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Rating Agencies: Creating, Amplifying or Drawn by Events in the Sovereign Debt Crisis?

Market sentiment has a strong and sustained influence on international capital flows. The change of risk appetite on the part of international investors explains more than half of the variation of the interest rate differential between domestic government bonds and those of a safe-haven reference country. In such an environment, downgradings of country ratings may have a destabilising effect. Yet, an investigation into the changes of ratings for four countries at the European periphery for the period from 1994 to 2011 shows no evidence for a vicious circle of rising interest rates, downgradings and sovereign debt increase.

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Rating agencies are currently the target of heavy criticism. Their judgement of certain countries' poor creditworthiness is seen as the cause of rising financing cost of government debt. Particularly heated is the debate about the downgrading of several euro area countries in the course of the sovereign debt crisis. Such downgrades have taken place since March 2010, largely in parallel with a widening interest rate differential of the respective government bonds vis-à-vis the German Bund benchmark (Tichy, 2011). The European Commission even threatens to forbid the agencies in critical situations to publish their country ratings. From many sides there is also the call for the creation of a European Rating Agency with the aim to confront the Anglo-Saxon-dominated agencies with an independent European opinion. Against this background, a factual analysis of the connection between changes in the interest rate differential and a country rating is considered appropriate. The starting point of such an analysis is the widening interest rate gap for several euro area countries vis-à-vis Germany. Unlike in the period before the start of the European Economic and Monetary Union (EMU), this gap can no longer be explained by different expectations about future inflation, but has other reasons.

Before entry into Monetary Union, the EU countries were able to use two economic policy instruments that are now no longer at their disposal: (1) an independent monetary policy with an own national currency allows the inflation rate to differ from the one abroad as well as (2) the adjustment of the exchange rate to changes in the international competitiveness that unavoidably arise from an inflation differential vis-à-vis the trading partners. With an unexpected bout of inflation, the real value of fixed-interest-rate government bonds diminishes, thereby facilitating a smooth debt reduction. What is important is the surprise element, since expected high inflation rates will already be reflected in current government bond yields. This relation is illustrated by the "Fisher equation" (Fisher, 1906) which splits the nominal interest rate in period t , i_t , into a real interest rate r_t , and the expected inflation rate π_t^e :

$$i_t = r_t + \pi_t^e.$$

As soon as the expected inflation rate increases, the nominal yield on government bonds rises by the same amount. The interest rate mark-up compensates investors for the loss in purchasing power that would arise from the higher expected inflation over the maturity period of the bond. If the actual inflation rate turns out lower than expected, i.e., if inflation expectations were wrong, the yield obtained is ex-post upward biased. If expected inflation is below the actual rate, the result is an ex-post loss of purchasing power and a real depreciation of government debt.

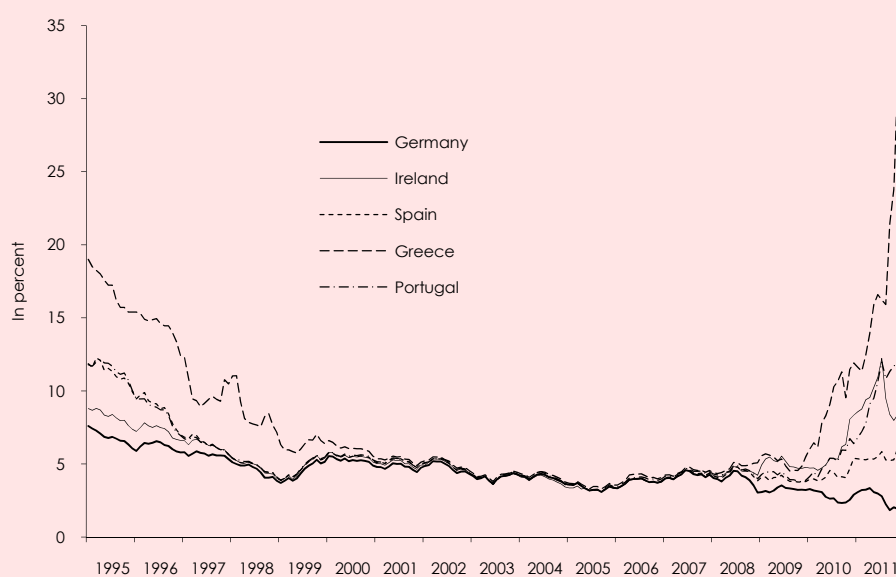
Inflation expectations are part of the nominal interest rate and compensate investors for the loss of purchasing power.

Figure 1 shows bond market yields for Germany and several countries at the euro area periphery with a remaining maturity of 10 years for the period from 1995 till autumn 2011. At the beginning of the period, interest rates for the periphery countries were significantly higher than the yield on German Federal government bonds. The difference mainly reflects the high actual and expected inflation rates of the periphery countries at the time. In 1995, the inflation rate was 8.9 percent in Greece, 4.2 percent in Portugal, 4.7 percent in Spain and 2.5 percent in Ireland. Between 1995 and entry into EMU, the interest rates of the periphery countries converged towards the German level. This convergence is explained by the loss of monetary independence by the periphery countries and a harmonisation of the expected inflation rate with the target rate of around 2 percent set by the Bundesbank and subsequently by the European Central Bank (ECB).

With the entry into the euro area inflation expectations moderated and yields on government bonds converged.

Figure 1: Interest rate convergence and divergence

Yields on 10-year government bonds



Sources: Oesterreichische Nationalbank (OeNB).

