LISBON SCHOOL OF ECONOMICS & MANAGEMENT
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MASTER
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MASTER´S FINAL WORK
DISSERTATION

EU SOVEREIGN RATINGS LAGS PRIOR AND AFTER THE GREAT RECESSION

GRAZIELLI ANGELUCCI PAINELI

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SUPERVISION:
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CRA – Credit Risk Agency

EU – European Union.

JCR – Japan Credit Rating Agency

R&I – Japan Rating & Investment Information

S&P – Standard and Poor' s

ABSTRACT

We study the variables that most affect the sovereign ratings change in the EU for Credit Rating Agencies Fitch and S&P. Using a panel probit model we assess the impact of different economic and political variables on sovereign ratings general change, increase and decrease before and after the Great Recession. Most importantly, we also analyse the lead lag time for each rating agency in these two periods, covering specifically 1997:12-2018:12. Our results show that economic and political variables are considered differently in both periods and that the lead lag for rating changes decreases after the crisis, especially when this change is a decrease in the rating. We then enrich the discussion by bringing some behavioural concepts into the reasoning of that change in the variables and lead lag behaviour.

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EU SOVEREIGN RATINGS LAGS PRIOR AND AFTER THE GREAT RECESSION
By Grazielli Angelucci Paineli

1. INTRODUCTION

The conflict of interests faced by Credit Rating Agencies (CRAs) was brought to higher evidence after the Great Recession in 2008. In this context, Bolton et al. (2007) described the three sources of conflicts: (i) CRAs conflict of understating risk to attract business, (ii) issuer´s ability to purchase only the most favourable ratings, and (3) the trusting nature of some investor clienteles.

Specifically for the sovereign credit ratings, the above can also apply. Reason being for instance, for the EU, as reported by Afonso et al. (2012), there were significant responses of government bond yield spreads to changes in rating notations and outlook, particularly in the case of negative announcements.

Also, on many other occasions, critiques arose on CRAs considerable time lag responding, i.e., ratings were not immediately downgraded once the problems in the sub-prime market became clear, hence CRAs were slow in adjusting their ratings. For instance, the day before Lehman went bankrupt on September 2018, the major CRAs gave the bank still investment grade ratings (Haan and Amtenbrink, 2011) or until a few days before Enron's bankruptcy in November 2001, all three major agencies rated it in the investment category: Standard & Poor's and Fitch gave it a BBB rating and Moody's gave it a notch below Baa3 rating (Jeon and Lovo, 2013).

Either aimed at private or sovereign institutions, CRAs usually provide an independent assessment on the ability of the issuer to meet their debt obligations and also an ongoing monitoring on the issuer rating in order to assess whether any relevant events have happened since the initial rating. Those services, despite of being used for important decision making for investors, regulators and institutions, are disclaimed always as the CRAs opinions.

However, if ratings are nothing more than opinions, they are subjected to the psychology of decision-making. Thaler (2015) and Gigerenzer and Gaissmaier (2011) bring two very important findings from that theory that may fit into the Rating agencies decision making: (i) present bias: the events in the present (or recent past) matter most in

decision making compared to past events and (ii) individuals and organizations often rely on simple heuristics in an adaptive way: deviations from logical or statistical principles become routinely interpreted as judgmental biases and attributed to cognitive heuristics such as "representativeness", in this particular case, professional experience and historical events can lead to cognitive heuristics.

Therefore, this paper analyses the behaviour of the rating agencies S&P and Fitch prior and after the Great Recession, during the period 1997:12-2018:12 for 28 EU countries, asking whether they have taken longer to change sovereign credit ratings in the EU prior to the crisis compared to after the crisis. Our main results show that the lead lag for rating changes decreases after the crisis, especially when this change is a decrease in the rating.

The remainder of the paper is organized as follows: Section 2 provides the literature review; Section 3 provides the empirical analysis, which is composed by the sub-sections methodology, data, results; and Section 4 is the conclusion.

2. REVIEW OF LITERATURE

There have been several studies regarding the transparency of the methodology used by CRAs (Hill, Brooks, and Faff, 2010; Bolton, Freixas, and Shapito, 2007; Jeon and Lovo, 2013; Vaaler, Mcnamara, and Mcnamara, 2004) and many other attempts to calibrate existing methods and also to create independent, simple data driven models that can provide a timely and consistent rating for counties (Polito and Wickens, 2015; Wei, 2003; Van Gestel et al., 2006; Bennell et al., 2006; Fernández-Navarro et al., 2013; Duan and Laere, 2012).

