Emotions in Macroeconomic News and their Impact on the European Bond Markets

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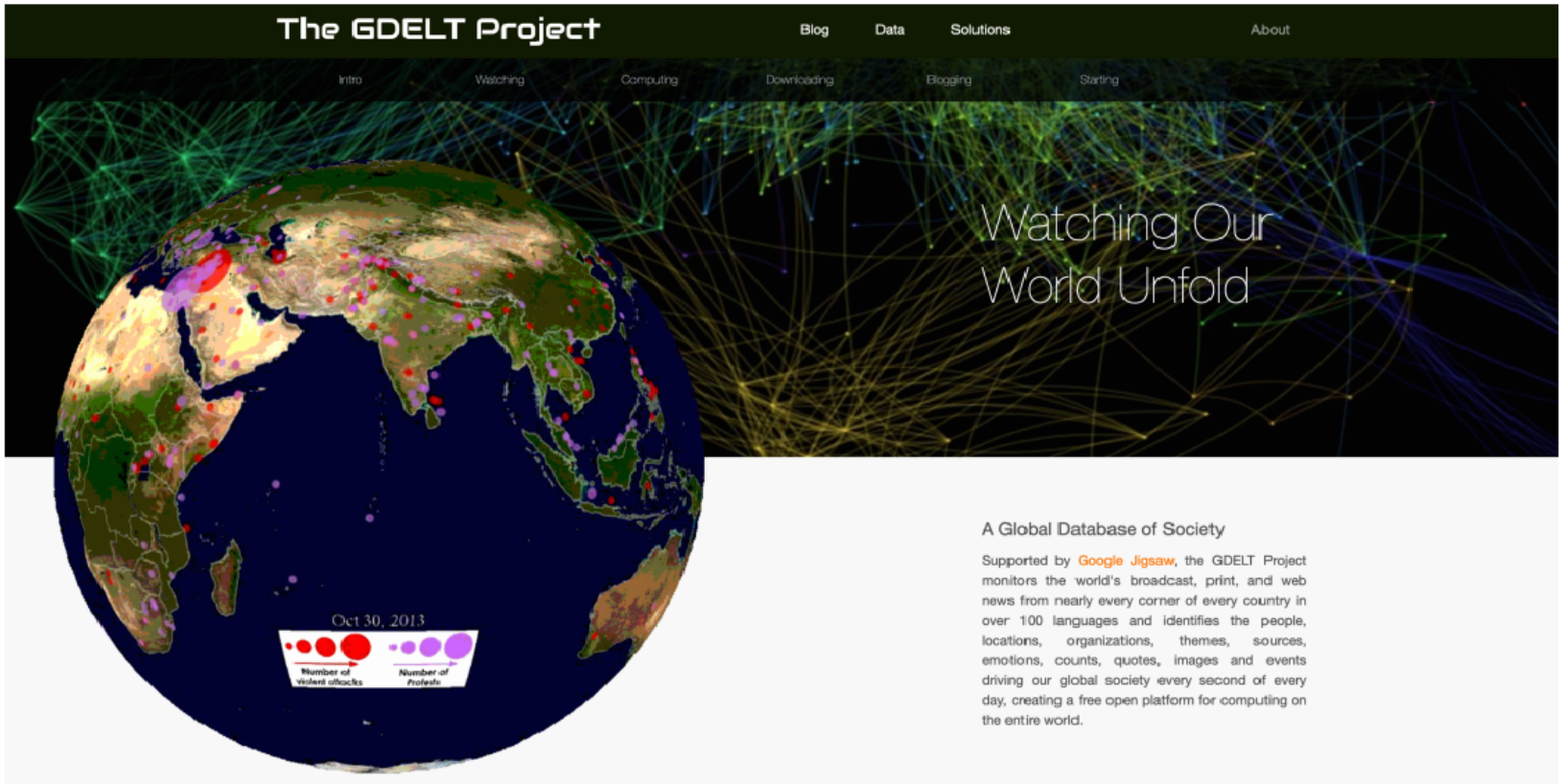
Centre for Advanced Studies

- **BigNOMICS project: Big Data and Economic Forecasting**
  - Team: Sebastiano Manzan (Lead Scientist), Luca Barbaglia, Sergio Consoli, Elisa Tosetti and Luca Tiozzo Pezzoli
- **Objective**: Can we use big data to
  - understand and predict economic/financial phenomena?
  - monitor the business cycle in real time?
- **Current Projects**:
  - Regional variation in household debt and the economic slump in Europe
  - Loan default analysis in Europe
  - News and spreads
  - Nowcasting with news

