Sovereign Ratings and Oil-Exporting Countries: The effect of high oil prices on ratings

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Abstract

We investigate how high and rising oil prices in the 2003-2008 period affected the sovereign ratings of oil-exporting countries, after controlling for fundamentals. Based on a large dataset of countries from Standard and Poor's and Moody's, we find strong statistical evidence of a large ratings premium–nearly two notches– for those oil-exporting countries with a large share of net oil revenue to gross domestic product, relative to countries with similar economic fundamentals. We have some limited forecast information from the rating agencies and the effect *increases* when we include this information, providing further evidence that this ratings premium is not driven by expected improvements in fundamentals. This finding has implications for asset prices in oil-exporting countries and highlights the risk that in the event of a sharp unanticipated drop in oil prices, sovereign rating downgrades of oil-exporting countries could be sharper than the deterioration in their economic fundamentals.

JEL Codes: C23; C25; E44; F30; G15
KEYWORDS: Oil-exporting countries, sovereign ratings, panel data

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Introduction

Sovereign credit ratings reflect rating agencies' opinions on the future ability and willingness of government to repay principal and interest on public debt on time. A sovereign rating may be viewed as a forward-looking estimate of the country's default probability by the rating agency. The sovereign rating is critical to the financial and economic stability of a country and is important for the following four reasons. Firstly, the sovereign rating is a key determinant of the interest rate a country faces in the international financial market, which in turn is a critical factor in determining asset prices in the sovereign. Secondly, sovereign rating usually acts as a cap on the credit ratings of domestic companies. Thirdly, some institutional investors have mandates to invest only in investment grade bonds. This means that a lower rating will unfavorably restrict the type of investments that a country can attract. Finally, Basel II[1] uses sovereign rating as a tool for determining overall risk of banks.

Oil prices surged from US$26 in late 2001 to over US$100 in early 2008, a rise of almost 300 per cent. This resulted in a sharp improvement in the economic fundamentals of oil-exporting countries and steady sovereign upgrades by Standard and Poor's (S&P) and Moody's Investment Service (Moody's). But did sovereign rating run ahead of the improvement in economic fundamentals? This is a very important question given the tight linkage between ratings and both corporate and sovereign bond prices and has significant implications for asset prices in oil-exporting countries[2]

The literature is rich in studies on the determinants of sovereign ratings. However, to the best of our knowledge, there have been no attempts to investigate whether rising oil prices have had an impact on S&P and Moody's ratings of oil-exporting countries, after controlling for improvements in fundamentals. This paper finds that there is evidence to suggest that, during the latter part of our sample period when oil prices were high, sovereign ratings of countries for whom net oil revenue accounted for more than 20 per cent of gross domestic product were significantly higher even after incorporating improving fundamentals. Our findings are robust to inclusion of explanatory variables, choice of econometric technique and definition of 'high' oil-exporting. High oil-exporting countries (where net oil revenue accounted for more than 20 per cent of gross domestic product) on average are rated two notches higher

[1] Basel II is the new rule book for international banks issued by Bank for International Settlements, located in Basel, Switzerland, which is designed to strengthen the stability of the financial system.

[2] For evidence on the effect of rating changes on national markets see Brooks et al. (2004), Gande and Parsley (2005), and Ferreira and Gama (2007).

in 2006, 2007 and 2008 vis-à-vis countries with similar fundamentals. This ratings premium is related to oil price in that it does not become significant until around 2003 in the Standard and Poor's sample and around 2005 in the Moody's sample. There is no ratings premium for oil-exporting countries when oil prices are low.

This paper makes three contributions to the existing literature. This is the first paper to examine whether rising oil prices have resulted in a ratings premium for oil-exporting countries, after controlling for improvements in economic fundamentals. Secondly, this is the first paper to incorporate, albeit in a limited way, forecasts of macro-economic variables by the sovereign ratings agencies into econometric models. This is important because rating agencies have stated explicitly that they examine both historical economic trends and forecasts when assigning sovereign ratings. Thirdly, this paper uses a large dataset and, to the best of our knowledge, is the first to introduce regulatory quality and net oil exporting status amongst the explanatory variables–as such our results advance our understanding of the determinants of sovereign rating. Our dataset incorporates 115 countries representing 92 per cent of sovereigns covered by S&P and 96 per cent of sovereigns covered by Moody's. We focus on the period 1998-2008 before the Global Financial Crisis (GFC) had a large affect on sovereign ratings. We thus avoid the complication of modeling the GFC to focus on the main question of interest.

This paper concludes that persistently high oil prices over the 2003-2008 period were accompanied by a positive shift in ratings for high oil-exporting countries. This could be interpreted as the ratings agencies' view of the changed value of the asset. However, an obvious and important risk to highlight is that in the event of a sharp drop in oil prices, downgrades of high oil-exporting countries could be sharper than the deterioration in economic fundamentals. This is particularly important given the well-documented volatility and unpredictability of resource prices.

The organization of the paper is as follows. Section 2 provides a brief review of the rating system and rating agencies, the literature on sovereign ratings determinants, and a description of our data. In section 3 we discuss the econometric models we employ. Section 4 presents the results. We also in that section discuss the interpretation of our results for oil-exporting countries in detail, examine the inclusion of forecast information and test the robustness of our model. We conclude in section 5.

I Ratings systems and our data

While there are a large number of credit rating agencies, S&P and Moody's are generally considered to be the two dominant players in the credit rating market. S&P

and Moody's use different qualitative codes for their ratings but there is a close correspondence between the two. S&P uses twenty-two categories from AAA (highest) to D (lowest). Moody's uses twenty-one categories from Aaa (highest) to C (lowest). For our analysis, we combine the lowest six categories of S&P (CCC+ to D) and the lowest five of Moody's (Caa1 to C) as there are very few countries in these categories. Table 1 shows the ratings scale for the two agencies and the number of sample observations in each category at July, 2008.

Several papers have considered the determinants of sovereign ratings. An early paper on the determinants of credit ratings is Cantor and Packer (1996). A comprehensive paper on the determinants of credit ratings is Afonso et al. (2011). (See also Afonso et al. (2006) and Afonso (2003).) Borio and Packer (2004) apply OLS regression to a linear representation of ratings to examine the determinants of ratings. Hilscher and Nosbusch (2010) focus on the importance of volatility in terms of trade. Rowland and Torres (2005) discuss the relationship between sovereign credit spread and credit ratings using a panel data approach. Bhatia (2002) provides an extensive review of the rating methodologies of the agencies. Afonso et al. (2009) and Bissoondoyal-Bheenick et al. (2006) discuss different econometric methodologies to study the determinants of sovereign ratings. In general, these papers conclude that ratings can be explained by a small set of quantitative explanatory variables including per-capita Gross Domestic Product (GDP), GDP growth, fiscal balance, inflation, public debt, external debt, current account receipts, foreign exchange reserves, investment, unemployment and trade and investment as percentages of GDP. In addition, qualitative variables such as the level of economic/technological development, quality of government, geographical location of sovereigns and default history are found to be significant in explaining ratings. Studies released by S&P and Moody's generally concur with the academic literature on the above set of explanatory variables as being the relevant ones.

Mora (2006) argues that credit agencies did not aggravate the East Asian crises, contrary to the popularly held view. This paper is related to ours in that it studies the issue of whether or not credit agencies over- or under-react to global, macro-economic phenomena. Ferreira and Gama (2007) show that downgrades in sovereign ratings can have negative stock market repercussions. Archer et al. (2007) include a variable on natural resource abundance in their study but find that it has an insignificant effect on ratings. We do find a significant effect of being a net oil producing country, but do not examine other natural resources.

