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Modelling the U.S. sovereign credit rating

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ABSTRACT

This paper proposes a new methodology for generating sovereign credit ratings. These are determined by mapping the probability that the debt-GDP ratio might exceed a maximum debt limit at some point in the future into a credit rating. The debt limit can be either ad hoc or based on the financial ability of a government to change fiscal policy in the future to meet its outstanding obligations. When applied to quarterly U.S. data from 1970 to 2011, two clear instances are found in which the U.S. sovereign credit rating would have been downgraded on this basis: during the 1970s oil crisis and in the aftermath of the Lehman collapse in 2008. This result is robust to several alternative views on the maximum borrowing capacity of the U.S. economy.

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1. Introduction

Credit ratings for both private sector and sovereign debt have come under intense scrutiny since the onset of the 2008 financial crisis. Credit rating agencies (CRAs) have been criticized for failing to identify the amount of risk accumulated by mortgage-backed securities in the United States during the lending boom of the 2000s. Following the recent downgrades of a number of eurozone sovereigns, CRAs have been accused of exacerbating the eurozone debt crisis and contributing to the rise of the cost of borrowing above sustainable levels in several European countries.

In 2011, concerns about the adequacy of the operating procedures of the leading CRAs have been expressed by the Security and Exchange Commission in a report on the CRAs' ability to make timely and accurate disclosures, and to allay fears about potential conflicts of interest.[2] At the same time, the European Commission issued a proposal for stricter rules for CRAs to make them more transparent, accountable and to increase competition in the sector. The Commission's proposal stressed the role of conflict of interest, political interference and inefficiencies in existing CRAs methodologies. It also suggested the creation of an European ratings foundation in order to counter the influence of U.S.-based CRAs and that individual investors should determine their own independent evaluation of credit ratings (European Commission, 2011).[3] In his review of the regulatory structure of CRAs, White (2010) also argues in favour of investors seeking their own independent assessment of the credit rating as a way of reducing reliance on CRAs. It is widely thought, however, that it would be too costly for individual investors to make their own credit evaluations. Cost is also the major reason why the European Commission abandoned its plan to create a new CRA.

The aim of this paper is to show how it would be possible to provide measures of sovereign credit ratings that are transparent, independent and timely. Transparency refers to the ease of the general public to access and to reproduce credit ratings, and to the ability of the public to make its own judgments about their validity. Independence reflects the derivation of sovereign credit ratings that are model-based rather than driven by the subjective evaluation of analysts. The evaluation can be updated systematically using the latest available data, and is timely for this reason. The measure is inexpensive to produce, and can even be automated. Given these properties, we argue that such a procedure

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[2] See Security and Exchange Commission (2011).

[3] Similar reactions from policy makers and commentators were prompted following the Latin American defaults in the early 1980s, the 1997 Asian banking crisis and the default of Enron in 2001.

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can provide benchmark statistics for sovereign credit ratings that could be especially useful not only for individual investors and independent (national and supranational) agencies, but also for policy makers and CRAs. Duan and Van Laere (2012) recently argued that the provision of sovereign credit ratings for private sector businesses is a public good that can be made available to financial market participants through the creation of a publicly-funded infrastructure. The model-based measure of the sovereign credit ratings serves a similar purpose but without requiring the creation of expensive infrastructures.

The methodology is an adaptation to government debt of Black and Scholes (1973) and Merton's (1974) measure of distance-to-default and default probability. This has three key elements: a forecast of the level of indebtedness over a given time horizon; an estimate of the uncertainty surrounding this forecast; and a measure of the maximum borrowing capacity of the sovereign country. We calculate the time-varying forecasts of the debt-GDP ratio and their volatility using a VAR model based on rolling-window estimation, hereafter a ROVAR model. Rolling-window estimation, favoured by Stock and Watson (2007, 2008) and Orphanides and Wei (2012) among the others, has the advantage of taking account of time-variation in the VAR coefficients and in their volatility over the sample period without taking a specific stance on the source of time-variation. In this way forecasts of the debt-GDP ratio, the uncertainty surrounding them and the implied default probability may be up-dated each period. This procedure is computationally inexpensive as the model can be estimated using standard classical methods. Having determined the default probability profile, this can be mapped into a credit rating using historic information on sovereign default probabilities and credit ratings.

The analysis requires the definition of a debt threshold (debt-GDP limit) beyond which a default event is assumed to occur. We implement two alternative views about the default threshold. The first, based on ad hoc values, is entirely agnostic about the economic rationale for the debt-GDP limit. Its usefulness is in providing preliminary evidence on the likely values of the model-based sovereign credit rating and on its sensitivity to forecasts of the debt-GDP ratio, macroeconomic volatility and the debt threshold itself. The second employs a real business cycle model with an elastic labour supply and distortionary taxation to derive the debt-GDP limit. This is based on the notion that governments default (either formally or de facto) only when they are not able to meet their financial obligations through using their fiscal instruments. We employ four alternative definitions of the debt limit, depending on whether future fiscal policy changes are anticipated or unanticipated and, in the second case, if they stem from changes in expenditure policy, tax policy or both. We apply this methodology to the U.S. sovereign credit rating for the period 1969:4 to 2011:2 for both ad hoc and theory-based debt-GDP limits, constructing quarterly time-series of credit ratings for short-term and long-term U.S. debt.

