Confidence and Unemployment in the European Union
A lesson from the 2004 enlargement

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resumo

Por forma a verificar se, na União Europeia, existe uma relação significativa entre os níveis de confiança e de desemprego, é utilizada, no artigo, uma metodologia de lógica difusa, aplicada a dados mensais para o indicador de confiança dos consumidores e para a taxa de desemprego. Os resultados evidenciam a existência de uma relação entre o desemprego e a confiança muito mais forte do que é aparente. Num exercício de previsão *ex-post* mostra-se, também, que aquela relação não se alterou, significativamente, após o alargamento de 2004 da União Europeia. Estes factos constituem uma lição para o período após o recente alargamento de 2007. A relação entre o desemprego e a confiança tem importantes implicações de política económica comunitária dada a sua relevância, em particular para (a renovada) estratégia de Lisboa.

résumé / abstract

Afin de vérifier s'il existe, dans l'Union Européenne une relation significative entre les niveaux de confiance et du chômage, nous avons utilisé, dans cet article, une méthodologie de logique diffuse appliquée à des données mensuelles pour l'indicateur de confiance des consommateurs et pour le taux de chômage. Les résultats prouvent l'existence d'une relation entre le chômage et la confiance beaucoup plus forte qu'il ne paraît. Dans un exercice de prévision *ex-post*, cet article montre aussi que cette relation n'a pas changé significativement après l'élargissement de l'Union Européenne en 2004. Ces faits constituent une leçon pour la période qui suit l'élargissement survenu tout récemment en 2007. En raison de sa pertinence, la relation entre le chômage et la confiance a d'importantes implications en termes de politique économique communautaire, en particulier pour la Stratégie de Lisbonne (renouvelée).

We use data for the monthly unemployment rate and consumer confidence indicator in the European Union to study whether there is a relationship between unemployment and confidence. Our estimation method is based on a fuzzy logic methodology with a Gaussian membership function. We find a stronger relationship between unemployment and confidence than it is apparent. We show in an ex-post prediction study that this relationship did not change, in a significant way, after the 2004 enlargement of the European Union. This fact constitutes a lesson for the post-2007 enlargement period. The link between unemployment and confidence has important policy implications given its relevance, in particular for the (latest call for a new start of the) Lisbon Strategy.

Classificação JEL: C10, C82, E24, E61.

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1. Introduction and Motivation

In March 2000 the European Council of the European Union (EU) launched the so-called Lisbon Strategy. The EU adopted a package of measures to promote growth and employment and set ambitious targets regarding the position of the EU economy in order to make it "the most dynamic and competitive knowledge-based economy in the world" by 2010. A few years ago, EU politicians have admitted the Lisbon Strategy has revealed to be excessively ambitious and have called for a new start with an emphasis on the creation of more and better jobs. In its supporting argumentation the European Commission (EC) stressed the role of confidence of the economic agents in the EU. It argued structural labour market reforms are beneficial because they significantly contribute to "an increase in growth and in employment *through a positive impact on confidence*" (European Commission, 2004: 19 [italics added]). This argument raises some doubts, however.

In the first place, there is, so far, no plain evidence that confidence and growth are, indeed, related, at least from a crisp/traditional point of view[1]. Plausibly, given the results that are about to be presented, confidence and growth may, indeed, be related from a fuzzy logic point of view, if one assumes that growth is related to *unemployment*, which seems to be possible, at least from a theoretical point of view[2]. From a practical point of view, for instance, the last progress reports of the EC on cohesion emphasise the importance of competitiveness, convergence and cooperation for growth, jobs and cohesion, and implicitly acknowledge the existence and importance of the relationship between unemployment and growth (see European Commission, 2005a; 2006b).

In the second place, it seems to be implicit in those arguments a condition whose fulfilment, indeed, is not automatically guaranteed. In fact, even a casual observation on the data about the employment and unemployment rates in the EU in the last years shows that an increase on the employment rates is *not* always associated with a decrease on the unemployment rates[3]. This fact gain importance when confidence is taken into account, as it seems to be the case.

