Appendix:
Emerging Market Capital Flows and U.S. Monetary Policy

A1. Data Sources and Coverage

Appendix Table 1: Data Sources

Variable	Source	Description
Private capital inflows	IMF Balance of Payments Statistics	[net private flows]= [net FDI] + [net portfolio inflows] + [net other inflows] – [IMF net lending] – [other official exceptional financing]
Federal funds rate	Federal Reserve Board	Effective federal funds rate
Fed balance sheet	Federal Reserve Board	Total assets of Federal Reserve banks
U.S. 10-year Treasury yield	Federal Reserve Economic Data (FRED)	
Long term yields	FRED, Bloomberg	Nominal yield on 10-year sovereign bond
EME credit growth	BIS	Change in total credit to the non-financial private sector
EMBI Global Spread	JPMorgan	Country-specific EMBI Global spread
Output Growth	Haver	Real GDP growth, year on year
Commodity Price Index	IMF, via FRED	IMF index of commodity prices
Policy Rates	Haver	Central bank policy rate
Shadow Federal Funds Rate	FRB Atlanta	Constructed by Xia&Wu (2015)
VIX	FRED	Implied volatility of S&P options

Data Availability Statement: The data that support the findings of this study are derived from publicly available sources: IMF Balance of Payments Statistics, the Federal Reserve Board's Financial Accounts of the United States, Federal Reserve Economic Data (FRED), the Bank for International Settlements, the Federal Reserve Bank of Atlanta, and national sources such as central banks and statistical agencies. Two series (EMBIG spreads and 10-year bond yields) were obtained from third party sources (JPMorgan and Bloomberg, respectively). Restrictions apply to the availability of these data, which were used under license. Data are available from the authors with the permission of those third party providers.

Appendix Table 2: Coverage and Summary Statistics, Sample Used in Regression Analysis

Country	Coverage Dates			Summary Statistics, Net Private Capital Flows (% of GDP) Mean	Standard Deviation
Argentina	1994:Q1	to	2017:Q1	0.1	7.08
Brazil	1996:Q1	to	2017:Q1	2.82	3.21
Chile	1999:Q2	to	2017:Q1	1.7	5.45
China	2001:Q1	to	2017:Q1	1.85	3.58
Colombia	2001:Q1	to	2017:Q1	3.64	2.22
Czech Republic	2004:Q1	to	2017:Q1	5.23	13.72
Hungary	1999:Q1	to	2017:Q1	3.85	9.49
India	2004:Q3	to	2017:Q1	3.42	2.85
Indonesia	2001:Q2	to	2017:Q1	1.19	2.84
Israel	2004:Q1	to	2017:Q1	-1.95	5.92
Korea	1994:Q1	to	2017:Q1	-0.52	4.33
Malaysia	1999:Q1	to	2017:Q1	-4.57	9.58
Mexico	1998:Q4	to	2017:Q1	3.11	2.61
Philippines	1994:Q1	to	2017:Q1	2.1	6.05
Poland	2000:Q1	to	2017:Q1	4.61	4.29
Romania	2001:Q3	to	2017:Q1	6.76	7.3
Russia	1998:Q1	to	2017:Q1	-2.13	6.7
South Africa	1998:Q1	to	2017:Q1	3.55	3.66
Thailand	1997:Q2	to	2017:Q1	-1.91	7.05
Turkey	1996:Q3	to	2017:Q1	4.08	5.43

Source: IMF BoPS; net private capital flows includes net FDI, portfolio, and other flows excluding payments support loans from the IMF or other official creditors.

A2. Regression Specification

We estimate a panel regression model using quarterly data on 19 major EMEs from 1994:Q1 to 2015:Q4. In specifying the model, we take on board the insights of the literature on the drivers of capital flows to EMEs and adopt a specification closely resembling those found in Fratszcher (2012) and Ahmed and Zlate (2014), and IMF (2016), among others. We model capital flows (measured as a share of the recipient economy's GDP) as a function of domestic growth prospects, monetary policy variables, and investor attitudes towards or perceptions of the country's riskiness:

$$\frac{Flow_{i,t}}{GDP_{i,t}} = \beta_1 Growth_Dif_{i,t} + \beta_2 \Delta Commodity_Prices_t + \beta_3 \Delta USPolicy_t + \beta_4 Rate_Dif_{i,t} + \beta_5 \Delta VIX_t + \beta_6 EMBIG_{i,t} + \beta_7 EMBIG_{i,t}^2 + \rho Flow_{i,t-1}/GDP_{i,t-1} + \theta_i + \varepsilon_{i,t}$$