However, prior literature on lead-lags analysis of ratings is very limited. Güttler and Wahrenburg (2006) assess biases in corporate credit ratings and lead-lag relationships for near-to-default issuers with multiple ratings by Moody's and S&P and found evidence that Moody's seems to adjust its ratings to increasing default risk in a timelier manner than S&P and that given a downgrade (upgrade) by the first rating agency, subsequent downgrades (upgrades) by the second rating agency are of greater magnitude in the short term. Guettler (2010) also analysed the statement that rating downgrades are known to make subsequent downgrades more likely and showed that investors, banks, and

regulators face a substantial risk of ignorance if they neglect the effect of rating downgrade momentum.

Nevertheless, the abovementioned literature is focused on corporate ratings and as Alsakka and ap Gwilym (2010) stated, there are significant discrepancies between corporate and sovereign ratings performance. Rating agencies apply different approaches and consider different inputs to evaluate the credit-worthiness of corporate and sovereign issuers. They investigated the presence of lead–lag relationships among sovereign ratings assigned by five agencies, namely Moody's, S&P, Fitch, Japan Credit Rating Agency (JCR) and Japan Rating & Investment Information (R&I) and showed that there exists interdependence in rating actions. Upgrade (downgrade) probabilities are much higher, and downgrade (upgrade) probabilities are much lower for a sovereign issuer with a recent upgrade (downgrade) by another agency. S&P tends to demonstrate the least dependence on other agencies, and Moody's tends to be the first mover in upgrades. Rating actions by Japanese agencies tend to lag those of the larger agencies, although there is some evidence that they lead Moody's downgrades.

This difference in behaviour can be explained through the essence of the credit ratings decisions. Vaaler et al. (2004) analysed whether expert decision making is vulnerable to distortion. Their findings undermined objectivity as, in their words, "decision making by expert organizations is significantly and substantially distorted by industry turbulence and positioning". Hence, while the main CRAs continue to attribute ratings based on their own models it is important to understand how their behaviour affects the ratings outcome.

Zarnoth and Sniezek (1997) describe two types of tasks that involve different behaviors. Tasks at the extreme judgmental end of the continuum are opinion questions such that no answer is more accurate than any other; intellective tasks are those that one could prove the accuracy of the correct response. As Gigerenzer and Gaissmaier (2011) also described

> "(Simon 1978) stressed in his Nobel Memorial Lecture, the classical model of rationality requires knowledge of all the relevant alternatives, their consequences and probabilities, and a predictable world without surprises. These conditions, however, are rarely met for the problems that individuals and organizations face. (L. J. Savage 2010), known as the founder of modern Bayesian decision theory, called such perfect knowledge small worlds, to be distinguished from large worlds. In large worlds, part of the relevant information is unknown or has to be estimated from

small samples, so that the conditions for rational decision theory are not met, making it an inappropriate norm for optimal reasoning."

Zarnoth and Sniezek (1997) research also shows that confidence should better predict influence on intellective rather than judgmental tasks simply because both confidence and influence are more highly correlated to a third variable, accuracy, for the intellective task.

As Cantor and Packer (1996) described, ratings can be largely explained by a small set of specific and measurable variables: per capita income, GDP growth, inflation, external debt, level of economic development and default history. Afonso, Gomes, and Rother (2011) also concluded that changes in GDP per capita, GDP growth, government debt, government balance have a short-run impact on a country's credit rating, while government effectiveness, external debt, foreign reserves and default history are important long-run determinants. That being, CRAs decisions are more of an intellective than a judgmental one and; as a result, they are subjected to overconfidence in their decision-making (Zarnoth and Sniezek 1997). This overconfidence leads decision makers to have the tendency to focus on their own abilities and successes rather than on situational factors (Gärling et al. 2009). This tendency continues until a breakpoint event, an external or internal shock such as a crisis happens, leading to a change in behaviour. In the case of the CRAs, it leads to a mass change in sovereign ratings and, consequently, herd behaviour (Haan and Amtenbrink 2011; Eijffinger 2012; Zarnoth and Sniezek 1997; Güttler and Wahrenburg 2006). As Güttler and Wahrenburg (2006) described, given a downgrade (upgrade) by the first rating agency, subsequent downgrades (upgrades) by the second rating agency are of greater magnitude in the short term and, harsher rating changes by one agency are followed by harsher rating changes in the same direction by the second agency. Other authors have also shown the level of pro-cyclicality and the "cliff effect" brought by the CRAs worsening the crisis. As Jeon and Lovo (2013) stated:

> "For instance, during the Euro zone crisis, the agencies were initially slow to downgrade Greek debt, especially Moody's which waited until December 2009 before taking its first decision. This waiting period was followed by a period of severe downgrades: after leaving the Greek rating unchanged from 2003 to 2009, Moody's downgraded it by nine notches in the fifteen months that followed. In particular, a downgrade from an investment grade to a speculative grade can be self-fulfilling. More precisely, given that regulations constrain many institutional investors to hold only bonds of investment grades, such downgrade can cause massive sales and make borrowing very difficult for the issuer. This is called the 'cliff effect'."

