INVESTMENT-GRADE OR "JUNK" STATUS: DO SOVEREIGN CREDIT RATINGS REALLY MATTER?

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Abstract

This paper examines the effects on government bond spreads as a result of a downgrade of a nation's sovereign debt to a speculative-grade rating from an investment-grade rating. The research was undertaken by examining empirical evidence in the literature, as well as through quantitative methods that studied the behaviour of government bond spreads before and after a downgrade for a sample of nations. The paper concludes that while a downgrade to a speculative-grade rating may not necessarily have a profound effect on bond spreads, there may be a substantial increase in the volatility surrounding these spreads.

1. INTRODUCTION

This paper examines the importance of sovereign credit ratings in terms of their impact on bond spreads and the cost of borrowing associated with sovereign debt. As credit ratings agencies and the ratings they assign play a prominent role in modern, globalised financial markets, a discussion on the impact of ratings and ratings changes on financial markets, specifically bond markets, is warranted. Section 2 begins by briefly motivating the existence of credit ratings. It then proceeds to discuss the empirical findings regarding whether or not credit ratings have a significant impact on the cost of sovereign borrowing and whether credit ratings affect the market or are affected by it. Section 3 discusses the methodology used to conduct the research on the impact of a downgrade to "junk" status on government bond spreads. This includes a brief explanation on the sources from which data were obtained as well as how the data was manipulated in order to answer the research question. Section 4 opens with examples of the behaviour of bond spreads over a period of four years for a few, chosen sovereigns before moving on to reaching more general conclusions. Section 5 concludes.

1. LITERATURE REVIEW

The concept of sovereign credit ratings has existed since the first half of the 20th century, with the eldest of the of the well-known credit ratings agencies, Moody's Investor Services (Moody's), being founded in 1900 (Moody's 2015).[1] According to Bhatia (2002) as recently as 1975, Moody's rated only three countries (Canada, the USA, Australia) while S&P focused only on Canada and the USA, with Fitch yet to rise to prominence. However, since then there has been rapid growth in the number of rated sovereigns, with Moody's and Standard and Poor's (S&P) making ratings available for 33 and 35 sovereigns respectively by 1990, and 108 and 83 respectively by the year 2000. The credit rating agencies began by focusing their efforts on rating developed countries where bond issues were largest. The concept of a rated sovereign is therefore even newer in emerging markets. Kräussl (2003) notes that while as recently as 1993 only 12 emerging countries carried a rating from Moody's, this number had grown to 64 by the year 2000.

A number of studies have examined the question of whether or not differences in credit ratings, in particular between investment-grade and speculative-grade, have any bearing on the market for government bonds, and in particular bond yields. Given that higher government bond yields imply higher debt service costs for governments, a significant inverse relationship between ratings and bond yields would indicate that countries with poor credit ratings should struggle to fund their debt given the high financing costs involved.

Cantor and Packer (1996), in a study involving 35 sovereigns rated by both S&P and Moody's, find that sovereign credit ratings have a significant ability to explain average sovereign bond yields, with 92% of the cross-sectional differences in bond spreads being explained by differences in credit ratings. However, they (Cantor and Packer, 1996) note that the effect of a sovereign ratings change differs depending on the rating that the nation in question holds at the time of the change. For investment-grade nations, the effects of a ratings change is insignificant, while it is significant for speculative-grade nations (Cantor and Packer, 1996). Cantor and Packer (1996) attribute this observation to the

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[1] The two other prominent credit ratings agencies (Standard and Poor's and Fitch Ratings) were founded in 1941 and 1914, respectively.

difficulty that investors have in determining the risk associated with speculative-grade economies, which would make them more reliant on the broad information provided by the credit ratings of those economies. By contrast, investors have more information available to them when making decisions concerning investment-grade sovereigns, which allows for less dependence on credit ratings when judging the risk and associated yield on sovereign bonds.

Using a set of 35 countries (with data from 1995-2010) Jaramillo and Tejada (2011) examine the possibility that credit ratings simply reflect changes in spreads due to altered macroeconomic fundamentals, rather than having any influence of their own. As such, they (Jaramillo and Tejada, 2011) focus on the effects of both ratings changes and changes in macroeconomic fundamentals on bond spreads. Furthermore, Jaramillo and Tejada (2011) focus on the effects of crossing the investment-grade threshold and place less emphasis on movements within ratings classes, i.e. ratings changes that cause a sovereign to remain either at speculative or investment-grade. Their (Jaramillo and Tejada, 2011) results indicate that, for the countries in question, there is a 36 percent difference in bond spreads related to movements between the lowest investment-grade rating (BBB-) and the highest speculative-grade rating (BB+). Furthermore, this difference is over and above any changes in spreads that come about as a result of changes in the macroeconomic fundamentals that supported the rating change in the first place.