This specification is consistent with the basic tenets of portfolio theory in which investment is posited to respond to differences in expected returns and risk. We capture the returns available to investors, based on the economy's ability to generate profits, with two variables: $Growth_Dif_{i,t}$, the difference between country i's annual growth rate in quarter t and average annual growth in the advanced economies,[1] and the quarter on quarter percentage change in $Commodity_Price_t$, a commodity price index constructed by the IMF. Growth differentials between EMEs and the advanced economies have been found to be a significant driver of flows both in earlier episodes of large inflows (Calvo, Liederman, and Reinhart 1996) and more recent periods (Ahmed and Zlate 2014). Our inclusion of commodity prices as a measure of the growth outlook reflects the fact that the majority of the EMEs in our sample are commodity exporters and follows Cerutti, Claessens, and Puy (2015).

We measure monetary conditions with two different variables. First, we follow Ahmed and Zlate (2014) in including $Rate_Dif_{i,t,}$ the difference between policy rate in country i at time t and the U.S. Federal Funds Rate. This measures the difference in returns on fixed income securities available in EMEs and those in advanced economies. Second, we measure U.S. monetary policy with the change in $USPolicy_t$, which is the fed funds rate prior to the first quarter of 2009 and the shadow fed funds rate constructed by Wu and Xia (2016) through the end of 2015.[2]

To capture investor perceptions of risk, we use the country-specific EMBI Global spread for country *i* during the quarter, $EMBIG_{i,t}$, allowing this variable to enter the specification in a nonlinear way to account for the fact that fluctuations in spreads at low levels may have different effects than when spreads are elevated. Our inclusion of a country-specific measure of perceived risk is in line with Chuhan, Claessens, and Mamingi (1998) who measure country-specific drivers of capital flows using a combination of bond prices and country risk ratings. We also include the VIX index to capture investors' attitude towards risk, as is common in the literature

[1] All GDP growth rates are four-quarter changes.

[2] As discussed in the body of the text, Wu and Xia (2016) use a term structure model to calculate the negative rate that bond yields imply would prevail when the Fed Funds Rate is at the zero lower bound if investors did not have the option to hold cash.

(Fratszcher 2012, Ahmed and Zlate 2014, Cerutti, Claessens, and Puy 2014). Specifically, the VIX measures the price of risk on U.S. equity markets using the implied volatility of S&P 500 options.

We also include in our specification a lagged dependent variable, reflecting the persistence or momentum of cross-border capital flows documented in prevous research (Froot, O'Connell, and Seasholes 2001, Levchenko and Mauro 2007, Bluedorn et al. 2013). Because time-invariant factors such as institutional quality and resource endowments can affect the long-term average level of inflows (Portes and Rey 2005, Besley and Mueller 2018), we allow that intercept to vary across countries with a country fixed-effect term.

The data constitute an unbalanced panel, with some countries (Argentina, Korea, Mexico, and the Philippines) having data back to 1994 while others enter the sample more recently. The policy rate differential variable has some very extreme observations, for example, values upwards of three hundred percent for countries in financial crisis. We therefore drop the largest five percent of our observations for the rate differential variable.

In order to plot the contributions of each variable to total capital flows in Chart 11, we calculate the cumulative contribution of the variable over the most recent four quarters. This includes the effects of their lagged values, working though their impact on the lagged dependent variable, which in turn influences the contemporaneous dependent variable with the coefficient ρ. Accordingly, in table 2 and chart 11 we do not explicitly identify the contribution of the lagged dependent variable. For example, the contribution of the interest rate differential to capital flows to country *i* in quarter *t* is given by

$$\widehat{Contrib_Rate_Dif}_{i,t} = \hat{\beta}_4 \sum_{k=0}^{3} \hat{\rho}^k Rate_Dif_{i,t-k}$$

In order to calculate the variables' contributions to aggregate capital flows to all the countries in our sample, we need to appropriately take into account the fact that capital flows are measured as a share of each country's GDP. Thus, for example, the contribution of the rate differential to aggregate capital flows is given by

$$Ag_\widehat{Contrib_Rate_Dif}_t = \frac{\sum_{i=1}^{N} GDP_{i,t} \times \widehat{Contrib_Rate_Dif}_{i,t}}{\sum_{i=1}^{N} GDP_{i,t}}$$

A4. Robustness

In this section, we conduct three sets of robustness checks. First we, verifying that our results are robust to changes in specification. Then show that our main results are change little when we modify our sample. Third and finally we examine the extent to which our results hold when we use different measures of capital flows to EMEs.

