



ISTITUTO DI STUDI E ANALISI ECONOMICA

**Leading indicators on construction and
retail trade sectors based on
ISAE survey data**

by

Luciana Crosilla

ISAE, Piazza Indipendenza, 4, 00185 Rome, Italy

Solange Leproux

ISAE, Piazza dell'Indipendenza, 4, 00185 Rome, Italy

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ISAE - Piazza dell’Indipendenza, 4 – 00185 Roma.

Tel. +39-06444821; www.isae.it

ABSTRACT

According to the Commission recommendations, ISAE has recently restructured the methodological framework of its survey on firms operating in the Italian construction sector and in retail trade. The innovations specifically regard the sampling design and the weight system for both sectors; this last revision, in particular, allowed the reconstruction of the ISAE historical series. In the light of the changes introduced, the aim of this paper is to analyze the cyclical features and to evaluate the “leading” performances of the new ISAE series with respect to the quantitative ISTAT data and to build a “leading indicator” for both construction and retail trade in Italy. We first apply the NBER methodology in order to establish the main cyclical features of the series. Then we use cross-correlation analysis to estimate the extent to which the ISAE variables and the ISTAT series are correlated. Moreover the Granger causality and out of sample tests were used to evaluate the forecasting performance of the ISAE series. On the basis of the results obtained, we finally build a leading indicator for both sectors, and test its performance comparing the results to those of the confidence index elaborated by ISAE.

Keywords: Leading indicators, cyclical analysis, construction survey, retail trade survey.

JEL Classification: C42, E32.

NON-TECHNICAL SUMMARY

Most of the analysis in the field of leading indicators has focused on composite indicators predicting the evolution of the aggregate economic activity. Quite the reverse, this study tries to make a contribution at a more disaggregated level, considering leading indicators for two specific sectors of the Italian economy: retail trade and construction. Using the econometric tools proposed in the literature, we build the leading indicators based on ISAE survey data.

INDICATORI ANTICIPATORI DELLE COSTRUZIONI E DEL COMMERCIO AL MINUTO SULLA BASE DELLE INCHIESTE ISAE

SINTESI

L'ISAE, in linea con le raccomandazioni della Commissione Europea, ha recentemente provveduto alla ristrutturazione delle inchieste congiunturali condotte presso le imprese delle costruzioni e del commercio al minuto. In particolare, per entrambi i settori, la ristrutturazione ha riguardato il disegno campionario e il sistema di pesi utilizzati per l'aggregazione dei dati elementari. L'introduzione di nuovi pesi ha consentito la ricostruzione delle serie storiche delle due inchieste. Alla luce di tali cambiamenti, lo scopo del lavoro è quello di analizzare le caratteristiche cicliche delle nuove serie, di valutarne le capacità anticipatrici rispetto a quelle delle serie ISTAT di riferimento e, quindi, di costruire un indicatore anticipatore per entrambi i settori. A tal fine, è stata applicata la metodologia del NBER per individuare le caratteristiche cicliche delle serie considerate. L'analisi di correlazione incrociata, il test di causalità secondo Granger e l'out of sample test sono stati utilizzati per valutare le capacità anticipatrici delle serie ISAE. Infine, sulla base dei risultati ottenuti, è stato costruito un indicatore anticipatore per entrambi i settori la cui performance è stata confrontata con quella dei rispettivi indicatori di fiducia elaborati dall'ISAE.

Parole chiave: indicatori anticipatori, analisi ciclica, inchiesta congiunturale sulle imprese di costruzione, inchiesta congiunturale sulle imprese del commercio al minuto

Classificazione JEL: C42, E32.

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1 INTRODUCTION ¹

Since the late 1990s, growth in the Italian construction industry has been strong. In particular, since 1998 the industry has been a driver for the entire economy and has been witnessing an expansion unparalleled in any other economic sector. The growth rate of construction is further confirmed by investments, which rose by 23% in real terms between 1999 and 2005 as against an increase of just 9% in GDP. Its role as a driving force of the Italian economy is also reflected on the job market. Figures over the past seven years (1998-2005) indicate that employment in construction grew by 28% compared to an overall increase worth of 9.6% in job creation nationwide (ANCE, 2006). Although growth in this sector was particularly intense in the early 2000s, and is currently considered to be slowing down, the overall trends ensure that the construction industry continues to play a key role in studies focusing on the future evolution of the Italian economy as a whole.

On the other hand, since the early 1990s, retail trade sales sector has been going through a very complex phase. It is a result of in-depth sector-specific changes arising from new distribution services and increasingly demanding and discerning customers. However, figures for the period 1992-2003 suggest that, whilst the number of retail business has fallen (-8.4%), the sector as a whole has in fact grown in terms of both employment (+18%) and value added (+25%). This latter data, in particular, when compared to the GDP (+24%), shows to which extent retail trade has contributed to wealth production in Italy.

The construction and retail trade sectors therefore play an increasingly crucial role in the evolution of the Italian economy.

Accordingly, the availability of timely information on current and expected trends in these sectors is crucial to both those operating in the sector and to the institutions in charge of shaping the economic policy. As a result, increasing attention has been focused on the statistical tools available for processing market data and measuring and forecasting economic trends. The statistician's arsenal in this context includes business tendency surveys which, albeit designed not to replace but to supplement quantitative measurements, deserve

¹ The first results of this working paper have been presented at the 28th CIRET conference, Rome, September 2006. The authors wish to thank Marco Malgarini for the useful comments and suggestions. A special thanks to Flora Fullone at ISAE for making changes in Bry-Boschan routine (EViews version for quarterly data). The views expressed in this paper are those of the authors and do not involve any responsibility of ISAE. Although the paper reports the results of a joint research of both authors, Luciana Crosilla wrote sections 3.1 and 4.1; Solange Leproux is responsible for sections 3.2 and 4.2.

a special mention. By providing for "quick" results, these surveys allow market operators and policy-makers alike to anticipate trends well ahead of the publication of official statistics (Pinca, 1992).

It is in light of these considerations that this paper focuses on constructing a leading indicator for forecasting and interpreting future economic trends² (Altissimo, Marchetti, Oneto, 2000).

To this end, use has been made of the results of ISAE construction and retail trade surveys, the restructuring of which has generated a new series of historical data. This study therefore also aims at analysing and testing the features and properties of those new data.

This paper goes as follows: section 2 illustrates each analytical step and provides a description of the methods applied; section 3 sets forth the results of the analysis, presenting them separately for the construction and retail trade respectively; section 4 provides a description of the leading indicators constructed for the two sectors, together with an assessment of the performances as against the data series of reference, further comparing forecasting capability against the relevant confidence indices. Finally, the conclusions of the study are set forth.

2 THE APPLIED METHODOLOGY

To begin with, the trends of the ISAE series for the construction and retail trade sectors were compared with some quantitative reference series, selected amongst those generated by ISTAT on the basis of the new methods used in the National Accounts (ISTAT, 2005). In particular, with regard to the construction survey, account was taken of monthly seasonally adjusted balances³ for the following variables: assessments on order-books and activity, expectations on order-books, employment and sales prices; the reference

² For retail trade, see also Martelli (1997)

³ Balances are the difference (in percentage points of total answers) between positive and negative options. In particular, if a question has three alternative options, 'positive', 'neutral' and 'negative' and if P, E and M (with P+E+M=100) denote the percentage respondents choosing respectively the option positive, neutral and negative, the balance is calculated as B=P-M. All the ISAE survey series were seasonally adjusted using the Tramo-Seats method with Demetra software (Gomez and Maravall, 2000).

series included, at the first step, quarterly seasonally adjusted figures⁴ for value added and sector-specific investments, the production index and GDP.

With respect to retail trade, the analysis focused on the monthly seasonally adjusted balances (see footnote 3) for the following variables: assessments on stock inventory levels, producer prices and current business trend; expectations on future business trend, order-book volumes and employment. The quantitative reference data for this sector, again subject to seasonal adjustment, included, on the other hand, the value added figures for retail, hotel and restaurant sales, the GDP, the retail sales index and total households' consumption⁵.

