



Defining, Measuring, and Predicting Business Cycles with Composite Indexes

Prepared for UN-CIRET **Workshop on short-term economic indicators**

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Forthcoming: Handbook of Composite Cyclical Indicators (joint with UNSD, Eurostat, The Conference Board)

■ Objectives:

- ✓ Providing statistical guidance on harmonized principles for the applications on cyclical composite indexes, standards for compilation and presentation
- ✓ Assisting providers in producing consistent and comparable composite indexes, enabling international comparisons based on best practices
- ✓ Supports development of comprehensive systems of cyclical measures
 - Methodological foundations
 - Practical guidance



Outline:

- Section 1: Introduction and definitions
 - ✓ A brief history of business cycle measurement and analysis
- Section 2: Data availability, frequency, and adjustment techniques
- Section 3: Variable and model selection techniques
- Section 4: Indicators measuring cyclical movements
- Section 5: Indicators for turning points detection
- Section 6: indicators measuring economic growth
- Section 7: Validation using real time data and forecasting
- Section 8: Guidelines for the construction of cyclical composite indicators



Working group

- UNSD
- Eurostat
- Statistics Netherlands
- The Conference Board



Status

- Draft handbook to be circulated among CIRET participants and core group of reviewers
- UN web site for review and feedback from the statistical community



Business Cycle Indicators (BCI - LEI) Program at The Conference Board

- Transfer from BEA 1995 (Leading Index, BCI Database)
- BCI advisory board
- Evaluation and updating composite indicators, 1996
- Global Indicators since 2000
- Economic theory informs selection of indicators but country specific features influence choice
- Updated LEI methodology in 2001 and 2005
- Introduction of statistical imputation, 2001
- Comprehensive benchmark revisions, 2012
- “Real” time analytic and production goals
- <http://www.conference-board.org/economics/bci>



Global Business Cycle Indicators Program (BCI - LEI)

- Introduced indexes for ten new countries since 2000
- Australia, Brazil, China, Euro Area, France, Germany, India, Japan, Mexico, South Korea, Spain, United Kingdom
- Consistent selection and calculation methodology allows international comparisons



Business cycles defined

“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.”

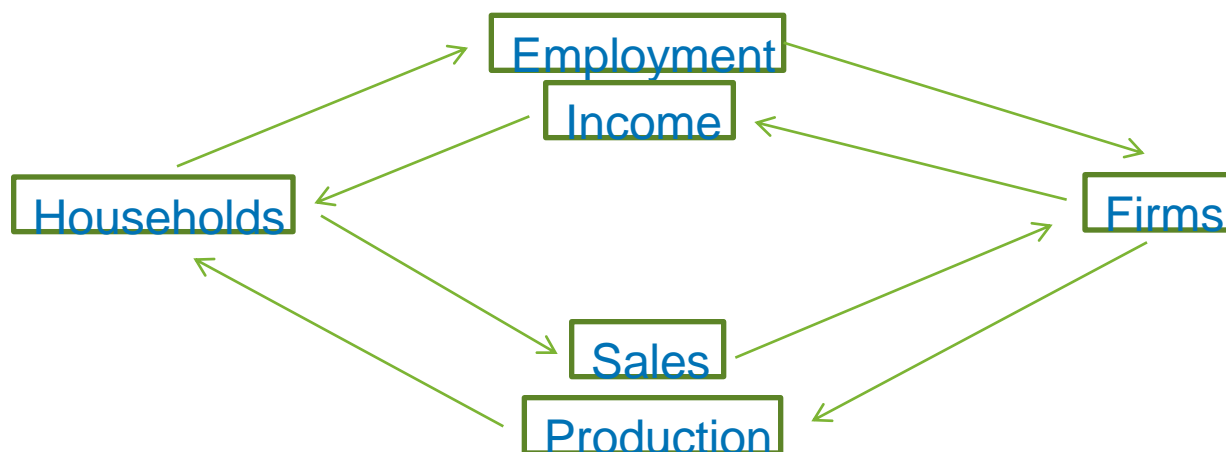
Wesley C. Mitchell, (1927), *Business Cycles: The Problem and Its Setting*, New York, NY: National Bureau of Economic Research.

Burns, A. F., and Mitchell, W. C. (1946), *Measuring Business Cycles*, New York, NY: National Bureau of Economic Research.



What is the business cycle?

- Coincident indicators define the business cycle in levels of economic activity in
 - Employees on Non-Agricultural Payrolls
 - Index of Industrial Production
 - Real Personal Income less Transfer Payments
 - Real Manufacturing and Trade Sales



The indicator approach to business cycle analysis

- Recurring and uniform sequences in economic activity
- Relationships between non-seasonal part of data is main concern in business cycle analysis
- Sequences are revealed in seasonally adjusted indicators, classified according to cyclical timing
 - ✓ Coincident indicators measure current conditions.
 - ✓ Leading indicators move in advance of coincident indicators.
 - ✓ Lagging indicators move after coincident indicators.
- Indicator approach is based on recurrence of these timing sequences and relationships between types of economic activity
- Composite indexes help define and predict turning points

