# PREDICTING RECESSIONS AND SLOWDOWNS:
# A ROBUST APPROACH

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# Predicting Recessions and Slowdowns:
# A Robust Approach

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## Abstract

This paper defines business and growth rate cycles and describes the importance of key coincident indicators and reference chronologies, following reflections on the definition of a recession. The robustness of turning point forecasts based on the indicator approach to business and growth rate cycles is discussed. Since economies undergo structural changes over the course of a business cycle, and rapid structural changes are characteristic of developing economies in particular, practical methods for the analysis and prediction of business cycles need to be robust to such shifts. The recent Great Recession also underscores why "this time, it's different" should not be considered a valid excuse for forecasting failure.

## 1. Introduction

This paper evaluates the robustness of the indicator approach to predicting business and growth rate cycles attributed to Geoffrey H. Moore and his associates. The indicator analysis technique employs systematic methods of interpreting economic indicators to monitor the pulse of the economy as well as to predict future movements in the economy. This approach is based on the premise that in a market-oriented economy, in cycle after cycle, economic indicators reach turning points in a known sequence. Basically, leading indicators turn before coincident indicators, which turn before lagging indicators.

One of the earliest systems of this kind was devised shortly before World War I, known as the Harvard ABC curves. The A curve represented speculation, more specifically stock prices. The B curve denoted business activity, measured by the volume of cheques drawn on bank deposits. The C curve represented the money market and was measured by the rate of interest on short-term commercial loans. Warren Persons at Harvard University showed that these three curves typically moved in sequence – stock prices first, bank debits second, and interest rates last, with the lagging movements in interest rates preceding the opposite turns in stock prices. This work was continued by researchers at the National Bureau of Economic Research (NBER) founded in 1920 and is discussed in Mitchell and Burns (1938), Burns and Mitchell (1946), Moore (1950, 1958, 1961, 1982), Klein (1983),, Zarnowitz (1991), and others.

Fluctuations in aggregate economic activity, that is, phases of the business cycle, can be tracked by using a comprehensive measure of aggregate economic activity. Generally, the gross domestic product (GDP) is used since it represents the most aggregate measure of economic activity. It is, however, inaccurate to chart the business cycle by this one variable alone, since some aspects of the aggregate economy may not be adequately represented in the GDP. A better alternative is to construct an index of variables using frequently available series that move contemporaneously with the business cycle, typically referred to as a coincident index.

An index of coincident economic indicators is a summary measure designed to track fluctuations in aggregate economic activity that make up the business cycle. Thus a coincident index can be used to decide the phase of the business cycle the economy is in at a given point in time. The index can therefore be used to help determine the timing of recessions and expansions as well as speedups and slowdowns in the economy.

Such a historical chronology is also necessary for designing a system for the prediction of recessions and recoveries. Specifically, the selection of leading economic

indicators that anticipate recessions and expansions should be based at least in large part on their historical accuracy in predicting them. The measurement of forecasting accuracy, however, requires an explicit definition of what is to be forecast. Given the precise historical dates when recessions and expansions started, it is possible to decide how well the leading indicators predicted them.

Thus a coincident index is valuable both for understanding the current state of the economy and for designing tools for the prediction of business cycles. The leading index, on the other hand, combines series that tend to lead at business cycle turns and provides a summary measure of what can be expected in the near future. Leading indicators generally represent commitments made with respect to future activity or are factors that influence such commitments. Whereas the coincident index determines the peaks and troughs of the business cycle, the leading index is designed to predict these.

The real challenge is to identify an approach robust enough to perform well in real time under diverse structural conditions in developed and developing economies alike: a way to make timely recession calls in fast-changing emerging markets as well as in mature economies undergoing material structural changes – whether the recessions are triggered by major crises or lesser shocks whose timing is typically unforeseeable. This is illustrated by the recent global recession that motivated the vital question of whether the recession, or the crisis associated with it, could have been foreseen.

The format of the paper is as follows. Section 2 reflects on the nature of business, growth and growth rate cycles, the definition of a recession and determination of the reference chronologies of business and growth rate cycles. Section 3 gives the reference chronologies for countries tracked by the Economic Cycle Research Institute (ECRI). Section 4 discusses the robustness of the indicator approach to predicting business and growth rate cycles. The next section reflects on the frequency of recessions expected in the future while the last section provides the conclusions and implications.

## 2. Business Cycles: Concept and Measurement

The National Bureau of Economic Research (NBER), formed in 1920 to address measurement problems in economics, pioneered research into business cycles. Due to NBER's decades of pioneering work, its basic methodology for business cycle analysis has remained a standard for examining fluctuations in business activity (Niemira and Klein,

1994, p.5). It is therefore appropriate to begin the discussion of business cycles with the characterization distilled by Wesley C. Mitchell and Arthur F. Burns (1946) from many years of research at the NBER:

*"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."*

What is striking about this definition is the emphasis on the concerted nature of the upswings and downswings in different measures of economic activity. In fact, the business cycle is a consensus of cycles in many activities, which have a tendency to peak and trough around the same time (Niemira and Klein, 1994, p.4). As noted by Moore (1982):

*"No single measure of aggregate economic activity is called for in the definition because several such measures appear relevant to the problem, including output, employment, income, and trade, and no single measure is either available for a long period or possesses all the desired attributes. Quarterly figures for gross national product (GNP) became available in the 1940s in the United States and even later, if at all, in other countries. Since monthly peak and trough dates are desired, quarterly figures are not sufficient in any case."*

Moore further notes:

*"Virtually all economic statistics are subject to error, and hence are often revised. Use of several measures necessitates an effort to determine what is the consensus among them, but it avoids some of the arbitrariness of deciding upon a single measure that perforce could be used only for a limited time with results that would be subject to revision every time the measure was revised."*

Furthermore, Zarnowitz and Boschan (1975) point out that some series *"prove more useful in one set of conditions, others in a different set. To increase the chances of getting true signals and reduce those of getting false ones, it is advisable to rely on all such potentially useful (series) as a group."*

Clearly, one significant advantage of analyzing a range of roughly coincident macroeconomic series is that almost all such time series are measured with error and are often revised, sometimes very significantly. Thus, the existence of such measurement error

alone is strong justification for avoiding reliance on any single macroeconomic time series to determine a business cycle chronology.

However, the motivation for looking at a range of measures other than GDP – irrespective of its frequency of measurement – is much more profound than simply allowing for measurement error. Rather it involves the essential philosophical question of what should constitute 'aggregate economic activity', and therefore the business cycle. It should be recognized as being much more than simply a downturn in measured output. Most crucially, it must also encompass employment dimensions.

Thus, analysis of series such as retail sales, industrial production and GDP may be regarded as attempts to gauge the current state of demand and output production in the economy. At the same time, the inclusion of series such as household income and employment is explicit recognition of the impact on community welfare of variation in output and demand and are therefore very much integral aspects of any business cycle. Some would argue that the inclusion of output measures indirectly captures these latter effects. Nevertheless, in different cycles and over the course of any given cycle, the relationship between output growth and employment is not very stable or precise. Another clue to what was in the minds of Burns and Mitchell is evident in the quote below from Burns (1952):

> *And if business cycles are …. a congeries of interrelated phenomena, any distinction between the problem of how business cycles run their course and how our economic organization works cannot but be artificial.* (p. 36)
> And again from Burns (1952):
> *To Mitchell a business cycle meant more than a fluctuation in a single aggregate such as national income or employment. It also meant that the fluctuation…. is diffused through economic activity… appearing, as a rule… in markets for… commodities and labor, in processes of saving and investment, in finance as well as in industry and commerce.* (p. 36)

Two features of a business cycle emerge from the above discussion. First, a genuine business cycle is marked by three "Ps" (Banerji, 1999). In other words, movements in economic activity have to be *pronounced, pervasive,* and *persistent* enough to fall into the category of a recession or expansion. Second, a single measure of economic activity cannot represent aggregate economic activity. Instead, a composite index of indicators that represents current economic activity is needed to identify and measure business cycles. Such a composite index is the coincident index that best captures the cyclical upswings and

downswings in economic activity. It represents the synchronous fluctuations in the aggregate measures of output, income, employment, and trade (sales).

