Fear and Lending in Sovereign Debt: The Role of Risk Premia in Default and Renegotiations

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WL/VMI seminar series

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Motivation

- Negotiations to restructure sovereign debt are long and costly
  - On average more than 8 years to complete (Benjamin and Wright 2013)
- International business cycles influence the outcome of sovereign debt restructurings (Asonuma and Joo 2019)
  - Find low international output is correlated with higher haircuts and lower delays
- The time-varying risk aversion of lenders can play an important role
  - Matters a lot for sovereign debt prices

What this paper does:

1. Data:
   - Find high significant relationship between lenders' risk appetite and debt restructuring outcomes (haircuts and delays)
   - Find suggestive evidence of higher rates of default when risk premia is high

What this paper does:

1. Data
2. Build a sovereign default model that has renegotiation with delays and time-varying international rates
   - Take into account that lenders will accept worse deals in bad times
   - Want: X% of defaults in the last 50 years were caused by changes in risk premia

What this paper does:

1. Data
2. Model
3. Quantitative Exercise
   - Show that a higher interest rate results in higher probability of default
   - Show that a higher interest rate results in both shorter delays in renegotiations and larger haircuts
   - The model can generate an average delay length comparable to that experienced by Argentina 2001

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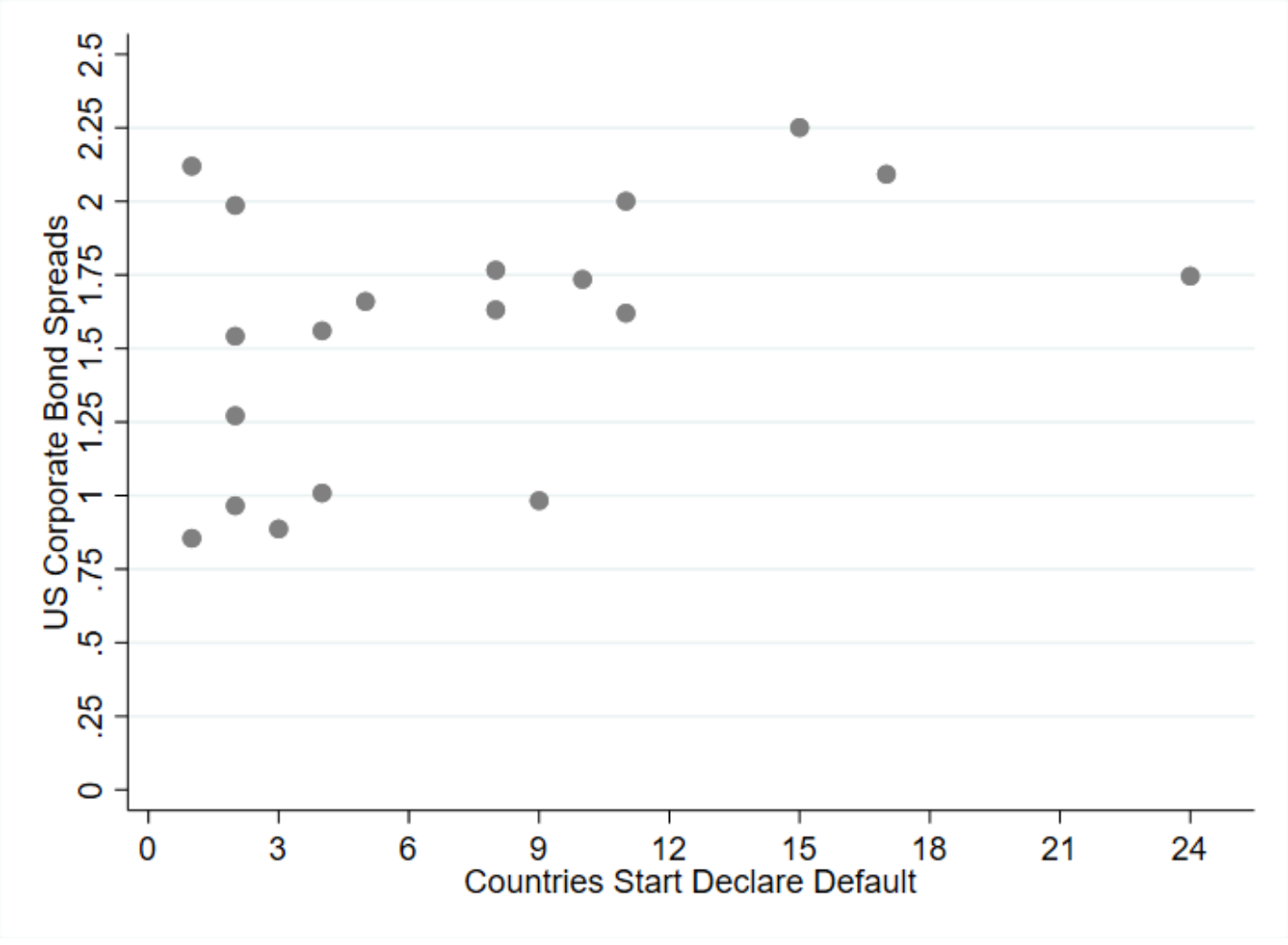
Line: Time varying risk premia affects both the default (higher interest rates make it more likely) and restructuring outcomes (higher interest rates lead to shorter delays and higher haircuts)

