

# *Modern Money Lab*

Working Paper No. 3, 2021.

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Do sovereign credit ratings affect the yields on sovereign debt? An exploration of the effect of monetary sovereignty.

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## Abstract

The recent expansion of most countries' debt issuance programs in response to the COVID-19 pandemic has brought the issue of sovereign debt sustainability back into focus. Traditional macroeconomic theory suggests that the size of a sovereign's debt burden affects its credit rating. While the relationship between sovereign credit ratings and the yields on sovereign bonds has received much attention, this paper considers the effect of monetary sovereignty. This investigation aims to answer the question, what effect does monetary sovereignty have on the yields of ten-year sovereign bonds? By examining the yields on ten-year sovereign bonds for a panel of 28 OECD countries from 2000 to 2020, this investigation argues that credit rating announcements (CRA) for sovereigns with a high degree of monetary sovereignty do not have a statistically significant effect on their yield. The panel of countries was divided into two sub-samples; those with low monetary sovereignty and those with a high degree of monetary sovereignty. A simple event study was applied to each country to analyse the effect of a CRA on the yield of that sovereign's ten-year bond over a three day window. The results were then aggregated to calculate the average change in the yield for countries with low monetary sovereignty (non-MS), and for those with a high degree of monetary sovereignty (MS). It was found that following a credit rating upgrade, there is a statistically significant difference in the yield spread between the non-MS and MS groups. Additionally, a credit rating downgrade affects the yield on sovereign bonds for non-MS countries, but does not have a statistically significant effect on MS countries. The monetary sovereignty perspective is not new, yet it has received little academic attention. This is the first known occasion where the effect of monetary sovereignty has been controlled for when assessing the relationship between CRAs and sovereign bond yields.

**Keywords:** *sovereign credit rating, monetary sovereignty, sovereign debt, event study*

**Word Count:** 9,420

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## Introduction

Due to the COVID-19 pandemic, many sovereign governments have dramatically increased their issuance of sovereign bonds to finance their economic stimulus programs. With this increase in government debt issuance, commentators and some economists have raised concerns with the costs associated with that borrowing (Virrender 2020; Wright 2020), and in particular concerns about sovereign credit ratings (Makin 2020). A sovereign credit rating is an opinion regarding the creditworthiness of a borrower (Fitch Ratings 2020b), with the majority of all sovereign ratings issued by either Standard and Poor's Rating Agency, Fitch or Moody's (USSEC 2020).

Traditional macroeconomic teaching presents the relationship that as a sovereign's credit rating deteriorates, the yield (price) associated with that sovereign's debt increases (Backus et al. 2014; Rebonato 2020). This relationship has been demonstrated by a wide variety of studies that have assessed the effect of a credit rating announcement (CRA) on the yield of a sovereign bond (Afonso, António, Furceri & Gomes 2012; Cantor & Packer 1996; El-Shagi & Schweinitz 2018; Gyodi 2017; Hull, Predescu & White 2004; Kaminsky & Schmukler 2002; Kenourgios, Umar & Lemonidi 2020; Liu & Morley 2013). However, an alternate perspective – monetary sovereignty – argues that for countries that issue their own currency, have a floating exchange rate and have little or no foreign currency denominated debt, CRAs are of no consequence.

For the dominant currencies of the world – the United States dollar (USD) and the Japanese Yen (JPY) – the yield on their local currency debt has appeared impervious to credit rating changes. For the US, its 'safe asset' status as the world's pseudo, global currency guarantees there will always be willing investors. Whereas for Japan, the Japanese central bank's proven ability to set the yield on their outstanding bonds runs contrary to traditional perceptions regarding the importance of sovereign credit ratings. It may be argued that these powerful nations are the exception to the rule, but this paper argues that their degree of high monetary sovereignty explains these phenomena.

An event study analysis is conducted on a group of countries to assess the effect sovereign CRAs have on the yields of sovereign ten-year bonds. Where this paper differs from the mainstream, is that it introduces monetary sovereignty criteria to distinguish between the monetary systems used by the sampled countries. Through application of the monetary sovereignty criteria, this paper hopes to answer the question: what effect does monetary sovereignty have on the yields of ten-year sovereign bonds?

## Background literature

### Credit ratings

A credit rating is an opinion regarding the creditworthiness of a borrower. In terms of a sovereign credit rating, three agencies provide virtually all sovereign credit ratings: Standard and Poor's (S&P) 53 per cent; Moody's 34 per cent and Fitch 12 per cent (USSEC 2020). Each agency assigns its sovereign credit rating based on the risk that the sovereign (a national or federal government) will not meet its financial obligations when they come due (Fitch Ratings 2020b; Moody's 2019; Standard and Poor Global Ratings 2020).

The goal of a sovereign credit rating is to reflect the credit risk associated with lending to that sovereign, but for all three agencies, it is not an absolute measure of the likelihood that such a sovereign will default (Fitch Ratings 2020b; Moody's 2020; Standard and Poor Global Ratings 2009). For each agency, the credit rating they apply to a sovereign is that agency's present and forward looking opinion of that sovereign's ability and willingness to service their financial obligations (Fitch Ratings 2020b; Moody's 2020; Standard and Poor Global Ratings 2009). For investors, the relevance of a sovereign credit rating is that it has the potential to influence whether they choose to purchase a sovereign's debt (e.g. an Australian Treasury Bond). Although the rating agencies make it clear that their ratings are not applicable to any specific debt instrument (e.g. three or five year Treasury Bonds), it is generally accepted that investors factor in sovereign credit ratings when making their investment decisions.

All three agencies apply a rank order system such that different sovereigns' credit risk can be assessed against each other (Fitch Ratings 2020a; Moody's 2020; Standard and Poor Global Ratings 2019). The ranking system used by each agency is similar, with S&P and Fitch using the same notation (AAA reflects the highest ranking) whereas Moody's uses Aaa to denote the lowest credit risk (Fitch Ratings 2020b; Moody's 2019; Standard and Poor Global Ratings 2020).

The highest group of ratings are investment grade. These rankings reflect a low to moderate credit risk: S&P and Fitch (BBB- to AAA); Moody's (Baa3 to Aaa). Ratings outside of these are deemed as speculative (Fitch Ratings 2020a; Moody's 2020; Standard and Poor Global Ratings 2020).

**Table 1:**

Standard and Poor's, Fitch and Moody's sovereign credit rating systems

| Characterisation of debt | Rating |       |         |
|--------------------------|--------|-------|---------|
|                          | S&P    | Fitch | Moody's |
| Investment grade         | AAA    | AAA   | Aaa     |
|                          | AA+    | AA+   | Aa1     |
|                          | AA     | AA    | Aa2     |
|                          | AA-    | AA-   | Aa3     |
|                          | A+     | A+    | A1      |
|                          | A      | A     | A2      |
|                          | A-     | A-    | A3      |
|                          | BBB+   | BBB+  | Baa1    |
|                          | BBB    | BBB   | Baa2    |
|                          | BBB-   | BBB-  | Baa3    |
| Speculative grade        | BB+    | BB+   | Ba1     |
|                          | BB     | BB    | Ba2     |
|                          | BB-    | BB-   | Ba3     |
|                          | B+     | B+    | B1      |
|                          | B      | B     | B2      |
|                          | B-     | B-    | B3      |
|                          | CCC+   | CCC+  | Caa1    |
|                          | CCC    | CCC   | Caa2    |
|                          | CCC-   | CCC-  | Caa3    |

|         |    |     |    |
|---------|----|-----|----|
|         | CC | CC  | Ca |
| Default | SD | C   | C  |
|         | D  | DDD |    |
|         |    | DD  |    |
|         |    | D   |    |

Source: adapted from Table 1 from Afonso, Furceri and Gomes (2012)

### Credit rating announcements and sovereign bond yields

The relationship between sovereign credit ratings and the yields on government debt has received much attention (Afonso, António, Furceri & Gomes 2012; Cantor & Packer 1996; El-Shagi & Schweinitz 2018; Gyodi 2017; Hull, Predescu & White 2004; Kaminsky & Schmukler 2002; Kenourgios, Umar & Lemonidi 2020; Liu & Morley 2013). Given that most sovereign governments issue bonds to the private sector to match their deficit spending, it is necessary that there are willing investors who will purchase their debt. If sovereign credit ratings are accepted as a valid reflection of the credit worthiness of a sovereign, then it is reasonable to assume that changes in a sovereign's rating will affect the yield on that sovereign's debt. It has been asserted that a change in credit rating affects the ability of a sovereign government to access capital markets and consequently its borrowing costs (Afonso, Antonio 2003; Afonso, Antonio, Gomes & Rother 2011; Bodea & Hicks 2018; Cantor & Packer 1996).

Cantor and Packer (1996) were one of the first to identify the presence of a relationship between changes in credit ratings and yields on sovereign debt. Their panel event study analysis demonstrated that credit rating announcements (CRAs) had a statistically significant effect on the yields of government debt; and in the direction expected (i.e. a rating downgrade resulted in a higher yield) (Cantor & Packer 1996). Using a panel of emerging economies and over a period of ten years (1990 – 2000), Kaminsky and Schmukler (2002) employed regression and event study analysis to conclude that single notch changes in sovereign credit ratings or outlooks, had on average a 2 percentage point effect on the yield spread of sovereign bonds.

Similarly, through the analysis of 27 advanced economies and 15 developing economies, El-Shagi and Schweinitz (2018) demonstrated that negative CRAs increased the yields on five year sovereign bonds. Furthermore, they concluded that when a sovereign's credit rating fell below the B+ level, a higher risk premium was added to bonds of those sovereigns (El-Shagi & Schweinitz 2018). Again, with a sample of 15 emerging countries, Kenourgios, Umar and Lemonidi (2020) recently demonstrated that CRAs have a statistically significant effect on the yields on 10 year sovereign bonds.

Predicting changes in credit ratings has attracted much scholarship, but it should be noted that with respect to the cost of borrowing for sovereigns, determining the factors that affect sovereign credit ratings is of doubtful importance unless it is accepted that CRAs affect the yields on government debt. It is this paper's assertion that all previous studies of the relationship between sovereign CRAs and sovereign bond yields have suffered from an omitted variable bias. That omitted variable bias is monetary sovereignty.

### Monetary sovereignty

Monetary sovereignty can best be thought of as a spectrum that describes the degree of domestic policy space available to a sovereign (Tankus 2018; Tcherneva 2017). The governments of countries with a high degree of monetary sovereignty face no purely financial constraint (Fullwiler 2020; Tymoigne 2020), whereas those at the opposite end of the spectrum, need to manage their domestic policy to avoid the risk of default.

At present, there is no specific, widely accepted description of what constitutes a high degree of 'monetary sovereignty', and the idea of it being akin to a spectrum, has been argued by some as only a recent phenomenon (Bonizzi, Kaltenbrunner & Michell 2019). However, it is generally accepted that a sovereign nation with a high degree of MS satisfies the following criteria (Fullwiler 2020; Tcherneva 2017; Tymoigne 2020):

- i) the sovereign has monopolistic control over the issuance of the local currency;
- ii) the local currency's value floats (i.e. there is no promise to convert it to gold, another currency or any material at a fixed rate of exchange);
- iii) the sovereign collects taxes only payable in the local currency; and
- iv) the sovereign has little or no debt denominated in a foreign currency.

Significantly, a sovereign government with a high degree of monetary sovereignty has the ability to always be able to purchase anything priced in their local currency; including the servicing of debt (Tcherneva 2017). Following this line of thinking, CRAs should be of no consequence for nations which satisfy the full monetary sovereignty criteria (Tymoigne 2020).

Nevertheless, there are opponents of this perspective (Bonizzi, Kaltenbrunner & Michell 2019; Vernengo & Caldentey 2019). Bonizzi, Kaltenbrunner and Michell (2019) make the valid point that many developing economies are reliant on essential imports (e.g. energy and food) priced in foreign currencies, and therefore even if they wish to become monetarily sovereign, their lack of local resources prevents them from the privileges of monetary sovereignty. Vernengo and Caldentey (2019) also make the point that developing economies with their own fiat currency do not have the same degree of policy space available as their more developed, monetarily sovereign peers. Mitchell, Wray and Watts (2019) acknowledge the reality of the real resource constraints faced by some countries, but do not stray from their claim that any sovereign authority can achieve full monetary sovereignty, citing it as a policy decision. In a more concessional tone, Kaboub's (2019) characterisation of monetary sovereignty acknowledges the challenges that some developing countries face and advises that despite them, all sovereign governments should look to increase their degree of monetary sovereignty over time. Kaboub (2019) emphasises that this does not necessarily mean that the transition is easy nor that it will occur over a short period of time. The debate regarding monetary sovereignty appears to be ongoing and further research is required.

The issue of monetary sovereignty has most publicly played out in Europe following the Euro debt crisis of 2012. Adherents of the monetary sovereignty perspective explain the crisis through indebted countries' lack of ability to provide Euros as a lender of last resort (Mabbett & Schelkle 2015), whilst others have argued that the Euro debt crisis was a balance of payments (BoP) crisis (Ali 2019; Cesaratto 2015). A review of both competing perspectives found the monetary sovereignty explanation more convincing and cited the Euro's payment system (TARGET2) – which acted to facilitate payments between European Monetary Union (EMU) states – as the main reason to discredit the BoP perspective (Febrero, Uxó & Bermejo 2018). Nevertheless, this area of dispute appears to continue to gain scholarly attention.