Jaramillo and Tejada (2011) find that a one-notch rating change between two investment-grade ratings results in spread changes of only 5-10 percent. A one-notch rating change has no significant effect if the sovereign in question remains at a speculative-grade rating. These findings are in contrast to Cantor and Packer (1996), who found that ratings changes have no significant effect on bond yields if the sovereign in question holds (and maintains) an investment-grade rating, but do have an effect on speculative-grade bond yields.

González-Rozada and Levy-Yeyati (2010) agree with Jaramillo and Tejada (2011) that crossing the investment-grade threshold has a significant effect on spreads. However, they (González-Rozada and Levy-Yeyati, 2010) find that in the case of emerging markets changes in bond spreads are due more to changes in exogenous global factors rather than changes in credit ratings. González-Rozada and Levy-Yeyati (2010) further find that ratings changes do not anticipate changes in spreads but rather lag them, reacting to significant market news rather than anticipating it. Their (González-Rozada and Levy-Yeyati, 2010) findings indicate that downgrades in emerging markets are preceded by increases in spreads (rather than followed by them) and that apart from a small impact of approximately 50 basis points, have little significant further impact on bond spreads. As a result, they (González-Rozada and Levy-Yeyati, (2010) conclude that credit ratings are largely endogenous. Rather than explaining changes in spreads, they are explained by them.

The findings of a study focusing on the Asian Crisis of 1997-1998 by Mora (2006) support the conclusions of González-Rozada and Levy-Yeyati (2010). Sovereign credit ratings were found to be sticky in nature rather than pro-cyclical. According to Mora (2006) actual credit ratings after the Crisis were slightly, but not substantially higher than ratings before the Crisis, implying that overoptimistic ratings were not to blame for the Crisis. Mora (2006) also notes that after the Asian Crisis, ratings remained conservative. Mora (2006) supports the view, therefore, that ratings changes generally come after changes in bond spreads, implying that ratings follow market news rather than predicting it.

Reisen and von Maltzan (1998) provide further insight into the above findings by stating that whether credit ratings lead or lag market expectations has implications beyond academic interest. Reisen and von Maltzan (1998) note that if ratings lagged spreads they would accentuate economic boom-bust cycles by reinforcing market euphoria during the "boom" phase. Conversely, during the "bust" phase, lagging ratings may lead to panic amongst investors and excessive capital outflows.

Through use of a two-way Granger Causality test, Reisen and von Maltzan (1998) find that sovereign credit ratings influence yield spreads and vice-versa, implying that credit ratings agencies and financial markets make use of broadly the same model to assess sovereign risk. Their (Reisen and von Maltzan, 1998) explanation for this finding is that in determining sovereign ratings, ratings agencies make use of publicly available information. The financial market also has access to this information, implying that there is a contamination effect – the effects of planned or implemented ratings changes are contaminated as the market responds to the same publicly available information as the ratings agencies.

Furthermore, Reisen and von Maltzan (1998) find that, in the case of emerging markets, the most important determinant of the size of the risk premium that these nations face is their willingness to repay the debt rather than their ability to do so.

Elliason (2002) focuses on 38 emerging markets in seeking to establish whether the claimed long-term properties of sovereign credit ratings (i.e. that they are forward-looking by nature) are sound.[2] To this end, several econometric models

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[2] It is worth noting that Elliason (2002) makes use of the same macroeconomic fundamentals as Cantor and Packer (1996) as explanatory variables in their econometric analysis. These are: per capita GDP, inflation, GDP growth, fiscal balance, external balance and the ratio of external debt to GDP. Elliason then goes further by estimating new models that makes use of some

were used and compared with a crisis indicator comprised of high, out-of-the-ordinary interest rate and exchange rate events. Elliason (2002) concludes that actual ratings adjustments in the 38 emerging markets were more severe than suggested by the macroeconomic fundamentals of the time. Furthermore, Elliason (2002) finds using the crisis indicator that credit ratings are largely pro-cyclical rather than counter-cyclical.

Elliason (2002) notes that ratings were adjusted more frequently in practice than was suggested in the model. This result (Elliason, 2002) brings into question the long-term, forward-looking properties of credit ratings. Such properties would lead to fewer ratings adjustments than actually occurred as credit ratings agencies would attempt to avoid reactions based on short-term business cycle fluctuations, focusing instead on the long-term trend of a sovereign's economic circumstances.

