Business cycles and the role of confidence: Evidence from Europe

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Abstract: Using an under-utilised dataset on consumer and business confidence indicators across the UK, France, Italy and the Netherlands, this paper considers the extent to which such indicators are linked to GDP and the business cycle. We adopt, cross correlation descriptive statistics, Granger causality tests, variance decomposition, and forecast probit tests to investigate the properties of the data. In general consumer and business confidence indicators are leading indicators and pro-cyclical. There is some evidence of causality between the indicators and GDP and confidence indicators would appear to have good predictive power of cycle turning points in relation to other leading indicators.

I. Introduction

The aim of this paper is to provide an investigation and a comprehensive empirical analysis into whether confidence indicators can be used to predict business cycle activity across four European economies. The motivation for doing this is to firstly employ a data set which as far as we are aware has to date been underused; and secondly, to see if consumer or business confidence indicators provide any evidence over and above existing leading indicators. Section II provides a brief summary of the literature relating confidence indices to output trends, section III describes the data. The empirical analysis takes place in sections IV, V, VI and VII, which consider cross sectional properties of the data, causality, variance decomposition and forecasts respectively. Section VIII concludes.

II. Existing literature

A number of papers exist in the literature, both theoretical and applied, which investigate the effect of confidence upon economic activity. Of the former Yew-Kuang (1992) asks whether a collapse in business confidence could trigger a recession. For instance, a stock market crash may induce a depression by reducing business confidence and aggregate demand. Potter (1999) suggests that business cycle asymmetries found in post war US data are inconsistent with the trends of the economy during the Great Depression. In a model of rational expectations such inconsistencies are examined by focusing upon the confidence of investors.

Considering the empirical literature on the impact of confidence upon economic activity, Matsusaka and Sbordone (1995) examining trends in US output over the period 1953 to 1988 find that consumer sentiment Granger causes GNP fluctuations, even after controlling for other potential leading indicators. Furthermore, variance decompositions

imply that between 13-16% of GNP variation is explained by consumer sentiment. Carroll et al. (1994) forecasting household expenditure, find that lagged consumer sentiment does have a degree of explanatory power in predicting current changes in household spending. The inability of economic forecasters to predict the 1991 US recession led Batchelor and Dua (1998) to investigate the role of consumer confidence indices. Their results show that consumer confidence would have improved the forecasts of the 1991 US downturn, but used at other times may have been misleading.

Eppright et al (1998) use multivariate VAR analysis on US data to investigate whether indices of aggregate consumer attitude and expectations possess any information not contained in other economic indicators. Their analysis reveals that consumer expectation measures provide predictive power over and above other leading indicators. Acemoglu and Scott (1994) reject the rational expectations permanent income hypothesis for the UK due to the strong predictive power of consumer confidence, and not labour income or any other macro variable. Bodo et al (2000) find that business confidence indices perform the best in terms of forecasting capability in the euro area using ARIMA and cointegrated VAR techniques. Lee and Shields (2000) examining UK manufacturing output trends over the period 1975 to 1993 also finds a role for business confidence in explaining the time profile of industrial outputs.

The literature relating confidence to output fluctuation is small and largely related to US evidence. After introducing the data in the following section we analyse the extent to which confidence indicators can be used as leading indicators across four countries.

III.   Data

The data used in the empirical analysis looks at four countries – the UK, France, Italy and the Netherlands over the period 1983 to 1998 based upon quarterly data. We gain measures of consumer and business confidence from detailed monthly reports called the *European Economy Consumer Survey Results*, and *Business and Consumer Survey Results* respectively[1]. The indicator is a weighted average of the percentage responses to a range of questions[2] and is constructed so the indicator lies within the range –100 to +100, where positive values indicate optimism. We add 100 to this index to enable us to convert the data to logarithms, i.e. all the data takes on positive values. The consumer and business confidence data are shown in Figures 1 to 4 for each country.

<<FIGURES 1 to 4 HERE>>

Abel *et al.* (1998) note that historically the consumer confidence indicator has been sensitive to output trends. For example, in the UK both consumer and business confidence indicators dropped significantly during periods of recession – notably the 1990 UK trough. In addition to the confidence indicators other potential leading indicators employed are: the real wage, employment, consumer expenditure, government expenditure, gross fixed investment, money supply (both broad and narrow measures), unemployment rate, interest rate, and the real effective exchange rate. These data are available for each country from Datastream.

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[1] Note that although the confidence indicators are available on a monthly basis, we aggregate to a quarterly interval. The reason that we do this is that GDP is only available on a quarterly basis. Although others have used industrial production, which is available by month, to proxy economic activity e.g. Andreou *et al.* (2000) it is debatable whether or not this is a good indicator. For example in 1995 industrial production accounted for only 26.6% of UK GDP. Moreover Andreou *et al.* (2000) note that industrial production is twice as volatile as quarterly GDP in the UK. Consequently, conclusions may differ from studies based upon industrial production data in comparison to those that use GDP. Furthermore, the business and consumer confidence indicators cover sectors other than manufacturing.

[2] The appendix shows the questions used in both the consumer and business confidence surveys.

The next section considers the cross sectional properties of the data and identifies potential leading indicators across countries.

