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

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November 3, 2020

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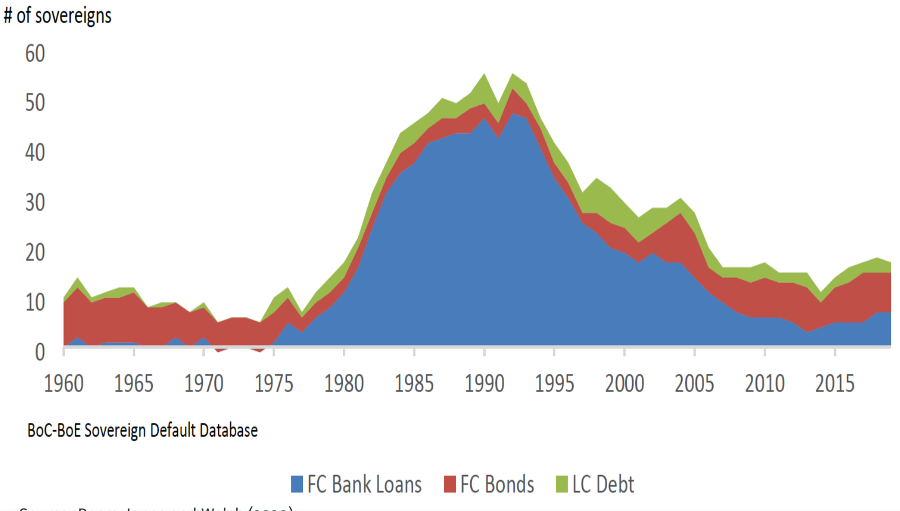
Do Sovereigns Default on Local Currency Debt?

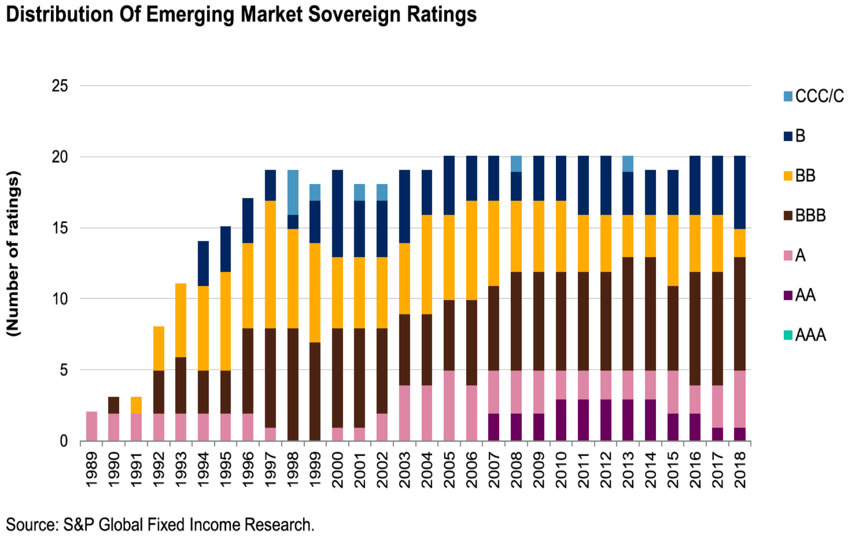


Source: Beers, Jones and Walsh (2020).

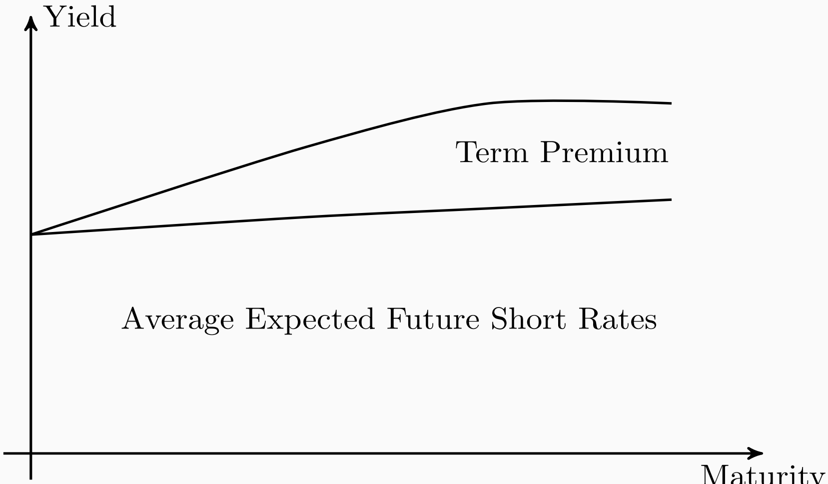
“Overt de jure defaults on domestic public debt ...are hardly rare. The assumption embedded in many theoretical models that governments always honour the nominal face value of debt is a significant overstatement, particularly for emerging markets past and present.”

Reinhart and Rogoff (2011)

Credit Risk in Local Currency Yields



Stylized Yield Curve Decomposition



Research Questions

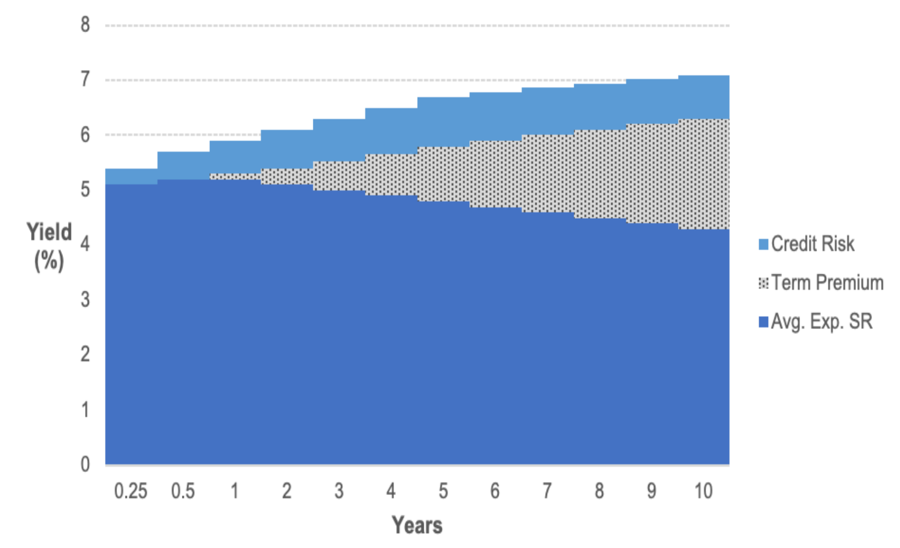
How to decompose sovereign yields of emerging markets (EM)?

