ISSN: 3049-7159

Research Article

Journal of Business and Econometrics Studies

Who's Afraid of the Greek Public Debt? An Event Study of the Greek Sovereign Spread on Key Dates

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Received: June 16, 2025; **Accepted:** June 23, 2025; **Published:** July 01, 2025

ABSTRACT

This study provides evidence of the very short-term element impact of news on sovereign spreads, validating market-sentiment effects even under unchanged fundamentals, as applicable during select dates in the Greek crisis narrative. The event study is performed for five key dates corresponding to the revelation of the true size of the Greek budget deficit in 2009, the S&P downgrade for Greece into Selective Default in 2012, the first-time election of SYRIZA in 2015, announcement of the Grexit referendum in 2015, the announcement of a generalized lockdown in response to the COVID-19 crisis in 2020. The analysis is replicated using two distinct benchmarks and two alternative event-window specifications. The application of event-study methods during an era of global shocks (such as COVID-19) is particularly timely.

Keywords: Greek Debt Crisis, Event Study, Sovereign Spreads, Greek Referendum, COVID-19, Greek PSI

Highlights

- Event study methods are applied to the Greek sovereign spread to determine whether key dates in the Greek debt crisis narrative constituted statistically significant events.
- Two distinct benchmarks are applied for the event study under two alternative event window specifications.
- The key dates considered are the following: the date of the revelation of the true size of the Greek budget deficit in October 2009; the S&P downgrade for Greece into Selective Default in 2012; the first-time election of SYRIZA in 2015; the announcement date of the Greek referendum in 2015 and the announcement date of a generalized lockdown in Greece in response to the COVID-19 crisis.
- Once both benchmarks and windows are considered, either of the events may have been statistically significant.

Introduction

Since the eruption of the Greek sovereign debt crisis, a commonly acceptable gauge of Greek public debt sustainability has been the level of the Greek sovereign spreads, namely the difference between the yield of the Greek 10-year government bond and that of the equivalent German bund. Although in the context of the Economic and Monetary Union (EMU), long-term interest rates across Member States were foreseen to converge, thereby eliminating sovereign spreads, the eruption of the crisis turned the attention of financial markets to a so-called fragmentation in long-term government bond yields.

Crisis episodes, macroeconomic developments and policy announcements have been accompanied by spikes and dips in sovereign spreads. In the light of the relatively high frequency of global crisis events-most recently Brexit, the eruption of the COVID-19 crisis, Russia's attack on Ukraine, the literature on event studies is growing. Similarly, since the eruption of the Eurozone sovereign debt crisis, a number of event studies have been applied to sovereign bonds to examine the impact of sovereign credit ratings downgrades or of important macroeconomic announcements.

This study contributes to the literature on the sovereign debt crisis, by providing market-based statistical evidence of the financial market impact of key dates on Greek sovereign default risk. Secondly, the findings and application to sovereign bonds constitute a contribution to the relatively small number of event studies covering bond markets (as opposed to corporate equity

Citation: Ersi-Iliana Savvopoulou. Who's Afraid of the Greek Public Debt? An Event Study of the Greek Sovereign Spread on Key Dates. J Bus Econo Stud. 2025. 2(4): 1-6. DOI: doi.org/10.61440/JBES.2025.v2.71

event studies). Thirdly, the study claims a minor methodological contribution to the field of event studies, by elucidating on the application of a risk metric as a proxy for returns. Last but not least, more recent events such as the announcement of the imposition of a generalized lockdown in response to COVID-19 are covered, thereby relating to the growing post-COVID economic research landscape.

Related Literature

This study is broadly linked to the literature on self-fulfilling crises and multiple equilibria , Arghyrou & Tsoukalas, Gros, DeGrauwe & Ji, Bruneau et al. According to the literature, uncertainty about fundamentals or economic policy and coordination failures set in motion self-fulfilling dynamics towards the bad equilibrium- even when the underlying quarterly or monthly fundamentals have not changed.

Event studies are most commonly applied to financial events to provide evidence of the market effect of announcements, particularly earnings or stock-splits. According to the semi-strong version of the Efficient Market Hypothesis, market prices reflect all publicly available information (Fama, 1970). Starting with Campbell et al., event studies introduce scepticism on market efficiency by examining how asset prices react to an event. Khotari & Warner provide an extended overview of the event study literature. Alternative statistics and methodologies have been applied in relevant literature (e.g. see Brown and Werner, for an overview of excess return measures) [1]. In essence, event study test statistics examine whether the null hypothesis that an estimated mean abnormal performance is different from zero may be rejected. If so, the selected date constitutes an event. Researchers select the appropriate events, a measure of excess returns and an event window which is ideally free from other extraordinary events.