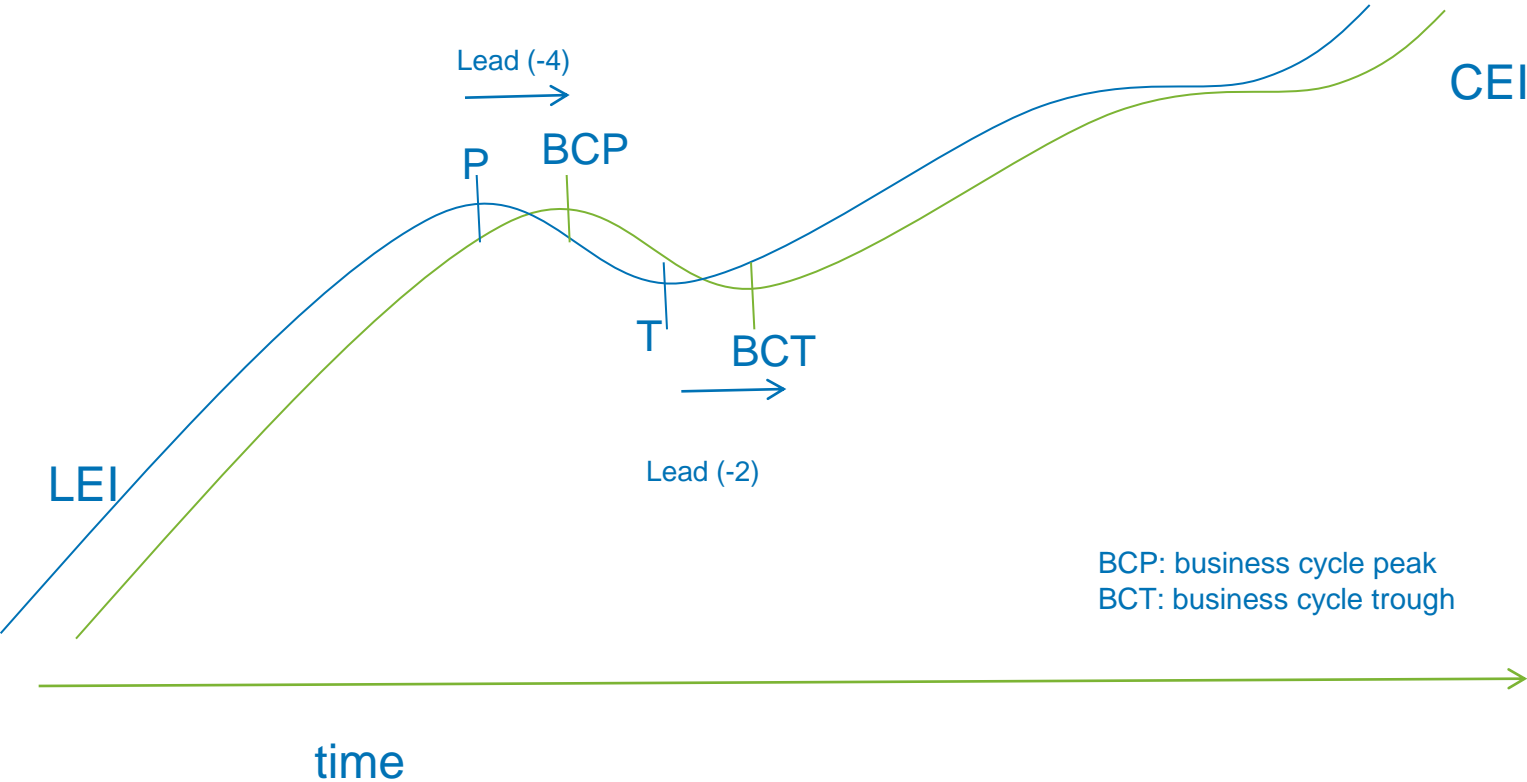


Composite indexes:

- Inform the short term forecast and economic outlook
- Track business cycles and anticipate their turning points
- The approach is focused on recessions or slowdowns
- International comparability is an important aspect



Cyclical timing: leading vs. coincident indicators



The Conference Board selection criteria for composite index components

- Economic Significance — cyclical timing must have economic meaning and be logical
- Conformity — the series must conform well to the business cycle
- Consistent Timing — the series must exhibit a consistent timing pattern as a leading, coincident or lagging indicator
- Smoothness — month-to-month movements must not be too erratic
- Statistical Adequacy — data must be collected and processed in a statistically reliable way (also must not have large and frequent revisions)
- Currency or Timeliness— series must be published on a reasonably prompt schedule, preferably within a month