Two main databases:

- Trebesch and Cruces/Trebesch haircut dataset
  - Start and end dates of 197 sovereign defaults / debt restructurings covering 1970-2020.
  - 187 sovereign debt restructurings results covering 1970-2013
  - External Debt
- Gilchrist and Zakrajsek
  - Excess bond premium for US financial firms
  - Reflects a change in the effective risk-bearing capacity of the financial sector
  - Commonly used as a proxy for the creditor risk appetite independent of business cycle movements



Positive correlation between defaulting and risk appetite

Negative and significant correlation between risk appetite and

$$Duration_{i,t} = \beta GZSpreads_t + \beta_0 \mathbb{C}_{i,t} + \epsilon_t$$

- GZ Spread- creditor risk appetite
- $\mathbb{C}$ controls- i.e. Local GDP, LIBOR, IMF programs, bond exchange, etc.

Similarly, for Haircuts

Duration vs Spreads

	GZ US excess bond premium, average (%)
	coef/se
GZ US excess bond premium, average (%)	-42.49*
Debtor GDP deviation from trend, end (%)	1.34*
External debt, end (% of GDP)	0.30**
Export/debt service ratio, end (%)	3.32***
LIBOR 12-month, end (%)	-11.87***
LIBOR 12-month, average (%)	13.99***
IMF-supported program, end (dummy)	-33.29**
Bond restructurings (dummy)	11.08
Contant	-
Sample	62
Adj-R^2	0.69
Root MSE	45.7

Higher Excess returns are associated with lower duration

Haircuts vs Spreads

	GZ US excess bond premium, end (%)
	coef/se
GZ US excess bond premium, end (%)	14.66**
Duration of restructurings (years)	0.18***
Debtor GDP deviation from trend, end (%)	0.17
Debtor per capita US$ GDP, end (thousand US$)	-3.11**
External debt, end (% of GDP)	0.15***
Export/debt service ratio, end (%)	0.31
LIBOR 12-month, end (%)	-0.08
LIBOR 12-month, average (%)	-3.16**
IMF-supported program, end (dummy)	-6.53
Bond restructurings (dummy)	-5.94
Post-1989 IMF lending regime (dummy)	7.94
Contant	59.14***
Sample	76
Adj-R^2	0.51
Root MSE	18.92

Higher Excess returns are associated with higher haircuts

Main takeaways:

1. Significant relationship between investors risk appetite and debt restructuring outcomes
2. Suggestive relationship between investors risk appetite and default decisions

- Small open economy
- Government chooses if to repay
- Government issues one-period debt, and choose consumption
- International lenders lend with a period interest rate of r_t
  - here r_t is not constant and is correlated with output

Timeline

1. Start period with $s = (B, Y, r)$
   - B is the bonds held by international investors
   - Y is stochastic output
   - r is stochastic world interest rate
2. If in good standing: Government decides to default or not
   - if default: Gov face quadratic productivity penalty, and renegotiations start the next period
   - if repays: Gov chooses B'
3. If in default: play a renegotiation game, where there is a random choice of who makes the first offer
   - if successful: you pay αB and reenter financial markets next period
   - if not: Pay a fixed rate of outstanding debt $\hat{r}B$