A study focusing on bonds spreads in the peripheral countries of the Eurozone by de Vries and de Haan (2014) provides further insights.[3] The authors use a model that aims to estimate the expected bond spreads for each of the peripheral Eurozone countries from 2012 – 2014, based on their credit ratings over the afore-mentioned years, as well as prevailing financial market conditions. While de Vries and de Haan (2014) agree with Cantor and Packer (1996) that ratings changes have a substantial ability to explain changes in bond spreads, they believe that the fundamental relationship between the two indicators has changed since 2012. De Vries and de Haan (2014) offer two explanations for this observation. The first is the unconventional monetary policies implemented by the European Central Bank in order to preserve the Euro after the threat of a break-up in the European Monetary Union emerged in 2012. The second is that the lower credit ratings are a deliberate reaction by the major credit ratings agencies in order to restore their damaged reputations, which suffered as a result of the 2008 global financial crisis.

2. METHODOLOGY

The overarching aim of this paper is to determine the likely effect on the cost of financing sovereign debt of a potential downgrade of South Africa's sovereign credit rating to speculative-grade status. In order to achieve this aim, it was necessary to analyze the cost of the sovereign debt of a sample of countries, all of which had held an investment-grade rating initially and were subsequently downgraded to speculative-grade. Data on the history of sovereign credit ratings for a large number of countries was obtained from Moody's and S&P. A list of nations that had initially held investment-grade ratings and were later downgraded to speculative-grade by either S&P or Moody's, or both, was extracted. The resulting sample contained a total of 27 nations from S&P and 22 nations from Moody's. This number was reduced significantly in order to consider only sovereigns that had undergone their downgrades to "junk" status at some point within the 21st century as these are the examples that are most relevant for South Africa due to their relative recent occurrence and the substantial increase in financial flows to emerging markets over the period.

For each of the eight countries that was selected for the final sample, monthly data on the yields of its 10-year US dollar government bond was obtained over a period of roughly four years: two years before the downgrade and two years after. These yields were then compared to the yields on the USA 10-year government bond (which is used as a proxy for the risk free rate) over the same period. From there, the spreads on the respective government bonds were analyzed in order to track their movements in the two year period leading up to the "junk" status downgrade, as well as for the two following years. In order to focus more closely on the effect of the downgrade in isolation the mean spreads of each sovereign's 10-year government bond was calculated for the six months preceding the downgrade as well as the six months following the downgrade. The same approach was used to determine the median spreads, maximum and minimum spreads and range of spreads over the same two periods. This allows for analyses on both the immediate effect of the downgrade on mean spreads as well as its effect on the range of spreads, i.e. the difference between the highest and lowest spread over the six month period.

Furthermore, the above-mentioned calculations were also performed on the recorded bond spreads for each sovereign over two additional eighteen-month periods. These two periods are those that occur from two years to six months before the downgrade and six months to two years after the downgrade. In essence, each sovereign is analyzed over a period of approximately four years, split into four shorter periods: two years to six months before the downgrade, six to zero months before the downgrade, zero to six months after the downgrade, and six months to two years after the downgrade. These additional analyses of spreads over the longer term creates a useful reference point for comparing the behavior of

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additional variables, namely debt to exports, export growth, the ratio of short-term debt to reserves and LIBOR interest rate spreads. However, except for the debt to export variable, none of the new variables make a significant difference to the model.
[3] The peripheral nations of the Eurozone, as defined by de Vries and de Haan (2014) are Greece, Ireland, Italy, Portugal and Spain. They use the acronym "GIIPS" to refer to these countries. The bond spreads of the above countries are their spreads vis-à-vis German bonds.

the spreads during the time of the downgrade to their historical behavior. In short, this approach allows for analyses on how spread behavior changed as the downgrade approached as well as any additional changes that occurred as time passed after the downgrade.

It is important to clarify the meaning of the terms used above to refer to the respective periods before and after the downgrades to speculative-grade. This is because it is rare (at least in the panel of nations with which this paper is concerned) for both S&P and Moody's to downgrade a sovereign to "junk" status during the same month. Typically, there is a difference of a few months. Consequently, the periods that relate to spread behavior before the downgrade refer specifically to the behavior of spreads before the first downgrade, irrespective of which credit rating agency was responsible for said downgrade. Similarly, the periods that relate to spread behavior after the downgrade refer specifically to the behavior of spreads after the second of the two downgrades. This is in order to ensure that the periods in question were not contaminated by including data that was relates to the intervening period between downgrades, i.e. after the first downgrade but before the second.

3. INTERPRETATION OF RESULTS

In order to ensure brevity, only a few examples of the full panel of eight sovereigns will be discussed in this section. Diagrams that summarise spread behaviour for the remainder of the sample can be found in the Appendix section. In the diagrams that follow, solid vertical lines represent a downgrade to a speculative-grade rating by S&P, while dashed lines represent a downgrade to a speculative-grade rating by Moody's. In the case of Brazil, both downgrades occurred during the same month, hence only a single, solid, vertical line is used.

