that the CLI Granger causes the business cycles in Malaysia. Also, the results show that the CLI have significant predictive power in forecasting the business cycles in Malaysia and CCI accurately mirrors the current economic situation of Malaysia’s economic activity.
ABSTRAK

PRESTASI PERAMALAN KITARAN PERNIAGAAN OLEH INDEKS KOMPOSIT PELOPOR DAN INDEKS KOMPOSIT SERENTAK: KAJIAN EMPIRIKAL DI MALAYSIA

Oleh
Henry Goh Chun Hian

Kajian ini telah dijalankan untuk mendapatkan pemahaman yang terperinci tentang prestasi peramalan dan juga perhubungan antara Indeks Komposit Pelopor (CLI) dan Indeks Komposit Serentak (CCI) dengan kitaran perniagaan di Malaysia. Indeks Pengeluaran Perindustrian (IIP) telah dipilih sebagai indeks yang melambangkan kitaran perniagaan di Malaysia. Penggunaan dan analisa terperinci CLI dan CCI akan dapat membantu penggubal polisi, para pelabur dan perniaga memantau keadaan ekonomi Malaysia dan mengetahui hala tuju kitaran perniagaan Malaysia dalam jangka masa pendek. Walaupun CLI dan CCI telah diaplikasikan di negara-negara maju seperti Amerika Syarikat dan negara-negara OECD buat masa yang lama, indeks ini tidak mendapat secukup perhatian di negara-negara membangun disebabkan kekangan maklumat bulanan yang diperlukan untuk mendapatkan kedua-dua indeks komposit ini. Kajian ini menggunakan data CLI dan CCI yang dikumpul oleh Jabatan Perangkaan Malaysia. Keputusan kajian ini mendapati bahawa CLI dapat mempengaruhi kitaran perniagaan Malaysia dan juga menunjukkan kebolehan indeks untuk meramalkan kitaran perniagaan Malaysia manakala CCI pula didapati mencerminkan keadaan ekonomi semasa di Malaysia.
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TABLE OF CONTENTS

LIST OF TABLES................................................................................................................... ix
LIST OF FIGURES.................................................................................................................. x

CHAPTER ONE: INTRODUCTION

1.0 Introduction.................................................................................................................. 1
1.1 Background of the Study............................................................................................ 3
1.2 Composite Leading Index and Composite Coincident Index................................. 6
1.3 Reference Series: Index of Industrial Production...................................................... 9
1.4 Problem Statement...................................................................................................... 10
1.5 Objectives of the Study.............................................................................................. 12
  1.5.1 General Objective................................................................................................. 12
  1.5.2 Specific Objectives............................................................................................. 12
1.6 Significance of the Study........................................................................................... 13

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction.................................................................................................................. 15
2.1 Reviews on Related Studies....................................................................................... 15

CHAPTER THREE: METHODOLOGY

3.0 Introduction.................................................................................................................. 29
3.1 Reference Series......................................................................................................... 29
3.2 Methodology................................................................................................................ 31
  3.2.1 Augmented Dickey-Fuller (1979) Unit Root Tests............................................. 31
3.2.2 Johansen and Juselius (1990) Cointegration Tests 
3.2.3 Causality and Vector Error Correction Modeling (VECM) 
3.2.4 Hodrick-Prescott (1980) Filter 
3.2.5 Bry-Boschan Method 

CHAPTER FOUR: EMPIRICAL RESULTS AND DISCUSSIONS

4.0 Introduction 
4.1 Empirical Results 
4.1.1 Augmented Dickey-Fuller (1979) Unit Root Test 
4.1.2 Johansen and Juselius (1990) Cointegration Test 
4.1.3 Granger Causality Test Results Based on VECM 
4.2 Analysis and Interpretation 
4.2.1 Hodrick-Prescott (1980) Filter 
4.2.2 Visual Inspection of CLI vs. IIP graph and CCI vs. IIP graph 

CHAPTER FIVE: CONCLUSION

5.0 Conclusion 
5.1 Recommendations 
5.2 Limitations 

REFERENCES
LIST OF TABLES

Table 1: ADF Unit Root Test Results .................................................... 42
Table 2: CLI and IIP Cointegration Test Results ..................................... 44
Table 3: CCI and IIP Cointegration Test Results ..................................... 45
Table 4: Granger Causality Test Results Based on VECM ............................ 47
LIST OF FIGURES

