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SOVEREIGN DEBT AS A CONTINGENT CLAIM: EXCUSABLE DEFAULT, REPUDIATION, AND REPUTATION

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ABSTRACT

History suggests the following stylized facts about default on sovereign debt:

(1) Defaults are associated with identifiably bad states of the world.
(2) Defaults are usually partial, rather than complete.
(3) Sovereign states usually are able to borrow again soon after a default.

Motivated by these facts, this paper analyses a reputational equilibrium in a model that interprets sovereign debts as contingent claims that both finance investments and facilitate risk shifting.

Loans are a useful device to facilitate risk shifting because they permit the prepayment of indemnities. Nevertheless, because the power to abrogate commitments without having to answer to a higher enforcement authority is an essential aspect of sovereignty, a decision by a sovereign to validate lender expectations about debt servicing depends on the sovereign's concern for its trustworthy reputation. A trustworthy reputation is valuable because it provides continued access to loans. A key aspect of the analysis is that lenders differentiate excusable default, which is associated with implicitly understood contingencies, from unjustifiable repudiation.

In the reputational equilibrium, the short-run benefits from repudiation are smaller than the long-run costs from loss of a trustworthy reputation. Thus, although sovereigns sometimes excusably default, they never repudiate their debts. The reputational equilibrium can involve efficient risk shifting and efficient investment or it can involve a binding lending ceiling that limits risk shifting and can also restrict investment. The factors that tend to produce a binding lending ceiling include a high time discount rate for the sovereign, low-risk aversion for the sovereign, and a low net return from the sovereign's investments.

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History suggests the following stylized facts about defaults on sovereign debt:

(1) Defaults are associated with identifiably bad states of the world.

(2) Defaults are usually partial rather than complete.

(3) Sovereign states often are able to borrow again soon after default.

Motivated by these facts, this paper develops an analysis of sovereign debt that interprets outcomes involving sovereign default as reflecting implicit understandings that a borrower may justifiably adjust its debt servicing obligations if the realized state of the world turns out to be unusually bad for the borrower. The idea that sovereign debts in effect are contingent claims implies that loans typically involve the shifting to the lender of risks associated with the fortunes of the borrower, in addition to the financing of investments by the borrower. Moreover, this interpretation implies that, in forming expectations about future sovereign behavior, lenders would sharply differentiate defaults that are excusable, because they are associated with implicitly understood contingencies, from defaults that are inexcusable, because they involve unjustifiable repudiation of servicing expectations. The extent of the risk shifting embodied in a loan depends on the extent of default that is excusable in the event of a bad realization.

The apparent rationale for the use of loans as a device to facilitate risk shifting is the desirability of the prepayment of indemnities. By borrowing an amount equal to the maximum indemnity for which it would contract, a large agent like a sovereign who wants to insure itself against the effects of bad states of the world can draw on the resources of many small and anonymous insurers, with whom it would be costly to write and to enforce contracts requiring the payment of an indemnity to the sovereign after the realization of a bad state of the world. The prepayment of indemnities as loans with contingent servicing

commitments also allows the sovereign to execute the contract without waiting for its lenders to verify the state of the world.

A critical aspect of all debts, whatever their risk-shifting component, is the means for validating lenders' servicing expectations--that is, for preventing unjustifiable repudiation. In this regard, private and sovereign debts are fundamentally different. Private debts are subject to laws regarding bankruptcy and enforcement of collateral. Sovereign debts, in contrast, are above the law. Indeed, the power to abrogate commitments without having to answer to a higher enforcement authority is an essential aspect of sovereignty. (On this interpretation, historical cases in which one sovereign seized the assets of another apparent sovereign who is failing to service its loans involve infringement of sovereignty.)

In the existing literature on sovereign debts, Lucas and Stokey (1983) develop a formal model of contingent debt as a device to shift risk, but they abstract from the problem of enforcing servicing commitments. Other recent literature, although offering some suggestion that the possibility of default implies risk shifting, does not analyze the relation between servicing and the realized state of the world and does not distinguish excusable default from unjustifiable repudiation. See, for example, Eaton and Gersovitz (April 1981; June 1981), Sachs (1982), Sachs and Cohen (1982), Kletzer (1984), and Manuelli (1984).