Government solves:

$$V(B, Y, r) = max \left\{ V^r(B, Y, r), V^d(B, Y^{def}, r) \right\}$$

Government Repays

So if the gov repays:
$V^r(B, Y, r) = \max_{B',C} \quad U(C) + \beta \mathbb{E}\left[V(B', Y', r')\right]$

ST ::

$$C + B = q(B', Y, r)B' + Y$$

Government Defaults

So when the gov defaults:
$V^d(B, Y, r) = \max_C \quad U(C) + \beta \mathbb{E}\left[V^r(B, Y', r')\right]$

ST ::

$$C + \hat{r}B = Y^{def}$$

Bargaining

- Stochastic bargaining game over α, similar to Merlo and Wilson (1995)
  - Stationary Strategies
- Players take turn making the first offer,
  - Probability ϕ the borrower makes the first offer
  - $1 - \phi$ the lender makes the first offer
- Whoever makes the first offer will choose such an offer so that it is accepted and gives them the maximum surplus
  - Lender will choose the highest α
  - Borrowers will choose the lowest α
  - Sometimes such a α will not exists , which creates delays

- In equilibrium, when the borrower proposes, the strategy is to propose an α that solves the following problem:

$$\alpha_B^*(y, B, r) = \arg\max V_B^{prop}(y, B, r) \tag{1}$$

s.t.

$$V_B^{prop} \geq V_B^{pass} \tag{2}$$

$$V_L^{accept} \geq V_L^{pass} \tag{3}$$

Similarly for the lender

▸ Details

The main two features will be:

1. Renegotiation can lead to delays as lenders want to capture a piece of a larger pie
2. During high r_t times, investors are relatively more impatient and leads to:
   - Less delays
   - higher haircuts
   - Ex-ante this can lead a country to default.

Bonds are priced to include recovery rates:

$$q(y, B, r) =$$

$$\frac{1}{(1+r)}\mathbb{E}\left[(1 - D(y', B', r')) + D(y', B', r')\left(\Delta_L(y', B', r')\right)\right]$$

▸ Alt.