IV.   Cross sectional properties

We employ cross correlation coefficients to establish whether the variables are leading or lagging indictors, and counter-cyclical or pro-cyclical, as is common in the literature (Blackburn and Ravn, 1992; Millard et al, 1997; Andreou et al, 2000). Initially, all the data are detrended subject to the Hodrick-Precott filter[3].   After all the data has been detrended using the HP filter we consider co-movements in variables to that of GDP. Entries in column t (through Tables 1 to 4) are the contemporaneous cross correlation coefficients between each explanatory variable and GDP, and the entries in columns $t-i$ and $t+i$ (i=1,2,3,4) are the non-contemporaneous cross correlations with GDP. A positive (negative) coefficient indicates that a series is pro-cyclical (counter-cyclical), and a number close to zero indicates that the series is largely unrelated to the GDP cycle. A relatively large number in the column $t-i$ ($t+i$) shows that the series tends to lead (lag) the GDP cycle by i quarters.

The results are given in Tables 1 to 4 for the UK, France, Italy and the Netherlands respectively, over the period 1983q1 to 1998q4. In the UK and France (Tables 1 and 2)

<<TABLES 1 to 4 HERE>>

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[3] The Hodrick Prescott (HP) filter (1980) can be used to define the cyclical component of a series, $y_t^C = y_t - y_t^{HP}$, where y_t denotes the series in question and y_t^{HP} is the estimate of the trend from the HP filter. Given that τ_t is the trend of the series y_t the trend component is obtained by solving the following convex minimisation problem: $\underset{\{\tau_t\}_{t=1}^T}{MIN} \sum_{t=1}^{T}(y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1}[(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})]^2$ where λ is a smoothing parameter. In this paper we define the value as $\lambda = 1600$ which is common practice for quarterly data.

the three strongest leading indicators, which are also pro-cyclical, are employment, money supply M3 and business confidence. In Italy both consumer expenditure and gross fixed investment display traits of leading and lagging the cycle, the latter being counter-cyclical. Business confidence clearly leads the cycle, whilst the real wage and unemployment lag. Consumer expenditure, unemployment and business confidence are all leading indicator in the Netherlands. A common finding across each country is that both consumer and business confidence are pro-cyclical and can be considered as leading indicators, with business confidence often one of the strongest three correlation's at fixed t

Next we use multivariate analysis to consider which series is most strongly correlated with GDP, controlling for country and time effects, by pooling across countries and time as follows:

$$GDP_{ct} = \beta + \varphi Time_t + \delta Country_c + y_{ct}\theta + \upsilon_{ct} \tag{1}$$

where GDP is detrended using the HP filter, and the matrix y contains the potential leading indicators also detrended by the HP method. The results of this analysis are shown in Table 5. Clearly, the business confidence indicator is significant and stands out

<<TABLE 5 HERE>>

as the third largest coefficient (column 1), whilst consumer and government expenditure exhibit the strongest effects. Removing, consumer and government expenditure (column 2) also provides a role for consumer confidence, although the negative coefficient suggests that on average across time and countries it lags the cycle. The following section looks at any causality links between the potential leading indicators and the cycle.

V. Causality

We carry out tests to see whether the coefficients of a subset of jointly determined variables in a VAR are equal to zero. Included in the VAR are GDP, the leading indicators identified from the cross correlation's (see Tables 1 to 4) plus the consumer and business confidence indicators. Thus the test is based upon the following:

$$GDP_t = \alpha + \sum_{p=1}^{L} \sum_{i=1}^{M} \Omega_{pi} Lead_{pt-i} + \sum_{i=1}^{M} \Phi_i Consumer_{t-i} + \sum_{i=1}^{M} \Theta_i Business_{t-i} + \kappa_t \quad (2)$$

A test of non-causality amounts to a null hypothesis of: $\Phi_i = 0$ for consumer confidence not Granger causing GDP, $\Theta_i = 0$ for business confidence not Granger causing GDP, and a joint test of consumer and business confidence not causing GDP of $\Phi_i + \Theta_i = 0$. If the null hypothesis is rejected this signifies that confidence indicators Granger cause GDP. Note all data is first differenced as ADF tests for stationarity revealed the data to be I(1). The results are shown in Table 6 for each of the four countries. For the UK the

<<TABLE 6 HERE>>

evidence suggests that consumer confidence does Granger cause the GDP cycle, whilst GDP Granger causes business confidence. In France and Italy the hypothesis that business confidence does not Granger cause the cycle can be rejected. Only in the Netherlands are no causality links between confidence and the GDP cycle established. The following considers the proportion of forecast errors explained by confidence indicators in relation to other indicators of economic activity.

VI. Variance decomposition

An alternative way to assess the quantitative importance of confidence indicators and other leading indicators in GDP fluctuations is to use the VAR residuals to decompose the innovations of each variable, Sims (1980a, 1980b). Defining u as a vector of forecast

errors from a trivariate VAR and Σ as the corresponding covariance matrix, then it is possible to find an orthonormal vector v and a lower triangular matrix G such that $GG' = \Sigma$ and $Gv = u$. Since v is orthonormal and G is lower triangular it is possible to derive the percentage contributions of innovations from each of the forecast errors associated with each endogenous variable. This can be applied to any arbitrary length forecast. We apply this method to the decompositions of GDP and the leading indicators from one to eight quarters ahead, with the results shown in Tables 7 to 10. In general

<<TABLES 7 to 10 HERE>>

both consumer and business confidence indicators are able to explain relatively large percentages of the k-ahead forecasts variance of GDP. In the UK, Table 7, for first quarter variance decompositions consumer confidence explains 8.6% of GDP variance, rising to 20.2% by 3 quarters ahead. Over each forecast horizon consumer confidence explains a larger proportion of UK GDP variance than business confidence. This is also true for Italy, Table 9, although both confidence indices explain a higher percentage than in the UK. Business confidence has a large role to play in both France (Table 8) and the Netherlands (Table 10), dominating the proportion explained by consumer confidence. Tables 7 to 10 reveal that either consumer or business confidence dominate the other potential leading indicators[4]. The following section considers whether the confidence indicators can be employed to predict turning points in the cycle.