During the first step of the analysis the cyclical features of the series considered were identified through the Bry-Boschan routine⁶ (Bry, Boschan, 1971), while the classical NBER approach (Burns and Mitchell, 1946) was adopted for the ISAE monthly series and the growth cycle approach (Mintz, 1972) for the ISTAT quarterly data. The trend component, in this last case, was estimated using the Hodrick-Prescott filter (Hodrick, Prescott, 1980).

The results obtained, in terms of mean leads/lags of the turning points of the ISAE series compared to the individual quantitative series, were subjected to further checks involving the calculation of the cross-correlation coefficients on the cyclical components of the analysed variables⁷. The study of the cross-correlation function features highlighted, even during this first phase of analysis, the ISAE variables and the quantitative reference variables that could potentially be used to construct a leading indicator in the sectors examined.

These same variables were subsequently subjected to further checking and selection using the econometric tests described below.

To this end, all the series underwent a preliminary testing for the presence of unit roots (namely, the test confirming that the time series data are not stationary), using the Augmented Dickey-Fuller (ADF) test. On the basis of the results of the ADF test, set forth in the attached tables nos. 1 and 2 in the appendix, the quantitative reference series that were found to be non-stationary were transformed into the first differences of the logarithms. The test results indicated that only some of the survey series variables were not stationary. This result might cause some surprise since these series, being bounded by

⁴ All ISTAT series were seasonally adjusted using the Tramo-Seats method.

⁵ In particular, the last series was seasonally adjusted and corrected for working days.

⁶ A version of the quarterly data of the Bry-Boschan routine (Schlitzer, 1993) was recently processed and proposed by Cacciotti, Cerciello, De Arcangelis and Giovannetti (2005).

⁷ After applying the Bry-Boschan routine, the ISAE series became quarterly, which facilitated the comparison with the quarterly ISTAT series.

construction, must be considered "stationary" (with reference to the presence of unit roots in series deemed to be stationary, see Brunello et al., 2000 and on the ISAE series, Bruno, Malgarini, 2002). On the basis of this last consideration, the survey series were not subject to any transformation.

The in sample properties of the ISAE series, were compared with those of the ISTAT series using the Granger test (Laszlo, 2004). The regression model used for the test includes the past values of both the dependent and independent variables. Given that the series were quarterly, a specific decision was made to insert up to 4 lags, thus giving rise to the following equation:

$$\Delta \log y_t = \alpha + \sum_{i=1}^1 \beta_i \Delta \log y_{t-i} + \sum_{i=1}^1 \gamma_i VI_{t-i} + \varepsilon_t \quad (1)$$

where i indicates the delay, y_t , the reference variable in the first differences of the logarithms, α , a constant, β_i and γ_i , respectively, regression coefficients for the past values of the dependent and independent variable VI (the ISAE series in question), and lastly, ε_t , the error. The test includes the null hypothesis where by the coefficients γ_i are equal to zero for every i .

Lastly, in order to test the forecasting capability of the ISAE series selected on the basis of the results obtained during previous analytical steps, equation (1) was extended with the addition of the contemporary value of the VI as an independent variable. Accordingly, equation (1) may be re-formulated as follows:

$$\Delta \log y_t = \alpha + \sum_{i=1}^1 \beta_i \Delta \log y_{t-i} + \sum_{i=0}^1 \gamma_i VI_{t-i} + \varepsilon_t \quad (2)$$

where the estimated values of the dependent variable are obtained using the "static" (one step) forecast. The validity of the forecasting model was assessed bearing in mind the RMSE (Root Mean Square Error) and the MAE (Mean Absolute Error) values, while the THEIL inequality coefficient (especially considered in its three components of bias, variance and covariance) was used to compare the forecast series with the real ones.

The forecast indicator for the construction and retail trade sectors was therefore constructed as the arithmetical mean only for the variables selected on the basis of their forecasting capability, as assessed by the results of the tests described.

The indicator performance was evaluated against the reference series, by replicating all the tests already applied to the individual series.

Moreover, the in sample and out of sample forecasting capabilities of the indicators were compared to those of the ISAE confidence indicators with respect to the selected reference series⁸.

In particular, the estimated model (2) for the leading indicator with regard to the reference series and the following more general regression model:

$$\Delta \log y_t = \alpha + \sum_{i=1}^1 \beta_i \Delta \log y_{t-i} + \varepsilon_t \quad (3)$$

were compared on the basis of the respective RMSE and MAE values in order to evaluate the usefulness of the indicator in forecasting the reference variable values.

3 ANALYSIS OF THE RESULTS ⁹

3.1 Construction

Since the 1960s, within the European Commission harmonized plan, ISAE has been carrying out the construction tendency survey on a monthly basis. Special attention is given to firms operating in residential and in not residential buildings, and to civil engineering as defined in ATECO81 classification. Since then, the survey has been reorganized in various occasions but no restructuring has ever been carried out for the sample plan. Recently, ISAE has also focused its attention on the need to review the sample as to assure a better quality of the survey results (see OCDE, 2003). Moreover, since the survey is via mail, particular attention has also been given to the monitoring of the answering firms to guarantee a stable sample in time. The results for total sector are a weighted average of every single sector, weighted on the basis of the investments estimated by ANCE for 2004.

⁸ The forecasting capabilities were not compared to those of the European Commission confidence indicators. The comparison seems superfluous because both E.C. climates are constructed with the same variables used for the ISAE confidence climates.

⁹ In order not to make heavy the job, in the text both tables and figures have not been enclosed all. These are available near the authors.

For the new weights used, the series for the total sector have been reconstructed beginning from 1995. The ISAE sample has been repeatedly revised and currently is represented by a “reasoned panel” of 500 firms - in coherence with the indications of the European Commission – stratified into geographic regions (North West, North East, Center, South) with proportional allocation of the units in the single strata (that is, in every single stratus there are a proportional number of firms to those of the correspondent stratus in the universe)¹⁰.

In further detail, the firm selection is carried out by a mixed technique: systematic-random extraction type with implicit stratification of small and medium firms (3-99 employees); conversely, large firms (100 and more employees) have all been included in the sample.

The selection, therefore, is not completely random: that corresponds to the requirement to follow “leader” firms (100 and more employees), through a large firms overlapped-sampling. On the other hand, in the reference universe firms with more than 100 employees are a small number (approximately 0.2% of the total firms).

The new criterion of sampling - introduced in the course of 2005 - has produced a remarkable increase in the response rate, thus assuring the representativeness of the sample also in the strata. Considering such innovations and the consequent increased survey representativeness, in 2006 ISAE introduced the monthly publication of data and the confidence climate calculation¹¹. Considering the recent restructure of survey, the analysis has also the aim to explore the new data set characteristics, with particular reference to the leading properties regarding quantitative ISTAT series.

The Bry-Boschan routine emphasizes that the ISAE series with leading characteristics are substantially three: assessments on activity, expectations on order books (that is the plans of construction) and expectations on employment.

In particular, all the three series turn out leading with reference to the value added (see Tab.1) while with reference to investments only the first and third series show such characteristic. Conversely, only expectations on employment seem to weakly anticipate the GDP, while no leading series are for the production index. Also from the graphic examination, the above-mentioned three ISAE series are characterized by a good approach to the cyclical course

¹⁰ We are currently planning the sample stratification also for activity sectors (according to ATECO 2002 with three figures) and consequently the micro data will be unified also for this sectors.

¹¹ The confidence climate is calculated, according to the EC methodology (European Commission, 1997), as a simple arithmetic mean of the questions regarding assessments on order books and expectations on employment. Thus, the confidence climate series is indexed with basis 2000=100.

of the reference series and, in particular, to the value added (see fig. 2, 3, 5 in the appendix) and to the investment series; this is also confirmed by the number of shared turning points: they are more numerous for the series which is being discussed here.