Figure 1 (a): Composite Leading Index (CLI) (before applying HP Filter) ........ 48
Figure 1 (b): Composite Leading Index (CLI) (after applying HP Filter) .......... 48
Figure 2 (a): Composite Coincident Index (CCI) (before applying HP Filter) .... 49
Figure 2 (b): Composite Coincident Index (CCI) (after applying HP Filter) ....... 49
Figure 3 (a): Index of Industrial Production (IIP) (before applying HP Filter) .... 50
Figure 3 (b): Index of Industrial Production (IIP) (after applying HP Filter) ..... 50
Figure 4: CLI versus IIP, 1972:01 – 2005:12 .................................................... 53
Figure 5: CCI versus IIP, 1972:01 – 2005:12 .................................................... 54
CHAPTER ONE
INTRODUCTION

1.0 Introduction

After the onslaught of the Asian financial crisis in 1997, many economists recognized that the impact of the crisis could have been reduced, if not completely avoided, if only businessmen, policy makers and planners of the countries involved in the crisis were provided with the appropriate information regarding the current economic situation and also an early warning system. This implies that there has been an increased emphasis on the importance of having complete and reliable information on economic indicators. By referring to the early warning indicators, the degree of severity of the economic situation at the time prior to the crisis could have been known.

Therefore precautionary steps and measures could be taken to address the situation before it develops into a big problem which will lead to a financial crisis. The mismanagement made by businessmen, policy makers and investors can be attributed to lack of appropriate information and economic indicators particularly short-term economic indicators which gauge the performance of the economy and can provide important feedback to enable decisions to be made wisely.

Although leading indicator approach is widely used, its application is only limited to industrialized countries. This is due to the fact that there is a major
constraint on data availability among developing countries, therefore the use of leading indicator approach to economic and business forecasting in developing countries is still relatively uncommon. In order to construct the leading indicators, high frequency data, preferably on a monthly basis and a long time series for each indicator are required. The problem faced by developing countries is the lack of high frequency data to construct commonly used leading indicators or the data available may not prove to be useful due to the short time series.

According to Fuhrer and Schuh (1998), recessions are caused by a host of factors occurring together and different for each recession. As such, government policies play important, but not fully understood roles. Policy makers should recognize and reduce vulnerability and although they cannot avoid every recession, they should focus on averting the major recessions like the Great Depression occurred in the 1930's.

Granger and Newbold (1986) stated that the leading economic index is intended only to forecast the timing of turning points and not the magnitude of the forthcoming expansion or contraction phase. They also mentioned that the leading economic index is not to be perceived as a general indicator of the economy at times other than near turning points. Due to this fact, evaluation of the leading economic index by standard statistical techniques is not easy.
1.1 Background of the Study

One approach to the prediction of recessions and expansions would be to monitor economic variables that tend to be sensitive to cyclical changes no matter what their causes (Phillips, 1998).

The indicator approach that made extensive use of composite leading, coincident and lagging indicators, also known as business cycle indicators was developed by Burns and Mitchell (1946) in the mid-1930s at the National Bureau of Economic Research (NBER). To get a clearer picture, it is worthwhile to recall their 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 or twelve years; they are not divisible into shorter cycles of similar character with amplitudes approximating their own". (Burns and Mitchell, Measuring Business Cycles, 1946, p. 21).

Burns and Mitchell (1946) led a research team at NBER to study a group of about 487 economic variables to see if turning points in the variables persistently led, coincided with, or lagged turning points in the U.S. business cycle. They evaluated
the economic variables series based on cyclical timing and business cycle conformity, in order to classify the economic variable series as leading, lagging or coincident. During the period of 1950s and 1960s, further researches were conducted and the NBER researchers combined the best economic variable series into composite indexes of leading, coincident and lagging economic indicators.

It can be seen that Burns and Mitchell's (1946) definition of business cycles has two key features. Firstly, it is the comovement among individual economic variables. Secondly, it is the division of business cycles into separate phases or regimes. Burns and Mitchell (1946) have considered in their analysis hundreds of series, including those measuring interest rates, transportation services, commodity output, prices, income and banking transactions and used the group of turning points in these individual series to determine the monthly dates of the turning points in the overall business cycle. Shishkin (1961) noted the early emphasis on the consistent pattern of comovement among various variables over the business cycle led directly to the creation of Composite Leading, Coincident and Lagging Indexes.

