Appendix

A Trend Inflation as a Proxy for Long-Term Inflation Forecasts

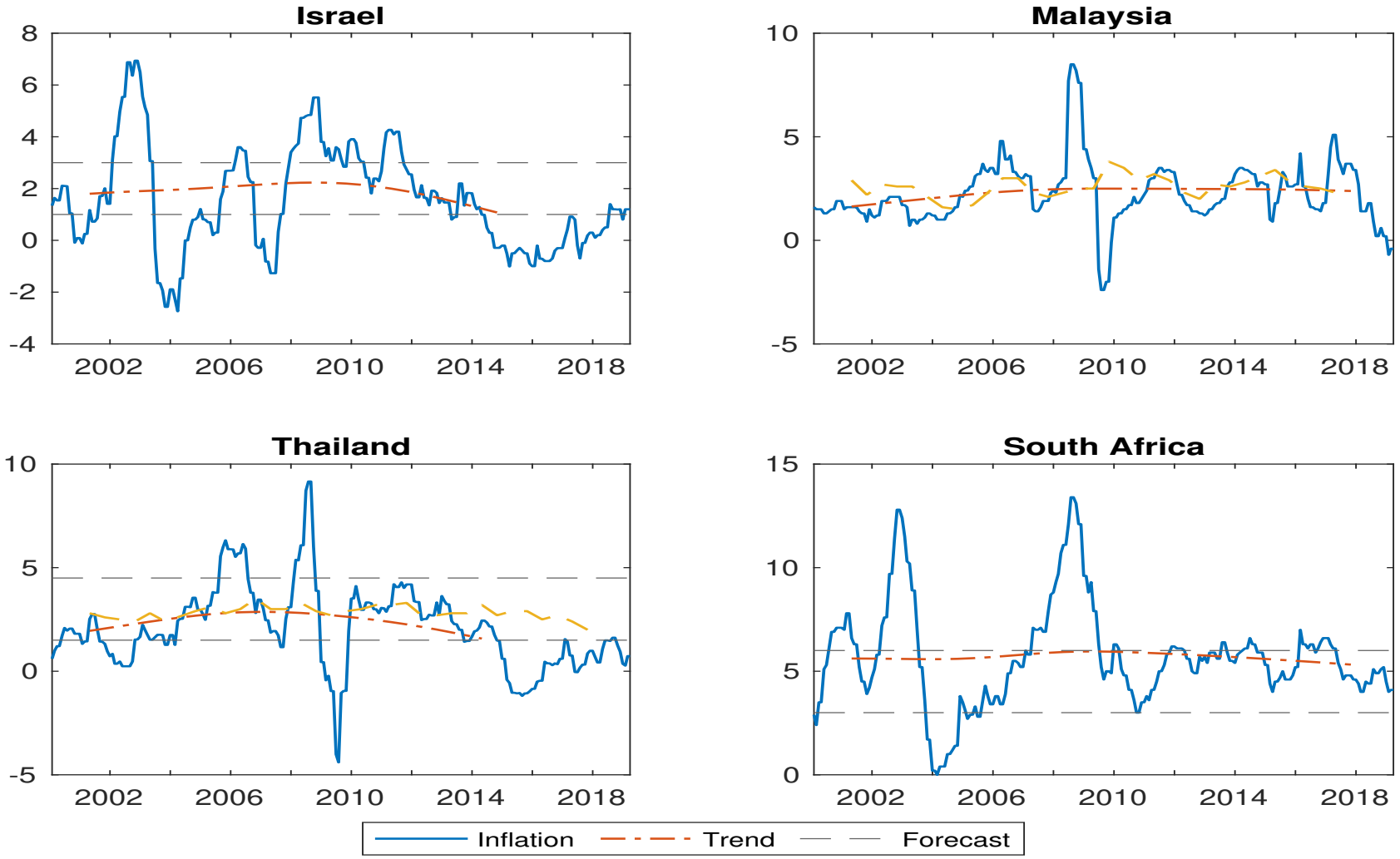
An advantage of the small open economy approach to infer long-term forecasts for the short rate is that, for emerging markets, it only requires data on inflation forecasts, or a proxy in the case of countries with no long-term forecasts available as is the case for Israel and South Africa.

Inflation expectations are hoped to match measures of inflation that exclude unexpected shocks and better reflect the inflation environment. Different measures of core inflation exist. I use the inflation trend obtained by applying the Hodrick–Prescott filter to the series of realized inflation of each country.

There are two main concerns for using this approach. Namely, the filter is sensitive to the sample period used and the resulting trend can be outside of the target inflation band due to the innate dynamics of the series, which would be at odds with survey data (see figure 1). In the case of Israel and South Africa, however, there is no marked upward or downward trend in their inflation during the sample period. Therefore, for both countries, trend inflation is calculated for the whole period for which survey data is available for the rest of the countries in the sample, and as long as the resulting trend is within the respective inflation target band.

Figure A.1 shows the realized and trend inflation for Israel and South Africa along with those of Malaysia and Thailand, two countries with a similar pattern for inflation (i.e. no marked upward or downward trend) and for which survey data is available. The figure shows that trend inflation seems to be a good proxy for the long-term inflation forecasts in Malaysia and Thailand. Also, as can be seen in the main text (figure 1), 5-year and long-term inflation forecasts follow each other closely, therefore trend inflation is used as the proxy for both the 5-year and the long-term inflation forecasts in the case of Israel and South Africa.

Figure A.1. Inflation Trend and Long-Horizon Forecast for Inflation



Notes: This figure plots consumer price inflation (solid line), inflation trend based on the Hodrick–Prescott filter (dash-dotted line) and long-term inflation forecast (dashed line). The figure also includes the upper and lower bounds for the domestic inflation target. The upper and lower bounds are the most recent ones for each country.

B Connectedness of Yields and Components

An alternative approach to rolling correlations for assessing the comovement of yields is the connectedness index of Diebold and Yilmaz (2014). The index assesses shares of forecast error variation in a country's bond market due to shocks arising elsewhere.[58] Higher numbers (between 0 and 100%) indicate a higher degree of comovement. Figure B.1 exhibits the same patterns as those reported in figure 6 using rolling correlations.

Figure B.2a compares the index for the nominal and synthetic yields of emerging markets with the nominal yields of advanced economies. The relatively low connectedness among the yields of emerging markets supports estimating the term structure models for their yield curves separately rather than jointly. More generally, the evidence of highly connected yields in advanced economies and low connected yields in emerging markets is consistent with global bond markets operating under a core-periphery structure, in which the bond markets of advanced economies constitute the (highly interconnected) core and those of emerging markets represent the (less connected) periphery who are in turn connected to the network mainly through countries in the core.[59] According to this view, shocks to emerging market yields are mainly idiosyncratic—reflected in less comovement among themselves—so what matters for them are not spillovers originating in other emerging markets but in advanced economies.

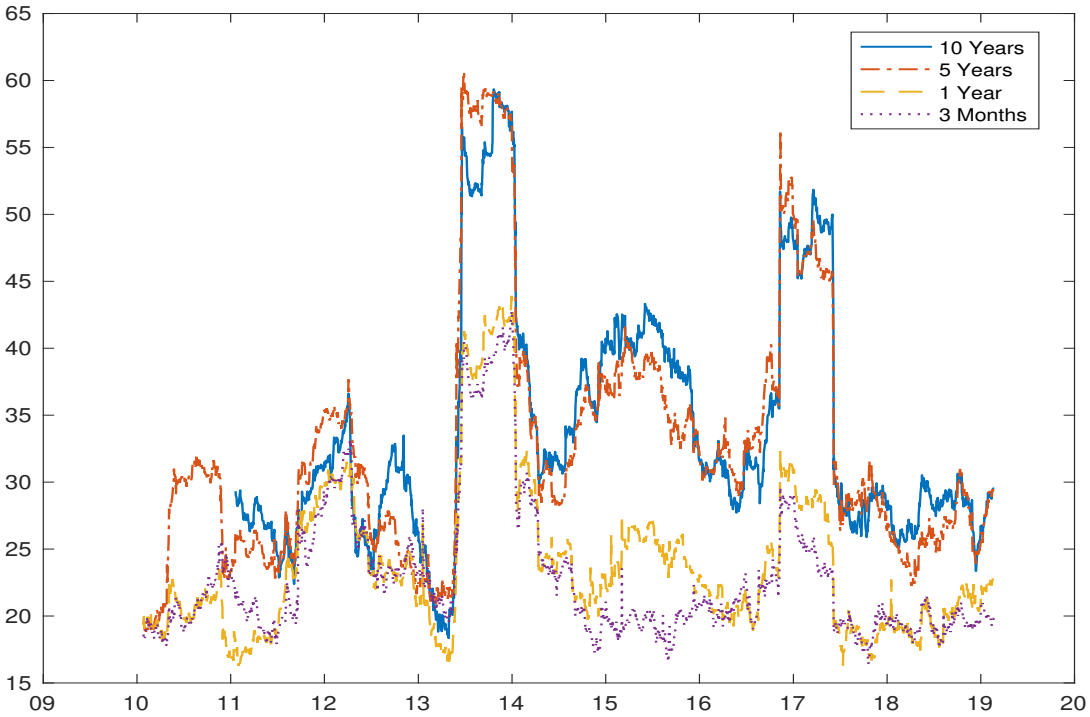
Figure B.2b shows the connectedness index for the components of emerging market yields. From all three components of emerging market yields, the term premium has been slightly more connected since the taper tantrum in 2013 with the expected future short rate becoming more connected towards the end of the sample.[60] Meanwhile, the credit risk compensation has been essentially the least connected component. Figure B.2a shows that the level of the index for synthetic yields tends to be higher than that for nominal yields, which supports that the credit risk component is more idiosyncratic.

