

**ETA TERRORISM:  
POLICE ACTION, POLITICAL MEASURES AND THE  
INFLUENCE OF VIOLENCE ON ECONOMIC ACTIVITY IN THE  
BASQUE COUNTRY**

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*Abstract*

*In the last 15 years or so, ETA activity has substantially decreased, but also changed. Whilst the type of killings has become more specialised (politicians, reporters, etc.), a new phenomenon based on urban guerrilla tactics, and called in Basque “kale borroka” (street fighting), has emerged, creating an atmosphere of violence in the streets. The contribution of this paper is threefold. First, we create a daily measure of the level of violence in the area. Second, we examine if police action and the repressive policy measures adopted by government have been effective in reducing the intensity of violence. Third, we investigate whether the level of violence has had an effect on the stock market index in the Basque Country. The results, based on daily data from July 1<sup>st</sup>, 2001 to November 15<sup>th</sup>, 2005 suggest that the only effective measure to reduce violence was the banning of Herri Batasuna (HB), the radical party close to ETA supporters. Moreover, there was a decrease in the stock market index as a consequence of the violence in the area.*

**Keywords:** *ETA, Terrorism, Economic Impact, Stock Exchange, Fractional Integration*

**JEL Classification:** *C22, D78, H56.*

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## **1. Introduction**

The impact of terrorism on economic activity has already been investigated in various papers such as Drakos and Kutan (2003), Enders and Sandler (1991), Enders and Sandler (1996), Enders, Sandler and Parise (1992). However, these studies mainly focus on the impact of terrorist activities on tourism. For regions where tourism is not a predominant economic activity, the effects of terrorism on the stock exchange have hardly been analysed. A rare study of this type is Abadie and Gardeazabal (2003). We revisit this issue in the present paper using an innovative approach.

The motivation for our analysis is the observed persistence of ETA terrorism activity in the Basque Country. Despite the signing of various political agreements to put an end to violence, terrorism activity has survived in a different form, namely as Kale Borroka. This persistence, notwithstanding the stated intention and apparent political will of the Spanish government to find a solution to the Basque problem, suggests that the two sides are not engaged in a very effective dialogue, and therefore that terrorism activity might still be carried out in the near future. Moreover, the emergence of the radical Islamic terrorism in Europe raises the possibility of its developing links with the terrorist activities of ETA, which is a nationalist terrorist group.

In order to analyse persistence in ETA terrorism and its impact on the stock market of the Basque Country this paper uses a novel method based on fractional integration which also allows for possible structural breaks. It improves upon related studies (e.g. Barros (2003), Abadie and Gardeazabal (2003), Barros and Gil-Alana (2006), Barros, Passos and Gil-Alana (2006)) in three ways: first, it uses a new measure of terrorism; second, it examines explicitly its effects on the stock exchange in the Basque country;

third, it models persistence in a fractional integration framework allowing for breaks in the series.

The paper is organised as follows: in section 2, we put the analysis in context by briefly reviewing the history of ETA; in section 3, we survey the empirical literature on this topic; in section 4, we present a new measure of the intensity of violence in the Basque Country; in section 5, we examine the different policies used to reduce the violence in the area. Section 6 analyses the effects of violence on the stock market, while Section 7 concludes.

## **2. A brief history of ETA**

The acronym ETA stands for Euskadi Ta Askatasuna, or Basque Fatherland and Liberty. The aim of its terrorist activities is to establish an independent state for the Basque people in the seven provinces in North-Eastern Spain and South-Western France where they have lived since ancient times. The group was created as an extreme, radical expression of the Basques' profound pride in their own unique identity and culture and their determination to be recognized as a nation. Their language, Euskera, is a living testament to their origins and longevity, given that it has no links with any other known language and precedes all the Indo-European languages spoken in Europe. The protection of Euskera has long been a vital element of the Basques' struggle. This long tradition makes their position within Europe rather unique.<sup>1</sup>

Today, following four decades of harsh repression of the Basques and their homeland under Franco as a punishment for their opposition during the Spanish Civil War, the language is thriving in the autonomous region. Euskera radio and TV stations, newspapers and literature serve an estimated 750,000 fluent speakers (of a total

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<sup>1</sup> In the Middle Ages they defeated the French king Charlemagne in Roncesvalles (Orreaga, in Basque), (Chanson de Roland, unknown author, 1080).

population of 2.5 million Basques). The future survival of this language would appear to be secured, since more than 90% of Basque children study in Euskera schools.

The nationalists consider the Basque Country to comprise seven provinces. Four of these are part of Spain. The other three belong to France. However, Spain only recognizes three provinces in the Basque Country, in what is called the “Comunidad Autónoma del País Vasco” (Basque Country Autonomous Community),

Whilst many Basques may traditionally harbour dreams of sovereign nationhood, it should not be assumed that ETA therefore enjoys mass active support for its terrorist activities among the majority of the population. Since democracy returned to Spain in 1975, the region has known great development and increased prosperity under the degree of autonomy granted by Madrid. Many Basques favour self-determination or increased autonomy, but wish to see this achieved through peaceful, political means rather than violence.

ETA’s first military action took place in 1961 with an unsuccessful attempt to derail a train carrying civil war veterans travelling to Donostia (San Sebastian) to celebrate the twenty-fifth anniversary of the Spanish Civil War. They then planted explosives in the police headquarters of the Basque cities of Bilbao and Vitoria (Abadie and Gardeazabal, 2003). Henceforward, they maintained continuous terrorist activity, with assassinations and kidnapping beginning in 1968. After a popular ETA activist was killed by the police in 1968, ETA produced its first victims, assassinating an inspector of the Policia Nacional and a member of the Guardia Civil. The Franco Government reacted by putting the entire Basque region under a prolonged siege. Thousands were jailed, tortured, and exiled, culminating in the 1970 Burgos trial and imprisonment of over a dozen ETA leaders. During the mid-1970s, ETA activities increased sharply, with 1978 to 1980 being their bloodiest years. In December 1973, ETA assassinated the Spanish

premier and putative successor to Franco, Luis Carrero Blanco, which marked a watershed in terrorist actions.