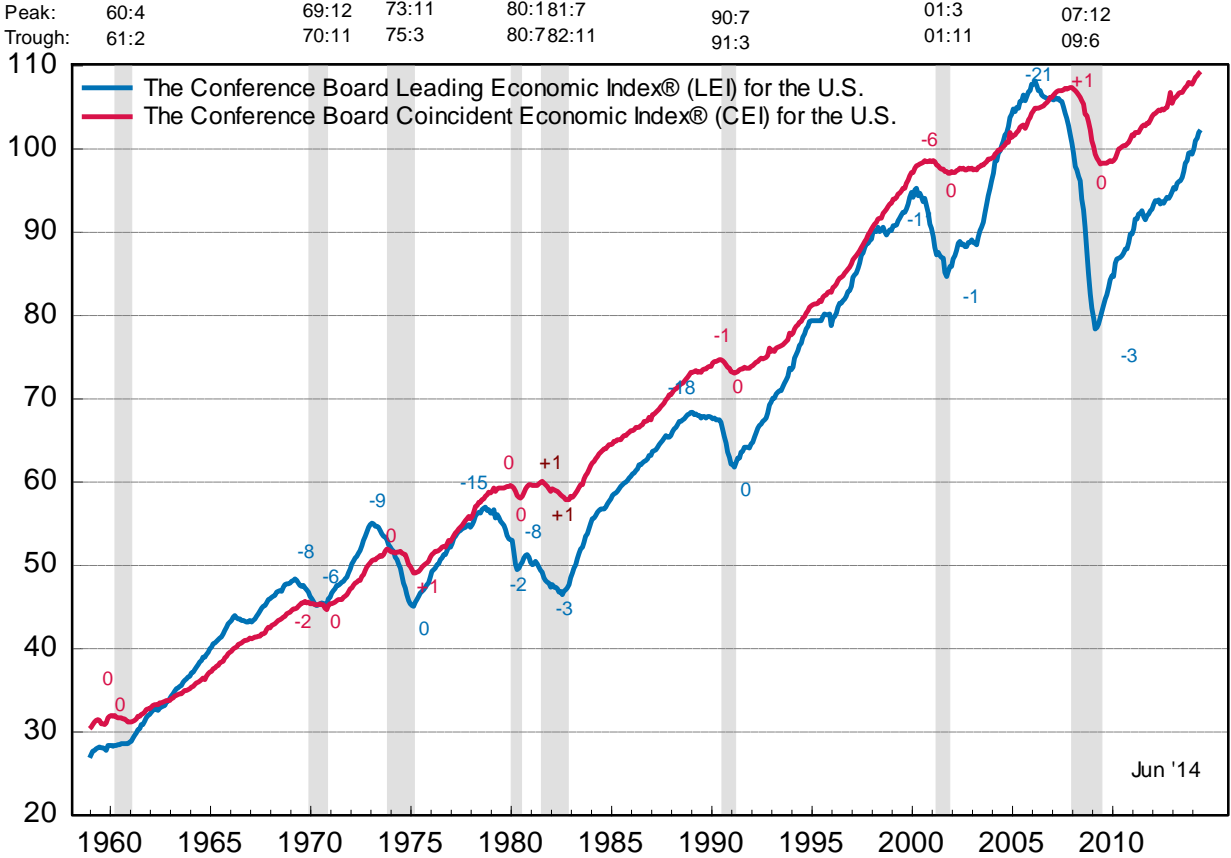
Construction of composite indexes

The indexes

- Bring cycles and turning points into focus
- “Real time” monitoring
- *The components are*
 - ✓ *Seasonally adjusted*
 - ✓ Deflated
 - ✓ Volatility adjusted
 - ✓ Weighted (equally or not)
 - ✓ Aggregated



Leading Economic Index summarizes and helps to predict the state of the economy and short term cyclical forces acting in and on it



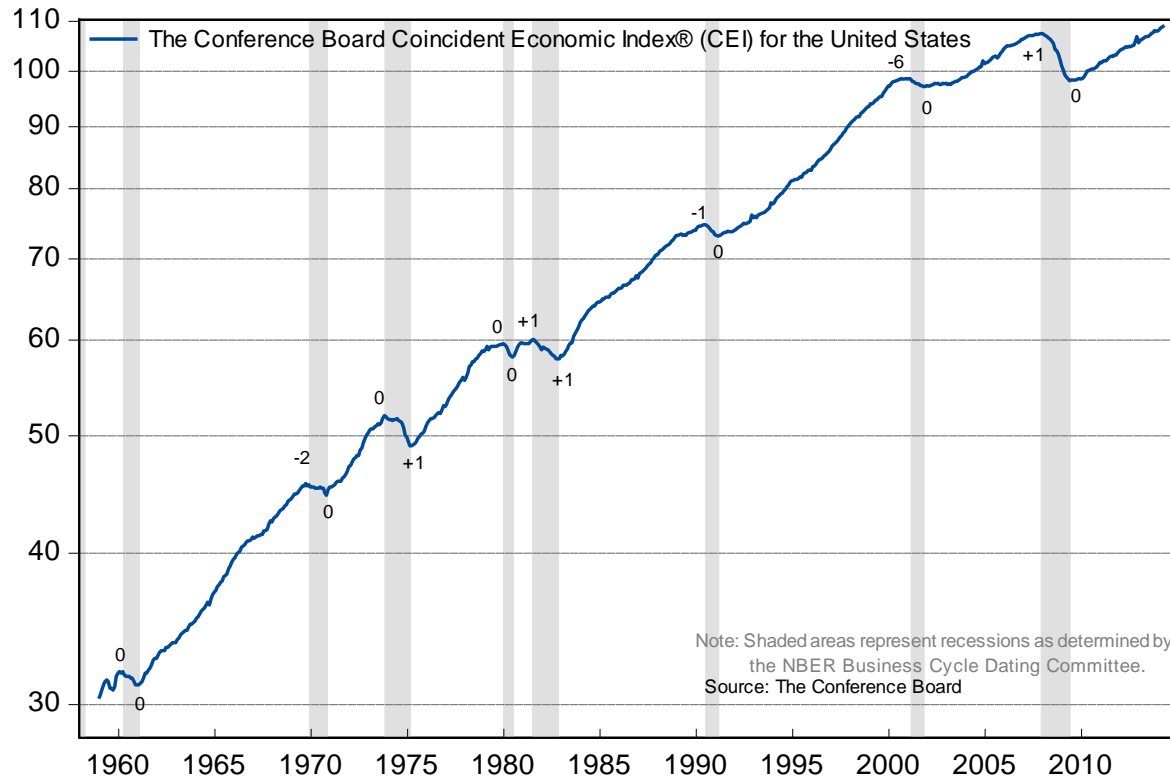
Note: Shaded areas represent recessions.
 Source: The Conference Board



