Explaining the Durations between Changes in Investment Risk Ratings: Evidences from a Multi-Country Study

Manitra A. Rakotoarisoa*

Paper prepared for presentation at the 9th Annual Missouri Economics Conference of the Federal Reserve Bank of St. Louis and the University of Missouri-Columbia, March 27-28, 2009

* Economic and Social Development, UNFAO. Viale delle Terme di Caracala 00153 Rome, Italy. Tel. 39 06 57053809 Fax 39 06 57054495. Email: manitra.rakotoarisoa@fao.org. The author thanks the ILRI/CGIAR for providing the data. The views expressed in this paper are the author's own and do no represent the views of any institutions.

Abstract

A widespread political, financial or economic crisis revives the long-standing question of why countries that endure the like levels of crisis and devote the like levels of efforts do not attract investment to recover at the same speed. Using a panel of monthly observations on investment risk ratings for 145 countries between 1984 and 2003, this study determines whether path-dependent and heterogeneity effects along with country-fixed characteristics caused the differences in durations before an upgrading or a downgrading in investment ratings across countries and across rating categories. The exit rate to a higher or lower investment rating is estimated using a competing risks model with random effects. The estimation takes into account the multiple spells and ranked exit destinations from each rating category. The model's covariates include fixed characteristics based on the geography, history, and culture of each country. Path-dependent effect is measured by the baseline hazard coefficient and heterogeneity effect by the variance of a multiplicative random component. After controlling for time-varying macroeconomic indicators such as GDP growth, inflation, trade openness and exchange rate alignment, the study finds that (i) heterogeneity effects including the graders' subjective assessment; (ii) path-dependent effects specific to each level of rating categories; and (iii) country-fixed indicators based on geography, history and culture all contribute to the differences of the rates at which investment ratings across countries and across rating categories change.

Keywords: country investment ratings; macroeconomic indicators; country-fixed characteristics; duration analysis; competing risks. (*JEL codes*: C41, E44, F21, O57.)

Explaining the Durations between Changes in Investment Risk Ratings: Evidences from a Multi-Country Study

I. Introduction

Country investment risk ratings have long helped foreign investors to decide whether and how much to invest in a country. Using information on the economic, social, and political conditions in each country, independent professional organizations periodically assign specific investment ratings, generally ranging from a *very high risk* category to a *very low risk* category. Although the rating methods entail some subjective assessments, a country aiming to improve their investment ratings to increase foreign investment devotes efforts such as lowering profit tax, reducing foreign exchange and interest rate risks, letting foreigners buy and own land, and signing agreements to protect foreign investment. However, it remains puzzling why some countries stay in a particular investment rating category for a longer period of time than others do, even when the levels of efforts to upgrade their rating to attract investment are the same. Indeed, after enduring like levels of political, financial or economic crisis, some countries attract more investment faster and recover more quickly and than others, even when both countries try equally hard to attract foreign investment[1]. Similarly, the time and effort needed to get the ratings upgraded or downgraded often vary across the rating categories not just across countries.

[1] The case of Angola and Kenya is one of many examples; the Economist Intelligence Unit (2007) projected that for the period 2007-2011, Angola will receive foreign investment inflows twenty times larger than those of Kenya although Kenya (a country relatively at peace until recently) has always been given consistently higher investment ratings than Angola (not long ago, a war-torn country).

The literature provides only limited explanations for the sources of these duration differences across countries and across rating categories. The idea of 'value of waiting' (Pindyck, 1991; Dixit, 1992) linked to investment uncertainty may explain the timing of a decision to invest based on an objective assessment of the risks or the expected returns, but such an idea cannot fully explain why the timing should differ when the risks or expected profits appear to be the same among countries. The subjective assessments of risks and expected returns by graders and investors that partly determine ratings and investment flows may contribute to these differences but have been ignored in the analysis. Likewise, no research has explored whether these differences in investment timing could arise from alternative characteristics specific either to countries or to the particular level of rating category.[2] This lack of understanding about what factors determine improvement in investment risk ratings and what causes the differences in the amount and timing of investment flow impairs the views and decisions of analysts and policy makers, who determine the design and timing of important policies aimed at attracting investment for job creation and economic growth. In this paper, I intend to contribute to filling this gap.

The objectives of this study are to determine and to explain the main sources of the differences in countries' duration of stay at the various rating categories and especially in the transition (or exit) rates, through upgrading or downgrading, from one particular risk rating category to another. The analysis uses the observations of monthly investment risk ratings from 145 countries between January 1984 and February 2003. The ratings are

[2] One reason Angola, despite its current low investment rating, is projected to attract higher rate of investment inflows than Kenya (see The Economist Intelligence Unit, 2007) is that Angola is rich in oil. This requires an investigation on

split into five different categories from *very high risk* to *very low risk* for investment. This unique dataset provides valuable insight into what determines countries' durations and exit rates out of various rating categories.

Three specific approaches distinguish this study from previous work:

(i) First, this study employs a competing risks model and takes into account the multiple spells featured in the data (as explained in Jenkins 2005). This model grows out of the duration-model literature first developed in engineering and biomedical and health sciences and later extended to social sciences and labor economics (Allison, 1982; Heckman and Honoré, 1989; Han and Hausman, 1990; Meyer, 1990; Narendranathan and Stewart, 1993a, 1993b; Box-Steffensmeier, De Boef, and Joyce, 2007). Duration models, especially the multi-spell and competing risks model, have not so far found many applications in the study of the durations in investment rating that influence investment inflow. The multiple spell (often simplified as multi-spell) and competing risks model particularly takes into account the countries' repeated movements in and out of a given investment risk rating category and the possibility that exit from any given rating category can have more than one destination. Such a model is used in this paper to allow comparisons among the rates of upgrading and downgrading across the rating categories.

(ii) Second, the use of the duration model in this paper invokes the 'heterogeneity hypothesis' (Heckman, 1991) which previously has not been tested in explaining the

---

how country-fixed characteristics (such as natural resources) influence the growth rates of investment ratings and actual investment inflows.

spells of failure to improve ratings and attract investment. This hypothesis implies that some country characteristics or shocks that a country has endured influence the investment ratings and amount of investment flow.[3] Such influence is often called the 'heterogeneity effect'. Past studies and policies aimed at reversing low investment ratings and lack of investment flow have taken into account mostly time-varying covariates such as demography, level of education and major macroeconomic indicators. These time-varying covariates might overlap with some of a country's main characteristics included among heterogeneity variables. However, these past studies have left out other important sources of heterogeneity that may arise from time-invariant or fixed factors, which include information on geography (e.g., territory size, length of the country's coastlines, and latitude), history (e.g., year of independence, foreign influence), or culture (ethno-linguistic). Several studies (Sachs, 2001, 2003; Dahl and Tufte, 1973; Easterly and Levine, 2002; Alesina and Spolaore, 2003; Rodrik, Subramanian and Trebbi, 2004; Rose, 2005; Hansson and Olsson 2006) have indeed highlighted the issue of how economic development is affected by these time-invariant (or fixed) factors, but there has been little or no specific investigation on how they affect the changes in investment ratings. I choose to focus on these time-invariant covariates to explore why attracting investment takes long for some countries compared to others.

[3] See Happe, Hussai and Redifer (2003)

(iii) Third, the use of the duration model also invokes another hypothesis, the *path-dependent hypothesis*, (Elbers and Ridder, 1982; Heckman, 1991; Parsley and Wei, 1993), which has not been tested previously in regards to the spells of rating stagnation and low investment. This hypothesis implies for instance that repeated failures over a relatively long period to attract investment may build a negative reputation that turns investment away. The reason is that investors may perceive the repeated failures as strong signals of some deeply-rooted conditions that are unfavorable to investment in the country; the lack of investment that ensues deprives the country the needed resources to improve its investment climate and invites more failures in the future. This describes the so-called 'path-dependent' or 'duration-dependence' effect, which in this case is a negative one.[4] This hypothesis remains unexamined in regards to spells in investment risk ratings and is tested in this paper.

Using the competing risks model that tests the two separate hypotheses on heterogeneity and path-dependent effects, this study attempts to extract ways countries, especially developing countries lacking investment, can improve their ratings and eventually attract more investment flow. Measurement of rates of exit across investment rating categories will provide useful information on how the level of efforts required to maintain or to upgrade to a high investment status may differ. Likewise, the results of the analysis help assess whether country-fixed characteristics (such as geography, culture, and history) and

[4] The negative path-dependent effect or persistence has numerous theoretical and application references in the in trade literature (e.g. Baldwin and Krugman, 1989) and remains rare in investment. The path-dependence in this paper is slightly different from (or a particular case of) the 'event'-dependence described in Box-Steffensmeier, De Boef and Joyce (2007); they treated the baseline hazard rate as functions of the number of spells (events) while this paper treats the baseline hazard rate only as a function of the duration of the spell.

eventually graders' perceptions are influential in attracting investment. Such an assessment will provide policy makers in countries lacking foreign investment with better information for allocating limited resources between the efforts to advertise a country's comparative advantages or improve its global image and the efforts to improve its internal investment climate.

II. Data

Investors refer to several investment risk ratings when making investment decisions. These ratings are often consistent across the professional organizations that calculate and publish them, although the data and methods used are not always the same. This study employs one of the most widely used risk rating indicators, the *Composite Risk Rating* of the International Country Risk Guides (ICRG) produced by PRS Group, Inc (2006). Other ratings include, for instance the *Coface* ratings by the Coface Insurance Group and the *Foreign Direct Investment confidence* index by A.T. Kearney Inc.[5]

The ICRG produces for each country three separate ratings: political, financial, and economic. From these three ratings ICRG creates a *composite rating* to grade a country's overall investment attractiveness. The political rating is calculated using subjective assessment of information such as political stability, level of corruption, conflicts, and level of bureaucracy. The financial rating is established using an assessment of country's ability to meet its financial obligations and to maintain stable exchange rate; the assessment is based on indicators such as foreign debt, balance of payment and exchange

[5] The *Coface* index is assigned using seven criteria: (i) vulnerability to shocks, (ii) foreign currency shortage risks, (iii) debt levels, (iv) government treasury, (v) risks in banking, (vi) risks from political institutions and (vii) government payments (Coface, 2003).

rate variation. The economic rating is an assessment of the state of a country's economy (strength and weakness); the assessment makes use of indicators such as Gross Domestic Product (GDP) per capita and annual GDP growth, inflation, and fiscal and trade balances.

The *Composite Risk Rating* of ICRG is a weighted average of the political, financial, and economic ratings. This composite rating is appealing for the estimation in the duration analysis of investment risk ratings because of the rich details and the wide country coverage it provides. It includes both subjective (e.g. in some of the political indicators) and more objective (e.g. in some of the financial and economic indicators) assessments of a country' abilities to attract investment. The ICRG assigns a score every month to each country's composite rating as a measure of the assessment of country's ability to attract investors. The score ranges form 0 (the riskiest) to 100 (the safest for investment). The ICRG also distributes these scores into five distinct rating categories as shown in table 1. The category number decreases with the level of investment risk: countries in rating category 5 are the most attractive and least risky whereas those in category 1 are the least attractive and the riskiest for investment.

(Table 1 insert here)

This paper uses the five risk rating categories described in table 1 because investors more likely look into these categories rather than the actual percent scores to decide whether and how much they will invest in a country.[6] Moreover, using the rating categories instead of the actual scores minimizes the differences that may exist between the ICRG ratings and ratings from other agencies that use different methods and publish at various frequencies. The data cover 145 countries and monthly observations between January 1984 and February 2003, i.e., 230 months per country. Some observations are missing, especially for countries that ceased to exist because they had merged with other countries (e.g., East and West Germany), or countries that gained independence or split with their former political administrative bloc (e.g. countries from the former Soviet bloc). Appendix 1 shows a table with the list of countries covered in this study and the distribution of countries' investment spells across five rating categories during the entire observation period. The table in Appendix 1 indicates that between 1983 and 2003, developed countries in West Europe and North America (e.g. Austria, Canada, United Kingdom, and United States) occupied the highest rating category, while developing countries in Sub-Saharan Africa (e.g. the Democratic Republic of Congo, Liberia and Mozambique) stayed more frequently at the lowest ratings.

(Figure 1, insert here)

(Figure 2, insert here)

Figure 1 shows how the number of countries at each rating category varies over time. The figure reveals that the number of countries staying in categories 3 (*moderate risk*) and 4 (*low risk*) has increased while the number of those in category 1 (*very high risk*) has declined. The same information is employed in figure 2 but is adjusted to indicate

[6] The ratings category gives unequal importance to a marginal increase in score. A one point score increase within a category is for instance less important than a 0.5 increase at the category's upper boundary.

the number of countries in each rating category per month divided by the total number of countries in all categories during that month. Figure 2 shows that the proportion of countries with *very high risk* (category 1) for investment has decreased over time while the proportions of countries with *moderate risk* and *low risk* in category 3 and 4 have clearly expanded. This inspires optimism that more countries have moved toward the improvement of their risk ratings to attract investment over time. The proportion of countries staying in the highest rating, the *very low risk* (category 5), appears to be stable at below 20% especially between 1996 and 1999 but drops significantly below 20% after 2000-2001. The changes in the proportion occupying category 5 follow the movement in the world economy for these periods. An economic expansion with growing investment in the 90s (the so-called 'dot com bubble', and low energy prices) kept the number of *very low risk* countries stable. But the percentage of *very low risk* countries shrunk after 1999, which coincided with the start of the recession and slump in the US and the world economies at that time.

III. Framework: Duration Model

In this study, duration refers to the number of months during which a country stays in one of the five rating categories before being upgraded or downgraded. I used a duration model to estimate the hazard rate or 'exit' rate, i.e., the probability at which the stay in a given rating category ends at a time t after a country has occupied that category for a prior duration t. I focused on two main goals. The first is to determine how the hazard rate varies with the duration of spells (path-dependent effect) and with the values of relevant covariates after controlling for heterogeneity effects that may arise from country or group of country characteristics. The second is to identify whether the baseline hazard rates of the transitions from one category to another are consistent across the five rating categories. This includes, for instance, the determination of whether the hazard rate of exiting out of category 3 to category 4 (an upgrade) is higher or lower than that of moving from category 4 to category 3 (a downgrade).