Quantitative exercise

Utility $U = \frac{C^{1-\gamma}}{1-\gamma}$

Default cost: $Y_{def} = Y + max\{0, d_0 Y - d_1 Y^2\}$

Output $Y_t = \rho Y_{t-1} + \epsilon_t + \upsilon_t$

Interest rate: $r_t = \rho r_{t-1} + \omega_t - \upsilon_t$

Parameters

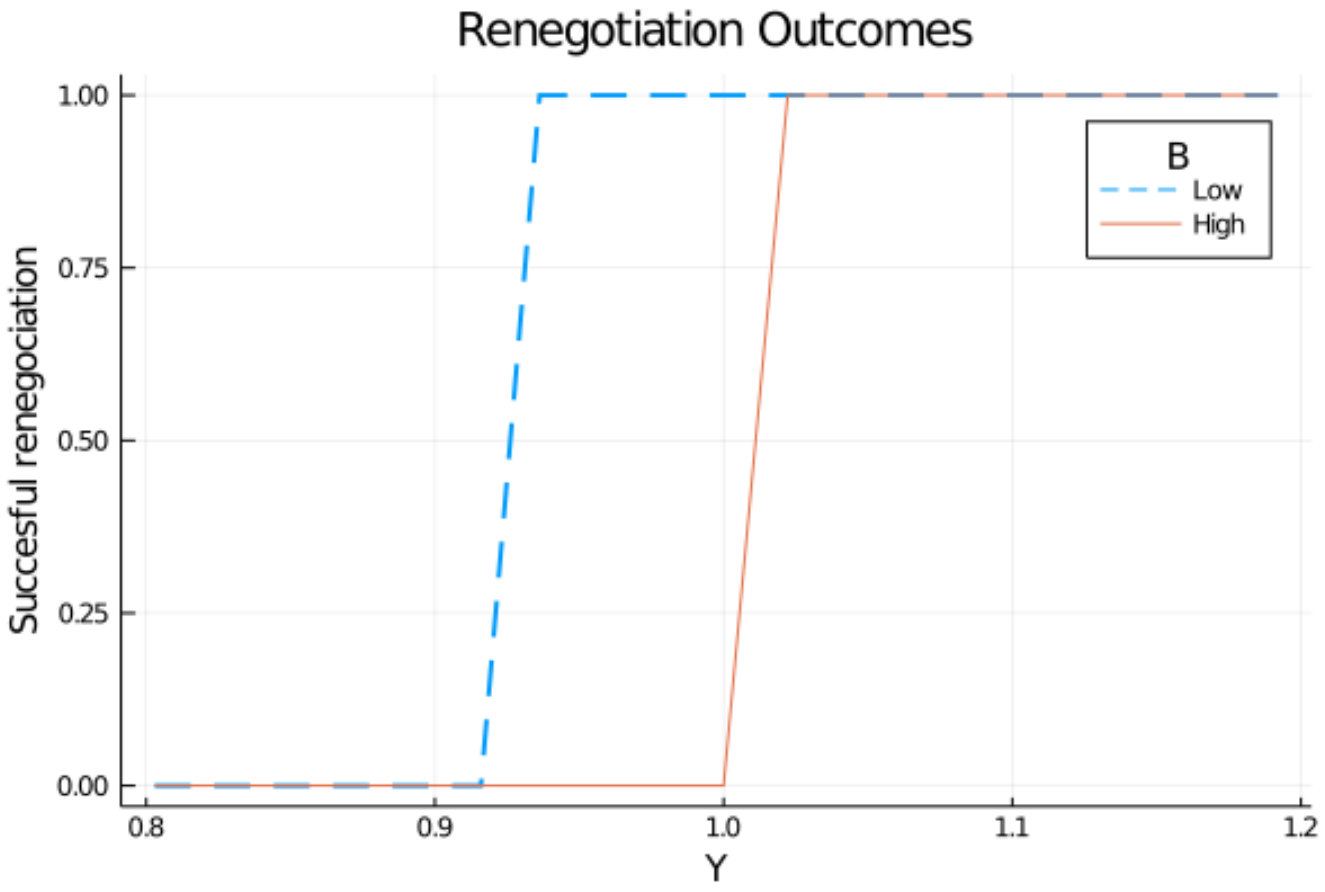
Parameter		**Value**	**Source**
Risk Aversion	γ	2	Standard
Autocorr in r	ρ_r	0.83	
Autocorr in Y	ρ_y	0.83	MECON
Output St Dev	σ_ϵ	0.007	
r St Dev	σ_ω	0.007	
Common St Dev	σ_υ	0.038	
Borrower Prop	ϕ	0.4	Bi (2008)
Discount Factor	β	0.96	
Minimum Service	$\hat{r}$	0.017	

