Deviations from FIRE and Exchange Rates: A GE Theory of Supply and Demand

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3. This paper: Allowing for data-motivated deviations from FIRE is crucial for explaining the positions of the participants in forex markets and exchange rate movements.

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   3.1 The Fama puzzle, delayed overshooting puzzle and hump-shaped dynamics of exchange rates.

Literature Review

- **Deviations from FIRE/Survey Data**:
  - Dominquez (1986), Froot and Frankel (1987; 1989), Ito (1990), Frankel and Chinn (2002; 2019) Coibion and Gorodnichenko (2015), Gennaioli, Ma, and Shleifer (2015), Coibion, Gorodnichenko, and Kamdar (2018), Bordalo et al. (2019), Nagel and Xu (2019), Bussiere et al. (2018), Frankel and Chinn (2019), Kalemli-Ozcan and Varela (2019), De Marco, Macchiavelli, and Valchev (2019) and Giglio et al. (2019)
- **Momentum**: Hong and Stein (1999), Menkhoff et al. (2012), Moskowitz, Ooi, and Pedersen (2012), Brian, Ooi, and Pedersen (2013), Baltas and Kosowski (2013), Hurst, Ooi, and Pedersen (2017) and Burnside and Cerrato (2019)
- **Order flow literature:** Evans and Lyons (2002; 2005a,b), Berger et al. (2008), Bacchetta and Van Wincoop (2006), Menkhoff et al (2016), Burnside, Cerrato and Zhang (2019)
- **Exchange Rate "Reconnect"** Lilley et al. (2019) and Adrian and Xie (2020)
- **Intermediation-based exchange rate models:** Kouri (1983), Blanchard et al (2005), Hau and Rey (2006), Adrian, Etula and Groen (2011), Gabaix and Maggiori (2015), Malamud and Schrimpf (2018), Camanho, Hau, Rey (2018), Itskhoki and Mukhin (2019), Gourinchas, Ray and Vayanos (2019)
- **Exchange rate dynamics**:
  - Fama puzzle and delayed overshooting puzzle: Fama (1984), Eichenbaum and Evans (1995), Gourinchas and Tornell (2004), Bacchetta and van Wincoop (2010, 2018)
  - Hump-shaped dynamics: Steinsson (2008), Crucini, Shintani, and Tsurugac (2014), Candian (2019)

Outline

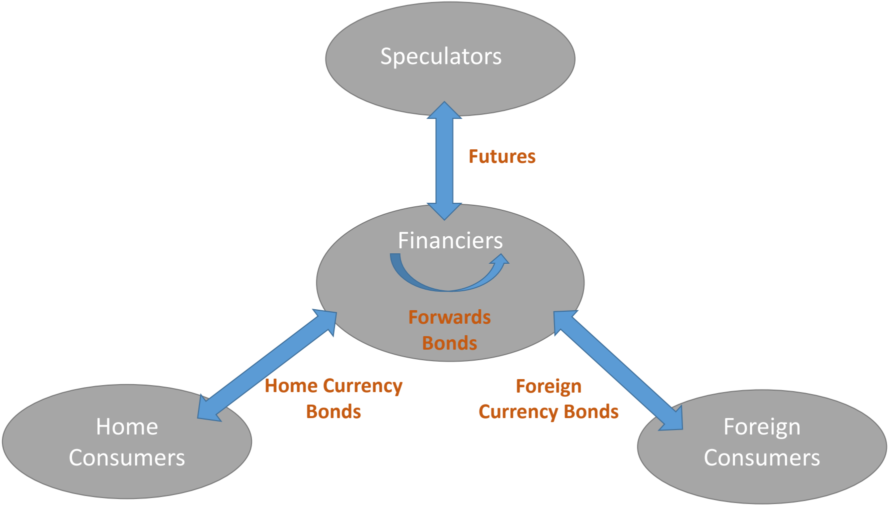
- Model
- Testable implications
- Data
- Empirical results: Linking beliefs, positions and realized exchange rates
- Empirical results: Nature of beliefs
- Deviations from FIRE: implications for exchange rate dynamics

Model

Model

- GE model
- 2 countries; 1 tradeable and 2 non-tradeable goods
- Three types of agents:
  - Home and foreign consumers
  - Financiers
  - Speculator
- Main simplifications on real side:
  - Endowment economy, flexible prices, specific preferences that allow us to focus only on exchange rate beliefs
- Main simplifications on financial side:
  - Exogenous financial market segmentation motivated by institutional details; abstract from trading frictions – terms of forward and futures contracts assumed to be the same; no trading costs

Exogenous Market Segmentation and Institutional Details



Model: Home Consumer

- Measure one of infinitely lived consumers who consume, derive utility from holding real money balances and trade in local currency bonds
- Log preferences over aggregate consumption and CD aggregator over T and NT
- Assuming constant money supply, the home consumer's Euler equation becomes:

$$R_t^{H,n} = \frac{1}{\tilde{E}_t \left(\Pi_{\tau=t+1}^{t+n} \beta_\tau \right)}$$

- n is the horizon of the bond
- β_τ is a time varying discount rate shock
- Assume an exogenous process for the home interest rate $R_t^{H,n}$ (i.e. monetary policy shock in the model is a discount rate shock)
- Similar equation for foreign

Details

Model: Financier

- Measure one of financiers who live for n periods and have no start up capital.
- Each financier i has mean variance preferences over end-of-life nominal profits.
- Trade bonds in both currencies, derivatives in OTC market (forwards) and on exchange (futures).

Model: Financier

Aggregate financier portfolio demand schedule/aggregate Euler is:

$$R_t^{F,n} B_t^{F,n} + X_t^n = \frac{\tilde{E}_t^F \left[\frac{1}{S_{t+n}} - \frac{R_t^{H,n}}{R_t^{F,n} S_t} \right]}{\sigma_{n,s}^2 \rho}.$$

- $\tilde{E}_t^F$ – average financiers' subjective beliefs
- S_t — nominal exchange rate defined as foreign per home (value of the home currency)
- ρ – risk aversion; $\sigma_{n,s}^2$ – exchange rate variance
- X_t^n and $B_t^{F,n}$– financiers' aggregate demand for foreign currency futures and bonds

- CIP holds
- Financiers are indifferent between short/long positions in bonds and using futures contracts – only the joint portfolio/their total foreign currency demand is determined.

Details

Model: Speculators

- Measure *m* of speculators who live for *n* periods and have no start up capital.
- Same mean variance preferences over end-of-life nominal profits, but can only trade futures.
- Trade derivatives on exchange (futures)
- Aggregate futures demand from speculators is:

$$X_t^{S,n} = \frac{\tilde{E}_t^S \left[\frac{1}{S_{t+n}} - \frac{R_t^H}{R_t^F S_t} \right]}{\rho \sigma_{n,s}^2} + \mu \varepsilon_t^\mu$$

- $\tilde{E}_t^S$ – average speculators' subjective beliefs
- $X_t^{S,n}$– speculators' aggregate demand for foreign currency future
- $\mu \varepsilon_t^\mu$ can be though of as "mistakes" by speculators or a noise-trading component of their demand.

Model: Market Clearing

- Financial markets:

$$B_t^{H,n} + \tilde{B}_t^{H,n} = 0; \quad B_t^{F,n} + \tilde{B}_t^{*F,n} = 0; \quad X_t^n + mX_t^{S,n} = 0. \tag{1}$$

- As only the financiers can trade OTC derivative contracts, the interpretation of X_t^n is the net aggregate demand from financiers for futures contracts.
- Goods markets:

$$Y_t^{NT} = C_t^{NT}; \quad Y_t^{*NT} = C_t^{*NT}; \quad C_t^T - Y_t^T + C_t^{*T} - Y_t^{*T} = 0.$$

Testable implications

Testable implication 1: Linking beliefs to positions

An approximation of the financier's optimal portfolio (log-linearize variables that are strictly positive and linearize the ones that can take negative values, $\{X_t^n, B_t^{F,n}\}$):

$$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n = \rho\sigma_{n,s}^2 X_t^n + \frac{\rho\sigma_{n,s}^2}{\bar{\beta}} B_t^{F,n},$$

- Lowercase = log deviation from steady-state

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Higher expected excess returns from being long the foreign currency/short the home currency should be reflected in larger positions in foreign currency assets.

Testable implication 2: Linking positions and expectations to realized exchange rates

$$s_t - s_{t-j} = -\rho\sigma_s^2(mX_t^{S,n} - mX_{t-j}^{S,n}) + \tilde{E}_t^F s_{t+n} - \tilde{E}_{t-j}^F s_{t-j+n} - (\tilde{r}_t^n - \tilde{r}_{t-j}^n) - \rho\sigma_s^2 \frac{1}{\bar{\beta}} \left(\tilde{B}_t^{*F,n} - \tilde{B}_{t-j}^{*F,n}\right)$$

The foreign currency appreciates if:

Speculators demand speculators have higher demand for foreign currency futures

Expectations financiers update upwards their expectations for the foreign currency value

Interest differential the foreign interest rate increases relative to the home interest rate

Foreign Consumers Demand the foreign consumers have a higher demand for foreign currency bonds

Data

Data

- We measure $X_t^n = -mX_t^{S,n}$ using CFTC Commitment of Traders (COT) reports.

