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on
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SINGAPORE'S GROWTH CHRONOLOGY, COINCIDENT AND LEADING INDICATORS

Singapore Department of Statistics
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SINGAPORE'S GROWTH CHRONOLOGY, COINCIDENT AND LEADING INDICATORS

I. Introduction

1. The study of business cycles and development of leading and coincident indicators was pioneered in the 1930s and 1940s by the National Bureau of Economic Research (NBER) in the United States. Since then, most industrial nations have adopted the use of Composite Leading Indices (CLIs) to anticipate the turning points of growth cycles, or fluctuations in the economy's growth rate.

2. As the CLI and their component leading indicators generally lead economic activity by six to twelve months, they serve as a useful advanced warning system to policy-makers. They are therefore closely monitored and tracked by economists and researchers, particularly those engaged in economic forecasting.

3. Singapore's CLI was first established in the aftermath of the 1985 economic recession with the help of the Centre for International Business Cycle Research (CIBCR) at Columbia University. Since the last review of the CLI in 1991, the Singapore economy has experienced significant structural changes, notably the emergence of the new economy and the shift in emphasis away from manufacturing towards the service sectors. As such, it is timely to update Singapore's growth chronology and, at the same time, review the coincident and leading indicators to ensure their continuing relevance in identifying and anticipating Singapore's growth cycles.

II. Methodology

4. The performance of a CLI is often judged against a reference series, which should preferably be an important economic indicator that measures broadly the level of economic activity. Gross Domestic Product (GDP), which measures the total economic output in the economy, can be used as such a series. The Index of Industrial Production (IIP), which is broadly indicative of the state of the economic cycle, has also been used among the Organisation for Economic Cooperation and Development (OECD) countries as it offers a high degree of comparability among member countries. However, business and growth cycle researchers consider it more satisfactory to rely on a number of comprehensive indicators rather than a single indicator.

5. Singapore has followed the approach of the US and UK by developing a Composite Coincident Index (CCI), which is an aggregate of macroeconomic indicators that move in tandem with business cycles, to track the state of the economy. In the present study and review, a revised and updated CCI will be the reference series for the identification of Singapore's growth cycles.

6. For the reference series to identify growth cycles, its overall trend must first be removed so that the underlying cyclical fluctuations will surface and become more prominent. Periods of expansions and contractions can then be determined from the turning points identified by these cyclical movements.

7. Trend estimation of the reference series and other economic indicators is performed using a modified version of the Phase-Average Trend (PAT) method. This technique was developed in the 1960s and is now widely accepted and used by international organisations such as NBER, The Conference Board (TCB) and OECD. Conceptually, the PAT method uses moving averages to separate the long-term trend from shorter-term cycles to obtain a series that has its trend component removed. The cyclical component that remains, which is known as "Deviation from Trend" cycles, represents alternating periods of growth rates above and below the long-term trend.

8. Identification of peaks and troughs in economic time series are performed using the Bry-Boschan procedure, which uses rules and specifications from the Burns-Mitchell definition of business cycles. This method first identifies tentative turning points from highly smoothed time series and subsequently, refines such turning points through less smoothed series.

9. When TCB took over the compilation of US composite indices from the NBER, it modified the methodology of the US Department of Commerce and developed a new method of calculating composite indices. This new methodology involves summing the standardised month-on-month changes of each component and computing the index using these sums. Our existing composite indices have been compiled using the methodology of the US Department of Commerce. However, in light of the methodological improvements introduced by TCB, we will compile the revised composite indices using TCB's methodology.

III. Singapore's Growth Cycle Chronology: The CCI

10. Growth cycles are broadly defined as fluctuations in the growth rate of "aggregate economic activity". Although real GDP may be the single economic indicator that closely measures aggregate economic activity, it fails to capture certain important economic activities such as employment and trade. Given that different economic processes need to be taken into consideration in deciding when expansions and contractions have occurred, a group of coincident economic indicators that generally move in tandem with aggregate economic activity is generally regarded as a better proxy for it than real GDP.

11. The NBER's Business Cycle Dating Committee emphasises broad-based measures of aggregate economic activity. The committee considers four indicators of output, income and sales (ie, quarterly real GDP, monthly real personal income excluding transfers, industrial production and real sales) and one indicator of employment (ie, non-agricultural payroll employment) in identifying turning points in

the economy activity. Therefore, the co-movement of these indicators is an essential aspect of business cycles and thus, instrumental in defining and dating those cycles.

12. Singapore's existing CCI comprises the following six components:
(i) Gross Domestic Product at 1995 market prices (GDP);
(ii) Index of Industrial Production (2003=100), excluding rubber processing and quarrying (IIP);
(iii) Non-oil Domestic Exports at 2000 market prices (NODX);
(iv) Non-oil Sea-borne Cargo Handled;
(v) Total Employment; and
(vi) Number of Unemployed Registered for Employment Assistance.

13. The various statistical tests carried out during our study show that two components have not performed favourably in recent years. Non-oil Sea-borne Cargo has shown leading properties while Number of Unemployed Registered has been lagging the CCI. As such, these two components will be excluded from the revised CCI.

14. Retail sales, which is among the indicators considered by NBER to coincide with economic activity, is not in our existing CCI. The Retail Sales Index (RSI), excluding motor vehicles, was tested and found to exhibit roughly coincident properties, especially in the 1990s. The inclusion of RSI, which covers part of the services industries, will allow the new CCI to provide a broader coverage of overall economic activity and balance the heavy weightage given to manufacturing-related indicators in the current CCI. The strength of its correlation with real GDP (0.9) makes the new CCI a reliable proxy for Singapore's overall economic activity.

