Using xtbreak to study the impacts of the European Central Bank announcements on the cost of sovereign borrowing

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- Introduction

- Hypotheses

- Empirical Facts

- Model of Sovereign Spreads

- Model Fit

- Conclusion

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Abstract

- This paper investigates how the announcements of the **European Central Bank** have impacted the accumulation of debt in **European countries**, by changing the **cost of sovereign borrowing**.

- We show that most of the variations in the cost of sovereign borrowing can be explained by a model that allows for structural breaks to account for **changes in expectations** after the ECB announcements. **The main oscillations in spreads can be explained by economic fundamentals.**

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Introduction

- Since the adoption of the Euro, many countries accumulated stocks of public debt that surpassed the limit of 60% of GDP (SGP).

  - Although the **Maastricht treaty** had a no bail out clause, investors seemed to have classified European bonds as low risk assets until the **European Sovereign Debt Crisis** started.

Introduction

- The cost of sovereign borrowing for each unit of new debt issuance today is the government yield agreed today for payment on next periods.

- Sovereign spread is the difference between a government yield and the yield of the anchor country, which is characterized by the lowest risk of default. In our analysis, we consider the difference between the average 10-year bond yield of each country, and the German bond yield.

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Hypotheses

- Two Hypotheses:
    1. Since the beginning of 2010, when international institutions and the ECB showed they would not bail out Greece, European sovereign spreads may have started to be more impacted by economic fundamentals (the ability to repay of each issuer) and risk aversion (the magnitude and duration of the crisis were uncertain).

    2. Economic fundamentals and risk aversion may also have had a lower impact on sovereign spreads since July 2012, when Mario Draghi, then president of the ECB, announced: "within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough."

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Empirical Facts

Sample:

- Austria, Belgium, France, Netherlands, Portugal, Ireland, Italy, Greece and Spain

- Balanced Quarterly Panel: from 2001q1 until 2013q4

Empirical Facts

- Question: What are the drivers of sovereign spreads?

  ➢ The countercyclical movement of spreads has been consistently evidenced (Cline, 1995; Cantor and Parker, 1996; Poiatti, 2020; Uribe and Yue, 2008;)

  ➢ Cline (1995); Cantor and Parker (1996); Hilscher and Nosbusch (2010); Akitoby and Stratmann (2008) have considered the ratio of total government debt to output to be a measure of fiscal sustainability important to determine sovereign spreads

Empirical Facts

- Question: What are the drivers of sovereign spreads?

- Hilscher and Nosbusch (2010) and De Grauwe and Ji (2013) show that sovereign spreads can be impacted by changes on the availability of resources generated though international trade to repay debt obligations.

