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The Prediction of Business Cycle Phases: Financial Variables and International Linkages

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ABSTRACT

This paper discusses recent research at the Centre for Growth and Business Cycle Research on the prediction of the expansion and recession phases of the business cycle for the UK, US, Germany, France and Italy. Financial variables are important predictors in these models, with the stock market playing a key role in the US but not the European countries, including the UK. In contrast, international linkages are important for the European countries. Our models suggest that the US and German economy have now emerged from the recession of 2001, and that all five countries will be in expansion during the third quarter of this year.

JEL classification: C22, E32, E37, E40.

Keywords: business cycles, financial variables, leading indicators, logistic classification models, regime prediction, business cycle linkages.

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Introduction

Policy makers and private agents have an on-going interest in predicting the business cycle phase, namely in predicting whether the macroeconomy will be in a period of expansion or recession. Indeed, after recessions in the US and Germany during 2001, there is currently much uncertainty about whether these and other developed countries of the world will experience further recessions in the early years of the new century. Much of this uncertainty is associated with the large declines experienced by major world stock markets in the recent past and the impact of this on growth in the real economy.

Over the last decade or so, academic economists have devoted a substantial amount of effort to modelling the distinctive features of the expansion and recession phases of the business cycle. Within this literature, business cycle phases are often referred to as regimes. Hamilton (1989) provided a seminal contribution, since he showed that a quantitative statistical model based on regimes could effectively mimic the qualitative procedures used by the National Bureau of Economic Research (NBER) in dating expansions and recessions for the US. The majority of subsequent work has also focused on the US, and an important branch is concerned with models that employ leading indicator variables to produce probabilistic statements about the prospects of future recession (or expansion) for the economy at a specific time horizon. Examples include Birchenhall, Jessen, Osborn and Simpson (1999), Camacho and Perez-Quiros (2002) and Estrella and Mishkin (1998). Although there is a much smaller body of research concerned with other countries, Birchenhall, Osborn and Sensier (2001) and Sensier, Artis, Osborn and Birchenhall (2002) develop models to predict the business cycle phases for the UK and European countries respectively.

This paper reviews approaches to business cycle regime prediction, focussing on the work undertaken at the Centre for Growth and Business Cycle Research (CGBCR) at the University of Manchester. More particularly, we outline the approach in the papers of Birchenhall *et al*. (1999, 2001) and Sensier *et al*. (2002), contrasting this with some other methods used in the literature. The CGBCR procedure is illustrated by updating our previous work for the UK, other European countries (Germany, France and Italy) and the US, to produce expansion probability models for each of these five countries. The leading indicators used in producing these probabilities are predominantly financial variables and, for the European countries (including the UK), they explicitly show international transmission effects from Germany and the US to their business cycle phases. Based on this analysis, we

contribute to the current discussion about the impact of recent stock market declines on the macroeconomic prospects for the US and Europe.

In brief, our prediction is that all four countries will be in expansion phases of the business cycle through the third quarter of 2002. These predictions are based on data to the end of June. More recent output indicators (as available at the end of August 2002) for both the US and Germany have caused commentators to raise the possibility of recession for these countries. Nevertheless, our current reading is that these point to slumps rather than declines in output. Therefore, we remain comfortable with the predictions of our models for expansion during this period.

The rest of the paper has the following structure. We first outline the characteristics of historical business cycle phases, followed by the methodology for predicting these phases. We then present the results of our models for the European countries and the US, including three-months ahead probability forecasts for the business cycle phase in each country for the third quarter of this year. Finally, we make some concluding remarks.

Historical Business Cycle Phases

Prior to analysing business cycle phases, historical dates are required for past recessions and expansions. In our work, we adopt the so-called "classical business cycle", which is concerned with the change in the absolute level of economic activity. This contrasts with the "growth cycle" that examines movements relative to some long run trend. We believe that policy makers and private agents are more concerned about absolute declines and expansions in activity than in growth cycle measures. In any case, an important difficulty with any growth cycle analysis is that it is based on a definition of trend and such definitions are essentially arbitrary.

