APPENDIX FOR "EXCHANGE RATE RECONNECT" BY

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A.1 Details on Meese-Rogoff Forecasting Regressions

We follow the tradition established by Meese and Rogoff (1983) in evaluating the "out-of-sample" fit of a model while giving the model the realized values of the regressors. The logic of this approach is this if a model were to fail at a true out-of-sample forecast exercise (predicting changes of the exchange rate in period $t+1$ only using information available at time t) then it would be unclear whether the failure was to due to the inability to forecast the model-relevant macroeconomic variables, or whether the implied relationship between macroeconomic variables and exchange rates does not hold in the data. By using the realized value of the regressors, we can be sure that if the model fails to predict exchange rates, it is because of the latter concern. Therefore, the sense in which this is an "out-of-sample" forecasting exercise is that we restrict the coefficients to be estimated using data available prior to the period in which the exchange rate is being forecast.

We consider an out-of-sample forecasting exercise with period K quarters to estimate model coefficients and P quarters to evaluate the model's performance. We denote the end of the model evaluation period as time period T. To estimate model parameters, we regress the quarterly change on the broad dollar on US portfolio flows to provide an in-sample estimate of the model parameters:

$$\Delta e^B_{USD,t} = \alpha_t + \beta_t f_t + \varepsilon_t. \tag{A.1}$$

In our baseline specifications, we will have an estimation window K of 40 quarters and an evaluation period P of 40 quarters. If we consider our latest evaluation window, where T is 2019Q2, then we begin our exercise by running the regression in Equation A.1 from 1997Q4 to 2007Q4. We then use the estimated coefficients $\hat{\alpha}_t$ and $\hat{\beta}_t$ and the realized observation of the capital flow in period $T-P+1$ (2008Q1) to forecast the exchange rate change in this period. We calculate our forecast of next period's exchange rate as

$$\widehat{\Delta e^B_{USD,t+1}} = \hat{\alpha}_t + \hat{\beta}_t f_{t+1} \tag{A.2}$$

The model's forecast error is the difference between the realized exchange rate change and the model-implied forecast

$$\varepsilon_{t+1} = \Delta e^B_{USD,t+1} - \widehat{\Delta e^B_{USD,t+1}} \tag{A.3}$$

We then repeat the procedure for the next sample period, running the regression in equation A.1 from $t \in [T-P-K+1, T-P+1]$, and using the newly estimated coefficients and the realization of capital flows in period $T-P+2$ to forecast the exchange rate change in period $T-P+2$. We repeat this exercise until we have an out-of-sample forecast for all quarters from period $T-P$ to

T.[1]

We can then evaluate the out-of-sample forecasting performance of the model by calculating two loss functions, the root mean squared error (RMSE) and the mean absolute error (MAE) for the evaluation period ending in period T.

$$RMSE_T = \left(\frac{1}{P} \sum_{t=T-P}^{T} \varepsilon_t^2 \right)^{1/2} \tag{A.4}$$

$$MAE_T = \left(\frac{1}{P} \sum_{t=T-P}^{T} |\varepsilon_t| \right) \tag{A.5}$$

A.2 Macroeconomic Model Descriptions

To select alternative models, we follow the literature review on fundamentals-based models is surveyed in Rossi (2013). In particular, we consider four alternative sets of explanatory variables. The first, which we label "UIP" for uncovered interest rate parity, uses the lagged interest rate differential between the US and the average of the other G10 currencies.

$$\Delta e^B_{USD,t} = \alpha + \beta \left(i^{USD}_{t-1} - \overline{i^{G10}_{t-1}} \right) + \varepsilon_t \tag{A.6}$$

This arises from models assuming that the expected excess return on currency investment is zero. Data on interest rates are from the IMF's database of International Financial Statistics. For market interest rates, we use the deposit rate for all countries except the Euro Area, for which we use the 3 month interbank rate, and the UK and US for which we use the 3 month treasury bill rate.

The second, which we label the "Monetary" model includes the inflation differential between the US and the other G10 countries, as well as the growth rate difference:

$$\Delta e^B_{USD,t} = \alpha + \beta \left(\pi^{USD}_t - \overline{\pi^{G10}_t} \right) + \gamma \left(\Delta y^{USD}_t - \overline{\Delta y^{G10}_t} \right) + \varepsilon_t \tag{A.7}$$

This is motivated by the classical monetary models of Dornbusch (1976) and Frankel (1979), where we replace money stock differentials with inflation differentials.

The third set of fundamentals, which we label "Taylor Rule" includes in the inflation differential between the US and the other G10 countries, alongside the output gap differential:

$$\Delta e^B_{USD,t} = \alpha + \beta \left(\pi^{USD}_t - \overline{\pi^{G10}_t} \right) + \gamma \left(\tilde{y}^{USD}_t - \overline{\tilde{y}^{G10}_t} \right) + \varepsilon_t \tag{A.8}$$

This is motivated by the empirical framework introduced in Molodtsova and Papell (2009), wherein a strict adherence to the UIP condition combined with adherence to a Taylor rule would make changes in the inflation and output gap differentials sufficient statistics for exchange rate depreciations. The fourth set of fundamentals we consider, which we label "Backus-Smith" uses the mean inflation and consumption growth differential between the US and the other G10 countries.

[1] This is a rolling window estimation scheme, meaning that we keep the number of observations used to estimate Equation A.1 fixed.

$$\Delta e^{B}_{USD,t} = \alpha + \beta\left(\pi^{USD}_t - \overline{\pi^{G10}_t}\right) + \gamma\left(\Delta c^{USD}_t - \overline{\Delta c^{G10}_t}\right) + +\varepsilon_t \tag{A.9}$$

The condition that the (real) exchange rate change is pinned down by the ratio of relative consumption growth is an equilibrium condition of open economy models with complete asset markets and CRRA preferences as in Backus and Smith (1993). We adopt a more flexible empirical implementation of this model, by not restricting the impact of relative prices on exchange rates to be one, and then estimate the nominal exchange rate appreciation.

A.3 Measuring Capital Flows

A.3.1 Balance of Payments

The primary measure of a capital flow we consider in this paper is the quarterly flow as a percentage of the lagged stock. We define this flow as $f_{a,i,d,t}$ where:

$$f_{a,i,d,t} \equiv \frac{F_{a,i,d,t}}{Q_{a,i,d,t-1}}$$

where a denotes the asset class and refers to the various BoP categories considered, i denotes the country investing or receiving the invest, t denotes the quarter, and d denotes the direction of the flow. The direction of the flow d can either be purchases of foreign securities (assets) or foreign purchases of domestic securities (liabilities). F denotes net purchases of securities during quarter. Q denotes the outstanding stock of securities at end of quarter. If the stock Q is reported annually in the IIP, we linearly interpolate the series to approximate the quarterly values. The U.S. IIP series for the stock of foreign bond positions is reported quarterly beginning in the fourth quarter of 2005, and therefore all observations after 2006 do not use any interpolation.

A.3.2 Morningstar

To study capital flows at the micro-level, we use data from Morningstar covering position-level data collected from mutual funds domiciled in over 50 countries. These data are collected from open-end funds (including exchange traded funds) that invest in a range of securities and derivatives. Reporting is typically monthly and, when not, is almost always quarterly. The dataset contains millions of individual positions, and by December 2017 we observe 11.5 million unique positions (6 million equity and 5.5 million bond positions) held by approximately 40,000 mutual funds worldwide. For more details on this data, see Maggiori et al. (2019a).

Each reported position contains information on the domicile of the mutual fund, the currency denomination of the security, the country in which the issuer is domiciled, the local currency price of the security, and the number of securities held since the last report. We use the procedure introduced in Coppola et al. (2019) to map the issuer of each security to the nationality of its ultimate parent. As such, we know the market values of every invested position of each fund in each reporting month. The change in the market value of each position (in US dollars) between two points in time is made up of three components - the foreign currency appreciation (if the asset is denominated in foreign currency), the local currency price appreciation of the asset, and the purchase or sale of the security at the US dollar price at the time of the transaction. We focus on the third component - the capital flow.

We measure the capital flow at the security level by taking each recorded sale or purchase of an individual security held by a fund, and multiplying this change in quantity by the price of the security (converted to US dollars) in the prior month, before the transaction occurred. While this method is the only way to ensure we exclude the two other aforementioned components, we note that we necessarily will measure the capital flow with error, since we do not observe the local currency price of the security at the time of the transaction, nor do we observe the exchange rate at the time of the transaction.

$$\begin{aligned} P_{s,t} &= \text{Price of security s, in US dollars, at time t} \\ N_{s,z,t} &= \text{Number of shares of security s, held by fund } z \text{ at time t} \\ \Delta N_{s,z,t} &= N_{s,z,t} - N_{s,z,t-1} \\ F_{s,z,t} &= P_{s,t-1} \cdot \Delta N_{s,z,t} \\ Q_{s,z,t} &= P_{s,t} \cdot N_{s,z,t} \end{aligned}$$

We are able to use this method to construct the capital flow for approximately 97% of positions, though we lack the information to do so in some cases (e.g. the first time a fund purchases a security) since we do not observe the reported price for a prior month. This means that in the remaining 3% of cases, we must include the local currency price appreciation in our measure of capital flows, though we never include the foreign currency appreciation.

