

Online appendix
for
“Private information in currency markets”
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This appendix provides several robustness checks and additional analysis conducted to support the main results of the paper “Private information in currency markets”. This appendix is organized as follows:

| Section | Title | Table |
|----------------|---|--------------|
| 1 | Robustness of (paper’s Table 3) event studies on FX returns conditional on institutional quality (<i>TI</i> Index). | OA-1 |
| 2 | Robustness of (paper’s Table 3 Panel A) event studies on FX returns (baseline) using sub-sample with low <i>TI</i> and high liquidity events. | OA-2 |
| 3 | Robustness of (paper’s Table 4) TSLS regressions using other institutional quality proxies, and other control variables. | OA-3 |
| 4 | Robustness of (paper’s Table 6) event studies on FX returns (baseline) conditional on institutional quality and <i>SDN</i> . | OA-4 |
| 5 | Robustness of (paper’s Table 7) event studies on <i>TRMIs</i> . | OA-5 |
| 6 | Robustness of (paper’s Table 3) event studies on FX returns adjusting for dollar risk, carry risk and local stock market returns. | OA-6 |
| 7 | Robustness of event studies on FX returns (baseline) using sub-sample without CDS. | OA-7 |
| 8 | Event studies on daily equity fund flows conditional on Institutional Quality. | OA-8 |

Overview

1. Robustness of (paper's Table 3) event studies on FX returns (baseline and adjusting for global risk factors), conditional on Institutional Quality.

In table OA-1, we replicate the results of Table 3 in the paper using the sample of rating and outlook changes, instead of only the sample of rating changes. Panels A, B and C, in Table OA-1 follow the same methodology as Table 3 in the paper. Specifically, the baseline case (Panel A) shows abnormal FX returns adjusted for mean FX returns in the estimation period; Panel B shows abnormal FX returns adjusted for the dollar risk and carry risk factor; Panel C shows abnormal FX returns further adjusted for the global equity index return and global bond index return. Results remain robust.

Adding changes in outlooks and watchlist inclusions/exclusions increases our sample size to 380 negative changes (rating downgrades and negative outlook changes). While the sample size increases, it should be noted that the impact related to each event is diluted, because a change in rating is not the same as a change in outlook (see for example the results of Michaelides, Milidonis, Nishiotis and Papakyriakou, 2015). Since the sample size increases, the statistical power of our analysis improves and we typically observe higher statistical significance throughout our results (event study and cross sectional regressions). On the other hand, since outlook changes constitute a weaker signal than a rating change, the economic significance of the results is, on average, slightly lower.

2. Robustness of (paper's Table 3 Panel A) event studies on FX returns (baseline) for low Institutional Quality (TI Index) and high liquidity events.

In table OA-2, we report event study results of abnormal (mean-adjusted) FX returns, conditional on institutional quality (*TI* index) and also on the level of liquidity using the Corwin-Schultz (2012) measure. Specifically, we estimate the median liquidity score and denote as high liquidity those events with a liquidity value above the median liquidity. We do this to address the concern that results may be driven by FX illiquidity. Hence, if results are significant in the sub-samples of low *TI* and high liquidity, these concerns are minimized. It should be noted, however, that the liquidity variable is missing for many events, where many of these are in the sample of low institutional quality countries. We report the results of the sub-sample that has both low *TI* and high liquidity for the sample of changes in ratings in Panel A of Table OA-2. Given the small sample size, we also report the same analysis for the sample of changes in ratings and outlooks. We observe that results are statistically significant in both panels, thus minimizing concerns that results are driven by low liquidity events in low institutional countries.

3. Robustness of (paper's Table 4) TSLS regressions using other institutional quality proxies, and other control variables.

In Table OA-3, we conduct several robustness checks for the TSLS analysis of Table 4 in the paper, with similar results. In panel A we re-run our analysis using *information ratios* instead of cumulative abnormal FX returns (*CAFXRs*). Specifically we estimate the standard

deviation of returns in the estimation period (window (-270,-21)), for each event, and divide *CAFXR*s by this standard deviation. We then use *information ratio* as a dependent variable in our regressions.

In Panels B and C, we show results for alternative measures of institutional quality. In Panel B, we use the country's development classification by the World Bank: any country denoted as high income is classified as developed ($EF=0$), while countries with low and medium income are classified as developing ($EF=1$). In Panel C, we use the PRS group's *Law and Order score*, which ranges from 1 (lowest institutional quality) to 6. PRS describes its Law and Order score as capturing the "...strength and impartiality of the legal system..." and also "...assesses popular observance of the law...". Instrumental variables chosen (following the approach in paper's Table 4, Panel B) for the *EF* variable are *landlocked*, *ethnicity fractionalization* and *religion fractionalization*. Similarly, instrumental variables chosen for the *Law and Order score* are *ethnicity fractionalization* and *religion fractionalization*. Instrumental variables are chosen following the procedure outlined in Table 4, Panel B, of the paper.

In panel D, we add as a control variable an indicator variable (*NIG*) taking the value of 1 if the rating after the downgrade of the rated country is below investment grade (i.e. value higher than 10; as shown in paper's Appendix A), and 0 otherwise.

In panel E, the *NIG* variable is replaced by the variable *rating* that takes all possible values of the rating (paper's appendix A).

In panel F, we address potential concerns about the impact of illiquidity in FX returns (Karnaukh, Ranaldo and Söderlind, 2015) by estimating the Corwin and Schultz (2012) *liquidity* measure on a daily basis and calculate average liquidity over the period [-40,-21] for

each event. The significant decrease in sample size should be noted, arising mostly from the missing observations in the low institutional quality countries. The significance of the *TI index* coefficient remains robust.

4. Robustness of (paper's Table 6) event studies on FX returns conditional on institutional quality and *SDN*.

Table 6 in the paper shows event studies on the FX returns (baseline) for the low Transparency International (*TI*) countries, conditional on the presence of rumors (*SDN*=1) and no rumors (*SDN*=0). Since the sample size is small in paper's Table 6, we re-run the same analysis on the sample of changes in ratings and outlooks. Results are shown in table OA-4, and they remain robust. Specifically, even in the absence of any rumors (*SDN*=0) we observe significant FX depreciation before the official announcement.