We constructed a panel data set of 115 countries from 1998 to 2008.[3] The current

[3]Our data and the STATA code to reproduce our results is available on our web page. *Link to be provided upon acceptance for publication.*

sovereign ratings data was obtained from Moody's Investors Service (2008). Historical Moody's ratings data was obtained from Bloomberg's (2007) and historical ratings data for Standard and Poor's was obtained from Standard & Poor's (2007b).[4] Excluding quasi-sovereigns[5], S&P rates 110 countries and Moody's rates 104 countries as at July 2008. In July 2008, 51 (46 per cent of countries covered) sovereigns are rated investment grade while 59 (54 per cent) are rated speculative grade by S&P. For Moody's, 47 sovereigns (45 per cent) are rated investment grade while 57 sovereigns (55 per cent) are rated speculative grade by Moody's. See Table 1 for details of our sub-sample.[6]

Table 2 provides a list of the variables used in our study along with the means and standard deviations for the 2008 cross-section of data. The majority of historical economic data was obtained from Moody's Investors Service (2008). The latter only covers countries rated by Moody's. For those countries in our S&P sample which are not rated by Moody's, we were able to obtain some data from Standard & Poor's (2007a). Otherwise, we obtained historical data from Fitch Ratings (2007) and International Monetary Fund (2005). The "advanced country" variable is defined in the World Economic Outlook database of the International Monetary Fund.[7] Our data also included 2008 forecast figures from S&P (see Standard & Poor's (2007b)) and 2008 and 2009 forecast figures from Moody's (see Moody's Investors Service (2008)). We use end-of-year rating.

External debt was obtained from World Bank (2007b), Bank for International Settlements (2007), and Moody's Investors Service (2008) but were only available for non-advanced countries. Data for Sri Lanka was obtained from Asian Development Bank (2007). Fiscal and external debt for twelve countries was obtained from official government web sites.[8] One might question whether this data has been subject to the same quality assurance as that available from international agencies, but we note that if we drop these countries from our analysis it does not affect our results.

Oil and gas production and consumption was collated from publicly available data, BP (2009). There were 39 net oil producing countries in the world in 2007, of which 25 countries were rated by S&P and/or Moody's. To distinguish countries in which oil revenue is only a small part of total revenue from those where it is the dominant

[4]Some of this data can only be accessed by registered users of Moody's or S&P.

[5]Quasi-sovereigns refer to sovereigns that are not independent states and include Cayman Islands, Isle of Man, Montserrat and Cook Islands. Quasi-sovereigns are excluded because their ratings are likely to be affected by the ratings of countries that have sovereignty over them.

[6]There are 93 countries that are rated by both S&P and Moody's. There are 9 countries which we drop from the S&P data due to lack of data on the macro-economic variables used in our study. Likewise, we drop 4 countries from the Moody's sample due to insufficient data.

[7]See `http://www.imf.org/external/pubs/ft/weo/faq.htm#q4b`.

[8]These countries were Benin, Cameroon, Macedonia, Mozambique, Serbia, Sri Lanka, Ghana, Georgia, Kenya, Madagascar, Senegal and Seychelles.

part of total revenue, we define a 'high' oil-exporting country as one where more than 20 per cent of GDP comes from oil and gas production. A 'low' oil-exporting country is one with positive net oil and gas production which accounts for less than 20 per cent of GDP. See Table 3 for a list of the fourteen high and eleven low oil-exporting countries in the year 2007 along with their 2008 sovereign ratings.[9] Cameroon and Nigeria are not rated by Moody's while S&P do not rate Azerbaijan nor the United Arab Emirates.

Our panel is unbalanced as S&P and Moody's have increased their country coverage significantly over the past several years. In 2000, for example, S&P covered 84 countries while Moody's covered 90 countries. This means that earlier years of sovereign rating data are missing for countries that were only recently assigned a rating by the rating agencies. We conduct our analysis on the unbalanced panel.

Some explanatory variables such as CPI inflation, GDP growth, fiscal balance as percentage of GDP and external debt to current account receipts tend to be volatile from year to year. Consequently, three year averages were used for these variables. This reflects the rating agencies' approach to taking a medium term view on these variables when assigning sovereign ratings. Moody's Investors Service (2002), Moody's Investors Service (2006), and Standard & Poor's (2006) provide detail about the approach of the agencies in determining ratings. The rating agencies stated during this time period that external debt was not a significant risk for developed countries as strong financial systems allowed government and corporate entities to borrow long term in domestic currency. On this basis, we set the coefficient on external debt for advanced countries to zero. Obviously, recent economic developments showed that external debt did provide significant risks and the rating agencies have changed their tune on this particular issue.[10] For our sample period, we think this is a valid restriction.

Once we take these three year averages, we start analysis in 1999 as the first two years are missing for the three-year averages. We were unable to obtain reliable unemployment data for most of the developing countries so we do not include this variable. If we include unemployment data for developed countries and a dummy for missing unemployment data (the best we can do given limited data), the results we present are unchanged. We include regulatory quality, which we have not seen used in other studies. We estimate our models with the full set of explanatory variables which have been identified as being important determinants of sovereign ratings.

[9] 'Low' and 'high' oil producing countries vary throughout the sample as oil revenue and total revenue fluctuate. Table 3 gives a snapshot for one year. Definitions of 'low' and 'high' for oil years are available from the authors or easily calculated from BP (2009).

[10] Ratings agencies came under heavy criticism during the global financial crisis for failing to accurately assess risk. Battersby (2012) discusses some of the changes the agencies have made in response to these criticisms.

II Model and econometric specifications

The dependent variable in our model is the foreign currency government bond rating of S&P and Moody's. Note that rating agencies also assign a variety of other types of foreign currency ratings to a sovereign, including country ceiling and bank deposits. However, the sovereign rating is synonymous with foreign currency government bond ratings and this is the rating which attracts the most attention from investors. Letting R_{it} be the sovereign rating, we have the following model

$$\begin{aligned} R_{it} =& \alpha_0 + \alpha_1 Dy2000_{it} + \ldots + \alpha_7 Dy2008_{it} \\ & \phi_1 Dlowoil_{it} * Dy1999_{it} + \ldots + \phi_9 Dlowoil_{it} * Dy2008_{it} \\ & \theta_1 Dhighoil_{it} * Dy1999_{it} + \ldots + \theta_9 Dhighoil_{it} * Dy2008_{it} \\ & \mathbf{x}'_{it}\boldsymbol{\beta} + \mathbf{z}'_i\boldsymbol{\gamma} + c_i + u_{it} \end{aligned} \tag{1}$$

where $Dy1999$ to $Dy2008$ are ten time dummies which take value one if the observation is in that year and value zero otherwise. Year 1999 is the omitted category. $Dlowoil_{it}$ is a dummy variable equal to one if country i has positive net oil and gas revenues less than 20 per cent of GDP in year t. $Dhighoil_{it}$ is a dummy variable equal to one if country i has positive net oil and gas revenue greater than 20 per cent of GDP in year t. To investigate the impact of rising oil prices, the low and high oil producing country dummies are interacted with year dummy variables. For example, $Dhighoil_{it} * Dy2008_{it} - Dy2008_{it}$ will measure the impact on sovereign ratings of being a high oil producing country in 2008 relative to being an oil-importing (negative net production) country in 2008. $\mathbf{x}_{it}$ are a vector of time-varying variables for country i at time t, e.g. GDP growth. $\mathbf{z}_i$ are a vector of non-time varying, country specific variables for country i, e.g. geographic location. c_i is an unobservable, time invariant country effect. c_i will capture things such as historical factors. u_{it} are all other unobserved factors.