VII. Forecasts

In order to gain an insight into the predictive power of consumer and business confidence, both of which are potential leading indicators (see above), a probit model is

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[4] Although changing the ordering the variables entered in the VAR affected the percentage contributions, the overall effects remained unchanged in that confidence indicators explained the largest proportion of GDP forecast variance.

used, with all data detrended by the HPF, following Estrella and Mishkin (1998). The probit form is defined by the following relationship:

$$s^*_{t+k} = x_t \beta + \varepsilon_t \tag{3}$$

where s^*_{t+k} is an unobservable, which determines the occurrence of a recession at time t where k is the length of the forecast horizon. The error term ε_t is normally distributed, x_t is a matrix of independent variables (all detrended by the HPF, see above) including a constant with a corresponding vector of coefficients β. The observable recession indicator r_t is related to the above model by:

$$r_t = \begin{cases} 1, & \text{if } s^*_t > 0 \\ 0, & \text{otherwise} \end{cases}$$

The form of the estimating equation is:

$$P(r_{t+k} = 1) = F(x_t \beta) \tag{4}$$

where F is the cumulative normal distribution function corresponding to ε. The model is estimated by maximum likelihood, with the likelihood function defined as follows:

$$L = \prod_{[r_{t+k}=1]} F(x_t \beta) \prod_{[r_{t+k}=0]} [1 - F(x_t \beta)] \tag{5}$$

We define a recession when filtered GDP is below trend. In practice the forecast horizon is four quarters ahead, so k is between 1 and 4. The principle measure of the models explanatory power is a pseudo R^2 developed by Estrella (1998):

$$\text{pseudo } R^2 = 1 - \left(\frac{\log L_u}{\log L_c} \right)^{-(2/n)\log L_c} \tag{6}$$

where L_c, L_u is the maximum value of the likelihood under the constraint that all coefficients except the intercept are zero and the unconstrained maximum value of the likelihood respectively.

For hypothesis testing after predicting two or more quarters ahead standard t-ratios cannot be used. This is because an overlapping data problem occurs in that the forecast horizon is longer than the observation interval. Consequently, forecast errors are likely to be serially correlated. As a result t-statistics are calculated using standard errors adjusted for the overlapping data problem by adopting the Newey-West (1987) approach to serially correlated errors. An estimator of the covariance matrix is given by:

$$Q = \frac{1}{n}\sum_{i=1}^{n} e_i^2 x_i x_i' + \frac{1}{n}\sum_{z=1}^{M}\sum_{t=z+1}^{n} \omega_k e_t e_{t-z}\left(x_k x_{t-z}' + x_{t-z}x_t'\right) \tag{7}$$

where $\omega_k = z \div (M + 1)$ which is a weighting coefficient with M being predetermined, x is a matrix of dependent variables and e is a vector of residuals.

The results are shown in Tables 11 to 14 for the UK, France, Italy and the Netherlands respectively. The t-statistics show that the majority of the potential leading indicators are

<<TABLES 11 to 14 HERE>>

significant. In the UK both business and consumer confidence can be used to predict the cycle. However, the predictive power of the business confidence indicator tails off after 1 period ahead forecasts, where it has the largest coefficient, to being ranked 4th when predicting 4 periods ahead. For the UK although the confidence indicators are always in the group of largest four coefficients, employment has the greatest predictive capability across forecast horizons.

In France (Table 12) business confidence has the largest predictive capability in 1 and 2 period ahead forecasts, falling to 3rd largest coefficient thereafter. Although consumer confidence has no predictive power in 1 and 2 period ahead forecasts it is ranked the second largest impact thereafter. Confidence indicators have no predictive power in Italy, never one of the four largest coefficients, and are often insignificant. Government

expenditure seems to do the best job of predicting turning points in the Italian economy. Turing to the Netherlands (Table 14) across each forecast horizon business confidence has the most predictive power out of the potential leading indicators, followed by consumer expenditure. In most k ahead periods consumer confidence also has significant predictive power ranked either 3rd or 4th out of the potential leading indicators.

VIII. Conclusions

This paper has introduced a dataset containing business and consumer confidence indicators to explore to what extent such variables are related to the GDP cycle. Investigation of the confidence properties over four European countries from 1983 to 1998 suggests that in general they are leading indicators, pro-cyclical, have the potential to Granger cause GDP, explain a large percentage of the variance of GDP decompositions, and perhaps most strikingly have good predictive power of turning points in the cycle in the face of controlling for other potential leading indicators.

