Term Premia and Credit Risk in Emerging Markets: The Role of U.S. Monetary Policy

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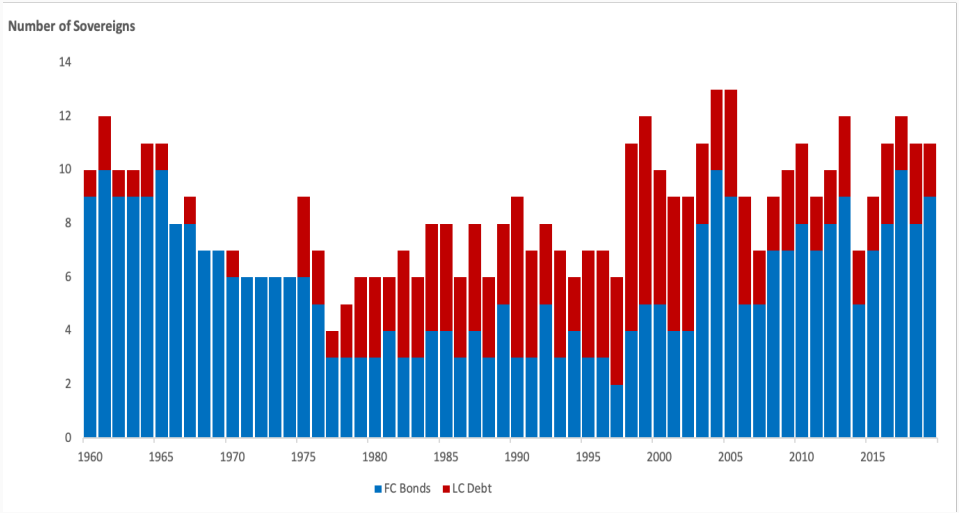
U.S. Monetary Policy Spillovers

Asset price effects of U.S. monetary policy abroad

- Stocks
- Exchange rates
- Bonds
  - Foreign currency (FC)
  - Local currency (LC)

By 2018, 90% of EM sovereign debt issued in LC (IMF-WB)

Do Sovereigns Default on Local Currency Debt?



Source: BoC-BoE Sovereign Default Database.

Credit Ratings

Research Questions

How to decompose the sovereign yields of emerging markets (EM)?

How does U.S. monetary policy transmit to EM yields?

- Does it influence expectations of future policy rates?
- Does it affect the term premium?
- Does it impact creditworthiness?

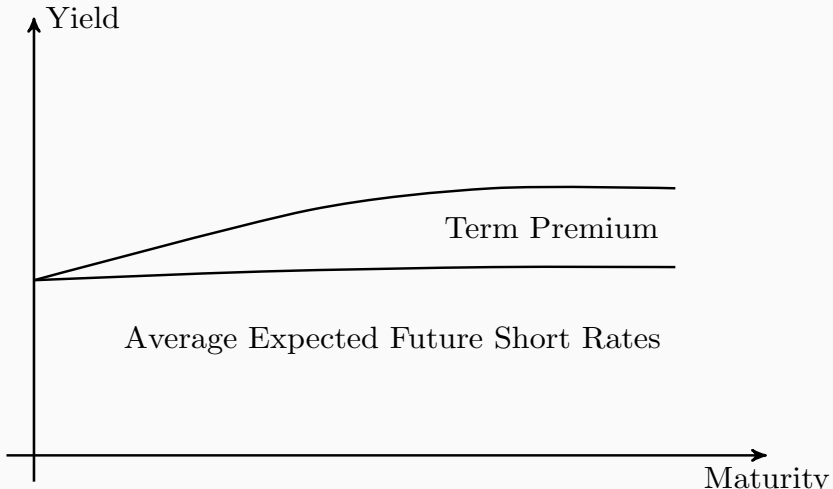
Relevance

Understand transmission channels to mitigate undesired impacts

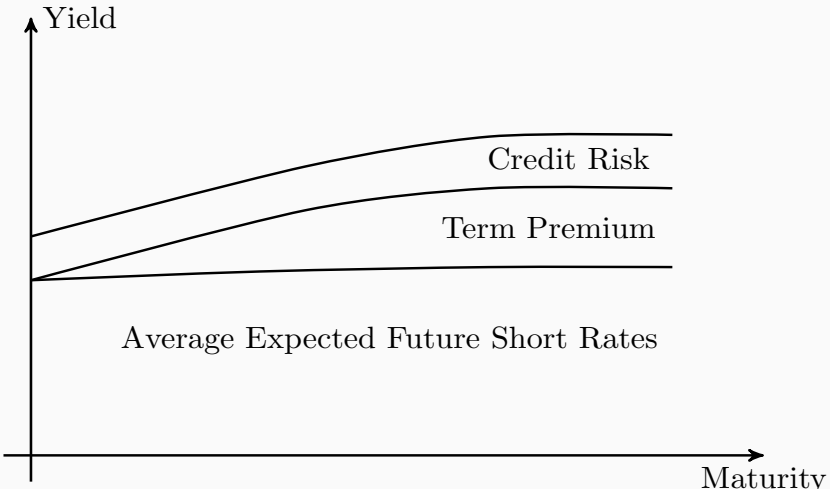
In 2020 due to **Covid** crisis:

- 36 sovereign downgrades, mostly EM
- 44 sovereigns with negative outlooks
- EM public debt projected to be above 60% of GDP (IMF)

Traditional Yield Curve Decomposition



Proposed EM Yield Curve Decomposition



U.S. Monetary Policy Spillovers

1. EM yields' response is economically significant, yet delayed
   - Response in EM slower than in U.S.

2. All three components react to U.S. monetary policy
   - EM central banks expected to follow Fed's monetary stance
   - EM term premia response similar to AE term premia
   - Fiscal implications in EM of U.S. monetary policy

3. Unconventional policies limit EM monetary autonomy along curve
   - Global financial cycle more relevant at the long end

Related Literature

Synthetic yields and covered interest rate parity deviations

- Du and Schreger (2016); Du, Im, and Schreger (2018a); Du, Tepper, and Verdelhan (2018b)

Sovereign default in EM local currency bonds

- Reinhart and Rogoff (2011); Du and Schreger (2016); Erce and Mallucci (2018); Ottonello and Perez (2019)

Global financial cycle

- Rey (2013); Turner (2014); Obstfeld (2015); Kalemli-Özcan (2019); Kolasa and Wesołowski (2020)

Spillovers of U.S. monetary policy to EM yields

- Hausman and Wongswan (2011); Bowman, Londono, and Sapriza (2015); Curcuru, Kamin, Li, and Rodriguez (2018); Albagli, Ceballos, Claro, and Romero (2019); Adrian, Crump, Durham, and Moench (2019)

Yield Curves

Nominal Yield Curves

Bloomberg Fair Value par yield curves $\rightarrow$ Zero-coupon yield curves ($y_{t,n}^{LC}$)

- But credit risk in $y_{t,n}^{LC}$

Approach: Synthetic LC yields ($\widetilde{y}_{t,n}^{LC}$) as *free of credit risk*

- Swap U.S. Treasury yields into LC using currency derivatives

Assumption: Frictionless financial markets (Du and Schreger, 2016)

- Arbitrageurs have access to U.S. and LC bonds
- Derivatives have no counterparty risk
- U.S. yields are free of default risk