15. The revised CCI will therefore comprise the following five components:
(i) Gross Domestic Product at 1995 market prices (GDP);
(ii) Index of Industrial Production (2003=100), excluding rubber processing and quarrying (IIP);
(iii) Non-oil Domestic Exports at 2000 market prices (NODX);
(iv) Total Employment; and
(v) Retail Sales Index at constant prices (1997=100), excluding motor vehicles (RSI).

16. With the changes in the CCI components better reflecting cyclical movements over the past 20 years, the revised CCI was used as the basis to update Singapore's growth cycle chronology from 1985 onwards (see Table 1). Prior to 1985, the old chronology established in the *Economic Survey of Singapore Third Quarter 1987* will remain unchanged.[1]

[1] Given that the growth cycle trough in January 86 was established in 1987, new data available since then have affected the previous estimate of the long-term trend and shifted the date for this particular turning point. Hence, based on the new growth cycle chronology, this trough date has been revised to December 85.

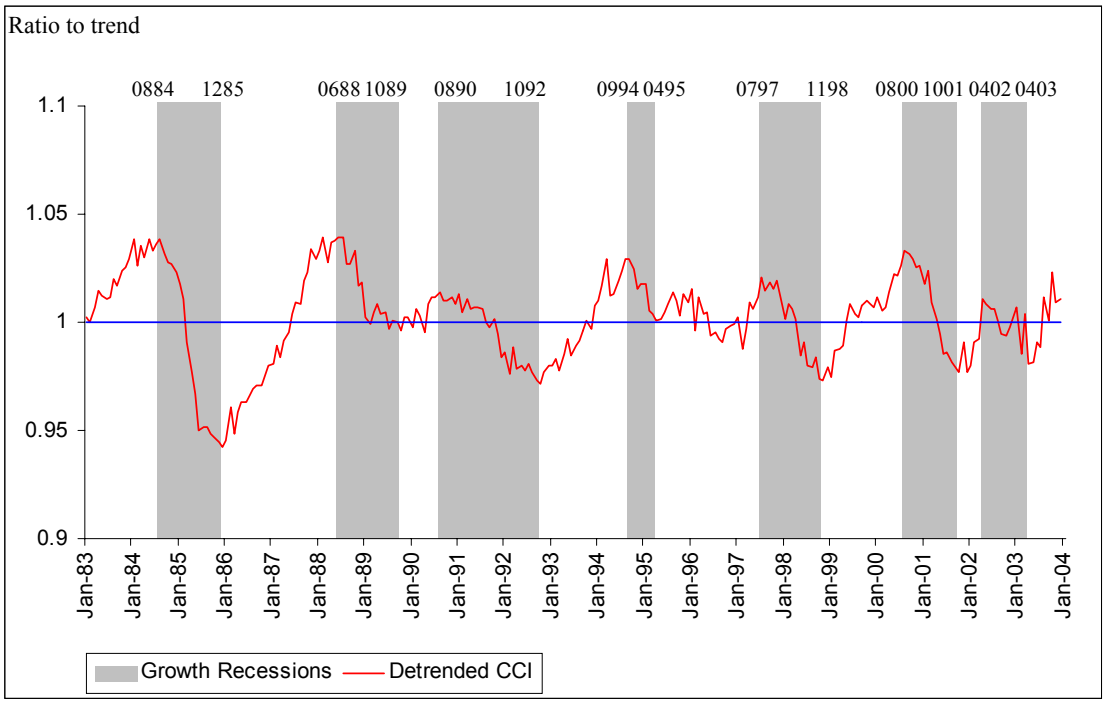
17. On the basis of the revised CCI, the latest turning point identified by the Bry-Boschan procedure indicated that a growth cycle trough has occurred in April 2003[2] (see Table 1). This trough date thus marks the end of 12 months of cyclical slowdown that began April 2002 and the beginning of an upturn in the overall economic activity (see Chart 1). The Singapore economy continued to maintain its growth momentum into Q1 04 with broad-based recovery in all major sectors.

Table 1
Growth Cycle Chronology of Singapore

Date of Peak and Trough			**Average Duration in Months**			
Peak (P)	Trough (T)	Peak (P)	Low-growth (P to T)	High-growth (T to P)	Full Cycle (P to P)	Full Cycle (T to T)
Aug 84	Dec 85	Jun 88	16	30	46	46
Jun 88	Oct 89	Aug 90	16	10	26	36
Aug 90	Oct 92	Sep 94	26	23	49	30
Sep 94	Apr 95	Jul 97	7	27	34	43
Jul 97	Nov 98	Aug 00	16	21	37	35
Aug 00	Oct 01	Apr 02	14	6	20	18
Apr-02	Apr-03	-	12	-	-	-

Chart 1

Singapore's Growth Cycles, 1983-2004



[2] The trough date is preliminary as the end-of-period trend estimates may be substantially revised when new data become available.

18. Since the 1985 recession, six growth cycles are identified for the Singapore economy. Absolute declines in aggregate economic activity or classical recessions were exhibited in two of these cycles (ie, the Asian financial crisis in 1997-98 and the recession in 2001).

IV. Selection Criteria for CLI Components

19. There are several key criteria for the selection of leading indicators to be included as components of the CLI. These include economic significance, cyclical behaviour and the statistical quality of the data.

20. There should preferably be an economic rationale for an indicator to be included in the CLI. Such an indicator could cause fluctuations in economic activity, giving a short-term prediction of the overall state of economy and hence acting as a useful leading indicator. Indicators that express early sentiments and expectations of economic agents through business surveys could also provide policy-makers and economists an early warning of the overall health of the economy. Indicators measuring activity during the early stages of production could be useful in anticipating market demands and production output one to two quarters in advance.