[58] Following Adrian et al. (2019) and Bostanci and Yilmaz (2020), I compute the index using a VAR(1), with a forecast horizon of 10 days and a rolling window of 150 days for the daily changes of yields.

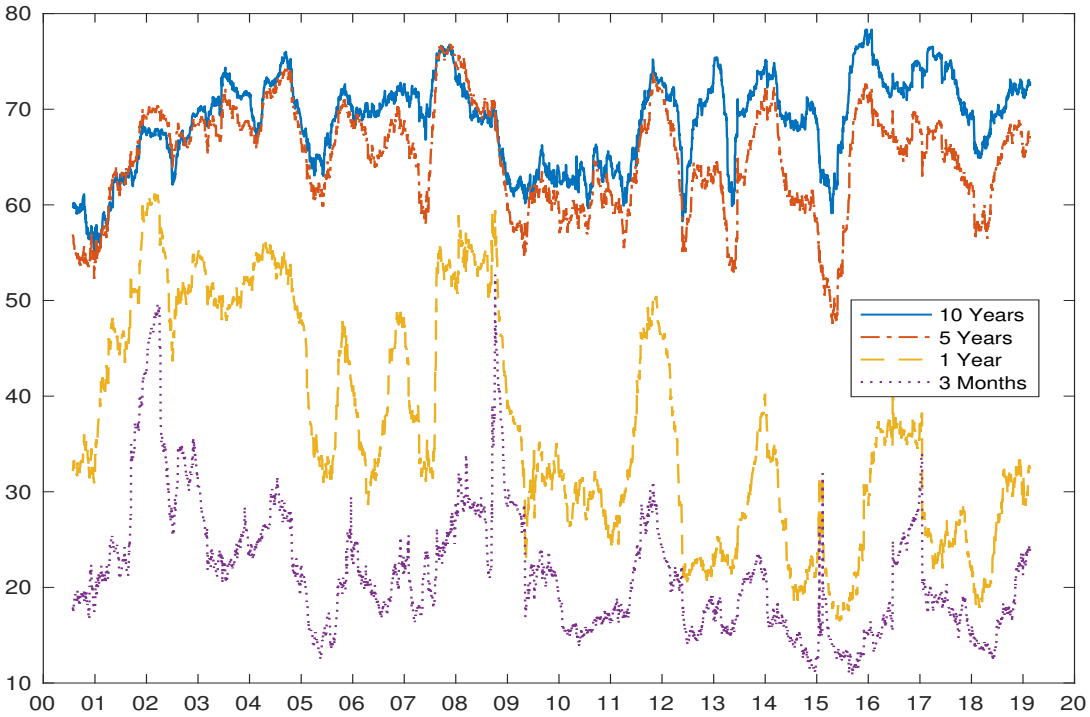
[59] The core-periphery structure has been shown to be a good description of different networks in economics and finance. Craig and von Peter (2014), for example, show that the interbank market operates under such a structure.

[60] Adrian et al. (2019) show that the increase in the connectedness among the yields of advanced economies has been driven by an increase in the connectedness of their term premia.

Figure B.1. Comovement of Yield Curves: Connectedness Index



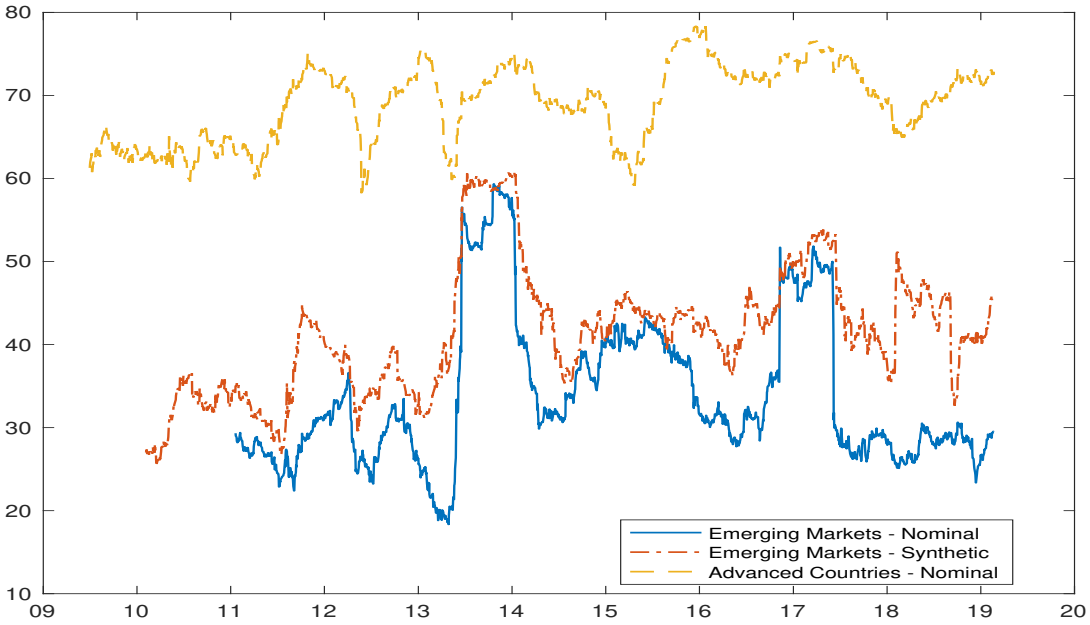
(a) Emerging Markets



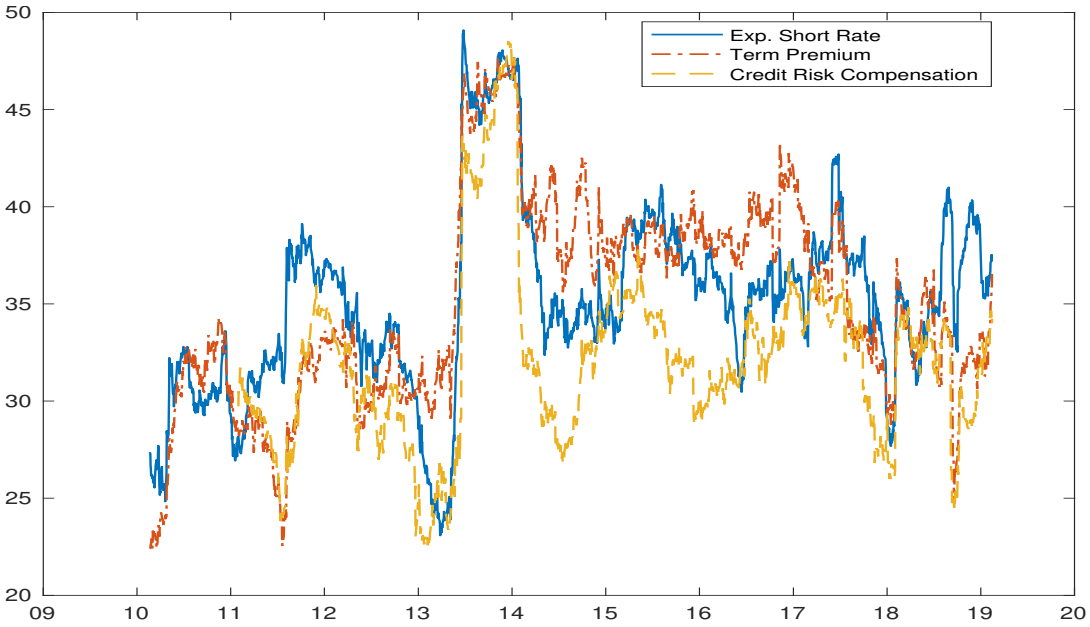
(b) Advanced Economies

Notes: This figure plots the connectedness index of Diebold and Yilmaz (2014) for the nominal yields of emerging markets and advanced economies for different maturities: 10 years (solid line), 5 years (dash-dotted line), 1 year (dashed line), and 3 months (dotted line). The index is obtained using a vector autoregression of order 1, with a forecast horizon of 10 days and a rolling window of 150 days for the daily changes of the nominal yields at each maturity.

Figure B.2. Connectedness of 10-Year Yields and Components



(a) Nominal and Synthetic Yields



(b) Nominal Yield Components

Notes: This figure plots the connectedness index of Diebold and Yilmaz (2014) for 10-year yields. Panel (a) compares the connectedness index of nominal (solid line) and synthetic (dash-dotted line) yields of emerging markets and the nominal (dashed line) yields of advanced economies. Panel (b) compares the connectedness index of each component of the nominal yields of emerging markets: the expected future short rate (solid line), the term premium (dash-dotted line) and the credit risk compensation (dashed line). The index is obtained using a vector autoregression of order 1, with a forecast horizon of 10 days and a rolling window of 150 days for the daily changes of the 10-year yields and their components. The index for some components has a shorter history because its computation requires a balanced panel and the components do not start on the same date (e.g. the construction of the synthetic curves does not involve nominal yields).