A recession is often considered to be in progress when two consecutive quarters of decline occur in real gross domestic product. Although this simple definition works reasonably well in practice, it does not capture all aspects of interest to economists and it is not applicable to monthly data. The National Bureau of Economic Research (NBER) has a widely accepted chronology for the classical business cycle over the last century for the US, and it defines a recession as "a significant decline in activity spread across the economy, lasting more than a few months, visible in industrial production, employment, real income and wholesale-retail sales" (Hall *et al.,* 2002). Although no corresponding definitive chronology is

available for other countries, the Economic Cycle Research Institute (ECRI) uses NBER-style procedures to date classical cycle turning points for various countries and their chronology for the US is identical with that of the NBER. We adopt the ECRI chronology for our analysis, with their peak and trough dates from 1970 onwards shown in the Appendix for the US and the four European countries we examine.

As discussed by Osborn, Sensier and Simpson (2001) in the UK context, recessions are relatively rare events. Over the last thirty years, each of the countries analysed here has experienced between three (in the case of the UK) and six (for the US) recessions. Indeed, the three recessions of the mid-1970s, the beginning of the 1980s and of the early 1990s are international phenomena, effectively common to each of these five countries (although the precise dates differ). Alone among the five countries examined, the UK has not experienced any idiosyncratic recessions.

Recent experience differs across countries. The long 1990s economic expansion in the US ended in March 2001, while a peak in economic activity in Germany occurred in January 2001. According to the ECRI dates currently available, no corresponding trough has yet been identified for either of these countries. Therefore, in our subsequent analysis regarding this period, we consider both Germany and the US to be in recession until the end of the period we examine, namely June 2002. This does not preclude the possibility that the end of the recession will later be identified by ECRI to have occurred prior to June 2002, but in adopting the ECRI dates we cannot pre-judge any such decision. Perhaps surprisingly, the 2001 recessions of the US and Germany have apparently not been transmitted to France, Italy or the UK.

Again based on the ECRI dates, the five countries considered here were in recession between 15 percent (for the UK) and 26 percent (in the case of Germany) of the time between the beginning of 1970 and the end of 2001. Therefore, it is the norm that these countries are in an expansion phase of the business cycle, and it is a non-trivial task to develop models that can accurately forecast the month of the onset of a future recession or, indeed, the date of a subsequent return to expansion.

Artis, Kontolemis and Osborn (1997) analyse the properties and international correlations between the business cycle phases for the G7 and European countries up to 1993. They draw out a core group of European countries with closely allied phases, including Germany, France and Italy. Although essentially descriptive, with no potential channels explicitly examined for the transmission of cycles, this analysis provided a background to later business cycle research undertaken at CGBCR.

In modelling business cycle phases, a choice must be made of the data frequency to be used, with the obvious candidates being quarterly or monthly data. In common with most work for the US, our research has predominantly focused on the monthly frequency. This does not yield any additional business cycle turning points compared with quarterly data, but it does use more finely tuned information about the precise timing of these turning points. Also, economic conditions can change quite dramatically within a quarter, and hence in real time agents will generally prefer more timely monthly data. The results reported below relate to the prediction of business cycle phases at the monthly frequency.

Business Cycle Regime Prediction

Approaches to Regime Modelling

Historically, methods used to predict business cycle phases were informal, often based on using graphical techniques to compare turning points in potential leading indicator series with turning points in the real economy; a UK example is provided by Central Statistical Office (1975). The usefulness of such an approach is limited, not only by its informality but also because a turning point in a leading indicator does not yield a prediction of the specific timing of any subsequent turning point in the real economy. Recent academic research on business cycle phase prediction has turned to methods that can yield precise predictions of this type.

As mentioned above, a key paper in this recent academic literature is Hamilton (1989), who developed a model based on the idea that growth in US gross domestic product could be captured through a dynamic model that switches between two regimes with different growth characteristics. Although the models treats the regimes as unobserved (and hence one task of the model is to reveal the likely regime for each period in the sample), Hamilton found in practice that they aligned well with expansions and recessions as dated by the NBER. His model is completed by two so-called transition probabilities, namely a probability for expansion at period t given expansion at the preceding period $t - 1$ and a probability for recession at t given recession at $t - 1$. These two probabilities are, in general, distinct, and Hamilton assumes them to be constant over time. As a tool for forecasting, this regime-switching model can be extended by making each of these two probabilities a function of leading indicator variables; see Filardo (1994) in the US context or Simpson, Osborn and Sensier (2001) for a UK application. The regime probability for period t

then depends not only on the regime (recession or expansion) applying at $t-1$, but also on economic conditions applying at $t-1$. In this context, Simpson *et al*. found interest rates to be informative for predicting regimes in UK gross domestic product.