Introduction

- Economic and political events often produce movements in the spread between government yields relative to a benchmark (e.g., German bund)
- Economists typically use proxies for credit and liquidity risks and measure risk aversion to explain these spreads
- Can news provide the additional sentiment about economic and political uncertainty that is priced in the spread?
  - Binary sentiment classification: Tetlock et al. (2008) and Loughran and McDonald (2011)
  - Multivariate emotional classification: Strapparava and Validutti (2004)

GDELT: Global Data on Events, Location and Tone



https://www.gdeltproject.org/

GDELT: Global Data on Events, Location and Tone

- **GDELT is an open Big Data platform on worldwide news that**:
  - Provide translation in 65 languages
  - Extract people, locations, organizations, counts, quotes, images and million of themes from common used practitioners topical taxonomies
  - Measures thousands of emotional dimensions expressed by means of popular dictionaries in the literature
  - Collect and analyze over 88 milion articles a year and more 180000 news outlets. Dimension of around 8TB (growing 2TB each year)
  - Real-time

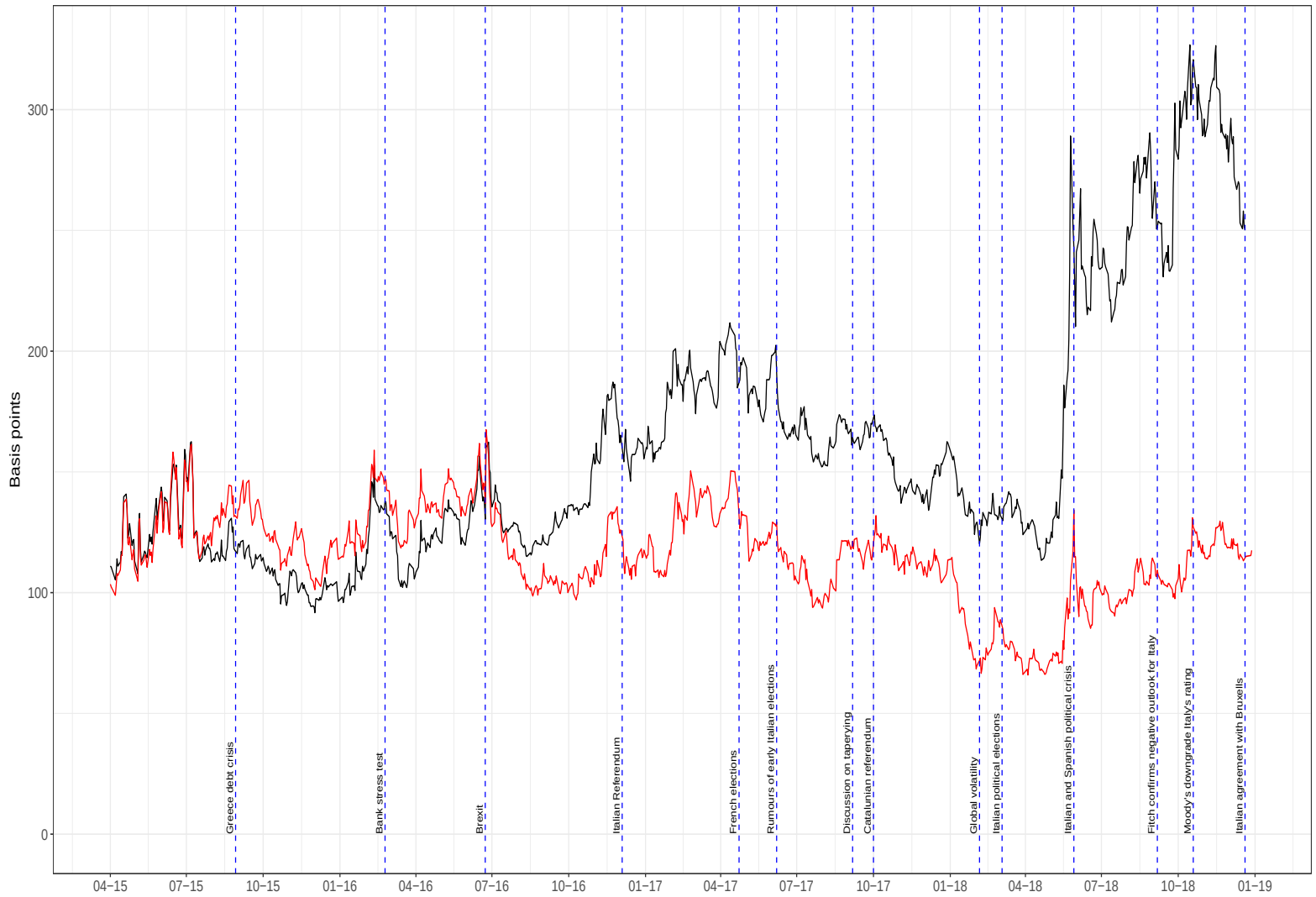
GDELT: Features of the Data

- **For each news article recorded in the data set (Global Knowledge Graph - GKG)**
  - Topics: selected among over 2,300 themes (e.g., taxes, trade, interest rate, etc.)
  - The average tone of the document as a whole
  - 2230 emotional dimensions: density (number of words) of emotions (e.g. Anxiety) according to many different dictionaries (e.g. McDonald and Loughran (2011) and WordNet Affect of Strapparava and Validutti (2004))
  - List of locations (with latitude and longitude)
  - List of persons and organizations
  - Exact position in the article of the above to carry proximity analysis