C Supplementary Tables

D Supplementary Figures

Table C.1. Drivers of the Emerging Market 5-Year Nominal Yield and Its Components

	Nominal	E. Short Rate	Term Premium	Credit Risk
U.S. Term Premium	1.27***	1.03***	0.77***	-0.53***
	(0.17)	(0.13)	(0.06)	(0.13)
U.S. E. Short Rate	0.04	0.03	0.11**	-0.12***
	(0.06)	(0.04)	(0.03)	(0.04)
Local Policy Rate	0.41***	0.60***	-0.15***	-0.02
	(0.03)	(0.04)	(0.02)	(0.02)
Inflation	12.34***	-0.93	8.69***	4.41**
	(2.33)	(3.20)	(1.93)	(1.61)
Unemployment	18.56***	-3.62	10.57***	11.10***
	(3.11)	(2.81)	(1.28)	(2.05)
LC per USD (Std.)	33.70***	40.88***	4.06	-8.17*
	(5.28)	(5.06)	(2.52)	(3.28)
Log(Vix)	57.66***	-29.44*	25.78***	61.95***
	(9.95)	(11.34)	(7.19)	(9.69)
Log(EPU U.S.)	8.97	-3.58	-0.13	10.86**
	(4.88)	(4.27)	(2.92)	(3.58)
Log(EPU Global)	-66.11***	-40.05***	-19.45*	-8.35
	(16.52)	(11.80)	(8.06)	(9.52)
Global Ind. Prod.	2.32**	-0.41	0.90*	1.86*
	(0.84)	(0.83)	(0.38)	(0.75)
Fixed Effects	Yes	Yes	Yes	Yes
Lags	4	4	4	4
No. Countries	15	15	15	15
Observations	2194	2194	2194	2194
R^2	0.74	0.73	0.37	0.30

Notes: This table reports the estimated slope coefficients of panel data regressions of the 5-year nominal yield and its components (expected short rate, term premium and credit risk compensation) on selected explanatory variables. The sample includes monthly data for 15 emerging markets starting in 2000:1 and ending in 2019:1. The dependent variables are expressed in basis points. The explanatory variables are the U.S. term premium and the U.S. expected short rate according to Kim and Wright (2005) with the same maturity as the dependent variables, the policy rate, domestic inflation and unemployment, the standardized exchange rate (local currency per USD), the log of the Vix, the log of the U.S. and global economic policy uncertainty indexes based on Baker et al. (2016), the global economic activity index of Hamilton (2019). Driscoll–Kraay standard errors in parenthesis; lag length up to which the residuals may be autocorrelated is indicated. *, **, *** asterisks respectively indicate significance at the 10%, 5% and 1% level.

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

	Nominal	E. Short Rate	Term Premium	Credit Risk
U.S. Term Premium	1.87***	2.06***	0.54**	-0.73*
	(0.38)	(0.41)	(0.20)	(0.31)
U.S. E. Short Rate	-0.01	-0.04	0.07***	-0.07*
	(0.04)	(0.04)	(0.02)	(0.03)
Local Policy Rate	0.73***	0.80***	0.02	-0.04
	(0.03)	(0.04)	(0.02)	(0.02)
Inflation	7.48**	-0.92	7.75***	3.83*
	(2.30)	(3.78)	(2.20)	(1.67)
Unemployment	4.98	-6.51*	1.47	8.29***
	(2.81)	(3.03)	(1.75)	(1.42)
LC per USD (Std.)	28.41***	38.98***	7.24*	-7.46
	(4.61)	(5.64)	(3.20)	(4.08)
Log(Vix)	33.84***	-29.80*	-8.86	80.67***
	(7.50)	(12.81)	(7.83)	(11.03)
Log(EPU U.S.)	4.71	-3.02	-8.54**	12.41**
	(3.36)	(5.84)	(2.69)	(3.99)
Log(EPU Global)	-50.90***	-47.85***	3.45	-5.26
	(12.55)	(12.57)	(7.40)	(9.52)
Global Ind. Prod.	2.28**	-1.21	-1.10*	3.47***
	(0.77)	(1.00)	(0.53)	(0.63)
Fixed Effects	Yes	Yes	Yes	Yes
Lags	4	4	4	4
No. Countries	15	15	15	15
Observations	2194	2194	2194	2194
R^2	0.82	0.74	0.20	0.31

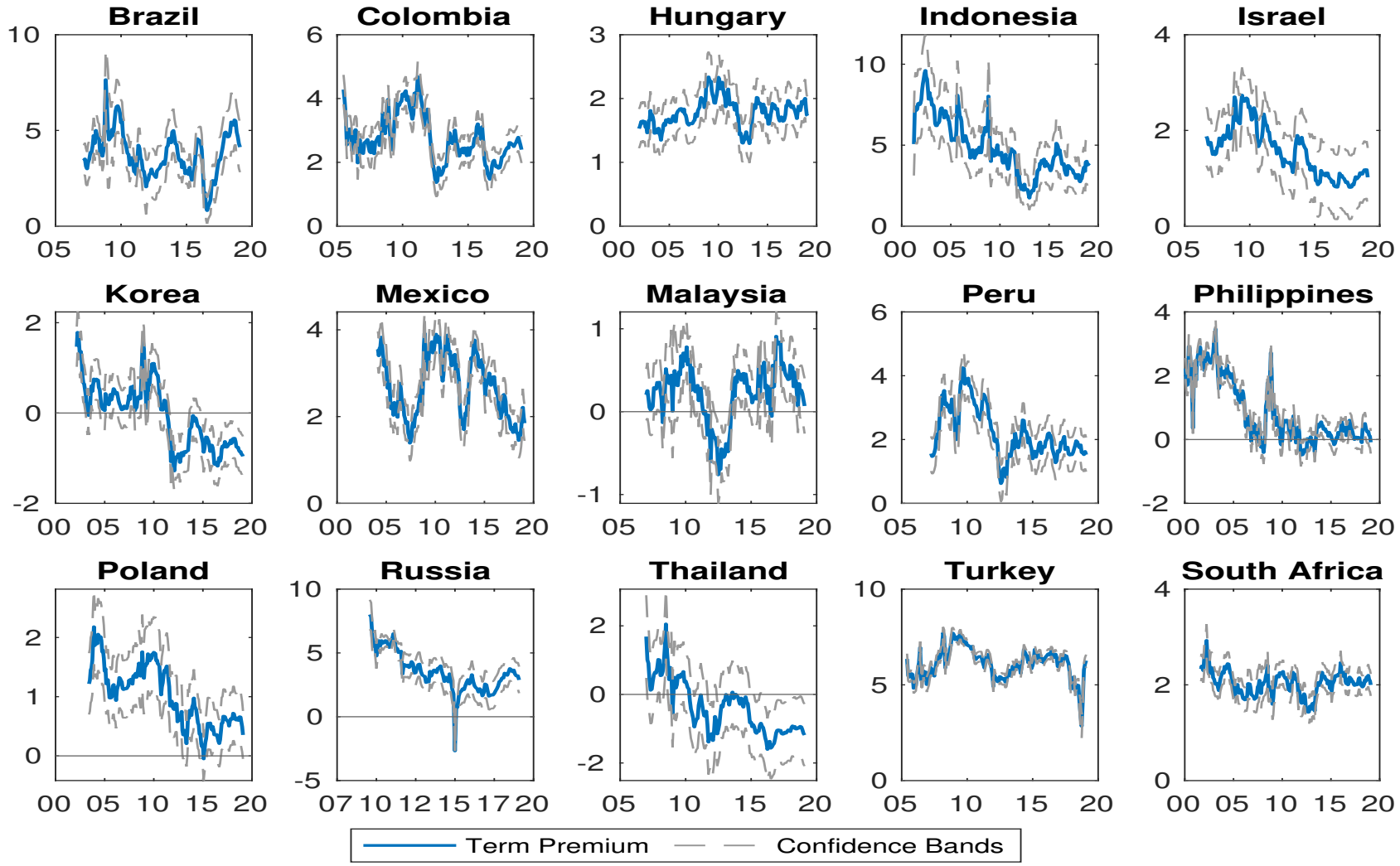
Notes: This table reports the estimated slope coefficients of panel data regressions of the 1-year nominal yield and its components (expected short rate, term premium and credit risk compensation) on selected explanatory variables. The sample includes monthly data for 15 emerging markets starting in 2000:1 and ending in 2019:1. The dependent variables are expressed in basis points. The explanatory variables are the U.S. term premium and the U.S. expected short rate according to Kim and Wright (2005) with the same maturity as the dependent variables, the policy rate, domestic inflation and unemployment, the standardized exchange rate (local currency per USD), the log of the Vix, the log of the U.S. and global economic policy uncertainty indexes based on Baker et al. (2016), the global economic activity index of Hamilton (2019). Driscoll–Kraay standard errors in parenthesis; lag length up to which the residuals may be autocorrelated is indicated. *, **, *** asterisks respectively indicate significance at the 10%, 5% and 1% level.

