Foreign Investor Feedback Trading in an Emerging Financial Market

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Motivation

- Emerging economy financial markets experienced a surge in cross-border capital inflows following the GFC
- Favorable global liquidity conditions have interacted with improving local fundamentals to drive this trend (CGFS, 2021)
- Due to data limitations, research that can leverage the precision of market microstructure to study the effects of foreign investor participation in local financial markets is scant

Roadmap

- **Starting Point**
  - Previous research provides mixed evidence concerning the impact of foreign investors on local financial markets
    - Largely focus on one market segment (mostly equity)
    - Data is sourced from a single platform or brokerage firm

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  - Leverages a new regulatory dataset on trading dynamics in Thailand's financial market
    - Buy- and sell transactions in foreign exchange, equity, and fixed income markets
    - Trading identifier for different groups of market participants
    - Free of any reporting biases
    - Substantial time series coverage of post-GFC period

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$\rightarrow$ Re-assess the link between trading dynamics and returns

$\rightarrow$ Explore differences between foreign and local investors

$\rightarrow$ Examine trading motives of foreign investors

Preview: Main Findings

1. **Heterogeneous Trading Impact**
   - Foreign investor trading and returns are positively correlated *across all markets*
   - Local "informed" investors (e.g., asset managers) affect prices positively, but have a smaller impact and/or only with a delay
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2. **Asymmetric Information**
   - Foreign investor trading has a persistent impact on local assets
     - Order flow predicts returns up to 1-week
     - Impact of local trading dissipates quickly
   - Local investors react systematically stronger to local news
     - News explain a large proportion of local trading over various horizons

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3. **Trading Motives**
   - On average, foreign order flow is in line with time series momentum trading
     - Following positive return realizations, foreigners increase their positions
     - In aggregate, local investors trade contrary to past returns
   - Evidence for portfolio rebalancing is weak
     - Rel. higher local returns are related to stronger capital inflows
     - Order flow in equity and bond markets are positively linked to Thai baht

Related literature

- Local and foreign investor trading decision in equity markets.

  Grinblatt & Keloharju (2000), Froot et al (2001), Kim & Wei (2002), Hau & Rey (2005), Richards (2005), Angudelo et al (2019), Lundblad et al (2022, Ho (2022).

- Trading in Thai financial markets.

  Gyntelberg et al (2014, 2018), Koosakul & Ananchotikul (2019), Koosakul & Shim (2021).

- Feedback effects and order flow dynamics.

  Evans and Lyons (2002), Payne (2003), Danielsson & Love (2006), Breedon et al (2021),

- Heterogeneous impact of news on prices and trading decisions.

  Altavilla et al (2017), Feunou et al (2023)

Data

- **Time Series**
  - 10 years of data, daily frequency
  - Covering post-GFC period: January 2011 - August 2020
- **Investor Types**
  - Trading identifiers for foreign and local investors
  - Local investors are further categorized into five different groups (e.g., asset managers, corporates, retail traders)
- **Asset Classes**
  - Regulatory data from various Thai authorities
  - Trading dynamics in foreign exchange, equity and long-term fixed income markets

$\rightarrow$ *Holistic view of trading dynamics without any reporting biases*

⏩ Inst. Details

Variables

- **Order Flow**
  - Buyer- minus seller-initiated traded volume

$$OF_t^{j,c} = BUY_t^{j,c} - SELL_t^{j,c},$$

- **Trading Volume**
  - Buyer- plus seller-initiated traded volume

$$VOL_t^{j,c} = BUY_t^{j,c} + SELL_t^{j,c},$$

- **Normalized Order Flow**
  - Normalized trading flow relative to daily volume in asset class c by market participant j

$$NOF_t^{j,c} = \frac{OF_t^{j,c}}{VOL_t^{j,c}}.$$

Returns and normalized order flow: foreign exchange

	Ret	FO	IT	AM	CO	RE	LC	TOT
Mean	-0.15	0.08	-0.30	-0.58	-0.06	0.15	-0.09	-0.01
t-stat	(-0.24)	(20.77)	(-35.86)	(-77.35)	(-17.95)	(63.50)	(-34.82)	(-2.69)
Median	0.00	0.08	-0.30	-0.68	-0.05	0.16	-0.09	-0.00
z-stat	(0.80)	(17.74)	(-28.99)	(-40.44)	(-15.39)	(40.61)	(-26.43)	(-1.34)
Std. Dev.	30.22	0.18	0.41	0.36	0.15	0.12	0.13	0.09
Skewness	0.09	-0.17	0.45	1.27	0.09	-0.42	0.03	-0.13
Kurtosis	5.74	3.09	2.87	4.43	3.28	5.33	3.15	3.40
ACorr	0.07	0.32	0.07	0.23	0.23	0.34	0.17	0.23

- FX returns are random and unpredictable

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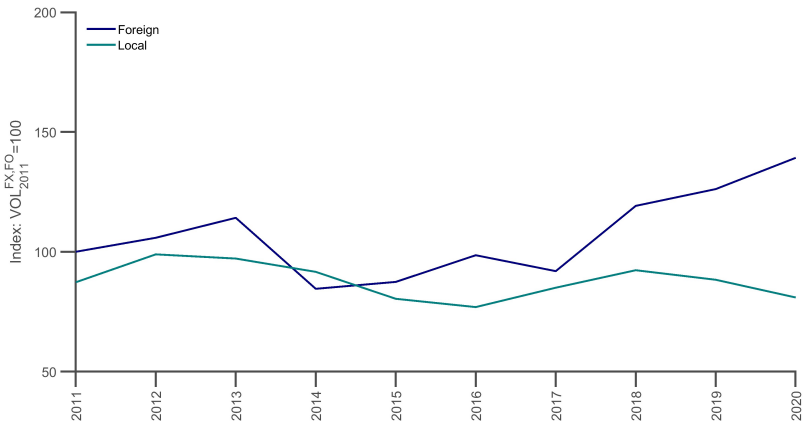
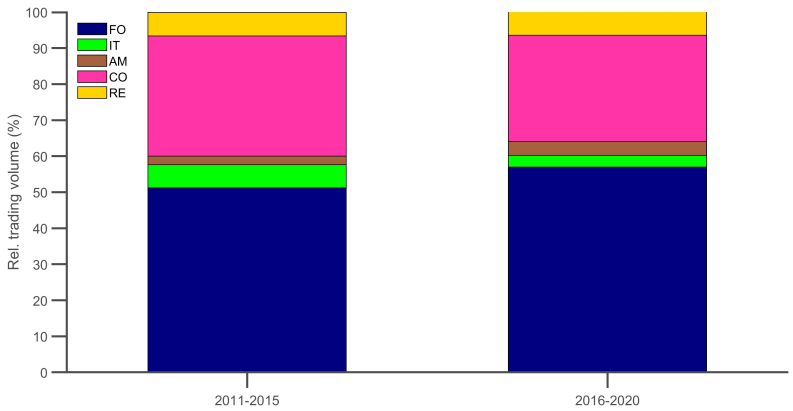
- FX returns are random and unpredictable
- FO normalized order flow is positive, while LC is negative (on average)
- Various, but distinct, patterns across local investor groups