Synthetic Yield Curves

$$\widetilde{y}^{LC}_{t,n} = y^{US}_{t,n} + \rho_{t,n}$$

$\widetilde{y}^{LC}_{t,n}$: n-period zero-coupon *synthetic* yield of a country in LC at time t

$y^{US}_{t,n}$: n-period zero-coupon yield of the U.S. in USD at time t

$\rho_{t,n}$: n-period foreign exchange forward premium from USD to LC at time t

- < 1 Year: Currency forwards

$$(forward_{t,n} - spot_t)/n$$

- ≥ 1 Year: Cross-currency swaps
  - Cross-currency basis swaps
  - Interest rate swaps

Deviations from CIP (Covered Interest Parity)

$$\phi_{t,n} = y^{LC}_{t,n} - \widetilde{y}^{LC}_{t,n}$$

Measures:

- Sovereign credit risk in EM
  Du and Schreger (2016)
- Convenience yield for advanced economies (AE)
  Du, Im, and Schreger (2018a)
- Financial market frictions for banks
  Du, Tepper, and Verdelhan (2018b)

Here: Emphasis on $\widetilde{y}^{LC}_{t,n}$

Data

15 EM countries:

- Brazil, Colombia, Hungary, Indonesia, Israel, Korea, Malaysia, Mexico, Peru, Philippines, Poland, Russia, Thailand, Turkey, South Africa

Daily data starting in January 2000 to January 2019

Maturities (in years): 0.25, 0.5, 1, 2, ..., 10

Sources for synthetic yields:

- $y_{t,n}^{US}$: Gürkaynak, Sack, and Wright (2007); CRSP Risk-Free Rates
- $\rho_{t,n}$: Bloomberg; Datastream

Descriptive Statistics

		3M	6M	1Y	2Y	5Y	10Y
Nominal Yields	Emerging Markets						
	Average	5.1	5.3	5.4	5.7	6.3	6.8
	S. Dev.	3.2	3.3	3.2	3.2	3.0	2.9
	Advanced Economies						
	Average	2.0	2.1	2.1	2.3	2.7	3.2
	S. Dev.	2.1	2.1	2.1	2.1	2.0	1.8
Synthetic Yields	Emerging Markets						
	Average	5.1	5.2	5.3	5.3	5.8	6.3
	S. Dev.	4.3	4.1	4.0	3.7	3.4	3.2
	Advanced Economies						
	Average	1.6	1.7	1.8	2.0	2.5	3.2
	S. Dev.	2.1	2.1	2.2	2.1	2.0	2.0

Notes: All figures are expressed in annualized percentage points. Advanced economies: Australia, Canada, Denmark, Germany, Japan, Norway, New Zealand, Sweden, Switzerland and the U.K.

Affine Term Structure Model

Model Overview

Standard discrete-time nominal affine term structure model

- Assumes default-free bonds $\rightarrow$ Synthetic yields ($\widetilde{y}^{LC}_{t,n}$) for EM

Intuition:

- Yields driven by pricing factors X_t
- Dynamics of pricing factors ($\mathbb{P}$ and $\mathbb{Q}$ measures)
- No-arbitrage restrictions ensure consistency

Model augmented with survey data

▸ Asset Pricing ▸ SDF ▸ Bond Prices ▸ Augmented Version

EM Yield Decomposition

Fitted synthetic yields

$$y_{t,n}^{\mathbb{Q}} = A_n^{\mathbb{Q}} + B_n^{\mathbb{Q}} X_t,$$

Average expected future short rate

$$y_{t,n}^{\mathbb{P}} = A_n^{\mathbb{P}} + B_n^{\mathbb{P}} X_t,$$

Term premium

$$\tau_{t,n} = y_{t,n}^{\mathbb{Q}} - y_{t,n}^{\mathbb{P}}.$$

Credit risk compensation

$$\phi_{t,n} = y_{t,n}^{LC} - y_{t,n}^{\mathbb{Q}}$$

Weak Identification

Yields accurately identify $\{\mu^{\mathbb{Q}}, \Phi^{\mathbb{Q}}\}$, yet $\{\mu^{\mathbb{P}}, \Phi^{\mathbb{P}}\}$ poorly identified

- Bond yields are persistent
- Unstable yield decompositions

Solutions: Survey data, parameter restrictions, bias-corrected estimators

Surveys provide robust decompositions of AE yields (Guimarães, 2014)

- Important for EM yields due to small sample sizes

Survey Data

No data on long-term forecasts for EM short rates

Implied forecast for EM short rates using existing data

- EM inflation expectations: 5 years ahead and long-term
  - Twice a year from Consensus Economics (CE)
- Implied long-term expectations of U.S real interest rate
  - T-bill rate, CPI inflation from Survey of Professional Forecasters (SPF)

$$i_{t,n}^{survey} = \pi_{t,n}^{CEsurvey} + r_{t,n}^{*} = \pi_{t,n}^{CEsurvey} + \left(i_{t,n}^{SPFsurvey} - \pi_{t,n}^{SPFsurvey} \right).$$

▸ Implied Forecasts

Model Estimation

Estimate parameters by MLE with monthly data

- Joslin, Singleton, and Zhu (2011) normalization

Estimate survey-augmented model by Kalman filter (missing data)

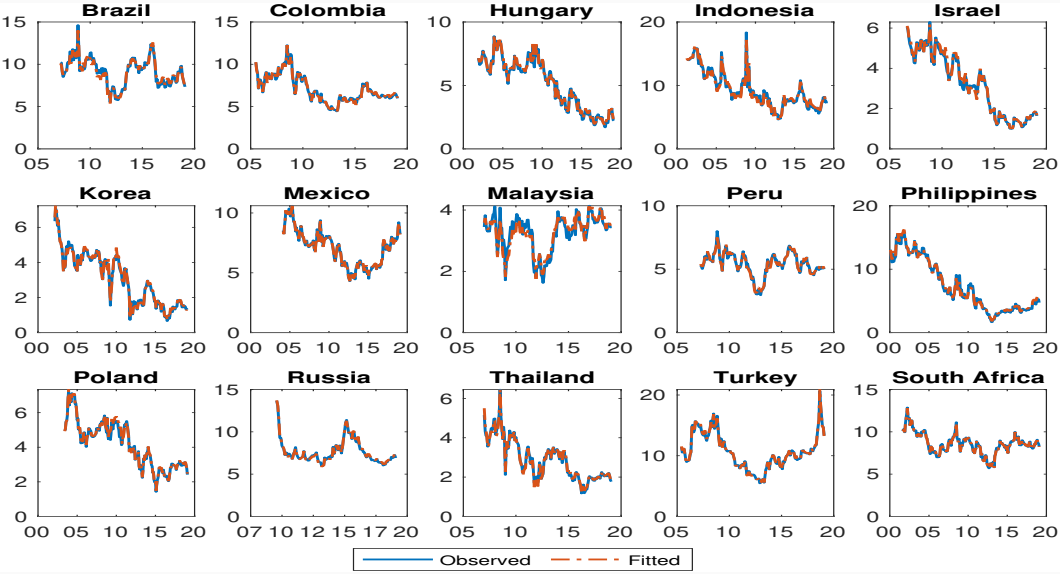
- Surveys as 'noisy' expectations measures (Kim and Orphanides, 2012)