In a more extreme rejection of monetary sovereignty, some academic work discredited the idea altogether and instead advocated that digital, private currencies will be the future, global unit of monetary account (Schwartz 2004; Steil 2007). In one instance, it was predicted that sovereign governments will need to find new means, other than monetary policy, to achieve macroeconomic objectives (Cohen 2001). The rise of the cryptocurrency has been heralded as a candidate for this role,

but a recent review into its attributes concluded that in its present form, cryptocurrencies have features similar to a highly volatile financial asset, rather than characteristics commonly associated with money (Fama, Fumagalli & Lucarelli 2019). In any case, unless the cryptocurrency is demanded by a sovereign government as payment of citizens' tax obligations, it is difficult to see how widespread uptake of the new currency will occur.

Although potentially obvious when brought to one's attention, the importance of monopolistic control over a non-convertible fiat currency is often missed by academics when investigating the issue of public debt. Mainstream economic analysis appears yet to develop frameworks to evaluate the elements of monetary sovereignty present in so many modern economies. Reinhart and Rogoff's (2004) exchange rate classification is the most obvious consideration of one aspect of monetary sovereignty – promise of currency convertibility – yet it falls short in accounting for the other monetary sovereignty criteria (Fullwiler 2020; Tcherneva 2017; Tymoigne 2020). Their classification includes three classes of exchange rates (Fixed, Intermediate and Floating) of which there exist 14 different level descriptions (Reinhart & Rogoff 2004), yet it is insufficient to differentiate degrees of monetary sovereignty amongst countries.

### Monetary sovereignty and CRAs

Within the CRA bond yield literature, no researcher has distinguished between monetary and non-monetary sovereign debt. In their 2013 paper, Jahjah, Wei and Yue (2013) used Reinhart and Rogoff's (2004) exchange rate classification to explore the effect of exchange rate policy on sovereign bond spreads. They reviewed 42 developing countries between 1990 to 2006 and observed that countries with less flexible exchange rate regimes faced higher yields and were less likely to issue debt (Jahjah, Wei & Yue 2013). To explain this result, the authors suggested that investors punish issuers with less flexible exchange rates and instead focussed their discussion on currency over and under valuations. The authors did not comment on the significance of issuing debt in the currency in which a sovereign issues (Jahjah, Wei & Yue 2013). From a monetary sovereignty perspective, the authors seemingly did not appreciate the significance of debt issued in a sovereign's own currency.

A similar analysis of the bond yields of central European countries during the period of 2001 to 2014 found that CRAs did not explain changes in sovereign bond yields (Gyodi 2017). Gyodi (2017) concluded that investors must have separately assessed the riskiness of sovereign debt for each individual country and that the Eurozone crisis did not affect all European countries equally; despite their geographical proximity. An alternate explanation for Gyodi's (2017) observation – one offered by a monetary sovereignty perspective – is that Poland, Bulgaria, Czech Republic, Hungary and Romania each borrow money in their own sovereign currency and thus do not face the same default risk as the Euro currency using countries of Latvia, Lithuania, Slovakia and Slovenia. The last four listed countries do not have a high degree of monetary sovereignty and therefore their default risk is greater.

In a similar way, de Vries and de Haan (2016), in their uncertainty in accounting for divergences in the relationship between CRAs and changes in the yields of Greek, Irish, Italian, Portuguese and Spanish (GIIPS) bonds during and after the Euro debt crisis, identified the importance of the currency issuer's ability to always make payments denominated in their currency. The authors did not explore the idea of monetary sovereignty, but did acknowledge the effect of Mario Draghi's – then President of the European Central Bank – commitment on July 26, 2012 to maintain the Euro currency at whatever cost necessary (de Vries & de Haan 2016). As the issuer of the Euro currency, Draghi promised to service all of the Euro denominated debt of the GIIPS if they had insufficient Euros. In response, the

yields on the Euro denominated debt of the GIIPS reduced as the default risk had effectively been removed (de Vries & de Haan 2016).

This paper seeks to make at least one significant contribution to the literature about credit rating announcements and yields on sovereign debt. It seeks to provide empirical evidence to support the notion that monetary sovereignty is an important determinant of sovereign bond yields and that CRAs for countries with a high degree of monetary sovereignty are of little consequence.

## Data and analytical method

### Data

There have been many different groups of countries chosen to explore the relationship between CRAs and yields on sovereign debt. Some authors have focussed on the differences between developed and developing economies (e.g. El-Shagi and Schweinitz 2018) whilst others have focussed on different geographical areas (e.g. Kenourgios, Umar and Lemonidi 2020). To minimise the issue of selection bias, where countries with particular monetary traits could be included or excluded, all member countries of the Organisation for Economic Co-operation and Development (OECD) as of September 2020 were included. OECD countries were chosen as membership reflects a certain level of economic development. As far as I am aware, no published literature along this line of enquiry has explicitly looked at a sample of OECD countries.

Available data on the daily yields of ten-year sovereign bonds was collected for all OECD countries for the period January 1 2000 to September 28 2020. Refinitiv Eikon was used to collect this data and the bond line codes for each sovereign's data can be found in Appendix 1. The period from 2000 to 2020 was selected as it allows for a large number of observations (both CRAs and bond yields), but also spans the global financial crisis (2008-2009) and the Euro debt crisis (2012). As the effect of a CRA should be evident in day to day changes – based on the assumption that the bond market is reasonably efficient in its transfer of information – daily bond yield data was chosen.

Sovereign credit rating announcements from Standard and Poor's (S&P), Moody's and Fitch were taken from the Trading Economics website for the sample period (Trading Economics 2020). For sovereigns who had received a credit rating prior to January 1 2000, the most recent credit rating was used as that sovereign's baseline credit rating from which the next announcement was assessed against. Four different CRAs were collected from Trading Economics (2020): credit rating upgrade; credit rating downgrade; positive outlook and negative outlook.

A credit rating upgrade (downgrade) was recorded if the CRA was different to the latest CRA from that agency. On occasion, an agency (S&P, Fitch or Moody) made a CRA but did not alter the credit rating. Most often when this happened, the agency changed the credit rating outlook, and therefore it was just the rating outlook change which was extracted. As well as making a positive or negative outlook declaration, rating agencies would also at times declare the rating as stable. These CRAs were not extracted as neither the credit rating nor outlook changed from the most recent announcement. It is foreseeable that a stable CRA may too have an impact on a daily yield, but this paper did not consider this effect.

## Inclusion/Exclusion criteria

OECD countries were included if they satisfied the following:

- Member of the OECD as of January 1, 2000;
- $\geq 3,500$  individual observations of daily, ten-year sovereign bond yields between January 1 2000 and September 28 2020.

These limitations were placed on the sample to improve the internal validity of the results. To avoid criticism of including countries who had only recently become a member of the OECD, it was decided that countries should be a member of the OECD for the duration of the period of interest. A larger sample of daily yield observations improves the statistical precision of the results. Three thousand five hundred observations was set as the cut off requirement as this covers approximately half of all possible days (from January 1 2000 to September 28 2020) where a bond yield could have been given.

## Monetary sovereignty criteria

The following criteria were used to distinguish between countries' degree of monetary sovereignty. As previously state, there is no published criteria to differentiate degrees of monetary sovereignty (Bonizzi, Kaltenbrunner & Michell 2019). Figure 1 was created based on the publications of those who have discussed the monetary sovereignty perspective (Fullwiler 2020; Tcherneva 2017; Tymoigne 2020). The monetary sovereignty criteria applied in this paper is basic and does not account for degree of net foreign currency denominated debt. Ideally, this factor is incorporated into the differentiation of countries, but due to time restrictions and a lack of available data, this was not feasible. To be classified as a *monetary sovereign* country, a country had to satisfy all the criteria.

### Figure 1:

#### Monetary sovereignty criteria

##### Monetary sovereignty criteria

- 
- Issues the local currency
  - Nonconvertible fiat currency (i.e. floating exchange)
  - Monopolistic control over currency issuance

## Analytical method

### Event study

A standard event study methodology was used to assess the effect of a CRA on the daily yield of a sovereign bond. Similar to the event study methodology employed by Afonso, Furceri and Gomes (2012), I measured the response of the yield on the ten-year sovereign bond over a three day period (-1, 0, 1); where the CRA occurred at time zero. The justification for a narrow event window is that it decreases the potential that factors outside of the CRA were responsible for changes in the bond's yield. Moreover, it can be argued that if CRAs provide new information to the bond trading market and that the market is efficient, a change to the credit rating of a sovereign should result in an immediate change to that sovereign's bond yield.

Two separate panels of country specific data were created for each country's specific credit rating events and their daily bond yields. For each country, the panels were merged to create two master panels of data; one with all the daily yields for all countries and the other with all the dates where a country received a CRA.

Over the three day window, three yield spreads were calculated. The yield spread from the day of the CRA (0) and the yield of the previous day (-1); the yield the day after the CRA (1) and the yield on the day of the CRA (0); and the spread between the yields after (1) and before (-1) the CRA. For each CRA, three spreads were calculated. The average spread for each event type (e.g. upgrade) was then calculated for the entire sample (n = 28 countries) and the sub-samples (non-MS n = 14 and MS n = 14 groups).

## Results

### Characteristics of the data

The country sample included in this analysis covered 28 countries. As of September 28, 2020 there were 37 countries which were members of the OECD. Daily bond yield data could not be obtained for Estonia, Latvia, the Czech Republic and Luxembourg and hence they were excluded. Likewise Chile, Slovenia, Israel, Lithuania and Colombia were excluded as they joined the OECD after the year 2000. Slovakia was included despite joining the OECD on December 14, 2000. It was thought that OECD membership for 18 of the 19 years of interest was sufficient for Slovakia to be included. Appendix 4, details the date each OECD member joined the OECD.

A total of 137,626 individual, daily ten-year sovereign bond yield observations were captured for the remaining 28 OECD countries over the sample period (2000 to 2020). On average, each country had 4,915 daily yield observations. Table 2 summarises the daily yield observations.

**Table 2:**

Descending order, number of daily yield observations on ten-year sovereign bonds

| Country | From     | To        | Observations |
|---------|----------|-----------|--------------|
| NET     | 1-Jan-00 | 28-Sep-20 | 5337         |
| BEL     | 1-Jan-00 | 28-Sep-20 | 5333         |
| FRA     | 1-Jan-00 | 28-Sep-20 | 5332         |
| SPA     | 1-Jan-00 | 28-Sep-20 | 5317         |
| POR     | 1-Jan-00 | 28-Sep-20 | 5316         |
| GER     | 1-Jan-00 | 28-Sep-20 | 5305         |
| ITA     | 1-Jan-00 | 28-Sep-20 | 5293         |
| UK      | 1-Jan-00 | 28-Sep-20 | 5281         |
| FIN     | 1-Jan-00 | 28-Sep-20 | 5266         |
| AUS     | 1-Jan-00 | 28-Sep-20 | 5263         |
| POL     | 1-Jan-00 | 28-Sep-20 | 5252         |
| GRE     | 1-Jan-00 | 28-Sep-20 | 5247         |
| DEN     | 1-Jan-00 | 28-Sep-20 | 5232         |
| USA     | 1-Jan-00 | 28-Sep-20 | 5227         |
| CAN     | 1-Jan-00 | 28-Sep-20 | 5198         |
| SWE     | 1-Jan-00 | 28-Sep-20 | 5160         |
| NZ      | 1-Jan-00 | 28-Sep-20 | 5152         |
| AUT     | 1-Jan-00 | 28-Sep-20 | 5150         |
| SWI     | 1-Jan-00 | 28-Sep-20 | 5147         |
| JAP     | 1-Jan-00 | 28-Sep-20 | 5084         |

|     |           |              |               |
|-----|-----------|--------------|---------------|
| NOR | 1-Jan-00  | 28-Sep-20    | 5032          |
| IRE | 1-Jan-00  | 28-Sep-20    | 4925          |
| MEX | 31-Jul-01 | 28-Sep-20    | 4751          |
| KOR | 25-Oct-00 | 28-Sep-20    | 4516          |
| HUN | 26-Aug-03 | 28-Sep-20    | 4246          |
| ICE | 21-May-02 | 28-Sep-20    | 3887          |
| SLK | 31-May-07 | 28-Sep-20    | 2697          |
| TUR | 27-Jan-10 | 28-Sep-20    | 2680          |
|     |           | <b>Total</b> | <b>137626</b> |
|     |           | <b>Mean</b>  | <b>4915</b>   |

NET: Netherlands; BEL: Belgium; FRA: France; SPA: Spain; POR: Portugal; GER: Germany; ITA: Italy; UK: United Kingdom; FIN: Finland; AUS: Australia; POL: Poland; GRE: Greece; DEN: Denmark; USA: United States of America; CAN: Canada; SWE: Sweden; NZ: New Zealand; AUT: Austria; SWI: Switzerland; JAP: Japan; NOR: Norway; IRE: Ireland; MEX: Mexico; KOR: South Korea; HUN: Hungary; ICE: Iceland; SLK: Slovakia; TUR: Turkey.

Greece had the highest number of total CRAs ( $n = 63$ ) over the sample period and there was only one country, Norway, which did not receive a credit rating announcement during the period of interest. Of the total CRAs, 40 per cent ( $n = 198$ ) were accounted for by the European GIIPS countries (Greece, Ireland, Italy, Portugal and Spain). Given the high percentage of CRAs received by European countries, there is potential that the results are biased to Europe. To account for the potential European bias, a part of the analysis has removed CRAs which occurred within 14 days of any previous CRA. This is potentially important given the GIIPS countries received frequent CRAs during 2011-2012, and hence a large number of CRAs within a short period of time may obscure the true effect of a CRA. Galil and Soffer (2011) first introduced the idea of removing contaminated CRAs to avoid the chance of underestimating the effect of a CRAs. Kenourgios, Umar and Lemonidi (2020) also removed contaminated CRAs in their analysis.

