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## **The Greek Tragedy**

Narratives and Imagined Futures  
in the Greek Sovereign Debt Crisis

Jens Beckert and Lukas Arndt



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## Abstract

Between 2009 and 2015 Greece underwent a profound sovereign debt crisis that led to a serious political crisis in Europe and the restructuring of Greek debt. We argue that the prevalence of negative narratives about the future contributed to the changes in spreads of Greek bonds during the crisis. We support our argument by presenting results from text mining a corpus of 9,435 articles from the *Financial Times* and the *Wall Street Journal*. Based on sentiments and a machine learning model predicting future reference, we identify newspaper articles which generate negative and uncertain outlooks for the future in the expert discourse. We provide evidence from time series regression analysis showing that these negative imagined futures have explanatory power in models estimating spread development of Greek vs. German sovereign bonds. We suggest that these findings provide good evidence for the relevance of “imagined futures” for investors’ behavior, and give directions for an innovative contribution of sociology to understanding the microfoundations of financial crises.

**Keywords:** bond spreads, economic sociology, financial markets, Greek debt crisis, imagined futures, sentiment analysis, sovereign debt, valuation

## Zusammenfassung

Zwischen 2009 und 2015 durchlebte Griechenland eine tiefgreifende Staatsschuldenkrise, die zu einer schweren politischen Krise in Europa und zur Umstrukturierung der griechischen Schulden führte. Wir argumentieren, dass die Prävalenz negativer Narrative über die Zukunft zu den Veränderungen der Spreads griechischer Anleihen während der Krise beigetragen hat. Zur Untermauerung dieser These präsentieren wir die Ergebnisse der Textanalyse eines Korpus von 9.435 Artikeln aus der *Financial Times* und dem *Wall Street Journal*. Auf der Grundlage von Sentiments und einem maschinellen Lernmodell zur Erkennung von Zukunftsvorhersagen identifizieren wir Zeitungsartikel, die negative und unsichere Zukunftsaussichten im Expertendiskurs erzeugen. Wir zeigen anhand von Zeitreihen-Regressionsanalysen, dass diese negativen Zukunftsvorstellungen Erklärungskraft in Modellen zur Schätzung der Spread-Entwicklung von griechischen gegenüber deutschen Staatsanleihen haben. Diese Ergebnisse liefern Evidenz für die Relevanz imaginierter Zukünfte für das Verhalten von Anlegern und ermöglichen einen innovativen Beitrag der Soziologie zum Verständnis der Mikroebene von Finanzkrisen.

**Schlagwörter:** Anleihen-Spreads, Bewertung, Finanzmärkte, griechische Schuldenkrise, imaginierte Zukünfte, Staatsverschuldung, Sentimentanalyse, Wirtschaftssoziologie

**Contents**

1	Introduction	1
2	Explaining the Greek sovereign debt crisis	3
	Macroeconomic fundamentals	3
	Market sentiment	7
3	The model: Imagined futures as mediators between economic facts and decision making	8
4	Research design	11
	Hypotheses	11
	Sample	12
	Main independent variable	14
	Outcome and confounding variables	17
	Estimation strategy	18
5	Results	19
6	Conclusion	22
	References	23

# The Greek Tragedy: Narratives and Imagined Futures in the Greek Sovereign Debt Crisis

## 1 Introduction

Financial crises strike societies at a fundamental level but often seem unforeseeable. It is for this reason that their explanation and the possibility of predicting them occupy a prominent place in the social sciences. This holds for economic history and economic theory (Akerlof and Shiller 2009; Eichengreen 1996; Kindleberger and Aliber 2005; Minsky 1986; Reinhart and Rogoff 2009), but also for economic sociology (Deutschmann 2019; Krippner 2012; Lounsbury and Hirsch 2010; MacKenzie 2011; Beunza and Stark 2004) and political economy (Boyer 2018; Fouskas and Dimoulas 2013; Streeck 2014; Fligstein 2021; Blyth 2015).

In this paper we expand on a sociological explanation of financial crises. Based on an analysis of the Greek debt crisis between 2009 and 2015, we argue that the explanation of financial crises should put the shifts of future narratives circulating in financial markets front and center. It is through cognitive framing by narratives articulating imaginaries of the future that the expectations of market actors are shaped (Zuckerman 1999; Kennedy 2008). These expectations in turn determine the assessment of risks and thus the willingness to buy or sell assets. We argue that, given the Knightian uncertainty (Knight 1921) actors face in financial crises, expectations are not determined by available information and a dominant economic model toward which actors converge. Because of Knightian uncertainty, information necessarily becomes interpreted in contingent ways. The accounts on which expectations are based are “imagined futures” (Beckert and Bronk 2018; Beckert 2016; Jessop 2013) through which actors make sense of the situation (Weick 1995; Maitlis and Christianson 2014; Gephart, Topal, and Zhang 2010). Imagined futures (we also use the term “future narratives”) are not true or false, but rather credible or unconvincing to actors. If they are seen as credible, they frame the situation and serve as “placeholders,” meaning that actors are willing to act *as if* the future would indeed unfold as anticipated, even though uncertainty prevents the probabilistic foreknowledge of outcomes. *In this sense*, expectations under conditions of uncertainty are fictional.

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We develop this idea in discussion with economic theories that proceed from clearly defined microfoundations to explain economic outcomes, most importantly the rational expectations hypothesis (REH). From the background of a critical assessment of the REH, our paper attempts to help laying the groundwork for developing *sociologically informed microfoundations* for the explanation of financial crises. To test the relevance of imagined futures, we investigate the expert discourse in financial markets during the Greek debt crisis as represented in media reporting on the crisis. We are interested in the effects of these framings on the assessments of investors regarding the perceived likelihood of Greek debt repayment and thus on bond prices.

Instead of directly following variation in the content of dominant imagined futures, we suggest a measure for negative-uncertain future narratives. We find that the spread of pessimistic narratives of the future can be seen as shattering confidence in the value of Greek bonds, amplifying and possibly triggering the crisis. We thus show a mechanism for how the imagined futures in narrative accounts – expressed in media reports reflecting narratives circulating in the expert world of investors, analysts, politics, central banks, and international organizations – are associated to investment. This association is demonstrated while controlling for standard measures of economic fundamentals. To support the claim of the relevance of the future narratives, we also provide evidence that the negative imagined futures influencing bond spreads had possible alternative frames; throughout the crisis some of the commentators advocated more optimistic interpretations of the Greek financial situation.

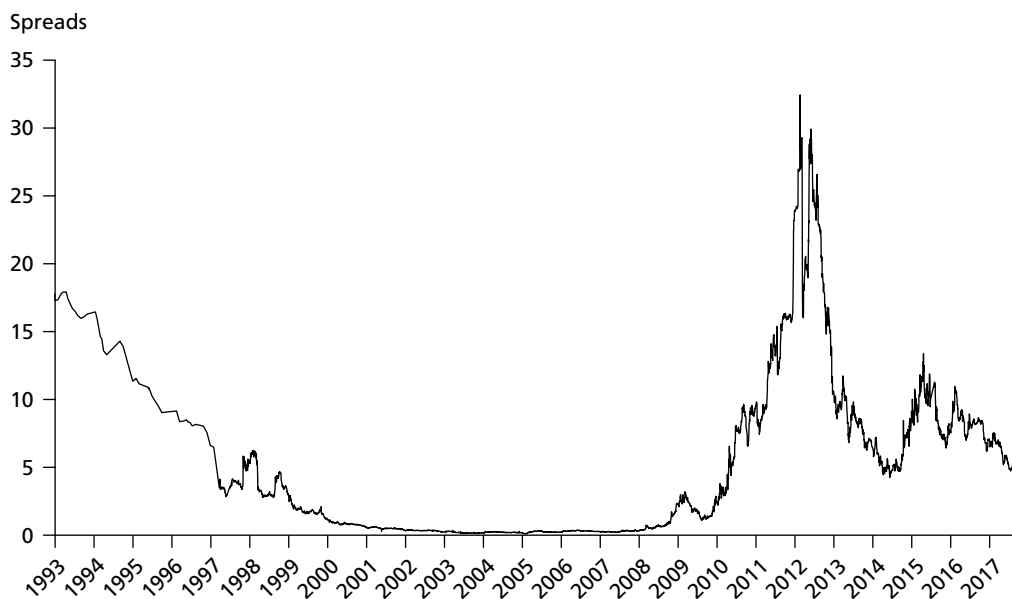
To provide evidence for the suggested mechanism, we describe measures of sentiment and reference to the future applied to a corpus of newspaper articles on the Greek economy from the *Financial Times* and the *Wall Street Journal*, published between 2009 and 2015. We develop a measure based on the combination of negative-uncertain sentiment among articles that refer to the future as a proxy for narratives that imagine a pessimistic future for Greek bonds. We test for the effect of this measure on the yield spread of Greek sovereign bonds with time series regression analysis controlling for other common associations identified in the literature.