  - The real effective exchange rate

- Caballero and Krishnamurthy (2008) and Krishnamurthy (2010): empirical evidence of "flight-to-quality". We include the VIX, the equity volatility index, in order to control for global risk aversion.
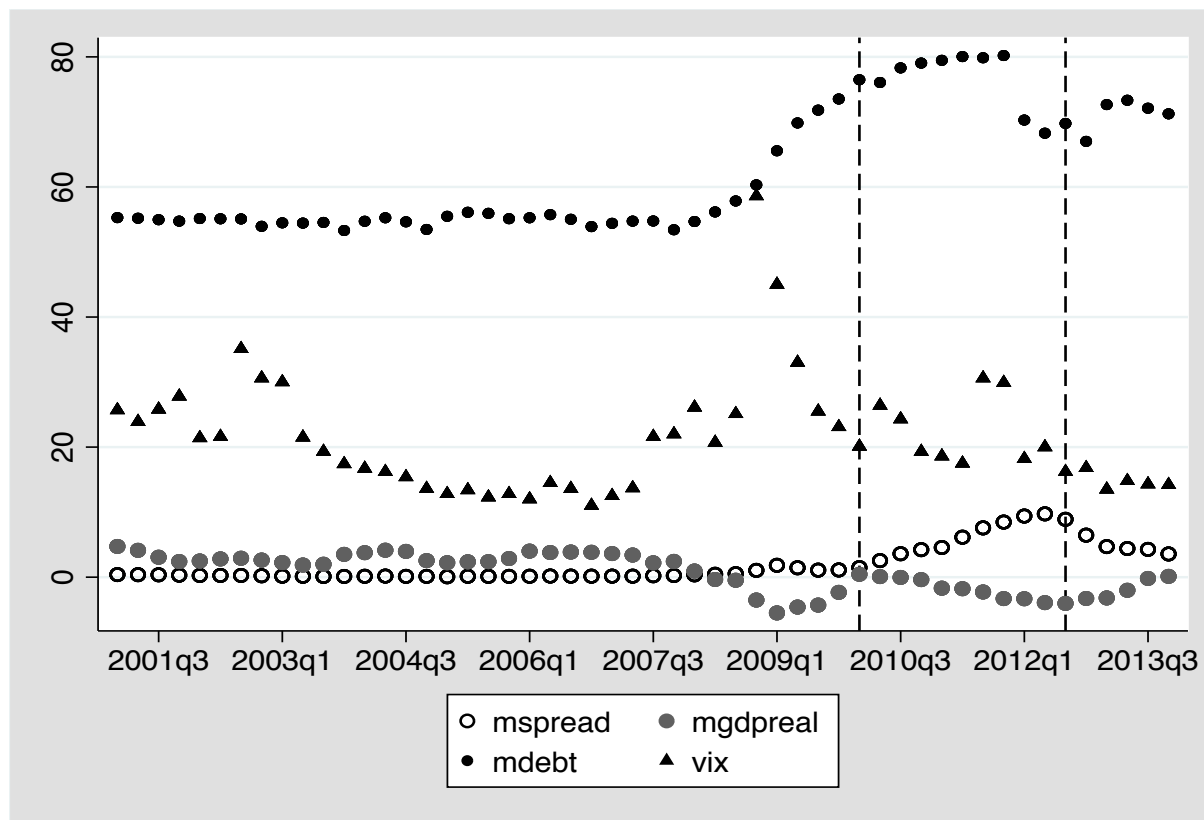
Empirical Facts

Data:

- *Spread*: difference between the average 10-year bond yield of each country, and the Germany's bond yield (Source: Eurostat)

- *GDPreal*: The Real GDP Growth Rate yoy (Source: Eurostat)

- *Debt*: Total Government Debt Securities (% GDP) (Source: Eurostat)

- *REER*: The Real Effective Exchange Rate (Source: Eurostat)

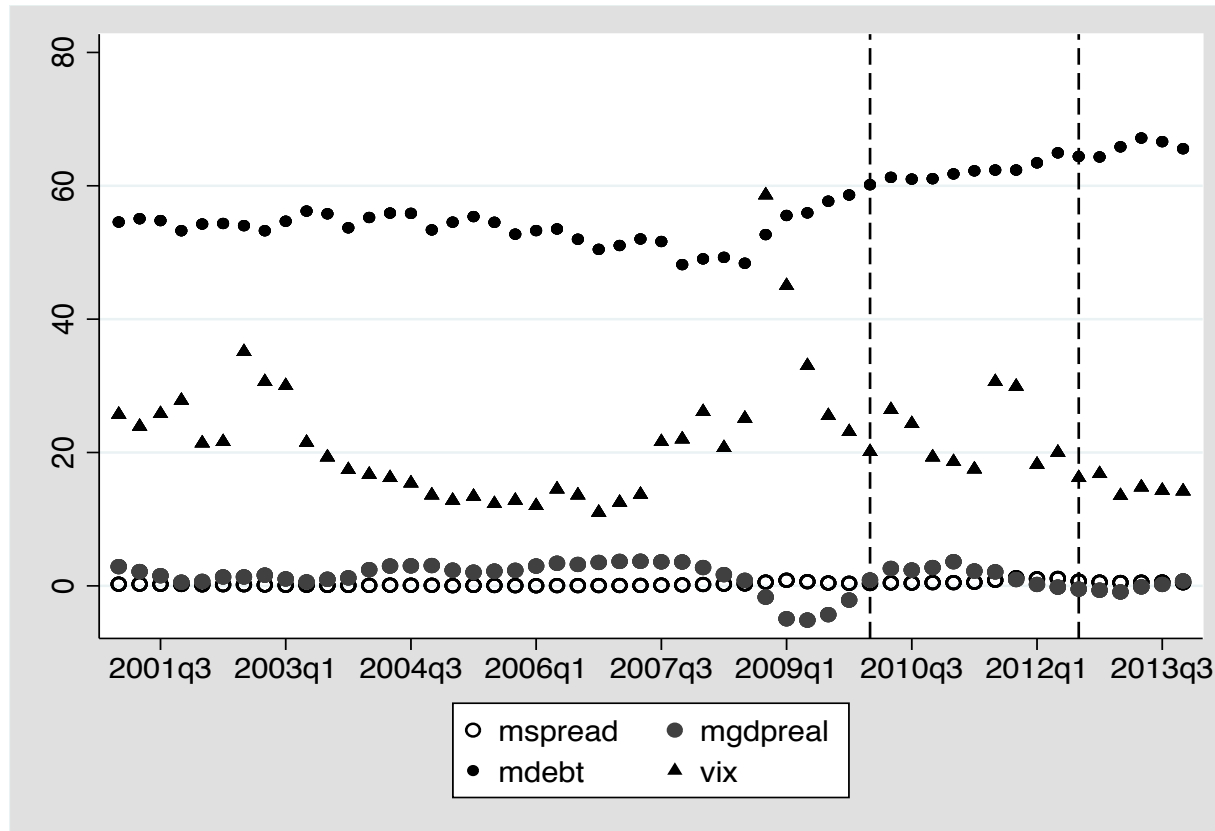- *VIX*: Implied Volatility of the S&P Index (Source: Bloomberg)