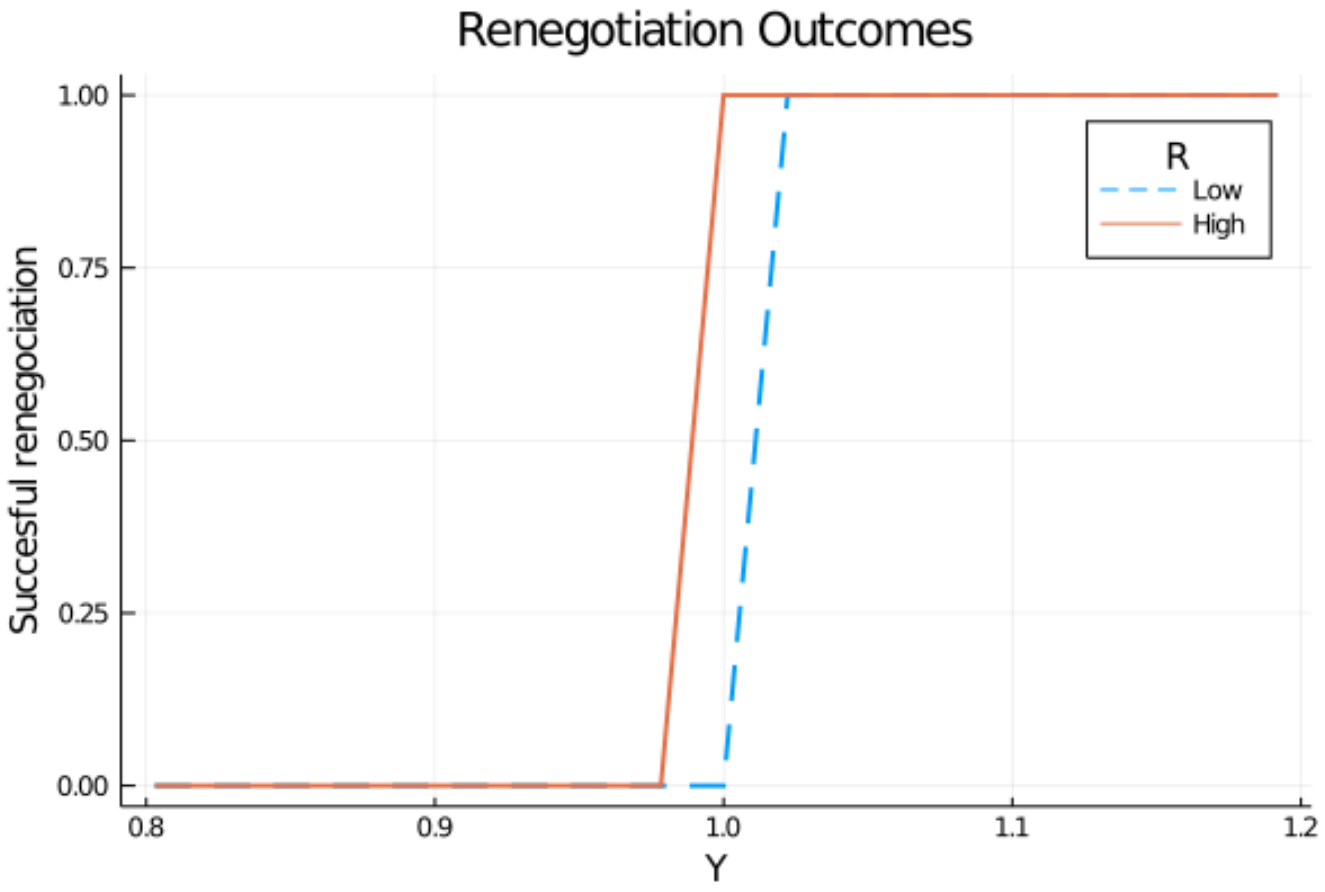
Table: Parameters

Some moments

Moment	**Data**	**Model**	**Source**
Default Probabilities	1.92%	2.40%	Bi (2008)
Debt Recovery Rate	35%	37%	S & Z (2005)
Renegotiation Delay (Qts)	13.3	16	

Table: Moments


Renegotiation Outcomes
Succesful renegociation
1.00
0.75
0.50
0.25
0.00
0.8
0.9
1.0
1.1
1.2
Y
B
Low
High


