Default Traps

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1. Introduction

The history of sovereign borrowing is replete with evidence of 'serial default': countries that default once are often the ones that default again. An early study by Lindert and Morton (1989) found that countries that defaulted at least once in the period between 1820 and 1929 were, on average, 69 percent more likely to default in the 1930s; countries that incurred arrears in repayment or were forced into re-scheduling between 1940 and 1979 were 70 percent more likely to default in the 1980s.[1]

The experience of serial defaulters typically involves a vicious circle of default, penal interest rates, and greater borrowing to service the higher interest rates. In contrast, other countries enjoy virtuous circles of borrowing and repayment with declining sovereign spreads. While history suggests that individual countries can graduate from the former group to the latter, the process is typically very slow and not immune to setbacks. At the time of writing, for instance, countries in southern Europe that had reputedly graduated from serial default seem to be at risk of falling back in that state. Understanding the causes of serial default is a matter of considerable policy interest. It has potentially profound implications for explaining observed growth divergences across groups of countries as well as for the design of a sound international financial architecture.

Strikingly, however, theoretical models of serial default remain in short supply in the otherwise voluminous literature on sovereign debt.[2] In this chapter we describe a model in which a sovereign borrower's output volatility and persistence of its income shocks interact with informational asymmetry about the nature of such shocks to create an environment in which serial default occurs spontaneously.[3] We also present empirical evidence in support of our theoretical model.

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2. Explaining Serial Default

At its simplest, serial default might be a consequence of persistence in factors that make a country vulnerable to adverse macroeconomic shocks. If poor economic management or weak institutions make a country prone to default, repeated default may reflect only the slow evolution of these "structural" factors. Similarly, if default is triggered by negative shocks to a country's output, any persistence in shocks will generate serial default. While persistence is indeed a crucial ingredient of the model we describe below, we argue that even mild forms of informational asymmetry can exacerbate the impact of the underlying persistence.

Formal economic modeling of sovereign default usually treats default as the outcome of a calculated choice between the long-term consequences of default vs. repayment. In particular, default avoids the short-term pain of repayment, but imposes long-term costs: the loss of reputation as a creditworthy borrower might hinder future access to international capital markets, thereby compromising defaulters' ability to smooth consumption in the face of future income shocks. Default may also be punished through economic sanctions and disruption of trading arrangements, which lower future output. Many of these models focus on how severe these penalties need to be in order to incentivize borrowers to repay their debts.

We build a theory of serial default – what we call "default traps" – by combining the template of previous economic models with two stylized facts. First, many countries vulnerable to serial default display considerable volatility and persistence in their national output: shocks to output not only tend to be large but, quite notably, are also very persistent. Second, such countries are characterized by poor institutional transparency: information on economic fundamentals, which is of considerable relevance to lenders' assessment of the borrower's future repayment capacity, is hard to come by. This may be due to poor data-collection capabilities in these countries, or obfuscation of relevant statistical information, especially in times of economic upheaval. Recent ambiguities about Greek national statistics provide an example. With limited information about fundamentals, any act of default (or, conversely, the act of repayment) provides a valuable signal about future economic prospects. Characteristically, when market expectations are shaped by observations on a binary choice – default vs. repayment – beliefs become quite fragile. An act of default can lead investors to "assume the worst", generating excessive pessimism about the country's future economic trajectory. Conversely, repayment, even when only narrowly achieved, can spawn confidence beyond that which is merited by the fundamentals.

Such fragility of expectations exacerbates the risk of serial default. Consider a sovereign borrower that finances its investment needs through issuing short-term debt (bonds) in international markets. Suppose that its ability to meet repayment obligations depends on its realized output, so that negative shocks to output can trigger default. If output shocks are persistent – so that a negative shock to output is likely to result a prolonged period of below-average performance – any direct observation of negative shocks will lead investors to reassess the likelihood of future default. Where sovereign spreads are determined competitively and reflect the market assessment of sovereign default risk, we would expect the spread to rise. However – and this is the crucial point – if investors are unable to observe the economic fundamentals directly, they can only make inferences from observing default events. In such situations, an act of default triggers a dramatic revision of market expectations, and the greater pessimism result in a surge in sovereign spreads. We label this discrete jump in a country's sovereign spread following a default event as the 'default premium'.