Table C.3. Descriptive Statistics of U.S. Monetary Policy Surprises

	Mean	Std. Dev.	Min.	Max.	Obs
Target Surprises (abs. values)	2.6	6.7	0.0	46.5	162
Target Surprises > 0	3.8	3.9	0.0	14.4	33
Target Surprises < 0	-6.2	11.0	-46.5	-0.3	47
Forward Guidance Surprises (abs. values)	6.0	6.5	0.0	54.6	162
Forward Guidance Surprises > 0	5.4	4.9	0.0	24.9	89
Forward Guidance Surprises < 0	-6.7	8.0	-54.6	-0.0	73
Asset Purchase Surprises (abs. values)	2.2	3.5	0.1	29.9	86
Asset Purchase Surprises > 0	1.9	2.2	0.1	10.3	41
Asset Purchase Surprises < 0	-2.5	4.4	-29.9	-0.1	45

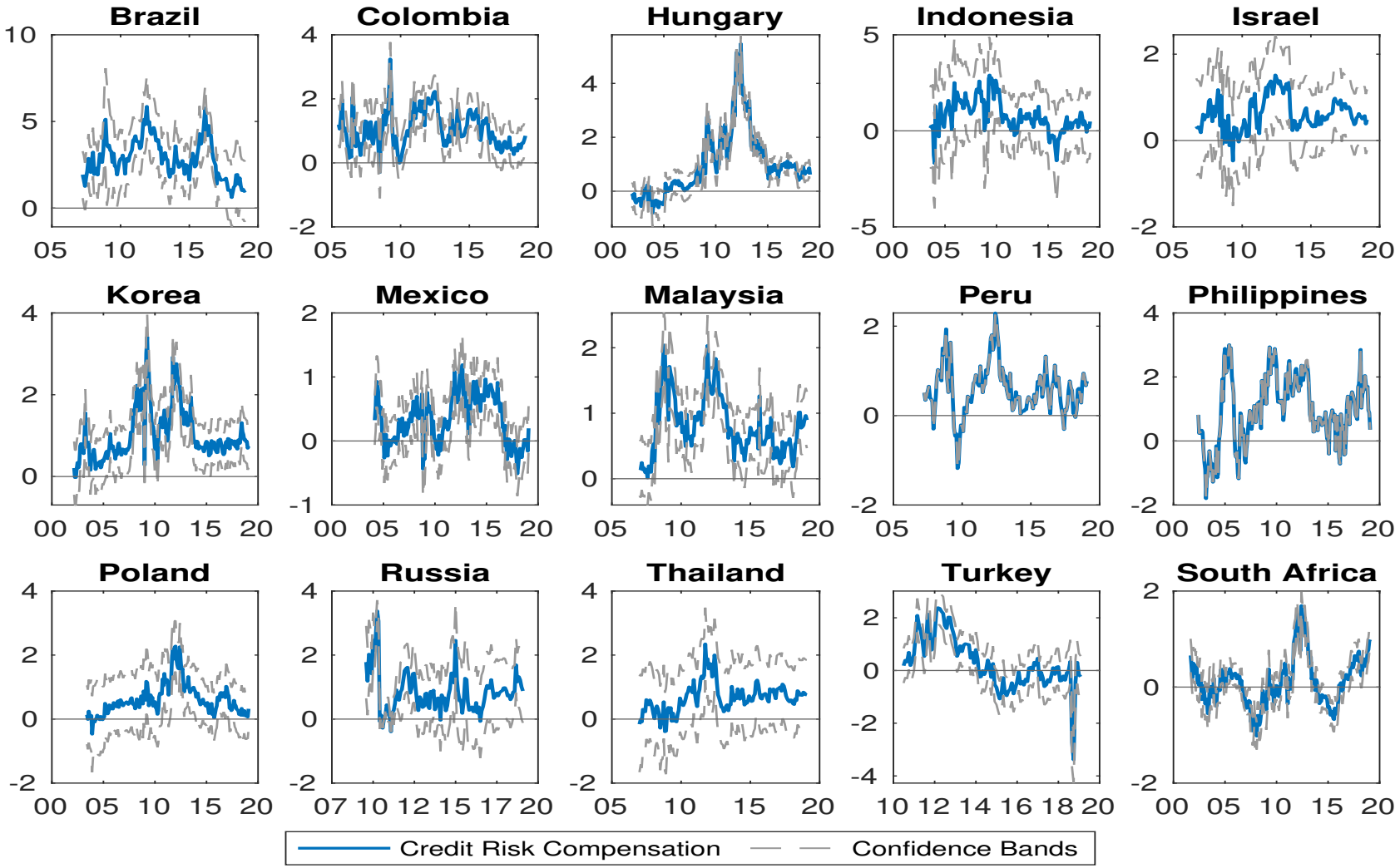
Notes: This table reports the average, the standard deviation, the minimum and the maximum values on monetary policy announcement days for the target, forward guidance and asset purchase surprises, see section 5.2 for details. Target surprises are zero between January 2009 to November 2015. Forward guidance surprises span the whole sample period from January 2000 to January 2019. Asset purchase surprises are considered from October 2008 onwards.

Figure D.1. The 10-Year Term Premium of Emerging Markets



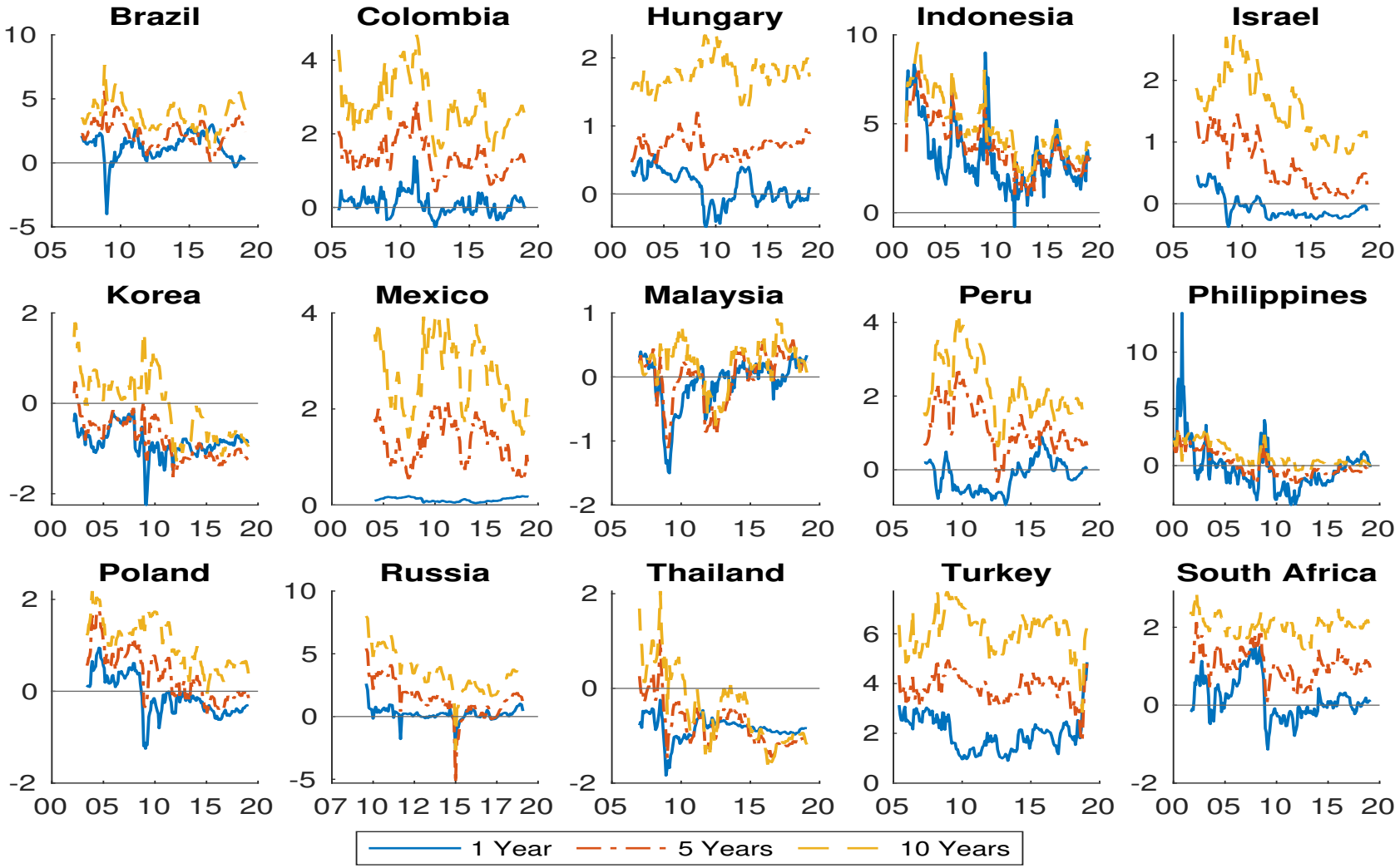
Notes: This figure plots the model-implied 10-year term premium (solid line) along with 2-standard-error confidence intervals (dashed lines). The standard errors are estimated using the delta method. The covariance matrix is estimated using the sample Hessian estimator calculated numerically from the joint log density.