Empirical Facts

Peripheral Economies over the Business Cycles

Source: Author's own calculations based on data from Eurostat and Bloomberg.

Empirical Facts

Central Economies over the Business Cycles

Source: Author's own calculations based on data from Eurostat and Bloomberg.

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Model of Sovereign Spreads

- Can we identify breaks in the spread pricing function after the ECB announcements?

Model of Sovereign Spreads

- **Use the command xtbreak to test for the number and time of breaks. (Ditzen, Karavias & Westerlund, 2021. Xtbreak: Estimating and testing for structural breaks in Stata)**

- **Hypothesis 2 (test for unknown number and time of breaks for all countries)**

xtbreak test spread gdpreal debt reer vix, hypothesis(2) breaks(1 4)

H0: no break(s) vs. H1: 1 <= s <= 4 break(s)

----------------- Bai & Perron Critical Values -----------------

Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
UDmax(tau)	66.09	5.10	4.09	3.65

Estimated break points: 2010q3

Model of Sovereign Spreads

- **Use the command xtbreak to test for the number and time of breaks. (Ditzen, Karavias & Westerlund. 2021)**

- **Hypothesis 2 (test for unknown number and time of breaks – peripheral economies)**

xtbreak test spread gdpreal debt reer vix, hypothesis(2) breaks(1 4)

H0: no break(s) vs. H1: 1 <= s <= 4 break(s)

```
----------------- Bai & Perron Critical Values -----------------
          Test       1% Critical    5% Critical    10% Critical
        Statistic       Value          Value          Value
--------------------------------------------------------------------
 UDmax(tau)     67.73          5.10           4.09           3.65
--------------------------------------------------------------------
```

Estimated break points: 2010q3

* evaluated at a level of 0.95.

Model of Sovereign Spreads

- **Hypothesis 1 (test for known number and unknown time of breaks)**

xtbreak test spread gdpreal debt reer vix, hypothesis(1) breaks(1)

(Karavias, Narayan & Westerlund. 2021)

H0: no break(s) vs. H1: 1 break(s)

```
----------------- Bai & Perron Critical Values -----------------
          Test          1% Critical    5% Critical    10% Critical
        Statistic          Value          Value          Value
--------------------------------------------------------------------------
 supW(tau)        67.73          5.06           4.05           3.56
--------------------------------------------------------------------------
```

Estimated break points: 2010q3

Model of Sovereign Spreads

- Xtbreak does not choose a break after the " whatever it takes announcement" (July, 2012)

- However: the limited time period after 2012q3 can imply highly correlated break variables and a loss of statistical significance

- Shall we test for a break since 2012q3, conditionally on the break 2010q3?