In models that derive from the regime-switching approach of Hamilton (1989), the primary interest is not the regime itself, but rather the observed variable being explicitly modelled, such as quarterly output growth. Where the focus is on forecasting the business cycle phase itself, and reliable historical data are available for the business cycle chronology, these models are put at a disadvantage by treating past regimes as unknown. Also, since two transition probabilities are required, with relatively few switches between expansion and recessions occurring in the postwar period, only one or two leading indicator series can in practice be used in modelling the transition probabilities.

Side-stepping these problems, a recent strand of the literature has treated the business cycle phase (expansion or recession) as being an observed binary variable, using statistical techniques designed for modelling such variables. More specifically, Estrella and Mishkin (1998) use the probit model while Birchenhall *et al*. (1999) adopt logistic regression for modelling the US business cycle regimes of the NBER in terms of leading indicators. For the purpose of model estimation, any month within an NBER expansion is defined as taking the value one and any month within recession as having the value zero. This binary business cycle phase variable for time t is then modelled as a function observed explanatory variables, or leading indicators, up to period $t-h$, with the model delivering an estimated probability, $\hat{p}_{t|t-h}$, that the phase at period t will be expansion. Then $1-\hat{p}_{t|t-h}$ is the estimated probability of recession at t. In both cases, this probability represents a h-step ahead prediction of the business cycle phase, since information on leading indicators to $t-h$ is used. Since only one probability is required, and the regime is observed, more leading indicator information can be incorporated than in generalisations of the Hamilton (1989) approach.

Leading Indicators

The history of the use of leading indicator data to predict business cycle phases dates back to Burns and Mitchell (1946). It is usual to combine a range of individual leading indicators into a single composite indicator, essentially by scaling individual series and then averaging (see, for example, Green and Beckman, 1993). For the US, our modelling employs the widely used composite leading indicator of the Conference

Board, which is designed to predict classical business cycle phases. Until late-1995, this series and the corresponding composite coincident index were produced by the Bureau of Economic Analysis of the US Department of Commerce. As in Birchenhall *et al.* (1999), we draw on previous research by using the composite leading indicator and its components as potential leading indicators for the US.

There are no comparable widely used composite indicators for classical cycles in the other countries of interest here. The Central Statistical Office (now the Office for National Statistics) published UK growth cycle leading indicators from the early 1970s until 1997, with their methodology being based essentially on detrending and averaging across series (Central Statistical Office, 1975). Other early leading indicator work for the UK was undertaken at the National Institute (O'Dea, 1975), with recent National Institute research by Camba-Mendez, Katetanios, Smith and Weale (2001) developing leading indicator models for growth in gross domestic product in the four European countries studied here.

However, interest in our research is concerned with predicting classical business cycle phases. As in Sensier *et al.* (2002), we adopt the OECD composite leading indicators for the growth cycle (Nilsson, 1987) with the trend restored, as these may be useful for the classical cycle. The other series used for the four European countries are the domestic financial variables of narrow money (expressed in real terms by dividing the nominal series by the consumer price index), stock market prices, short-term and long-term interest rates for each country. Estrella and Mishkin (1998) find the interest rate term structure (long rate less short rate) to have predictive information for US business cycle phases. We use the term structure when this is preferred in terms of our measure of fit compared to the inclusion of the separate long and short interest rates. Where found to be relevant, current real activity is included, as represented by the index of industrial production[1].

The nature of links among the countries of the European Union is a central issue in Europe, especially since the launch of the Single European Currency, as interest rates for the participating countries are now set by the European Central Bank. With the exception of Artis and Zhang (1997, 1999), however, there are few explicit studies of the links between economic activity in the countries of the EU, and between these countries and the US. In order to study the international aspects of the EU, our modelling allows the possibility that variables for the other European countries of our study, plus the US, could affect each of the four countries. The international variables

considered in this context are stock market prices, short-term interest rates, the composite leading indicators and industrial production.