- Positions decomposed into speculators and hedgers.
  - Hedgers category is almost entirely represented by the dealers category in the more recent Traders in Financial Futures (TFF) reports.
  - The CFTC describes dealers as follows:

    "These participants are what are typically described as the 'sell side' of the market. Though they may not predominantly sell futures, they do design and sell various financial assets to clients. They tend to have matched books or offset their risk across markets and clients. Futures contracts are part of the pricing and balancing of risk associated with the products they sell and their activities. These include large banks (U.S. and non-U.S.) and dealers in securities, swaps and other derivatives."

- Weekly reports of open interest (positions) in futures on the following currencies against the dollar: AUD, CAD, CHF, EUR (DEM before 1999), GBP, JPY, NZD.

Role of Broker-Dealers

- Net dealer/hedgers' demand for currency futures
  = Net demand for currency derivatives of broker-dealer clients (financiers in the model)
  = –Net speculators' demand for currency futures

Data

- Proposed proxy of the average expectation of financiers: Forecasts from *Consensus Economics* (1M, 3M, 12M, 24M horizons available) – first paper to make use of the individual level forecasts as well
  - Caveat — In this paper we cannot determine whether the OTC market participants use the CE or the large banks reporting to CE forecasts directly or use similar fundamentals/factors in their forecasting models
  - Left for future work where we have individual positions as well
- Positions from the CFTC are not broken down by maturity.
  We run regressions with the CFTC data and various horizons of expectations.
- We match positions with forecasts from the most recent *Consensus Economics* publication.

Empirical results: Linking beliefs, positions and realized exchange rates

Evidence on implication 1: Linking Consensus average forecast to positions

$$X_t = \alpha^{CF} + \beta^{CF} \left(s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n \right) + \varepsilon_t^{CF}$$

where the model implies $\beta^{CF} > 0$.

Table: Positions and Expected Excess Returns Before Feb 7, 2007 – Weekly Frequency

(A) Over the Next Quarter (Before Feb 7, 2007)

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.069***	0.247***	0.187***	0.045***	0.082***	16.418***	0.028***
	(0.006)	(0.011)	(0.009)	(0.009)	(0.004)	(1.091)	(0.003)
# of Obs	712	747	464	712	741	743	54
Adj. R^2	0.16	0.44	0.41	0.02	0.22	0.25	0.61

(C) Over the Next Year (Before Feb 7, 2007)

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.217***	0.579***	0.516***	0.352***	0.212***	32.882***	0.114***
	(0.018)	(0.031)	(0.028)	(0.035)	(0.014)	(2.972)	(0.009)
# of Obs	712	744	468	494	747	747	54
Adj. R^2	0.22	0.29	0.32	0.14	0.16	0.14	0.77

Monthly Bonds Reverse Causality Omitted Var Bias

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Table: Positions and Expected Excess Returns After Feb 7, 2007 – Weekly Frequency

(B) Over the Next Quarter

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.099***	0.160***	0.145***	0.280***	0.053***	27.966***	0.024***
	(0.012)	(0.018)	(0.016)	(0.040)	(0.008)	(2.567)	(0.003)
# of Obs	587	587	204	587	584	587	587
Adj. R^2	0.09	0.12	0.37	0.06	0.04	0.15	0.11

(D) Over the Next Year

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.310***	0.775***	0.388***	0.902***	0.457***	118.558***	0.087***
	(0.044)	(0.060)	(0.033)	(0.141)	(0.033)	(6.380)	(0.008)
# of Obs	499	486	499	499	482	499	499
Adj. R^2	0.05	0.23	0.26	0.05	0.28	0.28	0.14

Monthly Bonds Reverse Causality Omitted Var Bias

Evidence on implication 1: What about rational expectations?

$$s_t - s_{t+n} + \tilde{r}_t^n = \alpha^{FIRE} + \beta^{FIRE} X_t + \varepsilon_{t+n}^{FIRE}.$$

where the model implies $\beta^{FIRE} > 0$.

Table: Positions and Realized Excess Returns – Weekly Frequency

(A) Over the Next Quarter (Before Feb 7, 2007)

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
X_t	-1.740^{**}	-0.694	0.592	-0.824^{**}	0.233	-0.001	-19.083^{**}
	(0.751)	(0.528)	(0.492)	(0.408)	(0.711)	(0.004)	(8.340)
# of Obs	712	747	464	712	741	743	54
Adj. R^2	0.04	0.02	0.01	0.03	-0.00	-0.00	0.24

(C) Over the Next Year (Before Feb 7, 2007)

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
X_t	-2.005^{**}	-0.433	-0.103	-1.160^{**}	-0.149	-0.002	-0.290
	(0.840)	(0.449)	(0.366)	(0.475)	(0.463)	(0.002)	(2.008)
# of Obs	712	744	468	494	747	747	54
Adj. R^2	0.14	0.03	-0.00	0.18	-0.00	0.00	-0.02

Evidence on implication 1: What about rational expectations?

$$s_t - s_{t+n} + \tilde{r}_t^n = \alpha^{FIRE} + \beta^{FIRE} X_t + \varepsilon_{t+n}^{FIRE}.$$

where the model implies $\beta^{FIRE} > 0$.

Table: Positions and Realized Excess Returns – Weekly Frequency

(B) Over the Next Quarter (After Feb 7, 2007)

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
X_t	-0.028	0.141	0.184	-0.275	-0.167	-0.003	1.722
	(0.411)	(0.381)	(0.758)	(0.170)	(0.644)	(0.003)	(2.292)
# of Obs	587	587	204	587	584	587	587
Adj. R^2	-0.00	-0.00	-0.00	0.03	-0.00	0.01	0.00

(D) Over the Next Year (After Feb 7, 2007)

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
X_t	-0.057	-0.057	0.805^*	0.003	0.828^*	-0.004^*	2.803
	(0.373)	(0.268)	(0.423)	(0.137)	(0.462)	(0.002)	(1.737)
# of Obs	499	486	499	499	482	499	499
Adj. R^2	-0.00	-0.00	0.06	-0.00	0.05	0.07	0.05

Evidence on implication 2: Linking positions and beliefs to realized exchange rates

$$s_t - s_{t-j} = \alpha^{CF} + \beta^{CF}\left(mX_t^S - mX_{t-j}^S\right) + \psi^{CF}\left(\tilde{r}_t^n - \tilde{r}_{t-j}^n\right) + \lambda^{CF}\left(\tilde{E}_t^F s_{t+n} - \tilde{E}_{t-j}^F s_{t-j+n}\right) + \varepsilon_t^{CF}.$$

where the model implies $\lambda^{CF} > 0$ and $\beta^{CF}, \psi^{CF} < 0$.

Linking positions to realized exchange rates; Monthly: One-Month Changes

Only Positions

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$m\Delta X_t^S$	-0.893^{***}	-0.447^{***}	-0.681^{***}	-0.339^{***}	-1.031^{***}	-0.004^{***}	-3.374^{***}
	(0.092)	(0.044)	(0.056)	(0.031)	(0.095)	(0.000)	(0.655)
# of Obs	186	200	193	200	200	250	81
Adj. R^2	0.28	0.24	0.37	0.29	0.35	0.35	0.28

All Variables

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$m\Delta X_t^S$	-0.798^{***}	-0.393^{***}	-0.658^{***}	-0.338^{***}	-0.947^{***}	-0.003^{***}	-3.117^{***}
	(0.099)	(0.052)	(0.058)	(0.029)	(0.098)	(0.000)	(0.633)
$\Delta\tilde{r}_t^n$	-1.906^{*}	-0.008	-0.619	-1.107	-0.698	-1.257	0.423
	(1.078)	(0.413)	(0.822)	(0.718)	(0.661)	(0.782)	(1.141)
$\Delta\tilde{E}_t^F s_{t+n}$	0.509^{***}	0.398^{***}	0.137	0.390^{***}	0.417^{***}	0.487^{***}	0.332^{**}
	(0.134)	(0.124)	(0.129)	(0.095)	(0.104)	(0.094)	(0.166)
# of Obs	186	200	193	200	200	250	81
Adj. R^2	0.47	0.32	0.38	0.41	0.48	0.51	0.33

Bonds

Evidence on implication 2: Linking positions and beliefs to realized exchange rates

$$s_t - s_{t-j} = \alpha^{CF} + \beta^{CF}\left(mX_t^S - mX_{t-j}^S\right) + \psi^{CF}\left(\tilde{r}_t^n - \tilde{r}_{t-j}^n\right) + \lambda^{CF}\left(\tilde{E}_t^F s_{t+n} - \tilde{E}_{t-j}^F s_{t-j+n}\right) + \varepsilon_t^{CF}.$$

where the model implies $\lambda^{CF} > 0$ and $\beta^{CF}, \psi^{CF} < 0$.