Reusens and Croux (2017) found empirical evidence that the credit rating agencies changed their sovereign credit rating assessment after the start of the European debt crisis. They state that financial balance, the economic development and the external debt became substantially more important after 2009, and the effect of Eurozone membership switched from positive to negative. In addition, GDP growth and government debt, as well as their interaction, gained much importance, such that the positive effect of GDP growth on the credit rating became considerable, especially for highly indebted sovereigns, and that the negative effect of government debt became large, especially for low growth countries.

This behaviour is presented in our results: pre crisis, rating change decisions did not follow a common lag or path. For Fitch, political variables were the ones exclusively relevant, whereas for S&P, it was the country´s production index. After a breaking point – the Great Recession – the rating change is triggered and both agencies begin to decrease ratings at a higher speed and based on different variables than before.

3. EMPIRICAL ANALYSIS

3.1 Methodology

We use a panel data probit model to identify the impact on rating changes following the equation below. This is ran for both agencies, S&P and Fitch:

$$\Delta ratingch_{it} = a + \beta_1 yc_{it} + \beta_2 debt_{it} + \beta_3 growth_{it} + \beta_4 inflation_{it} + \beta_5 ipi_{it} + \beta_6 stability_{it} + \beta_7 effectiveness_{it} + \beta_8 ruleoflaw_{it} + \varepsilon_{it}. \quad (1)$$

Equation (1) models the impact of the possible determinants on the rating change, where yc is the variation of the monthly sovereign yield for each country in the given period. Bernoth, Hagen, and Schuknecht (2004) show that higher yield levels for EU countries reflect positive default and higher risk premia. In that sense, an increase (reduction) in the yield is assumed to deteriorate (improve) credit worthiness contributing to the reduction (increase) of sovereign ratings.

$debt$ is the variation of government debt as a percentage of GDP for each country in the specific month and is assumed to be one of the main variables in the CRAs rating analysis. The literature has a vast group of theories on the optimal sovereign debt-to-GDP ratio for specific countries, Reinhart et al. (2003), for example, state that "safe" levels of debt ratio of countries that have experienced defaults are lower than industrialized ones.

An increase (reduction) in debt-to-GDP is assumed to deteriorate (improve) credit worthiness contributing to the reduction (increase) of sovereign ratings.

$growth$ is GDP real growth for each country. This variable is used as a proxy for the effects of growth in the rating change. According to (Alesina et al., 1992), for periods of economic slowdown, sovereign debt becomes higher. Therefore, an increase (reduction) in growth performance is assumed to improve (deteriorate) credit worthiness contributing to the increase (reduction) of sovereign ratings.

$inflation$ accounts for the inflation index and attempts to capture the implication of other economic variables in the countries´ economic performance and, therefore in its credit quality. (Ehrmann et al., 2007) has shown that if inflation expectations in a given country are not perfectly anchored, then one might expect that macroeconomic announcements lead to level shifts in the yield curve. A relevant increase (reduction) in inflation is assumed to deteriorate (improve) credit worthiness contributing to the reduction (increase) of sovereign ratings.

ipi is the industrial production indicator that refers to the output of the industrial sector. This variable is used as a proxy for the effects of economic growth. Therefore, an increase (reduction) in industrial production is assumed to improve (deteriorate) credit worthiness contributing to the increase (reduction) of sovereign ratings.

$stability$ accounts for a World Bank Governance Indicator of Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism. It ranges from approximately -2.5 (weak) to 2.5 (strong). This variable is used as a proxy of political risk for each country, and, as Depken, Lafountain, and Butters (2006) described, variables to asses political risk are also relevant for ratings determination. In this sense, we use three World Bank Governance Indicators, as described below. Therefore, an increase (reduction) in stability is assumed to improve (deteriorate) credit worthiness contributing to the increase (reduction) of sovereign ratings.

$effectiveness$ is also part of the World Bank Governance Indicator and reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. It

ranges from approximately -2.5 (weak) to 2.5 (strong). This variable is used as a proxy of political risk for each country. Therefore, an increase (reduction) in stability is assumed to improve (deteriorate) credit worthiness contributing to the increase (reduction) of sovereign ratings.

Finally, $rule\ of\ law$ is part of the World Bank Governance Indicator and reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. It ranges from approximately -2.5 (weak) to 2.5 (strong). This variable is used as a proxy of political risk for each country. Therefore, an increase (reduction) in stability is assumed to improve (deteriorate) credit worthiness contributing to the increase (reduction) of sovereign ratings. We will also use lags for the explanatory variable yield change.