**Tab.1 Construction sector: Value added and ISAE data
main cyclical features**

	Value added	Assessments on order books	Assessments on activity	Expectations on order books	Expectations on selling prices	Expectations on employment
Number of cycles	1	1	1	2	1	3
Number of turning points	4	3	4	6	4	8
Number of shared turning points	\	1	3	3	1	3
False signals	\	2	1	3	3	5
Missing	\	3	1	1	3	1
Turning Points						
Peak	1995q4	\	\	\	\	\
Trough	1997q1	1997q1	1997q1	1996q2	1997q4	1997q1
Peak	1997q4	\	1998q1	1998q3	\	1998q1
Trough	1999q3	\	1998q4	1998q4	\	1998q4
Peak	\	\	\	2001q1	2001q2	2000q1
Trough	\	\	\	2001q4	\	2001q4
Peak	\	2002q3	2002q3	2002q3	\	2002q3
Trough	\	\	\	\	\	2003q4
Peak	\	\	\	\	\	\
Trough	\	2004q1	\	\	2004q3	\
Peak	\	\	\	\	2004q4	2004q2
Mean lead(-)/lag(+) at turning points (in quarters)						
Total		0	-0,7	-1,0	3,0	-0,7
Downturns		\	1,0	3,0	\	1,0
Upturns		0	-1,5	-3,0	3,0	-1,5
Cross-Correlation function						
$\rho(0)$		0,16	0,28	0,11	0,24	0,07
$\rho \max(\text{lead(-)/lag(+)})$		0,49(-6)	0,57(-1)	0,40(-2)	0,61(-3)	0,52(-5)

Source: Own calculations on ISAE and ISTAT data.

Period: 1995-1, 2005-4.

The Cross-Correlation analysis shows a significant anticipation lead on all ISAE variables in respect to the investments and to the value added (see Tab.1). The correlation between survey series and production index is quite weak. However, the cross-correlation function between GDP and ISAE series shows coincident characteristics, except for expectations on employment. We have pointed out that this variable has a good cyclical profile in respect to the GDP. And yet, considering that the leading capability at the turning points is weak and that at least two variables are necessary for the construction of a

leading indicator, we have decided not to consider GDP in the following steps. From the results obtained in this first step of analysis, we will subsequently consider assessments on activity, expectations on order books and on employment, and value added and investments as reference series.

The in-sample properties of the ISAE series have been evaluated by the Granger test. We estimate the generalized regression model described in equation (1), in which 4 lags have been considered both for ISAE variables (chosen as independent variables) and reference series (dependent variables¹²). Assessments on activity Granger-cause the value added and investments; expectations on employment “do not cause” both the value added and investments: in both cases the statistic-test value is, however, very near to the critical value (for the value added see Tab. 3 in the appendix). Considerations such as these as well as the observation that employment expectations have a coherent cyclical trend which is parallel to the investment series, determined the choice not to discard the variable. To sum up, the expectations on order books have shown a good ability to Granger cause the value added.

For all the ISAE series analyzed in the previous step, “out-of-sample” properties were investigated with respect to the value added (see Tab. 4 in appendix) and investments. We estimated the model (2) and evaluated the main statistical indicators for 1-step ahead forecasts for the period 2004:1 - 2005:4¹³. As for the reference value added series, we have a good forecasting performance for assessments on activity and for expectations on order books: the RMSE and MAE of the models including assessments on activity and expectations on order books, respectively, are much smaller than those including expectations on employment. The Theil inequality coefficient of the forecasts obtained with assessments on activity is 0,42 and it is 0,45 for value added forecasts with expectations on order books. This last series provides more biased forecasts. Expectations on employment produces forecasts with a Theil coefficient similar to that one of the others two series (in this case 0,43) but it increases bias while the contrary happens for the covariance. On the whole, assessments on activity and expectations on order books may be considered the series providing the best value added “forecast”.

¹² As specified in paragraph 1, for the verification of in sample and out of sample properties the reference series were transformed in the first difference of the logarithms. Conversely, the ISAE series were not transformed.

¹³ The choice of the number of steps to consider for the evaluation of out of sample properties is based on the lead for which the ISAE series are available in relation to the reference series.

Turning to describe the results for the reference investment series, we notice that the model including assessments on activity has a better performance, considering RMSE and MAE, compared to that including expectations on employment; the Theil coefficient is equal to 0,50 and 0,61, for forecasts obtained by including in the model assessments on activity and expectations on employment, respectively. Moreover, bias and variance are higher (hence the covariance is lower) for forecasts through expectations on employment. For investments, the best forecasting performance is that obtained through assessments on activity.

3.2 Retail sector

The ISAE survey on the retail sector was first launched in 1986 as part of the Europe-wide harmonised programme. Through the gathering of assessments and expectations, it proposes to supply, ahead of official statistics, the data required to pinpoint changes underway within the sector and, therefore, the short term prospects that seem to open up.

Carried out on a monthly basis since 1992, the survey was first revised in 1998 and then again in 2000. The latter revision saw the introduction of a large number of innovations and updates in both the statistical and methodological aspects of the survey, which are described in detail in a specific ISAE publication (Leproux, 2003). The main revision results include: the theoretical predisposition of a new unitary sample design, embracing retail trade distribution on the whole¹⁴; the adoption of the retail enterprise as a statistical unit; the acquisition of the "ASIA" archive, as the basis of the sample; the adoption of a new rule distinguishing between the two types of distribution (traditional retail trade and large distribution¹⁵) and therefore, the choice of a

¹⁴ At the time of the revision, in fact, the survey featured a sampling dichotomy based on two samples: one only for large-scale retailing and the other for the traditional retail trade. The theoretical sample is now a basket of 1000 firms, stratified into two types of business, four geographical areas and five sectors of activity. The number of business in each stratification is proportional to the ASIA (Statistical Archive of Operating Companies) universe of retail firms with three or more employees and it is weighted with the value of the turnover of the sector.

¹⁵ The current rule, based on the ISTAT definition proposed during the revision of the retail sales index with 1995 as the base year, defines traditional retailers as specialised sales outlets with a sales area of less than 400 square metres. The firms operating in the form of supermarkets, hypermarkets, discounts stores, large stores or other specialised sales outlets measuring 400 square metres or more are classified as large distribution. For shops selling mainly food products, the classification threshold falls to 200 square metres.

new criterion of attributing returned questionnaires to one or the other type of retailing.

Upon completion of the revision and after the stability of the sample was checked, a synthetic retail trade confidence indicator was constructed. In accordance with the procedure followed at European Community level, it was calculated as the simple arithmetical mean of the seasonally adjusted balances of the variables pertaining to assessments on business trend and on inventories and the expectations on business trend.

In 2004, in order to take account of the new structure of the Italian distribution sector that emerged during the second half of the 1990s, the weighting system used to obtain the figures representing the sector as a whole was updated with the new ISTAT 2000 weights¹⁶. At that time, the series of the retail sector indicator was recalculated as from January 2000 using the new weights and constructing a new index, expressed on the basis of 2000=100¹⁷; the confidence indicator series calculated at the disaggregated level, with reference, that is to say, only to traditional retail trade and only to large distribution, were also re-based on the year 2000.

In the light of the changes introduced during the revision of 2000, as well as the new historical series expressed on the basis of 2000=100 and calculated using the new system of weights, this paper aims, first and foremost, at assessing the forecasting capabilities of the new survey variables as against series of official statistics.

For this end, the cyclical features of the qualitative series of the survey, identified – as already pointed out in the preceding section – by using the Bry-Boschan routine, were compared with those of the quantitative variables selected as possible reference series.

¹⁶ Until February 2004, in fact, for each variable covered by the survey, the corresponding value representing the entire sector was obtained as the weighted mean of the two balances (for large distribution and traditional distribution). Each of the latter was weighted with the 1995 ISTAT estimate of the percentage of turnover for that particular type of distribution, under which, in particular, 17.4% of turnover was attributed to "modern" retailing and the remaining 82.4% to traditional retailing. As from March 2004, to obtain the balance for the retail sector as a whole, the weighting system is based on the new ISTAT 2000 estimates under which 38.4% of overall turnover is attributed to large-distribution and the remaining 61.6% to traditional distribution.

