An Indicator of Economic Sentiment for the Italian Economy

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ABSTRACT*

The long and sustained expansion of the nineties has generated, especially in the US, widespread rumours about the "death of the cycle". Nevertheless, towards the end of the last decade, it became clear that fluctuations of economic activity were far from being extinct. This has contributed greatly to a renewed interest among economists for the elaboration of statistical indicators capable of tracking and, if possible, anticipating the cyclical features of the economy. The aim of this paper is to build such an aggregate composite indicator for the Italian Economy, based on the ISAE surveys on households and those on the manufacturing, retail and construction sector. The first step of the analysis consists in using a dynamic factor model to extract a "common factor" from the different series of each survey, which may be interpreted as a composite confidence indicator. We then evaluate, for each survey, its in-sample and out-of sample properties, comparing them with those of the usual ISAE-EC Confidence indicators. Finally, we use again the dynamic factor model to build, from the sectoral Composite Indicator (CI), a Composite Aggregate Indicator (CAI) for the Italian economy, and test its ability in tracking the cyclical features of Italian aggregate GDP.

JEL Classification: C42, E32, E37

Key Words: Confidence Indicators, Leading Indicators, Cyclical Analysis

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The authors are responsible for all remaning errors.

NON TECHNICAL SUMMARY

In this paper we try to summarize the information contained in Italian business and consumer surveys calculating a composite index for each of the survey which should help explain some quantitative reference variables, namely households' consumptions, industrial production, retail trade and investments in constructions.
The four composite indicators (CI) are then further aggregated in a composite aggregate indicator (CAI) and its performance in tracking the cyclical evolution of Italian Gross domestic product is tested.
The paper analyses the performance of these indicators compared with that of the already availble indicators calculated by ISAE and EC.

UN INDICATORE DI FIDUCIA PER L'ECONOMIA ITALIANA

SINTESI

La lunga e sostenuta espansione degli anni novanta ha generato, specialmente negli Stati Uniti, un fiorire di voci riguardo la fine del ciclo economico. Tuttavia, verso la fine dello scorso decennio è divenuto chiaro che le fluttuazioni nell'attività economica sono un fenomeno tutt'altro che esaurito. Ciò ha prodotto un rinnovato interesse tra gli economisti riguardo all'elaborazione di indicatori statistici capaci di segnalare e, possibilmente, anticipare, i movimenti ciclici dell'economia. Lo scopo di questo lavoro è di costruire un indicatore composito per l'economia italiana basato sulle inchieste ISAE sulle famiglie e sui settori manifatturiero, del commercio al minuto e delle costruzioni. Il primo passo dell'analisi è consistito nell'uso di un modello fattoriale dinamico per estrarre una "componente comune" dalle diverse serie di ogni inchiesta, che può essere interpretata come un indicatore di fiducia. Nel lavoro si valuta, per ogni inchiesta, le caratteristiche di adattamento e previsive del relativo indicatore, confrontandole con quelle dei classici indicatori ISAE-CE. Infine, sintetizzando gli indicatori settoriali, sempre per mezzo di un modello fattoriale dinamico, si è ottenuto un indicatore composito aggregato (CAI) per l'economia italiana e si è verificata la sua capacità nel segnalare l'evoluzione ciclica del prodotto interno lordo.

Classificazione JEL: C42, E32, E37.

Parole chiave: Indicatori di fiducia, Indicatori anticipatori, analisi del ciclo economico.

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1 INTRODUCTION

The long and sustained expansion of the nineties has generated, especially in the US, widespread rumours about the “death of the cycle”. Nevertheless, towards the end of the last decade, it became clear that fluctuations of economic activity were far from being extinct. In Italy in particular, and in general in the EU, they have been indeed relatively frequent in the recent past, and this has contributed greatly to a renewed interest among economists in the elaboration of statistical indicators capable to provide early detection and even prediction of turning points[1].

A first definition of business cycles has been introduced in the literature by Burns and Mitchell in 1946; according to it, in short, a “cycle” is a fluctuation of economic activity that is widespread across sectors and persistent in time. Abstracting for now from specifying if we refer to a “classical” definition of cycles (based upon movements in the level of activity, as in the traditional NBER approach) or to a more modern “growth cycle” approach (that has to do with deviation from long-time trend), it is important to note that, in order to analyse and, if possible, to forecast aggregate fluctuations, this definition implies that it’s crucial to have at hand composite indicators, that gathers information from different sectors and agents across the economy.

The aim of this paper is to construct such a composite indicator, using only qualitative information, stemming from ISAE business and households’ surveys. They have indeed the desirable property of being released almost in real time, usually with a large lead with respect to quantitive data (e.g. those on production, employment, retail sales, not to mention National Accounts). Their readily availability, and the fact that they provide information about agents’ judgment and forecast on business and personal situation, makes them, in our opinion, the ideal candidates for the construction of composite indicators capable of tracking and even anticipating the fluctuations of economic activity, especially at turning points.

At the European level, and for each country in the EU, the European Commission has recently developed such an indicator, calculated using only information from business and consumers’ surveys[2]. However, the Economic Sentiment indicators of the Commission are explicitly designed to fit better at the aggregate than at the country level. Even considering the growing synchronisation of European

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1 See, among others, Pagan and Harding (2001) and other participants to a Seminary held in the Bank of Italy, Rome, September 7-8, 2001.

2 Goldrian, Lindbauer, Nerb (2001).

economies, however, there are still relevant cyclical and structural differences among the countries participating to the EMU: therefore, it seems that there is enough room to try to construct a Composite Aggregate Indicator, that may be interpreted as a Sentiment Indicator, for the Italian economy, specifically designed to fit the peculiar characteristics of the Italian cycle.

The paper goes as follows: section two introduces the dynamic factor model we use in order to extract a "common factor", which may explain the bulk of movements observed in the different series of a survey. In such a model, a variable (i. e. a single qualitative series from a survey) is supposed to be composed of one (or possibly more) dynamic factor(s), common to all the series of the survey, and an idiosyncratic component, specific to that variable. We firstly test for the number of such common dynamic factors (see on this Nyblom and Harvey, 2000), and then proceed to estimate them, with the aid of the Kalman filter, once the model is cast in state-space form.

Section three presents the results obtained applying the model introduced in section two to the surveys for manufacturing, construction and retail sector and for the consumers. Firstly, the main cyclical features of the chosen indicator are compared with those of a reference series and of the corresponding usual ISAE-EC sectoral confidence indicator. Then the in-sample and out-of sample performance of the chosen indicator is assessed, estimating a fairly general and simple statistical model, including some lags of the reference series and of the chosen indicator. Finally, section four presents the Composite Aggregate Indicator (CAI) built upon the four sectoral indexes computed in section three; again, we extract a dynamic common factor and assess its ability of monitoring cyclical fluctuations of Italian economy, as represented by real GDP. Some considerations about the results obtained and the possible future developments conclude the study.

2 METHODOLOGY

The purpose of building a composite indicator for the entire economy extracting the information from a given dataset can be solved by means of factor models. Indeed, the very idea of a composite indicator is that there is a good degree of "commonality" among a set of variables, which can be synthesized in some way. The use of factor models enables us to formalise the problem in an elegant way and to estimate the common component of interest.

The model we intend to apply is a dynamic factor model. Let X_{it} be the i-th of N variables observed at time t, a dynamic factor model can be denoted:

$$X_{it} = \sum_{j=1}^{J} \gamma_j F_{jt} + u_{it}$$
$$\phi_j(L) F_{jt} = \eta_{jt} \qquad \text{with } i = 1,2,..,N;\ t = 1,2,...,T;\ j = 1,2,..,J; \quad J<N; \quad (1)$$
$$\theta(L) u_{it} = \varepsilon_{it}$$

where F_{jt} is the j-th common factor and u_{it} an idiosyncratic component specific to the i-variable. L is the lag operator such that $L_k Y_t = Y_{t-k}$. Model (1) is a factor model because each one of the X_{it} variables contains one (or more) common factor(s) F_{jt}, and it is dynamic in that both F_{jt} and u_{it} follow dynamic processes, which are governed, respectively, by the random variables η_{jt} and ε_{it}.

Dynamic factor models have been extensively used in economics. Among others we remind the papers of Geweke (1977), Sargent and Sims (1977), Stock and Watson (1991 and 1998), Forni and Reichlin (1998). Moreover, factor models have been used to build composite indicators from business survey data (Goldrian *et al*., 2001; Doz and Lenglart, 1999; European Commission, 2000).

In this paper we specify an exact parametric dynamic factor model for each of the four surveys we want to synthesize. A further model is defined to aggregate the four composite indicators in a so-called Composite Aggregate Indicator.