Appendix

Harmonized consumer survey

The consumer confidence indicator is the arithmetic average of results to the following five questions:-

Q1 How does the financial situation of your household now compare with what it was 12 months ago?

    i.   got a lot better
    ii. got a little better
    iii. stayed the same
    iv. got a little worse
    v.   don't know

Q2 How do you think the financial position of your household will change over the next 12 months?

    i.   get a lot better
    ii. get a little better
    iii. stay the same
    iv. get a little worse
    v.   don't know

Q3 How do you think the general economic situation in this country has changed over the last 12 months?

    i.   got a lot better
    ii. got a little better
    iii. stayed the same
    iv. got a little worse
    v.   don't know

Q4 How do you think the general economic situation in this country will develop over the next 12 months?

    i.   get a lot better
    ii. get a little better
    iii. stay the same
    iv. get a little worse
    v.   don't know

Q5 Over the next 12 months, how do you think the amount of money you will spend on major purchases will compare with what you spent over the last 12 months? Will it be:

    i.   much more?
    ii. a little more?
    iii. about the same?
    iv. a little less?
    v.   much less?
    vi. don't know

<u>Harmonized business survey</u>

The business confidence indicator is the arithmetic average of results to the following five questions:-

Q1 Production trend observed in recent months

      i.   up
      ii.   unchanged
      iii.   down

Q2 Assessment of order book-levels

      i.   above normal
      ii.   normal
      iii.   below normal

Q3 Assessment of export order-book levels

      i.   above normal
      ii.   normal
      iii.   below normal

Q4 Assessment of stocks of finished products

      i.   above normal
      ii.   normal
      iii.   below normal

Q5 Production expectations for the months ahead

      i.   up
      ii.   unchanged
      iii.   down

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Figure 1 Consumer and business confidence in the UK.

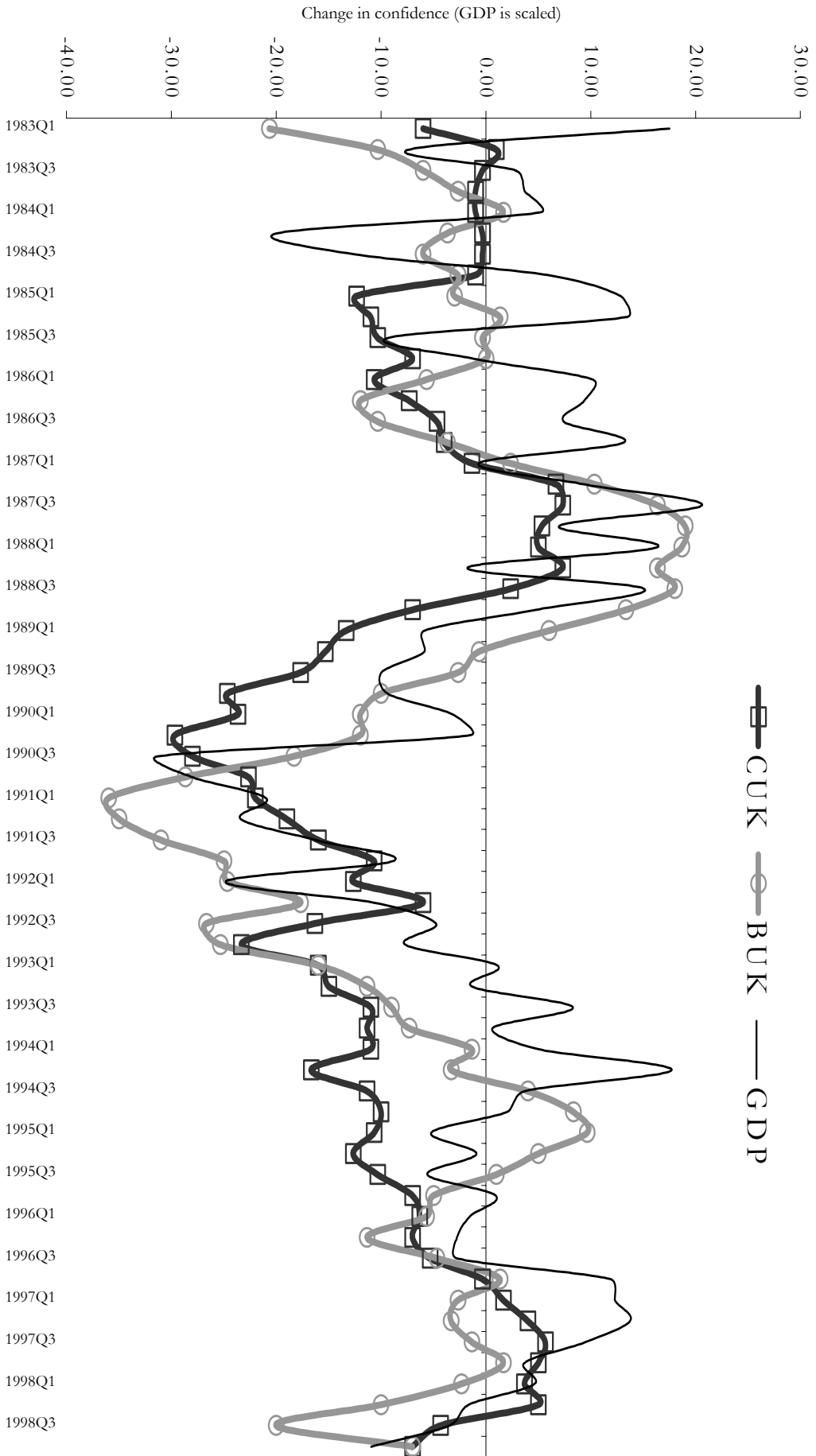Change in confidence (GDP is scaled)

CUK BUK GDP

Figure 2 Consumer and business confidence in France.