However, the removal of contaminated CRAs did not fundamentally change the characteristics of this dataset. Following the removal of contaminated CRAs, the percentage of CRAs accounted for by the GIIPS group decreased to 37 per cent of the total sample ( $n = 161$ ), down 3 per cent from the original. The overall number of CRAs following the removal of contaminated CRAs was 436; a 13 per cent decrease. Table 3 reports the total number of different CRAs (e.g. upgrade, downgrade, positive outlook or negative outlook) received for each country from 2000 to 2020. Contaminated CRAs have been removed from Table 3. A more detailed account of CRAs for each country, including which agency provided the CRA, can be found in Appendix 2.

**Table 3:**

Descending order, total CRAs during sample period (contaminated CRAs removed)

| Country | Upgrade | Downgrade | Positive | Negative | TOTAL |
|---------|---------|-----------|----------|----------|-------|
| GRE     | 18      | 17        | 6        | 6        | 47    |
| IRE     | 12      | 12        | 4        | 4        | 32    |
| HUN     | 6       | 10        | 5        | 9        | 30    |
| ICE     | 11      | 6         | 5        | 8        | 30    |
| POR     | 6       | 10        | 8        | 6        | 30    |
| SPA     | 11      | 11        | 3        | 3        | 28    |
| MEX     | 10      | 5         | 5        | 6        | 26    |
| ITA     | 2       | 15        | 0        | 7        | 24    |

|     |     |     |    |     |     |
|-----|-----|-----|----|-----|-----|
| TUR | 5   | 11  | 2  | 6   | 24  |
| JAP | 2   | 11  | 2  | 7   | 22  |
| KOR | 9   | 3   | 7  | 1   | 20  |
| POL | 5   | 1   | 7  | 2   | 15  |
| BEL | 1   | 3   | 1  | 7   | 12  |
| UK  | 0   | 4   | 0  | 8   | 12  |
| FIN | 1   | 3   | 2  | 5   | 11  |
| AUT | 1   | 3   | 1  | 5   | 10  |
| FRA | 0   | 6   | 1  | 3   | 10  |
| NZ  | 2   | 2   | 3  | 3   | 10  |
| SLK | 2   | 1   | 6  | 1   | 10  |
| AUS | 3   | 0   | 0  | 3   | 6   |
| CAN | 5   | 1   | 0  | 0   | 6   |
| NET | 1   | 1   | 1  | 3   | 6   |
| SWE | 4   | 0   | 2  | 0   | 6   |
| USA | 0   | 0   | 0  | 4   | 4   |
| DEN | 2   | 0   | 1  | 0   | 3   |
| GER | 0   | 0   | 0  | 1   | 1   |
| SWI | 1   | 0   | 0  | 0   | 1   |
| NOR | 0   | 0   | 0  | 0   | 0   |
|     | 120 | 136 | 72 | 108 | 436 |

The defining feature of this paper is the introduction of a monetary sovereignty criteria. Based on the criteria described in Table 1, all 28 countries were screened and placed in either the 'non-Monetary Sovereign' or 'Monetary Sovereign' sub-sample. The event study analysis was performed on the whole sample (28 countries), as well as the non-MS (n = 14) and MS (n = 14) sub-samples.

**Table 4:**  
Monetary sovereignty classification

| <u>Non-Monetary Sovereign</u> | <u>Monetary Sovereign</u> |
|-------------------------------|---------------------------|
| AUT                           | AUS                       |
| BEL                           | CAN                       |
| DEN                           | ICE                       |
| FIN                           | JAP                       |
| FRA                           | KOR                       |
| GER                           | NZ                        |
| GRE                           | NOR                       |
| HUN                           | POL                       |
| IRE                           | SWE                       |
| ITA                           | SWI                       |
| NET                           | UK                        |
| POR                           | USA                       |
| SLK                           | MEX                       |
| SPA                           | TUR                       |

All countries within the non-Monetary Sovereign group are European, and all but Denmark and Hungary are a part of the European Monetary Union (EMU). Countries of the EMU share the Euro currency, whereas Denmark and Hungary issue their own currency but restrict their monetary

sovereignty by pegging the value of their local currency to the value of the Euro. All the non-monetary sovereign countries have reduced their capacity to maintain an independent monetary policy. Germany is a case in point, as the institutional arrangements of the European Central Bank (ECB) have been suggested to favour Germany and as such give Germany more monetary sovereignty than some of its EMU peers. As the ECB is located in Germany, some commentators have suggested that Germany has greater influence over the ECB than other EMU member countries. For the purpose of this preliminary analysis into the effect of monetary sovereignty on sovereign bond yields, the monetary sovereignty issue of Germany is not considered. In any case, Germany only received one CRA during the period of interest so its effect on the total analysis is negligible.

Appendix 3 provides more detail as to the classification of countries into non-Monetary Sovereign and Monetary Sovereign countries. This division of countries is used in the analysis to test the hypothesis that CRAs for monetary sovereign countries does not affect the yields on their ten-year sovereign bonds. Table 5 shows that non-MS countries received a larger number of CRAs during the study period, and that the majority of the additional CRAs came in the form of downgrades. Given the higher number of downgrades for non-MS countries, any difference between the effect of downgrades for non-MS and MS countries may need to be interpreted with caution. Alternatively, a higher number of downgrades may in fact present a more accurate reflection of the true effect of a downgrade.

**Table 5:**

Summary of CRAs within sub-groups, contaminated CRAs removed (2000 – 2020)

|        | Upgrade | Downgrade | Positive | Negative | TOTAL |
|--------|---------|-----------|----------|----------|-------|
| All    | 120     | 136       | 72       | 108      | 436   |
| non-MS | 63      | 92        | 39       | 60       | 254   |
| MS     | 57      | 44        | 33       | 48       | 182   |

Note: based on the categorisation presented in Table 4.

Given difficulties in classifying some countries as a full monetary sovereign on account of the monetary sovereignty spectrum, two summaries of the event study will be reported. One table will detail the average daily yield spreads with Mexico and Turkey included in the ‘MS’ group of countries, and the other table will include Mexico and Turkey in the ‘non-MS’ group of countries. Although Mexico and Turkey are both OECD countries, they are the only two countries included in this analysis not to be classified by the World Bank at the highest income bracket. Instead, Mexico and Turkey are classified as ‘upper middle’ income countries (World Bank 2020). Unfortunately, it is very difficult to acquire data on the outstanding net, foreign currency denominated debt owed by the Mexican and Turkish governments. If this data was readily available, determining the monetary sovereignty of each country would have been easier. Instead, to avoid controversy, both from the monetary sovereignty perspective and others, two summaries of the event study will be reported.

### Event study analysis

Over a three day window, this event study provides evidence to suggest that sovereign CRAs have no consistent (i.e. for all types of CRAs), statistically significant effect on the yields of ten-year sovereign bonds. This finding holds true for both Table 6 (‘non-MS’ without Mexico and Turkey) and Table 7 (‘non-MS’ group with Mexico and Turkey).

The null hypothesis for the statistical significance test was that CRAs would have no effect on the average daily yield spread for any group of countries. Across the two tables, there were only six average yield spreads that were statistically significantly different to the null hypothesis at the 5 or 1 per cent level for the 'non-MS' and 'MS' groups. This suggests that there is potentially no clear difference in the effect of a CRA for 'non-MS' countries when compared to 'MS' countries.

However, statistical significance is only one, albeit important consideration. Comparing the magnitude of the average spreads between the 'non-MS' and 'MS' groups across Table 6 and 7 shows that the effect of an upgrade or a downgrade is considerably larger for 'non-MS' countries than it is for 'MS' countries. This observation is in line with the monetary sovereignty perspective that argues that a CRA is of more consequence to a 'non-MS' country. Of particular interest is the average increase in yield of 0.103 basis points for 'non-MS' countries over the three day window (-1, 1) following a credit downgrade (Table 6). Although the spread is not statistically significant, it is the largest single change observed and it is almost ten times greater than the average effect over the same spread for 'MS' countries. A 0.1 per cent change in the yield on a sovereign bond may not be statistically significant, but it is potentially of great consequence to an investor. When interpreting the significance of the results of Tables 6 and 7, the size of any change may be equally important to consider.

**Table 6:**  
Average daily yield spread changes for different events, contaminated CRAs removed (2000 to 2020)

|        | Negative Events         |                           |                           | Positive Events             |                              |                             |
|--------|-------------------------|---------------------------|---------------------------|-----------------------------|------------------------------|-----------------------------|
|        | Rating downgrade        |                           |                           | Rating upgrade              |                              |                             |
|        | (-1, 1)                 | (-1, 0)                   | (0, 1)                    | (-1, 1)                     | (-1, 0)                      | (0, 1)                      |
| All    | <b>0.065</b><br>(1.553) | <b>0.003</b><br>(0.159)   | <b>0.063**</b><br>(2.038) | <b>-0.030**</b><br>(-2.089) | <b>-0.019***</b><br>(-3.103) | <b>-0.011</b><br>(-1.038)   |
| non-MS | <b>0.103</b><br>(1.623) | <b>0.011</b><br>(0.422)   | <b>0.092*</b><br>(1.946)  | <b>-0.040*</b><br>(-1.731)  | <b>-0.023***</b><br>(-2.653) | <b>-0.017</b><br>(-0.982)   |
| MS     | <b>0.015</b><br>(0.336) | <b>-0.008</b><br>(-0.413) | <b>0.023</b><br>(0.799)   | <b>-0.019</b><br>(-1.213)   | <b>-0.015*</b><br>(-1.739)   | <b>-0.004</b><br>(-0.394)   |
|        | Negative outlook        |                           |                           | Positive outlook            |                              |                             |
|        | (-1, 1)                 | (-1, 0)                   | (0, 1)                    | (-1, 1)                     | (-1, 0)                      | (0, 1)                      |
|        | (-1, 1)                 | (-1, 0)                   | (0, 1)                    | (-1, 1)                     | (-1, 0)                      | (0, 1)                      |
| All    | <b>0.023</b><br>(1.281) | <b>0.007</b><br>(0.762)   | <b>0.015</b><br>(1.202)   | <b>-0.017</b><br>(-1.166)   | <b>-0.009</b><br>(-1.193)    | <b>-0.007</b><br>(-0.841)   |
| non-MS | <b>0.016</b><br>(1.045) | <b>0.010</b><br>(1.296)   | <b>0.006</b><br>(0.336)   | <b>0.007</b><br>(0.441)     | <b>-0.004</b><br>(-0.402)    | <b>0.011</b><br>(1.308)     |
| MS     | <b>0.031</b><br>(0.878) | <b>0.003</b><br>(0.153)   | <b>0.028</b><br>(1.576)   | <b>-0.052**</b><br>(-2.257) | <b>-0.017</b><br>(-1.439)    | <b>-0.034**</b><br>(-2.516) |

Note: non-MS and MS groups as detailed in Table 4.

T-statistics in brackets. \*\*\*, \*\*, \* statistical significance at 1%, 5% and 10% respectively.

Interpretation: (-1, 0) measures the difference between the daily yield on the close of the day of a CRA (0) and the close of day yield from the previous day (-1). E.g. on average for 'All' countries, in response to a rating upgrade (top right), the yield decreased by 0.019 basis points.

When Mexico and Turkey were removed from the 'MS' group and included in the 'non-MS' group (Table 7), the average magnitude of the effect of a CRA on the 'MS' group fell. Of interest is the decrease in the magnitude of the effect for 'MS' countries in response to a rating upgrade. Where there was initially a statistically significant effect on the day of the upgrade (-0.015\*) in Table 6, the average spread fell to -0.006 basis points which was not statistically significant. Conversely, the effect

on the 'non-MS' group in Table 7 following a rating upgrade was that the average spread increased across all three time periods.

**Table 7:**

Average daily yield spread changes for different events with MEXICO and TURKEY swapped, contaminated CRAs removed (2000 to 2020)

|                     | Negative Events         |                           |                          | Positive Events             |                              |                            |
|---------------------|-------------------------|---------------------------|--------------------------|-----------------------------|------------------------------|----------------------------|
|                     | Rating downgrade        |                           |                          | Rating upgrade              |                              |                            |
|                     | (-1, 1)                 | (-1, 0)                   | (0, 1)                   | (-1, 1)                     | (-1, 0)                      | (0, 1)                     |
| non-MS (+MEX, +TUR) | <b>0.087</b><br>(1.524) | <b>0.007</b><br>(0.279)   | <b>0.080*</b><br>(1.933) | <b>-0.051**</b><br>(-2.432) | <b>-0.028***</b><br>(-3.409) | <b>-0.023</b><br>(-1.535)  |
| MS (-MEX, -TUR)     | <b>0.021</b><br>(0.438) | <b>-0.005</b><br>(-0.358) | <b>0.027</b><br>(0.750)  | <b>0.003</b><br>(0.365)     | <b>-0.006</b><br>(-0.766)    | <b>0.009</b><br>(1.043)    |
|                     | Negative outlook        |                           |                          | Positive outlook            |                              |                            |
|                     | (-1, 1)                 | (-1, 0)                   | (0, 1)                   | (-1, 1)                     | (-1, 0)                      | (0, 1)                     |
| non-MS (+MEX, +TUR) | <b>0.018</b><br>(1.229) | <b>0.007</b><br>(0.798)   | <b>0.012</b><br>(0.723)  | <b>-0.012</b><br>(-0.596)   | <b>-0.010</b><br>(-0.973)    | <b>-0.001</b><br>(-0.129)  |
| MS (-MEX, -TUR)     | <b>0.031</b><br>(0.731) | <b>0.008</b><br>(0.371)   | <b>0.023</b><br>(1.066)  | <b>-0.028**</b><br>(-2.464) | <b>-0.007</b><br>(-0.885)    | <b>-0.021*</b><br>(-1.921) |

Note: non-MS has had MEXICO and TURKEY added; MS group has had MEXICO and TURKEY removed.