In Appendix Table A1, we demonstrate that our results are robust to changes in specification. Dropping commodity prices from the regression has little effect on the coefficient estimates. When we run the regression without the VIX, our key result remains in that commodity prices are more important than U.S. monetary policy in driving flows. The fourth column of Table A1 demonstrates that the VIX is significantly related to flows when we run the regression without the EMBIG spread variables. Thus our inclusion of the EMBIG spread, which is a measure of risk specific to emerging markets, explains why our findings differ from previous studies (e.g. Fratzscher 2012) which find the VIX significant. In the fifth column of the table we orthogonalize the VIX to the Fed Funds rate. This does not render the VIX statistically significant, indicating that the lack of significance is not the result of collinearity between U.S. interest rates and the VIX.

The right-most two columns in Table A3 demonstrate that our results are robust to using alternate measures of monetary policy at the zero lower bound. With the shadow rate constructed by Bauer and Rudebusch (2016) we obtain a slightly smaller estimate for the coefficient on the U.S. policy rate (column 6), while using the shadow rate constructed by Lombardi and Zhu (forthcoming) results in a somewhat higher estimate. The coefficients on the other variables do not change substantially.

Table A4 demonstrates that our results are robust to changes in the composition of our sample. In the first column, we exclude China from our estimation, and the results change very little. Nor do the coefficient estimates change substantially when we exclude the Global Financial Crisis (specifically, 2008:Q3 to 2009:Q2) from our sample.

In columns 3 and 4 we run the regression separately for those countries that are commodity exporters (column 3) and those that are not (column 4).[3] Counterintuitively, higher commodity prices (as well as higher growth differentials) significantly boost capital flows to non-commodity exporters, but not to commodity exporters; only the VIX and the EMBIG spread significantly affect flows to commodity exporters. This may reflect that commodity prices are responsive to global demand conditions which in turn affect the economic growth of non-commodity exporters, especially emerging Asian economies like China. Therefore, periods of high commodity prices are periods of high profitability and high capital flows to non-commodity exporters. Conversely, many commodity exporters, especially in Latin America, are more financially vulnerable, and thus their capital inflows may be primarily sensitive to risk indicators. In any event, as shown in Column 4, the coefficient on commodity prices is not significantly different between the two groups. More research on this is clearly required.

[3] Following Ahmed, Coulibaly, and Zlate (2017) we use the list of commodity exporters included in the World Bank's 2017 Global Economic Prospects report.

In Appendix table A5, we examine to what extent our findings hold for alternate measures of capital inflows. In column 1, the dependent variable is gross flows, which is the acquisition of assets in the recipient economy by foreigners. While the results are not dramatically different from our main regression, we do see that U.S. monetary policy and the VIX carry somewhat larger coefficients than with our main specification. This is intuitive, in that financial conditions in the advanced economies appear to matter more for investors outside of emerging markets.

In column 2 of Table A5, we see that our coefficient estimates do not change dramatically when we exclude FDI from our measure of capital flows. This is unsurprising in that FDI is by far the most stable component of capital flows. Thus most of the variation over time in flows that our model analyzes is due to fluctuations in the two other components of total private capital flows. This is further demonstrated by the regression in column 3, where the dependent variable is FDI. None of the explanatory variables are significantly related to FDI, and the R-squared of the regression falls by only 0.05, because nearly all of the variation in FDI is across countries and thus captured by the fixed effects.

