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Sovereign Credit Ratings and Portfolio Investments in Emerging Economies

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Abstract:
In this paper, we are examining the potential effects on portfolio investments that result from changes in sovereign credit ratings within 14 emerging economies over the years 1994-2010. As previous literature indicates, a major factor in determining whether a country has access to capital is based on its sovereign credit risk, which takes into account a country's likelihood of defaulting on its foreign debt obligations. This paper examines past literature, explains our data collection methodology, applies various econometric techniques to estimate the impact of credit rating changes, and test different econometric theories to see whether they apply in these circumstances. Using data on sovereign credit ratings from Fitch Ratings and data on portfolio investments from the IMF, and utilizing primarily fixed effects and panel OLS estimation models, we find evidence of some responsiveness of portfolio investments to up- and downgrades in sovereign credit ratings.

Keywords*: Tomato diseases, Leaf images, Deep Learning, CNN, Pest Management.*

Introduction:

Markets rely on access to capital to function effectively. Savings, from both domestic and international investors, provides this necessary resource. Assuming free capital mobility, investors have an array of choices as to where to place their funds, all with varying risk. The primary means most investors use to make such a determination is an organization's credit rating. Sovereign credit ratings are the foundation for all credit ratings in a particular country, as the sovereign credit rating tends to be the highest in the country. As Reinhart (2002) states, "sovereign credit ratings play an important role in determining the terms and the extent to which a country will have access to international capital markets." More specifically, Emara (2012) finds that average annual long-term bond yields decrease by approximately 4.4% in response to an increase in a country's sovereign debt rating. This clearly affects a country's enterprises' ability to access capital markets – the enterprises' credit ratings – subsequently affecting the capital flows in and out of the country.

The importance of sovereign ratings is not newly realized. Significant research has been conducted in this field, which we have reviewed and adapted to develop our methodology for this paper. To estimate the effects of sovereign credit ratings on portfolio investments in countries, we are utilizing a panel of 14 emerging economies over the years 1994-2010. Following Gande and Parsley (2004), we look at potential asymmetries in portfolio responses to allow for different effects for sovereign credit downgrades versus upgrades. While Gande and Parsley (2004) looked at developed and developing countries, we look at emerging market economies since these economies tend to exhibit higher default risk - exposing portfolio investors to this risk. Biglaiser et al (2008) posit that because of this, investors in emerging markets are more likely to be responsive to

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the advice of credit rating agencies. Emara (2015) find evidence, using dynamic panel system GMM estimation for 23 emerging economies for the years 1990-2012, suggesting that sovereign credit ratings are essential for emerging economies' access to international capital markets. Thus, we might expect portfolio investments in emerging markets to be more sensitive to changes in these ratings.

Gande and Parsley (2004) use data from 85 countries, from 1996-2002, and find that sovereign credit rating changes are associated with substantial portfolio flows for the countries experiencing rating changes, i.e. the changes do represent new information to capital markets. They find that this effect is asymmetric – negative rating changes are associated with portfolio outflows, whereas positive rating changes do not seem to be associated with any significant portfolio flow changes. Gande and Parsley (2004) also find that the effects of sovereign credit rating changes depend on the level of corruption in the country experiencing the upgrade or downgrade. Less corrupt countries have smaller portfolio flow responses to credit rating events, and they are net recipients of capital inflows around downgrades *outside* of the country.

An obvious caveat to looking at changes in portfolio investments around the time of credit rating changes is that credit events are often times anticipated. For example, expectations are shaped by credit agencies' credit outlooks. Thus, capital flows and portfolio investments might already have adjusted by the time the credit rating event actually occurs. However, results from Gande and Parsley (2004), Froot and Ramadorai (2003), Froot, O'Connell and Seasholes (2001), and Gelos and Wei (2004), all show that there is in fact additional flow velocity post rating change, even if rating changes are anticipated in advance. Koerner and Trautwein's (2014) results confirm the significant role of sovereign ratings for bilateral portfolio investments.

Kim and Wu (2008) use a panel of 51 emerging economies over the years 1995-2003 to examine at the effects of sovereign credit ratings on financial sector development and capital flows. They find a significant effect, showing that long-term local currency ratings encourage growth in the domestic market, but discourage capital flows. Long-term foreign currency sovereign ratings, however, are important for both attracting capital flows and for financial intermediary development. This is consistent with economic theory, as the ability to repay debt denominated in foreign currency should matter more for foreign investors than the ability to repay local currency denominated debt – as this debt can be inflated away by the domestic government. Thus, foreign capital flows should respond more positively to upgrades in a country's ability to repay foreign currency denominated debt, as opposed to local currency denominated debt – which is why we are looking at foreign currency ratings in this study.

Economic theory would also dictate that the interest rate parity condition should hold. This theory states that once adjusting for risk and transaction costs, there should be no arbitrage opportunities across markets. In relation to capital flows, as sovereign credit ratings experience upgrades or downgrades, we should witness a movement of capital as the risk adjusted return changes. This explanation is a little superficial because risk is a continuous function that should be continuously evaluated and credit ratings are discrete, but we still expect a rating change to present discontinuities in flows.

"Portfolio investments are generally more volatile than traditional foreign investment, and more prone to flight in response to perceived risk," thus we would expect a large change in portfolio investment in response to sovereign debt rating changes. As extensively documented in economic literature (e.g. Calvo (1998)), changes in portfolio investments - for example related to a "sudden stop" - can cause a balance of payment crisis and subsequently a currency crisis, as in the case of Mexico during the so-called "Tequila Crisis". Thus, countries that are experiencing large unstable portfolio inflows

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following a credit upgrade ought to be careful not to rely on such inflows to cover current account deficits - as such portfolio investments are easily reversible - especially in the case of a credit downgrade or any other perceived risk increase. Hence, the responsiveness of portfolio investments to credit rating changes, as we are looking at here, is an important topic with regards to economic policy in countries prone to such events - especially emerging economies.

The organization of the following sections is: In section II, we present the particulars relating to data, while we present the methodology we employed for analyzing the correlation in section III. Section IV presents and elaborates the empirical results we obtain along with robustness checks. In section V we provide a thorough discussion on the results. And in section VI we present the conclusion, implications and recommendations.

II. Data

To conduct our empirical analysis, we gathered a time series dominant panel data set consisting of a cross-section of 14 emerging economies as part of a total of 42 countries, over the time series 1994-2010 (68 quarters). These specific countries are chosen for reasons we will address later. Information on net portfolio investments, recorded on a quarterly basis, was gathered from the IMF's International Financial Statistics database. Sovereign credit rating changes are from Fitch Ratings, where we utilize a dummy variable for each time a country's sovereign rating is downgraded and a separate dummy variable identifying an upgrade. This enables us to account for potential asymmetries in the portfolio investment response to credit rating downgrades and upgrades. As shown in Gande and Parsley (2004), Fitch, Moody's, and S&P follow each other closely, thus our choice of applying Fitch's ratings should not greatly influence our results.