In order to verify the specific impact on rating increases and decreases, we estimate the model:

$$increase_{it} = a + \beta_1 yc_{it} + \beta_2 debt_{it} + \beta_3 growth_{it} + \beta_4 inflation_{it} +$$
$$\beta_5 ipi_{it} + \beta_6 stability_{it} + \beta_7 effectiveness_{it} + \beta_8 ruleoflaw_{it} + \varepsilon_{it} \qquad (2)$$

where $increase$ narrows the data sample to the events exclusively for a rating increase. Following (2), the model also analyses the lags in rating increase:

$$increase_{it} = a + \beta_1 yc_{it-1} + \beta_2 yc_{it-2} + \beta_3 yc_{it-3} + \beta_4 debt_{it} + \beta_5 growth_{it} +$$
$$\beta_6 inflation_{it} + \beta_7 ipi_{it} + \beta_8 stability_{it} + \beta_9 effectiveness_{it} + \beta_{10} ruleoflaw_{it} +$$
$$\varepsilon_{it} \qquad (3)$$

The same is done for the rating decrease. For the sake of clarity in the results analysis, it is used the module of the rating decrease:

$$moddecrease_{it} = a + \beta_1 yc_{it} + \beta_2 debt_{it} + \beta_3 growth_{it} + \beta_4 inflation_{it} +$$
$$\beta_5 ipi_{it} + \beta_6 stability_{it} + \beta_7 effectiveness_{it} + \beta_8 ruleoflaw_{it} + \varepsilon_{it} \qquad (4)$$

And

$$moddecrease_{it} = a + \beta_1 yc_{it-1} + \beta_2 yc_{it-2} + \beta_3 yc_{it-3} + \beta_4 debt_{it} +$$
$$\beta_5 growth_{it} + \beta_6 inflation_{it} + \beta_7 ipi_{it} + \beta_8 stability_{it} + \beta_9 effectiveness_{it} +$$
$$\beta_{10} ruleoflaw_{it} + \varepsilon_{it} \qquad (5)$$

As the last part of the analysis, we run the lag model based on *debt* as well to verify whether the response time of the CRAs change with debt variations compared to the yield change variations:

$$increase_{it} = a + \beta_1 debt_{it-1} + \beta_2 debt_{it-2} + \beta_3 debt_{it-3} + \beta_4 yc_{it} +$$
$$\beta_5 growth_{it} + \beta_6 inflation_{it} + \beta_7 ipi_{it} + \beta_8 stability_{it} + \beta_9 effectiveness_{it} +$$
$$\beta_{10} ruleoflaw_{it} + \varepsilon_{it} \qquad\qquad (6)$$

And

$$moddecrease_{it} = a + \beta_1 debt_{it-1} + \beta_2 debt_{it-2} + \beta_3 debt_{it-3} + \beta_4 yc_{it} +$$
$$\beta_5 growth_{it} + \beta_6 inflation_{it} + \beta_7 ipi_{it} + \beta_8 stability_{it} + \beta_9 effectiveness_{it} +$$
$$\beta_{10} ruleoflaw_{it} + \varepsilon_{it} \qquad\qquad (7)$$

3.1. Data

The study considers a panel of the 28 members states of the European Union[1] as of today, except Luxembourg, Latvia and Estonia due to lack of data in historical yields, measured in a monthly frequency over the time period 1997:12-2018:12. The Great Recession, which we call "crisis period" is considered from October/2008 onwards.

CRAs issue their ratings on a letter grading scale; for this paper we discuss Fitch´s and S&P which have pretty much the same grading, as per Table I. This comprises 21 grades, from AAA indicating the best quality rating, to C indicating default.

[TABLE I]

3.3 Results

The investigation starts by estimating the effect of the variables in the rating change, rating increase and decrease. The results are in Tables II to IV. We can see that different variables have the most significant impact on *rating change*, as per Table II. For the overall period, Fitch gives more relevance to the sovereign debt changes in each country, whereas S&P, to *inflation* and *growth*. Both agencies present significant result for the

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[1] Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech, Estonia, Germany, Denmark, Finland, France, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom.

crisis variable, showing that in the crisis period, there is an increase in the rating change occurrence.

[TABLE II]

Considering rating *increase*, as per Table III, both agencies continue to show some divergencies. To Fitch, the countries´ yield change (*yc*), *growth, ipi* and *effectiveness* contribute significantly with the expected signs: as *yc* grows the pace of rating increase diminishes; an increase in *ipi* and *effectiveness* has a positive impact in rating increase and positive growth contributes to the rating increase. However, *rule of law* shows the opposite sign as expected. This could show us that the perceptions of the agents regarding confidence in and abide by the rules of society may take longer to show up than the ratings upgrade. To S&P *growth* and yc are presented as significant with the theoretically expected sign.