Our models predict the business cycle phase three months ahead, so we use information dated *t* - 3 and earlier to forecast whether the regime will be in expansion in month *t*. A three-month horizon is realistic in that it allows for time lags in the availability of data (especially for real series, including industrial production) and for lags in the response of agents to economic information, both domestic and (where relevant) international. The data we use are monthly and the in-sample period used in developing the models for the European countries is from January 1970 to December 1996 and for the US this is January 1965 to December 1996[2]. We use the data for January 1997 to June 2002 to examine out-of-sample forecast performance. To illustrate the value of our approach in real time, we predict the probability of expansion for each of the individual months July to September of 2002.

Data Transformations and Variable Selection

As in our earlier work, the majority of leading indicators[3] are used in the form of growth rates, by taking logs and then differences. However, the appropriate range of difference is unclear *a priori*, since a short difference over one month will be very noisy and hence may be unreliable for regime prediction, while a long difference (say over one year) may imply a loss of too much information. Our solution is to take a range of differences over 3, 6, 9 and 12 months, allowing our variable selection procedure to decide which of these (if any) is appropriate. Interest rate series are analysed without these transformations, but intermittent lags at 3, 6, 9 and 12 months are permitted. The term structure is computed as the difference between the long and short rates at these lags.

Our model selection procedure is detailed in Sensier *et al.* (2002), which is developed from that in Birchenhall *et al.* (1999). Broadly speaking, this is a "general to specific" procedure, which commences from a specification that includes four differences (over 3, 6, 9 and 12 months) or lags (for interest rate series) of the relevant leading indicator variables. Specific differences or lags are then dropped one by one

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[1] As in Sensier *et al.* (2002), retail sales was also considered but was never selected in any model.

[2] The different starting date for the US model allows us to incorporate the information related to the US recession that began at the end of 1969.

[3] Outliers are removed for a number of series and these are generally associated with events that do not relate to the business cycle, such as strikes. Further details are available from the authors on request.

when this improves the in-sample period fit as measured by the Schwarz Information Criterion (SIC). SIC measures fit in terms of the difference between the observed binary business cycle phase variable (with the value one for expansion and zero for recession) and the estimated probability of expansion for each month, with this balanced by a penalty term that depends on the number of coefficients estimated in relation to the sample size.

Results

European Counties

Our preferred business cycle phase prediction models for the four European countries[4] are summarised in Table 1, by showing the signs of the estimated coefficients and the period(s) of differencing or the lag(s) selected for each variable. The estimated coefficients are effectively unchanged from those reported in Sensier *et al*. (2002), where additional discussion of the results may be found. To focus on the prediction of business cycle phases, prediction error information is included. For each of the in-sample and out-of-sample periods, prediction errors are shown as percentages of the number of observations within expansions and recessions, with the numbers of errors and corresponding total number of phase observations in parentheses. As usual in the regime prediction literature, estimated probabilities are converted to binary regime predictions using the "0.5 rule", so that an estimated expansion probability over 0.5 is considered to be a prediction of expansion while one less than 0.5 is a recession prediction. Further, expansion prediction probabilities are shown for July to September 2002, which dates are subsequent to the data period (ending in June 2002) used in this study.

A number of aspects of the results in Table 1 are worthy of note. In terms of linkages between the European countries, German series play a role in the prediction of business cycle phases for France and Italy, but not for the UK. Further, no series for France, Italy or the UK helps phase prediction for any other European country. This provides evidence about the "German leadership" hypothesis for the European countries of France and Italy in the context of business cycle regimes, but the UK

[4] As noted in Sensier *et al.* (2002), the best model according to SIC for Germany included the composite leading indicator for France, but not the US composite leading indicator. However, the French leading indicator of the OECD, as used here, actually includes the US one as a component, making interpretation difficult. Therefore, we preferred the second best model for Germany according to SIC, which uses the US leading indictor series. With this single exception, the models reported are the ones that delivered the lowest SIC.

does not follow this pattern. Although the methodology used here is quite different (by focusing on prediction of business cycle phases, instead of being based on contemporaneous cross-correlations between growth rates), this fits with the pattern of results in Artis and Zhang (1997, 1999).

