On Wars, Sanctions and Sovereign Default

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Introduction

- February–April 2022
    - Following the invasion of Ukraine, Russia faced a freezing of its international reserves ($\approx$ 30% of its GDP)
    - The goal was to hinder the financing of the war, but Russia was still allowed to use reserves to make debt payments
    - On April 4, 2002, the US Treasury blocked these payments, and Russia failed to meet its obligations
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- This paper: we explore the role of restrictions on international reserves as economic sanctions and develop a <u>simple model</u> that can account for these events

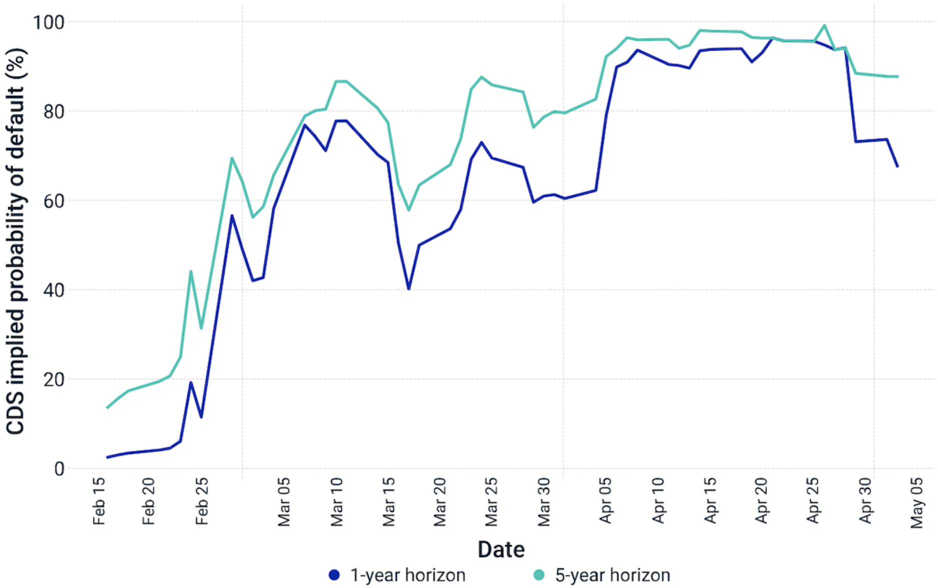

Figure 1: Default probabilities for Russian gov't bonds in 2022

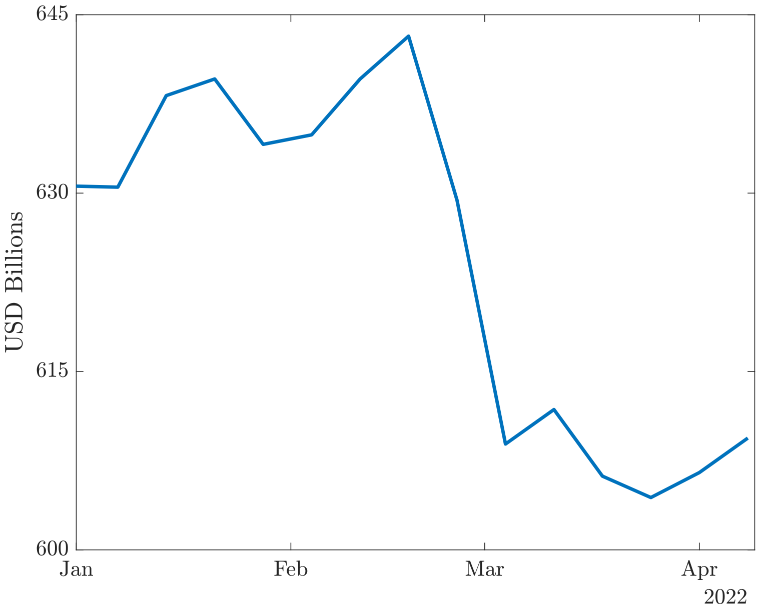

Figure 2: Russian Foreign Reserves in 2022

Overview of the paper (1)

What we do

- Simple model of restrictions on int'l reserves as economic sanctions
- Two countries: debtor, Russia (sanctioned); creditor, US/West (sanctioning)
- Sanctioned country:
  - chooses default/repayment, borrowing and reserve accumulation
- Sanctioning country:
  - can impose restrictions on the use of use of reserves (by the other country)
  - welfare decreasing in the utility of the sanctioned country $\rightarrow$ **geopolitical externality**
- Solve for the the Stackelberg-Nash equilibrium

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Under what conditions would the sanctioning country choose hard enough restrictions that will trigger a default by the sanctioned country?