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?

Understanding transmission channels $\rightarrow$ Mitigate undesired impacts

Average EM Yield Curve Decomposition



U.S. Monetary Policy Spillovers

1. EM yields' response is economically significant, yet delayed over days
2. All three components react
   - Reassessment of policy rate expectations
   - Repricing of interest and credit risks
3. Unconventional measures limit EM monetary autonomy along the yield curve

Related Literature

Synthetic yields and covered interest rate parity deviations

- Du-Schreger (2016), Du-Im-Schreger (2018), Du-Tepper-Verdelhan (2018)

Sovereign default in EM local currency bonds

- Reinhart-Rogoff (2011), Du-Schreger (2016), Erce-Mallucci (2018), Otonello-Pérez (2019)

Spillovers of U.S. monetary policy to EM yields

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

Yield Curves

Nominal Yield Curves

Local currency (LC) nominal yield curves ($y^{LC}_{t,n}$) from:

- Bloomberg Fair Value par yield curves $\rightarrow$ Zero-coupon yield curves

But credit risk embedded in LC nominal yields of EM

Approach: Synthetic LC yields can be treated as *free of credit risk*

- Swap U.S. Treasury yields into LC using currency derivatives
- Why not CDS (credit default swaps)?

Synthetic Yield Curves

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

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

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

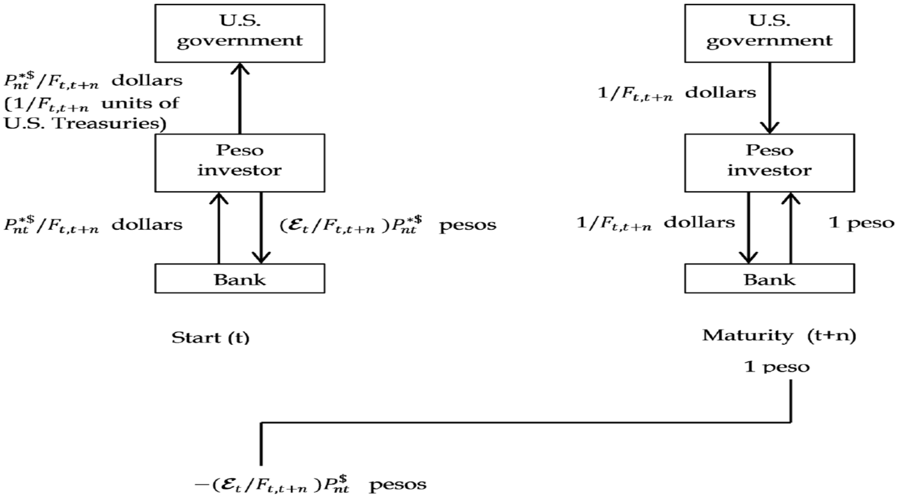
$\rho_{t,n}$: n-period forward premium from USD to LC at time t

- < 1 Year: Currency forwards

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

- ≥ 1 Year: Fixed-for-fixed cross-currency swaps
  - Cross-currency basis swaps
  - Interest rate swaps

Cash Flow Diagram



Source: Du and Schreger (2016)

Benchmark

Assumptions:

(i) Unconstrained arbitrageurs have access to U.S. and LC bonds
(ii) Derivatives have no counterparty risk
(iii) U.S. yields are free of default risk

Du and Schreger (2016) show it is a useful benchmark

Deviations from CIP (Covered Interest Parity)

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

Measures:

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

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:

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

Affine Term Structure Model

Model Overview

Standard discrete-time nominal affine term structure model

- Assumption: Default-free bonds $\rightarrow$ Synthetic yields ($\widetilde{y}_{t,n}^{LC}$) for EM
- Augmented with survey data

A set of pricing factors X_t drives the dynamics of the term structure

No-arbitrage restrictions ensure consistency in cross section / time series

Yields are affine functions of the pricing factors

Bond Pricing

Under no arbitrage, there exists a stochastic discount factor M_{t+1} that prices all nominal bonds

Bond price today

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

There exists a theoretical risk-neutral pricing measure $\mathbb{Q}$ defined as

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

Dynamics Under $\mathbb{Q}$ Measure

Pricing factors under risk-neutral measure $\mathbb{Q}$

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

One-period interest rate

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

Bond prices

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

Fitted yields and loadings

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

Dynamics Under $\mathbb{P}$ Measure

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

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

Pricing factors under physical measure $\mathbb{P}$

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

EM Yield Decomposition

Future expected short rate as if investors were risk-neutral ($\lambda_0 = \lambda_1 = 0$)

$$y^{\mathbb{P}}_{t,n} = A^{\mathbb{P}}_n + B^{\mathbb{P}}_n X_t,$$

$$A^{\mathbb{P}}_n = -\frac{1}{n} A_n,\ B^{\mathbb{P}}_n = -\frac{1}{n} B_n,\ A_n = \mathcal{A}(\delta_0, \delta_1, \mu^{\mathbb{P}}, \Phi^{\mathbb{P}}, \Sigma, n) \ \text{ and } B_n = \mathcal{B}(\delta_1, \Phi^{\mathbb{P}}, n)$$