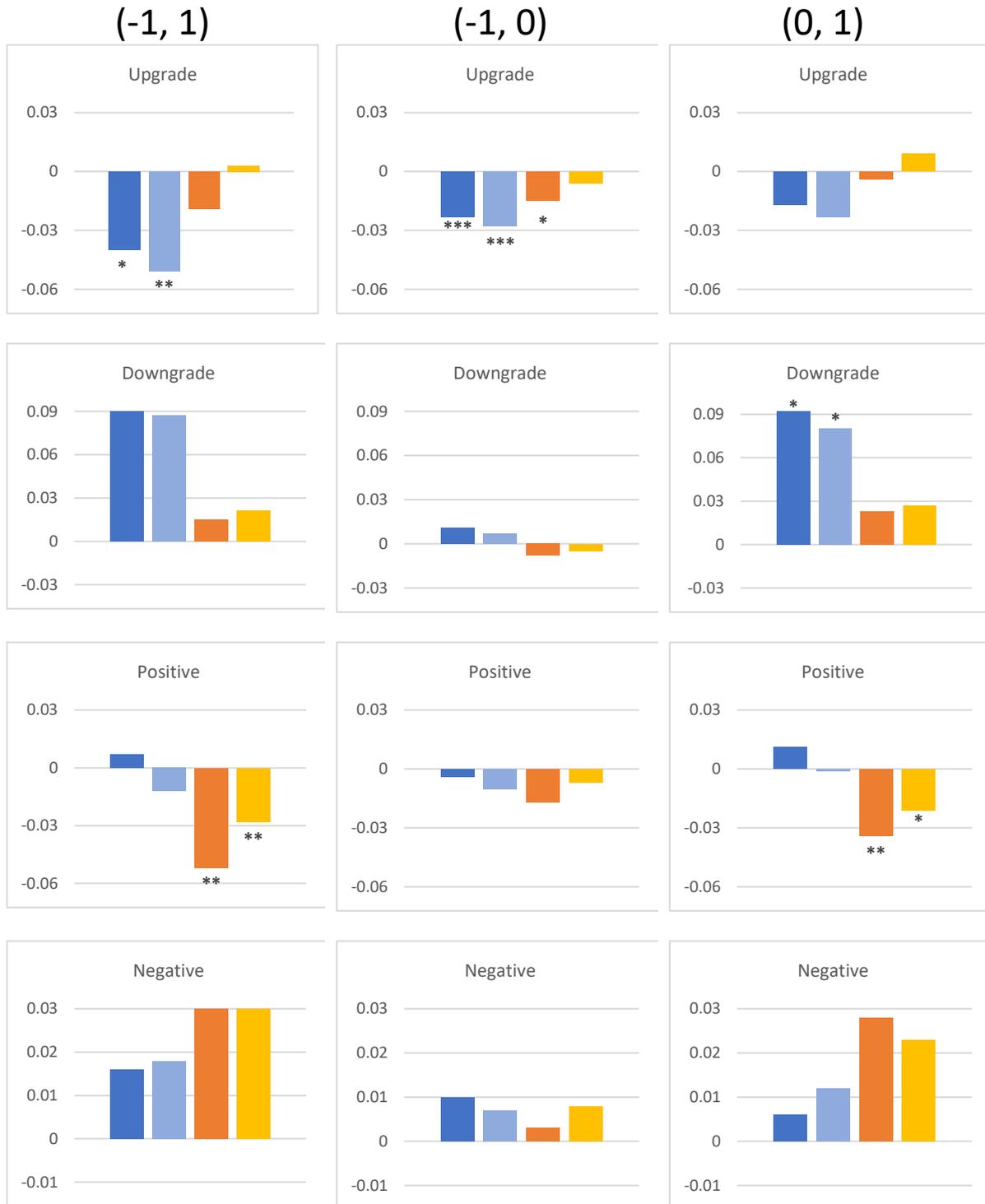
T-statistics in brackets. \*\*\*, \*\*, \* statistical significance at 1%, 5% and 10% respectively.

Table 8 provides a graphical depiction of the results from Table 6 and Table 7. Looking at Table 8 it is clear that the biggest difference in average yield spreads occurred the day after a CRA (0, 1); i.e. the height of the bars in the right hand column of graphs are taller than those of the middle. This is most pronounced for the negative events (downgrade or negative outlook) which show for 'non-MS' countries, following a downgrade, the yield increased sharply the day after the downgrade was announced (0.092\* Table 6; 0.080\* Table 7). When compared to the magnitude of the change following a negative outlook, the increase in yield for 'MS' countries is comparable for both a credit downgrade and a negative outlook announcement (approximately 0.03 basis point increase). This suggests that a negative event has a similar, but not statistically significant effect for 'MS' countries. However, for 'non-MS' countries, the effect of a negative outlook is much smaller compared to a credit rating downgrade which indicates that the market reacts stronger to a credit downgrade.

Of note for the 'MS' group of countries, is that it was only on the day of the credit rating downgrade (-1, 0) that the average bond yield moved in the direction opposite to what may have been expected. Following a credit downgrade, traditional thinking suggests the yield on the bond is expected to rise to compensate any investor for the extra perceived risk. For the 'MS' group of countries, the yield fell (-0.008 Table 6; -0.005 Table 7). Neither of these changes were statistically significant, and the yield then did increase the following day (0, 1), but it is interesting to note that across all observations and all time periods, this was the only instance (for both 'non-MS and 'MS') where the direction of the movement of the yield moved opposite to the traditional expectation. Caution needs to be applied in interpreting this finding, but given it was consistent for both combinations of 'MS' groups, there may be more that can be explored. Across the four types of CRAs, a negative outlook was the only event not to return a statistically significant result for either group of countries or across any time period.

**Table 8:**

Average bond yield spread across the three different windows with (without) Mexico and Turkey



Interpretation: the darker bars reflect the values in Table 6, the lighter bars reflect the results in Table 7.

Note: \*\*\*, \*\*, \* statistical significance at 1%, 5% and 10% respectively.

The middle column of Table 8 (-1, 0) captures the average effect on the yield on the day of the respective CRA. Interestingly, the largest, and only statistically significant effect on the day of a CRA occurred following a credit rating upgrade. For ‘non-MS’ countries (including and excluding Mexico and Turkey), there was a strong statistically significant effect: -0.023\*\*\* Table 6 and -0.028\*\*\* Table 7. When the ‘MS’ group of countries included Mexico and Turkey, a statistically significant result was returned on the day of a credit rating upgrade (-0.015\*), but this significance disappeared when Mexico and Turkey were removed (-0.006). Given that the magnitude of the effect for the ‘non-MS’ group of countries following a credit rating upgrade increased when Mexico and Turkey were included, and that the effect persisted over the three day window (-1, 1) (-0.051\*\*), it may suggest that these countries are more suited to the ‘non-MS’ categorisation. This suggestion is in line with the monetary sovereignty perspective that argues that a CRA is of more consequence to a country with a low degree of monetary sovereignty, and as such when excluded from a group of countries with a high degree of monetary sovereignty, the effect of the CRA will be reduced. This is portrayed in Table 7 following a credit rating upgrade.

As well as presenting the average spreads for each group of countries (Tables 6 and 7), the difference between the spreads were also calculated. Table 9 reports the differences between the average yield spread for the ‘non-MS’ and ‘MS’ groups from Tables 6 and 7.

For Table 6, the difference between the average daily yield spread for ‘non-MS’ countries (0.103) and ‘MS’ countries (0.015) over the three day window (-1, 1) was 0.088 basis points. Although it was the largest recorded difference, it failed to reach statistical significance.

**Table 9:**

Difference in spreads between non-MS and MS for each event (2000 – 2020), from Tables 6 and 7

|         | Negative Events           |                           |                           | Positive Events             |                            |                            |
|---------|---------------------------|---------------------------|---------------------------|-----------------------------|----------------------------|----------------------------|
|         | Rating downgrade          |                           |                           | Rating upgrade              |                            |                            |
|         | (-1, 1)                   | (-1, 0)                   | (0, 1)                    | (-1, 1)                     | (-1, 0)                    | (0, 1)                     |
| Table 6 | <b>0.088</b><br>(1.115)   | <b>0.019</b><br>(0.554)   | <b>0.069</b><br>(1.206)   | <b>-0.021</b><br>(-0.714)   | <b>-0.008</b><br>(-0.647)  | <b>-0.013</b><br>(-0.602)  |
| Table 7 | <b>0.066</b><br>(0.783)   | <b>0.012</b><br>(0.339)   | <b>0.053</b><br>(0.866)   | <b>-0.054**</b><br>(-1.998) | <b>-0.022*</b><br>(-1.892) | <b>-0.032</b><br>(-1.554)  |
|         | Negative outlook          |                           |                           | Positive outlook            |                            |                            |
|         | (-1, 1)                   | (-1, 0)                   | (0, 1)                    | (-1, 1)                     | (-1, 0)                    | (0, 1)                     |
| Table 6 | <b>-0.015</b><br>(-0.400) | <b>0.007</b><br>(0.371)   | <b>-0.022</b><br>(-0.852) | <b>0.059**</b><br>(2.388)   | <b>0.013</b><br>(0.848)    | <b>0.045***</b><br>(3.232) |
| Table 7 | <b>-0.013</b><br>(-0.345) | <b>-0.001</b><br>(-0.051) | <b>-0.011</b><br>(-0.415) | <b>0.016</b><br>(0.570)     | <b>-0.003</b><br>(-0.201)  | <b>0.020</b><br>(1.139)    |

Note: the numbers reported in bold are the difference in basis points of the average yields between the non-MS and MS groups from Table 6 and 7 respectively.

T-statistics in brackets. \*\*\*, \*\*, \* statistical significance at 1%, 5% and 10% respectively.

Of most interest is the reversal in which CRA was associated with a statistically significant difference in average yield spreads between the two tables. When Mexico and Turkey were included in the ‘MS’ group (Table 6), there was a strong statistical difference between groups following a positive outlook change: 0.059\*\* (-1, 1) and 0.045\*\*\* (0, 1). When Mexico and Turkey were removed from the ‘MS’ group (Table 7), the statistically significant differences disappeared (0.016 and 0.020) respectively. The

removal of Mexico and Turkey from the 'MS' group did not eliminate the statistical significance for this group of countries, but it did eliminate any statistically significant difference with the 'non-MS' group of countries. If the categorisation of countries used in Table 7 is taken to be a more accurate reflection of countries' degree of monetary sovereignty, then the lack of a statistically significant difference between 'MS' and 'non-MS' countries may suggest that positive outlook announcements do not affect either group of countries differently.

However, it should also be acknowledged that for the 'MS' group of countries used in Table 6 there were only 8 of the 14 countries that received a positive outlook announcement ( $n = 33$ ) from 2000 – 2020 (see Table 3). When Mexico and Turkey were removed, the number of positive outlook announcements fell to 26, of which 19 (73 per cent of the sample) were from South Korea ( $n = 7$ ), Poland ( $n = 7$ ) and Iceland ( $n = 5$ ). This should be considered when interpreting the effect of a positive outlook on the bond yield spread for 'MS' countries as the statistically significant effect returned in Table 7 may in fact be biased to the effect in three 'MS' countries.

The difference in spreads following a credit rating upgrade in the Table 7 groups produced a strongly significant difference over the three day window ( $-0.054^{**}$ ). The sign (+ or -) of the difference is interesting, but rather it is the size of the difference which is most important. A statistically significant difference indicates that a credit rating upgrade affects 'non-MS' and 'MS' countries differently. For the 'MS' group in Table 7, the average spread over the three day window  $(-1, 1)$  was only 0.003 basis points and unsurprisingly was not statistically significant. Given the spread for the 'non-MS' group for the same period was  $-0.051^{**}$  basis points and the difference between the two groups ( $-0.054$ ) was statistically significantly different to zero, there is preliminary evidence to suggest that there is a difference in the effect of a credit rating upgrade for 'non-MS' and 'MS' countries. This finding has not previously been reported in the literature. Moreover, Table 9 shows that on the day of the credit rating upgrade  $(-1, 0)$  there is a statistically significant difference between the two groups of countries ( $-0.022^*$ ). This suggests that upon hearing of a credit rating upgrade (assuming the bond market is informationally efficient), investors treat 'non-MS' and 'MS' countries differently.

## Discussion

The findings of this paper provide preliminary evidence to suggest that a country's degree of monetary sovereignty influences the effect a credit rating announcement has on the ten-year sovereign bond yield spread. Compared to Afonso, Furceri and Gomes' (2012) paper which found negative events to have significant effects on the bond yield spread over a three day window, this event study analysis found positive events to be more significant to both 'non-MS' and 'MS' countries.