The long-ruling dictator Franco died in 1975, and democracy was restored. This was to lead to the Basque region being granted a degree of autonomy (by the Estatuto de Autonomía del País Vasco, promulgated in 1979) with its own parliament, control over several areas such as education and taxes, and the promotion of the Basque language in schools.

In the last 15 years or so, ETA activity has substantially decreased, but also changed. The number of victims has considerably fallen, the type of killings becoming more specialized (politicians, reporters, etc.). On the other hand, a new phenomenon based on urban guerrilla tactics, and called in Basque “Kale Borroka” (street fighting), has emerged, creating an atmosphere of violence in the streets. This can be characterised as low-intensity urban terrorism fomented by ETA, and amounts to street hooliganism perpetrated by the youth wing of the terrorist movement. According to the UN Commissioner for Human Rights in Spain: “*these acts have deteriorated to such a point that it affects not only the fundamental rights of individuals but also the free exercise of certain civil and political rights which are the basis and foundation of every democracy*”. (Gil-Robles, 2001).

The Spanish Constitution of 1978 does not explicitly provide for the independence of the Basque Country, and it was against this backdrop that ETA continued its strategy of individual terrorism during the transition period as well. In December 1982, the left-wing Socialist Party came to power and set up the anti-terrorist group GAL (Anti-Terrorist Liberation Group) to combat ETA. These were para-military death squads that were active from 1983 to 1987. The GAL units hunted down ETA members, and killed at least 28 of them. In January 1988, all the political parties with representation in the

Basque Parliament, with the exception of HB (Herri Batasuna, the radical nationalist party), signed the agreement known as the Pact of Ajuria-Enea, in the firm belief that the only way to achieve normality and peace in the Basque Country was to respect the choices and desires of the Basque people. Negotiations to end ETA violence were held in Algeria in 1992 but failed in their objective. Unsuccessful ETA attempts on the life of Prime Ministerial candidate José María Aznar and of King Juan Carlos, in April and August 1995 respectively, were among the most notorious attacks. Aznar's Popular Party was elected in May 1996 and reinforced and maintained the hard-line approach on terrorism until its unexpected demise in March 2004, precipitated by what turned out to be radical Islamic terrorist attacks in Madrid 3 days before the elections.

By the late 1990's ETA had lost most of its support in the main cities and important ETA commando cells had been eliminated by the police. As a result, the organization changed its strategy. Together with other nationalist parties, the parliamentary representation of ETA (EH, Euskal Herritarrok, or "We Basque Citizens", former HB), approved the so-called "Treaty of Lizarra" in the fall of 1998. This declaration contained the obligation to hold open, but exclusively Basque, negotiations on the political future of the Basque Country. Following the signing of this treaty, ETA announced an unlimited, unconditional ceasefire in September 1998.

The ceasefire was maintained until 3 December 1999. ETA's justifications for resuming its attacks were the unchanging hard-line stance of the Spanish Government against the separatists and the weak response of the moderate nationalists to the latter. In fact, scarcely any negotiations took place. Aznar was only willing to discuss the transfer of a few ETA prisoners to Basque Country jails and the disarming of the organization. Under no circumstances was the Government prepared to grant ETA more influence in Basque politics, let alone contemplate the group's unequivocal demand for

independence and unification of all Basque provinces, including the three provinces in France.

On the contrary, Aznar never left any doubts as to his determination to solve the Basque question by police methods, and stepped up the pursuit of ETA members during this period. Since ETA had apparently used the ceasefire period to improve its logistics and stock up explosives and weapons, it was only a matter of time before violence would break out again. The hardline position of the Popular Party against ETA included political measures such as the closing down of radio stations and newspapers (Egin, July, 1998; Egunkaria, February, 2003) or the “Ley de Partidos” (June, 2002) that led to the banning of Herri Batasuna from political activity (August, 2002).

### **3. Literature Review**

The economics literature on terrorism is rather limited (for a relatively up to date survey, see Enders and Sandler, 1995). Two main types of empirical studies can be found: time series models and cross-section or panel data models. Within this literature, ETA has been the subject of more papers than other known terrorist organisation. One reason for such emphasis on ETA is its longevity. Many time series studies on ETA use intervention analysis, regressing the number of terrorist incidents on indicators of policy intervention, to evaluate the effectiveness of the adopted policy (Enders and Sandler, 1993). Papers in this mould are Barros (2003), who analysed ETA killings and kidnaps with a VAR model from 1968 to 2000; Barros and Gil-Alana (2006), who estimated a fractional integration model for ETA attacks; and Barros, Passos and Gil-Alana (2006), who investigated the duration of ETA attacks with several duration models.

Alternatively, other studies use economic-impact analysis, regressing economic variables on terrorist incidents, to evaluate the economic impact of terrorism. For

instance, Enders and Sandler (1991) estimated a first-order VAR (Vector Auto-Regression) model to evaluate the economic impact of terrorism on tourism in Spain during the period from 1970 to 1988 (see also Enders (2004)). Abadie and Gardeazabal (2003) analysed the economic impact of ETA terrorism on GDP, concluding that there was an average 10% gap between per-capita GDP in the Basque Country and the per-capita GDP of a comparable region that does not suffer from terrorism. Moreover, when analysing Basque market-listed companies in comparison with non-Basque listed companies, they concluded that the former show a negative performance as an externality of terrorism. The present paper adopts this second time series approach to examine the impact of terrorism attacks on economic variables. In contrast to earlier studies, which treat terrorist events as stationary (Enders and Sandler, 1996), we model the order of integration of ETA terrorism attacks with fractional integration techniques, which allow for intra-annual integration. Second, we model possible breaks in the series within the fractional integration framework. Finally, we use information on Basque stock market prices to evaluate the impact of ETA violence.

#### **4. Measuring the intensity of violence**

Measures of the intensity of violence are usually based on counting violent episodes. For example, the ITERATE data set, the most renowned terrorist data set, counts the number of terrorist attacks and the number of killings, as well as other terrorist events. However, these methods are rather uni-dimensional as they inevitably lump together a large variety of terrorist actions. An alternative way to measure terrorism actions is to use a Likert-type variable defined as varying between zero and five to account for different types of terrorism intensity. This is the procedure adopted in the present paper.



