DO RATING AGENCIES EXHIBIT HERDING BEHAVIOUR?
EVIDENCE FROM SOVEREIGN RATINGS

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Abstract - Different rating agencies may have different levels of expertise (reputation) for different countries it is not obvious that such homogeneity holds. We therefore conduct poolability tests within this context to assess this assumption and find evidence of heterogeneity. This leads us to conduct country-by-country time-series tests, allowing all slope coefficients to vary across countries, to assess the lead-lag relationship among agencies. Our results do not support the expectation that Fitch is a follower for more (a leader for less) countries than Moody’s.

Keywords—sovereign ratings, cross-country heterogeneity

II. A Brief Literature Overview

A frequently cited argument underpinned by empirical research is that CRAs do not assess risk better than market participants themselves. CRAs do not have, and cannot have, superior information to market participants about uncertainty and the degree of insolvency (illiquidity) of the rated firms (sovereigns). Altman and Saunders (2001) show that CRAs may provide biased opinions since their ratings strategies are based on backward looking analyses rather than being forward looking. Amato and Furfine (2004) analyse changes of credit ratings assignments over business cycles to test the hypothesis about procyclical
behaviour of CRAs. They show that the opaque methodologies used by CRAs are conducted on a “through-the-cycle” basis, and not according to transitory fluctuations in credit quality. Bolton, Freixas and Shapiro (2009, 2012) explore a further interesting research question regarding the conflict of interest of CRAs that is linked with economic fundamentals. CRAs overestimate ratings in good times (booms) when there are a large number of naive investors and the probability of losing their reputation is lower. Their results correspond with the situation that occurred during the GFC when a large number of issued ratings were downgraded.

Another strand of the recent literature addresses further important research and policy related questions that are linked to reputational effects, competition and the reliability of CRAs’ ratings assignments – see Becker and Milbourn (2011), Mariano (2012), Bolton, Freixas and Shapiro (2012), Manso (2013) and Bar-Isaac and Shapiro (2013). Alsakka, ap Gwilym and Vu (2014) attempt to provide a theoretical framework that explains why CRAs fail to make reliable rating assignments in terms of their timeliness and accuracy. Morgan (2002) and Becker and Milbourn (2011) challenge the reliability of ratings assignments with respect to their opaqueness and the degree of competition. The above studies relates to research on information bias of rating assignments that is based on decision model theory. Following Banerjee (1994) this kind of explanation is based on the assumption that each decision maker considers the decisions taken by other decision makers in taking their own decision.

The literature on herding behaviour is well established and extensive in the area of finance (Trueman, 1994, Wermers, 1999, Sias, 2004, Choi and Sias, 2009). Sias (2004) confirms the hypothesis about institutional herding. Thus, institutional investors follow each other when they buy or sell the same shares. However, they show that substantial differences exist across institutions although institutional investors follow similarly classified institutional investors.

Applying the price leadership theory to the three sovereign CRAs and considering the possibility of intentional and spurious herding more generally raises the question of whether one agency systematically leads in the setting (and changing) of country ratings.

II. Data Sample

Ratings are measured on a 20 point ordinal scale following the literature – see, for example, Alsaka and ap Gwilym (2010). Thus, the highest rating (AAA) is represented by 20, the second highest rating (AA+ or AA1) is 19, the rating Caa3/CCC= 2, with all lower ratings (Ca/CC, C/C, LD/RD, D/DDD, DD, D) being set to 1 (the lowest rating category) because they are not comparable across CRAs.

Results that allow full slope coefficient heterogeneity could be obtained for 24 countries for the Fitch and Moody’s CRA pairing, 28 countries for the Fitch and S&P’s pairing and 23 countries for the Moody’s and S&P’s pairing. The sovereign ratings from Fitch Ratings and S&P’s are publicly available. We obtained the data sample for Moody’s sovereign ratings directly from the Agency.