Linking positions to realized exchange rates; Monthly: Three-Month Changes

Only Positions

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$m\Delta X_t^S$	-0.854^{***}	-0.506^{***}	-0.809^{***}	-0.393^{***}	-1.054^{***}	-0.005^{***}	-2.331^{***}
	(0.107)	(0.054)	(0.062)	(0.039)	(0.113)	(0.000)	(0.447)
# of Obs	285	289	127	287	291	295	141
Adj. R^2	0.28	0.30	0.54	0.23	0.28	0.30	0.25

All Variables

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$m\Delta X_t^S$	-0.664^{***}	-0.337^{***}	-0.659^{***}	-0.286^{***}	-0.668^{***}	-0.003^{***}	-2.922^{***}
	(0.106)	(0.052)	(0.051)	(0.029)	(0.093)	(0.000)	(0.364)
$\Delta\tilde{r}_t^n$	-0.913^{*}	0.800	0.560	-0.644	-0.899^{**}	-0.494	0.234
	(0.482)	(0.792)	(0.851)	(0.716)	(0.439)	(0.492)	(0.620)
$\Delta\tilde{E}_t^F s_{t+n}$	0.721^{***}	0.691^{***}	0.549^{***}	0.663^{***}	0.659^{***}	0.708^{***}	0.700^{***}
	(0.048)	(0.083)	(0.069)	(0.057)	(0.076)	(0.046)	(0.087)
# of Obs	180	194	84	193	193	239	76
Adj. R^2	0.77	0.68	0.79	0.71	0.72	0.79	0.80

Bonds

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$$s_t - s_{t-j} = \alpha^{CF} + \beta^{CF}\left(mX_t^S - mX_{t-j}^S\right) + \psi^{CF}\left(\tilde{r}_t^n - \tilde{r}_{t-j}^n\right) + \lambda^{CF}\left(\tilde{E}_t^F s_{t+n} - \tilde{E}_{t-j}^F s_{t-j+n}\right) + \varepsilon_t^{CF}.$$

where the model implies $\lambda^{CF} > 0$ and $\beta^{CF}, \psi^{CF} < 0$.

Linking positions to realized exchange rates; Monthly: One-Year Changes

Only Positions

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$m\Delta X_t^S$	-1.153^{***}	-0.624^{***}	-0.995^{***}	-0.285^{***}	-1.183^{***}	-0.006^{***}	-5.381^{***}
	(0.319)	(0.160)	(0.119)	(0.075)	(0.167)	(0.001)	(1.114)
# of Obs	253	254	205	212	256	268	110
Adj. R^2	0.17	0.15	0.27	0.10	0.21	0.16	0.27

All Variables

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$m\Delta X_t^S$	-0.466^{***}	-0.282^{***}	-0.667^{***}	-0.152^{***}	-0.557^{***}	-0.003^{***}	-2.915^{***}
	(0.137)	(0.073)	(0.078)	(0.025)	(0.078)	(0.000)	(0.367)
$\Delta\tilde{r}_t^n$	-0.900^{***}	-0.251	-1.228^{***}	-1.908^{***}	-1.291^{***}	-0.992^{*}	-1.629^{**}
	(0.325)	(0.211)	(0.397)	(0.418)	(0.251)	(0.535)	(0.661)
$\Delta\tilde{E}_t^F s_{t+n}$	1.005^{***}	1.078^{***}	0.965^{***}	1.028^{***}	0.948^{***}	0.905^{***}	0.856^{***}
	(0.048)	(0.049)	(0.074)	(0.068)	(0.078)	(0.058)	(0.064)
# of Obs	253	254	205	212	256	268	110
Adj. R^2	0.90	0.90	0.82	0.85	0.87	0.84	0.91

Bonds

Summary: Beliefs, positions, and realized exchange rates

- The average expectation of financiers, proxied by Consensus Economics exchange rate forecasts, is reflected in their derivatives positions—i.e., higher expected returns is associated with a larger demand.
- The model-implied variables explain the majority of exchange rate movements in a manner consistent with theory.

Empirical results: Nature of beliefs

Expectations

What drives the speculators' and financiers' subjective beliefs?

Speculators' Demand/Beliefs

- In the data, the speculators category from the CFTC legacy reports is approximately the same as the leveraged funds category in the CFTC TFF reports.
- Baltas and Kosowski (2013) and Brian, Ooi, and Pedersen (2013) argue that the leveraged funds in futures markets use primarily "momentum" trading strategy based on a belief that a currency will continue to appreciate if it has done so in the recent past
  - compare the returns of futures leveraged funds to the returns from a momentum trading strategy
- We also show that the majority of the speculators' positions can be explained by momentum (regress speculators' positions on past exchange rate changes)

Speculators' Demand/Beliefs

- Based on these results, we model speculators' beliefs to be consistent with the "momentum" trading strategy:

$$s_t - \tilde{E}_t^S s_{t+1} + \tilde{r}_t = \mu^s (s_{t-1} - s_t)$$

Momentum modelled similarly in Hong and Stein (1999).

- where $\mu^s > 0$
- Speculators belief that if the foreign currency has appreciated in the past it will appreciate in the future

Financiers' Deviations From FIRE

Define

$$\tilde{E}_t^F s_{t+n} = E_t s_{t+n} + \kappa_t^n,$$

where κ_t^n captures the deviation from FIRE and $E_t s_{t+n}$ stands for rational expectations.

- In order to reconcile the fact that the financiers' beliefs are consistent with the CE expectations and not FIRE ($\beta^{CF} > 0$ and $\beta^{FIRE} <= 0$) and that the speculators strategy is momentum, it has to be the case that:

$$\kappa_t^n = \eta^n \left(s_t - s_{t-1} \right),$$

- where $\eta^n < 0$.

- Given that the forecast error under FIRE is orthogonal to period t info, we estimate η^n from the following regression specification:

$$\tilde{E}_t^F s_{t+n} - s_{t+n} = \alpha + \eta^n \left(s_t - s_{t-1} \right) + \varepsilon_{t+n}$$

Details

Financiers' Deviations From FIRE

$$\tilde{E}_t^F s_{t+n} - s_{t+n} = \alpha + \eta^n (s_t - s_{t-1}) + \varepsilon_{t+n}$$

$n = 1$

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - s_{t-1}$	-0.595^{***}	-0.564^{***}	-0.194^{*}	-0.431^{***}	-0.347^{***}	-0.487^{***}	-0.495^{***}
	(0.121)	(0.128)	(0.104)	(0.102)	(0.103)	(0.096)	(0.106)
# of Obs	255	255	255	255	255	255	255
Adj. R^2	0.13	0.12	0.02	0.07	0.06	0.11	0.10

$n = 3$

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - s_{t-1}$	-0.649^{***}	-0.670^{***}	-0.357^{***}	-0.430^{***}	-0.430^{***}	-0.601^{***}	-0.707^{***}
	(0.140)	(0.140)	(0.112)	(0.110)	(0.141)	(0.122)	(0.161)
# of Obs	334	334	334	334	334	334	334
Adj. R^2	0.08	0.09	0.03	0.03	0.04	0.07	0.09

Financiers' Deviations From FIRE

$$\tilde{E}_t^F s_{t+n} - s_{t+n} = \alpha + \eta^n (s_t - s_{t-1}) + \varepsilon_{t+n}$$

$n = 12$

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - s_{t-1}$	-0.553	-0.592^{**}	-0.338^{*}	-0.467^{*}	-0.308^{*}	-0.768^{***}	-0.673^{**}
	(0.345)	(0.245)	(0.198)	(0.265)	(0.157)	(0.167)	(0.318)
# of Obs	264	264	264	264	264	264	264
Adj. R^2	0.01	0.02	0.01	0.01	0.00	0.04	0.02

$n = 24$

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - s_{t-1}$	-0.661^{*}	-0.832^{**}	-0.439^{**}	-0.633^{**}	-0.347^{*}	-0.694^{**}	-0.586
	(0.345)	(0.408)	(0.198)	(0.250)	(0.186)	(0.299)	(0.385)
# of Obs	264	264	264	264	264	264	264
Adj. R^2	0.01	0.02	0.01	0.01	0.00	0.02	0.01

Financiers' Deviations From FIRE

- $\eta^n < 0$ implies that the financiers, on average, believe that past appreciations of the currency will lead to larger future depreciations/smaller future appreciations relative to FIRE

Financiers' Deviations From FIRE

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Additional Results:

- We also estimate $\eta^n < 0$ using individual level data Individual
- Result robust to controlling for forecast revisions both when using the average or individual level exchange rate forecasts (comparison to Coibion and Gorodnichenko (2012; 2015), Gennaioli, Ma, and Shleifer (2015)) FR
- Expected exchange rate change mostly explained by past exchange rate changes and PPP PPP
    - If the exchange rate has appreciated in the past the CE forecasts is consistent with a belief that it will depreciate in the future – beliefs opposite to momentum – explains why we observe trade in the futures market

Deviations from FIRE: implications for exchange rate dynamics

Exchange Rate Puzzles

The model *qualitatively* matches a set of exchange rate moments

- Delayed overshooting puzzle – the exchange rate first appreciates over some period in response to contractionary monetary policy shocks before depreciating
- Fama puzzle – the realized excess return from being long the foreign currency is higher, the higher the interest rate of the foreign country is relative to the home country
- Hump-shape dynamics – a hump-shaped response of the exchange rate to its own disturbances in an AR process

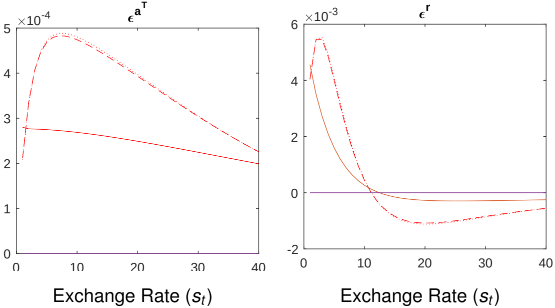
Hump-Shaped Dynamics

Persistence in exchange rate dynamics:

$$s_t - E_t s_{t+1} = -\left(\eta + m\mu^s\right)\left(s_{t-1} - s_t\right) - \tilde{r}_t - \rho\sigma_s^2 m\mu\hat{\varepsilon}_t^{\mu} + \rho\sigma_s^2 \frac{1}{\bar{\beta}} \widehat{\tilde{b}}_t^H .$$

Hump shaped dynamics of exchange rate as long as $(\eta + m\mu^s) < 0$ plus some shock persistence