The discrete adjustment of market expectations to default events is reinforced by a feedback mechanism. The surge in sovereign spreads following default increases the cost of future borrowing, and this higher cost in turn makes it harder for the country to repay in the future. Investors, who set interest rates in competitive markets, must internalize this risk, so the interest rates for countries that default tend to rise sharply. On the other hand countries that repay get the benefit of any market-held doubts, with lower interest rates; the lower borrowing costs reduce the risk of default, and market-determined interest rates are even lower for this reason. Given this feedback mechanism, the default premium – outcome of the gap between the pessimistic and optimistic assessments – can be quite large. Importantly, small chance events can tip a country from one trajectory to the other. For instance, if default triggered by purely transitory shocks is 'mis-read' by markets as a sign of future repayment difficulty, the resulting rise in sovereign spreads can have self-confirming consequences.

It is intuitive to see in this setting that this “default trap” becomes more acute when the output shocks display greater persistence. The underlying argument is intrinsically technical, but the intuition is plain to see. If income shocks are purely transitory rather than persistent, default in one period provides no information on the risk of future default. If so, the belief revision mechanism and the feedback process that support our model of serial default model are of little relevance.

3. Empirical Evidence

Our model of default traps gives rise to some testable hypotheses:

Hypotheses 1: Controlling for economic fundamentals, countries with a history of sovereign default face higher sovereign spreads: that is, there is a positive ‘default premium’.

Hypothesis 2: Countries with greater persistence of output shocks face higher sovereign spreads. The default premium rises with the persistence of output shocks.

Hypothesis 3: Countries with higher conditional volatility of output (i.e., subject to sizeable bad shocks) face higher spreads.

In order to test these hypotheses, we compiled a dataset that spans a long period, starting from the early globalization years of the 1870s through to 2004 (see Catão, Fostel, and Kapur (2009) for details and data sources). We start by examining how a country’s default risk depends empirically on various explanatory variables. The dependent variable in our regressions is the sovereign spread, measured as the (average) interest rate on a country’s sovereign bonds relative to the benchmark foreign interest rate of similar maturity: that benchmark is the UK for the initial period, and US for the later periods in our long sample.

The explanatory variables we consider are the international risk-free interest rate, the country’s indebtedness (the ratio of external debt to GDP), its openness (ratio of exports to GDP), measures of volatility and persistence of output shocks[4], and a default history indicator to capture the time-varying shifts in default premia. Further, because the default history interacts with persistence and with volatility, interactive terms are included in the regressions.

Table 1. Determinants of Sovereign Spreads: 1870-1913

	1	2	3	4
UK real interest rate	0.013	0.011	0.012	0.012
	(2.43)*	(2.62)**	(2.38)*	(2.38)*
Debt/GDP	0.01	0.015	0.012	0.012
	(13.06)**	(22.17)**	(12.14)**	(13.26)**
Export/GDP	-0.005	-0.011	-0.011	-0.01
	(-2.05)*	(-8.09)**	(-3.37)**	(-2.99)**
Volatility	0.151		0.109	0.122
	(9.52)**		(6.52)**	(6.47)**
Persistence	0.004		0.003	0.002
	(5.63)**		(3.14)**	(2.47)*
Volatility instrument		0.18		
		(5.57)**		
Persistence instrument		0.004		
		(4.12)**		
Default history			0.059	0.065
			(9.91)**	(6.44)**
Default history*volatility				-0.895
				(-3.80)**
Default history*persistence				0.032
				(3.67)**
Observations	619	598	570	570
Number of countries	23	22	21	21
R-squared	0.24	0.23	0.27	0.28
Robust z-statistics in parentheses; * denotes significance at 5%; ** significance at 1%				

Table 1 spans the pre-WWI era, reporting the pooled OLS regressions of the country sovereign spread as the dependent variable. Column (1) reports our baseline specification without a default premium term. The estimated coefficients have signs that are consistent with our theoretical model and are statistically significant at 5 percent. The point estimates show that a one percentage point increase in the conditional volatility implies a 14 basis point increase in sovereign spreads, while a 10 percentage point increase in persistence raises spreads by 5 basis points, all else constant. These effects may appear small by the standards of the 1980s or 1990s, but not by those of the pre-WWI era. Column (2) shows that these results are robust to endogeneity problems, since similar estimates are obtained once volatility and persistent indicators are instrumented out.