Indeed, closely associated to the relationship between unemployment and growth, and of noticeable relevance, is the importance of confidence for the business cycle, as a growing recent strand of literature recognises (see, for instance, Matsusaka and Sbordone, 1995, Santero and Westerlund, 1996, Mourougane and Roma, 2003, and Utaka, 2003). Still, as mentioned before, the relevance of consumer confidence for output growth is not yet an established fact. In any case, at the European level, the economic climate is recognised to be important for the European business cycle (see European Commission, 2000). Moreover, business surveys on the economic sentiment and consumer confidence conducted by the EC are said to have become "an indispensable tool for monitoring the evolution of the EU and the euro area economies, as well as monitoring developments in the applicant countries"[4].

That being said, the apparent link between unemployment and confidence is therefore the main issue of our paper. The objective of the paper is to explore whether the unemployment rate can be used to approximate and, if so, to predict the trajectory of the consumer confidence indicator.

1 What is less disputable is the influence of consumer confidence in consumption growth (see, among others, Ludvigson, 2004; European Commission, 2005b: 5, 22, 46, and 114; European Commission, 2006a: 1, 2 and 6).
2 A simple combination of an aggregate supply curve *a la* Lucas and a Phillips curve may lead to this theoretical result.
3 Besides the demographic factors explaining this empirical evidence, there may be theoretical explanations for a possible 'activity inflection' leading to a divergence between those two facts (see, among others, Laurent and L'Horty, 2004).
4 See http://europa.eu.int/comm/economy_finance/indicators/businessandconsumersurveys_en.htm.

We address this question empirically using monthly data from Eurostat for the EU (as a whole) unemployment rate and the consumer confidence indicator for the period January 1993 – December 2006. Our assessment is based on a crucial component of the fuzzy logic methodology, namely the use of the membership functions, as part of a fuzzification process[5].

Given a perception of the economic situation, consumers, in particular, and economic agents, in general, may be characterised by a certain level of confidence, which, as recognised by Santero and Westerlund (1996), is a subjective variable. This is so because, when looking at the economic situation, agents may establish their judgements regarding confidence based upon subjective criteria such as *low*, *normal*, and *high* values of the relevant aspects for confidence. If this is the case, a fuzzy logic approach is appropriate, rather than an approach based on traditional or crisp set theory.

A fuzzy logic approach is indeed appropriate when modelling vague or subjective concepts, such as perceptions emanating from the human brain. As fuzzy logic allows variables representing evaluation outcomes to assume 'intermediate' values, rather than merely discrete values associated to crisp evaluations such as *yes* and *no* or *true* and *false*, the vagueness or subjectivity of perceptions, which it is believed characterise human thought is, thus, (more) easily taken into account.

Since the seminal paper of Zadeh (1965), the theory and applications of fuzzy logic went through remarkable developments[6]. Notwithstanding this fact, given that one of the main objectives of fuzzy logic is to capture approximate rather than exact forms of reasoning, it is surprising the scarcity of applications of fuzzy logic to economic reasoning and decision taking. One exception to this fact is West and Linster (2003). Our paper intends to be another exception by a novel study into the link between unemployment and consumer confidence at an aggregate level[7].

We find that the unemployment rate is indeed a good *proxy variable* – in the econometrical sense of the term– of consumer confidence. We also show in an out-of-sample exercise that this relationship between unemployment and confidence is robust and did not change, in a significant way, after the May 2004 enlargement of the EU in which ten new member states joined. This result can be seen as a lesson for the period that follows the January 2007 enlargement of the EU after the entrance of Bulgaria and Romania.

In what concerns the direction of the above-mentioned relationship, our results hint at a causal link between unemployment and consumer confidence. This is interesting because, as we will show, it means that a *retrospective* use of an *objective* measure (unemployment rate) can predict a *subjective* measure, which is intrinsically *prospective* (consumer confidence)[8]. In fact, given that we obtained a much stronger correlation between the unemployment rate and consumer confidence than that by a conventional statistical approach *and* that the results of the out-of-sample prediction exercise were, at a minimum, acceptable, that allow us to state that the results indicate a causal link from the unemployment rate to consumer confidence.

5 The fuzzy logic methodology is outlined below.
6 Three excellent reviews of the fuzzy logic methodology and applications are Zimmerman (1991), Chen (1996) and Nguyen and Walker (2000).
7 To the best of our knowledge, Caleiro (2006) is indeed another exception, but it considers only one EU member state, namely Portugal.
8 The consumer confidence indicator is the arithmetic average of the balances (in percentage points) of the answers to the questions to consumers about their *expectations for the next 12 months* regarding a regarding the financial situation of their household, the general economic situation, unemployment expectations (with an inverted signs), and household savings (see European Commission, 2003).