21. The cycles in a potential leading indicator should consistently lead those of the reference series and there should ideally be no missing or extra cycles. Moreover, the leads at turning points should be relatively homogenous over the entire period.

22. In addition to the above, the timeliness and periodicity of the data need to be considered. Monthly series are preferred to quarterly series; the former are more timely and tend to be more sensitive to cyclical changes in the economy. Series should also not be revised frequently to minimise the extent of revision to the CLI.

23. The final set of component series will be selected so as to maximise the forecasting ability of the CLI. The series are evaluated based on several factors such as missing or extra cycles, homogeneity of leads at turning points and cross-correlations with the reference series. Two further statistical tests, the Granger causality test and a test of marginal predictive content, have also been carried out as part of the review and revision process.

V. Singapore's Current CLI

24. Singapore's current CLI comprises the following nine components:
    (i) Total New Companies Formed;
    (ii) CPF Default Rate (Manufacturing sector);
    (iii) Domestic Supply Price Index (Manufactured goods);
    (iv) Money Supply (M2);

(v) Stock Exchange of Singapore Indices;
(vi) Unit Labour Cost Index (Manufacturing);
(vii) Business Expectations for Stock of Finished Goods (Manufacturing sector);
(viii) Business Expectations for New Orders Received (Manufacturing sector); and
(ix) Business Expectations for Wholesale Trade.

The first five of these nine components are monthly series, while the remaining four are quarterly series.

25. The current CLI has a heavy bias towards the manufacturing sector with five of its nine components being manufacturing-related. The replacement of some of these components with new indicators would, as in the case of the CCI, reduce the emphasis on the manufacturing sector and at the same time provide a broader coverage of economic activity. The revised CLI will move more closely with the CCI, and will anticipate turning points in the overall economy with greater efficiency and accuracy.

26. The current CLI started its decline in April 2002 which coincides with the actual economic slowdown. The current CLI has bottomed out in February 2003 which correctly signals that the economy has entered its expansion stage.

27. On an overall basis, the current CLI has continued to perform reasonably well, leading the CCI at growth cycle turning points by 2.3 months. Furthermore, a cross-correlation analysis shows that there is a high correlation of 0.5 between the CLI and the CCI with the former having a lead time of four months.

28. However, its average lead has shortened significantly to about 1.5 months since 1990. An examination of the peaks shows that the CLI consistently failed to signal the downturns in recent years.

29. Since 1990, six of the nine components captured at least five out of ten turning points in advance of the actual turning points of the CCI. These six components are Total New Companies Formed, M2, Stock Exchange of Singapore Indices, Business Expectations for Wholesale Trade, Business Expectations for Stock of Finished Goods (Manufacturing sector), and Unit Labour Cost Index (Manufacturing).

30. With the exception of Unit Labour Cost Index (Manufacturing), these six components also exhibit the required qualities of leading indicators as they have healthy mean leads of between 2.3 to 8.2 months at turning points, while showing maximum cross-correlations of between 0.3 and 0.7 at leads of at least three months.

31. In comparison, Unit Labour Cost Index (Manufacturing) only has an average lead of 0.6 months since 1990. The performance of the ULC has been poor as its peaks lagged by an average of 1.5 months since 1990. The ULC is also not a very timely indicator, being available only a quarterly basis.

32. Both Stock of Finished Goods and New Orders Received series are obtained from the Business Expectation Surveys (BES) of the manufacturing sector. As these are qualitative surveys, data for the two series tended to move in similar directions with turning points close to each other. This is highlighted by the strong correlation of 0.7 between the trend-cycles of the series. The inclusion of both of them would over-weigh the business expectations of the manufacturing sector in the CLI. Since 1990, the average lead of Stock of Finished Goods is much better than that of New Orders Received when compared against CCI. New Orders Received also failed to capture the downturn during the Asian financial crisis and the recent growth recession in April 02. New Orders Received will thus be dropped from the CLI.

33. The remaining two components, namely CPF Default Rate (manufacturing) and Domestic Supply Price Index (Manufactured goods), performed relatively poorer.

34. Since 1990, the CPF Default Rate actually lags the CCI by an average of 0.2 months. Only two of its six turning points registered led the CCI; its most recent four turning points lagged the CCI. It also failed to detect the two turning points of CCI in October 2001 and April 2002. Cross-correlation analysis confirms that the CPF Default Rate has been lagging the CCI by three months. As the leading property of the CPF Default Rate is no longer evident, it should be dropped from the CLI.

35. Similarly, Domestic Supply Price Index (DSPI) lags the CCI by 0.5 months since 1990, with only three turning points leading the CCI. As DSPI exhibits lagging properties, it should also be excluded from the CLI.

36. On the basis of the above considerations, the four components discussed above (CPF Default Rate, DSPI, ULC and New Orders Received) will be dropped from the CLI. A summary of the performance of the current CLI components can be found in Table A.1.

VI. The Revised CLI

37. More than 80 economic indicators relating to various sectors of the economy were tested as potential components of the leading index. These indicators included external indicators, notably those of the US.