Figure 3 Consumer and business confidence in Italy.

Figure 4 Consumer and business confidence in the Netherlands.

<u>Table 1 UK Business Cycle Facts.</u>

	σ^2	t-4	t-3	t-2	t-1	T	t+1	t+2	t+3	t+4
Real wage	0.0094	0.1146	0.1350	0.1470	0.1592	0.1333	0.0911	0.0078	-0.0469	-0.0863
Employment	0.0116	**0.8477**	**0.8634**	**0.8589**	0.7972	0.6833	0.5353	0.3553	0.1592	-0.0379
Consumer expenditure	0.0169	0.4939	0.6402	0.7682	0.8673	**0.9188**	**0.8869**	**0.8055**	0.6735	0.5190
Government expenditure	0.0076	0.1724	0.0885	-0.0477	-0.1455	-0.2613	-0.3279	-0.3729	-0.4084	-0.4696
Gross Fixed Investment	0.0452	0.6519	0.7026	0.7319	**0.7487**	**0.7453**	**0.6983**	0.5866	0.4897	0.3901
Money supply M4	0.0261	**0.7915**	**0.6795**	**0.5507**	0.4212	0.2880	0.1373	-0.0124	-0.1695	-0.3294
Money Supply M0	0.0105	0.7674	**0.7803**	**0.7658**	**0.7331**	0.6823	0.5535	0.3927	0.2043	0.0165
Unemployment rate	0.1316	-0.7789	**-0.8257**	**-0.8374**	**-0.7985**	-0.6971	-0.5571	-0.3786	-0.1806	0.0232
Interest rate	0.1535	**0.6609**	**0.5939**	**0.4991**	0.3733	0.2368	0.0512	-0.1266	-0.2796	-0.4044
Real effective exchange rate	0.0467	0.1547	0.1752	**0.2019**	**0.1800**	0.0878	0.0006	-0.0811	-0.1707	**-0.2517**
Consumer confidence	0.0249	0.4273	0.5138	0.5694	**0.5901**	**0.5784**	**0.5646**	0.5175	0.4441	0.3369
Business confidence	0.0373	**0.8794**	**0.9138**	**0.9023**	0.8413	0.7373	0.5887	0.4153	0.2344	0.0512

The first column reports the standard deviation of the variable listed. The remaining columns show the correlation of the variable listed with GDP at lags and leads 1 through to 4 i.e. (t-1….t-4) and (t+1….t+4). All data are detrended using the Hodrick-Prescott filter. Sample period 1983q1 to 1998q4. The 3 strongest correlations are shown in bold.

<u>Table 2 France Business Cycle Facts.</u>

	σ^2	t-4	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4
Real wage	0.0054	0.4264	0.3571	0.3079	0.1836	0.0717	-0.0812	-0.1937	-0.3146	-0.3884
Employment	0.0173	**0.6715**	**0.8181**	**0.8109**	0.7530	0.6241	0.4762	0.3234	0.1929	0.0947
Consumer expenditure	0.0076	0.3268	0.4076	0.5694	0.6119	0.7057	0.5583	0.4419	0.3117	0.1688
Government expenditure	0.0085	-0.2159	-0.3579	-0.3546	-0.3311	-0.2554	-0.2515	-0.1986	-0.1431	-0.0716
Gross Fixed Investment	0.0288	0.3473	0.5402	0.6922	**0.8133**	**0.9058**	**0.8339**	0.7086	0.5873	0.4686
Money supply M3	0.0189	**0.7026**	**0.7854**	**0.6687**	0.4934	0.2927	0.1605	-0.0382	-0.1552	-0.2455
Money Supply M1	0.0352	0.1658	0.2743	0.2266	0.1936	0.0849	0.1455	0.0868	0.0763	-0.0094
Unemployment rate	0.0514	-0.5781	-0.7594	**-0.8569**	**-0.8518**	-0.7916	-0.6931	-0.5421	-0.3842	-0.2384
Interest rate	0.0519	0.5856	0.6888	**0.7019**	0.6219	0.4559	0.2816	0.0713	-0.1302	-0.3039
Real effective exchange rate	0.0181	-0.3096	-0.2339	-0.1922	-0.2278	-0.2991	-0.3806	-0.4165	-0.3463	-0.2062
Consumer confidence	0.0162	0.4558	0.5452	0.5613	0.4917	0.3591	0.1879	0.0329	-0.0951	-0.1737
Business confidence	0.0274	**0.6559**	**0.8194**	**0.9056**	0.8994	0.8091	0.6484	0.4473	0.2613	0.0981

The first column reports the standard deviation of the variable listed. The remaining columns show the correlation of the variable listed with GDP at lags and leads 1 through to 4 i.e. (t-1….t-4) and (t+1….t+4). All data are detrended using the Hodrick-Prescott filter. Sample period 1983q1 to 1998q4. The 3 strongest correlations are shown in bold.