The fact that the servicing of sovereign debts, unlike private debts, is not subject to external enforcement, suggests that the decision by a sovereign not to repudiate its debts depends on the sovereign's concern for its trustworthy reputation for validating lenders' servicing expectations. The present paper derives the properties of a reputational equilibrium in a model in which sovereign debts serve to share risks to the mutual advantage of borrowers and lenders, as well as to finance investments. A key assumption of the model is that a sovereign's trustworthy reputation is valuable because it generates expectations about

future debt servicing that cause lenders to allow the sovereign continued access to loans.

In the reputational equilibrium, which emerges as an endogenous outcome of the repeated interaction between lenders and the sovereign, lenders' expectations about contingent debt servicing are such that the rational sovereign always chooses to validate these expectations. In other words, even if the sovereign sometimes excusably defaults, it never repudiates its debts. In general, however, this reputational equilibrium can require a lending ceiling that prevents the sovereign from borrowing as much as it would if it could make a servicing commitment that was subject to external enforcement.

I. Analytical Framework

To focus the analysis on essentials, assume that the sovereign's lenders are risk neutral, that all sovereign debts are implicitly contingent claims that mature in one period, and that the sovereign can use the proceeds from its borrowings either to invest in a concave risk-free productive technology that is available only to itself and matures in one period or to purchase risk-free assets that are generally available. The simplifying assumption that the technology is risk-free separates the sovereign's exposure to risk from its decision to invest and enables the analysis to define efficient investment independently of the availability of risk shifting. The assumptions about technology also enable the analysis to abstract from the problems of insolvency and moral hazard in investment. In general, insolvency is not an important consideration because it implies a less binding constraint on borrowing than does the temptation to repudiate. The neglect of moral hazard, although a useful analytical simplification, is more problematical because the temptation for the sovereign to consume rather than to invest the proceeds of its borrowing is both real and potentially related to the temptation to repudiate.

In this setup, the sovereign borrows to invest, but services debt in such a way as to shift risk to its lenders. Given the lenders' expectations about contingent servicing of existing debt formulated in period $t-1$, the sovereign's proximate choice variables in period t are current debt service, s_t, the amount of new debt to issue, b_t, and an implicit plan for contingent servicing of this new debt. This planned servicing function is $R_t(z_{t+1})$, where z_{t+1} represents a distinguishable and verifiable realization of a stochastic component of income in period $t+1$. The choice of s_t, which in general is a point on an actual servicing function $S_t(z_t)$, amounts to a decision either to validate or to repudiate lenders' expectations.

The sovereign's objective is to maximize the expectation of the present value of current and future utility from consumption, given by

$$(1) \quad E_{c,t}U_t = u(c_t) + \sum_{i=1}^{\infty} E_{c,t}[u(c_{t+i})]/(1+\delta)^i$$

$$\text{with} \quad u' > 0, \quad u'' < 0, \quad \text{and} \quad u'(0) = \infty,$$

where $E_{c,t}$ is an operator that denotes an expectation taken over possible realizations of c conditional on information available in period t, c_t is an index of consumption in period t, and δ is the sovereign's constant discount rate. Consumption in period t equals the return from investing the proceeds of last period's borrowing, $F(b_{t-1})$, plus the current stochastic component of income, z_t, minus current debt service, s_t--that is,

$$(2) \quad c_t = F(b_{t-1}) + z_t - s_t, \quad \text{subject to} \quad s_t \geq 0.$$

The components of consumption are key elements of the problem. The form of $F(\cdot)$ reflects the sovereign's choice to invest in its productive technology until the marginal product equals the depreciation rate of unity plus the risk-free interest

rate. Accordingly, $F(\cdot)$ satisfies $F' > 1+\rho$ and $F'' < 0$ for $b_{t-1} < B$ and $F' = 1+\rho$ and $F'' = 0$ for $b_{t-1} \geq B$, where B is a nonnegative parameter. The stochastic variable z_t has discrete realizations ranging from a good state, Z, to a worst state, ζ, with stationary probability distribution $p(z)$ and fixed mean $\bar{z}$. To make the interpretation of excusable default interesting, assume that the probability of the good state, $p(Z)$, is large relative to the probabilities of the inferior states like $p(\zeta)$. The nonnegativity constraint on s_t reflects the assumption that it is not feasible to write and to enforce contracts that require insurers to indemnify the sovereign after the realization of a bad state of the world.