Standard errors by delta method

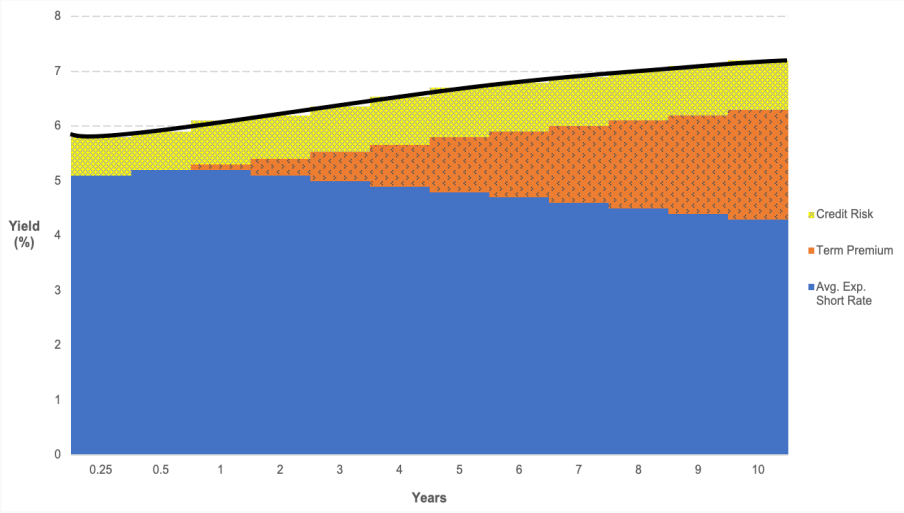
Estimate daily pricing factors

EM Yield Decomposition

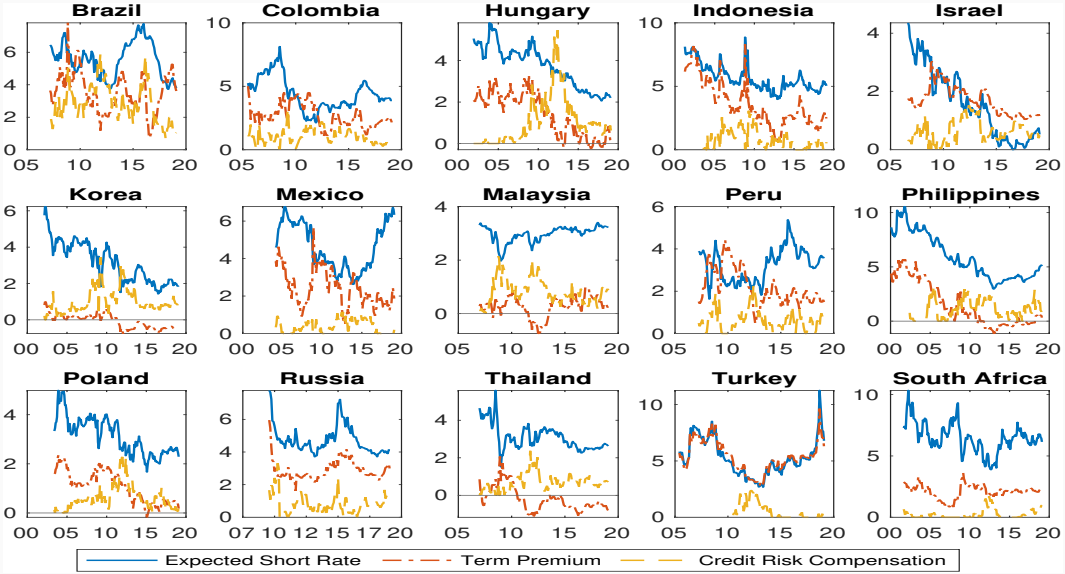
10Y


Brazil
Colombia
Hungary
Indonesia
Israel
Korea
Mexico
Malaysia
Peru
Philippines
Poland
Russia
Thailand
Turkey
South Africa
Observed
Fitted

Average EM Yield Curve Decomposition

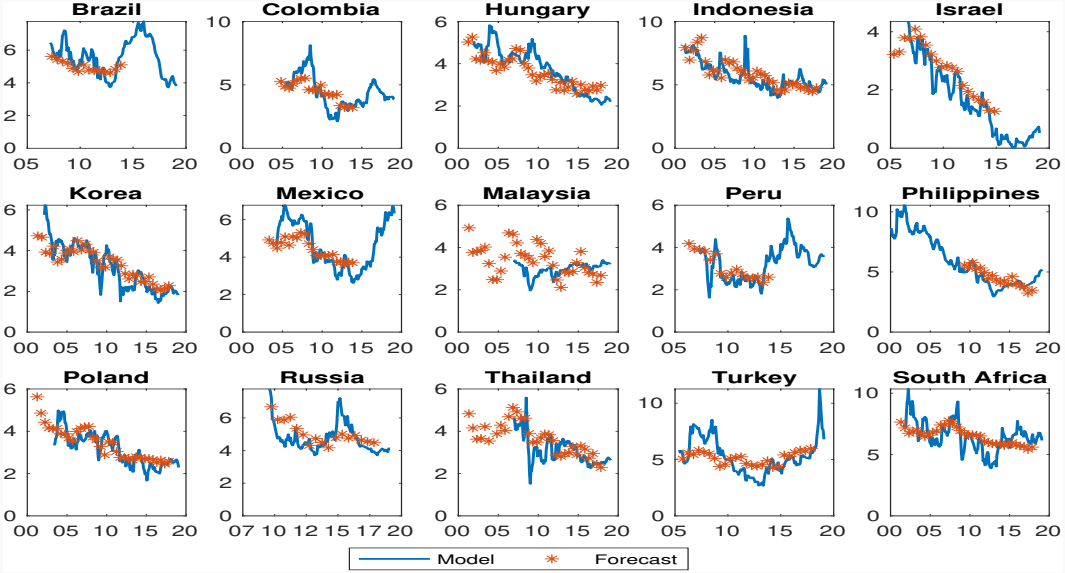


10Y



▸ Term Premia
▸ Credit Risk Compensation

10Y


Brazil
Colombia
Hungary
Indonesia
Israel
Korea
Mexico
Malaysia
Peru
Philippines
Poland
Russia
Thailand
Turkey
South Africa
Model
Forecast

Term Premium and Inflation Uncertainty

Term premium compensates for inflation uncertainty (Wright, 2011)

Inflation higher and more volatile in EM than AE (Ha et al., 2019)

Is inflation uncertainty relevant for EM term premia?

$$\tau_{i,t} = \alpha_i + \beta_1 \sigma^{\pi}_{i,t} + \beta_2 g_{i,t} + u_{i,t},$$

$\sigma^{\pi}_{i,t}$ of π permanent component in UCSV model (Stock and Watson, 2007)

EM Term Premia and Inflation Uncertainty

	6 Months		1 Year		2 Years		5 Years		10 Years	
UCSV-Perm	93.0	75.3	85.7*	83.2	88.7***	97.8**	103.1***	124.2***	121.9***	151.3***
	(52.2)	(49.5)	(37.1)	(43.7)	(24.7)	(31.6)	(15.3)	(18.7)	(16.1)	(18.3)
GDP Growth		-2.56		-2.62		-1.91		-2.14		-3.97*
		(3.37)		(4.00)		(3.53)		(1.67)		(1.55)
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lags	3	3	3	3	3	3	3	3	3	3
No. Countries	15	14	15	14	15	14	15	14	15	14
Observations	870	796	870	796	870	796	870	796	870	796
R^2	0.04	0.03	0.04	0.03	0.05	0.05	0.10	0.11	0.11	0.15

Notes: Driscoll–Kraay standard errors are in parenthesis. *, **, *** asterisks respectively indicate significance at the 10%, 5% and 1% level.