¹⁷ In order to be able to link the new confidence climate series in retail trade as a whole, available from January 2000, with the pre-existing historical series covering the period from January 1990 (first database year) to December 1999, the old index was adjusted using an appropriate coefficient. The latter was calculated as the ratio between 100 (i.e. the average value of the old index) and the average value of the 12 old indices, base 1995, referred to year 2000.

**Tab. 2 Retail sector: Households' expenditures and ISAE data
main cyclical features**

	Households' expenditures	Assessments on business trend	Expectations on business trend	Assessments on inventories	Expectations on employment	Assessments on producer prices	Expectations on order-books
Number of cycles	4	1	2	1	1	2	2
Number of turning points	10	5	5	4	4	6	6
Number of shared turning points	\	4	4	3	2	6	6
False signals	\	1	1	1	2	0	0
Missing	\	6	6	7	8	4	4
Turning Points							
Trough	\	\	\	\	\	\	\
Peak	1992q1	\	\	\	\	\	\
Trough	1993q3	\	\	\	\	\	\
Peak	1994q4	\	\	\	\	\	\
Trough	1996q3	\	1996q4	\	\	1996q4	\
Peak	1997q3	\	\	\	\	1998q1	1998q1
Trough	1998q1	\	\	1997q2	\	1999q2	1998q4
Peak	\	\	\	1998q4	\	\	\
Trough	\	\	\	\	\	\	\
Peak	2000q4	2000q2	2000q2	\	2000q2	2000q4	2000q3
Trough	2002q2	2001q4	2001q4	2002q3	2001q1	2001q4	2001q4
Peak	\	\	2002q4	\	2002q1	\	\
Trough	\	\	\	\	2003q3	\	\
Peak	2004q1	2003q1	\	2003q2	\	2003q1	2003q2
Trough	2005q1	2003q4	2004q1	\	\	\	2004q2
Peak		2004q3					
Mean lead(-)/lag(+) at turning points							
Total		-3,2	-1,7	-1,7	-3,5	0,7	-0,7
Downturns		-3	-2,0	-3,0	-2,0	-0,7	-0,7
Upturns		-3,5	-1,7	-1,0	-5,0	1,3	-0,7
Households' expenditures							
$\rho(0)$		0,56	0,39	-0,23	0,45	0,33	0,57
ρ max (lead(-)/lag(+))		0,54 (-1)	0,48 (-1)	-0,27 (-1)	0,47 (-1)	0,26 (-1)	0,65 (-1)

Source: Own calculations on ISAE and ISTAT data.

Period: 1990-1, 2005-4.

For the purposes of our study, it is first of the utmost importance to underline that, at least for the period under consideration (January 1990/December 2005), most of the survey variables seem to lead, on the average, the reference series in question. In particular, table 2, comparing the cyclical profiles of the ISAE variables with the chronology of the consumption series, shows that the only variable that does not lead the reference figure, on average, is “assessments on producer prices”. Moreover, all the variables show a leading profile on average compared to the value added of retail trade with the

sole exception of assessments on stock levels and the expected volume of orders.

Finally, two variables do not lead, on average, the GDP series, taken as the reference series: assessments on stock levels and assessments on producer prices. Indeed, the cyclical profile of the series pertaining to the index of retail sales only features three turning points, perhaps, mainly due to the short period for which the series is available (January 1996/December 2005). This observation, while giving rise to some early doubts on the soundness of applying the subsequent analytical techniques contemplated, did not lead to the exclusion, at this early phase of the study, of the variable in question from list of those that could be selected, leaving room to the option of excluding it, if necessary, in the light of the results of subsequent analyses.

In order to study more in detail the empirical relationship between the ISAE series and the reference series selected, the cross-correlation functions on the cyclical components of all the variables considered, were analysed. More specifically, with regard to survey variables and households' expenditures, the table 2 presents the values of the contemporaneous correlation $\rho(0)$, and maximum coefficients corresponding to the lead indicated in brackets.

Generally speaking, it seems that all the survey series show quite high contemporaneous coefficients and that nearly all feature a maximum correlation only one quarter in advance. The variable pertaining to expectations on order books, in particular, features the highest advance correlation of all the variables regardless of the reference series considered. Quite the reverse, the variable pertaining to assessments on inventories – which is anti-cyclical and inversely proportional of the various reference series¹⁸ – shows a rather modest degree of alignment with all the quantitative reference variables.

Finally, unsatisfactory test results were obtained, for all the qualitative variables considered, when compared to the evolution of the retail sales index. In the light of these and of the previous results, a decision was made to definitely exclude this series from the set of possible reference variables.

The relationship between the qualitative survey series and the selected reference series was then further checked using certain simple econometric tools.

¹⁸ On the basis of the results of the ISAE surveys, stock levels are anti-cyclical. In calculating confidence climate indicators, stock levels are in fact always taken with negative sign. The nature of the relationship between stock levels and the economic cycle has been widely debated in literature. In such regard, see, for instance, Blinder, Maccini, (1991) or, for a different theoretical standpoint, Blinder, (1986) and Ramey and Vine, (2003).

First of all, using the first differences of the logarithms to ensure that the reference series were stationary¹⁹, the F causality tests according to Granger, was applied to check whether the ISAE variables could help explain the trends of the quantitative variables within the sample. To this end, up to 4 delays of the ISAE variables (VI) considered from time to time were inserted into equation (1) as formulated in the previous section.

At the level of significance of 5% only the expectations on order books seem to cause the GDP for Granger's purposes. Moreover, at the same level of significance ($\gamma=0,05$), the econometric exercise led to the refusal of the null hypothesis of non-causality in Granger's terms, in the case of expectations on employment and expectations on order books, when compared to the quantitative series of retail value added. Finally, we refuse the null hypothesis for expectations on business trend, at the level of significance of 5%, and for expectations on order books, at the level of significance of 1%, when compared to households' expenditures (see Tab. 5 in the appendix).

Therefore, to check forecasting capabilities outside the sample of the selected ISAE variables, against the reference variables, equation (2) as formulated in the previous section, was applied including up to 8 delays in the individual survey variables considered²⁰. The equation in particular was estimated up to the fourth quarter of 2001, therefore evaluating only the static forecasts made during the period between the first quarter of 2002 and the last quarter of 2005. Observing the results and, in particular the RMSE values of the various models, it has decided to proceed in the elaboration of the leading indicator only considering expectations on business trend and expectations on order books against the households' expenditures (see Tab. 6 in the appendix).

Proceeding in this way, the variable pertaining to expectations on order books seems to feature a higher forecasting capacity when compared to the selected reference series (households' expenditures). All in all, even the degree of reliability of the one step estimates obtained by including the other variable in the model, through our screening, to forecast the consumption series, i.e. the variable pertaining to expectations on business trend, may be deemed satisfactory.

Especially in the light of these last results, confirming the previous tests outcomes, it may be concluded that to construct a leading indicator for retail

¹⁹ As mentioned above, the results of the ADF test applied to the reference series considered at level, are provided in the appendix (table 2).

²⁰ Really, the out of sample forecasting capabilities of the variables in question, when compared to the selected reference series, were initially assessed by inserting up to only 4 delays of the ISAE variables alternatively considered, into equation (2). The results obtained in this way, however, were not considered satisfactory.

trade, households' expenditures must be selected as the reference series, and that, when compared to this series, only expectations on business trend and expectations order books, taken together, may be said to possess the forecasting features required to construct the synthetic indicator.