Term premium

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

Credit risk compensation

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

Weak Identification

Yield data accurately identifies $\{\mu^{\mathbb{Q}}, \Phi^{\mathbb{Q}}\}$, yet $\{\mu^{\mathbb{P}}, \Phi^{\mathbb{P}}\}$ poorly identified

- Bond yields are persistent
- Unstable yield decompositions

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

Guimarães (2014): Surveys provide robust decompositions of yields

- Surveys anchor the long run mean of interest rates
- Important for EM due to small sample sizes

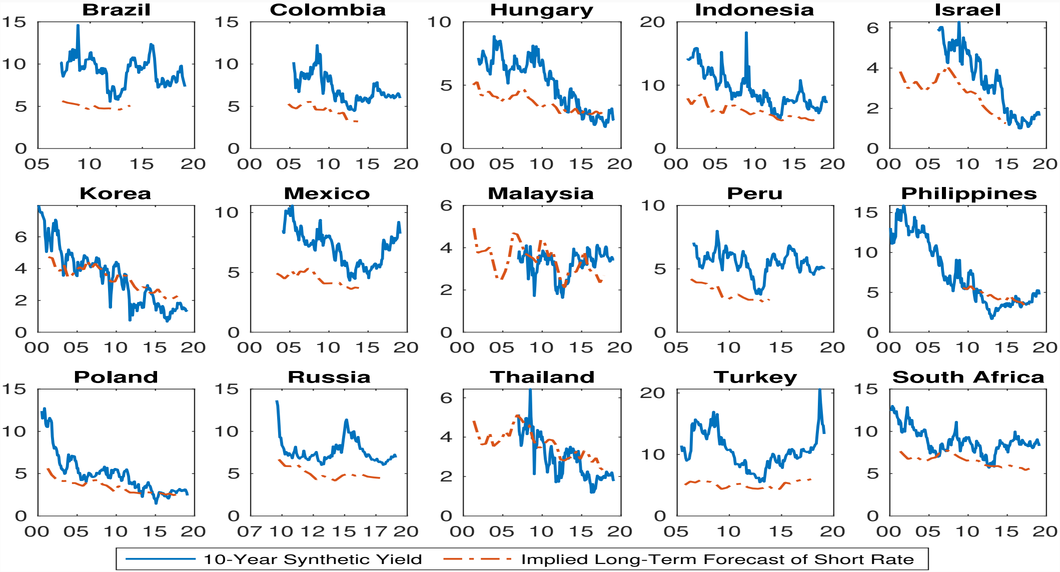
Survey Data

No data on long-term forecasts for the short rate in EM

Implied forecast for the short rate in EM from existing data

- EM inflation expectations from Consensus Economics (CE)
  - Twice a year
- Implied U.S real rate from Survey of Professional Forecasters (SPF)
  - T-bill rate, CPI inflation

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



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Thailand
Turkey
South Africa
10-Year Synthetic Yield
Implied Long-Term Forecast of Short Rate

Survey-Augmented Model

Expected average short rate under $\mathbb{P}$

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

Forward rate from n to m periods hence

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

Model Estimation

Estimate parameters by MLE with monthly data

- Joslin, Singleton, and Zhu (2011) normalization of the model

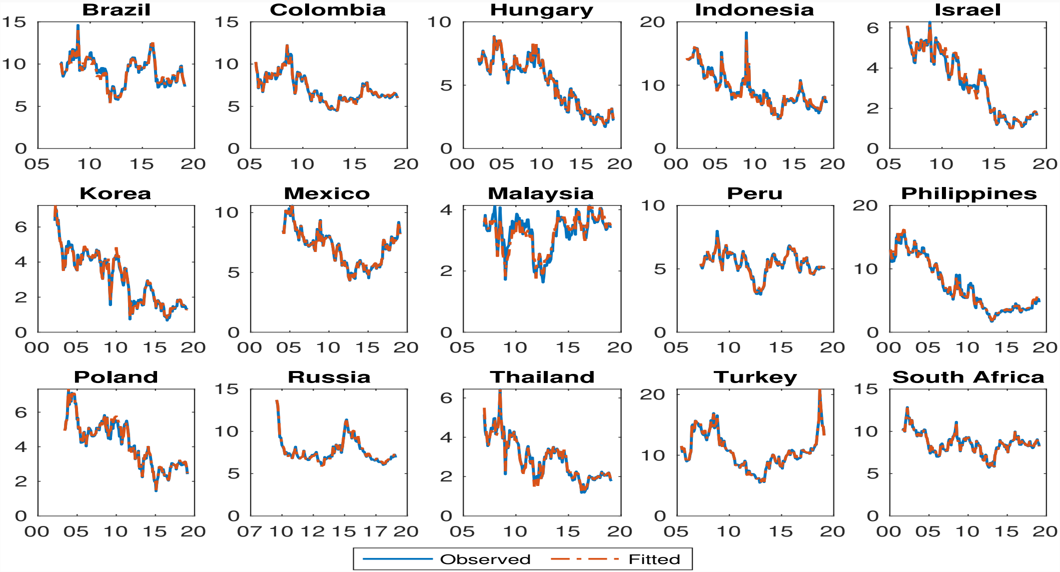
Estimate survey-augmented model by Kalman filter (missing data)