Figure D.2. The 10-Year Credit Risk Compensation of Emerging Markets



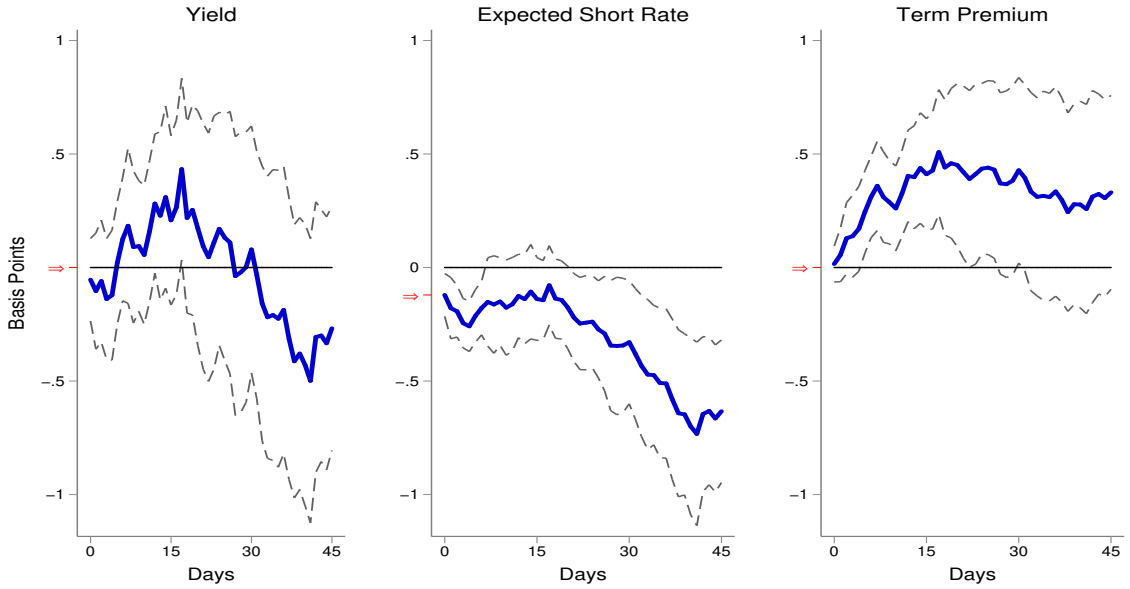
Notes: This figure plots the model-implied 10-year credit risk compensation (solid line) along with 2-standard-error confidence intervals (dashed lines). The standard errors are estimated using the delta method. The covariance matrix is estimated using the sample Hessian estimator calculated numerically from the joint log density.

Figure D.3. Term Structure of Term Premia

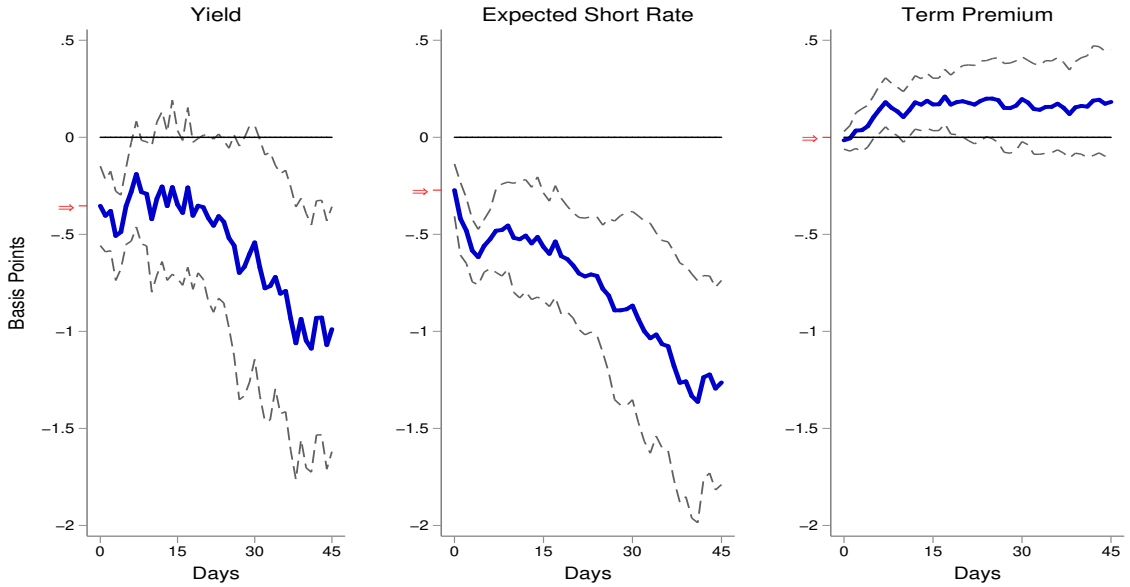


Notes: This figure plots the model-implied term premium for different maturities: 1 year (solid line), 5 years (dashed line) and 10 years (dash-dotted line).

Figure D.4. Response of the U.S. Yield Curve to a Target Surprise



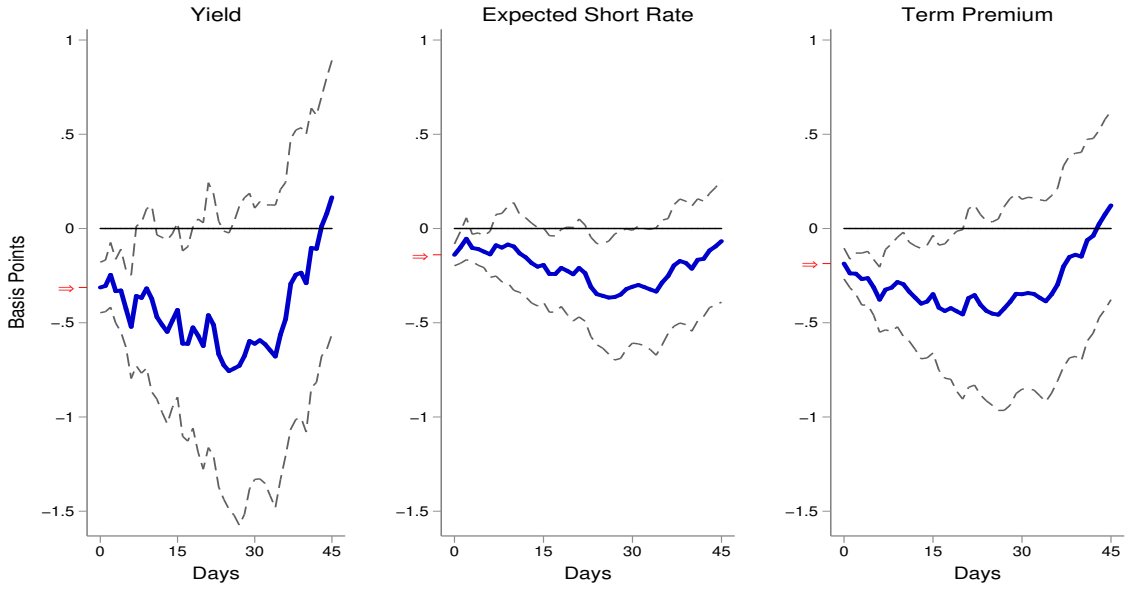
(a) 10-Year Yield



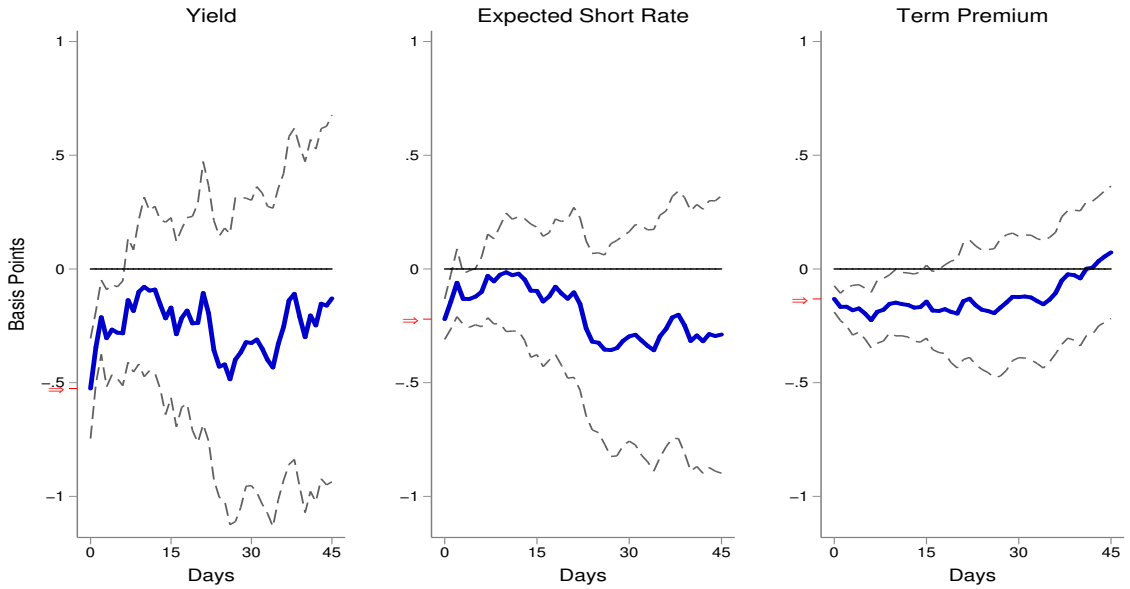
(b) 2-Year Yield

Notes: This figure shows the response following Jordà (2005) of the 10- and 2-year U.S. yields and their components to a target easing surprise of 1 basis point. U.S. yields are zero-coupon yields from Gürkaynak et al. (2007), and are decomposed into an expected future short-term interest rate and a term premium following Kim and Wright (2005). Target surprises are identified using intraday data around Fed's monetary policy announcements, see section 5.2 for details. An arrow indicates the contemporaneous ($h = 0$) effect. The 90% confidence bands are based on Driscoll–Kraay standard errors.