Further, as there might be significant changes to portfolio flows in and out of a country when its debt rating is updated to investment grade from speculative grade (or vice versa), we include dummy variables for movements to and from investment grade to identify these potential flows. As several institutional investors (e.g. pension funds) are only allowed to hold investment grade debt in their portfolios, we would expect a more exaggerated change in portfolio investments for a country when its sovereign debt rating moves along this margin.

Following Gande and Parlsey (2004) who find significant differences in the effect of credit ratings depending on the level of corruption in the country, we are including a proxy for corruption – transparency – from Williams (2014). Transparency is rated on a scale from 0 to 100, and a higher level of the index corresponds to a higher level of transparency. We have chosen to rescale this index to 0-1 so that it follows a similar scale as the openness index, which we will discuss next.

When looking at the responsiveness of portfolio investments to sovereign credit upgrades or downgrades, it is natural to believe that the degree of capital mobility allowed in and out of a specific country will affect the range of possible outcomes for that country. Therefore, we have included the Chinn-Ito Financial Openness Index (KAOPEN) in our data set as a possible control variable. This index measures a country's degree of capital account openness – as introduced by Chinn and Ito (2006). KAOPEN is - as described by the authors - "the first principal component of variables pertaining to regulatory controls over current or capital transactions, the existence of multiple exchange rates, and the requirements of surrendering export proceeds." Rather than implementing separate controls for all the aforementioned economic conditions, we use KAOPEN since the authors have already proven correlation with all these factors. The KAOPEN index is normalized to a range between 0 and 1, where 0 refers to the strictest capital control regimes and 1 the most open regimes.

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To control for the size of the economy, we are using gross domestic product, measured in today's US dollar. We would expect increased portfolio flows when a country's economy grows, but it is worth noting that slower (or negative) growth increases the probability of default on sovereign debt, thereby increasing the probability of a credit downgrade. This could cause endogeneity problems, as reverse causation would be plausible. GDP data is acquired from the World Bank.

The largest limitation posed by our data selection is the inconsistent availability of observations across sources for our countries and years of interest. For example, the IMF has data dating back before 1994 and until 2015, but the data collected by Williams (2014) for the transparency index only contains data until 2010. Furthermore, Fitch reports credit ratings for different countries in different years, but the earliest free publically available data is from 1994. This creates discrepancies that must be addressed by our methodology. Looking at countries for which Fitch reported credit ratings, and to minimize omitted observations, we decide to examine only countries that the IMF has net flows data on from 1994 through 2010. This enables us to match annual transparency and openness scores to most quarterly observations. However, this creates a problem within years as the data on openness and transparency are constant over quarters, providing no variability within quarters that a regression can pick up on. We assert, however, that the transparency and openness indices do not change dramatically for countries across years. Since we are using them as control variables, this does not emerge as a major problem in our analysis because we are not interested in their direct effects. The result is a cross-section of 55 countries to work with.

Once identifying the 55 countries that have sovereign credit scores, net flow information from the IMF, a transparency index, and an openness index, we filter out countries that have no change in sovereign credit rating during the period of interest. We do this because there is nothing to regress our dependent variable on for these cases if we are looking at the impact of a change in credit rating (since there is no change). This leaves us with a cross section of 42 countries. Next, we identify those countries in our dataset that qualify as emerging markets per the IMF list of emerging economies. Of the 42 in our dataset, 14 qualify as emerging. We create a dummy variable to identify these economies as emerging so that we can do conditional regressions, but we do not eliminate the developed and underdeveloped economies in the event we want to use these for comparison later. Upon review of this finalized data set, it is worth noting that there are several emerging economies that have zeros for the value of portfolio investment for several periods. Specifically, these countries are India, Indonesia, and Ukraine. These observations may be outliers due to measurement error or as a result of a lack of openness in their capital accounts. We will test both possibilities during our regression analysis.

As alluded to previously, we create dummy variables for upgrades and a downgrades in credit ratings. Since we do not know the initial credit rating for all countries in 1994, we are forced to assume they correspond to the initial credit scores reported by Fitch after 1994. This means we must ignore the first reported value by Fitch and start examining changes for each country beginning with the first change in the Fitch ratings. In addition, by using a dummy variable, we ignore the magnitude of the credit change in that quarter (for example, applying our methodology, we cannot tell if a rating goes from AAA to AA versus AAA to B), and the potential difference in response (for example, the impact on portfolio flows by going from an A to AA versus B to BB). We do this for simplicity and to aggregate the number of credit events available to exploit. However, we do take into consideration the discrete jump from investment to speculative grade, and vice versa, as this is expected to have a particularly large effect on investment behavior. For

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example, most pension funds are required to hold only investment grade securities, thus a downgrade from BBB- to BB+ would be expected to have a much larger effect on portfolio investments than an equally sized credit change from AAA- to AA+. Consequently, we have included a dummy variable that captures the movements between investment and speculative grade, and estimate additional models with this change incorporated.

In the appendix (Table 1) we report the countries in our dataset, whether they are emerging or not, number of upgrades and downgrades in credit ratings from 1994-2010, as well as number of times the countries have moved along the margins of investment to speculative grade and vice versa.

III. Estimation Methodology

Our main question of interest is whether sovereign debt ratings influence portfolio flows. We are attempting to determine this through various econometric estimation techniques. We begin by estimating a short panel OLS model containing only portfolio flows regressed on the changes in sovereign debt ratings. We subsequently estimate panel OLS models with variables controlling for factors such as the openness of the economy, the size of the economy as measured by GDP, and transparency as a proxy for corruption. Then, we estimate fixed effects and random effects models, where - through utilization of the Hausman Test - we end up using the fixed effects model for our subsequent analyses.

Next, we introduce dynamic panel models with lagged variables of portfolio investments - to control for inertia in portfolio investments - as well as lagged variables of the upgrades and downgrades in credit ratings. We expect an upgrade in credit rating last quarter to have an impact (decrease in net portfolio holdings as investment returns from abroad) on this quarter's portfolio investments in a given country. We test lagged changes in flows because we would expect there to be a delay between the time an investor receives information, when they change their outlook, and the time it takes them to take action by reallocating capital. Since not all investments have the same liquidity, and because international transactions in emerging markets can often take greater time, we speculate that major portfolio changes may not be realized for one to two quarters after a credit rating change. On the contrary, there is reason to believe that due to expectations of a credit rating change, investors might proactively adjust their foreign holdings in anticipation of a rating change. This would be evidence of a market with perfect information that prices in expectations before changes occur. By applying a F-test of joint significance on the lagged variables, however, these lags are determined to be statistically insignificant - and we continue our analyses using only current values of upgrades and downgrades in sovereign debt ratings. Investors seem to respond instantaneously to rating changes. All of these models are estimated for emerging market economies only, but we relax this constraint in our sensitivity analysis later.