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

Standard errors by delta method

Estimate daily pricing factors

EM Yield Decomposition



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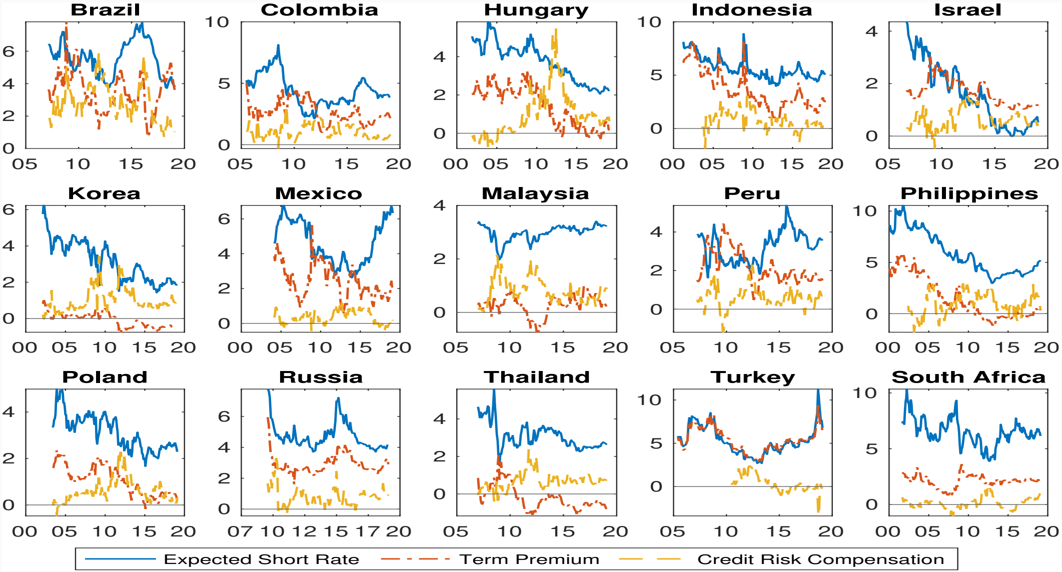
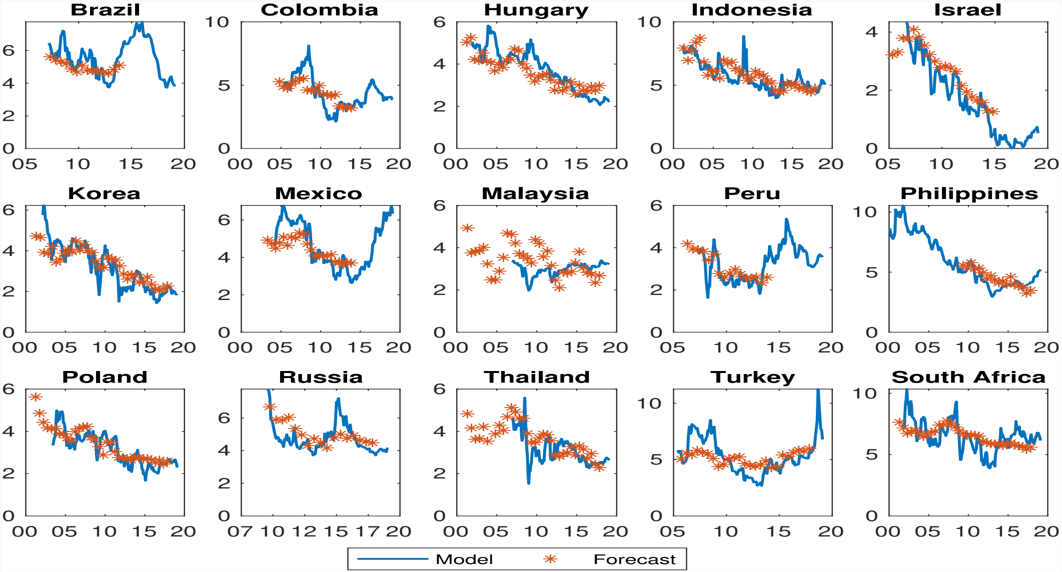
South Africa
Observed
Fitted



Term Premia
Credit Risk Compensation


Brazil
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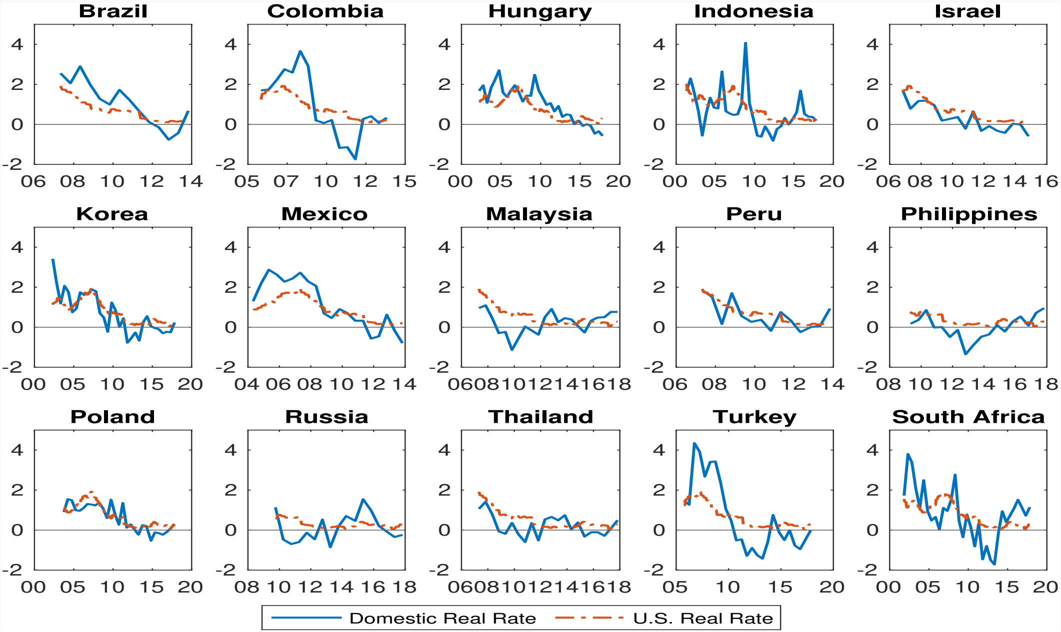
Model
Forecast



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Peru
Philippines
Poland
Russia
Thailand
Turkey
South Africa
Domestic Real Rate
U.S. Real Rate

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 more relevant to term premia in EM?