It might be argued that the use of a debt limit based exclusively on a government's financial ability to generate fiscal savings provides too narrow a view of the borrowing capacity of a country, and that taking into account additional factors might result in either higher or lower debt limits. A government could, for example, either inflate away its debt obligations or alter the maturity structure of debt. Credit ratings may also be influenced by a country's default history and a government's willingness to meet its financial obligations. There are two main reasons why we choose not to incorporate these possible extensions into our proposed methodology. First, it would significantly complicate the analysis. Second, adopting a narrow and specific view of the maximum borrowing capacity has the advantage that the resulting credit rating has an unambiguous economic interpretation that can be easily communicated to investors and the general public. Any differences between the model-based and the official credit ratings might indicate the impact of factors, in addition to those associated with fiscal policy, that have contributed to the subjective judgment of CRAs. These discrepancies are likely to be smaller for advanced countries with stable political, independent central banks committed to maintain price stability, and fiscal authorities interested in retain reputation in sovereign bond markets, than for other countries.[4]

U.S. Treasury securities have long been considered risk-free assets. Historically, they have received the highest credit-quality rating by all CRAs. Since the latest global financial crisis, however, both prominent economists (see, for example, Buiter (2010)) and market participants have increasingly taken the view that U.S. bonds are no longer risk-free assets. The change in the market sentiment is reflected in the fast-growing trend in the price of credit default swaps (CDS) for U.S. sovereign bonds, an indicator of the market's perception of the U.S. government creditworthiness.

This is illustrated very clearly in Fig. 1 which shows the price of U.S. Treasury securities CDSs over the three and half years (from January 2008 to June 2011) before Standard and Poor's downgraded the U.S. sovereign credit rating by one notch from its highest ranking on August 5, 2011.[5] Early in 2008, the 5-year U.S. sovereign CDSs traded below 10 basis points (bps). The price rose substantially in July 2008 when IndyMac Bank collapsed, and rose further in September 2008 when Lehman Brothers declared bankruptcy and AIG attempted to negotiate a bridging loan from the Federal Reserve. CDS prices also increased in early 2009 to just below 100 bps and, after a sharp decline to about 30 bps in the first half of the 2009, again increased steadily. By the end of June 2011 U.S. bonds CDS traded at about 51 bps, twice as much as German sovereign CDS (26 bps) and close to that of Japan CDS (52 bps).[6] Notwithstanding this sharp deterioration of the market's perception of its creditworthiness over this period, U.S. government debt has received the highest quality ranking by all CRAs during this period.[7]

In contrast, the model-based sovereign credit rating derived in this paper appears to be more in line with the market's perception about the creditworthiness of the U.S. government. The results suggest that the U.S. sovereign credit rating would have been of the highest quality for most of the last 40 years with the exception of two periods where the credit rating is lower: the oil crisis in the early 1970s and in the aftermath of IndyMac Bank and Lehman Brothers collapse. The extent and duration of these downgrades depend on the level of the debt-GDP limit, and in no case does the credit rating fall to speculative grade. The differences between the model-based and the official credit ratings illustrate the point made earlier, that factors other than the ability of to generate fiscal savings may have influenced the judgment of the CRAs in these two instances. A possible explanation for the differences between the credit ratings of the early 1970s is that the Fed printed money to purchase U.S. Treasury securities. A major factor affecting the official credit ratings in the post-Lehman period discrepancy is likely to be confidence that the U.S. government would honour

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[4] In the U.S., as in most advanced countries, honouring sovereign debt is a constitutional obligation. This was recently restated by the U.S. Treasury's General Counsel George W. Madison, see The New York Times, July 8 2011.

[5] The data are from Datastream (Thomson Reuters CDS), accessed on July 11, 2012. The sample includes daily observations from January 7, 2008 to June 30, 2011. No data on U.S. sovereign CDS is available prior January 2008. The U.S. macroeconomic data is only available up to 2011:2, therefore defining the end of the CDS sample period.

[6] On July 11, 2012, the 5-year CDSs were traded at about 47 bps, while the price on German CDS was about 32 bps and that of Japan CDS is 59 bps.

[7] In 2011, the main CRAs (Fitch Ratings, Moody's and Standard and Poor's) expressed concern about the medium-term perspectives of the U.S. fiscal outlook and lowered the outlook of the U.S. sovereign debt to negative. All three CRAs also began issuing warnings about a possible (though limited to one or two notches) downgrade of the U.S. sovereign credit rating.

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