One possible interpretation of this setup is that c_t represents national consumption and that $F(b_{t-1}) + z_t$ is real national income. Another possibility, which may be more realistic, is to regard the sovereign as a proprietor and to interpret c_t as the proprietor's own consumption and $F(b_{t-1}) + z_t$ as the proprietor's income from taxes and other sources net of expenditures necessary for its survival. Depending on the choice between these interpretations, z_t can reflect either the randomness of factors that affect real national income or the randomness of factors, like external threats or internal discontent, that affect the net revenues of a proprietary sovereign. In any event, the concavity of $u(c_t)$ motivates the sovereign to issue debt with planned servicing that is contingent on z_t.

Equation (2) does not consider explicitly the possibility of financing current consumption out of savings or out of current borrowing. The important point is that, given that feasible limits on savings and accumulated debt are finite, these devices, even if available to the sovereign, could not facilitate complete smoothing of consumption. As an analytical device, the randomness of z_t can represent the net variability of resources available for current consumption and debt service after allowing for net current saving.

The supply price of loans is a critical constraint on the sovereign's choices. Given competition among the sovereign's lenders, who are risk neutral, market clearing implies that the expected value of debt servicing in period $t+1$ conditional on information available in period t equals the alternative risk-free return on the amount lent to the sovereign in period t--that is,

$$(3) \quad E_{z,t}\{E_{S,t}[S_{t+1}(z_{t+1})]\} = (1+\rho)b_t,$$

where $E_{z,t}\{\cdot\} = \sum_z p(z)\{\cdot\}$

and $E_{S,t}[S_{t+1}(z_{t+1})]$ is the lenders' expectation, taken over possible realizations of $S_{t+1}(\cdot)$, of the function that will govern the sovereign's actual servicing decision in period $t+1$. Equation (3) measures the expected value of debt servicing as the sum over all possible states of z of the products of the probability of each state occurring and the expectation of the schedule of the amounts of servicing that the sovereign will choose in each state.

The final component needed to complete the analytical framework is the determination of $E_{S,t}[S_{t+1}(z_{t+1})]$. The analysis assumes that the lenders' expectation of the amount of debt servicing that the sovereign will provide next period in each possible realized state of the world is based on common knowledge. This assumption implies that lenders know the function $u(\cdot)$. The key element in the analysis is the lenders' perception of the strategy that the sovereign employs in attempting to maximize its expected utility. The different solutions for the properties of sovereign debt derived in the following sections reflect possible differences in these strategies.

II. Efficient Risk Shifting and Excusable Default

To focus the analysis and provide a useful benchmark case, suppose that the sovereign could irrevocably commit itself in period t to a state-contingent debt-servicing function for

period $t+1$, given by $\hat{R}_t(z_{t+1})$. This irrevocable commitment, with servicing contingent on the realization of z_{t+1}, would allow the possibility of excusable default, but would preclude repudiation. Accordingly, this irrevocable commitment would determine the lenders' expectation of the actual debt servicing schedule--that is,

$$(4) \quad E_{S,t}[S_{t+1}(z_{t+1})] = \hat{R}_t(z_{t+1}).$$

Equation (4) implies that by choosing and irrevocably committing itself to a servicing function, the sovereign directly controls its lenders' expectations. At the same time, given an irrevocable commitment, the sovereign has no effective choice regarding the amount of current income to devote to servicing debt issued last period. Its current choices involve only the amount of new debt to issue and the contingent servicing commitment to attach to this debt. The choices, given by $\hat{b}_t$ and $\hat{R}_t(z_{t+1})$, that maximize $E_{c,t}U_t$ subject to equations (1) - (4) and the condition $s_{t+1} \geq 0$ are

$$(5) \quad \hat{b}_t = \hat{b} = \max\left(B, \frac{\bar{z}-\zeta}{1+\rho}\right) \text{ and}$$

$$(6) \quad \hat{R}_t(z_{t+1}) = \hat{R}(z_{t+1}) = z_{t+1} - \bar{z} + (1+\rho)\hat{b} \geq z_{t+1} - \zeta.$$