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Model Fit

- All Economies: Fitted Parameters until 2010q3

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	(1) spread	(2) spread	(3) spread
gdpreal	-0.09*	-0.03	-0.04
	(-2.66)	(-1.33)	(-1.55)
debt	0.09**	0.05**	0.05**
	(4.93)	(4.75)	(4.71)
reer	0.04	-0.04	-0.06
	(0.64)	(-0.77)	(-1.06)
vix	0.00	0.01	0.01
	(0.63)	(2.10)	(1.84)

(t statistics in parentheses* p<0.05, ** p<0.01)

Model Fit

```
-----------------------------------------------------------------
                   (1)          (2)          (3)
                 spread       spread       spread
-----------------------------------------------------------------
d2010q3_gdp                   -0.56*       -0.67*
                             (-2.59)      (-3.07)

d2010q3_debt                  0.02         0.02
                             (1.19)       (1.42)

d2010q3_reer                 -0.02*       -0.00
                             (-2.53)      (-0.10)

d2010q3_vix                   0.13**       0.05*
                             (4.26)       (2.92)

d2012q3_vix                               -0.11**
                                          (-3.91)
-----------------------------------------------------------------
R-sq             0.46         0.68         0.72
BIC           1401.30      1178.10      1117.69
-----------------------------------------------------------------
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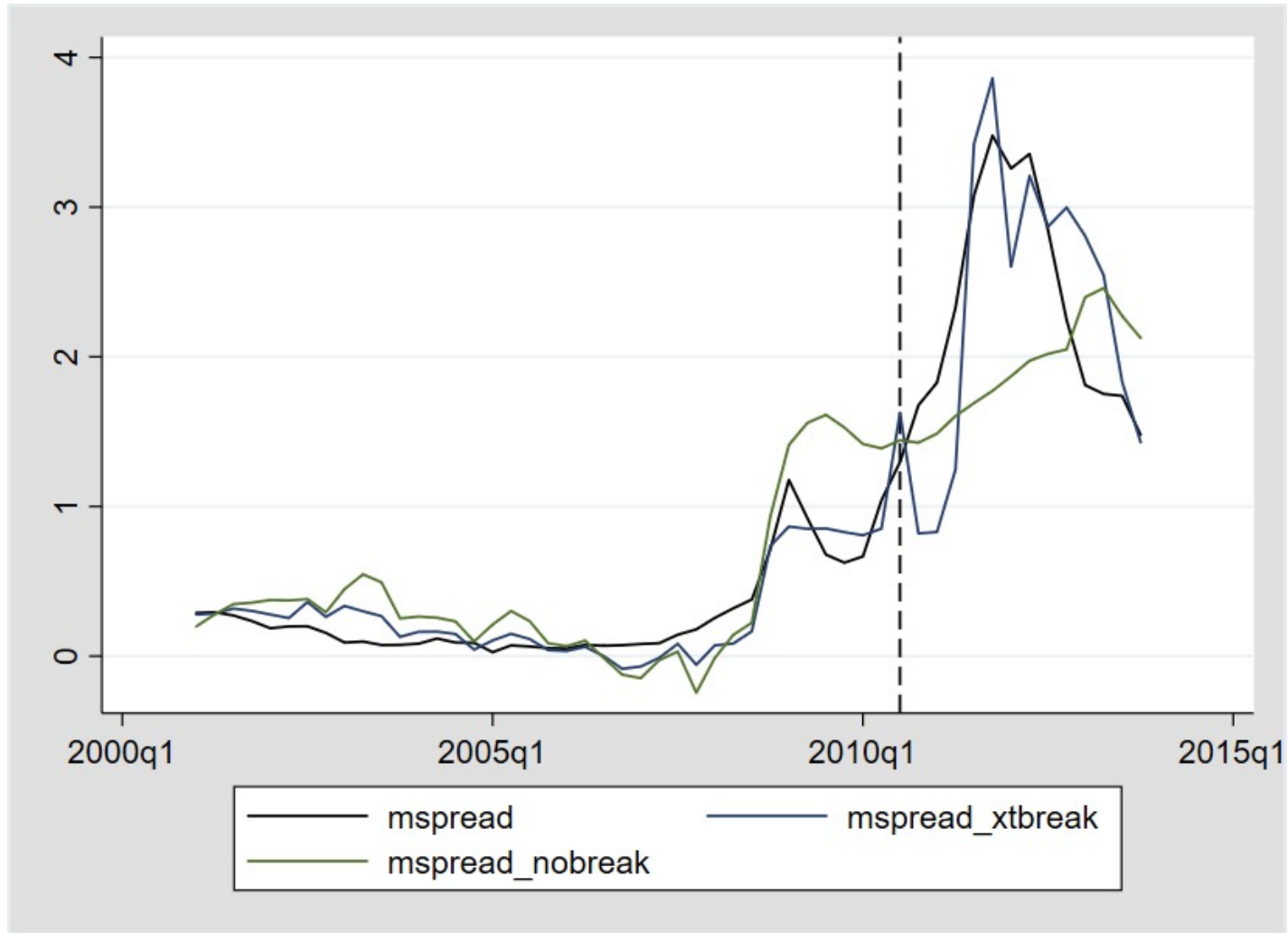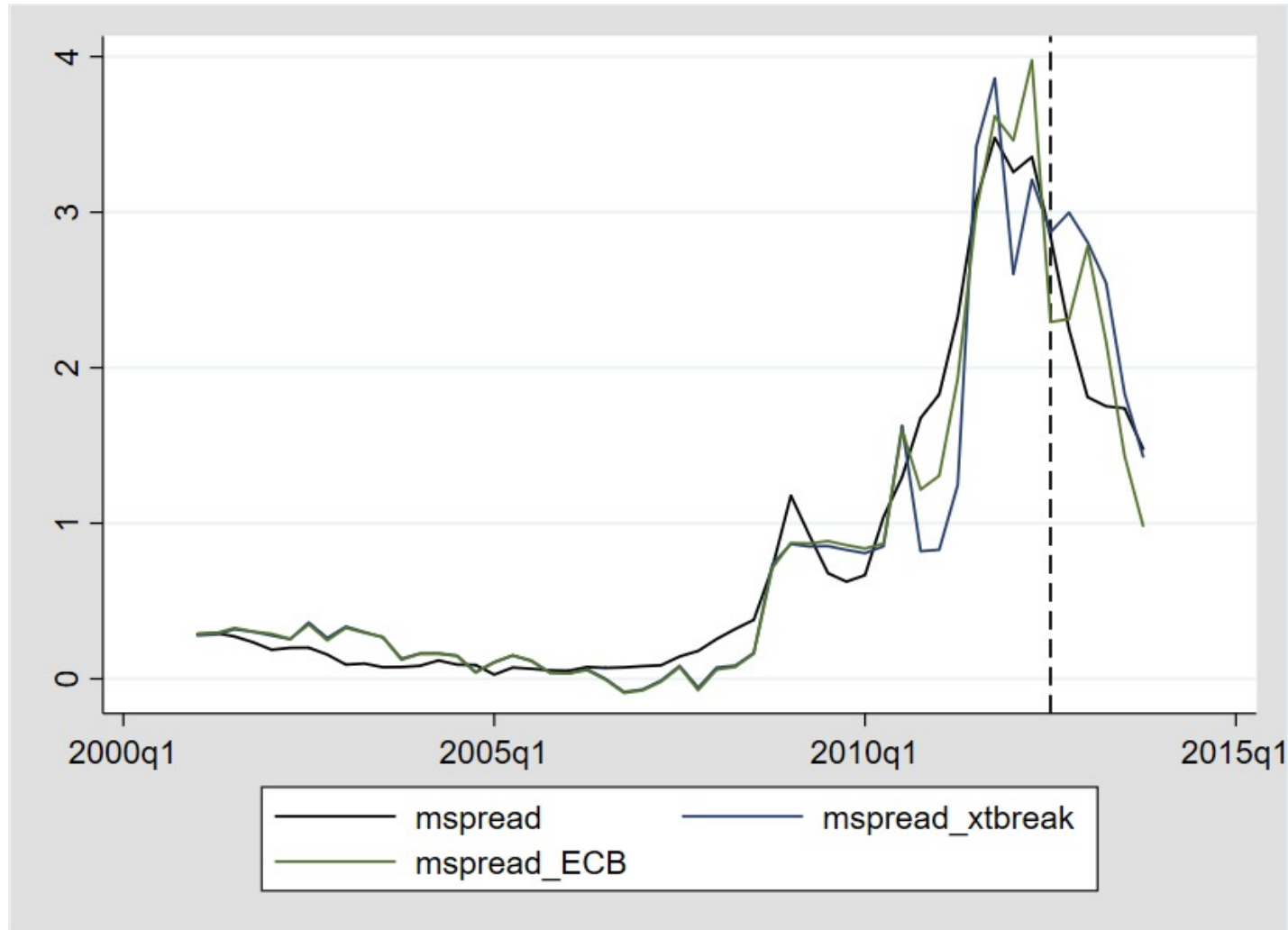
Model Fit

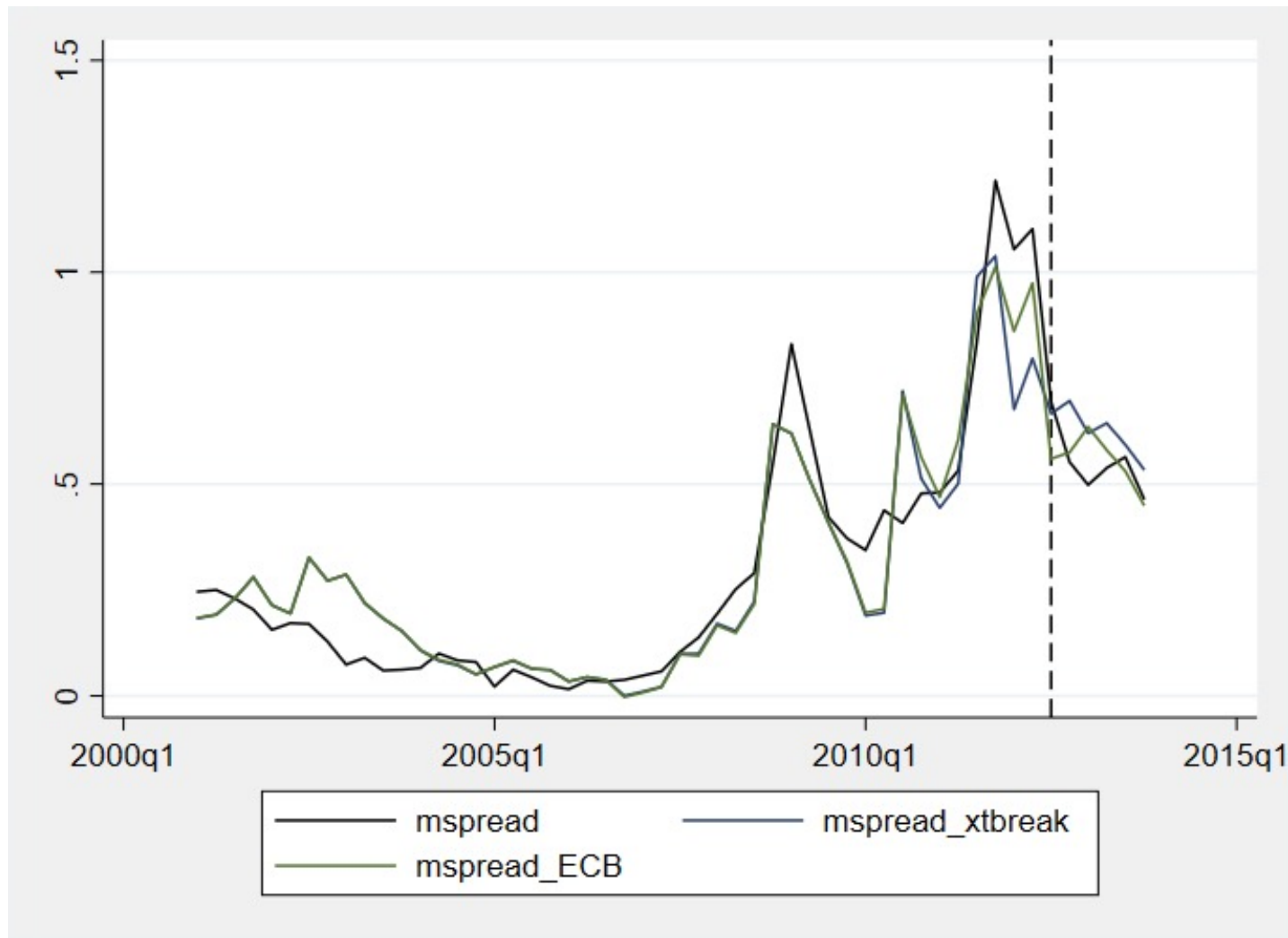- All Economies: Actual and Fitted Spreads (no break and 2010q3 break)

Model Fit

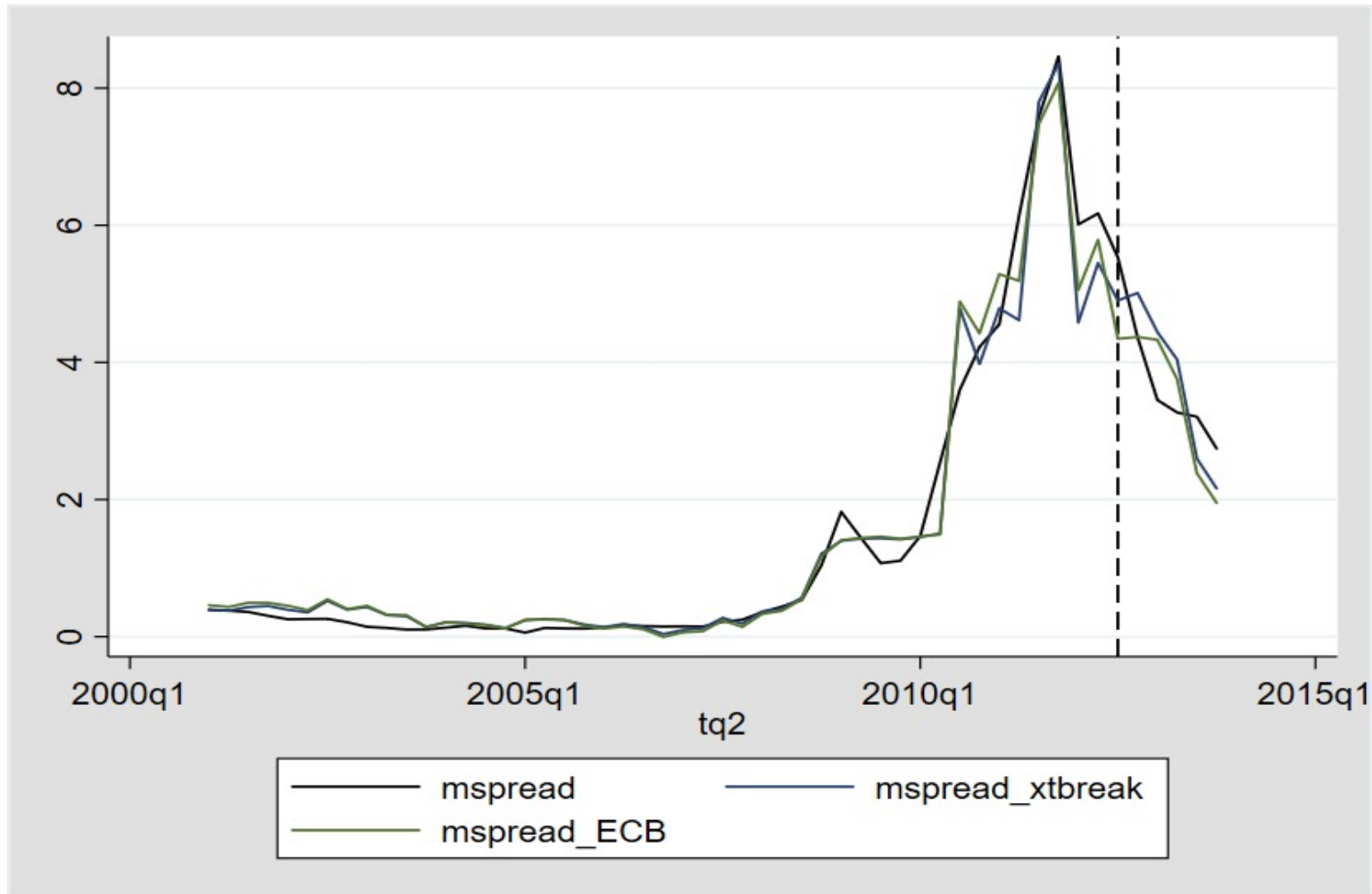- All Economies: Actual and Fitted Spreads (2010q3 and 2012q3 breaks)

Model Fit

- Central Economies: Actual and Fitted Spreads (2010q3 and 2012q3 breaks)

Model Fit

- Peripheral Economies: Actual and Fitted Spreads (2010q3 and 2012q3 breaks)

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Conclusion

▪ In this paper, I show that a model that incorporates structural breaks to represent changes in bail out expectations can explain most variations in European spreads.

Conclusion

I show that much of the variations of European sovereign spreads can be explained by economic fundamentals in a model that allows for two structural breaks:

➢ The first, when investors realized the fiscal sustainability of the EMU should be understood in a decentralized fashion, when the ECB showed it would not fully bail out Greece

➢ The second, when the ECB realized the existence of the euro was in check and announced it would be able to financially assist the countries in trouble.

Thank you!