We begin by giving a short overview of the Greek sovereign debt crisis and reviewing existing explanations for the development of the yield spread of Greek bonds during the crisis. Section three introduces the role of imagined futures in financial markets and crises. We suggest the mechanism for how narratives are associated with market actors' risk perception and, for our case, Greek bond spreads. Section four introduces our hypotheses, sample, measures, and estimation strategy. In conclusion, we discuss the results and their implications.

## 2 Explaining the Greek sovereign debt crisis

Between 2009 and 2015 Greece experienced a severe sovereign debt crisis, which led in 2011 to a 50 percent “haircut” on debt owed to private banks, to the failure to repay an IMF loan in 2015, and to a total of more than 320 billion euro in bailout loans (in 2010, 2012, and 2015) provided by the IMF, the Eurogroup, and the ECB. The Greek sovereign debt crisis is usually visualized by a graph showing the yield spread between Greek sovereign debt and German government bonds (Figure 1). This spread signals the assessment by financial markets of the riskiness of investments into Greek sovereign debt at any given point in time. The long-term graph shows three phases: a phase of convergence from the early 1990s related to the introduction of the euro in 2001; a phase of near parity until 2009; and a phase of strong divergence since 2009. We focus on the last of these phases in order to analyze one instance of narrative shift with precision. We present three types of explanations for sovereign bond pricing before introducing a new additional mechanism to account for spread development.

Figure 1 Convergence, near-equality, and divergence. Development of the spread between interest rates on Greek sovereign bonds compared to German bonds from 1993 to 2017 (percentage points)



Source: based on data from Eurostat (2017).

### Macroeconomic fundamentals

What explains the sudden rise in bond spreads? In macroeconomics, sovereign debt crises are explained by changes in economic fundamentals, such as vast increases in public debt, increases in interest rates, currency devaluation, and the decline in economic growth, leading to reduced repayment capacity on the part of the state due to fiscal constraints (Minsky 1992; 1986; Reinhart and Rogoff 2009).

For spreads of EMU countries' bonds, these studies provide mixed evidence for the level of short-term interest rates (Manganelli and Wolswijk 2007; Migiakis and Malliaropoulos 2016) and expected budget deficits and government debt ratios relative to Germany (Attinasi, Checherita-Westphal, and Nickel 2009). Fiscal imbalances were strongly related to sovereign debt spreads after 2009 (Alfonso, Arghyrou, and Kontonikas 2015; Aßmann and Boysen-Hogrefe 2012; Beirne and Fratzscher 2013; Ramirez and Menhem 2012; Schuknecht, von Hagen, and Wolswijk 2010). Generally, macroeconomic fundamentals are seen as important to explain EMU government bond spreads.

Despite this evidence, it seems questionable whether bond spreads are simply a mirror image of the macroeconomic situation as represented in the statistical indicators. A first sign for this is that the studies on long-term spread development in the euro countries show that market actors seem to have completely disregarded varying macroeconomic performance during the phases of convergence and stability (1990s to 2008), especially differences in fiscal sustainability (see also Buiter and Sibert 2005).

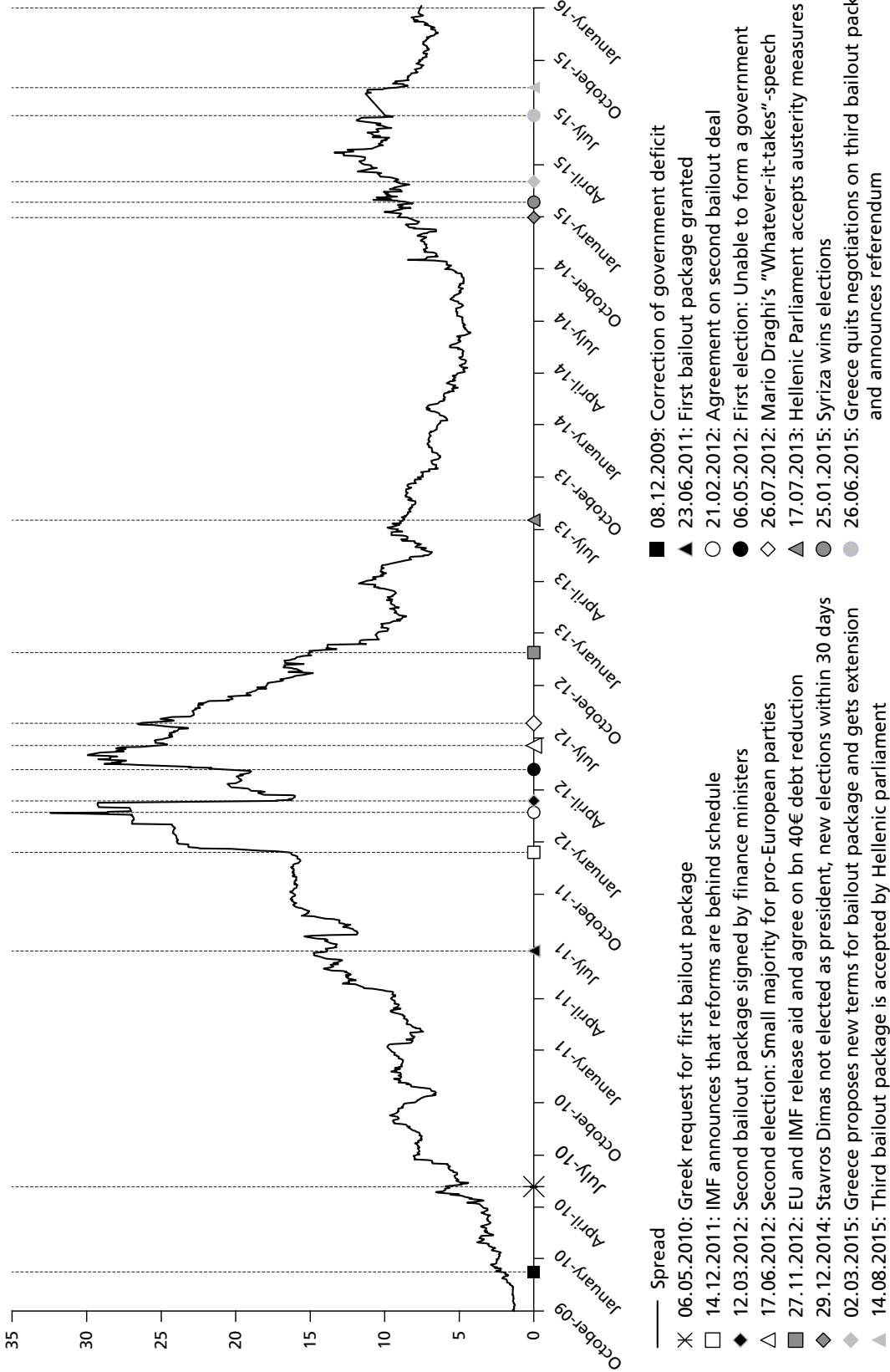
More signs for the limits of explanations that merely rely on macroeconomic indicators are provided by studies on Greece, the country standing at the core of the European crisis. It is especially argued for Greece that yield spreads did not appropriately reflect fiscal imbalances before the financial crisis due to the lack of reliable statistics and ignorance regarding information on existing bailout regulations (Gourinchas, Philippon, and Vayanos 2016). At the same time, there is evidence that the steep rise of yields in the Greek crisis overshoot relative to the macroeconomic situation (Gibson, Hall, and Tavlás 2012). Further evidence suggests that the market reaction to fundamentals such as GDP growth or debt stock was stronger for Greece than other EMU countries (Gibson, Hall, and Tavlás 2015; Gourinchas, Philippon, and Vayanos 2016).