Narrowly speaking, this result means that unemployment cannot be discarded from the key elements explaining confidence. If so, this must serve as a policy guidance, revealing its importance at, notably, the European Employment Strategy, as the evolving employment pillar of the Lisbon Strategy, which is supposed to function as a basis for employment policy coordination, and at the New Employment Guidelines for the new EU-27.

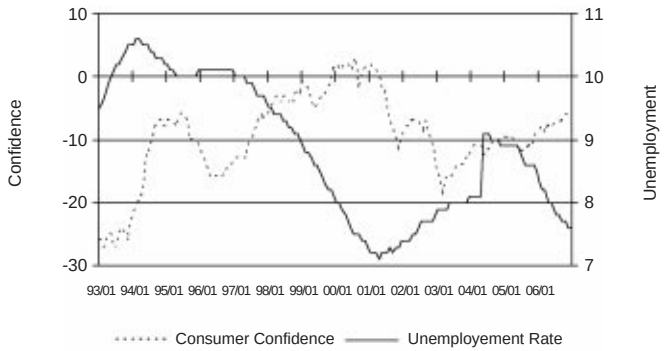
In broader terms, the link between unemployment and consumer confidence suggests there exists a reconfirmation of the well-known causal relationship between unemployment and economic growth: unemployment affects confidence, which affects spending and hence economic growth[9]. This, in turn, must be taken into account, for instance, when considering that the resolution of the growth problem will induce the creation of more and better jobs (see European Commission, 2007). This consequence is, in principle, non-disputable but it is our view that the achievement of good results also at the unemployment level will help, via an increase in confidence, achieving good results at the growth level.

The rest of the paper is structured as follows. Section 2 describes the data. Section 3 introduces and applies the specific fuzzy logic methodology that is used in this study. In Section 4 we study whether the relationship between unemployment and confidence that we established in Section 3 underwent a change after the May 2004 enlargement round of the EU. Section 5 concludes.

2. The Data

The source of the data, which is monthly and covers the period January 1993 until December 2006, is the Eurostat. We retrieved data for the unemployment rate and for the consumer confidence indicator in the EU as a whole. Note that our time series extend beyond the previous round of enlargement in May 2004, when ten new member states entered the EU, and finish immediately before the last round of enlargement in January 2007. Thus, the pre-enlargement data, from January 1993 until April 2004, is based on the EU-15 countries; and the post-enlargement data, from May 2004 until December 2006, on the entire EU-25. See Figure 1.

Figure 1 – Confidence and unemployment in the whole EU before and after the 2004 enlargemente



9 The expectations involved in the formation of confidence sustain that link. Delorme et al. (2001) is an interesting study into the relationship between consumer confidence and rational expectations.

Figure 1 shows the time series for the unemployment rate and the consumer confidence indicator. Roughly speaking, at the beginning of the period, a noticeable increase in the unemployment rate leading to a peak around 1994 can be observed, followed by a period of stabilisation at a lower level until 1997. To this fact is not strange the economic crisis that characterised the EU after the German reunification. After 1997 a general decline started, which was halted when, in the beginning of 2001, the unemployment level hit 7.4%. From mid-2001 onwards the unemployment rate increased again with a spike in May 2004 reflecting higher unemployment levels in the accession states. In general, consumer confidence was on the increase until the beginning of 2001. After that it decreased in a few steps followed by a tentative increase. On the basis of Figure 1 it is not obvious to approximate or predict consumer confidence using the unemployment data, although there seems to be a tentative inverse relationship between the two time series[10].

3. The Relationship between Confidence and Unemployment

We start with a brief presentation of the fuzzy logic approach that will be used throughout the paper. Consider a universal set U and let A be a subset of U in the classical sense, i.e. $A \subseteq U$. Following the logic of traditional, or *crisp*, sets, the degree to which an element of U is a member of A is either 1 (the element of U is "in" A) or 0 (it is "out"). Formally, the *characteristic function* of A is a mapping onto a binary variable: $\mu_A : U \rightarrow \{0,1\}$, where $\mu_A(\chi) = 1$ for $\chi \in A$, and $\mu_A(\chi) = 0$ for $\chi \notin A$. The traditional characteristic function discriminates respectively between members and non-members of the crisp set. The generalisation to a fuzzy set is made by relaxing the strict separation between elements belonging or not to A. In fuzzy logic the characteristic function is typically allowed to assume any value in the interval $[0,1]$[11].