38. Table 2 summarises the findings arrived at through the statistical analysis of these indicators.

Table 2
Summary Findings of Some Potential Leading Indicators

Series	Remarks
Prime Lending Rate	Erratic Cycles
Inter-bank Overnight Rate	Erratic Cycles
Domestic Liquidity Indicator	Leading Properties
Non-oil Total Exports	Coincident Properties
Total Domestic Exports	Good Coincident Properties
Non-oil Imports	Mild Leading Properties
Non-oil Retained Imports	Strong Leading Properties
Non-oil Sea-borne Cargo	Leading Properties
Total Air-Cargo Handled	Mild Leading Properties
Singapore Manufactured Products Price Index	Lagging Properties
Sale of Electricity (Manufacturing sector)	Good Coincidental Properties
Overall Unit Business Cost of Manufacturing	Lagging Properties
CPF Default Rate (Overall)	Erratic Cycles
Retail Trade: Forecast for the next 6 months	Good Coincidental Properties
Local Purchasing Managers' Index	Short Series
US Consumer Confidence Index	Mild Leading properties
US Composite Leading Index	Coincidental Properties
US New Orders for Electronic Products	Mild Leading Properties
US Purchasing Managers' Index	Leading Properties
Global Semiconductor Sales	Coincidental Properties
US Semiconductor – Book to Bill Ratio	Short Series

39. Of the potential economic indicators, four were considered to be suitable for inclusion in the CLI. These are:

(i) US Purchasing Manager's Index (Manufacturing) (PMI);
(ii) Total Non-oil Seaborne Cargo Handled;
(iii) Domestic Liquidity Indicator (DLI) and
(iv) Non-oil Retained Imports (NORI).

40. The US PMI, a series compiled by the National Association of Purchasing Management (NAPM), has an average lead of 1.7 months over the CCI. As this is an external indicator, it is not expected to pick up periods of localised growth moderation. Excluding these periods, the average lead time of the US PMI over the CCI improves to 3.4 months.

41. Total Non-oil Seaborne Cargo handled was found to lead the CCI by an average of 6.0 months since 1990. Besides having good leading properties, this indicator serves well as a proxy for externally induced production activities on account of the high proportion of electronics components and products shipped by sea.

42. The Domestic Liquidity Indicator (DLI), which is weighted average of the change in the nominal effective exchange rate of the Singapore dollar and the 3-month domestic interbank rate, was introduced by the Monetary Authority of Singapore (MAS) as a measure of overall monetary conditions. On the basis of statistical tests and simulations carried out, a modified DLI was found to have good leading properties, leading the CLI by an average of 1.6 months.

43. The turning points of non-oil retained imports (NORI) were found to lead by the CCI by an average of 2.6 months. That NORI has good leading properties is not surprising. As imports retained in the economy would have to be either used as intermediate inputs or consumed, NORI could be expected to lead economic activity in the manufacturing and retail sectors.

44. On the basis of the foregoing, the revised CLI will comprise the following components:

(i) Total New Companies Formed;
(ii) Money Supply (M2);
(iii) Stock Exchange of Singapore Indices;
(iv) Business Expectations for Stock of Finished Goods (Manufacturing sector);
(v) Business Expectations for Wholesale Trade;
(vi) US Purchasing Managers' Index (Manufacturing);
(vii) Total Non-oil Seaborne Cargo Handled;
(viii) Domestic Liquidity Indicator (DLI); and
(ix) Total Non-oil Retained Imports (NORI)

45. These components have good leading properties with all nine of them having turning points that lead the CCI on at least five out of ten occasions since 1990. Besides their leading tendencies, these components also satisfy the criterion of 'economic relevance' as follows:

- Indicators that affect overall economic activity eg. M2; DLI
- Indicators that reflect the expectations of economic agents eg. Wholesale Trade; Total New Companies Formed, Stock of Finished Goods.
- Indicators that measure economic activity at the early stages of production eg. NORI.
- Indicators that respond quickly to changes in economic activity eg. Total Non-oil Seaborne Cargo Handled.

46. The revised CLI has only two quarterly series, compared with four in the existing CLI. With seven monthly components available to compile the revised CLI (compared to just five in the current CLI), the revised CLI will be more timely than the current CLI and at the same time, will be subjected to smaller revisions than the current CLI.

47. The revised CLI leads the CCI by an average of 3.4 months since 1990. Unlike the current CLI, the revised CLI anticipates better the turning points of the CCI. The revised CLI peaked in March 2002, one month ahead of the onset of the recent recession. With a trough identified in February 2003, the revised CLI signals correctly the economic rebound in the 2nd half of 2003.

48. Looking at the 6-month smoothed change, the revised CLI has continued to grow since February 2003. Expanding at an annual rate of 14% in March 2004, the revised CLI signals that economic growth is likely to continue into the 2nd half of 2004, consistent with the improvement in the global electronics demand and upturn of the global economy.