Such a Likert-type variable ranging between 0 and 5 enables us to compare different types of terrorism activity with different social impact, and to construct a terrorist index. Index variables in addition to the one adopted in the paper can be found in papers using questionnaire data (see, e.g., Gans, Hsu and Stern (2002) and Morris and Pavet (1992)).

**[Insert Table 1 about here]**

The Likert-type variable employed in this paper refers to the daily level of violence in the Basque Country and will be denoted by  $DVI_t$ . This variable takes a value of 0 if there has not been any violent incident related to ETA terrorism during a single day. It takes a value of 1 (Very Low Level of Violence) if there has been only a small number ( $\leq 5$ ) of incidents of “kale borroka” across the Basque geography. It takes a value of 2 (Low Level of Violence) if there are more than 5 acts of kale borroka in a single day.  $DVI_t = 3$  (Medium Level of Violence) if there are generalized incidents of kale borroka or if ETA has put bombs with less than 5 kilograms of explosives. Level 4 (High Level of Violence) is achieved with ETA bombs which are stronger than 5 kilograms of explosives or if there have been serious injuries as a consequence of a terrorist attack. Finally, Level 5 (Very High Level of Violence) occurs when there are one or more fatalities in the attacks. Although this classification does not distinguish between one or more than one killing in a single day of terrorist activity, we would argue that the death of even a single person is sufficiently important to be defined as the highest level of violence.

From a first inspection of the data one can see that the sample mean for the variable in the period analysed in the paper (1<sup>st</sup> July, 2001 – 15<sup>th</sup> November, 2005) is relatively low (0.8011), implying a level of violence slightly below Level 1, which corresponds to the category “Very Low Level of Violence”; this is considerably lower

than in previous periods (e.g., 1978-1980, with a mean value higher than 4; or the decade of the 80s, with a value of around 3.5)

Another feature of these data is that there is not a monotonic decrease in violent activity during the recent period: the annual means from 2001 through 2005 are equal to 1.364, 0.879, 0.671, 0.720 and 0.691, respectively. Moreover, the values displayed in Figure 1, which correspond to the monthly averages, show that the highest level of violence occurred in November 2005, that is, the last month in the sample.<sup>2</sup>

## 5. Deterrence policies

In this section we examine which factors may affect the daily level of violence in the Basque Country ( $DVI_t$ ). For this purpose, we first run linear regressions using as dependent variables the following ones:  $ARR_t$ : daily number of arrests related to ETA violence;  $LEAD_t$ : a step dummy increasing by 1 each time the police arrest ETA leaders;  $EGK_t$ : a dummy variable equal to 1 after the police closed the Basque newspaper *Egunkaria* (February 20<sup>th</sup>, 2002);  $HB_t$ : a dummy variable taking a value of 1 after *Herri Batasuna* was declared illegal (August 27<sup>th</sup>, 2002); and finally,  $11-M_t$ : a dummy variable equal to 1 after the March 11<sup>th</sup> Islamic attack in Madrid. These variables are fully described in Table 2.

**[Insert Tables 2 and 3 about here]**

We estimate by Ordinary (Generalized) Least Squares (OLS-GLS) the following regression model:

$$DVI_t = a_1 + a_2 ARR_t + a_3 LEAD_t + a_4 EGK_t + a_5 HB_t + a_6 11M_t + u_t \quad (1)$$

where  $u_t$  is the error term, adopting different ARMA representations. Table 3 displays the estimated coefficients, assuming that  $u_t$  is an ARMA(1,1) process. The specification

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<sup>2</sup> At the time of writing (February, 2006) the violence still persists in the Basque Country, and the average monthly values for December 2005 and January 2006 are respectively 0.719 and 0.662.

was chosen according to the AIC and BIC criteria. It can be seen immediately from this Table that only LEAD, EGK and HB have a negative effect on ETA violence. By contrast, the number of daily arrests and the 11-M attacks have a positive coefficient. An explanation for the positive coefficient on the number of arrests might be the fact that, when police arrest people in the Basque Country, this usually provokes incidents in the streets by ETA supporters, thereby increasing the acts of “kale borroka” and the feeling of violence. On the other hand, the two political measures (closeness of Egunkaria and banning of Herri Batasuna) have a negative coefficient, though only the latter is significant at conventional statistical levels, suggesting that, according to our model, this was the only effective measure to reduce violence in the area.

However, the analysis presented so far is based upon the assumption that the error term  $u_t$  in equation (1) is integrated of order 0, i.e.,  $u_t \sim I(0)$ . In our view, it is plausible to think instead that the level of violence in the Basque Country instead follows an  $I(d)$  process with  $d > 0$ . In fact some earlier studies have shown that ETA violence is integrated of order  $d$  with  $d$  strictly higher than 0 (see Barros and Gil-Alana, 2006). Thus, in what follows, we assume that the level of violence ( $DVI_t$ ) is described by (1) with  $u_t$  given by:

$$(1 - L)^d u_t = v_t, \quad t = 1, 2, \dots \quad (2)$$

where  $v_t$  is  $I(0)$ . Hence, if  $d = 0$ , we are in the previous case, analysed in Table 3. We now test:

$$H_o : d = d_o, \quad (3)$$

for any real value  $d_o$  in a model given by (1) and (2), assuming that  $v_t$  is white noise, AR, etc.

In Table 4 we report the results based on Robinson’s (1994) statistic, testing  $H_o$  (3) in (1) and (2), for  $d_o$ -values = 0, 0.10, ..., 1, assuming that  $v_t$  is white noise, AR(1)

and AR(2) respectively. Higher AR orders and MA processes were also employed and the results were in line with those presented here. The statistic proposed by Robinson (1994) is fully described in the Appendix, and follows a standard normal distribution. Thus, significantly positive values imply rejections of the null in favour of alternatives of the form:  $d > d_0$ , and, similarly, significant negative ones imply rejections of the null in favour of smaller orders of integration ( $d < d_0$ ). We can see in Table 4 that, if  $d = 0$ , the null hypothesis is rejected for all types of disturbances in favour of alternatives of the form  $d > 0$ , implying long-memory behaviour. We can also note that if  $v_t$  is white noise or AR(1) the null cannot be rejected for  $d_0 = 0.10$ , and, if  $v_t$  is AR(2), the non-rejections take place for values of  $d_0$  constrained between 0.10 and 0.20. Hence, in Table 5, we display the statistics for a range of  $d_0$ -values constrained between 0.10 and 0.20 with 0.01 increments. Note that the lowest statistic in absolute value should correspond to a value of  $d$  that is an approximation to the maximum likelihood estimate.<sup>2</sup>

**[Insert Tables 4 and 5 about here]**

The results in Table 5 show that, if  $v_t$  is white noise,  $H_0$  cannot be rejected for values of  $d$  constrained between 0.10 and 0.15, and the lowest statistic corresponds to  $d_0 = 0.12$ . When allowing for autocorrelated disturbances, we observe more non-rejections and the lowest statistics occur in both cases at  $d_0 = 0.13$ .