<u>Table 3 Italy Business Cycle Facts.</u>

	σ^2	t-4	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4
Real wage	0.0154	-0.4442	-0.4986	-0.4695	-0.4059	-0.3336	-0.2792	-0.3208	-0.3985	-0.4643
Employment	0.0076	0.5662	0.6096	0.6214	0.5835	0.4875	0.3260	0.1529	-0.0358	-0.2419
Consumer expenditure	0.0099	0.3947	0.5117	0.6395	0.7352	0.7685	0.6942	0.5255	0.3162	0.0774
Government expenditure	0.0049	-0.0443	-0.0736	-0.1004	-0.0736	-0.1038	-0.1214	-0.0584	0.0261	0.0957
Gross Fixed Investment	0.0349	0.5573	0.7118	0.8127	0.8551	0.8203	0.6466	0.4354	0.2075	-0.0259
Money Supply M1	0.0228	-0.2764	-0.2694	-0.2636	-0.2567	-0.2228	-0.0771	-0.0142	-0.0562	-0.1288
Unemployment rate	0.0398	-0.4763	-0.3905	-0.2073	-0.0909	0.1137	0.2946	0.4768	0.4827	0.5103
Interest rate	0.1188	0.4786	0.6169	0.6222	0.5272	0.3855	0.1852	-0.0188	-0.1962	-0.3359
Real effective exchange rate	0.0448	0.4798	0.3908	0.3859	0.3037	0.1951	0.1332	0.0382	-0.0446	-0.1129
Consumer confidence	0.0313	0.2712	0.3429	0.3432	0.2583	0.1514	0.0325	-0.0965	-0.1851	-0.2694
Business confidence	0.0308	0.6014	0.7579	0.8470	0.8577	0.7800	0.6372	0.4661	0.2887	0.1221

The first column reports the standard deviation of the variable listed. The remaining columns show the correlation of the variable listed with GDP at lags and leads 1 through to 4 i.e. (t-1….t-4) and (t+1….t+4). All data are detrended using the Hodrick-Prescott filter.
Sample period 1983q1 to 1998q4. The 3 strongest correlations are shown in bold.

<u>Table 4 Netherlands Business Cycle Facts.</u>

	σ^2	t-4	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4
Real wage	0.0108	0.1223	-0.0369	-0.0518	-0.1765	-0.2945	-0.4347	-0.5822	-0.4529	-0.3755
Employment	0.0484	0.0061	0.0877	0.2712	0.1975	0.1581	0.1374	0.0813	0.0960	0.0918
Consumer expenditure	0.0086	0.5319	0.5799	0.4689	0.4786	0.4942	0.2879	0.1595	0.0893	-0.0733
Government expenditure	0.0093	0.1427	0.1381	0.1412	0.1765	-0.0170	0.1809	0.1139	-0.0493	-0.0711
Gross Fixed Investment	0.0632	-0.1779	-0.2573	-0.1891	-0.1857	0.1462	-0.1074	-0.0415	0.0346	0.1797
Money supply M3	0.0187	0.3458	0.2939	0.2614	0.2216	0.2446	0.1641	0.1359	0.0981	0.0640
Money Supply M1	0.0272	0.2368	0.1793	0.0839	-0.0613	0.0355	-0.0358	-0.0324	0.0148	0.1079
Unemployment rate	0.0894	-0.6762	-0.7012	-0.6704	-0.5908	-0.5027	-0.3756	-0.2276	-0.0780	0.0766
Interest rate	0.0872	0.3412	0.4277	0.5186	0.6288	0.5913	0.5619	0.5345	0.3802	0.2179
Real effective exchange rate	0.1015	-0.1819	-0.2169	-0.2501	-0.2359	-0.3428	-0.3598	-0.3434	-0.3124	-0.2645
Consumer confidence	0.0347	0.4389	0.5254	0.5570	0.5294	0.4794	0.4763	0.4002	0.3093	0.2396
Business confidence	0.0109	0.5139	0.6475	0.7426	0.7619	0.6799	0.6416	0.5221	0.3761	0.2511

The first column reports the standard deviation of the variable listed. The remaining columns show the correlation of the variable listed with GDP at lags and leads 1 through to 4 i.e. (t-1….t-4) and (t+1….t+4). All data are detrended using the Hodrick-Prescott filter. Sample period 1983q1 to 1998q4. The 3 strongest correlations are shown in bold.

Table 5 Multivariate Business Cycle Facts.

	Coefficient	T – ratio	Coefficient	T – ratio
Intercept	0.00172	0.6899	-1.08331	-2.6400
Real wage	0.03417	0.6719	0.05555	1.0614
Employment	-0.00515	-0.3507	-0.02493	-1.7208
Consumer expenditure	0.77662	15.9494	na	na
Government expenditure	0.28076	6.7212	na	na
Gross Fixed Investment	0.04098	3.5364	0.05192	5.3144
Money Supply (narrow)	-0.01589	-3.7243	-0.01516	-1.1337
Unemployment rate	0.01133	1.4363	0.00061	0.0452
Interest rate	0.00763	1.2177	0.00348	0.4810
Real effective exchange rate	-0.05665	-3.3650	-0.01629	-0.7619
Consumer confidence	-0.00259	-0.1408	-0.14976	-2.2199
Business confidence	0.09633	2.9999	0.13677	2.5970
Observations		256		
$\overline{R}^2$		0.9989		0.9981

All data are detrended using the Hodrick-Prescott filter. Sample period 1983q1 to 1998q4. The 3 strongest correlations are shown in bold. Estimation is based upon Cochrane-Orcutt AR(4) method. Controls used in the regression are a time trend and country dummies (with the UK as the reference group).

Table 6 Confidence Indicators Granger Non-Causality Tests.