U.S. Monetary Policy Spillovers

The Yield Curve Channel

Long-term yields influenced by global forces

- Global financial cycle (Rey, 2013)

Unconventional monetary policies abroad affect EM yields

- Long-term via the term premium (Turner, 2014)
- Short-term via risk spillovers (Kalemli-Özcan, 2019)

EM monetary autonomy:

- Declines along the yield curve (Obstfeld, 2015)

Implications of Yield Curve Channel

Long-term EM yields comove more than short-term ones

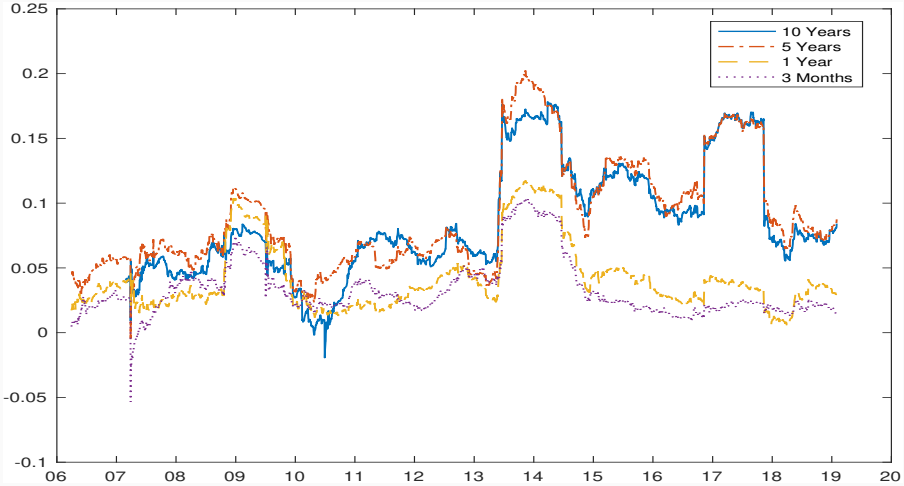
Direct relationships at different maturities

- U.S. term premium $\rightarrow$ EM term premium
- U.S. expected future short rates $\rightarrow$ EM expected future short rates

Cross relationships at the short end

- U.S. term premium $\rightarrow$ EM expected future short rates

EM Yields Comovement



▸ D-Y Index

Rolling Correlations

Is There A Yield Curve Channel?

$$y_{i,t} = \alpha_i + \gamma_1' z_{i,t}^1 + \gamma_2' z_{i,t}^2 + u_{i,t}$$

$y_{i,t}$: nominal EM yields and their three components

α_i: country fixed effects

$z_{i,t}^1$: U.S. yield curve decomposition (Kim and Wright, 2005)

$z_{i,t}^2$: Global and domestic drivers

- VIX, EPU (Baker et al., 2016) & global activity (Hamilton, 2019) indexes
- Policy rate, inflation, unemployment, exchange rate (standardized)

Drivers of Emerging Market Nominal Yields and Their Components

	Nominal	E. Short Rate	Term Premium	Credit Risk
	10Y			
U.S. Term Premium	0.97***	0.54***	0.85***	-0.42***
	(0.14)	(0.08)	(0.09)	(0.11)
U.S. E. Short Rate	0.17	0.25***	0.08	-0.17**
	(0.09)	(0.05)	(0.06)	(0.06)
Local Policy Rate	0.24***	0.30***	0.01	-0.06***
	(0.03)	(0.02)	(0.02)	(0.02)
Log(Vix)	49.95***	-20.18	30.13**	40.01***
	(12.63)	(10.45)	(10.49)	(9.59)
R^2	0.68	0.71	0.49	0.23
	2Y			
U.S. Term Premium	1.59***	1.68***	0.58***	-0.68**
	(0.22)	(0.17)	(0.17)	(0.21)
U.S. E. Short Rate	-0.03	-0.02	0.05	-0.06
	(0.04)	(0.03)	(0.03)	(0.04)
Local Policy Rate	0.64***	0.56***	0.13***	-0.05
	(0.03)	(0.03)	(0.02)	(0.03)
Log(Vix)	46.41***	-20.29	-9.10	75.79***
	(8.16)	(13.92)	(7.68)	(11.92)
R^2	0.80	0.75	0.35	0.29
Fixed Effects	Yes	Yes	Yes	Yes
Lags	4	4	4	4
No. Countries	15	15	15	15
Observations	2194	2194	2194	2194

Notes: Driscoll–Kraay standard errors in parenthesis. *, **, *** asterisks respectively indicate significance at the 10%, 5% and 1% level.

▸ 10Y
▸ 2Y

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▸ 10Y
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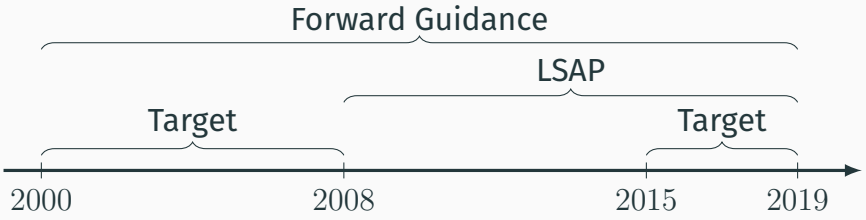
▸ 10Y
▸ 2Y

U.S. Monetary Policy Surprises

Asset price changes in 2-hour windows around FOMC meetings

- Target: federal funds futures contracts
- Forward guidance: residual of 8th Eurodollar yield on target surprise
- Asset purchases: residual of 10Y Treasury yield on previous surprises



See Kuttner (2001); Gürkaynak et al. (2005); Swanson (2018); Rogers et al. (2018).

Measuring the Effects on EM Yields

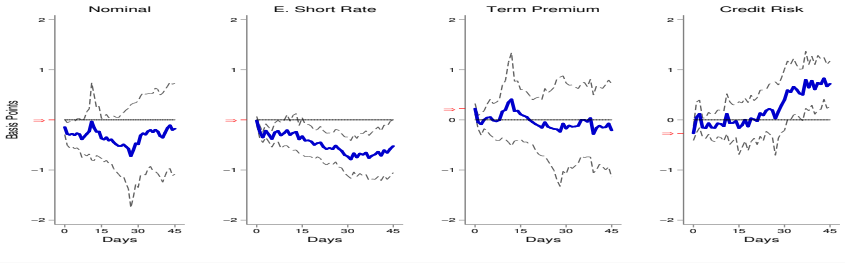
Panel local projections:

$$y_{i,t+h} - y_{i,t-1} = \alpha_{h,i} + \sum_{j=1}^{3} \beta_h^j \epsilon_t^j + \gamma_h \Delta y_{i,t-1} + \eta_h s_{i,t-1} + u_{i,t+h}$$