5. Robustness of (paper's Table 7) event studies on *TRMIs*.

Table 7 in the paper shows event studies on the news analytics database (*TRMI*) for the low Transparency International (*TI*) countries, conditional on the presence of rumors (*SDN*=1) and no rumors (*SDN*=0). Given the small sample size in this table, we replicate the analysis (Table 7) using the sample of changes in ratings and outlooks. Results are shown in table OA-5, and they remain robust. Specifically, we do not observe any significant abnormal changes in *TRMI*, in the sub-sample of no rumors (*SDN*=0) either in the local country (Panel A) or the US (benchmark country).

6. Robustness of (paper's Table 3) event studies on FX returns (adjusting for dollar risk, carry risk and local stock market returns).

In Table OA-6 we conduct event studies on cumulative abnormal FX returns, adjusted for dollar risk, carry risk, and local stock returns (paper's equation (6)). Event studies are conditional on the level of institutional quality (high vs. low *TI* index). We show results using the sample of rating changes. Results in the pre-event window (-10, -3) for low *TI* remain qualitatively the same.

7. Robustness of event studies on FX returns (baseline) using sub-sample without CDS.

In Table OA-7 we conduct event studies on cumulative abnormal (mean adjusted) FX returns for the sub-sample that does not have CDS traded instruments. We do this to address the potential concern that the CDS market may act as an information platform for the FX market. Event studies are conditional on the level of institutional quality (high vs. low *TI* index). In panel A we show the analysis using the sample of rating changes. Given the small sample size, we also show the same analysis using the sample of changes in ratings and outlooks in Panel B. Results for the low *TI* and *SDN=0* subsample remain statistically significant, which indicates the presence of pre-event FX depreciation, even in the absence of a CDS traded instrument.

8. Event studies on daily net equity fund flows conditional on Institutional Quality.

In Table OA-8 we conduct event studies cumulative abnormal equity fund flows in/out of the country being downgraded. The flow variable is measured using the ratio of net flow in USD divided by the asset value of the funds the previous day. In Panel A, the analysis uses the sample of rating changes. Given the small sample size, we also show the analysis using the sample of ratings and outlooks (Panel B). Results are not statistically significant, as discussed in the paper (i.e. no evidence of information flow from equity fund flows to FX markets).

Tables

Table OA-1

Abnormal FX returns conditional on Transparency Index (*TI*) including outlook changes.

This table presents event studies of how sovereign debt downgrades affect foreign exchange (FX) returns conditional on the Corruption Perception Transparency Index (*TI*) score for the FM (first mover including outlooks) rating agency. FM rating changes comprise the union of all rating and outlook changes by the three rating agencies (Fitch, Moody's and Standard & Poor's), which are not led by rating actions (rating and outlook changes) by any of the three rating agencies, in the twenty trading days prior to their official announcements. We report cumulative average abnormal foreign exchange return (*CAAFXR*) using three different regression models (raw FX returns are relative to the USD; winsorized at the 1st and 99th percentiles). Panel A shows mean-adjusted *CAAFXRs*. Panel B reports *CAAFXRs* adjusted for dollar risk and carry risk. Panel C further adjusts *CAAFXRs* from Panel B for the global equity index return and global bond index return. Sample size is denoted by *n*. *p*-values are based on the Kolari and Pynnonen (2010) approach. ***, **, and * denote statistical significance (SS) at the 1%, 5%, and 10% level, respectively. *CAAFXRs* are winsorized at the 1st and 99th percentiles.

| <i>Panel A: Mean-adjusted CAAFXRs (baseline) conditional on TI score</i> | | | | | | |
|--|--|-----------------|----|--|-----------------|-----|
| Event window | High <i>TI</i> (low corruption; <i>n</i> =189) | | | Low <i>TI</i> (high corruption; <i>n</i> =191) | | |
| | <i>CAAFXR</i> | <i>p</i> -value | SS | <i>CAAFXR</i> | <i>p</i> -value | SS |
| Pre-event: | | | | | | |
| (-20,-3) | -0.600% | 0.032 | ** | -0.736% | 0.001 | *** |
| (-10,-3) | -0.435% | 0.027 | ** | -0.511% | 0.001 | *** |
| (-5,-3) | -0.189% | 0.053 | * | -0.123% | 0.056 | * |
| At the event: | | | | | | |
| (0,+1) | -0.333% | 0.027 | ** | -0.155% | 0.085 | * |
| (-1,+1) | -0.423% | 0.044 | ** | -0.145% | 0.019 | ** |
| After the event: | | | | | | |
| (+2,+5) | 0.118% | 0.577 | | 0.011% | 0.962 | |
| (+2,+10) | 0.029% | 0.327 | | 0.073% | 0.729 | |
| (+2,+20) | 0.302% | 0.466 | | -0.355% | 0.168 | |
| Around the event: | | | | | | |
| (-5,+5) | -0.436% | 0.095 | * | -0.240% | 0.012 | ** |
| (-10,+10) | -0.771% | 0.080 | * | -0.567% | 0.001 | *** |
| (-20,+20) | -0.663% | 0.122 | | -1.220% | 0.030 | ** |

Panel B: CAAFXR (adjusted for dollar risk and carry risk) conditional on TI score

| Event window | High TI (low corruption; n=181) | | | Low TI (high corruption; n=190) | | |
|-------------------|---------------------------------|---------|----|---------------------------------|---------|-----|
| | CAAFXR | p-value | SS | CAAFXR | p-value | SS |
| Pre-Event: | | | | | | |
| (-20,-3) | -0.306% | 0.239 | | -0.751% | 0.001 | *** |
| (-10,-3) | -0.282% | 0.161 | | -0.576% | 0.001 | *** |
| (-5,-3) | -0.100% | 0.190 | | -0.148% | 0.046 | ** |
| At the event: | | | | | | |
| (0,+1) | -0.296% | 0.047 | ** | -0.174% | 0.045 | ** |
| (-1,+1) | -0.371% | 0.064 | * | -0.173% | 0.008 | *** |
| After the event: | | | | | | |
| (+2,+5) | 0.028% | 0.460 | | -0.013% | 0.920 | |
| (+2,+10) | -0.246% | 0.203 | | 0.051% | 0.751 | |
| (+2,+20) | 0.035% | 0.379 | | -0.328% | 0.169 | |
| Around the event: | | | | | | |
| (-5,+5) | -0.384% | 0.127 | | -0.300% | 0.006 | *** |
| (-10,+10) | -0.839% | 0.085 | * | -0.665% | 0.000 | *** |
| (-20,+20) | -0.582% | 0.175 | | -1.218% | 0.031 | ** |