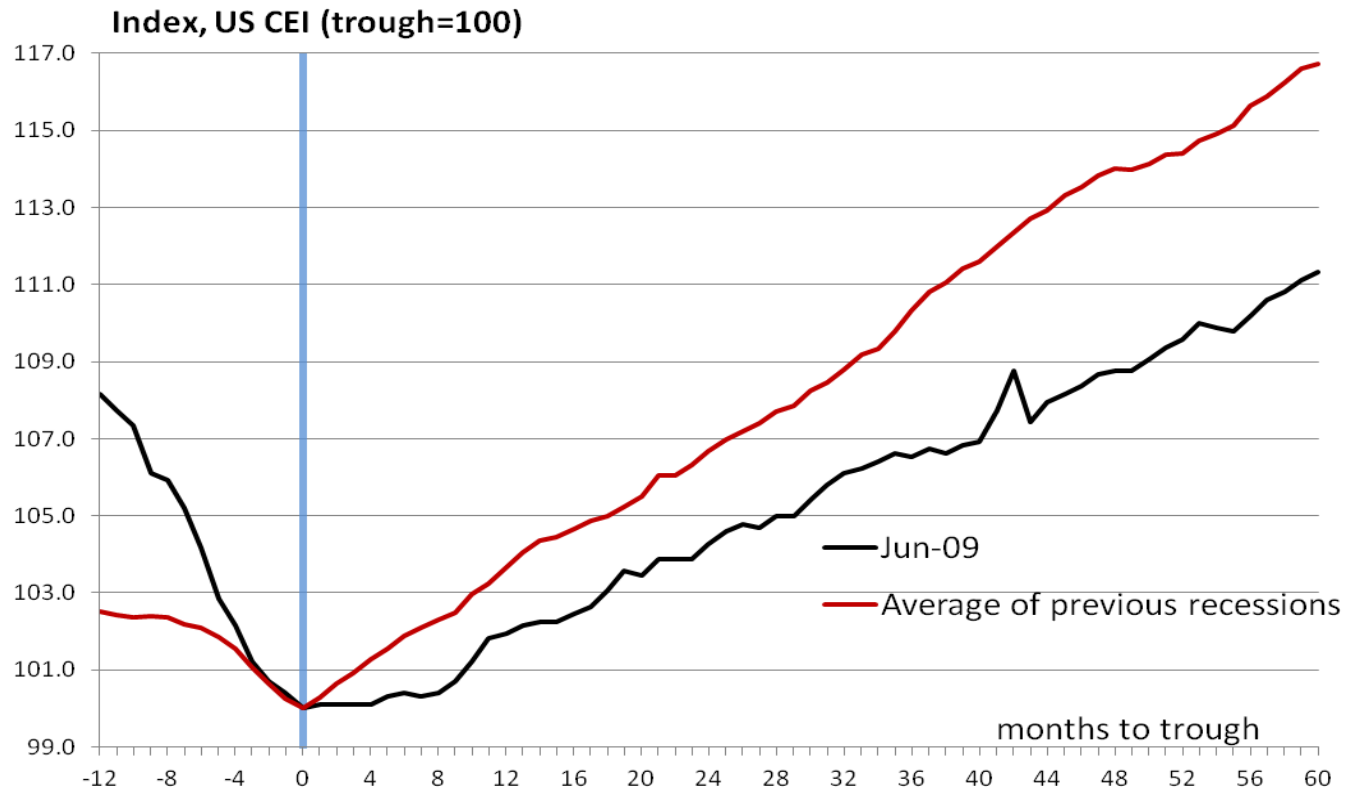
Coincident index closely tracks GDP; two consecutive declines in GDP is not a good rule to define a recession

5 recessions
in 25 years

3 recessions in
30 years



U.S. CEI shows slower than average recovery post great recession



Source: The Conference Board. Recession dates are decided by NBER.



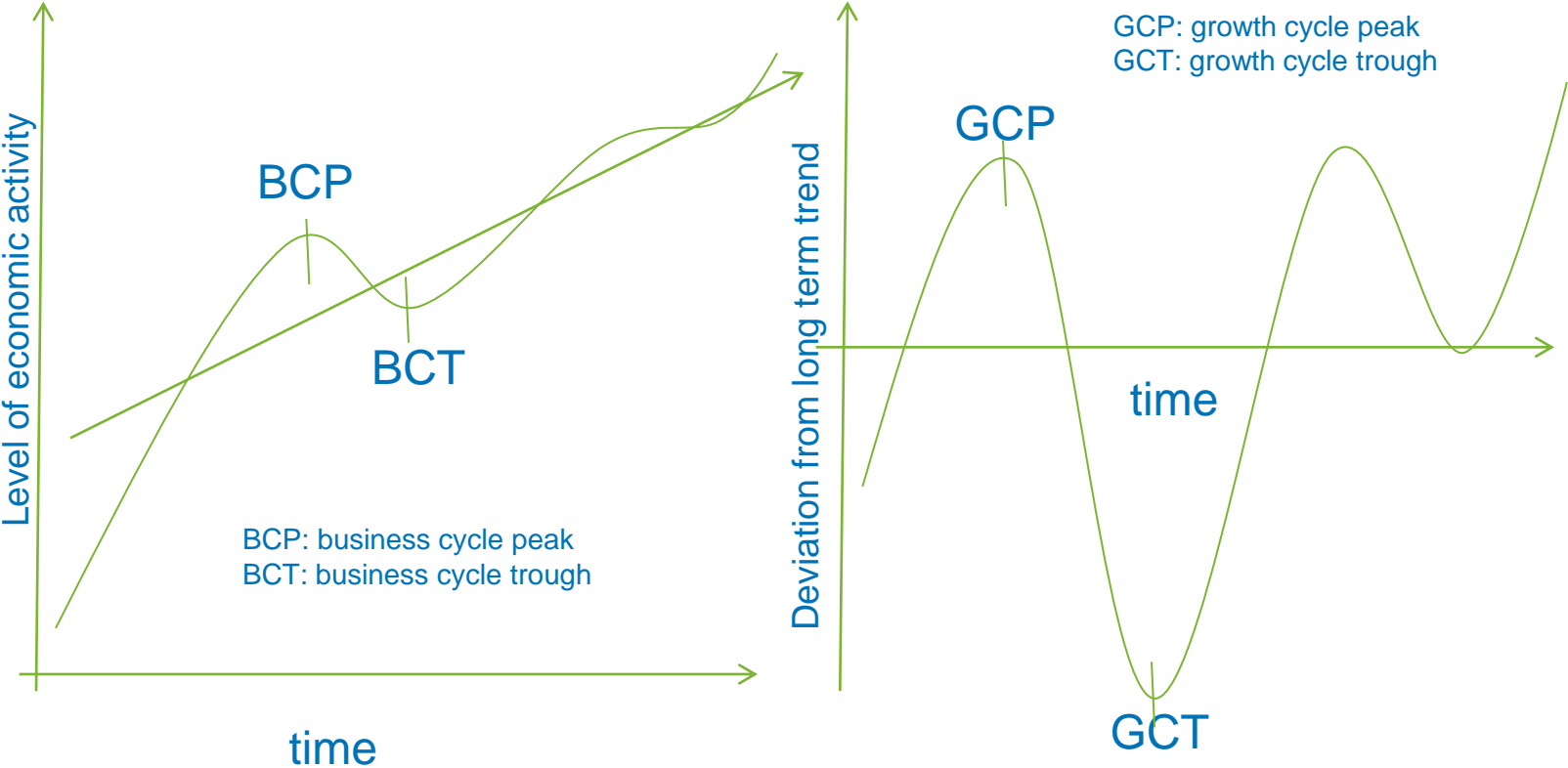
Chronology of business cycle turning points compared with CEI turning points