4.1. Brazil
Of the sample of nine nations mentioned above, Brazil is the only sovereign to have been downgraded to "junk" status by both S&P and Moody's in the same month (February 2016). This makes it a useful point of departure for interpreting the effects of a downgrade on a nation's sovereign debt.

In the eighteen-month period from two years to six months before Brazil's twin downgrades, its 10-year government bond yield was trading at a mean spread of 10.050 percentage points, with a range of 2.258 percentage points. In the six months leading up to the downgrade, the mean spread climbed to 13. 525 percentage points vis-à-vis the10-year USA government bond. The range on the spreads fell to 2.155 basis points. When compared to the preceding eighteen-month period (i.e. the period from two years to six months before the downgrade) these numbers represent a sharp increase in the recorded mean spread of 347 basis points, while the range fell by a small margin of 10 basis points.

However, this trend did not continue in the six months after the downgrade. Means spreads fell to 10.916 percentage points (a 261 basis point reversal of the increase mentioned above), while the range became smaller at 1.875 percentage points, which equates to a reduction of 280 basis points. Thus, the six month period following Brazil's downgrade to "junk" status in February 2016 saw a return of spreads to levels comparable to those recorded two-years to six months before the downgrade, albeit 86 basis points higher. Given that Brazil's two downgrades occurred during the early part of 2016, no conclusions can be offered at this time concerning spreads and the range on spreads in the longer term.
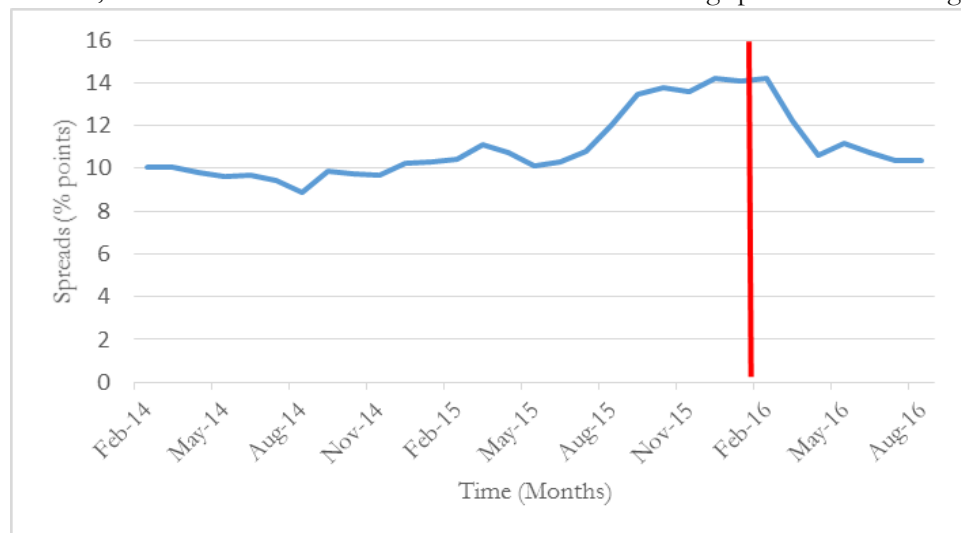

Figure 1: Brazil 10-year government bond versus USA 10-year government bond

4.2 Croatia

Croatia's downgrade to speculative-grade by S&P in December 2012 and Moody's in February 2013 produces results contrary to *a priori* expectations. In the period spanning two years to six months before the S&P downgrade, mean spreads were 4.228 percentage points. In the six months preceding the downgrade this number fell slightly to 4.191 percentage points. However, the range of spreads increased by 65 basis points over these two respective periods, from 2.004 percentage points to 2.651 percentage points.

Mean spreads continued to fall in the six months following the second of the two downgrades (by Moody's in February 2013) and were 2.717 percentage points over this period, with a dramatic reduction in the range, which fell to 0.408 percentage points. In the following eighteen months, mean spreads fell further to 1.996 percentage points, while the range increased by 98 basis points to 1.392 percentage points.

Therefore, spreads declined even as the two downgrades approached and continued to do so even after Croatia's sovereign debt was confirmed at a speculative-grade rating. While the range on spreads certainly fluctuated over the entire four year periods, these changes were relatively modest, especially when compared to the large swings experienced in the Brazilian case. As these results contradict the theoretical expectations of the inverse relationship between spreads and credit ratings, it is probable that the effects of the downgrades were being overshadowed by changes in other macroeconomic factors, such as Croatia's joining of the European Union in July 2013.

Figure 2: Croatia 10-year government bond versus USA 10-year government bond

4.3 Russia

Russia was downgraded from investment-grade to speculative-grade by S&P in January 2015 and by Moody's in February 2015. Over the eighteen-month period from two years to six months before the first of the downgrades, mean spreads on the Russian 10-year government bond were 5.277 percentage points, with a range of 2.226 percentage points. The six month period before the downgrade saw mean spreads of 8.210 percentage points, an increase of 292 basis points. In addition, the range on spreads during this period was 5.020 percentage points, an increase of 279 basis points.