Note that equation (1) could also be estimated by the following equivalent model:

$$\begin{aligned} R_{it} =& \alpha_0 + \alpha_1 p_{it} + \ldots + \alpha_7 p_{it} \\ & \phi_1 Dlowoil_{it} * p_{it} + \ldots + \phi_9 Dlowoil_{it} * p_{it} \\ & \theta_1 Dhighoil_{it} * p_{it} + \ldots + \theta_9 Dhighoil_{it} * p_{it} \\ & \mathbf{x}'_{it}\boldsymbol{\beta} + \mathbf{z}'_i\boldsymbol{\gamma} + c_i + u_{it} \end{aligned} \tag{2}$$

where p_{it} is the annual oil price. The variation in the two models is exactly the same (annual oil prices vary in exactly the same was as time dummies–they are different in different years but, within year, the same for all countries) and the coefficient estimates

for $\boldsymbol{\beta}$ and $\boldsymbol{\gamma}$ from the two models will be identical. The signs and statistical significances of the α_k, ϕ_k and θ_k will be identical in the two models. The actual estimated values of the α_k, ϕ_k and θ_k will be different–estimates from equation (2) will be equal to those of equation (1) scaled down by the oil price for that year. Our preference is to present the results from the first approach because it allows us to discuss the results in terms of the annual effect. Below, we also discuss our results in terms of the relationship between oil prices and sovereign ratings, i.e., in terms of the coefficient estimates from equation (2).

We estimate equation (1) using four different econometric approaches: ordinary least squares (OLS) applied to the pooled panel sample, random effects estimation, fixed effects estimation, and random effects, ordered probit estimation. These four methodologies encompass the main techniques which have been used in the literature.

There are two main methodological issues which arise. The first issue is the treatment of unobserved, time invariant country-specific factors, c_i. If c_i are uncorrelated with $\mathbf{x}_{it}$ and $\mathbf{z}_i$, then any of these four techniques should produce unbiased estimates. In this situation, random effects will be preferable on efficiency grounds since fixed effects makes inefficient use of the data[11] and OLS fails to account for the correlation which is created by the panel structure of the data. The c_i will capture any unobserved or unmeasurable country-specific effects such as cultural or historical factors. These factors may be related to observable macro-economic variables (as is found in the economic growth literature, see Barro (1997), for example). Under the assumption that c_i are correlated with any of the included variables in $\mathbf{x}_{it}$ or $\mathbf{z}_i$, only fixed effects will provide unbiased estimation. OLS, random effects, and random effects ordered probit will all be inconsistent under this assumption as none of these techniques remove c_i from the model.[12] Our *a priori* belief is that the unobserved country effects are correlated with the other explanatory variables and theoretically, therefore, we think that the fixed effects results should be the most reliable.

The second important methodological issue is the treatment of R_{it}. Many papers treat the ratings as being on a linear scale (see column 6 of table 1). This incorporates the perhaps undesirable assumption that the distance between a rating of AAA and AA+ is the same as the distance between a rating of BBB- and BB+. Any one step change in ratings is equivalent to any other one step change under this assumption. As

[11] Fixed effects uses only the within-country variation and hence is not making any use of between-country variation. We also estimate a model on first-differences and the results are very similar to the fixed effects model. In the absence of mis-specification, this is what one would expect. Ordered probit is not identified with fixed effects assumptions (see Wooldridge (2002), chapter 15) and our panel is not long enough to estimate an ordered probit on first differences on individual countries.

[12] The discussion in this paragraph assumes that the standard assumptions hold and that the model is otherwise correctly specified. For details, see Wooldridge (2002) or Hsiao (2003).

R_{it} can be thought of as representing the probability of default, this variable should really be viewed as providing information about this underlying latent (unobserved) probability. An ordered probit specification, using random effects to account for the correlation induced by the panel structure, provides less restrictive assumptions about the relationship between the R_{it} and the probability of default. See the recent papers by Bissoondoyal-Bheenick et al. (2006) and Afonso et al. (2009) which discuss this issue in the context of the determinants of sovereign ratings.

An alternative option to deal with possible non-linearity in R_{it} is to adopt an ad hoc transformation of the linear scale. We explored ad hoc transformations of the linear rating scale (such as the paper by Afonso et al. (2006)) using a logistic transformation but we found that it did not make much difference for our results.[13] Other possibilities would be to use a transformation which converts ratings to a value based upon historical default frequency (see Bongini et al. (2002)) or a transformation based upon implied spreads.

III Results

The main question of interest is whether ratings agencies have increased ratings for oil-exporting countries in the recent period of sharp increases in oil and gas prices beyond what might be expected based only upon the improvement in fundamentals. We find strong evidence in the latter part of the sample period of a ratings premium for high oil-exporting countries. This finding is robust to a wide range of econometric models, to the variables which are included in the study, and to the use of forecast information in addition to currently available information. Table 4 presents the coefficient estimates and their standard errors from models estimated on the sovereign ratings data from Standard and Poor's (S&P) while Table 5 presents the results for Moody's.

We began by estimating equation (1) by the four approaches discussed in section II with the inclusion of a full set of control variables for the Standard and Poor's and Moody's data, respectively. As described above, we interact time dummies with dummy variables for low and high oil-exporting countries. For the Standard and Poor's data, we find that the year dummies are jointly insignificant. The p-value on the test of joint significance for the year dummies ranges from .42 for the ordered probit model to .92 for the linear regression model. For the linear regression and random effects models, we also find that the interactions between low oil exports and year dummies are insignificant (p-value of .72). In Table 4, therefore, we report the results without the year dummies and without the interactions between low oil exports and year dummies

[13] These are available from the authors.

for the linear and random effects models. Similarly for the Moody's data, we find for all four models that the interactions between low oil exports and the time dummies are jointly insignificant (p-values ranging from .73 to .99) and only report the models without these coefficients.[14]

Looking at tables 4 and 5, the interaction terms between time and high oil-exporting, we find that these coefficients are significant from 2003 onwards for Standard and Poor's and from 2005 onwards for Moody's. The size of the coefficients (and their statistical significance) is increasing over the latter half of the sample period in both cases. This result, which is the main one of our paper, is consistent across all four econometric specifications of our model and is robust to inclusion/exclusion of any of the other independent variables. We discuss the interpretation of these results in detail in section A.

Fixed effects is the only method which controls for correlation between unobserved country effects and included explanatory variables. We can test this assumption using the Hausman (1978) test. This test, conditional on the model being specified correctly in other ways, compares the fixed effects and random effects coefficients and can be used as a test of correlation between unobserved time-invariant omitted variables and included exogenous variables. For the Standard and Poor's data, we find a test statistic of 70.4 and for the Moody's data, a test statistic of 90. In both cases the p-value of the test is less than .001 and we thus reject the null hypothesis that unobserved country effects are uncorrelated with the included explanatory variables. The implication is that the assumptions which underpin OLS, linear random effects, and random effects ordered probit are invalid. On the basis of this test, and in line with our *a priori* assumptions as outlined above, we prefer the fixed effects specification. In the discussion that follows, we will thus focus on the fixed effects models.