4 LEADING INDICATORS

4.1 Construction

A set of series, selected because of their ability to predict the evolution of a quantitative reference series, can be combined together into a leading indicator. This approach should minimize some of the undesired features emerged in the evaluation of each single variable, in particular their irregular behaviour in anticipating cyclical turning points or their weak forecasting ability (Carnazza, Oneto, 1996). Taking this remark into consideration, we noticed, from the analysis carried out in the previous step, that assessments on activity and expectations on order books have a leading ability of turning points and a satisfactory forecast performance, as the econometric tests evidence, for the value added. In particular, the cyclical profile of the series seems to point to a good degree of conformity (same number cycles, small number of false signals and of missing points) to the value added.

With reference to investments, only the assessments on activity have a leading and forecast good performance while expectations on employment only have a good leading ability of turning points. For this variable, the in sample and out of sample properties are not satisfactory (the results of the Granger test are weak: the value of F-Statistic falls within the area of the acceptance of the null hypothesis although it is close to the threshold limit of refusal of this hypothesis). As only one ISAE series has satisfactory leading properties on the whole, we decide to discard the investments reference series²¹. Therefore we proceed to the construction of a leading indicator for value added (LVA), using

²¹ Considering that expectations on employment have acceptable leading capability at turning points and satisfactory out of sample properties while Granger test results are weak, we tried to construct a leading indicator for the investments combining the series of assessments on activity and expectations on employment. The indicator exhibits sufficient leading capability at turning points when subjected to the Bry-Boschan routine but econometric tests do not highlight satisfactory forecasting capabilities.

the series of assessments on activity and the expectations on order books (for the aggregation procedure see par. 2).

Tab. 3 Construction sector: Leading indicator and value added main cyclical features

	Value added	Leading indicator
Number of cycles	1	3
Number of turning points	4	9
Number of shared turning points	\	2
False signals	\	7
Missing	\	2
	Turning Points	
Peak	1995q4	1995q3
Trough	1997q1	\
Peak	1997q4	\
Trough	1999q3	1998q4
Peak	\	1999q4
Trough	\	2000q2
Peak	\	2001q1
Trough	\	2001q4
Peak	\	2002q3
Trough	\	2004q1
Peak	\	2005q1
	Mean lead(-)/lag(+) at turning points (in quarters)	
Total		-1,0
Downturns		-5,0
Upturns		-3,0

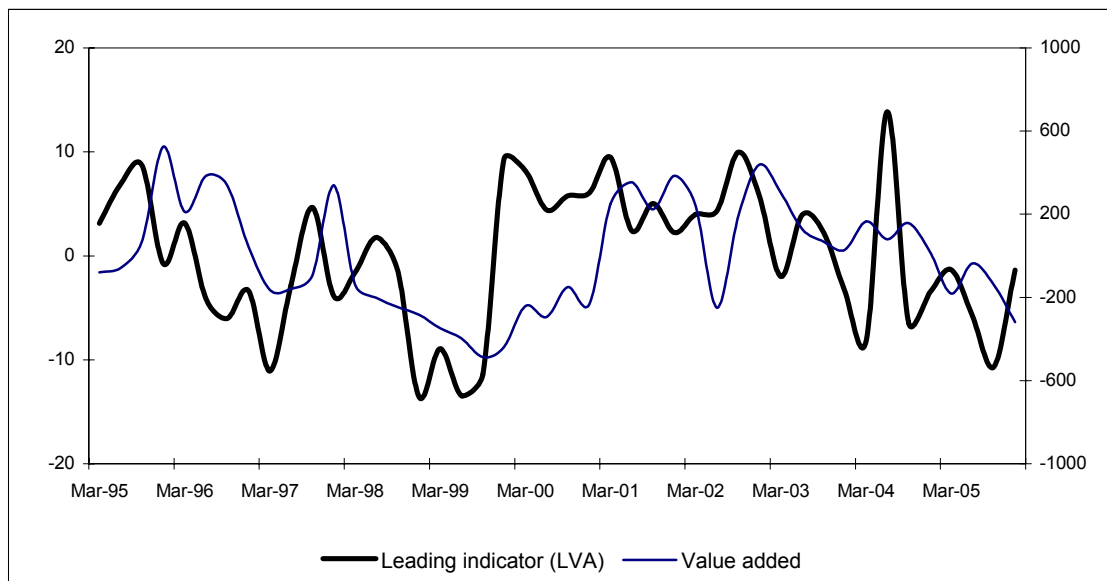
Source: Own calculations on ISAE and ISTAT data.

Period: 1995-1, 2005-4.

Applying the Bry-Boschan procedure, the cyclical features of the LVA indicator (Tab. 3) is characterized by three complete cycles, while the reference series has only one; moreover only four turning points are present for the value added while LVA is characterized by nine points.

As consequence, only two shared points are noticed between the two series (fourth quarter 1995 of the reference series is anticipated to the third quarter of the same year and third quarter 1999 is anticipated to fourth quarter 1998 – see Tab. 1 and Fig. 1); we marked the presence of false signals.

Fig. 1 Construction sector - Leading indicator and value added (cyclical components)



Tab. 4 Construction sector - Leading indicator for value added and ISAE confidence climate: cross-correlation, in sample and out of sample properties

	Cross-correlation function		Granger causality test	rmse	mae	Theil U			
	$\rho(0)$	$\rho \max(\text{lead}(-)/\text{lag}(+))$				Total	bias	var.	cov.
Leading indicator	0,21	0,50 (-1)	3,99* (0,01020)	0,00741	0,00561	0,3777	0,00408	0,05636	0,93955
ISAE Confidence climate index	0,13	0,55 (-6)	2,50 (0,06371)	0,01068	0,00917	0,48872	0,40841	0,00699	0,58459

Source: Own calculations on ISAE and ISTAT data.

Period: 1995-1, 2005-4

* Significant at 5%

According to the turning points alignment, global leading ability of the indicator is equal to one quarter. Instead, the cross correlation with the reference series peaks at lead -1 (0,50 is value – see Tab. 4). Analyzing the in-sample and out-of-sample properties (see again Tab. 4), it points out that LVA indicator “Granger-cause” the value added. It has an acceptable forecast out-of-sample

ability (Theil inequality coefficient is 0,38 with bias and covariance equal, respectively, to 0,004 and 0,94). In order to confirm the forecast abilities of the indicator, we estimate the general regression model (3), which explains the state of the reference series as its past dynamic. The results have been compared with those obtained estimating the model (2) that is the model in which has been added also past dynamics of the indicator. As shown in Tab. 5, to insert the past of the indicator decidedly improves the models goodness: the adjusted R^2 increases and MAE and the RMSE slightly improve.

Finally, we compare the cross-correlation and in sample and out-of-sample properties of the leading indicator with those of the confidence climates monthly released by ISAE (see Tab. 4). The cross-correlation between the LVA indicator and the value added peaks at lead -1 while that between ISAE confidence climate and the reference series peaks at lead -6 but with higher function value. Moreover, the ISAE confidence climate does not Granger-cause the value added. Comparing model (2) including, alternatively, the past dynamics of the LVA indicator and those of the confidence climate, we notice that RMSE and MAE are definitely higher for the models including the confidence climate. Also the forecasted values by the models including the confidence index, have an higher Theil coefficient and are more biased than the model including the leading indicator (the Theil coefficient value is 0,49 for ISAE confidence climate and 0,38 for the leading indicator). In this case, therefore, the leading performance of the indicator is decidedly better than that of the confidence climate.

Tab. 5 Construction sector - Leading indicator and value added: evaluation of the regression model and forecasts

Reference period		Leading indicator for value added	
		without leading indicator	with leading indicator
1995-2005	adjusted R^2	-0,095	0,184
	RMSE	0,008	0,007
2004-2005	MAE	0,008	0,006

Source: Own calculations on ISAE and ISTAT data.