Our next model specification involves regressing portfolio investments on credit upgrades and downgrades while including dummy variables for time. This method controls for the average portfolio investment in any given quarter. Finally, we also estimate a model utilizing the percentage change in portfolio investments from quarter to quarter as the dependent variable, and compare the response in emerging markets to all countries in our sample.

To evaluate how robust our results are, we conduct a sensitivity analysis. Our first item of interest is to determine the robustness of model specification. Therefore, as an alternative specification, we estimate a General Method of Moments model. GMM models deal with both fixed effects and possible endogeneity issues through the use of instrumental variables. Because GMM models require the cross sections to be larger than the time series (N>T), we are truncating the data to include

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only the last 10 years (2000-2010), i.e. the last 40 quarters, while using all countries (42), for these estimations.

Additionally, we want to see whether our results hold up for developed and underdeveloped economies as well as emerging ones - thus we relax the restriction on countries included in our sample to also include all 42 countries on which we have data. Our suspicion is that we would see a smaller change in flows for developed countries, as there is less assumed default risk due to well established capital markets that are highly regulated. Additionally, the downgrades in these markets are likely to be at the higher end of the spectrum (i.e. from AAA to AA+), which we suspect would concern investors less. Conversely, we expect underdeveloped countries to have few foreign investors to begin with, with a low desire for individuals within the country to invest domestically, so we believe that credit changes in these countries would have little impact until the country is at least seen as an emerging economy.

The degree of home bias (i.e. an investor's preference for investing domestically) in a country might influence our results if it varies significantly across countries. Cooper and Kaplanis (1994) find that the degree of home bias differs depending on investors' willingness to bear risk, which differs between countries. Specifically, this pertains to a country's inflation and domestic market risk. However, when applying a fixed effects model, this should not be a problem, as we do not expect the level of home bias within a country to change significantly over the time period used in our sample. With a fixed effects model, unobserved time invariant variables - as we believe the level of home bias is - will be captured by the country specific dummy variables, canceling out any effect.

Due to data availability, we are utilizing net acquisitions of portfolio investments in US dollars as our dependent variable. Thus, we expect a decrease (increase) in this variable to be associated with a credit upgrade (downgrade) in a given country. A sovereign credit upgrade (downgrade) would incentivise inflows (outflows) of portfolio investments, which would decrease (increase) a country's net acquisition of portfolio investments. This brings up certain issues. We are not taking into consideration how credit ratings events *outside* of a country might influence the portfolio flows to and from that country. For example, even if no rating changes happened for a given country, X, during a time frame, there still might still be inflows (outflows) to (from) country X caused by other countries that experienced credit downgrades (upgrades) during this time frame. In other words, we are not looking at relative credit ratings, which might be more important than pure rating changes.

The main models used in our estimations are outlined below.

Short Panel OLS:

$$\widehat{portfolio\ investment}_{i,t} = \hat{\beta}_0 + \hat{\beta}_1 ratingupgrade_{i,t} + \hat{\beta}_2 ratingdowngrade_{i,t} + \varepsilon_{i,t}$$

Pooled OLS model:

$$\widehat{portfolio\ investment}_{i,t} = \hat{\beta}_0 + \hat{\beta}_1 ratingupgrade_{i,t} + \hat{\beta}_2 ratingdowngrade_{i,t} + \hat{\beta}_3 KAOPEN_{i,t} + \hat{\beta}_4 transparencyscore_{i,t} + \hat{\beta}_5 GDP_{i,t} + \varepsilon_{i,t}$$

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Fixed effects model:

$$\widehat{portfolio\ investment}_{i,t} = \hat{\beta}_0 + \hat{\beta}_1 ratingupgrade_{i,t} + \hat{\beta}_2 ratingdowngrade_{i,t} + \hat{\beta}_3 KAOPEN_{i,t} + \hat{\beta}_4 transparencyscore_{i,t} + \hat{\beta}_5 GDP_{i,t} + \hat{\alpha}_1 D_1 + \cdots + \hat{\alpha}_{N-1} D_{N-1} + \varepsilon_{i,t}$$

Random effects model:

$$(\widehat{portfolio\ investment}_{i,t} - \theta\ \overline{portfolio\ investment_i}) = \hat{\beta}_0(1-\theta) + \hat{\beta}_1(ratingupgrade_{i,t} - \theta\ \overline{ratingupgrade_i}) + \hat{\beta}_2(ratingdowngrade_{i,t} - \theta\ \overline{ratingdowngrade_i}) + \hat{\beta}_3\ (KAOPEN_{i,t} - \theta\ \overline{KAOPEN_i}) + \hat{\beta}_4(transparencyscore_{i,t} - \theta\ \overline{transparencyscore_i}) + \hat{\beta}_5(GDP_{i,t} - \theta\ \overline{GDP_i}) + (\hat{w}_{i,t} - \theta\ \overline{w}_i)$$

$\theta \in [0,1]$ $\qquad w_{i,t} = \alpha_i + \varepsilon_{i,t}$

where for all above models t = 1994Q1, …, 2010Q4; i = 1, …, N,

where N=14 for emerging economies and 42 for the full sample size.

Time fixed effects:

$$\widehat{portfolio\ investment}_{i,t} = \hat{\beta}_0 + \hat{\beta}_1 ratingupgrade_{i,t} + \hat{\beta}_2 ratingdowngrade_{i,t} + \hat{\alpha}_1 Q_1 + \cdots + \hat{\alpha}_{t-1} Q_{t-1} + \varepsilon_{i,t}$$

Time fixed effects with dependent variable as percentage change in portfolio investments:

$$\%\ change\ in\ \widehat{portfolio\ investment}_{i,t} = \hat{\beta}_0 + \hat{\beta}_1 ratingupgrade_{i,t} + \hat{\beta}_2 ratingdowngrade_{i,t} + \hat{\alpha}_1 Q_1 + \cdots + \hat{\alpha}_{t-1} Q_{t-1} + \varepsilon_{i,t}$$

where for the two above models t = 1994Q1, …, 2010Q4; i = 1, …, N, where N=14 for emerging economies and 42 for the full sample size. Here, Q is a dummy for quarter.