III. Methodology

A Granger non-causality (GNC) style test is proposed for investigating the above hypotheses applied to the three pairs of CRAs’ ratings. This method is particularly appropriate for examining herding because it tests for precedence and so allows one CRA to observe another CRA’s assignment before making their assignment. A GNC-style method has been employed to analyse the lead-lag relationship between different CRAs’ bank rating assignments by, for example, Alsakka et al’s (2014). To illustrate the basic
GNC-style test consider the following specification where $\Delta RX_{it}$ denotes the change in rating assignment made by CRA $X$ for country $i$ in time period $t$ and $\Delta RY_{it}$ represents the change rating assignment made by CRA $Y$ for the same country and time period. We use the change in rating assignment because it reduces both the number of categories in the variables and the number of lags required in the model which reduces any problems in obtaining convergence in estimation.

$$\Delta RY_{it} = \alpha_1 \Delta RX_{it-1} + \alpha_2 \Delta RY_{it-1} + u_{1it} \quad [1]$$

These equations are estimated individually by ordered probit methods using time-series regressions for each country. Note that $\Delta RY_{it}^*$ denotes the unobserved dependent variable that is related to the observed dependent variable, $\Delta RY_{it}$, (assuming $J$ categories) as follows:

$$\Delta RY_{it} = 1 \quad \text{if} \quad \Delta RY_{it}^* \leq \lambda_{1j}$$
$$\Delta RY_{it} = j \quad \text{if} \quad \lambda_{j-1} < \Delta RY_{it}^* \leq \lambda_{j}$$
$$\Delta RY_{it} = J \quad \text{if} \quad \lambda_{J-1} < \Delta RY_{it}^*$$

where, $j = 2, 3, ..., J$; and $\lambda_{j-1,i}$ are unknown limit points to be estimated with the coefficients in equation (1).

We use a model with only one lag because it gives an unambiguous interpretation in terms of the signs of coefficients of interest and thereby facilitates their interpretation within the above hypotheses. This lag length is also indicated by the Schwartz Information Criterion (SC) for the time-series regressions.

We use time-series regressions to examine the lead-lag relationship between ratings rather than pooling the countries together (as is done in, for examples, Guttler and Wahrenburg, 2007, Alsakka and ap Gwilym, 2010, and Gomes, 2015) because pooling assumes the homogeneity of (slope) coefficients across countries.

The hypotheses are: $H_0: \alpha_i = \alpha_i \forall i$ and $H_1: \alpha_i \neq \alpha_i$, for any $i$. The test statistic for a given $i$ is:

$$S_{Ti} = (\bar{\alpha}_i - \bar{\alpha})' Var(\bar{\alpha}_i - \bar{\alpha})^{-1} (\bar{\alpha}_i - \bar{\alpha})$$

where $\bar{\alpha}_i$ is the time-series estimated slope coefficient estimator for the given individual $i$ and $\bar{\alpha}$ is a consistent pooled data estimator that assumes homogeneity of slope coefficients.

### IV. Results

This section discusses the following results in order: pooled regressions and poolability tests, full period individual country regressions, split sample individual country regressions.

Previous analyses of the lead-lag relationship between CRAs pool all countries together in one regression. The GNC (herding) coefficient is significant and positive at the 5% level in all 6 equations. This suggests bi-directional Granger-causality for all three rating agency pairings. That is, Fitch follows Moody’s ratings and Moody’s follows Fitch’s ratings while Fitch follows S&P’s ratings and S&P’s follows Fitch’s ratings. Similarly, Moody’s follows S&P’s ratings and S&P’s follows Moody’s ratings. These results suggest that all of the CRAs herd towards each others’ ratings with no clear leader or follower.

Unreported results based on the individual country poolability test statistic, $S_{Ti}$, available from the authors on request, reject poolability in 75 out of the 150 (50%) cases. Poolability is rejected for many countries for each CRA pairing and when both CRAs’ ratings are the dependent variable. This indicates the clear rejection of the poolability null and the need to estimate models (with different slope coefficients) country by country to reveal the heterogeneity across countries.

We therefore proceed to consider the time-series estimation of (1) for each CRA pairing for each individual country using the full available time-series sample to test our hypotheses.