Panel C: CAAFXR (adjusted for dollar risk, carry risk, the global equity index return and the global bond index return).

| Event window | High TI (low corruption; n=170) | | | Low TI (high corruption; n=183) | | |
|-------------------|---------------------------------|---------|----|---------------------------------|---------|-----|
| | CAAFXR | p-value | SS | CAAFXR | p-value | SS |
| Pre-event: | | | | | | |
| (-20,-3) | -0.211% | 0.246 | | -0.801% | 0.001 | *** |
| (-10,-3) | -0.261% | 0.133 | | -0.596% | 0.001 | *** |
| (-5,-3) | -0.087% | 0.185 | | -0.164% | 0.038 | ** |
| At the event: | | | | | | |
| (0,+1) | -0.290% | 0.044 | ** | -0.141% | 0.112 | |
| (-1,+1) | -0.343% | 0.070 | * | -0.123% | 0.039 | ** |
| After the event: | | | | | | |
| (+2,+5) | 0.006% | 0.393 | | 0.011% | 0.744 | |
| (+2,+10) | -0.243% | 0.177 | | 0.112% | 0.826 | |
| (+2,+20) | 0.085% | 0.363 | | -0.237% | 0.188 | |
| Around the event: | | | | | | |
| (-5,+5) | -0.358% | 0.118 | | -0.218% | 0.032 | ** |
| (-10,+10) | -0.780% | 0.075 | * | -0.549% | 0.003 | *** |
| (-20,+20) | -0.401% | 0.174 | | -1.102% | 0.041 | ** |

Table OA-2

Abnormal FX returns (baseline) with high liquidity, conditional on Transparency Index (*TI*)

This table presents event studies of how sovereign debt downgrades affect foreign exchange (FX) returns conditional on the Corruption Perception Transparency Index (*TI*) score for the FM (first mover) rating agency (raw FX returns are relative to the USD; winsorized at the 1st and 99th percentiles). FM rating changes comprise the union of all rating changes by the three rating agencies (Fitch, Moody's and Standard & Poor's), which are not led by rating actions (rating and outlook changes) by any of the three rating agencies, in the twenty trading days prior to their official announcements. We report cumulative average abnormal foreign exchange return (*CAAFXR*) for the sample of high liquidity events to address the issue that results may be driven by low liquidity. Panel A shows mean-adjusted *CAAFXRs* for the sample of rating changes only. Panel B shows results for the expanded sample that comprises both rating and outlook changes. Sample size is denoted by *n*. *p*-values are based on the Kolari and Pynnonen (2010) approach. ***, **, and * denote statistical significance (SS) at the 1%, 5%, and 10% level, respectively.

Panel A: Mean-adjusted CAAFXRs with low TI score and high liquidity (rating changes)

| Event window | Low <i>TI</i> (high corruption; <i>n</i> =33) | | |
|-------------------|---|-----------------|-----|
| | <i>CAAFXR</i> | <i>p</i> -value | SS |
| Pre-event: | | | |
| (-20,-3) | -1.512% | 0.019 | ** |
| (-10,-3) | -0.877% | 0.029 | ** |
| (-5,-3) | -0.418% | 0.048 | ** |
| At the event: | | | |
| (0,+1) | -0.236% | 0.388 | |
| (-1,+1) | -0.407% | 0.095 | * |
| After the event: | | | |
| (+2,+5) | 0.176% | 0.220 | |
| (+2,+10) | 0.156% | 0.296 | |
| (+2,+20) | -0.498% | 0.504 | |
| Around the event: | | | |
| (-5,+5) | -0.684% | 0.027 | ** |
| (-10,+10) | -1.163% | 0.029 | ** |
| (-20,+20) | -2.452% | 0.008 | *** |

Panel B: Mean-adjusted CAAFXR with low TI score and high liquidity (rating and outlook changes)

| Event window | Low TI (high corruption; n=79) | | |
|-------------------|--------------------------------|---------|-----|
| | CAAFXR | p-value | SS |
| Pre-event: | | | |
| (-20,-3) | -0.866% | 0.017 | ** |
| (-10,-3) | -0.508% | 0.028 | ** |
| (-5,-3) | -0.157% | 0.100 | |
| At the event: | | | |
| (0,+1) | -0.200% | 0.192 | |
| (-1,+1) | -0.296% | 0.028 | ** |
| After the event: | | | |
| (+2,+5) | 0.094% | 0.542 | |
| (+2,+10) | 0.038% | 0.909 | |
| (+2,+20) | -0.564% | 0.030 | ** |
| Around the event: | | | |
| (-5,+5) | -0.339% | 0.045 | ** |
| (-10,+10) | -0.746% | 0.014 | ** |
| (-20,+20) | -1.706% | 0.001 | *** |

Table OA-3**Robustness of regressions of cumulative abnormal foreign exchange (FX) returns (*CAFXR*s) on institutional quality**

This table reports robustness results of the 2nd stage of TSLS regressions (TSLS: two-stage least squares) of cumulative abnormal (mean adjusted) FX (*CAFXR*) returns on the institutional quality proxy (Transparency International, *TI*), for FM downgrades (raw FX returns are relative to the USD; winsorized at the 1st and 99th percentiles). FM rating changes comprise the union of all rating changes by the three rating agencies (Fitch, Moody's and Standard & Poor's), which are not led (contaminated) by rating actions (rating and outlook changes) by any of the three rating agencies, in the twenty trading days prior to their official announcements. The three instrumental variables (IVs) chosen in Table 4, Panel C are used: (a) the *landlocked* indicator variable which takes the value of 1 if the country is surrounded by land and 0 otherwise; (b) and (c) are the country's *Ethnicity fractionalization* and *Religion fractionalization*, respectively, which take values between 0 and 1, from Alesina, Devleeschauwer, Easterly, Kurlat, and Wacziarg, (2003). In Panel A, the dependent variable is the *CAFXR* divided by the standard deviation of FX excess returns in the estimation period (i.e. thus constructing an information ratio) and the independent variable is the *TI index*. Panels B and C show results using dependent variables as the mean adjusted *CAFXR* on alternative measures of institutional quality. Panel B uses the Emerging/Developed classification from the World Bank (with same IVs as Panel A; chosen in a similar fashion to Table 4, panel B) and Panel C uses the PRS law and order score (with same IVs except *landlocked*; chosen in a similar fashion to Table 4, panel B). Panel D reports TSLS regressions of mean adjusted *CAFXR* on *TI index* (Table 4, panel C) and the *NIG* variable (*NIG*=1 if rating after downgrade is non-investment grade and 0 otherwise). Panel E uses the full scale of ratings instead of *NIG* as a control variable. Panel F uses *TI index* and the liquidity variable (Corwin and Schultz, 2012) as a control (higher value implies lower liquidity). The following outputs are reported: the regressions "Coefficient" and the robust z-value and *p*-value of the regression coefficient (regression's constant is not shown). UID stands for under-identification test, OID stands for the over-identification test, and WID is the weak-identification tests. Furthermore, the Stock-Yogo weak identification test critical values that correspond to the relative bias and size of the IVs (10% maximal values). Statistical significance (SS) is shown at the 1%, 5%, and 10% levels, using ***, **, and *, respectively.