Column (3) introduces default history as an explanatory variable. This country-specific credit history indicator gauges how much of the default premium following the borrower's action (default vs. repayment) helps explain the evolution of spreads over and above the information contained in other fundamentals. Our indicator of default history is defined as the share of years in default since the beginning of the sample. As such, a positive default indicator decays over time with successive repayments and bounces back up every time a new default occurs. In terms of our model, we expect this variable to be positively correlated with current spreads and statistically significant. Its point estimate indicates that a country with a default history at the sample mean (0.08) has its spread boosted by over 40 basis points relative to a country that has never defaulted. Once again, since spreads for the 1870-1913 period averaged some 200 basis points, the effect was substantial. In particular, for those countries in the sample that spent up 30 percent of the time incurring arrears on foreign debt, the default premium could exceed 150 basis points. Column (4) measures how persistence and volatility of output interact with the default premium. Consistent with our model, conditional upon default, countries with higher persistence tend to have a higher default premium. In contrast, the negative sign on the interactive volatility variable (default history*volatility) indicates that higher conditional output volatility tends to dampen the default premium.

Table 2 turns to the inter-War period. For this period, neither the international risk-free rate nor the debt-to-GDP ratio is statistically significant at conventional levels though both retain their expected theoretical signs. The volatility and persistence indicators remain significant at 5% and effect of persistence on spreads is now larger than in the pre-WWI sample: a 10 percentage point increase in persistence leads to 14 basis point increase in spreads. Instrumenting both variables out as in column (2) halves the respective coefficients, but both variables remain significant at close to 5%.

Table 2. Determinants of Sovereign Spreads: 1925-1939

	1	2	3	4
UK real interest rate	0.005	0.005	0.006	0.005
	(0.53)	(0.66)	(0.69)	(0.58)
Debt/GDP	0.004	0.001	0.008	0.009
	(1.54)	(0.23)	(5.44)**	(7.00)**
Export/GDP	-0.057	-0.051	-0.039	-0.04
	(-4.61)**	(-3.97)**	(-4.99)**	(-5.02)**
Volatility	0.333		0.187	0.305
	(3.93)**		(4.19)**	(4.02)**
Persistence	0.014		0.009	0.01
	(2.20)*		(2.61)**	(3.28)**
Volatility instrument		0.168		
		(2.95)**		
Persistence instrument		0.007		
		(1.81)		
Default history			0.099	0.192
			(18.70)**	(3.16)**
Default history * volatility				-3.447
				(-3.49)**
Default history * persistence				0.183
				(3.25)**
Observations	305	305	305	305
Number of countries	25	25	25	25
R-squared	0.12	0.11	0.62	0.64

Column (3) in Table 2 shows that introducing the default history as an explanatory variable has a major impact on the regression fit and also on the statistical significance of the debt-to-GDP ratio. This may not appear surprising since there were many defaults during this short period. However, the results signal the presence of a positive and large default premium, the existence of which has previously been disputed in the literature on the inter-War period (Eichengreen and Portes, 1986; Jorgensen and Sachs, 1992). Introducing the interactive term between the default history and persistence also brings out results that clearly support our model.

Table 3. Determinants of Sovereign Spreads: 1994-2004				
	1	**2**	**3**	**4**
US real interest rate	0.161	0.161	0.177	0.173
	(2.14)**	(2.26)**	(2.33)**	(2.30)**
Debt/GDP	0.024	0.023	0.04	0.051
	(3.28)***	(2.94)***	(4.07)***	(4.54)***
Export/GDP	-0.044	-0.039	(0.05)	-0.057
	(-5.49)***	(-4.21)***	(5.72)***	(-6.12)***
Volatility	0.552	0.621	0.265	0.321
	(3.87)***	(3.85)***	(1)	(2.12)**
Persistence	0.02	0.019	0.028	0.022
	(3.32)***	(2.39)**	(5.29)***	(3.84)***
Default history		0.044	0.09	
		(1.97)**	(1.16)	
Default history * volatility			-0.138	
			(-1.51)	
Default history * persistence			0.415	1.544
			(0.32)	(2.51)**
Observations	189	189	189	189
Number of countries	28	28	28	28
R-squared	0.51	0.52	0.57	0.55