The values assigned by the membership function of a fuzzy set to the elements in the universal set indicate the *membership grade* or *degree of membership* (adherence, belonging) of each element in the set. For example, larger values indicate higher membership grades, i.e. more correspondence with full characteristics that describes the set. Hence, using fuzzy logic, one can reason like: "the observed value for the unemployment rate, say 5%, can be considered 'high', or 'normal' or 'low', each with a certain degree of membership". This way fuzzy logic can capture that economic agents often evaluate categories such as 'high', or 'normal' or 'low' differently, given their inherent subjectivity.

In what follows, it will be assumed that consumers use those kinds of subjective categories to construct an approximate indicator of their confidence. In general, this corresponds to the assumption of an inference mechanism based on *if-then* decision rules described as follows. The linguistic expressions 'high', 'normal', and 'low' unemployment constitute the so-called *antecedent set* in the universe of discourse of unemployment. A fuzzy algorithm relating those linguistic expressions with consumer confidence, as a subjective variable, is then constructed on the basis of *if-then* decision rules such as: 'if the observed value for the unemployment rate is considered to be 'low' with a higher degree of membership then consumer confidence rises'. Plainly, given the objectives of the paper, this kind of decision rule is crucial in order to consider that unemployment is relevant in the formation of confidence. In case of considering that confidence is a linguistic variable then an inference rule of the type: "if the unemployment rate is low then confidence is high" could be considered, making it possible to follow the traditional phases: fuzzification, knowledge base, inference mechanism and defuzzification. In fact, given the objectives of the paper, it is adequate to use only the first part of this process, i.e. the fuzzification part, which is based upon the determination of the membership degrees.

10 This impression is confirmed by the value of -0.504 for the contemporaneous correlation coefficient for the two time series.

11 In the context of fuzzy logic it is common to speak of a *membership function* instead of a *characteristic function* although these concepts are essentially the same.

We therefore assume that the unemployment rate is a linguistic variable, which can be characterised by those three qualitative (subjective) categories, i.e. 'unemployment rate' = {'low', 'normal', 'high'}, each of them being associated with a fuzzy set. The translation of the actual unemployment rates, being possible to take values in the interval [0,1] in theory, into these categories will be achieved through the use of membership functions associated with those fuzzy sets: 'low', 'normal' and 'high' unemployment.

Since the membership function should reflect the interpretation that each linguistic expression has in the context of reasoning, the choice of the general shape of the membership function is, in general, crucial in fuzzy logic, therefore should not be made ad-hoc. Given the characteristics of the case under consideration, there are two reasons for having chosen the Gaussian type of membership functions. In the first place, because Gaussian curves are consistent with the data in the sense of allowing any unemployment observation to be classified in each set 'low', 'normal', and 'high' with a non-zero degree of membership. In fact, given the mean and variance of the unemployment rates (see Figure 1), it seems plausible to consider that to any observed value of unemployment should be associated a non-zero, even if close to zero, degree of membership to any of those three sets[12]. In the second place, Gaussian membership functions are also in close agreement with the reasoning that is supposed to be done by economic agents when computing the fuzzy logic relationship between unemployment and confidence. This is so because it is assumed that: (*i*) for the determination of the membership degrees of each observed value of the unemployment rate, u_t, to those three fuzzy sets, economic agents consider important both the mean and the variance of the unemployment rates that they remember – this issue is to be clarified below – until that moment *t*, and (*ii*) within each of those three fuzzy sets, the closer is the observed value of the unemployment rate to the mean associated with the particular set under consideration the higher should be the membership degree of that observation to that fuzzy set, possibly in a non-linear way[13].

Thus, each membership function is of the shape

$$f(\chi, \mu, \sigma) = \frac{1}{\sqrt{2\pi\sigma}} \exp\left(\frac{(\chi - \mu^2)}{2\sigma^2} \right), \quad (1)$$

where *x* is the current value of unemployment, and μ and σ are, respectively, measures of location and dispersion in the unemployment data.