**[Insert Table 6 about here]**

Table 6 displays the estimated coefficients for each type of disturbances in the cases of the lowest statistics. Similarly to the I(0) case, negative coefficients (implying a reduction in the level of violence) are found for the arrests of ETA coup-members and

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<sup>2</sup> Robinson's (1994) statistic is based on the Whittle function, that is an approximation to the likelihood function.

the two political measures (closing down of Egunkaria and banning of HB); however, only the latter variable appears to be significant at conventional statistical levels.

The results presented so far seem to indicate that only the banning of HB produced a significant reduction in terrorist activities in the Basque Country. This took place in August 2002. Next, we examine the possibility of a structural break in the data, and, for this purpose, we use a simple procedure that enables us to estimate the deterministic components, the orders of integration and the time of the break endogenously to the model. Note that since the series of interest, the daily intensity of violence, is not  $I(0)$ , standard procedures like Bai and Perron (1998) cannot be directly applied. We assume that there is a unique break in the data, occurring at time  $T_b$ , and consider a model of the form:

$$y_t = \alpha_1 + x_t; \quad (1 - L)^{d_1} x_t = u_t, \quad t = 1, 2, \dots, T_b,$$

$$y_t = \alpha_2 + x_t; \quad (1 - L)^{d_2} x_t = u_t, \quad t = T_b + 1, \dots, T,$$

where  $d_1$  and  $d_2$  correspond respectively to the orders of integration of the first and the second subsample. Note that the model above can be expressed as:

$$(1 - L)^{d_1} y_t = \alpha_1 (1 - L)^{d_1} 1_t + u_t, \quad t = 1, 2, \dots, T_b, \quad (4)$$

$$(1 - L)^{d_2} y_t = \alpha_2 (1 - L)^{d_2} 1_t + u_t, \quad t = T_b + 1, \dots, T, \quad (5)$$

where  $1_t = 1$  for all  $t$ . First, we choose a grid for the values of the fractionally differencing parameters  $d_1$  and  $d_2$ , for example,  $d_{i0} = 0, 0.01, 0.02, \dots, 1, i = 1, 2$ . Then, for a given partition  $\{T_b\}$  and given  $d_1, d_2$ -values,  $(d_{10}^{(i)}, d_{20}^{(i)})$ , we estimate the  $\alpha$ 's by minimizing the sum of squared residuals,

$$\min \sum_{t=1}^{T_b} \left[ (1-L)^{d_{10}^{(i)}} y_t - \alpha_1 \tilde{1}_t(d_{10}^{(i)}) \right]^2 + \sum_{t=T_b+1}^T \left[ (1-L)^{d_{20}^{(i)}} y_t - \alpha_2 \tilde{1}_t(d_{20}^{(i)}) \right]^2$$

*w.r.t.*  $\{\alpha_1, \alpha_2, \beta_1, \beta_2\}$

Let  $\hat{\alpha}(T_b; d_{1o}^{(1)}, d_{2o}^{(1)})$  denote the resulting estimates for partition  $\{T_b\}$  and initial values  $d_{1o}^{(1)}$  and  $d_{2o}^{(1)}$ . Substituting these estimated values into the objective function, we get  $RSS(T_b; d_{1o}^{(1)}, d_{2o}^{(1)})$ , and minimizing this expression across all values of  $d_{1o}$  and  $d_{2o}$  in the grid we obtain:

$$RSS(T_b) = \arg \min_{\{i, j\}} RSS(T_b; d_{1o}^{(i)}, d_{2o}^{(j)}).$$

Then, the estimated break date,  $\hat{T}_k$ , is such that

$$\hat{T}_k = \arg \min_{i=1, \dots, m} RSS(T_i),$$

where the minimization is over all partitions  $T_1, T_2, \dots, T_m$ , such that  $T_i - T_{i-1} \geq |\varepsilon T|$ . The regression parameter estimates are the associated least-squares estimates of the estimated  $k$ -partition, i.e.,

$$\hat{\alpha}_i = \hat{\alpha}_i(\{\hat{T}_k\}),$$

and their corresponding differencing parameters,

$$\hat{d}_i = \hat{d}_i(\{\hat{T}_k\}),$$

for  $i = 1$  and  $2$ .

We do not report asymptotic results for the rates of convergence of the estimates, though they should be similar to those in Bai and Perron (1998), since we choose the values in such a way as to minimize the residual sum of squares and, under the appropriate specification,  $u_t$  should follow an  $I(0)$  process. Some Monte Carlo results based on this approach can be found in Gil-Alana (2006), where it is shown that this procedure correctly estimates the timing of the breaks and produces very accurate estimates of the model parameters, especially if the sample size is large.

**[Insert Table 7 about here]**

Table 7 reports the estimates of model (4) and (5) assuming that  $u_t$  is white noise and autocorrelated. In the latter case we suppose that  $u_t$  follows an AR(1) process. We also tried higher AR and MA processes, obtaining similar results. Starting with the case of white noise disturbances, we can see that the break takes place on May 8<sup>th</sup>, 2002, which is a few months before the banning of HB, though at that time it was already known that this would take place.<sup>3</sup> As expected, the estimate of the intercept is higher in the first subsample, and significant in both subsamples. Interestingly, the order of integration is substantially higher in the second subsample (0.14 compared with 0.03 in the first subsample). When  $u_t$  is assumed to follow an AR(1) process the results are very similar. The break occurs on May 1<sup>st</sup>, 2002, and the first subsample seems to follow an I(0) process, while  $d_2 = 0.15$ . The estimates for the intercepts are now 1.267 for the first subsample and 0.689 after the banning of HB, and both are statistically significant. On the whole, it would appear that there has been a substantial reduction in the intensity of the violence in the Basque Country since HB has been declared illegal; however, its persistence has increased as a result of the adoption of this measure.