Panel A: TSLS (second stage) regression of pre-event FX market reaction (information ratio) on *TI index*.

| <i>n</i> =195 Institutional Quality | <i>CAFXR</i> [-10, -3] | | | | <i>CAFXR</i> [-20, -3] | | | |
|---|------------------------|---------|-----------------|-----|------------------------|---------|-----------------|-----|
| | Coefficient | z-value | <i>p</i> -value | SS | Coefficient | z-value | <i>p</i> -value | SS |
| <i>TI index</i> | 0.5271 | 1.750 | 0.081 | * | 0.7977 | 1.820 | 0.069 | * |
| Test statistics | | | | | | | | |
| UID (Kleibergen-Paap rk LM statistic) | | 38.920 | 0.000 | *** | | 38.920 | 0.000 | *** |
| OID (Hansen <i>J</i> -statistic) | | 3.484 | 0.175 | | | 0.639 | 0.727 | |
| WID (Kleibergen-Paap rk Wald <i>F</i> -statistic) | | 37.442 | | | | 37.442 | | |
| WID (Cragg-Donald Wald <i>F</i> -statistic) | | 24.079 | | | | 24.079 | | |
| Stock-Yogo WID 10% relative bias | | 9.080 | | | | 9.080 | | |
| Stock-Yogo WID 10% size | | 22.300 | | | | 22.300 | | |

Panel B: TSLS (second stage) regression of pre-event FX market reaction on institutional quality (World Bank classification)

| <i>n</i> =195 Institutional Quality | CAFXR[-10, -3] | | | | CAFXR[-20, -3] | | | |
|---|-----------------|-------------|-------------|---------|-----------------|-------------|-------------|---------|
| | Coefficien t | z- value | p- value | SS | Coefficien t | z- value | p- value | SS |
| <i>Emerging/Frontier</i> | -0.0230 | -2.760 | 0.006 | ** * | -0.0295 | -2.340 | 0.019 | ** |
| Test statistics | | | | | | | | |
| UID (Kleibergen-Paap rk LM statistic) | | 43.14 | | ** * | | 43.14 | | ** * |
| | | 8 | 0.000 | | | 8 | 0.000 | |
| OID (Hansen <i>J</i> -statistic) | | 1.644 | 0.439 | | | 0.175 | 0.916 | |
| WID (Kleibergen-Paap rk Wald <i>F</i> - statistic) | | 35.04 | | | | 35.04 | | |
| | | 7 | | | | 7 | | |
| WID (Cragg-Donald Wald <i>F</i> -statistic) | | 32.72 | | | | 32.72 | | |
| | | 4 | | | | 4 | | |
| Stock-Yogo WID 10% relative bias | | 9.080 | | | | 9.080 | | |
| Stock-Yogo WID 10% size | | 22.30 | | | | 22.30 | | |
| | | 0 | | | | 0 | | |

Panel C: TSLS (second stage) regression of pre-event FX market reaction on institutional quality (PRS Law and Order)

| <i>n</i> =191 Institutional Quality | CAFXR[-10, -3] | | | | CAFXR[-20, -3] | | | |
|---|-----------------|-------------|-------------|---------|-----------------|-------------|-------------|---------|
| | Coefficien t | z- value | p- value | SS | Coefficien t | z- value | p- value | SS |
| <i>PRS Law and Order</i> | 0.0054 | 1.760 | 0.078 | * | 0.0093 | 1.980 | 0.048 | ** |
| Test statistics | | | | | | | | |
| UID (Kleibergen-Paap rk LM statistic) | | 38.92 | | ** * | | 38.92 | | ** * |
| | | 0 | 0.000 | | | 0 | 0.000 | |
| OID (Hansen <i>J</i> -statistic) | | 1.404 | 0.236 | | | 0.001 | 0.976 | |
| WID (Kleibergen-Paap rk Wald <i>F</i> - statistic) | | 54.40 | | | | 54.40 | | |
| | | 0 | | | | 0 | | |
| WID (Cragg-Donald Wald <i>F</i> -statistic) | | 34.84 | | | | 34.84 | | |
| | | 8 | | | | 8 | | |
| Stock-Yogo WID 10% relative bias | | - | | | | - | | |
| Stock-Yogo WID 10% size | | 19.93 | | | | 19.93 | | |
| | | 0 | | | | 0 | | |

Panel D: TSLS (second stage) regression of pre-event FX market reaction on TI index and major rating (NIG) classification.

| <i>n</i> =195 Institutional Quality | CAFXR[-10, -3] | | | | CAFXR[-20, -3] | | | |
|---|-----------------|-------------|-------------|----|-----------------|-------------|-------------|----|
| | Coefficien t | z- value | p- value | SS | Coefficien t | z- value | p- value | SS |
| <i>TI index</i> | 0.0066 | 2.510 | 0.012 | ** | 0.0074 | 1.950 | 0.051 | * |
| <i>NIG</i> | -0.0132 | -1.510 | 0.131 | | -0.0101 | -0.860 | 0.390 | |
| Test statistics | | | | | | | | |
| UID (Kleibergen-Paap rk LM statistic) | | 35.58 | | ** | | 35.58 | | ** |
| | | 3 | 0.000 | * | | 3 | 0.000 | * |
| OID (Hansen J-statistic) | | 1.370 | 0.504 | | | 0.073 | 0.964 | |
| WID (Kleibergen-Paap rk Wald F-statistic) | | 19.32 | | | | 19.32 | | |
| | | 9 | | | | 9 | | |
| WID (Cragg-Donald Wald F-statistic) | | 14.55 | | | | 14.55 | | |
| | | 8 | | | | 8 | | |
| Stock-Yogo WID 10% relative bias | | 9.080 | | | | 9.080 | | |
| Stock-Yogo WID 10% size | | 22.30 | | | | 22.30 | | |
| | | 0 | | | | 0 | | |