Figure D.5. Response of the U.S. Yield Curve to a Forward Guidance Surprise: 2000-2008



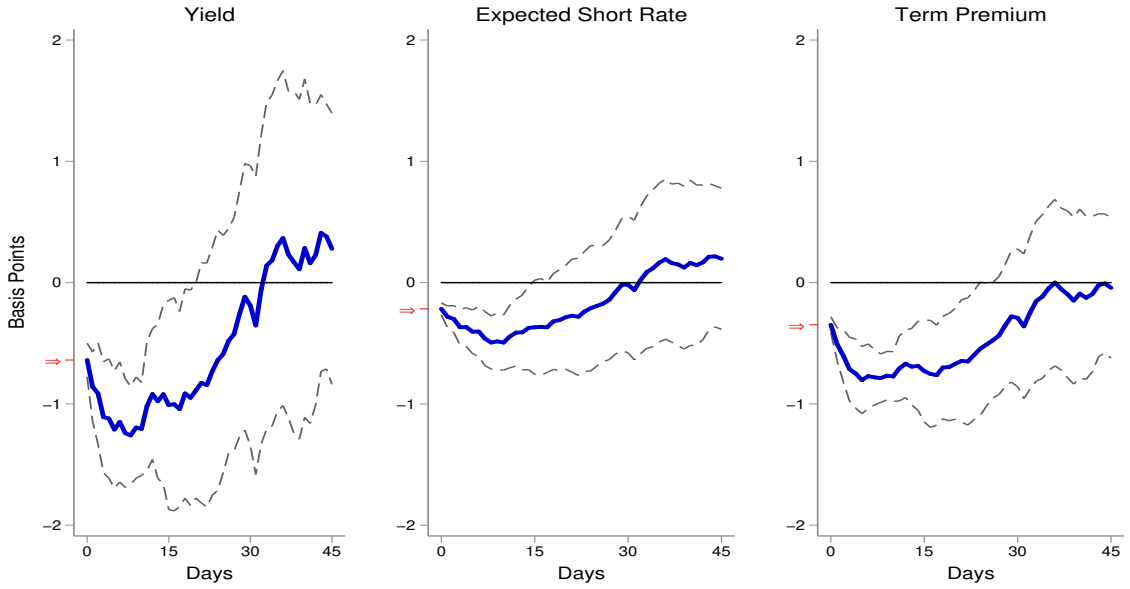
(a) 10-Year Yield



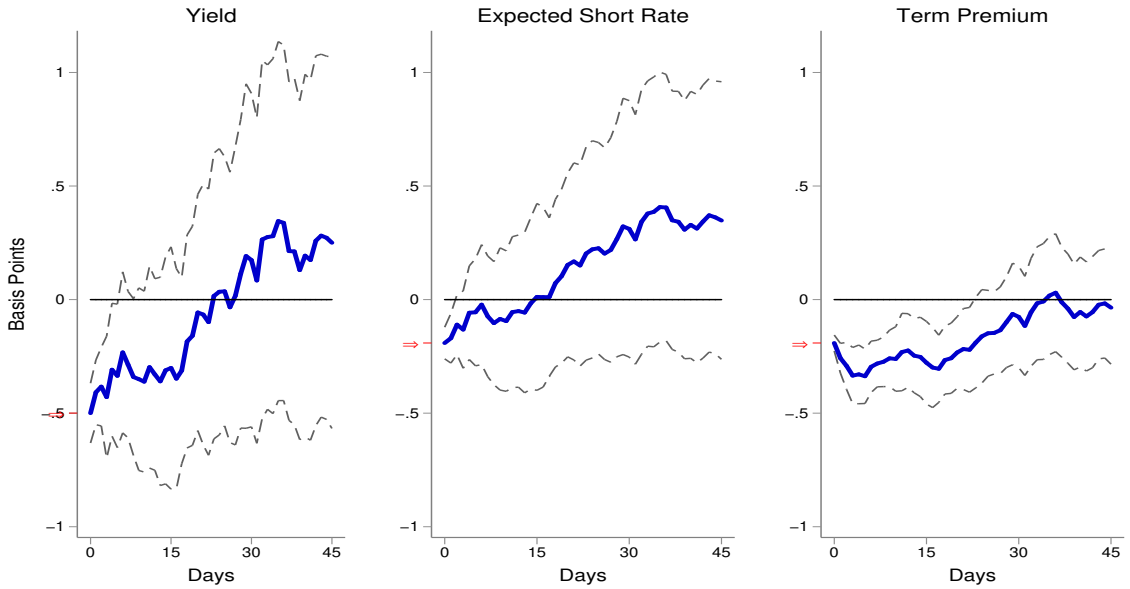
(b) 2-Year Yield

Notes: This figure shows the response following Jordà (2005) of the 10- and 2-year U.S. yields and their components to a forward guidance easing surprise of 1 basis point. U.S. yields are zero-coupon yields from Gürkaynak et al. (2007), and are decomposed into an expected future short-term interest rate and a term premium following Kim and Wright (2005). Forward guidance surprises are identified using intraday data around Fed's monetary policy announcements, see section 5.2 for details. An arrow indicates the contemporaneous ($h = 0$) effect. The 90% confidence bands are based on Driscoll–Kraay standard errors.

Figure D.6. Response of the U.S. Yield Curve to a Forward Guidance Surprise: 2008-2019