## **6. Violence and economic activity**

In this section we examine whether the level of violence in the Basque Country has had any effect on economic activity in the area. For this purpose, we use the DVI variable described in Section 3 as an indicator of the level of violence, and the Bilbao Stock Market index ( $BSM_t$ ) as an indicator of economic activity.

**[Insert Figures 1 – 3 about here]**

First, we examine the statistical properties of the individual series. Stock market indices are generally believed to be nonstationary, and to contain a unit root. On the

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<sup>3</sup> The “Ley de Partidos” was promulgated in June 2002.

other hand, visual inspection of the monthly averages of the DVI series, in Figure 1, seems to suggest that series in hand is stationary.

**[Insert Table 8 about here]**

Table 8 shows the fractional integration results for the two series. Note that the fractional integration approach nests the two classic cases of modelling statistical time series, the stationary case ( $d = 0$ ) and the unit root approach ( $d = 1$ ). We report the 95% confidence intervals as well as the quasi maximum likelihood estimate of  $d$  (in parenthesis within the brackets) in the frequency domain, assuming that the two series are  $I(d)$  with white noise, AR and Bloomfield disturbances.<sup>4</sup>

It can be seen that, for the stock market index, the values of  $d$  are close to 1 in all cases, ranging from 0.95 to 1.09. However, for the level of violence, the values are much smaller, ranging from 0.13 to 0.30. Thus, while BSM is clearly nonstationary and probably  $I(1)$ , DVI is stationary, though with a component of long memory behaviour.<sup>5</sup> Moreover, the fact that the two series exhibit different orders of integration invalidates any inference based on cointegration models. Consequently, in what follows, we assume that DVI is weakly exogenous, and consider a model of the following form:

$$BSM_t = \alpha + \beta DVI_{t-k} + x_t, \quad (6)$$

$$(1 - L)^{d_o} x_t = u_t,$$

with  $k$  in (6) equal to 0, 1, 2 and 3 and white noise and AR(1) and AR(2) disturbances  $u_t$ . As an alternative approach, we could have employed a dynamic lag-structure for DVI in (6) in line with the literature on dynamic regressions in standard models. However, that approach would have imposed the same degree of integration across the lags, whilst ours allows  $d$  to take different values for each lag.

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<sup>4</sup> The model of Bloomfield (1973) is a non-parametric approach of modelling the  $I(0)$  disturbances, that produces autocorrelations decaying exponentially as in the AR(MA) case.



**[Insert Table 9 about here]**

Table 9 reports, for each type of disturbances and for each  $k$ , the estimates for the coefficients (and their corresponding t-ratios), the value of  $d_0$  producing the lowest statistic, its confidence interval (at the 95% level) and the values for the short-run (AR) parameters. It can be seen that the results are robust to the different type of disturbances. The estimates of  $d$  are around 1 in all cases, and the slope coefficient only appears significant when  $k = 1$ , with a negative value, implying that an increase in the level of daily violence in the streets produces a reduction in the stock market index in the following period.

The final part of the analysis considers the possibility of a structural break in the stock market index, and applies the same procedure used in Section 4 to examine the relationship between the level of violence and the stock market index in the following period. Thus, the model is now

$$(1 - L)^{d_1} BSM_t = \alpha_1 (1 - L)^{d_1} 1_t + \beta_1 (1 - L)^{d_1} DVI_{t-1} + u_t, \quad t = 1, \dots, T_b$$

$$(1 - L)^{d_2} BSM_t = \alpha_2 (1 - L)^{d_2} 1_t + \beta_2 (1 - L)^{d_2} DVI_{t-1} + u_t, \quad t = T_b + 1, \dots, T,$$

and we jointly estimate  $d_{10}$ ,  $\alpha_1$ ,  $\beta_1$ ,  $d_{20}$ ,  $\alpha_2$ ,  $\beta_2$  along with the time break  $T_b$  by minimizing the RSS for a grid of values of  $T_b = T/10, T/10+1, \dots, 9T/10-1, 9T/10$ . The results are displayed in Table 10.

**[Insert Table 10 about here]**

Starting with the case of white noise disturbances, we can see that both coefficients, the intercept ( $\alpha_1$ ) and the slope ( $\beta_1$ ), are significant in the first subsample, while only the intercept ( $\alpha_2$ ) is significant after the break, which occurs on July 4<sup>th</sup>, 2002 (i.e. one month after the promulgation of the “Ley de Partidos”, and one month before

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<sup>5</sup> This latter result is consistent with Barro and Gil-Alana (2006) who found evidence of long memory (d

the banning of HB). The orders of integration oscillate around 1 in the two subsamples, with values of 1.03 and 0.95 respectively. We also find that the slope coefficient is negative in both cases, though only significant before the break, implying that the negative effect of violence on the stock market was stronger before the break. If  $u_t$  follows an AR(1) process, the two orders of integration are slightly below unity (0.97 and 0.98), and the slope coefficients are negative though insignificant in the two subsamples. The coefficients associated to the AR component are close to 0, suggesting that the white noise specification could be an adequate choice for this series. On the whole, the level of violence seems to affect negatively the stock market, with a stronger effect before the banning of Herri Batasuna.

## **7. Conclusions**

In the last 15 years or so, ETA activity has substantially decreased, but also changed. Whilst the number of carefully selected victims (politicians, reporters, etc.) has fallen, more diffuse violence has emerged, in the form of urban guerrilla tactics, known in Basque as “kale borroka” (street fighting). This paper has aimed to analyse this new phenomenon and its economic consequences. Its contribution is threefold. First, we have created a daily measure of the level of violence in the area. Second, we have examined if police action and the repressive policy measures adopted by government have been effective in reducing the intensity of violence. Third, we have investigated whether the level of violence has had an effect on the stock market index in the Basque Country. We have improved upon earlier studies not only by using a more appropriate measure of the level of violence, but also by modelling its high degree of persistence by means of fractional integration techniques, and allowing for possible breaks.