Over the six-month period following the second downgrade, means spreads decreased slightly to 8.090 percentage points. The range, however, decreased dramatically by 340 basis points to 1.62 percentage points. Over the following eighteen-month period, mean spreads further fell to 7.554 percentage points, while the range increased to 2.350 percentage points.

The results for Russia thus indicate a 228 basis point increase in mean spreads in the period 6-24 months after the downgrade compared with the period from two years to six months before the first of the downgrades. . Hence, Russia witnessed a pattern of rising spreads as the downgrade approached, followed by a gradual decrease in spreads after the announcements had passed. However, even two years after Russia's downgrade to a speculative-grade credit rating, spreads remained consistently higher than two years before the announcements. The ranges of spreads at two years before and two years after the downgrades were hardly changed, respectively, 2.226 vs 2.350 percentage points.
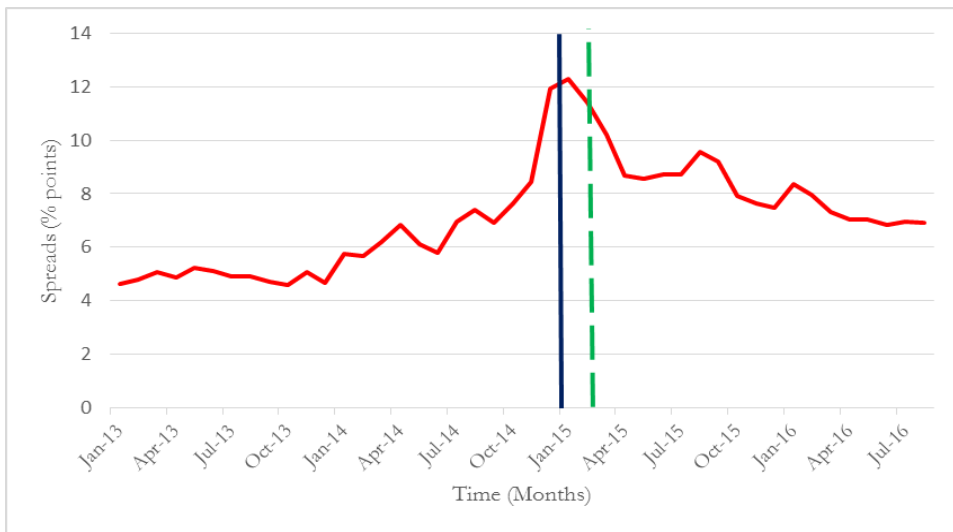
Figure 3: Russia 10-year government bond versus US 10-year government bond

4.4 General Conclusions

Having discussed the behaviour of means spreads for a few, specific sovereigns, a more general set of conclusions concerning the behaviour of spreads over the entire sample of nations may now be offered. For the sake of clarity, it is useful to divide the following session into several segments, using the same time periods as those utilized above.

A tabular summary of the results is presented below, followed by a discussion. The table indicates the behaviour of mean spreads for each of the eight sovereigns in question over the four relevant time periods. Mean spreads are reported in percentage points. The figures in brackets represent the change in mean spreads compared to the previous period and are reported in basis points. For ease of reference, the four respective periods under discussion will be referred to by the letter that accompanies their heading in the table below.

Summary of Mean Spreads over Time				
Country and Time Period	24 to 6 Months Before (Period A)	6 Months and Less Before (Period B)	6 Months and Less After (Period C)	6 to 24 Months After (Period D)
Brazil	10.050	13.525 (+348)	10.916 (-261)	N/A
Croatia	4.228	4.191(-4)	2.717 (-147)	1.996 (-72)
Greece	1.691	2.322 (+63)	8.534 (+621)	19.704 (+1117)
Hungary	4.314	5.154 (+84)	6.770 (+162)	4.310 (-246)
Russia	5.277	8.210 (+293)	8.087 (-12)	7.554 (-53)
Portugal	1.719	5.786 (+407)	9.859 (+407)	4.571(-529)
Philippines	8.685	7.386 (-130)	7.975 (+59)	4.586 (-339)
Slovenia	3.533	3.644 (+11)	3.996 (+35)	0.603 (-339)
Overall Mean Spread Values	4.937	6.277 (+134)	7.357 (+108)	6.189 (-117)
Mean Range Values	2.672	2.448(-22)	1.356(-109)	7.020(+566)

4.4.1 Two Years to Six Months before First Downgrade (Period A)

Over the eighteen-month period occurring two years to six months before the downgrade, the average mean spread for the panel of eight nations was 4.937 percentage points, with an average range of 2.672 percentage points. For the majority of sovereigns in the sample, their individual ranges over the relevant period of time was close to the average range reported above. In other words, the individual range values were closely clustered around the average range for the panel, with one or two exceptions. No individual nation's range on spreads over this period differed drastically from the mean, with Portugal (range of 4.173 percentage points) responsible for the largest difference from the mean at 150 basis points. Hence, over the sample of nations, the range on bond spreads was fairly consistent during this period of time.