A second implication is the important role played by the US economy for Germany and the UK. It appears that economic and financial conditions in the US, as represented by the composite leading indicator and short-term interest rates, have a direct impact on the probability of expansion (and hence of recession) for these two countries. Again although a different methodology is employed, this is in line with the conclusion of Artis, Kontolemis and Osborn (1997) that Germany plays a key role in linking the business cycle of North America to that of "core" European countries.

Finally, financial variables play a very important role in the prediction of business cycle phases for each of these four countries. This is especially true for interest rates, since domestic interest rates always enter the model, together with at least one foreign (US or German) interest rate series. Although the sign of the domestic short-term interest rate is unambiguously negative in all cases, including for Germany in its effect through the term structure, foreign interest rates and the long-term interest rates have different effects for different countries and sometimes at different lags.

Interestingly, in no case does the domestic stock market have a positive influence on the prediction of expansion for the economy: this variable enters only for Germany and France, with a negative sign in each case. Indeed, since the primary effects of international financial variables on business cycles in these countries appear to operate through interest rates rather than stock prices, policymakers should not be unduly concerned about recent declines in international stock market prices increasing the chances of recession in any of these European countries. This is reinforced by the post-sample expansion probabilities shown in Table 1 for the months of July to September, which are effectively one for each of these countries.

Figures 1 to 4 illustrate the performance of these models in predicting the business cycle phase, with recessions shown by shading in these diagrams. Since the model delivers the probability of expansion at a horizon of three months, a "perfect" model would have a probability of one for all expansion periods and a probability of zero for all months within recessions. However, such a result in unrealistic in the sense that probability statements about the occurrence of some event can only be expected to be correct *ex post* with the relative frequency as given by the probability.

Table 1. Expansion Prediction Models for European Countries

Variable	Germany	France	Italy	UK
Domestic variables				
Industrial production	+ (12)			
Composite leading indicator	+ (3, 12)	+ (6)		
Real money	+ (3)		- (12)	- (12)
Stock prices	- (3)	- (6, 12)		
Short interest rate		- (3, 6)	- (3)	- (3, 12)
Long interest rate				+ (3), - (9)
Term structure	+ (9)			
German variables				
Composite leading indicator			+ (12)	
Short interest rate		+ (9), - (12)	- (12)	
US variables				
Composite leading indicator	+ (6)			+ (12)
Short interest rate	- (3), + (6)	+ (6)		+ (9)
SIC	113.2	168.3	91.19	113.9
Errors In-Sample (Jan 1970 – Dec 1996)				
Expansions	2% (5/229)	1% (5/253)	2% (7/246)	2% (8/268)
Recessions	7% (7/95)	19% (14/71)	8% (7/78)	16% (9/56)
Errors Out-of-Sample (Jan 1997 – Jun 2002)				
Expansions	0% (0/49)	(0/66)	(0/66)	(0/66)
Recessions	58% (10/17)	(0/0)	(0/0)	(0/0)
Expansion Prediction Probabilities				
July 2002	0.9999	1	1	1
August 2002	1	1	1	1
September 2002	1	1	1	1

Notes: Selected variables are shown as sign of the coefficient for the difference or the lag (for interest rate series) that enters the model, together with the corresponding difference or lag in parentheses. Errors are shown as the percentage of months in each of the expansion and recession phase where the phase is incorrectly predicted, together with (in parentheses) the number of errors and the number of months in that regime.

A glance at these figures indicates that future periods of expansion are generally predicted relatively well (with probabilities very close to one), but recessions periods are more difficult to predict overall.

More specifically, all four models yield expansion prediction errors in Table 1 of only 1 or 2 percent. For Italy and the UK (Figures 3 and 4), these errors mainly concern the precise timing of the recession of the early 1990s, rather than giving "false signals" of a recession that does not materialise. As seen in Figure 2, the expansion predictions for France are fairly erratic, since the probability sometimes dips to between 0.6 and 0.8 (or lower) during expansions. In-sample recession period errors are higher than for expansions across all countries, at between 7 and 19 percent. In general, these occur where there is a "double dip" pattern during a recession, where the model incorrectly predicts expansion but then returns to recession prediction within the period later identified as a single recession by ECRI. There is only one recession for any of these countries within our out-of-sample period, where the onset of the 2001 recession for Germany is not predicted by the model until August 2001, whereas recession was in progress by February of that year. The model suggests that the German economy would emerge from the recession in May 2002, although no recovery has yet been dated by ECRI.