After constructing this capital flow for each position, we then aggregate these flows to various levels of analysis. The most detailed level is broken down to flows within each asset class (bond or equity), by the currency of the security, the source country (the domicile of the investing fund), and the destination country (the domicile of the ultimate parent issuer of the security). For example, for our benchmark regression using capital flows presented in Figure 3a, the set $\mathscr{Z}_i$ includes all securities which are bonds, bought or sold by funds domiciled in the United States, and issued by destination countries which are not the United States.

$$\begin{aligned} F_{\mathscr{Z},t} &\equiv \sum_{z \in \mathscr{Z}_i} F_{s,z,t} \\ Q_{\mathscr{Z},t} &= \sum_{z \in \mathscr{Z}_i} Q_{s,z,t} \end{aligned}$$

For all analysis except where noted, we measure these capital flows in percentage growth terms, compared to the market value of investment in the prior quarter. When we refer to a 1% capital flow, we will be referring to a value of 0.01 for the following measure:

$$f_{\mathscr{Z},t} \equiv \frac{F_{\mathscr{Z},t}}{Q_{\mathscr{Z},t-1}} = \frac{\sum_{z \in \mathscr{Z}_i} P_{s,t-1} \cdot \Delta N_{s,z,t}}{\sum_{z \in \mathscr{Z}_i} P_{s,t-1} \cdot N_{s,z,t-1}}$$

A.4 Funding the purchases of foreign bonds

Purchases of foreign bonds by U.S. mutual funds must be financed either by selling other securities or from net flows into the mutual fund sector. In Appendix Table A.9, we show that it is flows into and out of the mutual fund sector, rather than purchases and sales of domestic securities by the funds themselves, that coincide with these foreign bond flows. To demonstrate this, we run regressions of the following form:

$$F_t = \alpha + \beta F^B_{USA,foreign,t} + \varepsilon_t$$

where $F^B_{USA,foreign,t}$ is the quarterly purchase of foreign issued bonds by the U.S. investor and F_t is a particular measure of flows from U.S. mutual funds. All variables are measured in US dollars.

The first column, labeled “Flows into Funds," measures the total dollar value of flows into and out of the US-domiciled mutual fund sector. The regression coefficient of 1.38 on U.S. Foreign Bond Purchases means that for every $1 of foreign bond purchases by U.S. mutual funds, an average of $1.38 flows into the U.S. mutual fund sector.

The next four columns look within the U.S. mutual fund sector and ask whether fund holdings of all U.S. bonds, U.S. Sovereign Bonds, U.S. Corporate Bonds, U.S. Other Bonds (i.e. ABS, MBS), and equities change with purchases or sales of foreign bonds. When U.S. mutual funds purchase $1 of foreign bonds, they also buy 40 cents worth of corporate bonds. We also find statistically insignificant sales of sovereign and other bonds, as well as purchases of equities. We therefore conclude the bulk of U.S. flows into and out of foreign bonds is largely financed with flows into and out of the mutual fund sector, rather than sales or purchases of other asset classes by the mutual funds themselves.

Appendix Tables

Table A.1: G10 Bilateral Exchange Rates and Change in GZ Spreads, 2007-2018

R^2	AUD	CAD	CHF	EUR	GBP	JPY	NOK	NZD	SEK	USD
AUD		2	24	17	5	34	1	4	7	23
CAD	2		14	9	2	36	0	0	2	30
CHF	24	14		4	7	12	20	11	10	1
EUR	17	9	4		2	19	17	5	6	7
GBP	5	2	7	2		25	3	1	0	20
JPY	34	36	12	19	25		35	22	26	9
NOK	1	0	20	17	3	35		1	5	24
NZD	4	0	11	5	1	22	1		1	12
SEK	7	2	10	6	0	26	5	1		13
USD	23	30	1	7	20	9	24	12	13	
Mean	13	10	11	10	7	24	12	6	8	16

Notes: This table reports the R^2 of regressions of the form $\Delta e_{i,j,t} = \alpha + \beta f_t + \varepsilon_t$, where $\Delta e_{i,j,t}$ is the monthly change in the bilateral exchange rate of the currency in row i and column j, and f_t is the change in U.S. corporate bond spreads, taken from Gilchrist and Zakrajšek (2012). Exchange rate data are from Thomson Reuters Datastream and bond position data are from the IMF Balance of Payments database. Data is measured monthly from 2007-2018.

Table A.2: G10 Bilateral Exchange Rates and Change in U.S. Corporate Bond Spreads, 1977-2006

R^2	AUD	CAD	CHF	EUR	GBP	JPY	NOK	NZD	SEK	USD
AUD		2	6	5	7	5	5	0	3	5
CAD	2		3	2	3	2	2	1	1	4
CHF	6	3		1	0	0	1	6	2	1
EUR	5	2	1		0	0	0	5	1	0
GBP	7	3	0	0		0	1	6	1	1
JPY	5	2	0	0	0		0	4	0	0
NOK	5	2	1	0	1	0		4	0	0
NZD	0	1	6	5	6	4	4		3	3
SEK	3	1	2	1	1	0	0	3		0
USD	5	4	1	0	1	0	0	3	0	
Mean	4	2	2	2	2	1	1	4	1	2

Notes: This table reports the R^2 of regressions of the form $\Delta e_{i,j,t} = \alpha + \beta f_t + \varepsilon_t$, where $\Delta e_{i,j,t}$ is the quarterly change in the bilateral exchange rate of the currency in row i and column j, and f_t is the change in U.S. corporate bond spreads, taken from Gilchrist and Zakrajšek (2012). Exchange rate data are from Thomson Reuters Datastream and bond position data are from the IMF Balance of Payments database. Data is measured monthly from 2007-2018.

Table A.3: US Dollar and Gross and Net Capital Flows

Panel A: 1977-2006								
Purchaser	Issuer	Asset Class	Δe^B_{USD}	Δe^B_{USD}	Δe^B_{USD}	Δe^B_{USD}	Δe^B_{USD}	Δe^B_{USD}
Net IIP (US - RoW)	Net IIP (US - RoW)	Bond	0.21					
			(0.11)					
		Equity		-0.11				
				(0.16)				
U.S.	RoW	Bond			0.091			
					(0.13)			
		Equity				-0.23		
						(0.17)		
RoW	U.S.	Bond					0.30	
							(0.16)	
		Equity						-0.48
								(0.28)
Observations			120	120	120	120	120	120
R^2			0.03	0.01	0.00	0.01	0.02	0.03
Panel B: 2007-2019								
Purchaser	Issuer	Asset Class	Δe^B_{USD}	Δe^B_{USD}	Δe^B_{USD}	Δe^B_{USD}	Δe^B_{USD}	Δe^B_{USD}
Net IIP (US - RoW)	Net IIP (US - RoW)	Bond	-0.12					
			(0.36)					
		Equity		0.62				
				(0.28)				
U.S.	RoW	Bond			0.85			
					(0.16)			
		Equity				0.30		
						(0.70)		
RoW	U.S.	Bond					0.91	
							(0.43)	
		Equity						1.05
								(0.35)
Observations			50	50	50	50	50	50
R^2			0.00	0.05	0.32	0.01	0.08	0.14

Notes: This table reports regressions results of the form $\Delta e^B_{USD,t} = \alpha + \beta f_t + \varepsilon_t$, where $\Delta e^B_{USD,t}$ is the quarterly change in the broad US dollar and f_t is a particular measure of capital flows described in the first three columns of the table. Purchases of bonds and equities are normalized by the stock of holdings of that asset at the end of the previous quarter. Net positions are normalized by the sum of the stock of the U.S. position in foreign assets and the foreign position in U.S. assets for each type of security. Panel (A) reports regression results from 1977Q1-2006Q4 and Panel (B) reports regression results from 2007Q1-2019Q2. Exchange rate data are from Thomson Reuters Datastream and international investment position data are from the IMF Balance of Payments.