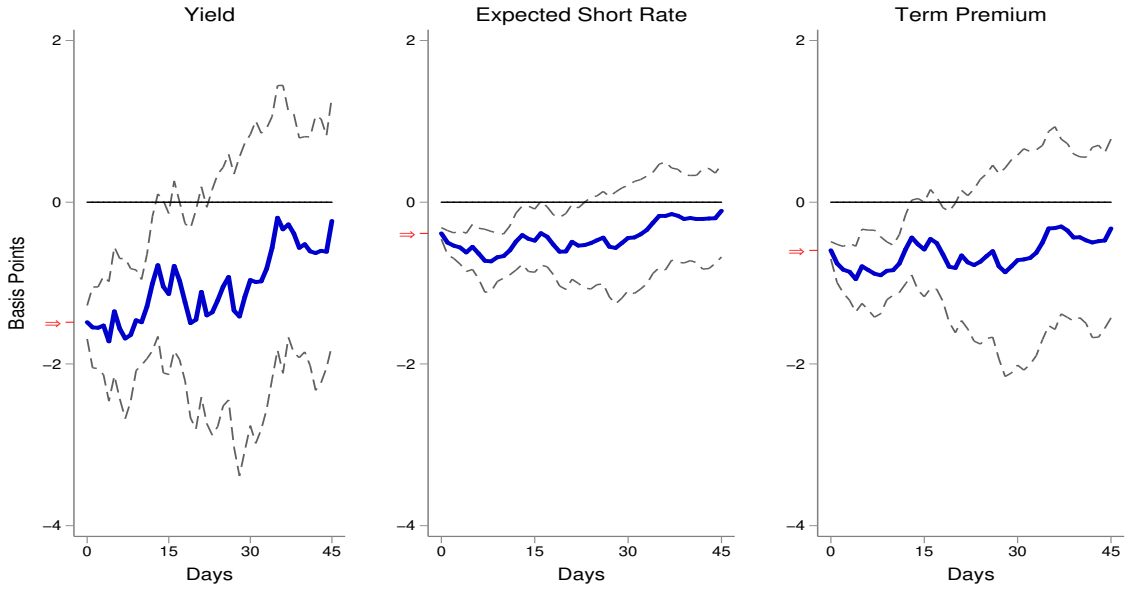
(a) 10-Year Yield



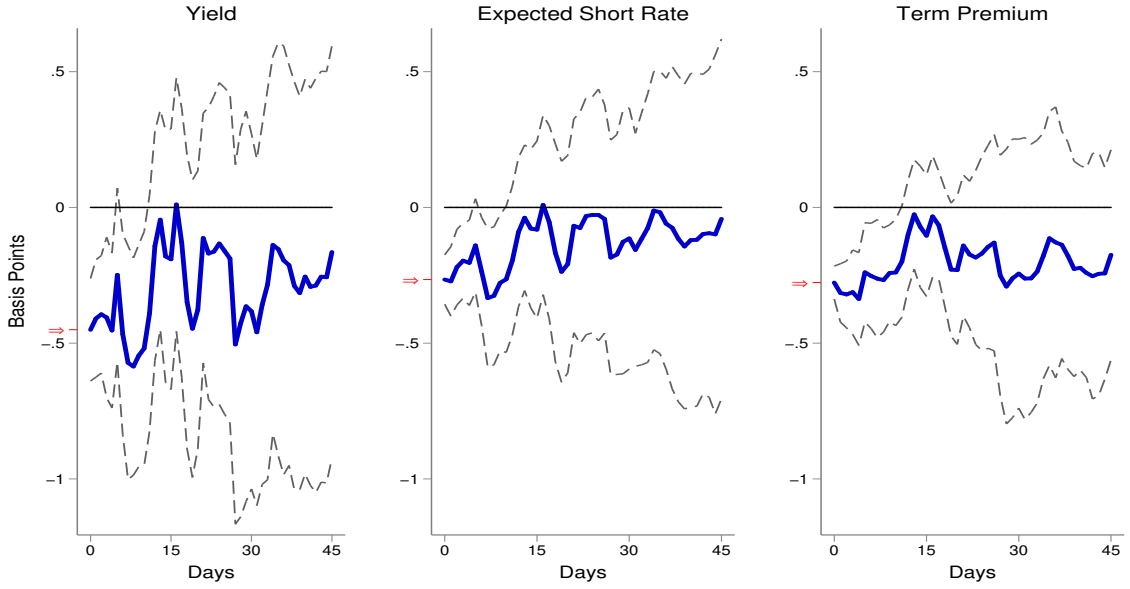
(b) 2-Year Yield

Notes: This figure shows the response following Jordà (2005) of the 10- and 2-year U.S. yields and their components to a forward guidance easing surprise of 1 basis point. U.S. yields are zero-coupon yields from Gürkaynak et al. (2007), and are decomposed into an expected future short-term interest rate and a term premium following Kim and Wright (2005). Forward guidance surprises are identified using intraday data around Fed's monetary policy announcements, see section 5.2 for details. An arrow indicates the contemporaneous ($h = 0$) effect. The 90% confidence bands are based on Driscoll–Kraay standard errors.

Figure D.7. Response of the U.S. Yield Curve to an Asset Purchase Surprise



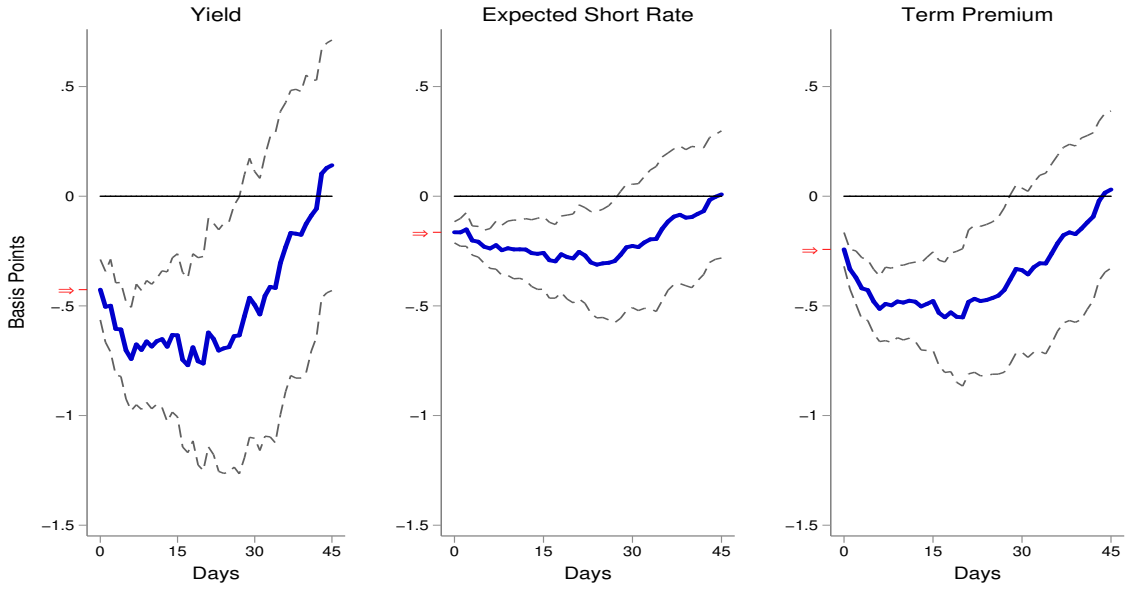
(a) 10-Year Yield



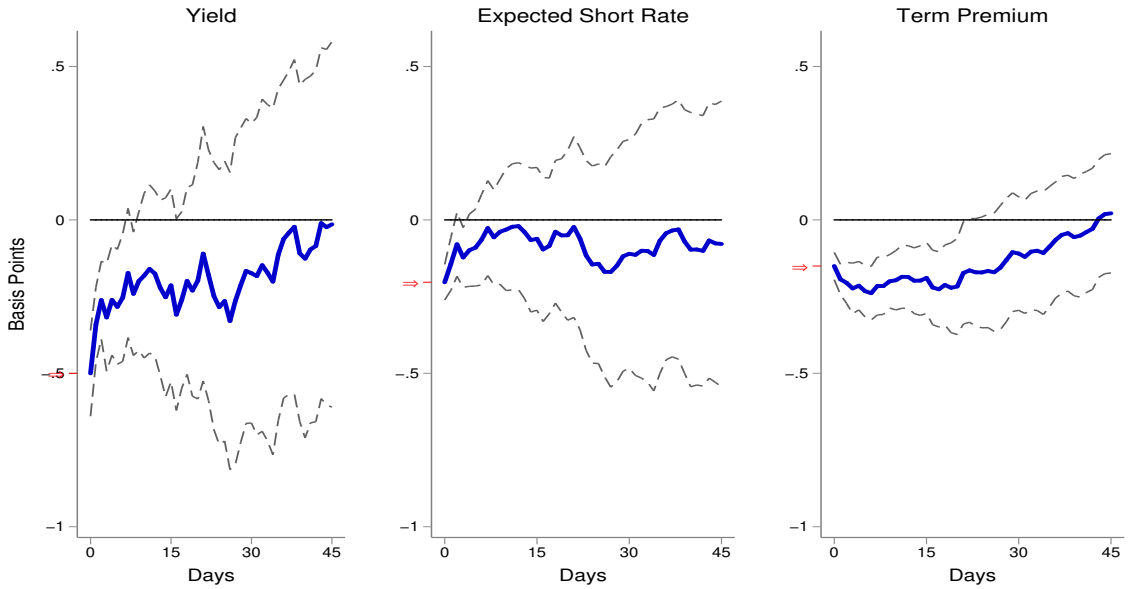
(b) 2-Year Yield

Notes: This figure shows the response following Jordà (2005) of the 10- and 2-year U.S. yields and their components to an asset purchase easing surprise of 1 basis point. U.S. yields are zero-coupon yields from Gürkaynak et al. (2007), and are decomposed into an expected future short-term interest rate and a term premium following Kim and Wright (2005). Asset purchase surprises are identified using intraday data around Fed's monetary policy announcements, see section 5.2 for details. An arrow indicates the contemporaneous ($h = 0$) effect. The 90% confidence bands are based on Driscoll–Kraay standard errors.

Figure D.8. Response of the U.S. Yield Curve to a Forward Guidance Surprise: 2000-2019