VII. CLI's Lead Over GDP

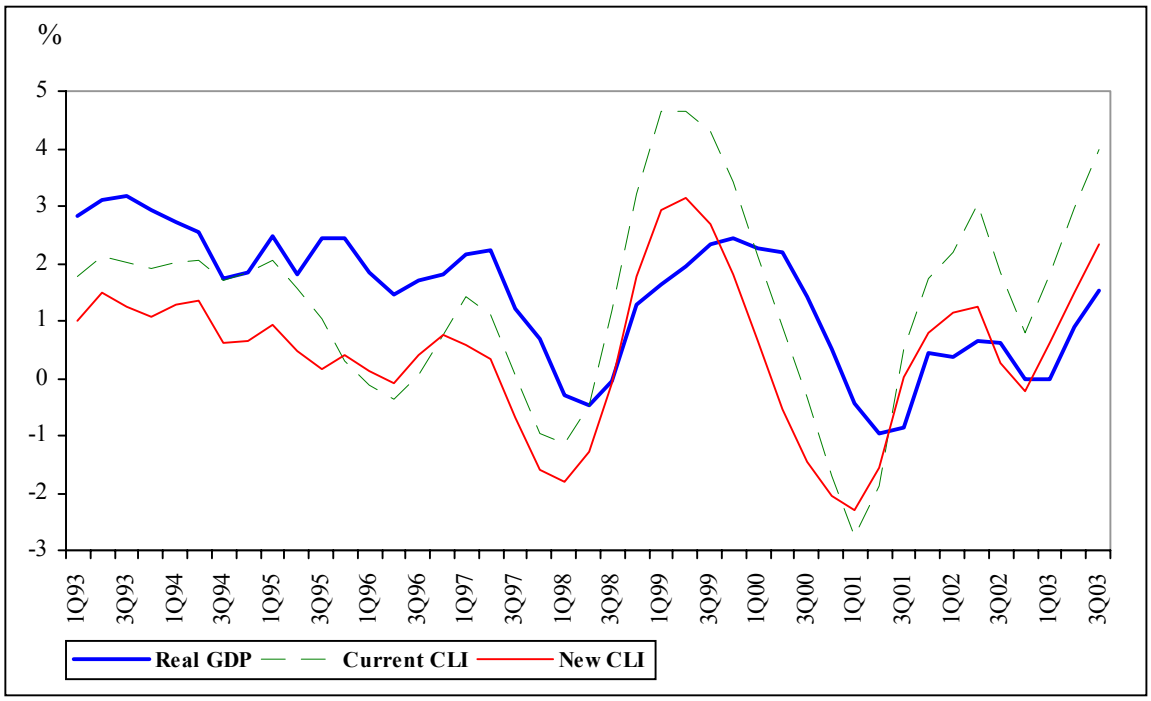
49. Even though the CCI is a broad aggregate measure showing changes in the direction of economic activity, real GDP remains the single most important economic indicator that policy-makers and economists focus on. Thus, it will be useful to examine the lead of the CLI with respect to the turning points in real GDP.

50. As both real GDP and CLI are available on a quarterly basis, a simple 5-period moving average of the quarter-on-quarter changes in growth rates is used in the evaluation. This method of presenting and analysing simple growth rates of data series has been used by TCB. The identification of turning points can be made with greater ease as such a series is smoother than the more commonly used quarter-on-quarter annualised rates of change. Table 3 shows the turning points of real GDP, the current CLI and the new CLI using a 5-period moving average of quarter-on-quarter growth rates since 1990. Chart 2 presents the (adjusted) growth rates of these series.

Table 3
Turning points of real GDP, current CLI and new CLI

Turning Points of Real GDP	Current CLI	Lead (-)/Lag (+)	New CLI	Lead (-)/Lag (+)
3Q93 (P)	2Q93	-1Q	2Q93	-1Q
2Q96 (T)	2Q96	0Q	2Q96	0Q
2Q97 (P)	1Q97	-1Q	4Q96	-2Q
2Q98 (T)	1Q98	-1Q	1Q98	-1Q
4Q99 (P)	1Q99	-3Q	2Q99	-2Q
2Q01 (T)	1Q01	-1Q	1Q01	-1Q
2Q02 (P)	2Q02	0Q	2Q02	0Q
4Q02 (T)	4Q02	0Q	4Q02	0Q
Average Lead		**-0.9Q**		**-0.9Q**

Chart 2
5-period moving average of quarter-on-quarter growth rates of
real GDP, current CLI and new CLI



51. Similar to the current CLI, the revised CLI leads real GDP by 0.9Q on a quarterly basis since 1990. However, the maximum cross-correlation of the new CLI with real GDP is 0.63 at a lead of 1.3Q. This is better than that of the current CLI, whose cross-correlation with real GDP is 0.56 at the same lead.

52. A close examination of the contraction between Q1 95 and Q2 96 shows that this phase is relatively mild with the (adjusted) growth rate of real GDP declining by only 1.0 percentage-points over 6 quarters. During the same period, the (adjusted) growth rates of the current CLI and manufacturing sector fell by 2.4 and 3.4 percentage-points respectively. The slower decline in GDP relative to manufacturing could be explained by the strong growth of the other sectors during this period. With its over-emphasis on the manufacturing sector, the current CLI has a tendency to indicate a 'false alarm' of an impending recession whenever there is a sharp decline in the manufacturing sector.

53. In contrast, the revised CLI does not record this 'false alarm', declining only 1.1 percentage-points during the same period, which is very similar to the decline recorded by real GDP. The revised CLI's reduced emphasis on the manufacturing sector provides a better balance in anticipating both the CCI and real GDP.

VIII. Concluding Remarks

54. The revisions to Singapore's CCI and CLI have enhanced their performances in identifying and anticipating Singapore's growth cycles. Chart 3 shows the revised CCI and CLI in level terms while Chart 4 illustrates the trend-adjusted revised CCI and CLI.