Even in the period from 2003 to 2006, when differences were the lowest, interest rates of the periphery countries deviated slightly from those in Germany. The reasons can be demonstrated by way of a decomposition of the real interest rate for each country n into four components (Koch, 2011):

$$r_{t,n} = e_t + c_{t,n} + l_{t,n} + s_{t,n}.$$

The natural interest rate e_t is equal for all countries and matches, e.g., the risk-free real Eonia swap rate. The credit risk premium $c_{t,n}$ may differ from country to country and denotes the credit risk of the country concerned, i.e., it reflects the country's probability of defaulting on its government bonds. The component $l_{t,n}$ is a country-specific liquidity premium, determined by the size and deepness of the respective bond market. The liquidity premium compensates the investor for the different degree of liquidity on country-specific bond markets, i.e., for the risk of not finding a buyer if he wants to sell. The market for German government bonds, for example, is characterised by high liquidity since both the amount of German government bond issues and that of daily transactions are high. The smaller a country and the lower its public debt, the narrower is its market for government bonds and, accordingly, the higher the liquidity premia that the country has to offer. The maturity premium $s_{t,n}$ allows for the longer holding time of government bonds compared with daily money. Of these four components, only the risk-free Eonia swap rate can be observed from market data, and it is equal for all euro area countries. The other three components can only be derived in total ($c_{t,n} + l_{t,n} + s_{t,n}$) as the difference between the real bond yield and the swap rate.

The real interest rate consists of four components: the natural interest rate, the credit risk premium, the liquidity premium and the maturity premium. The reassessment of the three country-specific components by investors is a possible explanation for widening interest gaps vis-à-vis German government bonds.

A possible explanation for the upward drift of the interest rates for government bonds of the periphery countries, away from the low German level, is a re-assessment of these three non-observable components by investors. The adjustment of expectations could have extended to all three components, because the sovereign debt crisis and the rescue "packages" for Greece (May 2010), Ireland (November 2010) and Portugal (April 2011) both raised credit risks and diminished liquidity on the respective bond market. The holding premium $s_{i,n}$ should have reacted at least to the original time limit of the first rescue packages until end-2012 (De Grauwe, 2011).

Such a re-assessment is inferred by the market discipline hypothesis. Thereby, excessive deficits within EMU have led to an increase in the interest differential vis-à-vis a stable anchor country. This relationship has been claimed at an early stage by economists of investment banks (Bishop – Damrau – Miller, 1991), but also of the International Monetary Fund (IMF; Bayoumi – Goldstein – Woglom, 1995) and empirically confirmed for US Federal States. The connection between the interest differential and sovereign debt is therefore shown to be non-linear: starting from a low level of government debt, the interest rate on government bonds rises proportionally. If fiscal policy continues to run excessive deficits, the interest rate on bonds increases over-proportionally once the government debt/GDP ratio exceeds a critical threshold (Reinhart – Rogoff, 2011). In the extreme case, a country can no longer finance its government deficit via the bond market.

The non-linear reaction of the interest rate to the credit risk can also be established in theoretical models for economies linked by a fixed exchange rate. By setting a fixed exchange rate, a country renounces to the monetary policy instrument. As shown by Calvo (1988) in a multiple-equilibria model, even a responsible government will no longer be able to service its debt if the interest rate substantially exceeds the growth rate of GDP. In this model, high uncertainty or a speculative attack can drive the interest rate on government bonds above the GDP growth rate. Investors react to this shock by demanding higher interest rates, as the widening differential between interest rate and growth rate increases the risk of default, i.e., the credit risk premium $c_{i,n}$. The rise in interest rates in turn leads to higher financing cost. Eventually, this vicious circle may compel a country to stop its interest and redemption payments.

The hypothesis of governments being disciplined by markets, suggests that interest rate differentials vis-à-vis a stable anchor country play the role of warning signals of a non-sustainable budgetary policy. Accordingly, rising interest rate differentials, via higher financing cost and looming credit constraints, create an incentive to correct excessive deficits.

Discipline to be enforced by markets in case of excessive deficits can only work if there is free capital movement within EMU and implicit or explicit bail-outs of insolvent states are credibly ruled out among the members of the monetary union. The avoidance of implicit guarantees was one of the reasons for the mutual exclusion of liabilities in the Stability and Growth Pact (non-financial-assistance clause, Art. 125 TFEU). Already at an early stage, the European Commission (1990) called for external constraints for national fiscal policy in EMU. The Stability and Growth Pact introduced, apart from the non-liability clause, a preventive control mechanism and a corrective procedure which, however, suggested right from the beginning only a loose co-ordination of fiscal policy by the European Commission and the Council (Url, 2001). The preventive and the corrective arm were meant to prevent excessive deficits at the national level, but proved ex-post too weak, notably because also the large euro-area countries flouted the deficit procedures initiated by the Commission. Originally, the Delors-Report (Committee, 1989) foresaw binding rules for the members of EMU. Eventually, of this approach only the EMU entry criteria were retained for the EU governance framework.

Hypotheses to explain the widening of the interest differential

Empirical investigations show a non-linear relationship between the government debt ratio and the yield on government bonds. In a system of fixed exchange rates, non-linear reactions may occur also from a theoretical point of view.

The reaction of government bond yields is a potential correction device for excessive fiscal deficits. Nevertheless, the European Commission calls for additional mechanisms of fiscal policy co-ordination at an early stage.

A further driver of widening interest rate gaps is deemed, mainly in the political debate, to be the downgrading of ratings for sovereign bonds. Ratings are assessments of a country's creditworthiness by independent agencies. As *Ferri – Liu – Stiglitz* (1999) show, rating agencies cannot systematically predict crises on local government bond markets (see also *Tichy*, 2011). According to *Ferri – Liu – Stiglitz* (1999), agencies react to the outbreak of a government debt crisis by exaggerated adjustments of their ratings. *Kaminsky – Schmukler* (2002) illustrate the pro-cyclical pattern of ratings: downgrades mainly occur during a market downturn, upgrades predominantly in a period of rising equity prices. Carrying this argument further, *Kaminsky – Schmukler* (2002) show that changes in ratings have an impact on both bond and share prices, with the reaction apparently being non-linear. In a crisis, changes in ratings would impact on equity prices more strongly than in "normal" periods of the business cycle. From their data set, *Kaminsky – Schmukler* (2002) conclude that negative news contribute significantly, via downgrades, to an increase in the interest rate spread. In addition, downgrades will have the effect that turbulences in the country of origin will infect capital markets of other countries and trigger losses also there, leading to an increase in the interest spread vis-à-vis a safe-haven anchor country.