Renegotiation Outcomes
Succesful renegociation
1.00
0.75
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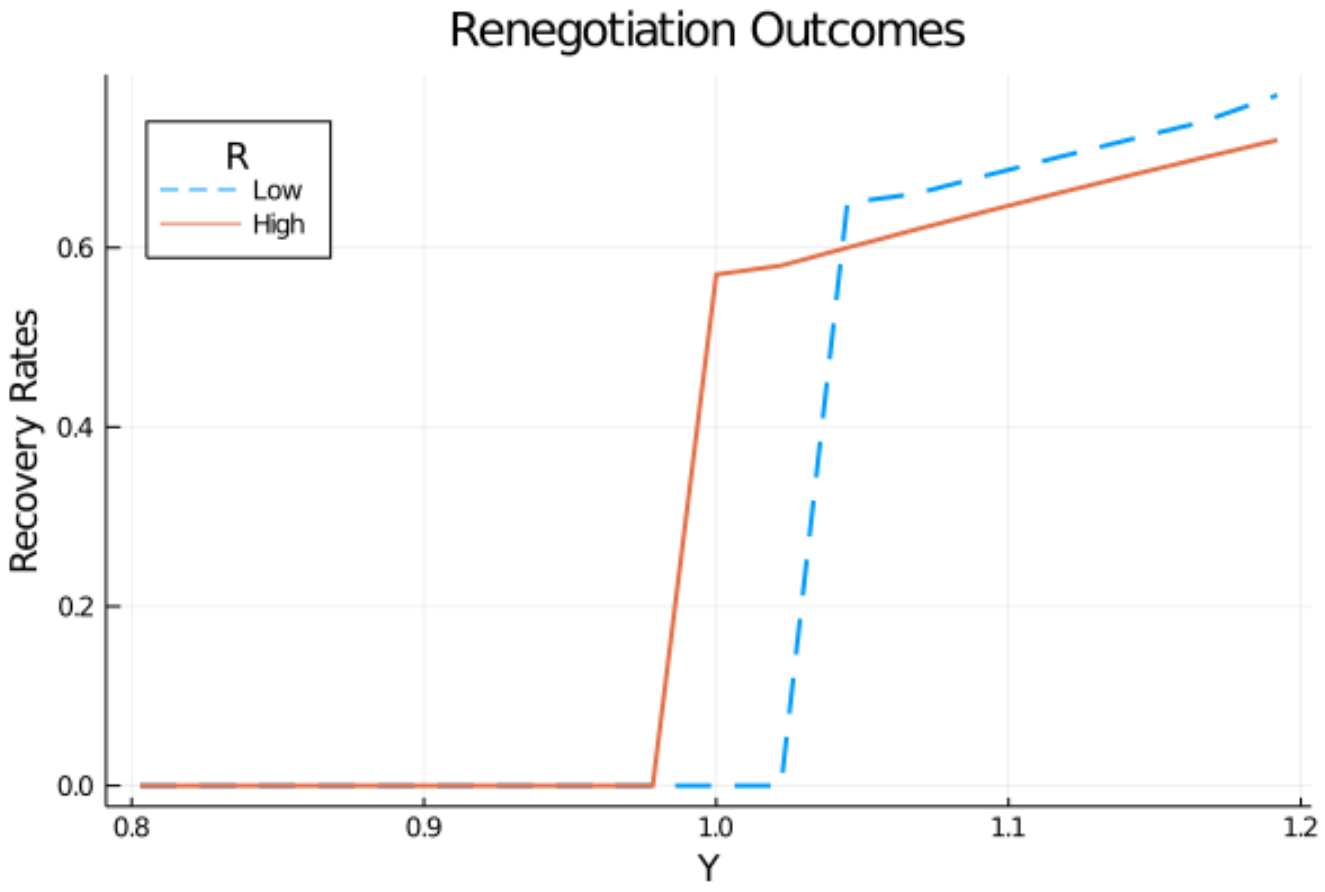
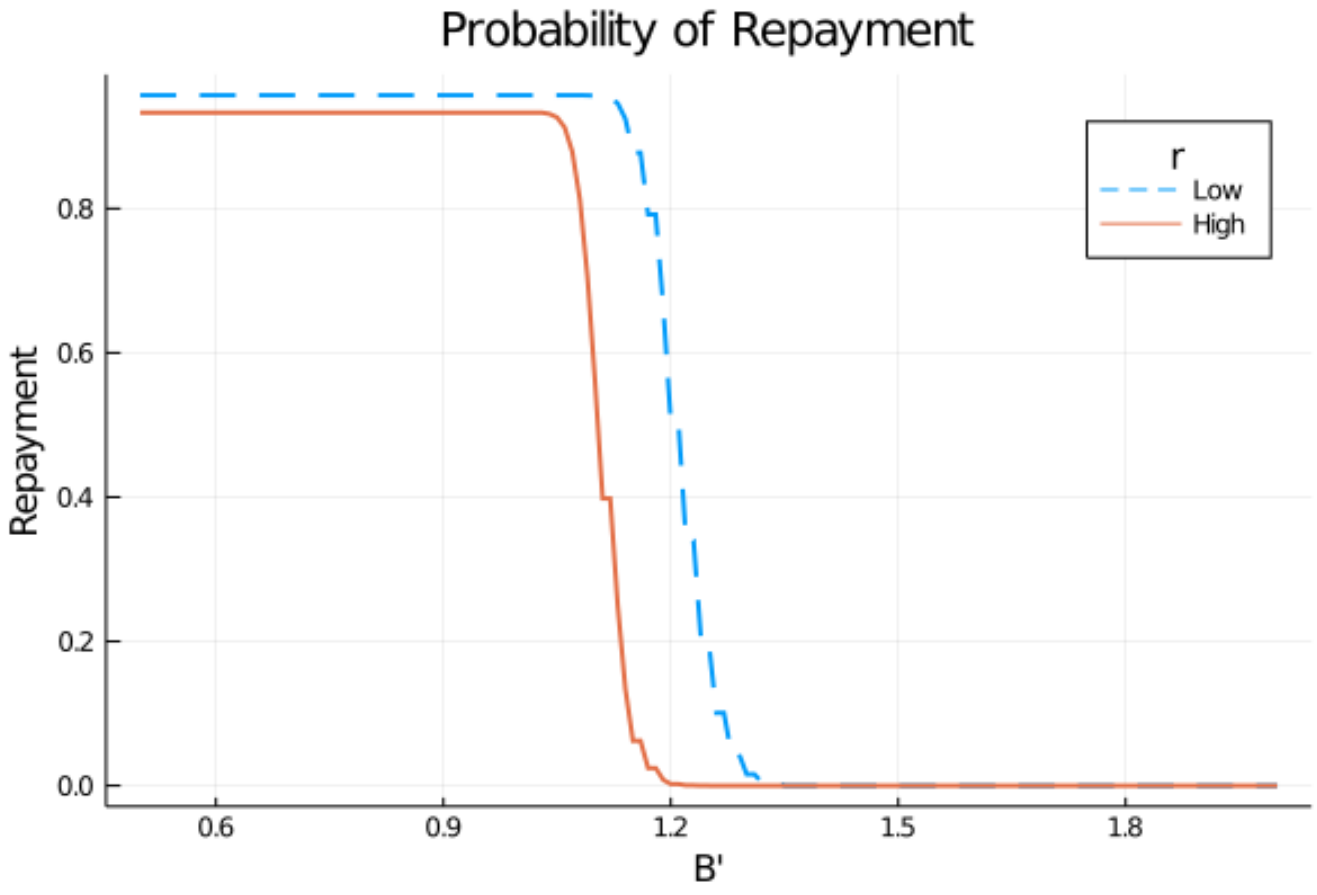
0.00
0.8
0.9
1.0
1.1
1.2
Y
R
Low
High