The different estimation methodologies applied to these models are described above, where different types of sample sizes (emerging economies exclusively versus the full sample size) are applied, fixed and random effects estimations are utilized as outlined, time fixed effects and lagged variables are included in some estimations, and GMM methodologies are applied where lagged upgrades and downgrades are used. As described above, for our GMM models t=2000,…,2010.

IV. Analysis of Results

We start our analysis by estimating a simple panel OLS model, where we regress portfolio investments on sovereign debt upgrades and downgrades in the period, for emerging markets only. Such an estimation gives insignificant results at all conventional significance levels. We then reestimate the same panel OLS models, controlling for KAOPEN, transparency score, and GDP. Again, the sovereign debt upgrades and downgrades are insignificant in explaining portfolio investments, but the coefficient on GDP is positive, and significant at the 5% significance level. We are utilizing clustered standard errors, which correct for both serial correlation and heteroskedasticity.

Further, we estimate fixed and random effects models for emerging economies. A Hausman Test is performed, in which we reject the null hypothesis that the random effects assumptions (individual specific effects are uncorrelated with the independent variables) hold, and thus continue our

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analysis using a fixed effects model. A simple fixed effects estimation gives us statistically significant results at the 10% significance level for both upgrades and downgrades in sovereign credit ratings, with the expected signs: negative and positive, respectively. A sovereign credit upgrade is associated with a 421,000,000 dollar decrease in a country's net portfolio investments, and a downgrade is associated with a 732,000,000 increase in a country's net portfolio investments - ceteris paribus. The R-squared - i.e. the percent of the variation in portfolio investments that is explained by our model is very low, 0.59%, for this simple model. A fixed effects model controlling for KAOPEN, transparency score, and GDP is therefore estimated, which also gives significant coefficients at the 10% levels for upgrades and downgrades. GDP is then significant at the 1% level, as expected. Ceteris paribus, our estimation results suggest that a sovereign credit rating upgrade is associated with a 409,000,000 decrease in a country's net portfolio investments, whereas a rating downgrade is associated with a 632,000,000 increase in the same variable. The R-squared for this model is 3.56%. Additionally, we estimate fixed effects models using lags of both upgrades and downgrades in credit ratings, as well as lags for portfolio investments, but joint F-tests of these lags - separately for lags of portfolio investments and lags of changes in credit ratings - lead us to fail to reject the null hypothesis that they are (jointly) insignificant in explaining the current period's portfolio investments. We therefore exclude such lags from our model.

We now estimate a panel OLS model while including dummy variables for each time period. As mentioned previously, this allows us to adjust for the average portfolio investment in the economy during any given quarter. This gives us statistically significant results for credit upgrades at the 5% significance level for both emerging economies and other economies in our dataset. Again, the R-squared for these results are substantially higher than any of our other models (11.2% for the model including only emerging economies), but this stems from the high within variation caused by our time fixed effect dummies. These findings are expected, because a decent portion of the explained variation in our data should be due to the growth of the global economy and increases/decreases in overall global portfolio flows from quarter to quarter. The results prove to be rich to both the emerging economies and the other economies in our data set. Surprisingly, using this model specification, credit downgrades are not statistically significant in explaining portfolio investments. Holding all other included variables constant, a credit upgrade is associated with a 489,000,000 dollar decrease in a country's net portfolio investments for emerging economies. Estimation of the same model for all countries in our data set gives results suggesting that a credit upgrade is associated with a 653,000,000 dollar decrease in portfolio investments. When including lagged up- and downgrades as well as control variables for openness of the economy and for transparency in this model, we find none of these control variables statistically significant - neither individually nor jointly.

Finding this specification relevant, we attempted one more transformation of our model by calculating the percent change from quarter to quarter of our dependent variable - portfolio investments. A regression of percent change in portfolio investments on credit upgrades and downgrades, while controlling for time fixed effects, produces statistically significant results at the five percent level for credit upgrades. The outcome shows that, for emerging economies, an upgrade results in just over a 200% decrease in net portfolio investment in that quarter, ceteris paribus. We find that no other controls are significant, nor are lags. The overall R-squared for this estimated model is 9.58%. Furthermore, these results do not hold up when including all countries in our sample.

As we are interested in examining the external validity of our model, we apply similar regressions

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to all countries in our sample - i.e. not just for emerging economies. This gives consistent results. It is worth noting, however, that when estimating a simple fixed effects model, the effect of a credit downgrade seems to be negative, rather than positive as we would expected, and is significant at the 10% level. This is surprising; it differs from what both theory and economic literature on the topic would suggest, and also differs from the results we got for emerging economies.

Additionally, we look at the effect on portfolio investments of movements between ratings of investment and speculative grades. For reasons presented earlier, we believe this to have a larger effect on portfolio investments than any other upgrades and downgrades. However, our results show insignificant effects on portfolio investments for credit rating movements along this margin. As there is very little variation in our data for these variables - i.e. few countries moved between speculative and investment grade over the time period covered - insignificant effects might not be surprising. There is not enough variation to exploit in the data.

We expect endogeneity problems to be present in our model, as credit rating changes would not only affect portfolio investments, but the reverse is also likely to be true. Therefore, we perform system and difference general method of moments analyses, where we use rating events as well as KAOPEN and GDP as endogenous variables in our analysis. Additionally, we introduce lagged credit upgrades and downgrades as endogenous explanatory variables; credit upgrade or downgrade in the previous quarter(s) are utilized to explain portfolio investments in the current quarter. Both the difference and the system GMM gives us Arellano-Bond test results as follows: We reject the null hypothesis of no autocorrelation of order 1 at the 5% significance level, and fail to reject the null hypothesis of no autocorrelation of order 2 at any conventional significance levels. In other words, we have autocorrelation of order one, but not of order two. These are the results we would want, as we can use the second lags as instruments, because these seem to be exogenous. The results from the Sargan-Hansen test for overidentification restrictions (robust) leads us to fail to reject the null hypotheses (for both GMM models) that the model and overidentification conditions are correctly specified. Therefore, our instruments are acceptable. The results from estimation of the difference GMM model do not give statistically significant coefficients on any of our variables of interest, but the system GMM suggests that a country's upgrade in credit rating is associated with - ceteris paribus - a decrease of 653,000,000 dollar in portfolio investments. This is statistically significant at the 5% significance level.

Finally, we perform a sensitivity analysis by estimating fixed effects models for emerging economies while excluding India, Indonesia and Ukraine - as explained in the data section. Doing so gives statistically significant coefficients for both upgrades and downgrades in sovereign credit ratings, as well as the expected signs: negative and positive, respectively. Our results do not seem to be influenced by potential data issues with these three countries, and the R-squared is similar in magnitude to our main models.

Our estimation results for all models are reported in Table 2 and Table 3 in the appendix.