The actual choice for the membership functions associated with the categories 'low', 'normal' and 'high' were determined as, respectively:

$$f\,(u_t\,,\,\bar{u}_t\,-k\sigma_t\,,\,\sigma_t), \quad (2)$$

$$f\,(u_t\,,\,\bar{u}_t\,,\,\sigma_t), \quad (3)$$

$$f\,(u_t\,,\,\bar{u}_t\,+k\sigma_t\,,\,\sigma_t), \quad (4)$$

where *f* is defined as in (1), in a truncated way as it is apparent. The non-normalised membership values of the current observation of unemployment, u_t, associated with the categories 'low',

12 This presumption achieves higher plausibility as the degrees of membership are to be computed on the basis of a moving window, i.e. a sub-set of the observations on unemployment, as it will be explained below.
13 There is a third assumption in what concerns the reasoning of economic agents, which is to be presented below.

'normal', and 'high' unemployment are thus given by (2), (3), and (4), respectively. Observe that the parameter $\bar{u}_t$ represents the current mean of the 'normal' unemployment set and that the parameter k can adjust the degree of separation between the three fuzzy sets, making it proportional to the dispersion in the data measured by σ_t. The value of k is to be determined as the optimal one, i.e. the one leading to the best fit of the relevant category of unemployment to confidence, whereas the values of $\bar{u}_t$ and σ_t are determined from the unemployment data. In particular, $\bar{u}_t$ and σ_t are computed as moving averages and moving standard deviations, respectively, as follows:

$$\bar{u}_t = \frac{\sum_{j=t-w+1}^{t} u_j}{w} \tag{5}$$

$$\sigma_t = \sqrt{\frac{\sum_{j=t-w+1}^{t} (u_j - \bar{u}_t)^2}{w-1}}\ , \tag{6}$$

for $t \geq w$, where w denotes the number of observations used to compute $\bar{u}_t$ and σ_t. The value of w is to be chosen from a grid of plausible values in order to obtain the best fit of the relevant category of unemployment to confidence.

Equations (5) and (6) capture the implicit assumption of bounded rationality of agents. Sargent (1993) argues that one way to substitute fully 'rational' agents by agents possessing bounded rationality is by assuming that the memory of agents is bounded. In this particular case, the length of the memory of agents is given by the length of the rolling window, w, in the moving average (5) and standard deviation (6). With each incoming new observation on the unemployment rate, consumers forget the oldest observation. This naturally implies that throughout the sample period the mean and the standard deviation, thus the membership functions, will change.

The next task is to proxy the consumer confidence variable using an estimation of the membership values for the unemployment categories. To put it clearer, this means that we are about to determine a time-series based upon the values of unemployment, using a fuzzification process, that relates to the time-series of confidence in an optimal way. In doing so, we consider that consumers form their confidence at date t, in a fuzzification process, by means of the inference mechanism described above, applied to the most recent w observations for the unemployment rate, i.e. the unemployment observations from $t - w + 1$ until t, for time periods $t \geq w + t_0$ (t_0 is the start date of the time series, here January 1993). Plainly this means a retrospective use of the unemployment rate by consumers.

Given that it is plausible that consumer confidence is inversely related to the unemployment rate, we put in relief the membership function of the 'low' unemployment category in our study. In order to determine the relevant membership values for the 'low' unemployment category, the only task generally consists on a 'normalisation' of (2), (3) and (4), after estimating $\bar{u}_t$ and σ_t from the unemployment data for the EU-15 member states for the period January 1993 until April 2004[14]. As the membership values given by (2), (3) and (4) can add up to more than 1, the normalised membership values are obtained in order that they add up to 1, which allows modelling another assumption about the reasoning of economic agents described as follows. Within the three fuzzy sets, i.e. 'low', 'normal' and 'high' unemployment, the higher (resp. smaller) is the observed value

14 Clearly this means that all the three membership functions are being considered as relevant, despite being also true that, for the reasons presented above, the set of 'low' levels of unemployment is made crucial in our analysis. See also the discussion below.

of the unemployment rate the smaller (resp. higher) should be its membership degree to the set of 'low' unemployment, and the higher (resp. smaller) should be its membership degree to the set of 'high' unemployment. Plainly, this may not happen with the non-normalised values, as obtained by (2) and (3), but it certainly happens after a normalisation as described above. However, prior to the 'normalisation' of the membership values, the undertaking of another task related to the form of memory of consumers, as described below, is, in our case, fundamental. Plainly, when computing the moving average (5) and standard deviation (6), is given the same importance to each observation in the rolling window as the weights of each lagged observation stay constant over time. A natural question that may arise is then: what if consumers, when forming their confidence level, possess non-constant memory, in the sense of not necessarily giving the same importance to all remembered observations of unemployment?