The Fitch and Moody’s CRA pairing. For 4 countries (ARG, CYP, ITA and LIT) there is a positive and
significant (at the 5% level) coefficient on $\Delta RM_{it-1}$ in the equation where $\Delta RF_{it}$ is the dependent variable indicating that Fitch’s current rating follows (herds towards) last period’s rating assigned by Moody’s. For no countries is this coefficient negative and significant indicating that Fitch’s current rating does not move away from (adverse herd against) Moody’s rating assigned last period for any country. Indeed, there are no instances of any CRA engaging in significant adverse herding against any other CRA for any pairing in any country. For 4 countries (ICE, LAT, RUS and TUR) there is evidence that Moody’s current rating follows (herds towards) Fitch’s rating assigned last period. These results suggest the unambiguous inference that Moody’s is the leader and Fitch is the follower for 4 countries (ARG, CYP, ITA and LIT) and that Fitch is the leader and Moody’s is the follower for 4 countries (ICE, LAT, RUS and TUR). For 3 countries (ARG, ICE and RUS) there is a positive and significant coefficient on $\Delta RF_{it-1}$ in the equation where $\Delta RF_{it}$ is the dependent variable suggesting that Fitch tends to follow its own past rating in making its current assignment (habit behaviour) for these countries. It is notable that in 2 of these countries (ICE and RUS) there is evidence that Moody’s follows Fitch’s rating confirming the independence of Fitch in making assignments for these countries. In 1 country (ITA) there is a negative and significant coefficient on $\Delta RF_{it-1}$ in the equation where $\Delta RF_{it}$ is the dependent variable suggesting that Fitch tends to reverse its own past rating in making its current assignment (contrarian habit behaviour) for this country. In this country there is evidence that Fitch follows Moody’s rating confirming Fitch’s tendency to herd towards Moody’s (rather than their own) rating in making their assignment for this country. For 1 country (URU) there is evidence of habit behaviour in Moody’s assignment and for 1 country (ROM) there is evidence of significant contrarian habit behaviour by Moody’s.

The Fitch and S&P’s CRA pairing. For 10 countries (CYP, DOM, ECU, GRE, INO, IRE, JAM, POR, SPA and TUR) there is a positive and significant coefficient on $\Delta RS_{it-1}$ in the equation where $\Delta RF_{it}$ is the dependent variable indicating that Fitch’s current rating follows (herds towards) last period’s rating assigned by S&P’s. For 6 countries (GRE, HOG, ICE, INO, RUS and URU) there is evidence that S&P’s current rating follows (herds towards) Fitch’s rating assigned last period. These results suggest the unambiguous inference that S&P’s is the leader and Fitch is the follower for 8 countries (CYP, DOM, ECU, IRE, JAM, POR, SPA and TUR) and that Fitch is the leader and S&P’s is the follower for 4 countries (HOG, ICE, RUS and URU). For GRE and INO the evidence suggest bi-directional Granger-causality where S&P’s appears to follow Fitch’s past ratings while Fitch simultaneously follows S&P’s past rating assignment. Two points about these inferences are worth noting. First, the coefficient on $\Delta RS_{it-1}$ in the equation where $\Delta RF_{it}$ is the dependent variable is more than (less than) that of the coefficient on $\Delta RF_{it-1}$ in the equation where $\Delta RS_{it}$ is the dependent variable suggesting that Fitch’s (S&P’s) tendency to follow S&P’s (Fitch’s) past rating assignment is greater than the other way around for GRE (INO). Second, these results might indicate a change in rating leadership through time for these countries. This issue can be assessed by consideration of whether the models’ coefficients change through time.

For 4 countries (ARG, ICE, INO and RUS) there is a positive and significant coefficient on $\Delta RF_{it-1}$ in the equation where $\Delta RF_{it}$ is the dependent variable suggesting that Fitch tends to follow its own past
rating in making its current assignment (habit behaviour) for these countries. It is notable that in 2 of these countries (ICE and RUS) there is unambiguous evidence that S&P’s follows Fitch’s rating confirming the independence of Fitch in making assignments for these countries. In no countries is there a negative and significant coefficient on \(\Delta RF_{it-1}\) in the equation where \(\Delta RF_{it}\) is the dependent variable suggesting that Fitch does not tend to reverse its own past rating in making its current assignment (contrarian habit behaviour) for any country. For 2 countries (ECU and POR) there is evidence of habit behaviour in S&P’s assignment while for 2 countries (BRA and URU) there is evidence of significant contrarian habit behaviour by S&P’s. In both ECU and POR there is evidence that Fitch follows S&P’s rating confirming the independence of S&P’s in making assignments for these countries. For URU the contrarian habit behaviour by S&P’s coincides with, and is confirming of, the evidence that S&P’s tends to herd towards Fitch’s assignments for this country.