Equations (5) and (6) indicate that a sovereign who is irrevocably committed not to repudiate would be able both to invest efficiently, thereby maximizing expected consumption, and to achieve efficient risk shifting, which in this case involves shifting to its risk-neutral lenders all risk associated with the stochastic component of income. Given the stationary structure of the model, the implied amount of borrowing and the implied contingent servicing function are time invariant. Equation (5) gives an amount of borrowing $\hat{b}$ that is sufficient both for the sovereign to invest in its productive technology until the marginal product equals one plus the risk-free interest rate and

for its lenders to prepay the indemnity associated with the worst state of the world, which is the discounted value of the difference between $\bar{z}$ and ζ.

Equation (6) gives a servicing function $\hat{R}(z_{t+1})$ that calls for adding the difference, which can be positive or negative, between the realization of z_{t+1} and the mean value $\bar{z}$ to repayment of loans at interest rate ρ. The interpretation of this servicing function is that the sovereign provides full servicing, equal to $Z - \bar{z} + (1+\rho)\hat{b}$, in the good state, but provides less than full servicing in inferior states, with the amount of default equal to the difference between Z and z_{t+1}. In the case of $\hat{b}$ equal to $\frac{\underline{z}-\zeta}{1+\rho}$, the worst state implies total default. Finally, the complete risk shifting given by equation (6) implies that consumption is independent of the realized state of the world and equals the expected value of income, which is the sum of the net revenue from the sovereign's investments and the mean value of z--that is,

$$(7) \quad \hat{c} = F(\hat{b}) - (1+\rho)\hat{b} + \bar{z}.$$

III. Sovereignty and Repudiation

In reality, sovereigns do not, and by their nature probably cannot, irrevocably commit themselves to a specific state-contingent servicing schedule, or to any other policy. Indeed, the power to abrogate commitments without having to answer to a higher authority is an essential property of sovereignty. Consequently, the analytical strategy of treating the lenders' expectations of debt servicing as a choice variable for the sovereign, which led to equations (5) and (6), does not seem to provide an empirically relevant analysis of sovereign debt.

To consider another useful benchmark case, suppose that, in addition to being incapable of controlling expectations through irrevocable commitments, the sovereign naively ignores any effect that its current actions have on expectations of its future

actions. Instead, the sovereign simply chooses actual current servicing, s_t, to maximize the expected utility of consumption, $E_{c,t}U_t$, taking the lenders' expectation, formulated in period t, of the servicing function for future periods, $E_{S,t}[S_{t+i}(z_{t+i})]$, $i \geq 1$, as given. Because the partial effect of reducing s_t is to increase c_t and $E_{c,t}U_t$, the solution to this problem would be an actual time-invariant servicing function $S(z_t)$ such that s_t equals zero for all realizations of z_t. In other words, the solution would be for the sovereign to repudiate any positive servicing commitments.

Assuming that lenders correctly perceive that the sovereign will face the same problem and obtain the same solution in the next period, lenders would anticipate repudiation of any positive servicing commitment for all realizations of z_{t+1}. Accordingly, $E_{S,t}[S_{t+1}(z_{t+1})]$ would equal zero and the constraint on the expected value of debt servicing given by equation (3) would imply that b_t also equals zero. This analysis shows that a sovereign who behaved naively in the sense of treating the servicing expectations of its lenders as given would be unable to issue any debt and unable to shift any risk. Such behavior would be "suboptimal" in the sense that there are functions that imply actual debt servicing greater than zero that would yield higher expected utility, if the sovereign could convince its lenders to expect such a function. The servicing function $\hat{R}(z_{t+1})$, given by equation (6), is the best of such functions.