V. Discussion

Our results are consistent with economic theory as well as the literature on the topic. Upgrades and downgrades in sovereign credit ratings do in fact influence portfolio investments in a given country, and in the direction one would expect. However, we discuss several limitations and potential biases with our results below.

We previously discussed several issues in our methodology section, e.g. relative versus absolute

rating changes. If other countries are experiencing credit upgrades, the country in question is experiencing a relative credit downgrade. However, this will not be accounted for in our data. Another concern which might influence our results is that we are not taking into consideration spillover effects - e.g. if country A is experiencing a credit upgrade, this might positively influence portfolio investments to country B if these countries are related in some way. Emara (2015) looked at contagion and capital flows to emerging markets, and found results suggesting that changes in sovereign credit ratings for one country could influence capital flows to another country. Additionally, contagion was also found in Latin America, by Calvo, Leiderman, and Reinhart (1993), where the authors argue that "conditions outside the region" were responsible for capital flows to the countries at the time. Such interconnectedness and global contagion is not accounted for in our data set and methodology.

Further, expectations, e.g. rating outlooks by rating agencies, are not taken into account in our analysis. One would expect that portfolio flows might change before a rating upgrade or downgrade, as investors gauge risk levels and also look at rating agencies' rating outlooks. This would only make our results underestimates of the effect of sovereign debt ratings on portfolio investments, thus creating a lower bound for what we can say the effect is. Additionally, as stated in our literature review, results from Gande and Parsley (2004), Froot and Ramadorai (2003), Froot, O'Connell and Seasholes (2001), and Gelos and Wei (2004) show that there are in fact additional portfolio flows after a rating change, even if rating changes are anticipated in advance. In addition to this pointing to the fact that investors do react to rating changes, such results could also be due to a large amount of passive institutional investors moving capital automatically as ratings change. In this instance, rating outlooks and expectations would not have an impact, as they would on active investors. Either way, this adds validity to our results.

Endogeneity is an obvious issue in our model. If the direction of causality is instead from portfolio investments to credit rating changes, our estimated coefficients will be biased. A fixed effects model requires exogeneity, but this problem is somewhat mitigated by a long time series, which we have in our model. Similarly, if an omitted variable - such as a political event - is causing both the rating change and the portfolio investments, our estimates will again be biased. To allow for both endogeneity and fixed effects in our model, we estimated general method of moments models, as explained in our methodology and results sections. However, this produced statistically insignificant results for many of our variables of interest. This alludes to larger endogeneity problems in our fixed effects and OLS models than we might have expected, thus - although our results are consistent with the literature on the topic - when one is interpreting our results it is important to keep these issues in mind. However, as stated under "Analysis of Results", when using a system GMM model - a credit upgrade was statistically significant in explaining portfolio investments - consistent with our results from the fixed effects estimations.

When considering our final model with time dummies and using the percentage change in portfolio investments as our dependent variable, we conclude that our results are significant only for emerging economies. We believe that might be because of the smaller magnitude of portfolio investments relative to developed countries and their increased volatility due to their emerging status. We expect countries on the fringe of development to have lower overall credit ratings and for these ratings to influence investors more greatly. Furthermore, since net portfolio investment is lower for most emerging economies, a change of equal magnitude as a developed country is a much larger percent change an emerging country. This helps to explain the strong statistically significant results we find for percent changes in net portfolio investments for upgrades in emerging countries.

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CONCLUSION:

In this paper, we are estimating effects of up- and downgrades of sovereign credit ratings on portfolio investments for 14 emerging economies over the years 1994-2010. Previous literature suggests that a crucial factor in determining whether a country has access to capital is its sovereign credit rating - taking into account the country's probability of defaulting or restructuring its debt obligations. Thus, a country's portfolio investments should be affected by its sovereign credit rating - as this rating is the basis for all other credit ratings within a country. We utilize data on sovereign credit ratings from Fitch Ratings and data on portfolio investments from the IMF, and - consistent with the literature - we find evidence of some responsiveness of portfolio investments to changes in sovereign credit ratings. The responses are of the expected signs, as we find that a country's sovereign credit rating upgrade is associated with a net reduction in the country's portfolio investments, and a downgrade is associated with a net increase in portfolio investments. As explained in the paper, this is logical - as a credit upgrade in any given country would presumably lead to a higher incidence of investment domestically relative to abroad, thus decreasing the country's net portfolio investments. Similarly, a credit downgrade would be expected to lead to a net increase in the country's portfolio investments. However, as discussed in the paper, we are cautious about interpreting our results, as we are concerned about endogeneity problems in our model specifications.

REFERENCES

1. Biglaiser et al (2008): "Sovereign Bond Ratings and the Democratic Advantage" Comparative Political Studies Vol 41 No 8, Retrieved on 3/20/2017 from: http://journals.sagepub.com/doi/pdf/10.1177/0010414007308021

2. Calvo, G.(1998): "Capital Flows and Capital-Market Crises: The Simple Economics of Sudden Stops" Journal of Applied Economics, Vol 1 No 1, Nov 1998, pp 35-54

3. Calvo, G.; Leiderman, L.; Reinhart, C. (1993): "Capital Inflows and Real Exchange Rate Appreciation in Latin America: The Role of External Factors" IMF Staff Paper Vol 40 No 1

4. Chinn, M. D.; Ito, H. (2006): "What Matters for Financial Development? Capital Controls, Institutions, and Interactions," *Journal of Development Economics*, Volume 81, Issue 1, 163-192 (October 2006)

5. Chinn, M.; Ito, H. (2014): "The Chinn-Ito Openness Index 2014 Update" Retrieved on 3/2/2017 from: http://web.pdx.edu/~ito/Readme_kaopen2014.pdf

6. Cooper, I.; Kaplanis, E. (1994): Home Bias in Equity Portfolios, Inflation Hedging, and International Capital Market Equilibrium" The Review of Financial Studies v7 n1 1994, Retrieved on 3/17/2017 from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.321.89&rep=rep1&type=pdf

7. Curtis, T.; Gladish, D.; Guntupalli, Mayuri; McElnea, B. (2005)"The Mexican Peso Crisis: A Balance of Payment Crisis" International Financial Policy, Retrieved on 3/20/2017 from: http://www.columbia.edu/~mu2166/UIM/BOP_Mexico.pdf

8. Emara, Noha (2012): "Inflation Volatility, Financial Institutions and Sovereign Debt Rating" Journal of Development and Economic Policies, 4(1) 29 – 53

9. Emara, Noha (2015): "Revisiting sovereign ratings, capital flows and financial contagion in emerging markets" World Journal of Applied Economics Vol. 1, No. 2