Growing presence of foreign investors: foreign exchange



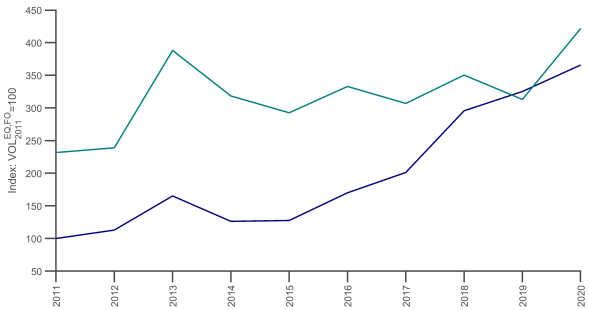
(a) Absolute Volume



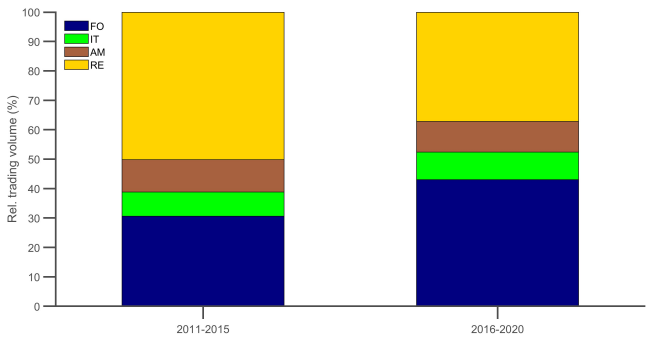
(b) Relative Volume

- FO trading volume grew over 40% over the sample period
- More than 50% of volume involves foreign investors
- Among local participants, corporates and institutional investors are the most active investor types

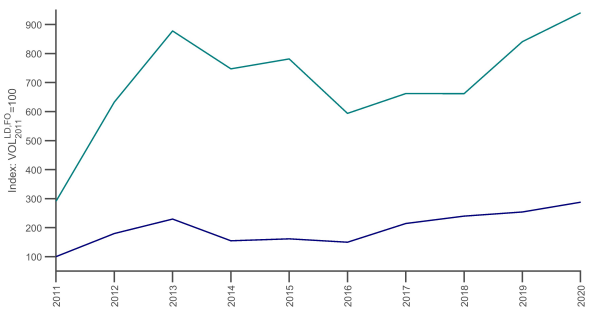
Strong heterogeneity in investor participation across markets



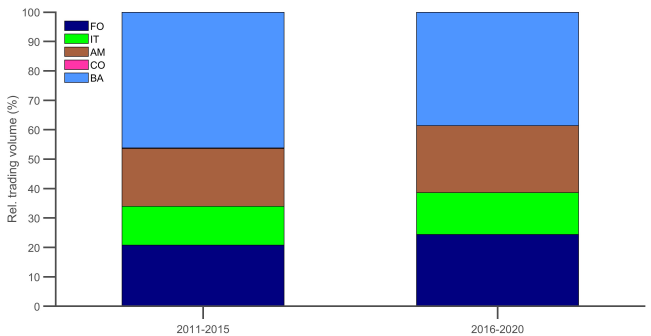
(c) EQ: Abs. Vol.



(d) EQ: Rel. Vol.



(e) LD: Abs. Vol.



(f) LD: Rel. Vol.

VAR

- To assess the linkage between investment decisions and returns, we consider a conventional VAR-setup, i.e.,

$$y_t + Ay_t = \alpha + \sum_{j=1}^{p} \phi_j y_{t-j} + \varepsilon_t,$$

where $y_t = [R_t, NOF_t]'$, R_t is the log return for an asset on ay t; NOF_t is the normalized order flow; A is a 2×2 matrix:

$$A = \begin{bmatrix} 0 & -a_{12} \\ -a_{21} & 0 \end{bmatrix}$$

a_{12}: contemporaneous impact of normalized order flow on returns
a_{21}: measures the effect of returns on normalized order flow

- **Challenge with low sampling frequency:** potential endogeneity due to contemporaneous impact of R_t on NOF_t ($-a_{21} \neq 0$) (see, e.g., Danielsson and Love, 2006)

Instrumental variable approach

$$y_i = z_i \Pi_i + \epsilon_i, \text{ i=1,2}$$

where Π_i is a $(1+k) \times 1$ parameter vector, y_t contains the endogeneous variables and together with ϵ_i are vectors of length $T \times 1$. z_i is a matrix of the size $T \times (1+k)$, containing the vectors of instruments z_{it}.

In matrix form:

$$\underbrace{\begin{bmatrix} R \\ NOF \end{bmatrix}}_{Y} = \underbrace{\begin{bmatrix} z_1 & 0_{T\times(1+k)} \\ 0_{T\times(1+k)} & z_2 \end{bmatrix}}_{Z} \underbrace{\begin{bmatrix} \Pi_1 \\ \Pi_2 \end{bmatrix}}_{\pi} + \underbrace{\begin{bmatrix} \epsilon^R \\ \epsilon^{NOF} \end{bmatrix}}_{\epsilon}$$

with the dimensions: Y is $2T \times 1$, Z is $2T \times 2(1+k)$, π is $2(1+k)$, and ϵ is $2T \times 1$. The system can be estimated using conventional two-stage least square estimator, in order to account for the contemporaneous relationship between R_t and NOF_t.