The other included explanatory variables in the models mostly have the expected signs. Advanced countries are rated higher on average while Latin and Central American countries and those with a previous history of default are rated lower on average after controlling for other variables. These results are consistent across all models and both data sets. GDP level and growth have significant positive effects, for the most part. They are insignificant in some of the models. Inflation, where significant, has a negative effect. Government debt has a negative effect, as does the ratio of external debt to current account receipts. The coefficients on trade as a percentage of GDP are

[14]The estimates which include all of the time dummies and interactions are available upon request from the authors. The magnitudes, signs and statistical significance of the coefficients which are reported are virtually unchanged by dropping these time dummies and interaction terms. In the Moody's sample for example, dropping the interactions between low oil exports and the time dummies causes the log-likelihood value to drop by only a very small amount from -1652.3 to -1653.3. We describe additional robustness testing in section B below.

generally negative, which may reflect small country exposure to international currency and market fluctuations. As many of the right-hand side variables are highly correlated, caution should be exercised in interpreting the individual coefficients. (e.g., This should not be interpreted as saying that trade is bad. Higher trade might be strongly correlated with higher GDP and the combination of the two may have a positive effect on ratings.)

Ours is the first study, to our knowledge, to include regulatory quality as an explanatory variable. We find that regulatory quality has a strong, positive effect on the sovereign rating as one might expect. We would encourage people to include this variable in future studies.

A Oil producing countries and sovereign ratings

How should we interpret the positive and significant coefficients on high-oil producing countries in the second part of the sample period? One interpretation is that we are capturing the improved value of the asset held by oil-exporting countries. The coefficients are small and statistically insignificant when oil prices are low, so it appears that oil prices need to rise above a certain level before this asset effect kicks in. Using the coefficients from equation (2) and averaging over the 2006-2008 period, once this threshold is reached, an oil price increase of $31 is associated with an improvement in an oil-exporting country's sovereign rating of 1 notch for Moody's. For S&P, the analogous price is $43.

Another possible explanation is that we are not properly accounting for the improved fundamentals of high oil-exporting countries. The ratings agencies explicitly state (see Moody's Investors Service (2002), Moody's Investors Service (2006) and Standard & Poor's (2006)) that they take into account forecast information in determining the ratings. Perhaps the significant and positive coefficients for high oil-exporting countries reflect forecasts of crude oil price increases and forecasted improvements in fundamentals which the rating agencies expect in these countries.

The first thing we can do is to consider whether the coefficients on high-oil producing countries appear to lead increases in crude oil prices or whether they are contemporaneously correlated with crude oil prices. Table 6 provides annual averages of weekly world crude oil prices. While oil prices are increasing for much of our sample, we note that this time period includes a large oil price drop in 2001 and flat prices overall between 2000 and 2003. Tables 7 and 8 present the correlations between our estimated coefficients and oil price changes and levels for our sample period and for the post-2000 period. These correlations give us some information, but it is important to recognize that they are based on only ten coefficients which are themselves estimates.

The standard errors for these correlation coefficients are fairly large.

In Table 7, we find only small correlations between oil price changes and our coefficients. There appears to be more contemporaneous correlation if we consider the post-2001 period only. If coefficients reflect forecasts of future oil price then there should be a strong correlation between past coefficients and current price changes but this is not the case, as can be seen in the second panel of Table 7.

In Table 8, we repeat the same exercise but for levels of oil price instead of changes. Correlations with levels are much higher than with changes. For Moody's, we find that contemporaneous correlations are higher than the correlation between the current coefficients and future prices. For Standard and Poor's we find high correlations with both current and future prices. One would not want to draw strong inference from these results, but we can at least conclude that the relationship between the ratings premium to high oil-exporting countries is related more to price levels than to changes. Furthermore the correlations between current prices and current ratings are at least as strong as those between current ratings and future prices. Neither of these would suggest that the ratings premium to high oil producing countries is driven more by expected improvements in oil prices than by current prices. Given the difficulty of forecasting resource prices in general, this is probably a good thing. We discuss this further in the conclusion.

Next, we look at whether these results reflect forecasts of the ratings agencies themselves. Our ability to do this is quite limited by data. We have no 2009 forecast information from Standard and Poor's. For Moody's, we have forecast information for all macro-economic variables listed in Table 2 from GDP per capita through total trade as a percentage of GDP. We only have this forecast information for 2009–we do not have any retrospective forecast information for previous periods. We include this forecast information for 2009 in the regression by interacting these values with a time dummy for 2008 since these were the forecasts for 2009 made in 2008 and should presumably only have an effect on 2008 values of the sovereign rating.

We found that all of the forecast variables were insignificant except government debt. Forecasts of government debt were significantly negative as expected. More surprisingly, we found that when we included the forecast variables in the regression of Table 5, the coefficient on high oil producing countries for 2008 *increased* from 2.65 to 2.79.[15] This increase was not statistically significant. However, if in fact the coefficients on high oil producing countries are capturing expected improvements in fundamentals, inclusion of these forecast variables should have made this coefficient

[15]This result is in the fixed effects model. The coefficient increases by a similar magnitude in the other models as well. Results available from the authors upon request. *We have included this in the appendix of the submitted version but would propose that it be dropped from the final paper.*

decrease, not increase. We view this as evidence that the premium in ratings for high-oil producing countries are driven by something more than expected improvements in fundamentals.

Lastly, we note that for the Standard and Poor's data we find a positive coefficient on the low-oil producing countries for every year, although the coefficients for 2001 and 2008 are not statistically significant. This could be interpreted as evidence that low-oil producing countries are also receiving a premium during this period. However, the coefficients seem unrelated to the price of oil. The coefficient in 2002, for example, when oil prices increased by a modest 3 per cent, appears larger (although the difference is not statistically significant) than the coefficient in 2005, when crude oil increased by 44 per cent. In fact, we can not reject the equality of the coefficients on low-oil producing countries across all eight years of our sample (p-value of the test is 0.43). We thus interpret this result as capturing something about the fixed effect for the low-oil producing set of countries shown in the top panel of Table 3. It is also worth noting that the coefficients on the dummy variables for high-oil producing countries are significantly greater than the coefficients on the dummy variables for low-oil producing countries (at the five per cent level) for the 2005 to 2008 period.

B Robustness and predictive accuracy

In addition to the Hausman test described above, we conducted a wide variety of specification tests and robustness checks which we outline in this section. All of the results discussed here are available from the authors upon request.

If we re-estimate any of the models eliminating all those variables which are insignificant for that model, our results are unaffected. The size of the coefficients on high-oil producing countries generally increases, but for the most part the changes are not significant.

One might worry that the results are driven by one particular country behaving as an influential observation. To check this, we subjected each model to a data exclusion test by sequentially dropping each high oil producing country one at a time and re-checking the estimates. For example, we drop Qatar from the sample, re-estimate all four models and check the estimates. We then replace Qatar back into the sample and drop Bahrain, re-estimating all four models and again checking the estimates, etc. While the coefficient of high oil-exporting countries varies a bit across the test, in all exclusion cases, the estimate of the coefficients on high oil-exporting countries remained significant for the 2003 to 2008 period in the Standard and Poor's data and for the 2005 to 2008 period for the Moody's data.