Appendix Table 3: Alternate Specifications

	(1) Baseline	(2) No Commodity Prices	(3) No VIX	(4) No EMBIG	(5) Orgthogonalized VIX	(6) Alt FFR	(7) Alt FFR
Growth differential	0.179***	0.187***	0.179***	0.236***	0.179***	0.178***	0.189***
	(0.054)	(0.056)	(0.054)	(0.047)	(0.054)	(0.054)	(0.054)
Δ Commodity prices	0.075***		0.079***	0.069***	0.074***	0.079***	0.071***
	(0.021)		(0.020)	(0.022)	(0.021)	(0.021)	(0.021)
Δ Fed funds rate	-0.709**	-0.928***	-0.607	-0.751**	-0.724**		
	(0.297)	(0.295)	(0.351)	(0.286)	(0.293)		
Policy rate differential	0.088	0.090	0.087	-0.020	0.088	0.092	0.086
	(0.064)	(0.063)	(0.065)	(0.040)	(0.064)	(0.065)	(0.063)
VIX	-0.015	-0.062**		-0.048*	-0.017	-0.006	-0.025
	(0.029)	(0.028)		(0.024)	(0.028)	(0.031)	(0.027)
EMBIG Spread	-0.562**	-0.573**	-0.580**		-0.560**	-0.556**	-0.548**
	(0.231)	(0.230)	(0.220)		(0.230)	(0.234)	(0.225)
EMBIG Spread^2	0.006	0.006	0.006		0.005	0.005	0.005
	(0.004)	(0.004)	(0.003)		(0.004)	(0.004)	(0.003)
Lagged dependent var	0.262***	0.269***	0.261***	0.327***	0.262***	0.262***	0.261***
	(0.048)	(0.049)	(0.048)	(0.061)	(0.048)	(0.048)	(0.049)
Δ Shadow FFR, B&R						-0.478	
						(0.414)	
Δ Shadow FFR, L&Z							-0.920***
							(0.263)
Observations	1304	1304	1304	1304	1304	1304	1304
R^2	0.423	0.413	0.423	0.395	0.423	0.422	0.427
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses
* p¡0.10, ** p¡0.05, *** p¡0.01

Appendix Table 4: Alternate Samples

	(1) Excl. China	(2) No GFC	(3) Commodity Exporters	(4) Non-Commodity Exporters[1]	(5) Difference (3)-(4)
Growth differential	0.182***	0.168**	0.071	0.331***	-0.281**
	(0.058)	(0.061)	(0.064)	(0.075)	(0.102)
Δ Commodity prices	0.071***	0.098***	0.048	0.093***	-0.046
	(0.022)	(0.031)	(0.043)	(0.023)	(0.046)
Δ Fed funds rate	-0.699**	-0.643**	-0.085	-1.175**	1.100*
	(0.312)	(0.282)	(0.364)	(0.448)	(0.558)
Policy rate differential	0.088	0.086	0.110	0.082	0.024
	(0.064)	(0.063)	(0.127)	(0.058)	(0.129)
VIX	-0.017	-0.029	-0.085**	0.068	-0.155**
	(0.031)	(0.035)	(0.034)	(0.051)	(0.060)
EMBIG Spread	-0.556**	-0.561**	-0.443*	-1.797*	1.457
	(0.231)	(0.224)	(0.205)	(0.981)	(0.984)
EMBIG Spread^2	0.005	0.005	0.003	0.138	-0.142
	(0.004)	(0.003)	(0.003)	(0.086)	(0.088)
Lagged dependent var	0.263***	0.231***	0.191***	0.258***	0.229***
	(0.049)	(0.064)	(0.046)	(0.065)	(0.045)
Observations	1244	1224	557	687	1244
R^2	0.421	0.435	0.390	0.470	0.437
Country FE	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

[1] Excluding China.

* p¡0.10, ** p¡0.05, *** p¡0.01

Appendix Table 5: Alternate Types of Capital Flows

	(1) Gross Inflows	(2) Net Non-FDI Flows	(3) Net FDI
Growth differential	0.102	0.156**	0.037
	(0.084)	(0.057)	(0.040)
Δ Commodity prices	0.079***	0.074***	0.003
	(0.023)	(0.024)	(0.008)
Δ Fed funds rate	-1.193**	-0.441	-0.273
	(0.512)	(0.380)	(0.258)
Policy rate differential	0.063	0.102	-0.012
	(0.056)	(0.066)	(0.019)
VIX	-0.088***	-0.008	-0.005
	(0.023)	(0.033)	(0.008)
EMBIG Spread	-0.877**	-0.617**	0.024
	(0.389)	(0.229)	(0.071)
EMBIG Spread^2	0.011*	0.006*	-0.000
	(0.006)	(0.003)	(0.001)
Lagged dependent var	0.253***	0.218***	0.115*
	(0.020)	(0.045)	(0.063)
Observations	1255	1304	1304
R^2	0.448	0.296	0.396
Country FE	Yes	Yes	Yes

Standard errors in parentheses

* p¡0.10, ** p¡0.05, *** p¡0.01