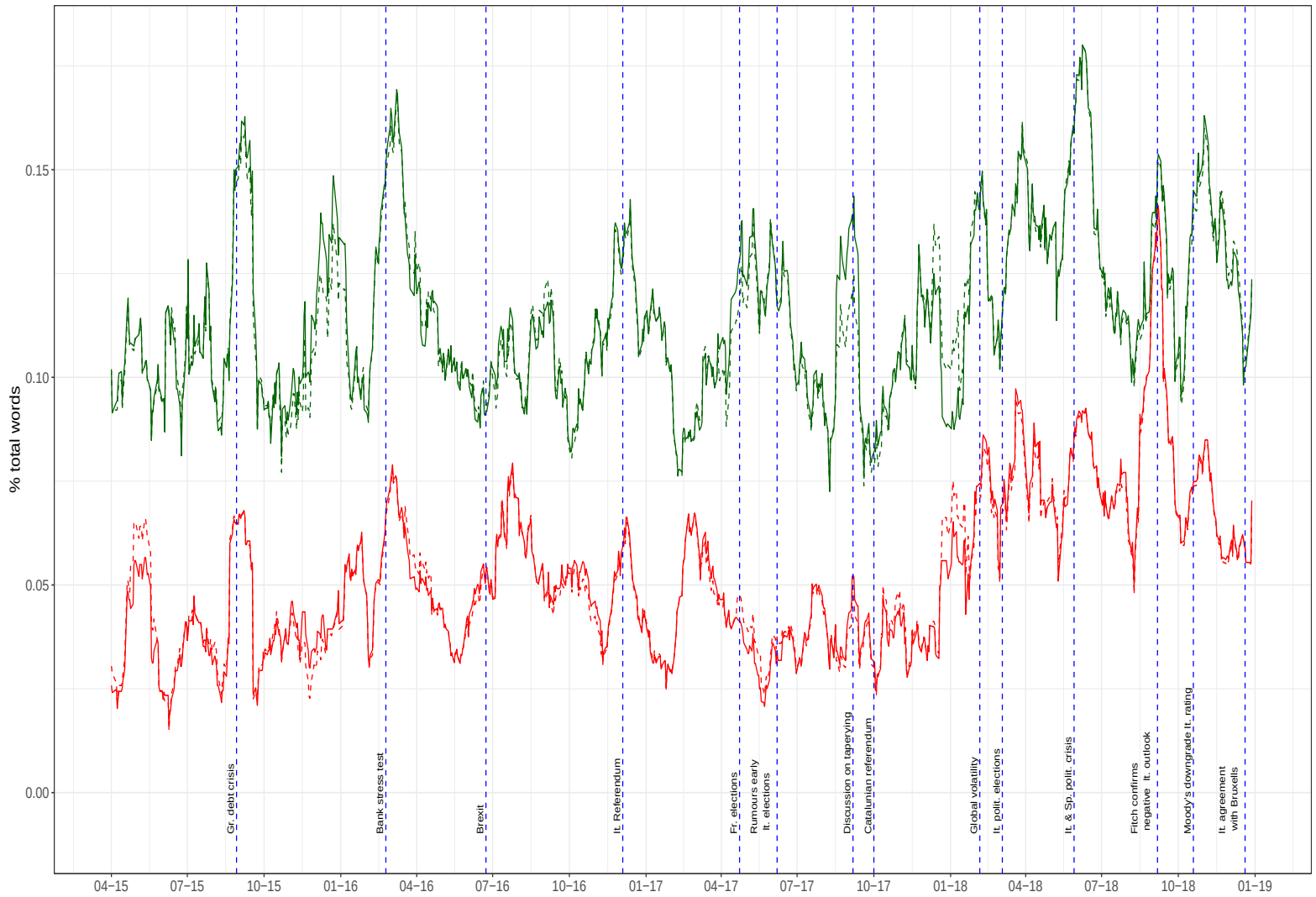
Data Extraction

- **Extract news articles mentioning Italy and Spain from March 2015 to December 2018**
  - **ElasticSearch**: NoSQL, open source database for classification and retrieval of news
- **We selected articles that might provide a signal for spread**
  - World Bank Taxonomy:
    Macroeconomic Vulnerability and Debt, Macroeconomic and Structural Policies (50% threshold)
  - Main Locations:
    Italian and Spanish news mentioning national and across nations events
  - Emotions:
    Anxiety and Panic from WordNet-Affect dictionary