Overview of the paper (2)

What we find

- For a low geopolitical externality, the optimal restriction involves squeezing the resources up to the point at which the sanctioned country is indifferent between repaying and defaulting $\rightarrow$ "soft" restrictions
- For a high geopolitical externality, the optimal restriction becomes a complete freezing of reserves and this induces a foreign default $\rightarrow$ "hard" restrictions

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- May sound surprising because default decision is optimal and so restrictions beyond the "soft" one do not actually hurt the foreign country

- Key: geopolitical externality is tilted towards the war period and a default reduces the foreign utility in that period

A Model of Financial Sanctions and Sovereign Default

Elements of the Model

- Model of the strategic interactions that result from international sanctions and the possibility of sovereign default

- Two countries: foreign (Russia) and the home (US/West).
  - Same utility function, $u(c)$; same discount factor, β
  - Home country has geopolitical externality

- There are also financial intermediaries with discount rate r

- Discrete time; infinite horizon

- Assume: (i) no uncertainty, and (ii) $\beta(1+r)=1$

Foreign Country (Russia)

- Starts period 0 with a portfolio (a_0^*, b_0^*) and receives constant income y^*
- Reserves (a^*) are one-period non-negative, risk-free assets that may be subject to restrictions (sanctions)
- Debt (b^*) is long-term with a maturity parameter δ. A bond issued in period t promises to pay: $\kappa\left[1, (1-\delta), (1-\delta)^2, (1-\delta)^3, \ldots\right]$

Budget constraint under Repayment:

$$c_t^* + g_t^* + \frac{a_{t+1}^*}{1+r} + \kappa b_t^* = a_t^* + y^* + q(a_{t+1}^*, b_{t+1}^*)[b_{t+1}^* - (1-\delta)b_t^*]$$

- $g_t^* \equiv$ fixed war expenditures. Ass. the war last only one period, $g_t^* = 0\,\forall t > 0$

$$c_t^* + g_t^* + \frac{a_{t+1}^*}{1+r} + \kappa b_t^* = a_t^* + y^* + q(a_{t+1}^*, b_{t+1}^*)[b_{t+1}^* - (1-\delta)b_t^*] \tag{1}$$

Two additional constraints in $t = 0$:

1. A restriction on the use of reserves:

$$\frac{a_1^*}{1+r} \geq \underline{a} \tag{2}$$

   - Assume $\underline{a} \leq a_0^*$, Russia cannot be forced to $\uparrow$ its reserves
   - Encompasses the case $\underline{a} = a_0^* - \kappa b_0^*$, which restricts reserves for purposes other than debt repayments
   - Harshest punishment: $\underline{a} = a_0^*$, reserves can't be used at all and interest payments can't be repatriated

2. Russia cannot issue new bonds:

$$b_1^* \leq b_0^*(1-\delta) \tag{3}$$

Foreign Country – Value of Default

Two costs of default:

- Income cost, ϕ^D: captures direct income costs of defaulting (above and beyond those coming from *other sanctions*) as well as reputational concerns
- Financial exclusion: lasts 1 period (the war period). This is w/o lost of generality

Budget constraint under default:

$$c_0^* + g^* = y^* - \phi^D$$

already assumes harshest sanction: $\underline{a} = a_0^*$. Also w/o lost of generality

Value of default:

$$V_D^*(a_0^*) = u(y^* - \phi^D - g^*) + \frac{\beta}{1-\beta} u(y^* + r a_0^*) \tag{4}$$

- **Assumption 1. (Binding reserve constraint)** *The foreign country's initial gross positions and government spending satisfy:* $g^* + \kappa b_0^* - a_0^* > (1-\beta)(1-\delta)b_0^*$.
  - This guarantees that (2) and (3) bind.

Value of Repayment:

$$V_R^*(a^*, b^*; \underline{a}) = \left\{ u(c^*) + \frac{\beta}{1-\beta} u\Big(y^* + (1-\beta)\left[\underline{a}(1+r) - (1-\delta)b^*\right] \Big) \right\} \tag{5}$$

subject to

$$c^* = y^* + (a^* - \underline{a}) - \kappa b^* - g^*$$

- the cont. value already imposes no-default for $t \geq 1$ (which holds cond. on repayment in $t = 0$)

Default decision. The decision to default at time 0 is as follows:

$$d^*(a^*, b^*; \underline{a}) = \begin{cases} 0 & \text{if } V_R^*(a^*, b^*; \underline{a}) \geq V_D^*(a) \\ 1 & \text{if } V_R^*(a^*, b^*; \underline{a}) < V_D^*(a) \end{cases}$$

Assumption 2. (Def. costs) *We assume ϕ^D is such that the government chooses*

1. *to repay when there are no restrictions on the use of reserves , and*
2. *to default when the harshest possible reserve restriction is imposed ($\underline{a} = a_0^*$).*