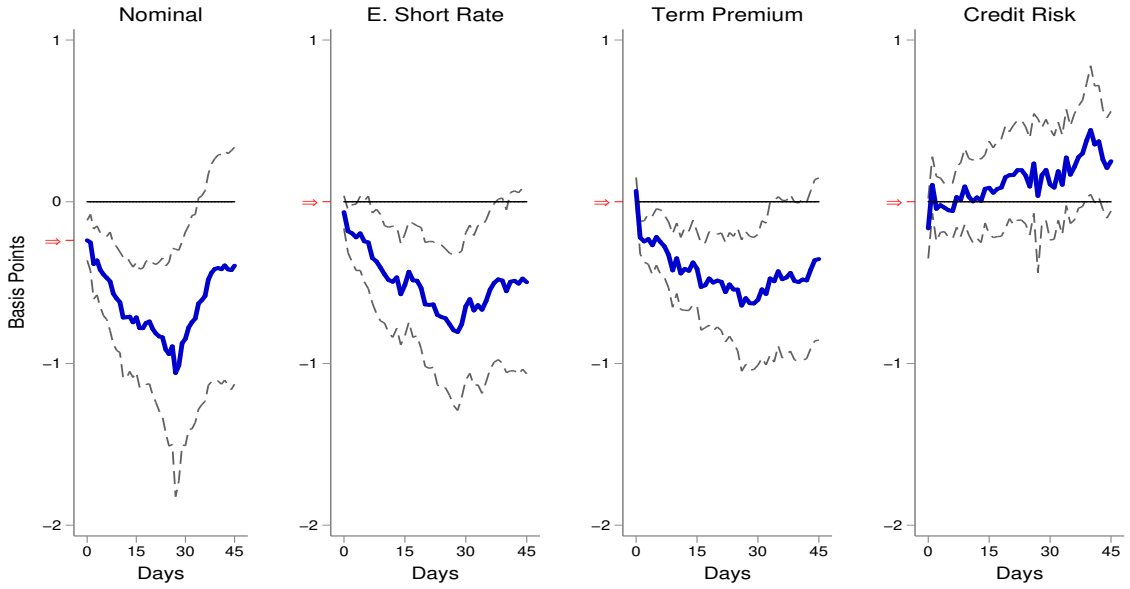
(a) 10-Year Yield



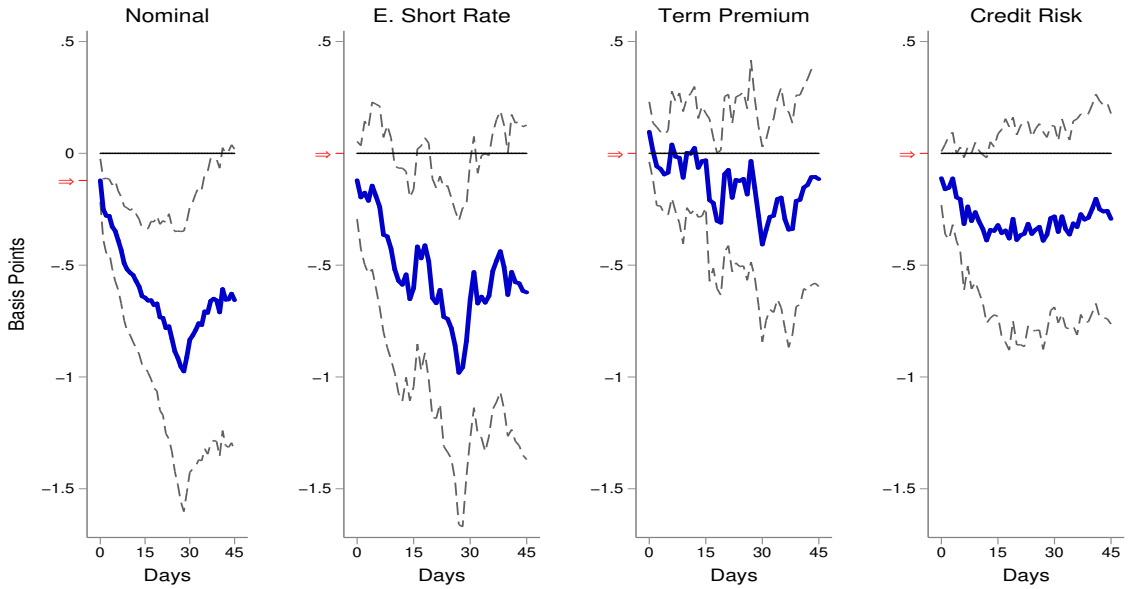
(b) 2-Year Yield

Notes: This figure shows the response following Jordà (2005) of the 10- and 2-year U.S. yields and their components to a forward guidance easing surprise of 1 basis point. U.S. yields are zero-coupon yields from Gürkaynak et al. (2007), and are decomposed into an expected future short-term interest rate and a term premium following Kim and Wright (2005). Forward guidance surprises are identified using intraday data around Fed's monetary policy announcements, see section 5.2 for details. An arrow indicates the contemporaneous ($h = 0$) effect. The 90% confidence bands are based on Driscoll–Kraay standard errors.

Figure D.9. Response of the Emerging Market Yield Curve to a Forward Guidance Surprise: 2000-2019



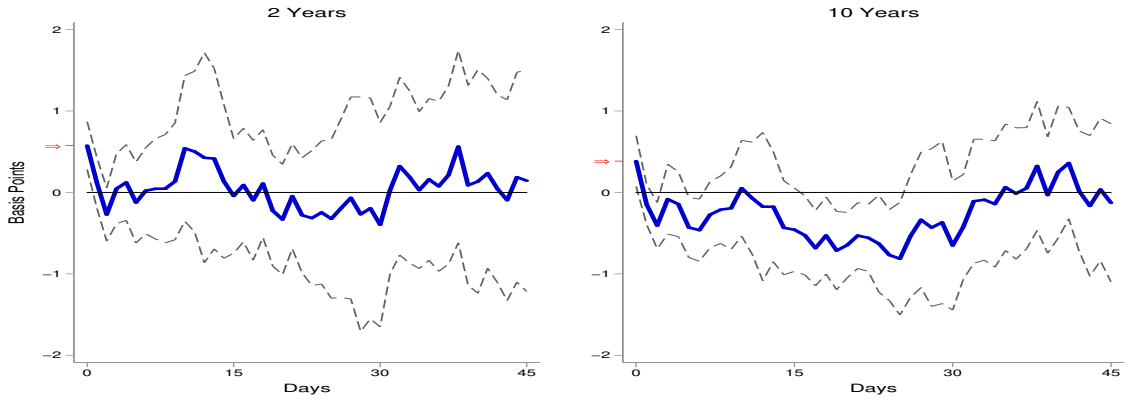
(a) 10-Year Yield



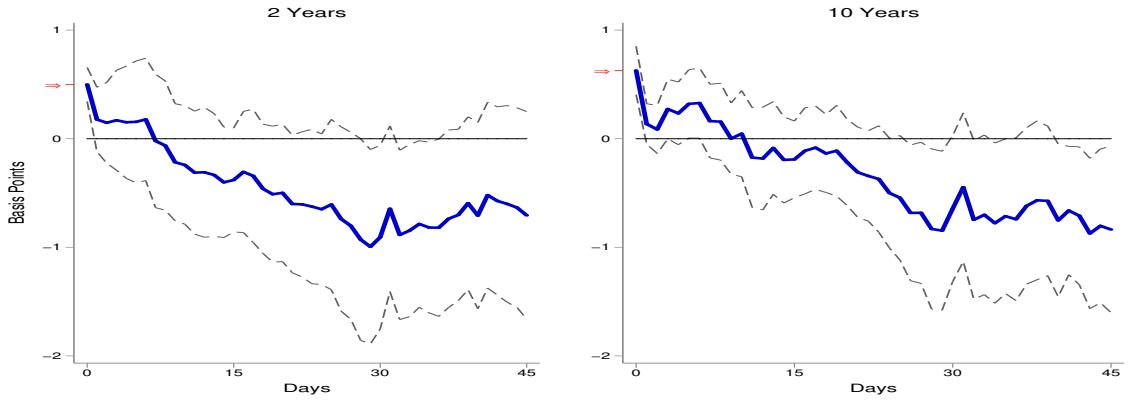
(b) 2-Year Yield

Notes: This figure shows the response following Jordà (2005) of the 10- and 2-year emerging market nominal yields and their components to a forward guidance easing surprise of 1 basis point. Nominal yields are decomposed into an expected future short-term interest rate, a term premium and credit risk compensation, see section 4 for details. Forward guidance surprises are identified using intraday data around Fed's monetary policy announcements, see section 5.2 for details. An arrow indicates the contemporaneous ($h = 0$) effect. The 90% confidence bands are based on Driscoll–Kraay standard errors.

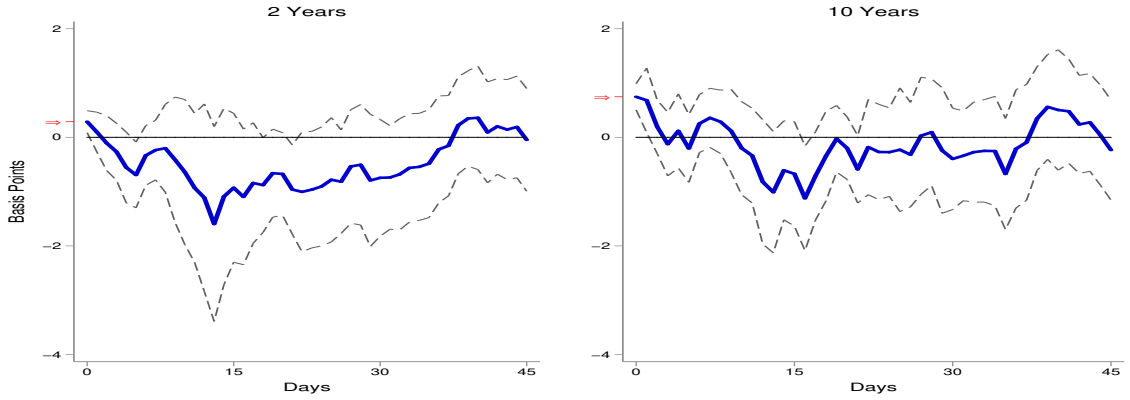
Figure D.10. Response of the Forward Premium to U.S. Monetary Policy Surprises



(a) Target Surprise: 2000-2008



(b) Forward Guidance Surprise: 2000-2019



(c) Asset Purchase Surprise: 2009-2019

Notes: This figure shows the response following Jordà (2005) of the 10- and 2-year foreign exchange forward premium of emerging markets to easing surprises in U.S. monetary policy of 1 basis point. The forward premium is calculated using cross-currency swaps, which are in turn constructed using cross-currency basis swaps and interest rate swaps, see section 2.1 for details. The target, forward guidance and asset purchase surprises are identified using intraday data around Fed's monetary policy announcements, see section 5.2 for details. An arrow indicates the contemporaneous ($h = 0$) effect. The 90% confidence bands are based on Driscoll–Kraay standard errors.