- Benchmark case: $\eta = -0.6$ $\mu^s < 1$ and $m = 0.02$



Hump-Shaped Dynamics

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Hump shaped dynamics of exchange rate as long as $(\eta + m\mu^s) < 0$ plus some shock persistence Intuition for hump-shaped impulse responses:

- If the exchange rate appreciates on impact in response to a shock, it will continue appreciating in the short run due to the persistence introduced by the subjective beliefs of the average financier.
- The exchange rate will depreciate eventually due to the decay of the shock itself (i.e., the shock is persistent but transient)

Detail

Hump-Shaped Dynamics

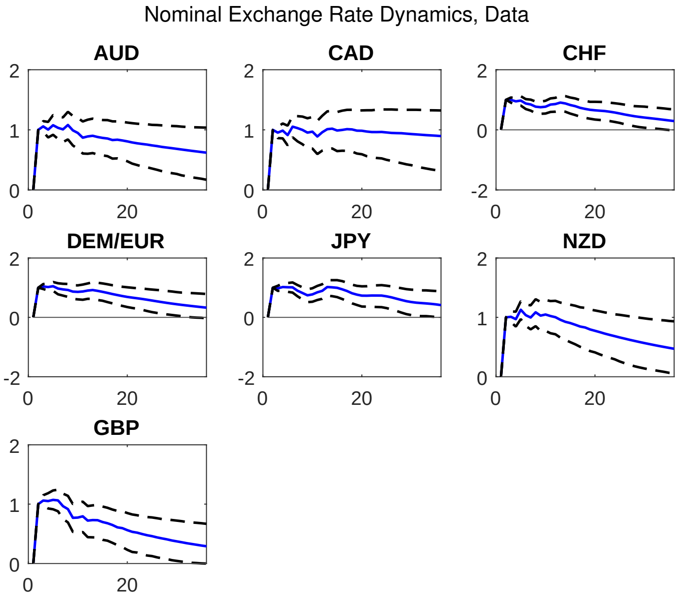
From estimated AR(12) processes following Steinsson (2008):

Table: Data and Model-Implied Moments

	Data	Baseline Model $\eta = -0.6$	Model under FIRE $\eta = 0$
α^s	0.974	0.890 [0.843, 0.927]	0.800 [0.698, 0.875]
UL/HL	0.199	0.612 [0.453, 0.717]	0 [0, 0]
2 HL−QL	0.876	0.397 [-0.558, 0.644]	-0.004 [-0.341, 0.160]
ϕ	1.483	0.777 [0.676, 0.872]	-0.051 [-0.309, 0.178]

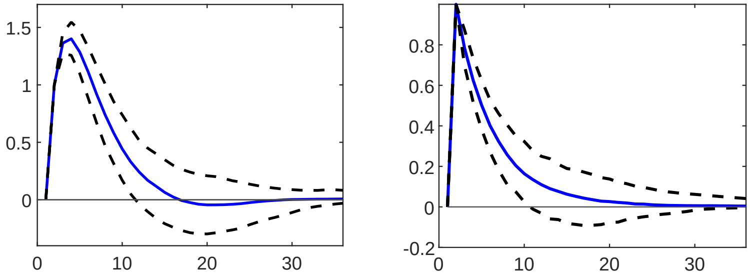
Note: Estimates of α^s are obtained from the regression $s_t = \mu\alpha^s s_{t-1} + \sum_{j=1}^{12} \psi_j \Delta s_{t-j} + \epsilon_t$. UL, HL, and QL denote the up-life, half-life, and quarter-life. ϕ is the estimate from the regression $s_t - s_{t+n} + \tilde{r}_t^n = \alpha + \phi\tilde{r}_t^n + \varepsilon_t$, where we use $n = 3$ in the data, given the longer and better quality interest rate series for $n = 3$, while the model is simulated with $n = 1$. Data moments are the average of pair-specific estimates for the seven currency pairs in our sample while model moments come from 1000 simulations each with 360 monthly observations. 5^{th} and 95^{th} percentiles from these simulations are presented in square brackets.

Hump-Shaped Dynamics: Data



Hump-Shaped Dynamics: Model

Nominal Exchange Rate Dynamics, Model Simulations



$\eta = -0.6$ $\eta = 0$

Conclusion

- We present a model of spot and derivative exchange rate markets which takes seriously the heterogeneity in beliefs and institutional details.

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Conclusion

- We present a model of spot and derivative exchange rate markets which takes seriously the heterogeneity in beliefs and institutional details.
- The model's predictions for both the determinants of demand and equilibrium exchange rates are supported in the data.
- We argue that understanding exchange rate supply and demand in forex markets and, hence, exchange rate dynamics requires better understanding the belief formation process of market participants.
- We uncover a particular deviation from FIRE that is supported in expectations data and helps to generate data-consistent exchange rate dynamics.

Model: Home Consumer

$$\max_{C_t, M_t, \tilde{B}_t^{H,n}} \tilde{E}_0 \sum_{t=0}^{\infty} \Pi_{\tau=0}^{t} \left(\beta_\tau\right) \left(\ln C_t + \omega \ln \left(\frac{M_t}{P_t} \right) \right)$$

$$\text{s.t.} \quad M_t + \tilde{B}_t^{H,n} + P_t C_t \leq P_t^T Y_t^T + P_t^{NT} Y_t^{NT} + R_{t-n}^{H,n} \tilde{B}_{t-n}^{H,n} + \pi_t^F + \pi_t^S + M_t^s [\chi_t \Pi_{\tau=0}^{t} \left(\beta_\tau\right)],$$

$$\text{where} \quad C_t = \left(C_t^T\right)^{\gamma} \left(C_t^{NT}\right)^{1-\gamma}$$

Assuming $M_t^s = \omega$ implies FOCs:

$$R_t^{H,n} = \frac{1}{\tilde{E}_t \left(\Pi_{\tau=t+1}^{t+n} \beta_\tau\right)}$$

$$P_t C_t = \frac{1}{\gamma} P_t^T C_t^T = \frac{1}{1-\gamma} P_t^{NT} C_t^{NT} = 1$$

$$RER_t = \frac{S_t P_t}{P_t^*} = \left(S_t\right)^{1-\gamma} \left(\frac{Y_t^{*NT}}{Y_t^{NT}} \right)^{1-\gamma}$$

- PPP holds: $\frac{S_t P_t^T}{P_t^{*T}} = 1$

Model: Financier

$$\max_{X_t^{n,i}, B_t^{F,n,i}} \tilde{E}_t^{F,i} \pi_{t+n}^{F,i} - \frac{\rho}{2} Var_t \left(\pi_{t+n}^{F,i} \right)$$

$$\text{s.t.} \quad B_t^{H,n,i} + \frac{B_t^{F,n,i}}{S_t} \leq 0$$

- $B_t^{F,n,i}$ and $B_t^{H,n,i}$ are financier *i*'s holdings of the foreign and home currency bonds, respectively
- Period $t + n$ profits:

$$\pi_{t+n}^{F,i} = \left(\frac{1}{S_{t+n}} - \frac{1}{F_t^n} \right) X_t^{n,i} + \left(\frac{R_t^{F,n}}{S_{t+n}} - \frac{R_t^{H,n}}{S_t} \right) B_t^{F,n,i}$$

- F_t^n is the futures price at which the two currencies will be exchanged defined as foreign per home.

Back

Evidence on implication 1: Linking Consensus average forecast to positions

$$X_t = \alpha^{CF} + \beta^{CF}\left(s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n\right) + \varepsilon_t^{CF}$$

where the model implies $\beta^{CF} > 0$.

Table: Positions and Expected Excess Returns Before Feb 7, 2007 – Monthly Frequency

(A) Over the Next Quarter (Before Feb 7, 2007)

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.06^{***}	0.27^{***}	0.22^{***}	-0.00	0.07^{***}	15.45^{***}	0.03^{***}
	(0.01)	(0.02)	(0.03)	(0.02)	(0.01)	(2.67)	(0.01)
# of Obs	159	162	105	158	164	171	13
Adj. R^2	0.10	0.35	0.29	-0.01	0.10	0.16	0.56

(C) Over the Next Year (Before Feb 7, 2007)

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.06^{***}	0.27^{***}	0.22^{***}	-0.00	0.07^{***}	15.45^{***}	0.03^{***}
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where the model implies $\beta^{CF} > 0$.

Table: Positions and Expected Excess Returns After Feb 7, 2007 – Monthly Frequency

(B) Over the Next Quarter

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.08^{**}	0.19^{***}	0.17^{***}	0.17	0.05^{*}	24.21^{***}	0.02^{**}
	(0.03)	(0.05)	(0.05)	(0.11)	(0.03)	(7.28)	(0.01)
# of Obs	132	131	28	132	130	130	132
Adj. R^2	0.02	0.08	0.32	0.01	0.02	0.08	0.03

(D) Over the Next Year

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.08^{**}	0.19^{***}	0.17^{***}	0.17	0.05^{*}	24.21^{***}	0.02^{**}
	(0.03)	(0.05)	(0.05)	(0.11)	(0.03)	(7.28)	(0.01)
# of Obs	132	131	28	132	130	130	132
Adj. R^2	0.02	0.08	0.32	0.01	0.02	0.08	0.03

Back

Evidence on implication 1: Linking Consensus average forecast to positions

$$X_t = \alpha^{CF} + \beta^{CF}\left(s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n\right) + \gamma^{CF} B_t^F + \varepsilon_t^{CF}$$

where the model implies $\beta^{CF} > 0$ and $\gamma^{CF} < 0$.