In a number of empirical studies, ratings have been identified as the cause of a widening of the interest gap vis-à-vis a safe anchor country.

The establishment of ratings for government bonds is currently dominated by three rating agencies: Fitch, Moody's and Standard & Poor's. Such ratings for government bonds or countries are intended to signal the issuing country's expected ability and determination of timely and entire redemption of the amount due. They always refer to the central government authority, in the case of Austria the federal government (Bund) and to the debt owed to private investors. The agencies do not assess the timely servicing of debt vis-à-vis other public institutions (*Bhatia*, 2002). The ratings of the three agencies cover different aspects of a public default. Standard & Poor's, for example, only judges the probability of public default without specifying its size (of a haircut), duration or the mode of unwinding (orderly or disorderly). Moody's ratings, for their part, assess not only the probability of default, but in addition also the payout-ratio in case of default. Fitch takes a middle-of-the-road approach between these two alternatives: it confines itself to stating the probability of insolvency up to the time of default, but once it occurs Fitch also estimates the expected repayment ratio.

Rating agencies and the generation of ratings

Fitch, Moody's and Standard & Poor's mostly issue their ratings on the probability of sovereign debt repayment as a combination of alphabetic characters, with "AAA" being the highest grade of creditworthiness. By omission of one A or replacement of A by one of the subsequent alphabetic letters, by lower-case characters, signs (+/-) or numeric characters, a lower level of credit standing is indicated. For analytical purposes, the ratings are translated into a numerical scale ranging from 1 (low credit standard) to 20 (top standard; *Bhatia*, 2002, Table 2). Ratings roughly distinguish between two categories of financial securities: such of "investment grade" and those of "speculative grade". Investors with low risk appetite confine their placements to papers of "investment grade", such that ratings become particularly sensitive around the borderline between "investment" and "speculative grade". Ratings are also usually associated with an outlook indicating the likely direction of a future change (positive, negative or constant).

An important dividing line in the assessment of sovereign financial soundness is between "investment grade" and "speculative grade".

Ratings are either mandated and paid by the issuing government authority or carried out without mandate, as the bond market concerned has to be observed anyway by the rating agencies, e.g., in the USA. A rating offers investors a simple indicator of the creditworthiness of public debtors. As far as rating agencies carry out an independent risk assessment, they allow investors to avoid high cost of acquiring information thanks to a signal that is straightforward to interpret. If the investors are financial intermediaries, the supervisory authorities sometimes also ask for ratings on the securities held. The fee for a rating either depends on the amount of the securities issued, or it is settled as a lump sum for large countries.

Rating agencies transform information on a country's political, economic and financial situation into a summary indicator for investors. In this way, they facilitate notably cross-border investments.

The issuers hope that the rating will enlarge the community of potential investors to foreigners who otherwise would have to incur high information costs. Country ratings

also have the advantage that they serve as a base for the risk assessment of the same country's corporate bonds. Thus, the country rating facilitates at the same time corporate financing via the capital market. The modern rating business for sovereign bonds is a relatively new phenomenon that became more widespread only after the abrogation of the US Interest Equalization Act in 1974. Previously, while international ratings were carried out by Moody's and Poor's Publishing, they were frequently suspended, such that in early 1975 only ratings for Australia, Canada and the USA were published (Bhatia, 2002). With the gradual abolition of the restrictions to international capital mobility, cross-border investment in government bonds gained importance, creating a need for further ratings of government debt. An ever growing number of countries are being rated since.

The key variable for rating agencies is the occurrence of an insolvency. The insolvency of a country is defined in the same way by all three agencies (Bhatia, 2002):

- absence of payment by the deadline of interest or redemption for a debt instrument, whereby the deadline is either the maturity date of the debt instrument or an additional respite;
- rescheduling, swap or restructuring of a debt security: the rating agency proceeds to an assessment whether such a move was enforced or voluntary.

This definition of insolvency, based on the rating agency's individual judgement, deliberately abstracts from any legal instruments or procedural steps of a court case, because in this way also hidden insolvencies can be evaluated as such by the rating agencies. This broad definition of insolvency, together with pending credit default swaps, is at the origin of the special deal for the voluntary haircut on Greek sovereign bonds. An insolvency is deemed completed by the ratings as soon as a new debt security is issued or a modification of an existing debt security in agreement with the creditors enters into force.

Ratings are always forward-looking, i.e., for a period of three to five years. For this period, the rating is to project the determination and ability of a country to repay its debt. Because of this look ahead, misjudgements are bound to occur which go beyond the normal forecasting errors of economic research institutes (Baumgartner, 2002), since the expectations of rating agencies relate both to the economic and the political developments of a country. The assessment of rating agencies thus rest on actual data, forecasts and personal judgements of the political future of the issuing country. This hybrid approach led to the elaboration of a structured procedure for the establishment of a country rating. A rating committee discusses a broad range of criteria¹ and finally takes a vote on the rating to be published. Ratings therefore reflect the opinion not of one single country analyst, but of a team of several persons. Besides, they are always formed in relation to reference countries. Bhatia (2002) describes in detail the role of the country experts, the composition of the rating committees and the different rating criteria.

At present, the quality of country ratings is still difficult to evaluate since, unlike for corporate ratings, only few insolvencies on internationally issued government bonds have occurred. The unforeseen debt restructuring of Mexico in 1994-95 and the Asian crisis of 1997-98 gave rise to the criticism of belated downgrades (Reisen – von Maltzan, 1998, Ferri – Liu – Stiglitz, 1999). In recent years, Ukraine (1998), Pakistan and Ecuador (1999), Argentina (2001) as well as Moldova (2002) were hit by insolvency. For all countries except Ukraine, ratings had been established at least 12 months ahead of the incidence of insolvency; all of them had been rated at "speculative grade". In 1997-98, the Asian crises offered the opportunity to assess the quality of current ratings; Bhatia (2002) and Ferri – Liu – Stiglitz (1999) note in this instance a belated and over-shooting downgrade. Likewise, for Argentina and Uruguay (2000-2002), the ratings have been lowered too late and to an exaggerated extent. Tichy (2011) arrives at a similar conclusion when examining the ratings for several euro

The assessment of a payment default on government bonds depends not only on factual legal steps, but also on judgemental evaluation by the rating agency.