Table A.4: Broad Dollar, Capital Flows, and Macro Fundamentals

	Δe^B_{USD}	Δe^B_{USD}	Δe^B_{USD}	Δe^B_{USD}	Δe^B_{USD}
Model		UIP	Backus-Smith	Monetary	Taylor Rule
Panel A: 1977-2006					
U.S. Flows	0.086				
	(0.14)				
$i^{US}_{t-1} - \bar{i}_{t-1}$		-0.53			
		(0.22)			
$\pi^{US}_t - \bar{\pi}_t$			-2.5	-0.32	-0.48
			(1.3)	(0.80)	(0.71)
$\Delta c^{US}_t - \overline{\Delta c}_t$			1.1		
			(1.3)		
$\Delta y^{US}_t - \overline{\Delta y}_t$				0.25	
				(0.47)	
$\tilde{y}^{US}_t - \bar{\tilde{y}}_t$					0.83
					(0.33)
Obs.	108	108	47	108	108
R^2	0.00	0.07	0.10	0.00	0.08
Panel B: 2007Q1-2019Q2					
U.S. Flows	0.85				
	(0.16)				
$i^{US}_{t-1} - \bar{i}_{t-1}$		1.3			
		(0.61)			
$\pi^{US}_t - \bar{\pi}_t$			2.5	2.8	2.9
			(0.65)	(0.57)	(0.54)
$\Delta c^{US}_t - \overline{\Delta c}_t$			-0.75		
			(1.28)		
$\Delta y^{US}_t - \overline{\Delta y}_t$				0.50	
				(1.17)	
$\tilde{y}^{US}_t - \bar{\tilde{y}}_t$					0.0063
					(0.099)
Obs.	50	50	50	50	50
R^2	0.32	0.08	0.15	0.15	0.15

Notes: This table reports regressions results of the form $\Delta e^B_{USD,t} = \alpha + \beta X_t + \varepsilon_t$, where $\Delta e^B_{USD,t}$ is the quarterly change in the broad US dollar and X_t captures various macroeconomic variables. For our baseline regressions, X_t is "U.S. Flows," net purchases of foreign bonds by the United States, normalized as a percentage of the value of the United States' foreign bond investment at the end of the prior quarter. For the "UIP" model, X_t is the lagged interest rate spread between the United States and the average of the other G10 countries. For the "Monetary" model, X_t contains two variables, the mean inflation difference between the United States and the other G10 countries and the mean growth difference between the United States and the other G10 countries. For "Taylor Rule", X_t contains the (relative value of) the two variables in a Taylor Rule, the mean inflation difference between the United States and the other G10 countries and the mean output gap differential between the United States and the other G10 countries. All macroeconomic variables are computed as the difference between the quarterly observation for the United States versus the average of all other G10 countries. Panel (A) reports regression results from 1977:Q1-2006:Q4 and Panel (B) reports regression results from 2007:Q1-2019:Q2. Exchange rate data are from Thomson Reuters Datastream, international investment data are from the IMF Balance of Payments, and macroeconomic data are from the IMF International Financial Statistics Database.

Table A.5: Meese-Rogoff Out Of Sample Model Performance

		Monthly				Quarterly			
		All Periods		Without Crisis		All Periods		Without Crisis	
Model		MAE	RMSE	MAE	RMSE	MAE	RMSE	MAE	RMSE
Global Return Factor	Ratio	0.75	0.71	0.78	0.73	0.78	0.74	0.86	0.82
	p-value	0.00	0.00	0.00	0.00	0.08	0.06	0.14	0.05
GZ Spread	Ratio	0.94	0.97	0.93	0.94	0.96	0.93	0.99	0.96
	p-value	0.03	0.37	0.01	0.00	0.42	0.20	0.78	0.33
S&P500 Log Return	Ratio	0.88	0.86	0.90	0.88	1.05	0.99	1.08	1.02
	p-value	0.05	0.02	0.12	0.05	0.66	0.89	0.44	0.84
Log VXO	Ratio	0.97	0.95	0.97	0.95	1.07	1.01	1.08	1.02
	p-value	0.54	0.21	0.61	0.30	0.61	0.92	0.58	0.87
Treasury Premium	Ratio	0.96	0.96	0.95	0.95	1.01	0.95	1.02	0.96
	p-value	0.25	0.24	0.26	0.26	0.95	0.61	0.85	0.71
Intermediary Returns	Ratio	0.91	0.88	0.94	0.92	0.98	0.99	0.98	1.00
	p-value	0.19	0.13	0.40	0.29	0.55	0.68	0.50	0.83
US Foreign Bond Purchases	Ratio					0.94	0.93	0.97	0.96
	p-value					0.35	0.22	0.54	0.37
Uncovered Interest Parity	Ratio					1.03	1.04	1.04	1.05
	p-value					0.38	0.18	0.30	0.08
Backus-Smith	Ratio					0.98	0.99	0.99	1.00
	p-value					0.65	0.60	0.81	0.85
Monetary	Ratio					0.98	1.00	0.99	1.01
	p-value					0.60	0.94	0.72	0.80
Taylor	Ratio					1.02	1.03	1.03	1.05
	p-value					0.81	0.62	0.69	0.39

Notes: This table reports the performance of exchange rate forecast models for the broad US dollar over the most recent 10 year sample for which data is available, using the standard Meese-Rogoff forecasting benchmark. We report the ratio of the model's root mean squared forecast error relative to a random walk, and the p-value of a Diebold-Mariano test for the performance of the model. We measure performance according to two penalty criteria - the mean absolute error (MAE) and the root mean squared error (RMSE). Each observation represents a 10 year model evaluation period (120 periods for the monthly model, 40 periods for the quarterly model), using 10 year estimation windows for the parameters, as described in Appendix Section A.1. The columns labelled "Without Crisis" exclude 2008:Q1 - 2009:Q2 from the evaluation period.

Table A.6: Bilateral Exchange Rates and Risk Factors

Panel A: Pre-2007		AUD	CAD	CHF	EUR	GBP	JPY	NOK	NZD	SEK
	β	-0.065	-0.035	-0.012	-0.021	-0.034	-0.028	-0.032	-0.064	-0.040
Global Return Factor	SE	0.008	0.006	0.015	0.013	0.014	0.014	0.010	0.009	0.013
	R^2	17	17	0	2	4	2	4	13	5
	β	0.045	0.020	-0.025	-0.013	-0.020	-0.013	-0.007	0.041	-0.001
GZ Spread	SE	0.011	0.006	0.012	0.011	0.010	0.011	0.013	0.012	0.012
	R^2	5	4	1	0	1	0	0	3	0
	β	-0.112	-0.099	0.085	0.045	0.027	-0.002	0.009	-0.068	-0.015
S&P 500	SE	0.036	0.019	0.046	0.041	0.039	0.047	0.038	0.046	0.046
	R^2	3	8	1	0	0	0	0	1	0
	β	0.039	0.017	-0.045	-0.027	-0.025	-0.024	-0.020	0.029	-0.013
Log VXO	SE	0.010	0.006	0.010	0.009	0.009	0.015	0.009	0.013	0.010
	R^2	6	4	5	2	2	1	1	3	1
	β	0.018	0.018	-0.004	-0.005	-0.003	0.037	0.011	0.021	-0.006
Treasury Premium	SE	0.034	0.016	0.027	0.025	0.023	0.037	0.024	0.033	0.023
	R^2	0	1	0	0	0	1	0	0	0
	β	-0.064	-0.053	0.086	0.061	0.042	0.023	0.035	-0.032	0.044
Intermediary Returns	SE	0.025	0.012	0.029	0.025	0.025	0.033	0.025	0.031	0.038
	R^2	2	5	2	2	1	0	1	0	1
	β	0.065	-0.046	-0.192	-0.102	-0.333	0.095	-0.084	-0.194	-0.024
U.S. Foreign Bond Purchases	SE	0.174	0.127	0.248	0.197	0.170	0.251	0.176	0.209	0.207
	R^2	0	0	0	0	2	0	0	1	0
Panel B: Post-2007		AUD	CAD	CHF	EUR	GBP	JPY	NOK	NZD	SEK
	β	-0.101	-0.075	-0.043	-0.057	-0.053	0.019	-0.082	-0.094	-0.079
Global Return Factor	SE	0.008	0.006	0.010	0.008	0.005	0.009	0.008	0.013	0.009
	R^2	55	56	16	31	34	4	49	42	46
	β	0.060	0.050	0.010	0.025	0.037	-0.027	0.053	0.045	0.039
GZ Spread	SE	0.016	0.009	0.011	0.013	0.006	0.007	0.008	0.019	0.011
	R^2	23	30	1	7	20	9	24	12	13
	β	-0.574	-0.435	-0.215	-0.333	-0.276	0.159	-0.454	-0.584	-0.470
S&P 500	SE	0.084	0.055	0.067	0.063	0.052	0.070	0.067	0.075	0.064
	R^2	38	41	9	23	20	6	32	35	35
	β	0.077	0.052	0.028	0.045	0.028	-0.027	0.061	0.076	0.056
Log VXO	SE	0.015	0.010	0.013	0.012	0.010	0.009	0.012	0.014	0.013
	R^2	21	18	5	13	6	5	18	18	15
	β	0.119	0.056	0.096	0.100	0.051	-0.020	0.102	0.107	0.098
Treasury Premium	SE	0.028	0.020	0.033	0.029	0.028	0.025	0.025	0.023	0.026
	R^2	12	5	12	15	5	1	11	9	11
	β	-0.277	-0.227	-0.099	-0.173	-0.179	0.123	-0.225	-0.295	-0.256
Intermediary Returns	SE	0.056	0.038	0.046	0.045	0.034	0.040	0.045	0.064	0.041
	R^2	25	31	5	17	23	10	22	25	29
	β	-1.36	-1.23	-.356	-0.660	-1.12	0.481	-1.36	-1.07	-1.11
U.S. Foreign Bond Purchases	SE	0.287	0.193	0.276	0.221	0.336	0.354	0.238	0.254	0.228
	R^2	35	45	5	14	36	5	37	26	29

Notes: This table reports regressions results of the form $\Delta e^{\$}_{i,t} = \alpha + \beta X_t + \varepsilon_t$, where $\Delta e^{\$}_{i,t}$ is the change in a bilateral exchange rate with the US dollar and X_t corresponds to the row label. "Global Return Factor," X_t is the global factor in world asset prices constructed by Miranda-Agrippino and Rey (2018). "GZ Spread," X_t is the U.S. corporate bond credit spread, taken from Gilchrist and Zakrajšek (2012). "S&P500," X_t is the log total return on the S&P500 index. "VXO," X_t is the change in the log transformation of an index of implied volatility on the stocks in the S&P100, from the CBOE. "Treasury Premium," X_t is the change in the one-year Treasury Premium, the average one-year tenor CIP deviation between developed country government bonds and U.S. Treasuries from Du et al. (2018). "Intermediary Returns," X_t is the value-weighted return on a portfolio of NY Fed primary dealers' holding companies and is taken from He et al. (2017). "U.S. Foreign Bond Purchases" is U.S. net purchases of foreign bonds, normalized as a percentage of the U.S. value of foreign bond investment at the end of the prior quarter. All regressions are run at a monthly frequency, except for U.S. Foreign Bond Purchases which is run quarterly.