## *What is a Recession?*

It is clear that there is no single adequate measure of economic activity. Furthermore, since economic statistics are generally subject to error, evidence from a number of independently compiled indicators is expected to be more reliable than from any individual series. Despite the advantages of using a composite coincident index, in recent years the rigorous definition of the business cycle has increasingly been overshadowed by more simplistic shortcuts. Very often, a single adequate measure of economic activity is used to date recessions. Perhaps the most popular rule-of-thumb designates a recession as at least two successive quarters of decline in the gross domestic product (GDP). Lost in that quest for simplicity are the essential characteristics of a recession – that it consists of a pervasive and pronounced downswing in a variety of measures of economic activity. Not surprisingly, such shortcuts can produce anomalous results. In fact, while two successive quarters of decline in GDP occur in most recessions, it is neither a necessary nor a sufficient condition for a recession (Layton and Banerji, 2003; Dua and Banerji, 1999, 2004, 2007).

For example, it is well known that in the mid 1970s, Japan experienced its worst recession since the Second World War in the aftermath of the jump in oil prices. At the time, there were severe and prolonged declines in Japanese industrial production, employment, retail sales, and wage and salary income. Yet Japanese GDP plunged in the first quarter of 1974, rose for the next two quarters, and then dipped again in the fourth quarter, finishing the year 2% below its year-ago level, but without satisfying the "two-down-quarters-of-GDP rule".

In the United States, the NBER officially identified a recession that lasted from January to July of 1980. Until 1995, the data showed only one quarter of decline in GDP during that period. Only the 1995 switch to chain-weighted GDP data produced two successive declines in GDP during that recession, belatedly vindicating the NBER's original decision. Clearly, the popular rule-of-thumb would have delayed the recognition of that recession by more than a decade! Also, the official U.S. recession of 1960-61 does not show two successive quarters of decline in GDP.

In the U.S. recession of 2001, initial data showed a GDP decline only in the third quarter of 2001 that many ascribed to the events of September 11. Based on this apparent one-quarter decline in GDP, some economists, as well as certain high officials in Washington, insisted as late

as July 2002 that there had been no recession at all in 2001, since GDP had not declined for two quarters. In late July 2002 – 16 months after the start of the recession – revised data showed that GDP had actually declined in each of the first three quarters of 2001, finally silencing denial of the recession. However, the latest data revisions indicate that GDP did not show two *successive* quarters of decline during the 2001 recession, though it involved a loss of nearly three million jobs – the biggest recessionary job loss in the post-World War II period until that time.

During the 2007-09 recession, which officially lasted from December 2007 to June 2009, GDP data was especially misleading. When the Lehman Brothers collapse triggered a global financial crisis in September 2008, nine months into the recession, the GDP data available at the time did not show any declines at all, though later revisions do show a decline in GDP in the first quarter of 2008. This apparent strength in GDP, along with the widespread and undue reliance on GDP as the shorthand method to determine whether the economy was in recession, badly misled policymakers. It may be embarrassing to recall in retrospect, but, based on guidance from an inflation-obsessed Fed, the U.S. futures markets in June 2008 – six months into the recession – were betting on more than a one-percentage-point rate hike by year-end – in the middle of a recession! Since the two-down-quarter "rule" results in such dangerously delayed recession recognition, particularly from the point of view of policy makers – as well as changes in the verdict even years after the fact – it is both misleading and inadequate.

In fact, theoretically, a recession is more than a decline in just output (which GDP measures) and empirically, the two-quarter GDP decline rule is not a necessary or sufficient condition for a recession to occur. Thus, such GDP declines are not always accompanied by the pronounced, pervasive, and persistent declines in output, income, employment, and retail and wholesale trade that mark a business cycle recession, or the complex processes that are the antecedents of a genuine recession. As a result, the symptoms that precede a real recession, as captured in the appropriate leading indicators, may not be seen ahead of such a mistakenly identified "recession". Such anomalies can lead not only to an erroneous dating of recessions, but also to difficulties in the proper selection of leading indicators of recessions and recoveries.

Thus, in order to predict recessions, it is first necessary to appreciate what they really are, and why both the NBER and ECRI determine business cycle dates on the basis of the broad measures of output, employment, income and sales.

Under certain circumstances, when spending falls, for instance, it triggers cascading declines in output, and consequently in employment and in income, which results in falling

sales, which in turn feeds back into a further fall in output, and so on, all the while spreading from industry to industry, region to region, and, of course, indicator to indicator. At some point in time, the vicious cycle switches to a virtuous cycle, in which rising output, for example, leads to higher employment, income and sales, feeding back into even higher output, and so on, resulting in a self-sustaining expansion. Thus, a *recession* is a vicious cycle of pronounced, pervasive and persistent cascading declines in output, income, employment and sales, eventually giving way to an *expansion*, which is an analogous virtuous cycle of rising economic activity. The transitions between the vicious and virtuous cycles are the *peaks* and *troughs* in the cycle, also known as cyclical *turning points*.

The business cycle peak is the point in time when the virtuous cycle switches to a vicious cycle, while the business cycle trough marks the transition from a vicious cycle to a virtuous cycle. Thus, those dates are determined on the basis of a carefully determined consensus among the specific measures of aggregate economic activity constituting the feedback loop – not GDP or employment alone.

### *Classical Cycles, Growth Cycles, and Growth Rate Cycles*

The above discussion describes "classical" business cycles that measure the ups and downs of the economy on the basis of the absolute levels of the key coincident indicators involved in recessionary vicious cycles and expansionary virtuous circles. A second definition of fluctuations in economic activity, termed a growth cycle, traces the ups and downs through deviations of the actual growth rate of the economy from its long-run trend rate of growth. In other words, a speedup (slowdown) in economic activity means a sustained period of growth higher (lower) than the long-run trend rate of growth.

Pronounced, pervasive and persistent economic slowdowns begin with reduced but still-positive growth rates and can eventually develop into recessions. The high-growth phase coincides with the business cycle recovery and the early phase of the expansion, while the low-growth phase corresponds to the later phase of the expansion, in the later stages leading to recession. Some slowdowns, however, continue to exhibit positive growth rates and culminate in renewed expansions, not recessions. As a result, all classical cycles associate with growth cycles, but not all growth cycles associate with classical cycles. Growth cycle chronologies based on trend-adjusted measures of economic activity were first developed by Mintz (1969, 1972, 1974). Burns and Mitchell noted the following about growth cycles:

> *If secular trends were eliminated at the outset as fully as are seasonal variations, they*
> *would show that business cycles are a more pervasive and a more potent factor in*

*economic life... For when the secular trend of a series rises rapidly, it may offset the influence of cyclical contractions in general business, or make the detection of this influence difficult. In such instances [the classical business cycle method] may indicate lapses from conformity to contractions in general business, which would not appear if the secular trend were removed.*

Growth cycle analysis also formed the basis for the international economic indicators (IEI) project started by Philip Klein and Geoffrey Moore at the NBER in the early 1970s. Following the work of Mintz, as well as Klein and Moore, when the OECD developed leading indicators for its member countries in the 1980s it decided to specifically focus on growth cycles.