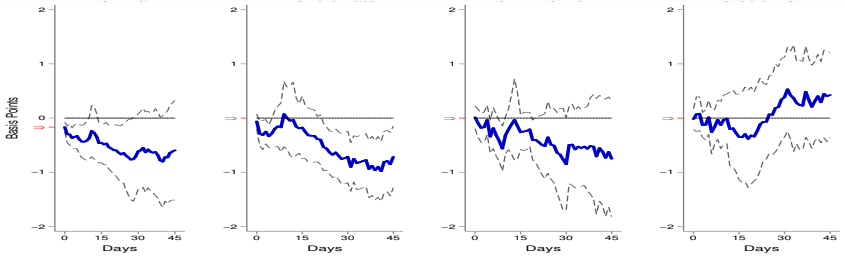
- $y_{i,t}$: 10Y and 2Y nominal EM yields and their components
- $h = 0, 1, \ldots, 45$ days
- $\alpha_{h,i}$: country fixed effects
- ϵ_t^j: three types of monetary policy surprises
- $s_{i,t-1}$: one-day lag in the exchange rate

Effects of Target Easing on EM Yields

10Y



2Y

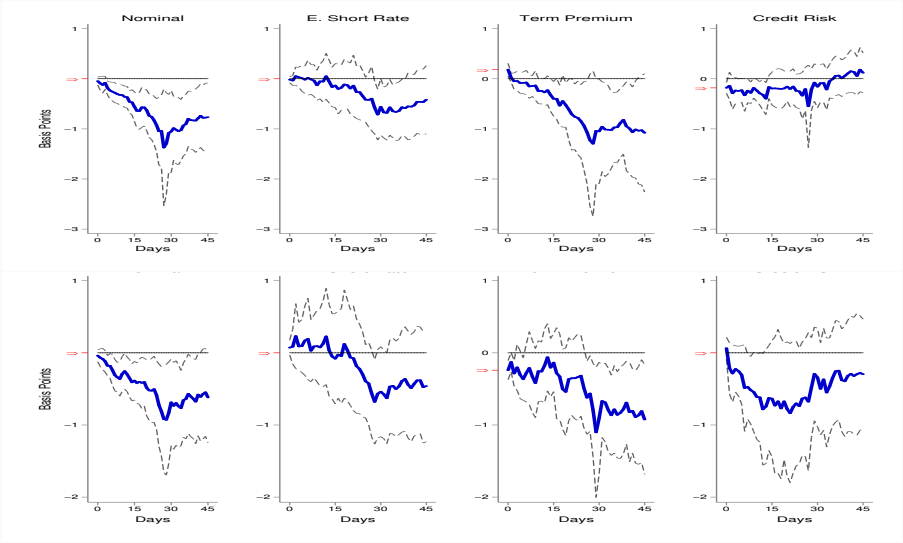


▸ US

Effects of Forward Guidance Easing on EM Yields: Pre-GFC

10Y

2Y

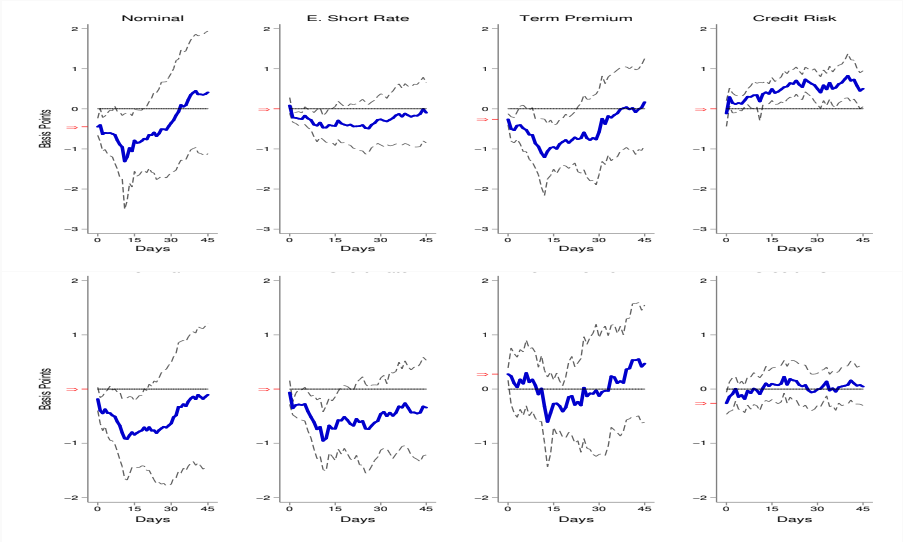


▸ US

Effects of Forward Guidance Easing on EM Yields: Post-GFC

10Y

2Y

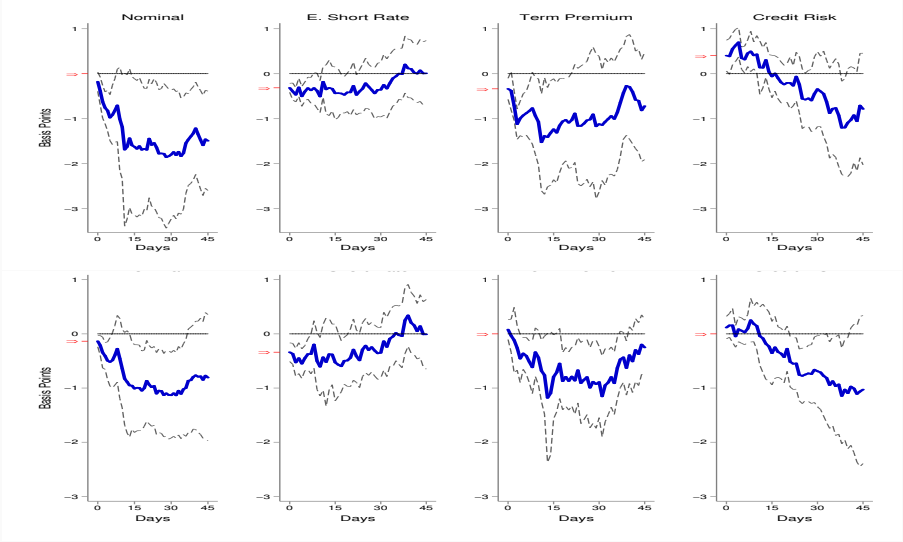


▸ US

Effects of Asset Purchase Easing on EM Yields

10Y

2Y



▸ US

Conclusions

Conclusions

Three-part decomposition of EM yields

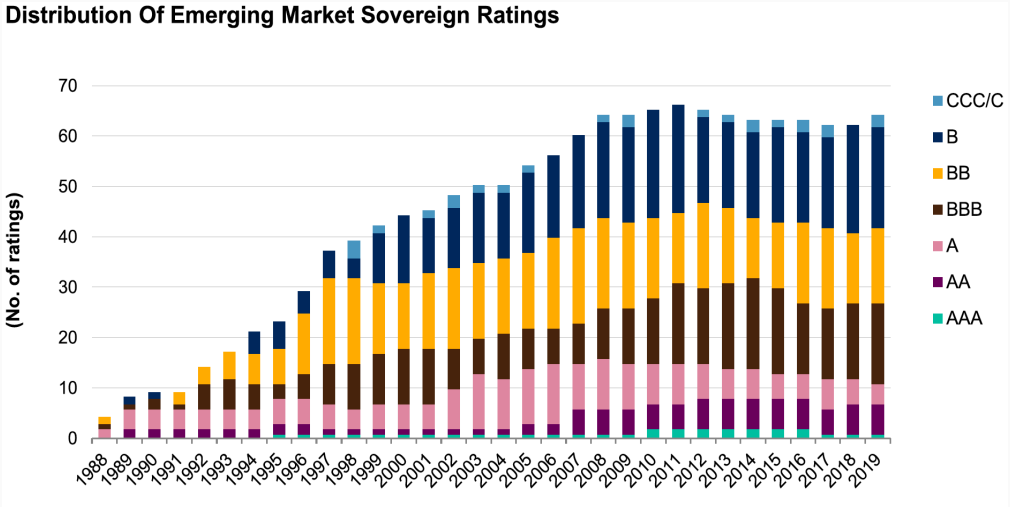
- Average expected short rates
- Term premium
- Credit risk compensation