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> 0) in the number of killings by ETA from 1968 to 2002 using the ITERATE database.

Our results, based on daily data from July 1<sup>st</sup>, 2001 to November 15<sup>th</sup>, 2005, suggest that the only effective measure to reduce violence was the banning of Herri Batasuna (HB), the radical party close to ETA supporters (the average values for the level of violence before and after the banning being 1.1184 and 0.6877 respectively). This controversial measure (which the majority of the Basque population opposes) appears to have successfully reduced the level of violence, though, at the same time, it has increased its degree of persistence. Moreover, there was a decrease in the stock market index as a result of the violence in the area, especially during the period prior to the banning of HB.

What policy measures should then be adopted on the basis of our findings? Simply banning Herri Batasuna appears not to be a recommendable policy, if one takes into account the persistence of ETA terrorism (see Barros and Alana (2006)), and the negative effects on the stock market (and possibly on growth and employment) in the region). In order to achieve a decrease in both political violence and its persistence, a political agreement seems indispensable. In its absence, one should expect ETA violence to continue in the future. Finding a way to eliminate national terrorism has become a necessity not only for economic reasons, but also to be able to focus on appropriate deterrence policies to deal with the rise of radical Islamic terrorism, which poses an increasing threat to Western societies.

## Appendix A

The LM test of Robinson (1994) for testing  $H_0$  (3) in (1) and (2) is

$$\hat{r} = \frac{T^{1/2}}{\hat{\sigma}^2} \hat{A}^{-1/2} \hat{a},$$

where  $T$  is the sample size and:

$$\hat{a} = \frac{-2\pi}{T} \sum_{j=1}^{T-1} \psi(\lambda_j) g(\lambda_j; \hat{\tau})^{-1} I(\lambda_j); \quad \hat{\sigma}^2 = \sigma^2(\hat{\tau}) = \frac{2\pi}{T} \sum_{j=1}^{T-1} g(\lambda_j; \hat{\tau})^{-1} I(\lambda_j);$$

$$\hat{A} = \frac{2}{T} \left( \sum_{j=1}^{T-1} \psi(\lambda_j)^2 - \sum_{j=1}^{T-1} \psi(\lambda_j) \hat{\varepsilon}(\lambda_j)' \times \left( \sum_{j=1}^{T-1} \hat{\varepsilon}(\lambda_j) \hat{\varepsilon}(\lambda_j)' \right)^{-1} \times \sum_{j=1}^{T-1} \hat{\varepsilon}(\lambda_j) \psi(\lambda_j) \right)$$

$$\psi(\lambda_j) = \log \left| 2 \sin \frac{\lambda_j}{2} \right|; \quad \hat{\varepsilon}(\lambda_j) = \frac{\partial}{\partial \tau} \log g(\lambda_j; \hat{\tau}); \quad \lambda_j = \frac{2\pi j}{T}; \quad \hat{\tau} = \arg \min \sigma^2(\tau).$$

$\hat{a}$  and  $\hat{A}$  in the above expressions are obtained through the first and second derivatives of the log-likelihood function with respect to  $d$  (see Robinson, 1994, page 1422, for further details).  $I(\lambda_j)$  is the periodogram of  $u_t$  evaluated under the null, i.e.:

$$\hat{u}_t = (1 - L)^{d_0} y_t - \hat{\beta}' w_t; \quad \hat{\beta} = \left( \sum_{t=1}^T w_t w_t' \right)^{-1} \sum_{t=1}^T w_t (1 - L)^{d_0} y_t; \quad w_t = (1 - L)^{d_0} z_t,$$

and  $g$  is a known function related to the spectral density function of  $u_t$ :

$$f(\lambda; \sigma^2; \tau) = \frac{\sigma^2}{2\pi} g(\lambda; \tau), \quad -\pi < \lambda \leq \pi.$$

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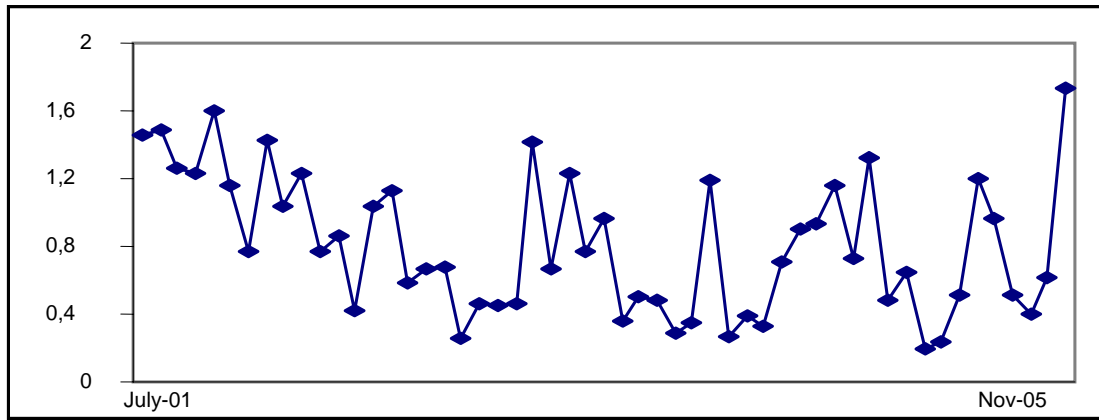
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<b>TABLE 1</b>	
Measuring the level of terrorist violence	
Level 0	No violence activity
Level 1	Very low level of violence (small acts of kale borroka)
Level 2	Low level of violence (Acts of kale borroka)
Level 3	Medium level of violence (Bombs with less than 5 kg of explosives; Kidnappings; Generalized acts of kale borroka)
Level 4	High level of violence (Bombs with more than 5 kg of explosives; Serious injuries as a consequence of a terrorist attack)
Level 5	Very high level of violence (Assassinations; Fatalities as a consequence of a terrorist attack)