[TABLE III]

For ratings *decrease* (Table IV) and taking Fitch into consideration, contrary to the rating increase analysis above, all economic variables become significant, with *yc, growth, debt and inflation* being all above the 95% level of confidence. As *decrease* is given in module, all variables present the expected signs. In this case, S&P also values most the economic variables, with *yc, crisis, growth* and *inflation* all above the 95% level. Once again, signs are aligned with expectations. For both agencies, as a country yield or inflation increases, the more the rating decreases and the higher the growth or the country´s effectiveness, the less ratings are decreased. The outstanding variable for rating decrease in this case is inflation, with the highest coefficient.

[TABLE IV]

Now we improve the previous analysis by examining also the extent to which the lags in increasing or decreasing sovereign ratings are affected pre crisis and post crisis based on the countries' *yc* (Tables V and VI). First, comparing only the behaviour within the same category, for a rating *increase* (Table V) we can see that, for Fitch, the political variable *effectiveness* is significant only in the pre-crisis period. *Rule of law* is also significant but with the opposite expected sign. After the crisis, the economic variables become the significant ones: *inflation*, *growth* and *ipi* also become significant variables,

all of them with the expected signs. Also, after the crisis the lag of one period is significant, showing a quicker response when compared to previous to the crisis. Considering S&P, prior to the crisis there are no significant variables, whereas after the crisis, *growth is* significant with the expected signs.

[TABLE V]

For a rating *decrease* (Table VI) prior to the crisis, there is no significance in the variables for both agencies, however, after the crisis we can see the relevant change in behaviour. Fitch changes its ratings with a lag of 1 or 3 periods and presents significant political variables, *effectives* and *rule of law*; however, it prioritizes economic variables, *debt, growth* and *inflation*. S&P, on the other hand, changes its ratings with a lag of 3 periods and presents significance for the economic variables *growth* and *inflation*. *Effectiveness* is also significant, and all variables present their expected signs. All of the significant variables present the expected signs.

[TABLE VI]

All in all, findings in Tables V and VI show that rating agencies do have a much quicker response after the crisis (lower lags) and that they tend to consider different variables for their analysis before and after the crisis.

Thirdly, we exam the extent to which the lags in increasing or decreasing sovereign ratings are affected pre crisis and post crisis based on the countries' *debt* (Tables VII and VIII). Considering rating increase prior to the crisis (Table VII), only Fitch shows some significance in the first period and also for the political variables *effectiveness* and *rule of law*. S&P only presents *ipi* as significant, but no lags whatsoever. After the crisis, Fitch presents significant results on the second period lag, whereas S&P on the second and third periods. *yc* is significant for both, additionally *ipi* is relevant only for Fitch and *inflation* only for S&P. All of the significant variables present the expected signs.

[TABLE VII]

Interestingly, comparing Table VII with Table V, we note that, after the crisis, S&P answers on rating increase are significant for *debt* at period two and three, but not for *yc*. Fitch, on the other hand, replies faster for *yc*, with a significant coefficient in the first period lag

Now taking into account the rating decrease lags on debt (Table VIII), Fitch is the only agency with some significance prior to the crisis period, in the second period lag. After the crisis, Fitch has no significance in lags whatsoever, whereas S&P shows relevant results for periods one and two. Comparing Tables VIII and VI, S&P shows again a faster response considering *debt* rather than *yc*, whereas Fitch has the opposite result.

[TABLE VIII]

This last analysis shows a clear difference in methodology between the two rating agencies, but, most importantly, show that both have presented different behaviour prior and after the crisis, with lower lead time lags when specially decreasing ratings.

Figure 5 in the Appendix shows the selected countries' yield and ratings evolution throughout the years. The summary of the findings for rating decrease and increase is shown in the Figures below.

FIGURE 1 – Significant lags in sovereign yield (*yc*) for Rating Decrease After the Crisis
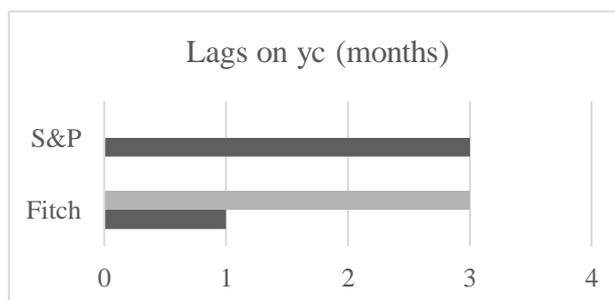
Note: The Figure shows that, after the crisis as the sovereign yield of the countries increased, Fitch decreases their sovereign ratings within 1 or 3 months, whereas S&P, decreases it within 3 months.