On average, on the day of a credit downgrade  $(-1, 0)$ , Afonso, Furceri and Gomes (2012) found that the daily yield on ten-year sovereign bonds increased by 0.08 basis points, and the change was statistically significant at 1 per cent ( $t\text{-stat} = 3.29$ ). Their analysis reviewed approximately 70,000 daily yields for 24 European Union countries over a 15 year period. Interestingly, in the event study analysis conducted in this paper, even when the 'MS' countries were removed from the sample (i.e. average yield spread calculated for 'non-MS' countries only), the credit downgrade only increased the yield by 0.011 basis points (Table 6) and 0.007 (Table 7). The sample of European countries used by Afonso, Furceri and Gomes (2012) was similar in monetary characteristics to this study's sample and as such there was no obvious difference in monetary sovereignty. Potentially the larger sample assessed by

this investigation nullified the effect of a credit downgrade, but nonetheless, this finding was different to what has previously been reported in the literature.

Again, the recent paper by Kenourgios, Umar and Lemonidi (2020) found a statistically significant relationship between a credit downgrade and an increase in the yield spread on ten-year sovereign bonds. A week following the downgrade, Kenourgios, Umar and Lemonidi (2020) reported that on average, across 15 countries, the yield increased by 0.175 basis points (significant at 1 per cent). European Monetary Union (EMU) countries were included in their sample (approximately 30 per cent), but most different to the event study conducted in this paper, was that Kenourgios, Umar and Lemonidi (2020) used aggregated weekly data. The week long window potentially captured effects from a downgrading which were missed by the narrower, three day window.

Interestingly, neither Afonso, Furceri and Gomes (2012) nor Kenourgios, Umar and Lemonidi (2020) found any positive event (upgrade or positive outlook) to have a statistically significant effect on bond yield spreads. The findings of this paper suggest that when monetary sovereignty is accounted for, there appears to be a statistically significant difference between the effect a positive credit rating announcement has on MS and non-MS countries. The literature regarding monetary sovereignty is not widespread and as such there are no other studies to draw upon to help explain and understand these findings. Irrespective of the limitations of this study, there is evidence to suggest that when controlling for relative wealth (OECD sample), there is a difference in the effect of some CRAs between countries.

This paper makes at least one significant contribution. It provides preliminary evidence to suggest that a country's degree of monetary sovereignty has a tangible effect on the yield of its ten-year sovereign bonds, particularly in response to a credit rating upgrade.

### Limitations

The use of an event study to analyse the effect of CRAs on sovereign bonds does have limitations. The simple event study conducted in this paper did not account for the magnitude of change in credit rating and therefore is insensitive to the effect of a multi-notch change in credit rating (i.e. from AAA to BBB-). Controlling for the size of the change in credit rating may reveal new information or potentially better explain larger changes in yield spreads.

Despite the author's best effort to obtain complete data, there were periods of missing bond yield data for most countries. The large sample size (>130,000 observations) minimised the bias of this issue, but what could not be avoided was that on occasion, a CRA occurred during a period of missing data. In these instances, the CRA was not included. Fortunately, this occurred on less than 10 occasions.

### What does this all mean and where to next?

One of the most telling findings from this paper has been the confirmation that more work needs to be done to better define the monetary sovereignty spectrum. The issue of Mexico and Turkey, and the subsequent effects of their inclusion (exclusion) on the results, highlights the difficulties that are encountered when trying to categorise countries that are not at either extreme of the monetary sovereignty spectrum. This paper highlights the need to further explore and bring to the attention of economists, policy makers and commentators the reality that different currency regimes have very real differences.

Such a suggested difference is that sovereign CRAs affect countries differently, dependent on their degree of monetary sovereignty. This paper suggests that the bond market is informationally inefficient. That being, on the day of or the day following a credit rating or outlook announcement, the sovereign ten-year bond spread did not significantly differ across all four types of CRAs. This was the case for positive events, but given the mainstream narrative that sovereign credit ratings matter and that investors determine the borrowing costs faced by sovereign governments, one would reasonably expect the market to change upon learning any new information. However, considering the history of sovereign bond yields, we do know that the yields do not predictably follow CRAs. The vast majority of sovereign bond yields have fallen to very close to or below a zero per cent rate of interest over the past 10 years. Despite multiple credit rating changes, the downwards trajectory has persisted. The issue of persistence was not addressed by this paper and further research should look at increasing the event window to 20 and 60 days to capture bond yield changes that do not occur immediately following a CRA. Of course, the larger the event window, the less certain a researcher can be that the CRA was the cause of any change in the bond's yield. Nonetheless, this is an important addition.

Another challenge encountered in researching for this paper was the scarcity of freely and easily accessible data on the net foreign currency obligations of countries. This paper has argued that foreign currency denominated debt lowers a federal government's monetary sovereignty. Without access to the level of net foreign currency denominated debt of each country, it will be very challenging to further develop the monetary sovereignty literature. Nowhere within the World Bank's *International Debt Statistics 2021* are net foreign currency denominated debt obligations listed. Similarly, the debt securities statistics for member countries of the Bank for International Settlements (2020) does not clearly detail the amount of outstanding foreign currency denominated debt. Publishing this statistic would assist in the classification of countries' degree of monetary sovereignty.

A recent paper by Prates (2020) provides a criticism of the monetary sovereignty perspective and whilst some may take issue with her characterisation, Prates (2020) does make a valuable contribution in attempting to address how one could score a country's degree of monetary sovereignty. Figure 2 below – taken from Prates (2020) – is the most recent example of how a series of countries (bottom right hand corner) can be scored in terms of their degree of monetary sovereignty. Focusing on the bottom right hand section, the closer a country is towards to the top right hand corner – as is the United States – the greater degree of monetary sovereignty they enjoy.

Developing a set of criteria to index different countries by their degree of monetary sovereignty should be a priority for academics who are interested in understanding what affects the yields on sovereign debt. This will not only allow for more accurate insights into the effect of sovereign CRAs, but also has the potential to give sovereign governments greater understanding of how best to organise their spending to make the most of their monetary system.

**Figure 2**  
Characterisation of the monetary sovereignty spectrum

|                         |  |                        |             |   |                              |  |
|-------------------------|--|------------------------|-------------|---|------------------------------|--|
|                         |  |                        |             | (Degree of) monetary sovereignty (MS)         |                              |  |
|                         |  |                        |             | - —————> +                                    |                              |  |
|                         |  |                        |             | <i>Non-sovereign<br/>currency<sup>a</sup></i> | <i>Sovereign currency</i>    |  |
|                         |  |                        |             | Degree of policy space                        |                              |  |
|                         |  |                        |             | - —————> +                                    |                              |  |
| Currency hierarchy (CH) | <i>Key currency</i>                          | Degree of policy space | +<br>↓<br>- | n.a.  | 1                            | United States                          |
|                         | <i>Center<br/>currencies</i>                 |                        |             | 3 Eurozone<br>countries                       | 2                            | e.g. UK, Japan, Canada,<br>Switzerland |
|                         | <i>Peripheral<br/>currencies<sup>b</sup></i> |                        |             | 6 Ecuador                                     | 5 e.g. Turkey,<br>Peru, etc. | 4 e.g. China, Brazil,<br>Mexico, India |

*Notes:* a. Countries that use a foreign currency, have a convertible currency, or are members of monetary unions. b. Based on the sample of emerging-market countries of the Institute of International Finance (IIF): Argentina, Brazil, Bulgaria, Chile, China, Colombia, Czech Republic, Ecuador, Egypt, Hungary, India, Indonesia, Korea, Lebanon, Malaysia, Mexico, Morocco, Nigeria, Peru, Philippines, Poland, Romania, Russia, Saudi Arabia, South Africa, Thailand, Turkey, Ukraine, United Arab Emirates.

Notes: as appears in Prates (2020)

As it currently stands, none of the three major sovereign credit rating agencies explicitly distinguish between a sovereign’s debt denominated in a foreign or local currency. All three agencies provide local and foreign currency sovereign credit ratings, but it is a local currency credit rating which is most widely discussed. The CRAs used in this event study are local currency sovereign credit ratings. Moody’s does not typically differentiate between local and foreign currency debt obligations (Moody’s 2019), whereas S&P (2020) usually rates the foreign currency sovereign rating one notch lower than the local currency rating to account for the unique powers of the sovereign government. Fitch (2020b) is the most detailed in how they treat local and foreign currency debt. For Fitch, the local currency and foreign currency sovereign rating of any country start out equal, but they may differ if certain factors exist. For example, if the local currency debt burden is proportionately higher (no further detail is provided) than the foreign currency debt burden, the local currency sovereign rating will be lowered. This appears to contradict their acknowledgement of the flexibility offered with a locally issued currency that is freely floating (Fitch 2020b) – monetary sovereignty principles.

The controversial finding of this paper is that for a group of countries (monetary sovereigns), sovereign credit ratings are of no consequence to the yield on their ten-year sovereign debt. Although not popularly held by mainstream economists, this assertion is not new. A recent paper by Fullwiler (2020) discusses how – for monetary sovereigns – the yield on their sovereign debt is a product of their interbank cash rate target (monetary policy) and therefore the sovereign government has control over the yield on its outstanding, local currency denominated debt. It must be stressed that this is not the case for all countries. Countries with a low degree of monetary sovereignty – ‘non-MS’ – cannot independently set their own domestic monetary policy and as such, they do not set the yield on their sovereign debt. The findings of this paper support Fullwiler’s (2020) work in that it demonstrates that the yield on ten-year sovereign bonds are not affected by sovereign CRAs. Further research should

look to include central bank cash rate target announcements to further test Fullwiler's and others' claims.

As well as assessing larger samples of countries, it will also be important to review individual countries in greater depth. Country specific, case studies will allow for a greater understanding of the degree of a country's monetary sovereignty and will contribute to better defining the monetary sovereignty spectrum. Likewise, comparing average yield spreads from different periods of time (e.g. pre-post global financial crisis) may provide insight into the bond market's response to sovereign CRAs.

The monetary sovereignty literature is in its infancy, but given recent events surrounding the expansion of sovereign governments' debt issuance, it is the perfect time to pursue a greater understanding. By removing the emphasis on sovereign credit ratings and revealing the power of a monetary sovereign to set the yield on their local currency debt, monetary sovereign governments will have greater freedom to decide how they should use their currency issuing ability.

## Conclusion

Despite the theoretical arguments of some, to date there has been a lack of empirical evidence to support the notion that credit rating announcements have a minimal effect on the sovereign bond yields of monetarily sovereign countries. This paper details the first known attempt to account for monetary sovereignty.

The monetary sovereignty perspective is far from universally accepted, but its strength is that it attempts to differentiate countries by how they operate their monetary systems. On average, across 28 OECD countries, a standard event study analysis revealed the following main findings: i) there is a statistically significant difference in the effect of a credit rating upgrade between non-monetary (non-MS) sovereign countries and countries that have a high degree of monetary sovereignty (MS); ii) a credit downgrade has a statistically significant effect on the average yield spread of sovereign ten-year bonds for non-MS countries, but not for MS countries.

Further research is required to better understand the effect of monetary sovereignty, but this paper gives reason to investigate.

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## Appendices

### Appendix 1

#### Codes from Refinitiv Eikon (10 year sovereign bonds)

|               |                         |             |                          |
|---------------|-------------------------|-------------|--------------------------|
| Australia     | AUGV 1.0000 21-Dec-2030 | Japan       | JPGV 0.1000 20-Jun-2030  |
| Austria       | ATGV 20-Feb-2030        | Lithuania   | LTGV 0.2000 28-Aug-2029  |
| Belgium       | BEGV 0.1000 22-Jun-2030 | Mexico      | MXGV 8.5000 31-May-2029  |
| Canada        | CAGV 1.2500 01-Jun-2030 | Netherlands | NLGV 15-Jul-2030         |
| Chile         | CLGV 6.0000 01-Jan-2032 | New Zealand | NZGV 1.5000 15-May-2031  |
| Colombia      | COGV 6.0000 28-Apr-2028 | Norway      | NOGV 1.3750 19-Aug-2030  |
| Denmark       | DKGV 0.5000 15-Nov-2029 | Poland      | PLGV 1.2500 25-Oct-2030  |
| Finland       | FIGV 15-Sep-2030        | Portugal    | PTGV 0.4750 18-Oct-2030  |
| France        | FRGV 25-Nov-2030        | Slovakia    | SKGV 0.7500 09-Apr-2030  |
| Germany       | DEGV 15-Aug-2030        | Slovenia    | SIGV 0.2750 14-Jan-2030  |
| Great Britain | GBGV 4.7500 07-Dec-2030 | South Korea | KRGV 1.3750 10-Jun-2030  |
| Greece        | GRGV 1.5000 18-Jun-2030 | Spain       | ESGV 1.2500 31-Oct-2030  |
| Hungary       | HUGV 3.2500 22-Oct-2031 | Sweden      | SEGV 0.7500 12-Nov-2029  |
| Iceland       | ISGV 6.5000 24-Jan-2031 | Switzerland | CHGV 0.5000 27-May-2030  |
| Ireland       | IEGV 0.2000 18-Oct-2030 | Turkey      | TRGV 12.4000 08-Mar-2028 |
| Israel        | ILGV 1.0000 31-Mar-2030 | USA         | UST 0.6250 15-Aug-2030   |
| Italy         | ITGV 1.6500 01-Dec-2030 |             |                          |