Panel E: TSLS (second stage) regression of pre-event FX market reaction on TI index and all Rating classification.

| <i>n</i> =195 Institutional Quality | CAFXR[-10, -3] | | | | CAFXR[-20, -3] | | | |
|---|-----------------|-------------|-------------|----|-----------------|-------------|-------------|----|
| | Coefficien t | z- value | p- value | SS | Coefficien t | z- value | p- value | SS |
| <i>TI index</i> | 0.0094 | 2.680 | 0.007 | ** | 0.0106 | 2.060 | 0.039 | ** |
| <i>Rating</i> | 0.0024 | 2.200 | 0.028 | ** | 0.0025 | 1.600 | 0.111 | ** |
| Test statistics | | | | | | | | |
| UID (Kleibergen-Paap rk LM statistic) | | 25.72 | | ** | | 25.72 | | ** |
| | | 6 | 0.000 | * | | 6 | 0.000 | * |
| OID (Hansen J-statistic) | | 0.939 | 0.625 | | | 0.237 | 0.881 | |
| WID (Kleibergen-Paap rk Wald F-statistic) | | 12.42 | | | | 12.42 | | |
| | | 9 | | | | 9 | | |
| WID (Cragg-Donald Wald F-statistic) | | 9.488 | | | | 9.488 | | |
| Stock-Yogo WID 10% relative bias | | 9.080 | | | | 9.080 | | |
| Stock-Yogo WID 10% size | | 22.30 | | | | 22.30 | | |
| | | 0 | | | | 0 | | |

Panel F: TSLS (second stage) regression of pre-event FX market reaction on TI index and liquidity

| <i>n</i> =122 Institutional Quality | <i>CAFXR</i> [-10, -3] | | | | <i>CAFXR</i> [-20, -3] | | | |
|---|------------------------|---------------------|---------------------|----|------------------------|---------------------|---------------------|---------|
| | Coefficien t | <i>z</i> - value | <i>p</i> - value | SS | Coefficien t | <i>z</i> - value | <i>p</i> - value | SS |
| <i>TI index</i> | 0.0041 | 1.890 | 0.059 | * | 0.0059 | 1.680 | 0.093 | * |
| <i>Liquidity</i> | 0.0043 | 0.680 | 0.495 | | 0.0410 | 3.270 | 0.001 | ** * |
| Test statistics | | | | | | | | |
| UID (Kleibergen-Paap rk <i>LM</i> statistic) | | 35.71 | | ** | | 35.71 | | ** |
| | | 7 | 0.000 | * | | 7 | 0.000 | * |
| OID (Hansen <i>J</i> -statistic) | | 2.805 | 0.246 | | | 0.112 | 0.946 | |
| WID (Kleibergen-Paap rk Wald <i>F</i> - statistic) | | 48.68 | | | | 48.68 | | |
| | | 1 | | | | 1 | | |
| WID (Cragg-Donald Wald <i>F</i> -statistic) | | 18.75 | | | | 18.75 | | |
| | | 0 | | | | 0 | | |
| Stock-Yogo WID 10% relative bias | | 9.080 | | | | 9.080 | | |
| Stock-Yogo WID 10% size | | 22.30 | | | | 22.30 | | |
| | | 0 | | | | 0 | | |

Table OA-4

Abnormal FX returns (low *TI* downgrades) conditional on Sovereign Downgrade News (*SDN*; rumors), using sample of rating and outlook changes.

This table presents cumulative average abnormal FX returns (*CAAFXR*; baseline) for the event windows specified, before, at, after and around the announcement of sovereign debt rating downgrades (low *TI*, ratings FM sample) conditional on *SDN*. *CAAFXRs* are mean-adjusted FX returns (raw FX returns are relative to the USD; winsorized at the 1st and 99th percentiles). The sample comprises rating and outlook changes. FM rating changes comprise the union of all rating changes by the three rating agencies (Fitch, Moody's and Standard & Poor's), which are not led (contaminated) by rating actions (rating and outlook changes) by any of the three rating agencies, in the twenty trading days prior to their official announcements. The *SDN* (Sovereign Downgrade News) indicator variable is assigned the value of one when there is at least one news item relevant to the downgrade before the announcement and zero otherwise. Results are shown separately for *SDN* = 0 ($n = 147$) and *SDN* = 1 ($n = 43$). Relative Day is the trading day relative to the day 0. *p*-values are based on the Kolari and Pynnonen (2010) approach. ***, **, and * denote statistical significance (SS) at the 1%, 5%, and 10% level, respectively.

| Event Window | <i>SDN</i> = 0 (no rumors; $n = 147$) | | | <i>SDN</i> = 1 (rumors; $n=43$) | | |
|---|--|-----------------|-----|----------------------------------|-----------------|----|
| | <i>CAAFXR</i> | <i>p</i> -value | SS | <i>CAAFXR</i> | <i>p</i> -value | SS |
| Cumulative average abnormal (mean adjusted) FX returns (<i>CAAFXRs</i>) for rating and outlook changes. | | | | | | |
| Pre-event: | | | | | | |
| (-20,-3) | -0.541% | 0.019 | ** | -1.445% | 0.014 | ** |
| (-10,-3) | -0.372% | 0.016 | ** | -1.046% | 0.012 | ** |
| (-5,-3) | -0.055% | 0.199 | | -0.402% | 0.067 | * |
| At the event: | | | | | | |
| (0,+1) | -0.221% | 0.100 | * | 0.042% | 0.530 | |
| (-1,+1) | -0.269% | 0.013 | ** | 0.243% | 0.607 | |
| After the event: | | | | | | |
| (+2,+5) | 0.017% | 0.830 | | -0.041% | 0.768 | |
| (+2,+10) | 0.018% | 0.640 | | 0.237% | 0.888 | |
| (+2,+20) | -0.528% | 0.187 | | 0.212% | 0.789 | |
| Around the event: | | | | | | |
| (-5,+5) | -0.274% | 0.027 | ** | -0.237% | 0.180 | |
| (-10,+10) | -0.589% | 0.005 | *** | -0.603% | 0.031 | ** |
| (-20,+20) | -1.305% | 0.063 | * | -1.027% | 0.052 | * |

Table OA-5

Abnormal TRMI Buzz and Sentiment (low *TI* downgrades) conditional on Sovereign Downgrade News (*SDN*; rumors) using sample of rating and outlook changes.