U.S. monetary policy **spillovers** to EM yields

1. Responses are economically significant yet delayed
2. Reassessment of policy rate expectations and repricing of risks
3. Evidence of a yield curve channel since 2008

Appendix

Credit Risk in Local Currency Yields



Sources: S&P Global Ratings Research and S&P Global Market Intelligence's CreditPro®.

Sovereigns Defaults

Asset Pricing

Under no arbitrage $\rightarrow \exists$ a stochastic discount factor $M_{t+1} > 0$

M_{t+1} prices all nominal bonds under probability measure $\mathbb{P}$

$$P_{t,n} = \mathrm{E}_t^{\mathbb{P}} \left[M_{t+1} P_{t+1,n-1} \right]$$

$M_{t+1} \rightarrow \exists$ a risk-neutral measure $\mathbb{Q}$ defined as

$$P_{t,n} = \mathrm{E}_t^{\mathbb{Q}} \left[\exp\left(-i_t\right) P_{t+1,n-1} \right]$$

Stochastic Discount Factor

Stochastic discount factor

$$M_{t+1} = \exp\left(-i_t - \frac{1}{2}\lambda_t'\lambda_t - \lambda_t'\nu_{t+1}^{\mathbb{P}}\right)$$

Market prices of risk

$$\lambda_t = \lambda_0 + \lambda_1 X_t$$

One-period interest rate

$$i_t = \delta_0 + \delta_1' X_t$$

Overview

Bond Pricing

Pricing factors under $\mathbb{P}$ measure

$$X_{t+1} = \mu^{\mathbb{P}} + \Phi^{\mathbb{P}} X_t + \Sigma \nu_{t+1}^{\mathbb{P}}$$

Bond prices

$$P_{t,n} = \exp\left(A_n + B_n X_t\right),$$

$$A_n = \mathcal{A}(\delta_0, \delta_1, \mu^{\mathbb{P}}, \Phi^{\mathbb{P}}, \Sigma, n)\ ,\ B_n = \mathcal{B}(\delta_1, \Phi^{\mathbb{P}}, n)$$

Pricing factors under $\mathbb{Q}$ measure

$$X_{t+1} = \mu^{\mathbb{Q}} + \Phi^{\mathbb{Q}} X_t + \Sigma \nu_{t+1}^{\mathbb{Q}}$$

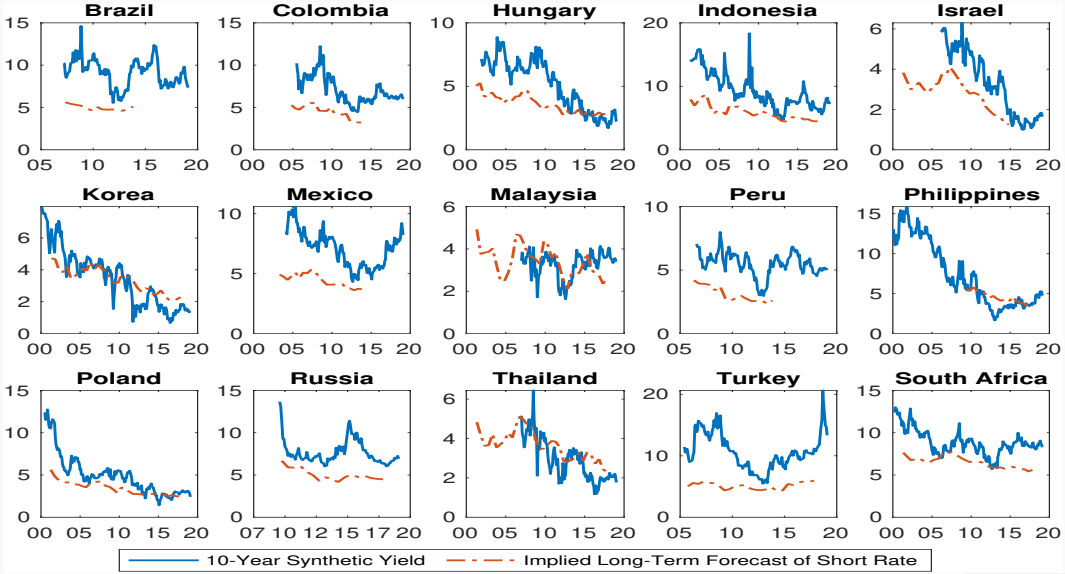
Survey-Augmented Model

Expected average short rate

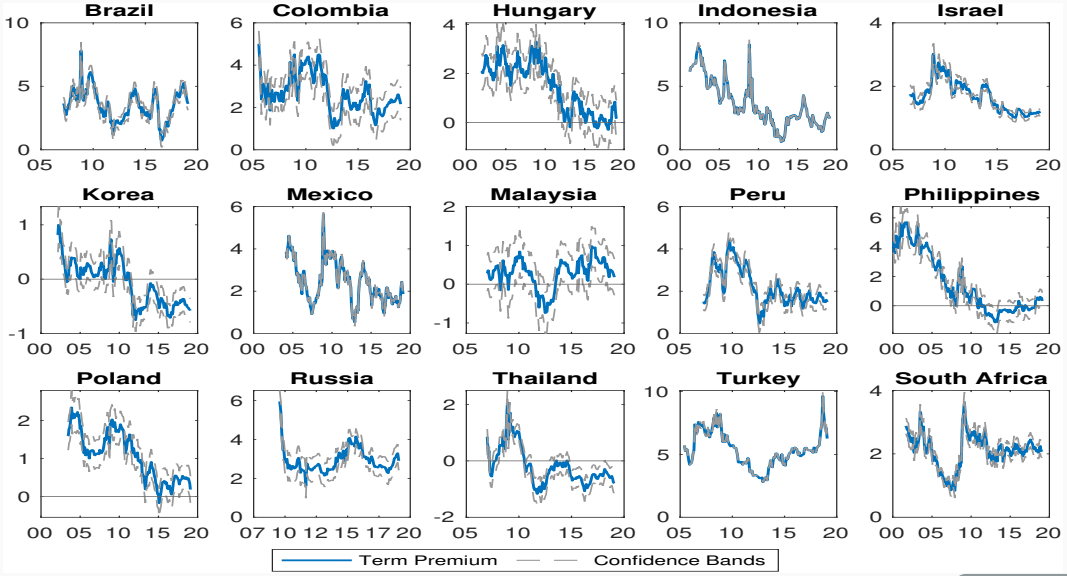
$$y^e_{t,n} = \frac{1}{n}\mathrm{E}^{\mathbb{P}}_t\left[\sum_{j=0}^{n-1} i_{t+j}\right] = A^e_n + B^e_n X_t,$$