TABLE IX

SIGNIFICANT VARIABLES FOR RATING DECREASE LAGS ON yc AFTER THE CRISIS

Fitch	S&P
debt	growth
growth	inflation
inflation	rule of law
rule of law	effectiveness
effectiveness	

Note: The Table shows that, for the same circumstances as Figure 1 shows, both agencies present the same significant variables, government debt being the additional one for Fitch.

For the period before the crisis there was no significance in the lags or economic or political variables.

FIGURE 2 – Significant lags in sovereign yield (*yc*) for Rating Increase After the Crisis
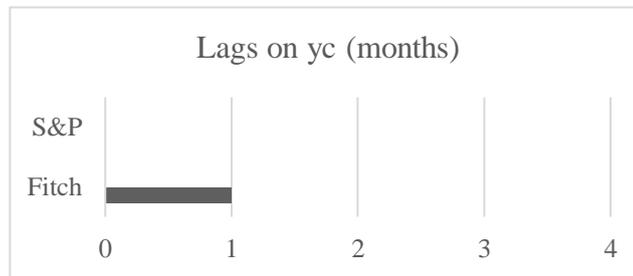
Note: The Figure shows that, after the crisis as the yield of the countries decreased, Fitch increases their sovereign ratings within 1 month, whereas S&P does not present any significance on lead lag times.

TABLE X

SIGNIFICANT VARIABLES FOR RATING INCREASE LAGS ON YC AFTER THE CRISIS

Fitch	S&P
debt	growth
inflation	
effectiveness	
rule of law	

Note: The Table shows that, for the same circumstances as Figure 2 shows, Fitch presents debt, inflation, effectiveness and rule of law as significant variables, whereas S&P, only growth.

For the period before the crisis only Fitch showed some significance in the political variables, effectiveness and rule of law. No significance in the lags were presented for neither of the agencies. Table XI shows these results.

TABLE XI

SIGNIFICANT VARIABLES FOR RATING INCREASE LAGS ON YC BEFORE THE CRISIS

Fitch	S&P
effectiveness	
rule of law	

FIGURE 3 – Lags in *debt* for Rating Decrease After the Crisis.
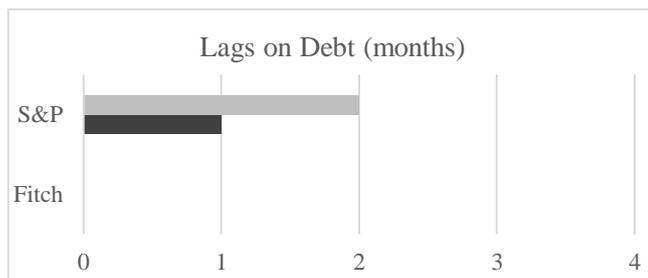
Note: The Figure shows that, after the crisis as the debt of the countries increased, S&P decreases their sovereign ratings within 1 and 2 months, whereas Fitch does not present any significance on lead lag times.

TABLE XII

SIGNIFICANT VARIABLES FOR RATING DECREASE LAGS ON DEBT AFTER THE CRISIS

Fitch	S&P
growth	yc
ipi	growth
inflation	inflation
effectiveness	effectiveness
rule of law	

Note: The Table shows that, for the same circumstances as Figure 3 shows, both agencies present the *growth, inflation* and *effectiveness* as significant variables. Additionally, Fitch also presents the political variables *ipi* and rule of law and S&P, *yc*.

For the period before the crisis only Fitch showed a 2-month lag significance, however, no other variables presented significance.

FIGURE 4 – Lags in *debt* for Rating Increase After the Crisis.
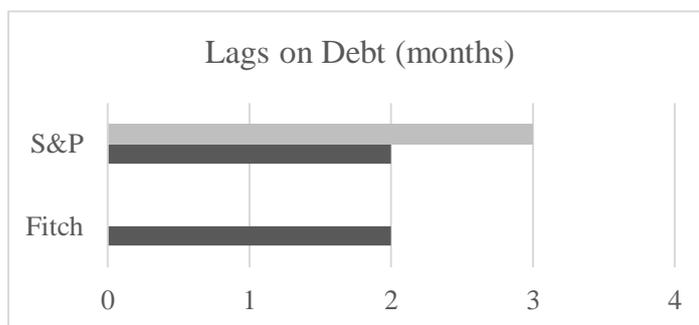
Note: The Figure shows that, after the crisis as the debt of the countries decreases, S&P increases their sovereign ratings within 2 and 3 months, whereas Fitch, after 2 months.