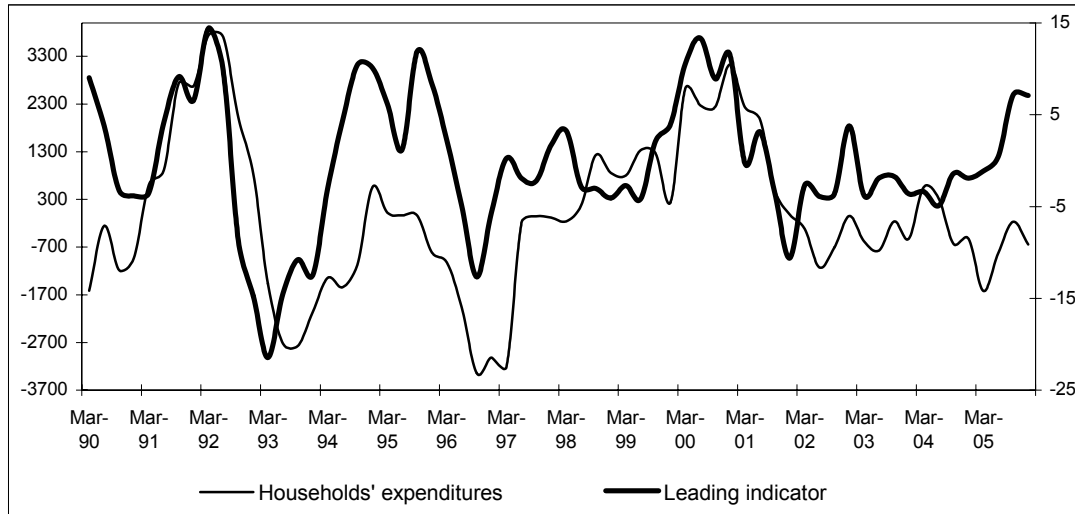
Period: 1995-1, 2005-4.

4.2 Retail sector

As already noted, the leading indicator for the retail sector was constructed as the simple mean of just two variables (expectations on business trend and expectations on order books) that – on the basis of households’

expenditures as the reference series – seem to possess the required forecasting features (Fig. 2).

Fig. 2 Retail sector - Households' expenditures and leading Indicator (cyclical components)



At this juncture, an attempt was made to test the performance of the thus constructed leading indicator as against the selected reference series by using the empirical analyses already applied during the previous steps (namely, cross-correlation and in and out of sample forecasts).

The results obtained – that were generally satisfactory – indicate, first and foremost, that when compared to the consumption series, the indicator features quite good leading ability (Tab. 6) and maximum correlation, one quarter in advance (0.59) and that the causality test according to Granger, for $\gamma=0.01$, leads to a decisive refusal of the hypothesis of non-causality between the indicator and the reference series (Tab. 7).

The statistical significance of the relationship between the constructed indicator and the households' expenditures series was therefore analysed, even outside the sample. This was done by inserting into equation (2), up to 8 delays of the independent variable, represented at this juncture by the new indicator. This equation was estimated, in particular, up to the last quarter of 2001, leaving, as a forecast window, the period between the first quarter of 2002 and the fourth quarter of 2005. The indicator really seems to possess modest out of sample forecasting capabilities; the value of the Theil coefficient is 0.60 with a bias and covariance of 0.02 and 0.89 respectively (Tab. 7).

Tab. 6 Retail sector: Leading Indicator, households' expenditures and main cyclical features

	Households' expenditures	Leading Indicator
Number of cycles	4	7
Number of turning points	10	3
Number of shared turning points	\	6
False signals	\	1
Missing	\	4
		Turning Points
Through	\	1990q4
Peak	1992q1	1992q1
Through	1993q3	1993q1
Peak	1994q4	1994q3
Through	1996q3	1996q3
Peak	1997q3	\
Through	1998q1	\
Peak	\	\
Through	\	\
Peak	2000q4	2000q2
Through	2002q2	2001q4
Peak	\	\
Through	\	\
Peak	2004q1	\
Through	2005q1	\
Peak		
	Mean lead(-)/lag(+) at turning points	
Total		-1,2
Downturns		-1
Upturns		-1,3

Source: Own calculations on ISAE and ISTAT data.

Period: 1990-1, 2005-4.

Tab. 7 Retail sector - Leading indicator for households' expenditures and ISAE confidence climate: cross-correlation, in sample and out of sample properties

	Cross-correlation function		In sample and out of sample properties						
			Granger causality test	rmse	mae	Theil U			
						Total	bias	var.	cov.
Leading indicator	$\rho(0)$	0,51	4,40* (0,004)	0,00397	0,00300	0,60532	0,02471	0,08113	0,89416
	$\rho \max(\text{lead}(-)/\text{lag}(+))$	0,59(-1)							
ISAE Confidence climate index	$\rho(0)$	0,5	2,59 (0,478)	0,00512	0,00421	0,65374	0,08951	0,01389	0,89660
	$\rho \max(\text{lead}(-)/\text{lag}(+))$	0,58(-1)							

Source: Own calculations on ISAE and ISTAT data.

Period: 1990-1, 2005-4.

* Significant at 1%.

Encouraging results were however obtained by comparing the mean squared error, obtained from the estimate of the afore-said equation, with that

resulting from the estimate of the model explaining consumption trends only on the basis of past dynamics (equation (3)). As indicated in table 8, taken

Tab. 8 Retail sector - Leading indicator and reference series: evaluation of the regression model and forecasts

Reference period		Leading indicator for households' expenditures	
		without leading indicator	with leading indicator
1990-2005	Adjusted R ²	0,0208	0,3622
	RMSE	0,0043	0,0040
2002-2005	MAE	0,0037	0,0030

Source: Own calculations on ISAE and ISTAT data.
 Period: 1990-1, 2005-4.

together, the two components – expectations on business trend and expectations on order books – contribute to reducing the forecasting error of the static estimates. In particular, the RMSE in the case of the model excluding the leading indicator (equation (3)) is 0.0043; when the equation includes the aggregation of the forecasting variables (equation (2)), on the other hand, the RMSE value is 0.0040. The leading indicator also improves the model in terms of MAE which, in fact, as indicated in the table, stands at 0.0037 when the model is estimated on the basis of past dynamics and at 0.003 if the equation includes delays of the constructed indicator.

A final comparison was made with a view to confirming the results obtained. The in-sample and out of sample forecasting capabilities of the indicator were compared to those of the retail trade confidence indicator using the households' expenditures series as reference.

As indicated again in table 7, a level of significance of 1%, the Granger test leads to the acceptance of the null hypothesis of non-causality between the confidence climate and the reference series²². Quite the reverse, that hypothesis must be refused if the leading indicator is considered.

²² With reference to a significance level of 5%, the value of the F statistic falls within the area of null hypothesis refusal, although it is close to the threshold limit of acceptance of this hypothesis.

To conclude, the indicator seems to possess the best (one step) out of sample forecasting capabilities: indeed, the RMSE, MAE and, finally, the Theil Inequality Coefficient values are all lower²³.

5 CONCLUDING REMARKS

This work involves the construction of a leading indicator for construction and of one for retail trade.

With reference to construction, the indicator was obtained as the simple mean of the balances of the assessments on the activity and expectations on order books, using value added as the reference series.

On the other hand, the retail trade indicator was obtained by aggregating, through an arithmetical mean, the balances of expectations on business trend and expectations on order books, using households' expenditures as the reference series.

With regard to construction, the indicator provides satisfactory results when subject to cross-correlation analysis and econometric tests while its capacity to regularly lead cyclical turning points seems weak. Finally, it must be pointed out that with regard to the series comprising the confidence climate, the variable regarding assessments on order books is excluded from the indicator. In particular, the assessments on order books exhibit capability to regularly lead cyclical turning points for none of the reference series; expectations on employment have shown a forecasting performance that is not particularly satisfactory, through leading capabilities at turning points are generally good when compared to the investment series. Moreover, this variable has a good cyclical profile with respect to the GDP, but its leading capability at turning points is weak.

²³ Also we tried to insert the consumer confidence into equations (1) and (2) as an independent variable to assess the forecasting capabilities compared to households' expenditures series, also of this latter indicator. Limited to the sampling period and to the application method of application of the analysis performed (number of lags introduced, forecasting sample chosen), by comparing the results obtained with those highlighted during the work one might infer that the econometric relationship between the consumer confidence climate and spending is weaker than that between spending and the construed leading indicator. It would also appear in general to be weaker than that between spending and retailers' confidence climate. The results of those last exercises are described in table 7 in the appendix.