A formal weighting scheme by scoring variables in terms of their cyclical timing, economic significance, business cycle conformity, smoothness, revisions, statistical adequacy and timeliness of release was firstly developed and applied by Moore and Shishkin (1967). Two criterions, namely cyclical timing and business cycle conformity were given more weight than the other criterions. Although the scoring system was formalized, it was not statistically rigorous. Whilst some statistical tools were used to measure criteria such as smoothness, variables were not
selected or weighted based on any statistical test of fit. Also despite the fact that care was taken to choose variables from many different economic processes, each of the indicators was analyzed separately and thus the marginal contributions of the indicators were not evaluated.

It is also worthy to take note of the mechanism that drives a business cycle which is known as a ‘recession’. According to Dua and Banerji (2006), a ‘recession’ occurs when a decline – however initiated or instigated – takes place in some measure of aggregate economic activity and causes cascading declines in the other key measures of activity. As a consequence, when the decline in sales figures leads to a dip in production, causing a plunge in jobs and lower income, which in turn contributes to a further fall in sales, resulting in a vicious cycle and a recession arises.

Thus, what illustrates a recessionary downturn is the domino effect of the transmission of economic weakness from sales to output to employment and income, resulting in further weakness in all of these measures. In a not so distant future, the vicious cycle is broken and a corresponding self-reinforcing virtuous cycle begins, with growth in output, employment, income and sales leading to further increases in one another, which signifies the business cycle recovery. So, it can be noted that the transition points between the vicious and virtuous cycles mark the start and end dates of recessions.
1.2 Composite Leading Index (CLI) and Composite Coincident Index (CCI)

Each of the individual economic variable series that form the Composite Leading Index (CLI) shares a leading relationship with respect to the reference series. The components of the CLI are usually selected from a large set of economic variables that include real sector, financial, monetary, and business survey data, taking into consideration their economic and statistical significance. The OECD extensively uses the system of leading indicator approach to predict the growth cycles in the economies of their member countries. Everhart and Duval-Hernandez (2000) reported that these exercises have been very effective in their forecasting ability and accuracy. However, they noted that for this technique to work properly, it is essential to have an adequate statistical system that provides a large set of economic variables, in a timely and precise manner, if at all possible, on a monthly basis.

The CLI provides helpful information about the future path of economy of a country, combining information from several economic series and jointly forecasting the future movements in the economy. Every single leading indicator in the CLI contains some information about the future turning points but it is unlikely that the individual leading indicators will show identical turning points. Therefore, the combined information in the CLI produces better predictions about the future turning points than any one of the individual leading indicators can generate on its own.
The CLI and CCI used in this study are compiled by the Department of Statistics Malaysia. The composite indexes are calculated using the Moore and Shiskin (1967) method which consists of averaging the month-to-month growth rates of the index components, after standardizing them to the same units, and then cumulating this average growth rate into an index. This index is then adjusted to have firstly, the same average absolute percent changes as the cyclical component of industrial production and secondly, the same average trend rate of growth as real GDP.

The leading indicators are typically measures of anticipations or new commitments to economic activity which will affect the overall economy in the months ahead. According to Yap (2001), there exist a few economic rationales as criteria for the selection of leading indicators to derive the CLI namely market expectations, external shocks, production time and policy impacts. The first economic rationale, market expectations shows that some economic variables tend to reflect, or to be very sensitive to, anticipations about future economic activity. The stock prices or survey results of business expectations or confidence are some examples of such indicators whereby changes in these indicators could signal changes in economic activity, whether the economy is heading into an expansion or recession phase. The second economic rationale, namely external shocks shows that economic activity is also likely to be influenced by various factors that local policy makers have no control of. Changes in terms of trade, interest rates and global demand are some examples as these indicators most likely affects the domestic economy and therefore are useful as leading indicators.
The third economic rationale, namely production time shows that producers and manufactures decisions to increase or reduce production of goods and imports of raw materials is an indicator of the direction of economic activity due to the fact that when the decision to produce goods have been made, it takes months or even years before actual production commence. The fourth economic rationale, policy impacts is quite easily understandable as fiscal and monetary policies are often used in an attempt to manipulate future level of economic activity.

The CLI provides early signal on the direction in which the economy is going. Among the earlier signs that an ongoing expansion may start to decelerate is a sustained decline in the CLI growth rate. Leading indicators are those which provide advance warning of probable change in economic activity, the most important function of the system. The CLI consists of different economic series which consistently lead the CCI by several months.