In estimating the hazard rate of country's investment risk rating, however, I had to confront three major related challenges. The first challenge was to choose the covariates entering the model. The data series on composite risk ratings are already the outcome of a series of assessments based on a large set of explanatory and mostly time-varying covariates. To account for the remaining covariates and eventually to reduce the variability due to unobserved heterogeneity in the model, some fixed indicators have to be introduced; the fixed indicators should be those that are expected to affect investment ratings directly. I have chosen three types of fixed indicators informed by the debate on the effects of country-fixed indicators on development highlighted in studies such as those of Mellinger, Sachs, and Gallup (2000); Sachs (2001, 2003), and Easterly and Levine (1997, 2002). These three types of indicators are geography (territory size, lengths of coastline and distance from the equator), history (foreign language influences and year of gaining independence or creation as a modern state), and culture (level of cultural diversity).

The second challenge was choosing the functional forms of the hazard rate. The use of a non-parametric method helps avoid the need for distributional assumptions (Heckman and Singer, 1984), so I first employed the Kaplan-Meier method, a non-parametric approach, to estimate the hazard rates to identify any path-dependent effects. But the need to test both the path-dependence and heterogeneity effects in a single model requires some distributional assumptions of the hazard functions and the random component test (e.g. Kelly and Lim, 2000; Therneau and Grambsch, 2000; and Box-Steffensmeier, De Boef, and Joyce 2007). For this reason, I tried known functional distributions, mainly from the family of proportional hazard functional forms, and chose the best models based of some goodness of fit criteria. The uses of both parametric and non-parametric methods allow comparison of the results on some of the estimates of the hazard rates and the path-dependence effects.

The third challenge was determining how the heterogeneity enters the hazard equation and choosing the distribution that represents the heterogeneity in the random-effect or 'frailty' model. This is important because mishandling the heterogeneity effect would lead at least to three major biases: (i) overestimation of the negative duration dependence, (ii) unstable coefficients for covariates, and (iii) biased coefficients for covariates (Kelly and Lim, 2000; Therneau and Grambsch, 2000; Jenkins, 2005; Box-Steffensmeier, De Boef, and Joyce, 2007). Several authors suggested introducing the random-effects in a separable multiplicative way in the model (e.g. Heckman and Honoré, 1989; Heckman, 1991; Mealli and Pudney, 1996; Jenkins, 2005), and using the *Gamma* or *Inverse Gaussian* distributions for a continuous time-model and the *Normal* or *Gamma* distribution for a discrete time-model (e.g. Jenkins, 2005). This paper follows these suggestions and employs the *Gamma* and *Normal* distributions. The analysis in this paper therefore entails two main steps: an exploratory step using non-parametric estimation of the survival and hazard rates and an analysis using a competing risks multi-spell model with frailty to estimate relevant parameters of the hazard functions.

III.a. Non-parametric estimation of the survival functions and hazard rates

The analysis first borrows the Kaplan-Meier method to determine the shapes of the survivor and hazard rate functions per risk category. This method is non-parametric in the sense that no functional form is assigned to the hazard rates (or equivalently to the distribution) in determining some characteristics of the hazard function. Multiple spells are taken into account as a country moves in and out of a given risk category a number of times during the period of the analysis. Then the analysis delves into the comparison of the shapes of the survival and hazard functions by relevant covariates such as regions and foreign influence.

I confined this analysis using a non-parametric method mostly to the study of durations in the boundary categories 1 and 5. The reason is that the direction of the exits from categories 1 and 5 is known with certainty and therefore easier to interpret. Additionally, because of the high frequency of the exit from category 3 (see Appendix 1), I used the non-parametric method to study this exit as well. Any exit from these categories (1, 3, and 5) is considered as a ‘failure’ in the duration-model analysis. However, the analysis at this stage cannot indicate whether the exit from category 3 is an upgrading or a downgrading. Prior to the estimation, the data are re-arranged for each of these three categories, as shown in table 2.

(Table 2, insert here)

From table 2 the usual *lifetable* (Kieffer, 1988; Cleves, 1999a, 1999b; Smith, 2006) in duration analysis can be created. The durations (the *t*'s) are ordered from low to high, and I call t_j the duration t for the jth order. At each t_j, N_j is the number of observations that neither completed nor censored before t_j. Likewise H_j is the number of observations that 'fail' (exit) at duration t_j. The estimate of the hazard rates at t_j is

$$(1a)\ \hat{\lambda}(t_j) = \frac{H_j}{N_j}.$$

An equivalent expression of the same distribution is the *Kaplan-Meier* estimator of the survivor function at t_j is

$$(1b)\ \hat{S}(t_j) = \prod_{i=1}^{j} \frac{N_i - H_i}{N_i},$$

where

- j is the order of the duration and j=1, 2, 3, …230; i is a subset of j as i= 1, 2, 3, …j

- t_j is the duration (number of months) and t_j=0, 1, … 230. (t_j is the time difference between the end (exit or 'failure') and the start of a single spell).[7]

[7] In the terms used in Box-Steffensmeier, De Boef and Joyce (2007), t_j is the 'gap time' duration, as opposed to 'elapsed time' duration. The latter refers to the duration starting at the beginning of the observation period (not at the beginning of the spell in consideration).

- N_i is the number of observations that are neither completed nor censored before duration t_i for i= 1,2,3, …j.

- H_i is the number of completed spells (exits) at duration t_i for i=1,2,3, … j.

The estimator in (1b) can also be interpreted as a maximum likelihood estimator. We plot functions (1a) and (1b) and observe the shapes of the curves. The slope of the hazard rate function particularly informs the type of path-dependent effect in the duration data.

III.b. The multi-spell and competing risks approach with random effects

Estimation of the hazard rates for this study employs the time-discrete model of multiple spells and competing risks. Such a model accommodates the data feature that the spells are measured in an interval censored to a length of one month and captures the likely correlations of the hazard parameters among rating categories.[8] I followed Jenkins (2005) and arranged the data in an 'episode-splitting' set so that each country has one observation per month (for all 230 months) indicating its rating status.[9] The 'episode-splitting' feature takes into account the timing and the sequences of all spells and exits over the 230 months period (including repeated spells when a country moves in and out of a category). To this newly organized dataset, the covariates with values that can vary

---

[8] Cleves (1999b) provided a summary of different methods handling competing risks models with ordered (the timing and sequence of the exits matter) and unordered (timing and sequence of the exits do not matter) events. Box-Steffensmeier and Zorn (2002) showed the application of such a method on political data. The ordered-event model of Prentice, Williams, and Peterson (1981) particularly considers that an exit to any category is conditional to the previous sequence of exits.The latter model may fit the monthly data in this study as, for instance, exit into category 4 cannot occur unless the country has entered category 3 or category 5 initially. These methods, however, are not able to include time-varying covariates especially in a discrete case.

[9] See Jenkins (2005), lesson Chapters 3 and 6.

per month were added. The duration data then become a *panel data* with the countries as sectional units.

The parameters of the hazard function are estimated based on the complementary log-logistic distribution for panel data, in which the entry (i.e. an exit from a higher or lower category) into a given rating category is estimated by treating the duration time as a discrete variable. Following Kieffer (1988) and especially Heckman (1991) and Horowitz (1999), the hazard rate *p(t)* at the end of duration *t* is written as follows:

(2) $Log\left(-Log(1-p(t)\right) = c(t) + \beta' \mathbf{X} + \log(v)$,

or

$p(t) = 1 - \exp\left[-\nu.\exp\left(c(t) + \beta' \mathbf{X}\right)\right]$, with $c(t) = (q\text{-}1).\log(t)$,

where β is a vector of parameters, **X** is a vector of covariates, and $c(t)$ is the baseline hazard and a function of the duration from which the path-dependent effect will be estimated. Heterogeneity, represented by the term v, enters the hazard function in a multiplicative form with the assumption that its distribution is known and its variance is finite. [10]

The baseline hazard function $c(t)$ in (2) can take different forms but I choose $c(t) = (q\text{-}1).\log(t)$, as the expression of the baseline hazard to simplify interpretation of the parameter values as in Jenkins (2005) and Smith (2005). The coefficient q-1 has a particular meaning in that its sign determines the sign of the first derivative of the baseline hazard with respect to the duration t , and, therefore, indicates how the hazard changes with the length of the duration. In this regard, if q-1>0 , (i.e. q>1), it implies there is a positive path-dependent effect: the longer a country stays in a rating the higher its chance of exiting out of that rating category. Conversely if q-1<0, (q<1), it can be concluded that there is a negative path-dependent effect (persistence): the longer a country stays in a rating category, the lower its chance of getting out of that category.

For the estimation, since there are at most K (K=4) destination categories for an exit out of a rating category, the general expression of the log-likelihood function for competing risks models (Narendranathan and Stewart, 1993b) for the ith individual country for an exit type κ can be written in general form as:

$$(3)\quad \log L_i = \alpha_i \log p_{\kappa i}(t_i) + \sum_{\tau_i=1}^{t_i-1}\left[\sum_{k=1}^{4}\log\{1-p_{ki}(\tau_i)\}\right],$$

where α_i is a dummy which is equal to one if the spell is completed and to zero when the spell is censored; t_i is, as before, the duration in number of months, and τ_i is a unit change in duration. The hazard rate $p(t)$ is of the form (2).

For the estimation, the vector $\mathbf{X}$ in (2) includes the following covariates:

- Macroeconomic indicators: GDP per capita, inflation rate, an index of distortion of the real exchange rate (as defined in Dollar (1992) and Easterly and Levine (2002)), and a trade openness index.

- Geography indicators: territory size, length of border, length of coastline, and latitude (absolute value of the distance from the equator scaled 0 to 1).

[10] For instance, the *Stata* command *xtcloglog* executes the estimation assuming that v follows a *normal* distribution.

- A history indicator: time elapsing from the year of gaining independence or of the return of sovereignty or creation as a modern state; I will also call this variable the *age* of the country since independence.

- A culture indicator (time): an ethno-linguistic fractionalization index.

The macroeconomic indicators are time-varying covariates, hypothesized to affect the rate of exit from (or entry to) a rating category. GDP per capita controls for the country's wealth: high GDP per capita assumes a healthy economy with high productivity which can attract investment. Inflation intends to capture efficacy and consistency in monetary policy of the country; low and stable inflation attracts investors in that it implies low production costs and low financial risks.

The real exchange rate distortion index controls for overvaluation (and undervaluation) of currency and accounts for a country's exchange rate policies (see appendix A2 on how the indicator is constructed). Overvalued currency, which often occurs under a fixed exchange rate regime, hurts competitiveness, and turns away foreign investors. *Openness* is the percentage of trade over GDP. *Openness* is an indicator of low barriers to trade and is expected to affect the chance of an upgrading in investment ratings.

The geography, history, and culture are fixed indicators or time-invariant and their effects on development and eventually on investment still stir unending debates. Some authors (e.g., Rodrik, 2004; Rose, 2005) argue that geography indicators do not play much role in development. For instance, they refer to the evidence that both small and large territories could become economic powerhouses. They also argue that geography and other fixed indicators may only affect development through institutions. But others (Sachs, 2001, 2003) argue that fixed indicators do have direct influence on development while institutions may not matter much, at least not directly. This second line of thought contends that *territory size* reflects the availability in natural resources and the ability to organize economic activity and to install and enforce rules of law (e.g. Alesina and Spolaore, 2003; Hanson and Olsson, 2006). Similarly, *length of coastline* could be an indicator of the ability to trade with the outside world at a lower cost. Longer coastlines could increase the chance of efficient transactions and hence facilitate an upgrading of investment ratings that eventually attracts investment. It could be also an indicator of the availability of sea resources.

Latitude in development studies is an indicator of the climate that affects productivity and economic activities and is included in several studies (Sachs, 2003; Easterly and Levine, 2002; La Porta et al., 1999). These studies argue that a country on or near the equator, where it is hot and humid, is theoretically prone to tropical diseases and harsh climate that reduce productivity and slow economic activities. Closeness to the equator, in this case, could therefore lessen countries' attractiveness to investment. Temperate climates prevailing in regions relatively far from the equator favor a more productive agriculture and entice economic activities (Landes, 1998); this could attract investment. Debate on these arguments would benefit from finding some evidence of the role that *latitude* plays in investment ratings and investment decisions.

The history indicator, here the country's *age*, may reflect a country's experience and maturity in governance, including the ability to maintain strong institutions and enforce the rules of law. 'Older' countries may have better governance than 'younger' states. If that statement is true, then 'older' states might inspire the confidence of foreign investors. Though *age* may not always correlate with increased investor confidence, it nevertheless can be taken into account and tested as a factor that influences the likelihood of an upgrade or a downgrade in risk ratings.

Ethno-linguistic fractionalization, a 'culture' indicator, measures the level of population diversity based on ethnic origin and language[11]. A high ethno-linguistic fractionalization index may indicate richness in culture and ability to communicate and cohabit among different ethno-linguistic groups. This could be an attraction for investors looking to exploit their clients' diversity, for instance by differentiating their products for higher gain (e.g., phone companies selling services in different languages or restaurant industries selling ethnic foods) in a single place. A high index might also imply a functioning society obeying, willingly or unwillingly, strict laws that protect individual rights amidst diversity. These advantages may inspire foreign investors' confidence in that they expect such laws would protect and guarantee their investment.

[11] See Easterly and Levine (1997), La Porta et al. (1999). The values of this index range from 0 to 1. The index is an average of five different indices: (i) probability that two randomly selected individuals from a given country will not belong to the same ethno-linguistic group, (ii) probability of two randomly selected people speaking different languages, (iii) probability that two randomly selected individuals do not speak the same language, (iv) percent of population not speaking the official language, and (v) percent of population not speaking the widely used language.

However, a high ethno-linguistic fractionalization index may also indicate permanent rifts and rivalries among the factions in society. This fractionalization could constitute a pre-condition for political instability or even civil war (Alesina, Easterly, and Baqir, 1999; Easterly and Levine, 1997). In this case, high fractionalization could frighten investors. Under either of the two opposing arguments, ethno-linguistic fractionalization index is expected to affect the change in investment in risk ratings.