Instrumental variable approach

Building upon Danielsson and Love (2006), we expand the dimensionality to include different types of oder flow (i.e. foreign and local investors):

$$\begin{aligned} y_t^c &= [r_t^c, NOF_t^{c,FO}, NOF_t^{c,LC}] \\ &= [r_t^c, \boldsymbol{NOF_t^c}] \end{aligned}$$

This implies that A_0 extends to a 3×3 matrix, i.e.,

$$A = \begin{bmatrix} 0 & -\beta_{FO} & -\beta_{LC} \\ -\gamma_r & 0 & -\gamma_{LC} \\ -\delta_r & -\delta_{FO} & 0 \end{bmatrix}$$

where β_{FO} (β_{LC}) measures to the contemporaneous impact of foreign (local) investors on returns, γ_r and γ_{LC} capture the contemporaneous impact of returns and local normalized order flow on foreign normalized order flow, and similarly δ_r and δ_{FO} measure the impact on local trading decisions.

Two-stage IV-VAR: foreign exchange

Foreign Exchange		
2.Stage	1.Stage	Instruments
Δs^{FX}	$\text{NOF}^{FO,FX}$; $\text{NOF}^{LC,FX}$	$\text{CDS}_{t-1:t-7}$; $\Delta s^{THBEUR}_{t:t-3}$; $\text{RR}^{1W}_{t-1:t-2}$; $\text{NOF}^{EQ,LC}_{t-1:t-3}$; $\text{NOF}^{EQ,FO}_{t-1:t-3}$; $\text{NOF}^{LD,LC}_{t-1:t-3}$; $\text{NOF}^{LD,FO}_{t-1:t-3}$; $\text{NOF}^{FX,FO}_{t-6:t-10}$; $\text{NOF}^{FX,LC}_{t-6:t-10}$; $\Delta s^{FX}_{t-6:t-10}$
$\text{NOF}^{FO,FX}$	$\text{NOF}^{LC,FX}$; Δs^{FX}	$\text{CDS}_{t-1:t-7}$; $\Delta s^{THBEUR}_{t:t-3}$; $\text{RR}^{1W}_{t-1:t-2}$; $\text{NOF}^{EQ,LC}_{t-1:t-3}$; $\text{NOF}^{EQ,FO}_{t-1:t-3}$; $\text{NOF}^{LD,LC}_{t-1:t-3}$; $\text{NOF}^{LD,FO}_{t-1:t-3}$; $\text{NOF}^{FX,FO}_{t-6:t-10}$; $\text{NOF}^{FX,LC}_{t-6:t-10}$; $\Delta s^{FX}_{t-6:t-10}$;
$\text{NOF}^{LC,FX}$	$\text{NOF}^{FO,FX}$; Δs^{FX}	Δs^{JPY}_{t-1}, Δs^{SGD}_{t-1}, Δs^{MYR}_{t-1}, Δs^{KRW}_{t-1}, RR^{1W}_{t-1},$\text{NOF}^{EQ,FO}_{t-1:t-3}$

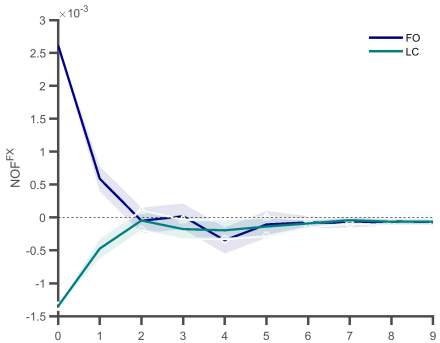
The column "2.Stage" refers to the eft-hand side variable in the second-stage regressions, "1.Stage" refers to the endogeneous variables in the first-stage regression, and "Instruments" lists the variables used as instruments. The sample period is January 2011 to August 2020.

- Order flow correlations across asset classes
- Forward-looking derivatives (e.g., CDS or FX risk reversals)
- Return dynamics in neighboring economies or non-tradable THB-pairs

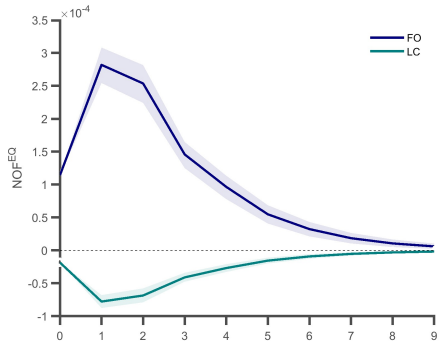
▸▸ EQ/LD ▸▸ Diagnostics

Impulse response functions

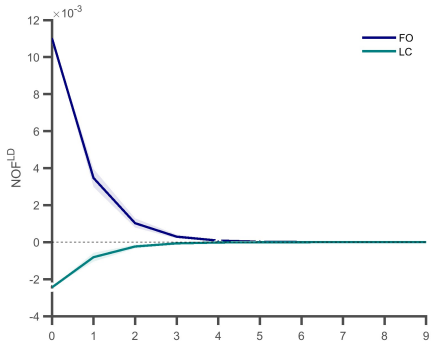
$\Delta s^{FX} \rightarrow NOF^{FO}, NOF^{LC}$



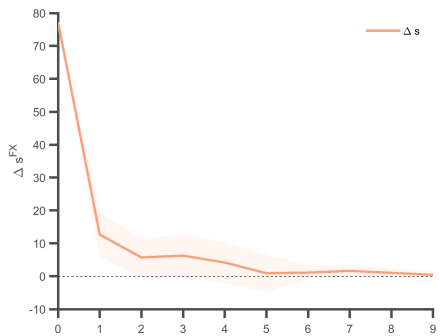
$\Delta s^{EQ} \rightarrow NOF^{FO}, NOF^{LC}$



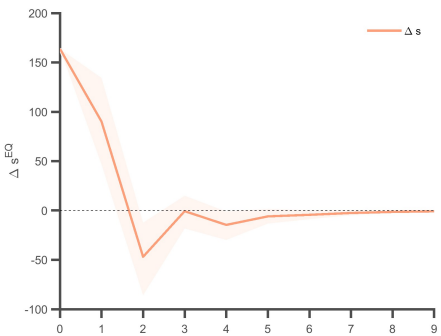
$\Delta s^{LD} \rightarrow NOF^{FO}, NOF^{LC}$



