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Country Risk Analysis

Section A.1: Sovereign Credit Rating Institutions

Prior to discussing the analysis of different country credit rating systems, it is important to understand the thought that goes into each of these systems. The systems that will be discussed in this paper include S&P, Moody's, Fitch, Institutional Investor, and International Country Risk Guide. S&P's sovereign ratings assess a government's willingness and ability to pay its debt based on the average score between political and economic scores and the average score between external, fiscal, and monetary scores. They then find a given country's credit rating using a chart of scores from the combination of these two averages (standardandpoors.com). Moody's ratings focus on the long-term risk and ability to make debt payments. They also emphasize qualitative indicators and not a define set of financial ratios or models as well as incorporate the predictability of cash flow (moodys.com). Fitch uses different macroeconomic indicators, examine public and external finance, seasonality, and vulnerability to shocks (fitchratings.com). Institutional Investor ratings are the weight of forecasts provided by senior economists, sovereign-risk analysts, leading global banks, and money management and securities firms (institutionalinvestor.com). International Country Risk Guide uses 22 variables in the categories of political, financial, and economic risk. Their political risk rating includes 12 weighted attributes. Economic risk includes a current, 1 year, and 5 year assessment (prsgroup.com).

Section A.2: Comparison of Change within Various Credit Rating Institutions

For the first level of comparison, Greek and Russian credit ratings from the period 1990 through 2012 are presented in Charts 1a and 1b, respectively. The rating systems ICRG and II present more gradual changes in their credit ratings while other systems can show significant jumps and plateaus due to their less frequent rating measures. Looking to Greek credit ratings, it appears that there was a significant rating upgrade for Moody's in early 2003 which was followed by less dramatic rating increases for Fitch, then II, and then S&P over the next year. With regard to downgrading, II and Fitch led the process in

January 2011which was then followed by the other three institutions only months after in March of the same year. Looking to 1b at Russian credit ratings, downgrades were led by Moody's in May of this year, followed by Fitch and S&P one month later, II a month after that, and ICRG downgrading several months later. When examining the upgrading trend in early 2000, S&P is in a clear lead in February of this year followed by an upgrade from II and ICRG in July, Fitch in August and with Moody's lagging behind by not upgrading until November.

Table 2 shows the correlations between rating changes for each credit rating system for both countries. This chart demonstrates the real lack of correlation between credit rating changes despite the fact that these agencies all claim to all use similar indicators. The highest correlation for Greece was between II and Fitch at 0.573. The highest correlation for Russia was 0.393 between S&P and Fitch.

The degrees of persistence in change in rating measures are presented in Table 3. The only significant autocorrelations found between both countries was for S &P and Fitch within Greece. These results indicate that there are residual effects of past ratings that impact current ratings in Greece for these two rating agencies. It also shows that for the presented agencies in Russia and the remaining agencies in Greece, their past ratings do not have residual effects on their current ratings.

Section A.3: Effects of Country Ratings on Capital Markets

In this section, Granger Causality was tested between the changes in rating measures and stock market returns (4a/b), the government bond market (5a/b), net direct investment flows (6a/b), and net portfolio investment flows (7a/b) for both Greece and Russia over the period of 1995 through 2012. The rating institutions used in this section are Moody's, Fitch, and ICRG

First to be discussed is Greece. In the realm of connection between rating changes and stock returns, ICRG is neither caused nor causes stock returns in this country. The test of granger causality of Moody's rating changes on stock returns proved statistically significant, and stock returns did not impact Moody's ratings back. This means that when a Moody's change in rating occurs in Greece, you can expect an impact on stock returns. Two-way causality occurs for Fitch rating changes in Greece. This means that when there is a change in Fitch ratings you can expect an impact on stock returns.

Additionally, Fitch ratings include stock returns in their calculation of Greek country ratings. The government bond market shows the same relationships that stock market returns have with country ratings in Greece. Fitch shows the same two-way causality, ICRG has no causality either way, and Moody's has significant causality on government bond ratings.

In Greece, both net direct investment and net portfolio investment inflows do not cause rating changes for Moody's, Fitch, or ICRG. Like stock and government bond returns, ICRG does not have an impact on these direct or portfolio investment inflows. For net direct investment inflows, Moody's does not have an impact but Fitch does. This means that a change in Fitch ratings will result in a change in direct investment in Greece. For net portfolio investment, both a change in Moody's or Fitch ratings will result in a change in portfolio investment in Greece.