IV. Results and Interpretation

IV.a. On the non-parametric analysis

Panels a, b, and c of figure 3 display the smoothed hazard rates for exits from categories 1, 5, and 3, respectively. The overall trends of the hazard rates are upward, indicating little or no negative path-dependent (no persistence) effect, but the curves are not monotonic. The decline in hazard rate beyond 200 months can be in general attributed to censoring bias in that the estimation method assumes countries staying in these categories at the end of the observation period will continue to stay there. The most significant pattern seen in figure 3 is however that the slopes of the hazard rates rise briskly at duration levels between 150 and 180 months. There is no theoretical explanation on why the data show such an inflection point in all three hazard curves specifically during these periods; I only attempt to interpret the allure of each curve separately.

(Figures 3, insert here)

For the exit out of category 1--here, the the exit is an upgrading--, figure 3a shows that the hazard rate first increases with the duration up to 50 months, then declines (negative path-dependent effect) for duration between 50 and 150 months, and finally rises sharply after about 150 months. In other words, countries in lowest ratings tend to improve either relatively early (before 50 months) or relatively late (beyond 150 months). This result challenges one to identify the causes of persistence (negative path-dependent effect) when durations last between 50 and 150 months. One might plausibly suppose that countries that exit at a relatively early period (after 50 months of stay) are those that have already had the foundation to improve (they are perhaps the ones which have been recently downgraded from other categories). But loss of exposure to investment and perhaps bad reputations take over when the duration lasts between 50 and 150 months. The high exit rate after 150 months (twelve and a half years) may indicate then that reform of the investment climate has finally taken root and prevailed over any negative reputation or shortcomings.

The rate of exit from category 5 –here, the exit is a downgrading--as shown in figure 3b is non-linear in duration but shows little evidence of a negative path-dependent (persistence) effect. Slight bumps and troughs seem to appear irregularly. The downgrading however accelerates after about 175 months (about 15 years). It might be assumed that beyond 175 months, countries with the highest rating become more vulnerable to shocks that precipitate the downgrading. This result means that highly-rated countries are not immune to downgrading even after having built a good reputation for 15 years.

To investigate further, especially to examine whether these patterns hold, I conducted the same analysis but within country groups defined by region and foreign influence. The 145 countries were separated into eight different regions: Sub-Saharan Africa (SSA), Middle-East and North-Africa (MENA), Latin America and Caribbean (LAC), North America (NA), East Europe and Central Asia (ECA), West Europe (WE), East Asia and Pacific (EAP), and South Asia (SA). For brevity, the full results are not reported here. The main finding is that contries in ECA have been the fastest to get out of the 'very high risk'category. Also, for countries staying more than 180 months in the top category (the 'very low risk'), the downgrading pace of those in West Europe and North America is slower than that of the rest of the world.

Each country was also assigned to one of four foreign languages having the most influence on the country's legal, economic or political system: English, French, Spanish, and 'Other.' The latter group includes countries speaking languages such as Chinese, Dutch, German, Italian, Portuguese, and Russian as well as countries that have no known foreign language of influence. Results show that the French-influenced countries had the highest pace of upgrading among all countries that were at the 'very high risk' category for durations between 50 and 150 months. Also, among all groups staying at least 120 months in the highest rating category, the French group had the slowest pace of downgrading. I have no specific explanations of this relatively good performace of some the French-influenced countries at these specific durations.

IV.b. On the multi-spell and competing risks model

Complementary log logistic model with covariates and heterogeneity as random effects

A preliminary test on the functional form especially the use of discrete-time model is first conducted. This entails the comparison of the parameter estimates complementary log-logistic (*cloglog*) function in (3) and that of an equivalent multinomial logit (*mlogit*) using the same covariates.[12] Results shown in Table 3 indicate that the two functional forms produce some similar results, the *cloglog* model perform better and produce results that are more consistent with the findings in the non-parametric approach.

(Table 3, insert here)

To estimate the path-dependent effect and the upgrading and downgrading rates, I focused on the characterization of the exits out of a given category using the *cloglog* functional form. The hazard model for the exit out of each of the five risk categories is estimated using equations (2) and (3).[13] Table 4 summarizes the results of the estimation.

(Table 4, insert here)

Comparing the results in table 4 with the *cloglog* estimates in table 3, one sees that including heterogeneity parameters does improve the fit based on the likelihood ratio.[14] The heterogeneity terms are all significant, indicating the importance of some country

[12] From this point onward, the following countries are excluded from the analysis because of lack of consistent macroeconomic data: Brunei, Cuba, Czechoslovakia, Iraq, North Korea, Qatar, Somalia, and Taiwan. Also the USSR as a single country was dropped, but most of the newly independent states from the Soviet Union are included as individual countries in the analysis.

[13] See Jenkins (2005) for details on the estimation technique; since the random effects are included, the estimation employs the *Stata* command *xtcloglog* that treats the data as a panel.

[14] Some of the criteria leading to the ratings are based on available, imperfect information and information that come directly from subjective assessment. But even when that the basic data are from objective sources, the weights used in calculating the score to make up the index can sometimes be subjective, chosen arbitrarily by the graders and especially investors. Therefore, the heterogeneity effect arising from these subjective assessments is always present.

characteristics other than those mentioned in the covariates for determining the rate of exit out of a given risk category. These other country characteristics causing heterogeneity effects are often unobservable, and may include differences in countries' reactions to shocks they previously endured, i.e. the difference in the degree of hysteresis (Dixit 1989, 1991, and 1992).[15] Likewise, subjective risk assessment from graders' perceptions or investors' own preferences may have contributed to the heterogeneity effects. Overall, these strong heterogeneity effects across all rating categories explain why countries with the same macroeconomic, geographic, historic, or cultural conditions may not receive the same reward or the same setback in their investment ratings.

In table 4, the results also show that the coefficients of the baseline hazard are positive (so that $q>1$) for the transitions from category 1 and 2: there is no persistence in the stays in these low ratings. The longer a country stays in category 1, the higher the chance to improve to rating category 2 and above. Likewise exit out of category 2 is highly probable the longer a country stays in that category, but the direction of the exit remains ambiguous at this point.

However, there is a negative path-dependent (persistence) effect in categories 3 and 4, as the coefficients of the baseline hazard are negative ($q<1$). This negative path-dependent effect implies that the longer a country stays in category 3 or 4, the lower the chance to exit. The persistence in categories 3 and 4 is difficult to explain at this stage of the analysis unless it is known whether the exit refers to an upgrade or a downgrade.

---

[15] Baldwin (1988) and Baldwin and Krugman (1989) use the term 'hysteresis' in trade to explain similar situations, i.e. how initial shocks (exchange rate fluctuations) have lag effects even long after the shock had been reversed.

As for the effects of the covariates on the hazard rate, I found, as expected, that an increase in GDP per capita induces the upgrading from category 1 to higher rating categories, along with the exits out of other categories. Additionally, increased *openness* boosts the rate of upgrading from category 1 to higher rating categories as expected. Moreover, lower inflation and lower exchange rate distortion favor an upgrade from category 1 to higher ratings. But high inflation and high real exchange rate distortion strongly increase the exit rates out of categories 2, 3, and 4.

Larger territories are likely to upgrade faster from category 1 than smaller territories. For the rest of the categories, the effect of territory size on exit rate is mixed: positive for category 3, negative for category 2, and not statistically significant for category 4. The *length of coastline* is slightly negatively correlated with the exit from category 1, which is puzzling. It is positively correlated to the exit rates for categories 2 and 3 and not correlated to the exit rates from category 4.

Latitude has no effect on the speed of an upgrade from category 1 or on the exit out of category 2. But *latitude* has positive effect on the rate of exit from category 3, and negative effect on that of category 4. 'Older' countries, perhaps because of the maturity of their institutions, also have higher chance of upgrading from category 1 faster than 'younger' countries.

A higher ethno-linguistic fractionalization index favors a quick exit from each rating category. For category 1, this means that higher diversity based on ethnicity and language is not a barrier but could be a tool to improvement in investment rating. This is perhaps because high ethno-linguistic fractionalization implies high cultural diversity attracting a wide span of investors from different origins. A high ethno-linguistic fractionalization could also be a symbol of the ability of a country's various factions to cohabit, i.e. a symbol of stability which secures investment.

The results highlight particularly the usual macroeconomic performance that countries with a *very high risk* (category 1) for investment must achieve to improve their rating: promoting higher GDP growth, controlling inflation and correcting for the overvaluation of currency through sound monetary and exchange rate policies, and removing trade barriers. But the results also indicate that fixed characteristics such as larger territory size, longer period elapsing since the country's independence and more cultural diversity can boost the chance to improve from the lowest ratings. Heterogeneity effects accounting for other unobserved country characteristics including graders' perception may also play an important role in pulling these countries out of this lowest investment rating category.

Direction of the exit from categories 2, 3 and 4

For categories 2, 3, and 4, analysis using the parametric method so far has allowed only describing the rate and conditions of exits out of these categories without any specification of the direction (up or down) of these exits. This section aims to determine the directions of the transitions from categories 2, 3, and 4 and the effects of the covariates on the exit rates.

My approach was to collapse all rating categories into only two groups of ratings at each category level: observations with ratings below (or above) a category versus the rest of the observations. To illustrate, in order to examine the 'upgrading' toward categories higher than category 3, I gathered all country observations in rating categories 1, 2, and 3 into one group and estimated the hazard rate of exit from such a group toward category 4 or 5. Similarly, to examine the 'downgrading' toward low ratings (categories 1 and 2) from higher ratings (categories 3, 4, and 5), I gathered all observations in ratings categories 3, 4, or 5 into one group and estimated the hazard rate of exit from that group toward category ratings 1 and 2. Both estimations use the same functional form of complementary log-logistic distribution with random effects as in equation (2). The results for exits to an upgrading are presented in table 5, and the results for exits to a downgrading are in table 6.

(Table 5, insert here)

(Table 6, insert here)

Upgrading

Table 5 indicates the strong heterogeneity effects in upgrading and confirms the hypotheses that some other factors associated with country characteristics (other than those already controlled for in the regression) or graders' subjective assessment have significant influence on the upgrading of investment ratings. Results also show that there was no negative path dependence (no persistence) in the upgrading from category 1, from categories 1 and 2 combined, or from categories 1, 2, and 3 combined. These results mean that the longer some countries stay in lower rating categories, the higher the chance that these countries transit to higher ratings categories. This brushes aside the idea of a negative reputation attached to being at lower ratings for long period. Also, these results offer hope for countries willing to improve: there is a reward for perseverance in the day-to-day efforts to build a better investment climate.

The only exception is on entry to category 5, the highest rating (i.e the *very low risk*) category. The coefficient on the baseline hazard is negative ($q<1$) suggesting that the hazard rate for an upgrading toward category 5 decreases with the length of stay in a lower category. This is an indication that, in general, it remains difficult to get to the highest rating. Still a few countries do succeed in getting into this highest category after a long period of intensive efforts to be safe and productive places for investment.

On the effects of the covariates, results in table 5 show that the increase in GDP per capita and more openness in trade increase the rate of exit toward an upgrading at all categories. On the downside, increased inflation unambiguously reduces the chance to upgrade. These results come as no surprise.

Real exchange-rate distortions have mixed effects on hazard rates of upgrading. The effect is negative on upgrading from category 1 or category 2. That an overvaluation of currency would reduce the chance of upgrading for countries in categories 1 and 2 finds support in the case of low-income countries that constitute the bulk of these lowest rating categories. These low-income countries, mostly in Sub-Saharan Africa, South Asia, and Latin America, have had overvalued currency in the past. Lack of productivity and competitiveness, along with high inflation under a fixed exchange rate regime, caused currency overvaluation and reduced the chance of securing foreign investment.

However, an increase in the currency overvaluation index appears to quicken the upgrading toward categories 4 and 5. To interpret this puzzling result, it is necessary to consider that countries that have upgraded faster to categories 4 and 5 include transition economies in Eastern Europe (see Holzner, 2006) and some newly industrialized countries in Asia (Russia, China, Japan, South Korea) where currencies are often undervalued. Undervaluation of currency in the host country has made local inputs and labor costs cheaper while keeping export prices lower: this has created an advantage for foreign investment. But keeping currency undervalued has now been widely criticized as a source of an artificial trade deficit for trading partners. Moreover, undervalued currency has a local downside implication in that it raises the costs of imported inputs (such as car parts and fossil fuel). Any move to more undervaluation (i.e., more distortions) of the currency could further raise the costs of imported inputs, which at some point may outweigh the benefits from undervaluation and hinder countries' chances to upgrade to higher rating categories. Alternatively, any correction of the initial undervaluation (i.e. a move toward a realignment or reevaluation of the currency) could send a signal of willingness to stop the central bank's manipulation of the currency value, to reduce inefficiencies, and to curb costs of imported inputs. Such a realignment could be favorably viewed by analysts and investors and boost these countries' ratings. This explains why an increase in the overvaluation index may, in some cases, quicken the pace to upgrading into categories 4 and 5.

The effect of *territory size* is mixed. For countries in rating categories 3 and below, the chance of an upgrading increases with the size of territory. But *territory size* does not affect upgrading to category 5, the highest rating. One explanation is that whereas abundant natural resources and labor (certainly of lower skill) in large-territory countries have helped these countries to overcome their low ratings, these factors become less relevant in achieving the highest rating. This can be seen in the fact that many relatively small territories (Hong Kong, Taiwan, Singapore, South Korea, and Mauritius) bave been among the countries in the highest rating category.

Recently, Hansson and Olsson (2006) have revived the debate on the role of territory size and have empirically found negative correlation between country size and rule of law, an institutional variable. They offered two interpretations that have direct implications on investment ratings in the present study. One interpretation is that there is a lack of incentive to uphold propriety rights and protection against expropriation in a large territory because of the large expected rents from the vast land and natural resources that may come with a large territory. The other interpretation is that the strength of an institution diminishes with the radial distance from the central physical location of the institution. In other words, the strength of an institution is, in general, more felt over the entirety of a small territory than over the entirety of a large territory which has many remote areas. Again, the evidence of the high investment ratings of small (mostly island, or peninsula) countries such as Hong-Kong, Singapore, South Korea, and Mauritius compared to their large neighboring territories supports these arguments. However, the drawbacks of these interpretations are that they lack precision on the exact definition of large or small size territory, and that they ignore other influential factors such as the degree of decentralization of the administration and the roles of information technology and communication. A large territory with highly structured and decentralized political power and with strong communication facilities may have fewer problems in establishing and enforcing rules of law than a small and disorganized state. Finally, supplementing the argument that larger territory size may be synonymous of abundant natural resources and labor, Dahl and Tufte (1973) argued that larger territory also may imply lower per capita cost of non-rival public goods and larger internal markets. These advantages could weigh favorably on investment ratings. These conflicting arguments may explain the mixed results on the effect of *territory.*

The results show that *length of coastline* generally boosts the chance of an upgrading across most categories. One interpretation is that a long coastline may indeed represent a high trade capacity and low transaction costs which offer an advantage for investment. The exception is the upgrading from category 1, where the coefficient of the length of coastline has a slightly negative impact on upgrading.