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

- $\sigma^{\pi}_{i,t}$: standard deviation of permanent component of inflation in UCSV model (Stock and Watson, 2007)

EM Term Premium 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: This table reports the slope coefficients of panel data regressions of the model-implied term premia for different maturities on the standard deviation of the permanent component of inflation according to the UCSV model (UCSV-Perm) and GDP growth. The sample includes quarterly data for 15 countries starting in 2000:I and ending in 2018:IV. The term premia is expressed in basis points. GDP growth is expressed in percent. All cases include country fixed effects. Driscoll–Kraay standard errors are in parenthesis. *, **, *** asterisks respectively indicate significance at the 10%, 5% and 1% level.

Spillovers

The Yield Curve Channel

Long-term yields highly correlated, influenced by global forces

Unconventional monetary policies abroad affect EM long-term yields

- Via the term premium (Turner, 2014)

EM monetary autonomy:

- Declines along the yield curve (Obstfeld, 2015)
- Limited also at the short end (Kalemli-Özcan, 2019)

Yield Curve Channel Implications

Do long-term EM yields comove more than short-term ones?

- Rolling correlations

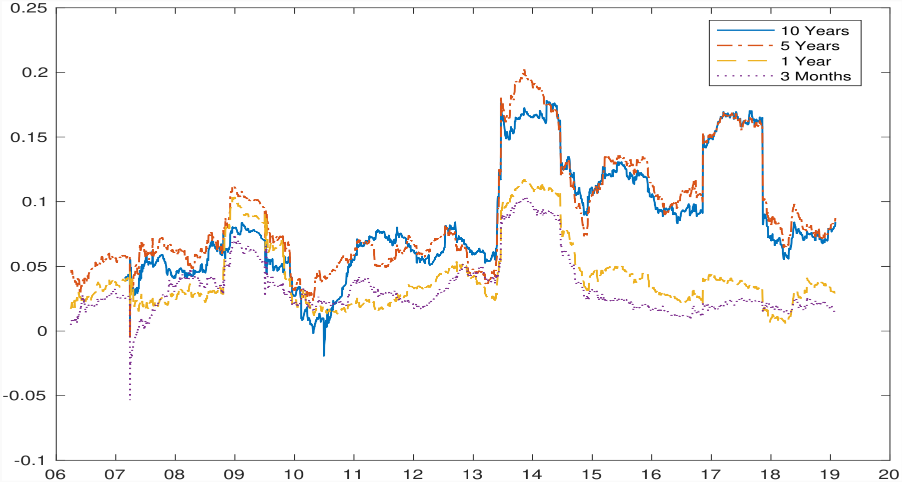
Direct relationships at different maturities

- 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?

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

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

α_i: country fixed effects

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

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

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

Table 1. Drivers of the Emerging Market 10-Year Nominal Yield and Its Components

	Nominal	E. Short Rate	Term Premium	Credit Rirsk
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. Lag length up to which the residuals may be auto-

Table 1. Drivers of the Emerging Market 2-Year Nominal Yield and Its Components

	Nominal	E. Short Rate	Term Premium	Credit Rirsk
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. Lag length up to which the residuals may be auto-

U.S. Monetary Policy Surprises

Identification:

- Asset price changes in 2-hour windows around FOMC meetings

Surprises:

- Target: federal funds futures contracts
- Forward guidance: residual of Eurodollar ED8 yield on target surprise
- Asset purchases: residual of 10Y Treasury yield on target and forward guidance surprises starting in 2009

See Kuttner (2001); Gürkaynak et al. (2005); Swanson (2018); Nakamura and Steinsson (2018)

U.S. Monetary Policy Effects on EM Yields

Panel local projections:

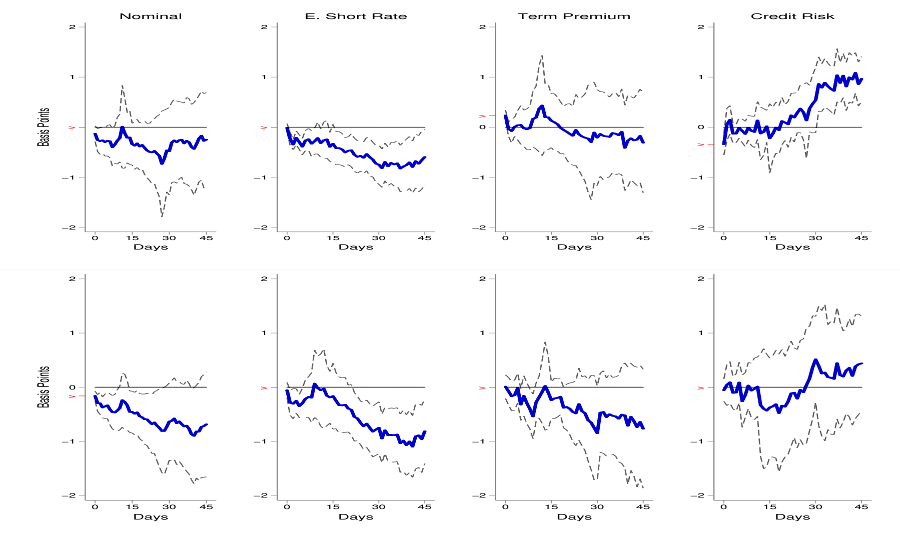
$$y_{i,t+h} - y_{i,t-1} = \alpha_{h,i} + \sum_{j=1}^{3} \beta_h^j \epsilon_t^j + \gamma_h \Delta y_{i,t-1} + \eta_h s_{i,t-1} + u_{i,t+h}$$

- $y_{i,t}$: 10- and 2-year nominal EM yields and their components
- $h = 0, 1, \ldots, 45$ is horizon in 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 Surprises