10. Froot, K.A.; Ramadorai, T. (2005): "Currency Returns, Intrinsic Value, and Institutional-Investor Flows" Retrieved on 3/19/2017 from: The Journal of Finance,

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ISSN: 0193-4120 Page No. 6940 - 6957

http://scholar.harvard.edu/files/kenfroot/files/currency_returns_intrinsic_value.pdf

11. Froot, K. A., O'Connell, P. G. J.,; Seasholes, M. S. (2001): "The portfolio flows of international investors" *Journal of Financial Economics*, *59*(2), 151-193, Retrieved on 3/18/2017 from: https://asu.pure.elsevier.com/en/publications/the-portfolio-flows-of-international-investors

12. Gande, A.; Parsley, D. (2004): "Sovereign Credit Ratings and International Portfolio Flows" IMF Working Paper, Retrieved on 3/17/2017 from: https://www.imf.org/external/np/seminars/eng/2004/ecbimf/pdf/parsle.pdf

13. Gelos, G.; Wei, S.-J. (2004): "Transparency and International Portfolio Holdings" Centre for Economic Policy Research, Retrieved on 4/1/2017 from: https://ideas.repec.org/p/cpr/ceprdp/4476.html

14. IMF, The (2016): "Data" Retrieved on 3/1/2017 from: https://www.imf.org/en/Data

15. Kim, S.-J.; Wu, E. (2008): "Sovereign Creidt Ratings, Capital Flows and Financial Sector Development in Emerging Markets" Emerging Markets Review 9(1) 17-39, Retrieved on 3/20/2017 from: https://www.researchgate.net/publication/222663472_Sovereign_Credit_Ratings_Capital_Flows_and_Financial_Sector_Development_in_Emerging_Markets

16. Koerner, F. M.; Trautwein, H.-M. (2014): "Sovereign Credit Ratings and the Transnationalization of Finance - Evidence from a Gravity Model of Portfolio Investment" Economics, The Open Access Open Assessment E-Journal, Economics Discussion Paper 2014-31, Retrieved 4/2/2017 from: http://www.economics-ejournal.org/economics/discussionpapers/2014-31/file

17. Reinhart, C. (2002): "Default, Currency Crises and Sovereign Credit Ratings" NBER Working Paper No 8738, Retrieved on 3/2/2017 from http://www.nber.org/papers/w8738

18. Williams, Andrew (2010): "Political and Institutional Variables - Data" Retrieved on 3/1/2017 from: https://andrewwilliamsecon.wordpress.com/datasets/

19. World Bank, The (2016): "GDP Data" Retrieved on 3/1/2017 form: data.worldbank.org

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APPENDIX:

Country	EM	Downgrades	Upgrades	Investment to Speculative Grade	Speculative to Investment Grade
Argentina	*	3	3	0	0
Armenia, Republic of		0	0	0	0
Bolivia		0	2	0	0
Brazil	*	3	7	0	1
Bulgaria	*	1	5	0	1
Chile	*	0	2	0	0
Croatia		1	1	1	1
Cyprus		0	1	0	0
Czech Republic		0	0	0	0
Denmark		0	1	0	0
Ecuador		1	2	0	0
Estonia		2	6	0	0
Finland		0	3	0	0
Georgia		1	0	0	0
Hungary	*	3	4	0	0
Iceland		3	1	1	0
India	*	1	2	0	1
Indonesia	*	2	5	1	0
Israel		1	2	0	0
Italy		2	1	0	0
Korea, Republic of		0	0	0	0
Latvia		4	2	1	0
Lithuania		2	5	0	1
Macedonia, FYR		0	0	0	0
Malta		0	1	0	0
Mexico	*	1	4	0	1
Moldova		3	1	0	0
New Zealand		0	0	0	0
Panama		0	1	0	1
Peru	*	1	3	0	1
Portugal		2	1	0	0
Russian Federation	*	2	7	0	1
Singapore		0	1	0	0
Slovak Republic		1	5	1	1
Slovenia		0	4	0	0
South Africa	*	0	4	0	1
Spain		1	2	0	0
Sri Lanka		1	0	0	0
Sweden		1	3	0	0
Thailand	*	1	3	0	1
Turkey	*	3	8	0	0
Ukraine	*	3	4	0	0

Table 1: Countries, classification as emerging economies (EM defined as per IMF (2016)), number of sovereign credit upgrades and downgrades 1994-2010.

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Dependent variable: Portfolio Investments	Static Panel OLS (short)	Static Panel OLS	RE	FE	FE	Dynamic FE	Dynamic Panel OLS	Static Panel OLS	FE	FE	FE	FE	Static Panel OLS w/ Time Fixed Effects	Static Panel OLS w/ Time Fixed Effects	System GMM	Difference GMM
Upgrade	-421000000	-429000000	-421000000*	-406000000*	-409000000*	-415000000*	-454000000	453000000*	-451000000		-511000000*	504000000*	-489000000*	-653000000**	-653000000**	394000000
SE	277000000	275000000	246000000*	246000000	246000000	252000000	289000000	233000000	402000000		304000000	303000000	294000000	269000000	297000000	255000000
Downgrade	670000000	560000000	670000000	732000000*	632000000*	758000000*	601000000	-1070000000	-1030000000*		998000000**	875000000*	648000000	-735000000	-655000000	-644000000
SE	544000000	521000000	381000000	381000000	380000000	392000000	573000000	689000000	576000000		490000000	487000000	540000000	691000000	850000000	1060000000
KAOPEN		122000000			96800000			938000000*	889000000*	111000000		52600000			1450000000	720000000
SE		307000000			326000000			548000000	511000000	327000000		378000000			1550000000	729000000
Transparency score		3990781			6017518			12000000	23000000	3566131		10300000			53300000	-4242314
SE		11200000			16400000			17200000	25500000	16500000		24300000			60200000	100000000
GDP		78882.75**			99682.86***			65537.19**	39534.08*	102737.1***		101418.3***				
SE		31408.3			25547.05			31219.52	21324.22	25598.84		28898.19				
1st Lag Portfolioinvestments						-0.0347058	0.0117269									
SE						0.034274	0.1318238									
1st Lag Upgrade						38500000	5840288								-405000000	-96600000
SE						255000000	252000000								271000000	225000000
1st Lag Downgrade						-83400000	-235000000								-626000000	-462000000
SE						405000000	222000000								982000000	1070000000
2nd Lag Upgrade						-35300000	-73100000									
SE						257000000	216000000									
2nd Lag Downgrade						-16600000	-156000000									
SE						400000000	102000000									
Speculative -> Investment Grade										39800000						
SE										652000000						
Investment Grade -> Speculative Grade										-62300000						
SE										1860000000						
Time Fixed Effects Included?													yes	yes		
Only EMs?	yes	yes	yes	yes	yes	yes	yes	no	no	yes	yes	yes	yes	no	no	no
Dropped Ukraine, Indonesia, India?	no	no	no	no	no	no	no	no	no	no	yes	yes	no	no	no	no
Adjusted for Clustered SE (on Country)	yes	yes					yes	yes					yes	yes		
R Squared (overall)	0.006	0.036	0.006	0.0059	0.0356	0.0048	0.007	0.0886	0.0809	0.0305	0.0085	0.0313	0.112	0.0491		
R Squared (between)	0.1656	0.1699	0.1656	0.2076	0.1717	0.7709	0.1192	0.3836	0.3436	0.1792	0.1615	0.0244	0.0334	0.0247		
R squared (within)	0.0073	0.0347	0.0073	0.0073	0.035	0.0087	0.0062	0.0069	0.0072	0.0288	0.0099	0.0373	0.1164	0.0608		
Years Used in Data Set	1994-2010	1994-2010	1994-2010	1994-2010	1994-2010	1994-2010	1994-2010	1994-2010	1994-2010	1994-2010	1994-2010	1994-2010	1994-2010	1994-2010	2000-2010	2000-2010