In Russia, Fitch demonstrates the same two-way causality with stock returns as it did in Greece. Unlike Greece, ICRG also demonstrates this same two-way causality. Moody's has no impact and is not impacted by stock returns. These data show that both Fitch and ICRG use Russian stock return data in their calculation the country's ratings and that stock market returns are impacted by both Fitch and ICRG rating changes. Turning to the Russian government bond market, there is no causality either way for Fitch or ICRG. For Moody's, changes in the country ratings does impact the government bond market, but the government bond market does not cause a change in Moody's ratings. For net direct investment flows, no significant causality was found in either direction for these three credit rating institutions. For net portfolio investment inflows, a change in this realm does cause a change in Fitch ratings, though Fitch ratings do not impact portfolio investment inflows. ICRG will result in a change in portfolio investment inflows in Russia, but the opposite is not true. Moody's showed no significant causality either way for this topic.

Section B: Regression Analysis on Relationships between Rating Measures and Various Economic Variables
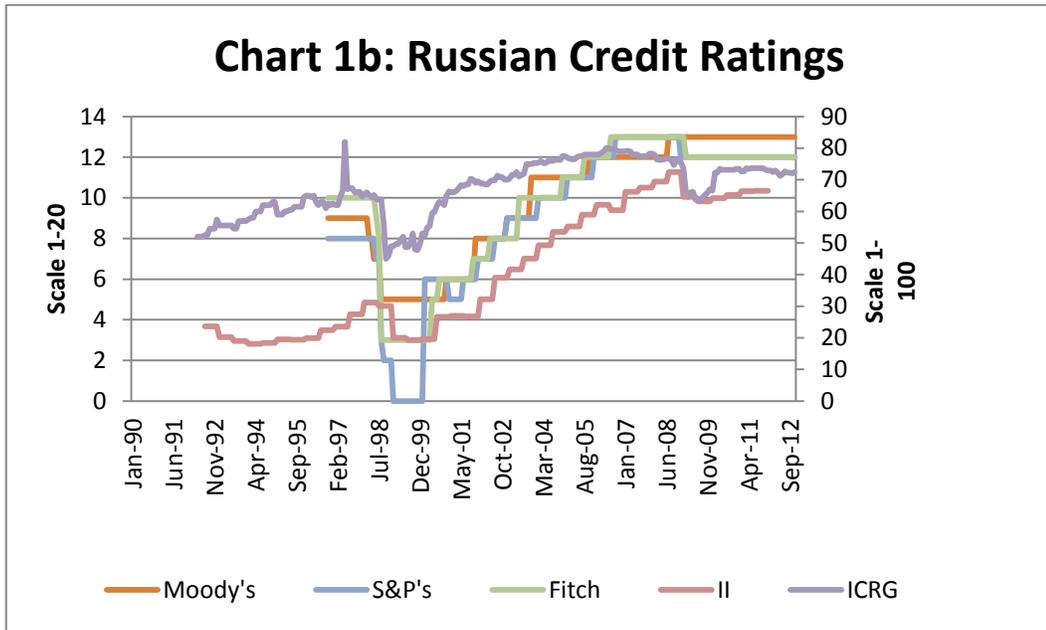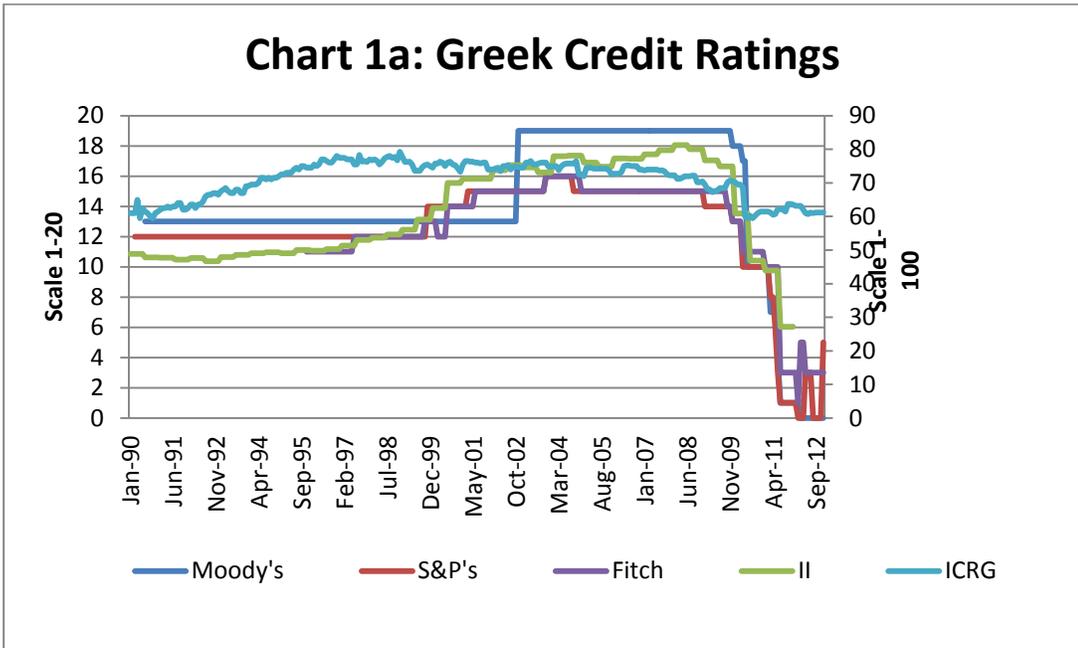
A regression analysis was conducted on the relationship between International Investor's credit ratings as of September 2003 and various economic variables including; per-capita GDP, GDP growth