In the first sub-section we illustrate a measure of the degree of commonality of the variables. In the second sub-section we deal with the unit root issue and apply a method to test unit roots in a multivariate context and to choose the number of common factors.

2.1 Degree of commonality

In order to analyse the degree of comovement among different series we adopt the measure proposed in Croux *et al.* (2001), which the authors term *cohesion*. They start by defining a measure of dynamic correlation between the realizations of two zero mean real stationary stochastic processes, x and y. Defining with $S_x(\lambda)$ and $S_y(\lambda)$ the spectral density function of x and y (with $-\pi\leq\lambda<\pi$) and with $C_{xy}(\lambda)$ the co-spectrum, the dynamic correlation $\rho_{xy}(\lambda)$ is defined as:

$$\rho_{xy}(\lambda) = \frac{C_{xy}(\lambda)}{\sqrt{S_x(\lambda) S_y(\lambda)}}. \qquad (2)$$

Dynamic correlation represents the real part of the coherency and measures correlation at different frequencies. It is different from the squared-coherency, in that the latter disregards the phase differences between variables.

A further step made by Croux *et al.* (2001) is to consider a vector $\boldsymbol{x}_t$ of $n \geq 2$ variables and a set of n weights w and to define a measure of *cohesion* of the set of variables:

$$coh_x(\lambda) = \frac{\sum_{i \neq j} w_i w_j \rho_{x_i x_j}(\lambda)}{\sum_{i \neq j} w_i w_j}. \qquad (3)$$

Both the measures (2) and (3) can be defined on a frequency band $\Lambda_+ = [\lambda_1, \lambda_2)$, with $0 \leq \lambda_1 < \lambda_2 \leq \pi$; this can be useful, for example, to detect the degree of comovement of different series at business cycle frequencies. Moreover, in order to identify if a small cohesion depends on small pairwise comovements or large positive and negative covariances cancelling out each other's, the authors propose the following modified version of (3):

$$coh_x^*(\lambda) = \frac{\sum_{i \neq j} w_i w_j \left|\rho_{x_i x_j}(\lambda)\right|}{\sum_{i \neq j} w_i w_j}. \qquad (4)$$

2.2 Testing unit roots and the number of factors

The series of business surveys are preliminary tested in order to determine their order of integration, by means of the Augmented Dickey-Fuller test, with lag length selected with a general-to-simple procedure; in particular, an initial specification of 20 lags is used and if the last lag is significant at 5%, that lag is chosen, otherwise the order is reduced by one until the last included lag is significant. The results, listed in Appendix A, show mixed evidence about unit roots. Actually, the survey series being bounded, they are often regarded as being stationary. Nevertheless, if expected time for the limits to become binding is very large, the sample realizations for the series can be perfectly consistent with a unit root process (for a discussion of this aspect see Brunello *et al.*, 2000).

Indeed, given the unobserved component framework chosen here, it is quite obvious to retain the same framework for testing stationarity. In this case we carry out a multivariate test, which takes into account the unobserved component nature of the model. In particular, we follow Harvey (2001) and test the hypothesis of a multivariate random walk model for each survey. In the same paper, Harvey describes also a test for the hypothesis of a specified number of common trends.

Let us consider a vector $\mathbf{x}_t$ of N time series following the local level model:

$$\begin{aligned} \mathbf{x}_t &= \boldsymbol{\mu}_t + \boldsymbol{\varepsilon}_t & \boldsymbol{\varepsilon}_t &\sim NID(0, \boldsymbol{\Sigma}_\varepsilon) & \\ \boldsymbol{\mu}_t &= \boldsymbol{\mu}_{t-1} + \boldsymbol{\eta}_t & \boldsymbol{\eta}_t &\sim NID(0, \boldsymbol{\Sigma}_\eta) & t = 1,\ldots,T \end{aligned} \quad (5)$$

where μ_t is a N-vector of stochastic trends and Σ_ε is an $N \times N$ positive definite matrix. The null hypothesis is that $\Sigma_\eta = 0$, so that the system is stationary. Nyblom and Harvey (2000) have derived a test against the homogeneous alternative $\Sigma_\eta = q\Sigma_\varepsilon$; they show that this test, which maximize its power against the homogeneous alternative, is consistent against all non-null Σ_η's. The test is given by:

$$\eta(N) = tr\left[\mathbf{S}^{-1}\mathbf{C}\right] \quad (6)$$

where:

$$\mathbf{C} = T^{-2}\sum_{i=1}^{T}\left[\sum_{t=1}^{i}\mathbf{e}_t\right]\left[\sum_{t=1}^{i}\mathbf{e}_t\right]' \qquad \text{and} \qquad \mathbf{S} = T^{-1}\sum_{t=1}^{T}\mathbf{e}_t\mathbf{e}_t'$$

and $\mathbf{e}_t = \mathbf{y}_t - \bar{\mathbf{y}}$.

Under the null hypothesis the distribution of (6) is sometimes referred to as Cramér-von Mises distribution with N degrees of freedom. The distribution may be represented as a series expansion of independent χ^2 variables with N degrees of freedom. Some critical values are tabulated in Harvey (2001).

If the ε_t's are allowed to follow a stationary stochastic process, it is still possible to calculate the test statistics $\eta(N)$ replacing the $\mathbf{S}$ matrix with a consistent estimate of the long run covariance matrix of the process, which we define $\mathbf{S}_0$. Harvey suggests using the non-parametric estimator defined in Kwiatkowsi *et al.* (1992); nevertheless he argues that this estimator can produce a test characterised by low power, compared to the parametric one, if a possible model for characterizing the autocorrelation of ε_t can be found. In this paper we estimate $\mathbf{S}_0$ nonparametrically, using the procedure suggested by Andrews (1991).

Once accepted the I(1) representation of the variables, a further step consists in trying to represent them with a multivariate random walk, where the matrix Σ_η has reduced rank, $K<N$. This would imply that the $(N\times 1)$ vector $\mathbf{x}_t$ could be modelled by a restricted number K of common trends. Nyblom and Harvey (2000) derive a test for the null hypothesis that $K = K^{*}<N$ against the alternative that $K > K^{*}$. The test, referred to as $\zeta_{K,N}$, has a limiting distribution which can be approximated by a series expansion given in Nyblom and Harvey (2000). The test is based on the eigenvalues of $\mathbf{S}^{-1}\mathbf{C}$ and, again, a non-parametric correction for serial correlation can be made replacing $\mathbf{S}$ with a consistent estimate of the long-run covariance matrix $\mathbf{S}_0$. In our case it is particularly interesting to test the hypothesis $K = 1$, so that a single common factor represents the movement of the $\mathbf{x}_t$ vector; such a factor could then be interpreted as a confidence indicator. Again, if the common trend hypothesis is accepted the final step is to estimate the model. A common dynamic one-factor model can be written as:

$$\begin{aligned} &\mathbf{x}_t = \boldsymbol{\theta}\mu_t + \mathbf{u}_t \\ &\mathbf{u}_t = \boldsymbol{\Phi}\mathbf{u}_{t-1} + \boldsymbol{\varepsilon}_t \qquad \boldsymbol{\varepsilon}_t \sim NID(0, \boldsymbol{\Sigma}_\varepsilon) \\ &\mu_t = \mu_{t-1} + \eta_t \qquad \eta_t \sim NID(0, \sigma^2_\eta) \qquad t = 1,\ldots,T \end{aligned} \tag{7}$$

where $\mathbf{x}_t$ is a vector of centred (deviations from the average) variables, θ is an $N\times 1$ vector of factor loadings, Σ_ε and Φ are diagonal $N\times N$ matrices, Σ_ε is uncorrelated with σ^2_η. In addition, as an identifying assumption, $\sigma^2_\eta = 1$. Once the model (7) has been cast in state space form, the model parameters θ, Φ and Σ_ε can be estimated maximizing the model likelihood evaluated with the Kalman filter.

The common factor component $E(\mu_t|\mathbf{x}_T)$ is then estimated (up to a scale factor), together with its variance $Var(\mu_t|\mathbf{x}_T)$ with the Kalman smoother.

3 SECTORAL INDICATORS

In this section, the methodology previously described is applied in order to build a Composite Indicator (CI), respectively, for the manufacturing, retail and the construction sector, and for the consumers. The resulting CI's are tested to evaluate both their capacity of closely tracking the main cyclical features of a reference series, and their usefulness in monitoring and predicting its behaviour.