Table 5 also show that the farther a country is from the equator, the higher the chance of upgrading especially for upgrading to category 3, 4, and even 5. This result is consistent with the view that temperate climate entices agricultural and economic activities (Landes 1998), hence facilitates attracting investment.[16] A country's *age* is unambiguously and positively associated with upgrading at all levels. If the country's *age* is proportional to the country's experience in governance and maturity of its institution, then the results

[16] The result is also consistent with the evidence of a positive correlation between the distance from the equator and property rights (La Porta et al., 1999); law governing property rights is one of the important requirements to which foreign investors pay their utmost attention.

suggest that *age* is certainly an advantage working in favor of high ratings and eventually more investment inflow.

Ethno-linguistic fractionalization has a positive effect on upgrading for the riskiest categories 1 and 2 but a negative effect on upgrading toward categories 4 and 5. I interpret this result as follows. Diversity appears to be an advantage at lower ratings because it provides the image of an attractive society that is rich in culture and a populace able to cohabit despite their differences. But upgrading to highest ratings requires less fractionalization because fewer rivalries, and little conflict between ethno-linguistic groups are perhaps most relevant in maintaining the stability that secures high ratings and a large inflow of investment.

Downgrading

Significant heterogeneity effects in downgrading are seen in table 6. Table 6 also indicates that there is some persistence in downgrading as the coefficients on the baseline hazard are negative ($q<1$). The longer a country stays in investment rating categories 2, 3, and 4, the smaller the chance that the country will be downgraded. This boosts one of my earlier findings in that staying longer in a category, especially in one of the lowest categories, does not affect the chance of being downgraded but increases the chance of an upgrading. This is good news for countries that persevere. Time spent and efforts devoted to reforming the economy and strengthening the institutions pay off; these efforts lead to a robust and attractive investment climate able to fend off shocks in the economy and prevent slides in ratings.

Table 6 also shows that the rate of exit toward downgrading decreases as per capita GDP and openness rise. However, as expected, the downgrading rate increases with inflation. Overvaluation of currency pushes countries to downgrade to categories 2 and 1; moves toward more undervaluation could increase the chance for a downgrading to categories 3 and lower.

The negative coefficients on *territory size* in table 6 indicate that small territories are more prone to being downgraded faster than are large territories. This also reinforces earlier findings on the advantages of large territory: having a 'large territory' helps maintain and even in some cases improve investment risk ratings.

Longer coastline prevents the downgrading of countries in categories 4 and 5. This reinforces the argument that *length of coastline* reflects high trade capacity and low transaction costs. However, longer coastline appears to increase the likelihood that countries in categories 2 or 3 downgrade into category 1. This result is puzzling but possibly serves as a reminder that a long coastline itself cannot be turned into an advantage unless the coastline has accessible and well-equipped harbors facilitating trade and transactions.

Results also show that the farther the country's distance from the equator, the smaller the chance that it will be downgraded from the highest ratings (categories 4 and 5). This result is consistent with what I found earlier on the positive role of *latitude* in investment ratings. A country's *age* unambiguously slows downgrading at all levels. This again supports the idea that a country's *age* reflects the maturity of its institutions and of its governance.

Finally, the ethno-linguistic fractionalization appears to halt the slide toward lowest ratings (categories 1 and 2) but has no impact on downgrading from the highest category. The explanation coincides with earlier remarks on upgrading, in that higher cultural diversity could be an advantage only for countries with low ratings if, for instance, investors view cultural diversity as more of an opportunity (e.g., a tourist attraction) and less of a handicap.

Breakdown by region and by foreign language of influence

The presence of a strong heterogeneity effect assumes that important differences in countries' characteristics remain unaccounted for. To isolate and reduce unobserved heterogeneity further, I conducted the same analysis within the region and foreign influence clusters. As in previous section, each country is assigned to one of the eight different regions: Sub-Saharan Africa (SSA), Middle-East and North Africa (MENA), Latin America and the Caribbean (LAC), North America (NA), East Europe and Central Asia (ECA), West Europe (WE), East Asia and Pacific (EAP), and South Asia (SA). The model in equation (2) is estimated within each group and takes into account the direction of the exit at each category. The results, which are available but not fully reported here for brevity, showed that on upgrading there is no persistence, except for East Europe and Central Asia countries' upgrading from category 1 and West Europe and Easia and Pacific countries' upgrading from category 4 to category 5. Why ECA countries, most of them are transition economies, were unable to upgrade fast when they are stuck at the lowest ranking is a reflection of the hardships of their poorest members (e.g. Moldova) to adjust to the reforms to market economy. That some West Europe and East Asia and Pacific countries also struggled to qualify to be the most attractive to investment in category 5 when they are stuck for a longtime in category 4 is puzzling, but it indicates that getting to the top rank is not easy even for relatively high ranked countries.

On downgrading, the result is consistent with the above conclusions and shows that unlike other regions, the East Europe and Central Asia region has higher chance to slide down to the lowest ranking category the longer they stay up above. This inability to build on improvement and hang on when they are in a higher category is a sign of the vulnerability of the reforms in the East Europe and Central Asia countries during the study period. Similarly, I found that when countries in West Europe and in East Asia and Pacific stayed in the highest rating category, the chance for them to downgrade increased with the length of their stay. This reinforces earlier findings from the non-parametric methods and confirms the difficulty of maintaining the stay in the highest rating even among the rich countries.

The effects of macroeconomic variables such as GDP per capita and openness are consistent across regions and similar to earlier conclusion, but the effects of some fixed characteristics on upgrading and downgradings are mixed. *Territory size* appears to work in favor of an upgrading while preventing a downgrading across regions, except for the 'Sub-Saharan Africa' and 'Latin America and Caribbean' regions. In these two regions, difficulties such as the lack of communication and infrastructure and weak enforcement of the rules of law in a vast territory (e.g. Sudan, D.R. Congo) may have hindered the advantages of having vast natural resources and cheap labor, at least from the graders' view. The impact of *length of coastline* also is mixed when the analysis controls for region. A relatively long coastline is an advantage only for the upgrading from category 1 of countries in 'Sub-Saharan Africa' region and for the upgrading toward categories 4 and 5 of 'East Asia and Pacific' countries. For the rest, *length of coastline* has no significant correlation with upgrading and downgrading; this result is a reminder that having a long coastline may not automatically be an advantage, at least not to everyone. *Latitude* also has a mixed impact across the region clusters. Further distance from the equator appears to slow upgrading except in three occasions: for 'Middle-East and North Africa' countries in category 1, for 'Latin America and the Caribbean' countries within ratings category 3 or below, and for 'East Asia and Pacific' countries in category 4 or lower (exiting to category 5).

Each country was also assigned to one of four major foreign languages as having the most influence on the country's legal or economic or political system: English, French, Spanish, and all the rest, combined in 'Other.' The results are consistent with what has been said so far but a few specific findings are worth mentioning briefly. *Territory size* and *latitude* seem to have positive correlations with the upgrading of 'English' countries to an upgrading or avoid a downgrading. For the other three language groups, *territory size* and *latitude* have the opposite effects. This result implies that 'English' influence associated with the attributes of large territory and temperate climate attracts investors more than other types of associations. Such a result invites further studies for confirmation.

High ethno-linguistic fractionalization proves to have a significant positive role in preventing countries in various foreign influence groups from being downgraded in their investment ratings. Moreover, ethno-linguistic fractionalization also boosts upgrading for countries under each group of influence. This result runs against the belief that diversity hurts more than it helps. The only clear exceptions to this trend are the upgrading rate of countries that lack 'English,' 'Spanish,' or 'French' influence in category 1, and that of the 'English- influenced' countries toward category 5. In the latter case, a low ethno-linguistic fractionalization appears to help 'English' countries to reach the highest investment rating category.

IV.c. Correcting for the selection bias

One problematic aspect of the duration models like the one in this paper could be selection bias. Duration data in the analysis are only observed for countries that are in the five categories during the period of study. Little is known about the 'censored' observations, i.e., observations for countries that have exited a given category before the recording of the observations and never come back to that category during the period of study.[17] For instance, little is known about what the true hazard rate of exit out of category 3 could be if one takes into account many countries in West Europe which had moved into and remained in categories 4 or 5 before the beginning of the observation period in January 1984. Moreover, the results on the breakdown by regions and by foreign influence indicate that some groups of countries have greater presence in some categories than in others. For instance, category 1 tends to include many least developed countries, whereas category 5 encloses mostly developed and industrialized countries. This implies that participation or selection (i.e. adherence) to a category even at the

[17] Similarly, little is known about the effect of the situation that there are countries that have not exited to any categories before the end of the observation period. This lends the name of censoring bias also but in the sense of a 'Heckman censoring' of non-randomness in being at a given rating category.

beginning of the period of study is not random but primarily based on some criteria such as a country's wealth status and actual returns to investment.

The parameters estimated so far may thus contain some of the selection bias. One option to correct for such a selection bias is to follow Heckman's two step method of correction, also called the *selectivity model* (Heckman, 1974, 1976, 1979) to include information from censored observations in the estimation of the hazard function. The first step is to estimate a selection (or participation) equation, a *probit* model that includes information on all countries in order to determine why a country is 'selected' into a given rating category. From this first step, the inverse of Mill's ratio is calculated. The second step is to estimate the parameters of the hazard rate equation (outcome equation) as in section III.b., except that information from the participation equation, through the inverse of Mill's ratio, is also included among the independent variables. The challenge lies in choosing the variables entering the participation and outcome equations. Estimates of the outcome equation using Heckman's method are asymptotically efficient.

Let a latent variable *e** for participation be associated with the dummy variable *e*, where *e*=1 (participation) when *e** exceeds some values and *e*=0 otherwise. Then the participation equation is

(3) $e^{*} = \mathbf{Z}\beta_2 + \varepsilon_2$

and the outcome equation is

(4) $Log(-Log(1-p(t)) = c(t) + \mathbf{X}\beta + \rho\sigma_v.\lambda + Log(\nu_2)$,

where ε_2 is the error term. The vector **Z** includes the following macroeconomic variables: GDP per capita, inflation (% change in Consumer Price Index); the trade openness index, and the real interest rate. $\boldsymbol{\beta}_2$ is a vector of parameters. The term ρ in (4) is the correlation coefficient between the error terms in the original hazard rate equation in (2) and the participation equation in (3). The term σ_v represents the standard deviation of the error term in (2).

In (4) the outcome equation with the vector **X** is in the same form as in (2) except that the inverse of Mill's ratio, $\lambda = \dfrac{\phi(Z\beta_2 / \sigma_e)}{\Phi(Z\beta_2 / \sigma_e)}$ is added in it as a covariate, for which the functions $\phi(.)$ and $\Phi(.)$ are the density and cumulative distribution of the normal distribution. The term σ_e represents the standard deviation of the error terms in (3).

Table 7 and table 8 summarize the results of the estimations of the hazard rates using the Heckman two-step model for upgrading and downgrading in investment risk ratings.

(Table 7, insert here)

(Table 8, insert here)

The coefficients on the inverse Mill's ratio are significant in all but one case. The test on the significance of the ρ coefficient is also statistically significant. Additionally, in comparing the results in tables 5 and 6 with the results in tables 7 and 8, one finds that based on the values of the log-likelihood, the correction brought by the Heckman model has significantly improved the fit. These outcomes justify the usefulness of the correction method.

The sign and the significance of the coefficients in the outcome equations of tables 7 and 8 remain almost the same as the results from the 'uncorrected' model in tables 5 and 6. The values of the coefficients from these two models differ only slightly. This is an indication of the robustness of the findings on upgrading and downgrading.

One of the few exceptions is that the positive effect of *latitude* on upgrading from category 1 is reinforced under the Heckman model, whereas that effect was not significant in the 'uncorrected' model. Similarly *territory size* has now a positive effect on the upgrading to category 5 whereas such a fixed indicator has no significant effect in the model without correction. The effect of inflation is weakened on the downgrading from higher categories to category 1 especially, and from higher categories (4 and 5) to category 3.

The use of the Heckman correction model also provides further insight into what determines the downgrading from category 5 (this information was not available because of non-convergence in the iteration during the estimation in the 'uncorrected' model). Table 8 shows that the coefficient of the exit rate out of category 5 is positive, $q>1$, which confirms the results from the non-parametric method and the results from the breakdown per region and per foreign influence: the longer the stay in category 5, the higher the chance of exiting category 5. This goes against the expectations that built-in reputation in the top category may save these countries from any slides in ratings. It is an indication, perhaps, that reputation of being in the top ranking (most attractive to foreign investment) is no guarantee for immunity to shocks (e.g., financial crises, recession, natural or manmade disasters, political uncertainty, and corruption scandals) causing a downgrading.

The results in Table 8 also show that a decrease in per capita income, an increase in trade protection, as well as an undervaluation of the currency significantly hasten the downgrading from category 5. These results come as expected and show once more the importance of these main macroeconomic indicators in the efforts to maintain the highest ratings. Additionally, some geographical and historical advantages significantly halt the slide from category 5. Larger territory size, longer coastline, further distance from the equator, and greater country *age* all work strongly in favor of maintaining the highest ratings category for investment. On the other hand, high level of ethno-linguistic fractionalization in the society increases the chance of slipping down from category 5 to lower ratings. These latter results reinforce the earlier findings in this paper.