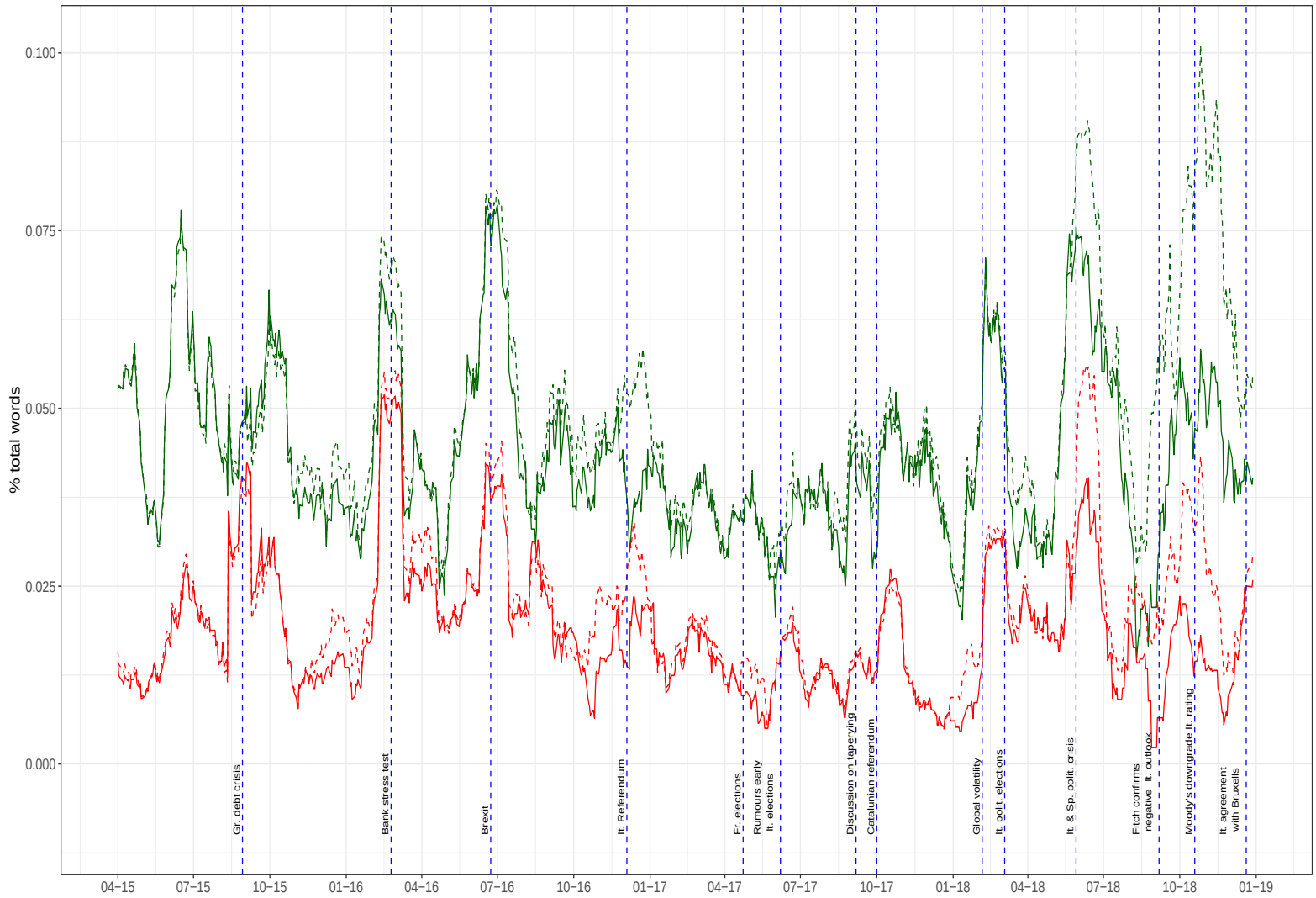
Italian and Spanish spreads



Emotions (Italy)



Emotions (Spain)



In-sample Analysis

- **We use a quantile regression model**
  - $q_\tau(\Delta Spread_{i,t}) = f(CR_{i,t}, LIQ_{i,t}, RAVE_{i,t}, EMOTION_{i,t})$

where

- $\Delta Spread_t^i$: change of the yield spread between country i and German bund in day t
- CRD_t^i: credit risk of country i in day t
- LIQ_t^i: liquidity risk of country i in day t
- $RAVE_t^i$: risk aversion in day t
- $EMOTION_t^i$: variables extracted from GDELT (sentiment or themes)