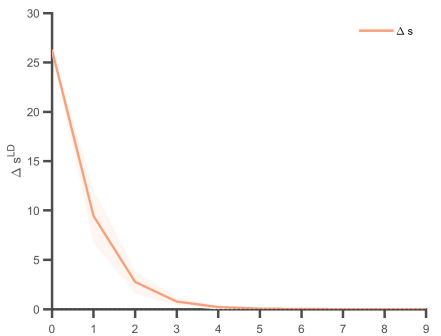
$NOF^{FO} \rightarrow \Delta s^{FX}$



$NOF^{FO} \rightarrow \Delta s^{EQ}$



$NOF^{FO} \rightarrow \Delta s^{LD}$



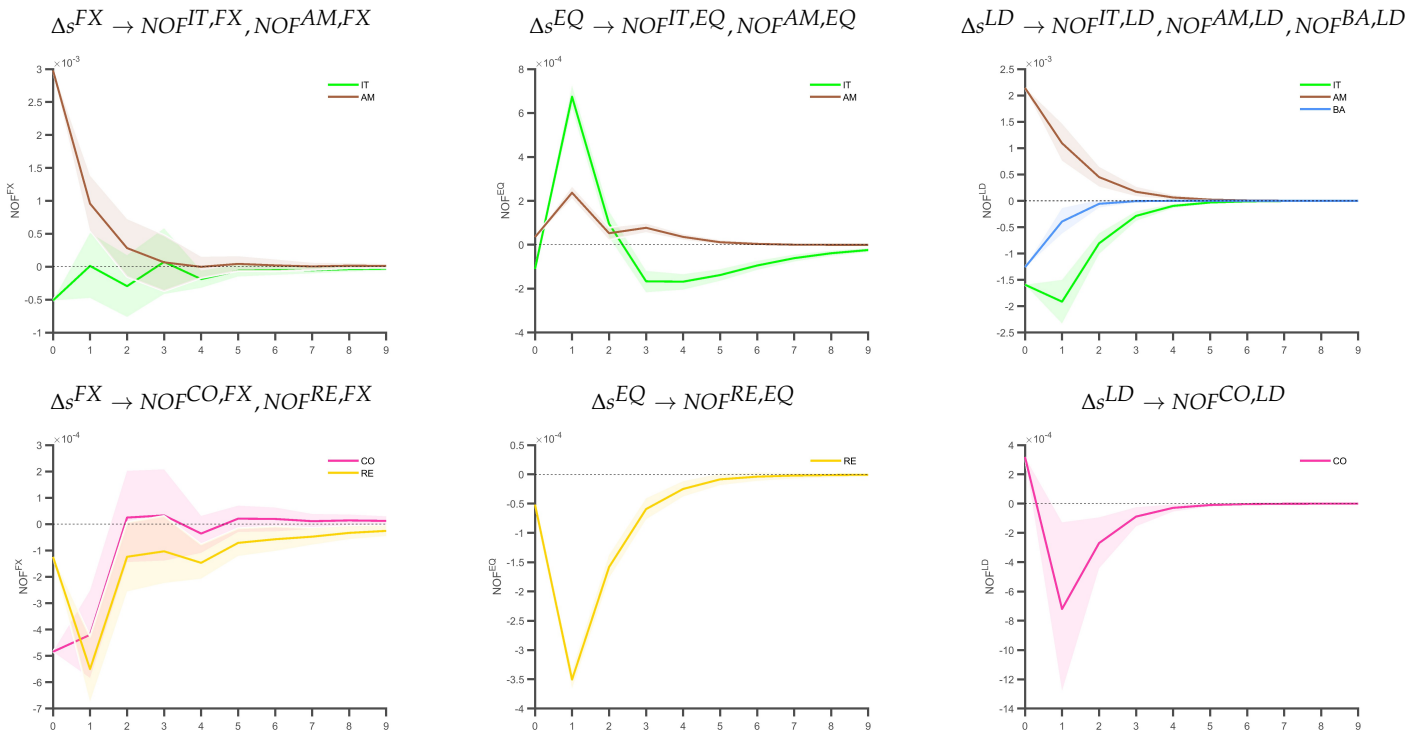
▶▶ Diagnostics ▶▶ Coefficients

IV-VAR with disaggregated local order flow

- The aggregate impluse responses of local investor order flow mask the significant hetergeneity in trading behavior among different local investor types
- Extends the y_t to a vector containing the returns in asset class c and up to six measures of order flow
- For example, for FX market dynamics, the y_t^{FX} would be defined as:

$$
\begin{aligned}
y_t^{FX} &= [r_t^{FX}, NOF_t^{FX,FO}, NOF_t^{FX,IT}, NOF_t^{FX,AM}, NOF_t^{FX,CO}, NOF_t^{FX,RE}] \\
&= [r_t^{FX}, \boldsymbol{NOF_t^{FX}}]
\end{aligned}
$$

Impulse response functions: financial vs non-financial local investors



Testing for persistent price impact

- IV-VAR results identify positive contemporaneous relationship between returns and normalized order flow of foreign investors
- Next, run predictive regressions between normalized order flow and cumulative future returns
- The presence of a persistent price impact of order flow can be interpreted as suggestive of informed trading (Lundblad et al, 2022)

Persistent impact of foreign investor order flow: foreign exchange

	1-Day	2-Day	1-Week	2-Week	1-Month
Foreign Investors					
β	0.08	0.08	0.07	0.05	0.03
	(3.74)	(2.95)	(2.69)	(1.57)	(0.95)
$\bar{R}^2$	0.01	0.01	0.00	0.00	0.00
Local Investors					
β	0.00	-0.03	-0.04	-0.03	-0.02
	(0.12)	(-1.15)	(-1.74)	(-1.11)	(-0.55)
$\bar{R}^2$	0.00	0.00	0.00	0.00	0.00

$$\sum \Delta s^{c}_{t+1:t+h} = \alpha + \beta NOF^{c,i}_{t} + \varepsilon_{t+1:t+h}$$

where $\sum \Delta s^{c}_{t+1:t+h}$ refers to the cumulative returns of the period t+1:t+h days ahead and NOF^{i}_{t} refers to normalized order flow of either foreign or local investors. Numbers in parentheses refer to t-statistics, based on Newey-West adjusted standard errors. The sample period is January 2011 to August 2020.