Coincident Economic Indexes (CEI)		North America				Europe					Asia-Pacific				
		U.S.		Mexico		Euro Area		France	Spain	Germany		United Kingdom	Australia	Japan	Korea
Turning Points (all countries)		Coincident Index	Coincident Index	Coincident Index	Coincident Index	Coincident Index	Coincident Index	Coincident Index	Coincident Index	Coincident Index	Coincident Index	Coincident Index	Coincident Index	Coincident Index	Coincident Index
Timing at Business Cycle Peaks															
1960's	Apr-60	0								May-66	-2		Dec-60	0	
	Dec-69	-2													
1970's	Nov-73	0			Aug-74	na	Aug-74	0		May-73	-1	Jun-73	4	Mar-74	3
										Nov-79	0	Aug-76	0	Feb-73	0
1980's	Jan-80	0	Nov-81	4	Mar-80	na	Feb-80	-1		Mar-80	0	May-82	-1	Sep-79	1
	Jul-81	-1	Sep-85	2			Oct-82	0							Aug-88
1990's	Jul-90	1	Nov-92	0	Feb-92	-12	Mar-92	1	Feb-92	0	Feb-91	0	May-90	0	Jul-90
			Nov-94	0						Feb-91	0	May-95	-5	Nov-91	-2
2000's	Mar-01	-1	Oct-00	1			Aug-02	2		Mar-01	-3			Mar-97	0
	Dec-07	1												Dec-00	0
														Nov-07	
Mean		-0.3		1.4		-12.0		0.4	0.0		-1.8		1.3		0.4
Median		0.0		1.0		-12.0		0.0	0.0		-1.5		0.0		0.0
St. Deviation		1.0		1.7		NA		1.1	NA		1.9		2.3		1.5
Extra Turns		0		0		1		0	0		1		1		0
Missed Turns		0		0		0		0	0		1		0		0
Number of Cycles		8		5		3		5	1		6		3		5
Timing at Business Cycle Troughs															
1960's	Feb-61	-1								May-67	0		May-61	0	
1970's	Nov-70	0			May-75	na	Mar-75	0		Oct-75	2	Aug-75	3	Mar-75	0
	Mar-75	0												Apr-77	3
1980's	Jul-80	-1	Jul-83	0	Nov-82	na	Aug-81	0		Nov-82	8	Feb-82	9	May-83	0
	Nov-82	1	Jan-87	0			Dec-84	6							Jun-80
1990's	Mar-91	0	Oct-93	3	Jul-93	1	Aug-93	1	May-93	0	Jul-93	4	Dec-92	1	Jul-91
			Jul-95	0							Feb-96	1			Feb-94
2000's	Nov-01	-2	Mar-02	0			May-03	0			Aug-03	0			Jul-98
	Jun-09	0												Feb-99	-3
														Jan-02	5
Mean		-0.4		0.6		1.0		1.4	0.0		2.5		4.3		0.2
Median		0.0		0.0		1.0		0.0	0.0		1.5		3.0		0.0
St. Deviation		0.9		1.3		NA		2.6	NA		3.1		4.2		1.8
Extra Turns		0		0		1		0	0		2		1		1
Missed Turns		0		0		0		0	0		2		0		0
Number of Cycles		8		5		3		5	1		6		3		4
Combined Statistics															
Mean		-0.3		1.0		-5.5		0.9	0.0		0.3		2.8		0.3
Median		0.0		0.0		-5.5		0.0	0.0		0.0		2.0		0.0
St. Deviation		0.9		1.5		9.2		2.0	0.0		3.3		3.4		1.6