That the effects of macroeconomic fundamentals on yield spreads are far from straightforward is also confirmed by a closer look at the timeline of yield spreads (Figure 2). The first divergence in yields of German and Greek sovereign bonds took place immediately during the financial crisis in 2008 and 2009. Here it appears that the financial crisis was a "wake-up call" (cf. Goldstein 1998) for investors who developed higher risk aversion given the experience of the global financial crisis. Though Greece was not the focus of the financial crisis, investors developed higher sensitivity to possible risks in the Greek bond market. At this point it was not a change in macroeconomic fundamentals as such that put pressure on Greek bonds, but rather a changed framing of the global financial situation that led to a changed interpretation of existing risks.

The dramatic reassessment of risks associated with Greek sovereign bonds came about with the revision of the projected government deficit in December 2009. This was arguably new information on fundamentals, which was subsequently priced in by the markets. But at the same time, it had been publicly known since the accession of Greece into the EMU that official government statistics in Greece were unreliable and frequently corrected (Streeck 2014).



Figure 2 The Greek sovereign debt crisis: Timeline of selected events relevant to the spread between interest rates on Greek and German long-term government bonds



From December 2009 onwards, spreads show a more or less continuous increase from little more than 2 percent to almost 17 percent in December 2011. During this time Greece requested a first bailout package from the European Union (EU) and the International Monetary Fund (IMF). This package, which improved the payment capacity of the Greek state and thus macroeconomic fundamentals, did not, contrary to what one would expect, have a decisive effect on the trend of spread development. Instead Greek bonds experienced the largest and most sudden spread increases between December 2011 and the winter of 2012. Ramirez and Menhem (2012) argue that investors at some point started to believe that the austerity measures mandated by the first bailout package in 2010 would lead to a self-reinforcing Greek recession, which would further deteriorate the fiscal situation and therefore make repayment less likely. Hence, an existing situation was reinterpreted based on a new future narrative.

On December 13, 2011, the IMF released its fifth review of the implementation of Greece's fiscal reforms and held a conference call to announce a negative update of growth projections for Greece (IMF 2011a; 2011b). This information revised expectations on the future payment capacity of the Greek state among investors. At this point, spreads shot up to about 25 percent and finally reached their crisis peak of roughly 32 percent on February 21, 2012. On this day the eurozone finance ministers agreed on the second bailout package of 130 billion euro. Following this, spreads showed the first relevant decrease since the summer of 2011.

It was not before the bailout package was signed by the eurozone finance ministers on March 13, 2012, that spreads dropped to 15 percent. However, perceived political instability, including two elections in 2012, raised market uncertainty again, until a stable pro-European government was elected in June 2012. The real turning point only came with ECB President Mario Draghi's speech on July 26, 2012, in which he famously announced that "the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough" (Draghi 2012). The impact of changes in the political situation and of Draghi's speech sheds additional critical light on attempts to explain yield spreads exclusively in relation to macroeconomic fundamentals. Neither of these events as such changed fundamentals, nor was it possible to calculate their actual impact. Rather they changed investors' expectations based on a contingent interpretation of their impact on the future sustainability of the European single currency project and specifically that Greece's sovereign debt would be repaid. Market movements are undoubtedly connected to unscheduled events that impact assessments of the future macroeconomic situation and thus the perception of risk. But what determines the effects of such events on expectations? We are arguing that when "investors face ambiguity about the likelihood of possible future outcomes under uncertainty they invoke narratives that assist in their interpretations of novel event's impacts on future returns" (Mangee 2021, 67).

## Market sentiment

Within economics, indications that financial crises are associated with expectations that deviate from economic fundamentals are provided by empirical studies, often from the field of behavioral economics, that identify contagion, herding, market sentiment, selective memory, or self-fulfilling prophecies as mechanisms influencing investor decisions and yield development (De Grauwe and Ji 2013; Giordano, Linciano, and Soccorso 2012; Spyrou 2013; Gennaioli and Shleifer 2018; Georgoutsos and Migiakis 2017; Mangee 2021).

Behavioral economists consider that expectations can be sticky, overreacting, or extrapolative and thus deviate from the REH. Herding and contagion are two mechanisms prominently highlighted in behavioral explanations. Herding relates to the fact that investors – to varying degrees – follow in a herd-like manner the development of acknowledged trends in the industry (Arnsward 2001, 33). They thus mimic the actions of the larger group. In addition, the retrieval of information, either through conversations with colleagues or from the media, seems to result in contagion of fear and, as a consequence, to collective behavior which drives prices irrationally (Arnsward 2001, 10). Contagion may be observed in a financial crisis even if there are no interdependencies between fundamentals in the various markets affected (as was observed for instance in the Asian crisis in the 1990s, e.g., by Staub 1998 and Goldstein 1998); it is caused by (and causes) increased general risk aversion and lack of confidence of actors. Such behavioral irrationalities are explained with imperfections in human information processing (Svetlova 2021, 7).

Some of the most interesting recent research in financial economics aiming to explain empirically observable deviations of asset prices from fundamentals evolves around the notion of investor sentiment (for overviews see Kearney and Liu 2014; Zhou 2018). What explains stock markets being more volatile than would be justified by the variation of fundamentals (Shiller 1981) and markets experiencing manias and crashes? The literature on investor sentiment argues that not all investors act by using fundamentals alone. Instead, there are “noise traders” (Black 1986) in financial markets who “irrationally act on noise as if it were information” (DeLong et al. 1990); they thus hold random beliefs about future returns. These beliefs do not contain new information (Tetlock 2007), but rather reflect the commentator’s subjective information and opinions. But instead of being eliminated by rational arbitrageurs who drive prices back to the stochastic predictions of the model, as assumed by REH, prices can diverge significantly from fundamental values when arbitrageurs have insufficient incentive to take positions against noise traders (DeLong et al. 1990, 705).

The impact of investor sentiment has been operationalized through the analysis of unstructured textual sources, stemming from corporations (e.g., quarterly reports), from public media, or from internet sources (Kearney and Liu 2014). This growing literature consistently finds “textual sentiment or the tone of qualitative information [...] to have important effects on stock prices and returns” (Kearney and Liu 2014, 180; see also Agar-

wal, Chen, and Zhang 2016; Price et al. 2012; Büchel and Konstantin 2013; Liu, Govindan, and Uzzi 2016; Hauptenthal and Neuenkirch 2017), with negative sentiments having the strongest impact.

Behavioral finance thus makes sentiments found in textual sources part of the explanation of price movements on financial markets. At the same time, sentiments as well as their aggregate outcomes such as herding and contagion are judged against the benchmark of rational trading strategies (portfolio diversification) and the information on rational expectations to be gained from dominant asset pricing models (Zhou 2018, 242; DeLong et al. 1990, 704). Thus the studies rely on the theoretical assumption of the existence of a “true model” that, as a benchmark, *should* determine investor behavior. The deviations that are nevertheless observable are seen as irrational noise.