Eight economic series representing activities in money, prices, trade, construction and business are currently included in the compilation of the Composite Leading Index. The CLI's components are as follow:

i) Real money supply, M1
ii) KLSE share price index, industrial (1970 = 100)
iii) Real, Total traded: Eight major partners
iv) CPI for services, growth rate (inverted)
v) Industrial material price index, growth rate
vi) Ratio of price to unit labour cost, manufacturing
vii) Housing permits, approved
viii) New companies, registered

The coincident indicators are comprehensive measure of the overall economic performance of the economy. The coincident indicators are those which reflect the current performance of the economy and tell us where we are. The CCI serves as a proxy indicator for the aggregate economic activity of the country. For the purpose of historical analysis, the index is used to establish reference dates that mark off periods of expansion and contraction in the country’s economy. The CCI’s components are as follows:

i) Index of industrial production
ii) Real gross imports
iii) Real salaries and wages, manufacturing
iv) Total employment, manufacturing
v) Real sales, manufacturing
vi) Real contributions, EPF

1.3 Reference Series: Index of Industrial Production (IIP)

The Index of Industrial Production (IIP) will be used to derive the business cycles for Malaysia that will also be known as the reference series in this study. The reference variable is the benchmark that indicates fluctuations in the economic
activity, and is the variable to be forecast. According to theory, the state of the economy would be best suited to be represented by real Gross Domestic Product (GDP), as it is the broadest statistical measure of economic activity. However, real GDP in Malaysia and virtually all other economies are only available on a quarterly basis and with a substantial lag.

For many researches conducted in the developed countries, the IIP is usually chosen as it has the advantage of being a monthly reported variable, measures the real sector of the economy and available for many countries. According to Mall (1999), it is also a common feature of the NBER and OECD methodologies and almost all papers on this leading indicator subject. For Malaysia, IIP is the variable selected as it is deemed more suitable in comparison with the real GDP variable as real GDP is only available on a quarterly basis while the IIP is available on a monthly basis, therefore reducing or even eliminating the information lag caused by the late publication of the real GDP quarterly figures.

1.4 Problem Statement

Developing countries in the Asia region with emerging economies have gained much attention since the 1990’s. Before the Asian financial crisis in 1997, most of the countries in this region have been growing at a remarkable pace. This has changed, however, after the Asian financial crisis in 1997. Many of these once booming countries were heavily in debt due to the depreciation of the national currency and capital flight out of the countries. This sudden loss of market
confidence towards these emerging economies has caused quite a stir in the international investment scene and many economists are of the opinion that there should be in place a monitoring system, in order to disseminate appropriate information regarding the current economic situation and also to provide an early warning system.

Earlier studies on the forecasting performance of the Composite Leading Index (CLI) and Composite Coincident Index (CCI) on Asian countries are limited. Although these indexes are published monthly by certain institutions in the countries, their uses are restricted. In Malaysia, the Department of Statistics Malaysia publishes the CLI and CCI monthly. Although the CLI and CCI are compiled in Malaysia, its usefulness is still yet to be proven.

According to Agrenor, McDermott and Prasad (2000), the classical analysis of leading and coincident indicators based on the business cycle approach uses simple unconditional correlation between the cyclical component of the reference series and the cyclical component of other variables supposed to lead or coincide with the reference series, and such correlations do not imply causation.

Hence, this study intends to establish the relationship between the CLI, CCI, and IIP in Malaysia. After the relationships are established using the Johansen and Juselius (1990) cointegration tests, we shall employ the Vector Error Correction Model (VECM) and Granger (1969) causality tests to prove whether there exist causal relationship between the CLI and the reference series. Next, the forecasting
performance of the CLI and CCI are measured against the reference series, IIP in order to review the effectiveness of the CLI and CCI in predicting business cycles in Malaysia.

1.5 Objectives of the Study

1.5.1 General Objective

Using Malaysia as the case, this study has two objectives. Firstly, we intend to examine whether business cycles and turning points in Malaysia can be accurately predicted and thus provide the signaling effect based on the Index of Industrial Production (IIP), using the Composite Leading Index (CLI) constructed through the Moore-Shiskin (1967) method and compiled by the Department of Statistics of Malaysia. Secondly, we attempt to investigate whether the Composite Coincident Index (CCI) accurately mirrors the business cycles in Malaysia, thus providing support to the fact that the index can track the current situation of the business cycles.