Of course, growth cycles, measured in terms of deviations from trend, necessitated the determination of the trend of the time series being analyzed. The Phase Average Trend (PAT), calculated by averaging business cycle phases, was used as the best trend measure by the OECD as well as in the IEI project, in order to measure growth cycles. However, one problem with the PAT (Boschan and Ebanks, 1978) as a benchmark for growth cycles is that it is subject to frequent and occasionally significant revisions, especially near the end of the series. While the OECD has recently switched from the PAT to the Hodrick-Prescott trend, this does not solve the problem of regular revisions of the trend estimates.

In other words, while growth cycles are not hard to identify in a historical time series, it is difficult to measure them accurately on a real-time basis (Boschan and Banerji, 1990). This is because the trend over the latest year or two is not accurately known and must be estimated, but the PAT estimates tend to be very unstable near the end (Cullity and Banerji, 1996). More generally, any measure of the most recent trend is necessarily an estimate and subject to revisions, so it is difficult to come to a precise determination of growth cycle dates, at least in real time.

This difficulty makes growth cycle analysis less than ideal as a tool for the real-time monitoring and forecasting of economic cycles, even though it may be useful for the purposes of historical analysis. This is one reason that by the late 1980s, Moore had started moving towards the use of *growth rate cycles* for the measurement of series which manifested few actual cyclical declines, but did show cyclical slowdowns.

Growth rate cycles are simply the cyclical upswings and downswings in the growth rate of economic activity. The growth rate used is the "six-month smoothed growth rate" concept, initiated by Moore to eliminate the need for the sort of extrapolation of the past

trend needed in growth cycle analysis. This smoothed growth rate is based on the ratio of the latest month's figure to its average over the preceding 12 months (and therefore centered about six months before the latest month). Unlike the more commonly used 12-month change, it is not very sensitive to any idiosyncratic occurrences 12 months earlier. A number of such advantages make the six-month smoothed growth rate a useful concept in cyclical analysis (Banerji, 1999). Cyclical turns in this growth rate define the growth rate cycle.

The growth rate cycle is related to Mintz's earlier work on the "step cycle" except that the former is based on the smoothed growth rate as mentioned above. Also, in concept, the growth rate cycle does not suggest that the growth rate passes through "high growth" and "low growth" steps, but moves, instead, from cyclical troughs to cyclical peaks and back again. At ECRI, which was founded by Moore, growth rate cycles rather than growth cycles are used as the primary tool to monitor international economies in real time. The growth rate cycle is, in effect, a second way to monitor slowdowns in contrast to downturns. Because of the difference in definition, growth rate cycles are different from growth cycles. Thus, what has emerged in recent years is the recognition that business cycles, growth cycles and growth rate cycles all need to be monitored in a complementary fashion. However, of the three, business cycles and growth rate cycles are more suitable for real-time monitoring and forecasting, while growth cycles are more suitable for historical analysis (Klein, 1998). The relationship between business cycles and growth rate cycles is illustrated in Figure 1.

What makes all these kinds of cycles valid units of analysis is that they all exhibit the key hallmark of cyclical behavior, which is the cyclical co-movement in many different economic activities. It is the near-simultaneous peaks and troughs in the broad measures of output, income, employment and sales, whether in terms of levels, deviations from trend or growth rates, that characterise economic cycles.

In sum, the absolute level of a coincident index helps date turning points in the classical business cycle while the smoothed growth rate of the coincident index measures the highs and lows of the growth rate cycle, or the speedups and slowdowns in the economy. Both are suitable for tracking the economy in real time. On the other hand, a leading index is a predictive tool to gauge if and when a recession or expansion may take place. The growth rate of the leading index is a harbinger of speedups and slowdowns in the economy. The relationship between the coincident and leading index is shown in Figure 2.

_**Determination of Turning Points and Dating Business and Growth Rate Cycles**_

The choice of turning points is made by mechanical procedures supplemented by rules of thumb and experienced judgment, starting with an objective alhorithm developed at the NBER (see Bry and Boschan, 1971). The rules embodied in this procedure trace their roots to Burns and Mitchell (1946) and continue to be applied by ECRI. Finally, turning points must pass muster through the experienced judgment of the researcher. A specific cycle, that is, a set of turning points for each series, is thus obtained.

A reference cycle chronology is then determined based on the consensus of the individual turning points in a set of coincident economic indicators. A reference cycle based on the levels of the coincident indicators thus gives the consensus of turning points of the coincident indicators. Apart from dating the recessions, this reference cycle serves as a benchmark to evaluate leading indicators and their historical leads. The reference cycle derived from growth rates of the coincident indicators gives the highs and lows of the growth rate cycle. This dates the slowdowns and the speedups in economic activity.

## 3. Reference Chronologies

ECRI has tracked 19 countries over a long period of time. These include the following: U.S., Canada, Mexico, Germany, France, U.K., Italy, Spain, Switzerland, Sweden, Austria, Japan, China, India, Korea, Australia, Taiwan, New Zealand and South Africa. It has also recently added Brazil to its list.

ECRI has established the recession start dates for almost all the economies it tracks that were recently in recession. Table 1 on Business Cycle Chronologies provides recession dates for the countries covered by ECRI, using the same approach used by the NBER to determine the official U.S. recession dates. This dating reveals an interesting sequence with respect to the recent global recession. Italy led the way, entering recession in August 2007, followed by New Zealand in November and the U.S. in December 2007. In February 2008, Japan, Taiwan, France and Spain fell simultaneously into recession, followed by Germany and Sweden in April, U.K. in May, Korea in July, and Brazil in August 2008.

The dates for the onset of the latest recession in various economies highlight the reality that the global contraction was highly concerted and that the decoupling hypothesis had been misguided. It is noteworthy, however, that both China and India did not experience a recession, but a milder counterpart called a slowdown, meaning a downshift in the pace of positive growth in economic activity. A recession, on the other hand, would have been more

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severe, involving a vicious cycle of pronounced, pervasive and persistent cascading *declines* in output, income, employment and sales, which both countries escaped. ECRI's growth rate cycle chronologies are given in Table 2.

While it makes sense to develop leading indicator systems using such reference chronologies as benchmarks, it is highly inadvisable to try to take "shortcuts" by relying on alternative, more simplistic recession "definitions", especially those based on GDP alone, such as "two down quarters of GDP" – which, as we have discussed, is an invalid definition of recession, despite its popularity, even among economists. As we have demonstrated, such misconceptions have resulted in serious policy errors that are subsequently obscured by data revisions. The reality is that properly-determined cycle chronologies form the essential basis for the development of reliable leading indicator systems, and simplistic shortcuts, such as the use of GDP as the sole arbiter of recessions and recoveries, can result in a very shaky and unreliable foundation for the development of economic indicator systems. Of course, because these reference chronologies constitute the very "target" that leading indicators should be designed to predict, a misconceived target can fatally undermine the integrity and accuracy of a leading indicator system developed on that basis. Thus, we cannot overemphasise the importance of developing proper reference chronologies.

Having defined recessions, slowdowns and the corresponding reference chronologies across economies on a uniform basis, we can proceed to the issue of testing for robustness. That is the true test of the worth of any recession forecasting approach.