US Models

As noted above, historically there has been much more attention paid to the prediction of business cycle phases in the US than in other countries. Hence many more variables have been used as potential leading indicators. The composite leading indicator of the Conference Board is widely used, and hence the first model examined for the US in Table 2 is based on this[5]. In this model, the four component series of the Conference Board's composite coincident indicator (industrial production, sales, income and non-agricultural employment) are allowed to enter to capture current economic conditions at period $t - 3$. Following Birchenhall *et al*. (1999), the second model considers the components of the composite leading indicator[6] as separate series. Due to the large number (ten) of component series, the coincident series are not

[5] Full details of these models, including estimated coefficients, can be found at the CGBCR website, http://www.ses.man.ac.uk/cgbcr/.

[6] Note, however, that some of the specific components have changed in the current composite leading indicator compared with that used in Birchenhall *et al.* (1999). The analysis reported here is based on the ten components currently used (http://www.globalindicators.org/us/LatestReleases/).

Table 2. Expansion Prediction Models for the US

Variable	CLI Model	Components of CLI Model
Coincident indicators		
Industrial production	- (3)	
Sales	- (6)	
Nonagricultural employment	+ (12)	
Income	+ (3), - (12)	
Leading indicators		
Composite index	+ (6, 9)	
Stock prices		+ (9)
Term structure		+ (3)
Vendor performance, slower deliveries		- (6)
House building permits		+ (6)
New orders, nondefence capital goods		+ (9)
Initial unemployment claims		- (9)
SIC	173.0	139.6
Errors In-Sample (Jan 1965 – Dec 1996)		
Expansions	3% (10/327)	2% (9/327)
Recessions	24% (14/57)	17% (10/57)
Errors Out-of-Sample (Jan 1997 – Jun 2002)		
Expansions	11% (6/51)	1% (1/51)
Recessions	66% (10/15)	26% (4/15)
Expansion Prediction Probabilities		
July 2002	0.7615	0.9306
August 2002	0.7453	0.9605
September 2002	0.6986	0.9976

Notes: see Table 1.

considered in this specification. As with the European models, not all series and differences initially considered enter the final models selected by SIC.

In common with the European country models of Table 1, the US models predict expansion months with greater accuracy than recession months. However, as can be seen from Figure 5, the composite leading indicator model for the US is sometimes a little erratic during expansions. In total, it gives ten "false signals" of recession within sample, and there are a number of further occasions where the expansion probability drops to around 0.8 within business cycle expansions. The role of the coincident indicators is interesting here, since there are negative signs on industrial production, sales growth and the twelve-month difference of income, whereas positive signs might be anticipated. As expected, the signs on the two differences for composite leading indicator are both positive. It is possible that the differing signs on these coincident and leading variables helps in the prediction of turning points.

Although coefficient estimates are not presented in Table 2, stock market prices (differenced over nine months) has the greatest weight in the components model. In contrast to the European models, the sign is positive. Therefore, stock market prices, play a more prominent role in predicting business cycle phases in the US than in the European countries. The term structure also enters this model, again emphasising the role of interest rates for business cycle phase prediction.

The component model dominates (according to both SIC and the errors for the prediction of recessions) the model that uses only the composite leading indicator, indicating a serious loss of information for the prediction of recessions if only the composite series is used. A similar result applied for the composite leading indicators in European countries, where other variables add information to (and sometimes eliminate) the domestic composite leading indicator. However, the composite series there are the OECD series designed to lead the growth cycle, whereas the US composite is that of the Conference Board and designed to lead the classical cycle. Therefore, this US result is more relevant.

The 2001 US recession, which is out of the sample period used for estimating these models, is predicted moderately well by both models. The composite leading indicator model gives a false early signal that the recession would begin in December 2000, and predicts it to finish too early (July 2001 is predicted to be an expansion month). A return to recession is predicted for July 2002. The component model predicts the onset of recession late, as June 2001, with it predicted to finish in

February 2002. As indicated by Figure 6, the component model, in particular, clearly shows the occurrence of this recession, with expansion probabilities close to zero.