Rating mistakes derive not only from inaccurate reading of the current economic situation and forecasting errors, but may also result from arbitrary judgements on a country's political future.

The quality of country ratings is difficult to evaluate in statistical terms, given that among the rated countries there have been only few insolvencies so far. Nevertheless, a number of investigations point to time lags in the adjustment of ratings and to herding behaviour.

¹ The criteria include political stability, current and projected values of macroeconomic indicators, fiscal policy, monetary policy and the external balance of the current and in particular the capital account.

area countries between 1994 and 2011. Moreover, according to *Bhatia* (2002), ratings follow the market consensus, suggesting the existence of herding behaviour, i.e., the ratings of all agencies are normally adjusted within a short time in the same direction.

From a macroeconomic point of view, the self-reinforcing effect of a rating downgrade during a crisis is a matter of concern. If agencies adjust their ratings as a reaction to market assessment and markets in turn react to the lower ratings by demanding higher risk premia, a vicious circle may be set in motion which may even lead to a sovereign debt crisis (*Calvo*, 1988). Conversely, an improvement in the rating may further add to already exaggerated expectations and give rise to capital inflows, lower interest rates and eventually an excessive accumulation of debt.

Bhatia (2002) cites the following possible reasons for inaccurate ratings:

- low quality and long time-lags of the macroeconomic data available,
- cost-induced low personnel capacity for country analysis of rating agencies, and
- incentives of rating agencies being distorted for various reasons.

Tichy (2011) also notes the well-known problems of economic forecasts, with errors being normally pro-cyclical and turning points rarely correctly identified.

Distorted incentives arise from the way that ratings are remunerated (*Stahl – Strausz*, 2010). Ratings of government bonds are in most cases paid by the rated country itself, creating an incentive for benign evaluation in "calm" times, whereas after a string of bad news the opinion changes abruptly: ratings are downgraded since forecast errors would severely endanger investor interests. Moreover, there is a positive correlation between country ratings and the more profitable corporate ratings as the latter normally have the rating of the country concerned as an upper limit. Further incentive problems may arise from close relations between national representatives and the country experts of the rating agencies, or from overlaps of agencies' consulting services with their rating function.

Whether market developments or rather the ratings are the key driver for movements of the interest rate spread is difficult to identify empirically, since normally both the macroeconomic fundamentals and fiscal policy interventions coincide with changes in the interest rate differential and in the ratings, moreover, both variables mutually interact.

Goldstein – Woglom (1992) and *Poterba – Rueben* (1999), using data for the US federal states, provide evidence for a positive correlation between the debt levels of individual Federal States and their interest rate spreads vis-à-vis bonds of other States, thereby confirming the market disciplining hypothesis. Likewise for the US Federal States, *Bayoumi – Goldstein – Woglom* (1995) establish a non-linear correlation between the debt level and the interest rate differential. Investigations for the US Federal States have the advantage that they refer to a common currency area and that therefore the interest rate does not include any exchange rate risk. Studies on the relationship between fiscal policy variables and the interest rates on long-term bond futures transactions for the USA (*Laubach*, 2009), or those on interest rate differentials between European countries (*Aizenman – Hutchison – Jinjark*, 2011, *Bernoth – von Hagen – Schuknecht*, 2004, *Bernoth – Wolff*, 2008, *Codogno – Favero – Missale*, 2003, *Faini*, 2006, *Hallerberg – Wolff*, 2006, *Heppke-Falk – Hüfner*, 2004, *Manganelli – Wolswijk*, 2009), OECD countries (*Alesina et al.*, 1992) or emerging markets (*Baldacci – Gupta – Mati*, 2008) suffer from this additional source of volatility. The nowadays high amount of international capital transactions also influences the supply of capital on the respective local bond markets even irrespective of the trend in the government deficit.

Accordingly, the results from international studies are less clear-cut; the majority of them nevertheless shows a significant correlation between a high actual or projected government deficit (or a high public debt) and the interest rate gap vis-à-vis an investment in a save-haven reference country. Thus, high interest rate spreads

The potentially self-reinforcing effect of rating adjustments is a matter of concern from a macroeconomic perspective, since it may a vicious circle.

Empirical investigation into the causes of interest rate differentials

Studies for the USA confirm a positive correlation between the government deficit or the debt level on the one hand, and the interest rate spread vis-à-vis a safe investment. International capital transactions may, however, decouple the interest rate differential from domestic fiscal policy.

appear to be at least partially determined by the underlying fiscal position and can be taken as a signal for excessive budget deficits.

In line with economic fundamentals, expectations of market participants in times of crisis often shift abruptly via the risk premium $c_{i,n}$ (see box). Via herding behaviour and the spill-over of negative sentiment to related markets, the assessment by market participants may eventually decouple itself from economic fundamentals, leading to the overshooting of interest rate spreads. This channel is particularly relevant for emerging economies with high reliance on capital imports, given that in the wake of a crisis investors' risk appetite drops sharply and capital flows revert to safe destinations (Eichengreen – Modhy, 1998).

Like the interest rate differentials, also the ratings are shaped by macroeconomic and fiscal policy factors, as already revealed by the catalogue of criteria that the rating agencies apply. This connection has first been explored by *Cantor – Packer* (1996). By way of a cross-country approach they explain 90 percent of the average rating of the two big agencies (Moody's, Standard & Poor's) by eight macro-economic variables. One of the most important explanatory variables is per-capita income. However, their sample mixes industrial and emerging economies, such that a large part of the explanation derives from large differences between those two groups. According to *Cantor – Packer* (1996), both agencies would use the same criteria at equal weights respectively; the ratings would also contain additional information not included in the macroeconomic data. This could be "soft" elements like the assessment of political stability. *Cantor – Packer* (1996) claim that a change in the rating would trigger an adjustment of market assessment via the risk premium. Budget and current account deficits, for their part, would have no impact on the interest rate differential.