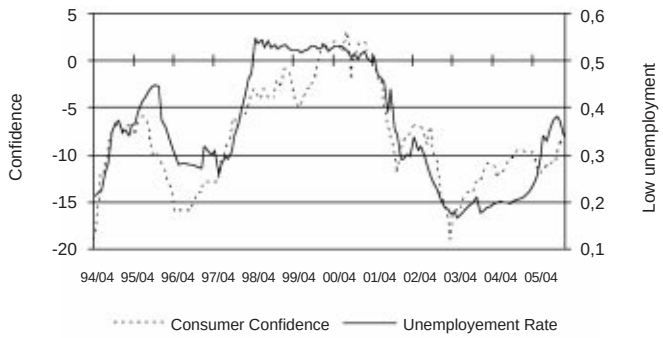
A straightforward way to accommodate the effects of non constant memory is to consider that, in moment t, the non-normalised membership values are *filtered,* i.e. multiplied by factors p_j, for $t - w + 1 \leq j \leq t$, such that consumers may attribute different importance to different lagged observations in the window when forming their confidence level. In order to obtain some robustness in the results, we performed this analysis under five different assumptions regarding the memory of consumers, namely *linear decaying memory*, *exponential decaying memory*, *free decaying memory*, *free memory*, and, as a benchmark case, *perfect memory*. The linear decaying memory assumes weights such that $p_t = 1,\ldots, p_{t-w} = 0$; the exponential decaying memory assumes weights such that $p_j = \exp(\lambda(j - t))$; the free decaying memory assumes weights such that $p_{t-w+1} \leq p_{t-w+2} \leq \ldots \leq p_{t-1} \leq p_t$; the free memory assumes weights such that $p_j \geq 0$; the perfect memory assumes weights such that $p_j = 1$, for $t - w + 1 \leq j \leq t$.

Following the procedure described above, the normalised membership values for the 'low', 'normal' and 'high' values of the unemployment rates were then obtained considering, for a grid of values of w, the parameterisation, in terms of the separation factor k and weights p_j, leading to the maximum correlation between the consumer confidence indicator and the 'low' normalised membership value for unemployment[15].

After the optimal parameterisations being determined, for a range of plausible values for w, a window of 16 months and consumers with a *free decaying memory* delivered the best results in terms of goodness of fit[16]. Considering this case, Figure 2 plots the original series of the consumer confidence indicator and the normalised membership values associated with 'low' unemployment.

15 The Matlab files created for this purpose are available upon request.
16 The highest values for the correlation coefficient between the consumer confidence indicator and the 'low' normalised membership values for unemployment were: 0.691 (perfect memory), 0.862 (linear decaying memory), 0.860 (exponential decaying memory), 0.876 (free decaying memory), and 0.877 (free memory).

Figure 2 – Confidence vs. its unemployment approximation (pre-2004 enlargement)



It appears from Figure 2 that, for the EU-15 group, consumer confidence is closely related to 'low' unemployment[17]. The correlation coefficient of 87.7% between these two series confirms this impression[18]. If there were no durable relationship between unemployment and consumer confidence, the fuzzy logic approach could lead to fair approximations during part(s) of the period under analysis, but would certainly fail, in an evident way, during the rest of the period. Therefore we would obtain a low(er) value for the correlation coefficient[19].

4. The Impact of the May 2004 Enlargement of the EU

As it is well-known, the enlargement of the EU in May 2004 substantially increased the number of member states. The EC classified this enlargement as an historic opportunity, given the number and importance of the new member states, as well as given the potential benefits, political and economic ones, due to the enlargement. This enlargement of the EU, and of the Economic and Monetary Union in the future, has, in our opinion, intensified the challenges that a common economic policy always involves. It is our view that a better understanding of all the consequences that the May 2004 enlargement has brought about, namely in terms of the relationship between unemployment and confidence, will alleviate those challenges.