TABLE XIII

SIGNIFICANT VARIABLES FOR RATING INCREASE LAGS ON DEBT AFTER THE CRISIS

Fitch	S&P
yc	yc
ipi	inflation

Note: The Table shows that, for the same circumstances as Figure 4 shows, both agencies present the *yc* as significant variables. Additionally, Fitch also presents *ipi* and S&P, *inflation*.

For the period before the crisis only Fitch showed a 1-month lag significance, as the variables below.

TABLE XIV

SIGNIFICANT VARIABLES FOR RATING INCREASE LAGS ON DEBT BEFORE THE CRISIS

Fitch	S&P
effectiveness	ipi
rule of law	

4. CONCLUSION

In this paper we studied Fitch and S&P´s difference in behaviour in the determination of sovereign credit ratings for the EU prior and after the Great Recession (October/2008 onwards). We consider a panel of the 28 members states of the European Union[2] as of today, except Luxembourg, Latvia and Estonia, measured in a monthly frequency over the time period 1997:12-2018:12.

Our empirical findings indicate that both agencies have significant different behaviours prior vs after the Great Recession. On a nutshell, after the crisis economic variables became the most significant, whereas political variables were the main significant variable before the crisis. Also, the lead lag on rating decrease diminished substantially after the crisis for both agencies with the difference that Fitch downgraded faster based on the countries' yield change, whereas S&P did it based on debt to debt ratio.

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[2] Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech, Estonia, Germany, Denmark, Finland, France, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom.

We conclude the work with a discussion that may be extended in further research: CRAs decisions are subjected to overconfidence, which leads decision makers to have the tendency to focus on their own abilities and successes rather than on situational factors. However, given an external shock, suck as a crisis, this behaviour changed dramatically to all agencies, consequently leading to heard behaviour and the "cliff effect". Our research corroborate previous works showing that the agencies have indeed changed their assessment after the Great Recession and that given a downgrade (upgrade) by the first rating agency, subsequent downgrades (upgrades) by the second rating agency are of greater magnitude in the short term and, harsher rating changes by one agency are followed by harsher rating changes in the same direction by the second agency.

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TABLE I

Category	Linear Transform.	Fitch	S&P	Credit Quality
Investment Grade	21	AAA	AAA	Highest quality
	20	AA+	AA+	High Quality
	19	AA	AA	
	18	AA-	AA-	
	17	A+	A+	Strong payment capacity
	16	A	A	
	15	A-	A-	
	14	BBB+	BBB+	Adequate payment capacity
	13	BBB	BBB	
	12	BBB-	BBB-	
Speculative	11	BB+	BB+	Likely to fulfil obligations
	10	BB	BB	
	9	BB-	BB-	
	8	B+	B+	High credit risk
	7	B	B	
	6	B-	B-	
	5	CCC+	CCC	Very high credit risk
	4	CCC	CC	
	3	CCC-	C	
	2	CC	CC	Default
	1	C, DDD, DD, D	C, D	

Source: CRAs websites, formatted by the author.

TABLE II

MODELLING RATING CHANGE

	Total Period	Total Period
	Fitch	S&P
yc	0.212	0.024
crisis	0.219**	1.058***
debt	0.438*	0.001
growth	-1.810	-2.610*
ipi	0.887	0.453
inflation	-0.551	6.006**
stability	-0.065	-0.270
effectiveness	-0.162	-0.708
ruleoflaw	-0.124	0.384
Nº observations	4,696	4,708

Note: The asterisks ***, **, * indicate significance at the 1, 5, 10% level respectively.

TABLE IIII

MODELLING RATING INCREASE

	Total Period	Total Period
	Fitch	S&P
yc	-0.229***	-0.283***
crisis	0.060	0.752***
debt	-0.038	-0.003
growth	4.730**	6.263***
ipi	1.983**	1.675
inflation	-0.949	-0.497
stability	0.082	0.157
effectiveness	0.712**	0.210
ruleoflaw	-1.068***	-0.390
Nº observations	4,696	4,708

Note: The asterisks ***, **, * indicate significance at the 1, 5, 10% level respectively.

TABLE IV

MODELLING RATING DECREASE

	Total Period	Total Period
	Fitch	S&P
yc	0.157**	0.177***
crisis	0.685***	1.107***
debt	0.077***	-0.001
growth	-4.183***	-5.923***
ipi	-0.571	0.471
inflation	7.235**	9.390***
stability	-0.148	-0.252
effectiveness	-0.770**	-1.076**
ruleoflaw	0.644*	0.830*
Nº observations	4,696	4,708

Note: The asterisks ***, **, * indicate significance at the 1, 5, 10% level respectively.