V. Conclusions and Implications

I have sought to address the issue of what causes differences in the durations and exit rates in investment ratings across countries and across rating categories. This paper presented estimations of whether path-dependence and heterogeneity (country fixed-characteristics) caused these differences and affected countries' downgrading and from each level of five ratings categories. I employed a unique dataset based on monthly observation of investment risk ratings for 145 countries between 1983 and 2003. The country ratings were presented in five categories ranging from *very high risk* to *very low risk* for investment. The framework was based on a competing risks and multiple spell model with random effects using both non-parametric and parametric methods for the estimation.

A unique feature of the estimation procedure was that it took into account the ranked exit destinations in the duration analysis. Moreover, the analysis corrected for selection and censoring biases using the Heckman two-step model. The path-dependence effect was measured by the sign of the coefficient on the baseline hazard. The heterogeneity effect, included in the model as a multiplicative random effect, was measured by its variance. The estimation controlled for main macroeconomic indicators (GDP per capita, inflation, openness, and real exchange rate distortions) and especially for some fixed geographical (territory size, length of coastline, and latitude), historical (age since independence), and cultural (ethno-linguistic fractionalization) indicators. The impacts of these indicators on investment ratings were also estimated.

I found a strong presence of heterogeneity even after controlling for relevant fixed indicators based on country characteristics and after disaggregating by region and by foreign influence. The strong heterogeneity effect on hazard rates indicated that some other unobserved country characteristics remained unexplored. But more importantly, it signaled that other purposes linked to subjective assessment of graders may be at play. Such a strong heterogeneity effect explains why countries providing the same efforts to attract investment may still get different ratings.

Another important result was the positive path-dependent effect in the upgrading of investment ratings: the longer a country stays in a category, the higher its chance of a promotion to the next highest rating category. This applied to upgrading in all rating categories except for a specific range of duration in the lowest rating (*very high risk*) category and for the upgrading toward the highest rating (*very low risk*) category, where negative path-dependent effects were scarcely found. Alternatively, results showed a negative path-dependent effect in downgrading: the longer a country stays in a category, the smaller the chance to drop to lower categories. This applied to downgrading from all rating categories except downgrading from the highest rating, where a positive path-dependent effect was found. The estimated values of the baseline hazard also showed that the upgrading or downgrading rates are not the same across categories.

These results on path-dependent effects actually offer hope for countries in that there is a reward for perseverance in the efforts to attract investment. As such efforts take roots and continue over a long period of time, the chance to upgrade increases while the chance to downgrade decreases. Results also imply that a long stay in low rating categories does not necessarily (at least not permanently) stigmatize the country and does not hold back efforts to upgrade. The only exception, showing the stark difference in exit rates across categories, is the difficulty to get and maintain the highest rating status. The chance to get the highest rating is smaller the longer a country stays in the second-highest category. But a long stay in the highest rating category increases the chance to downgrade. In other words, access to the highest rating requires tremendous efforts and good reputation, but being at the highest ratings does not provide complete immunity to shocks and downgrading. This sets a warning that attracting investment requires continuous, not once-for-all, efforts.

I also estimated the effects of macroeconomic indicators used as control variables on the investment ratings. Increases in country's income, low inflation, and low trade barriers improved the chance to upgrade while reducing the chance to downgrade. However, real exchange rate distortions, whether an acute overvaluation or a severe undervaluation of currency, harmed the chance for upgrading while increasing the likelihood for downgrading.

On the effects of fixed indicators, the other set of control variables, results indicated that a large territory size, a long coastline, and a location far from the equator counted as advantages in country's investment ratings. This implies that graders and eventually investors may see a large territory as a potential for vast natural and human resources, long coastline as an indicator of high capacity to trade at low transaction costs, and long distance from the equator as an impulse to high productivity.

Similarly, results indicated that a long period elapsing from the year of independence constitutes an advantage in investment ratings. The length of the period elapsing since the year of independence can be seen as a proxy to represent the degree of maturity of institutions and experience in governance and in enforcing the rules of law. High cultural diversity represented by ethno-linguistic fractionalization also played a positive role in investment ratings, except in the case of upgrading to the highest ratings, for which less ethno-linguistic diversity seemed to be needed.

Disaggregating the data and conducting the analysis by region and by foreign influence under both non-parametric and parametric methods did not alter these findings. These estimation results were also robust to correction of selection and censoring biases through the Heckman selection model. Nevertheless, the interpretation of the results requires some caution as, for instance, the study could not cover events before 1984, thus excluding major shocks such as the oil shock in the early 1970s. A much longer series would be useful but was not available for the analysis. Also, the results were tied to the distributional assumption of the exit rates and of the random component representing the heterogeneity. However, the use of other functional forms and distributions that may fit the data and analysis better remains rare in the literature.

The findings in this paper have specific implications for how countries could conduct efforts to improve investment ratings in their quest for an increase in capital inflow. Evidence supports that investors may not always follow what the ratings suggest; even when the country's ratings are favorable for investment, investors also include their own subjective assessments before making decisions. Policy makers cannot control these subjective assessments that are included in the heterogeneity part of the ratings or the investment decisions. However, they can design and implement policies to influence graders' perceptions and investors' decisions. These policies could be aimed at multiplying contacts between local and foreign investors, increasing the country's exposure to investment, and advertising the country's image and comparative advantages in the eyes of potential investors.

Much can also be achieved through identification and correction of any innate shortcomings based on geography, history, and culture. Though it is difficult, even impossible, to extend territory size, to increase the length of coastline, or to move a country further from the equator, regional integration and cooperation can increase labor and resource movements and increase trade capacity by lowering trade barriers and transaction costs. Moreover, better infrastructure and communication services (roads and ports) could overcome some of the natural shortcomings. Similarly, though a country's year of independence cannot be changed, it is possible to speed up the maturity and strengthening of institutions by actions such as reducing corruption and enforcing laws.

All of these actions are important, but as this study also showed, they are no substitute for the usual domestic list-to-do efforts to foster sound macroeconomic policies such as promoting sustainable income growth, averting high inflation and exchange rate misalignment, and increasing trade openness. Likewise, no action could substitute for sound public policies building human capital stock or for sound investment policies ensuring investment security along with a political stability. Improvement in investment risk ratings, as the findings imply, requires a combination of both the efforts to improve the investment climate internally and the equally important efforts to correct any innate shortcomings and to advertise achievements and comparative advantages abroad. Aggressively pursuing the two is necessary to increase the chance of attracting more investment for economic development and growth.

References

Alesina, Alberto, R. Baqir and W. Easterly. 1999. Public Goods and Ethnic Divisions. Quarterly Journal of Economics, 114: 1243-84.

Alesina, Alberto and G. Spolaore, 2003. The Size of Nations. Cambridge, Mass: MIT Press.

Allison, Paul, 1982. Discrete-Time Methods for the Analysis of Event Histories. Social Methodology 13: 61-98.

Baldwin, Richard, 1988. Hysteresis in Import Prices: The Beachhead Effects. American Economic Review 78: 773-85.

Baldwin, Richard, and P. Krugman. 1989. Persistent Trade Effects of Large Exchange Rate Shocks. Quarterly Journal of Economics 104: 635-54.

Box-Steffensmeier, Janet, and C. Zorn. 2002. Duration Models for Repeated Events. Journal of Politics 64:1069-94.

Box-Steffensmeier, Janet, S.de Boef, and K. Joyce. 2007. Event Dependence and Heterogeneity in Duration Models: The Conditional Frailty Model. Political Analysis *15*:237-56.

Central Intelligence Agency. 2006. CIA World Factbooks published online.

Cleves, Mario. 1999a. Analysis of Multiple Failure-Time Data with Stata. Stata Technical Bulletin 49:30-39.

Cleves, Mario. 1999b. Stsetting Spell-Type Data. Stata Corp: Frequently Asked Question, published on line in www.stata.com/support/faqs/stat/stspell.html.

Coface Insurance Group. 2003. The Handbook of a Country Risks: A Guide to International Trade and Business. COFACE Paris, France.

Dahl, Robert, and E. Tufte. 1973. Size and Democracy. Stanford University Press.

Dixit, Avinash. 1989. Hysteresis, Import Penetration, and Exchange Rate Pass-Through. Quarterly Journal of Economics 104: 205-28.

Dixit, Avinash. 1991. Analytical Approximations in the Model of Hysteresis. Review of Economic Studies 58: 141-51.

Dixit, Avinash. 1992. Investment and Hysteresis. The Journal of Economic Perspectives 6 : 107-32.

Dollar, David. 1992. Outward-oriented Developing Economies Really Do Grow More Rapidly: Evidence from 95 LDCs, 1976-1985. Economic Development and Cultural Change April 40: 523-44.

Easterly, William, and R. Levine. 1997. Africa's Growth Tragedy: Policies and Ethnic Divisions. Quarterly Journal of Economics 112: 1203-50.

Easterly, William, and R. Levine. 2002. Tropics, Germs, and Crops: How Endowments Influence Economic Development. National Bureau of Economic Research Working paper no. 9106.

Economist Intelligence Unit, The. 2007. World Investment Prospects to 2011: Foreign Direct Investment and the Challenge of Political Risks. London and New York.

Elbers, Chris, and G. Ridder. 1982. True and Spurious Duration Dependence: The Identifiability of the Proportional Hazard Model. Review of Economic Studies 49: 403-09.

Geography.about.com. Geography Atlas: Online country data.

Han, Aaron, and J. Hausman. 1990. Flexible Parametric Estimation of Duration and Competing Risks Models. Journal of Applied Econometrics. 5: 1-28.

Hansson, Gustav and O. Olsson. 2006. Country Size and the Rule of Law: Resuscitating Montesquieu. Working Papers in Economics 200, Göteborg University, Department of Economics.

Happe, Nancy, M. Hussai, and L. Redifer. 2003. Absorber les Chocs. Finance and Développement 40: 24-27.

Heckman, James. 1974. Shadow Wages, Market Wages and Labor Supply. Econometrica 42: 679–93.

Heckman, James. 1976. The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimator for Such Models. Annals of Economic and Social Measurement 5: 475–92.

Heckman, James. 1979. Sample Selection Bias as a Specification Error. Econometrica 47: 153–61.

Heckman, James, and B. Honoré. 1989. The Identifiability of the Competing Risks Model. Biometrika 76: 325-30.

Heckman, James. 1991. Identifying the Hand of Past: Distinguishing State Dependence from Heterogeneity. Papers and Proceedings of the Hundred and Third Annual Meeting of the American Economic Association, American Economic Review 81: 75-79.

Heckman, James, and B. Singer. 1984. A Method for Minimizing the Impact of Distributional Assumptions in Econometric Models for Duration Data. Econometrica 52: 271-320.

Heston, Alan, R. Summers, and B. Aten. 2006. Penn World Table Version 6.2. Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania.

Holzner, Mario. 2006. Real Exchange Rate Distortion in Southeast Europe. Unpublished paper prepared for the 'Global Development Network Southeast Europe' project of The World Bank and Austrian Ministry of Finance.

Horowitz, Joel. 1999. Semiparametric Estimation of a Proportional Hazard Model with Unobserved Heterogeneity. Econometrica 67: 1001-28.

Jenkins, Stephen. 2005. Survival Analysis with Stata. Online courses material. http://www.iser.essex.ac.uk/teaching/degree/stephenj/ec968/

Kelly, Patrick, and L. Lim. 2000. Survival Analysis for Recurrent Event Data: An Application to Childhood Infectious Disease. Statistics in Medicine 19:13-33.

Kieffer, Nicholas. 1988. Economic Duration Data and Hazard Functions. Journal of Economic Literature 26: 646-79.

Landes, David. 1998. The Wealth and Poverty of Nations. W.W. Norton, New York, NY.

La Porta, Rafael, F. Lopez-de-Silanes, A. Shleifer, and R. Vishny. 1999. The Quality of Government. Journal of Law, Economics and Organization V15, N1: 222-79.

Mealli, Fabrizia, and S. Pudney. 1996. Occupational Pensions and Job Mobility in Britain: Estimation of a Random-Effects Competing Risks Model. Journal of Applied Econometrics 11: 293-320.

Mellinger, Andrew, J.Sachs and J.Gallup. 2000. Climate, Coastal Proximity, and Development, in Oxford Handbook of Economic Geography. Clark, Gordon L., Maryann P. Feldman, and Meric S. Gertler, eds. Oxford University Press, 2000.

de Meyer, Bernard. 1990. Unemployment Insurance and Unemployment Spells. Econometrica 58: 757-82.

Narendranathan, Wiji, and M. Stewart. 1993a. How Does Benefit Vary as Unemployment Spells Lengthen? Journal of Applied Econometrics 8: 361-81.

Narendranathan, Wiji, and M. Stewart. 1993b. Modeling the Probability of Leaving Unemployment: Competing Risks Models with Flexible Base-Line Hazards. Applied Statistics 42: 63-83.

Parsley, David, and S.Wei. 1993. Insignificant and Inconsequential Hysteresis: The Case of U.S. Bilateral Trade. Review of Economics and Statistics 75: 606-13.

Pindyck, Robert. 1991. Irreversibility, Uncertainty and Investment. Journal of Economic Literature 29: 1110-48.

Prentice, Ross, B. Williams, and A. Peterson. 1981. On the Regression Analysis of Multivariate Failure Time. Biometrika 68: 373-79.

PRS Group. 2006. International Country Risks Guide. www.ICRGonline.com

Rodrik, Dani, A. Subramanian, and F. Trebbi. 2004. Institutions Rule: The Primacy of Institutions over Geography and Integration in Economic Development. Journal of Economic Growth 9: 131-65.

Rose, Andrew. 2005. Size Really Doesn't Matter: In Search of a National Scale Effect. CEPR Working Paper no. 5350.

Sachs, Jeffrey. 2001. Tropical Underdevelopment. National Bureau of Economic Research Working Paper no. 8119.

Sachs, Jeffrey. 2003. Institutions Don't Rule: Direct Effects of Geography on Per Capita Income. National Bureau of Economic Research Working Paper no. 9490.

Smith, Jeffrey. 2006. Lecture on Microeconomics: Duration Data. Online course material.

Therneau, Terry, and P. Grambsch. 2000. Modeling Survival Data: Extending the Cox Model. New-York: Springer-Verlag.

World Bank. 2006. Global Development Finance. Published online.

World Bank. 2006. World Bank Development Indicators. Published online.