10Y

2Y



US

Effects of Forward Guidance Surprises: Pre-GFC

10Y

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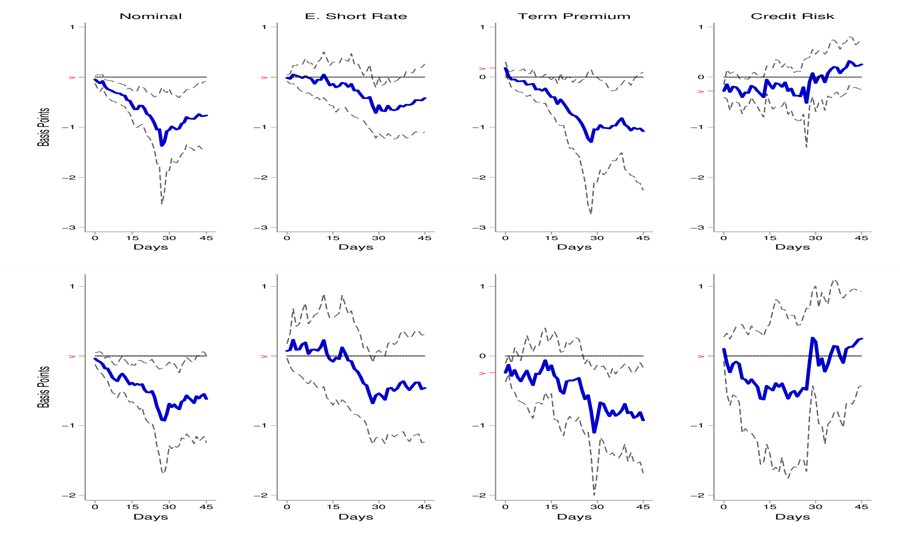

US

Effects of Forward Guidance Surprises: Post-GFC

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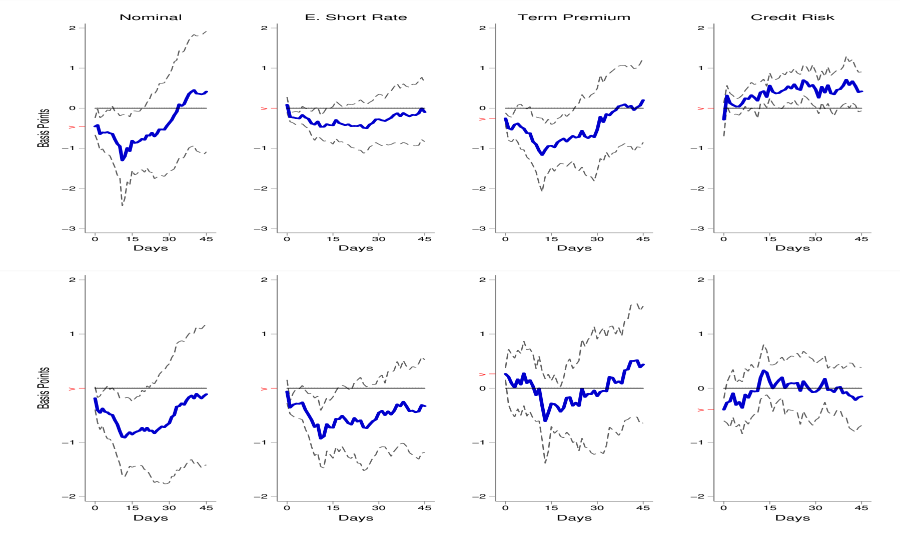
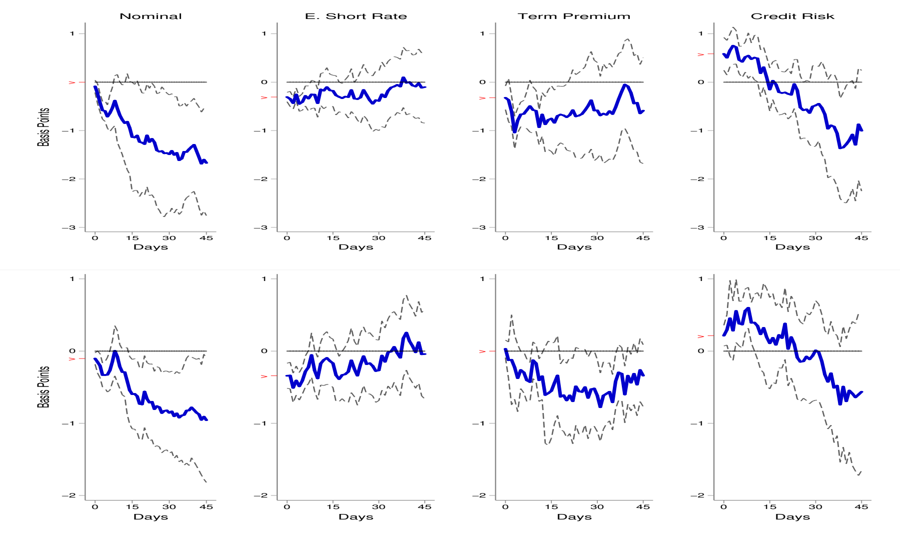