Despite the substantial declines in stock market prices, the component model indicates a high probability of the US economy being in expansion over the period July to September this year. In contrast, the composite leading indicator model indicates a probability of recession around 0.25-0.3. However, in view of the better performance of the component model for earlier periods, we are confident of expansion for the US economy at this time. July industrial production data for the US implies modest growth, which is compatible with our prediction of expansion for the overall economy.

Conclusions

Recent empirical research at CGBCR has focussed on the prediction of business cycle expansion and recession regimes. This paper summarises and updates that work, constructing three-months ahead prediction models for business cycle phases in Germany, France, Italy, the UK and the US. Our results indicate roles for German variables in the models for France and Italy, underlining the linkages between business cycles in these "core" European countries. The US composite business cycle leading indicator is influential for Germany and the UK, so that we would generally anticipate recessions in the US to impact on the prospects of recession for these countries. Through Germany, this will also ultimately affect France and Italy.

Financial variables play important roles in all our models. Domestic interest rates always enter, with higher short-term interest rates increasing the probability of recession. However, declining stock market prices increase the recession probability only in the case of the US, indicating that policymakers in the European countries do not need to be overly concerned about their direct impact on the business cycle in these countries. The immediate outlook is good for all countries, since our preferred models indicate high probability of expansion for July to September 2002. This is reassuring for the US, indicating that the past declines in the stock market are not sufficient to overturn other indicators of expansion. Based on industrial production data for July, the prediction of US growth appears to be correct, despite the fact that the growth experienced seems to have been very modest.

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Appendix

ECRI Classical Business Cycle Turning Point Dates 1970-2001

Peak or Trough	US	Germany	France	Italy	UK
Peak	Dec 1969			Oct 1970	
Trough	Nov 1970			Aug 1971	
Peak	Nov 1973	Aug 1973	Jul 1974	Apr 1974	Sep 1974
Trough	Mar 1975	Jul 1975	Jun 1975	Apr 1975	Aug 1975
Peak	Jan 1980	Jan 1980	Aug 1979	May 1980	Jun 1979
Trough	Jul 1980		Jun 1980		May 1981
Peak	Jul 1981		Apr 1982		
Trough	Nov 1982	Oct 1982	Dec 1984	May 1983	
Peak	Jul 1990	Jan 1991	Feb 1992	Feb 1992	May 1990
Trough	Mar 1991	Apr 1994	Aug 1993	Oct 1993	Mar 1992
Peak	Mar 2001	Jan 2001			