Renegotiation Outcomes
R
Low
High
Recovery Rates
0.0
0.2
0.4
0.6
0.8
0.9
1.0
1.1
1.2
Y


Probability of Repayment
Repayment
0.0
0.2
0.4
0.6
0.8
0.6
0.9
1.2
1.5
1.8
B'
r
Low
High

Conclusion

What I do:

- Document relationship between risk appetite and renegotiation outcomes.
- Build a model that can show similar features
- show model can plausibly recreate some of the moments

What I want:

- Better series for time-varying risk premia
- More complete model
- Expand to not only be about one country
- Do counterfactuals

Renegotiation Equations

The payoff functions if there is a solution:

$$\Delta_B^B(Y, B, r) = V_B^{prop} = U(Y_{def} - \alpha_B^* B) + \beta EV(Y', 0, r')$$

$$\Delta_L^B(Y, B, r) = V_L^{accept} = \alpha_B^* B$$

Otherwise, passing give the payoffs

$$\Delta_B^B(Y, B, r) = V_B^{pass} = U(Y_{def} - \hat{r}B) + \beta E\Delta_B(Y', B, r')$$

$$\Delta_L^B(Y, B, r) = V_L^{pass} = \hat{r}B + \tfrac{1}{1+r}\beta E\Delta_L(Y', B, r')$$

Back

Similar formulation

Similarly, we can have lenders to have utility functions to be:

$$U_{L,T}(C_{L,T}) = \frac{C_{L,T}^{1-\eta_t}}{1-\eta_t} + \frac{1}{r_t}\mathbb{E}\left[\frac{C_{L,T+1}^{1-\eta_{t+1}}}{1-\eta_{t+1}}\right]$$

Effects:

- changes $q(B', Y, r)$ but does not particularly changes results
- less nice pictures and slightly more complicated
- Open question about how to calibrate r_t and η_t

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