Differently from previous analysis on the informative content of the ISAE surveys (see Carnazza and Parigi, 2001), we do not concentrate only on supply-side indicators, extending the study also to consumers' expenditures, on the basis of the information stemming from the ISAE monthly survey. The consideration of a consumption indicator beside those on the supply-side of the economy rests on the assumption that, given the large weight of consumption on final demand, it is strongly correlated with aggregate activity[3]; on the other hand, on the basis of some analysis carried out at ISAE[4], the ISAE consumers' confidence indicator seems to be significantly linked with total consumption expenditure.

In the first subsection, we follow the traditional NBER approach, in that we look for a dating of the reference series and then evaluate the coherence of the chosen indicators with this chronology. However, our analysis differs from the traditional NBER approach, in that we have chosen to look for "sectoral reference series", and not for a general "Italian reference series", based on some aggregate (industrial production, GDP) or composite (leading or coincident) indicator: in this, our analysis differs also from some recent works aimed at identifying the aggregate cycle for Italian and European economy[5]. Indeed, the set of information stemming from business and consumers surveys, in our opinion, is more easily linked to the cyclical evolution of the sector/agent on which the survey is conducted, than to an aggregate cyclical measure. A more thorough discussion of the aggregate cyclical behaviour may be conducted instead on the basis of the CAI constructed, on the aggregation of the sectoral CI discussed here. This will be the object of section 4.

We depart from the traditional NBER approach also in using a growth cycle approach, looking at deviation of activity from long-time trend[6]. A band-pass filter (see Baxter and King, 1999) is considered to extract the cyclical components of the reference series, while the Bry-Boschan routine[7] is used in order to assess the timing of peaks and troughs of the reference series and of the confidence indicators. All the analysis is carried at the monthly frequency; quarterly data are transformed accordingly, by means of a procedure implemented in the software Winrats 5.0 (Doan, 2000).

In the second subsection, we use a typical "econometric" approach to evaluate the performance of the chosen indicators with respect to the reference series; in this case, the reference variable is transformed taking the yearly log-differences, in

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[3] On this particular point, see Altissimo, Marchetti, Oneto (2000), p. 39.

[4] See Carnazza and Oneto (1996), Bovi, Lupi, Pappalardo (2000).

[5] For Italy, see again Altissimo, Marchetti, Oneto (2000); at the European level, see Goldrian, Lindbauer, Nerb (2002).

[6] For an introduction to the growth cycle approach, see Mintz (1972).

[7] See Bry and Boschan (1971); for an application to the Italian economy, see Schlitzer (1993), and, more recently, Altissimo, Marchetti and Oneto (2000).

order to rule out long term components[8]. To evaluate the in-sample performance, the usual Granger-causality test is implemented, using the following fairly general regression model, including the past values of the reference series and of the CI (up to 4 lags for quarterly variables, 12 for monthly series):

$$\Delta^s y_t = \alpha + \sum_{i=1}^{l} \alpha_i \Delta^s y_{t-l} + \sum_{i=1}^{l} \beta_i CI_{t-l} + \varepsilon_t \qquad (8)$$

where $\Delta^s = 1\text{-}L^s$ and y_t is the sectoral reference series, seasonally adjusted; the hypothesis that CI does not Granger cause y is tested, verifying that $\beta_i=0$ for all i. Finally, to test the out-of-sample property of the confidence indicators, we add to equation (8) the contemporaneous level of the CI, which usually shows a good correlation with the reference series, and compute Root Mean Square Errors (RMSE) and Mean Absolute Errors (MAE) and the Theil inequality coefficient for the dynamic forecasts of the models including alternatively the CI and the usual ISAE-EC confidence indexes.

3.1 A Composite Indicator for the Manufacturing Sector

Nine series are used to calculate the composite indicator for the manufacturing sector (see Appendix B). The series are seasonally adjusted with TRAMO-SEATS (Gómez and Maravall, 1998), whenever necessary.

The cohesion index (4) for this sector is shown in figure (1). The series are characterised by a strong degree of comovement, especially at business cycles frequencies. This is promising in order to extract a common component indicator.

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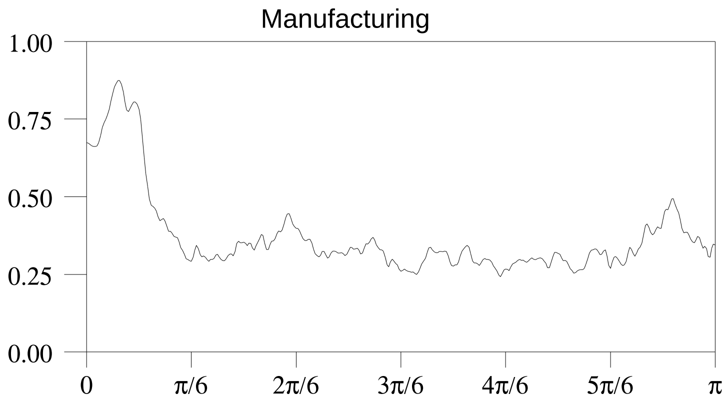
[8] The relationship between the seasonal difference of the reference variable and the level of the CI can be justified on the ground that the CI is essentially a cyclical indicator measuring the deviation with respect to a "normal" situation. Seasonal difference of the reference variable is chosen to measure the cyclical component of that variable. The alternative of using a band-pass filter may results in unstable estimation of the cyclical component at the extremes of the sample; this is a quite undesirable property if we want to use the Confidence indicators to estimate and, if possible, anticipate, the behaviour of the reference series.

Figure 1: Cohesion index for manufacturing sector[9]



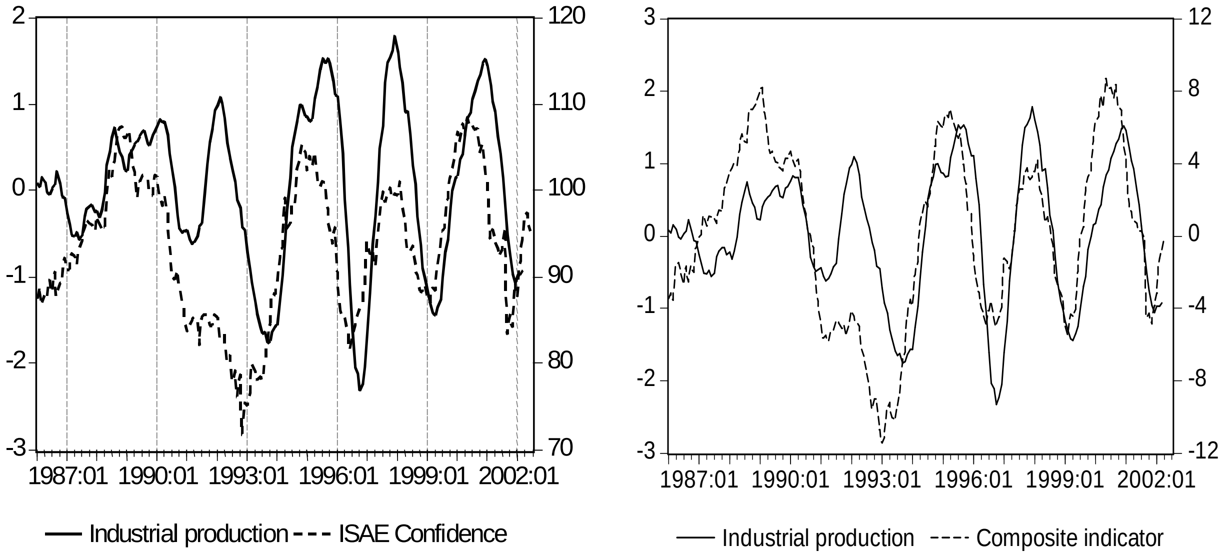
The test (6) has been calculated using $\mathbf{S}_0$ to replace the **S** matrix; its value is 2.327, just a little larger than the 5% critical value for $\eta(9)$ given in Harvey (2001), which is 2.326. Moreover, the test for the null of one common trend, $\zeta_{1,9}$, takes the value 0.627, which is well below the 5% critical value of 1.233 calculated using the expansion given in Nyblom and Harvey (2000). So, for the case of manufacturing, a common trend representation can be used, and the common factor component in (7) may be estimated with the Kalman smoother and interpreted as a confidence indicator for the manufacturing sector.