With regard to retail trade, only two variables – that is to say, the very ones used to construct the indicator – seem to have forecasting capabilities when compared to the households' expenditures series taken as reference. This result emerged while comparing the cyclical trends, the cross-correlation functions and (in-sample and out-of-sample) forecasting capabilities of the individual ISAE variables, as against all the reference series initially considered. Finally, it must be pointed out that the variables used to construct the leading indicator only partially differ from those considered for the construction of the retail trade confidence indicator. The two indicators in fact share the series pertaining to expectations on business trend.

All in all, the results of our study seem satisfactory, both when assessed in the light of the reference series and when compared to the performance of the respective confidence indicators.

It must however be underlined that these results are closely linked to the methods used, to the sample period considered and, finally, to the data frequency²⁴.

Future studies must be carried out to check the possibility of replicating and going deeper into the analyses presented here, with the benefit of a longer sample period as well as the application of econometric tests to monthly data both for the survey and for the reference series²⁵. Such studies may also include other surveyed variables that were not considered in this analysis.

²⁴ The ISAE monthly series were grouped on a quarterly basis so as to ensure that their frequency was the same as that of the quantitative variables of reference.

²⁵ The methods proposed in the most recent literatures may be used to transform quarterly series into monthly series, (in particular, see, Altissimo *et al.*, 2006).

APPENDIX

Figure 1 - Construction sector –Value added and assessments on order books (cyclical components)

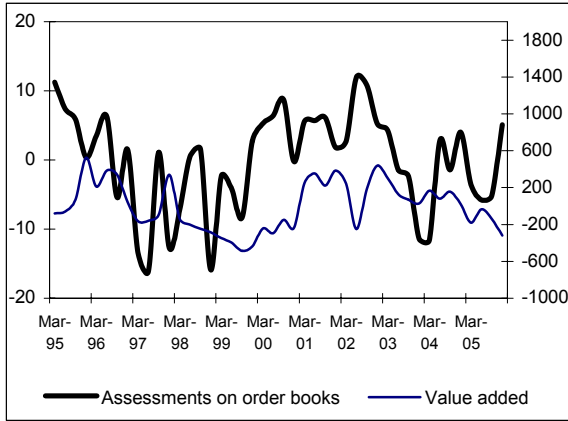


Figure 2 - Construction sector - Value added and assessments on activity (cyclical components)

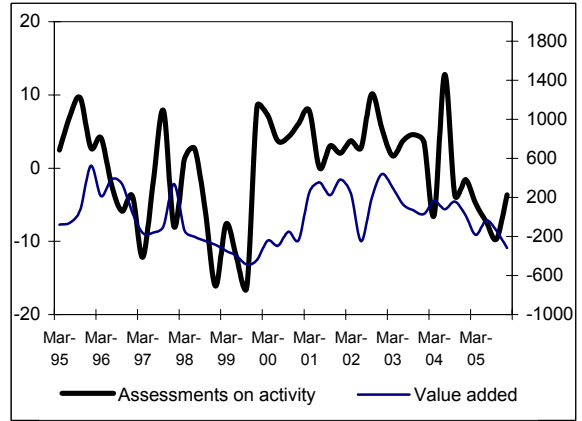


Figure 3 - Construction sector - Value added and expectations on order books (cyclical components)

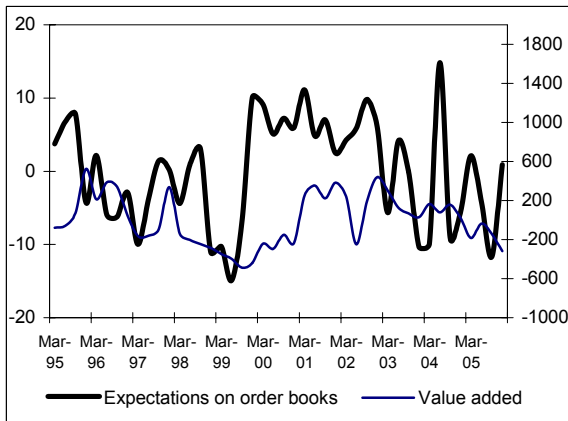


Figure 4 - Construction sector - Value added and expectations on selling prices (cyclical components)

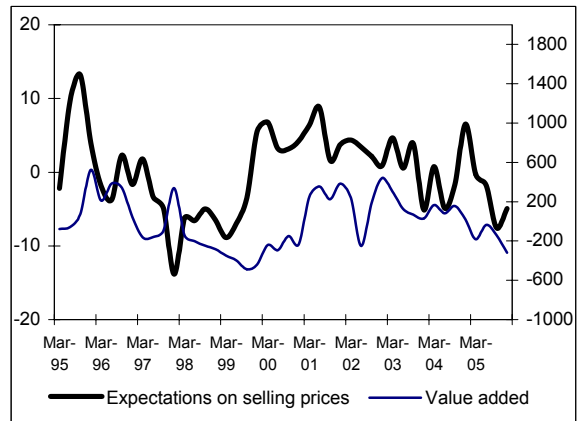


Figure 5 - Construction sector - Value added and expectations on employment (cyclical components)

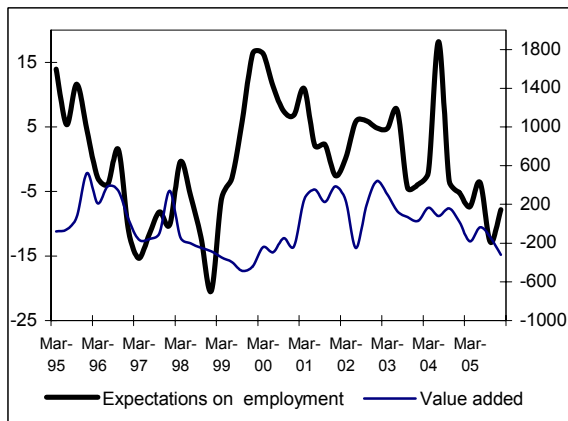


Figure 6 - Retail sector - Households' expenditures and assessments on business trend (cyclical components)

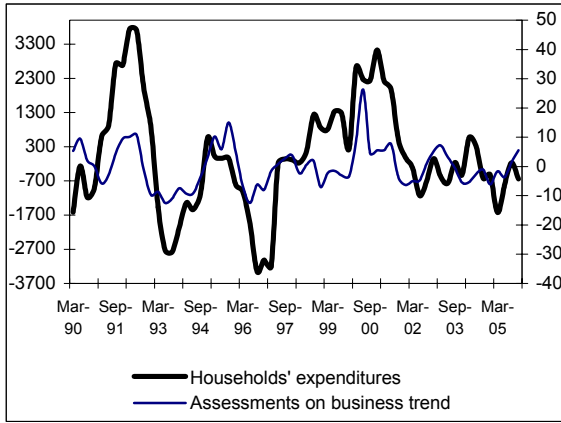


Figure 7 - Retail sector - Households' expenditures and expectations on business trend (cyclical components)

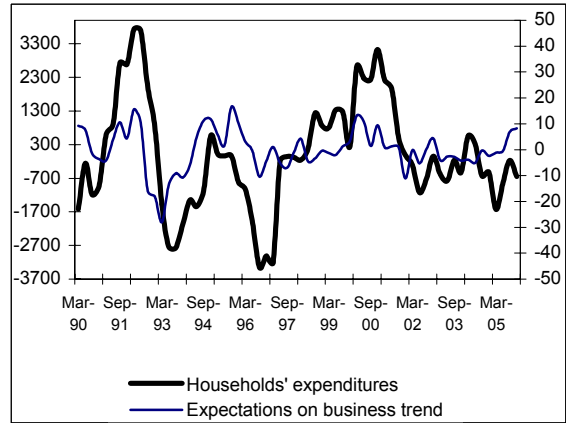


Figure 8 - Retail sector - Households' expenditures and assessments on inventories (cyclical components)