Studies on the influence of market sentiment and risk appetite on international capital transactions

Over the last years, several investigations have focused on the connection between market sentiment and international capital transfers. *Powell – Martinez* (2008) e.g., identify, besides a number of macroeconomic variables explaining the interest rate differential of emerging markets, also a reaction of capital flows to the degree of risk aversion of international investors. During the period from 2003 to 2007, investors' risk appetite increased markedly and was responsible for a large part of the decline in the interest rate gap of emerging economies.

As demonstrated by *Gonzales-Rozada – Yeyati* (2008), international investors' risk preference together with the international liquidity situation explain around half of the longer-term variation of the interest rate differential; allowing for country-specific elasticities, this share rises up to 80 percent. Thus, interest rate gaps are influenced by international capital flows rather than by domestic fiscal policy.

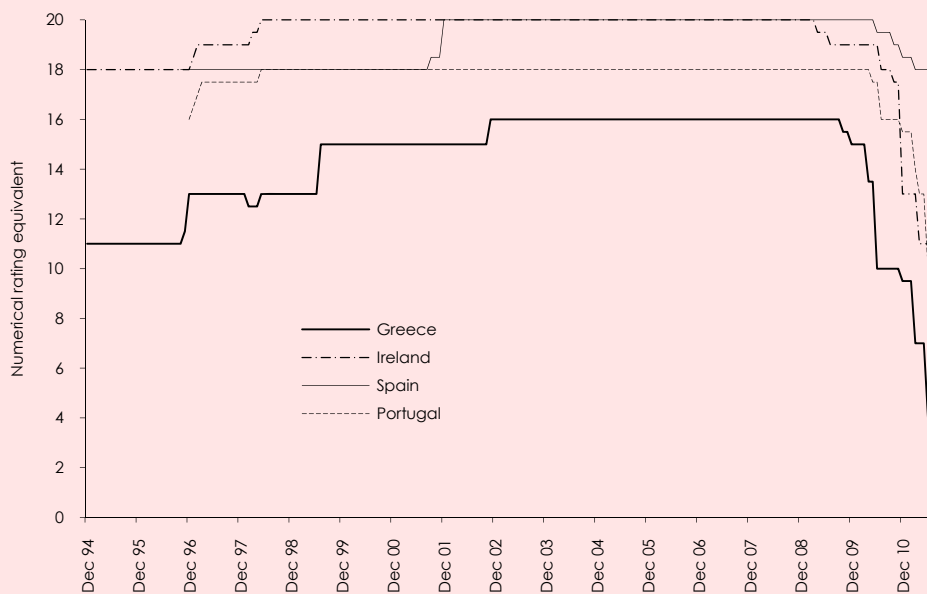
Attinasi – Checherita – Nickel (2009) attribute on average 56 percent of the rise in the interest rate differential to a decline in the risk preference of investors, whereas 21 percent would be due to an expected increase in the fiscal deficit and public debt, 14 percent to tighter liquidity and 9 percent to the rescue "packages" for banks.

The results by *Ferri – Liu – Stiglitz* (1999) and *Kaminsky – Schmukler* (2002) emphasise the role of rating agencies even more. Both papers postulate a causal relationship between rating downgrades of government bonds and an increase in the interest rate spread. *Gärtner – Griesbach – Jung* (2011), applying Granger-causality tests, identify a direct link from changes in ratings to adjustments in the interest rate differential. However, given the discrete character of ratings, the results from *Gärtner – Griesbach – Jung* (2011) should be interpreted with caution. The modelling of both variables in a vector-autoregression leads systematically to non-normally-distributed estimation errors, thereby reducing the reliability of Granger-causality tests.

Besides technical reservations concerning a causal relationship between ratings and interest rate gaps, empirical results also advise against such a conclusion. According to *Reinhart (2002)*, ratings consistently fail in predicting currency crises, since downgrades and accurate forecasts of government insolvencies are normally carried out only after the onset of a currency crisis. The results of *Mora (2006)* also point to the time lags to which rating adjustments are subject. *Mora (2006)* estimates a model of detailed specification for the prediction of rating changes and compares the predicted with the actual ratings: during the Asian crisis of 1997-98, ratings were adjusted only gradually, and ratings followed a smooth trend over time (see Figure 2 for countries at the euro area periphery). These two phenomena are incompatible with a pro-cyclical pattern of ratings. Moreover, *Mora (2006)* claims that before the Asian crisis actual ratings were above the predicted ones, whereas during the crisis they were broadly in line with predictions. After the crisis, the ratings increased less than suggested by economic fundamentals or financial market data. *Tichy (2011)* also concludes from a comparison of ratings for the countries at the euro area periphery that ratings lag behind the released data for interest rate differentials and macro-economic variables. *Reisen – von Maltzan (1998)* find a mutual impact between the respective interest rate differential vis-à-vis the US and the country rating; according to their event studies, the interest spread against the USA already changes in the run-up to an adjustment of the rating or the outlook.

Ratings are smooth over time, and changes systematically occur with a time lag. This impression is confirmed by the Asian crisis of 1997-98 and the current sovereign debt crisis in the euro area.

Figure 2: Ratings for euro area countries with large interest differentials vis-à-vis German federal government bonds



Source: Moody's. Ratings are transposed into a scale ranging from 1 (low creditworthiness) to 20 (high creditworthiness).

Gonzales-Rozada – Yeyati (2008) summarise the pattern of interest rate differentials and ratings by this hypothesis: ratings of emerging economies react endogenously to changes of the interest spread vis-à-vis a safe-haven international benchmark rate; conversely, a change in the rating does not normally lead to a marked adjustment of the interest rate gap. *Gonzales-Rozada – Yeyati (2008)* verify this hypothesis for a panel across countries and rating adjustments: the interest spread rises markedly on average ahead of a rating downgrade, but hardly changes after the rating adjustment. Conversely, in the case of an improvement of the rating, the interest spread diminishes up to the moment of adjustment, remaining broadly constant thereafter.