The Moody’s and S&P’s CRA pairing. For 14 countries (ARG, ECU, GRE, ICE, INO, IRE, JAM, NEW, PHI, POR, ROM, SLO, THA and VEN) there is a positive and significant coefficient on \(\Delta RS_{it-1}\) in the equation where \(\Delta RM_{it}\) is the dependent variable indicating that Moody’s current rating follows (herds towards) last period’s rating assigned by S&P’s. For 5 countries (ARG, CYP, INO, RUS and SLO) there is evidence that S&P’s current rating herds towards Moody’s rating assigned last period. These results suggest the unambiguous inference that S&P’s is the leader and Moody’s is the follower for 11 countries (ECU, GRE, ICE, IRE, JAM, NEW, PHI, POR, ROM, THA and VEN) and that Moody’s is the leader and S&P’s is the follower for 2 countries (CYP and RUS). For 3 countries (ARG, INO and SLO) the evidence suggest bi-directional Granger-causality where S&P’s appears to follow Moody’s past ratings while Moody’s simultaneously follows S&P’s past rating assignment. We note that the coefficients on \(\Delta RM_{it-1}\) in the equations where \(\Delta RS_{it}\) is the dependent variable are more than (less than) the coefficients on \(\Delta RS_{it-1}\) in the equations where \(\Delta RM_{it}\) is the dependent variable for ARG and INO (SLO) suggesting that S&P’s (Moody’s) tendency to follow Moody’s (S&P’s) past rating assignment is greater than the other way around for these countries. This bi-directional causality might indicate a change in rating assignment leadership through time for these countries.

For 2 countries (THA and URU) there is a positive and significant coefficient on \(\Delta RM_{it-1}\) in the equation where \(\Delta RS_{it}\) is the dependent variable suggesting that Moody’s tends to follow its own past rating in making its current assignment (habit behaviour) for this country. In 1 of these countries (THA) there is unambiguous evidence that S&P’s follows Moody’s rating confirming the independence of Moody’s in making assignments for this country. In 3 countries (ICE, JAM and ROM) there is a negative and significant coefficient on \(\Delta RM_{it-1}\) in the equation where \(\Delta RM_{it}\) is the dependent variable suggesting that Moody’s tends to reverse its own past rating in making its current assignment (contrarian habit behaviour) for these countries. In all 3 of these countries there is unambiguous evidence that Moody’s follows S&P’s rating confirming Moody’s tendency to herd towards S&P’s (rather than its own) rating in making its assignment for these countries. For 4 countries (ECU, ICE, POR and SLO) there is evidence of habit behaviour in S&P’s assignment however there is no evidence of significant contrarian habit behaviour by S&P’s for any country. In ECU, ICE, POR and SLO there is evidence that Moody’s follows S&P’s rating.
confirming the independence of S&P’s in making assignments for these countries. This conclusion is reinforced for ICE because there is evidence that Moody’s engages in contrarian habit behaviour for this country.

Overall there is evidence of leadership/follower behaviour between Fitch and Moody’s for 8 out of 24 (33%) countries, between Fitch and S&P’s in 14 out of 28 (50%) countries and between Moody’s and S&P’s for 16 out of 23 (70%) countries. As might be expected S&P’s is the leader for more countries than the other CRAs although it is not the leader for all countries. Perhaps unexpectedly Fitch is not less of a leader or more of a follower than Moody’s.

If a CRA unambiguously leads the other for any pairing for a particular country this is indicated with the letter “L” in that CRA’s column. If there is bi-directional Granger-causality (dual leadership) this is indicated with an “L” in the column headed “Dual”. The CRA with the largest GNC coefficient when there is bi-directional Granger-causality is indicated with the symbol “F” (Fitch), “M” (Moody’s) or “S” (S&P’s) in the “Dual” column. The absence of leadership is indicated by a blank entry while “-” indicates that estimation results are unavailable for a particular CRA pairing in a specific country. When a CRA’s leadership is confirmed by it exhibiting positive habit behaviour this is indicated by “H*”, where * denotes F for Fitch, M for Moody’s and S for S&P’s. Leadership that is reinforced by contrarian habit behaviour is denoted with “C*”.