Table A.7: Broad Exchange Rates and Risk Factors

Panel A: Pre-2007		AUD	CAD	CHF	EUR	GBP	JPY	NOK	NZD	SEK	USD
	β	-0.035	-0.002	0.023	0.014	0.000	0.005	0.001	-0.035	-0.008	0.037
Global Return Factor	SE	0.010	0.006	0.009	0.007	0.009	0.010	0.005	0.011	0.008	0.009
	R^2	5	0	4	2	0	0	0	5	1	9
	β	0.047	0.020	-0.030	-0.018	-0.025	-0.018	-0.011	0.042	-0.004	-0.003
GZ Spread	SE	0.010	0.008	0.009	0.007	0.007	0.009	0.009	0.010	0.007	0.008
	R^2	6	2	3	2	3	1	1	5	0	0
	β	-0.110	-0.095	0.109	0.064	0.044	0.012	0.024	-0.061	-0.002	0.015
S&P 500	SE	0.040	0.025	0.032	0.024	0.028	0.038	0.023	0.049	0.033	0.028
	R^2	3	3	4	3	1	0	0	1	0	0
	β	0.051	0.027	-0.043	-0.022	-0.020	-0.019	-0.015	0.039	-0.007	0.008
Log VXO	SE	0.009	0.007	0.006	0.005	0.008	0.013	0.006	0.013	0.007	0.007
	R^2	9	4	11	5	3	1	2	7	0	0
	β	0.010	0.010	-0.014	-0.016	-0.013	0.031	0.003	0.014	-0.016	-0.010
Treasury Premium	SE	0.027	0.017	0.024	0.017	0.021	0.034	0.018	0.027	0.015	0.018
	R^2	0	0	1	1	0	1	0	0	1	0
	β	-0.087	-0.075	0.080	0.052	0.030	0.010	0.023	-0.051	0.033	-0.016
Intermediary Returns	SE	0.025	0.018	0.021	0.015	0.020	0.028	0.015	0.030	0.030	0.018
	R^2	4	5	4	4	1	0	1	1	1	0
	β	0.163	0.040	-0.123	-0.023	-0.279	0.196	-0.003	-0.125	0.064	0.091
U.S. Foreign Bond Purchases	SE	0.174	0.164	0.190	0.121	0.113	0.220	0.133	0.198	0.161	0.13
	R^2	0	0	0	0	3	1	0	0	0	0
Panel B: Post-2007		AUD	CAD	CHF	EUR	GBP	JPY	NOK	NZD	SEK	USD
	β	-0.049	-0.020	0.015	-0.001	0.004	0.084	-0.029	-0.042	-0.025	0.063
Global Return Factor	SE	0.006	0.007	0.007	0.005	0.006	0.011	0.005	0.009	0.005	0.006
	R^2	36	8	4	0	0	46	17	18	15	52
	β	0.034	0.023	-0.021	-0.005	0.009	-0.063	0.026	0.018	0.011	-0.032
GZ Spread	SE	0.010	0.006	0.005	0.006	0.006	0.014	0.005	0.013	0.004	0.009
	R^2	20	13	9	1	2	31	17	4	3	17
	β	-0.285	-0.130	0.115	-0.017	0.047	0.530	-0.151	-0.295	-0.169	0.354
S&P 500	SE	0.059	0.050	0.050	0.034	0.038	0.095	0.045	0.057	0.042	0.045
	R^2	26	7	5	0	1	40	10	20	15	35
	β	0.041	0.014	-0.013	0.006	-0.013	-0.074	0.024	0.041	0.018	-0.044
Log VXO	SE	0.008	0.007	0.009	0.006	0.008	0.012	0.007	0.009	0.007	0.010
	R^2	16	3	2	1	2	23	8	11	5	17
	β	0.053	-0.017	0.028	0.032	-0.023	-0.101	0.035	0.041	0.030	-0.079
Treasury Premium	SE	0.020	0.021	0.030	0.021	0.030	0.025	0.020	0.014	0.017	0.017
	R^2	6	1	2	5	1	10	4	3	3	12
	β	-0.129	-0.074	0.069	-0.014	-0.020	0.316	-0.071	-0.149	-0.106	0.179
Intermediary Returns	SE	0.034	0.030	0.035	0.024	0.031	0.057	0.029	0.046	0.021	0.034
	R^2	15	7	5	0	0	39	6	14	17	25
	β	-0.654	-0.394	0.457	0.120	-0.394	1.388	-0.661	-0.334	-0.381	0.850
U.S. Foreign Bond Purchases	SE	0.187	0.237	0.243	0.173	0.347	0.374	0.187	0.193	0.134	0.160
	R^2	22	11	14	1	7	34	25	5	13	32

Notes: This table reports regressions results of the form $\Delta e^B_{i,t} = \alpha + \beta X_t + \varepsilon_t$, where $\Delta e^B_{i,t}$ is the change in a broad exchange rate versus all other G10 currencies equally weighted and X_t corresponds to the row label. "Global Return Factor," X_t is the global factor in world asset prices constructed by Miranda-Agrippino and Rey (2018). "GZ Spread," X_t is the U.S. corporate bond credit spread, taken from Gilchrist and Zakrajšek (2012). "S&P500," X_t is the log total return on the S&P500 index. "VXO," X_t is the change in the log transformation of an index of implied volatility on the stocks in the S&P100, from the CBOE. "Treasury Premium," X_t is the change in the one-year Treasury Premium, the average one-year tenor CIP deviation between developed country government bonds and U.S. Treasuries from Du et al. (2018). "Intermediary Returns," X_t is the value-weighted return on a portfolio of NY Fed primary dealers' holding companies and is taken from He et al. (2017). "U.S. Foreign Bond Purchases" is U.S. net purchases of foreign bonds, normalized as a percentage of the U.S. value of foreign bond investment at the end of the prior quarter. All regressions are run at a monthly frequency, except for U.S. Foreign Bond Purchases which is run quarterly.

Table A.8: Broad US Dollar and U.S. Purchases of Foreign Bonds

	Δe^B_{USD}	Δe^B_{USD}	Δe^B_{USD}
	1977-2006	2007-2017	2007-2017
	BoP	BoP	Morningstar
U.S. Purchases of Foreign Bonds	0.091	0.86	0.50
	(0.13)	(0.16)	(0.08)
Constant	-0.0016	-0.013	-0.014
	(0.0045)	(0.0060)	(0.0055)
Observations	120	44	44
R^2	0.00	0.33	0.39

Notes: This table reports regressions results of the form $\Delta e^B_{USD,t} = \alpha + \beta f_t + \varepsilon_t$, where $\Delta e^B_{USD,t}$ is the quarterly change in the broad US dollar and f_t is a particular measure of capital flows listed in the first column of the table. Purchases of bonds are normalized by the stock of holdings of that asset at the end of the previous quarter. The BoP measure is defined as net purchases of foreign bonds by the United States, where transactions are recorded at their current value during the quarter, normalized as a percentage of the United States' value of foreign bond investment at the end of the prior quarter. The Morningstar measure defines net purchases of foreign bonds as the change in the quantity of each foreign bond held multiplied by the prior quarter's end of period price, normalized as a percentage of the value of mutual fund foreign bond investment at the end of the prior quarter.

Table A.9: U.S. Purchases of Foreign Bonds and Coincident Flows

	External Allocations	Internal Allocations				
	Flows into Funds	All U.S. Bonds	U.S. Sov Bonds	U.S. Corp Bonds	U.S. Other Bonds	Equities
U.S. Foreign Bond Purchases	1.38	-0.16	-0.20	0.40	-0.29	0.81
	(0.31)	(0.65)	(0.45)	(0.094)	(0.32)	(0.45)
Constant	26.5	50.3	25.3	9.18	16.8	34.1
	(6.98)	(10.5)	(6.42)	(1.96)	(6.18)	(8.41)
Observations	44	44	44	44	44	44
R^2	0.28	0.00	0.11	0.33	0.01	0.10

Notes: This table reports regression results of the form $F_t = \alpha + \beta F^B_{USA,foreign,t} + \varepsilon_t$, where $F^B_{USA,foreign}$ is the quarterly purchases of foreign issued bonds by the U.S. investor, and F_t is a particular measure of U.S. flows. All variables are in the units of U.S. dollars in levels. External allocations refer to flows at the outside investor level - injections and withdrawals from U.S. domiciled mutual funds. Internal allocations refer to flows at the fund level. "Flows into Funds" refers to end investor injections into U.S. domiciled mutual funds. "U.S. Sovereign Bonds" and "U.S. Corporate Bonds" are bond purchases, restricting the sample to the universe of debt issued by the U.S. Federal Government and U.S. corporations, respectively. "U.S. Other Bonds" refers to all other bonds issued domestically and "Equities" refers to flows into stocks. All position data are from Morningstar.

