



## Country credit risk determinants with model uncertainty



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### ABSTRACT

We analyze the economic and political determinants of country credit risk in both developed and emerging economies by using sovereign yield spreads as risk indicators. We document a high degree of model uncertainty and apply Bayesian Model Averaging to deal with this issue. GDP growth and external debt to GDP ratio are highly likely to influence default risk in emerging and developed economies. Inflation, import growth, openness, and trade freedom are additionally relevant in developed economies, whereas developing countries' default risk is also influenced by debt service ratio, history of recent defaults, and the ratio of foreign exchange reserves to imports.

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## 1. Introduction

The latest financial crisis demonstrated very clearly that country default risk is an important issue in international lending for both developing and developed economies. While country default risk has mostly been considered a problem specifically for developing and transition economies, during the global financial crisis developed countries have faced debt servicing difficulties as well. This leads to the question: Which factors drive default risk in developing and developed countries, and what are the similarities and differences between the two groups of countries in this respect? This issue is analyzed in our paper.

For emerging markets in particular, there exists a variety of empirical papers that analyze default risk by applying regression models in which some default indicator is regressed on potential explanatory variables. Potential risk indicators used as dependent variable include sovereign bond yield spreads, ratings, or dummies that indicate whether a country has defaulted or not in a certain period. Since almost no defaults in developed economies have happened until the very recent years and defaults are still rare events for these countries, the dummy variable approach has not yet been applied for those countries. There are, however, some papers that explore the determinants of yield spreads for developed economies. All these strands of the literature are discussed in more detail in Section 2. In overviewing the literature, the most striking result is that the findings with respect to important determinants are quite different and even contracting – even within the same strand literature. A large number of variables was found to be significant in explaining default risk. One approach to deal with this issue is employing Bayesian Model Averaging (BMA).

BMA essentially makes use of information from every possible empirical model (linear regression model in our case) that can be constructed from a given set of regressors, i.e., any univariate model, the full model and any combination in between. The results of all these models are averaged to derive inference regarding the importance of certain regressors and specific models. In

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this way, information from the entire model space is incorporated in the results, while usually only one or some selected models are considered. Thus, BMA results are more robust and data mining concerns are mitigated.

Several studies have applied BMA (or similar techniques) in a number of empirical settings. In recent years it became a popular tool in analyzing the determinants of economic growth (see, e.g., Fernandez, Ley, & Steel, 2001b; Masanjala & Papageorgiou, 2008; Sala-i-Martin, Doppelhofer, & Miller, 2004). Avramov (2002) and Cremers (2002) use Bayesian techniques in the context of stock return predictability, while Vrontos, Vrontos, and Giamouridis (2008) apply it to model hedge fund pricing. Koop, Potter, and Strachan (2008) use BMA to investigate the consumption–wealth relationship. Bandiera, Cuaresma, and Vincelette (2010) apply BMA for estimation and prediction of sovereign defaults.<sup>1</sup>

We use yield spread as a dependent variable since we are interested in analyzing developed, as well as emerging economies, and for both sets of countries there exist required data and literature where spreads are used as risk indicators. The use of spreads has some advantages. They lead sovereign bond rating changes, as it is shown in a separate strand of literature (see, e.g. Cantor & Packer, 1996; Larrain, Reisen, & von Maltzan, 1997). Compared to a dummy variable indicating defaults, spreads are a more precise measure of risk.

Since it is reasonable to assume that the drivers of default risk at least partly differ for developed and emerging countries, we analyze them separately in two sub-samples. In addition, no defaults in the sub-sample of developed nations are observed during our sample period. One sub-sample comprises thirty-one emerging countries included in the EMBI + index for the years 1996–2011. Additionally, we consider 19 OECD countries. We employ fixed effects panel estimation. As potential drivers of default risk, we consider a number of economic variables, most of which have been found significant in the literature. In addition, we include data on political variables obtained from Heritage Foundation in order to account for socio-political and governance characteristics. We use annual data since we aim to analyze fundamental, long-term determinants of default risk. For many economic and political variables this is the highest frequency available.

Our findings indicate that for developed as well as developing countries, GDP growth and external debt to GDP ratio are important determinants of default risk. In addition to these common determinants, default risk for developed and developing countries depends on fairly different drivers. Developed countries' risk is, additionally, driven by inflation, import growth, openness, and trade freedom, while default risk of emerging economies also depends on the debt service ratio, history of recent defaults, and the foreign exchange reserves to imports ratio.

The remainder is organized as follows. In Section 2 we overview the existing literature on yield spread determinants. Section 3 explains the basic idea of BMA. Section 4 presents the variables used in the analysis and the estimation results. Section 5 concludes.

## 2. Country default risk and determinants of sovereign yield spreads: Prior results

### 2.1. Theoretical literature

Regarding the theoretical literature, we can distinguish two important strands. The first strand is focused on a country's ability to pay, i.e., the funds the country is able to acquire for debt servicing. The second strand of the literature emphasizes the importance of willingness to pay (see Eaton & Fernandez, 1995; Eaton, Gersovitz, & Stiglitz, 1986, for an overview).

As a starting point for the literature on countries' ability to make debt servicing payments, one can refer to early works by Domar (1944, 1950). Based on a model with linear differential equations Domar (1944) shows that the 'burden of debt' (i.e., the share of GDP that has to be spent for debt servicing) does not grow infinitely, but rather converges toward a fixed value — as long as the GDP growth rate is higher than the debt growth. Important parameters (besides GDP growth and debt growth) of this model are interest rates and the investment ratio, which he assumes to be exogenous and constant.<sup>2</sup> Domar (1944) is focused on internal debt and the government's ability to service obligations towards the countries' inhabitants. Hence the above named variables that rather describe the general development of the economy are supposed to be important determinants of country default risk.

Domar (1950), by contrast, is concerned with external debt. The question of external debt is of special importance for countries heavily indebted against external borrowers, as it is often the case for developing countries. Domar (1950) proposed a model that analyzes the development of external indebtedness over time and its relation to capital exports and imports. The importance of external variables related to the balance of payments is discussed in several later papers (see, e.g., Diaz-Alejandro, 1984; Simonsen, 1985). They emphasize that acquiring funds for servicing external debt may impose additional restrictions, since important parts of the GDP, such as many services, non-tradable goods or infrastructure, cannot be exported to earn funds for external debt servicing.

In addition to several variables belonging to the monetary side of the balance of payments (such as external indebtedness, debt service and maturity of debt), variables related to the real side of the balance of payment, such as current account, trade balance, exports and imports are of importance. This is because (net) capital exports (for debt servicing) are mirrored by real transactions, e.g., (net) exports of goods and services. Of course, foreign exchange reserves can also be used for debt servicing. Contrary to other items, such as exports and imports, which face exchange rate risks and uncertainty about volumes, the amount

<sup>1</sup> Although our approach is somewhat similar to theirs, our paper differs along several dimensions. First, we analyze sovereign credit spreads, rather than defaults. Second, we employ a wider array of variables. Third, we conduct the analysis in a panel setting, rather than on pooled data. Finally, we consider both developed and developing countries, while Bandiera et al. (2010) focus on developing countries only. Maltritz (2012) analyzes sovereign yield spread determinants in the sample of Eurozone countries.

<sup>2</sup> Based on similar ideas the so called growth-cum-debt literature (see, e.g., Avramovic, 1964; Solomon, 1977; Nowzad and Williams, 1981) has evolved.

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