Table: Positions and Expected Excess Returns; Financiers' Foreign Currency Asset Holdings Proxied Using Interbank Loans Before Feb 7, 2007 – Weekly Frequency

(A) Over the Next Quarter (Before Feb 7, 2007)

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.084***	0.259***	0.193***	0.068***	0.095***	17.691***	0.017***
	(0.005)	(0.012)	(0.010)	(0.011)	(0.005)	(1.320)	(0.002)
B_t^F	−0.082***	0.011***	−0.008	0.010***	−0.010***	−0.003	−0.057***
	(0.004)	(0.002)	(0.006)	(0.001)	(0.001)	(0.002)	(0.008)
# of Obs	543	578	464	577	578	575	54
Adj. R^2	0.57	0.47	0.41	0.29	0.40	0.27	0.74

(C) Over the Next Year (Before Feb 7, 2007)

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.084***	0.259***	0.193***	0.068***	0.095***	17.691***	0.017***
	(0.005)	(0.012)	(0.010)	(0.011)	(0.005)	(1.320)	(0.002)
B_t^F	−0.082***	0.011***	−0.008	0.010***	−0.010***	−0.003	−0.057***
	(0.004)	(0.002)	(0.006)	(0.001)	(0.001)	(0.002)	(0.008)
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Back

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$$X_t = \alpha^{CF} + \beta^{CF}\left(s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n\right) + \gamma^{CF} B_t^F + \varepsilon_t^{CF}$$

where the model implies $\beta^{CF} > 0$ and $\gamma^{CF} < 0$.

Table: Positions and Expected Excess Returns; Financiers' Foreign Currency Asset Holdings Proxied Using Interbank Loans After Feb 7, 2007 – Weekly Frequency

(B) Over the Next Quarter

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.110^{***}	0.164^{***}	0.149^{***}	0.320^{***}	0.057^{***}	31.363^{***}	0.026^{***}
	(0.011)	(0.017)	(0.015)	(0.040)	(0.008)	(2.684)	(0.003)
B_t^F	-0.058^{***}	0.024^{***}	0.004^{**}	0.013^{***}	0.015^{***}	0.018^{***}	-0.046^{***}
	(0.005)	(0.004)	(0.002)	(0.003)	(0.003)	(0.002)	(0.006)
# of Obs	587	587	204	587	584	587	587
Adj. R^2	0.23	0.16	0.39	0.11	0.08	0.26	0.18

(D) Over the Next Year

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.110^{***}	0.164^{***}	0.149^{***}	0.320^{***}	0.057^{***}	31.363^{***}	0.026^{***}
	(0.011)	(0.017)	(0.015)	(0.040)	(0.008)	(2.684)	(0.003)
B_t^F	-0.058^{***}	0.024^{***}	0.004^{**}	0.013^{***}	0.015^{***}	0.018^{***}	-0.046^{***}
	(0.005)	(0.004)	(0.002)	(0.003)	(0.003)	(0.002)	(0.006)
# of Obs	587	587	204	587	584	587	587
Adj. R^2	0.23	0.16	0.39	0.11	0.08	0.26	0.18

Back

Explaining Positions with Expected Excess Returns and Controlling for Lagged Positions

Table: Positions and Expected Excess Returns Before Feb 7, 2007 – Weekly Frequency

(A) Over the Next Quarter (Before Feb 7, 2007)

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.028***	0.138***	0.145***	0.045***	0.055***	8.503***	0.015**
	(0.005)	(0.019)	(0.016)	(0.011)	(0.006)	(1.710)	(0.006)
X_{t-2}	1.121***	0.879***	0.875***	0.919***	0.922***	0.764***	0.418
	(0.205)	(0.102)	(0.180)	(0.142)	(0.091)	(0.130)	(0.269)
X_{t-3}	−0.236	−0.403**	−0.229	−0.017	−0.078	−0.061	0.413
	(0.330)	(0.180)	(0.228)	(0.185)	(0.144)	(0.142)	(0.394)
X_{t-4}	−0.249	0.206	0.110	0.090	−0.218	0.239	0.533
	(0.278)	(0.247)	(0.169)	(0.153)	(0.160)	(0.169)	(0.593)
X_{t-5}	0.263	0.077	0.007	−0.156	0.240**	−0.111	−0.815
	(0.193)	(0.157)	(0.104)	(0.155)	(0.112)	(0.113)	(0.493)
# of Obs	157	160	105	158	164	169	11
Adj. R^2	0.86	0.81	0.83	0.84	0.80	0.78	0.91

(C) Over the Next Year (Before Feb 7, 2007)

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.050***	0.146**	0.234***	0.048	0.092***	11.269***	0.081**
	(0.015)	(0.058)	(0.044)	(0.041)	(0.016)	(3.667)	(0.030)
X_{t-2}	1.173***	1.133***	1.025***	0.934***	0.963***	0.787***	0.218
	(0.212)	(0.116)	(0.214)	(0.196)	(0.090)	(0.137)	(0.157)
X_{t-3}	−0.282	−0.563***	−0.385	−0.191	−0.107	−0.056	0.598*
	(0.339)	(0.206)	(0.271)	(0.255)	(0.145)	(0.156)	(0.286)
X_{t-4}	−0.234	0.218	0.238	0.284	−0.163	0.323*	0.301
	(0.289)	(0.302)	(0.215)	(0.177)	(0.169)	(0.173)	(0.552)
X_{t-5}	0.219	0.063	−0.122	−0.277	0.156	−0.221*	−0.819
	(0.199)	(0.198)	(0.144)	(0.167)	(0.120)	(0.113)	(0.437)
# of Obs	151	153	105	112	157	168	11
Adj. R^2	0.85	0.77	0.76	0.78	0.79	0.74	0.94

Explaining Positions with Expected Excess Returns and Controlling for Lagged Positions

Table: Positions and Expected Excess Returns After Feb 7, 2007 – Weekly Frequency

(B) Over the Next Quarter

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.094***	0.078***	0.109***	0.193***	0.078***	15.289***	0.013***
	(0.014)	(0.020)	(0.034)	(0.030)	(0.013)	(2.181)	(0.003)
X_{t-2}	1.063***	1.464***	1.385***	1.080***	0.849***	1.086***	1.422***
	(0.188)	(0.160)	(0.390)	(0.153)	(0.137)	(0.116)	(0.197)
X_{t-3}	−0.422	−0.534***	−1.146**	−0.289	0.085	−0.194	−0.724**
	(0.296)	(0.190)	(0.518)	(0.220)	(0.222)	(0.163)	(0.310)
X_{t-4}	0.091	−0.093	−0.051	−0.189	−0.298	−0.081	0.220
	(0.233)	(0.168)	(0.304)	(0.196)	(0.219)	(0.164)	(0.286)
X_{t-5}	0.159	0.101	0.407*	0.339***	0.255**	0.071	−0.095
	(0.110)	(0.142)	(0.202)	(0.118)	(0.106)	(0.102)	(0.160)
# of Obs	132	131	28	132	130	130	132
Adj. R^2	0.89	0.91	0.73	0.94	0.89	0.91	0.80

(D) Over the Next Year

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.219***	0.168***	0.205***	0.480***	0.240***	30.140***	0.031***
	(0.046)	(0.062)	(0.044)	(0.105)	(0.042)	(7.547)	(0.011)
X_{t-2}	1.147***	1.491***	0.788***	1.177***	0.867***	1.152***	1.282***
	(0.213)	(0.156)	(0.261)	(0.163)	(0.146)	(0.134)	(0.164)
X_{t-3}	−0.470	−0.570***	0.003	−0.320	0.180	−0.239	−0.359
	(0.368)	(0.197)	(0.398)	(0.228)	(0.247)	(0.184)	(0.290)
X_{t-4}	0.124	−0.092	−0.047	−0.120	−0.634***	−0.107	−0.326
	(0.304)	(0.220)	(0.319)	(0.229)	(0.231)	(0.195)	(0.318)
X_{t-5}	0.084	0.092	0.011	0.170	0.363***	0.043	0.228
	(0.152)	(0.198)	(0.192)	(0.147)	(0.111)	(0.128)	(0.187)
# of Obs	111	107	111	111	107	110	109
Adj. R^2	0.88	0.91	0.71	0.92	0.86	0.90	0.83

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Explaining Positions with Expected Excess Returns and Controlling for VIX and Exchange Rate Variance– Weekly Frequency

Table: Positions and Expected Excess Returns Before Feb 7, 2007 – Weekly Frequency

(A) Over the Next Quarter (Before Feb 7, 2007)

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.062***	0.277***	0.181***	0.061***	0.080***	17.006***	0.026***
	(0.005)	(0.011)	(0.008)	(0.009)	(0.004)	(1.135)	(0.002)
VIX	0.830***	−1.774***	−2.785***	−1.944***	0.431***	−8.903	0.674**
	(0.244)	(0.234)	(0.324)	(0.448)	(0.158)	(36.161)	(0.291)
$\sigma^2_{s,t}$	−0.000	−0.003***	−0.002***	0.000	0.000***	0.024**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.011)	(0.000)
# of Obs	712	747	464	712	741	743	54
Adj. R^2	0.18	0.54	0.57	0.04	0.23	0.25	0.74

(C) Over the Next Year (Before Feb 7, 2007)