Table 1 compares the chronology of the CI with that of the confidence indicator monthly released by ISAE, seasonally adjusted, and of the reference series, i.e. the cyclical component (extracted with the band-pass filter) of the index of industrial production, monthly released by ISTAT, seasonally adjusted. The Bry-Boschan routine is able to identify 4 complete cycles (from trough to trough) in the reference series. The first cycle, starting with the trough of May 1987, terminates in March 1991; the second, ends with the first devaluation of the lira and the following trough, reached a year later (October 1993). The third is characterised by the strong 1994-1995 recovery and the new recession following the second devaluation; the fourth cycle terminates with the 1998-1999 recession (the trough

[9] The value of the cohesion index is reported in the vertical axis, while the horizontal one shows the frequency in radians.

is located in April 1999) that was mainly driven by the crisis on the Asian markets. Industrial production reaches again a peak in December 2000 and starts to decline afterwards; the procedure is not able to locate a new trough, that, according to figure 2, may have occurred between December 2001 and the first months of 2002.

Figure 2. Industrial production, and confidence indicators



On the basis of both the ISAE and the CI, it is possible to identify only two of the four complete cycles of industrial production, failing to recognise the first trough in mid-1987 and that in March 1991. This is probably due to the lack of available data at the beginning of the sample; also the leading nature of the confidence indicators may have played a role, in that, at that time, as confirmed by the inspection of fig. 2, the indicators were already in an expansionary phase. In the case of the short 1991-1993 cycle, both confidence indicators failed in locating the February 1992 peak, which was largely underestimated.

Duration of cycles is, on average, fairly similar for the two indicators: for the usual ISAE index, expansions are slightly longer than those of the CI. The ISAE indicator may be also considered more leading: on average, it is capable of anticipating by 6.7 months a turning point of the reference series, with respect to a 4.9 months lead for the CI. This is probably due to the fact that the usual ISAE index is calculated as an average of only three series, two of which (expectations on production in the next three months and evaluation on the level of inventories with respect to their “normal” level) are usually thought to anticipate industrial production[10], while the CI is calculated on the basis of the whole set of information stemming from the ISAE survey. The cross correlation with the reference series peaks at lag 3 for the ISAE index and lag 4 for the CI, and it is higher for the CI than for the ISAE indicator.

Table 1: Industrial production and confidence indicators: main cyclical features and cross-correlations[1]

	Industrial production	ISAE Confidence	Composite Indicator
	Number of cycles		
From min. to min.	4	2	2
Duration of cycles (months):	35.75	37	36,5
Expansions (months)	20.25	21	20,5
Recessions (months)	15.5	16	16
	Turning Points		
Trough	1987:5	/	/
Peak	1990:3	1988:10	1989:1
Trough	1991:3	/	/
Peak	1992:2	/	/
Through	1993:10	1992:12	1993:1
Peak	1995:8	1994:11	1995:3
Through	1996:10	1996:6	1996:10
Peak	1997:12	1998:1	1998:1
Through	1999:4	1999:2	1999:2
Peak	2000:12	2000:6	2000:6
Mean lead (-)/lag (+) at turning points: total		-6.7	-4.9
- downturns		-7.75	-5.75
- upturns		-5.33	-3.66
	Cross-Correlation function		
– ρ_0		0.5693	0.6363
– ρ max (lead(-)/lag(+))		0.7133 (-4)	0.7181 (-3)

1. Period: 1986:1, 2002:1; probabilities in brackets.
Source: Own calculations on ISAE and ISTAT data.

In-sample properties of the two indicators are evaluated estimating the general regression model of equation (8), in which 12 lags of both the dependent variable and the Confidence indicators are considered. Both the CI and the usual ISAE confidence indicator Granger-cause Italian industrial production (table 2).

10 On this, see again Schlitzer (1993).

However, the usual ISAE indicator slightly outperforms the CI: the inclusion of the latter increases the S.E. of the regression by 1.6 percentage points, and slightly reduces the R^2 coefficient (correct for the degree of freedom), from 0.31 to 0.29.

Table 2: Industrial production and confidence indicators: in sample and out-of sample performance

	In sample performance					
	Granger causality test	R^2	Akaike & Schwarz Criteria	F-test	SER	Autocorrelation 1-12 (F-stat.)
ISAE Confidence	3.450 (0.000)	0.308	-5.744 -5.306	4.382 (0.00)	0.0128	1.235 (0.265)
Composite Indicator	3.084 (0.000)	0.293	-5.722 -5.283	4.140 (0.00)	0.0130	0.544 (0.822)

	Out of sample performance						
	ME	MAE	RMSE	Theil U			
				Total	bias	Variance	Covariance
ISAE Confidence							
1-steps-ahead	0.00514	0.01171	0.01668	0.28997	0.09488	0.00000	0.90507
2-steps-ahead	0.00580	0.01269	0.01720	0.30659	0.11362	0.00474	0.88164
Composite Indicator							
1-steps-ahead	0.00547	0.00915	0.01211	0.21590	0.20416	0.01124	0.78460
2-steps-ahead	0.00615	0.00992	0.01255	0.22873	0.23985	0.03593	0.72422

1 Period: 1987:2, 2002:4; probabilities in brackets.
Source: Own calculations on ISAE and ISTAT data.

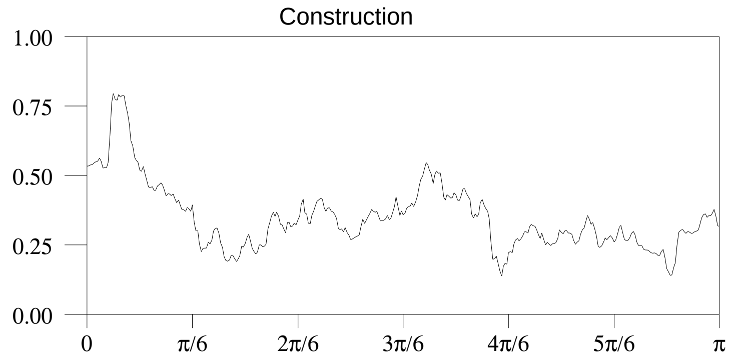
As for the out-of-sample properties, we estimate again equation 8, adding the consideration of the contemporaneous level of the two indicators, and evaluate the main statistical indicators for 1 and 2-steps ahead forecasts for the period 2001:1-2002:1[11]. Including the CI instead of the ISAE Confidence Indicator implies a 27% reduction of the RMSE for both 1 and 2-steps-ahead forecast; also the Theil inequality coefficient is much smaller for the Composite Indicator than for the ISAE Confidence, even if the latter shows a smaller bias with respect to the Composite Indicator.

[11] For all the sectors, the choice on how many steps to consider for the evaluation of out of sample properties is based on the lead for which the Confidence indicators are available with respect to the reference series.

3.2 A Composite Indicator for the Construction Sector

For the construction sector, five questions are considered. The cohesion is quite high, and its shape is similar to the manufacturing case (fig. 3). In particular, business cycle frequencies show a high value (about 0.75) of the index. The test for stationarity $\eta(5)$ takes the value 1.503 which, confronted to the 5% critical value of 1.463 leads to refuse the null. On the other hand the hypothesis of one common trend is accepted. The test value for $\zeta_{1,5}$ is, in fact, 0.611 and the 5% critical value is 0.712. So, the Composite Indicator for the construction sector may be extracted with the Kalman smoother.

Figure 3: Cohesion index for the construction sector



The reference series here is the cyclical components (extracted with the band-pass filter) of gross fixed investment in construction, seasonally adjusted, National Accounts data (figure 4)[12]. The Bry-Boschan routine is able to identify 5 complete cycles of the reference series; the sector shows indeed one more cycle, occurring at the end of the eighties, with respect to manufacturing, that may be taken as the cyclical benchmark: after the September 1987 trough, a peak is reached in August 1988, and a new trough in March 1989. In the remaining four cycles, twice the construction sector cycle appear to be lagging and twice leading with respect to industrial production: the “first devaluation” cycle ends with the December 1994 trough, while in manufacturing the lowest point is reached in October 1993. After the second devaluation, the trough is reached 5 months later than in manufacturing (March 1997, with respect to October 1996). In the 1989-1990/1 cycle, the trough in construction is reached in December 1990 (March 1991 in manufacturing); in

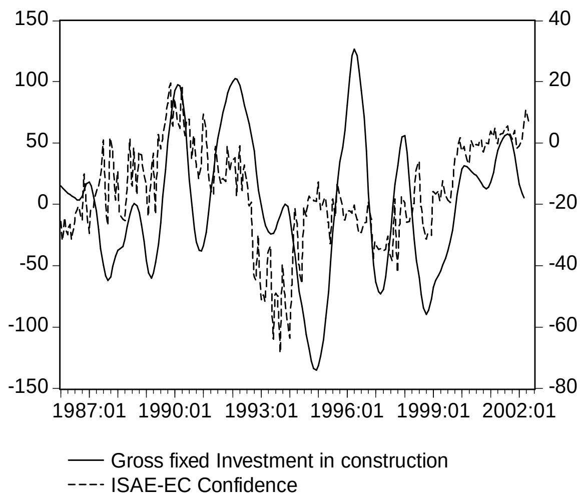
[12] The use of national accounts data as reference variable, although questionable in principle, was necessary because monthly data on construction production are very limited in their scope and definition, thus being not sufficiently representative of the short term evolution of the sector.