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Lemma 1. (Threshold sanction, $\hat{a}$) *Suppose Assumption 2 holds. Let (a^*, b^*) be the initial financial position, then there exists a restriction on the use of reserves $0 \leq \hat{a} \leq a_0^*$ such that $V^R(a^*, b^*; \underline{a}) \geq V^D(a^*)$ if and only if $\underline{a} \leq \hat{a}$.*

Home Country (US/West)

Preferences:

$$W = \sum_{t=0}^{\infty} \beta^t u(c_t) - \eta u(c_0^*)$$

- $\eta > 0$ measures the intensity with which **H** wishes to punish **F** during the war
- Note: we use $u(c_0^*)$, but the key is for the geopolitical externality to be relatively more important during the war period
- Home's portfolio: αb_0^* and other net-foreign-assets k_0.
- Given constant income y and constant return on its portfolio $(1 + r)$, Home's consumption is

$$c_t = y + (1 - \beta)\left[\alpha b_0^*(1 - d^*) + k_0\right], \qquad \forall t \geq 0$$

Home Country - Welfare

$$W(\underline{a}; d^*) = \frac{1}{1-\beta} u\Big(y + (1-\beta)(\alpha b_0^*(1-d^*) + k_0)\Big) - \eta u(c_0^*(\underline{a}, d^*)) \tag{6}$$

- $c_0^*(\underline{a}, d^*) \equiv$ consump. available to **F** as a function of $\underline{a}$ and its default decision d^*.
- **H**'s welfare is entirely determined by the **F**'s default decision and by $c_0^*(\underline{a}, d^*)$
- **H** can alter both with its sanctions, $\underline{a}$

- Trade-off: imposing restrictions reduces the geopolitical externality, but it may trigger a default, which implies fewer resources for **H**.

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$$\underline{\mathbb{A}} = argmax_{\underline{a}}\, W(\underline{a}; \mathbb{D}^*(\underline{a})),$$

where

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and V_R, V_D *and* W *were defined in* (4), (5), *and* (6), *respectively.*

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- Solve by backward induction.
- Distinguish the payoffs when F defaults and when it repays (which is a function of $\underline{a}$)

Home Country's Optimal Policy

Let us define the payoff function $\tilde{W}(\underline{a}) = W\left(\underline{a}; d^*(a, b; \underline{a})\right)$. We have that

$$\tilde{W}(\underline{a}) = \begin{cases} \frac{1}{1-\beta} u(y + (1-\beta)(\alpha b_0^* + k_0)) - \eta u\left(y^* - g^* + a_0^* - \underline{a} - \kappa b_0^*\right) & \text{if } \underline{a} \leq \hat{a}. \\ \frac{1}{1-\beta} u(y + (1-\beta)k_0) - \eta u\left(y^* - g^* - \phi^D\right) & \text{if } \underline{a} > \hat{a}. \end{cases}$$

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- $\tilde{W}(\underline{a})$ is strictly increasing in $\underline{a}$ if $\underline{a} \leq \hat{a}$ while it is independent of $\underline{a}$ if $\underline{a} > \hat{a}$.
- $\tilde{W}(\underline{a})$ features in general a discontinuity at $\underline{a} = \hat{a}$.

- It follows that H's policy satisfies $\underline{a} \geq \hat{a}$.
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- It follows that H's policy satisfies $\underline{a} \geq \hat{a}$.
  In particular, the solution is either $\underline{a} = \hat{a}$ or any $\underline{a} > \hat{a}$.
- In other words: conditional on inducing F to repay, H squeezes F's resources up to the point at which it becomes indifferent between repaying and defaulting.
- When the geopol. externality η is low, the outcome is that the H induces repayment. However, if η is large, it's optimal for H to induce default.

Equilibrium – Proposition 1

Proposition 1. (Threshold externality, $\hat{\eta}$) There exists a threshold

$$\hat{\eta} = \frac{u(y + (1-\beta)(\alpha b_0^* + k_0)) - u(y + (1-\beta)k_0)}{(1-\beta)\left[u\left(y^* - g^* + a_0^* - \hat{a} - \kappa b_0^*\right)\right] - u\left(y^* - g^* - \phi^D\right)} > 0$$

such that:

- if $\eta \leq \hat{\eta}$, the home country chooses $\underline{a} = \hat{a}$ and the foreign country repays, and
- if $\eta > \hat{\eta}$, the home country sets $\underline{a} > \hat{a}$ and the foreign country defaults.