▸ US

Effects of Asset Purchase Surprises

10Y

2Y



US

Conclusions

Conclusions

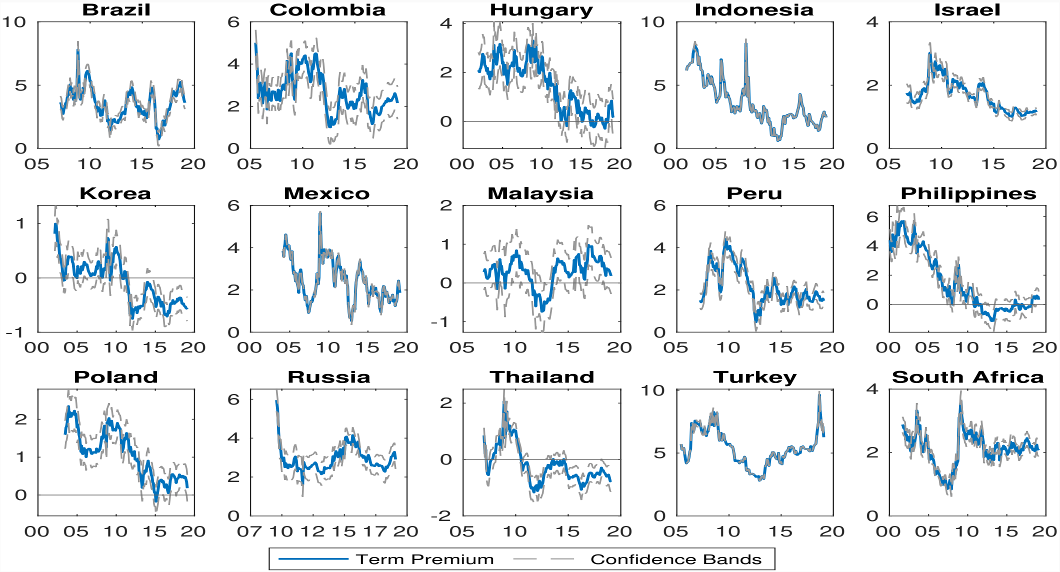
Three-part decomposition of EM yields

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

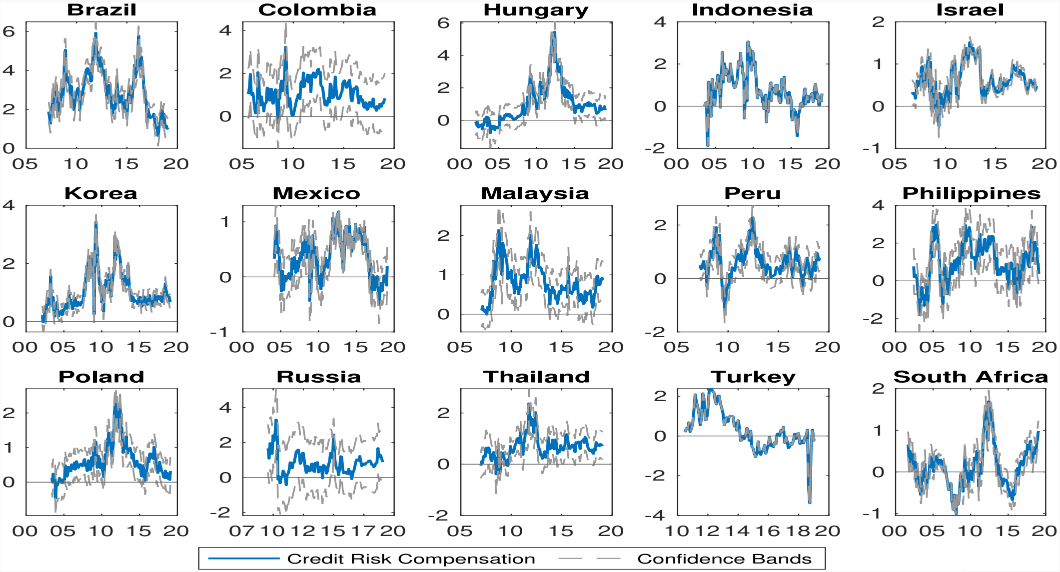
U.S. monetary policy spillovers

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

Appendix

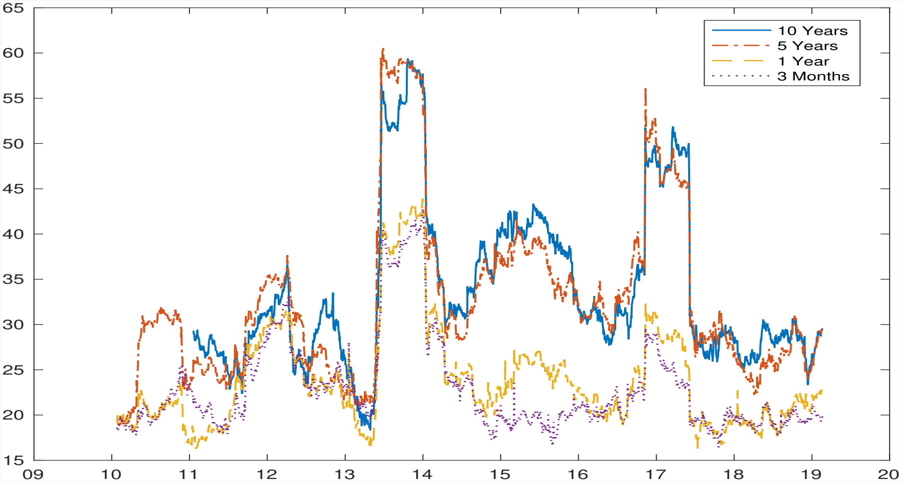


Decomposition



Decomposition

EM Yields Comovement



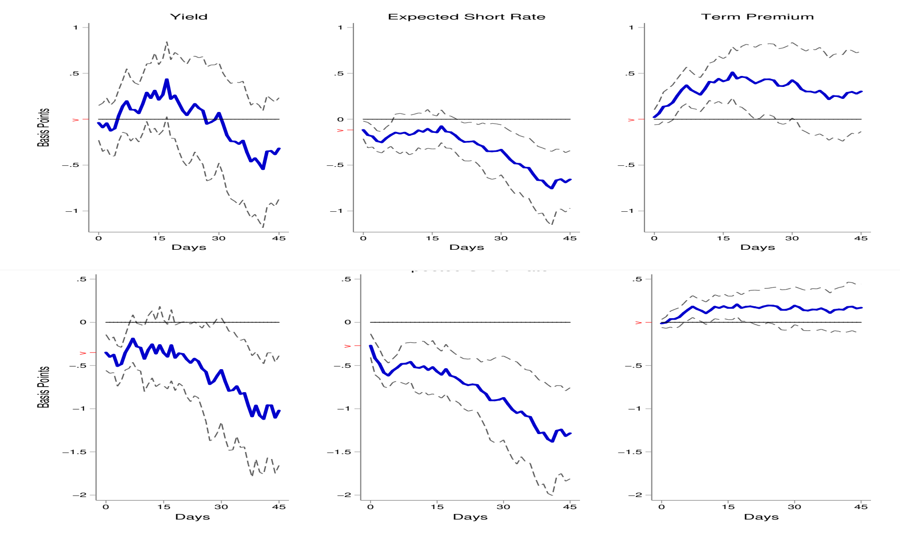
Rolling Corr.