<b>TABLE 2</b>				
Description of the variables used in the paper				
Name	Definition	Range	Mean	Stand. Dev.
DVI <sub>t</sub>	Level of daily Violence Intensity	[0 - 5]	0.8011	1.4644
ARR <sub>t</sub>	Number of daily arrests	[0 - 80]	0.9662	3.7355
LEAD <sub>t</sub>	Step dummy ETA leaders arrests	[0 - 14]	5.3721	6.6601
EGK <sub>t</sub>	Dummy variable for the close of EGUNKARIA	[0 - 1]	0.6253	0.7908
HB <sub>t</sub>	Dummy variable for the banning of HB	[0 - 1]	0.7360	0.8579
11-M <sub>t</sub>	Dummy variable for the 11-M attack in Madrid	[0 - 1]	0.3839	0.6196
BSM <sub>t</sub>	Bilbao daily Stock Market Index	[976.32 – 1956.35]	1410.87	1428.50

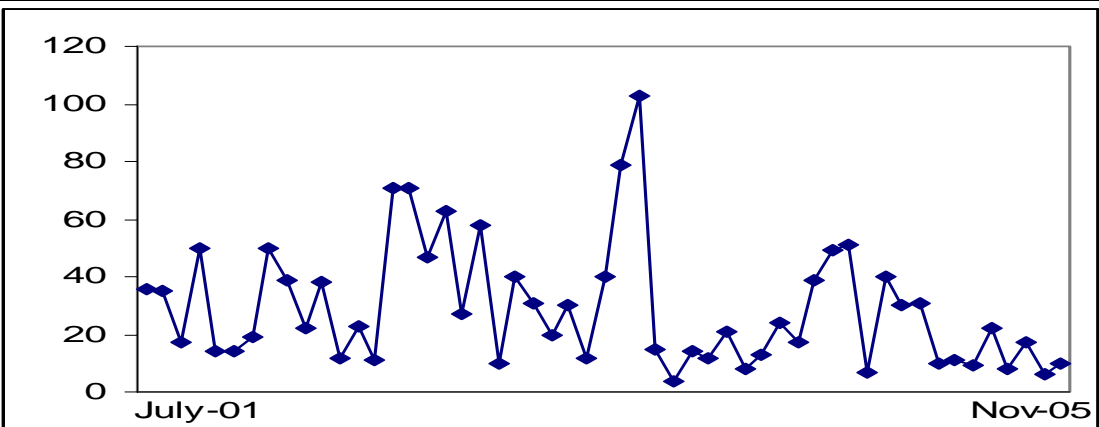
**FIGURE 1**

Monthly average of the daily level of violence intensity in the Basque Country



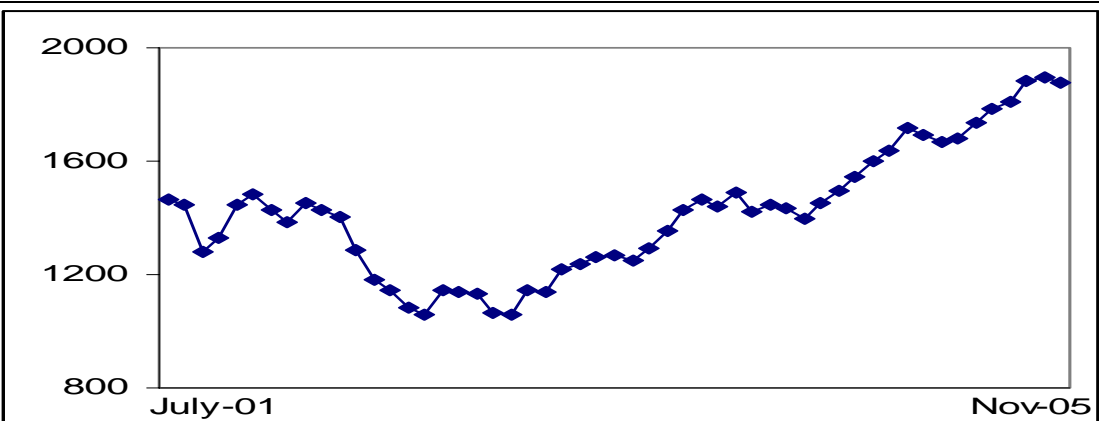
**FIGURE 2**

Monthly number of arrests related to ETA violence



**FIGURE 3**

Monthly average of the Bilbao 2000 Stock Market Index



<b>TABLE 3</b>			
<b>Estimated coefficients based on the standard I(0) regression model</b>			
	Coefficient	Standard Error	t-Statistic
<b>Constant term</b>	<b>1.131886</b>	<b>0.098763</b>	<b>11.46066</b>
ARR <sub>t</sub>	0.007656	0.008206	0.933060
LEAD <sub>t</sub>	-0.010443	0.030147	-0.346393
EGK <sub>t</sub>	-0.011525	0.174010	-0.066230
<b>HB<sub>t</sub></b>	<b>-0.414802</b>	<b>0.175394</b>	<b>-2.364973</b>
11-M <sub>t</sub>	0.085630	0.203060	0.421699
<b>AR(1) coefficient</b>	<b>0.816661</b>	<b>0.056092</b>	<b>14.55933</b>
<b>MA(1) coefficient</b>	<b>-0.709542</b>	<b>0.068595</b>	<b>-10.34392</b>

<b>TABLE 4</b>			
<b>Testing the order of integration in the regression model given by (1) and (2)</b>			
d	White noise	AR (1)	AR (2)
0.00	8.859	5.505	13.814
0.10	<b>1.184</b>	<b>1.013</b>	2.469
0.20	-3.400	-1.841	-5.025
0.30	-6.627	-4.171	-10.735
0.40	-8.950	-6.039	-15.083
0.50	-10.665	-7.534	-18.427
0.60	-11.980	-8.782	-21.085
0.70	-13.038	-9.886	-23.294
0.80	-13.903	-10.845	-25.156
0.90	-14.611	-11.655	-26.743
1.00	-15.202	-12.344	-28.129

In bold: Non-rejection values of the null hypothesis at the 5% level.