If we vary the definition of high oil-exporting to 30% or to 10% the results are

unchanged. Likewise if we combine all oil-exporting countries into one group we find statistically significant coefficient estimates which lie between those for low and high oil-exporting countries when they are estimated separately.

The results remain significant if we replace the standard error estimates with estimates calculated from a robust variance-covariance matrix formed using the standard outer-product formula (see Wooldridge (2002)). As Wooldridge (2002) points out, some caution needs to be exercised in using this robust standard error correction in panel data models, however when the cross-sectional sample size (n) is large relative to the number of time periods (T) (in our case $n \geq 100$ and $T = 9$) this gives consistent (in n) estimates. All coefficients in 2005 onwards remain significant at the 5 per cent level (or smaller) when we use the robust standard errors.

If we re-estimate the model on smaller samples and predict forward one year, the model performs very well. Using 1999-2004, 1999-2005, 1999-2006, and 1999-2007 we predicted 2005, 2006, 2007, and 2008 values, respectively, and one hundred percent of the predicted ratings lie within two notches of the truth. The fixed effects and random effects models correctly predict 64 and 68 per cent of the ratings for the Standard and Poor's and Moody's data, respectively. 97 and 99 per cent are within one notch of the predicted rating. The predictive accuracy of the model is strong.

Finally, we test the residuals from the fixed effects model for first-order autocorrelation which we are able to reject.

IV Discussion and Conclusion

We find strong statistical evidence that Standard and Poor's and Moody's are giving a premium in their sovereign ratings to countries for whom net oil and gas revenues account for more than 20 per cent of gross domestic product. This premium coincides with the rapid increase in oil prices since 2003 and reflects the increased value of the asset held by oil-exporting countries. The premium is statistically significant since 2003 for Standard and Poor's and since 2005 for Moody's. The size of the premium appears to have grown over time and in 2008 the premium is 2.13 for Standard and Poor's and 2.65 for Moody's. This means, in practical terms, that high oil producing countries have a sovereign rating more than two notches higher than non-oil producing countries with similar economic fundamentals. In terms of the relationship to oil prices, for Moody's, a $31 increase in the price of oil is associated with a ratings increase of one notch over the 2005-2008 period. For Standard and Poor's, a $43 increase in the price of oil is associated with a ratings increase of one notch over the 2003-2008 period. These results are robust to a wide range of model assumptions, econometric

techniques, and the inclusion of macro-economic explanatory variables.

One interesting feature of these results is that Standard and Poor's appears to lead Moody's in initiating the oil-exporter premium. This is in contrast to the conventional wisdom that Moody's tends to be the first mover in upgrades–see Alsakka and ap Gwilym (2010).

The ratings premium to high oil producing countries is very large. Using our preferred results for Standard and Poor's ratings, a country would need to increase its economic growth by *seven percentage points per year* to get an equally large boost in their sovereign rating. Based upon the results for Moody's, a country would need to increase its economic growth by six percentage points per year. This numerical comparison should be taken with some caution as the macro economic variables in our model are highly correlated with one another but this does make it clear that the effect is large.

One hypothesis is that the ratings agencies premium to high oil producing countries reflects expected improvements in fundamentals for which we are unable to control. We find no evidence for this. In fact, including forecasts (for Moody's only) for the 2008 ratings causes the premium to high oil producing countries to *increase*. This is exactly the opposite of what we would expect if our results are in fact driven by expected improvements in economic fundamentals.

Another possible source of our results is that many of the macro-economic aggregates which we have included in our model of the determinants of sovereign ratings are likely measured with error. It could be that the dummy variable for being an oil producer is proxying for other macroeconomic fundamentals which are less well-measured. However, in this case, one would expect the significant effect of being an oil-exporting country to be less strongly related to price, which varies much more than economic fundamentals.

Perhaps sovereign ratings agencies have incorporated forecasts of future oil prices into their models? This may well be the case, but we are sceptical about their ability to do so accurately. First, in the post-2000 period, we find higher correlations between current premiums to high oil-exporting countries and current oil prices than we do between current premiums and future changes in oil prices. For Moody's, the correlation between current premiums and future price changes is *negative*. This evidence is based on few observations, however, and may perhaps be discounted.

A recent paper, Hilscher and Nosbusch (2010), posits that rating premiums are given when forecasts of economic fundamentals are more stable. It may be that increasing oil revenue, particularly for developing countries, provides a source of more easily assessed revenue and that what is being picked up here is another version of a

'stability premium' or a channel through which that premium can operate. Oil revenue may also provide countries with improved access to capital markets. Market risk premium, which Hill et al. (2010) show may affect ratings, may then be affected. A variety of channels, triggered by increased oil revenue, may be operating.

Importantly, resource prices in general, and oil prices in particular, are extremely difficult to forecast.[16] In early 1999, The Economist (1999a) magazine, along with many finance and business observers, forecast declining oil prices on the basis of several years of very low oil prices. Exactly the opposite happened and The Economist (1999b) published their *mea culpa* nine months later.

Being a net oil producer enhances the ability of a country to meet its external obligations and therefore should be one of the fundamental determinants of a country's sovereign rating. One basic conclusion of our paper, therefore, is that this variable should be included in future studies of the determinants of sovereign ratings. That the benefit of being an oil producer increases as the price of oil increases seems sensible as an oil producing country's ability to meet its obligations increases with oil price. Nonetheless, given the very large ratings premium that the agencies appear to be giving to these countries makes them particularly exposed to unexpected drops in oil prices, even if their current ability to meet their obligations increases as oil prices rise. After a decade of high oil prices, observers seem only able to imagine high and ever increasing prices. Such expectations have often been disappointed in the past and, in the event of an unexpected drop in oil prices, high oil producing countries sovereign ratings can be expected to suffer. The subsequent downgrades will be more severe than that warranted by the deterioration in economic fundamentals if ratings agencies simultaneously withdraw the premium which they appear to be assigning to these countries.

[16] We considered including oil price forecasts in the regressions but decided against it for this reason and the lack of consensus forecasts.

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Table 1: Ratings systems of Standard and Poor's (S&P) and Moody's

	S&P (101)		**Moody's** (100)		
	Rating	**Sample size**	**Rating**	**Sample size**	**Linear scale values**
Highest Quality	AAA	17	Aaa	20	17
	AA+	2	Aa1	3	16
	AA	3	Aa2	7	15
	AA-	5	Aa3	6	14
Strong Payment Capacity	A+	3	A1	6	13
	A	12	A2	7	12
	A-	5	A3	2	11
Adequate Payment Capacity	BBB+	8	Baa1	5	10
	BBB	2	Baa2	4	9
	BBB-	4	Baa3	6	8
Unlikely to fulfill obligations, ongoing uncertainty	BB+	7	Ba1	5	7
	BB	4	Ba2	7	6
	BB-	7	Ba3	4	5
High credit risk	B+	11	B1	5	4
	B	8	B2	5	3
	B-	2	B3	5	2
Very High credit risk	CCC+	1	Caa1	3	1
	CCC	0	Caa2	0	1
	CCC-	0	Caa3	0	1
Near default with possibility of recovery	CC	0	Ca	0	1
Default	SD	0	C	0	1
	D	0			1

Our panel is unbalanced and the number of observations in the sample size columns reflect the sample at the last period for which we have data, July 2008.