## 4. Predicting Turning Points

The sheer severity of the Great Recession for many developed economies – most importantly the United States – motivates the vital question of whether the recession, or the crisis that triggered it, could have been foreseen. The crisis itself, while highly damaging and unusually widespread in this era of globalization, actually shared key characteristics with past crises. Yet, hardly anybody who correctly foresaw the crisis also predicted *when* the recession would arrive. Rather, they kept warning of calamity – often for years – until they were vindicated. In other words, even if they were correct about the big picture, they were generally wrong about recession timing. After all, the true test of a forecasting approach is its ability to predict whether – and if so, when – an actual recession will begin.

Consensus forecasts performed poorly, but no worse than usual, in predicting the latest recession. Figure 3 shows how forecasts (consensus and individual) can easily miss turning points. Since consensus forecasts are known to be among the most accurate, that is a sad commentary on the general accuracy of recession forecasting. Yet it merely confirms the conclusion of the IMF's 63-country study from nearly a decade ago (Loungani, 2001) that "the record of failure to predict recessions is virtually unblemished."

Thus, the real challenge is not to identify the best model to predict recessions *ex post* in a specific economy over a given time frame, but to identify those approaches that were robust enough to perform well in real time under diverse structural conditions: a way to make timely recession calls in fast-changing emerging markets as well as in mature economies undergoing material structural changes – whether the recessions are triggered by major crises or lesser shocks whose timing is typically unforeseeable.

In the United States, the Great Recession marked a structural break from the Great Moderation lasting from the mid-1980s to the eve of that recession. The Great Moderation, in turn, represented a structural change from earlier, more volatile cyclical patterns. The U.S. may now be on the cusp of a new era with very different cyclical characteristics – once again demanding forecasting tools that can keep functioning under changing conditions. Thus, it would do little good to develop models optimized on the basis of past performance if the future is likely to be quite different. Quite simply, structural change, rapid or gradual, is integral to the evolution of both developing and developed economies, and is therefore likely to have important implications for business cycles in the decade ahead. Real-time forecasting failure cannot therefore always be blamed on "parameter drift" or "this time, it's different," as an excuse for forecast error.

An actionable recession-forecasting approach must thus be a robust one, capable of making timely recession and recovery calls in spite of structural changes, in developed and developing economies alike, whether triggered by major crises or smaller shocks. As we shall see, this is far from an impossible dream.

### *Geoffrey H. More: Father of Leading Indicators*

Geoffrey H. Moore started his six-decade career in the late 1930s, when he joined his mentors Wesley C. Mitchell and Arthur F. Burns at the NBER in New York. Building on their 1938 work on "leading indicators of cyclical revival", Moore established the very first list of "leading indicators of cyclical revival and recession" – i.e., leading indicators as we

know them today. In the late 1950s and early 1960s, he developed the composite index method with Julius Shiskin, with whom he also created the original index of leading economic indicators.

In order to extend his leading indicator systems beyond U.S. borders, Moore had to first establish cyclical turning point dates for the different economies as objective benchmarks to test whether the indicators actually led those turning points. Of course, he had decades of experience doing this: before there was a Business Cycle Dating Committee, Moore determined the U.S. business cycle dates almost single-handedly on the NBER's behalf from 1947 to 1978, with a short break when he was on assignment in Washington in 1969 to 1973. When he retired, the NBER created the formal Business Cycle Dating Committee, of which he remained a member until his death ten years ago.

Moore established ECRI to preserve and advance the tradition of business cycle research he and his colleagues had pioneered at the NBER, which veered off in a completely different direction after Moore's retirement. Naturally, ECRI long ago began to establish historical recession dates for economies other than the U.S., using the longstanding NBER approach. ECRI has long maintained these business cycle chronologies, which function as historical references for 20-odd economies, including China, India and Brazil, as described in the previous section. These recession dates serve as objective benchmarks for determining recession-forecasting performance. A discussion of the definition of recession is given in the previous section and in Layton and Banerji (2003).

### _An Answer to "Measurement Without Theory"_

It is important to understand the process followed by Moore in selecting the first leading indicators of recession and recovery. Based on decades of prior business cycle research covering many economies, Moore and his colleagues already had a clear concept of the main drivers of business cycles. If those were indeed the prime movers of business cycles, the natural next step was to identify related time series where the early signs of a turn in the cycle should potentially first appear.

Only after developing this initial shortlist of economic indicators – based not on empirical fit but on an understanding of business cycle theory – did Moore move on to examine the empirical record of their behavior at business cycle peaks and troughs. This empirical testing – based on U.S. data from 1870 to 1938 – determined the final selection of Moore's 1950 list of leading indicators of recession and recovery.

Contrary to the impression created by the well-known Koopmans (1947) critique of "measurement without theory," this entire process was rooted in business cycle theory: not in falsifiable statistical models, to be sure, but in a theoretical, conceptual understanding of the drivers of the business cycle, nevertheless. Empirical testing played only a secondary role in this process. This was far from a data-mining approach.

Nearly half a century later, Moore asked the question: we know that the original leading indicators anticipated both recessions and recoveries in the late 19th and early 20th centuries, but what have they done for us lately? He tested their "out-of-sample" performance, so to say, in the second half of the 20th century. The results, according to Moore, provided a fitting answer to the old charge that the methods of Mitchell, Burns, Moore and their NBER colleagues amounted to "measurement without theory". We recently completed a similar analysis stretching from the mid-20th century through the early 21st century, including the Great Recession. The results are worth recounting.

The original empirical criteria used by Moore in selecting the leading indicators focused on their ability to lead U.S. business cycle peaks and troughs before World War II. Our results showed that the cyclical peaks and troughs in same original leading indicators (determined on the basis of the Bry-Boschan algorithm) continued to lead U.S. business cycle turning points in the post-World War II period as well. But we went further.

We gathered data on the same indicators, or their closest equivalents, in all the Group of Seven (G7) developed economies other than the U.S. in the postwar period (specifically, Japan, Germany, U.K., France, Italy and Canada). Remarkably, when we compared their turning points with the respective business cycle chronologies established independently by ECRI on the same basis as in the U.S., their performance held up. In fact, the average lead time was slightly longer than in the U.S.

Next, we conducted a similar analysis, but on the basis of growth rate cycles (which some call acceleration-deceleration cycles, consisting of alternating cyclical upswings and downswings in economic growth) rather than classical business cycles. We found that the growth rates of the same leading indicators continued to lead the respective growth rate cycle turning points, which had been determined independently by ECRI for all the G7 economies. These results are summarized in Figure 4.

In the early 1990s, Moore's original analysis had reached analogous conclusions for a slightly different group of countries when testing the same indicators on the basis of growth cycles (also called deviation cycles, consisting of alternating periods of above-trend and

below-trend economic growth). Once again, their findings emphasized the durability of these leading indicators in terms of their ability to lead at cyclical turning points.

We also constructed a composite leading index out of Moore's original list of U.S. leading indicators. That leading index covers 107 years and 21 recessions, including the 1907-08 and 1920-21 depressions, the entire period of the Great Depression, and the more recent Great Moderation. Again, no data fitting was involved in creating the index.

So how did this Index of Original Leading Indicators (IOLI) perform during the Great Recession, which caught so many by surprise? As a matter of record, it peaked in July 2007, five months before the official December 2007 U.S. business cycle peak. It subsequently troughed in March 2009, three months before the June 2009 U.S. business cycle trough.