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.241***	0.746***	0.512***	0.353***	0.204***	32.402***	0.105***
	(0.019)	(0.029)	(0.024)	(0.034)	(0.014)	(3.133)	(0.008)
VIX	−0.307	−2.588***	−3.676***	0.338	0.189	−99.503**	0.461*
	(0.230)	(0.259)	(0.315)	(0.509)	(0.156)	(39.157)	(0.250)
$\sigma^2_{s,t}$	−0.000**	−0.002***	−0.002***	−0.000*	0.000***	0.005	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.010)	(0.000)
# of Obs	712	744	468	494	747	747	54
Adj. R^2	0.23	0.41	0.52	0.14	0.17	0.14	0.80

Explaining Positions with Expected Excess Returns and Controlling for VIX and Exchange Rate Variance– Weekly Frequency

Table: Positions and Expected Excess Returns After Feb 7, 2007 – Weekly Frequency

(B) Over the Next Quarter

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.114***	0.185***	0.153***	0.310***	0.060***	19.379***	0.029***
	(0.012)	(0.019)	(0.015)	(0.042)	(0.008)	(2.368)	(0.003)
VIX	−2.655***	−3.497***	−1.035*	−3.706**	−1.471***	−1245.441***	−0.446***
	(0.633)	(0.718)	(0.578)	(1.597)	(0.284)	(70.577)	(0.156)
$\sigma_{s,t}^2$	0.000***	0.001***	−0.000	0.001***	0.002***	−0.041	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.050)	(0.000)
# of Obs	587	587	204	587	584	587	587
Adj. R^2	0.11	0.16	0.38	0.07	0.24	0.43	0.14

(D) Over the Next Year

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - \tilde{E}_t^F s_{t+n} + \tilde{r}_t^n$	0.482***	0.869***	0.446***	1.324***	0.430***	84.538***	0.085***
	(0.058)	(0.060)	(0.041)	(0.158)	(0.034)	(7.068)	(0.010)
VIX	−5.183***	−4.997***	−2.032***	−11.056***	−0.940**	−1170.118***	−0.056
	(0.910)	(0.649)	(0.301)	(1.715)	(0.401)	(96.576)	(0.161)
$\sigma_{s,t}^2$	0.000***	0.001***	−0.000	0.001**	0.001***	0.031	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.059)	(0.000)
# of Obs	499	486	499	499	482	499	499
Adj. R^2	0.10	0.30	0.33	0.13	0.31	0.48	0.14

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Evidence on implication 2: Linking positions to realized exchange rates

$$s_t - s_{t-j} = \alpha^{CF} + \beta^{CF}\left(mX_t^S - mX_{t-j}^S\right) + \psi^{CF}\left(\tilde{r}_t^n - \tilde{r}_{t-j}^n\right) + \lambda^{CF}\left(\tilde{E}_t^F s_{t+n} - \tilde{E}_{t-j}^F s_{t-j+n}\right) + \gamma^{CF}\left(\tilde{B}_t^{*F} - \tilde{B}_{t-j}^{*F}\right) + \varepsilon_t^{CF}.$$

where the model implies $\lambda^{CF} > 0$ and $\gamma^{CF}, \beta^{CF}, \psi^{CF} < 0$.

Monthly; Foreign Consumers' Asset Holdings in the Foreign Currency Proxied Using Interbank Loans; Monthly Change

Only Positions

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$m\Delta X_t^S$	-0.893^{***}	-0.447^{***}	-0.681^{***}	-0.339^{***}	-1.031^{***}	-0.004^{***}	-3.374^{***}
	(0.092)	(0.044)	(0.056)	(0.031)	(0.095)	(0.000)	(0.655)
# of Obs	186	200	193	200	200	250	81
Adj. R^2	0.28	0.24	0.37	0.29	0.35	0.35	0.28

All Variables

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$m\Delta X_t^S$	-0.765^{***}	-0.393^{***}	-0.652^{***}	-0.317^{***}	-0.861^{***}	-0.003^{***}	-2.668^{***}
	(0.103)	(0.052)	(0.058)	(0.028)	(0.097)	(0.000)	(0.578)
$\Delta\tilde{r}_t^n$	-1.933^{*}	-0.058	-0.590	-0.988^{*}	-0.773	-1.312	0.920
	(1.050)	(0.402)	(0.831)	(0.581)	(0.704)	(0.798)	(1.059)
$\Delta\tilde{E}_t^F s_{t+n}$	0.473^{***}	0.402^{***}	0.150	0.426^{***}	0.438^{***}	0.494^{***}	0.376^{**}
	(0.120)	(0.122)	(0.124)	(0.087)	(0.097)	(0.094)	(0.155)
$\Delta\tilde{B}_t^{*F}$	-0.141^{**}	0.025	-0.032	0.026^{***}	-0.045^{*}	-0.000	-0.514^{***}
	(0.058)	(0.017)	(0.029)	(0.010)	(0.025)	(0.000)	(0.130)
# of Obs	186	200	193	200	200	250	81
Adj. R^2	0.49	0.33	0.38	0.45	0.50	0.51	0.41

Back

Evidence on implication 2: Linking positions to realized exchange rates

$$s_t - s_{t-j} = \alpha^{CF} + \beta^{CF}\left(mX_t^S - mX_{t-j}^S\right) + \psi^{CF}\left(\tilde{r}_t^n - \tilde{r}_{t-j}^n\right) + \lambda^{CF}\left(\tilde{E}_t^F s_{t+n} - \tilde{E}_{t-j}^F s_{t-j+n}\right) + \gamma^{CF}\left(\tilde{B}_t^{*F} - \tilde{B}_{t-j}^{*F}\right) + \varepsilon_t^{CF}.$$

where the model implies $\lambda^{CF} > 0$ and $\gamma^{CF}, \beta^{CF}, \psi^{CF} < 0$.

Monthly; Foreign Consumers' Asset Holdings in the Foreign Currency Proxied Using Interbank Loans; Quarterly Change

Only Positions

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$m\Delta X_t^S$	-0.854^{***}	-0.506^{***}	-0.809^{***}	-0.393^{***}	-1.054^{***}	-0.005^{***}	-2.331^{***}
	(0.107)	(0.054)	(0.062)	(0.039)	(0.113)	(0.000)	(0.447)
# of Obs	285	289	127	287	291	295	141
Adj. R^2	0.28	0.30	0.54	0.23	0.28	0.30	0.25

All Variables

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$m\Delta X_t^S$	-0.648^{***}	-0.338^{***}	-0.654^{***}	-0.288^{***}	-0.658^{***}	-0.003^{***}	-2.753^{***}
	(0.108)	(0.050)	(0.053)	(0.029)	(0.095)	(0.000)	(0.393)
$\Delta\tilde{r}_t^n$	-0.858^{*}	0.742	0.507	-0.631	-0.939^{**}	-0.539	0.662
	(0.471)	(0.803)	(0.820)	(0.700)	(0.463)	(0.497)	(0.585)
$\Delta\tilde{E}_t^F s_{t+n}$	0.707^{***}	0.687^{***}	0.536^{***}	0.669^{***}	0.664^{***}	0.713^{***}	0.717^{***}
	(0.044)	(0.088)	(0.063)	(0.057)	(0.074)	(0.048)	(0.092)
$\Delta\tilde{B}_t^{*F}$	-0.036	0.018	-0.027^{**}	0.004	-0.006	-0.000	-0.144^{**}
	(0.029)	(0.011)	(0.012)	(0.004)	(0.012)	(0.000)	(0.055)
# of Obs	180	194	84	193	193	239	76
Adj. R^2	0.77	0.68	0.81	0.71	0.72	0.79	0.81

Back

Evidence on implication 2: Linking positions to realized exchange rates

$$s_t - s_{t-j} = \alpha^{CF} + \beta^{CF}\left(mX_t^S - mX_{t-j}^S\right) + \psi^{CF}\left(\tilde{r}_t^n - \tilde{r}_{t-j}^n\right) +$$
$$\lambda^{CF}\left(\tilde{E}_t^F s_{t+n} - \tilde{E}_{t-j}^F s_{t-j+n}\right) + \gamma^{CF}\left(\tilde{B}_t^{*F} - \tilde{B}_{t-j}^{*F}\right) + \varepsilon_t^{CF}.$$

where the model implies $\lambda^{CF} > 0$ and $\gamma^{CF}, \beta^{CF}, \psi^{CF} < 0$.