Table 2: Variable definitions and descriptive statistics
Regression sample for Moody's analysis (n=100)
Values for 2008 cross-section of data

Variable	Mean	Standard deviation	Minimum	Maximum
Lowoil =1 if country has positive net receipts from oil and gas of less than 20% of GDP	0.10	0.30	0	1
Highoil =1 if country has positive net receipts from oil and gas of more than 20% of GDP	0.13	0.34	0	1
Advanced Country =1 if advanced country (Defined by IMF–see section 2 above)	0.28	0.45	0	1
Latin and Central America =1 if in Latin or Central America	0.21	0.41	0	1
Default History =1 if country has defaulted since 1975	0.12	0.33	0	1
GDP per capita Nominal gross domestic product measured as a fraction of U.S. GDP.	0.46	0.50	0.015	2.53
GDP growth Three year average of real GDP growth	5.63	3.21	0.3	22.3
CPI inflation Three year average of consumer price index inflation	6.02	3.84	0.67	21.5
Fiscal balance as % of GDP The difference between total revenue and expenditure as a percentage of GDP.	0.86	6.28	-11	31.9
Government Debt as % of GDP Direct debt of government held by the public at year-end as % of GDP	38.9	31.2	0.0	197.5
Current account as % of GDP Three-year average of balance of payments of all imports and exports as % of GDP	0.36	11.8	-22.6	48.6
External debt to current account receipts (three year average)	65.0	58.6	0	277.2
Investment as % of GDP Includes private and public investment	24.0	6.1	11	42.5
Total trade as % of GDP Exports and imports as percentage of GDP	104.9	63.0	26.6	410
Government effectiveness World bank measure of governance ranging from about -2.5 (worst) to about 2.5 (best). See World Bank (2007a)	0.51	0.92	-1.12	2.29
Regulatory quality World bank measure of regulatory quality ranging from about -2.5 (worst) to about 2.5 (best). See World Bank (2007a)	0.50	0.83	-1.8	1.95

Our panel is unbalanced and the descriptive statistics are calculated for the 100 countries which appear in the last year of our panel (2008). The overlap between the Moody's and Standard and Poor's samples is over 90%. Descriptive statistics for S&P sample are very similar and we do not present them. They are available from the authors upon request.

Table 3: Net oil-exporting countries in our data and their ratings by Standard and Poor's (S&P) and Moody's

	Net oil and gas as percentage of GDP in 2007	**S&P ratings, July 2008**	**Moody's rating, July 2008**
Low oil-exporting countries			
Denmark	1.9	AAA	Aaa
Indonesia	3.6	BB-	Ba3
Argentina	3.7	B+	B3
Canada	4.0	AAA	Aaa
Mexico	4.5	BBB+	Baa1
Cameroon	5.4	B	nr
Tunisia	5.5	BBB	A3
Columbia	5.8	BB+	Ba2
Egypt	6.2	BB+	Ba1
Malaysia	8.3	A-	A3
Vietnam	16.0	BB	Ba3
High oil-exporting countries			
Ecuador	21.5	B-	B3
Russian Federation	22.4	BBB+	Baa2
Bahrain	23.5	A	Aa3
Norway	26.5	AAA	Aaa
Venezuela	30.0	BB-	B2
United Arab Emirates	39.9	nr	Aa2
Kazakhstan	42.9	BBB	A2
Nigeria	58.3	BB-	nr
Kuwait	60.5	AA-	Aa2
Saudi Arabia	61.4	AA-	Aa3
Qatar	64.9	AA-	Aa2
Azerbaijan	68.9	nr	Baa2
Oman	70.7	A	Aa3
Trinidad and Tobago	72.6	A-	Baa1

nr: not rated
Sources: British Petroleum, International Monetary Fund, World Bank, Moody's

Table 4 (part 1): Coefficients from estimated models
Determinants of Standard and Poor's (S&P) Sovereign Rating

	Estimated models			
	OLS	**Linear Fixed Effects**	**Linear Random Effects**	**Ordered Probit Random Effects**
Sample size	$N = 880$	$T = 9$, $n = 101$, $N = 807$	$T = 9$, $n = 101$, $N = 807$	$T = 9$, $n = 101$, $N = 807$
Explanatory Variables				
Year dummies				
lowoil*y1999		n/a		-0.58 (0.35)
lowoil*y2000		0.63^{*} (0.36)		0.58 (0.38)
lowoil*y2001		0.14 (0.36)		-0.38 (0.38)
lowoil*y2002		0.73^{***} (0.33)		0.37 (0.38)
lowoil*y2003		0.89^{***} (0.34)		0.96^{***} (0.37)
lowoil*y2004		0.59^{*} (0.34)		0.54 (0.37)
lowoil*y2005		0.65^{*} (0.34)		0.61^{*} (0.35)
lowoil*y2006		0.60^{*} (0.35)		0.70^{*} (0.37)
lowoil*y2007		0.60^{*} (0.35)		0.72^{**} (0.37)
lowoil*y2008		0.10 (0.35)		0.42 (0.39)
highoil*y1999	1.51^{**} (0.73)	0.45 (0.57)	0.89^{*} (0.52)	1.30^{**} (0.57)
highoil*y2000	0.53 (0.52)	0.012 (0.43)	0.15 (0.38)	-0.13 (0.43)
highoil*y2001	0.13 (0.52)	0.22 (0.42)	0.18 (0.38)	0.18 (0.43)
highoil*y2002	-0.20 (0.56)	0.012 (0.44)	-0.053 (0.40)	0.34 (0.44)
highoil*y2003	0.74 (0.49)	0.68^{*} (0.41)	0.64^{*} (0.36)	1.18^{***} (0.41)
highoil*y2004	0.96^{*} (0.50)	0.96^{***} (0.41)	0.87^{**} (0.37)	1.43^{***} (0.42)
highoil*y2005	0.91^{*} (0.49)	1.13^{***} (0.40)	0.91^{**} (0.36)	1.42^{***} (0.42)
highoil*y2006	1.13^{**} (0.46)	1.56^{***} (0.39)	1.19^{***} (0.35)	1.83^{***} (0.40)
highoil*y2007	1.29^{***} (0.47)	1.77^{***} (0.40)	1.37^{***} (0.35)	2.12^{***} (0.41)
highoil*y2008	2.18^{***} (0.51)	2.13^{***} (0.40)	1.89^{***} (0.37)	2.21^{***} (0.41)

Numbers in parentheses are standard errors.
***significant at 1% level; **significant at 5% level; *significant at 10% level

Table 4 (part 2): Coefficients from estimated models
Determinants of Standard and Poor's (S&P) Sovereign Rating

