Interest rate cyclicality and government debt sustainability in emerging and advanced economies

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Based on work in progress

Dovis, A., Xiang Fang (HKU), Yang Liu (HKU)
"Emerging Market Spreads and Risk Premium: Risk-free rate and convenience yield"

Questions

- How cyclicality of financing costs affect debt sustainability
- Can government affect financing costs?

Why important?

- Correlation of spreads higher than correlation of fundamentals
- Waves of debt crises in EMEs
- Financing cost can be common factor driving spreads

What is right measure of financing cost for EME?

- US treasury interest rate (but convenience yield)
- Dollar risk-free rate, proxied by Refcorp, Longstaff (2004)
- Synthetic risk-free rate: defaultable bond + CDS

Important to distinguish because different levels and cyclicality

Main take-aways

Measures of financing cost from US risk-free assets are procyclical

- Then defaultable debt is a hedge
- Counterfactually earn a negative risk-premium

EME debt earn convenience yield but low in bad-times;
Risk-free cost of financing slightly countercyclical

- Then defaultable debt is risky
- Earn positive risk-premium (quantification in progress)

Work to understand sources of convenience yield/wedge

- Causality: convenience yield $\longleftrightarrow$ default risk

Measurement

- $M_t = \exp(m_t)$ is SDF of int'l investors
- r_{ft}: risk-free rate proxied by refcorp

$$\mathbb{E}_t\left[\exp(m_{t+1} + r_{ft})\right] = 0$$

- US Treasuries

$$\mathbb{E}_t\left[\exp(m_{t+1} + y_t^{us})\right] = \exp(\mu_t^{us})$$

where
  - y_t^{us}: yield on US Treasury
  - μ_t^{us}: (in)convenience yield on US Treasury

Measurement, cont.

- EME with default risk
- **Defaultable bond + CDS** to have synthetic risk-free asset
  - Similar logic to Jiang et al. (2022) for eurozone
- Let δ_{t+1} be indicator of bond repayment
- The bond price, $q_t = \exp(-y_t^*)$, satisfies

$$\mathbb{E}_t \left[M_{t+1} \frac{\delta_{t+1}}{q_t} \right] = \exp\left(\mu_t^*\right)$$

- The CDS price, q_t^{CDS}, satisfies

$$\mathbb{E}_t \left[M_{t+1} \frac{1-\delta_{t+1}}{q_t^{CDS}} \right] = \exp\left(\mu_t^{CDS}\right)$$