	Confidence Granger causes GDP cycle		GDP cycle Granger causes Confidence	
	Consumer confidence	Business confidence	Consumer confidence	Business confidence
UK	4.172*	0.372	3.542	5.295*
France	0.101	5.483*	1.725	3.074
Italy	0.022	4.328*	1.274	0.915
Netherlands	0.270	0.784	0.185	3.209

Each VAR has a lag length of 2 chosen by the Schwartz criterion and includes leading indicators identified from Tables 1 to 4.

The LR test statistic is based upon a Chi Squared and * denotes significance at the 5 per cent level or above.

<u>Table 7 Orthogonalised forecast error variance decompositions 8 quarters ahead for the UK.</u>

Horizon	GDP	Business confidence	Consumer confidence	Real wages	Employment	M4	MO	Unemployment	Interest rate	Exchange rate
1 quarter	88.6%	0.0%	8.6%	0.2%	0.0%	0.0%	1.0%	0.2%	1.1%	0.2%
2 quarters	73.8%	0.7%	18.3%	3.0%	1.2%	0.1%	0.1%	0.1%	1.3%	1.3%
3 quarters	64.3%	0.9%	20.2%	4.6%	3.9%	0.1%	1.2%	0.2%	2.2%	2.4%
4 quarters	58.9%	0.6%	19.9%	5.6%	6.3%	0.4%	2.4%	0.6%	2.3%	3.0%
5 quarters	56.9%	1.4%	19.1%	5.7%	7.2%	0.5%	3.3%	0.7%	2.3%	2.9%
6 quarters	53.9%	3.6%	17.7%	5.1%	8.7%	0.7%	3.9%	0.8%	2.5%	3.0%
7 quarters	52.1%	5.0%	16.5%	4.8%	9.6%	1.1%	3.8%	1.1%	2.7%	3.2%
8 quarters	49.9%	5.4%	15.6%	4.5%	9.6%	2.1%	3.7%	1.7%	3.5%	3.9%

The underlying VAR has a lag length of 2 chosen by the Schwartz criterion.

Table 8 Orthogonalised forecast error variance decompositions 8 quarters ahead for France.

Horizon	GDP	Business confidence	Consumer confidence	Real wages	Employment	Consumer expenditure	Government expenditure	M3	M1	Exchange rate
1 quarter	35.9%	44.7%	2.7%	8.3%	2.3%	0.0%	2.4%	1.8%	0.0%	1.8%
2 quarters	25.1%	50.4%	3.9%	11.5%	2.5%	0.1%	1.5%	2.0%	0.4%	1.6%
3 quarters	17.3%	45.4%	9.8%	16.9%	2.1%	1.6%	2.3%	2.7%	0.3%	1.5%
4 quarters	13.6%	39.2%	13.9%	21.6%	1.6%	1.3%	2.8%	4.2%	0.3%	1.5%
5 quarters	11.3%	32.2%	15.4%	26.0%	1.8%	1.1%	3.5%	6.6%	0.4%	1.8%
6 quarters	9.2%	27.7%	15.6%	29.2%	1.7%	0.9%	3.1%	9.6%	1.3%	1.7%
7 quarters	7.8%	27.6%	13.9%	29.3%	1.5%	1.6%	2.6%	11.9%	2.2%	1.5%
8 quarters	6.9%	27.7%	12.5%	29.2%	1.6%	1.9%	2.5%	13.5%	3.0%	1.3%

The underlying VAR has a lag length of 2 chosen by the Schwartz criterion.

Table 9 Orthogonalised forecast error variance decompositions 8 quarters ahead for Italy.

Horizon	GDP	Business confidence	Consumer confidence	Real wages	Employment	Consumer expenditure	Government expenditure	Gross fixed invest	M1	Interest rate	Exchange rate
1 quarter	75.1%	2.9%	0.1%	6.5%	0.3%	1.8%	5.8%	0.2%	0.5%	6.7%	0.0%
2 quarters	50.4%	17.9%	8.9%	6.5%	0.3%	2.1%	4.2%	0.3%	2.4%	6.9%	0.0%
3 quarters	32.9%	12.8%	23.3%	5.2%	1.9%	9.2%	2.7%	5.6%	1.7%	4.5%	0.2%
4 quarters	29.2%	9.6%	17.2%	5.4%	5.7%	9.9%	5.6%	9.9%	1.7%	5.0%	0.7%
5 quarters	27.9%	9.7%	19.9%	5.7%	5.2%	7.5%	4.4%	10.9%	3.6%	4.5%	0.7%
6 quarters	21.5%	16.0%	20.3%	7.5%	4.8%	5.9%	3.3%	8.5%	6.9%	4.8%	0.5%
7 quarters	19.0%	15.4%	22.1%	6.9%	4.7%	6.6%	5.6%	7.8%	6.0%	4.8%	1.1%
8 quarters	18.1%	14.5%	18.9%	13.5%	6.8%	6.7%	4.7%	6.5%	4.9%	3.9%	1.4%

The underlying VAR has a lag length of 2 chosen by the Schwartz criterion.

Table 10 Orthogonalised forecast error variance decompositions 8 quarters ahead for the Netherlands.