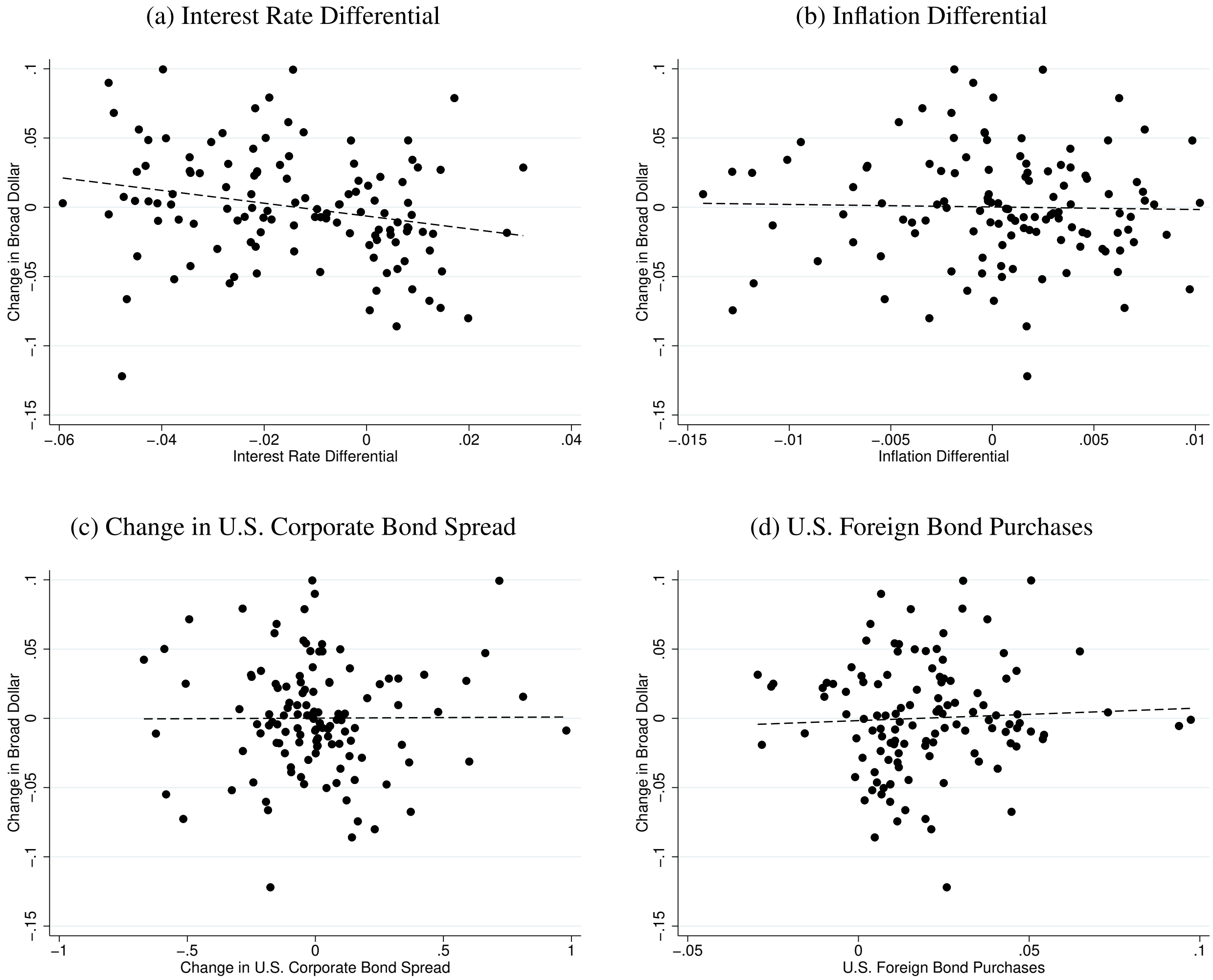
Table A.10: Bilateral Exchange Rates with the US Dollar, Global and Idiosyncratic Factors

Currencies	Restricted Regression			Unrestricted Regression					Partial-R^2
	US to all ex. country i			US to all ex. country i		US to country i			
	β	s.e.	R^2	β	s.e.	β	s.e.	R^2	
AUD	-0.82	(0.14)	0.44	-0.55	(0.16)	-0.31	(0.12)	0.53	0.09
BRL	-0.85	(0.16)	0.29	-0.88	(0.16)	0.081	(0.17)	0.30	0.01
CAD	-0.47	(0.14)	0.31	-0.46	(0.14)	-0.03	(0.13)	0.31	0.00
CHF	-0.26	(0.13)	0.09	-0.28	(0.13)	0.12	(0.050)	0.17	0.08
COP	-0.71	(0.17)	0.29	-0.55	(0.17)	-0.26	(0.11)	0.34	0.05
CZK	-0.57	(0.14)	0.20	-0.58	(0.13)	-0.0068	(0.0012)	0.29	0.09
DKK	-0.38	(0.11)	0.16	-0.37	(0.13)	-0.0036	(0.027)	0.16	0.00
EUR	-0.32	(0.17)	0.09	-0.062	(0.21)	-0.22	(0.11)	0.19	0.10
GBP	-0.58	(0.16)	0.36	-0.44	(0.20)	-0.08	(0.091)	0.37	0.01
IDR	-0.35	(0.16)	0.16	-0.34	(0.18)	-0.1	(0.13)	0.18	0.02
ILS	-0.31	(0.10)	0.13	-0.31	(0.11)	0.0037	(0.025)	0.13	0.00
INR	-0.42	(0.067)	0.31	-0.42	(0.069)	-0.017	(0.024)	0.32	0.01
JPY	0.042	(0.17)	0.00	0.039	(0.17)	0.0098	(0.061)	0.00	0.00
KRW	-0.60	(0.081)	0.40	-0.61	(0.081)	0.021	(0.027)	0.41	0.01
MXN	-0.54	(0.19)	0.24	-0.55	(0.20)	0.01	(0.17)	0.24	0.00
MYR	-0.27	(0.084)	0.12	-0.26	(0.074)	-0.0066	(0.024)	0.12	0.00
NOK	-0.69	(0.13)	0.34	-0.58	(0.10)	-0.11	(0.029)	0.41	0.07
NZD	-0.66	(0.11)	0.36	-0.64	(0.13)	-0.015	(0.037)	0.36	0.00
PLN	-0.81	(0.18)	0.28	-0.69	(0.19)	-0.046	(0.023)	0.30	0.02
RUB	-0.70	(0.20)	0.17	-0.68	(0.20)	-0.076	(0.14)	0.18	0.01
SEK	-0.63	(0.12)	0.33	-0.46	(0.14)	-0.12	(0.058)	0.38	0.05
SGD	-0.24	(0.056)	0.20	-0.25	(0.058)	0.0044	(0.020)	0.20	0.00
TRY	-0.44	(0.21)	0.19	-0.48	(0.18)	-0.17	(0.071)	0.24	0.05
ZAR	-0.54	(0.19)	0.18	-0.28	(0.18)	-0.20	(0.048)	0.37	0.19
Average			0.23					0.26	0.04

Notes: The dependent variable of each regression in the left panel is the log change in each foreign currency against the US dollar, defined such that a negative value corresponds to an appreciation of the non-US dollar currency. The average R^2 is the mean R^2 from separate regressions for each currency. The regressor titled "U.S. to All ex. Country i" is the percentage increase in foreign bond investment in all countries which are not the natural issuer of the currency, while the regressor titled "US to Country i" is the percentage increase in foreign bond investment in all countries which are the natural issuer of the currency. A negative coefficient for "U.S. to All ex. Country i" indicates that the listed currency appreciates against the US dollar when the United States is purchasing foreign bonds. A negative coefficient for "U.S. to Country i" indicates that the listed currency appreciates against the US dollar when the United States is purchasing that country's bonds. Units are defined as percentage changes, as described in section A.3.2. All regressions are conducted at a quarterly frequency. The sample period for all regressions is from 2007:Q1 to 2017:Q4. Standard errors are calculated allowing for heteroskedasticity. Exchange rate data are from Thomson Reuters Datastream and bond position data are from Morningstar.