- The *risk-free cost of financing* is

$$r_{ft}^* \equiv y_t^* - q_t^{CDS} = r_{ft} + \mu_t^*$$

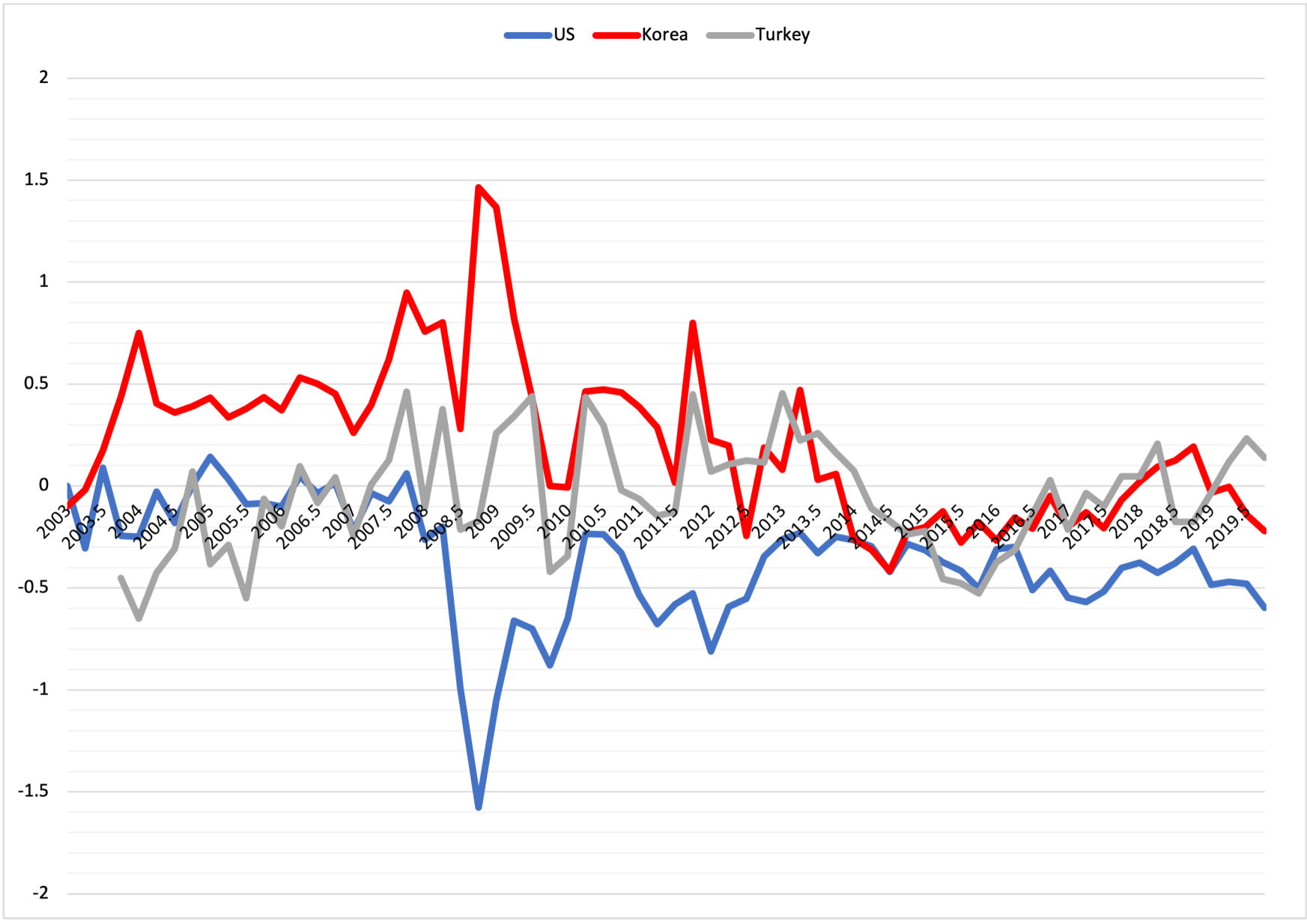
Cyclicality cost of financing

	5y Treasury	Refcorp	μ_t^{US}	r_{ft}^*	μ_t^*
mean	1.47	1.74	-0.27	0.47	-0.24
st. dev.	1.76	1.66	0.27	1.29	0.33
corr. w/ Δc	**0.42**	**0.36**	**0.56**	**-0.07**	**-0.26**
sample	1991Q2-2019Q4	-	-	2003Q1-2019Q4	-

EMEs are Brazil, Colombia, Korea, Mexico, Philippines, Turkey

- US treasury and refcorp are pro-cyciclical
- EME risk-free cost a-cyclical
- EME inconvenience yield is countercyclical
  - Consistent with Jiang et al. (2022) finding that convenience yield of high-debt eurozone countries goes up in crises relative to Germany

Convenience yield: US vs. Korea vs. Turkey



What does μ_t^* capture?

- Segmented financial markets and collateral constraints
  $\Rightarrow$ μ_t^* related to multiplier on participants' collateral constraints
  - Bocola (2016), Morelli-Ottonello-Perez (2022)

- Convenience yields in domestic credit market
  $\Rightarrow$ μ_t^* related to value for collateral/payments
  - Perez (2018)

- Financial repression
  $\Rightarrow$ μ_t^* related to multiplier on regulatory constraint
  - Chari-Dovis-Kehoe (2020), Perez (2018)

- Liquidity
  $\Rightarrow$ μ_t^* related to market tightness
  - Chaumont (2021), Passadore-Xu (2022)

Implications for debt sustainability

- Through lens of standard quantitative sovereign debt model
- Let $M^* = M_{t+1} \exp(-\mu_t^*)$ be exogenous to government problem
  - Treat μ_t^* as a wedge
- Study how cyclicality of $R_f^* = 1/\mathbb{E}M^*$ affects debt sustainability and spreads
- Show: if country's fundamentals weakly correlated:
  - If risk-free cost is countercyclical, then defaultable debt is risky
    - positive risk-premium
  - If risk-free cost is procyclical, then defaultable debt is a hedge
    - negative risk-premium

Quantitative Eaton-Gersovitz model

- Exogenous state $s = (z, \nu)$
  - z matters for SDF
  - ν country's fundamentals
- Government's problem:

$$V(b, s) = \max_{\delta, c, b'} \delta \left\{ u(c; \nu) + \beta \mathbb{E}\left[V\left(b', s'\right) | s \right] \right\} + (1 - \delta) V^d(s)$$

  subject to

$$c + q\left(b', s\right) b' \leqslant y(\nu) + b$$

  where V^d is the value of defaulting
- Pricing schedule:

$$q\left(b', s\right) = \mathbb{E}\left[M^*\left(z, z'\right) \delta\left(b', s'\right) | s \right]$$

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- Pricing schedule:

$$q\left(b', s\right) = \frac{\mathbb{E}\left[\delta\left(b', s'\right) | s\right]}{R_f^*(z)} + \operatorname{Cov}\left(M^*\left(z, z'\right), \delta\left(b', s'\right) | s, b\right)$$

M^* ciclicality and risk premium

Suppose

- ν and z are uncorrelated
- $z_H > z_L$ then $M(z, z_H) > M(z, z_L)$
- z is persistent
- volatility of $M(z, z')$ is (weakly) increasing in z

and either:

1. Procyclical risk-free cost: $R_f^*(z_H) < R_f^*(z_L)$
2. Countercyclical risk-free cost: $R_f^*(z_H) > R_f^*(z_L)$

Proposition.