⏩ EQ ⏩ LD

Persistent vs transitory order flow

	Foreign			Local		
	FX	EQ	LD	FX	EQ	LD
Mov. Avg.: 1-Month						
PNOF	0.03	0.01	0.01	-0.01	-0.01	-0.02
	(1.30)	(0.45)	(0.46)	(-0.58)	(-0.55)	(-0.72)
TNOF	0.08	0.06	0.10	0.00	-0.06	0.00
	(3.63)	(2.94)	(4.30)	(0.08)	(-2.75)	(0.03)
$\bar{R}^2$	0.01	0.00	0.01	0.00	0.00	0.00
Mov. Avg.: 6-Months						
PNOF	0.01	0.01	-0.01	0.03	0.00	-0.01
	(0.39)	(0.49)	(-0.44)	(1.04)	(-0.01)	(-0.31)
TPNOF	0.08	0.06	0.09	0.00	-0.06	0.00
	(3.40)	(2.96)	(4.00)	(0.02)	(-2.68)	(0.25)
$\bar{R}^2$	0.01	0.00	0.01	0.00	0.00	0.00

$$\Delta s^c_{t+1} = \alpha + \beta^P PNOF^{c,i}_t + \beta^T TNOF^{c,i}_t + \varepsilon_{t+1}$$

where Δs^c_{t+1} refers to the returns during period t+1 in asset class c. $PNOF^{c,i}_t$ and $TNOF^{c,i}_t$ refer to the permanent and transitory component of normalized order flow in asset class c of either foreign or local investors. The permanent component is defined as the moving average over the previus 1-, or 6-months, and the transitory component is the difference between observed normalized order flow and the permanent component. The sample period is January 2011 to August 2020.

News and order flow

- 1. Stage Regression: Daily regression

$$NOF_t^c = \alpha + \sum_{i=i}^{n} \beta_i^c news_{i,t} + \varepsilon_t^c,$$

where $news_{i,t}$ measures announcement surprise

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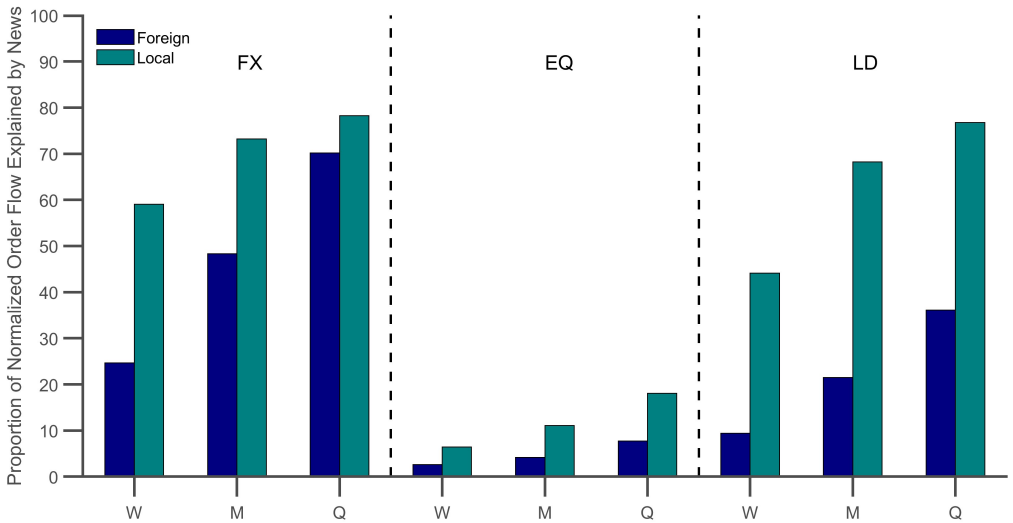
- 2. Stage Regression: Low-frequency regression

$$NOF_t^{h,c} = \kappa^{h,c} nix_t^{h,c} + \mu_t^{h,c}, \tag{1}$$

$nix_t^{h,c} := \widehat{NOF_t^c}$: Fitted values over horizon h

- $\kappa^{h,c}$ measures the component of order flow explained by local news

Explanatory power of news



This figure shows the proportion of foreign (FO, navy) and local (LC, teal) order flow that is explained by news at different frequencies. For each asset class - foreign exchange (FX), equity (EQ), and fixed income (LD) - the adjusted $\bar{R}^2$ is reported for data sampled at the weekly (W), monthly (M), and quarterly (Q) frequency. The sample period is January 2011 to August 2020.

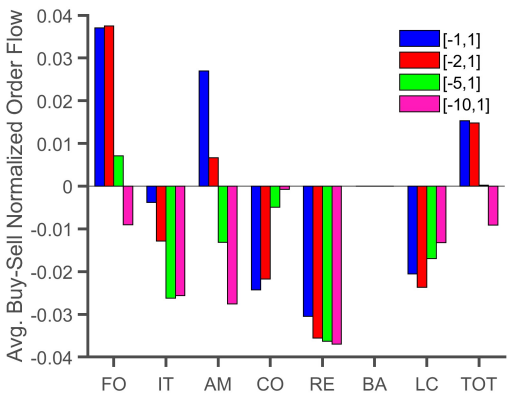
Momentum trading vs portfolio rebalancing

- Positive feedback trading by foreign investors is line with momentum investment strategies, found to deliver higher returns in emerging markets (eg Naranjo and Porter, 2007).

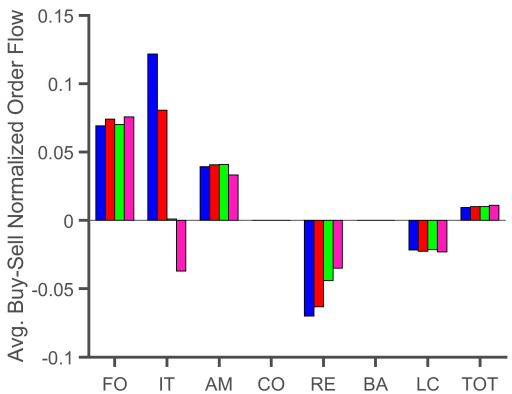
- Next, test for momentum trading and the alternative hypothesis that order flow dynamics can instead be driven by portfolio rebalancing (Hau & Rey, 2005; Gyntelberg et al, 2014).