IV. Reputational Equilibrium

The analysis in the preceding sections assumed that the sovereign treats lenders' expectations of debt servicing either as a control variable or as a given. Both theoretical considerations and actual experience suggest that these assumptions fail to capture essential elements of the market for sovereign debt. To develop a more interesting model, suppose that, although the sovereign cannot directly control lenders' expectations about future debt servicing by irrevocably committing itself to a

servicing schedule, it can influence these expectations through its choice of the amount of current income to devote to debt servicing. The linkage between current servicing and expectations about future servicing is the sovereign's reputation for trustworthiness. Given this linkage, a rational sovereign would consider how its current servicing decision affects its reputation and how its reputation affects its ability to borrow now and in the future. Only a sovereign that ignored its reputation would behave as in Section III, but such behavior would be naive.

The present analysis presumes that the sovereign is rational and that the process by which it appoints and removes individual policymakers is consistent with this presumption. Accordingly, reputation resides with the sovereign and not with individual policymakers.

To model the determination of the sovereign's reputation, assume that lenders expect that the sovereign will always service its debts in accord with the lenders' presumption that the sovereign is rational as long as the sovereign has never violated this presumption in the past. If, however, the sovereign were ever to repudiate its debts, lenders would expect such behavior in the future and the sovereign would lose its trustworthy reputation.

In addition, lenders' expectations of debt servicing are rational in the sense that lenders are able to replicate the sovereign's solution of its choice problem. Specifically, if the sovereign has a trustworthy reputation, lenders expect the actual contingent servicing function to be the plan, given by $R_t^*(z_{t+1})$, that a rational sovereign, who knows how lenders would react to repudiation, would formulate and actually carry out. Given the stationary structure of the model, this function is time invariant. If, however, a sovereign does not have a trustworthy reputation, lenders expect it to choose zero servicing in order to maximize current consumption. These assumptions about the sovereign's reputation and lenders' expectations imply that

(8) for $t = 0$, $E_{S,t}[S_{t+1}(z_{t+1})] = R^*(z_{t+1})$ and

for $t > 0$, either $E_{S,t}[S_{t+1}(z_{t+1})] = R^*(z_{t+1})$

if $s_{t-j} = R^*(z_{t-j})$ for all $j = 0, \ldots, t-1$

or $E_{S,t}[S_{t+1}(z_{t+1})] = 0$ otherwise,

where the initial loan occurs in period zero (making s_1 the first observation on actual debt service).

The assumption that lenders have rational expectations implies that announcements by the sovereign would not communicate any information to the lenders. Accordingly, treating the sovereign's plan for contingent debt servicing as an implicit understanding with its lenders is innocuous. The only servicing schedule that the sovereign would credibly announce would be $R^*(z_{t+1})$, but such an announcement would be redundant.

According to this model, lenders are backward looking in determining the sovereign's reputation, but are forward looking in determining expected servicing. Moreover, the inability of a sovereign who repudiates to issue any new debt would result automatically from the reaction of individual lenders who form servicing expectations according to condition (8). Although condition (8) also implies that a sovereign could never recover a trustworthy reputation that it had lost, this property of the model is not restrictive because allowing recovery of reputation is isomorphic in its effect on $R^*(z_{t+1})$ to raising the sovereign's discount rate for future utility.

The problem for a rational sovereign is to choose s_t, b_t, and a plan $R_t(z_{t+1})$, as part of an implicit program $\{b_{t+i}, R_{t+i}(z_{t+i+1})\}_{i=0}^{\infty}$, so as to maximize $E_{c,t}U_t$, subject to equations (1) - (3) and (8). These choices establish a reputational equilibrium in which for all realizations of z_{t+1}, if the sovereign chooses s_t to validate the lenders' expected

contingent servicing function, expected utility is at least as large as it would be if the sovereign were to maximize current consumption by repudiating its debt. Thus, in a reputational equilibrium, a rational sovereign always plans to service newly issued debt in accord with the function $R^*(z_{t+1})$, and in the next period always validates lenders' servicing expectations and keeps its trustworthy reputation by choosing s_{t+1} in accord with a function $S(z_{t+1})$ that is identical to $R^*(z_{t+1})$.