What we have, then, is strong evidence of the robustness of the original leading indicators of recession and recovery – across time and space, as well as three different definitions of economic cycles. At a juncture when so many of the "scientific" statistical models appear to have failed in their forecasts, strongly refutes the widely accepted but unwarranted old charge that classical business cycle analysis amounts to "measurement without theory". In fact, in the absence of sound theoretical underpinnings, it would be astonishing indeed to see a display of such robustness in a set of forecasting tools.

### _Testing for Significance_

Given these results, most economists might be sorely tempted to conduct "scientific" statistical tests on these leading indicators. In fact, they may wonder why we have not conducted such tests ourselves.

The key reason is our caution about using such tests, which is justified by an old admonition from Granger and Newbold (1986) that many prefer to overlook: A leading index "is intended only to forecast the timing of turning points and not the size of the forthcoming downswing or upswing nor to be a general indicator of the economy at times other than near turning points. Because of this, (its) evaluation … by standard statistical techniques is not easy".

In other words, the evaluation of a leading index should be based purely on whether its cyclical peaks lead business cycle peaks, and whether its cyclical troughs lead business cycle troughs. So how well does the IOLI perform at turning points?

Over its 107-year span, the IOLI exhibits a median lead of 4.5 months at U.S. business cycle peaks and three months at business cycle troughs, leading at 93% of business

cycle turning points. In the "out-of-sample" postwar period, the statistics are quite similar (perhaps slightly better): the IOLI has a median lead of six months at business cycle peaks and three months at business cycle troughs, leading at 91% of business cycle turning points.

Based on this historical record, while avoiding standard statistical tests in accordance with Granger and Newbold's warning, we can still use a non-standard, non-parametric statistical test to evaluate the significance of the IOLI's leads at business cycle turning points. The resultant Lead Profiles (Banerji, 2000) show, at a 99% confidence level, that the IOLI has a lead of at least three months at both business cycle peaks and troughs; at a 95% confidence level, they also show that the IOLI has a lead of at least four months at business cycle peaks. The IOLI's lead of five months at the 2007 business cycle peak and around three months at the 2009 business cycle trough is very much in line with this historical record.

The point is not that this is the best possible leading index or that these lead times are especially long. In fact, based on six decades of research since Moore's identification of the original leading list of indicators of revival and recession, ECRI has developed an international array of specialized leading indexes (Banerji and Hiris, 2001) that number well over a hundred, and serve as the basis for ECRI's turning point forecasts.

The real value of the IOLI's lead is as testimony to its remarkable robustness and "out-of-sample" performance: after all, its leads at the peak and trough of the Great Recession were not that different from those at the peak and trough of the 1907-08 depression more than a century ago. The century since that depression has seen remarkable changes in the U.S. business cycle – and the IOLI continued to function very well through all of those structural shifts. What the IOLI provides is really a proof of concept. That is the key takeaway from over a century of leading indicator data (Banerji, 2010).

This property of robustness must be an essential feature of good real-time forecasts. This is even more relevant today since there is reason to believe that we are about to see further changes to the contours of the U.S. business cycle.


## 5. More Frequent Recessions Ahead?

In the summer of 2008, before the Lehman Brothers debacle, all the major developed economies were already in recession. While recognizing that reality, ECRI researchers also uncovered a longstanding pattern of falling trend growth in successive past U.S. expansions,

beginning at least as far back as the 1970s. This did not bode well for the expansion that would follow (*U.S. Cyclical Outlook*, 2008).

This pattern was evident across all of the broad coincident indicators that determine the start and end dates of business cycles. In fact, the last (2001-07) U.S. expansion exhibited the lowest trend growth of any U.S. expansion on record – in terms of not only GDP and industrial production, but also employment, income and sales (Figure 5). If this pattern of falling growth in successive expansions remained intact, the next expansion would likely be even slower.

Following the collapse of Lehman Brothers in September 2008, the U.S. economy fell off a cliff. Evidently, the Great Moderation was over. By January 2009, when the New Year began, ECRI was convinced that the Great Moderation would not soon return, and the implications had become evident: we had transitioned into an era of heightened cyclical volatility, which, along with low trend growth, dictated more frequent recessions (*International Cyclical Outlook*, 2009).

Why did ECRI not believe in the return of the Great Moderation? Its logic was rooted in the very explanations that had been proffered in earlier years to explain the Great Moderation. The main explanations had been: 1) better supply chain management systems, leading to milder inventory cycles; 2) more skilled monetary policy; and 3) luck.

Though there was certainly some evidence to support the contention that milder inventory cycles had helped to reduce cyclical volatility, its obituary had already been written a decade ago, the summer before the September 11 attacks. Surveying the devastation that followed the popping of the Information Technology bubble, Stephen Cecchetti (2001) had written: "How ironic that the producers of the equipment that was to have eliminated the inventory cycle are themselves its foremost victims." During the Great Recession, apparently disregarding the virtues of better supply chain management, the inventory cycle returned with a vengeance, thanks largely to the Bullwhip Effect, which refers to the amplification of cyclical fluctuations up the supply chain. This is increasingly relevant because international sourcing has grown rapidly since the end of the cold war, with all major economies becoming far more export-dependent than before.

As for the thesis that the Great Moderation was all about skilled monetary policy, the less said the better. The timing of monetary policy, especially in the lead-up to the crisis, surely left much to be desired.

Finally, the luck factor is certainly relevant. For one thing, unusually in the 1990s, the major economies took turns falling into recession, starting with the "English-speaking recession" in 1990-92, followed by recession in continental Europe and Japan in 1992-94, and a renewed Japanese recession in 1997-99, along with deep recessions in Asia following the Asian crisis. Thus, there was almost always some slack in the global markets during the decade, strengthening disinflationary forces during much of the 1990s – the decade that dominated the period of the Great Moderation. Also, the end of the cold war and the integration of the ex-Soviet economies, along with China and India, into the global market economy, produced unprecedented deflationary forces that helped foster a period of non-inflationary growth with reduced need for Fed intervention. In sum, it does appear that luck may have played a key role in sustaining the Great Moderation. However, those forces are hardly likely to be replicated in the decade ahead – especially when Chinese wages are rising rapidly and commodity prices are trending upward.

Long expansions tend to occur when cyclical volatility falls, the economy's trend rate of growth increases, or both. Of course, the 2001-07 expansion, as discussed, saw the slowest pace of growth among all postwar expansions. It is only the relatively low cyclical volatility seen during the 2001-07 business cycle that kept the expansion going as long as six years before it succumbed to a cyclical downturn.

But since the end of that expansion, the U.S. has seen a sharp increase in cyclical volatility. If, as we believe, the Great Moderation is not about to stage a comeback, while the low trend rate of growth seen in the 2001-07 expansion either persists or declines during the current expansion, the U.S. will probably see more frequent recessions in the coming years.

We cannot presume to be able to foresee all the structural changes that various economies, and specifically the U.S., will undergo in the current decade. However, the probable convergence of heightened cyclical volatility and slower trend growth (which incidentally also tends to follow financial crises), would generally lead to more frequent recessions – quite a different pattern from the period of the Great Moderation, but not a replay of the Great Recession either.

In other words, the decade that has just begun may be sufficiently uncharted territory, in terms of the contours of business cycles, to question the wisdom of estimating the parameters of conventional econometric models on the basis of data from period of either the Great Recession or the Great Moderation – or from even earlier time periods, for that matter. Once again, such risks underscore the value of robust approaches to turning point forecasting

in the years ahead. Of course, in rapidly changing emerging markets, the need for such robust forecasting systems is self-evident.

