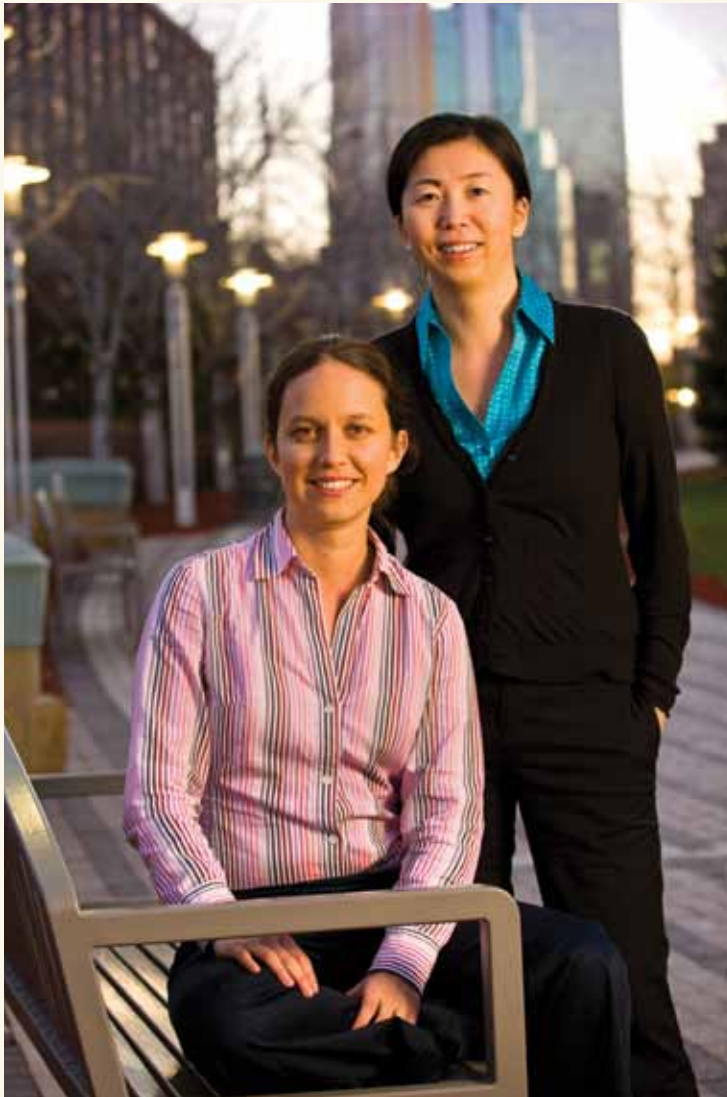


## Research Digest

### Debtors' prism

*Sovereign default contagion may result from borrowers interacting strategically in debt markets*



Cristina Arellano and Yan Bai

**W**hen countries default on their sovereign debt, history shows, they tend to do so at roughly the same time. This was true during the Latin American default crisis in the 1980s, when nearly all Latin American countries defaulted. Simultaneous or serial default has threatened Europe as well in recent years, with Greece defaulting in 2012 and other nations—especially Italy, Portugal

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and Spain—also in fragile condition. This clustering of sovereign default has happened frequently over the past two centuries. Despite this pattern, however, economic theorists have usually focused on default by countries in isolation from one another and largely ignored the empirical reality of recurrent international contagion.

In “Linkages across Sovereign Debt Markets” (SR 491 at [minneapolisfed.org](http://minneapolisfed.org)), Minneapolis Fed economist Cristina Arellano, working with Yan Bai of the University of Rochester, offers a solid, somewhat complex explanation for the phenomenon. It hinges on borrowers themselves and

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their strategic interplay in international debt markets. And as Arellano and Bai demonstrate, their intricate model matches recent events well and may therefore be quite useful for understanding Europe's current default dilemma.

### International debt relations

The key mechanism in their model, Arellano and Bai write, is that “countries are linked to one another by borrowing from and renegotiating with common lenders.” It rests on the idea that because these nations obtain loans from the same set of lending institutions, such as the foreign banks, they find themselves interconnected, and they use that association to their mutual and individual benefit. “Having a common lender generates linkages across countries,” they write. But instead of focusing on coordination among lenders, as some researchers have, Arellano and Bai seek an explanation that relies on how borrowers interact with one another in international debt markets. It turns out to be a fruitful approach.