1.5.2 Specific Objectives

In addition, specifically, the objectives of this study are to:

i) examine the causal relationship between the CLI and the business cycle.

ii) examine the causal relationship between the CCI and the business cycle.
determine how many months of signaling are provided by the CLI for turning points in the business cycle and associate important events to the business cycle that occurred before, during and after the turning points.

1.6 Significance of the Study

This study attempts to evaluate the forecasting performance of the Composite Leading Index (CLI) and Composite Coincident Index (CCI) in the Malaysian business cycle. The findings of this study will prove to be useful to various parties.

Many countries\(^1\), especially the developed countries in the world now use the leading indicator approach to predict turning points in the business cycles due to several factors. Firstly, the leading indicator approach has been established to be a reliable and inexpensive forecasting tool since its founding. Secondly, it is important for policy makers to recognize the turning points in business cycles to enable them to trigger preventative countercyclical policy measures. Thirdly, investors provided with the information on business cycles can reallocate their assets among alternative investments to optimize their return which will further enhance the economy since scarce resource are allocated to their most efficient use. Fourthly, producers and manufacturers can gauge the future demand to control or manage the demand and supply of goods.

\(^1\) See for example, Kranendonk, Bonenkamp and Verbruggen (2004), Cawthray, Gaudreault and Lamy (2001), and Camba Mendez, Kapetanios, and Weale (1999).
If the CLI and CCI are accurate in forecasting turning points in the Malaysian business cycles, this means that further studies can be conducted to apply the above mentioned indexes into Malaysia's economy to provide an early warning system or signal as to when the economy is going into an expansion or contraction phase.

If, however, the CLI and CCI are inaccurate in forecasting turning points in the Malaysian business cycles, then other researches should be conducted in order to derive other methods of forecasting the Malaysian business cycles. The rest of this study is organized as follows. Chapter Two discusses the literature review, Chapter Three describes the methodology, Chapter Four reports the results, and Chapter Five concludes.
CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

There are considerable numbers of economics literature studies that examine the methods of deriving the Composite Leading Index (CLI) from selected leading indicators and Composite Coincident Index (CCI) from selected coincident indicators and also the forecasting performance of CLI and CCI. While a major number of empirical studies focus on developed countries, only a few studies have been conducted for developing countries.

2.1 Reviews on Related Studies

Based on an improved variant of the NBER method, Berk and Bikker (1995) introduced new leading indicators for 15 industrialized countries that enable the business cycles in manufacturing to be forecasted quite accurately between four and six months ahead. They used the leading indicators to investigate the international interdependence of business cycles and to examine the degree to which growing economic integration, such as the European Community has affected the interdependence. They noted that one of the most remarkable aspects of the business cycles is that similar patterns are reflected in almost every macro-economic variable, thus reflecting their interdependence. This interdependence is a global phenomenon as it is not restricted to national macroeconomic variables only. Thus, the world’s
economies are strongly integrated as at an international level, the business cycle of some countries leads that of others, implying that the leading country acts as an engine of growth. They suggested that since the business cycles of some countries clearly lead those of others through their studies, the relationship of international interdependence can be used to further improve the predictive power of the leading indicators in the lagging countries.

In an analysis which contrasts the real-time performance during a ten-year period of the CLI produced by the Conference Board for U.S. to the Stock and Watson Leading Index, Phillips (1998) applied a simple non-linear Bayesian, regime-switching model (Diebold and Rudebusch, 1989) to the Conference Board index and compared its performance to the Stock and Watson Leading Index, which is based on a linear VAR model. His results show that in the first out-of-sample cyclical change, the Stock and Watson Leading Index failed to reveal, or forecast the recession which occurred in the U.S. during the period from 1990-1991. He noted that the short time period since the inception of the Stock and Watson Leading Index, which includes only one recession, limits the results of this study. He revealed that more time and business cycles are needed to fully examine the usefulness of the different types of leading index models such as the Stock and Watson Leading Index.

Using Granger causality test, Bikker and Kenaedy (1999) found that the CLI contributes substantially in explaining past inflation, which underlies the performance of leading indicators for seven EU countries namely Belgium, Germany, France, Italy, the Netherlands, Sweden, and U.K. They also applied the