While event studies have often been applied by practitioners to equity markets, a relative scarcity is noted in bond market event studies potentially due to the less frequent trading in corporate bonds [2].

Methodology and Results

For the purposes of this study the customary application of the sovereign bond yield as a proxy of returns for Greek Government Bonds has been followed, as typical in sovereign bond event studies. Hence, the first step in the return's calculation has been eliminated. For the second step of ABR calculations, two alternative Benchmarks (BM) have been applied. First, the benchmark is idiosyncratic to Greece and the difference is taken from the historical mean yield for GGBs. Secondly, sovereign spreads are applied, as a measure of the relative risk of Greece against the benchmark Bund. Thus, the German Bund yield is applied as the appropriate benchmark measure against GGB yields.

As compared to typical corporate bond event studies, a risk measure has been used as a proxy of returns on relevant bonds. This may be justified due to the focus on sovereign bond markets which is usually focused on the issuer (Sovereign) side rather than the investor side. The above methodological clarification provides a methodological contribution in the growing field of event studies, particularly as sovereign debt studies in the context of the Eurozone regain traction due to geopolitical and crisis developments.

In line with recent literature on the effect of uncertainty on sovereign spreads, standard event-study methods are applied to Greek sovereign risk. Daily data on Greek 10-Year Government Bond Yields and 10-Year German Bund Yields are extracted between January 2, 2002 and October 15, 2020 (market close values, in percent format). The Greek sovereign spread is calculated in levels (as percentage points) using trading-day data, and after correcting for trading-day differences across the two countries.

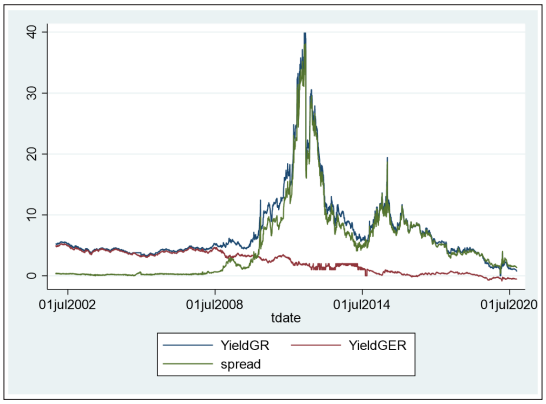

Figure 1: The Evolution of Daily Greek and German 10-year Government Bond Yields and of the Spread therein (percentage points), Source: Investing.com

The following key dates are selected for an event study of abnormal returns for investors on Greek bonds (based on the cumulative abnormal yield and spread of the Greek 10-year government bond) for dates when Greek debt sustainability concerns were stronger:

- The time of the revelation of the Greek deficit by the newly elected government, also deemed to be the official start of the Greek and Euro area debt crisis: October 19, 2009
- The S&P downgrade of the Greek debt into 'selective default'(SD) in anticipation of restructuring: February 27, 2012
- The election of a left-wing government with an anti-austerity fiscal plan: January 26, 2015
- The announcement of the Greek referendum to be held on July 6, 2015, also considered as the tipping point for the potential of a government policy choice for Grexit: June 29, 2015
- The government reaction to COVID-19 by imposing a generalized lockdown: March 23, 2020

For the definition of the event window, a topic of debate in relevant studies, this study follows Godl & Kleinert in selecting 4 days prior and 4 days after the event (s=4) "to hedge against the possibility of assigning the wrong date to an event" [3]. As a robustness check, a 10-day event window was also selected (s=10).

The event-study setup requires the selection of an appropriate benchmark to compute abnormal returns, as equity-market event studies make use of a benchmark market portfolio [4]. For the Greek yield, this benchmark safe rate was the equivalent-

maturity German Bund (10Year), as the computation of a euro-area average yield would be problematic in terms of economic significance [3].

This choice reflects basic asset pricing theory, according to which the yield on the Greek bond should be equal to the risk-free interest rate plus a risk premium. Assuming that the German Bund yield is approximately a risk-free rate and assuming that risk-aversion does not vary, if there is no information-relevant event, the yield on the Greek government bond should remain stable unless there is a change in market "expectations about the future solvency of the issuer", i.e. a change in debt sustainability [3,5].