This table presents event studies of sovereign debt rating downgrades and outlooks on two daily variables: *TRMI Buzz (log)*, and *TRMI Sentiment*. TRMI stands for Thomson Reuters MarketPsych Indices. *Buzz* measures the frequency of news related to the country of interest. *Sentiment* is a multi-dimensional, normalized index capturing macro-related, political and other news that affect Sentiment. The *SDN* (Sovereign Downgrade News) indicator variable is assigned the value of one when there is at least one news item relevant to the downgrade before the announcement and zero otherwise. Results are shown for low *TI* events split in subsamples with *SDN* = 0 and *SDN* = 1 for the FM rating agency. FM rating changes comprise the union of all rating changes by the three rating agencies (Fitch, Moody's and Standard & Poor's), which are not led (contaminated) by rating actions (rating and outlook changes) by any of the three rating agencies, in the twenty trading days prior to their official announcements. Relative day is the trading day relative to the event day (day 0). Panel A shows the cumulative average abnormal index for the TRMI variables, *CAAI*, for news related to the downgraded country. Panel B shows the cumulative average abnormal index for the TRMI variables, *CAAI*, for news related to the US, since foreign exchange returns are measured relative to the US dollar. Sample size is denoted by *n*. *p*-values are based on the Koları and Pynnonen (2010) approach. ***, **, and * denote statistical significance (SS) at the 1%, 5%, and 10% level, respectively.

Panel A: Cumulative average abnormal TRMIs (CAAI) for downgraded country, for sample of rating and outlook changes.

| Event window | <i>SDN = 0 (No Rumors; n=104)</i> | | | | | | <i>SDN = 1 (Rumors; n=35)</i> | | | | | |
|-------------------|-----------------------------------|----------------|-----|-------------------------------|----------------|-----|-------------------------------|----------------|----|-------------------------------|----------------|-----|
| | <i>TRMI Buzz (local)</i> | | | <i>TRMI Sentiment (local)</i> | | | <i>TRMI Buzz (local)</i> | | | <i>TRMI Sentiment (local)</i> | | |
| | <i>CAAI</i> | <i>p-value</i> | SS | <i>CAAI</i> | <i>p-value</i> | SS | <i>CAAI</i> | <i>p-value</i> | SS | <i>CAAI</i> | <i>p-value</i> | SS |
| Pre-event: | | | | | | | | | | | | |
| (-20,-3) | -0.979 | 0.440 | | -0.109 | 0.340 | | -0.340 | 0.716 | | -0.122 | 0.620 | |
| (-10,-3) | -0.276 | 0.763 | | -0.067 | 0.180 | | 0.191 | 0.898 | | -0.006 | 0.880 | |
| (-5,-3) | 0.055 | 0.707 | | -0.033 | 0.159 | | 0.152 | 0.950 | | 0.000 | 0.918 | |
| At the event: | | | | | | | | | | | | |
| (0,+1) | 0.578 | 0.007 | *** | -0.083 | 0.001 | *** | 0.653 | 0.122 | | -0.095 | 0.000 | *** |
| (-1,+1) | 0.613 | 0.052 | * | -0.097 | 0.003 | *** | 0.942 | 0.106 | | -0.111 | 0.016 | ** |
| After the event: | | | | | | | | | | | | |
| (+2,+5) | 0.325 | 0.358 | | 0.007 | 0.551 | | 0.356 | 0.684 | | 0.007 | 0.960 | |
| (+2,+10) | 0.253 | 0.726 | | -0.019 | 0.690 | | 0.538 | 0.747 | | 0.013 | 0.891 | |
| (+2,+20) | 1.256 | 0.427 | | -0.027 | 0.925 | | -0.614 | 0.589 | | 0.097 | 0.697 | |
| Around the event: | | | | | | | | | | | | |
| (-5,+5) | 1.118 | 0.187 | | -0.145 | 0.028 | ** | 1.608 | 0.395 | | -0.129 | 0.333 | |
| (-10,+10) | 0.714 | 0.619 | | -0.205 | 0.103 | | 1.829 | 0.591 | | -0.128 | 0.595 | |
| (-20,+20) | 1.015 | 0.681 | | -0.254 | 0.374 | | 0.147 | 0.850 | | -0.161 | 0.773 | |

Panel B: Cumulative average abnormal TRMIs (CAAI) for US, for sample of rating and outlook changes.