### **3 The model: Imagined futures as mediators between economic facts and decision making**

We follow this literature in its assumption that investor expectations on bond markets are not determined by fundamentals and a dominant economic model. But we explain the observable behavior and its market effects not as irrational deviation from a rational benchmark model, but rather based on the concept of Knightian uncertainty. This leads to a different understanding of the role of future narratives, that they are not random noise that erroneously receives attention, but rather the semantic form in which actors make sense of and frame a projected future (Gephart, Topal, and Zhang 2010).

The imagined futures emerging from the interpretation of the situation are subsumed into narrative form, stories that are held to be true by actors and circulate in the field. The stories inform expectations and guide decisions to the extent they are seen as providing a credible account of future market development. If they come to dominate the market they become a “valuation convention” (Orléan 2014) that frames the market in a specific way and expresses market consensus. Since actual future developments of financial markets are (as in the Greek case) uncertain and unpredictable, the expectations actors form can only *pretend* to represent a future state of the world to which actors can relate *as if* it would indeed be the future present (Beckert 2016). The imagined futures thus operate as “placeholders” (Riles 2010) by being “treated as signals about the underlying state of affairs (or fundamentals)” (Tuckett, Smith, and Nyman 2014, 122).

Financial crises are situations in which prevailing imagined futures are suddenly brought into question and markets are influenced by “narrative revision” (King 2017). Investors are no longer willing to take on financial risks stemming from market exposure, the valuation convention changes, and bond markets can become illiquid and freeze.

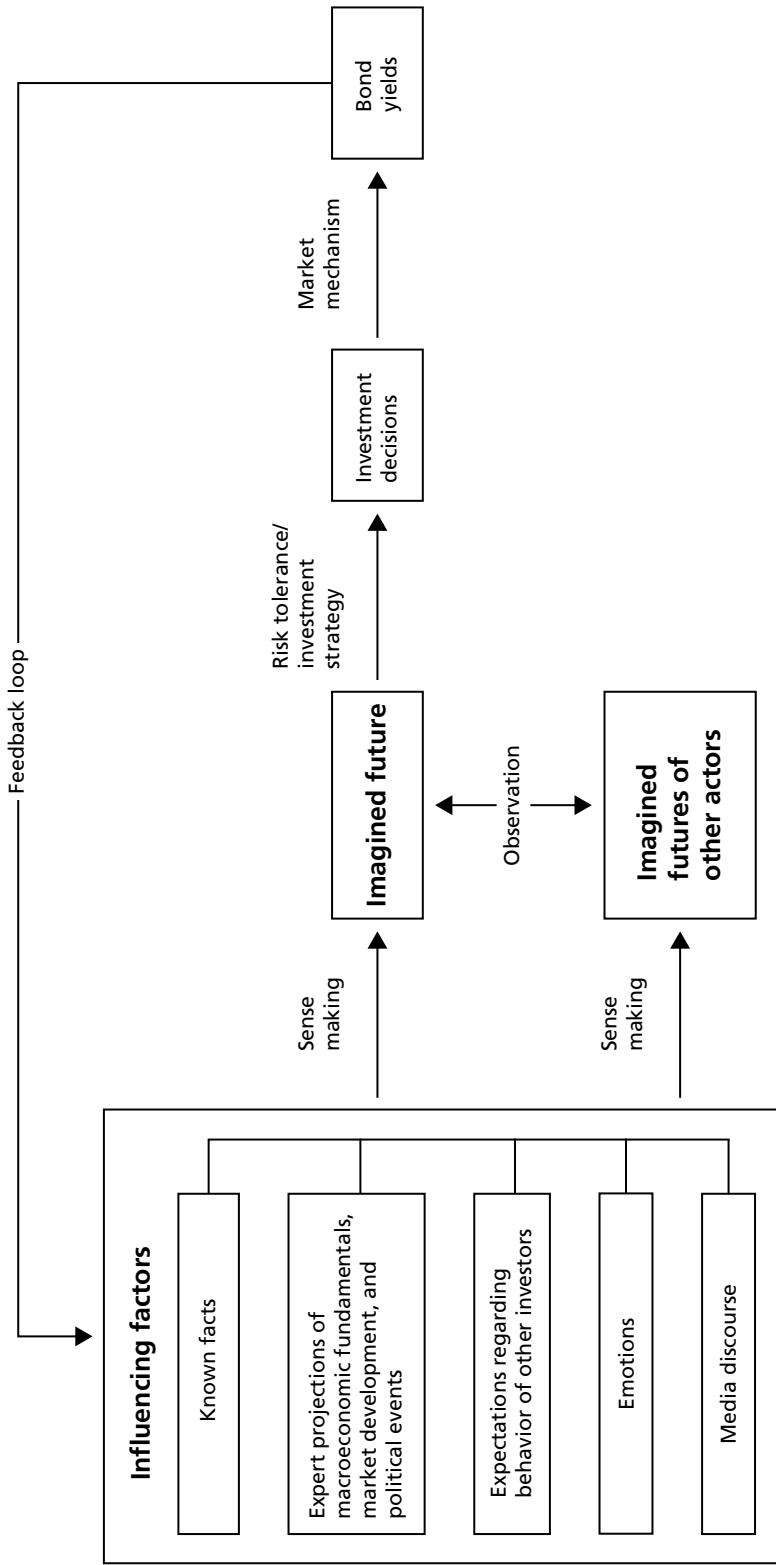
The argument here is not that expectations and the revision of expectations are *independent* of economic fundamentals, but rather that the information from which expectations are formed are not deterministic but need interpretation or judgment. Prevailing interpretations can in turn shape fundamentals through the decisions they trigger, an example of which are the opinions articulated by credit rating agencies.<sup>1</sup> The assessment of the situation and the resulting framing takes place in discursive practices among relevant market actors; practices that importantly find their representation in articles published in the financial press. This also suggests that the *re-establishment* of confidence, a precondition for the end of a financial crisis, is not a determinate process following *automatically* from a change in macroeconomic fundamentals, but rather a discursive process where central economic and political actors assert themselves visibly behind a new valuation convention (Orléan 2014, 169).

We suggest that narratives embodying imagined futures do play an independent role in individual risk perception and consequently action beyond macroeconomic facts. The suggested driver is the narrative accounts of the future. The accounts of the situation are the outcome of an intersubjective process in which actors observe known facts, expert opinions and projections, the media discourse, and each other, i.e., the framings of others and their actual trading behavior.<sup>2</sup> Based on these reciprocal observations and the emotions involved (Tuckett 2018), dominant expectations emerge, stabilize, or change. Expert opinions and projections are provided by investors, analysts, macroeconomic forecasters, central banks, and international agencies among others, and become mediated through media reporting, for example, in the financial press. From all these inflows and their processing, individual market actors imagine the future to unfold in a specific way which expresses how they make sense of the situation (Figure 3).

Such an understanding of financial crises seems to fit closely with the development of yield spreads in the Greek sovereign debt crisis. While an optimistic scenario prevailed up to 2008, where investors largely ignored the risks of Greek bonds based on a valuation convention anchored in the (wrong) assessment that these bonds would ultimately be guaranteed by the other euro countries, this framing changed in 2009, in a situation in which financial markets were already stressed from the world financial crisis. The revision of Greek budget figures could now have a very different impact on the confidence of investors than the same information would have had five years earlier. The argument that confidence is regained by political action (Orléan 2014) is confirmed by the tremendous influence of the speech by Mario Draghi in 2012, an event that also demonstrates the role of positional power in the framing of an economic situation.

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- 1 Other studies underline the importance of credit ratings and their impact on investors' perception and action (Manganelli and Wolswijk 2007). Credit ratings are not market fundamentals but opinions on future default risk. Studies show that ratings rather *follow* market development; they confirm a dominant market perception rather than changing it (Malliaropoulos and Migiakis 2016).
  - 2 The latter point is expressed in Keynes' beauty contest according to which short-term market success flows from second-guessing which narratives will dominate the expectations of other investors.