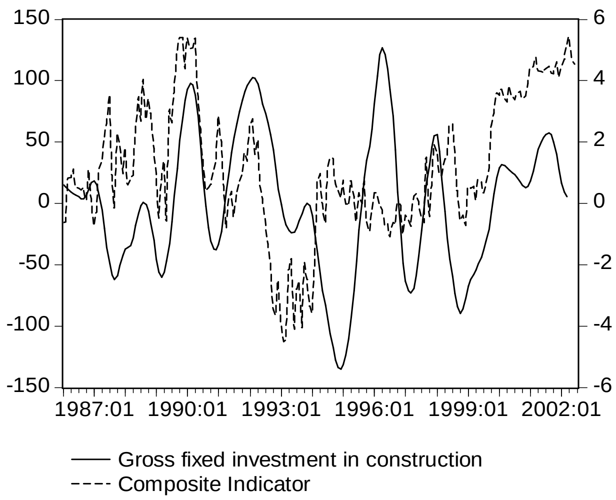
the last, in October 1998, with respect to April 1999. After that, a new peak is not located yet, even if there may be graphical evidence of a downturn in August 2001 (in this case, with a 8-month lag with respect to industrial production).

The ISAE-EC Confidence[13] climate fails to identify most of the turning points of the construction sector: the Bry-Boschan routine is able to locate only one complete cycle, going from the trough of end-1993 to that of mid-1997; after that, the indicator enters a long expansionary phase, that has not ended yet. On the basis of the CI, is possible to locate 8 out of 11 turning points and 3 complete cycles of the reference series, with a good leading at turning points. However, also the CI fails to signal the downturn of beginning 2001: according to it, the construction sector would still be in the expansion that started in July 1998. Both confidence indicators show a quite weak contemporary cross-correlation with the reference series; for the ISAE-EC indicator, it peaks at the seasonal lag, for the CI in t-2 (with a smaller coefficient).

The ISAE-EC Index does not Granger-cause the growth of investment in construction, while the CI does (table 4); the equation including the CI clearly outperforms the other even in terms of S.E. of the regression and R^2 coefficient. However, in terms of out of sample performance, the equation including the ISAE-EC Confidence Indicator is better than the other: considering the 1-step-ahead forecasts in the period 1999:1-2002:1, including the CI instead of the ISAE confidence imply a 14% rise of the RMSE and a 6,4% rise of the MAE. However, the ISAE-EC indicator is more biased with respect to the CI.

Figure 4: Investments in construction and confidence indicators





[13] ISAE does not calculate a confidence indicator for the construction sector on a regular basis; however, an indicator based on the ISAE survey is calculated by the EC, as a simple arithmetic mean of the question regarding order books level and employment expectations. In the paper, we have applied the EC methodology to the ISAE series to calculate the Construction Confidence Indicator.

Table 3: Gross fixed investment in construction and Confidence

Indicators: main cyclical features and cross-correlations

	GFI in construction	ISAE-EC Confidence Climate	Composite Sentiment Indicator
Number of cycles	5	1	3
Cyclical features: duration (in months):	26,6	43	29.33
Expansions (months)	12.2	12	11.67
Recessions (months)	14.4	31	17.67
	Turning Points		
Through	1987:9		
Peak	1988:8		
Through	1989:3		1989:2
Peak	1990:2	1989:11	1989:10
Through	1990:12		1991:5
Peak	1992:2		1992:2
Through	1994:12	1993:12	1993:2
Peak	1996:4	1994:11	1994:8
Through	1997:3	1997:6	1996:8
Peak	1997:12		1998:7
Through	1998:10		
Mean lead (-)/lag (+) at turning points: total		-7.25	-9.43
- downturns		-10.00	-10.25
- upturns		-4.5	-6.25
Correlation coefficients			
– ρ_0		0.2847	0.2295
– ρ max (lead(-)/lag(+))		0.4393 (-12)	0.2465 (-2)

1. Period: 1986:1, 2002:3; probabilities in brackets.
Source: Own calculations on ISAE and ISTAT data.

Table 4: Gross fixed investment in construction and Confidence Indicators: in-sample and out-of-sample performance[1]

	In sample						
	Granger causality test	R^2	Akaike & Schwartz Criteria	F-test	SER	Autocorrelation 1-4 (F-stat.)	
ISAE-EC Confidence Indicator	1.350 (0.264)	0.804	-5.111 -4.799	31.82 (0.00)	0.0176	3.211 (0.020)	
Composite Indicator	2.175 (0.085)	0.822	-5.173 -4.824	31.18 (0.00)	0.0168	1.352 (0.265)	
	Out of sample – 1 step ahead forecast						
	ME	MAE	RMSE	Theil U			
				Total	bias	var.	cov.
ISAE EC Confidence Indicator	-0.0025	0.0124	0.0157	0.19226	0.02599	0.07230	0.90171
Composite Indicator	0.0013	0.0132	0.0179	0.21004	0.00516	0.07940	0.91544

1 Period: 1987:1, 2002:1; probabilities in brackets.
Source: Own calculations on ISAE and ISTAT data.

3.3 A Composite Indicator for the Retail Sector

Cohesion among the six series from the retail sales survey is less evident (figure 5) than in manufacturing and construction. The test for stationarity $\eta(6)$ takes the value 2.669, which is higher than the 5% critical value of 1.686, thus accepting the alternative of non-stationarity. On the other hand, the test of the one factor hypothesis $\zeta_{1,6}$ takes the value 0.601, which is less than the 5% critical value, which is 0.826. The null hypothesis is then accepted and a common factor may be extracted with the usual procedure described in session 2.

Figure 5: Cohesion index for the retail sales

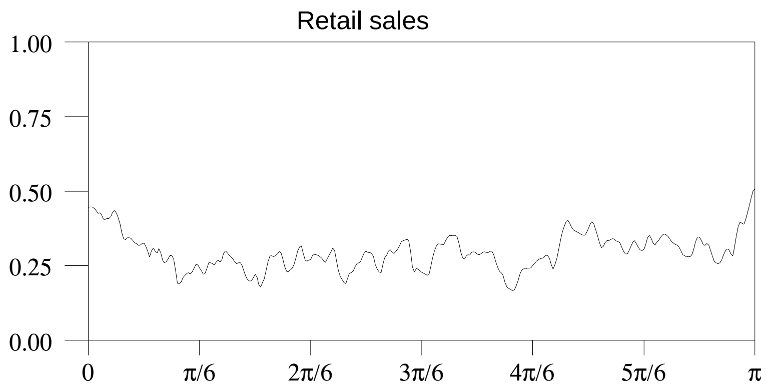
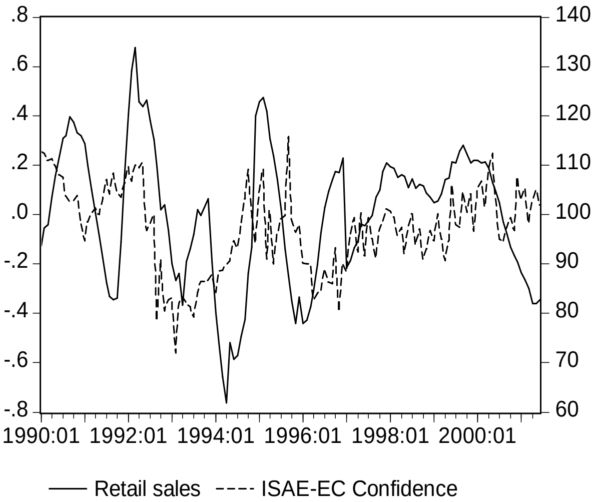


Figure 6: Retail sales and confidence indicators



To analyse the performance of the CI for the retail sector, we need to choose as usual a reference series; in this case, the choice is not straightforward. A possible option is to use value added for the retail sector, available on a quarterly basis; however, updated quarterly data are referred to an aggregation of the retail sector with repairs, hotels and restaurant, which do not enter the ISAE survey. Therefore, we choose as a reference series the index of retail sales, monthly published by Eurostat, available only from 1990 onwards (figure 6). In terms of sectors considered, the composition of the index is similar to that of the ISAE survey, even if it is not exactly the same: in fact, the ISAE survey includes also information from automobile sellers, that are not in the retail sales index. Moreover, the retail sales survey has been extensively revised in 1995. Bearing this caveat in mind, table 5 provides the analysis of the main cyclical features of the reference series, together with those of the CI and of an indicator of confidence elaborated from the ISAE survey on the basis of the EC methodology[14].