| Event window | <i>SDN = 0 (No Rumors; n=132)</i> | | | | | | <i>SDN = 1 (Rumors; n=36)</i> | | | | | |
|--------------------------|-----------------------------------|----------------|-----------|--------------------------|----------------|-----------|-------------------------------|----------------|-----------|--------------------------|----------------|-----------|
| | <i>TRMI Buzz US</i> | | | <i>TRMI Sentiment US</i> | | | <i>TRMI Buzz US</i> | | | <i>TRMI Sentiment US</i> | | |
| | <i>CAAI</i> | <i>p-value</i> | <i>SS</i> | <i>CAAI</i> | <i>p-value</i> | <i>SS</i> | <i>CAAI</i> | <i>p-value</i> | <i>SS</i> | <i>CAAI</i> | <i>p-value</i> | <i>SS</i> |
| <i>Pre-event:</i> | | | | | | | | | | | | |
| (-20,-3) | -0.341 | 0.520 | | 0.027 | 0.562 | | 1.322 | 0.178 | | -0.105 | 0.165 | |
| (-10,-3) | -0.146 | 0.665 | | 0.020 | 0.422 | | 0.718 | 0.126 | | -0.026 | 0.543 | |
| (-5,-3) | -0.083 | 0.595 | | 0.014 | 0.137 | | 0.337 | 0.052 | * | -0.001 | 0.939 | |
| <i>At the event:</i> | | | | | | | | | | | | |
| (0,+1) | -0.008 | 0.906 | | -0.001 | 0.674 | | 0.093 | 0.494 | | -0.002 | 0.892 | |
| (-1,+1) | -0.002 | 0.940 | | -0.001 | 0.759 | | 0.168 | 0.393 | | -0.008 | 0.653 | |
| <i>After the event:</i> | | | | | | | | | | | | |
| (+2,+5) | -0.216 | 0.339 | | 0.011 | 0.421 | | 0.359 | 0.152 | | 0.006 | 0.819 | |
| (+2,+10) | -0.575 | 0.226 | | 0.016 | 0.557 | | 0.716 | 0.301 | | 0.014 | 0.838 | |
| (+2,+20) | -0.716 | 0.386 | | 0.047 | 0.459 | | 1.031 | 0.745 | | 0.067 | 0.532 | |
| <i>Around the event:</i> | | | | | | | | | | | | |
| (-5,+5) | -0.283 | 0.515 | | 0.029 | 0.394 | | 0.970 | 0.110 | | -0.016 | 0.760 | |
| (-10,+10) | -0.705 | 0.409 | | 0.040 | 0.534 | | 1.708 | 0.175 | | -0.034 | 0.734 | |
| (-20,+20) | -1.042 | 0.435 | | 0.078 | 0.508 | | 2.626 | 0.392 | | -0.059 | 0.722 | |

Table OA-6

Abnormal FX returns (adjusting for dollar risk, carry risk and local stock returns), conditional on Transparency Index (*TI*)

This table presents event studies of how sovereign debt downgrades affect foreign exchange (FX) returns conditional on the Corruption Perception Transparency Index (TI) score for the FM (first mover) rating agency. FM rating changes comprise the union of all rating changes by the three rating agencies (Fitch, Moody's and Standard & Poor's), which are not led by rating actions (rating and outlook changes) by any of the three rating agencies, in the twenty trading days prior to their official announcements. We report cumulative average abnormal foreign exchange return (*CAAFXR*) adjusted for dollar risk, carry risk, and local stock market returns. Sample size is denoted by *n*. *p*-values are based on the Kolari and Pynnonen (2010) approach. ***, **, and * denote statistical significance (SS) at the 1%, 5%, and 10% level, respectively. *CAAFXRs* are winsorized at the 1st and 99th percentiles.

| Event window | High <i>TI</i> (low corruption; n=72) | | | Low <i>TI</i> (high corruption; n=70) | | |
|--|---------------------------------------|-----------------|----|---------------------------------------|-----------------|----|
| | <i>CAAFXR</i> | <i>p</i> -value | SS | <i>CAAFXR</i> | <i>p</i> -value | SS |
| Panel A: <i>CAAFXRs</i> conditional on <i>TI</i> score (only rating changes) | | | | | | |
| Pre-event: | | | | | | |
| (-20,-3) | 0.209% | 0.795 | | -0.677% | 0.123 | |
| (-10,-3) | -0.073% | 0.776 | | -0.648% | 0.036 | ** |
| (-5,-3) | -0.146% | 0.229 | | -0.172% | 0.216 | |
| At the event: | | | | | | |
| (0,+1) | -0.408% | 0.074 | * | -0.127% | 0.144 | |
| (-1,+1) | -0.609% | 0.093 | * | -0.042% | 0.112 | |
| After the event: | | | | | | |
| (+2,+5) | -0.043% | 0.360 | | -0.045% | 0.411 | |
| (+2,+10) | -0.382% | 0.244 | | 0.221% | 0.278 | |
| (+2,+20) | 0.087% | 0.354 | | -0.405% | 0.291 | |
| Around the event: | | | | | | |
| (-5,+5) | -0.775% | 0.144 | | -0.288% | 0.113 | |
| (-10,+10) | -1.041% | 0.179 | | -0.498% | 0.101 | |
| (-20,+20) | -0.289% | 0.298 | | -1.152% | 0.186 | |

Table OA-7

Abnormal FX returns (low *TI* downgrades *without CDS data*) conditional on Sovereign Downgrade News (*SDN*; rumors)

This table presents cumulative average abnormal FX returns (*CAAFXR*; baseline) for the event windows before, at, after and around the announcement of sovereign debt rating downgrades (low *TI*, without traded *CDS* derivatives) conditional on *SDN* for the FM rating agency. *CAAFXR* are mean-adjusted FX returns (raw FX returns are relative to the USD; winsorized at the 1st and 99th percentiles). FM rating changes comprise the union of all rating changes by the three rating agencies (Fitch, Moody's and Standard & Poor's), which are not led (contaminated) by rating actions (rating and outlook changes) by any of the three rating agencies, in the twenty trading days prior to their official announcements. The *SDN* (Sovereign Downgrade News) indicator is assigned the value of one when there is at least one news item relevant to the downgrade before the announcement and zero otherwise. Panel A shows results for the sample of rating changes. Panel B shows results for the sample of rating and outlook changes. Results in both panels are shown separately for *SDN* = 0 and *SDN* = 1. Relative Day is the trading day relative to the day 0. *p*-values are based on the Kolari and Pynnonen (2010) approach. ***, **, and * denote statistical significance (SS) at the 1%, 5%, and 10% level, respectively.

| <i>Panel A: Cumulative average abnormal FX returns (CAAFXRs) for rating changes sample</i> | | | | | | |
|--|--|---------|-----|---------------------------------------|---------|----|
| Event Window | <i>SDN</i> = 0 (no rumors; <i>n</i> =53) | | | <i>SDN</i> = 1 (rumors; <i>n</i> =13) | | |
| | CAAFXR % | P-value | SS | CAAFXR % | P-value | SS |
| Pre-event: | | | | | | |
| (-20,-3) | -1.304% | 0.018 | ** | -2.275% | 0.324 | |
| (-10,-3) | -0.955% | 0.013 | ** | -1.942% | 0.176 | |
| (-5,-3) | -0.294% | 0.109 | | -0.627% | 0.199 | |
| At the event: | | | | | | |
| (0,+1) | -0.158% | 0.341 | | 0.849% | 0.183 | |
| (-1,+1) | -0.254% | 0.218 | | 1.268% | 0.679 | |
| After the event: | | | | | | |
| (+2,+5) | -0.199% | 0.205 | | 0.204% | 0.496 | |
| (+2,+10) | -0.096% | 0.349 | | 1.140% | 0.722 | |
| (+2,+20) | -0.904% | 0.240 | | 0.891% | 0.905 | |
| Around the event: | | | | | | |
| (-5,+5) | -0.609% | 0.032 | ** | 0.504% | 0.925 | |
| (-10,+10) | -1.167% | 0.010 | *** | 0.124% | 0.463 | |
| (-20,+20) | -2.324% | 0.120 | | -0.458% | 0.465 | |