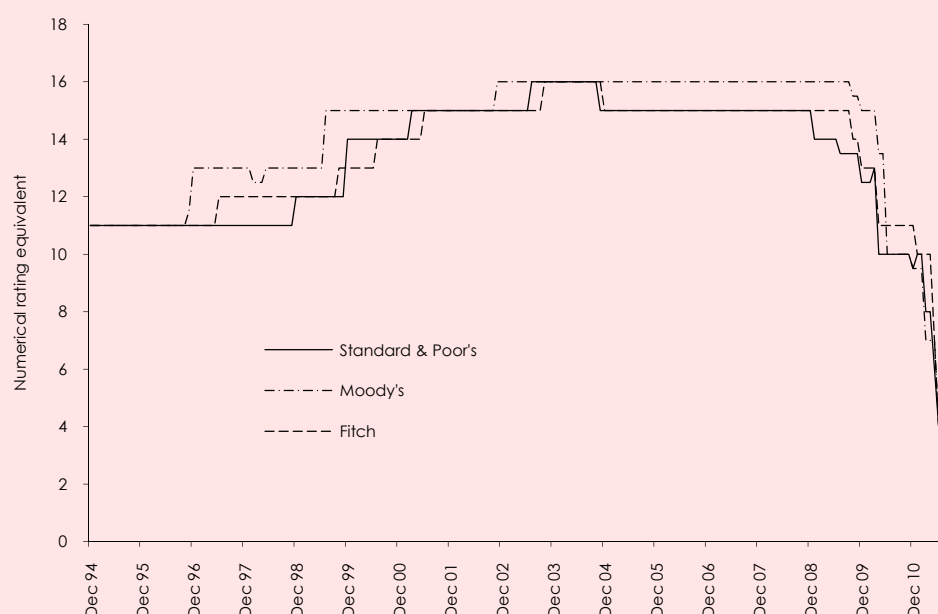
Against the background of the hitherto contradictory empirical results, WIFO presents its own study on the connection between ratings and the interest rate gap across the euro area countries. Like with Tichy (2011), the focus is on the ratings for Greece, Ireland, Spain and Portugal (Figure 2). For Greece and Ireland, ratings by all three agencies (Fitch, Moody's, Standard & Poor's) are available since 1994. For Portugal and Spain, the series starts somewhat later (since end-1996). In Figure 3, the ratings of the three agencies for Greece are translated into a scale ranging from 1 to 20, whereby 1 represents the lowest and 20 the highest degree of creditworthiness. Between 1995 and 2003, the credit rating of Greece was increased in several steps, eventually reaching a high of 16. Greece's downgrades started in early 2009 and swiftly gained momentum in 2010.

The stepwise schedule of ratings renders a time-series-based econometric analysis impossible. At the point of time when the rating changes, the model will normally fail to correctly predict either the direction or the size of the change. Thus, heavy outliers will distort the coefficients, while tests based upon the assumption of a normal distribution cannot be applied. Considering this data structure, Gonzales-Rozada – Yeyati (2008) use an event study for the analysis, i.e., the data are structured by events, losing their time dimension.

Rating changes and interest rate differentials in the euro area

The stepwise profile of ratings complicates the econometric analysis and requires a data transformation.

Figure 3: Rating of Greece by different agencies



Source: Rating agencies. Ratings are transposed into a scale ranging from 1 (low creditworthiness) to 20 (high creditworthiness).

For the four countries presented in Figure 2 (Greece, Ireland, Spain, Portugal), a total of 94 rating changes were recorded between December 1994 and July 2011. The following analysis treats each of these episodes as an observation. The dependent variable is the size of the rating adjustment at the point of time t , e.g., Standard & Poor's raised the rating for Greece in December 1999 by 2 notches (Figure 3). Before the rating change at time t , financial markets had new information in the form of an adjustment of the interest rate differential vis-à-vis Germany. The change in the interest rate gap is measured for the period between the previous rating change and the month before the latest rating change ($t-1$). Due to such structuring along the time dimension, all problems of endogeneity can be avoided in the analysis, since the rating adjustment at time t occurs after the end point of the period for which the cumulated interest rate gap (since the last rating adjustment) is calculated. Model 5 in Table 1 also takes into account the assessments by the two other rating agencies in the period before the adjustment of the rating for the country concerned ($t-1$).

The regression models presented here are based upon a transformation of the rating time series into episodes marked by a rating adjustment. The explanatory variables always describe the development in the period before or after a rating adjustment.

This information, the time span since the last own rating adjustment and that since the last rating adjustment by one of the other two agencies, or else some dummy variables that denote the country and the rating agency enters into the models in different combinations.

Even an adjustment of the data for their time structure solves only partially the problem of non-normal estimation errors. The p value for the Jarque-Bera test for normally-distributed estimation errors is very small for the models 1 and 3, such that the hypothesis of normally-distributed estimation errors must be rejected. Yet, models 2, 4 and 5 allow valid conclusions to be drawn from the significance level of the coefficients (Table 1). Among the country dummies, Spain is significantly negative, i.e., rating changes for Spain turn out markedly smaller on average than for the other three countries surveyed. The size of the rating change is independent from the agency that adjusted its rating at time t , since both agency dummies are non-significant. However, the cumulated interest rate differential between the last rating change and time t has a significantly negative impact on the size of the rating change, i.e., if, for example, the interest gap between Greece and Germany widened by 1 percentage point since the last rating change, the rating will be lowered by 1.3 percentage points on average. The longer the last rating change dates back, the larger will be the adjustment, i.e., in times of crisis the ratings are normally adjusted in small steps at short intervals, whereas in stable periods changes are less frequent but have bigger stepsize (Figure 2).

The sample of countries at the euro area periphery exhibits a significant and over-proportional reaction of ratings to a widening of the interest rate gap vis-à-vis Germany. In times of crisis, the frequency of rating adjustments is significantly higher.