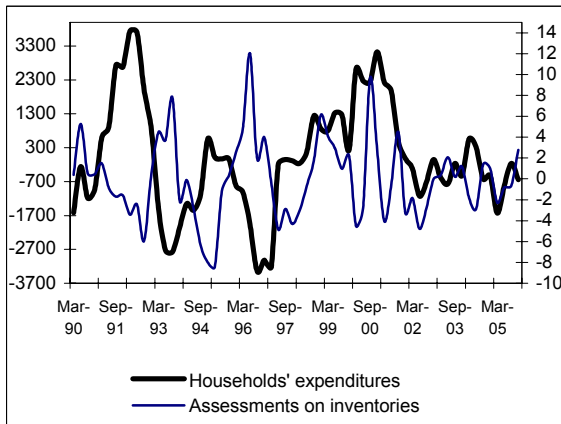


Figure 9 - Retail sector - Households' expenditures and expectations on employment (cyclical components)

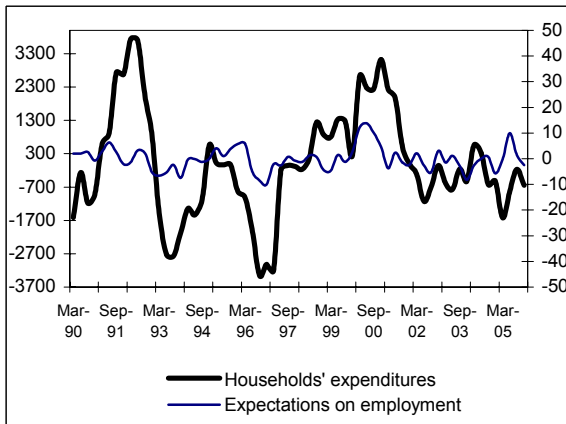


Figure 10 - Retail sector - Households' expenditures and assessments on producer prices (cyclical components)

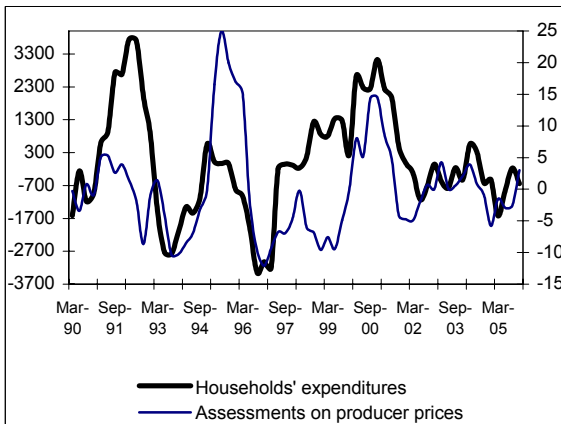
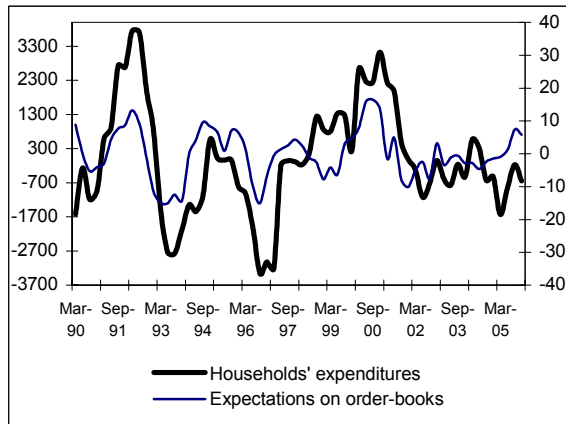


Figure 11 - Retail sector - Households' expenditures and expectations on order-books (cyclical components)



Tab. 1 Augmented Dickey-Fuller test for construction sector

	Test	Probability
Construction index production	-2,68	0,2493
Investments	-2,39	0,3757
Gross Domestic Product	-1,23	0,8902
Value Added	-1,90	0,6343
Assessments on order books	-1,49	0,1273
Assessments on activity	-2,58**	0,0101
Expectations on order books	-1,66***	0,0912
Expectations on selling prices	-1,42	0,1434
Expectations on employment	-2,28**	0,0223

Source: Own calculations on ISAE and ISTAT data.

Period: 1995- 2005 (monthly frequencies for ISAE data and quarterly frequencies for ISTAT data).

** significant at 5%. ***significant at 10%.

Tab. 2 Augmented Dickey-Fuller test for retail sector

	Test	Probability
Added value	-2,06	0,5558
Households' expenditures	-1,62	0,7734
Gross Domestic Product	-2,09	0,5415
Assessments on business trend	-2,05	0,0393
Expectations on business trend	-3,51*	0,0005
Assessments on inventories	-1,32	0,1735
Expectations on employment	-2,33	0,0197
Assessments on producer prices	-1,51	0,123
Expectations on order-books	-2,11	0,0337

Source: Own calculations on ISAE and ISTAT data.

Period: 1990- 2005 (monthly frequencies for ISAE data and quarterly frequencies for ISTAT data)

* significant at 1%.

Tab. 3 Construction sector -ISAE data and value added: in sample performance

	Granger causality test	Probability
Assessments on activity	3,637*	0,015
Expectations on order books	3,403*	0,021
Expectations on employment	2,660	0,052

Source: Own calculations on ISAE and ISTAT data.

Period: 1995-1, 2005-4.

* Significant at 5%.

Tab. 4 Construction sector- ISAE data and value added: one step ahead forecast

	RMSE	MAE	Theil U			
			Total	bias	var.	cov.
Assessments on activity	0,00781	0,00598	0,42425	0,01469	0,00037	0,98493
Expectations on order books	0,00980	0,00777	0,45392	0,06293	0,17957	0,75748
Expectations on employment	0,01004	0,00787	0,43577	0,48455	0,00687	0,50857

Source: Own calculations on ISAE and ISTAT data.

Period: 1995-1, 2005-4.

**Tab. 5 Retail sector -ISAE data and Households' expenditures:
in sample performance**

	Granger causality test	Probability
Assessments on business trend	1,439	0,235
Expectations on business trend	3,112*	0,023
Assessments on inventories	1,437	0,236
Expectations on employment	2,023	0,105
Assessments on producer prices	0,502	0,734
Expectations on order-books	4,555**	0,003

Source: Own calculations on ISAE and ISTAT data.

Period: 1990-1, 2005-4.

* significant at 5%. **significant at 1%.

**Tab. 6 Retail sector- ISAE data and Households' expenditures:
one step ahead forecast**

	RMSE	MAE	Theil U			
			Total	bias	var.	cov.
Expectations on business trend	0,004625	0,003891	0,626389	0,134691	0,043108	0,822201
Expectations on order-books	0,003243	0,002731	0,49764	0,001475	0,062844	0,935681

Source: Own calculations on ISAE and ISTAT data.

Period: 1990-1, 2005-4.

**Tab. 7 Retail sector - Leading indicator for Households' expenditures, retail
confidence climate, consumer confidence climate: cross-correlation,
in sample and out of sample properties**

	Cross-correlation function		In sample and out of sample properties		
			Granger causality test	rmse	mae
Leading indicator	$\rho(0)$	0,51	4,40* (0,004)	0,00397	0,00300
	$\rho \max(\text{lead(-)}/\text{lag(+)})$	0,59 (-1)			
Retail confidence climate	$\rho(0)$	0,5	2,59 (0,478)	0,00512	0,00421
	$\rho \max(\text{lead(-)}/\text{lag(+)})$	0,58 (-1)			
Consumer confidence climate	$\rho(0)$	0,37	1,72 (0,161)	0,00700	0,00500
	$\rho \max(\text{lead(-)}/\text{lag(+)})$	0,42 (-1)			

Source: Own calculations on ISAE and ISTAT data.

Period: 1990-1, 2005-4.

* Significant at 1%.

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