Past returns and momentum trading, by investor group

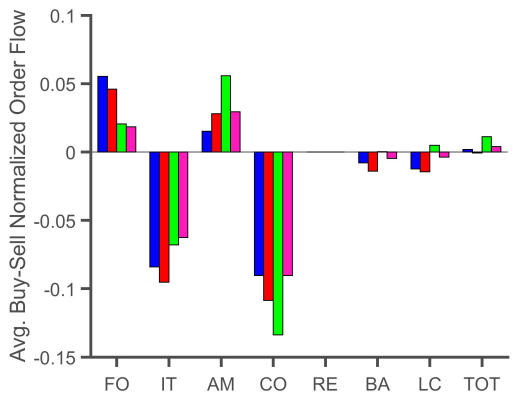
Foreign exchange



Equities

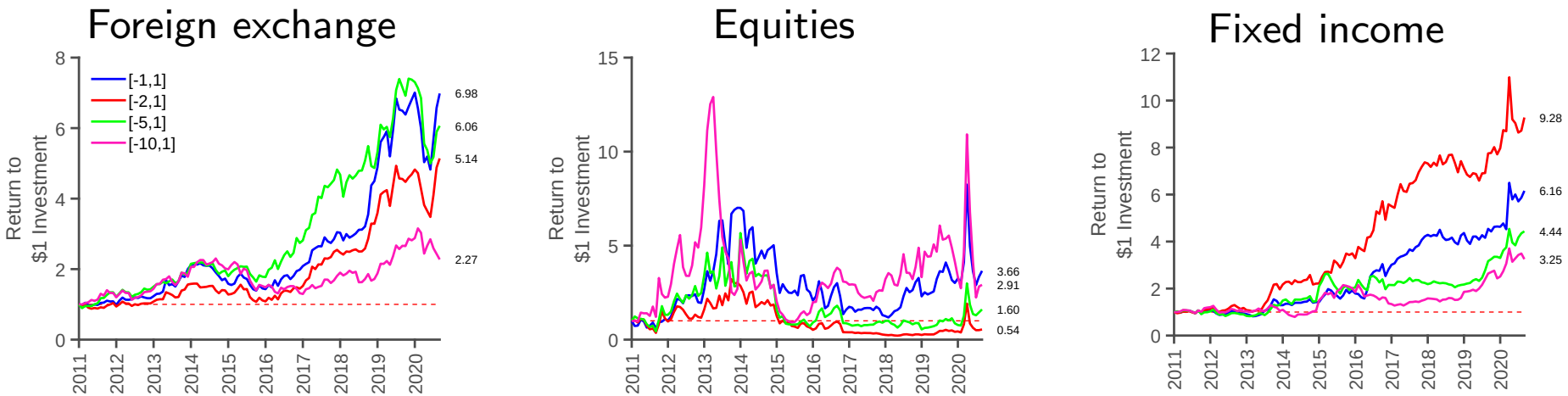


Fixed income



Average difference between buy and sell order flow based on past returns over different formation periods. If past returns are positive (negative), we assume an investor buys (sells) THB assets. The bars show the average difference in order flow between these long and short positions: a positive difference is in line with momentum trading. We consider different formation periods from one day (i.e. -1) to 10 days (i.e.-10). The holding period is always one day, i.e., the portfolio is rebalanced on a daily basis. The y-axis shows the average difference between long and short normalized order flow positions. The sample period is January 2011 to August 2020.

Total return index - foreign investor momentum trading



Hypothetical return indices to a $1 investment at the beginning of the sample period. If past order flow is positive (negative), we assume an investor buys (sells) THB assets. We consider different formation periods from one day (i.e. -1) to 10 days (i.e.-10). The holding period is always one day, i.e., the portfolio is rebalanced on a daily basis. The sample period is January 2011 to August 2020.

Foreign investor trading and portfolio rebalancing

	Equity			Fixed Income		
	r_t^{FX}	$NOF_t^{EQ,FO}$	r_t^{FX}	r_t^{FX}	$NOF_t^{LD,FO}$	r_t^{FX}
$NOF_t^{EQ,FO}$	37.10***					
	(5.40)					
$r_t^{TH,EQ} - r_t^{US,EQ}$		0.00***	0.01			
		(4.55)	(1.50)			
$NOF_t^{LD,FO}$				9.32***		
				(6.38)		
$r_t^{TH,LD} - r_t^{US,LD}$					0.00***	0.07***
					(3.12)	(5.55)
Controls	YES	YES	YES	YES	YES	YES
Obs	2,356	2,356	2,356	2,356	2,356	2,356
$\bar{R}^2$	0.22	0.06	0.20	0.22	0.02	0.22

H1: Increase in FO demand for local assets, is associated with appreciation of local currency $\rightarrow$ Don't reject

Foreign investor trading and portfolio rebalancing

	Equity			Fixed Income		
	r_t^{FX}	$NOF_t^{EQ,FO}$	r_t^{FX}	r_t^{FX}	$NOF_t^{LD,FO}$	r_t^{FX}
$NOF_t^{EQ,FO}$	37.10***					
	(5.40)					
$r_t^{TH,EQ} - r_t^{US,EQ}$		0.00***	0.01			
		(4.55)	(1.50)			
$NOF_t^{LD,FO}$				9.32***		
				(6.38)		
$r_t^{TH,LD} - r_t^{US,LD}$					0.00***	0.07***
					(3.12)	(5.55)
Controls	YES	YES	YES	YES	YES	YES
Obs	2,356	2,356	2,356	2,356	2,356	2,356
$\bar{R}^2$	0.22	0.06	0.20	0.22	0.02	0.22

H1: Increase in FO demand for local assets, is associated with appreciation of local currency $\rightarrow$ Don't reject

H2: Higher rel. local returns should be associated with selling pressure $\rightarrow$ Reject

Foreign investor trading and portfolio rebalancing

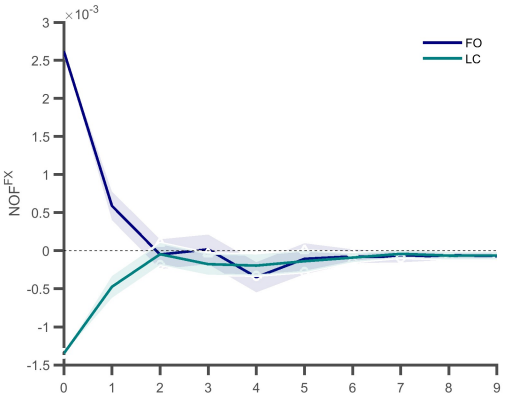
	Equity			Fixed Income		
	r_t^{FX}	$NOF_t^{EQ,FO}$	r_t^{FX}	r_t^{FX}	$NOF_t^{LD,FO}$	r_t^{FX}
$NOF_t^{EQ,FO}$	37.10***					
	(5.40)					
$r_t^{TH,EQ} - r_t^{US,EQ}$		0.00***	0.01			
		(4.55)	(1.50)			
$NOF_t^{LD,FO}$				9.32***		
				(6.38)		
$r_t^{TH,LD} - r_t^{US,LD}$					0.00***	0.07***
					(3.12)	(5.55)
Controls	YES	YES	YES	YES	YES	YES
Obs	2,356	2,356	2,356	2,356	2,356	2,356
$\bar{R}^2$	0.22	0.06	0.20	0.22	0.02	0.22