## Appendix 2

Number of credit rating changes from each of the three main credit rating agencies (2000 to 2020)

| Country      | Upgrades  |           |           | Downgrades |           |           | Positive  |           |           | Negative  |           |           |
|--------------|-----------|-----------|-----------|------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|              | upF       | upM       | upSP      | downF      | downM     | downSP    | posF      | posM      | posSP     | negF      | negM      | negSP     |
| AUS          | 2         | 1         | 1         | 0          | 0         | 0         | 0         | 0         | 0         | 1         | 0         | 2         |
| AUT          | 1         | 0         | 0         | 1          | 1         | 1         | 1         | 0         | 0         | 1         | 1         | 3         |
| BEL          | 1         | 0         | 0         | 2          | 0         | 1         | 0         | 1         | 0         | 4         | 2         | 2         |
| CAN          | 2         | 2         | 1         | 1          | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         |
| DEN          | 1         | 0         | 1         | 0          | 0         | 0         | 1         | 0         | 0         | 0         | 0         | 0         |
| FIN          | 0         | 0         | 1         | 1          | 1         | 1         | 1         | 0         | 1         | 1         | 1         | 3         |
| FRA          | 0         | 0         | 0         | 2          | 2         | 2         | 0         | 1         | 0         | 2         | 0         | 1         |
| GER          | 0         | 0         | 0         | 0          | 0         | 0         | 0         | 0         | 0         | 0         | 1         | 0         |
| GRE          | 8         | 5         | 8         | 10         | 7         | 13        | 3         | 1         | 2         | 2         | 0         | 4         |
| HUN          | 3         | 1         | 3         | 4          | 5         | 5         | 1         | 2         | 2         | 4         | 1         | 4         |
| ICE          | 4         | 4         | 4         | 3          | 4         | 5         | 2         | 1         | 2         | 3         | 3         | 3         |
| IRE          | 3         | 4         | 5         | 4          | 5         | 6         | 1         | 1         | 2         | 1         | 2         | 2         |
| ITA          | 1         | 1         | 0         | 6          | 4         | 7         | 0         | 0         | 0         | 3         | 1         | 4         |
| JAP          | 0         | 1         | 1         | 4          | 3         | 5         | 0         | 1         | 2         | 4         | 1         | 3         |
| KOR          | 3         | 2         | 6         | 0          | 3         | 0         | 1         | 5         | 1         | 1         | 0         | 0         |
| MEX          | 4         | 3         | 4         | 3          | 1         | 2         | 1         | 2         | 2         | 1         | 2         | 3         |
| NET          | 0         | 0         | 1         | 0          | 0         | 1         | 0         | 0         | 1         | 1         | 1         | 1         |
| NOR          | 0         | 0         | 0         | 0          | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         |
| NZ           | 1         | 1         | 0         | 1          | 0         | 1         | 2         | 0         | 1         | 1         | 0         | 2         |
| POL          | 1         | 1         | 3         | 0          | 0         | 1         | 3         | 0         | 5         | 0         | 1         | 1         |
| POR          | 1         | 3         | 3         | 5          | 5         | 5         | 3         | 2         | 3         | 3         | 1         | 4         |
| SLK          | 0         | 0         | 2         | 1          | 0         | 0         | 2         | 2         | 2         | 0         | 0         | 1         |
| SPA          | 4         | 2         | 5         | 4          | 6         | 6         | 1         | 0         | 2         | 1         | 1         | 2         |
| SWE          | 2         | 1         | 1         | 0          | 0         | 0         | 1         | 0         | 1         | 0         | 0         | 0         |
| SWI          | 1         | 0         | 0         | 0          | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         |
| TUR          | 1         | 2         | 2         | 3          | 5         | 3         | 1         | 1         | 0         | 2         | 2         | 2         |
| UK           | 0         | 0         | 0         | 3          | 2         | 1         | 0         | 0         | 0         | 2         | 3         | 3         |
| USA          | 0         | 0         | 0         | 0          | 0         | 1         | 0         | 0         | 0         | 2         | 1         | 1         |
| <b>TOTAL</b> | <b>44</b> | <b>34</b> | <b>52</b> | <b>58</b>  | <b>54</b> | <b>67</b> | <b>25</b> | <b>20</b> | <b>29</b> | <b>40</b> | <b>25</b> | <b>51</b> |

Note: full sample, contaminated CRAs included.

## Appendix 3

### Monetary characteristics of the countries

| Country         | Issues local currency | Floating exchange rate | Floated    | Reason for not being monetarily sovereign |
|-----------------|-----------------------|------------------------|------------|---|
| AUSTRALIA       | ✓                     | ✓                      | 12/12/1983 |   |
| AUSTRIA         |                       |                        |            | EMU                                       |
| BELGIUM         |                       |                        |            | EMU                                       |
| CANADA          | ✓                     | ✓                      | 31/05/1970 |   |
| DENMARK         | ✓                     |                        |            | Pegged to the Euro since 1981             |
| FINLAND         |                       |                        |            | EMU                                       |
| FRANCE          |                       |                        |            | EMU                                       |
| GERMANY         |                       |                        |            | EMU                                       |
| GREECE          |                       |                        |            | EMU                                       |
| HUNGARY         | ✓                     |                        |            | Pegged to Euro since 2000                 |
| ICELAND         | ✓                     | ✓                      | Unknown    |   |
| IRELAND         |                       |                        |            | EMU                                       |
| ITALY           |                       |                        |            | EMU                                       |
| JAPAN           | ✓                     | ✓                      | 14/02/1973 |   |
| SOUTH KOREA     | ✓                     | ✓                      | 1/12/1997  |   |
| MEXICO          | ✓                     | ✓                      | 19/12/1994 |   |
| NETHERLANDS     |                       |                        |            | EMU                                       |
| NEW ZEALAND     | ✓                     | ✓                      | 4/03/1985  |   |
| NORWAY          | ✓                     | ✓                      | 1/12/1992  |   |
| POLAND          | ✓                     | ✓                      | 1/04/2000  |   |
| PORTUGAL        |                       |                        |            | EMU                                       |
| SLOVAK REPUBLIC |                       |                        |            | EMU                                       |
| SPAIN           |                       |                        |            | EMU                                       |
| SWEDEN          | ✓                     | ✓                      | 19/11/1992 |   |
| SWITZERLAND     | ✓                     | ✓                      | 23/01/1973 |   |
| TURKEY          | ✓                     | ✓                      | 28/05/2001 |   |
| UNITED KINGDOM  | ✓                     | ✓                      | 23/06/1972 |   |
| UNITED STATES   | ✓                     | ✓                      | 15/08/1971 |   |

EMU = European Monetary Union

Sources: from a variety of publications from the International Monetary Fund; World Bank; official website of the European Union and websites of country specific central banks.

## Appendix 4

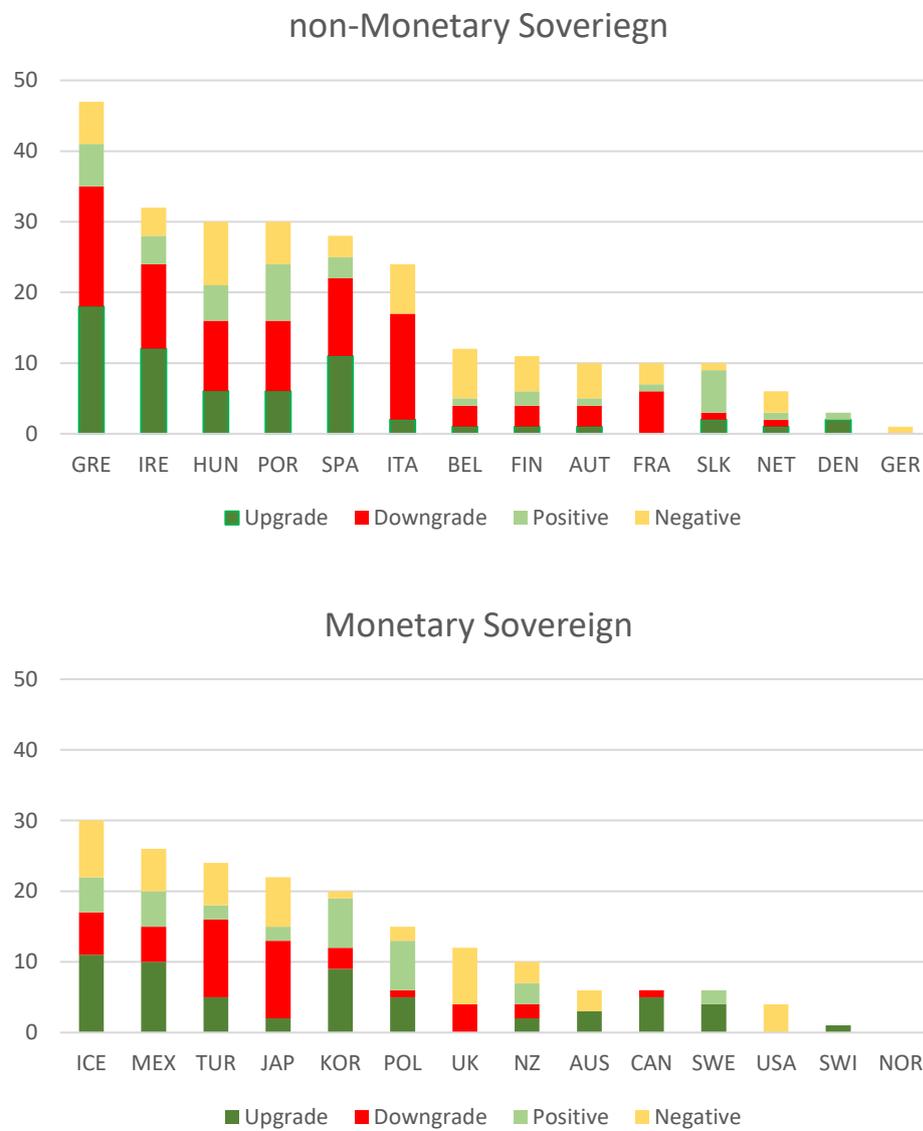
### OECD membership

| <b>Country</b> | <b>OECD membership</b> | <b>Country</b>  | <b>OECD membership</b> |
|----------------|------------------------|-----------------|------------------------|
| CANADA         | 10/04/1961             | ITALY           | 29/03/1962             |
| UNITED STATES  | 12/04/1961             | JAPAN           | 28/04/1964             |
| UNITED KINGDOM | 2/05/1961              | FINLAND         | 28/01/1969             |
| DENMARK        | 30/05/1961             | AUSTRALIA       | 7/06/1971              |
| ICELAND        | 5/06/1961              | NEW ZEALAND     | 29/05/1973             |
| NORWAY         | 4/07/1961              | MEXICO          | 18/05/1994             |
| TURKEY         | 2/08/1961              | CZECH REPUBLIC  | 21/12/1995             |
| SPAIN          | 3/08/1961              | HUNGARY         | 7/05/1996              |
| PORTUGAL       | 4/08/1961              | POLAND          | 22/11/1996             |
| FRANCE         | 7/08/1961              | SOUTH KOREA     | 12/12/1996             |
| IRELAND        | 17/08/1961             | SLOVAK REPUBLIC | 14/12/2000             |
| BELGIUM        | 13/09/1961             | CHILE           | 7/05/2010              |
| GERMANY        | 27/09/1961             | SLOVENIA        | 21/07/2010             |
| GREECE         | 27/09/1961             | ISRAEL          | 7/09/2010              |
| SWEDEN         | 28/09/1961             | ESTONIA         | 9/12/2010              |
| SWITZERLAND    | 28/09/1961             | LATVIA          | 1/07/2016              |
| AUSTRIA        | 29/09/1961             | LITHUANIA       | 5/07/2018              |
| NETHERLANDS    | 13/11/1961             | COLOMBIA        | 28/04/2020             |
| LUXEMBOURG     | 7/12/1961              |                 |                        |

Source: <https://www.oecd.org/about/document/list-oecd-member-countries.htm>

## Appendix 5

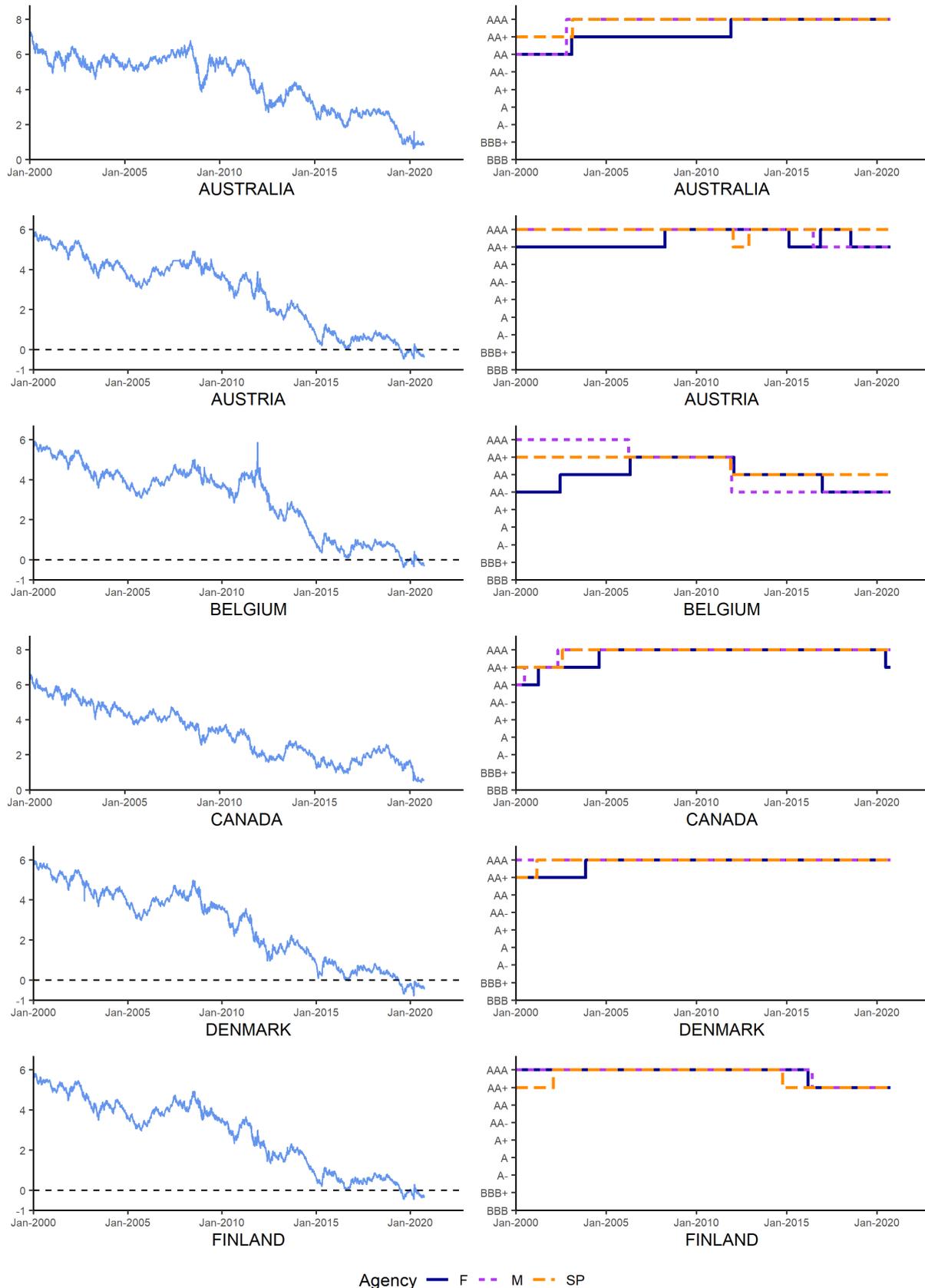
Distribution of CRAs within the 'non-MS' and 'MS' groups as categorised by Table 4