Table 1: Impact of changes in the interest rate differential vis-à-vis Germany on rating changes

	Dependent variable: size of rating change				
	Model 1	Model 2	Model 3	Model 4	Model 5
Constant term	- 1.36***	- 1.45	- 1.60**	- 1.79	1.46**
Dummy variable					
Greece	-	0.90	-	0.97	-
Ireland	-	- 0.12	-	- 0.11	-
Spain	-	- 2.86**	-	- 2.83**	-
Standard & Poor's	-	-	0.22	0.17	-
Moody's	-	-	0.39	0.58	-
Interest spread vs. Germany	- 1.31***	- 1.31***	- 1.30***	- 1.29***	- 0.46***
Own time lag	0.02**	0.03***	0.02**	0.03***	0.01**
Relation to other ratings	-	-	-	-	- 2.13***
Time lag of other ratings	-	-	-	-	- 0.07
Interaction (other)	-	-	-	-	0.08
Observations	94	94	94	94	94
R^2 corr.	0.22	0.30	0.20	0.28	0.33
p value Jarque-Bera test	0.00	0.17	0.00	0.28	0.44

Source: WIFO calculations. Estimation procedure: OLS. Country dummies assume value 1 if the rating change concerns country i . Agency dummies assume value 1 if the rating is changed by agency j . Interest spread vs. Germany: spread in month of rating change minus spread at time of last rating change. Own time lag: number of months since last rating adjustment by the respective agency. Relation to other ratings: ratio between own rating and average rating of other agencies in period before rating change. Time lag of other ratings: number of months between last rating change by other agencies and time of own rating change. Interaction (other ratings): squared relation to other ratings and time lag of the other ratings. * . . . significant at 10 percent level, ** . . . significant at 5 percent level, *** . . . significant at 1 percent level.

Of particular interest are the results from model 5 which also includes the ratings by the two other agencies: first, by the relation between the own rating and the average of the two other agencies in the month preceding the adjustment ($t-1$), and second, by the time-lag between the own rating adjustment and the last-observed adjustment by one of the other agencies. Additionally, an interaction term between these two factors is introduced which, however, is not significantly different from zero. The relation between the own and the other ratings is significantly negative. If therefore the own rating is above the average of the other two, it will tend to be adjusted downwards; if it is below, the adjustment will tend upwards.

There is a tendency for ratings to be adjusted in the same sense as done by the two other rating agencies, i.e., existing differences of assessment between the agencies become smaller, providing tentative evidence for herding behaviour.

Tables 2 and 3 show the results for the reverse causality of rating changes impacting on the interest rate differential, one month ($t+1$) and three months ($t+3$) after the rating adjustment, respectively. This term structure obviates an endogenous relation between a change in the interest gap and the rating. The structure of the models is different from that in Table 1, since they capture, apart from the rating change at time t and the dummy variables, also the short-term dynamics of the interest rate differential vis-à-vis Germany. All models in Tables 2 and 3 require an adjustment for outliers in order to obtain normally-distributed estimation errors². These regression equations take up the approach by Stock – Watson (1999) for multiple-stage projections of inflation rates and connect the change in the interest rate differential over one months and over three months with the own dynamics of these variables up to the rating change and the size of the adjustment. The 94 observations suggest that, on average, rating upgrades by 1 point lead to a narrowing of the interest rate gap by 0.2 percentage point in the subsequent month (Table 2). Until the third month following an upgrade, the interest rate differential is reduced by an overall 0.5 percentage point (Table 3).

The interest rate differential vis-à-vis Germany exhibits a significant reaction to rating adjustments. Downgrades are shown to lead to an increase in the interest rate gap by some 0.3 percentage point within one to three months. This amount appears too small to trigger a vicious circle.

Table 2: Impact of rating changes on the interest rate differential vis-à-vis Germany one month after the rating adjustment

	Dependent variable: interest rate differential vis-à-vis Germany one month after the rating change			
	Model 1	Model 2	Model 3	Model 4
Constant term	0.14**	0.42***	0.08	0.41**
Dummy variable				
Greece	–	– 0.31**	–	– 0.31**
Ireland	–	– 0.27*	–	– 0.28*
Spain	–	– 0.38**	–	– 0.39**
Standard & Poor's	–	–	0.04	– 0.02
Moody's	–	–	0.12	0.09
Positive outliers	1.73***	1.74***	1.70***	1.72***
Negative outliers	– 2.09***	– 2.06***	– 2.16***	– 2.14***
Size of rating change	– 0.22***	– 0.20***	– 0.20***	– 0.19***
Interest spread in period t	0.17**	0.16*	0.18**	0.18**
Interest spread in period $t-1$	– 0.27***	– 0.29***	– 0.27***	– 0.29***
Interest spread in period $t-2$	– 0.06	– 0.05	– 0.04	– 0.03
Interest spread in period $t-3$	– 0.07	– 0.08	– 0.07	– 0.08
Observations	94	94	94	94
R^2 corr.	0.57	0.59	0.57	0.58
p value Jarque-Bera test	0.53	0.75	0.52	0.73

Source: WIFO calculations. Estimation procedure: OLS. Country dummies assume value 1 if the rating change concerns country i . Agency dummies assume value 1 if the rating is changed by agency j . The dummies for positive and negative outliers assume value 1 if the estimation error of the model is exceptionally large (outliers). Size of rating change: adjustment vis-à-vis previously published rating. Interest spread in period t : average spread during month of rating change. Interest spread in period $t-1$: average spread during one month before change. Interest spread in period $t-2$: average spread during two months before change. Interest spread in period $t-3$: average spread during three months before change. *... significant at 10 percent level, **... significant at 5 percent level, ***... significant at 1 percent level.

² The use of heteroscedasticity-adjusted standard deviations for the test controls only partially for the distortion of coefficients caused by outliers. For this reason, two dummy variables are introduced into the regression which for two particularly large estimation errors (positive outliers) and for two particularly small errors (negative outliers), respectively, assume the value 1. By this intervention, the coefficient for the rating change increases somewhat, and for the estimation errors of all regressions the zero-hypothesis of a normal distribution can no longer be rejected.