Figure 3 The model of imagined futures as mediators between economic facts and decision making



The model does not claim that all investors frame the future in the same way. To be relevant for the development of yield spreads in a financial crisis, however, it is necessary that a multitude of relevant actors believe in a particular future. In a crisis situation the conventional view of the situation is destroyed and a new narrative with a pessimistic risk assessment comes to dominate. Of course, similar expectations regarding future risks do not automatically lead to the same financial behavior: decisions stem not only from risk assessments but also from varying risk tolerance and diverse investment strategies (Arnsward 2001).

The shift in the dominant frame in a market is to be distinguished from changes in beliefs by individual market actors in one narrative or the other. Such changes can occur frequently, but are only of secondary importance for the development of the market. Truly relevant for substantial market shifts are changes in the overall direction of the prevailing narratives, i.e., a break with the predominant valuation convention. It is therefore not important to know when exactly a particular actor starts or stops believing in a specific imagined future. The analytical focus needs to be on the distribution of the direction of market assessment to be found in narrative accounts.

#### **4 Research design**

As a test of our argument, we examine whether negative future construction predicts the development of spreads between Greek and German bonds, while controlling for other factors. Following the mechanism suggested in section 3, we assume that the way we measure how the construction and increasing dominance of a pessimistic imagined future progressively led to the dissolution of the valuation convention of Greek bonds and thus to steadily increasing spreads. We concentrate on the time period between the beginning of the crisis in October 2009 and 2015, thereby beginning with the first indications that Greece's government deficit was actually much higher than previously reported. This is the most telling period to demonstrate the relevance of the extension of negative future narratives and their impact for spread development. We first present our hypotheses. We then continue to present the sample of newspaper articles we used, a measure for negative future construction as our main independent variable, the dependent variable and other variables used, our estimation strategy, and results.

#### **Hypotheses**

Given the uncertainty of the future development of bond markets, investors had to rely on narratives encapsulating imagined futures to come to investment decisions. We suggest that the propensity of negative interpretations of the future is especially related

to spread development. The higher the volume of negative assessments of the future in the expert discourse, the more we expect investors to deem sovereign bonds as risky. We therefore expect that a high number of negative and uncertain articles on a crisis country with future references – negative future construction – shows short-term and long-term effects on spreads while controlling for other factors.

H1: Changes in the absolute number of published articles referring to the future that are high in uncertainty and negativity is related to an increase in spreads in the short run.

H2: The level of published articles high in uncertainty *and* negativity reflects shifts toward another imagined future and stands in a long-term equilibrium with spread development.

In the following, we present the sample, variables, and estimation strategy used to test these hypotheses.

## Sample

To give support to the claim that changes in imagined futures are important to explain the development of yield spreads in the Greek crisis, our empirical analysis examines assessments of the financial situation of Greece in a corpus of newspaper articles from two large international financial newspapers. We analyze a total of 9,435 newspaper articles from the *Financial Times* and the *Wall Street Journal*, published between September 2009 and December 2015.

We start with the assumption that the articles enable us to understand how investors and analysts perceive and interpret the economic situation of the crisis countries because media sentiment and investor sentiment correlate strongly. Research shows an impact of media reporting on market prices (Mercille 2013; Engelberg and Parsons 2011; Peress 2014). Research on business journalism also shows the strong entanglement of the *Financial Times* and the *Wall Street Journal* with expert analysts, and their frequent use as sources (Corcoran and Fahy 2009; Douai and Wu 2014; Doyle 2016; Tetlock 2007). This does not mean that we claim traders would form their risk assessments primarily based on newspaper accounts. We rather argue that there is sufficient congruence between these accounts and the other sources of information traders rely on (for instance the Bloomberg news feed) for the newspaper articles to be used as proxies for risk assessment and its narrative construction.

We start to build our corpus based on all texts published in the *Financial Times* and the *Wall Street Journal* between 2009 and 2015 on the Greek economy. Throughout the presentation of our analysis, we complement the quantitative investigation by reviewing



Table 1 Sample composition and selection procedures

	Financial Times			Wall Street Journal		
	N	Excl.	% of N	N	Excl.	% of N
All articles on LexisNexis containing two counts of "greece" or "greek" between Sep 2009 and Dec 2015	11,440		100%	4,914		100%
At least five counts of "econ, financ, debt, future, outlook, fiscal, deficit, default, bond, household, expect, bank, market, currency, ecb, budget, austerity, credit, inflation, bailout, bail-out, invest, monetary, unemploy"	10,586	854	92%	4,417	497	89%
Exclude for other reasons such as specific irrelevant columns and article formats	9,012	1,574	78%	4,312	105	87%
Remove duplicate articles <sup>1</sup>	6,271	2,741	54%	3,153	1,159	73%
Total:	6,271 66%		+	3,153 33%	=	9,435 100%

1 We performed hierarchical cluster analysis based on cosine distance between texts in Python to identify and remove duplicates with a full text similarity of 0.9 or more.

and interpreting the qualitative content of the articles. In the selection of the articles we were interested in texts that are relevant for the assessment of the states' ability and willingness to repay government debts and therefore for the pricing of government bonds. The sample is based on all *Financial Times* and *Wall Street Journal* articles available online through the scientific database LexisNexis. We searched for articles containing the words "greece" or "greek" between 1990 and 2015. In a second step, we increased the minimum counts to at least two per article, to exclude articles that mention Greece only peripherally. Next, we created a list of word stems to identify articles on economic and financial topics as well as expectations concerning the future. Only articles containing five or more of the following word stems were selected: "econ, financ, debt, future, outlook, fiscal, deficit, default, bond, household, expect, bank, market, currency, ecb, budget, austerity, credit, inflation, bailout, bailout, invest, monetary, unemploy."<sup>3</sup> The sample constructed is a corpus of all content written by journalists and other authors in these newspapers. It mostly reports on the analyses of experts or is written by experts, who thus contribute to the interpretation of the Greek economic situation. Table 1 presents the sample and how it was constructed. We conducted text preparation in Python, and estimation and reporting in R.

3 Word stems are standardized word reductions to capture all words of the same word family. That means the stem "econ" counts all words such as economic, economy, etc. We manually performed precision and recall tests based on a random sample of 100 articles for, first, a focus on Greece and, second, the focus on relevant economic topics. Our subjective impression and the test results, give confidence in the validity. Hand coded focus on Greece: Precision = 0.75, Recall = 1; Hand coded focus on relevant economic topics: Precision = 0.86, Recall = 0.89.

Among these articles, we need to identify those articles that develop imagined futures about the Greek economy. To achieve this, we further separate our sample based on two resources. The first is a supervised learning model from cognitive science, developed and trained by Robertson, Carney, and Trudell (2021) to predict the use of English language referring to the future based on semantic annotations of online content on Reddit and Twitter. We use this model to predict the probability of future time reference for each sentence in an article, and then calculate the share of sentences within each article that has a probability of 50 percent or more to refer to the future. We repeated the performance test as applied by the authors for our corpus and the reference to future prediction and achieved an accuracy of 0.78 (cf. Appendix 1a). We performed prediction with the SpaCy package in Python (Honnibal and Montani 2017) based on the work of Robertson (2021).<sup>4</sup>

The second resource we use is a dictionary of positive, negative, and uncertainty sentiments developed by Loughran and McDonald (2011). The authors used a more general and traditional dictionary as a basis and adjusted the original word lists to a financial context. Although the dictionary was originally developed for application in business finance, we use it to capture sentiment on all articles related to economic topics according to our sampling.<sup>5</sup> We use the suggested word lists and weighting scheme by Loughran and McDonald (2011). Using this scheme we aggregate negative sentiment calculated by article.