Monthly; Foreign Consumers' Asset Holdings in the Foreign Currency Proxied Using Interbank Loans; Annual Change

Only Positions

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$m\Delta X_t^S$	-1.153^{***}	-0.624^{***}	-0.995^{***}	-0.285^{***}	-1.183^{***}	-0.006^{***}	-5.381^{***}
	(0.319)	(0.160)	(0.119)	(0.075)	(0.167)	(0.001)	(1.114)
# of Obs	253	254	205	212	256	268	110
Adj. R^2	0.17	0.15	0.27	0.10	0.21	0.16	0.27

All Variables

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$m\Delta X_t^S$	-0.450^{***}	-0.273^{***}	-0.667^{***}	-0.159^{***}	-0.494^{***}	-0.003^{***}	-2.812^{***}
	(0.139)	(0.069)	(0.075)	(0.024)	(0.065)	(0.000)	(0.398)
$\Delta\tilde{r}_t^n$	-0.895^{**}	-0.469^{**}	-1.116^{***}	-1.932^{***}	-1.384^{***}	-1.539^{***}	-1.331^{**}
	(0.374)	(0.231)	(0.365)	(0.419)	(0.252)	(0.462)	(0.648)
$\Delta\tilde{E}_t^F s_{t+n}$	0.994^{***}	1.060^{***}	0.970^{***}	1.041^{***}	0.979^{***}	0.866^{***}	0.866^{***}
	(0.048)	(0.058)	(0.076)	(0.069)	(0.069)	(0.052)	(0.065)
$\Delta\tilde{B}_t^{*F}$	-0.022	0.024^{***}	-0.018^{*}	0.003	0.009	0.000	-0.097
	(0.028)	(0.008)	(0.010)	(0.004)	(0.006)	(0.000)	(0.061)
# of Obs	224	226	205	212	225	230	110
Adj. R^2	0.90	0.91	0.83	0.85	0.88	0.86	0.91

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Speculators' Demand/Beliefs

- We test whether the speculators' positions are consistent with "momentum" or with "carry trade" trading strategies
- We decompose the speculators' demand using an OLS estimate of:

$$X_t^S = \alpha^s + \underbrace{\beta_{30}^s \Delta_{30}^{-1} s_{t-1} + \beta_{90}^s \Delta_{90}^{-1} s_{t-1} + \beta_{120}^s \Delta_{120}^{-1} s_{t-1} + \beta_{365}^s \Delta_{365}^{-1} s_{t-1}}_{Momentum}$$
$$+ \underbrace{\beta_3^i \tilde{r}_{t-1}^3 + \beta_{12}^i \tilde{r}_{t-1}^{12}}_{Carry} + \varepsilon_t^s,$$

where $\Delta_k^{-1} s_{t-1} = s_{t-k-1} - s_{t-1}$, to compute

$$1 = \frac{Cov\left(Momentum, X^S\right)}{Var\left(X^S\right)} + \frac{Cov\left(Carry, X^S\right)}{Var\left(X^S\right)} + \frac{Cov\left(Residual, X^S\right)}{Var\left(X^S\right)}$$

Speculators' Demand/Beliefs

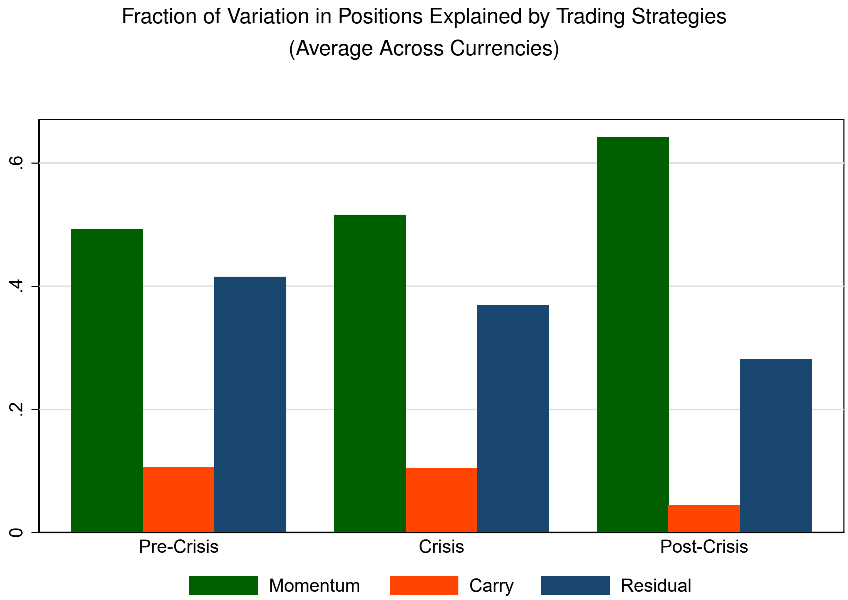
Prevalence of Momentum-Based Speculator Demand

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_{t-30} - s_{t-1}$	6.647*	2.236	19.494***	32.559**	11.119***	2615.681***	−0.128
	(4.029)	(9.216)	(4.859)	(13.372)	(3.183)	(563.921)	(1.048)
$s_{t-60} - s_{t-1}$	6.681**	14.111*	21.291***	9.058	11.704***	2199.367***	3.048***
	(3.358)	(7.207)	(3.962)	(12.295)	(3.007)	(582.754)	(0.985)
$s_{t-90} - s_{t-1}$	6.103*	14.336***	12.401***	14.239	2.451	1008.590*	2.143**
	(3.408)	(5.539)	(3.775)	(11.525)	(2.966)	(558.883)	(0.876)
$s_{t-120} - s_{t-1}$	11.999***	18.926***	15.342***	20.866**	5.484***	1254.034***	2.955***
	(2.499)	(3.571)	(2.834)	(8.814)	(1.961)	(384.139)	(0.647)
$s_{t-365} - s_{t-1}$	10.525***	16.484***	4.782***	40.051***	7.036***	2506.901***	2.301***
	(0.801)	(0.877)	(1.254)	(2.915)	(0.685)	(155.752)	(0.233)
$\tilde{r}^3_{t-1}$	1.318***	−1.319***	1.292***	−10.495***	−0.069	54.398	−0.012
	(0.265)	(0.240)	(0.492)	(1.426)	(0.159)	(47.607)	(0.041)
$\tilde{r}^{12}_{t-1}$	−0.886***	1.656***	−0.753	9.334***	0.347**	−60.091	0.035
	(0.271)	(0.267)	(0.479)	(1.426)	(0.162)	(46.590)	(0.065)
# of Obs	1226	1275	656	995	1226	1251	578
Adj. R^2	0.47	0.54	0.70	0.42	0.40	0.54	0.52

Only Momentum Terms

Adj. R^2	0.43	0.50	0.52	0.32	0.40	0.50	0.41

Speculators' Demand/Beliefs



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Financiers' Deviations From FIRE

Define

$$\tilde{E}_t^F s_{t+n} = E_t s_{t+n} + \kappa_t^n,$$

where κ_t^n captures the deviation from FIRE.

- Decomposing the regression coefficient from regressing the subjective expected/realized excess return on the average financiers' derivatives positions:

$$\beta^{CF} = \beta^{FIRE} - \frac{Cov(\kappa_t^n, X_t)}{Var(X_t)}.$$

Since we estimate $\beta^{CF} > 0$ and $\beta^{FIRE} <= 0$, it has to be the case:

$$Cov(\kappa_t^n, X_t) < 0.$$

Plugging in speculators' demand

$$Cov(\kappa_t^n, m\frac{\mu^s (s_t - s_{t-1})}{\rho\sigma_{n,s}^2} - m\mu\varepsilon_t^\mu) < 0. \tag{2}$$

Therefore, we conjecture that

$$\kappa_t^n = \eta^n (s_t - s_{t-1})$$

- In order for inequality (2) to be satisfied, it will have to be the case $\eta^n < 0$.
- If the Consensus Economic forecasts were consistent with FIRE then $\eta^n = 0$

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Financiers' Deviations From FIRE: Individual Level Data

$n = 1$

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - s_{t-1}$	-0.533^{***}	-0.456^{***}	-0.099^{***}	-0.247^{***}	-0.259^{***}	-0.301^{***}	-0.377^{***}
	(0.036)	(0.034)	(0.031)	(0.032)	(0.033)	(0.070)	(0.036)
# of Obs	4703	4248	3933	4425	4407	4464	4168
Adj. R^2	0.20	0.19	0.21	0.09	0.08	0.08	0.15

$n = 3$

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - s_{t-1}$	-0.589^{***}	-0.558^{***}	-0.201^{***}	-0.348^{***}	-0.421^{***}	-0.501^{***}	-0.539^{***}
	(0.052)	(0.055)	(0.046)	(0.058)	(0.055)	(0.046)	(0.060)
# of Obs	4582	4103	3795	4281	4264	4322	4058
Adj. R^2	0.11	0.14	0.11	0.06	0.05	0.07	0.10

$n = 12$

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - s_{t-1}$	-0.320	-0.333^{***}	-0.135	-0.179	-0.219^{**}	-0.732^{***}	-0.407^{*}
	(0.193)	(0.113)	(0.100)	(0.148)	(0.083)	(0.087)	(0.200)
# of Obs	2276	1955	1751	2061	2048	2084	1851
Adj. R^2	0.07	0.09	0.08	0.04	0.01	0.07	0.05

$n = 24$

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - s_{t-1}$	-0.689^{***}	-0.734^{***}	-0.445^{***}	-0.483^{***}	-0.260^{**}	-0.740^{***}	-0.585^{*}
	(0.224)	(0.157)	(0.111)	(0.128)	(0.099)	(0.221)	(0.292)
# of Obs	2305	1966	1780	2072	2058	2091	1874
Adj. R^2	0.18	0.26	0.30	0.15	0.13	0.09	0.17

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Financiers' Deviations From FIRE

Table: Exchange Rate Surprises, 3M Ahead

(A) Forecast Revisions

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$\tilde{E}_t^F s_{t+3} - \tilde{E}_{t-9}^F s_{t+3}$	0.018	-0.002	-0.006	0.031	0.191^{***}	-0.019	-0.035
	(0.082)	(0.069)	(0.077)	(0.065)	(0.065)	(0.060)	(0.079)
# of Obs	334	334	334	334	334	334	334
Adj. R^2	-0.00	-0.00	-0.00	-0.00	0.07	-0.00	-0.00

(B) Monthly Exchange Rate Change and Forecast Revisions

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$\tilde{E}_t^F s_{t+3} - \tilde{E}_{t-9}^F s_{t+3}$	0.050	0.032	0.013	0.058	0.220^{***}	0.009	0.005
	(0.079)	(0.065)	(0.076)	(0.066)	(0.059)	(0.059)	(0.075)
$s_t - s_{t-1}$	-0.675^{***}	-0.684^{***}	-0.362^{***}	-0.460^{***}	-0.532^{***}	-0.605^{***}	-0.710^{***}
	(0.148)	(0.143)	(0.113)	(0.118)	(0.137)	(0.126)	(0.156)
# of Obs	334	334	334	334	334	334	334
Adj. R^2	0.08	0.09	0.02	0.04	0.13	0.07	0.09

Note: Estimates of $\{\beta_n^5, \psi_n^5\}$ from the regression $\tilde{E}_t^F s_{t+n} - s_{t+n} = \alpha_n^5 + \beta_n^5(s_t - s_{t-1}) + \psi_n^5(\tilde{E}_t^F s_{t+n} - \tilde{E}_{t-j}^F s_{t+n}) + \varepsilon_{t+n}^5$ for $n = 3$ with or without restricting $\beta_n^5 = 0$. Newey-West heteroskedasticity and autocorrelation consistent standard errors in parentheses.

