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journal homepage: www.elsevier.com/locate/jmonecoSovereign default and maturity choice[☆]Juan M. Sánchez^{a,*}, Horacio Sapriza^b, Emircan Yurdagül^c^a Research Division, Federal Reserve Bank of St. Louis, P.O. Box 442, St. Louis, MO 63166-0442, USA^b Federal Reserve Board, USA^c Universidad Carlos III, Spain

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ABSTRACT

This study develops a novel model of endogenous sovereign debt maturity that rationalizes various stylized facts about debt maturity and the yield spread curve: first, sovereign debt duration and maturity generally exceed one year, and co-move positively with the business cycle. Second, sovereign yield spread curves are usually non-linear and upward-sloped, and may become non-monotonic and inverted during a period of high credit market stress, such as a default episode. Finally, output volatility, impatience, risk aversion, and especially sudden stops, are key determinants of maturity, both in our model and in the data.

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1. Introduction

Our paper proposes a new approach to studying the maturity of sovereign debt and the term structure of interest rate spreads. The new framework rationalizes the maturity choice for sovereign debt and the pricing of this debt at each maturity. The model shows that when economic growth weakens (bad times), sovereign debt maturity and duration shorten, default risk and interest rate spreads over risk-free debt increase, and the term spreads decline, often resulting in a humped or in a negatively sloped yield spread curve for the borrowing country.

The model also helps identify the key factors determining a country's debt maturity. The results show that sovereign debt maturity and duration are explained by the trade-off between the benefits of long-term debt from the hedging of

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Table 1
Maturity and yield spreads over the business cycle.

	Maturity	1 year spread	10 year spread
Overall	7.70	1.23	1.79
Bad times	7.12	1.58	2.93
Corr. with log(output)	0.46	−0.21	−0.43

Note: The maturity data are from 117 observations, from Argentina, Brazil, Chile, Colombia, Hungary, Mexico, Peru, Poland, Slovenia and Turkey. The yield spreads are from Brazil, Chile, Colombia, Mexico, Peru, Slovenia and Turkey and include 72 observations with both 1 and 10 year maturity spreads information for more than 6 years. The correlations in the table are averages across country-specific correlations. The rest are the averages across country-specific medians. Bad times are the years when the detrended (HP) log output is below 0. In the data, the paper computes output as GDP per capita. Spreads are given as percentages. See the Online Appendix for additional description of the variables.

changes in the rollover costs of the debt, and its costs from higher spreads due to debt dilution. Changes in economic conditions or country characteristics that increase hedging incentives, such as increasing the risk aversion and especially the probability of sudden stops, imply a longer equilibrium debt maturity. In fact, the analysis shows that in the absence of sudden stops, the median maturity in the economy is only one year, the shortest possible in the model. Changes that tend to lower sovereign borrowing costs, such as increasing the discount factor, lead to higher debt maturity in equilibrium, as it becomes relatively less expensive for the economy to borrow longer term. In contrast, changes that tend to increase sovereign borrowing costs, such as higher income volatility, lead to a reduction in debt maturity to partially offset the increase in yield spreads. The calibrated model in the paper accounts, qualitatively and quantitatively, for differences in debt maturity across several economies over the last 20 years.

The behavior of debt maturity and yield spreads over the business cycle using data for several economies is summarized in Table 1. The first column of the table shows that the maturity of sovereign debt tends to be procyclical, i.e., bad times are linked to the shortening of the average debt maturity. The table also highlights that even during bad times, countries tend to sustain debt maturities that significantly exceed one year.¹ Finally, the last two columns of the table show that 1 year and 10 year sovereign bond yield spreads are countercyclical.

The new modeling approach presented in this study identifies four economic and financial market features as key in determining sovereign debt maturity. The first factor is the volatility of GDP growth. The empirical analysis and the model in the paper show that a country with a more volatile process for income growth seeks to mitigate the higher yield spreads from higher default risk by both deleveraging and lowering its debt maturity.

The second and most influential factor affecting sovereign debt maturity in the model is the possibility of a sudden stop. The presence of sudden stops as a long-standing feature of international credit markets has been well-documented in the literature (see for instance Edwards, 2007). Sudden stops may significantly shape the maturity profile of sovereign debt, as the possibility of a sudden withdrawal of funding that makes the sovereign unable to repay its immediate debt obligations creates a strong incentive for the sovereign to borrow at longer maturities. Other things equal, economies with less open capital accounts are less exposed to sudden stops. The study shows, using data for several economies, that countries with more open capital accounts have a longer maturity of their sovereign debt. Consistent with the empirical evidence, the model in the paper also points to the probability of sudden stop episodes as crucial to capture the average sovereign debt maturity documented in the data.

The third economic feature that can significantly affect the choice of sovereign debt maturity is the degree of risk aversion of the borrower. The higher the risk aversion, the higher the incentive of the sovereign to insure itself against movements in market interest rates or other shocks that may deteriorate the country's borrowing conditions, by fixing the terms of the debt contract. Interestingly, a higher risk aversion of the sovereign borrower may also be interpreted as an economy with a higher level of after-tax income inequality among heterogeneous households, as argued by Ferriere (2015), who also associates inequality to stronger incentives to default. Thus, our model results suggest that economies with more pronounced income inequality tend to borrow at longer maturities, a result that we also find in the data.

Finally, the fourth economic characteristic with key implications for the choice of debt maturity by the sovereign is the degree of patience in the economy, which may be proxied in the data by the fraction of youngsters in the overall population of the country. The model predicts that a country with a higher level of patience should exhibit lower outstanding debt and yield spreads, but higher maturity and duration, a testable hypotheses that is confirmed by the empirical cross-country analysis. Intuitively, a more patient country can partially trade the lower average yield spreads from a lower outstanding debt balance by extending its maturity to improve its rollover risk profile.

¹ Some countries in the sample had no data available on debt duration, so the analysis omits the duration data to maximize the sample size, but replicating the same exercise with duration delivers very similar results.

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