Chart 3
Revised CCI and CLI

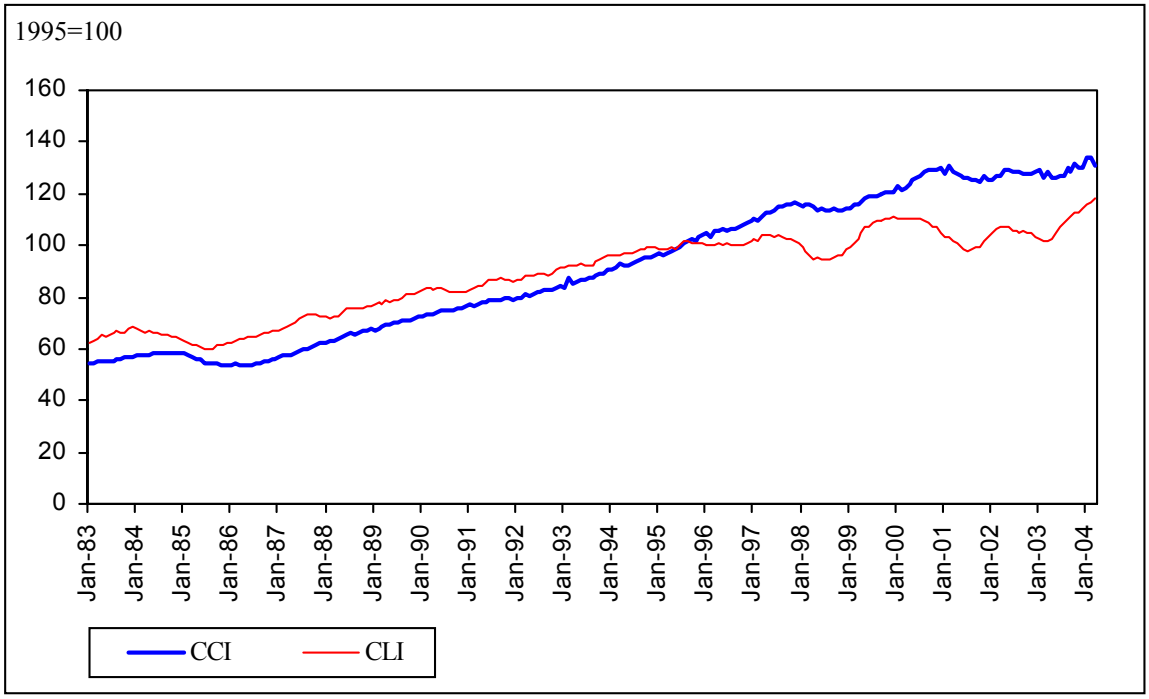
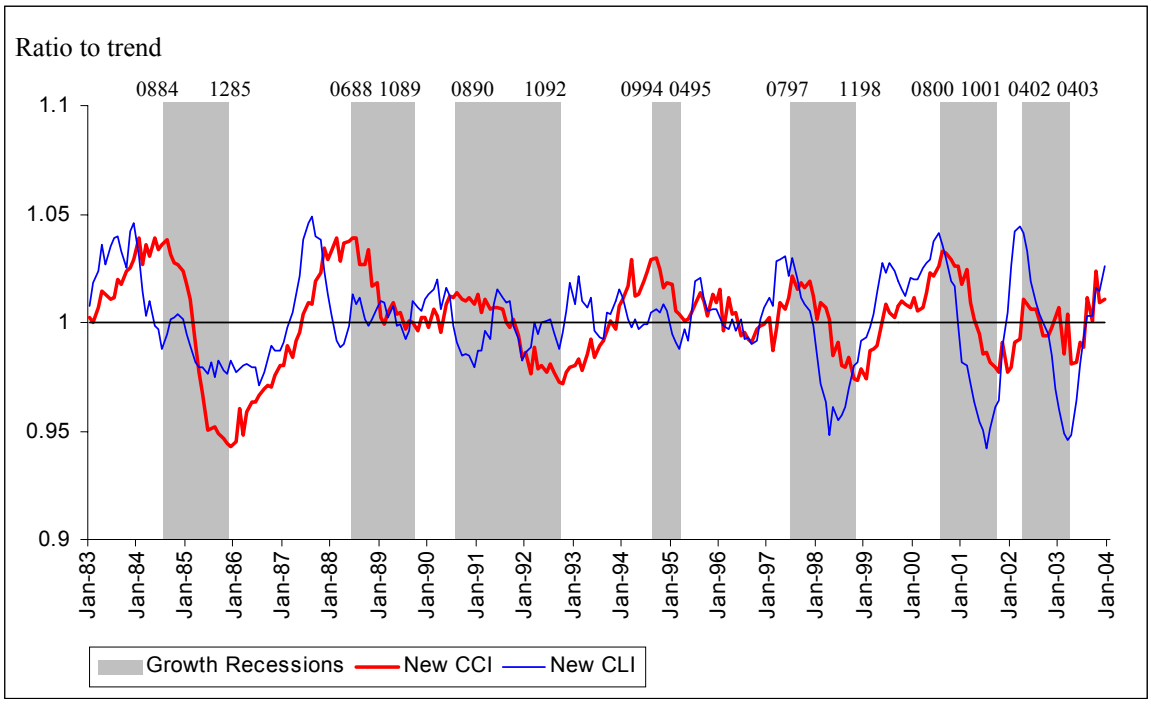


Chart 4
Revised CCI and CLI (Trend-adjusted)



55. In revising the CCI, two of the existing six components have been dropped while the RSI has been added to provide a broader coverage of the service industries. The revised CCI provides a more comprehensive measure of Singapore's aggregate economic activity and reflects better the economy's growth cycle fluctuations.

56. In the revision of the CLI, four of the existing components were replaced by four new indicators, i.e. the US PMI, Non-oil Seaborne Cargo Handled, DLI and Non-oil Retained Imports, which were incorporated to improve the overall leading properties of the new CLI. The revised CLI was found to anticipate better both the CCI and GDP.