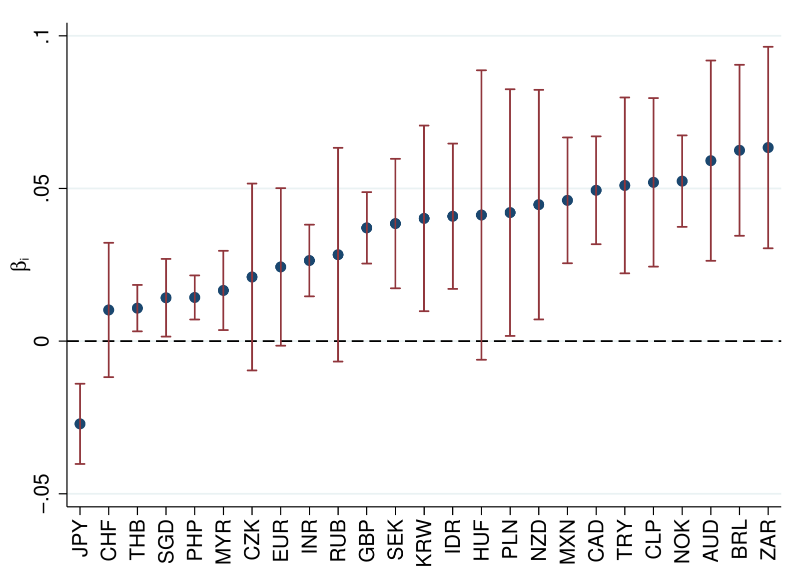
Appendix Figures

Figure A.1: Exchange Rate Disconnect, 1977-2006



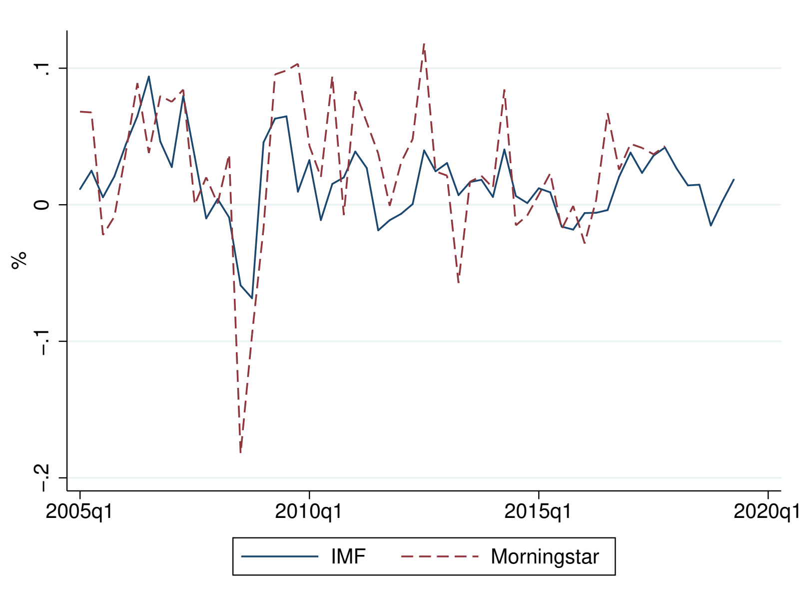
Notes: This figure plots the relationship between various macroeconomic variables and quarterly changes in the broad dollar exchange rate from 1977-2006. Changes in the broad dollar are reported on the y-axis and the relevant macroeconomic quantity is reported on the x-axis. A positive change in the broad dollar indicates dollar depreciation, and a rightward move in the x-axis corresponds to a higher level for the United States minus the G10 countries. Panel A tests the UIP model, using the average lagged interest rate differential in the United States relative to the mean of the other G10 economies. Panel B looks at the equivalent in the U.S. inflation rate relative to the inflation rate of the other G10 economies. Panel C uses the change in U.S. corporate bond spreads, taken from Gilchrist and Zakrajšek (2012). Panel D looks at U.S. purchases of foreign bonds by the United States, normalized as a percentage of the United States' value of foreign bond investment at the end of the prior quarters. The R^2s of these regressions are 0.06, 0.00, 0.00 and 0.00 respectively. Exchange rate data are from Thomson Reuters Datastream and macroeconomic data are from the IMF International Financial Statistics Database.

Figure A.2: Reconnect of Bilateral Exchange Rates and GZ Spread, β's for 2007-2018



Notes: This figure reports the coefficient estimate of the following regression specification: $\Delta e^{\$}_{i,t} = \alpha_i + \beta_i f_t + \varepsilon_t$, where $\Delta e^{\$}_{i,t}$ is the monthly change in the log bilateral exchange rate against the US dollar and f_t is the change in U.S. corporate bond spreads, as measured by the "GZ Spread" taken from Gilchrist and Zakrajšek (2012). The blue dots indicate the coefficient point estimates, β_i, and the red bars indicate two standard error bands. A positive coefficient indicates that the listed currency depreciates bilaterally against the US dollar when U.S. corporate bond spreads rise.

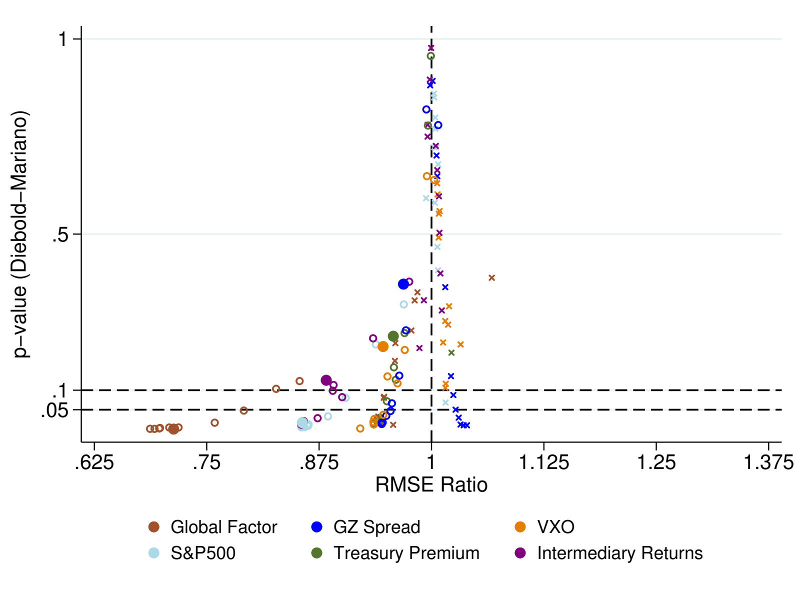
Figure A.3: U.S. Foreign Bond Flows: BoP and Morningstar



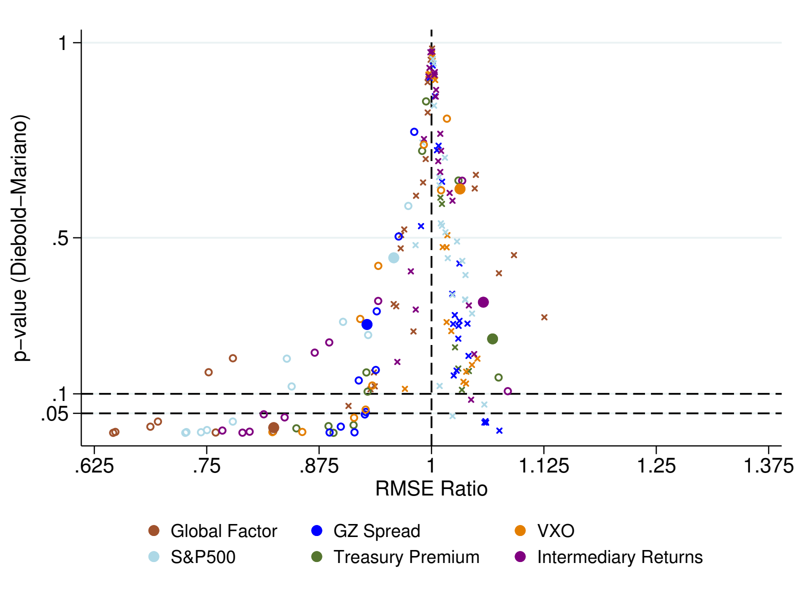
Notes: A comparison of two measures of U.S. purchases of foreign assets using the IMF Balance of Payments and Morningstar's database of U.S. mutual fund positions. The IMF measure is defined as net purchases of foreign bonds by the United States, where transactions are recorded at their current value during the quarter, normalized as a percentage of the United States' value of foreign bond investment at the end of the prior quarter. The Morningstar measure defines net purchases of foreign bonds by the change in the quantity of each foreign bond held multiplied by the prior quarter's end of period price, normalized as a percentage of the mutual funds' value of foreign bond investment at the end of the prior quarter. The correlation coefficient between the two series is 0.66.