There is no evidence of any CRA leading or following another CRA for 11 of the 35 countries which at first sight appears to suggest an absence of herding for many (almost one third) of the nations considered. However, for only one of these countries (BRA) are results on leadership available for all 3 CRAs which means that such a conclusion could be partly due to unavailable estimation results rather than a complete lack of herding. For 4 countries (ECU, IRE, JAM and POR) there is evidence that S&P’s leads both Fitch and Moody’s without any evidence that S&P’s follows either of these CRAs indicating that S&P’s is the clear leader for these countries. In none of these countries is this conclusion due to unavailable estimation results because results are available for all 3 CRAs in each case. For 3 countries (ICE, RUS, and TUR) there is evidence that Fitch leads both Moody’s and S&P’s without any evidence that Fitch follows either of these CRAs. However, in one of these countries (TUR), this conclusion is because the results are not available for Moody’s and S&P’s. Nevertheless, in this case, our results still provide strong evidence that Fitch is the clear leader for these 3 countries. For 1 country (CYP) there is evidence that Moody’s leads Fitch and S&P’s without any evidence that Moody’s follows either of these CRAs suggesting that Moody’s is the clear leader for this country. This way of presenting the evidence confirms the conclusions drawn above that S&P’s is the unambiguous leader for more countries than the other CRAs which is consistent with the prior belief that this is because this is most established CRA with greatest reputational capital. The inference that Fitch exhibits unambiguous more leadership than Moody’s also confirms the conclusions from the discussion above however it is not consistent with our prior belief that Fitch is likely to have the least reputational capital. This latter conclusion may be due to our consideration of only a subset of countries that are rated and that it is not representative of the population or it may be that for sovereign ratings over the period considered that Moody’s is the primary follower in ratings assignments.
V. Conclusion
Given that different CRAs may have dissimilar levels of expertise and reputational capital for different countries it is not obvious that such homogeneity holds. We therefore are the first to conduct poolability tests within this context to assess this assumption and find evidence of heterogeneity of slope coefficients and thereby extend the literature on herding among CRAs’ sovereign assignments. This leads us to conduct country-by-country time-series tests (that allow full slope heterogeneity across countries) to assess the lead-lag relationship among agencies and, to our knowledge, we are the first to do this for sovereign ratings. These results suggest an absence of herding across the CRAs for almost one third of the 35 countries that we consider. They also indicate that no one CRA is the leader for all countries where herding is apparent. Nevertheless, they do suggest that S&P’s is the leader for more countries than the other CRAs which is consistent with the prior belief that S&P’s is the most established CRA with greatest reputational capital. We also find that Fitch exhibits leadership for more countries than Moody’s which is unexpected because Fitch may be regarded as the CRA possessing the least reputational capital. These findings contribute to an ongoing debate about the regulatory implications for CRAs and the openness of the market for new entrants. Although we cannot confirm the herding behaviour in all cases, it is evident that S&P’s has a dominant position in the market such that the remaining two agencies often follow the leading agency. Thus CRAs do not collude completely. S&P’s differentiates itself from the other two CRAs in terms of ratings quality. Extension of our research could be directed in several ways.

One unanswered question is whether all three CRAs use the same quantitative determinants with the same weights for sovereign rating assignments. In other words, it would be desirable to assess and compare how reliable the models are for predicting sovereign ratings. This could also be done so as to distinguish between emerging markets and developed economies. This could help explain the reputational effects of CRAs and provide insights into why CRAs herd.

VI. References


**Appendix**

The 35 countries (with their associated country identifier given in parentheses) are: Argentina (ARG), Bahrain (BAR), Brazil (BRA), Cyprus (CYP), Czech Republic (CZE), Dominican Republic (DOM), Ecuador (ECU), Estonia (EST), Greece (GRE), Hong Kong (HKG), Hungary (HUN), Iceland (ICE), Indonesia (INO), Ireland (IRE), Italy (ITA), Jamaica (JAM), Kazakhstan (KAZ), South Korea (KOR), Latvia (LAT), Lebanon (LEB), Lithuania (LIT), New Zealand (NEW), Peru (PER), Philippines (PHI), Portugal (POR), Romania (ROM), Russia (RUS), Slovakia (SLO), Slovenia (SLV), Spain (SPA), Thailand (THA), Turkey (TUR), Ukraine (UKR), Uruguay (URU), Venezuela (VEN).