*** Significant at the 1 % level
** Significant at the 5% level
* Significant at the 10% level

Table 2: Results - Dependent Variable: Portfolio Investments

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Dependent Variable: % Change in Portfolio Investments	Static Panel OLS w/ Time Fixed Effects	Static Panel OLS w/ Time Fixed Effects
Upgrade	-218.11 **	85.82
SE	85.86	156.77
Downgrade	9.289	-154.69
SE	216.89	309.55
Time Fixed Effects Included?	yes	yes
Only EMs?	yes	no
R Squared (overall)	0.0958	0.0283
R squared (between)	0.0256	0.0438
R Squared (within)	0.0979	0.0285
Years Used in Data Set	1994-2010	1994-2010

*** Significant at the 1 % level
** Significant at the 5% level
* Significant at the 10% level

Table 3: Results - Dependent Variable: % Change in Portfolio Investments

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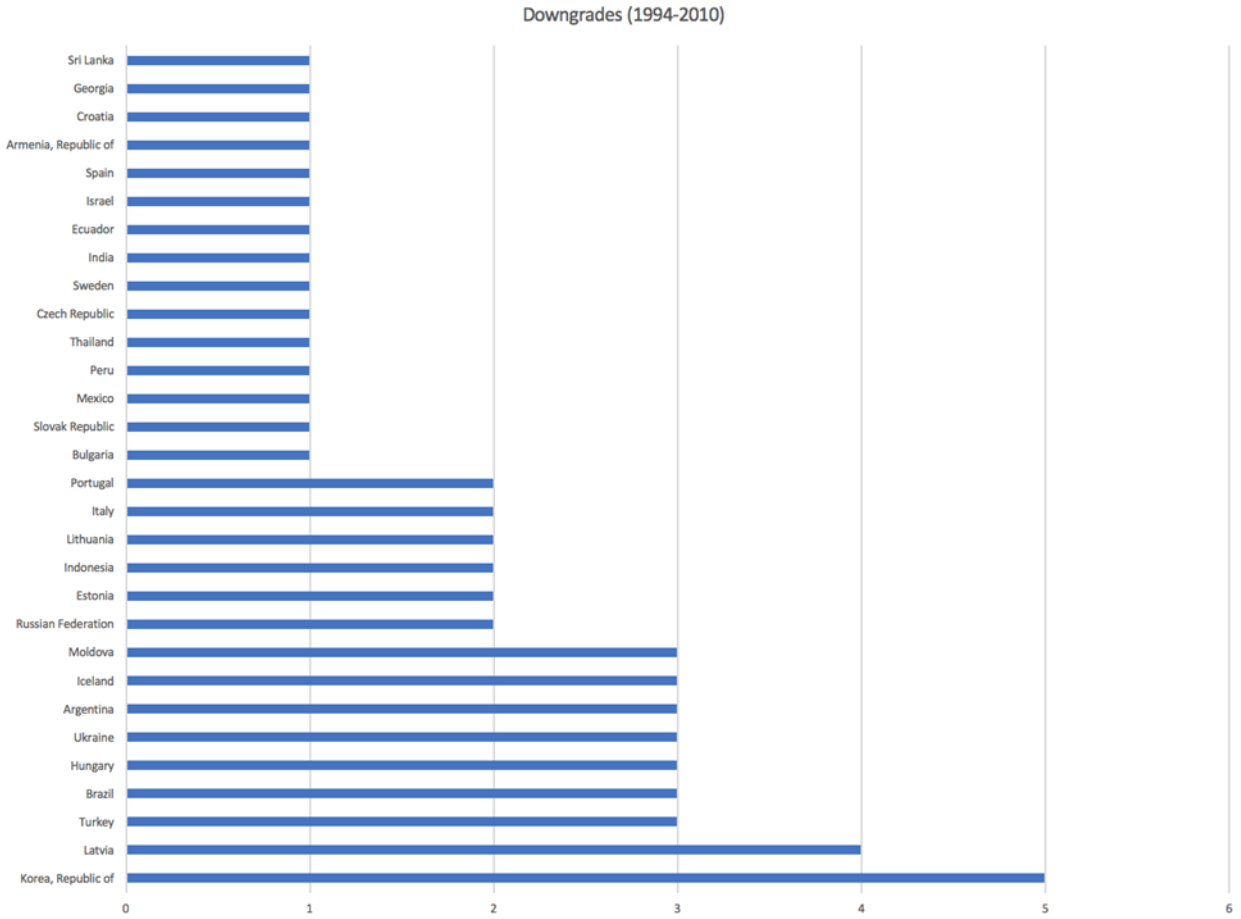

Chart 1: Number of credit downgrades by country, all countries in dataset, from 1994-2010.