Figure A.4: Reconnect of Risk Measures: Out-Of-Sample Forecasting

(a) 10-Year Evaluation Periods



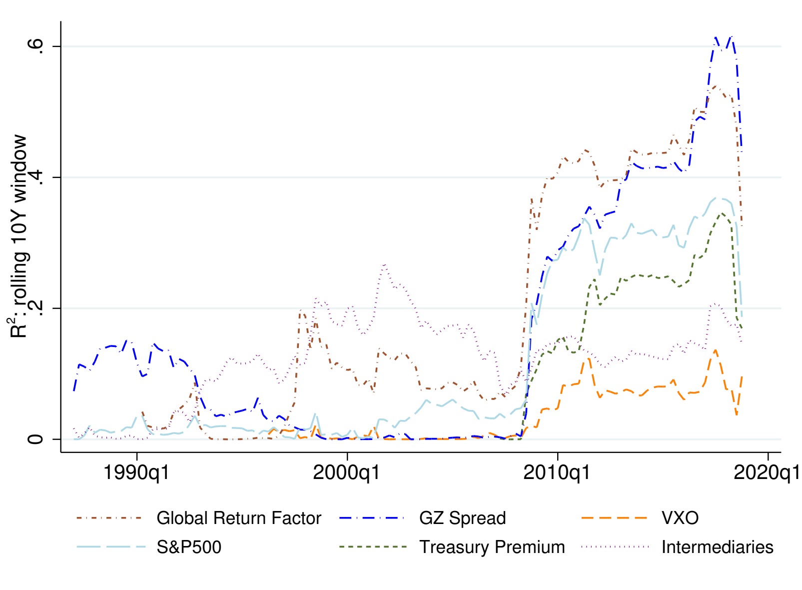
(b) 5-Year Evaluation Periods



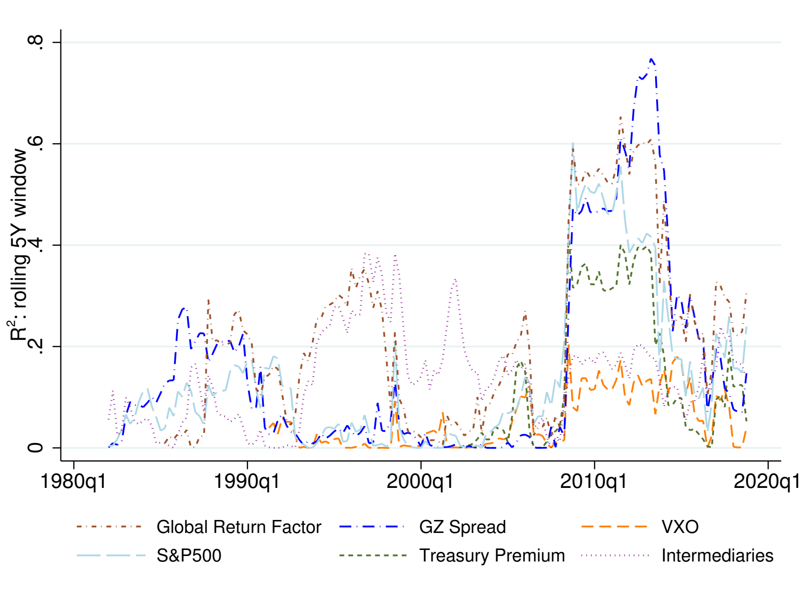
Notes: This figure reports the performance of exchange rate forecasts using each of our six risk proxies relative to a random walk over different sample periods. Each marker reports the p-value of a Diebold-Mariano test for the performance of the model relative to a random walk (y-axis) and the ratio of the model's root mean squared forecast error relative to a random walk. Each observation represents a 120- or 60-month model evaluation period, using a 120- or 60-month rolling estimation windows, as described in Appendix Section A.1. The "x" markers represent windows where all forecasts are for periods prior to 2007, the hollow dots represent windows where the forecasts mix periods before and after 2007, and the solid dots represent windows where all forecast periods occur after 2007.

Figure A.5: Comovement of U.S. Foreign Bond Purchases and Risk Measures

(a) 10-Year Rolling Window



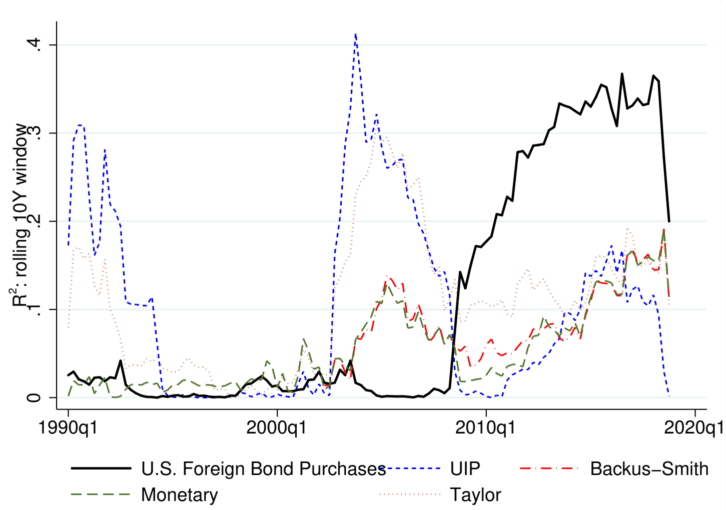
(b) 5-Year Rolling Window



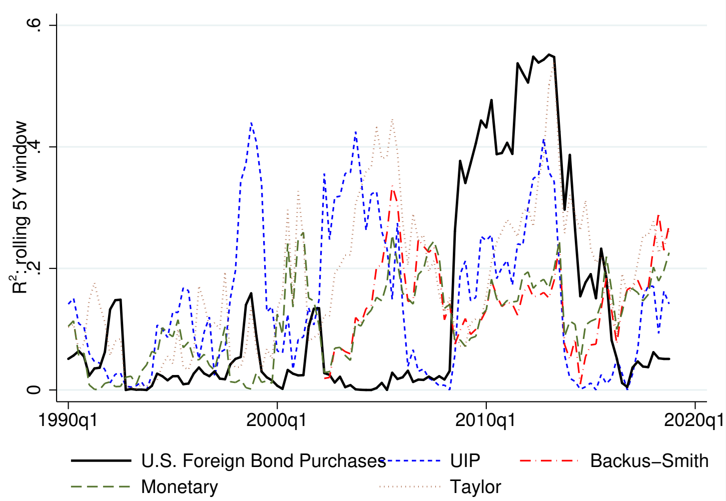
Notes: The figures show the R^2 from 40-quarter and 20-quarter rolling regressions of U.S. Foreign Bond Purchases against various indicators of risk. The regression specification is $f_t = \alpha + \beta X_t + \varepsilon_t$, where f_t refers to the net purchases of foreign bonds by the United States, normalized as a percentage of the value of U.S. foreign bond holdings at the end of the prior quarter. X_t corresponds to different variables depending on the model in question.For "VXO," X_t is the quarterly change in the log transformation of an index of implied volatility on the stocks in the S&P100, from the CBOE. For "S&P500," X_t is the log total return on the S&P500 index. For "Treasury Premium," X_t is the change in the one-year Treasury Premium, the average one-year tenor CIP deviation between developed country government bonds and U.S. Treasuries from Du et al. (2018). For "GZ Spread," X_t is the U.S. corporate bond credit spread, taken from Gilchrist and Zakrajšek (2012). For "Intermediaries," X_t is the value-weighted return on a portfolio of NY Fed primary dealers' holding companies and is taken from He et al. (2017). For "Global Return Factor," X_t is the global factor in world asset prices constructed by Miranda-Agrippino and Rey (2018).