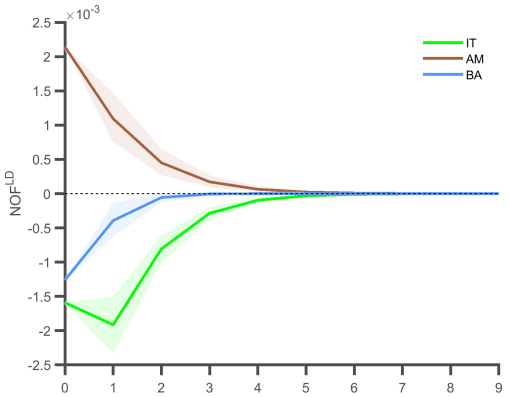
H1: Increase in FO demand for local assets, is associated with appreciation of local currency $\rightarrow$ Don't reject

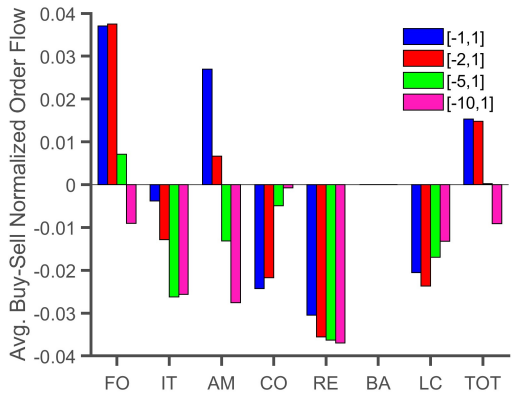
H2: Higher rel. local returns should be associated with selling pressure $\rightarrow$ Reject

H3: Higher rel. local returns should be associated with depreciation of local currency $\rightarrow$ Reject

Conclusion







- Substantial differences in price impact between foreigners and local investors across markets
- Local investors have heterogeneous investment profile
- Foreign investors appear to be better informed, and follow momentum-like approach
- Suggests momentum dynamics in EMEs are affected by investor composition
- Indicates that foreign investor participation may impact short-term price dynamics (in addition to economic fundamentals)

Portfolio rebalancing with lagged regressors

	Equity			Fixed Income		
	r_t^{FX}	$NOF_t^{EQ,FO}$	r_t^{FX}	r_t^{FX}	$NOF_t^{LD,FO}$	r_t^{FX}
α	3.15	0.08***	21.89***	3.50	0.16***	7.78*
	(1.15)	(6.12)	(7.95)	(1.30)	(2.64)	(1.90)
NOF_{t-1}^{EQ}	20.47***					
	(3.05)					
$r_{t-1}^{TH,EQ} - r_{t-1}^{US,EQ}$		0.00***	0.08***			
		(8.11)	(12.46)			
NOF_{t-1}^{LD}				2.07		
				(1.46)		
$r_{t-1}^{TH,LD} - r_{t-1}^{US,LD}$					0.00*	0.02
					(1.77)	(1.53)
NOF_{t-1}^{FX}	11.85***	0.07***	12.04***	13.60***	0.16***	13.63***
	(3.20)	(6.16)	(3.24)	(3.66)	(2.89)	(3.67)
VIX_{t-1}	-0.10	-0.00***	-0.31***	-0.13	-0.01**	-0.19
	(-0.68)	(-4.99)	(-2.63)	(-0.90)	(-2.54)	(-1.24)
$10M3M_{t-1}$	-1.71**	0.01***	0.63	-1.64**	0.04***	-1.03
	(-2.37)	(3.23)	(0.79)	(-2.21)	(2.82)	(-1.21)
Obs	2,355	2,355	2,355	2,355	2,355	2,355
$\bar{R}^2$	0.01	0.13	0.11	0.01	0.02	0.01

This table reports results with lagged regressors for with foreign investor portfolio rebalancing activity. The sample period is January 2011 to August 2020.

Institutional background

- **Non-resident investor access**
  - Non-residents normally acquire the funds involved in the purchase of baht-denominated equities and bonds by transacting in the FX market
  - Deposit the funds in the special non-resident baht accounts (NRBAs), transact in local securities by drawing down NRBAs
  - NRBAs are subject to limits on overnight balances

- **Local market reporting**
  - All licensed FX dealers submit detailed daily report of their FX transactions to the Bank of Thailand
  - Trade records in equities maintained by the Thailand Stock Exchange Market (SET)
  - Trade records in bonds maintained by the Thai Bond Market Association (TBMA)

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Persistent impact of foreign investor order flow: Equity

	1-Day	2-Day	1-Week	2-Week	1-Month
Foreign Investors					
β	0.05	0.01	0.01	0.04	0.01
	(2.41)	(0.36)	(0.15)	(1.21)	(0.26)
$\bar{R}^2$	0.00	0.00	0.00	0.00	0.00
Local Investors					
β	-0.05	-0.02	-0.03	-0.06	-0.03
	(-2.43)	(-0.68)	(-0.92)	(-1.65)	(-0.62)
$\bar{R}^2$	0.00	0.00	0.00	0.00	0.00

$$\sum \Delta s^{c}_{t+1:t+h} = \alpha + \beta NOF^{c,i}_{t} + \varepsilon_{t+1:t+h}$$

where $\sum \Delta s^{c}_{t+1:t+h}$ refers to the cumulative returns of the period t+1:t+h days ahead and NOF^{i}_{t} refers to normalized order flow of either foreign or local investors. Numbers in parentheses refer to t-statistics, based on Newey-West adjusted standard errors. The sample period is January 2011 to August 2020.