SINGAPORE DEPARTMENT OF STATISTICS
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Table A.1: Cyclical Timing and Summary Measures of Current Leading Economic Indicators

CCI		Current CLI			Total New Companies			CPF Default Rate			DSPI			M2		
Dates	P/T	Dates	P/T	L/Lg	Dates	P/T	L/Lg	Dates	P/T	L/Lg	Dates	P/T	L/Lg	Dates	P/T	L/Lg
Aug-84	P	Nov-83	P	-9	Oct-83	P	-10	Feb-84	P	-6	Nov-83	P	-9	Jul-83	P	-13
Dec-85	T	May-85	T	-7	Aug-85	T	-4	Dec-85	T	0	Feb-86	T	+2	Mar-86	T	+3
Jun-88	P	-	-	-	Jun-87	P	-12	Dec-87	P	-6	Jan-88	P	-5	Dec-87	P	-6
Oct-89	T	-	-	-	Mar-88	T	-19	Apr-89	T	-6	Jun-90	T	+8	Jan-89	T	-9
Aug-90	P	Jan-90	P	-7	Apr-90	P	-4	Sep-89	P	-11	May-91	P	+9	Oct-90	P	+2
					Feb-91	T	X									
Oct-92	T	Jun-93	T	8	-	-	-	Jun-92	T	-4	Jan-92	T	-9	Jan-92	T	-9
														Jul-92	P	X
Sep-94	P	Apr-94	P	-5	Apr-93	P	-17*	Jan-95	P	+4	-	-	-	-	-	-
Apr-95	T	Feb-95	T	-2	Apr-95	T	0	Feb-97	T	X	-	-	-	Feb-94	T	-14
Jul-97	P	Jul-97	P	0	Feb-97	P	-5	Sep-97	P	+2	Feb-98	P	+7	Jul-96	P	-12
Nov-98	T	Jun-98	T	-5	May-98	T	-6	Dec-98	T	+1	Nov-98	T	0	Oct-97	T	-13
Aug-00	P	Aug-00	P	0	Mar-00	P	-5	May-01	P	+9	May-00	P	-3	Dec-99	P	-8
Oct-01	T	Aug-01	T	-2	Nov-01	T	+1	-	-	-	Sep-01	T	-1	Oct-00	T	-12
Apr-02	P	Apr-02	P	0				-	-	-	-	-	-	Nov-01	P	-5
Apr-03	T	Feb-03	T	-2				-	-	-	-	-	-	Jan-03	T	-3
From 1990-																
Average (P)				-2.40			-4.67			1.00			+4.33			-5.75
Average (T)				-0.60			-1.67			-1.50			-3.33			-10.20
Median (all turns)				-2.00			-4.50			1.50			-0.50			-9.00
Correlation				0.52			0.75			0.40			0.45			0.30
Months lead/lag				-4.0			-4.0			3.0			-3.0			-4.0
MCD				1			5			4			1			2

Notes: The median lead (-) or lag (+) in months is the middle value in an odd-numbered array and the average of the two middle values in an even-numbered array; X's are extra turns recorded by indicators that cannot be matched to turning points in the reference cycle chronology; the correlations shown are the maximum cross-correlation with the CCI at months lead/lag given.

Table A.1: Cyclical Timing and Summary Measures of Current Leading Economic Indicators (con't)

CCI		SES Indices			ULC			Stock of Finished Goods			New Orders			Wholesale Trade		
Dates	P/T	Dates	P/T	L/Lg	Dates	P/T	L/Lg	Dates	P/T	L/Lg	Dates	P/T	L/Lg	Dates	P/T	L/Lg
Aug-84	P	Jan-84	P	-7	Nov-83	P	-9	Nov-83	P	-9	Dec-83	P	-8	Nov-83	P	-9
Dec-85	T	Apr-86	T	+4	Nov-85	T	-1	Jul-85	T	-5	May-85	T	-7	Apr-85	T	-8
Jun-88	P	Jul-87	P	-11	May-88	P	-1	Feb-89	P	+8	Jul-88	P	+1	Aug-87	P	-10
Oct-89	T	Feb-88	T		Feb-89	T	-8	Nov-89	T	+1	May-89	T	-5	Apr-89	T	-6
Aug-90	P	Feb-90	P	-6	Feb-91	P	+6	Jun-90	P	-2	Apr-90	P	-4	Oct-89	P	-10
Oct-92	T	Feb-93	T	+4	May-92	T	-5	May-91	T	-17*	Jul-91	T	-15*	Aug-92	T	-2
Sep-94	P	Jan-94	P	-8	May-94	P	-4	-	-	-	-	-	-	Oct-93	P	-11
Apr-95	T	Feb-95	T	-2	Feb-95	T	-2	-	-	-	-	-	-	Apr-94	T	-12
Jul-97	P	Aug-97	P	+1	Nov-97	P	+4	May-97	P	-2	Jul-97	P	0	May-97	P	-2
Nov-98	T	Sep-98	T	-2	Aug-98	T	-3	May-98	T	-6	Jun-98	T	-5	May-98	T	-6
Aug-00	P	Dec-99	P	-8	Aug-00	P	0	Jun-00	P	-2	Jul-00	P	-1	Jul-99	P	-13
Oct-01	T	Oct-01	T	0	Sep-01	T	-1	Jun-01	T	-4	Sep-01	T	-1	Jul-01	T	-3
Apr-02	P	Mar-02	P	-1				Feb-02	P	-2	Apr-02	P	0	Apr-02	P	0
Apr-03	T	Mar-03	T	-1				Feb-03	T	-2				Feb-03	T	-2
From 1990-																
Average (P)				-4.40			+1.50			-2.00			-1.25			-7.20
Average (T)				-0.20			-2.75			-4.00			-3.00			-5.00
Median (all turns)				-1.50			-1.50			-2.00			-1.00			-4.50
Correlation				0.48			0.48			0.46			0.60			0.52
Months lead/lag				-3.0			-4.0			-4.0			-4.0			-4.0
MCD				2			1			2			1			2

Notes: * Not included in computation for Average (P), Average (T) and Median

Table A.2: Cyclical Timing and Summary Measures of New Leading Economic Indicators