Connectedness Index (Diebold and Yilmaz, 2014)

Effects of Target Surprises

10Y

2Y

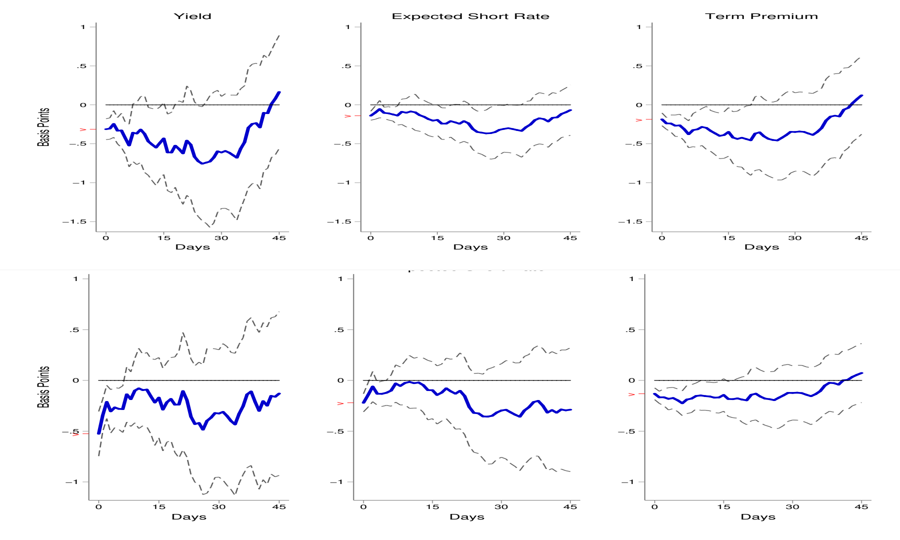


EM

Effects of Forward Guidance Surprises: Pre-GFC

10Y

2Y



EM

Effects of Forward Guidance Surprises: Post-GFC

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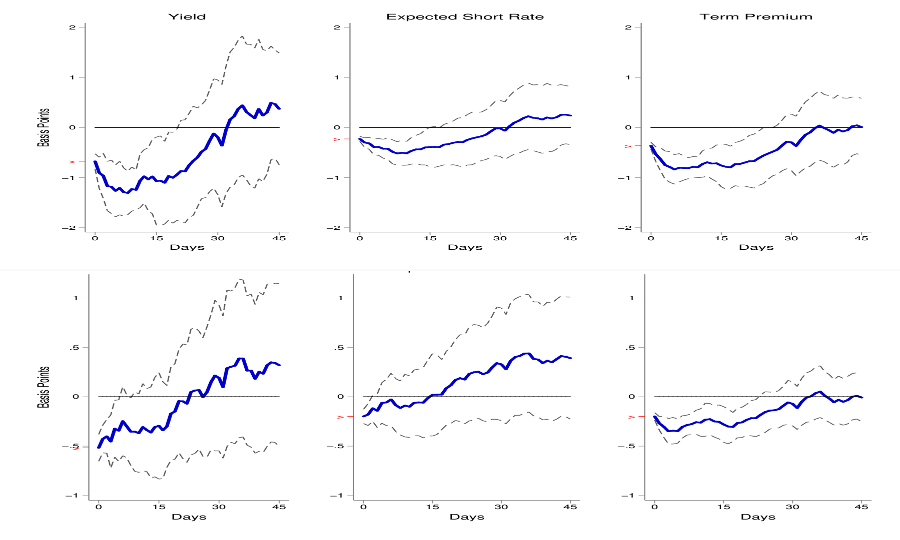
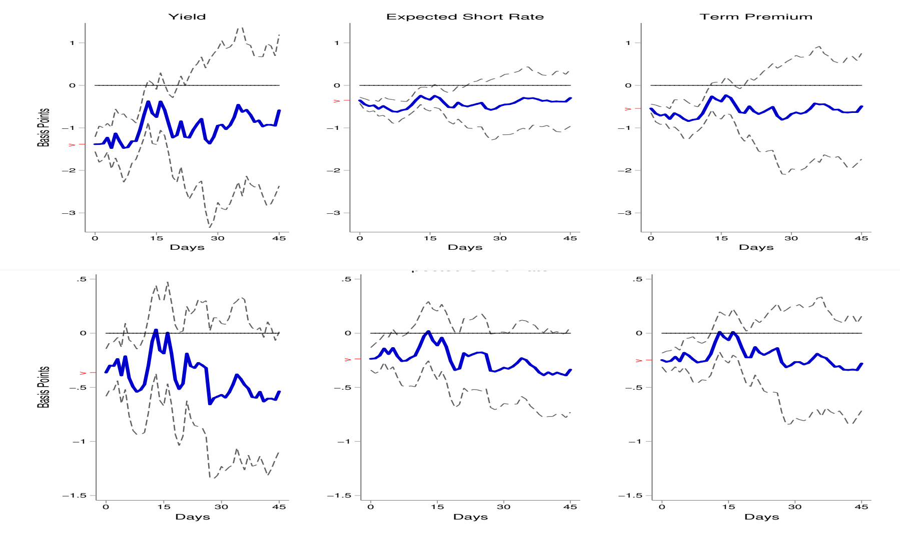


EM

Effects of Asset Purchase Surprises

10Y

2Y



EM