Italy - National Events

	Dependent variable: $\Delta Spread_t^{0.95}$			
$Anxiety_t$	39.754^{***}			
	(14.272)			
$Panic_t$		48.400^{**}		
		(19.236)		
LM $negative_t$			3.814^{***}	
			(1.255)	
CRD_t	-3.175^{***}	-3.201^{***}	-3.157^{***}	-3.095^{***}
	(0.465)	(0.442)	(0.285)	(0.405)
ΔLIQ_t	1.496^{***}	2.324^{*}	1.329	2.753^{*}
	(0.291)	(1.379)	(1.627)	(1.579)
$\Delta RAVE_t$	0.024	0.062	-0.312	-0.232
	(0.332)	(0.361)	(0.320)	(0.316)
Constant	4.381^{***}	6.137^{***}	-2.050	8.417^{***}
	(1.288)	(0.943)	(3.237)	(0.542)
R^2	0.273	0.272	0.278	0.255
ANOVA test	[0.00]	[0.01]	[0.00]	–

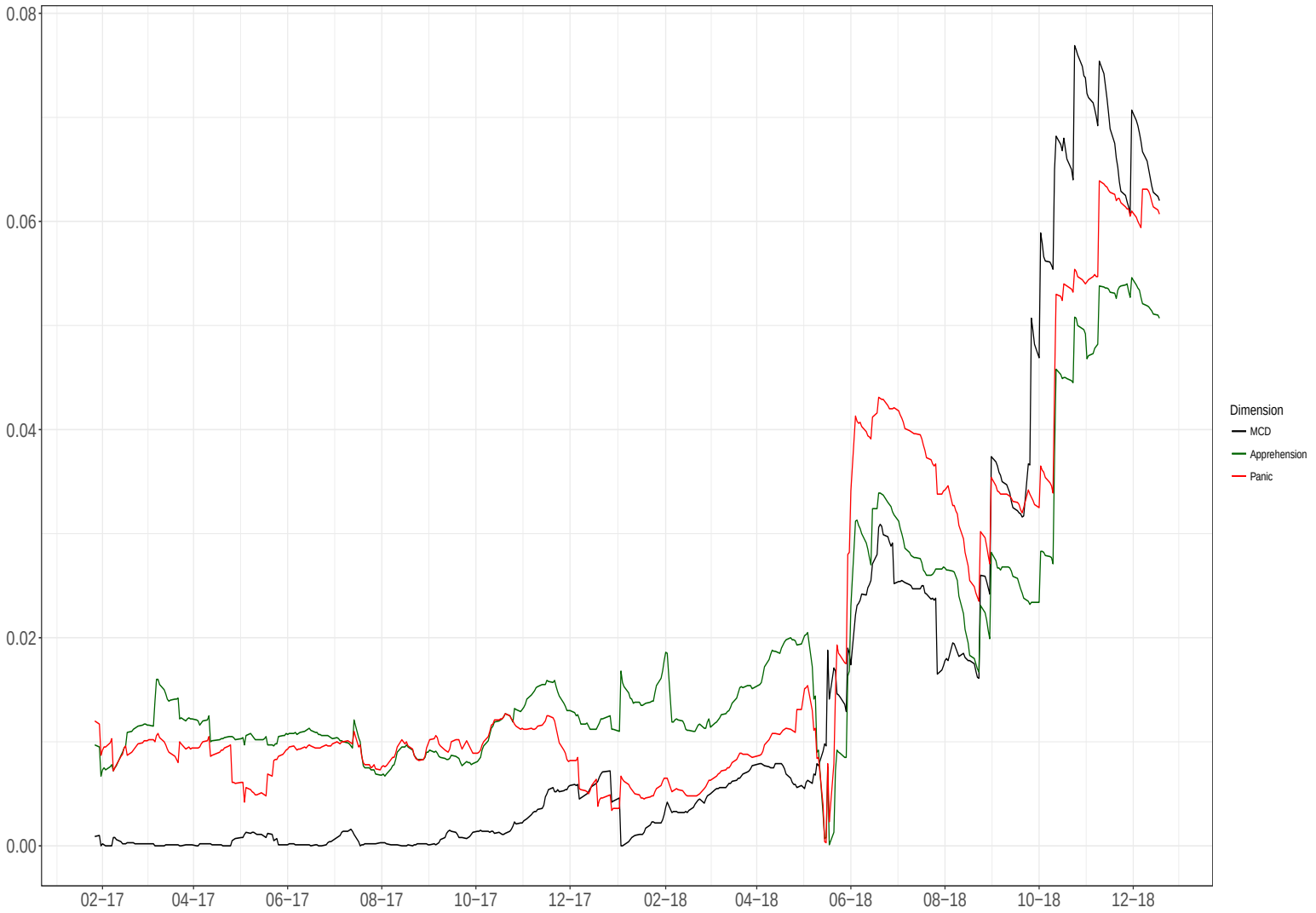
Spain - National Events

	Dependent variable: $\Delta Spread_t^{0.95}$			
$Anxiety_t$	37.202^{**}			
	(17.661)			
$Panic_t$		61.322^{***}		
		(15.382)		
LM $negative_t$			0.621	
			(0.712)	
CRD_t	-2.767^{***}	-2.784^{***}	-2.639^{***}	-2.752^{***}
	(0.477)	(0.479)	(0.375)	(0.406)
ΔLIQ_t	0.651	0.855	0.849	0.992
	(0.778)	(0.776)	(0.874)	(0.873)
$\Delta RAVE_t$	-0.221	-0.228	-0.063	-0.177
	(0.426)	(0.429)	(0.432)	(0.314)
Constant	4.942^{***}	5.402^{***}	4.218^{*}	6.670^{***}
	(0.891)	(0.491)	(2.550)	(0.478)
R^2	0.212	0.214	0.208	0.207
ANOVA test	[0.04]	[0.00]	[0.38]	–