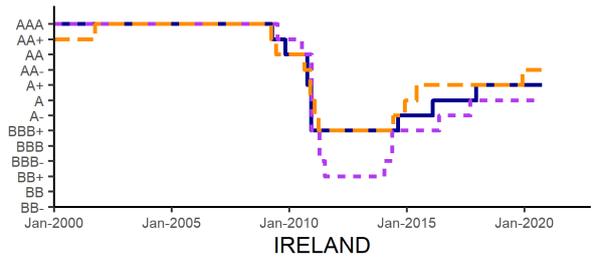
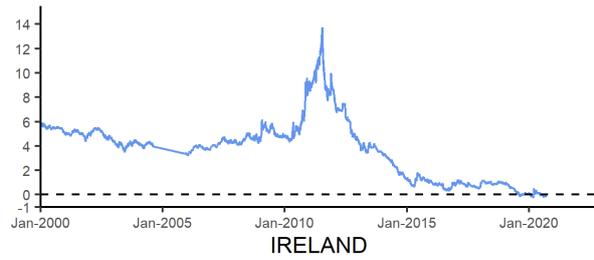
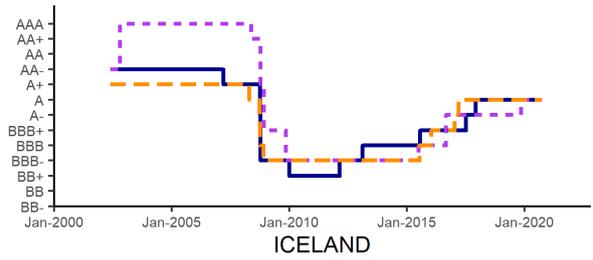
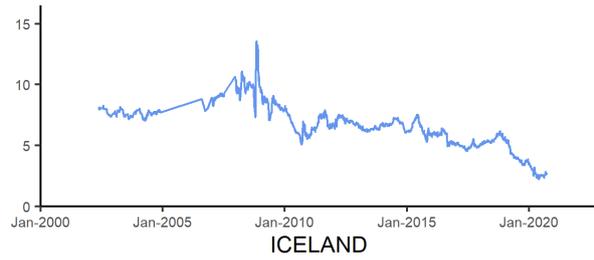
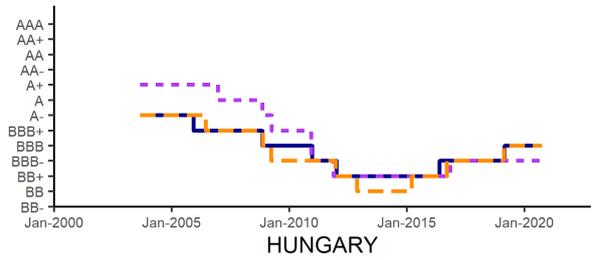
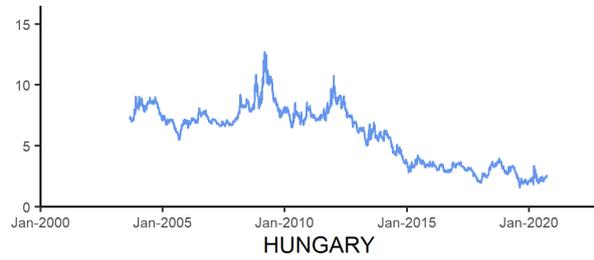
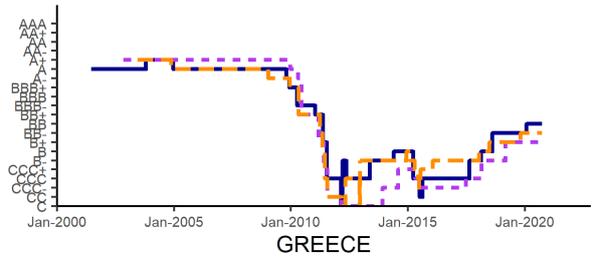
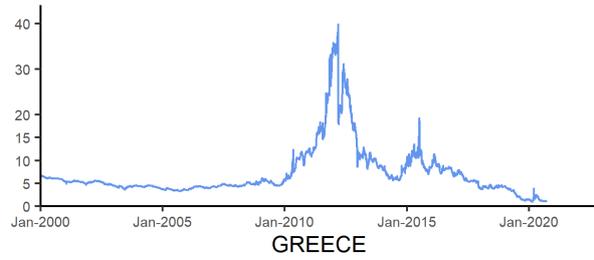
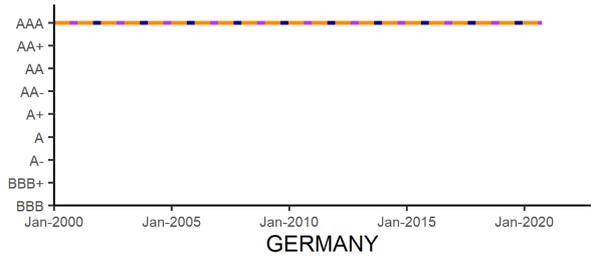
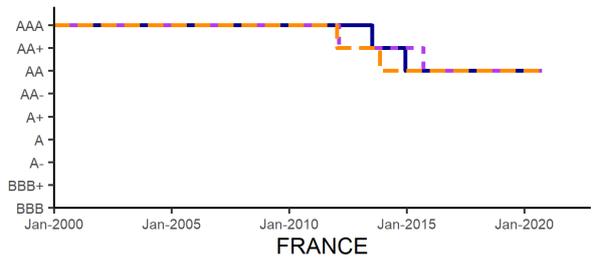
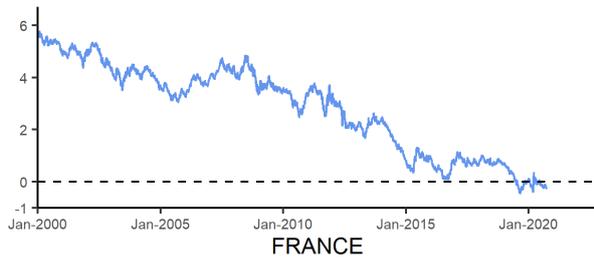


Note: created from data from Table 3.

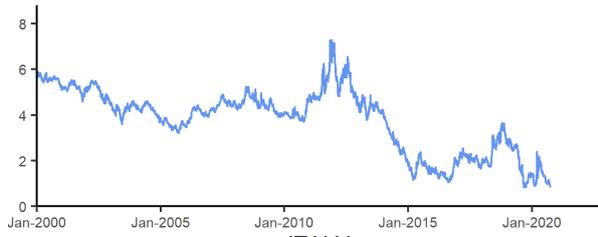
## Appendix 6

Yield (per cent) on 10 year sovereign bond and corresponding sovereign credit rating

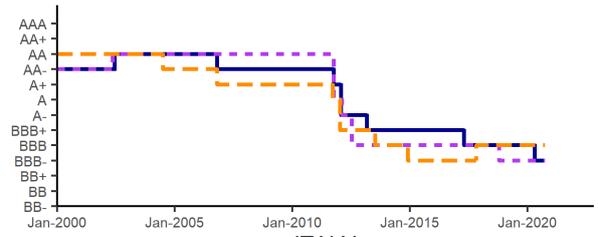




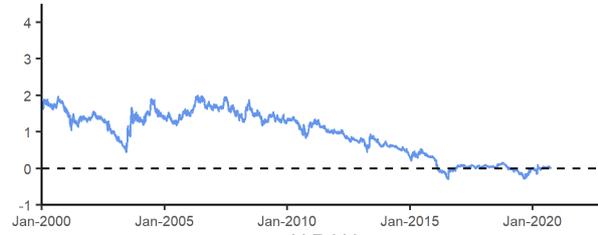
Agency — F — M — SP



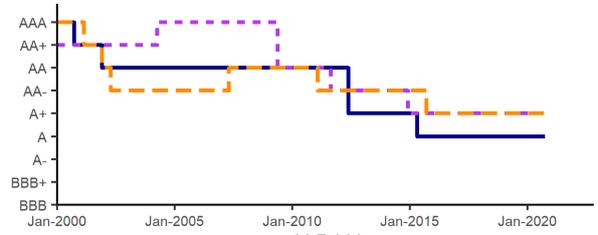
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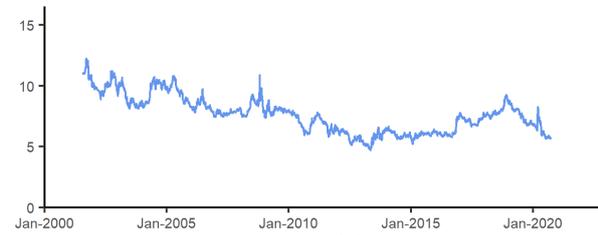
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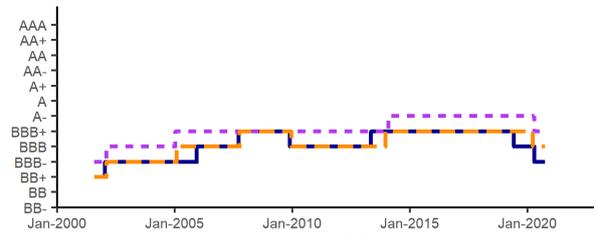
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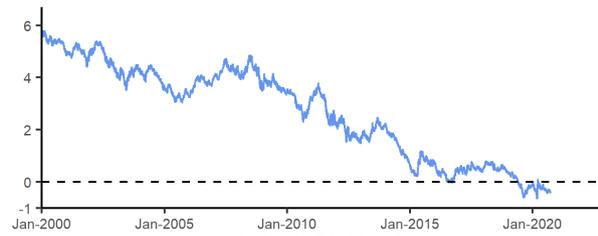
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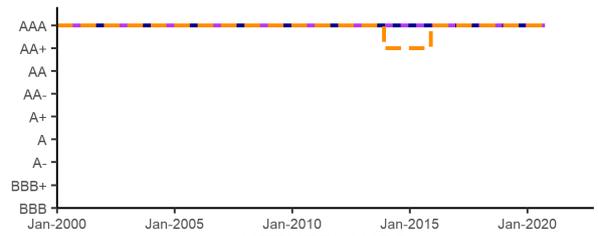
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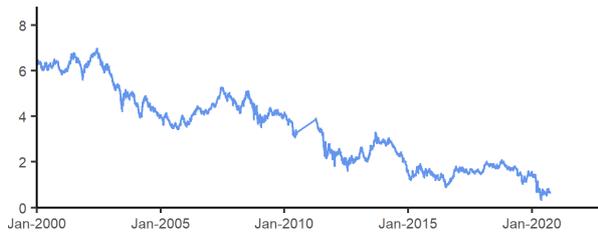
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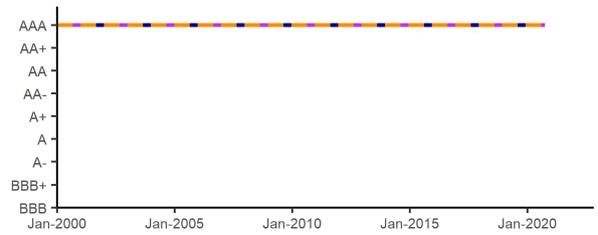
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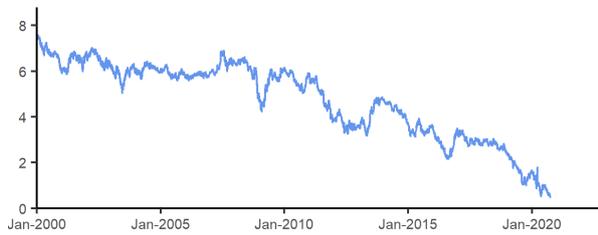
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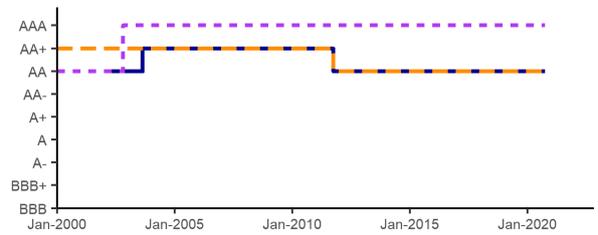
NORWAY