	Estimated models			
	OLS	**Linear Fixed Effects**	**Linear Random Effects**	**Ordered Probit Random Effects**
Explanatory Variable				
Advanced Country	2.15^{***} (0.23)	n/a	1.78^{***} (0.26)	2.55^{***} (0.25)
Latin and Central America	-1.45^{***} (0.14)	n/a	-1.44^{***} (0.37)	-2.24^{***} (0.14)
Default History	-0.94^{***} (0.20)	-0.49^{**} (0.25)	-0.49^{**} (0.23)	-0.88^{***} (0.17)
GDP (as fraction of US GDP)	0.45^{*} (0.26)	1.21^{***} (0.32)	1.50^{***} (0.28)	4.71^{***} (0.37)
GDP growth (3 year average)	0.039 (0.024)	0.037^{***} (0.021)	0.044^{**} (0.020)	0.050^{**} (0.021)
CPI inflation (3 year average)	-0.048^{***} (0.0051)	-0.018^{***} (0.0036)	-0.022^{***} (0.0036)	-0.024^{***} (0.0048)
Fiscal balance as % of GDP (3 year average)	0.0027 (0.016	0.038^{**} (0.018)	0.046^{***} (0.016)	0.085^{***} (0.016)
Government debt as % of GDP	-0.0088^{***} (0.0019)	-0.007^{**} (0.0029)	-0.007^{***} (0.0025)	-0.017^{***} (0.0018)
Current account as % of GDP (3 year average)	0.081^{***} (0.0086)	-0.019^{*} (0.011)	0.0046 (0.0096)	-0.0019 (0.0089)
External debt to CA receipts (3 year average)	-0.0081^{***} (0.0009)	-0.0080^{***} (0.0012)	-0.0083^{***} (0.0010)	-0.0099^{***} (0.00084)
Investment as % of GDP	0.040^{***} (0.0096)	0.047^{***} (0.011)	0.041^{***} (0.010)	0.012 (0.0086)
Total trade as % of GDP	-0.0096^{***} (0.0009)	0.0046^{*} (0.0026)	-0.0026 (0.0017)	-0.0030^{***} (0.0011)
Government effectiveness	1.4^{***} (0.2)	1.55^{***} (0.22)	1.86^{***} (0.19)	2.76^{***} (0.19)
Regulatory quality	2.2^{***} (0.2)	1.30^{**} (0.19)	1.38^{***} (0.18)	1.28^{***} (0.18)
Constant	8.3^{***} (0.3)	6.5^{***} (0.4)	7.3^{***} (0.4)	n/a
Log-likelihood value	-1546.7	-978.2	-1205.3	-1012.1

Numbers in parentheses are standard errors.
***significant at 1% level; **significant at 5% level; *significant at 10% level
The constant in the fixed effects regression is the average of the country-specific effects.
Note that comparing likelihood values across models is not a valid model selection tool in the presence of unobserved heterogeneity.

Table 5 (part 1): Coefficients from estimated models
Determinants of Moody's Sovereign Rating

	Estimated models			
	OLS	**Linear Fixed Effects**	**Linear Random Effects**	**Ordered Probit Random Effects**
Sample size	$N = 929$	$T = 10$, $n = 100$, $N = 829$	$T = 10$, $n = 100$, $N = 929$	$T = 10$, $n = 100$, $N = 929$
Explanatory Variables				
Year dummies				
y2000	0.095 (0.24)	0.0092 (0.13)	0.15 (0.14)	0.42** (0.19)
y2001	0.16 (0.24)	0.16 (0.13)	0.26** (0.14)	0.61*** (0.19)
y2002	0.70*** (0.24)	0.76*** (0.13)	0.78*** (0.14)	1.32*** (0.20)
y2003	0.66*** (0.24)	0.88*** (0.13)	0.81*** (0.14)	1.33*** (0.20)
y2004	0.49** (0.24)	0.69*** (0.14)	0.63*** (0.14)	1.15*** (0.20)
y2005	0.54*** (0.24)	0.64*** (0.14)	0.64*** (0.14)	1.17*** (0.20)
y2006	0.88*** (0.24)	0.89*** (0.15)	0.95*** (0.15)	1.76*** (0.21)
y2007	0.89*** (0.24)	0.86*** (0.16)	0.91*** (0.15)	1.67*** (0.21)
y2008	0.92*** (0.24)	0.87*** (0.16)	0.89*** (0.15)	1.57*** (0.21)
highoil*y1999	1.29** (0.63)	0.99** (0.48)	1.25*** (0.46)	2.10*** (0.50)
highoil*y2000	0.75 (0.50)	0.34 (0.40)	0.47 (0.38)	0.75* (0.41)
highoil*y2001	0.41 (0.51)	0.36 (0.39)	0.46 (0.37)	0.76* (0.41)
highoil*y2002	0.099 (0.53)	−0.07 (0.40)	−0.15 (0.38)	0.62 (0.41)
highoil*y2003	0.19 (0.50)	0.17 (0.39)	0.29 (0.37)	0.49 (0.42)
highoil*y2004	0.57 (0.51)	0.40 (0.39)	0.53 (0.37)	1.01** (0.41)
highoil*y2005	1.35** (0.50)	1.17*** (0.37)	1.32** (0.37)	2.39*** (0.43)
highoil*y2006	2.33*** (0.47)	2.33*** (0.36)	2.36*** (0.35)	3.74*** (0.41)
highoil*y2007	2.40*** (0.48)	2.56*** (0.37)	2.53*** (0.36)	3.99*** (0.42)
highoil*y2008	2.43*** (0.48)	2.65*** (0.37)	2.58*** (0.37)	3.94*** (0.42)

Numbers in parentheses are standard errors.
***significant at 1% level; **significant at 5% level; *significant at 10% level

Table 5 (part 2): Coefficients from estimated models
Determinants of Moody's Sovereign Rating

	Estimated models			
	OLS	**Linear Fixed Effects**	**Linear Random Effects**	**Ordered Probit Random Effects**
Explanatory Variable				
Advanced Country	2.74^{***} (0.22)	n/a	2.21^{***} (0.27)	2.57^{***} (0.24)
Latin and Central America	-1.66^{***} (0.14)	n/a	-2.06^{***} (0.34)	-2.05^{***} (0.14)
Default History	-2.29^{***} (0.19)	-2.72^{***} (0.22)	-2.47^{***} (0.22)	-3.05^{***} (0.20)
GDP (as fraction of US GDP)	0.39 (0.26)	-0.51 (0.35)	0.58^{*} (0.30)	3.33^{***} (0.35)
GDP growth (3 year average)	-0.026 (0.021)	0.042^{**} (0.018)	0.023 (0.018)	-0.036^{*} (0.019)
CPI inflation (3 year average)	-0.039^{***} (0.0055)	-0.0043 (0.0038)	-0.0095^{**} (0.0039)	-0.013^{***} (0.0047)
Fiscal balance as % of GDP (3 year average)	0.0011 (0.015)	0.063^{***} (0.015)	0.052^{***} (0.015)	0.027^{**} (0.013)
Government debt as % of GDP	-0.0082^{***} (0.0020)	-0.021^{***} (0.0033)	-0.0094^{***} (0.0028)	-0.011^{***} (0.0021)
Current account as % of GDP (3 year average)	0.050^{***} (0.0080)	-0.0096 (0.0096)	0.0009 (0.0091)	0.00046 (0.0074)
External debt to CA receipts (3 year average)	-0.0067^{***} (0.00089)	0.0011 (0.0013)	-0.0045^{***} (0.0010)	-0.0084^{***} (0.0010)
Investment as % of GDP	0.077^{***} (0.0097)	0.040^{**} (0.011)	0.037^{***} (0.011)	0.058^{***} (0.0097)
Total trade as % of GDP	-0.0079^{***} (0.00096)	0.012^{***} (0.0032)	-0.0008 (0.0019)	-0.0096^{***} (0.0010)
Government effectiveness	1.37^{***} (0.19)	0.82^{***} (0.25)	1.64^{***} (0.21)	3.05^{***} (0.22)
Regulatory quality	1.92^{***} (0.19)	1.28^{***} (0.19)	1.51^{***} (0.19)	1.61^{***} (0.21)
Constant	7.3^{***} (0.3)	6.8^{***} (0.5)	7.2^{***} (0.4)	n/a
Log-likelihood value	-1653.3	-1025.8	-1282.3	-1029.9

Numbers in parentheses are standard errors.
***significant at 1% level; **significant at 5% level; *significant at 10% level
The constant in the fixed effects regression is the average of the country-specific effects.
Note that comparing likelihood values across models is not a valid model selection tool in the presence of unobserved heterogeneity.