Combining these two resources we end up with two sets of articles to take a closer look at. The first set is supposed to capture accounts that try to imagine how the future could look. We define this as the top 25 percent of articles in terms of shares of sentences that are predicted to refer to the future by our model. This includes all articles with 15 percent of sentences or more referring to the future. To capture not only reference to the future but also uncertainty about it, we look at those articles that are also in the top 25 percent of weighted uncertainty sentiment as suggested by Loughran and McDonald (2011). The second set of articles refer to the future as described above but are also in the top 25 percent of negative sentiment, which allows us to look at especially negative future outlooks.

### Main independent variable

The following three aspects of the expert discourse are especially relevant to our argument: the way participants are exposed to Knightian uncertainty; how negatively they view the economic situation of Greece and the other PIIGS states; and how they con-

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4 Sincere thanks to Cole Robertson for providing the trained model.

5 The words with the largest leverage for the two sentiments “negative” and “uncertainty” are presented in Appendix 1b. We also illustrate in Appendix 1d that our results are robust to an alternative dictionary for negativity.

struct negative imagined futures on the basis of both. Using the measure described above, we identified articles representing these three dimensions. In the following, we present example excerpts for each of them, to illustrate what we measure with the procedure.

*Uncertainty: Who knows what is going to happen?*

Especially from 2009 onwards, articles with a high count on uncertainty sentiment and future reference openly discuss the unfortunate uncertainty of the Greek financial situation. To give one example, one of the most “uncertain” articles is titled “*Why the probability of Greek eurozone exit is 99 percent wrong, probably.*” 20 percent of sentences in this article are predicted to refer to the future:

What is the probability of Greece exiting the eurozone? The fluctuating survival chances of the eurozone’s weakest economy are hugely important for global financial markets. Statisticians would say the odds are impossible to calculate. ‘Grexit’ – Greece’s exit – would follow a sequence of events, decisions and emotional choices by voters and politicians, and unpredictable economic and financial forces. Even if point estimates were possible, this week’s news flow shows they would change from hour to hour. [...] The danger, however, is assigning numerical probabilities creates the false impression that markets have superior knowledge about the future; the risk is of being caught out badly when they are wrong. (FT 9161, 03/07/2015)

The sentiment of uncertainty became prominent in the media discourse at a time when Greek bond levels were only just beginning to rise. It seems plausible that this might have been because negative sentiments became more evident around the same time.

*Negativity: Judging Greece*

When it comes to negativity, the overall development is similar. Negative sentiment, i.e., pessimistic outlooks regarding Greece’s ability to repay its debt, was high and rapidly evolving during its onset. Again, it is telling to take a look at one of the most negatively weighted articles:

*Debt Fears Rattle Europe:* The euro tumbled as debt woes spread around the euro zone from Greece, where pledges of austerity and fiscal rigor failed to stem growing fears that the Continent’s economic recovery could be derailed. The euro fell as low as \$1.4505 on Tuesday, its lowest level since early October. [...] The exploding budget deficits of weaker economies have forced Germany and other financially stronger countries to think about how to shore up other members of the euro zone against a potential financial-market rout. [...] “We must change or sink,” Mr. Papandreou said. [...] But the prospect of Greek austerity has already sparked protests by pensioners, students and public-sector unions in the past two weeks, and officials fear a wave of social unrest. (WSJ 3101, 16/12/2009)

Such negative narratives paint a very dark picture of Greece’s fiscal situation and the ability of the state to handle it. Where we see the most interesting aspects of such future narratives, however, is where these two forms of sentiment come together.

*Negative uncertainty: Constructing negative futures*

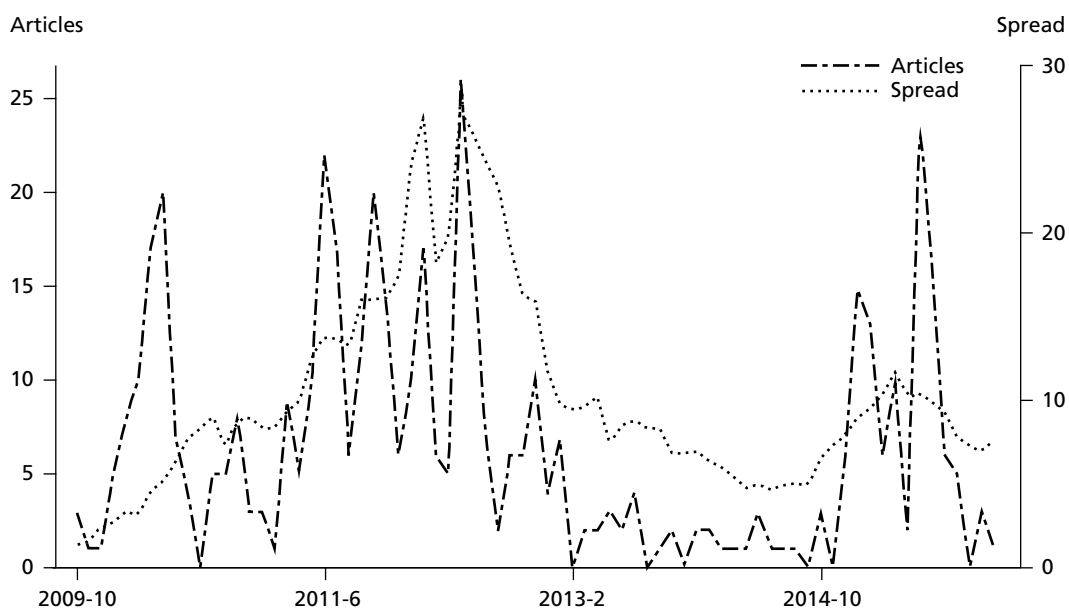
Negative uncertainty, the combination of perspectives of uncertainty and negativity, is most concentrated at the onset of the crisis, but inspection of these articles over time suggests that it might also covary with spreads in later stages of the crisis (Figure 4). In this category we counted articles that refer to the future and are at the same time in the top quarter of both sentiment distributions: the weighted measure for negative sentiment and the weighted measure for uncertainty sentiment. What this measure points to is illustrated by an article in the *Financial Times*:

*Social unrest does violence to hopes of Greek reform:* Sunday's explosion of street violence in Athens underlines the danger that political disorder will thwart Greece's attempt to implement the economic reforms required to avert a debt default [...] "The message is very worrying," said a senior socialist politician. "As long as the economic crisis persists, there is a lack of trust in the government and unemployment continues to go up, the social unrest will grow." With Greece in its fifth consecutive year of recession and its eurozone partners frustrated at the slowness of reform, the flames that consumed dozens of buildings in the capital are licking at the nation's future in Europe's monetary union. [...] Although parliament passed the measures, the rebellion and urban violence raise the prospect that the next Greek government, which will take office after elections set for April, will lack the authority and determination to hold the austerity course. [...] (FT 19756, 14/02/2012)

As Figure 4 suggests, negative future construction moved together with spreads during several phases. At the onset of the crisis articles with negative uncertainty increase dramatically. In the fall of 2012, fewer such articles appear and a more positive narrative seems to emerge, before negative expectations dominated again with the second peak of the crisis in 2015.

As described in the sample section, we use articles which refer to the future, show high negativity *and* high uncertainty as a proxy for expectations of a negative future of Greece. Among those articles that refer most to the future, we counted the frequency of articles with relatively high negativity and uncertainty sentiment. We identify articles which are both in the top 25 percent in terms of uncertainty sentiment among the full corpus *and* at the same time in the top 25 percent of negativity sentiment among all articles. Our measure thus differs from the sentiment analyses used in economics (Zhou 2018) by actually measuring dramatically articulated negative expectations of future development and not just sentiments. Text excerpts of the top fifty negative-uncertain articles are presented in Appendix 1e. We also present the different trajectories of our variable compared to plain sentiment to illustrate the difference in Appendix 1c.