Table 3 reports the results for our last sub-sample, 1994-2004. Once again, the persistence and volatility variables are found to be statistically significant and so are the other two relevant model-dictated variables -- the risk-free US interest rate and the debt-to-GDP ratio. Once again, there is clear evidence of a positive and significant default premium, as shown in column (2). This is so even though the 1994-2004 sample is severely biased toward countries that have defaulted serially in the past (mostly issuers of Brady bonds), excluding all advanced countries that were previously present in the two pre-WWII samples. Regression results in column (3) reflect these two sample limitations -- the very limited time-series dimension and the bias towards countries that with higher output volatility and persistence that have default serially in the past. The resulting multicolinearity between the stand-alone default history variables and its interactive terms with conditional output volatility and persistence renders them statistically insignificant individually at 5%, when included together in the regression, although yielding the expected sign. Looking at the underlying data, the reason is clear: the correlation coefficients between default history and the two interactive terms are 0.89 and 0.92 respectively. In other words, not much new information can be drawn from such interactive terms once default history, persistence and volatility are already present in the regression. Indeed, column (4) shows that once the two key variables of our model – namely, default history and shock persistence – are interacted, their joint significance is clear.

4. Conclusion

Theoretical models of sovereign debt typically assume that default is punished by denial of access to international capital markets. Our model builds instead on a punishment that takes the form of a long-lasting rise in the cost of issuing fresh debt, something widely observed in practice. In contrast with previous models, ours also highlights how imperfect information between lenders and borrowers exacerbates this cost: When lenders are poorly informed, a sovereign borrower's repayment choice can trigger a sharp shift in lenders' expectations about the risk of future default. Default causes the lenders to assuming the worst about the repayment prospects on future loans, while repayment creates a more favorable outlook. The difference between interest rates commensurate with these differing scenarios generates a *default premium* in sovereign spreads. The default premium raises the cost of future repayments beyond what is justified by the fundamentals, creating the possibility of "default traps". That is, a country that has defaulted once will face a long-last higher cost of repaying which, in turn, makes it more prone to default again once hit by a sufficiently bad shock in the future. We argue that this is a key causal mechanism of serial default.

Our empirical estimations are fully consistent with such a mechanism: previous default history and higher underlying persistence of output shocks are highly significant in explaining the evolution of sovereign spreads and risk of further defaults, over and above other determinants of country risk. To the extent that higher output persistence reflects deep structural features of some economies (such as poor institutions and widespread market failures) and that greater asymmetry of information between borrowers and lenders exacerbate market punishment of defaulters via higher spreads, mitigating these structural and informational weaknesses are key to avoiding default traps. Yet, history also indicates that tackling these deep-rooted weaknesses is bound to be a hard and long process, and one potentially subject to great reversals. As a result, graduation from serial default is hardly a trivial path, and will possibly remain a non-monotonic one in practice.

Endnotes

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[1] A list of sovereign default and debt rescheduling episodes can be compiled from various sources, including Lindert and Morton (1989), Borenzstein and Pannizza (2009), Sturzenegger and Zettelmeyer (2007), Reinhart and Rogoff (2009), and Moody's (2009). While there are discrepancies among these sources when it comes to classifying events as default or re-scheduling, the identification of serial defaulters, broadly-defined, is unequivocal.

[2] See, for instance, the well-known surveys of the sovereign debt literature, such as Eaton and Fernandez (1995), Obstfeld and Rogoff (1996), Sturzenegger and Zettelmeyer (2007), and Reinhart and Rogoff (2009).

[3] This analysis is based on Catão, Fostel and Kapur (2009).

[4] One issue in constructing volatility and persistence measures to input as regressors is whether the shocks in the model should be interpreted as shocks to trends or shocks to cycle. It turns out that our findings are robust to this choice. Hence, we report results based on a standard measure of stochastic persistence the slope coefficient of a regression of de-trended real GDP (obtained by the standard HP-filter method which makes the series stationary) on its first-order lag. Using the same regression, we compute stochastic volatility as the standard deviation of the residuals. To allow for gradually evolving changes in volatility and persistence, we compute both measures recursively over a 20-year rolling window, except for earlier in the sample, where use 10-year windows to economize on degrees of freedom.

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