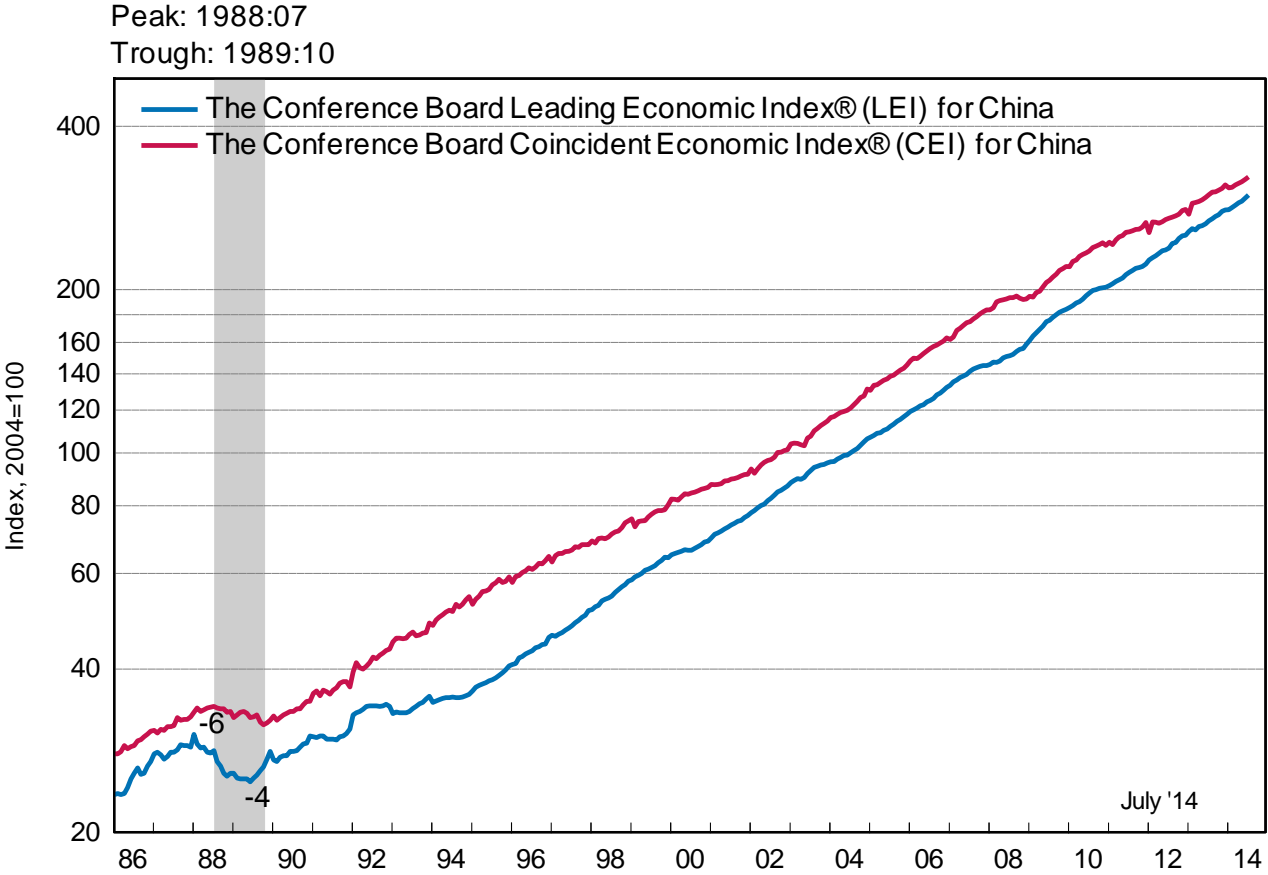
Source: The Conference Board



Using CEIs to define business cycles vs. growth cycles



The level of the China LEI and CEI shows only one classical business cycle



Note: The shaded areas represent business cycle recessions determined by The Conference Board Coincident Economic Index for China.
Source: The Conference Board



The Conference Board Coincident Economic Index® (CEI) for China: Components

- **Value-Added Industrial Production**
(Billions of 2004 Yuan, deflated by PPI, S.A.)
- **Retail Sales of Consumer Goods**
(Billions of 2004 Yuan, deflated by RPI, S.A.)
- **Volume of Passenger Traffic**
(Person Bn-Kilo, S.A.)
- **Electricity Production**
(Billions of KWH, S.A.)
- **Manufacturing Employment**
(Person Mn, S.A.)



CEI sectoral coverage

Relevant sectors	Indicator Name
Manufacturing	Value added of industrial production*
Manufacturing	Manufacturing employment
Household & consumer attitudes	Retail sales of consumer goods
Household and consumer attitudes / overall economic activity	Volume of passenger traffic
Overall economic activity	Electricity production

* Note: gross value of industrial output used for January 1986 – December 1989



The Conference Board Leading Economic Index[®] (LEI) for China: Components

- **Consumer Expectations Index**
- **Total Loans Issued by Financial Institutions**
(Billions of 2004 Yuan, deflated by PPI, S.A.)
- **5000 Industry Enterprises Diffusion Index: Raw Materials Supply**
(S.A.)
- **PMI: Manufacturing: Supplier Delivery**
(S.A.)
- **PMI: Manufacturing: New Export Orders**
(S.A.)
- **Floor Space Started: Total**
(Thousands of Sq M, S.A.)