Mean spreads, by contrast, differed substantially over the sample, with a large difference between the highest (Brazil, 10.050 percentage points) and the lowest (Greece, 1.691 percentage points) over the eighteen-month period in question.

To sum up, while means spreads differed substantially across the sample during this period, the bonds of the respective sovereigns generally traded within a fairly similar range.

4.4.2 Six Months and Less before First Downgrade (Period B)

The six month period of time before the first downgrade saw the average mean spread of the eight nations climb to 6.277 percentage points, an increase of 134 basis points compared to Period A. While substantial, there does not appear to be any set pattern for the reported change in spread behaviour, with noticeable differences across countries. For example, Portugal saw its mean spread rise drastically by nearly 639 basis points over this period compared to Period A above, with a mean spread of 9.887 percentage points versus a previous means spread of 3.500 percentage points. By contrast, mean spreads on the Slovenian 10-year government bond increased by only 11 basis points (3.644 percentage points vs. 3.533 percentage points). Hence, while mean spreads increased on the whole sample, there was significant variation on a country-by-country basis.

The mean range on spreads remained remarkably consistent over this period compared to Period A, with a slight reduction of just over 22 basis points. Furthermore, the majority of countries continued to return ranges that were in close proximity to the mean. It was initially suspected that the case of Slovenia (where the range on spreads fell from 3.832 percentage points to 1.393 percentage points) would skew the data. However, recalculating the mean range for the sample without including Slovenia resulted in a mean range of 2.599 percentage points. This figure is even nearer to the mean from the preceding eighteen-month period than when Slovenia was included. Thus, the range on spreads for each country remained close to the average range on spreads for the entire sample.

4.4.3 Six Months and Less after Second Downgrade (Period C)

The six-month period immediately following the second downgrade to speculative-grade saw a further increase in mean spreads to 7.357 percentage points. This represents an increase of 108 basis points on Period B, whereas the previous period saw an increase of 134 basis points on Period A. Hence, the increases in spreads over the differing periods are of a similar size. Cumulatively, mean spreads in the six months after the second downgrade were 242 basis points higher than during the period two years to six months before the first downgrade.

There was a 109 basis point reduction in the mean range on spreads from Period B, which fell from 2.448 percentage points to 1.356 percentage points. The exclusion of Croatia (which saw the range on spreads fall from 2.004 percentage points to only 0.401 percentage points over the adjacent periods) resulted only in the overall mean range on spreads increasing to 1.49 percentage points. Hence, the general effect of the downgrade to "junk" status was a reduction in the mean range in the short term.

4.4.4 Six Months to Two Years after Second Downgrade (Period D)[4]

The longer term period taking place after the second downgrades saw a reduction in mean spreads, from 7.357 percentage points to 6.189 percentage points. However, this is still a 125 basis point increase from Period A, the first period under consideration. Hence, while mean spreads fell as time passed after the final downgrade, they tended to remain at a level higher than they were originally. It should be noted that this result is highly affected by the case of Greece, which saw mean spreads rocket to 19.704 percentage points over the period in question, a staggering increase of 1117 basis points when compared to Period C. Removing Greece from the calculation resulted in a reversal of the result reported above; mean spreads fell to 3.937 percentage points, which is even lower than the reported mean over the first eighteen-month period (4.937 percentage points). As indicated by the table above, four out of the seven (since Brazil is excluded in this case) sovereigns saw a reduction in mean spreads in Period D compared to Period A.

The mean range on spreads climbed to 7.020 percentage points over this period. As before, Greece is responsible for a large part of this increase, given that its range on spreads was 26.610 percentage points over this period. However, unlike for the mean, discarding Greece did not lead to an overall reduction in the range of spreads. Instead, the range on mean spreads was 3.755 percentage points, which is still higher than any of the mean range values obtained for previous periods. Indeed, while mean spreads could be argued to have fallen (at least after the exclusion of Greece) when compared Period A, the range on means spreads is still higher by 108 basis points for the second eighteen-month period when compared to the first.