Table 6: Annual average of world crude oil prices, 1998-2008

Year	Average price of crude oil, in $U.S., over 52 weeks	Percentage increase from previous year
1998	$11.82	
1999	$17.27	46%
2000	$27.07	57%
2001	$22.73	-16%
2002	$23.47	3%
2003	$27.11	16%
2004	$34.75	28%
2005	$49.87	44%
2006	$60.32	21%
2007	$69.19	15%
2008	$95.62	38%

Source: `http://tonto.eia.doe.gov/dnav/pet/pet_pri_wco_k_w.htm`

Table 7: Correlations between coefficients on high-oil producing countries and changes in world crude oil prices (approximate standard errors in parentheses)

Years	Standard and Poor's Results	Moody's Results
Contemporaneous correlations		
1999 - 2008	0.14 (0.33)	0.18 (0.32)
2001 - 2008	0.67 (0.21)	0.45 (0.30)
Correlations between current oil price changes and coefficients from previous year		
2000 - 2008	0.41 (0.29)	0.25 (0.33)
2002 - 2008	0.49 (0.31)	0.18 (0.39)

In the second part of table, years refer to oil price changes

Table 8: Correlations between coefficients on high-oil producing countries and levels of world crude oil prices (approximate standard errors in parentheses)

Years	Standard and Poor's Results	Moody's Results
Contemporaneous correlations		
1999 - 2008	0.93 (0.04)	0.89 (0.07)
2001 - 2008	0.95 (0.04)	0.94 (0.04)
Correlations between current oil price levels and coefficients from previous year		
2000 - 2008	0.96 (0.03)	0.87 (0.08)
2002 - 2008	0.95 (0.03)	0.92 (0.06)

In the second part of table, years refer to oil price levels

Appendix

For referees, not for inclusion in final paper

Table: Descriptive statistics
Regression sample for S&P analysis (n=101)
Values for 2008 cross-section of data

Variable	Obs	Mean	Std. Dev.	Min	Max
lowoilpro~07	101	.1089109	.3130811	0	1
highoilpr~07	101	.1188119	.3251808	0	1
acty	101	.2475248	.4337267	0	1
latam	101	.1683168	.3760135	0	1
default	101	.1089109	.3130811	0	1
gdppc_fracus	101	.3707335	.4263808	.0071658	2.211173
gdpgr_m	101	5.159406	2.357289	.7666667	11.3
cpi_m	101	4.79802	3.37697	.3333333	17.13333
gvtbaltogd~m	101	-.0071948	5.773623	-10.9	35.4
gvtdebttogdp	101	43.66337	31.95211	1.4	214.2
curraccbal~m	101	.6324422	11.15869	-20.16667	47.03333
extdebttoc~m	101	67.5369	58.1903	0	284
invttogdp	101	23.89703	5.690632	13	44
openecon	101	101.4099	65.19901	27.9	457
goveffect	101	.4972277	.9049764	-1.12	2.29
regqua	101	.4837624	.8103294	-1.35	1.95

Fixed effects for Moody's including 2009 forecasts

```
Fixed-effects (within) regression               Number of obs      =       929
Group variable: countryid                       Number of groups   =       100

R-sq:  within  = 0.6216                         Obs per group: min =         2
       between = 0.5900                                        avg =       9.3
       overall = 0.6024                                        max =        10

                                                F(40,789)          =     32.41
corr(u_i, Xb)  = 0.3888                         Prob > F           =    0.0000
```

ratings17	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
y2000	.0143303	.1333337	0.11	0.914	-.2474005	.2760611
y01	.163868	.1317336	1.24	0.214	-.0947219	.4224578
y02	.7568127	.1308065	5.79	0.000	.5000428	1.013583
y03	.8798862	.1343584	6.55	0.000	.6161439	1.143629
y04	.7312611	.138489	5.28	0.000	.4594107	1.003111
y05	.6846351	.1430888	4.78	0.000	.4037554	.9655148
y06	.9418107	.1514034	6.22	0.000	.6446097	1.239012
y07	.9055775	.1593589	5.68	0.000	.59276	1.218395
y08	.7635237	.4946009	1.54	0.123	-.2073656	1.734413
highoilpr~99	.948453	.4859771	1.95	0.051	-.0055081	1.902414
highoilpr~00	.2835543	.3987099	0.71	0.477	-.4991035	1.066212
highoilpr~01	.3080895	.393423	0.78	0.434	-.4641902	1.080369
highoilpr~02	.0175433	.4011307	0.04	0.965	-.7698663	.8049529
highoilpr~03	.121974	.3903733	0.31	0.755	-.6443191	.888267
highoilpr~04	.3025408	.3879723	0.78	0.436	-.4590392	1.064121
highoilpr~05	1.063746	.3770166	2.82	0.005	.3236723	1.803821
highoilpr~06	2.200444	.3643806	6.04	0.000	1.485174	2.915714
highoilpr~07	2.417722	.3729117	6.48	0.000	1.685706	3.149738
highoilpr~08	2.79643	.44277	6.32	0.000	1.927284	3.665577
default	-2.708004	.2252504	-12.02	0.000	-3.150165	-2.265843
gdppc_fracus	-.3031014	.4232421	-0.72	0.474	-1.133915	.5277123
gdpgr_m	.0398203	.0182927	2.18	0.030	.0039122	.0757283
cpi_m	-.0038022	.003808	-1.00	0.318	-.0112771	.0036728
gvtbaltogd~m	.0703243	.0166463	4.22	0.000	.037648	.1030006
gvtdebttogdp	-.0199083	.0034168	-5.83	0.000	-.0266154	-.0132012
curraccbal~m	-.0116382	.0105096	-1.11	0.268	-.0322682	.0089918
extdebttoc~m	.0012252	.0012799	0.96	0.339	-.0012871	.0037375
invttogdp	.0388406	.0115376	3.37	0.001	.0161925	.0614887
openecon	.0107411	.0032462	3.31	0.001	.0043689	.0171132
goveffect	.8177515	.2512488	3.25	0.001	.3245562	1.310947
regqua	1.25114	.1941305	6.44	0.000	.8700668	1.632214
gdppc_fra~09	-.4032228	.2700885	-1.49	0.136	-.9333997	.1269542
gdpgr_m_09	-.0266412	.0475324	-0.56	0.575	-.1199462	.0666638
cpi_m_09	-.0488753	.0277273	-1.76	0.078	-.1033033	.0055527
gvtbaltog~09	-.0202974	.0245667	-0.83	0.409	-.0685212	.0279264
gvtdebtto~09	-.0069811	.0035419	-1.97	0.049	-.0139338	-.0000284
curraccba~09	.006881	.013712	0.50	0.616	-.0200353	.0337972
extdebtto~09	.0022503	.0017481	1.29	0.198	-.0011811	.0056816
invttogdp_09	.0240985	.0166224	1.45	0.148	-.008531	.0567279
openecon_09	.0026347	.0015025	1.75	0.080	-.0003147	.005584
_cons	7.197895	.4602864	15.64	0.000	6.294364	8.101425