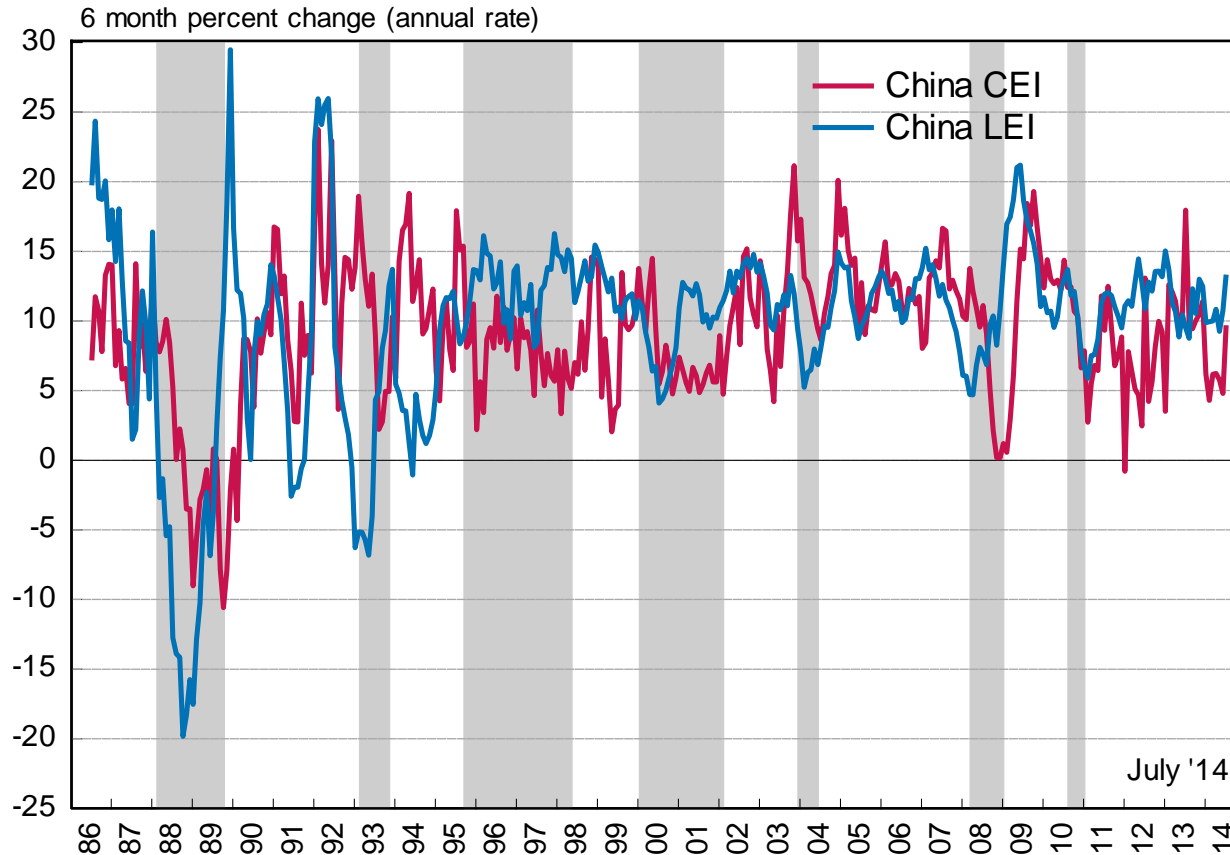


LEI sectoral coverage

Relevant sectors	Indicator Name
Money and credit	Total loans
Manufacturing / export	Exports (pre-2005) / PMI export orders (post- 2005)
Manufacturing	Manufacturing PMI Supplier Deliveries
Manufacturing	PBoC 5000 Raw Materials Supply sub-index
Household and consumer attitudes	Consumer expectations
Construction	Floor space started



Growth rate of the China LEI can help predicting short-term economic growth fluctuations, although policy moves often blur the picture

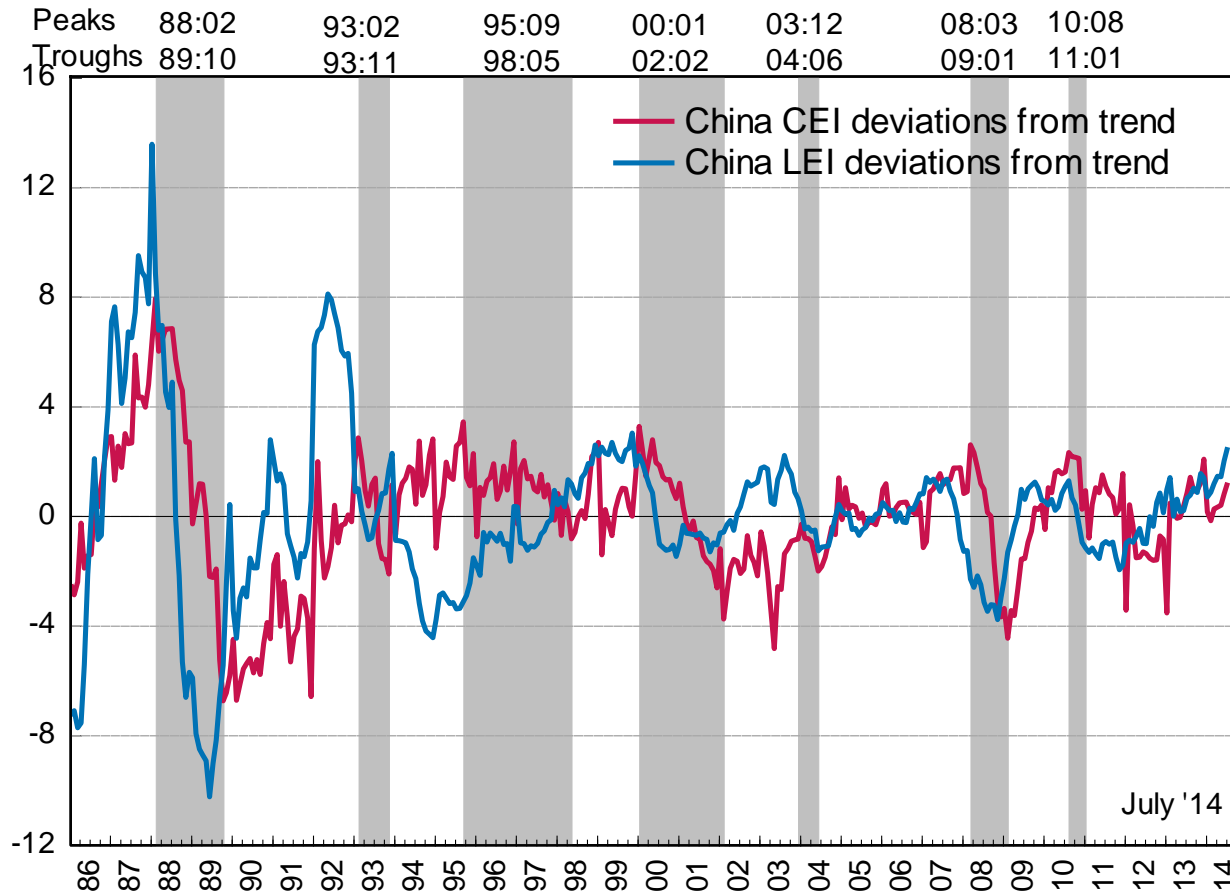


Note: The shaded areas represent growth cycle recessions determined by deviations from the trend of The Conference Board Coincident Economic Index for China.