According to the null hypothesis, the trading date considered for each case does not constitute an event for Greek sovereign yields.

Using the Historical Mean of the Greek 10-Yr Government Bond Yield as the Benchmark

Cumulative Average abnormal returns (CAARs) are computed for the 10Yr-Government Bond Yield compared to its historical mean value, estimated via the estudy command in STATA.

Table 1: Event Study CAAR for Greek Sovereign Bond Yields, Oct 19, 2009

```
Event date: 19oct2009, with 2 event windows specified, under the Normality assumption
SECURITYCAAR[-4,4]       CAAR[-10,-10]
spread  769.32%***        83.84%
          (0.0000)         (0.1393)
_____________________________________________________

*** p-value < .01, ** p-value <.05, * p-value <.1
p-values in parentheses
```

The date corresponding to the announcement of the size of the true Greek budget deficit is statistically significant only when a 4-day event window is used.

Table 2: Event Study CAAR for Greek Sovereign Bond Yields, Feb 27, 2012

```
Event date: 27feb2012, with 2 event windows specified, under the Normality assumption
SECURITY CAAR[-4,4]       CAAR[-10,-10]
YieldGR  26552.37%***     2791.05%***
           (0.0000)         (0.0000)
_____________________________________________________

*** p-value < .01, ** p-value <.05, * p-value <.1
p-values in parentheses
```

Under both event-window specifications, the date of the downgrade by the S&P of the Greek government into Selective Default status, a number of days prior to the PSI, is statistically significant as an event.

Table 3: Event Study CAAR for Greek Sovereign Bond Yields, Jan 26, 2015

```
Event date: 26jan2015, with 2 event windows specified, under the Normality assumption
SECURITY CAAR[-4,4]       CAAR[-10,-10]
YieldGR  1250.87%          66.50%
           (0.5420)         (0.9224)
_____________________________________________________

*** p-value < .01, ** p-value <.05, * p-value <.1
p-values in parentheses
```

The election of a new left-wing party in government, although associated with a very high CAAR on a 4-day window, it does not appear to be a statistically significant event for Greek sovereign yields based on this method.

Table 4: Event Study CAAR for Greek Sovereign Bond Yields, Jun 29, 2015

```
Event date: 29jun2015, with 2 event windows specified, under the Normality assumption
SECURITY CAAR[-4,4]       CAAR[-10,-10]
YieldGR  4356.61%**       467.27%
           (0.0309)         (0.4870)
_____________________________________________________________

*** p-value < .01, ** p-value <.05, * p-value <.1
p-values in parentheses
```

The announcement of a referendum is associated with the highest CAAR calculated among all 4-day event windows and is statistically significant at the 5% level. However, the event may not be significant for a 10-day window. This may be in line with the easing effect on market fears due to the reassuring announcement of extraordinary policy measures by the ECB.

Table 5: Event Study CAAR for Greek Sovereign Bond Yields, Mar 23, 2020

```
Event date: 23mar2020, with 2 event windows specified, under the Normality assumption
SECURITY CAAR[-4,4]       CAAR[-10,-10]
YieldGR  -4650.93%**      -579.99%
           (0.0102)         (0.3364)
_____________________________________________________________

*** p-value < .01, ** p-value <.05, * p-value <.1
p-values in parentheses
```

Under a 4-day event window, the announcement of a general lockdown due to COVID-19 proved to be an informational event for Greek yields at a 4-day event window. However, statistical significance is not confirmed under a 10-day window.

Therefore, under the normality assumption and using historical mean yields as a benchmark, only the announcement of the PSI is statistically significant under both event windows.

Using the Market Index (German Bund) as Benchmark

Table 6: Event Study CAAR for Greek Sovereign Bond Yields, Oct 19, 2009

```
Event date: 19oct2009, with 2 event windows specified, under the Normality assumption
SECURITY CAAR[-4,4]       CAAR[-10,-10]
YieldGR  -528.16%***      -82.02%*
           (0.0000)         (0.0529)
_____________________________________________________________

*** p-value < .01, ** p-value <.05, * p-value <.1
p-values in parentheses
```

Under this specification, whereby CAAR for the Greek yield are compared to those of a market benchmark (the Bund yield), the announcement of the Greek deficit is associated with an opposite sign, potentially indicating the European dimension of the debt crisis. When a 10-day event window is applied, results are not statistically significant at the 5% level.