The contingent servicing plan $R^*(z_{t+1})$, accordingly, is in the set of functions $R(z_{t+1})$ that represent incentive-compatible plans. Moreover, it is the incentive-compatible plan that produces the largest value of $E_{c,t}U_t$. The analytical problem is to determine the function $R^*(z_{t+1})$ that fits this specification.

This function, together with specification of lenders's expectations given by conditions (8) and the required expected value of debt servicing given by equation (3), implies an associated time invariant value for b_t^*, given by

$$(9) \quad b_t^* = b^* = \sum_z p(z)\, R^*(z_{t+1})/(1+\rho).$$

Equation (9) says that the sovereign borrows an amount equal to the discounted expected value of the debt servicing implied by the servicing function $R^*(z_{t+1})$. Note that conditions (8) also imply, because the sovereign starts with a trustworthy reputation, that b_o equals b^*.

Let the function $V_t(\cdot)$ denote the dependence of expected utility on the actual contingent servicing function that the sovereign uses in period t and plans to use in period $t+1$ and expects to plan to use in subsequent periods. Given the stationary structure of the problem, the sovereign expects that it will plan to use in period $t+i$, $i > 1$, the same contingent servicing function as it plans to use in period $t+1$. Thus, the expression

$$E_{c,t}U_t = V_t[S_t(z_t), R_t(z_{t+1})]$$

fully describes the function $V(\cdot)$.

As a member of the set of incentive compatible servicing plans, the function $R^*(\cdot)$ satisfies the incentive-compatibility conditions for period one,

$$(10) \quad V_1[R^*(z_1), R^*(z_2)] \geq V_1(0,0)$$

for all possible realizations of z_1 and z_2.

Period one is critical because of the initial condition that in period zero lenders expect the the actual servicing function to be $R^*(z_1)$. Equation (10) says that the function $R^*(\cdot)$ is such that for all possible states of the world a plan that involves always validating lenders' expectations that actual servicing will conform to $R^*(\cdot)$ would generate in period one higher expected utility for a rational sovereign than would a decision to repudiate.

Given that, if the sovereign honors $R^*(z_1)$, lenders do not change their expectations, any function $R^*(\cdot)$ that satisfies condition (10) also satisfies the analogous condition for period two and, by extension, for every subsequent period. Therefore, the sovereign's plan to honor $R^*(\cdot)$ in the future is time consistent. Moreover, it is clear that any plan that involved honoring $R^*(z_1)$ in period one but repudiating in the future would not be time consistent.

V. Efficient Risk Shifting or a Binding Lending Ceiling?

The analysis in Section II derived the contingent servicing commitment $\hat{R}(z_{t+1})$, and the associated amount of borrowing $\hat{b}$, that produced the highest value of $E_{c,t}U_t$, given that $E_{S,t}[S_{t+1}(z_{t+1})]$ equals $\hat{R}(z_{t+1})$. If $\hat{R}(z_{t+1})$ is in the set of incentive-compatible servicing plans, then $R^*(z_{t+1})$ equals

$\hat{R}(z_{t+1})$ and b^* equals $\hat{b}$. As discussed above, the amount of borrowing $\hat{b}$ enables the sovereign both to invest efficiently, thereby maximizing expected income, and to achieve efficient risk shifting, which in the present framework involves shifting all risk to the risk-neutral lenders. If, alternatively, $\hat{R}(z_{t+1})$ is not in the set of incentive-compatible servicing plans, lenders would not permit the sovereign to borrow the amount $\hat{b}$. Such a binding lending ceiling either would prevent the sovereign from shifting all risk to the lenders, even if the sovereign would continue to invest efficiently, or would prevent the sovereign from investing efficiently, thereby facing the sovereign with a tradeoff between expected consumption and the riskiness of consumption.