Forward rate from n to m periods hence

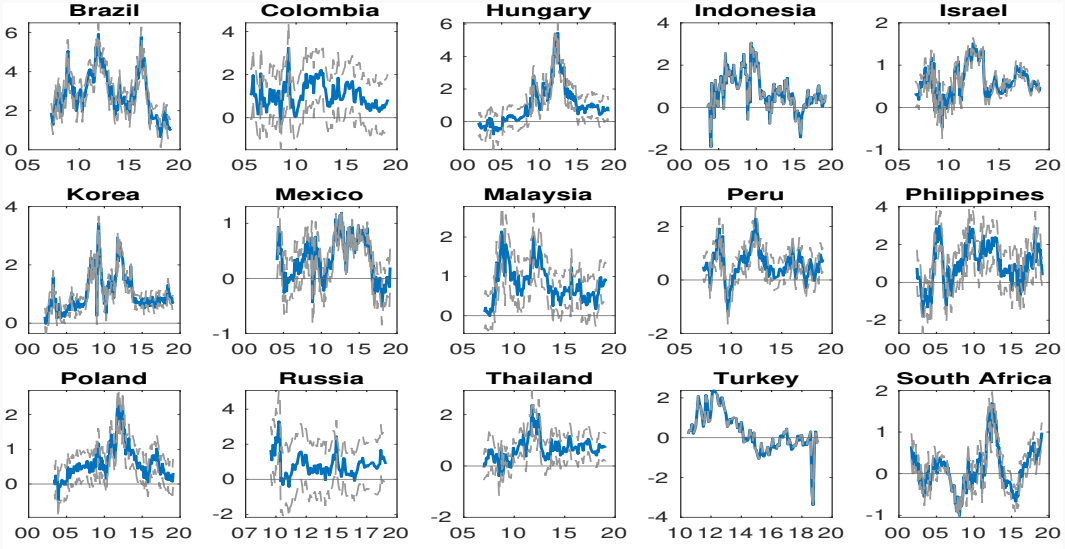
$$f^e_{t,n|m} = \frac{1}{m-n}\mathrm{E}^{\mathbb{P}}_t\left[\sum_{j=n}^{m-1} i_{t+j}\right] = A^e_{n|m} + B^e_{n|m} X_t.$$


Brazil
Colombia
Hungary
Indonesia
Israel
Korea
Mexico
Malaysia
Peru
Philippines
Poland
Russia
Thailand
Turkey
South Africa
10-Year Synthetic Yield
Implied Long-Term Forecast of Short Rate

Survey Data

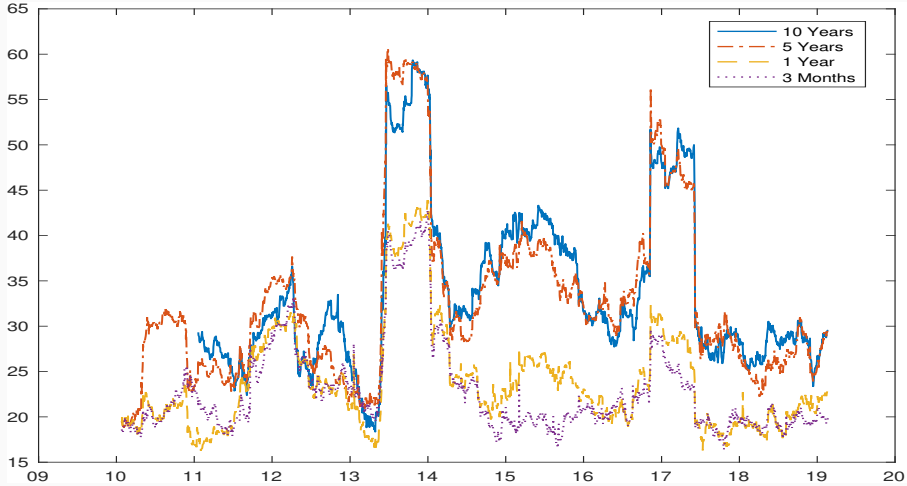


Decomposition



Decomposition

EM Yields Comovement



Rolling Corr.

Connectedness Index (Diebold and Yilmaz, 2014)

Drivers of the Emerging Market 10-Year Nominal Yield and Its Components

	Nominal	E. Short Rate	Term Premium	Credit Risk
U.S. Term Premium	0.97***	0.54***	0.85***	-0.42***
	(0.14)	(0.08)	(0.09)	(0.11)
U.S. E. Short Rate	0.17	0.25***	0.08	-0.17**
	(0.09)	(0.05)	(0.06)	(0.06)
Policy Rate	0.24***	0.30***	0.01	-0.06***
	(0.03)	(0.02)	(0.02)	(0.02)
Inflation	15.26***	1.77	7.06***	6.43***
	(2.27)	(1.56)	(1.36)	(1.73)
Unemployment	23.88***	1.14	10.74***	12.00***
	(3.43)	(2.09)	(1.65)	(2.23)
LC per USD (Std.)	41.58***	33.11***	22.07***	-13.61***
	(5.74)	(3.52)	(3.18)	(3.85)
Log(Vix)	49.95***	-20.18	30.13**	40.01***
	(12.63)	(10.45)	(10.49)	(9.59)
Log(EPU U.S.)	7.08	-3.81	-0.44	11.32**
	(5.58)	(2.69)	(2.72)	(3.93)
Log(EPU Global)	-61.04**	-38.72***	-19.64	-2.68
	(20.51)	(6.98)	(11.75)	(10.72)
Global Ind. Prod.	1.16	0.79	-0.10	0.46
	(1.13)	(0.86)	(0.46)	(0.93)
Fixed Effects	Yes	Yes	Yes	Yes
Lags	4	4	4	4
No. Countries	15	15	15	15
Observations	2194	2194	2194	2194
R^2	0.68	0.71	0.49	0.23

Notes: Driscoll–Kraay standard errors in parenthesis.