rate, inflation rate, external balance (measured by current account balance as a percentage of GDP), fiscal balance (measured by cash surplus/deficit as a percentage of GDP), openness (measured by exports plus imports as a percentage of GDP), and corruption. Originally, external debt to GDP ratio and government external debt as a percentage of GDP were additional indicators used but due to data constraints, these variables were dropped in favor of a more robust model. In the creation of this model, a White test was run to determine if there was heteroskedasticity. With a p-value of 0.266, it was determined that the model did not have this issue. Correlations were also examined between each variable which determined that there were also no multicolinearity problems. Descriptive statistics for these variables are presented in Table 8 with regression analysis results presented in Table 9.

As previously explained, II is a rating agency that creates a weighted average of rating opinions from experts in the field so significant variables should indicate what expert economists generally use in their determination of credit ratings. Per-capita GDP was a positively significant variable, a conclusion we would expect because an increase in this measure shows an increase in economic resilience. Contrary to what one would expect, GDP growth rate was not significant. GDP growth rate is generally a significant macroeconomic performance indicator. Another similar performance indicator is inflation, which presented a result one would expect. Increased inflation has a negative impact on II credit ratings. External balance was not found to be a significant factor in II credit ratings meaning that an export/import surplus or deficit does not have an impact on a country's willingness and ability to pay for it's debt in the view of II experts. Fiscal balance is significant, though not in the direction one would expect. Generally, a government budget deficit would not increase a country rating, as this model shows. A likely rationale for this result is that the data may be skewed toward developed countries because of data constraints. These countries tend to have government budget deficits yet retain their high credit ratings. Openness of an economy showed to have a negative impact on II credit ratings. While one may feel that more globalized countries would be more developed and have better credit ratings, it is possible that within the pool of countries used in this data set, a more closed economy resulted in a certain level of protection from external shocks. Finally, corruption (an indicator that increases with decreased corruption) was found to

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be significant and positive. This is intuitive since an increase in corruption would certainly cause a country to have a less stable economy and in turn, a lower credit rating.

Appendix

Chart 1a: Greek Credit Ratings

Legend: Moody's, S&P's, Fitch, II, ICRG

Chart 1b: Russian Credit Ratings

Legend: Moody's, S&P's, Fitch, II, ICRG

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Table 2: Correlations Between Credit Ratings

Greece

	Moody	S&P	II	Fitch	IRCG
Moody		0.265	0.168	0.202	0.006
S&P			0.198	0.204	-0.023
II				0.573	0.014
Fitch					0.017
IRCG					

Russia

	Moody	S&P	II	Fitch	IRCG
Moody		0.256	0.024	0.363	0.006
S&P			0.183	0.393	0.016
II				-0.008	0.044
Fitch					0.090
IRCG					

Table 3: Persistence in Change in Rating Measures

Greece

	Moody	S&P	II	Fitch	IRCG
AR(1)	0.087	0.207*	0.000	-0.089	-0.123*
Std. Error	(0.061)	(0.004)	(0.062)	(0.070)	(0.060)

Russia

	Moody	S&P	II	Fitch	IRCG
AR(1)	0.000	0.059	0.000	0.143	-0.124
Std. Error	(0.722)	(0.072)	(0.066)	(0.071)	(0.063)

* Indicates significance at 10%

Table 4a: Causality between Changes in Greek Country Ratings and Stock Market Returns

Test if Rating Granger Causes Stock Returns

	Moody	Fitch	ICRG
Observations	204	193	204
F-Statistic	3.057*	2.581*	1.100

Test if Stock Returns Granger Causes Ratings

	Moody	Fitch	ICRG
Observations	204	193	204
F-Statistic	0.766	2.450*	0.856

* Denotes significance at 10%

Table 4b: Causality between Changes in Russian Country Ratings and Stock Market Returns