Their model starts with two nations, labeled Home and Foreign, that borrow from a shared set of lenders. Each nation is powerful enough economically to affect international lending markets or, as economists put it, each borrowing country is “strategically large.” The central economic actions exam-

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ined by the model are borrowing, defaulting on those loans and subsequently renegotiating with lenders to borrow again.

A nation that defaults on its loan pays a price: It receives a bad credit rating, it is excluded from borrowing internationally for a time and, without that access to foreign funds, its national economic output suffers. A nation in default responds by renegotiating its debt with an international committee of lenders and bargaining with that committee over debt “recovery,” meaning that the nation in default negotiates the percentage of outstanding debt it will be required to repay to regain good credit standing and renewed access to international lending markets.

### The other side of debt

Lenders trade bonds with the two borrowers, Home and Foreign. They receive loan payoffs, and make decisions about new loans, in order to maximize their revenue. Because there are many of them, bond prices simply compensate them for delaying dividend payments and for potential future defaults by borrowing nations. Recovery rates

are determined in the renegotiation process after a default has occurred.

The key interaction in the model consists of each nation understanding that the other nation's debt activity will impact its own ability to borrow and that they have a mutual interest in minimizing borrowing costs and recovery rates. They find that each “Home” nation's default incentives are affected by the borrowing activity of the other—in their eyes, the “Foreign”—nation.

As the economists write, “default is more likely for [a] country when [its] debt is high, the price [of borrowing] is low, and the recovery [rate] is low. The default decisions of the two countries are linked because bond prices today and recoveries tomorrow depend on the decisions of both countries through the lenders' problem.”

By “lenders' problem,” they're referring to the fact that lending institutions have to figure out how to maximize their revenue from debt recovery and bond payments. If, as a lender, one nation fully repays its debt to me, I'll be less likely to offer lenient terms to other nations when renegotiating loans because I know I can get dependable revenue from

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the first (demonstrably solvent) country. But if one nation defaults, I may make concessions when renegotiating loans to another borrowing nation simply because my revenue options are more limited. Observing this, the second nation will be more likely to default, since the lender will probably negotiate a lower recovery rate.

Also, bond prices are set to reflect lenders’ financing costs, and recovery rate and default probabilities, both adjusted for risk. So if one nation defaults, the other nation will face a higher cost of new borrowing—because lenders will adjust prices to reflect their loss of capital inflow from the first loan. That in itself will make that second nation more prone to default.

“The main idea,” write Arellano and Bai in summing up their model’s mechanism: “[F]oreign defaults lead to home defaults because foreign defaults lead to lower future recoveries and tighter current bond prices for the home country.”

### Numbers to the theory

Borrowers’ coordination in their approach to lenders can thereby

generate the historically observed pattern of sovereign default by many nations at more or less the same time, and Arellano and Bai use their model to measure the strength and nature of the coordination linkage.

Calibrating model parameters to figures observed in Europe for risk-free rate volatility, average recovery rates and lower recoveries observed in multiple-country

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renegotiations, they find that about one-quarter of home defaults are due solely to foreign country defaults. Of these, 11 percent happen because of “fundamental” foreign defaults (the result of that nation’s high debt and low income), and the remaining 14 percent are due to “self-fulfilling” defaults, where both countries default only because the other is. Debt repayment is also contagious, with 27 percent of foreign country repayments occurring

because the home nation repays.

The model also predicts that interest rate spreads among countries will be correlated, as seen in the data. Cross-country spread correlation in the model is 0.43, implying that half of the Italy-Greece spread correlation of 0.97 is due to debt linkages. This correlation in spreads “arises largely because countries default together,” observe the economists. “The probability of default at home rises from an average of 4.5% to over 37% ... when the foreign country defaults.”

In addition, the model predicts that foreign defaults hinder home negotiations because recovery rates

spike. “Recoveries for the home country during foreign defaults increase from an average of 66% to 90%” and reduce the home countries’ probability of renegotiation from nearly certain to almost nil.

The model, in short, delivers realistic results and, as Arellano and Bai conclude, “provides a framework in which to study some of the recent economic events in Europe.”

—Douglas Clement