Drivers of the Emerging Market 2-Year Nominal Yield and Its Components

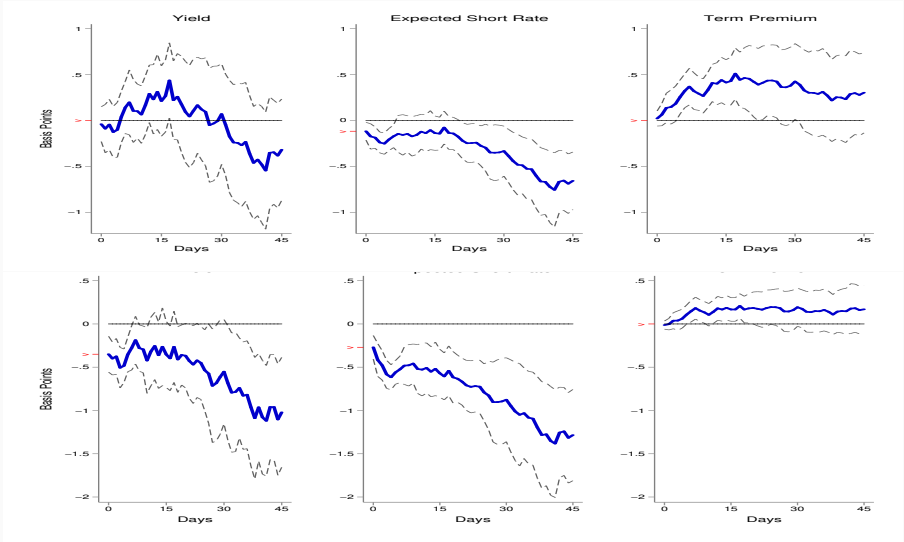
	Nominal	E. Short Rate	Term Premium	Credit Risk
U.S. Term Premium	1.59***	1.68***	0.58***	-0.68**
	(0.22)	(0.17)	(0.17)	(0.21)
U.S. E. Short Rate	-0.03	-0.02	0.05	-0.06
	(0.04)	(0.03)	(0.03)	(0.04)
Policy Rate	0.64***	0.56***	0.13***	-0.05
	(0.03)	(0.03)	(0.02)	(0.03)
Inflation	8.91***	-0.15	7.40**	1.67
	(2.25)	(2.58)	(2.25)	(2.50)
Unemployment	9.39**	-0.62	0.04	9.97***
	(2.91)	(2.14)	(1.61)	(2.14)
LC per USD (Std.)	27.18***	25.67***	17.86***	-16.36**
	(4.84)	(4.86)	(4.04)	(4.91)
Log(Vix)	46.41***	-20.29	-9.10	75.79***
	(8.16)	(13.92)	(7.68)	(11.92)
Log(EPU U.S.)	8.42*	-0.66	-7.01*	16.10***
	(3.82)	(3.91)	(2.79)	(4.15)
Log(EPU Global)	-60.39***	-44.01***	-10.88	-5.50
	(13.69)	(9.62)	(9.32)	(12.88)
Global Ind. Prod.	2.61***	0.36	-1.16*	3.41***
	(0.68)	(0.93)	(0.57)	(0.76)
Fixed Effects	Yes	Yes	Yes	Yes
Lags	4	4	4	4
No. Countries	15	15	15	15
Observations	2194	2194	2194	2194
R^2	0.80	0.75	0.35	0.29

Notes: Driscoll–Kraay standard errors in parenthesis.

Effects of Target Easing on U.S. Yields

10Y

2Y

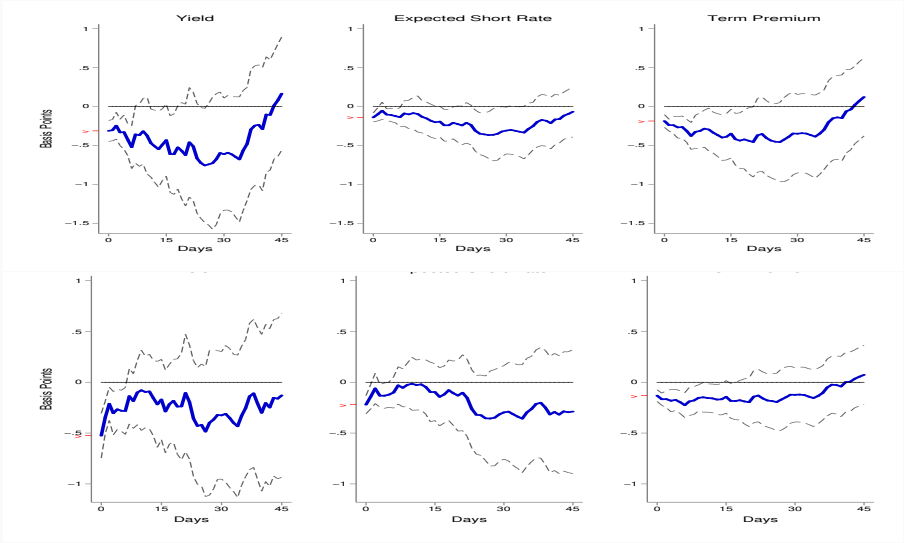


EM

Effects of Forward Guidance Easing on U.S. Yields: Pre-GFC

10Y

2Y

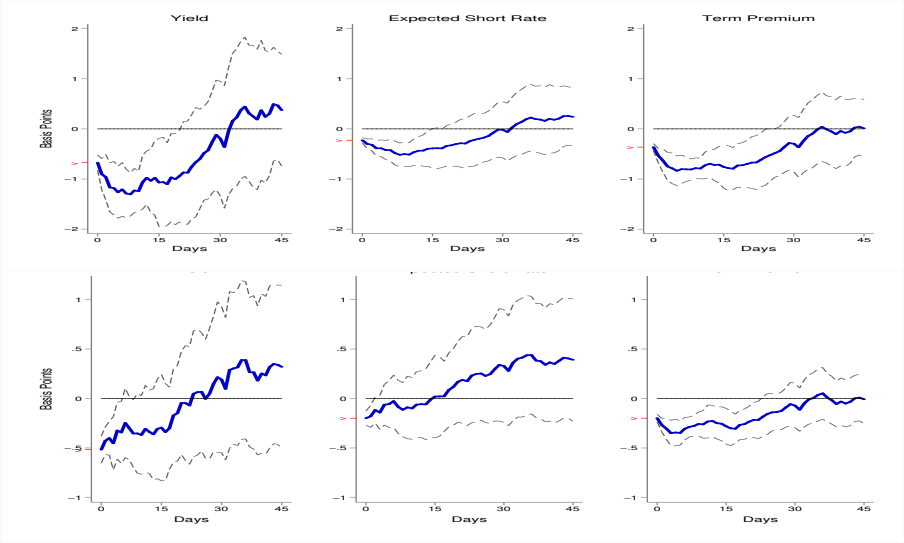


EM

Effects of Forward Guidance Easing on U.S. Yields: Post-GFC

10Y

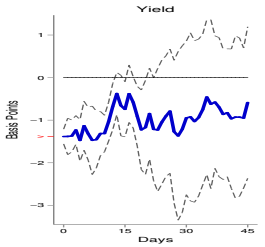
2Y

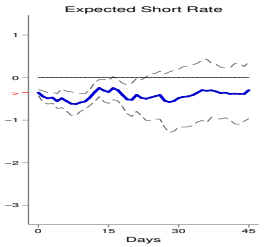


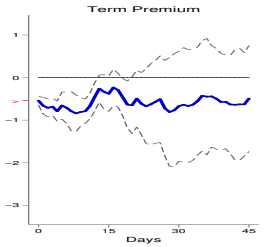
EM

Effects of Asset Purchase Easing on U.S. Yields

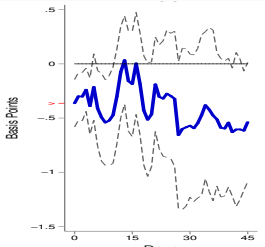
10Y

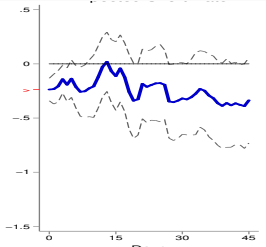


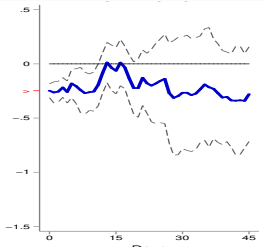




2Y







EM