Test if Rating Granger Causes Stock Returns

	Moody	Fitch	ICRG
Observations	182	182	204
F-Statistic	1.381	1.833*	2.018*

Test if Stock Returns Granger Causes Ratings

	Moody	Fitch	ICRG
Observations	182	182	204
F-Statistic	0.459	2.324*	4.554*

* Denotes significance at 10%

Table 5a: Causality between Changes in Greek Country Ratings and Government Bond Market Returns

Test if Rating Granger Causes Bond Returns

	Moody	Fitch	ICRG
Observations	156	156	156
F-Statistic	1.804*	2.215*	1.034

Test if Bond Returns Granger Causes Ratings

	Moody	Fitch	ICRG
Observations	156	156	156
F-Statistic	0.625	2.213*	1.170

* Denotes significance at 10%

Table 5b: Causality between Changes in Russian Country Ratings and Government Bond Market Returns

Test if Rating Granger Causes Bond Returns

	Moody	Fitch	ICRG
Observations	156	156	156
F-Statistic	2.227*	1.043	0.762

Test if Bond Returns Granger Causes Ratings

	Moody	Fitch	ICRG
Observations	156	156	156
F-Statistic	0.947	1.108	0.455

* Denotes significance at 10%

Table 6a: Causality between Changes in Greek Country Ratings and Net Direct Investment Inflows

Test if Rating Granger Causes Direct Investment

	Moody	Fitch	ICRG
Observations	213	166	213
F-Statistic	1.136	1.772*	0.600

Test if Direct Investment Granger Causes Ratings

	Moody	Fitch	ICRG
Observations	213	166	213
F-Statistic	1.483	0.687	0.902

* Denotes significance at 10%

Table 6b: Causality between Changes in Russian Country Ratings and Net Direct Investment Inflows

Test if Rating Granger Causes Direct Investment

	Moody	Fitch	ICRG
Observations	179	179	213
F-Statistic	0.063	0.207	0.164

Test if Direct Investment Granger Causes Ratings

	Moody	Fitch	ICRG
Observations	179	179	213
F-Statistic	0.102	0.225	0.398

* Denotes significance at 10%

Table 7a: Causality between Changes in Greek Country Ratings and Net Portfolio Investment Inflows

Test if Rating Granger Causes Portfolio Investment

	Moody	Fitch	ICRG
Observations	153	153	153
F-Statistic	2.349*	10.282*	1.286

Test if Portfolio Investment Granger Causes Ratings

	Moody	Fitch	ICRG
Observations	153	153	153
F-Statistic	0.609	0.948	0.869

* Denotes significance at 10%

Table 7b: Causality between Changes in RussianCountry Ratings and Net Portfolio Investment Inflows

Test if Rating Granger Causes Portfolio Investment

	Moody	Fitch	ICRG
Observations	179	179	213
F-Statistic	0.544	0.238	3.021*

Test if Portfolio Investment Granger Causes Ratings

	Moody	Fitch	ICRG
Observations	179	179	213
F-Statistic	1.248	3.923*	1.568

* Denotes significance at 10%

Table 8: Descriptive Statistics for II Credit Rating Determination Data

	Country Rating	GDP Per Capita	GDP Growth Rate	Inflation Rate	External Balance	Fiscal Balance	Openess	Corruption
Minimum	6.70	240.76	-41.30	-3.50	-64.50	-13.25	0.36	1.02
Maximum	95.30	65548.93	17.32	431.70	52.84	10.59	386.97	9.34
Mean	44.78	10552.86	3.81	8.84	-4.93	-1.79	88.42	4.17
Standard Deviation	26.02	12620.52	5.92	34.06	16.96	3.59	49.13	2.10

Table 9: Estimation Results for Relationship between II Rating Measures and Economic Variables (as of September 2003)

Estimation Equation:

$\ln(countryrating) = c + \beta_0 * \ln(gdpcap) + \beta_1 gdpgrow + \beta_2 inflation + \beta_3 external + \beta_4 fiscal + \beta_5 openness + \beta_6 * \ln(corruption)$ error

Independent Variable	Coefficient
Constant	1.077* (0.310)
GDP per Capita	0.256* (0.043)
GDP Growth Rate	0.003 (0.009)
Inflation Rate	-0.018* (0..05)
External Balance	0.004 (0.329)
Fiscal Balance	-0.019* (0.009)
Openness	-0.001* (0.000)
Corruption	0.382* (0.111)
Observations	82

Notes:

Standard Errors are in parenthesis

* Denotes statistically significant at 10% level