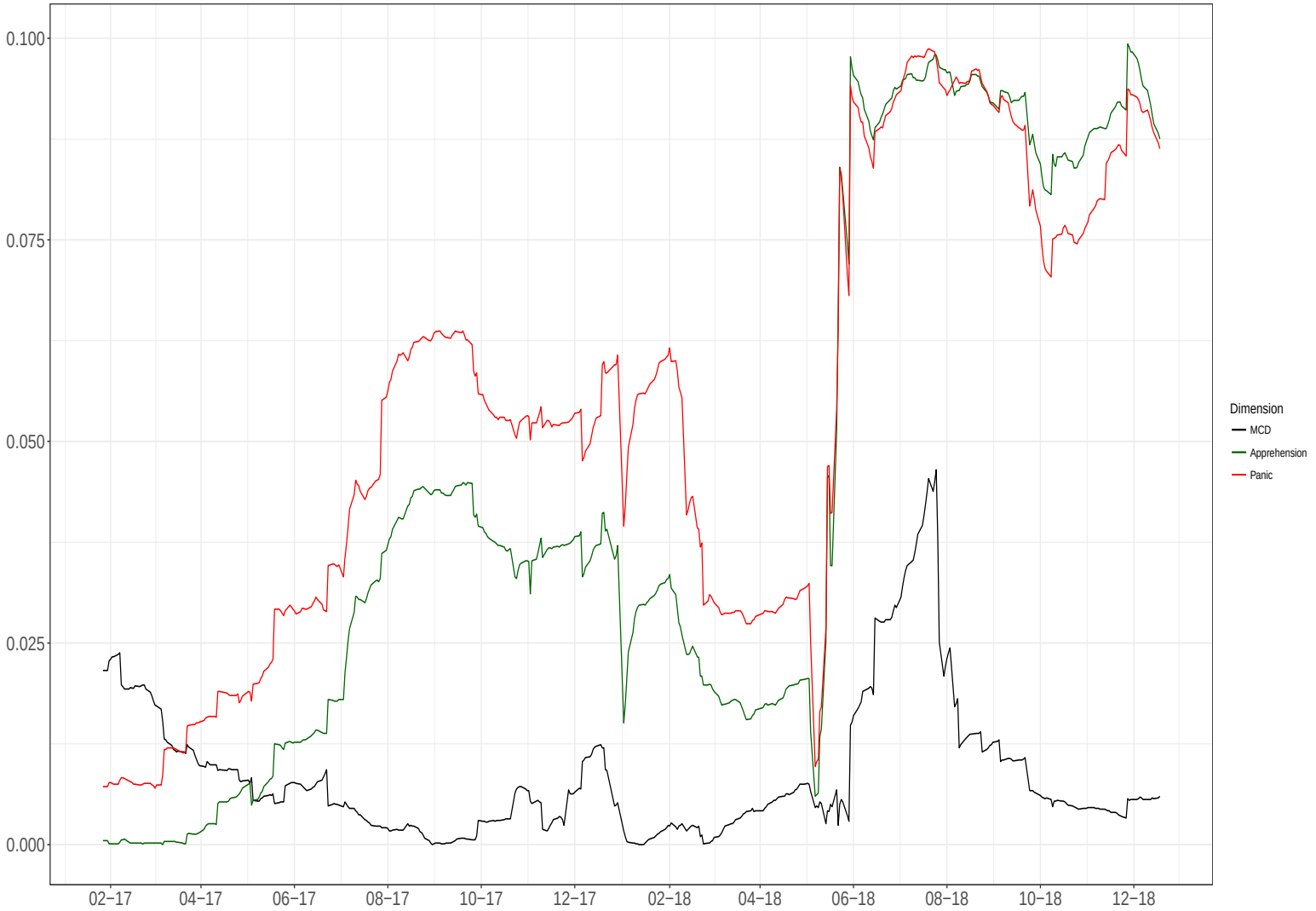
Spain - International events

	Dependent variable: $\Delta Spread_t^{0.95}$			
Anxiety$_t$	33.444*			
	(17.288)			
Panic$_t$		70.472***		
		(25.531)		
LM negative$_t$			0.867	
			(1.044)	
CRD_t	−2.770***	−2.883***	−2.574***	−2.752***
	(0.516)	(0.354)	(0.544)	(0.406)
ΔLIQ_t	0.674	0.355	0.829	0.992
	(0.634)	(0.752)	(0.992)	(0.873)
$\Delta RAVE_t$	−0.224	−0.348	−0.025	−0.177
	(0.440)	(0.236)	(0.353)	(0.314)
Constant	5.066***	5.219***	3.300	6.670***
	(0.947)	(0.621)	(3.820)	(0.478)
R^2	0.211	0.219	0.208	0.207
ANOVA test	[0.05]	[0.01]	[0.41]	–