Appendix 1
Number of months of stay in each investment rating category between January 1984 and February 2003

Country	Region*	Investment Rating Category					Total
		1 Very high risk	2 High risk	3 Moderate risk	4 Low risk	5 Very low risk	
Albania	ECA	27	44	138	0	0	209
Algeria	MENA	0	195	35	0	0	230
Angola	SSA	142	67	0	0	0	209
Argentina	LAC	82	23	45	80	0	230
Armenia	ECA	0	23	28	0	0	51
Australia	EAP	0	0	0	66	164	230
Austria	WE	0	0	0	0	230	230
Azerbaijan	ECA	0	25	26	0	0	51
Bahamas	LAC	0	0	0	199	20	219
Bahrain	MENA	0	12	82	121	7	222
Bangladesh	SA	104	22	104	0	0	230
Belarus	ECA	0	23	35	0	0	58
Belgium	WE	0	0	0	38	192	230
Bolivia	LAC	79	28	111	12	0	230
Botswana	SSA	0	0	42	131	48	221
Brazil	LAC	6	83	137	4	0	230
Brunei	EAP	0	0	0	0	209	209
Bulgaria	ECA	0	47	116	56	0	219
Burkina Faso	SSA	1	156	57	0	0	214
Cameroon	SSA	10	163	57	0	0	230
Canada	NA	0	0	0	0	230	230
Chile	LAC	38	10	47	109	26	230
China	EAP	0	23	75	121	0	219
Colombia	LAC	0	113	114	3	0	230
Congo, Dem. Rep.	SSA	222	8	0	0	0	230
Congo Rep.	SSA	62	132	21	0	0	215
Costa Rica	LAC	0	70	26	134	0	230
Cote d'Ivoire	SSA	0	93	105	0	0	198
Croatia	ECA	0	0	14	37	0	51
Cuba	LAC	84	46	79	0	0	209
Cyprus	WE	0	0	53	105	61	219
Czech Republic	ECA	0	0	0	85	37	122
Czechoslovakia	ECA	0	0	39	58	0	97
Denmark	WE	0	0	0	0	230	230
Dominican Republic	LAC	66	40	66	58	0	230
East Germany	ECA	0	0	57	12	0	69
Ecuador	LAC	29	113	88	0	0	230
Egypt	MENA	64	32	79	55	0	230
El Salvador	LAC	103	7	55	65	0	230
Estonia	ECA	0	0	0	52	0	52
Ethiopia	SSA	118	51	51	0	0	220
Finland	WE	0	0	0	14	216	230

France	WE	0	0	0	47	183	230
Gabon	SSA	0	0	219	11	0	230
Gambia, The	SSA	11	70	117	12	0	210
Germany	WE	0	0	0	3	146	149
Ghana	SSA	51	73	106	0	0	230
Greece	WE	0	44	79	107	0	230
Guatemala	LAC	93	39	67	31	0	230
Guinea	SSA	86	77	46	0	0	209
Guinea-Bissau	SSA	204	4	0	0	0	208
Guyana	LAC	84	42	103	1	0	230
Haiti	LAC	152	78	0	0	0	230
Honduras	LAC	86	83	61	0	0	230
Hong Kong	EAP	0	0	31	130	69	230
Hungary	ECA	0	0	76	145	2	223
Iceland	WE	0	0	0	134	96	230
India	SA	29	85	112	4	0	230
Indonesia	EAP	58	83	56	33	0	230
Iran	MENA	84	12	104	30	0	230
Iraq	MENA	230	0	0	0	0	230
Ireland	WE	0	0	0	64	166	230
Israel	MENA	19	69	80	62	0	230
Italy	WE	0	0	0	148	82	230
Jamaica	LAC	3	70	72	85	0	230
Japan	EAP	0	0	0	2	228	230
Jordan	MENA	31	65	30	104	0	230
Kazakstan	ECA	0	0	24	27	0	51
Kenya	SSA	3	140	87	0	0	230
Kuwait	MENA	14	33	60	73	50	230
Latvia	ECA	0	0	0	51	0	51
Lebanon	MENA	105	69	56	0	0	230
Liberia	SSA	225	5	0	0	0	230
Libya	MENA	81	15	118	16	0	230
Lithuania	ECA	0	0	1	50	0	51
Luxembourg	WE	0	0	0	0	219	219
Madagascar	SSA	51	109	59	0	0	219
Malawi	SSA	0	183	47	0	0	230
Malaysia	EAP	0	0	57	127	46	230
Mali	SSA	101	74	48	0	0	223
Malta	MENA	0	0	59	47	97	203
Mexico	LAC	0	38	101	91	0	230
Moldova	ECA	9	19	23	0	0	51
Mongolia	EAP	0	80	122	1	0	203
Morocco	MENA	52	44	28	106	0	230
Mozambique	SSA	143	55	11	0	0	209
Myanmar	EAP	40	66	28	0	0	134
Namibia	SSA	11	12	18	108	8	157
Netherlands	WE	0	0	0	0	230	230
New Caledonia	EAP	78	15	34	0	0	127

New Zealand	EAP	0	0	0	64	166	230
Nicaragua	LAC	114	106	10	0	0	230
Niger	SSA	65	136	16	0	0	217
Nigeria	SSA	75	141	14	0	0	230
North Korea	EAP	178	13	18	0	0	209
Norway	WE	0	0	0	0	230	230
Oman	MENA	0	27	51	132	14	224
Pakistan	SA	100	88	42	0	0	230
Panama	LAC	26	85	51	68	0	230
Papua New Guinea	EAP	0	43	179	4	0	226
Paraguay	LAC	10	72	75	73	0	230
Peru	LAC	110	21	91	8	0	230
Philippines	EAP	96	7	77	50	0	230
Poland	ECA	49	24	23	97	26	219
Portugal	WE	0	0	23	134	73	230
Qatar	MENA	0	70	58	95	0	223
Romania	ECA	36	85	102	0	0	223
Russia	ECA	12	37	72	9	1	131
Saudi Arabia	MENA	0	54	53	119	4	230
Senegal	SSA	0	132	98	0	0	230
Sierra Leone	SSA	209	9	0	0	0	218
Singapore	EAP	0	0	0	45	185	230
Slovakia	ECA	0	0	5	117	0	122
Slovenia	ECA	0	0	0	43	8	51
Somalia	SSA	216	2	0	0	0	218
South Africa	SSA	0	44	116	70	0	230
South Korea	EAP	0	0	39	104	73	216
Spain	WE	0	0	10	180	40	230
Sri Lanka	SA	91	46	93	0	0	230
Sudan	SSA	207	23	0	0	0	230
Suriname	LAC	96	40	65	9	0	210
Sweden	WE	0	0	0	6	224	230
Switzerland	WE	0	0	0	0	230	230
Syria	MENA	85	11	95	39	0	230
Taiwan	EAP	0	0	0	24	206	230
Tanzania	SSA	53	115	62	0	0	230
Thailand	EAP	0	8	97	116	9	230
Togo	SSA	35	149	46	0	0	230
Trinidad & Tobago	LAC	0	57	94	79	0	230
Tunisia	SSA	41	52	39	98	0	230
Turkey	ECA	53	124	53	0	0	230
U.K.	WE	0	0	0	34	196	230
U.S.	NA	0	0	0	16	214	230
U.S.S.R.	ECA	0	16	41	28	0	85
Uganda	SSA	117	46	67	0	0	230
Ukraine	ECA	0	15	44	0	0	59
United Arab Emirates	MENA	0	83	13	107	27	230
Uruguay	LAC	0	44	97	89	0	230

Venezuela	LAC	0	39	160	31	0	230
Vietnam	EAP	91	32	61	25	0	209
West Germany	WE	0	0	0	0	81	81
Yemen, Rep.	MENA	8	38	104	0	0	150
Yugoslavia	ECA	153	77	0	0	0	230
Zambia	SSA	102	95	33	0	0	230
Zimbabwe	SSA	93	85	52	0	0	230
Total		5,892	5,891	6,861	5,578	5,299	29,521

Sources: Adapted from PRS Group Inc. (2006)
Note. * Regions are Sub-Saharan Africa (SSA); Middle-East and North-Africa (MENA); Latin America and Caribbean (LAC); North America (NA); East Europe and Central Asia (ECA); West Europe (WE); East Asia and Pacific (EAP); and South Asia (SA).

Appendix 2
Data and Sources

- **Country Risk Ratings**: PRS group Inc. (2006)

- **GDP per capita** (PPP constant international $, year 2000) from the World Bank in ($ 1000)

- **Inflation** (%): Change in consumer price levels of World Bank Development Indicators and Global Development Finance (World Bank)

- **Real Exchange Rate Distortion**: Using the Dollar and Easterly-Levine method. (Dollar, 1992; Easterly and Levine, 1997)
RERD = RPL/PRL
Where RERD= Real Exchange Rate Distortion
RPL = Actual Real Price level = (Price level/price level in the US)*100
PRL = Predicted RPL; it is obtained from the regression:
RPL = a + b*GDP +c*GDP-square +c*Year Dummy

- **Real Interest Rate** (%) of World Bank Development indicator and Global Development Finance (World Bank)

- **Openness:** Import plus export divided by real GDP at constant $ year 2000 (unit, %) from Heston, Summers and Aten (2006)

- **Territory Size** (million km-square) World Bank and Geography Atlas (geography.about.com)

- **Length of Coastline** (1,000 km) World Bank and Geography Atlas (geography.about.com)

- **Years elapsing since independence (age)**. Geography Atlas (geography.about.com) , and CIA *factbooks*. Year 2001 was chosen as the base year.

- **Latitude**: absolute value of the distance from the equator; adjusted to take a value between 0 and 1 (La Porta et al.)

- **Ethno-linguistic fractionalization** (scaled from 0 to 1). The index is an average of five different indices: (i) probability that two randomly selected individuals from a given country will not belong to the same ethno-linguistic group, (ii) probability of two randomly selected people speaking different languages, (iii) probability that two randomly selected individuals do not speak the same language, (iv) percent of population not speaking the official language, and (v) percent of population not speaking the widely used language (La Porta et al., 1999.)

TABLE 1

DESCRIPTION OF THE INVESTMENT RATING CATEGORIES

Category	Appellation	Scores
1	Very High Risk	00.0 to 49.5 points
2	High Risk	50.0 to 59.5 points
3	Moderate Risk	60.0 to 69.5 points
4	Low risk	70.0 to 79.5 points
5	Very Low Risk	80.0 to 100 points

Source: PRS Group Inc.

TABLE 2

AN EXAMPLE OF INPUT DATA STRUCTURE FOR KAPLAN-MEIER SURVIVAL ANALYSIS

Observation	Id (country)	Begin	End	Failure (=1)	t=end-begin	X=Covariates
1	1	0	70	0	70	.
2	1	70	230	1	160	.
3	2	25	230	0	205	.
…	…	…	…	…		.

Source: Author; udapted from Jenkins (2005), Cleves (1999a, 1999b)

TABLE 3

ESTIMATES OF THE HAZARD FUNCTIONS FOR ENTRY TO AN INVESTMENT RATING CATEGORY USING MULTINOMIAL LOGIT (*mlogit*) VS. COMPLEMENTARY LOG-LOGISTIC (*cloglog*) FUNCTIONAL FORMS

	Entry to category 1 (very high risk)[a]	**Entry to category 2 (high risk)**		**Entry to category 3 (moderate risk)**		**Entry to category 4 (low risk)**		**Entry to category 5 (very low risk)**	
	Dependent variable : hazard rate								
Independent variables									
	cloglog	mlogit	cloglog	mlogit	cloglog	mlogit	cloglog	mlogit	cloglog
Log(t)	-0.549**	0.497 **	-0.246**	1.609**	0.532**	2.353**	0.619**	1.342**	-0.597**
(Baseline hazard)	(0.016)	(0.0287)	(0.0147)	(0.041)	(0.023)	(0.057)	(0.029)	(0.064)	(0.028)
Macro covariates									
GDP per capita	-0.310**	0.280**	-0.138**	0.465**	-0.062**	0.585**	-0.015**	0.761**	0.156**
	(0.012)	(0.017)	(0.005)	(0.018)	(0.004)	(0.018)	(0.003)	(0.019)	(0.005)
Inflation	0.002**	-0.002**	-0.0004**	-0.002**	-0.0002**	-0.068**	-0.039**	-0.214**	-0.116**
	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.004)	(0.002)	(0.009)	(0.006)
Real exchange rate distortion	0.004**	-0.003**	-0.0001	-0.007**	-0.004**	-0.011**	-0.004**	-0.006**	0.005**
	(0.0003)	(0.0004)	(0.00011)	(0.0005)	(0.0003)	(0.0008)	(0.0005)	(0.001)	(0.001)
Openness	-0.034**	0.033**	-0.0005	0.042**	0.0001	0.051**	0.00002	0.068**	0.013**
	(0.001)	(0.0013)	(0.0004)	(0.0014)	(0.0003)	(0.002)	(0.0004)	(0.001)	(0.0005)
Fixed covariates									
Territory size	-0.439**	0.442**	0.120**	0.454**	0.053**	0.505**	-0.054**	0.597**	0.033*
	(0.028)	(0.033)	(0.015)	(0.036)	(0.014)	(0.048)	(0.016)	(0.052)	(0.014)
Length of coastline	0.032**	-0.046**	-0.015**	-0.045**	-0.008**	-0.010*	-0.0013	0.031**	0.036**
	(0.002)	(0.003)	(0.0021)	(0.003)	(0.002)	(0.004)	(0.0012)	(0.007)	(0.004)
Latitude	-0.540**	0.465*	0.030	0.089	-1.958**	4.266**	-0.444**	8.081**	2.612**
	(0.165)	(0.227)	(0.139)	(0.262)	(0.147)	(0.330)	(0.163)	(0.435)	(0.193)
Years elapsing since independence (*age*)	-0.002**	0.001^{+}	-0.002**	0.007**	0.00017	0.009**	0.001**	0.009**	0.001**
	(0.0003)	(0.0005)	(0.0002)	(0.0005)	(0.00012)	(0.0005)	(0.0001)	(0.0005)	(0.0001)
Ethno-linguistic fractionalization	-0.815**	1.131**	0.025	1.614**	-0.332**	-0.647**	-2.330**	-0.986**	-2.176**
	(0.077)	(0.113)	(0.062)	(0.126)	(0.060)	(0.161)	(0.083)	(3.164)	(0.184)
Constant	3.989**	-4.547**	0.738**	-11.153**	-2.413**	-16.40**	-2.866**	-18.154**	-3.166**
	(0.111)	(0.192)	(0.089)	(0.262)	(0.126)	(0.372)	(0.171)	(0.442)	(0.193)
N = 19604									
Log likelihood R = -16432 (for *mlogit*)	-4949		-8260		-8871		-7518		-2888
Pseudo R-Sq= 0.46 (for *mlogit*)									