Figure 4 Negative-uncertain articles referring to the future and spreads on Greek sovereign bonds relative to German bonds (percentage points)



Note: Negative-uncertain articles is defined as the monthly absolute number of articles published which were – relative to all articles – in the top 25% of all three measures: negativity sentiment, uncertainty sentiment, and future reference.

### Outcome and confounding variables

Our dependent variable is the spread between German and Greek sovereign bonds at the daily level (Eurostat 2017). In addition to our main independent variable described above, we include confounders inspired by other studies estimating spreads between Germany and Greece in the crisis period (Arghyrou and Kontonikas 2010; Aßmann and Boysen-Hogrefe 2012; Beirne and Fratzscher 2013). We only use information that was known to investors at the time because only this knowledge could have influenced behavior.

In line with the econometric literature, we consider three measures of macroeconomic fundamentals from the forecasts of the European Commission: first, general government debt as percent of GDP; second, forecasted government balance; and third, changes in the harmonized consumer price index (inflation) (EC 2019). The actual, non-forecasted data is only published afterward. The forecasts were published twice a year until 2013, and three times a year since then, but this was the only prominent forecast known to investors at the time. Both measures can be expected to be related to spreads: lower projected government debt as percentage of GDP and a projected more positive fiscal balance should both decrease spreads. We use the spread between changes in the harmonized index of consumer prices between Germany and Greece as a measure for international competitiveness as suggested by Gibson, Hall, and Tavlas (2012).

The literature suggests a common international risk factor to explain the spreads on sovereign bonds, for which we include two typical measures (cf. Manganelli and Wolszijk 2007). First, we use the Chicago Board Options Exchange (CBOE) Volatility Index (VIX). As a second measure, we include Moody's seasoned AAA corporate bond yields relative to the yield on 10-year treasury constant maturity US bonds. Both of these indicators are provided by the Federal Reserve Bank of St. Louis (FRED 2019b; 2019a). We interpolated missing values, e.g., for weekends.

We use the data in two samples. We aggregate the data from daily to the weekly and monthly level by using variable medians, e.g., median spread or risk aversion in a week or month.<sup>6</sup> The only exception is the number of negative and uncertain articles published for which we use the sum for the respective period. The reason for aggregating is that we do not expect our measures to have an immediate daily effect and the number of articles per day is low. We expect prevalence, sentiment, as well as the number of uncertain and negative articles to be much better represented when aggregated to a week or a month. Our first sample is made up of 326 weeks, and our second sample of 75 months.

### Estimation strategy

We apply time series regression to analyze short-term and long-term effects of the developed measure for negative future construction on spreads while controlling for other factors. We follow the procedure for model selection suggested by Philips (2018) and the respective R package *dynamac*. This can be roughly summarized as testing all variables for stationarity, including (differenced) lags until there is no autocorrelation in the residuals anymore, performing a specific test for cointegration and, finally, estimating error-correction models or autoregressive distributed lag models dependent on the result of this test. One way to describe the difference between autoregressive distributed lag models and error-correction models is that the former estimate coefficients for how a one-unit short-term change of an independent variable from one period ( $t-n$ ) to the most recent period ( $t-0$ ) is related to changes in the dependent variable. The latter type of models implements the idea of an equilibrium between two or more of the variables which move together over time (cointegration). If the level of one variable moves away from the equilibrium value, the other variables move toward the new equilibrium over multiple periods until it is reached.

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6 The reason not to use the daily level is that we do not expect our measures to have an immediate daily effect and the number of articles per day can be relatively low. We expect prevalence, sentiment, as well as the number of uncertain and negative articles to be much better represented when aggregated to a few days or a month. After all, what we are trying to measure is the characteristics of the overall expert discourse and not the effect of individual articles or newspaper issues.

In our application, all variables used are non-stationary and  $I(1)$ , as indicated by KPSS ( $p < .05$ ) and Augmented Dickey-Fuller tests ( $p > .05$ ). All variables are differenced in the ARDL models due to their non-stationarity. Therefore, coefficients are interpreted as changes in the median relative to the median of the last period. In the ECM models, cointegrated variables are also included in levels to model the equilibrium relationship. We provide correlations and autocorrelations of the differenced variables in Appendices 2a and 2b. Time series plots of all variables are provided in Appendix 2c.

## 5 Results

Table 2 presents results from our time series regression for the weekly and monthly level. On the weekly level, our main independent variable of top negative-uncertain articles shows a positive and significant coefficient. The publication of one additional such article is on average related to a spread increase between German and Greek bonds of 0.076 percentage points. On the weekly level, we therefore find some first support for our H1.

One percentage point increase of projected government debt per GDP in the EC forecasts is related to an increase in 0.125 percentage points of spreads. Positive significant coefficients are also estimated for the volatility index (VIX), as well as weekly for the projected government balance. Other control variables such as Moody's AAA rated corporations in comparison to yields on 10-year US government bonds (risk aversion) or the harmonized consumer price index do not add explanatory power to the weekly model judged by the BIC and were therefore not included.

On the monthly level, we do find further evidence in favor of our main independent variable. Coefficients from the autoregressive distributed lag model suggest that the publication of an additional article in the top 25 percent of negativity and uncertainty sentiments is related to a spread increase of 0.093 percentage points. On the monthly level we therefore find strong support for our hypothesis 1. The only other control variable that shows a statistically significant coefficient and adds explanatory power is projected government debt as percent of GDP eleven months ago.

Finally, we model a long-term relationship, based on the idea of cointegration between the number of negative and uncertain articles and spreads. With the publication of more of such articles we assume that spread levels will adjust to this higher level over time and increase as well. A test of cointegration by Pesaran, Shin, and Smith (2001) with small-sample critical values provided by Narayan (2005) (cf. Philips 2018, 234) indicates cointegration at the 95 percent confidence level.<sup>7</sup> The coefficients presented in

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7 For more details, see Appendix 2e.

Table 2 Coefficients and standard errors estimated from autoregressive (finite) distributed lag models (ARDLM) and an error correction model (ECM) on a weekly and on a monthly level

	Dependent variable: Spreads between Interest Rates on Greek and German Sovereign Bonds		
	ARDL Weekly (1)	ARDL Monthly (2)	ECM Monthly (3)
$\Delta$ No. Negative-Uncertain Articles	.07* (.032)	.09** (.033)	.12*** (.034)
$\Delta$ No. Negative-Uncertain Articles <sub>t-1</sub>			-.07* (.037)
$\Delta$ No. Negative-Uncertain Articles <sub>t-2</sub>	.00 (.032)	.04 (.034)	
No. Negative-Uncertain Articles <sub>t-1</sub>			.13** (.044)
$\Delta$ Spreads <sub>t-1</sub>	.01 (.055)	.23* (.106)	.18 (.109)
$\Delta$ Spreads <sub>t-2</sub>		-.35** (.116)	-.34** (.102)
$\Delta$ Spreads <sub>t-3</sub>		.30** (.105)	.22* (.103)
$\Delta$ Spreads <sub>t-5</sub>	.07 (.055)		-.11** (.036)
Spreads <sub>t-1</sub>			-.11** (.036)
$\Delta$ Proj. Gov. Debt/GDP	.12*** (.024)		
$\Delta$ Proj. Gov. Debt/GDP <sub>t-1</sub>	-.05* (.024)		.10* (.048)
$\Delta$ Proj. Gov. Debt/GDP <sub>t-5</sub>	.03 (.024)		
$\Delta$ Proj. Gov. Debt/GDP <sub>t-11</sub>		.11* (.052)	.10* (.048)
$\Delta$ Proj. Gov. Balance	.07 (.047)		
$\Delta$ VIX	.06* (.027)		
Constant	-.00 (.066)	-.05 (.201)	.22 (.378)
Breusch-Godfrey Test (AR1)	0.68	0.49	0.44
Breusch-Godfrey Test (AR2)	0.89	0.68	0.74
Breusch-Godfrey Test (AR3)	0.68	0.81	0.86
BIC	1062.65	317.84	313.67
BIC/N	3.30	4.23	4.18
Observations	322	75	75
R <sup>2</sup>	.16	.35	.45
Adjusted R <sup>2</sup>	.13	.30	.39
Pesaran, Shin, and Smith (2001) test suggests cointegration of number of negative-uncertain articles and spreads?			Yes*

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ , based on two-tailed tests.