1. Under 1, the risk-premium is negative.
2. Under 2, the risk-premium is positive.

Logic for the result

If R_f^* is procyclical then

- Government faces low cost of financing when M^* is high
- Less incentives to default
- $\Rightarrow \text{Cov}\left(M^*\left(z, z'\right), \delta\left(b', z', \nu'\right)\right) > 0$ and defaultable bonds are hedge for int'l investors

Symmetric argument if R_f^* countercyclical

Ignoring $\mu^* \Rightarrow$ negative risk premium

Moment	Data	Benchmark	Correlated outout growth				
			Comparative Statics				
			0.2	0.4	0.6	0.8	1
Default frequency	2.2	2.33	1.87	1.92	1.54	1.46	1.29
Average spread	4.5	0.63	0.57	0.65	0.58	0.62	0.60
Sovereign risk premia	2.3	**-1.72**	-1.31	-1.28	-0.97	-0.85	-0.69
			Recalibrate				
			0.2	0.4	0.6	0.8	1
Default frequency	2.2	2.33	2.22	2.06	2.03	2.01	2.05
Average spread	4.5	0.63	0.67	0.69	0.77	0.85	0.98
Sovereign risk premia	2.3	-1.72	-1.57	-1.38	-1.27	-1.16	-1.09

SDF = affine factor model estimated to fit US term structure

In progress: Quantifying role of μ^*

- Since measured $R_f^* \approx$ a-cyclical $\Rightarrow$ cannot generate large risk-premium but at least no "puzzle" w/ negative risk-premium

Lesson from today

- Cyclicality of risk-free rate typically positive
- But depends on shocks
  - Consider typical NK model:
    - Demand shocks $\Rightarrow \downarrow \mathrm{i}, \pi$ and $\downarrow \mathrm{y}$
    - Supply shocks $\Rightarrow \uparrow \mathrm{i}, \pi$ and $\downarrow \mathrm{y}$
- With supply shocks:
  - High cost of refinancing in bad times
  - Risk-premium (on top of convenience yield part)
  - Today or 1980s

Endogenous convenience yield

μ_t^* can depend on properties of $(\mathfrak{b}_{t+1}, \delta_{t+1})$

- Convenience yield only for debt that repays in bad times
  - E.g., higher liquidity needs in bad times
  - Or bank-runs are more likely in bad-times
- Reinforcing loop: safer asset $\Rightarrow$ high convenience yields $\Rightarrow$ low financing cost in recession $\Rightarrow$ safer asset ...
  - Potential for multiple equilibria
- Can justify negative association between convenience yields and default probabilities in Jiang et al. (2022)

One more idea about cyclicality of returns

- Suppose gov't can choose how much to repay in each state
  - Inflation
- Should repayments be procyclical if gov't wants insurance?
  - i.e., countercyclical defict Δ
- If high demand for insurance in recession and marginal buyer of debt *not* representative holder of legacy debt
  $\Rightarrow$ might be optimal to repay more in recession
- Gov't budget: $R(s)B + \Delta(s) = Q(s)B'$
  - $R(s)$ goes up in recession, $R(s_L) > R(s_H)$
  - Promise $R(s'_L) > R(s'_H) \Rightarrow Q(z)$ goes up more than R
  - Thus, Δ can be higher in recession even with $B' \approx B$
- New buyers of debt insure both gov't budget and legacy debt holders

Financial repression?

μ_t^* can depend on government regulation

- Should governments force banks to hold more debt to create "convenience yield"?
  - i.e., multiplier on regulatory constraint
- Chari-Dovis-Kehoe (2020): No, if can tax banks
  - Financial repression is equivalent to taxing banks + distortions to capital allocation
- But it can be used to increase credibility to repay debt

Conclusion

- If risk-free cost of financing procyclical, then easier to support debt and negative risk premium

- Measured convenience yield in EMEs is procyclical:
  - Contribute to countercyclical risk-free cost of financing
  - Can help to account for risk-premium on defaultable EM bond

- Next: Relation b/w default probability and convenience yield