Note. a: Category 1 serves as the basis in the multinomial (*mlogit*) model.
The figures in parentheses below the coefficients are *t*-values
Levels of significance: + at 0.1 , * at 0.05 and ** at 0.01

TABLE 4

PARAMETER ESTIMATES OF THE HAZARD FUNCTIONS FOR EXIT OUT OF AN INVESTMENT RATING CATEGORY USING COMPLEMENTARY LOG-LOGISTIC FUNCTIONAL FORM WITH RANDOM EFFECTS

	Exit from category 1 (very high risk)	**Exit from category 2 (high risk)**	**Exit from category 3 (moderate risk)**	**Exit from category 4 (low risk)**
	Dependent variable: Hazard rate			
Independent variables :				
Log(t)	0.809**	0.276 **	-0.386**	-0.548**
(baseline hazard)	(0.025)	(0.016)	(0.014)	(0.020)
Macro covariates				
GDP per capita	0.202**	0.120**	0.100**	0.057**
	(0.008)	(0.004)	(0.003)	(0.003)
Inflation	-0.001**	0.0003**	0.0002**	0.035**
	(0.0001)	(0.00004)	(0.00001)	(0.002)
Real exchange rate distortion	-0.002**	0.002**	0.002**	0.001^{+}
	(0.0003)	(0.0003)	(0.0002)	(0.0006)
Openness	0.016**	0.002**	0.0002	-0.0007
	(0.001)	(0.0007)	(0.0006)	(0.0004)
Fixed covariates				
Territory size	0.124*	-0.002**	0.060**	0.012
	(0.005)	(0.034)	(0.024)	(0.020)
Length of coastline	-0.007^{+}	0.016^{+}	0.012^{+}	0.0042
	(0.004)	(0.009)	(0.006)	(0.0048)
Latitude	-0.270	0.275	0.803**	-0.827**
	(0.364)	(0.404)	(0.238)	(0.004)
Years elapsing since independence (*age*)	0.006**	0.003**	0.0001	0.0003
	(0.009)	(0.0007)	(0.0002)	(0.0004)
Ethno-linguistic fractionalization	1.001**	0.328**	0.560**	1.987**
	(0.225)	(0.200)	(0.118)	(0.147)
Heterogeneity test	**	**	**	**
N = 19604 T=230				
Log likelihood	-3470	-6452	-7216	4841

Note. The hazard functions in a complementary log-logistic functional form with random effects were estimated using the command *xtcloglog* in Stata software. The null hypothesis for the heterogeneity test (a likelihood ratio test) is that the variance of heterogeneity divided by one plus the same variance is equal to zero. The figures in parentheses below the coefficients are *t*-values

Levels of significance: $^{+}$ at 0.1 , * at 0.05 and ** at 0.01.

TABLE 5

PARAMETER ESTIMATES OF THE HAZARD FUNCTIONS FOR UPGRADING IN INVESTMENT RATINGS USING COMPLEMENTARY LOG-LOGISTIC FUNCTIONAL FORM WITH RANDOM EFFECTS

	From category 1 to higher categories	**From category 1 and 2 to higher categories**	**From category 1 2 and 3 to higher categories**	**From category 4 and lower to category 5**
Independent variables		**Dependent variable : hazard rate**		
Log (t)	0.809**	1.646**	1.274**	-0.683**
(baseline hazard)	(0.025)	(0.032)	(0.042)	(0.043)
Macro covariates				
GDP per capita	0.202**	0.221**	0.146**	0.202**
	(0.008)	(0.007)	(0.006)	(0.013)
Inflation	-0.001*	-0.004**	-0.046**	-0.055**
	(0.0001)	(0.001)	(0.004)	(0.006)
Real exchange rate	-0.002**	-0.001*	0.007**	0.010**
distortion	(0.0003)	(0.0004)	(0.0008)	(0.001)
Openness	0.016**	0.007**	0.016**	0.023**
	(0.001)	(0.0007)	(0.0008)	(0.0014)
Fixed covariates				
Territory size	0.124*	-0.025	0.099+	0.028
	(0.005)	(0.032)	(0.051)	(0.065)
Length of coastline	-0.007+	0.017**	0.044**	0.050**
	(0.004)	(0.004)	(0.006)	(0.015)
Latitude	-0.270	1.306*	5.250**	3.781**
	(0.364)	(0.512)	(0.364)	(0.590)
Years since	0.006**	0.006**	0.004**	0.002*
independence (*age*)	(0.009)	(0.0009)	(0.0002)	(0.0007)
Ethno-linguistic	1.001**	0.689**	-1.738**	-2.938**
fractionalization	(0.225)	(0.208)	(0.216)	(0.455)
Heterogeneity test	**	**	**	**
Log-likelihood	-3470	-4543	-2673	-2207

Note. The null hypothesis for the heterogeneity test (a likelihood ratio test) is that the variance of heterogeneity divided by one plus the same variance is equal to zero. The figures in parentheses below the coefficients are *t*-values

Levels of significance: + at 0.1 , * at 0.05 and ** at 0.01.

TABLE 6

PARAMETER ESTIMATES OF HAZARD FUNCTION FOR DOWNGRADING IN INVESTMENT RATINGS USING COMPLEMENTARY LOG-LOGISTIC FUNCTIONAL FORM WITH RANDOM EFFECTS

	To category 1 (from higher categories)	**To category 1 and 2 (from higher categories)**	**To category 3 and lower (from categories 4 and 5)**
Independent variables:	**Dependent variable : hazard rate**		
Log(t)	-0718**	-1.239**	-0.966**
Baseline hazard	(0.021)	(0.023)	(0.031)
Macro covariates			
GDP per capita	-0.418**	-0.333**	-0.239**
	(0.019)	(0.009)	(0.006)
Inflation	0.0006**	0.0004**	0.042**
	(0.0001)	(0.0001)	(0.003)
Real exchange rate	0.003**	0.001*	-0.002*
distortion	(0.0007)	(0.004)	(0.0008)
Openness	-0.050**	-0.013**	-0.013**
	(0.002)	(0.001)	(0.0009)
Fixed covariates			
Territory size	-0.367*	-0.018	-0.194**
	(0.078)	(0,071)	(0.070)
Length of coastline	0.037**	-0.011**	-0.026**
	(0.006)	(0.004)	(0.004)
Latitude	-0.060	0.186	-1.503**
	(1.082)	(0.530)	(0.369)
Years elapsing since	-0.002+	-0.006**	-0.003**
independence *(age)*	(0.001)	(0.001)	(0.0003)
Ethno-linguistic	-1.371**	-0.857**	0.337
Fractionalization	(0.372)	(0.255)	(0.227)
Heterogeneity test	**	**	**
Log-likelihood	-3404	-4645	-2669

Note. The null hypothesis for the heterogeneity test (a likelihood ratio test) is that the variance of heterogeneity divided by one plus the same variance is equal to zero.
The figures in parentheses below the coefficients are *t*-values.
Levels of significance: + at 0.1, * at 0.05 and ** at 0.01.

TABLE 7

PARAMETER ESTIMATES OF THE HAZARD FUNCTION FOR UPGRADING IN INVESTMENT RATINGS IN A TWO-STEP HECKMAN MODEL

	From category 1 to higher categories		**From category 1 and 2 to higher categories**		**From category 1, 2 and 3 to higher categories**		**From category1 2 3 4 to category 5**	
	Probit equation	**Hazard rate equation**	**Probit equation**	**Hazard rate equation**	**Probit equation**	**Hazard rate equation**	**Probit equation**	**Hazard rate equation**
Independent variables:								
Log(t) (Baseline hazard)		0.795** (0.309)		1.456** (0.037)		1.311** (0.045)		-0.576** (0.043)
Macro covariates								
GDP per capita	-0.159** (0.005)	0.134** (0.020)	-0.145** (0.002)	0.181** (0.040)	-0.152** (0.002)	0.595** (0.043)	-0.149** (0.002)	0.388** (0.023)
Inflation	0.002** (0.0001)	-0.002* (0.001)	0.009** (0.0004)	-0.024** (0.003)	0.029** (0.001)	-0.101** (0.008)	0.062** (0.003)	-0.089** (0.009)
Real exchange rate distortion		-0.003** (0.0004)		-0.002** (0.0005)		0.008** (0.0009)		0.009** (0.002)
Real interest rate	-0.021** (0.001)		-0.011** (0.001)		0.004** (0.001)		0.032** (0.003)	
Openness	-0.008** (0.0005)	0.004** (0.001)	-0.006** (0.0003)	0.004* (0.002)	-0.003** (0.0002)	0.023** (0.001)	-0.0007** (0.0002)	0.020** (0.002)
Fixed covariates								
Territory size		0.259** (0.081)		-0.009^{+} (0.049)		0.149** (0.051)		0.127** (0.047)
Length of coastline		-0.009* (0.004)		0.019** (0.004)		0.033** (0.004)		0.021^{+} (0.013)
Latitude		1.816** (0.592)		1.962** (0.493)		4.819** (0.390)		2.214** (0.631)
Years since independence (*age*)		0.005** (0.001)		0.006** (0.0007)		0.0038** (0.0002		0.002** (0.007)
Ethno-linguistic fractionalization		1.108** (0.204)		0.624** (0.235)		-1.115** (0.235)		-1.860** (0.446)
Inverse of Mill's ratio		2.106** (0.122)		0.160 (0.337)		-4.084** (0.391)		-1.884** (0.213)
Heterogeneity test		**		**		**		**
Log-Likelihood		-2274		-3402		-2354		-2115

Note. The dependent variable in the *probit* equation' is the probability of the countries participation in the rating category. The dependent variable in the 'hazard rate equation' is the hazard rate. The estimation of the hazard equation employs a complementary log-logistic functional form with random-effects. The null hypothesis for the heterogeneity test (a likelihood ratio test) is that the variance of heterogeneity divided by one plus the same variance is equal to zero. The figures in parentheses below the coefficients are *t*-values. Levels of significance: $^{+}$ at 0.1 , * at 0.05 and ** at 0.01.

TABLE 8

PARAMETER ESTIMATES OF THE HAZARD FUNCTION FOR DOWNGRADING IN INVESTMENT RATINGS IN A TWO-STEP HECKMAN MODEL

	To category 1 from higher categories		**To category 1 and 2 from higher categories**		**To category 3 and lower from cat 4 and 5**		**To category 4 and lower from category 5**	
	Probit equation	**Hazard rate equation**	**Probit equation**	**Hazard rate equation**	**Probit equation**	**Hazard rate equation**	**Probit equation**	**Hazard rate equation**
Independent variables:								
Log(t)		-0.759**		-1.211***		-1.405**		0.234**
(Baseline hazard)		(0.028)		(0.027)		(0.046)		(0.035)
Macroeconomic covariates								
GDP per capita	0.160**	-0.329**	0.145**	-0.218**	0.152**	-0.036	0.149**	-0.147**
	(0.005)	(0.024)	(0.003)	(0.015)	(0.002)	(0.025)	(0.002)	(0.026)
Inflation	-0.0018**	0.0001	-0.009**	0.012**	-0.029**	0.013^{+}	-0.062**	0.006
	(0.0001)	(0.0001)	(0.0004)	(0.003)	(0.001)	(0.006)	(0.003)	(0.011)
Real exchange rate distortion		0.0066**		0.002**		-0.003**		-0.006**
		(0.0006)		(0.0004)		(0.001)		(0.001)
Real interest rate	0.021**		0.0111**		-0.004**		-0.032**	
	(0.001)		(0.0008)		(0.001)		(0.003)	
Openness	0.008**	-0.029**	0.0063**	-0.0002	0.003**	-0.008**	0.0007**	-0.014**
	(0.0004)	(0.002)	(0.0003)	(0.0015)	(0.0002)	(0.001)	(0.0002)	(0.001)
Fixed covariates								
Territory size		-1.380*		-0.252*		-0.382**		-0.136**
		(0.161)		(0.118)		(0.079)		(0.048)
Length of coastline		0.066**		-0.0001		-0.021**		-0.019^{+}
		(0.008)		(0.0005)		(0.005)		(0.011)
Latitude		-2.419^{+}		0.259		-3.153**		-1.245*
		(1.321)		(0.534)		(0.457)		(0.492)
Years since independence (age)		-0.004**		-0.006**		-0.004**		-0.001**
		(0.001)		(0.0008)		(0.0003)		(0.0002)
Ethno-linguistic fractionalization		-2.194**		-0.807**		1.083**		0.728
		(0.457)		(0.240)		(0.288)		(0.474)
Inverse of Mill's ratio		3.173**		2.044**		2.342**		0.392^{+}
		(0.225)		(0.240)		(0.319)		(0.218)
Heterogeneity test		**		**		**		**
Log-likelihood		-2233		-3364		-2312		-2086

Note. The dependent variable in the *probit* equation is the probability of the countries participation in the rating category. The dependent variable in the 'hazard rate equation' is the hazard rate. The estimation of the hazard equation employs a complementary log-logistic functional form with random-effects. The null hypothesis for the heterogeneity test (a likelihood ratio test) is that the variance of heterogeneity divided by one plus the same variance is equal to zero. The figures in parentheses below the coefficients are *t*-values. Levels of significance: $^{+}$ at 0.1 , * at 0.05 and ** at 0.01.