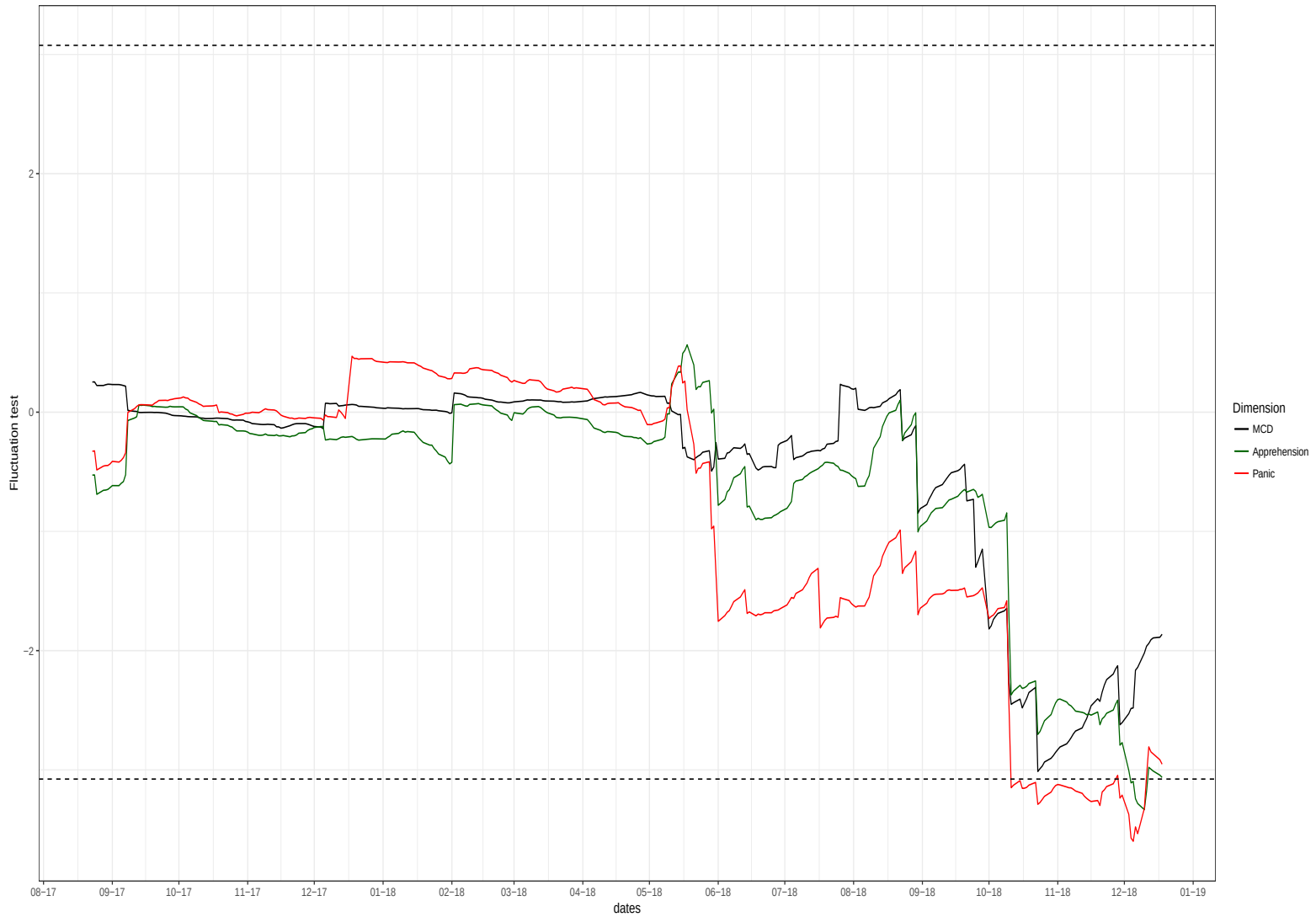
Italy rolling R^2



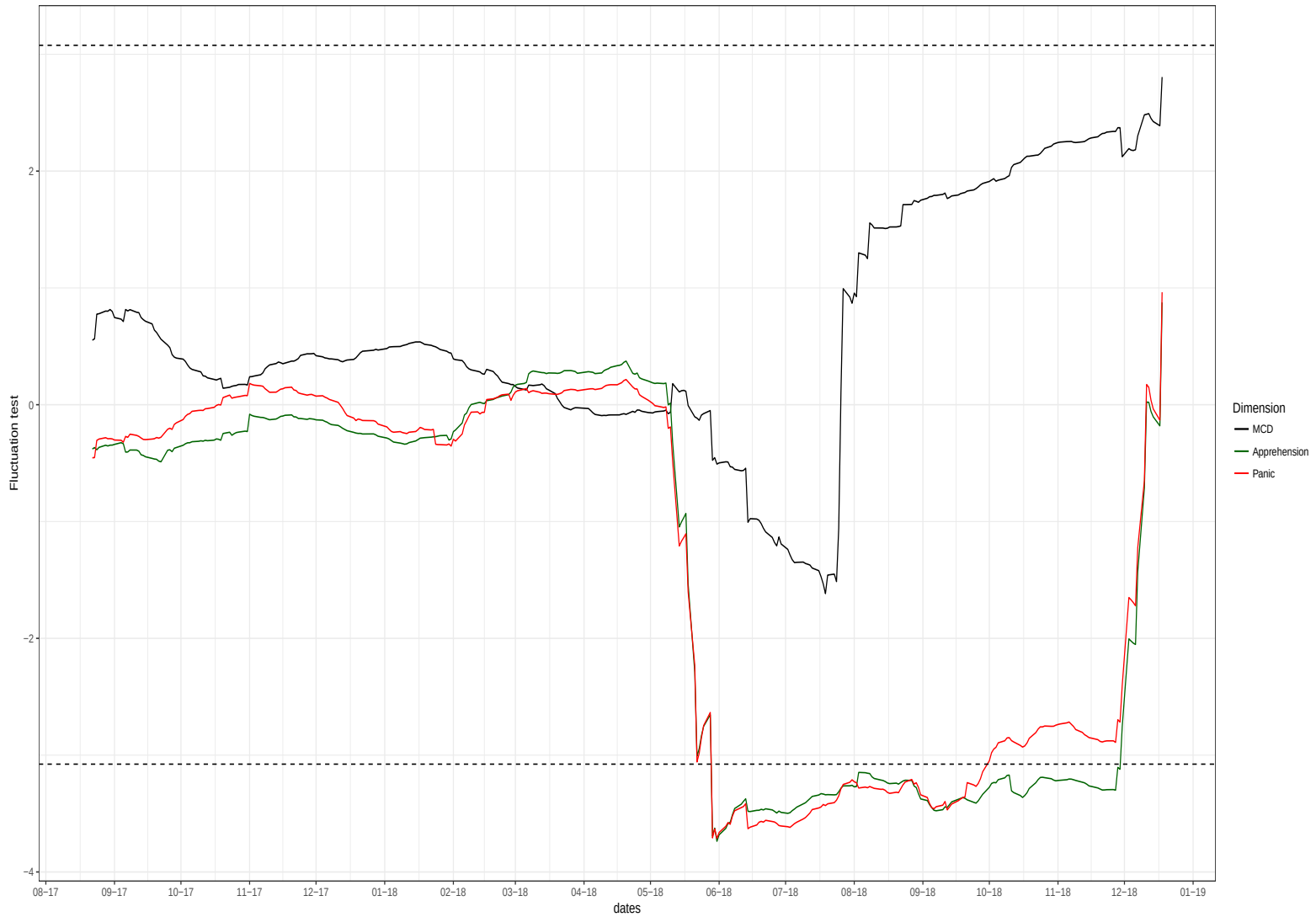
Spain rolling R^2



Out-of-Sample Analysis: Italy



Spain


Fluctuation test
2
0
−2
−4
08−17
09−17
10−17
11−17
12−17
01−18
02−18
03−18
04−18
05−18
06−18
07−18
08−18
09−18
10−18
11−18
12−18
01−19
dates
Dimension
MCD
Apprehension
Panic

Conclusion

- **Topic frequencies and sentiment indicators are useful to explain the extreme movement of spread**
  - Spreads seems to be associated with sentiment of diffidence, frustration and gratefulness (WordNet Affect 1.1 - Strapparava and Valitutti (2004)) which are related to the concept of uncertainty
  - Political Risk is captured by the political parties theme
- **News seems to be useful predictors in addition to traditional financial variables**