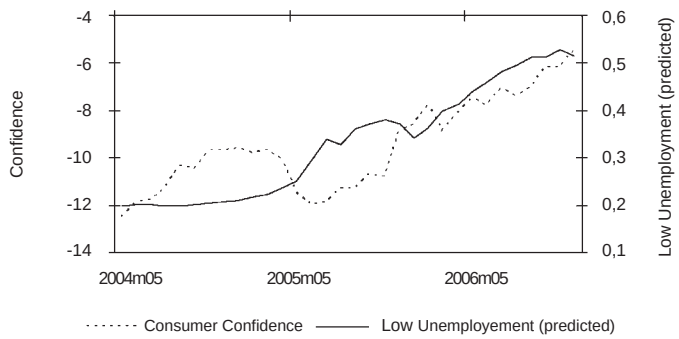
In our final analysis we formed an out-of-sample forecast of the consumer confidence indicator to verify whether the enlargement of the EU in May 2004 has challenged the relationship between unemployment and consumer confidence. Recall that our analysis was entirely based on the

17 To be sure about a possible aggregation bias, the data on the individual countries also show that, in general, unemployment is not related to consumer confidence in a traditional way. For almost all the individual cases, for instance, for Portugal (a small economy) and France (a big economy) this superiority of the fuzzy logic results over the crisp ones is also evident.
18 As an aside exercise, the 'estimation' period was enlarged until December 2006. Not surprisingly, the correlation coefficient has decreased, but only by a slight amount. The corresponding figure is available upon request.
19 We also attempted to proxy consumer confidence using the inflation rate, using exactly the same fuzzy logic approach as above. This procedure led to a visually bad result (the figure is available upon request). The correlation coefficient between the two variables, being as low as 4.5%, indicates that there is no significant relationship between inflation and confidence in the EU.

pre-enlargement period, i.e. January 1993 until April 2004. The forecasting period in this study was the period May 2004 until December 2006. An *out-of-sample forecasting* or *ex-post prediction* study is a well-known procedure for model evaluation. A subset of the available observations is not used for estimation and retained to contrast the ex-post model prediction to the actually observed values of the endogenous variable (see, for instance, Harvey, 1990: 181-189). In our case, this means that the normalised degrees of membership for the 'low' unemployment set are computed for each observation of the unemployment rate, *after the 2004 enlargement*, by the use of the optimal values of the parameters w, k, and p_j previously determined, i.e. for the pre-2004 enlargement period.

Figure 3 plots the results of the ex-post model prediction study, i.e. the actual level of confidence and the predicted 'low' unemployment degrees using the optimal parameterisation previously determined. Although the number of observations hinders a meaningful formal analysis of the forecast error, Figure 3 clearly suggests the May 2004 round of enlargement did not challenge the relationship between confidence and unemployment, which is a remarkable result given the number and importance of the (then) new EU member states. The correlation coefficient between the two series plotted in Figure 3 is 78.2%, which is a noteworthy value given the time span of the ex-post period, i.e. 32 months.

Figure 3 – An ex-post (2004 enlargement) prediction exercise



The results in this section thus specify the usefulness of this out-of-sample exercise as indeed, they clearly support that the ('low' category of) unemployment rate could be used to predict the evolution of the consumer confidence, in the case for the period after the 2004 enlargement.

5. Conclusion and Discussion

This paper has revealed the importance of unemployment for confidence. Using a fundamental part of the fuzzy logic methodology, i.e. the membership functions associated with the relevant fuzzy sets, we have found that the membership degrees for 'low' unemployment proxy consumer confidence very well[20]. A decrease (increase) in the perception of unemployment being low is

20 Again, it should be made clear that the fuzzy logic methodology includes other components, which, by the nature of the objectives of the paper, are not considered here.

associated with an increase (decrease) in confidence. We also found that the latest round of enlargement of the EU with ten new member states did not upset the relationship between confidence and unemployment. These results are relevant, for instance, for the undertaking of a new start of the Lisbon Strategy, which has being called a few years ago. In fact, given that the increase in the employment rate (to 70%, as a goal of the new Lisbon Strategy) does not necessarily imply that the EU unemployment rate will decrease. If so, the alleged increase in confidence, as a beneficial factor for growth (as another objective of that Strategy) is likely to be inexistent.