To analyze the conditions that determine whether $\hat{R}(z_{t+1})$ is incentive compatible, it is necessary to evaluate condition (10) for $R^*(z_{t+1})$ equal to $\hat{R}(z_{t+1})$. Considering equation (1) for $t = 1$, and substituting $\hat{c}$ from equation (7) for c_t and c_{t+i}, $i = 1 \ldots \infty$, gives

$$(11) \quad V_1[\hat{R}(z_1), \hat{R}(z_2)] = (1 + \tfrac{1}{\delta})\, u(\hat{c})$$

$$= (1 + \tfrac{1}{\delta})\, u[F(\hat{b}) - (1+\rho)\hat{b} + \bar{z}].$$

To calculate $V_1(0,0)$ given that $E_{S,0}[S_1(z_1)]$ equals $\hat{R}(z_1)$, observe that by repudiating its debts in period one, the sovereign would obtain consumption in period one equal to $F(\hat{b}) + z_1$. At the same time, repudiation would cause the sovereign to lose its trustworthy reputation. Consequently, in all subsequent periods, the equilibrium under anticipated repudiation, analyzed in Section III, would obtain. In this equilibrium, the sovereign is unable to borrow and, accordingly, obtains consumption equal to z_t. Substituting these terms into equation (1) yields

$$(12) \quad V_1(0,0) = u[F(\hat{b}) + z_1] + \tfrac{1}{\delta} \textstyle\sum_z p(z)\, u(z_t).$$

Note that equations (6) and (7) imply

$$F(\hat{b}) + z_1 = \hat{c} + \hat{R}(z_1).$$

Comparison of equations (11) and (12) shows that current considerations favor repudiation because $u(\hat{c})$ is smaller than $u[\hat{c} + \hat{R}(z_1)]$, whereas future considerations discourage repudiation because $\frac{1}{\delta} u[F(\hat{b}) - (1+\rho)\hat{b} + \bar{z}]$ is larger than $\frac{1}{\delta} \int_z p(z)\, u(z)$. Looking more closely at future considerations, the factors that weigh against repudiation of $\hat{R}(\cdot)$ are a low value of the discount rate δ, greater concavity (risk aversion) of the function $u(\cdot)$, a larger variance of the stochastic variable z, and a larger net return from investing the loan $F(\hat{b}) - (1+\rho)\hat{b}$. Looking more closely at current considerations, the factors that weigh against repudiation of $\hat{R}(\cdot)$ are a smaller value of $\hat{R}(z_1)$ and, again, greater concavity of $u(\cdot)$. From equation (6), the value of $\hat{R}(z_1)$ depends positively on the difference between z_1 and the mean value $\bar{z}$ and on the size of $(1+\rho)\hat{b}$, which, from equation (5), equals the larger of $(1+\rho)B$ and the difference between $\bar{z}$ and the minimum value ζ. Note that, because the largest value of $\hat{R}(z_1)$ obtains if the realization of z_1 is the good state Z, the incentive to repudiate is largest in the good state. Hence, if $\hat{R}(Z)$ satisfies condition (10), $\hat{R}(z_1)$ satisfies the incentive-compatibility conditions for all possible realizations of z_1.

Suppose that $\hat{R}(z_{t+1})$ does not satisfy equation (10) for z_{t+1} equal to Z, and, perhaps, for some adjacent values of z_{t+1}. In this event, the function $R^*(z_{t+1})$ involves less planned servicing for z_{t+1} equal to Z and for these adjacent values of z_{t+1} than does $\hat{R}(z_{t+1})$ such that $R^*(z_{t+1})$ satisfies equation (10) as an equality for these states. With $R^*(z_{t+1})$ less than $\hat{R}(z_{t+1})$ for one or more values of z_1, equation (9) implies that b^* is less than $\hat{b}$. Given b^* less than $\hat{b}$, equation (5) implies that b^* is less than either B or $\frac{\bar{z}-\zeta}{1+\rho}$ or both. In other words, if the expected value of debt

servicing associated with efficient investment and efficient risk shifting is not incentive compatible, the sovereign cannot borrow enough either to invest in its productive technology until the marginal product equals one plus the risk-free interest rate or for its lenders to prepay the indemnity required in the worst state of the world under complete risk shifting or both.