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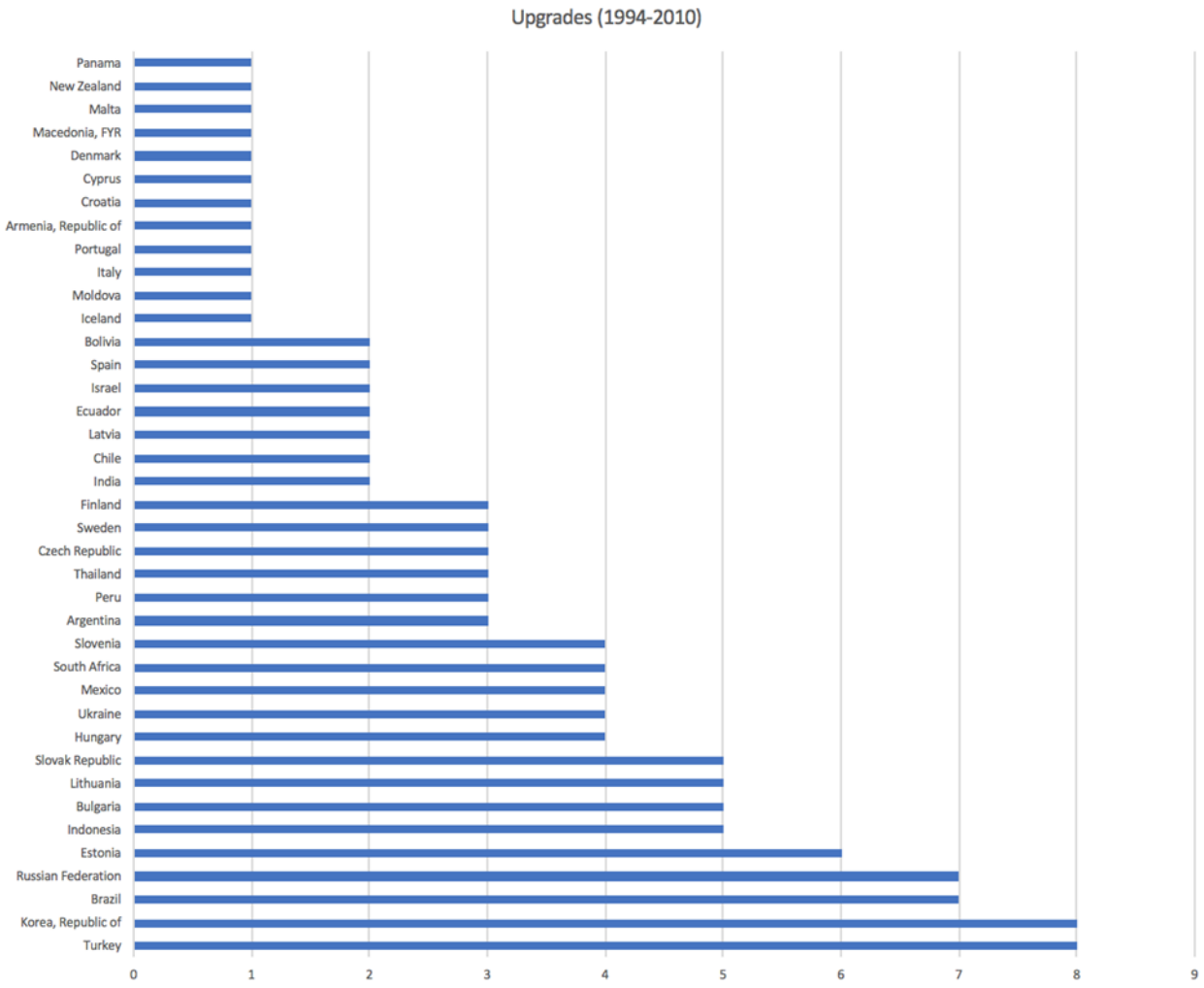

Chart 2: Number of credit upgrades by country, all countries in dataset, from 1994-2010.

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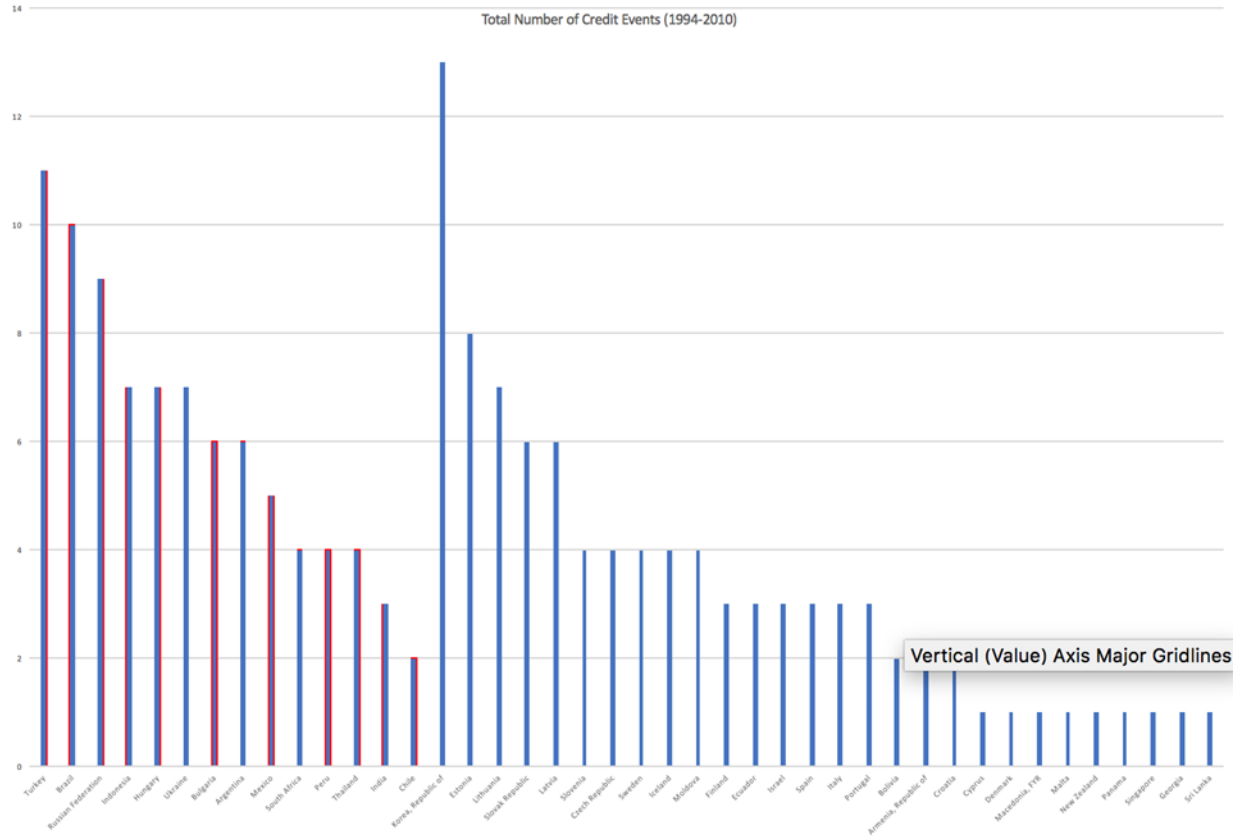

Chart 3: Number of credit events, separated by emerging economies (left) and underdeveloped and developed economies (all countries in dataset - right) from 1994-2010.