Financiers' Deviations From FIRE

Table: Exchange Rate Surprises, 12M Ahead

(A) Forecast Revisions

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$\tilde{E}^F_t s_{t+12} - \tilde{E}^F_{t-12} s_{t+12}$	-0.040	-0.168	-0.042	0.017	0.116	0.109	-0.014
	(0.196)	(0.205)	(0.167)	(0.170)	(0.152)	(0.173)	(0.203)
# of Obs	264	264	264	264	264	264	264
Adj. R^2	-0.00	0.02	-0.00	-0.00	0.01	0.00	-0.00

(B) Monthly Exchange Rate Change and Forecast Revisions

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$\tilde{E}^F_t s_{t+12} - \tilde{E}^F_{t-12} s_{t+12}$	-0.020	-0.143	-0.031	0.034	0.128	0.135	0.012
	(0.190)	(0.200)	(0.163)	(0.165)	(0.151)	(0.170)	(0.196)
$s_t - s_{t-1}$	-0.546^{*}	-0.525^{***}	-0.332^{*}	-0.479^{*}	-0.351^{**}	-0.812^{***}	-0.677^{**}
	(0.305)	(0.184)	(0.191)	(0.256)	(0.158)	(0.168)	(0.277)
# of Obs	264	264	264	264	264	264	264
Adj. R^2	0.01	0.03	0.00	0.01	0.01	0.05	0.02

Note: Estimates of $\{\beta^5_n, \psi^5_n\}$ from the regression $\tilde{E}^F_t s_{t+n} - s_{t+n} = \alpha^5_n + \beta^5_n(s_t - s_{t-1}) + \psi^5_n(\tilde{E}^F_t s_{t+n} - \tilde{E}^F_{t-j} s_{t+n}) + \varepsilon^5_{t+n}$ for $n = 12$ with or without restricting $\beta^5_n = 0$. Newey-West heteroskedasticity and autocorrelation consistent standard errors in parentheses.

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What drives Consensus forecasts overall?

Exchange rate change forecasts, 1M Ahead ($s_t - \tilde{E}_t^F s_{t+1}$)

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - s_{t-1}$	0.445***	0.479***	0.349***	0.382***	0.395***	0.457***	0.451***
	(0.033)	(0.029)	(0.039)	(0.030)	(0.037)	(0.027)	(0.034)
# of Obs	255	255	255	255	255	255	255
Adj. R^2	0.46	0.62	0.41	0.45	0.51	0.58	0.46

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - s_{t-1}$	0.429***	0.473***	0.322***	0.370***	0.413***	0.454***	0.434***
	(0.032)	(0.029)	(0.035)	(0.028)	(0.035)	(0.027)	(0.032)
RER_t	0.030***	0.012***	0.051***	0.022***	$-$0.026***	0.005	0.033***
	(0.004)	(0.003)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)
# of Obs	255	255	255	255	255	255	255
Adj. R^2	0.54	0.63	0.54	0.48	0.54	0.58	0.54

Note: Heteroskedasticity-consistent standard errors in parentheses.

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What drives Consensus forecasts overall?

Exchange rate change forecasts, 24M Ahead ($s_t - \tilde{E}_t^F s_{t+24}$)

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - s_{t-1}$	0.654^{***}	0.602^{***}	0.620^{***}	0.592^{***}	0.537^{***}	0.645^{***}	0.638^{***}
	(0.143)	(0.092)	(0.175)	(0.146)	(0.090)	(0.114)	(0.165)
# of Obs	285	285	285	285	285	285	285
Adj. R^2	0.07	0.15	0.07	0.07	0.15	0.09	0.06

	AUD	CAD	CHF	DEM/EUR	GBP	JPY	NZD
$s_t - s_{t-1}$	0.472^{***}	0.491^{***}	0.385^{***}	0.416^{***}	0.392^{***}	0.609^{***}	0.441^{***}
	(0.066)	(0.059)	(0.072)	(0.081)	(0.075)	(0.111)	(0.079)
RER_t	0.343^{***}	0.199^{***}	0.456^{***}	0.339^{***}	0.219^{***}	0.079^{***}	0.378^{***}
	(0.010)	(0.007)	(0.019)	(0.017)	(0.018)	(0.020)	(0.012)
# of Obs	285	285	285	285	285	285	285
Adj. R^2	0.82	0.74	0.77	0.66	0.53	0.13	0.71

Note: Heteroskedasticity-consistent standard errors in parentheses.

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Macro implications for exchange rate dynamics

- The model can be reduced to the following equations in $\{s_t, \hat{x}_t, \hat{\tilde{b}}_t^H\}$:

$$s_t = -\tilde{a}_t^T - \frac{2}{\gamma}\underbrace{\left(\hat{\tilde{b}}_t^H - \frac{1}{\bar{\beta}}\hat{\tilde{b}}_{t-1}^H\right)}_{nx_t}$$

$$\hat{x}_t + \underbrace{m\left(\frac{\mu^s}{\rho\sigma_s^2}\left(s_{t-1} - s_t\right) + \mu\hat{\varepsilon}_t^\mu\right)}_{\hat{x}_t^s} = 0$$

$$\lambda_t = \rho\sigma_s^2\left(\hat{x}_t + \frac{1}{\bar{\beta}}\hat{\tilde{b}}_t^H\right)$$

  where $\tilde{a}_t^T \equiv a_t^{*T} - a_t^T$ and $\lambda_t \equiv -\tilde{E}_t^F s_{t+1} + s_t + \tilde{r}_t$ is the financiers' expected excess return of investing in the foreign currency by borrowing in home currency.

- Financiers' beliefs: $\tilde{E}_t^F s_{t+1} = E_t s_{t+1} + \eta\left(s_t - s_{t-1}\right)$

- $\tilde{a}_t^T$ and $\tilde{r}_t$ are assumed to AR(1).

- $\hat{\varepsilon}_t^\mu$ is assumed to be iid.

Demand/Supply

$$Demand^F_{FC} = -Demand^S_{FC} - \frac{1}{\bar{\beta}} Demand^{FC}_{FC}$$

$$Demand^F_{FC} = \frac{\lambda_t}{\rho\sigma_s^2} = \frac{\overbrace{-E_t s_{t+1} - \eta\left(s_t - s_{t-1}\right)}^{-\tilde{E}^F_t s_{t+1}} + s_t + \tilde{r}_t}{\rho\sigma_s^2}$$

$$-Demand^S_{FC} = -m\underbrace{\left(\frac{\mu^s}{\rho\sigma_s^2}\left(s_{t-1} - s_t\right) + \mu\hat{\varepsilon}^{\mu}_t\right)}_{\hat{x}^S_t}$$

$$-\frac{1}{\bar{\beta}} Demand^{FC}_{FC} = -\frac{1}{\bar{\beta}}\underbrace{\left(\frac{1}{\bar{\beta}}\widehat{\tilde{b}}^{*F}_{t-1} + \overbrace{s_t\frac{\gamma}{2} + \tilde{a}^T_t\frac{\gamma}{2}}^{nx^*_t}\right)}_{\widehat{\tilde{b}}^{*F}_t},$$

Impulse Responses – TFP shock

Consider the case of no futures market, $m = 0$

- An increase of $\varepsilon_t^{a^T}$, appreciates the home currency
- Due to consumption smoothing, higher tradable output at home increases the home consumers' home currency bond holdings
- For the bond market to clear, the average financier must decrease her home currency bond holdings and increase her foreign currency bond holdings and the foreign consumers must decrease their foreign currency bond holdings.
- The former is achieved via a contemporaneous foreign currency depreciation, which increases the expected excess return of the average financier from investing in the foreign currency bond,
- The latter is due to lower foreign currency price of tradeables due to higher supply of tradeables, which leads to increased consumption of tradeables by the foreign consumer and hence more foreign currency borrowing.

Impulse Responses – Monetary Policy Shock

Consider the case of no futures market, $m = 0$

- An increase of ε_t^r appreciates the home currency
- It lowers the financiers' average expected excess return from being long the foreign currency, increasing the financiers' demand for the home currency bond and decreasing it for the foreign currency bond.
- For the bond market to clear, home consumers must lower their savings in the home currency bond while the foreign consumers increase their savings in the foreign currency bond.
- Both are achieved via a contemporaneous foreign currency depreciation.
- The weaker foreign currency increases the foreign currency price of the tradeable good, which lowers the foreign consumers' consumption of the tradeable good and the foreign consumers increase their savings in the foreign bond.
- The opposite is true for the home consumer. The weaker foreign currency decreases the home currency price of the tradeable good, which leads to higher consumption of the home consumers of the tradeable good and the home consumers decrease their savings in the home bond.