Discussion of Proposition 1

- Proposition 1 underscores how the model can account for the evolution of the motivating facts: first "soft" restrictions, then "hard" ones.
- Theoretically, the finding that a creditor may find it optimal to push the debtor into default is perhaps surprising

  $\rightarrow$ subtle because the decision to default by F is optimal, which means that restrictions larger than $\hat{a}$ do not actually hurt F
- <u>Crucial feature:</u> H suffers more from current than future F utility flows (externality tilted towards present, war period).
- Show in an Appendix that if the H were to face a constant geopolitical externality over time, it would never be optimal to trigger a default. It would choose $\eta = \hat{\eta}$.

A Simple Calibration

A Numerical Example

Goal: gauge the quant. effects of the geopol. external. and argue that under plausible params. the model can account for the events surrounding the Russian default

- Parameterize F using Russian data and H using US data
- Log utility for both countries. 1 period = 1 year
- Normalize $y = 1$, make $y^* = y/14$.
- World interest rate $r = 0.01$ and $\beta = 1/(1 + r)$
- Russian portfolio: $a_0^* = 0.3y^*$, $b_0^* = .2y^*$, $\delta = 0.14$ (maturity $\approx$ 6.8 yrs.)
- US initial portfolio: $k_0 = -0.6y$; $\alpha = 0.5$ (Russian debt held by foreigners)
- Given previous parameters:
    - Set g^* to min. value that satisfies Assumption 1
    - Set ϕ^D so that $\hat{a} = a_0^* - \kappa b_0^*$

A Numerical Example - Parameter Values

Income in H	y	1
Income in F	$y*$	$y/14$
World interest rate	r	0.01
Discount factor	β	$1/(1+r)$
Initial Reserves in F	a_0^*	$0.3\,y^*$
Initial Debt in F	b_0^*	$0.2\,y^*$
Coupon decay rate	δ	0.138
Other net-foreign-assets in H	k_0	$-0.6\,y$
H's exposure to F's debt	α	0.50
Default cost	ϕ^D	$0.13\,y^*$
War spending	g^*	$0.28\,y^*$
Geopolitical externality	$\{\eta^{Low}, \eta^{High}\}$	$\{0.03,\ 0.05\}$

Results – Value Functions and Thresholds

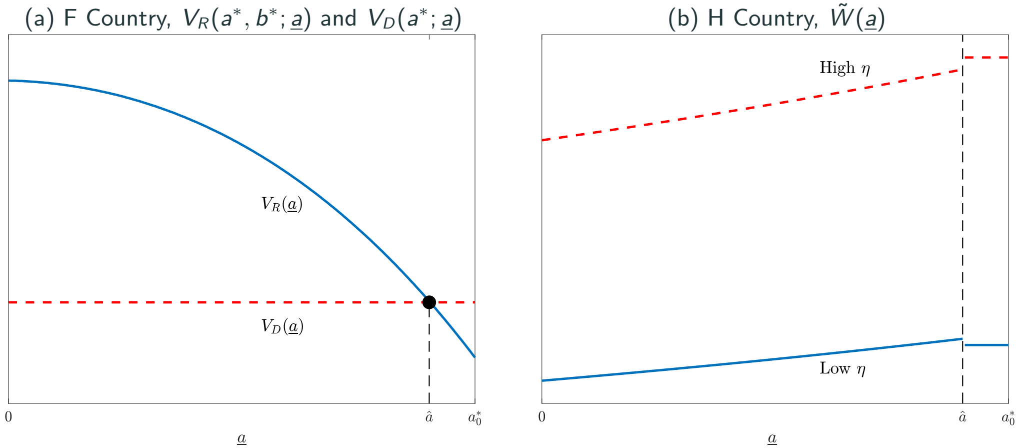

Figure 3: Value functions for Home and Foreign Countries

- Low η: squeeze but don't trigger default; High η: trigger default
- $\hat{\eta} = 0.04 \rightarrow$ *H is willing to suffer a 0.01% decline in permanent consumption to reduce the utility of F to its level under default*

Conclusions

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- Present a simple model to think about the implications of restrictions on the use of international reserves as economic sanctions
- We find that soft restrictions come at no cost for the sanctioning country—they restrict resources available to the sanctioned country without negative consequences for the sanctioning country.
- However, hard restrictions (e.g. a complete freezing of reserves) can trigger a default.
- Even though the decision to default is an optimal response by the sanctioned country, we show that a complete freezing of reserves may be optimal when the geopolitical externality is high

Conclusions (2)

- Extensions:
  - Income uncertainty; preference shocks (e.g. a shifter in the geopolitical externality)
  - Interact with other sanctions: trade (most clear case)
  - Discrete vs. Continuous punishment technologies

- Exciting research topic. Lots to explore. **Congrats** again to the *Kiel Institute* on this new venture!

Danke!