[14] As for the construction sector survey, ISAE does not calculate yet a confidence indicator for the retail sector on a regular basis; the EC indicator is calculated as a simple arithmetic mean of the questions regarding actual and expected business level and inventories; in the paper, we have applied the EC methodology to the ISAE series to calculate the Retail Confidence Indicator. For a description of the ISAE survey on the retail sector, see again Martelli (1998).

Table 5: Retail sales and Confidence Indicators: main cyclical features and cross-correlations

	Retail sales	ISAE-EC Confidence Climate	Composite Indicator
Number of cycles	3	3	3
Cyclical features: duration (in months):	29.33	30.667	34
Expansions (months)	13.33	17.667	14
Recessions (months)	16	13	20
	Turning Points		
Through	1991:9	1991:2	1990:11
Peak	1992:3	1992:3	1991:11
Through	1994:3	1993:1	1994:11
Peak	1995:2	1994:10	1995:7
Through	1996:2	1996:5	1996:7
Peak	1998:1	1997:12	1998:5
Through	1999:1	1998:10	1999:5
Peak	1999:9	2000:4	2000:3
Mean lead(-)/lag(+) at turning points: total		-2.5	+2.25
- downturns		-5.5	+1.75
- upturns		+0.5	+2.75
Correlation coefficients			
– ρ_0		0.2684	0.3594
– ρ max (lead(-)/lag(+))		0.3767 (-4)	0.3594 (0)

1. Period: 1990:1, 2002:3; probabilities in brackets.
Source: Own calculations on ISAE and Eurostat data.

The Bry-Boschan routine identifies three complete cycles for both the reference series and the confidence indicators. Looking at the reference series, the first cycle may be considered linked to the first devaluation of the Italian currency in 1992; the cyclical chronology for the retail sector is slightly lagging in this case with respect to that of industrial production, the trough occurring in March 1994 (October 1993 in the manufacturing sector); in the following two cycles (that again may be considered linked to the second devaluation and the Asian crisis), however, the trough is reached earlier than in manufacturing. The indicator elaborated on the basis of the ISAE-EC methodology generally anticipates the turning points of the reference series; the average lead equals 2.5 months and its cross-correlation peaks at lag 4. On the basis of the analysis of turning points and

Table 6: Retail trade and Confidence Indicators: in-sample and out-of-sample performance[1]

	In sample						
	Granger causality test	R^2	Akaike & Schwarzt Criteria	F-test	SER	Autocorrelation 1-12 (F-stat.)	
ISAE-EC Confidence Indicator	1.026 (0.431)	0.4954	-5.805 -5.191	5.645 (0.00)	0.012	1.169 (0.318)	
Composite Indicator	0.990 (0.464)	0.4931	-5.80 -5.18	5.607 (0.00)	0.012	1.373 (0.195)	
	Out of sample – 1 step ahead forecast						
	ME	MAE	RMSE	Theil U			
				Tot.	bias	variance	covariance
ISAE-EC Confidence	-0.00013	0.0054	0.0061	0.361	0.0005	0.0279	0.97159
Composite Indicator	-0.00353	0.0041	0.0051	0.254	0.4824	0.0045	0.51313

1 Period: 1987:1, 2002:1; probabilities in brackets.
Source: Own calculations on ISAE and ISTAT data.

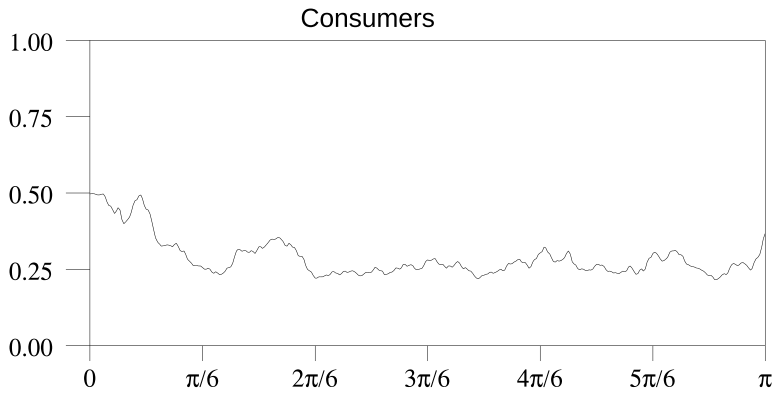
of the cross-correlation function, the CI may be considered as a coincident or even a lagging indicator of the retail sales cycle; on average, its turning points are lagged with respect to the reference series by 2.25 months; cross-correlation peaks at lag 0.

The ISAE-EC indicator outperforms the CI in terms of in-sample performance: the results of the estimation of the usual regression models including alternatively the two confidence indicators show however that neither the ISAE-EC Confidence nor the CI Granger-cause the annual rate of growth of retail sales. Interestingly, the CI outperforms instead the ISAE-EC Confidence in terms of out-of-sample performance: the 1-step-ahead RMSE of the model including the CI is 16% lower than that with the ISAE-EC index. The Theil inequality index being lower for the CI than for the ISAE EC confidence, it signals however that the CI is strongly biased: in other terms, the CI is much better than the ISAE indicator in forecasting the cyclical behaviour of the reference series, but it tends to systematically under-estimate the level of the retail sales index.

3.4 A Composite Indicator for Households' Consumption

In the case of consumer survey, the fifteen questions considered show an overall low cohesion. The index never reaches the value 0.50 (fig. 7).

Figure 7: Cohesion index for the consumer survey



As far as the test for stationarity $\eta(15)$ is considered, its value is 2.625, well below the critical value at 5% of 3.543 and at 10% (3.264). Actually, this is not completely consistent with the results of the Augmented Dickey-Fuller test, which for most of the series leads to accept the I(1) hypothesis (see again Appendix A). Indeed, as shown in Harvey (2001), the correction proposed to take into account possible autocorrelation of ε_t in model (5), is likely to lower the power of the test, leading to accept too often the null of stationarity.

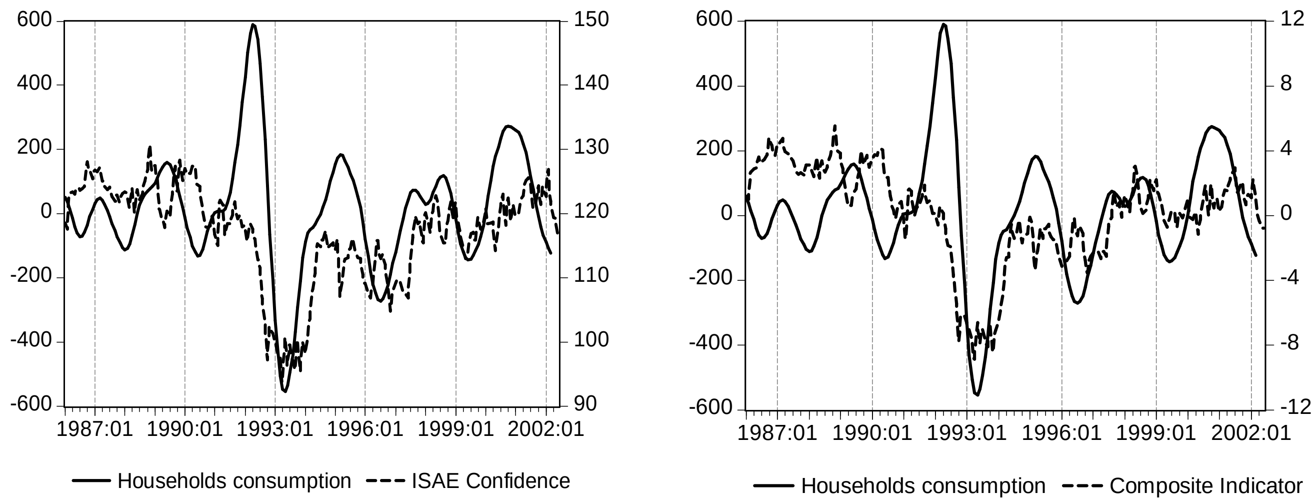
In order to be safe about possible nonstationarity and not being able to accept the hypothesis of one single common trend, we build a dynamic factor model on first differenced variables:

$$\begin{aligned} \Delta\mathbf{x}_t &= \boldsymbol{\theta}\Delta\mu_t + \mathbf{v}_t \\ \mathbf{v}_t &= \boldsymbol{\Phi}\mathbf{v}_{t-1} + \boldsymbol{\varepsilon}_t \qquad && \boldsymbol{\varepsilon}_t \sim NID(0, \boldsymbol{\Sigma}_\varepsilon) \\ \Delta\mu_t &= \varphi\Delta\mu_{t-1} + \eta_t && \eta_t \sim NID(0, \sigma_\eta^2) \qquad t = 1,\dots,T \end{aligned} \tag{9}$$

Model (9) differs from model (7) in that variables $\mathbf{x}_t$ are replaced by $\Delta\mathbf{x}_t$ and the common factor μ_t by $\Delta\mu_t$, with the latter following an AR(1) stationary autoregressive process with $|\phi|<1$. Starting from model (9), the common trend (interpreted as a composite indicator) may be extracted in the usual way.