Source: http://www.businesscycle.com/research/intlcycledates.asp

Figure 1: German Model

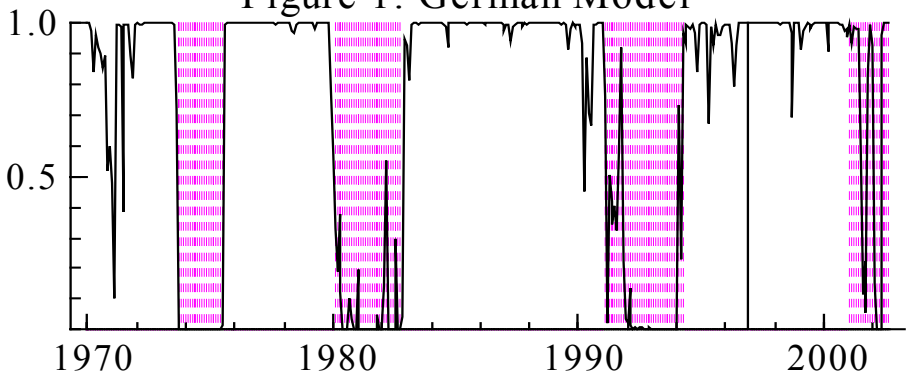

Figure 2: French Model

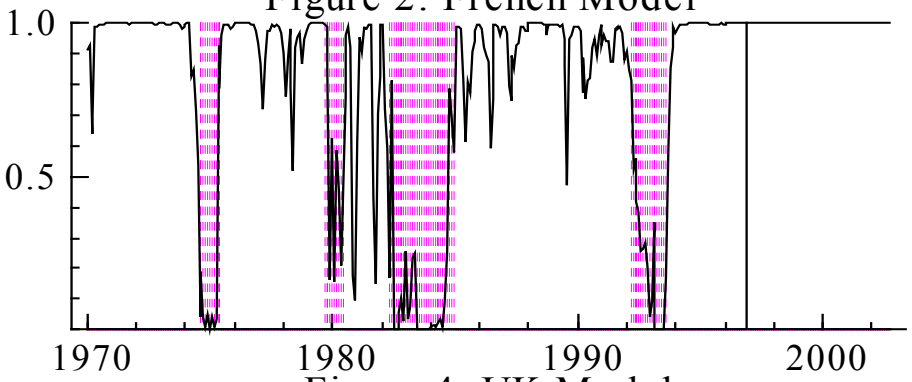

Figure 3: Italian Model

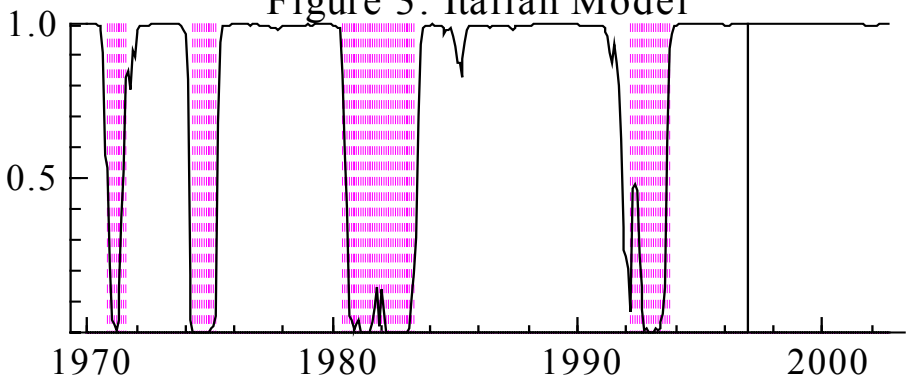

Figure 4: UK Model

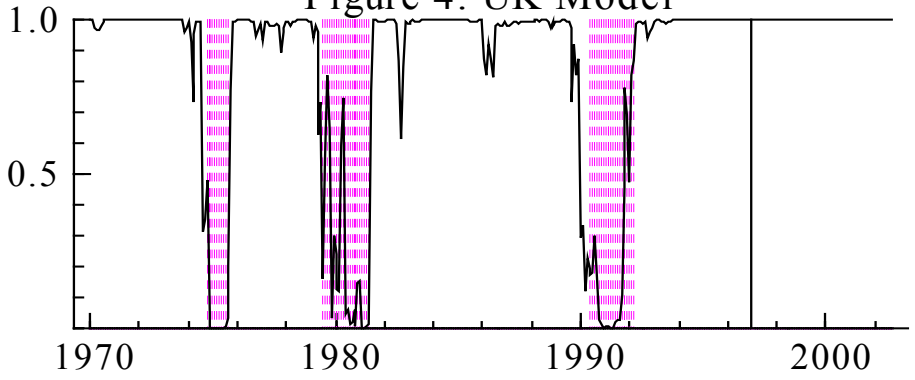

Figure 5: US CLI Model

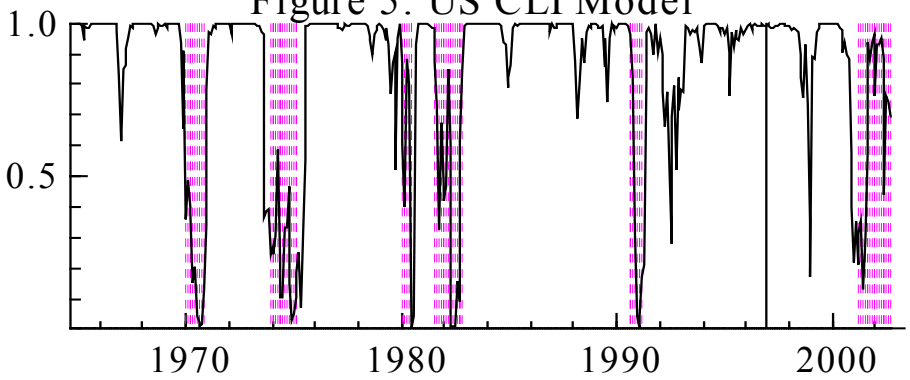

Figure 6: US Components Model