TABLE V

MODELLING RATING INCREASE LAGS ON YC

	Crisis = 0	Crisis = 0	Crisis = 1	Crisis = 1
	Fitch	S&P	Fitch	S&P
yc				
lag1	0.181	0.427	-0.179**	-0.036
lag2	0.250	1.032	-0.211	-0.210
lag3	0.423	-0.729	0.003	-0.064
lag4	0.506	1.019	0.037	-0.111
debt	0.470	-0.004	-0.077	0.002
growth	3.474	-16.918	4.46**	6.714***
ipi	1.288	12.903	2.079**	1.159
inflation	-0.318	1.488	-4.420**	-5.741
stability	0.111	1.156	0.248	0.279
effectiveness	1.256*	0.808	0.132	0.135
ruleoflaw	-1.715*	-2.820	-0.690	-0.387
Nº observations	1,825	1,837	2,790	2,790

Note: The asterisks ***, **, * indicate significance at the 1, 5, 10% level respectively.
Note: Crisis from October/2008

TABLE VI

MODELLING RATING DECREASE LAGS ON YC

	Crisis = 0	Crisis = 0	Crisis = 1	Crisis = 1
	Fitch	S&P	Fitch	S&P
yc				
lag1	0.131	0.043	-0.180**	0.079
lag2	-0.426	1.685	0.081	0.075
lag3	0.518	-0.963	0.145**	0.127**
lag4	-1.065	-0.051	0.091	-0.012
debt	-0.158	-0.023	0.084***	0.015
growth	-6.245	-18.432	-3.53*	-5.730***
ipi	0.657	3.438	0.084	0.395
inflation	1.285	6.403	7.895**	7.854**
stability	0.177	-0.540	-0.178	-0.116
effectiveness	0.225	-0.350	-0.936**	-1.013*
ruleoflaw	-0.797	-0.195	0.833*	0.772*
Nº observations	1,825	1,837	2,790	2,790

Note: The asterisks ***, **, * indicate significance at the 1, 5, 10% level respectively.

TABLE VII

MODELLING RATING INCREASE LAGS ON DEBT

	Crisis = 0	Crisis = 0	Crisis = 1	Crisis = 1
	Fitch	S&P	Fitch	S&P
debt				
lag1	-0.160**	-0.552	0.065	0.026
lag2	-0.094	0.199	-0.140**	-0.149*
lag3	-0.013	-0.122	-0.007	0.187**
lag4	0.102	0.180	-0.083	-0.029
yc	-0.310	0.161	-0.201*	-0.304***
growth	4.247	-15.088	3.177	4.342
ipi	1.379	12.852*	1.956*	1.159
inflation	-0.561	1.489	-4.712	-5.804*
stability	0.107	1.241	0.216	0.223
effectiveness	0.938*	-0.231	0.099	-0.032
ruleoflaw	-1.327**	-2.116	-0.680	-0.365
Nº observations	1,780	1,802	2,796	2,797

Note: The asterisks ***, **, * indicate significance at the 1, 5, 10% level respectively.

TABLE VIII

MODELLING RATING DECREASE LAGS ON DEBT

	Crisis = 0	Crisis = 0	Crisis = 1	Crisis = 1
	Fitch	S&P	Fitch	S&P
debt				
lag1	-0.003	-0.409	-0.021	0.096**
lag2	-0.370***	0.455	-0.041	0.080*
lag3	-0.088	-0.192	0.013	-0.048
lag4	0.009	0.560	-0.014	-0.028
yc	0.158	-0.594	0.145	0.190***
growth	-5.107	-18.032	-2.168**	-4.755***
ipi	-0.246	4.846	-0.081**	0.717
inflation	-0.794	6.342	12.645***	7.756**
stability	0.340	-0.909	-0.284	-0.043
effectiveness	-0.297	-1.113	-1.159*	-0.970*
ruleoflaw	-0.528	-0.016	1.059*	-0.689
Nº observations	1,780	1,802	2,796	2,797

Note: The asterisks ***, **, * indicate significance at the 1, 5, 10% level respectively.

TABLE IX

SOURCES

Variable	Source
	Fitch
yc	Thomson Reuters Eikon
debt	Eurostat
growth	https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=EU
ipi	https://data.oecd.org/industry/industrial-production.htm
inflation	https://ec.europa.eu/eurostat/data/database?node_code=teicp000#
stability	http://info.worldbank.org/governance/wgi/#home
effectiveness	http://info.worldbank.org/governance/wgi/#home
ruleoflaw	http://info.worldbank.org/governance/wgi/#home
Fitch Ratings	Thomson Reuters Eikon
S&P Ratings	Thomson Reuters Eikon

FIGURE 5

SOVEREIGN YIELDS AND FITCH RATINGS IN SELECTED COUNTRIES