## 6. Conclusions and Implications

The foregoing should not be considered to be a substantive recommendation regarding the choice of specific leading indicators or models to predict the next recession. Rather, based on what has been called "the longest running experiment in economics," which continues today at ECRI, it represents a critical proof of concept, demonstrating just how robust well-selected leading indicators can be, even in the face of dramatic structural changes across space and time, more of which undoubtedly await us in the years ahead. This finding of robustness of the leads of well-selected leading indicators at cycle turning points lies at the foundation of ECRI's approach, providing an ability to make timely recession and recovery calls in real time even under changing conditions.

In order to assess robustness, it is imperative to be able to verify that conceptually similar leading indicators work across many economies with varying economic structures over long periods of time. This requires uniform benchmarks based on consistent definitions of recessions and slowdowns – specifically, reliable business cycle and growth rate cycle chronologies, respectively.

What we have shown is that, when evaluated against those objective cyclical benchmarks, the original leading indicators of recession and recovery – selected primarily on a conceptual basis – continue to exhibit remarkably robust performance under a wide range of conditions in the developed economies. Whether we are faced with the specific likelihood of more frequent U.S. recessions, as ECRI's research suggests, or with unforeseeable changes in structural conditions that may shape the next cycle, it is our belief that it would surely be prudent to rely on a time-tested, robust approach to business cycle forecasting. In fact, ECRI's long and successful real-time experience in calling recessions and recoveries well ahead of consensus testifies to the value of such an approach.

In developing economies, where structural conditions are quite different from those in developed economies – and especially because rapid structural change is part and parcel of the development process – similar robust approaches should be considered essential to recession forecasting. But that does not mean it is necessarily useful to slavishly copy what might work in structurally-different developed economies.

In fact, before assuming that such leading indicator systems would work in developing economies that might be at various stages of development, it would be essential to verify such a contention – but this can only be done in the context of reliable cycle chronologies. In order to properly develop such chronologies, developing economies would need to start collecting data on the full complement of high-frequency (monthly or quarterly) coincident indicators, specifically, the broad measures of output, income, employment and sales.

While this is hardly a trivial project, it is eminently feasible given a strong official commitment. It is not critical that official government bodies should directly collect such data. In a country like India, for instance, there is enough private-sector expertise in collecting survey data to justify regular surveys of the key coincident indicators – if necessary, subcontracted to the private sector. It is only the collection of such data by a broad range of developing economies over a period of several years that can then lead to the development of reliable cycle chronologies, against which one could test the viability of robust systems of leading indicators for such economies, which could then be used with confidence by policymakers.

The alternative is to do what economists have long been doing, with consistently poor results: namely, back-fit econometric models to whatever historical time series might be available, fail to forecast recessions in real time, and repeatedly re-jigger the same models, only to see them fail again and again in real time in subsequent economic cycles. This is a patently futile approach. As the saying goes, "insanity is doing the same thing over and over and expecting a different result".

The field of economic forecasting faces formidable challenges in the years ahead. Even robust leading indicators can provide only a partial answer. After all, unlike econometric models, they are designed to predict only the timing of cyclical turning points, not forecasts of the magnitude of economic variables. Nor can they answer "what if" questions, which are often central to policy decisions. In other words, a well-designed leading indicator approach should be seen as a complementary tool, but one that is capable of providing invaluable guidance in the lead-up to recessions and recoveries, preventing decision makers from being blindsided by the inevitable turning points in years to come.