Our results call for further studies to firmly establish our outcome, i.e. the clear importance of unemployment for consumer confidence. One obvious extension of the present study is to proceed with similar analyses for individual EU member states (see Caleiro, 2006), as well as for nations elsewhere in the world. It is also important to understand why unemployment is important for the formation of consumer confidence. This study suggests that any theory of consumer confidence cannot deny the unemployment figures. In other words, our results indicate that ignoring the unemployment trajectory, when attaining high(er) levels of confidence is a policy objective will, in general, lead to a failure. In the paper we remain agnostic as to the process behind the formation of consumer confidence, which can be, indeed, analysed by the remaining parts of the fuzzification methodology. Thus, possible explanations for the link between unemployment and consumer confidence are left for future research. However, since consumer confidence is important for spending levels and thus for economic growth, our result stresses a potentially important new rationale to explicitly target the unemployment rate, and not to considered it as a mere suggestion hinted at in the Lisbon Strategy (see European Commission, 2004).

A better understanding for the driving factors behind confidence indicators seems of crucial importance for an incumbent who wants the electorate to be characterised by a particularly high level of confidence at the day of potential re-election. The seminal paper of Nordhaus (1975) and some other political business cycle models consider the importance of the unemployment rate for the electorate but ignore the importance of confidence. A casual observation on the reality shows that re-elections are associated with peaks in consumer confidence and, indeed, also with changes in unemployment rate that are electorally-pleasing. We would like to also take up these matters in future research.

References

Caleiro, A. (2006) How is confidence related to unemployment in Portugal?, *Applied Economics Letters*, 13, 13, 887-890.

Chen, C. (ed.) (1996) *Fuzzy Logic and Neural Network Handbook*, New York, Mc-Graw Hill.

Delorme, C.; Kamerschen, D.; Voeks, L. (2001) Consumer confidence and rational expectations in the United States compared with the United Kingdom, *Applied Economics*, 33, 863-869.

European Commission (2000) Business Climate Indicator for the Euro Area (Presentation Paper), *Directorate General for Economic and Financial Affairs*.

European Commission (2003) The Joint Harmonised EU Programme of Business and Consumer Surveys: User Guide, *Directorate General for Economic and Financial Affairs, Economic Studies and Research, Business Surveys*.

European Commission (2004) Presidency conclusions on the Lisbon strategy 2000-2004 by theme, June.

European Commission (2005a) *Third progress report on cohesion: Towards a new partnership for growth, jobs and cohesion*, May, Brussels.

European Commission (2005b) *European Economy*, 5, Autumn.

European Commission (2006a) *Interim forecast*, February.

European Commission (2006b) *Fourth progress report on cohesion: The Growth and Jobs Strategy and the Reform of European cohesion policy*, June, Brussels.

European Commission (2007) *Joint Employment Report 2006/2007*, February, Brussels.

Harvey, A. (1990) *The Econometric Analysis of Time Series*, New York, Philip Allan.

Laurent, T.; L'Horty, Y. (2004) Incitation au retour à l'emploi: une perspective dynamique, *Travail et Emploi,* 98, 67-75.

Ludvigson, S. (2004) Consumer Confidence and Consumer Spending, *Journal of Economic Perspectives*, 18(2), 29-50.

Matsusaka, J.; Sbordone, A. (1995) Consumer Confidence and Economic Fluctuations, *Economic Inquiry*, 33(2), 296-318.

Mourougane, A.; Roma, M. (2003) Can confidence indicators be useful to predict short term real GDP growth?, *Applied Economics Letters*, 10, 519-522.

Nguyen, H.; Walker, E. (2000) *A First Course in Fuzzy Logic*, 2nd edition, Boca Raton, Chapman & Hall/CRC.

Nordhaus, W. (1975) The Political Business Cycle, *The Review of Economic Studies*, 42, 2, 169-190.

Santero, T.; Westerlund, N. (1996) Confidence Indicators and their Relationship to Changes in Economic Activity, *Economics Department Working Paper* No. 170, OECD.

Sargent, T. (1993) *Bounded Rationality in Macroeconomics*, Oxford, Clarendon Press.

Utaka, A. (2003) Confidence and the real economy – the Japanese case, *Applied Economics*, 35, 337-342.

West, J.; Linster, B. (2003) The Evolution of Fuzzy Rules as Strategies in Two-Player Games, *Southern Economic Journal*, 69, 3, 705-717.

Zadeh, L. (1965) Fuzzy Sets, *Information and Control*, 8, 338-353.

Zimmerman, H. (1991) *Fuzzy Set Theory – and Its Applications*, Boston, Kluwer Academic Publishers.