Total consumption of households is chosen as the reference series (figure 8). The analysis leads to the identification of 4 cycles of consumption expenditures (from trough to trough, table 7). The first occurs between January 1988 and June 1990; the second is linked to the first big devaluation of the lira and the 1992 major financial crisis, and it is bounded between the troughs of June 1990 and May 1993; the third is characterized by the recovery following the 1992 shock, and the new recession after the second big devaluation, with a trough occurring in July 1996; the fourth cycle may be linked to the recession following the crisis of Asian markets at the end of the nineties, and it is engulfed between the troughs occurred in July 1996 and July 1999. Consumption expenditures peak again at the end of the year 2000, and the following recession has not reached a trough yet according to the available data.

Figure 8: Households consumption and confidence indicators



Both the indicators based on the ISAE survey fail in identifying the October 2000 peak; the Consumers' Confidence monthly released by ISAE fails also in identifying the early cycle at the end of the eighties (probably due to lack of available data). However, it shows a more leading nature with respect to the reference cycle than the CI; as for the manufacturing indicator, this is probably due to the fact that the CI includes the complete set of information stemming from the survey, while the ISAE confidence indicator has been constructed choosing a subset that gives more emphasis to consumers' expectations[15]. Both the indicators release the same information on the last two turning points, namely the trough of May 1999 and the peak in May 1998, anticipating, respectively of 1 and 3 months

[15] For a description of the ISAE Consumers' confidence indicator, see Martelli (1998).

those of the reference series. The correlation between the cyclical component of the reference series and the ISAE confidence indicator peaks in t-3, that with the CI in t-2; the correlation is higher for the ISAE Confidence indicator than for the CI.

Table 7: Households' Consumption and Confidence Indicators: main cyclical features and cross-correlations

	Consumers' expenditures	ISAE Confidence Climate	Composite Indicator
	Number of cycles		
From min. to min.	4	4	4
Duration of cycles (months):	34.25	30	34.75
Expansions (months)	21.5	13.5	16
Recessions (months)	12.75	16.5	18.75
	Turning Points		
Peak	1987:3		1987:2
Trough	1988:1		1987:10
Peak	1989:6	1988:12	1988:11
Through	1990:6	1989:5	1989:5
Peak	1992:4	1990:4	1990:4
Through	1993:5	1993:3	1993:3
Peak	1995:3	1994:8	1995:1
Through	1996:7	1996:11	1996:4
Peak	1998:8	1998:5	1998:5
Trough	1999:6	1999:5	1999:5
Peak	2000:10		
Mean lead(-)/lag(+) at turning points: total		-6.5	-5.6
- Expansions		-10	-7.4
- Recessions		-3	-4.4
	Cross-Correlation function		
– ρ_0		0.3954	0.3652
– ρ max (lead(-)/lag(+))		0.4161 (-3)	0.3841 (-2)

1. Period: 1986:1, 2002:3; probabilities in brackets.
Source: Own calculations on ISAE and ISTAT data.

Both indicators do not Granger-cause the (growth of) consumption expenditures at the 90% confidence level (table 8); however, the lags of the CI are statistically significant at the 81.5% level, with respect to the 57% level of those of the ISAE consumers' confidence. Both SE and R^2 are better for the model including the CI than for that with the ISAE index; the model with the CI is preferred also on the basis of the usual Akaike and Schwartz information criteria.

As for the out-of-sample performance, table 8 presents the results from the estimation of the usual regression model including also the contemporaneous level of the confidence indicators. The consideration of the CI increases the 1-step-ahead RMSE and the Theil inequality coefficient. However, in this case the CI is less biased than the ISAE Confidence indicator.

Table 8: Consumption and confidence indicators: the in-sample and out-of-sample performance[1]

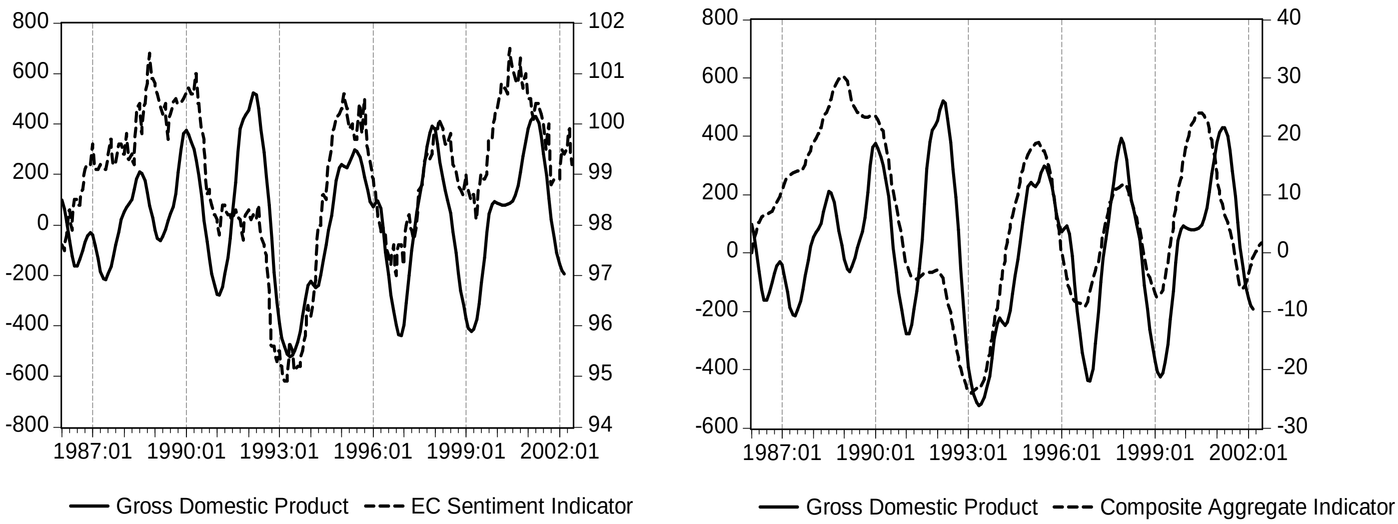
	In sample						
	Granger Causality test	R^2	Akaike & Schwartz Criteria	F-test	SER	Autocorrelation 1-4 (F-stat.)	
ISAE Confidence Indicator	0.9726 (0.430)	0.896	-7.466 -7.154	65.84 (0.00)	0.0054	1.868 (0.1313)	
Composite Indicator	1.611 (0.185)	0.900	-7.510 -7.199	69.14 (0.00)	0.0053	2.166 (0.087)	
	Out of sample – 1 step ahead forecast						
	ME	MAE	RMSE	Theil U Total	Bias	Var	Covar.
ISAE-EC Indicator	0.00305	0.00447	0.00600	0.1325	0.25759	0.3678	0.37453
Composite Indicator	0.00270	0.00459	0.00627	0.1402	0.18507	0.49641	0.31852

1 Period: 1987:1, 2002:1; probabilities in brackets.
Source: Own calculations on ISAE and ISTAT data.

4 ESTIMATING A COMPOSITE AGGREGATE INDICATOR (CAI) FOR ITALIAN ECONOMY

The CAI is calculated synthesising the information contained in the four sectoral indicators for manufacturing, consumers, retail trade and construction. Model (9) was used on the first differenced variables to get the common component. On the basis of the Bry-Boschan routine, is has been possible to identify 5 major cycles of the reference series, i.e. quarterly Italian GDP (figure 9). The first complete cycle, going from the trough of June 1987 to that in March 1989, is found also in the CAI, but not in the EC Sentiment Indicator. On the other hand, the following cyclical episode (the one going from March 1989 to February 1991) does not emerge from the analysis of neither the EC Sentiment nor the CAI. According to the first, a short expansion, going from July 1987 to April 1990, is followed by a long recession, linked to the first devaluation, that ends with the beginning-1993 trough (an indication leading of two months with respect to the reference cycle).