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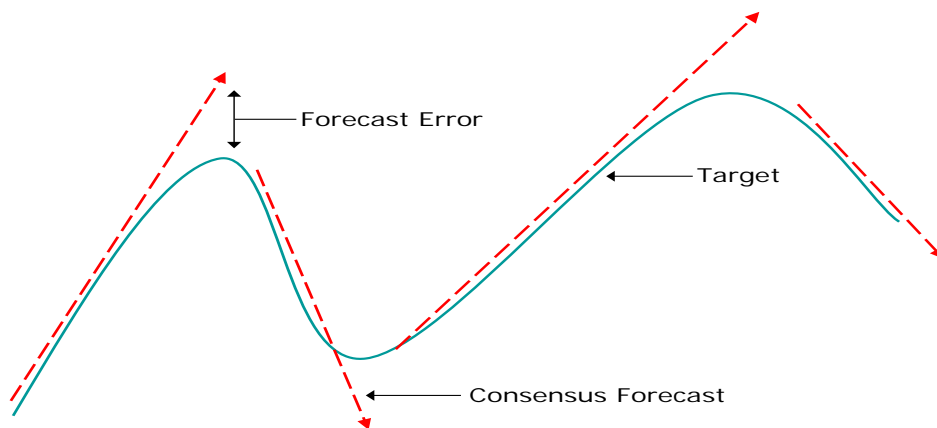
# Figure 1
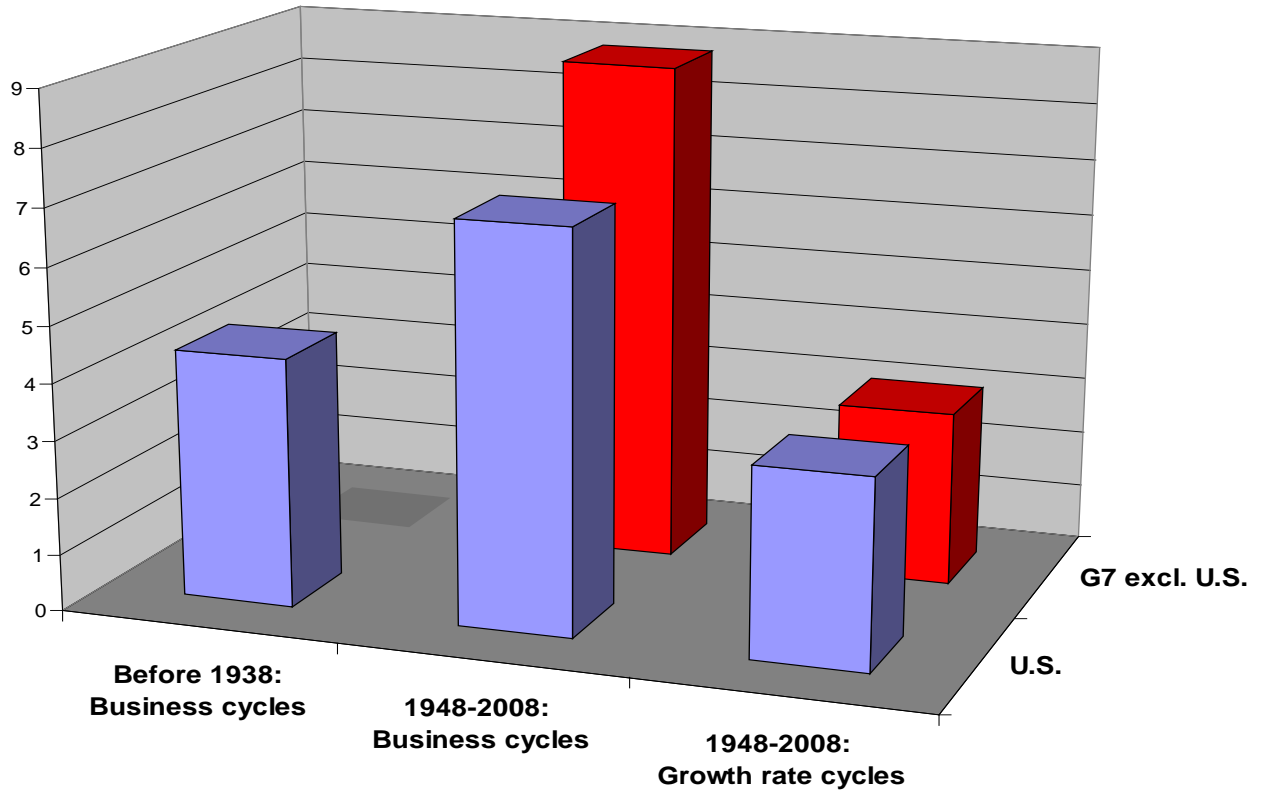## Business Cycles and Growth Rate Cycles
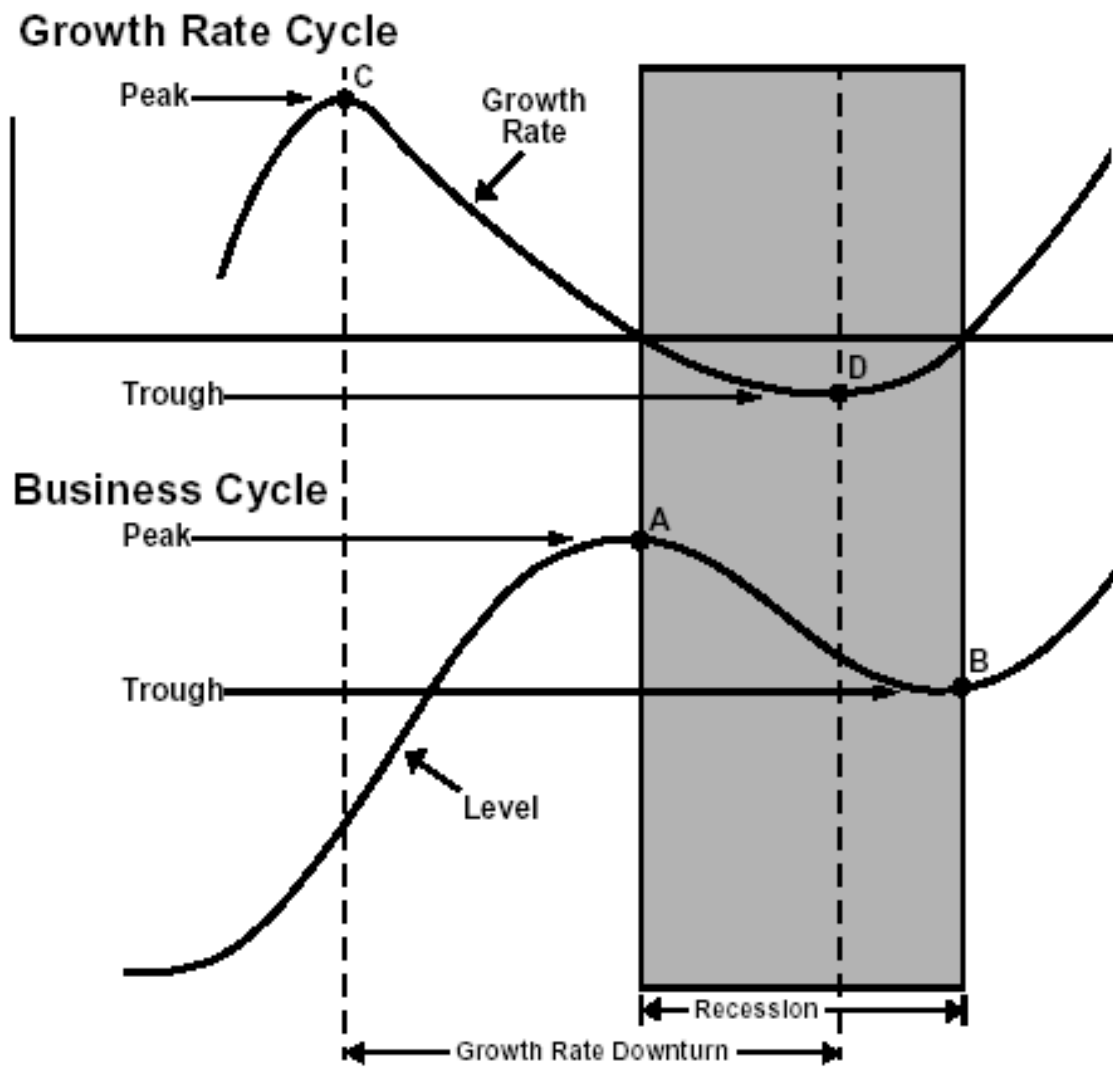
**Figure 2**
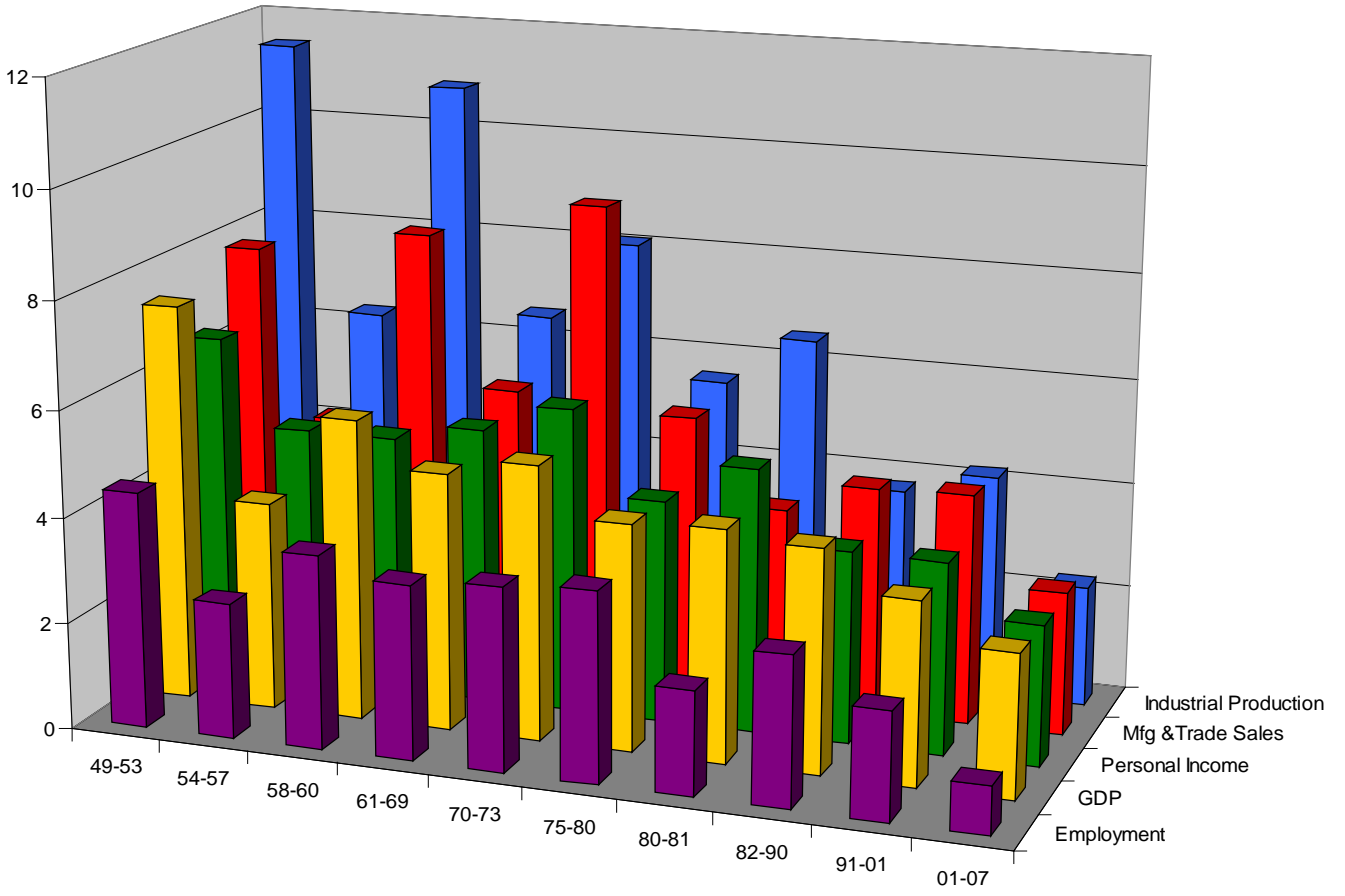**Prediction of Turning Points by Leading Index**
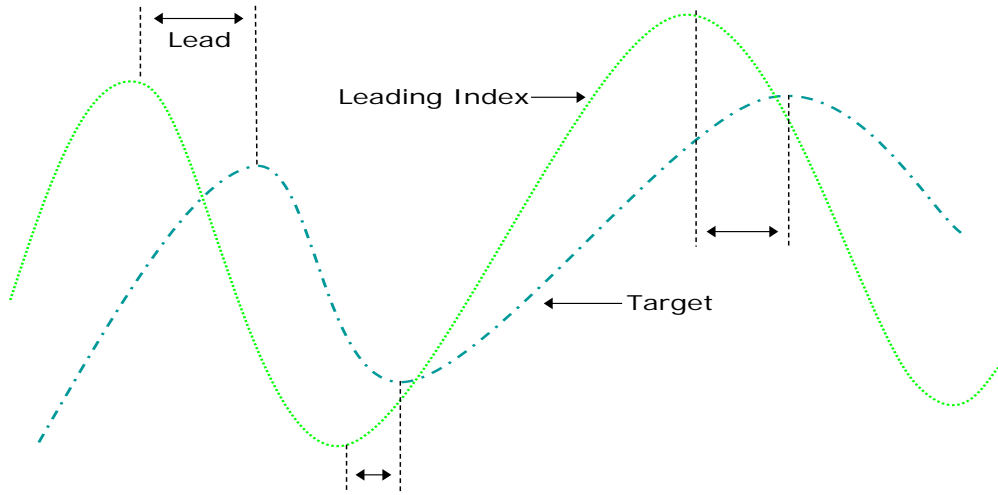