NORWAY

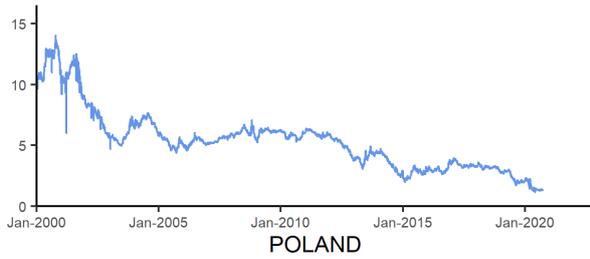


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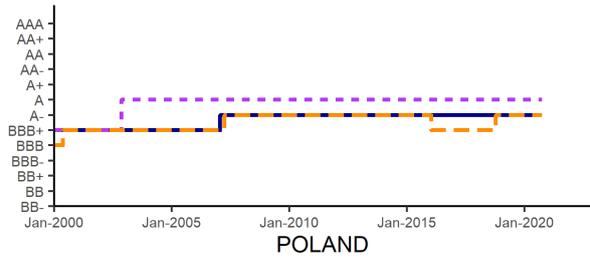


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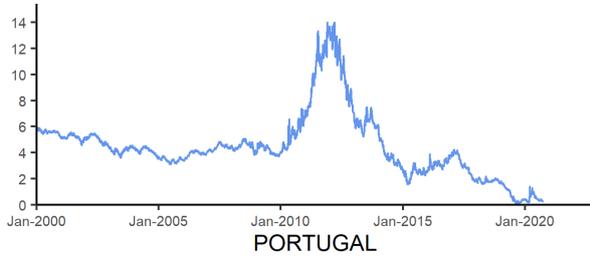
Agency — F — M — SP



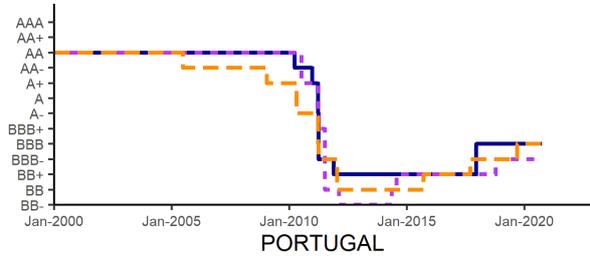
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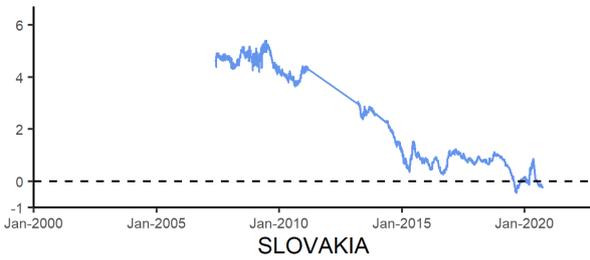
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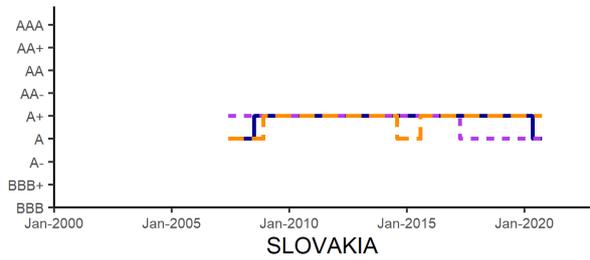
PORTUGAL



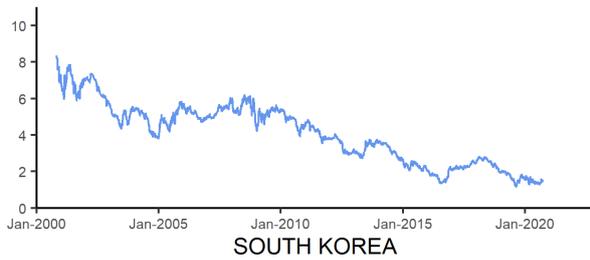
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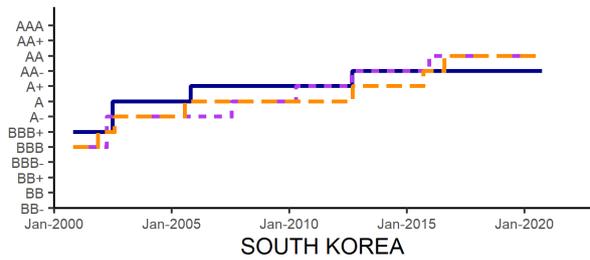
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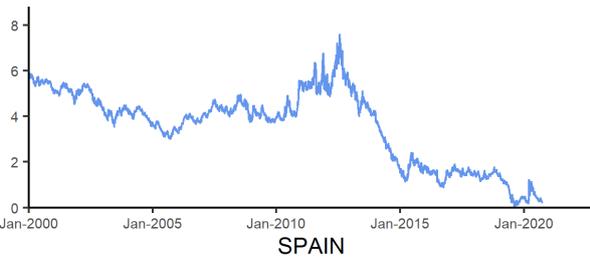
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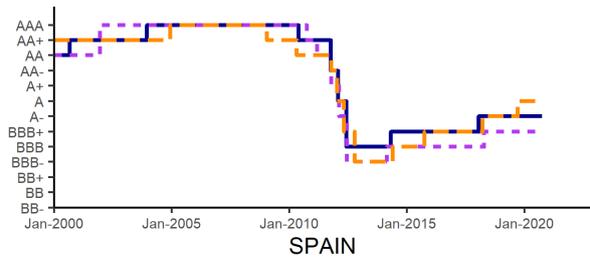
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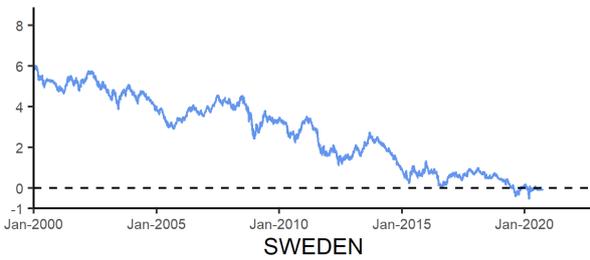
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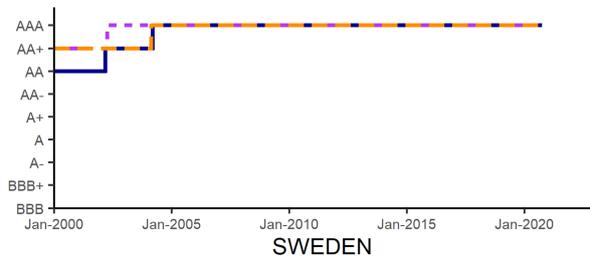
SPAIN



SPAIN

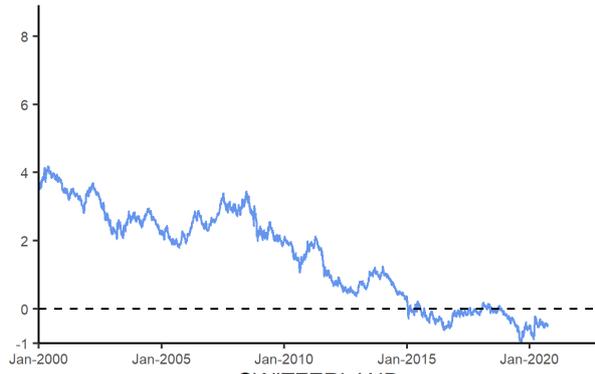


SWEDEN

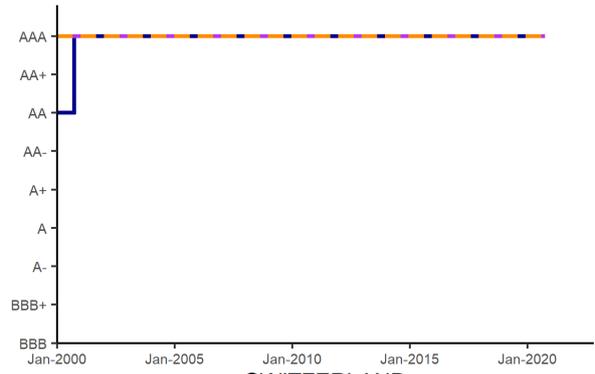


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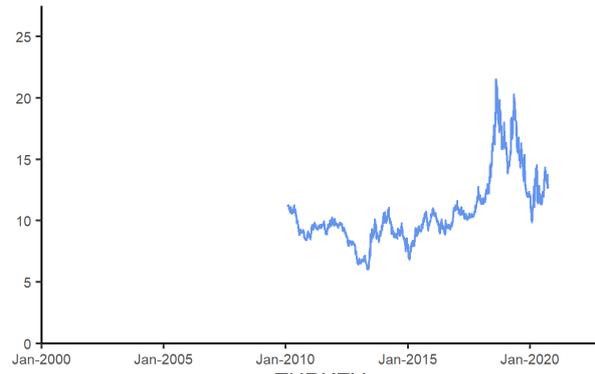
Agency — F — M — SP



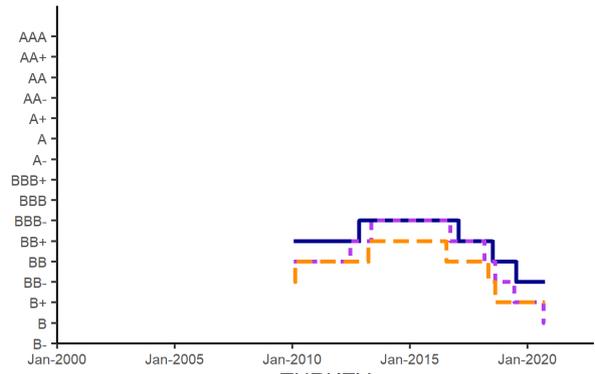
SWITZERLAND



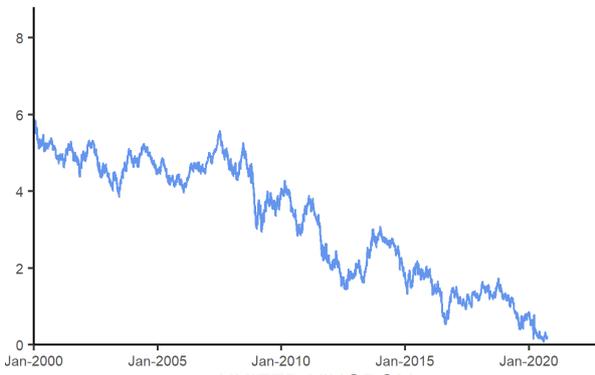
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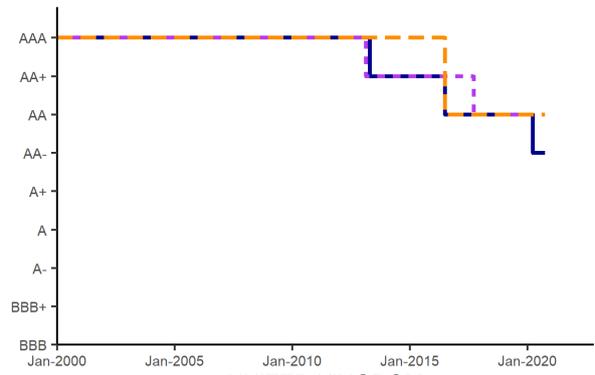
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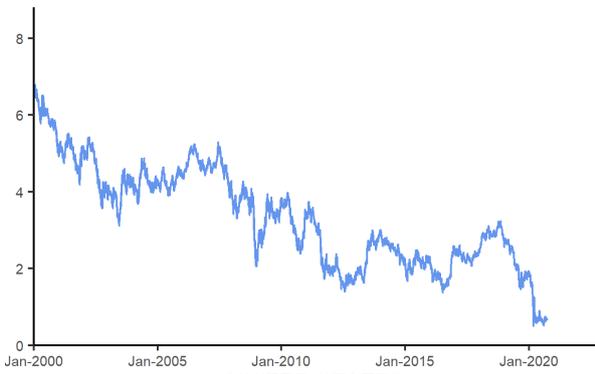
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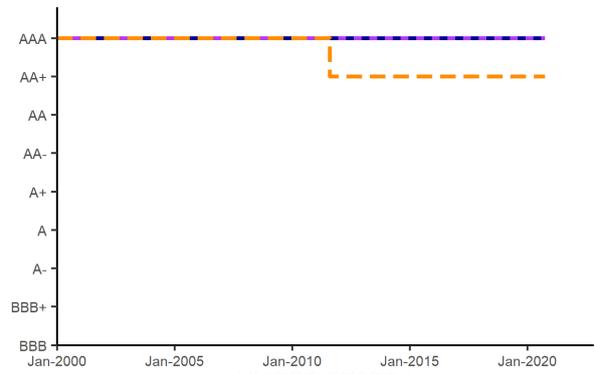
UNITED KINGDOM



UNITED KINGDOM



UNITED STATES



UNITED STATES

Agency — F — M — SP