The simplest case to analyze has b^* sufficient for efficient investment but insufficient for efficient risk shifting--that is,

$$\hat{b} = \frac{\bar{z}-\zeta}{1+\rho} > b^* > B.$$

In this case, because investment remains efficient, the expected values of income and consumption, given by $F(b^*) - (1+\rho)b^* + \bar{z}$, are still equal to $\hat{c}$. Actual consumption, denoted by $c^*(z_{t+1})$, however, depends on the realized state of the world. For example, if $\hat{R}(z_{t+1})$ satisfies equation (10) for all realizations of z_{t+1} less than Z, then consumption in state Z is larger than $\hat{c}$, whereas consumption in all other states is smaller than $\hat{c}$. Nevertheless, the amount of borrowing is such that the lenders prepay an indemnity sufficient to equalize consumption in all states other than state Z, and the contingent servicing function enables the sovereign to shift to its lenders all risk not associated with state Z. Specifically, the reputational equilibrium has the following properties:

$$R^*(Z) < \hat{R}(Z),$$

$$R^*(z_{t+1}) = \hat{R}(z_{t+1}) = z_{t+1} - \zeta \quad \text{for all} \quad t > 0 \quad \text{and for all} \quad z_{t+1} < Z,$$

$$b^* = \hat{b} - p(Z)[\hat{R}(Z) - R^*(Z)]/(1+\rho),$$

$$c^*(Z) = \hat{c} + [1-p(Z)][\hat{R}(Z) - R^*(Z)], \quad \text{and}$$

$$c^*(z_{t+1}) = \hat{c} - p(Z)[\hat{R}(Z) - R^*(Z)] \quad \text{for all} \quad t > 0 \quad \text{and for all} \quad z_{t+1} < Z.$$

Another instructive case has b^* sufficient for efficient risk shifting but insufficient for efficient investment--that is,

$$\hat{b} = B > b^* > \frac{\bar{z}-\zeta}{1+\rho}.$$

In this case, the expected values of income and consumption, given by $F(b^*) - (1+\rho)b^* + \bar{z}$, are less than $\hat{c}$, the expected value of income and consumption associated with efficient investment. The sovereign, nevertheless, could choose an amount of borrowing and a servicing function, with a servicing plan less than $\hat{R}(z_{t+1})$ for all realizations of z_{t+1}, such that actual consumption would be state invariant. Even though the sovereign is risk averse, however, it would accept some state-dependence of consumption in order to have a higher expected value of consumption. Thus, in general $R^*(z_{t+1})$ will be such that consumption in state Z is higher than in the other states. As a final case, b^* can be insufficient both for efficient investment and for efficient risk shifting--that is,

$$b^* < \min\left(B, \frac{\bar{z}-\zeta}{1+\rho}\right).$$

In this case, the sovereign faces an even less favorable tradeoff between the expected value of consumption and the riskiness of consumption.

In each of these cases, even though lenders are risk neutral, the binding lending ceiling makes risk shifting incomplete. Risk aversion by lenders would further limit risk shifting, but would not completely preclude risk shifting. Specifically, with risk averse lenders, efficient risk shifting would be incomplete. Accordingly, future considerations would weigh less heavily against repudiation and, as a result, the sovereign would face, ceteris paribus, a lower lending ceiling.

VI. Summary

This paper has analyzed a reputational equilibrium in a model that interprets sovereign debts as contingent claims that both finance investments and facilitate risk shifting. In this model, lenders differentiate excusable default, which is associated with implicitly understood contingencies, from unjustifiable repudiation. The model implies that, although all bad states of the world cause excusable default, only the worst state of the world can produce total default. Moreover, being consistent with lenders' expectations about debt servicing, excusable default does not preclude continued access to loans.

Because the power to abrogate commitments without having to answer to higher enforcement authority is an essential aspect of sovereignty, the sovereign's decision to validate lenders' expectations about debt servicing depends on the sovereign's concern for its trustworthy reputation. A trustworthy reputation is valuable because it provides continued access to loans.

In the reputational equilibrium, the short-run gains from repudiation are smaller than the long-run costs from loss of a trustworthy reputation. Thus, although sovereigns sometimes excusably default, they always resist the temptation, which is greatest in the good state of the world, to repudiate their debts. The reputational equilibrium can involve efficient risk shifting and efficient investment or it can involve a binding lending ceiling that limits risk shifting and can also restrict investment. The factors that tend to produce a binding lending ceiling include a high time discount rate for the sovereign, low risk aversion for the sovereign, and a low net return from the sovereign's investments.

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