**Figure 3**
**Prediction of Turning Points**

**Figure 4**

**Average Leads, in Months, of**

**Eight Leading Indicators Selected in 1950**

**Figure 5
Annualized Growth in U.S. Coincident Indicators
in Postwar U.S. Expansions (%)**

# ECRI
## ECONOMIC CYCLE RESEARCH INSTITUTE

## BUSINESS CYCLE PEAK AND TROUGH DATES, 21 Countries, 1948-2009, Page 1 of 2

| Period | Peak or Trough | AMERICA | | | | EUROPE | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | United States | Canada | Mexico | Brazil | Germany | France | United Kingdom | Italy | Spain | Switzerland | Sweden | Austria |
| 1948-1950 | P | 11/48 | | | | | | | | | | | |
| | T | 10/49 | | | | | | | | | | | |
| 1951-1952 | P | | | | | | | | | | | | |
| | T | | | | | | | 8/52 | | | | | |
| 1953-1955 | P | 7/53 | 5/53 | | | | | | | | | | |
| | T | 5/54 | 6/54 | | | | | | | | | | |
| 1956-1959 | P | 8/57 | 10/56 | | | | 11/57 | | | | | | |
| | T | 4/58 | 2/58 | | | | 4/59 | | | | | | |
| 1960-1961 | P | 4/60 | | | | | | | | | | | |
| | T | 2/61 | | | | | | | | | | | |
| 1962-1966 | P | | | | | 3/66 | | | 1/64 | | | | |
| | T | | | | | | | | 3/65 | | | | |
| 1967-1968 | P | | | | | | | | | | | | |
| | T | | | | | 5/67 | | | | | | | |
| 1969-1973 | P | 12/69 | | | | | | | 10/70 | | | 10/70 | |
| | T | 11/70 | | | | | | | 8/71 | | | 11/71 | |
| 1973-1975 | P | 11/73 | | | | 8/73 | 7/74 | 9/74 | 4/74 | | 4/74 | 7/75 | 8/74 |
| | T | 3/75 | | | | 7/75 | 6/75 | 8/75 | 4/75 | | | | 6/75 |
| 1976-1978 | P | | | | | | | | | | | | |
| | T | | | | | | | | | | 3/76 | 11/77 | |
| 1979-1980 | P | 1/80 | | | | 1/80 | 8/79 | 6/79 | 5/80 | 3/80 | | 2/80 | 2/80 |
| | T | 7/80 | | | | | 6/80 | | | | | | |
| 1981-1983 | P | 7/81 | 4/81 | 3/82 | | | 4/82 | | | | 9/81 | | |
| | T | 11/82 | 11/82 | 7/83 | 12/83 | 10/82 | | 5/81 | 5/83 | | 11/82 | 6/83 | 1/83 |
| 1984-1986 | P | | | 10/85 | | | | | | | | | |
| | T | 11/86 | | | | | 12/84 | | | 5/84 | | | |
| 1987-1988 | P | | | | 2/87 | | | | | | | | |
| | T | | | | 7/87 | | | | | | | | |
| 1989-1991 | P | 7/90 | 3/90 | | 8/89 | 1/91 | | 5/90 | | 11/91 | 3/90 | 6/90 | |
| | T | 3/91 | | | | | | | | | | | |
| 1992-1994 | P | | | 10/92 | | | 2/92 | | 2/92 | | | | 4/92 |
| | T | | 3/92 | 10/93 | 3/92 | 4/94 | 8/93 | 3/92 | 10/93 | 12/93 | 9/93 | 7/93 | 6/93 |
| 1994-1996 | P | | | 11/94 | 3/95 | | | | | | 12/94 | | 5/95 |
| | T | | | 7/95 | 9/95 | | | | | | 9/96 | | 3/96 |
| 1997-1999 | P | | | | 10/97 | | | | | | | | |
| | T | | | | 4/99 | | | | | | | | |
| 2000-2001 | P | 3/01 | | 8/00 | 2/01 | 1/01 | | | | | 3/01 | | 1/01 |
| | T | 11/01 | | | 12/01 | | | | | | | | 12/01 |
| 2002-2003 | P | | | 10/02 | | | 8/02 | | | | | | |
| | T | | | 8/03 | 6/03 | 8/03 | 5/03 | | | | 3/03 | | |
| 2004-2009 | P | 12/07 | 1/08 | 4/08 | 8/08 | 4/08 | 2/08 | 5/08 | 8/07 | 2/08 | 5/08 | 4/08 | 2/08 |
| | T | 6/09 | 7/09 | 5/09 | 1/09 | 1/09 | 2/09 | 1/10 | 1/10 | | 5/09 | 3/09 | 6/09 |

**SOURCE:** Economic Cycle Research Institute (ECRI) **www.businesscycle.com** (except for the United States, NBER).

**NOTE:** Shaded cells represent periods for which data are not available.