Figure A.6: In-Sample Explanatory Power of Capital Flows and Other Fundamentals

(a) 10-Year Rolling Window

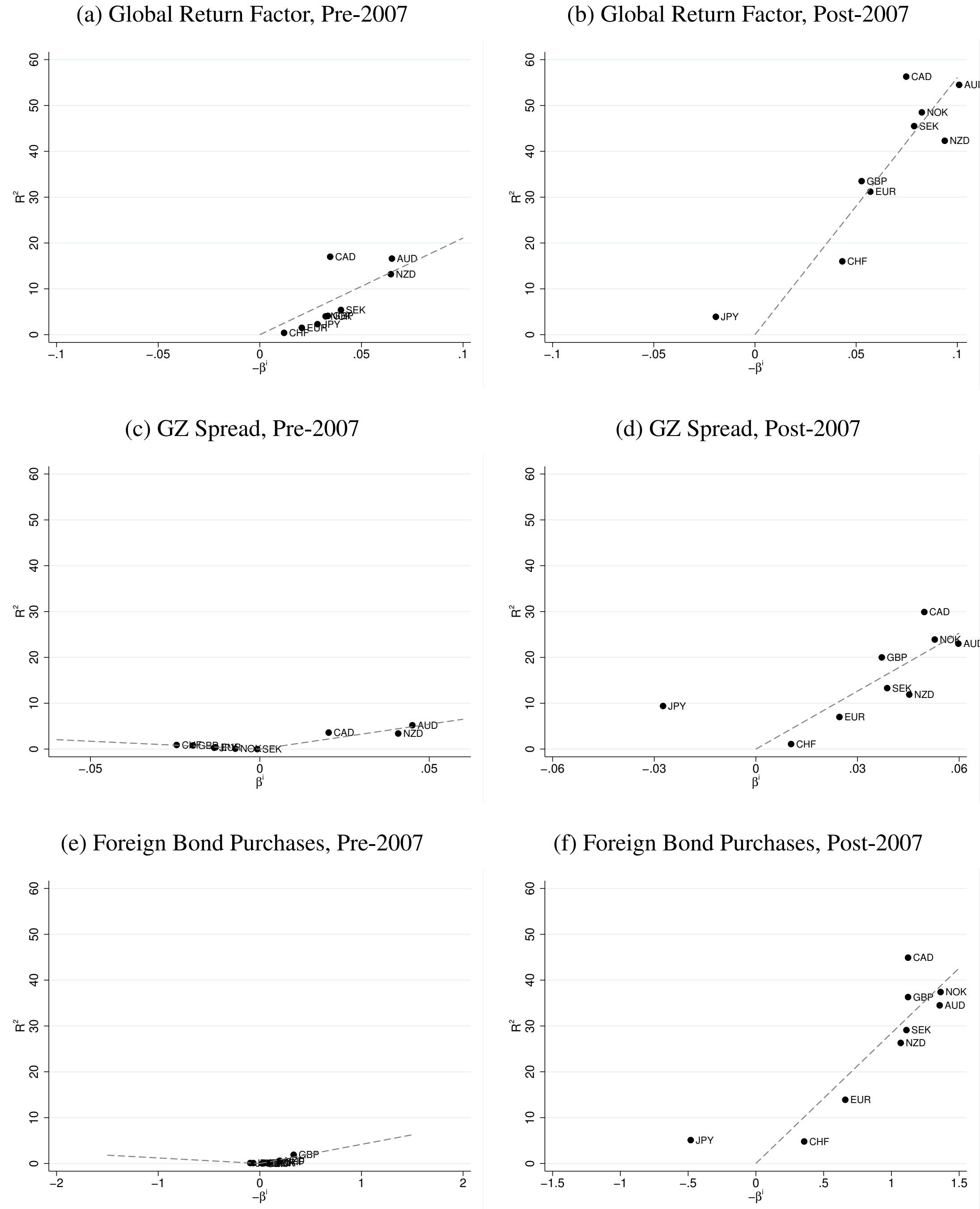


(b) 5-Year Rolling Window



Notes: The figure shows the rolling R^2 for regressions of the form $\Delta e^B_{USD,t} = \alpha + \beta X_t + \varepsilon_t$ where $\Delta e_{USD,t^B}$ is the quarterly average log change in the US dollar versus the other G10 currencies against various models. X_t corresponds to different variables depending on the model in question. For "U.S. Foreign Bond Purchases," X_t is net purchases of foreign bonds by the United States, normalized as a percentage of the United States' value of foreign bond investment at the end of the prior quarter. For the "UIP" model, X_t is the lagged interest rate spread between the United States and the average of the other G10 countries. For the "Monetary" model, X_t contains two variables, the mean inflation difference between the United States and the other G10 countries and the mean growth difference between the United States and the other G10 countries. For "Taylor", X_t contains the (relative value of) the two variables in a Taylor Rule, the mean inflation difference between the United States and the other G10 countries and the mean output gap differential between the United States and the other G10 countries. All macroeconomic variables are computed as the difference between the quarterly observation for the United States versus the average of all other G10 countries. Interest rate differentials are computed from the series "Deposit Rates" from the IFS where available, and from "Treasury Bills, 3 month" otherwise. Growth is measured as the log change in real Gross Domestic Product and the output gap is calculated using the cyclical component of the same logarithmic series from a detrended HP filter with l = 1600. Exchange rate data are from Thomson Reuters Datastream, international investment data are from the IMF Balance of Payments, and macroeconomic data are from the IMF International Financial Statistics Database.

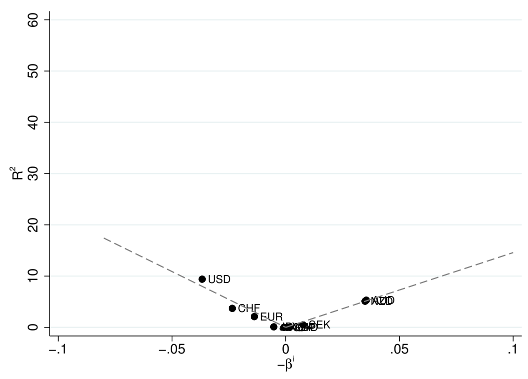
Figure A.7: Regression β and R^2, Bilateral Exchange Rates



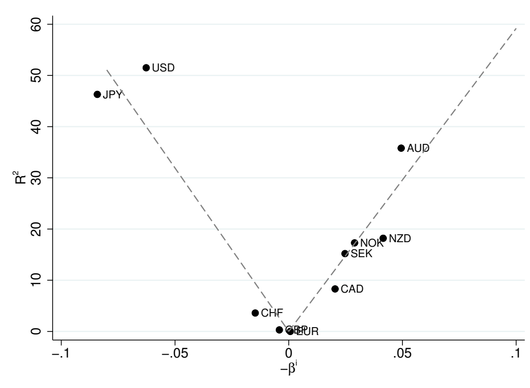
Notes: These graphs report the β and R^2 of regressions of $\Delta e^{\$}_{i,t} = \alpha + \beta X_t + \varepsilon_t$, where $\Delta e^{\$}_{i,t}$ is the change in a bilateral exchange rate versus the US dollar and X_t corresponds to an indicator of risk. The left panels show the results for the sample prior to 2007, while the right panels use the sample of 2007 onwards. The top panel uses "Global Return Factor" as X_t - the the global factor in world asset prices constructed by Miranda-Agrippino and Rey (2018). The middle panel uses "GZ Spread" as X_t - the U.S. corporate bond credit spread, taken from Gilchrist and Zakrajšek (2012). The bottom panel “Foreign Bond Purchases" is U.S. net purchases of foreign bonds, normalized as a percentage of the U.S. value of foreign bond investment at the end of the prior quarter. Dashed lines indicate the best fit between the R^2 and β of each currency sample, constrained such that the line passes through (0,0).

Figure A.8: Regression β and R^2, Broad Exchange Rates

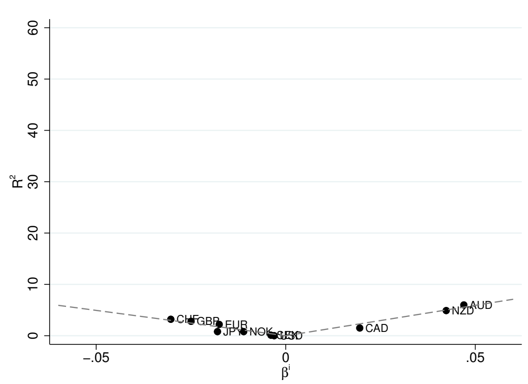
(a) Global Return Factor, Pre-2007



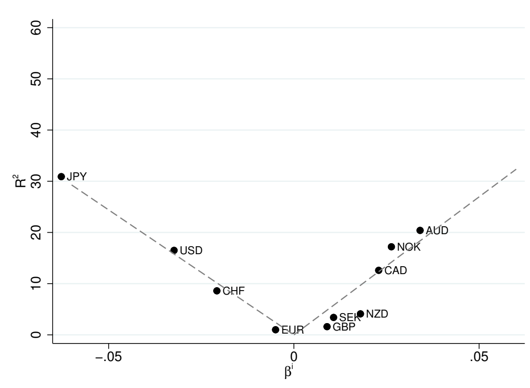
(b) Global Return Factor, Post-2007



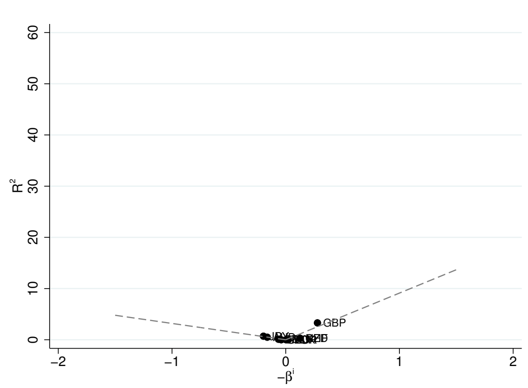
(c) GZ Spread, Pre-2007



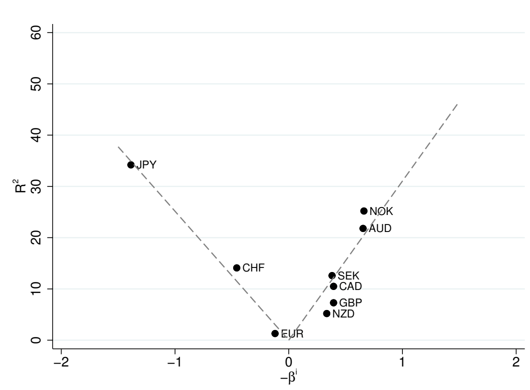
(d) GZ Spread, Post-2007



(e) Foreign Bond Purchases, Pre-2007



(f) Foreign Bond Purchases, Post-2007



Notes: These graphs report the β and R^2 of regressions of the form $\Delta e^B_{i,t} = \alpha + \beta X_t + \varepsilon_t$, where $\Delta e^B_{i,t}$ is the change in a broad exchange rate versus all other G10 currencies and X_t corresponds to an indicator of risk. The left panels show the results for the sample prior to 2007, while the right panels use the sample of 2007 onwards. The top panel uses "Global Return Factor" as X_t - the the global factor in world asset prices constructed by Miranda-Agrippino and Rey (2018). The middle panel uses "GZ Spread" as X_t - the U.S. corporate bond credit spread, taken from Gilchrist and Zakrajšek (2012). The bottom panel “Foreign Bond Purchases" is U.S. net purchases of foreign bonds, normalized as a percentage of the U.S. value of foreign bond investment at the end of the prior quarter. Dashed lines indicate the best fit between the R^2 and β of each currency sample, constrained such that the line passes through (0,0).