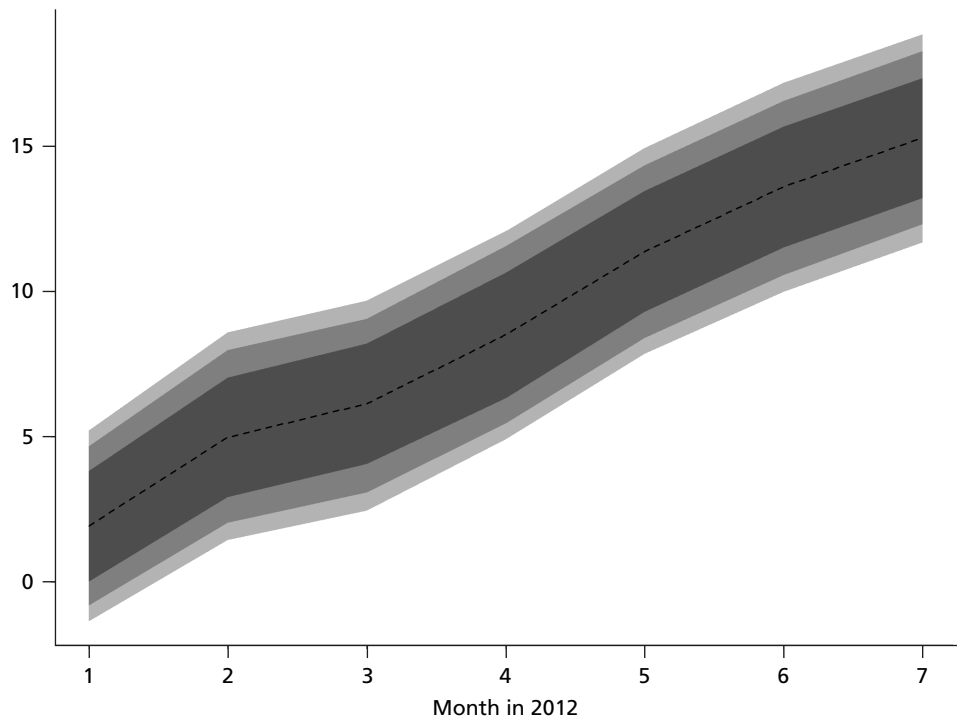
Model M7 suggest that when the absolute amount (level) of negative-uncertain articles increases, the level of spreads follows and adjusts to this increase.

To get a better understanding of this result, Figure 5 illustrates the long-term adjustment of spreads on negative narratives estimated from the data. The graph shows the development of spreads between Greek and German bonds when there was an increase in the publication of negative-uncertain articles and everything else remained equal over five months. We see a steady long-term adjustment of spreads which we interpret as a shift toward a more negative valuation convention for Greece driven by negative future construction in the expert discourse. This supports our theoretical mechanism: the spread level adjusts to a new level of negativity – a shift to a new dominant narrative. Our model therefore suggests that a continuous shock in the level of negative future construction can trigger an increase in spreads over several months. We suggest that this provides an explanation for the onset of a financial crisis: actors start to construct



Figure 5 Simulation of the monthly long-term adjustment of spreads to a new level of 20 negative and uncertain articles published from February to July 2012

Increase in spread GRC/GER bonds



Note: Coefficients are simulated with 10,000 draws from a multivariate normal distribution with the estimated coefficients as mean, and variance from the variance-covariance of the estimated model. Additional uncertainty is introduced with random draws from the chi-squared distribution (for more details see Jordan and Philips 2018, 477–86). The spikes denote simulated 75%, 90%, and 95% confidence levels from dark to light. All other differenced variables are held constant at zero. A steady spread increase occurs only driven by top negative uncertain articles, until the equilibrium with spreads is reached.

and offer imagined futures in an uncertain situation that – like in the Greek case – can lead to the establishment of a negative consensus. This gives good support to a theoretically plausible long-term equilibrium between negative future construction and spreads – and therefore our hypothesis H2. M7 is also the best model in terms of BIC and adjusted  $R^2$  to describe the monthly data.

We tested for robustness against heteroscedasticity and autocorrelation and checked whether the results remain (cf. Appendix 2f.). We also estimated regressions at the daily level but do not find a significant correlation between our independent variable and the dependent variable at this level (cf. Appendix 2d). However, we do not expect our measures to have an immediate daily effect and the number of articles per day is low. We expect prevalence, sentiment, as well as the number of uncertain and negative articles to be much better represented when aggregated to a week or a month. After all, what we are trying to measure is the prevalence of such negative narratives in the overall expert

discourse and not the effect of individual articles or newspaper issues. We also estimated regressions without control variables and the associations of the main analysis hold in terms of magnitude and direction (cf. Appendix 2g). Finally, we discuss and test the independence of credit ratings to our findings in an additional analysis in Appendix 3. Results suggest that our main independent variable shows an association to spread development even when controlling for credit ratings. In our view, our main results are confirmed by these robustness checks, especially the relevance of negative imagined futures.

## 6 Conclusion

The onset and unfolding of financial crises cannot be explained by merely focusing on the development of economic fundamentals on which actors act rationally by using all available information efficiently. We provided a sociological explanation that takes future-oriented narratives as a starting point. We took the example of Greek sovereign bond spreads, especially between 2009 and 2015, to demonstrate the relevance of prevailing narratives in financial crises. A detailed analysis of references to the future and sentiments expressed in articles published in two major international financial newspapers reveals that investment behavior becomes risk averse and bond spreads increase when articles portraying an uncertain and negative future become prevalent.

To test this assumption, we used a measure developed in our text analysis to estimate spreads while controlling for conventional predictors. We find evidence that, on both the monthly and weekly levels, the number of articles constructing negative future narratives shows a positive effect on spreads in the short run. Furthermore, there is good statistical evidence for a long-term equilibrium between negative future narrative construction and spread levels for Greece but also for Spain and Italy as other salient crisis countries of the sovereign debt crisis. An increase in negative-uncertain articles published is related to short-term and long-term increases in spreads.

These results provide evidence for the relevance of imagined futures for market behavior and market development during the Greek sovereign debt crisis. They can be seen as building blocks for a sociologically informed understanding of financial crises that provides a microfoundation for explaining the macro-outcome of yield spreads on financial markets. Decisions under conditions of uncertainty are shaped by narratives that provide images of possible futures that circulate in the field and constitute the expectations of actors. These narratives allow actors, despite the uncertainty in financial crises, to build the necessary confidence to act. The expectations built from narratives are fictional in the sense that they assess the situation in the mode of “as-if.” They are the contingent outcome of discursively established interpretations of the situation and thus socially constituted (Holmes 2009; Abolafia 2010; Tuckett et al. 2020). Actors can-

not determine optimal decisions, but act with the conviction that their interpretations would accurately predict future development.

The Greek debt crisis is an especially interesting example for investigating the role of imagined futures. While the revision of government debt to GDP ratio in October 2009 is often seen as the trigger of the crisis, this stands at odds with the observation that spread levels increased slowly over several months. Future expectations of investors and how these are changing in the situation provide a better explanation for the onset of the crisis as well as elements of its further evolution. The fact that markets overshot in their risk assessment of Greek bonds during the crisis also implies that imagined futures may lead to inefficient market equilibria. At least in crisis situations, market prices do not inform investors reliably about risks.

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