<b>TABLE 5</b>			
<b>Testing the order of integration for a shorter range of values of d</b>			
d	White noise	AR (1)	AR (2)
0.11	<b>0.647</b>	<b>0.704</b>	<b>1.627</b>
<b>0.12</b>	<b>0.130**</b>	<b>0.400</b>	<b>0.806</b>
<b>0.13</b>	<b>-0.369</b>	<b>0.101**</b>	<b>0.007**</b>
0.14	<b>-0.850</b>	<b>-0.192</b>	<b>-0.771</b>
0.15	<b>-1.314</b>	<b>-0.480</b>	<b>-1.529</b>
0.16	-1.762	<b>-0.763</b>	-2.267
0.17	-2.193	<b>-1.041</b>	-2.985
0.18	-2.610	<b>-1.313</b>	-3.684
0.19	-3.012	<b>-1.580</b>	-4.364

\*\* : Lowest statistic for each type of disturbances

<b>TABLE 6</b>			
<b>Estimated coefficients based on the standard I(0) regression model</b>			
Disturbances	White noise	AR(1) disturbances	AR(2) disturbances
	Coefficient (t-value)	Coefficient (t-value)	Coefficient (t-value)
<b>Constant term</b>	<b>1.098442 (9.211)</b>	<b>1.109670 (8.868)</b>	<b>1.118376 (9.078)</b>
ARR <sub>t</sub>	0.008816 (1.072)	0.008619 (1.048)	0.008754 (1.063)
LEAD <sub>t</sub>	-0.002560 (-0.079)	-0.003925 (-0.118)	-0.004279 (-0.132)
EGK <sub>t</sub>	-0.043013 (-0.228)	-0.048220 (-0.248)	-0.045793 (-0.240)
<b>HB<sub>t</sub></b>	<b>-0.366006 (-1.937)</b>	<b>-0.363589 (-1.865)</b>	<b>-0.371215 (-1.940)</b>
11-M <sub>t</sub>	0.036537 (0.169)	0.043704 (0.196)	0.043997 (0.201)
<b>AR(1) coefficient</b>	---	-0.011666 (-0.465)	-0.012395 (-0.494)
<b>AR(2) coefficients</b>	---	---	-0.019833 (-0.790)

<b>TABLE 7</b>		
Parameter estimates with a single break		
	White noise	AR (1) disturbances
$\alpha_1$	1.270	1.267
(t-value $\alpha_1$ )	(14.256)	(16.424)
$\alpha_2$	0.689	0.689
(t-value $\alpha_2$ )	(8.628)	(8.072)
$d_1$	0.03	0.00
$d_2$	0.14	0.15
$T_b$	May 8 <sup>th</sup> , 2002	May 1 <sup>st</sup> , 2002
AR coeff. (1 <sup>st</sup> s.)	---	0.051
AR coeff. (2 <sup>nd</sup> s.)	---	-0.013

<b>TABLE 8</b>		
Estimating the order of integration of each series		
Disturbances	$BSM_t$	$DVI_t$
White noise	[0.95 (0.97) 1.00]	[0.13 (0.15) 0.17]
AR (1)	[0.95 (0.99) 1.04]	[0.17 (0.21) 0.24]
AR (2)	[0.97 (1.03) 1.09]	[0.17 (0.23) 0.30]
Bloomfield (1)	[0.96 (0.99) 1.04]	[0.15 (0.18) 0.23]
Bloomfield (2)	[0.97 (1.02) 1.06]	[0.18 (0.21) 0.27]

<b>TABLE 9</b>							
<b>Testing the effects of violence intensity on the stock market index</b>							
Model: $BSM_t = \beta_0 + \beta_1 DVI_t + x_t; (1 - L)^d x_t = u_t; u_t$ is $I(0)$							
$u_t$	K	Conf. Interval	d	$\beta_0$ (S.E.)	$\beta_0$ (S.E.)	$\alpha_1$	$\alpha_1$
White noise	k = 0	[0.95 1.00]	0.97	1539.34 (114.00)	0.2712 (1.256)	---	---
	<b>k = 1</b>	<b>[0.95 1.00]</b>	<b>0.98</b>	<b>1539.64 (114.10)</b>	<b>-0.4656 (-2.158)</b>	---	---
	k = 2	[0.95 1.00]	0.98	1570.30 (116.30)	-0.0002 (-0.001)	---	---
	k = 3	[0.95 1.00]	0.97	1560.14 (115.54)	-0.0091 (-0.042)	---	---
AR (1)	k = 0	[0.95 1.04]	0.99	1538.18 (113.86)	0.2725 (1.275)	-0.027	---
	<b>k = 1</b>	<b>[0.95 1.03]</b>	<b>0.98</b>	<b>1538.07 (114.06)</b>	<b>-0.4644 (-2.165)</b>	<b>-0.018</b>	---
	k = 2	[0.94 1.04]	0.98	1568.71 (116.38)	-0.0012 (-0.005)	-0.017	---
	k = 3	[0.93 1.03]	0.99	1558.55 (115.67)	-0.0091 (-0.042)	-0.018	---
AR (2)	k = 0	[0.97 1.10]	1.03	1539.79 (114.14)	0.2744 (1.310)	-0.068	-0.049
	<b>k = 1</b>	<b>[0.94 1.08]</b>	<b>1.01</b>	<b>1539.58 (114.21)</b>	<b>-0.4608 (-2.181)</b>	<b>-0.047</b>	<b>-0.035</b>
	k = 2	[0.93 1.10]	1.01	1571.54 (116.62)	-0.0086 (-0.040)	-0.038	-0.031
	k = 3	[0.92 1.10]	1.00	1561.09 (115.88)	-0.0056 (-0.026)	-0.030	-0.026

$BSM_t$  is the stock market index and  $DVI_t$  is the violence intensity.

<b>TABLE 10</b>		
Parameter estimates with a single break		
	White noise	AR (1) disturbances
$\alpha_1$	1539.47	1539.31
(t-value $\alpha_1$ )	(89.801)	(86.333)
$\beta_1$	-1.033	-0.730
(t-value $\beta_1$ )	(-2.216)	(1.484)
$\alpha_2$	1259.37	1195.84
(t-value $\alpha_2$ )	(105.02)	(104.23)
$\beta_2$	-0.197	-0.039
(t-value $\beta_2$ )	(-0.019)	(0.177)
$d_1$	1.03	0.97
$d_2$	0.95	0.98
$T_b$	July 4 <sup>th</sup> , 2002	July 29 <sup>th</sup> , 2002
AR coeff. (1 <sup>st</sup> s.)	---	0.071
AR coeff. (2 <sup>nd</sup> s.)	---	-0.062