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The timing and accuracy of leading and lagging business cycle indicators: A new approach

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Abstract

Leading and trailing indexes are characterized by their timing and their accuracy. Timing is the lead or lagging (trailing) time relative to a target time series, here industrial production (IP). Accuracy is measured here by the correspondence between the directions of changes in the indicator and the target. By plotting candidate leading and trailing time series and the target time series in phase plots and using the rotational properties of such trajectories, we found that the NBER composite leading index had lead times similar to those previously reported. From a topological map of composite as well as single leading and lagging indexes, some indexes showed unexpected properties. The interest rate spread showed a trailing pattern. The composite indicators, as well as average working hours per week and the consumer price index, behaved as expected. The method helps characterize leading and trailing indicators. With each new index that is paired with IP, one can immediately assess whether the index behaves as anticipated (leading, coinciding or trailing) with respect to IP.

Keywords: Business cycles; Composite leading indicator; Composite lagging indicator; Interest rate spread; Federal funds; Money supply; Principal component analysis

1. Introduction

The purpose of a leading indicator is to predict the peaks and troughs of the swings in the economy sufficiently far in advance that it is possible to react to the extreme events they represent. In practice a leading indicator is normally assumed to predict the timing of the peak less than a quarter of a cycle in advance.

The objective of this study is to characterize the leading and lagging indexes of the US business cycles. We present the results in the form of topological graphs that give the relative position of leading and lagging indexes along two axes, one representing timing (advanced warning time) and one representing accuracy (consistent movements of indicator and

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target series in the same direction). We hypothesise that leading indicators and their components will be in a different timing cluster than trailing indicators and their components.

Furthermore, we hypothesise that the composite indicators will outperform the single component indexes. The rationale for this second hypothesis is that no one of these latter series contributes in a dominant or major way to business cycles.

The method we use distinguishes itself from other methods in three ways. It focuses on the contemporaneous interaction between the indicator considered and the target index, as opposed to leading or lagging relationships between the two indexes (as for example, with Granger-causality analysis). Second, it does not focus on the peak or trough episodes of the target index, but rather considers interactions between the series over the entire business cycle. Third, the important features of the relationships between indicators and targets are compactly summarized through principal component analysis, PCA.

Certain indicators previously classified as leading indicators, such as the interest rate spread, are found to be coincident or slightly lagging. The methodology also shows the consistency with which the expected relationship between an indicator and the target is upheld empirically (accuracy).

The rest of the paper is organized as follows. First we describe our choice of leading and lagging indexes. Thereafter we describe the method used for identifying the properties of the indexes, as well as the construction of prototypes of leading and lagging indexes against which we compare indexes reported in the literature. Lastly we discuss our findings within the framework of a forecasting taxonomy.

2. Data descriptions

US monthly data 1955–2000 on industrial production is the target in this study. We emphasize leading and lagging indexes, although characteristics expected of coincident indicators are also presented. We hereafter use the term trailing index for the lagging index, so as to be able to use the prefix "L" for leading indexes and the prefix "T" for lagging or trailing indexes in tables and figures. All variables used are from Ecomagic (2005).

The dating of recessions comes from the Business Cycle Dating Committee of the National Bureau of Economic Research (NBER). During the 36-year period 1960 to 1996, six recessions were defined, making the average time between recessions 5–6 years. However, the actual times between recessions vary from 1.5 years to 10 years. For summary data see Filardo (1999).

2.1. Leading indexes

For leading indicators we used the composite leading indicator of the Conference Board (11 separate component indexes), and three component indexes (weight factors in parentheses): Interest rate spread (0.329); Money supply: M2 (0.2778); and Average weekly hours (0.1963).

One rationale for using the interest rate spread, defined by the Conference Board as the 10-year Treasury bond rate minus the federal funds rate, is to try to capture policy actions of the monetary authority. When the Federal Reserve tightens monetary policy by raising the federal funds rate, while longer term rates remain relatively unchanged, the spread declines and may become negative. The subsequent impact of the restrictive monetary policy is to slow output growth, so that decreases in the spread anticipate economic downturns. A sceptical review of the performance of the interest rate spread in this capacity is presented in Stock and Watson (2003).

The role of a monetary aggregate as a leading index, M2 in this study, dates back to earlier evidence on the relationship between money and output (Andersen & Jordan, 1986; Friedman & Schwartz, 1963). The rationale for using average weekly hours as a leading index is that the working hours of people already employed can be adjusted relatively quickly to accommodate expected changes in output demand. Consequently, changes in weekly hours tend to precede changes in industrial production.

2.2. Trailing indexes

As trailing indicators we used the Composite Lagging index of the Conference Board (with 7 separate components) and the consumer price index