Table 3: Impact of rating changes on the interest rate differential vis-à-vis Germany three months after the rating adjustment

	Dependent variable: interest rate differential vis-à-vis Germany three months after the rating change			
	Model 1	Model 2	Model 3	Model 4
Constant term	0.38**	0.65	0.44	0.77
Dummy variable				
Greece	–	0.06	–	0.02
Ireland	–	– 0.54	–	– 0.58
Spain	–	– 0.76	–	– 0.82
Standard & Poor's	–	–	– 0.12	– 0.18
Moody's	–	–	– 0.01	– 0.01
Positive outliers	5.64***	5.26***	5.61***	5.22***
Negative outliers	– 4.36***	– 4.30***	– 4.42***	– 4.39***
Size of rating change	– 0.45***	– 0.50***	– 0.44***	– 0.49***
Interest spread in period t	0.47*	0.32	0.48*	0.35
Interest spread in period $t-1$	0.49*	0.42	0.48*	0.41
Interest spread in period $t-2$	0.47*	0.46*	0.48*	0.47*
Interest spread in period $t-3$	– 0.05	– 0.05	– 0.03	– 0.02
Observations	94	94	94	94
R^2 corr.	0.65	0.66	0.64	0.66
p value Jarque-Bera test	0.32	0.46	0.25	0.30

Source: WIFO calculations. Estimation procedure: OLS. Country dummies assume value 1 if the rating change concerns country i . Agency dummies assume value 1 if the rating is changed by agency j . The dummies for positive and negative outliers assume value 1 if the estimation error of the model is exceptionally large (outliers). Size of rating change: adjustment vis-à-vis previously published rating. Interest spread in period t : average spread during quarter of rating change. Interest spread in period $t-1$: average spread during one quarter before change. Interest spread in period $t-2$: average spread during two quarters before change. Interest spread in period $t-3$: average spread during three quarters before change. *... significant at 10 percent level, **... significant at 5 percent level, ***... significant at 1 percent level.

Before the financial market crisis of 2008-09, rating agencies judged the soundness of complex financial products significantly above their underlying probability of default. Distorted incentives deriving from the conflict between simultaneous advisory and rating activities were to some extent held responsible for this misjudgement. Presumably, also the under-estimation of liquidity shortages gave rise to excessively optimistic ratings. In any case, all agencies were accused of adjusting their assessments too late and for not having anticipated the financial market crisis. As a reaction, both the USA and the EU took measures to reinforce control over the rating agencies. Since the beginning of 2011, rating agencies operating in the EU are liable to certification by the European Securities and Markets Authority (ESMA) and must make their working methods transparent.

In the current sovereign debt crisis, the rating agencies markedly shortened their reaction lag in adjusting the ratings of government bonds and put more emphasis on indicators of fiscal imbalances. Now they are blamed the opposite, i.e., to downgrade the ratings for government bonds prematurely, upon insufficient evidence and to an overshooting extent. In this way, they would have triggered and indeed exacerbated the European sovereign debt crisis. As suggested by theoretical models of economies in a fixed-exchange-rate regime, they have allegedly set in motion a spiral of interest rate hikes that pushed the countries at the euro area periphery towards the brink or even into insolvency. They were thus also responsible for the current problems within the European Union.

The empirical investigations available so far on the relation between rating changes and the reaction of the interest rate spread vis-à-vis government bonds of a safe-haven reference country do not lend firm support to this conclusion. Many studies rather suggest that ratings are adjusted with a lag to macroeconomic, fiscal, and balance of payments data. Few are the cases where rating agencies can be shown as having triggered increases in interest rate differentials. Likewise, a mutual reaction between rating changes and the subsequent trend in interest rate spreads cannot be established with certainty.

Summary and conclusions

The results presented here for four countries at the euro area periphery (Greece, Ireland, Spain, Portugal) show rating changes to occur as a rule after a change in the interest rate gap, and to an over-proportional extent. Following a rating adjustment, there will be a further reaction of the interest spread, partly driven by the rating change, but also by the dynamics in the bond market. However, the interest rate reaction caused by a rating change is less than proportional, i.e., in our sample, rating changes do not have a destabilising effect. The term structure of the model employed here rather suggests that rating agencies' actions are driven by the events of the sovereign debt crisis. Further evidence in this direction is the clear herding behaviour among agencies: whenever the distance of the own rating to the average rating by the two other agencies is large, rating adjustments converge towards the average. A benign interpretation of this statistically significant phenomenon would point to time lags in data processing by the agencies. This may even claim some plausibility, considering the likely scarcity of the agencies' analytical resources.

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Rating Agencies: Creating, Amplifying or Drawn by Events in the Sovereign Debt Crisis? – Summary

Rating agencies transform data on the political, economic and financial situation of a country into a simple signal for investors. In doing so, they facilitate primarily cross-border investment. Some empirical studies have pinpointed ratings as a cause for the widening interest gap compared to a country that offers safe investment opportunities. Other empirical studies, on the other hand, found a non-linear link between fundamental data on the fiscal position of a country and its interest rate gap vis-à-vis a country with safe investment opportunities.

The risk that a vicious circle of higher interest rates and downgrading could be triggered by rating agencies needs close attention during the current sovereign debt crisis, because rating mistakes have occasionally occurred in the past. Higher interest rates for government bonds act as a signal that market participants lose faith in a state's ability to continue its debt service duly, and at the same time they make it more difficult to consolidate the budget because of higher on interest payments.

An analysis of rating changes for four countries at the periphery of the euro area confirms the findings of prior empirical studies. Rating changes show a significant and disproportionate response to a widening of the interest gap between peripheral countries and Germany, and downgradings during the crisis since 2010 occurred significantly more often and were markedly less steep than in more quiet periods. Moreover, rating agencies are driven by a herd instinct in that they tend to adjust their own rating towards those of the other agencies. A widening of the interest gap to Germany by 1 percentage point causes ratings to be lowered by 1.3 percentage points on average. Conversely, rating adjustments in turn cause the interest gap to Germany to be widened, where a downgrading by 1 percentage point increases the interest gap by 0.2 to 0.5 percentage points. These parameters are too small to generate a vicious circle so that rating agencies cannot be blamed to have a destabilising effect during the current sovereign debt crisis in the euro area.