4. CONCLUSION

This paper aimed to determine the effects of a downgrade to a speculative-grade rating on the cost of a nation's sovereign debt. *A priori* expectations were that a downgrade to "junk" status would lead to an increase in bond spreads, as it was expected that a lower sovereign credit rating would lead to a risk premium being placed on a given nation's sovereign

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[4] This section excludes data from Brazil, as its downgrade to speculative-grade occurred only in February 2016. Hence, long-term conclusions could not be drawn at the time of writing.

debt. While this expectation appears to have been met when considering the sample as a whole, the results relating to individual sovereigns were more mixed. Although the *a priori* expectation was met in several of the sovereigns that made up the sample set, the effect of a downgrade to a speculative-grade ratings remains uncertain, with other nations in the sample return results contrary to expectations. Furthermore, while mean spreads generally appeared to increase for the majority of sovereigns over the short-term after the downgrade, it is not certain that they remained at a higher level over the longer-term. Indeed, several nations within the sample returned lower bond spreads over the two-year period following their respective downgrades than when they were still rated as investment-grade sovereigns.

More concrete conclusions may be drawn from the behaviour of the range of spreads over the relevant time periods. The majority of sovereigns returned a range on spreads that was higher over the two-year period following their respective downgrades than over the two-year period prior to the downgrade. This indicates a generally higher level of fluctuation between the highest and lowest spreads on a sovereign's government bonds over a period of time. When taken together with the conclusions concerning the behaviour of mean spreads, it may be concluded that while the downgrades did not necessarily lead to higher mean spreads over all sovereigns, they did often lead to higher volatility in spreads. Hence, while spreads tended to remain close to the mean before the downgrades, they began to display larger variation after the downgrades had taken place.

In summary, it may be concluded that in certain cases a downgrade to "junk" status has an effect on a nation's 10-year government bond spreads, as well as the range within which they trade. However, the observed behaviour does not appear to be predictable to a high level of accuracy over the sample of nations in question. As such, while a downgrade to a speculative-grade rating may produce an effect on the cost of a nation's sovereign debt, it is not certain that it (the downgrade) is the only influence on a sovereign's spread behaviour. Instead, it appears more likely that, in addition to the downgrade, a variety of other factors may be affecting bond spread behaviour. Thus, the market may be reacting to other macro-economic information rather than simply looking to credit ratings for guidance. Sovereign credit ratings appear to have an influence on a nation's sovereign debt, at least in certain cases. How sizeable that influence is, however, remains uncertain.
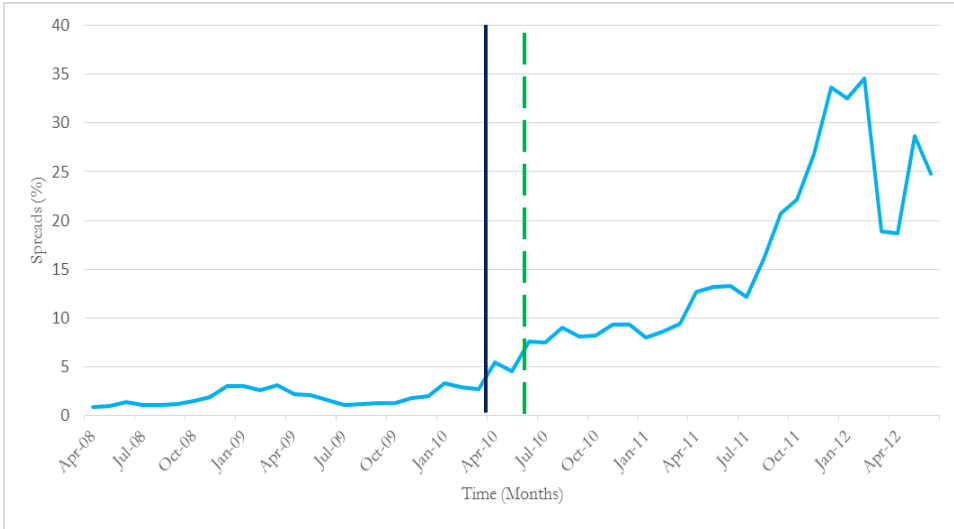
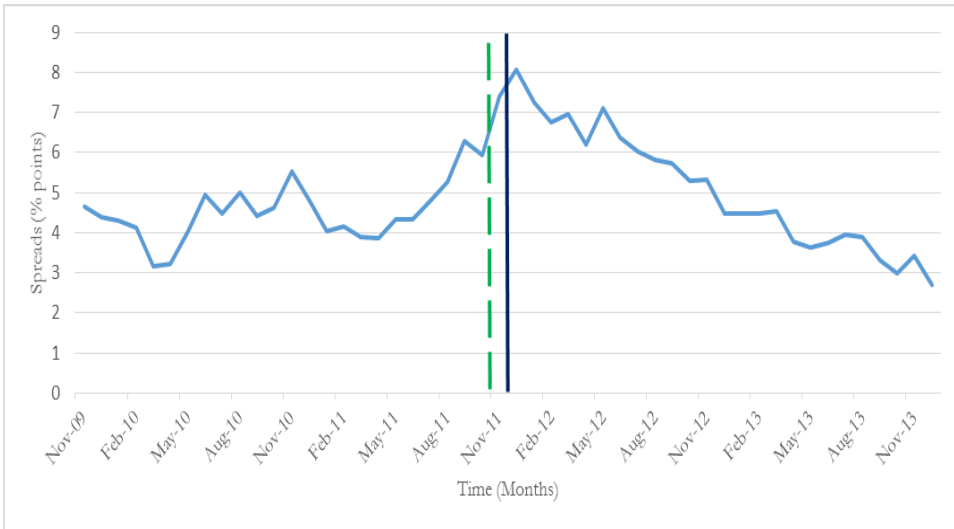*Figure 4: Greece 10-year government bond versus USA 10-year government bond*

