



# Writing off sovereign debt: Default and recovery rates over the cycle <sup>☆</sup>



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## ABSTRACT

This paper studies the joint determination of sovereign borrowing, default and debt restructuring outcomes. In the data, low debt recovery rates are associated with deep recessions in defaulting countries, high indebtedness at the time of default, and high borrowing costs post-default. I develop a dynamic model of sovereign debt to account for these facts. Recovery rates in the model are determined as the result of two countervailing forces: Cyclical conditions which reduce recovery rates in recessions, and procyclical borrowing which has the opposite effect. The former needs to be sufficiently strong for the model to match the data, and I present empirical evidence and a theoretical rationale for such excess sensitivity of restructuring outcomes to cyclical conditions in the form of countercyclical bargaining power of the sovereign. In the calibrated model, I show that accounting for the cyclical nature of recoveries is important for correctly predicting the timing of default events. Procyclical and low recovery rates are detrimental for welfare, but the gains from eliminating the cyclical nature of recoveries are more than twice as high as those from raising average recovery rates.

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## 1. Introduction

Sovereign defaults entail haircuts for investors: The borrowing country typically writes off part but not all of its debt. How much of their investment creditors recover is systematically related to macroeconomic conditions in the defaulting country both pre- and post-default. Defaulters tend to repay less of what they owe if they experience severe recessions during default; they repay a smaller share the more debt they default on; and smaller shares repaid are associated with higher borrowing costs post-restructuring.

Recent empirical advances have improved available estimates of debt recovery rates and their linkages with the macroeconomy, and quantitative sovereign default models increasingly include non-zero recovery rates. But it is an open question to what extent these theories are successful at accounting for the behavior of recovery rates jointly with other key variables of interest such as cyclical conditions and debt levels. This is what this paper addresses.

I develop a dynamic model of sovereign debt that can account for key features of borrowing, default and restructuring outcomes. The model builds on a standard sovereign default framework: A benevolent government borrows externally in order to smooth consumption against stochastic endowment shocks, but cannot commit to repay. I incorporate endogenous

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recovery rates resulting from debt renegotiations between the sovereign and creditors in a static Nash bargaining game over the joint surplus. Bond spreads in the model reflect both default probabilities and expected recovery rates, and the sovereign takes into account the effect of additional borrowing on spreads.

I show that recovery rates in this model are determined as the result of two opposing forces: On the one hand, high output leads to high recovery rates, as in the data. This is because good times are periods of low default risk in the model, and so the sovereign can afford to repay more of the face value without driving down the market value of the new debt, maximizing the joint surplus in the restructuring game. On the other hand, more defaulted debt lowers recovery rates, everything else equal, and the sovereign defaults on more debt if it occurs during good times. Thus, via this debt channel, recovery rates tend to be lower in good times, contrary to what is observed in the data. In the canonical model, the debt channel dominates the output channel, leading to the failure of the theory to account for the key empirical properties of recovery rates.

To reconcile model and data, I propose an excess sensitivity of recovery outcomes to cyclical conditions: In defaults that are accompanied by particularly bad recessions, the country optimally receives a larger share of the surplus over and above that implied by Nash payoffs than in defaults that occur during milder downturns. I show in a simplified version of the model that such countercyclical bargaining power arises endogenously if there is a benevolent third party such as a supranational policymaker that is involved in the bargaining process (but not the day-to-day borrowing), and I present empirical evidence for such involvement of third parties in debt renegotiations.

In the full model, I implement the excess sensitivity of bargaining outcomes to cyclical conditions in reduced form and explore its quantitative implications. A version of the model calibrated to Argentina captures the empirical relationship between recovery rates and macro variables: Low recovery rates are preceded by worse recessions and higher indebtedness, and result in higher borrowing costs post-restructuring.

The model successfully predicts the negative correlation between recovery rates and spreads because default risk remains countercyclical in the quantitative model. In the basic model, default risk is higher in bad times implying countercyclical spreads. Here, there is an offsetting effect: Low recoveries in bad times reduce default risk since default incentives are increasing in debt, and thus imply procyclical spreads, everything else equal. Quantitatively, the first effect remains sufficiently strong for the model to predict countercyclical spreads and thus a negative correlation between recovery rates and spreads.

I explore which features of the model are quantitatively and qualitatively important for the success of the model. I show that long term bonds are crucial for the ability of the theory to account for recovery rate co-movements. With short term debt, spreads do not vary enough with output, especially immediately post-restructuring when default risk is low. The average default duration on the other hand is shown to be quantitatively but not qualitatively important: Longer exclusion periods render cyclical conditions at the time of default uncorrelated with those at the time of restructuring, but for empirically plausible default episode durations of up to 25 years the model continues to imply procyclical recovery rates. Average bargaining power of the sovereign also affects the cyclicity of renegotiation outcomes, but does not qualitatively change the co-movement of recovery rates.

In terms of policy implications, I show that omitting the cyclicity of recoveries from the theory results in systematically incorrect predictions of the timing of default events. In particular, while aggregate default rates across models with and without excess sensitivity of bargaining power are similar, the model that is consistent with the data in terms of the co-movement of recovery rates predicts defaults to occur systematically earlier, on average by one quarter.

On the normative side, I show that bargaining protocols that allow for either procyclical or low recovery rates are detrimental for welfare from an ex-ante perspective. Even though higher debt write-downs, particularly in bad times, are beneficial to the sovereign in those states of the world, the anticipation of these write-downs also increase incentives to default, and the welfare losses associated with these increased default incentives dominate the potential gains. For the benchmark model, welfare gains from eliminating the procyclicity of bargaining outcomes are worth 0.25% of lifetime consumption. This makes them more than twice as high as the gains from reducing *average* recovery rates. The analysis thus suggests one concrete welfare-improving policy prescription for debt restructurings: To ignore weak cyclical conditions as an argument for lenient restructuring terms.

### 1.1. Literature

The empirical observations that motivate this paper are based on recovery rate estimates and results in [Cruces and Trebesch \(2013\)](#). In that paper the authors show that recovery rates tends to be negatively related to post-restructuring spreads. I highlight two additional facts – the relationship of recovery rates with both cyclical conditions and indebtedness. These are consistent with evidence based on recovery rate estimates by [Benjamin and Wright \(2009\)](#), also discussed in [Yue \(2010\)](#).

The theoretical part of the paper builds on the literature on sovereign default in the spirit of [Eaton and Gersovitz \(1981\)](#). There is a large number of studies that extend the benchmark quantitative sovereign default models of, for example, [Arellano \(2008\)](#) or [Aguiar and Gopinath \(2006\)](#) along several dimensions. It is becoming increasingly common to include positive recovery rates in these theories, but their ability to account for key empirical features of recovery rates, including their cyclical properties, has not been evaluated.

There are a number of contributions that discuss some of the aspects of debt recovery that this paper focuses on: [Yue \(2010\)](#) shows that an optimal debt recovery rate resulting from Nash bargaining is negatively related to the amount

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