Source: The Conference Board



Identifying growth slowdowns from China's long-term growth trend

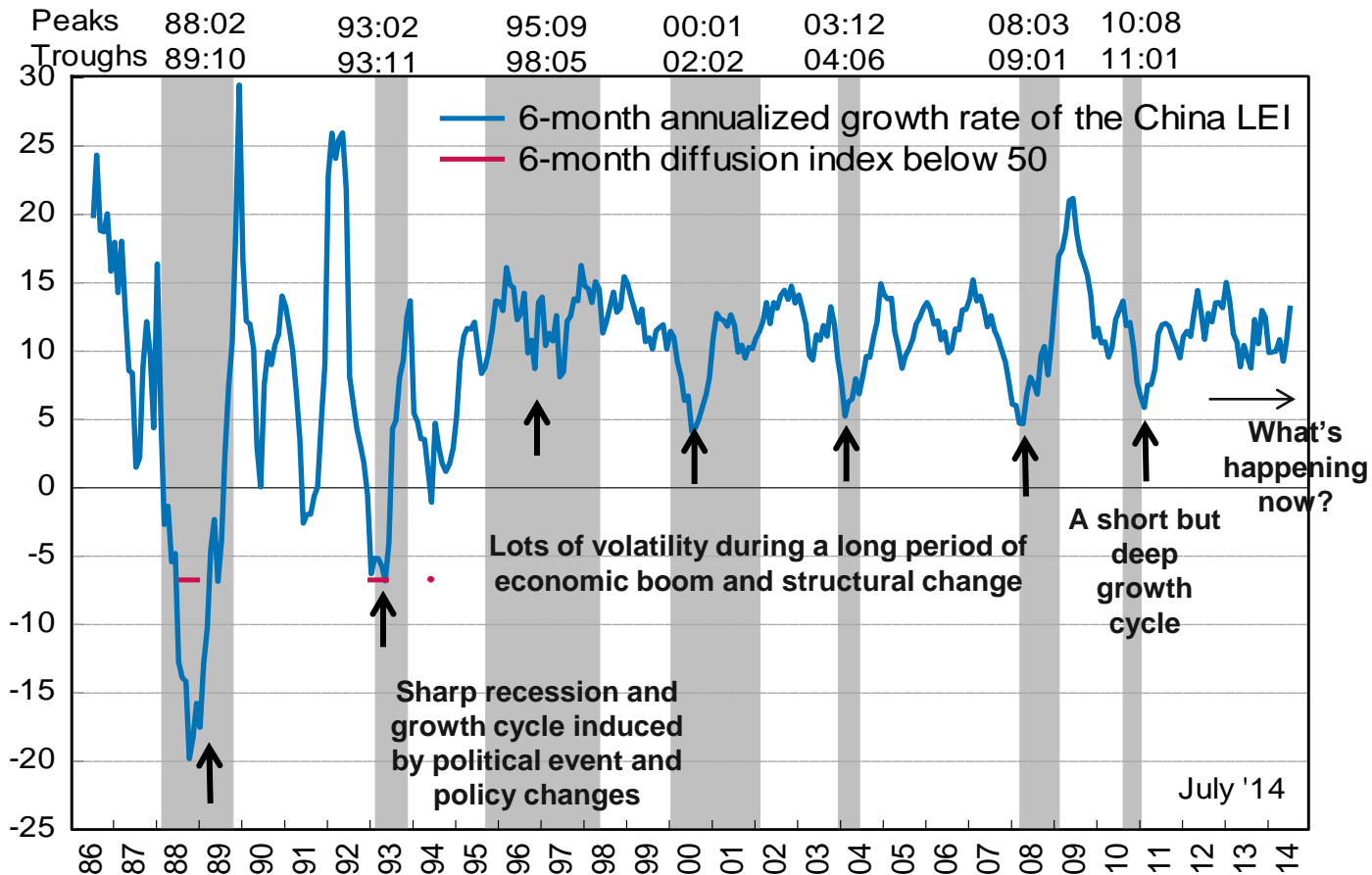


Note: The shaded areas represent growth cycle recessions determined by deviations from the trend of The Conference Board Coincident Economic Index for China.

Source: The Conference Board



Depth, Duration, and Diffusion (3Ds) of declines can help predict major contractions



Note: shaded areas represent chronologies derived from deviations from the trend of India CEI+GDP determined by Bry-Boschan algorithm

Source: The Conference Board



Growth cycles in China look increasingly synchronized with neighboring emerging economies

India CEI+GDP		China CEI		Correlations
Growth Cycles		Growth Cycles		at t=0
Peak	Trough	Peak	Trough	
		Feb-1988	Oct-1989	1990 - 2000
Mar-1991	Jan-1993	Feb-1993	Nov-1993	-0.20
Aug-1993	May-1994			
Feb-1996	Dec-1998	Sep-1995	May-1998	
Feb-2000	Feb-2003	Jan-2000	Feb-2002	2000 - 2012
Dec-2003	May-2004	Dec-2003	Jun-2004	0.75
Apr-2008	Feb-2009	Mar-2008	Jan-2009	
Feb-2011*		Aug-2010	Feb-2011	

* Tentative peak, no trough was found

Source: The Conference Board