Horizon	GDP	Business confidence	Consumer confidence	Employment	Consumer expenditure	Government expenditure	Gross fixed invest	M3	Unemployment	Exchange rate
1 quarter	70.6%	9.8%	3.3%	4.8%	2.2%	6.1%	0.2%	0.7%	0.0%	2.2%
2 quarters	62.7%	9.9%	3.2%	6.7%	4.3%	8.5%	1.8%	0.6%	0.3%	1.9%
3 quarters	56.8%	9.2%	3.9%	9.6%	4.4%	8.3%	4.4%	0.6%	0.4%	2.3%
4 quarters	50.1%	8.6%	4.3%	9.5%	6.8%	7.4%	7.7%	1.8%	1.5%	2.3%
5 quarters	47.9%	8.3%	4.1%	9.3%	7.5%	7.8%	8.1%	1.7%	3.1%	2.1%
6 quarters	44.5%	7.8%	3.9%	9.1%	7.6%	7.7%	7.8%	2.4%	7.1%	2.2%
7 quarters	44.4%	7.5%	5.8%	8.6%	7.3%	7.4%	7.6%	2.6%	6.7%	2.1%
8 quarters	44.8%	7.7%	5.7%	8.4%	7.1%	7.2%	7.4%	2.6%	6.9%	2.1%

The underlying VAR has a lag length of 2 chosen by the Schwartz criterion.

Table 11 UK measures of fit and t-statistics for probit model k quarters ahead.

	Business confidence	Consumer confidence	Real wages	Employment	M4	MO	Unemployment	Interest rate	Exchange rate
k=1 period									
Pseudo R^2					0.387				
t-stat	–20.374 (1)	–12.071 (4)	–7.647 (3)	11.164 (2)	10.879	2.184	15.293	115.628	–3.085
k=2 periods									
Pseudo R^2					0.317				
t-stat	–6.356 (3)	–9.524 (4)	–3.410	6.229 (1)	2.582	–4.438 (2)	7.625	18.117	1.427
k=3 periods									
Pseudo R^2					0.302				
t-stat	–4.424 (4)	–12.176 (3)	1.219	6.928 (1)	-0.347	–10.445 (2)	2.942	10.069	1.990
k=4 periods									
Pseudo R^2					0.313				
t-stat	–5.489 (4)	–9.980 (3)	1.205	4.441 (1)	-0.434	–6.328 (2)	1.557	9.462	3.322

(.) shows the rank of the largest 4 coefficients in absolute terms.

Table 12 France measures of fit and t-statistics for probit model k quarters ahead.

	Business confidence	Consumer confidence	Real wages	Employment	Consumer expenditure	Government expenditure	M3	M1	Exchange rate
k=1 period									
Pseudo R^2					0.398				
t-stat	–31.679 (1)	6.398	7.484 (4)	6.920	0.296	–15.989 (2)	32.244 (3)	–27.087	10.808
k=2 periods									
Pseudo R^2					0.388				
t-stat	–43.347 (1)	7.703	8.243 (4)	7.101	–6.852	–10.267 (3)	25.448 (2)	–5.729	3.485
k=3 periods									
Pseudo R^2					0.332				
t-stat	–8.249 (3)	9.043 (2)	9.795 (1)	-1.070	–3.399 (4)	–3.224	5.339	–4.173	5.994
k=4 periods									
Pseudo R^2					0.270				
t-stat	–3.608 (3)	9.437 (2)	7.652 (1)	–3.257 (4)	-0.986	-1.124	2.275	-1.154	2.689

(.) shows the rank of the largest 4 coefficients in absolute terms.

Table 13 Italy measures of fit and t-statistics for probit model k quarters ahead.

	Business confidence	Consumer confidence	Real wages	Employment	Consumer expenditure	Government expenditure	Gross fixed investment	M1	Interest rates	Exchange rate
K=1 period										
Pseudo R^2					0.393					
t-stat	-4.317	2.283	6.378	22.206 (1)	-23.617 (2)	-4.585 (3)	-6.014	-10.188 (4)	-1.518	15.777
k=2 periods										
Pseudo R^2					0.364					
t-stat	-0.045	4.832	5.331 (4)	3.384 (3)	-13.774 (1)	-11.295 (2)	-0.509	9.601	4.145	8.852
k=3 periods										
Pseudo R^2					0.395					
t-stat	1.064	0.561	22.359 (4)	20.622 (3)	-21.458 (2)	-14.245 (1)	-4.077	11.498	14.564	4.443
k=4 periods										
Pseudo R^2					0.399					
t-stat	-2.767	-0.128	31.867 (4)	38.391 (1)	-49.312 (3)	-34.188 (2)	-9.022	1.623	12.097	-15.209

(.) shows the rank of the largest 4 coefficients in absolute terms.

Table 14 Netherlands measures of fit and t-statistics for probit model k quarters ahead.

	Business confidence	Consumer confidence	Employment	Consumer expenditure	Government expenditure	Gross fixed investment	M3	Unemployment	Interest rate
k=1 period									
Pseudo R^2					0.267				
t-stat	-6.228 (1)	-3.804 (3)	0.758	1.042	2.772 (2)	-1.305	-1.785	-5.688 (4)	-0.554
k=2 periods									
Pseudo R^2					0.217				
t-stat	-4.151 (1)	-2.331 (3)	0.607	3.181 (2)	1.215	-0.656	-1.515	-3.645 (4)	-2.964
k=3 periods									
Pseudo R^2					0.229				
t-stat	-4.390 (1)	-2.878	1.521	5.103 (2)	2.245 (3)	-0.991	-3.808 (4)	2.360	0.910
k=4 periods									
Pseudo R^2					0.340				
t-stat	-11.852 (1)	-6.384 (4)	-1.303	7.945 (2)	7.282 (3)	-18.711	-3.601	-16.308	-0.454

(.) shows the rank of the largest 4 coefficients in absolute terms.