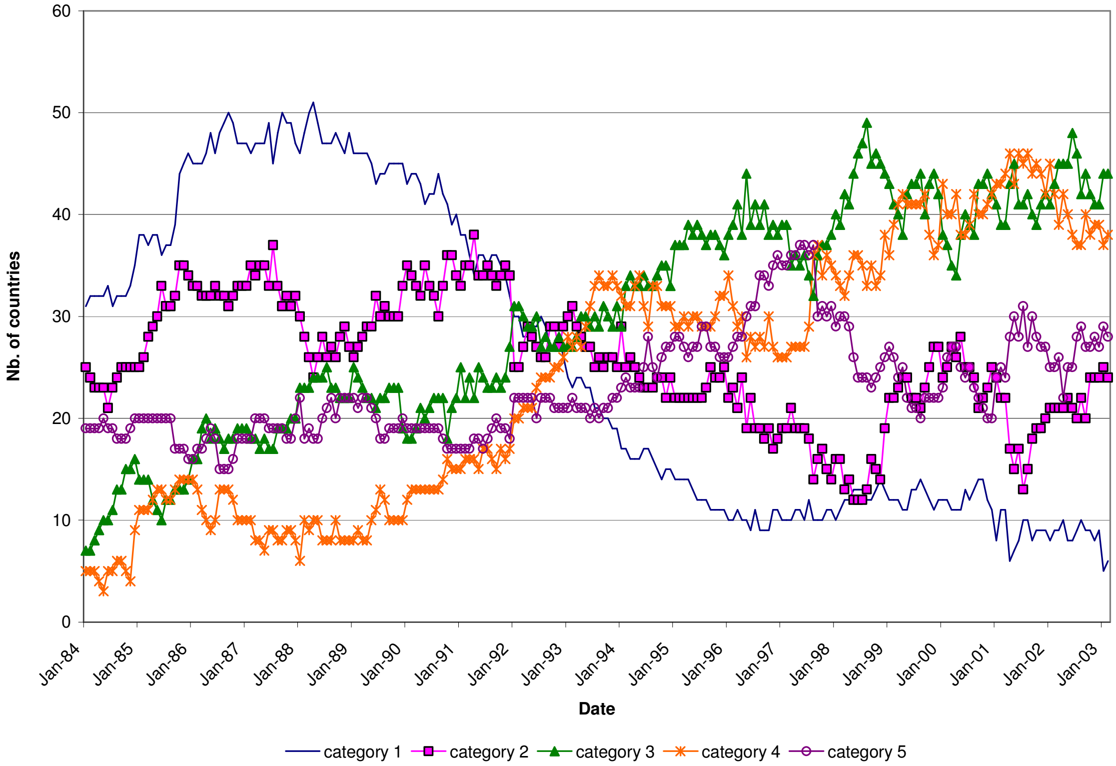


Figure 1. Number of countries in each rating category per month
Source: PRS group Inc. (2006)

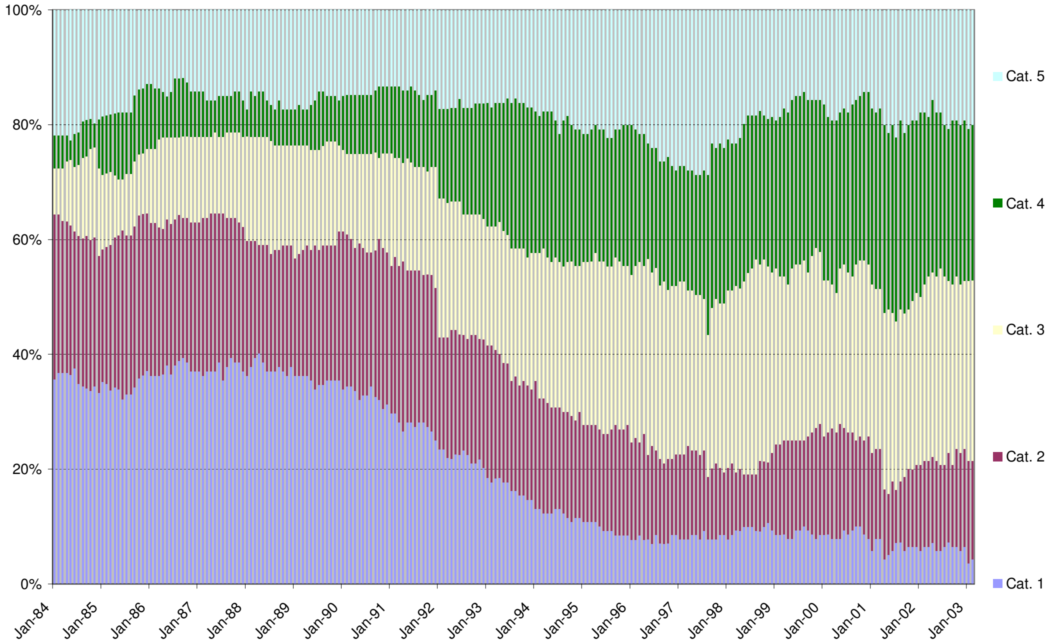
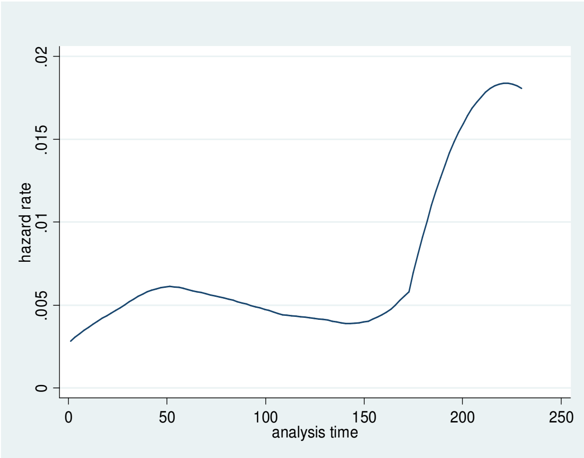
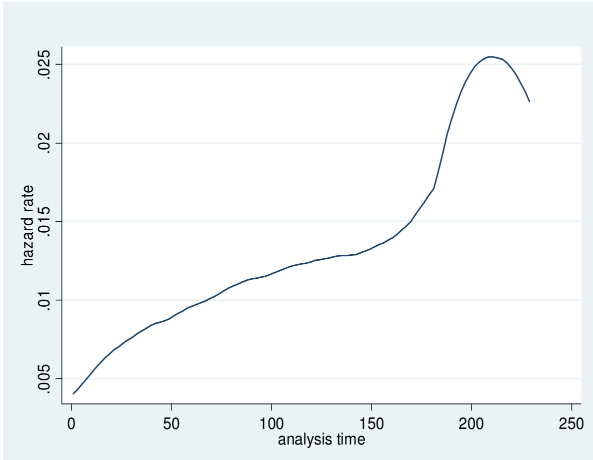


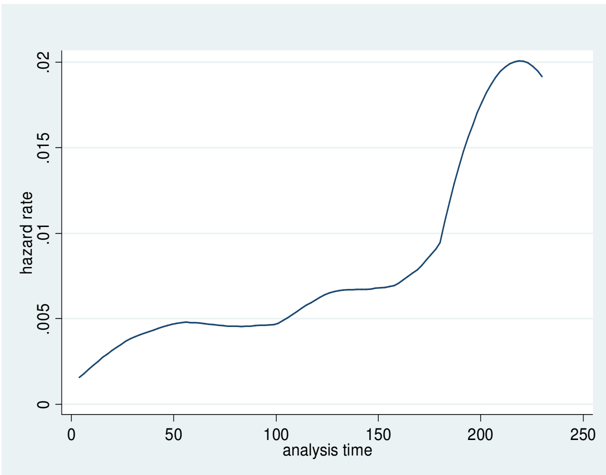
Figure 2. Distribution of the countries' investment ratings across the five rating categories
Source: PRS Group Inc. (2006)
Note. The five shaded areas represent the five ratings from the lowest rating (category 1) at the bottom to the highest (category 5) at the top. The width of each shaded area represents the number of countries in that category divided by the total number of countries over time.



(a) Exit (upgrading) from rating category 1

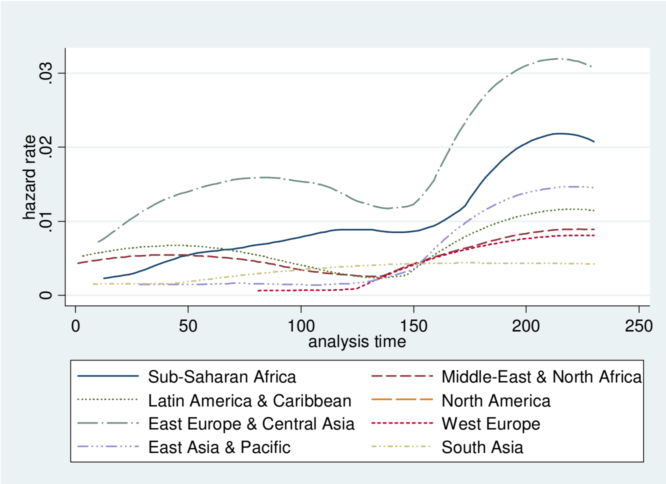


(c) Exit from rating category 3

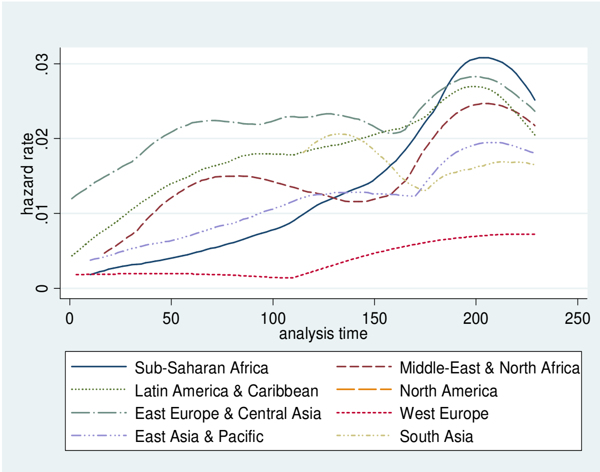


(b) Exit (downgrading) from rating category 5

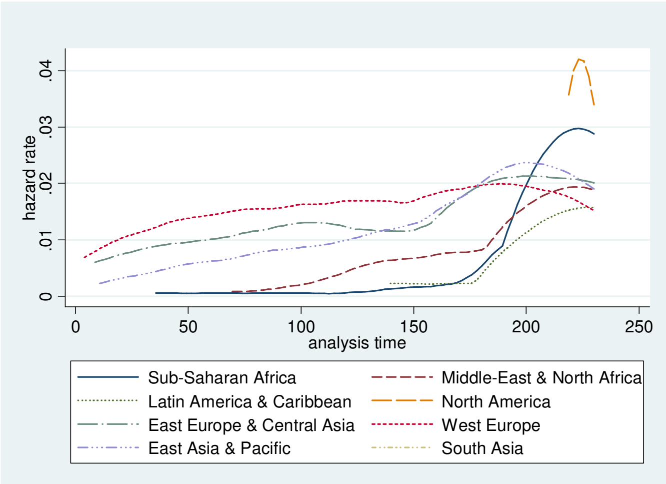
Figure 3. Hazard functions for the exits from selected investment rating categories



(a) Exit (Upgrading) from rating category 1

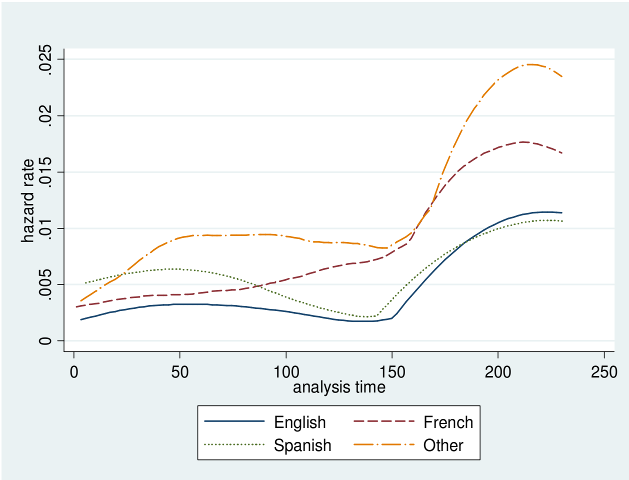


(c) Exit from rating category 3

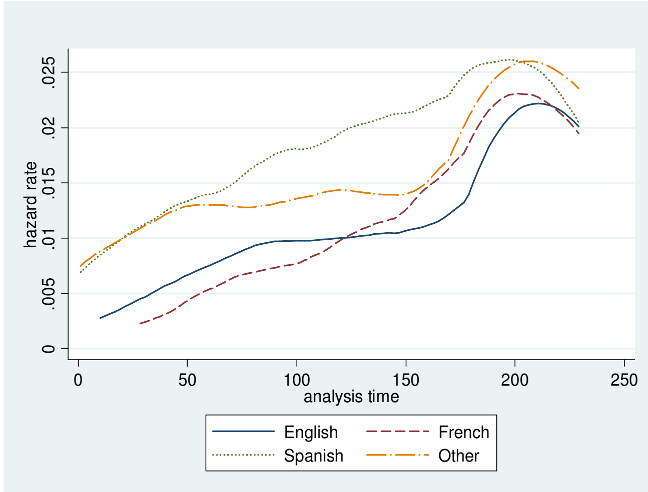


(b) Exit (downgrading) from rating category 5

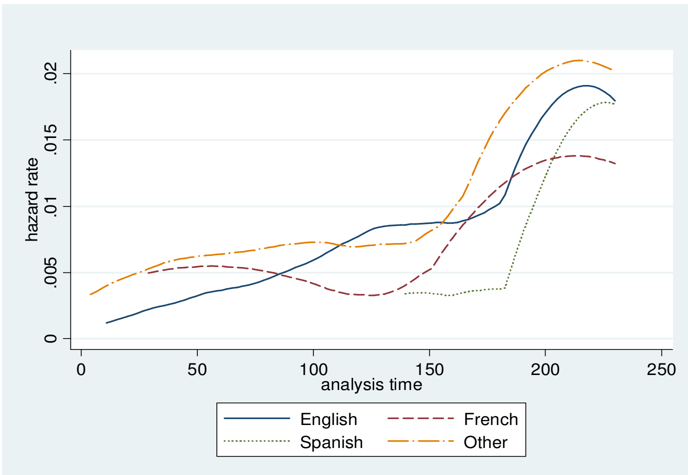
Figure 4. Hazard functions for the exits from selected rating categories, by regional group



(a) Exit (upgrading) from rating category 1



(c) Exit from rating category 3



(b) Exit (downgrading) from rating category 5

Figure 5. Hazard functions for the exits from selected rating categories, by language of influence group.