Panel B: Cumulative average abnormal FX returns (CAAFXRs) for rating and outlook changes sample

| Event Window | <i>SDN = 0 (no rumors; n=84)</i> | | | <i>SDN = 1 (rumors; n=18)</i> | | |
|--------------------------|----------------------------------|----------------|-----------|-------------------------------|----------------|-----------|
| | <i>CAAFXR %</i> | <i>P-value</i> | <i>SS</i> | <i>CAAFXR %</i> | <i>P-value</i> | <i>SS</i> |
| <i>Pre-event:</i> | | | | | | |
| (-20,-3) | -0.857% | 0.022 | ** | -1.739% | 0.258 | |
| (-10,-3) | -0.671% | 0.016 | ** | -1.570% | 0.092 | * |
| (-5,-3) | -0.155% | 0.163 | | -0.498% | 0.195 | |
| <i>At the event:</i> | | | | | | |
| (0,+1) | -0.220% | 0.099 | * | 0.578% | 0.295 | |
| (-1,+1) | -0.341% | 0.029 | ** | 0.890% | 0.759 | |
| <i>After the event:</i> | | | | | | |
| (+2,+5) | 0.041% | 0.760 | | -0.169% | 0.648 | |
| (+2,+10) | -0.025% | 0.440 | | 0.659% | 0.930 | |
| (+2,+20) | -0.484% | 0.218 | | 0.680% | 0.851 | |
| <i>Around the event:</i> | | | | | | |
| (-5,+5) | -0.414% | 0.040 | ** | 0.045% | 0.480 | |
| (-10,+10) | -0.997% | 0.006 | *** | -0.198% | 0.258 | |
| (-20,+20) | -1.642% | 0.096 | * | -0.346% | 0.394 | |

Table OA-8 Daily abnormal fund flows returns conditional on Transparency Index (TI)

This table presents event studies of daily country equity fund flows around official sovereign debt downgrade announcements conditional on the Transparency Index (TI) score for the FM (first mover) rating agency. FM rating changes comprise the union of all rating changes by the three rating agencies (Fitch, Moody's and Standard & Poor's), which are not led by rating actions (rating and outlook changes) by any of the three rating agencies, in the twenty trading days prior to their announcements. We report cumulative average abnormal (mean-adjusted) equity fund flows (CAAEFF). Panel A (B) shows results for sample of rating (and outlook) changes. Sample size is denoted by *n*. *p*-values are based on the Kolari and Pynnonen (2010) approach. ***, **, and * denote statistical significance (SS) at the 1%, 5%, and 10% level, respectively.

| <i>Panel A: Mean-adjusted Fund Flows conditional on TI score (rating changes)</i> | | | | | | |
|---|--|-----------------|----|--|-----------------|----|
| Event window | High TI (low corruption; <i>n</i> =18) | | | Low TI (high corruption; <i>n</i> =21) | | |
| | CAAEFFs | <i>p</i> -value | SS | CAAEFFs | <i>p</i> -value | SS |
| Pre-event: | | | | | | |
| (-20,-3) | -0.0863 | 0.602 | | 0.013 | 0.631 | |
| (-10,-3) | 0.1683 | 0.332 | | 0.086 | 0.693 | |
| (-5,-3) | 0.1165 | 0.192 | | 0.128 | 0.735 | |
| At the event: | | | | | | |
| (0,+1) | -0.2745 | 0.241 | | -0.006 | 0.808 | |
| (-1,+1) | -0.2551 | 0.383 | | 0.013 | 0.690 | |
| After the event: | | | | | | |
| (+2,+5) | -0.1395 | 0.477 | | -0.026 | 0.435 | |
| (+2,+10) | -0.1589 | 0.839 | | -0.202 | 0.274 | |
| (+2,+20) | -0.2373 | 0.975 | | 0.015 | 0.511 | |
| Around the event: | | | | | | |
| (-5,+5) | -0.287 | 0.767 | | 0.097 | 0.840 | |
| (-10,+10) | -0.2545 | 0.973 | | -0.122 | 0.630 | |
| (-20,+20) | -0.5876 | 0.941 | | 0.023 | 0.576 | |
| <i>Panel B: Mean-adjusted Fund Flows conditional on TI score (rating and outlook changes)</i> | | | | | | |
| Event window | High TI (low corruption; <i>n</i> =52) | | | Low TI (high corruption; <i>n</i> =53) | | |
| | CAAEFFs | <i>p</i> -value | SS | CAAEFFs | <i>p</i> -value | SS |
| Pre-event: | | | | | | |
| (-20,-3) | -0.342 | 0.629 | | -0.202 | 0.697 | |
| (-10,-3) | -0.203 | 0.527 | | -0.006 | 0.419 | |
| (-5,-3) | -0.062 | 0.456 | | 0.085 | 0.333 | |
| At the event: | | | | | | |
| (0,+1) | -0.169 | 0.290 | | 0.011 | 0.906 | |
| (-1,+1) | -0.295 | 0.258 | | 0.040 | 0.470 | |
| After the event: | | | | | | |
| (+2,+5) | -0.123 | 0.480 | | 0.546 | 0.782 | |
| (+2,+10) | -0.387 | 0.202 | | 0.735 | 0.631 | |
| (+2,+20) | -0.482 | 0.551 | | 1.138 | 0.688 | |
| Around the event: | | | | | | |
| (-5,+5) | -0.525 | 0.203 | | 0.671 | 0.455 | |
| (-10,+10) | -0.929 | 0.182 | | 0.769 | 0.395 | |
| (-20,+20) | -1.164 | 0.368 | | 0.975 | 0.848 | |