Table 7: Event Study CAAR for Greek Sovereign Bond Yields, Feb 27, 2012

```
Event date: 27feb2012, with 2 event windows specified, under the Normality assumption
SECURITY CAAR[-4,4]       CAAR[-10,-10]
YieldGR  6613.45%***      572.07%
           (0.0000)         (0.2254)
_____________________________________________________________

*** p-value < .01, ** p-value <.05, * p-value <.1
p-values in parentheses
```

Surprisingly, the announcement of the Greek downgrade is not statistically significant with a 10-day event window. Yet, it remains highly significant under a 4-day event window.

Table 8: Event Study CAAR for Greek Sovereign Bond Yields, Jan 26, 2015

```
Event date: 26jan2015, with 2 event windows specified, under the Normality assumption
SECURITY CAAR[-4,4]       CAAR[-10,-10]
YieldGR  2036.56%***      157.92%
           (0.0000)         (0.1632)
_____________________________________________________________

*** p-value < .01, ** p-value <.05, * p-value <.1
p-values in parentheses
```

The January 2015 election is highly statistically significant and is associated with a very large CAAR for Greek sovereign spreads under a 4-day event window.

Table 9: Event Study CAAR for Greek Sovereign Bond Yields, Jun 29, 2015

```
Event date: 29jun2015, with 2 event windows specified, under the Normality assumption
SECURITY CAAR[-4,4]       CAAR[-10,-10]
YieldGR  4579.25%***      477.65%***
           (0.0000)         (0.0003)
_____________________________________________________________

*** p-value < .01, ** p-value <.05, * p-value <.1
p-values in parentheses
```

In contrast, the announcement of the Greek referendum constitutes a statistically significant event under both event windows.

Table 10: Event Study CAAR for Greek Sovereign Bond Yields, Mar 23, 2020

```
Event date: 23mar2020, with 2 event windows specified, under the Normality assumption
SECURITY CAAR[-4,4]       CAAR[-10,-10]
YieldGR  568.36%***       125.52%*
           (0.0047)         (0.0607)
_____________________________________________________________

*** p-value < .01, ** p-value <.05, * p-value <.1
p-values in parentheses
```

As under the alternative method, the announcement of a general lockdown in response to COVID-18 in March 2020 constituted a statistically significant event only with a 4-day event window at the 5% level of significance.

As under the alternative method, the announcement of a general lockdown in response to COVID-18 in March 2020 constituted a statistically significant event only with a 4-day event window at the 5% level of significance.

Combining the results of Tables 1-10, although all event dates may be statistically significant under a 4-day event window, the announcement of the Greek downgrade into Selective Default by S&P prior to the PSI has a more robust effect on Greek yields, compared to historical means. Similarly, when the benchmark is the cumulative return on the German Bund, the announcement of the Greek referendum is the most robust event, although 4-day CAAR is still higher in the days prior to the Greek PSI.

Table 11: Summary of Statistically Significant CAAR Event Study Dates, at the 5% Significance Level.

Event Date	Method 1	Method 2
10Oct2009	Significant at 4-day window	Significant at 4-day window, but negative CAAR
27Feb2012	Significant at 4-day and 10-day window	Significant at 4-day window
26Jan2015	Not significant	Significant at 4-day window
29Jun2015	Significant at 4-day window	Significant at 4-day and 10-day window
23Mar2020	Significant at 4-day window	Significant at 4-day window

Conclusion

The innovative application of a risk perspective for the abnormal returns commonly used in event study methods has potentially generated a novel sub-field for event studies, as pertaining to sovereign risk. According to the main findings of this study, the

announcement of the Greek downgrade into Selective Default by S&P prior to the PSI and the announcement of the Greek referendum are highly statistically significant events for the Greek sovereign spread, alluding to underlying market fears of default on the Greek public debt in relevant dates.

In line with the long-standing critique in the literature, this event study may be biased by evidence of non-normality in and fat tails in the distributions of daily yields, potential non-synchronous trading activity and serial dependence across trading day yields, as well as by the non-stationarity of daily variances [1]. Future research could apply more advanced bootstrapping and data mining methods to eliminate some of the above concerns [6-10]. Alternatively, OLS models could be used for the specification of the abnormal return, as already performed in panel studies of Eurozone sovereign spreads a la Godl and Kleinert [11-15]. Lastly, the statistical significance of additional and more recent events could be examined [16-18].

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