CCI		New CLI			Total New Companies			M2			SES Indices			Stock of Finished Goods		
Dates	P/T	Dates	P/T	L/Lg	Dates	P/T	L/Lg	Dates	P/T	L/Lg	Dates	P/T	L/Lg	Dates	P/T	L/Lg
Aug-84	P	Dec-83	P	-8	Oct-83	P	-10	Jul-83	P	-13	Jan-84	P	-7	Nov-83	P	-9
Dec-85	T	Jul-86	T	+7	Aug-85	T	-4	Mar-86	T	+3	Apr-86	T	+4	Jul-85	T	-5
Jun-88	P	Aug-87	P	-10	Jun-87	P	-12	Dec-87	P	-6	Jul-87	P	-11	Feb-89	P	+8
Oct-89	T	Mar-88	T	-19	Mar-88	T	-19	Jan-89	T	-9	Feb-88	T		Nov-89	T	+1
Aug-90	P	Mar-90	P	-5	Apr-90	P	-4	Oct-90	P	+2	Feb-90	P	-6	Jun-90	P	-2
		Dec-90	T	X	Feb-91	T	X									
Oct-92	T	-	-	-	-	-	-	Jan-92	T	-9	Feb-93	T	+4	May-91	T	-17*
								Jul-92	P	X						
Sep-94	P	Dec-93	P	-9	Apr-93	P	-17*	-	-	-	Jan-94	P	-8	-	-	-
Apr-95	T	Mar-95	T	-1	Apr-95	T	0	Feb-94	T	-14	Feb-95	T	-2	-	-	-
Jul-97	P	May-97	P	-2	Feb-97	P	-5	Jul-96	P	-12	Aug-97	P	+1	May-97	P	-2
Nov-98	T	Apr-98	T	-7	May-98	T	-6	Oct-97	T	-13	Sep-98	T	-2	May-98	T	-6
Aug-00	P	Jul-00	P	-1	Mar-00	P	-5	Dec-99	P	-8	Dec-99	P	-8	Jun-00	P	-2
Oct-01	T	Jul-01	T	-3	Nov-01	T	+1	Oct-00	T	-12	Oct-01	T	0	Jun-01	T	-4
Apr-02	P	Mar-02	P	-1				Nov-01	P	-5	Mar-02	P	-1	Feb-02	P	-2
Apr-03	T	Feb-03	T	-2				Jan-03	T	-3	Mar-03	T	-1	Feb-03	T	-2
From 1990-																
Average (P)				-3.60			-4.67			-5.75			-4.40			-2.00
Average (T)				-3.25			-1.67			-10.20			-0.20			-4.00
Median				-2.00			-4.50			-9.00			-1.50			-2.00
Correlation				0.62			0.75			0.30			0.48			0.46
Months lead/lag				-4.0			-4.0			-4.0			-3.0			-4.0
MCD				1			5			2			2			2

Notes: * Not included in computation for Average (P), Average (T) and Median

Table A.2: Cyclical Timing and Summary Measures of New Leading Economic Indicators (con't)

CCI		Wholesale Trade			US PMI			Seaborne Cargo			DLI[3]			Non-oil Retained Imports		
Dates	P/T	Dates	P/T	L/Lg	Dates	P/T	L/Lg	Dates	P/T	L/Lg	Dates	P/T	L/Lg	Dates	P/T	L/Lg
Aug-84	P	Nov-83	P	-9	Nov-83	P	-9	Jul-84	P	-1	NA			May-83	P	-15
Dec-85	T	Apr-85	T	-8	Sep-84	T	-15	Dec-85	T	0	NA			Jun-85	T	-6
Jun-88	P	Aug-87	P	-10	Sep-87	P	-9				NA			-	-	-
Oct-89	T	Apr-89	T	-6	Aug-89	T	-2				Jun-89	T	-4	-	-	-
Aug-90	P	Oct-89	P	-10	May-90	P	-3	Nov-89	P	-9	Mar-90	P	-5	Jan-90	P	-7
Oct-92	T	Aug-92	T	-2	Dec-91	T	-10	Dec-91	T	-10	-	-	-	Jun-92	T	-4
								Jan-93	P	X						
Sep-94	P	Oct-93	P	-11	Oct-94	P	+1	-	-	-	-	-	-	Mar-94	P	-6
Apr-95	T	Apr-94	T	-12	Jan-96	T	+9	Jun-94	T	-10	Apr-95	T	0	Feb-95	T	-2
Jul-97	P	May-97	P	-2	Nov-97	P	+4	Apr-97	P	-3	Nov-97	P	+4	Sep-97	P	+2
Nov-98	T	May-98	T	-6	Dec-98	T	+1	Mar-98	T	-8	Oct-98	T	-1	Sep-98	T	-2
Aug-00	P	Jul-99	P	-13	Nov-99	P	-9	Mar-00	P	-5	Aug-99	P	-12	Aug-00	P	0
Oct-01	T	Jul-01	T	-3	Jan-01	T	-9	Jan-01	T	-9	Sep-01	T	-1	Aug-01	T	-2
Apr-02	P	Apr-02	P	0	Mar-02	P	-1	May-02	P	+1	Aug-02	P	+4			
Apr-03	T	Feb-03	T	-2	Apr-03	T	0	Mar-03	T	-1	Feb-03	T	-2			
From 1990-																
Average (P)				-7.20			-1.60			-4.00			-2.25			-2.75
Average (T)				-5.00			-1.80			-7.60			-1.00			-2.50
Median (all turns)				-4.50			-0.50			-8.00			-1.00			-2.00
Correlation				0.52			0.44			0.40			0.40			0.43
Months lead/lag				-4.0			-9.0			-3.0			-1.0			-1.0
MCD				2			2			3			5			4

[3] DLI is only available from 1989.