Figure 9: Italian GDP and confidence indicators



Looking at the CAI, we are able to identify a very long recession at the beginning of the sample, ending in February 1993 (again, two months earlier than for the reference series). Consistently, the average length of recession is much longer for the CAI and the EC sentiment indicator than for the reference series. As for the two following cycles, both the EC Sentiment indicator and the CAI are able to anticipate turning points for the "second devaluation cycle" (1993:5-1996:11), and are instead lagging with respect to those of the "Asian Crisis cycle" (1999:11-1999:3). The next downturn, located in March 2001 for the reference series, is anticipated, respectively, by 9 and 10 months by the EC and CAI. The cross-correlation functions with the reference series peaks in t-1 for the EC index and in t-3 for the CAI; both indicators show a fairly good correlation with the reference series. It is noteworthy that, at peaks, the correlation with the reference series is stronger for the EC Sentiment indicator than for the CAI.

Regression analysis shows somewhat different results; according to the estimation of the usual regression models including up to 4 lags are of both GDP growth and sentiment indicators, both the EC Sentiment Indicator and the CI Granger-cause the annual growth rate of Italian GDP; however, considering the proportion of variance explained by the regression and the usual information criteria, the model including the CAI outperforms the one with the EC Sentiment.

Table 9: Italian GDP and Economic Sentiment Indicators: main cyclical features and cross-correlations[1]

	Gross Domestic Product	EC Sentiment Indicator	Composite Indicator
Number of cycles	5	3	2
Length of cycles	28.2	39	36
- Expansions	14.8	16.667	20.5
- Recessions	13.4	22.339	15.5
	Turning Points		
Through	1987:6		
Peak	1988:7	1988:12	1988:12
Through	1989:3	1989:7	
Peak	1990:1	1990:4	
Through	1991:2		
Peak	1992:3		
Through	1993:5	1993:3	1993:2
Peak	1995:6	1995:2	1995:3
Through	1996:11	1996:9	1996:9
Peak	1997:12	1998:3	1998:1
Trough	1999:3	1999:4	1999:2
Peak	2001:3	2000:7	2000:6
Mean lead(-)/lag(+) at turning points: total		0	-1.7
- downturns		-0.2	-1.5
- upturns		+0.25	-2.0
Correlation coefficients			
– ρ_0		0.6049	0.5034
– ρ max (lead(-)/lag(+))		0.6162 (-1)	0.5684 (-3)

1. Period: 1986:1, 2002:7

Source: Own calculations on ISAE, EC and ISTAT data.

In terms of out-of-sample performance, the Mean Error for 1-step-ahead forecasts is lower for the CAI, but RMSE and the Theil inequality coefficient are both higher than for the EC Sentiment Indicator. However, the EC Sentiment indicator is strongly biased: according to the decomposition of the Theil' inequality coefficient, more than 50% of the error is attributable to distortion in mean, while for the CAI almost the 96% of it is linked to the covariation between the index and the reference series.

Table 10: Italian GDP and Confidence Indicators: in-sample and out-of-sample performance[1]

	In sample					
	Granger causality test	R^2	Akaike & Schwarzt Criteria	F-test	SER	Autocorrelation 1-4 (F-stat.)
ISAE-EC Confidence Indicator	3.773 (0.009)	0.734	-7.003 -6.691	21.73 (0.00)	0.007	4.569 (0.003)
Composite Indicator	15.887 (0.000)	0.846	-7.546 -7.235	42.12 (0.00)	0.0052	0.6352 (0.639)

	Out of sample – 1 step ahead forecast						
	ME	MAE	RMSE	Theil U			
				Total	Bias	Var.	Cov.
ISAE EC Confidence Indicator	0.00381	0.00433	0.00527	0.115	0.52199	0.03361	0.44441
Composite Indicator	0.00087	0.00467	0.00543	0.124	0.02578	0.01426	0.95996

1 Period: 1987:1, 2002:1; probabilities in brackets.
Source: Own calculations on ISAE and ISTAT data.

5 CONCLUSIONS

In this paper we have built four synthetic indicators (CI) for each one of the qualitative surveys conducted by ISAE, concerning manufacturing, retail trades, construction and consumers, using a dynamic factor model. The first three indicators, by gathering information about present situation and future prospects of a specific industry, should help explaining the short term movements of a quantitative variable related to that sector. On the other hand, the synthetic indicator of the consumer survey should resume what is commonly denoted as consumer confidence, which is sometimes claimed to have a role in explaining consumer behaviour. On this basis a comparison with a quantitative variable for each sector is carried out, analysing the in-sample and out-of-sample properties, also in comparison with the synthetic indicator produced by ISAE.

The evidence is somewhat mixed. For the retail trade and the construction sector the cyclical characteristics of the quantitative variables chosen do not match well with that of the qualitative indicators, both the ones presented here and those calculated with ISAE-EC methodology. Concerning consumer survey, the CI shows a superior in sample and out of sample performance with respect to the usual ISAE confidence indicator. For the manufacturing sector, where the survey is more consolidated and the quantitative reference variable is more accurately measured, we have a significant increase in the out-of-sample performance using the CI indicator.

An analogous improvement is observed in a composite aggregate indicator calculated aggregating, again with a dynamic factor model, the four sectoral indicators. In this case the reference series is the GDP, and the forecasting performance of the model which uses the CAI is slightly worse than the model which uses the EC indicator in term of RMSE, but much better in terms of bias reduction.

Further research is needed to improve the construction of sectoral composite indicators, selecting those variables, which can help maximizing the fit with an observed variable, especially for the consumer survey. At the aggregate level, the loss of discarding some of the surveys (namely construction and retail sales) may be explored.

Appendix A – Augmented Dickey-Fuller tests

Table 1: Augmented Dickey-Fuller test for manufacturing sector

	Lags	Test[1]
Order books (total)	4	-3.22*
Order books (domestic)	16	-1.57
Order books (foreign)	6	-3.89**
Production trend in recent months	4	-2.94*
Stock of finished products	7	-2.31
Expectations on order books	1	-3.03*
Expectations on production	17	-2.27
Expectations on selling prices	6	-2.99*
Expectations on general economic situation	1	-2.98*

1 * significant at 5%; ** significant at 1%

Table 2: Augmented Dickey-Fuller test for retail sales

	Lags	Test[1]
Business levels	12	-2.19
Stocks	2	-1.94
Prices	1	-4.39**
Level of orders	13	-2.46
Expectations on employment	9	-2.30
Expectations on prices	16	-1.00
Expectations on business levels	12	-2.01

1 * significant at 5%; ** significant at 1%

Table 3: Augmented Dickey-Fuller test for the construction sector

	Lags	Test[1]
Order books	15	-3.16*
Trend of activity	7	-3.21*
Expectations on orders	2	-3.92**
Expectations on prices	12	-1.72
Expectations on employment	9	-2.49

1 * significant at 5%; ** significant at 1%

Table 4: Augmented Dickey-Fuller test for the consumer survey

	Lags	Test[1]
General Economic Situation	3	-2.15
General Economic Situation – expect.	16	-3.12*
Unemployment – expectations	18	-1.56
Economic Situation of the Family	16	-1.90
Economic Situation of the Family – exp.	10	-2.89
Financial Situation of households	7	-1.90
Savings – expectations	14	-3.45**
Savings	2	-1.86
Major Purchases	8	-1.28
Price Trends	2	-2.15
Price Trends – expectations	1	-1.79
Major Purchases – expectations	12	-3.14*
Purchasing of a car	11	-2.15
Purchasing of a house	18	-1.12
Major housing works	2	-2.84

1 * significant at 5%; ** significant at 1%

Appendix B – The ISAE surveys on the manufacturing, retail and construction sector and on the consumers

Manufacturing sector:
Assessments on: Order books (total, domestic, foreign), Production trend in recent months, Stock of finished products

Expectations on: Order books, Production, Selling Prices, General Economic situation

Retail trade
Assessments on: Business levels, Level of orders, Prices
Expectations on: Business levels, Prices, Employment

Construction sector
Assessments on: Trend of activity, Order books
Expectations on: Order books, Employment, Prices

Households:
Assessments on: Economic Situation of the Family, Financial Situation of households, Savings, Major Purchases, Price Trends, General Economic Situation

Expectations on: Economic Situation of the Family, Savings, Major Purchases, Purchasing of a car, Purchasing of a house, Major housing works, Price Trends, General Economic Situation, Unemployment

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