Figure 5: Hungary 10-year government bond versus USA 10-year government bond

Figure 6: Portugal 10-year government bond versus USA 10-year government bond
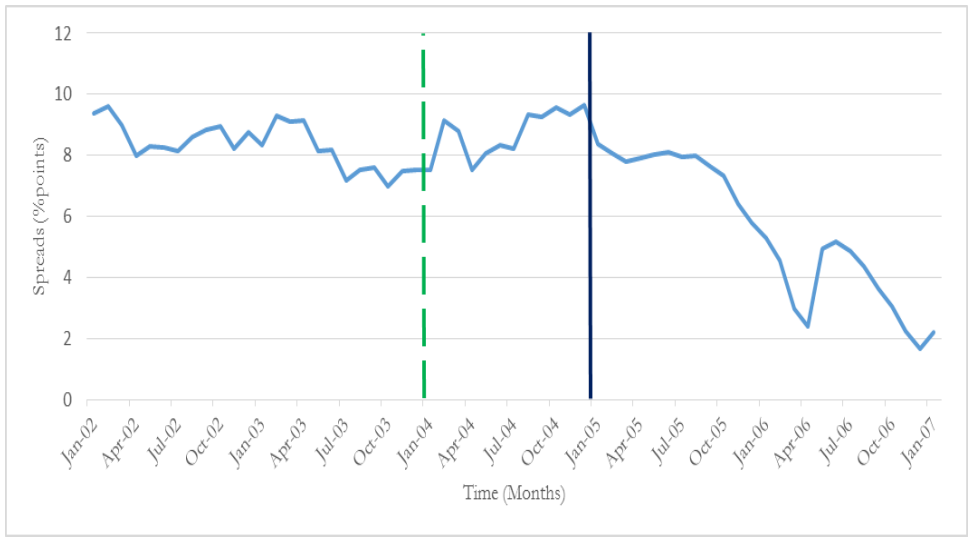
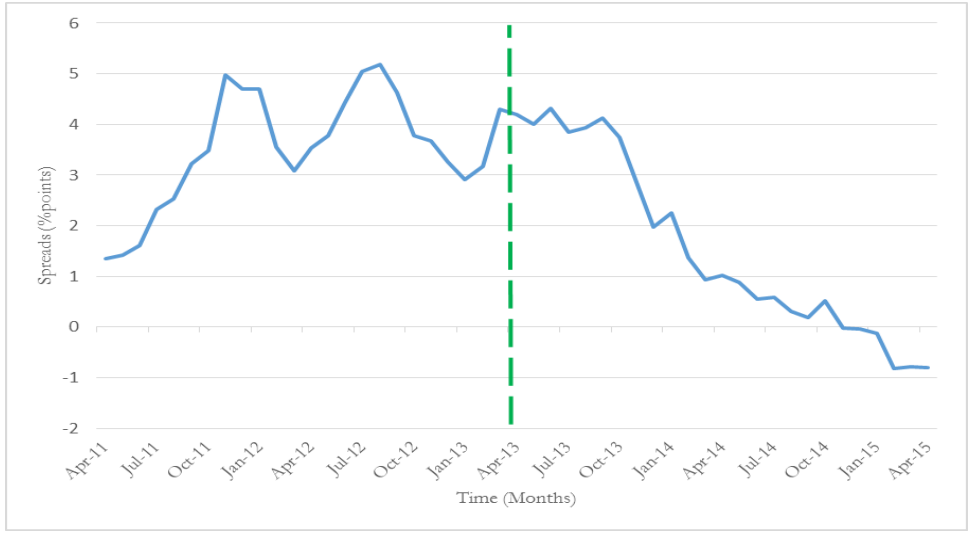*Figure 7: Philippines 10-year government bond versus USA 10-year government bond*

Figure 8: Slovenia 10-year government bond versus USA 10-year government bond

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