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Persistent impact of foreign investor order flow: Fixed income

	1-Day	2-Day	1-Week	2-Week	1-Month
Foreign Investors					
β	0.10	0.09	0.04	0.02	0.01
	(3.98)	(3.49)	(1.47)	(0.52)	(0.25)
$\bar{R}^2$	0.01	0.01	0.00	0.00	0.00
Local Investors					
β	0.00	0.00	0.02	0.00	-0.02
	(-0.18)	(-0.21)	(0.93)	(0.09)	(-0.72)
$\bar{R}^2$	0.00	0.00	0.00	0.00	0.00

$$\sum \Delta s^{c}_{t+1:t+h} = \alpha + \beta NOF^{c,i}_{t} + \varepsilon_{t+1:t+h}$$

where $\sum \Delta s^{c}_{t+1:t+h}$ refers to the cumulative returns of the period t+1:t+h days ahead and NOF^{i}_{t} refers to normalized order flow of either foreign or local investors. Numbers in parentheses refer to t-statistics, based on Newey-West adjusted standard errors. The sample period is January 2011 to August 2020.

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Two-stage IV-VAR: Equities and fixed income

Equity		
2.Stage	1.Stage	Instruments
Δs^{EQ}	$\text{NOF}^{FO,EQ}$; $\text{NOF}^{LC,EQ}$	$\text{CDS}_{t-1:t-5}$; $\Delta s^{EW}_{t:t-3}$; $\text{NOF}^{FX,FO}_{t-1:t-3}$; $\text{NOF}^{FX,LC}_{t-1:t-3}$; $\text{NOF}^{LD,FO}_{t-1:t-3}$; $\text{NOF}^{LD,LC}_{t-1:t-3}$
$\text{NOF}^{FO,EQ}$	$\text{NOF}^{LC,EQ}$; Δs^{EQ}	$\text{CDS}_{t-1:t-5}$; $\Delta s^{JP}_{t-1:t-2}$; Δs^{SG}_{t-1}
$\text{NOF}^{LC,EQ}$	$\text{NOF}^{FO,EQ}$; Δs^{EQ}	$\text{CDS}_{t-1:t-5}$; $\Delta s^{JP}_{t-1:t-2}$; Δs^{SG}_{t-1}
Fixed Income		
2.Stage	1.Stage	Instruments
Δs^{LD}	$\text{NOF}^{FO,LD}$; $\text{NOF}^{LC,LD}$	$\text{CDS}_{t-1:t-10}$; $\Delta s^{FX}_{t-1:t-2}$; $\Delta s^{EQ}_{t-1:t-2}$; $RR^{FX}_{t-1:t-2}$;$\Delta s^{EW}_{t-1:t-2}$; $\text{NOF}^{FX,FO}_{t-1:t-3}$; $\text{NOF}^{FX,LC}_{t-1:t-3}$; $\text{NOF}^{EQ,FO}_{t-1:t-3}$; $\text{NOF}^{EQ,LC}_{t-1:t-3}$
$\text{NOF}^{FO,LD}$	Δs^{LD}; $\text{NOF}^{LC,LD}$	$\text{CDS}_{t-1:t-10}$;$\Delta s^{JP}_{t-1:t-5}$; $\text{NOF}^{FX,FO}_{t-1:t-2}$; $\text{NOF}^{FX,LC}_{t-1:t-2}$; $\text{NOF}^{EQ,FO}_{t-1:t-2}$; $\text{NOF}^{LD,LC}_{t-1:t-2}$
$\text{NOF}^{LC,LD}$	Δs^{LD}; $\text{NOF}^{FO,LD}$	$\text{CDS}_{t-1:t-10}$; $\Delta s^{FX}_{t-1:t-2}$; $\Delta s^{EQ}_{t-1:t-2}$; $RR^{FX}_{t-1:t-2}$;$\Delta s^{asia}_{t-1:t-2}$; $\text{NOF}^{FX,FO}_{t-1:t-3}$; $\text{NOF}^{FX,LC}_{t-1:t-3}$; $\text{NOF}^{EQ,FO}_{t-1:t-3}$; $\text{NOF}^{LD,LC}_{t-1:t-3}$

The column "2.Stage" refers to the left-hand side variable in the second-stage regressions, "1.Stage" refers to the endogeneous variables in the first-stage regression, and "Instruments" lists the variables used as instruments. The sample period is January 2011 to August 2020.

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IV-Regression diagnostics

Panel D: IV-Regression Diagnostics

	FX			EQ			LD		
	Δs	NOF^{FO}	NOF^{LC}	Δs	NOF^{FO}	NOF^{LC}	Δs	NOF^{FO}	NOF^{LC}
p-val$^{Instr.1}$	0.00	0.00	0.00	0.00	0.20	0.20	0.00	0.01	0.06
Instr 2									
$\bar{R}^2$	0.12	0.12	0.15	0.30	0.32	0.35	0.04	0.04	0.08
F-test	3.82	3.82	13.81	3.07	3.13	2.39	2.18	2.64	5.02
p-val$^{Instr.2}$	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.19	0.00
Weak Id	1.88	2.64	4.31	1.03	2.24	1.88	1.99	2.18	2.07
J-stat	0.05	0.10	0.09	0.53	0.39	0.20	0.38	0.32	0.19
End.	0.29	0.98	0.10	0.76	0.10	0.15	0.99	0.13	0.27

Diagnostic statistics from the instrumental variable regressions. $p-val^{Instr.1}$ and $p-val^{Instr.1}$ show the p-value of an F-test of excluded instruments. The row "J-stat" refers to the p-value of the Hansen J-statistics (i.e., a test of overidentifying restrictions with the null hypothesis that the instruments are valid.), and "End." reports the p-value of endogeneity tests (i.e., a test with the null hypothesis that the specified endogeneous regressors can actually be treated as exogeneous). The sample period is January 2011 to August 2020.

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IV-VAR contemporaneous coefficients

	FX			EQ			LD		
	Δs	NOF^{FO}	NOF^{LC}	Δs	NOF^{FO}	NOF^{LC}	Δs	OF^{FO}	NOF^{LC}
Δs		0.00	0.00		0.00	0.00		0.01	0.01
		(4.42)	(-0.81)		(0.72)	(0.63)		(2.21)	-1.37
NOF^{FO}	87.72		-0.38	307.94		-0.32	27.25		0.01
	(4.40)		(-3.11)	(0.61)		(-6.45)	(1.70)		(0.12)
NOF^{LC}	25.47	-0.35		453.61	-2.77		16.31	-1.02	
	(1.33)	(-3.45)		(0.32)	(-6.74)		(0.48)	(-1.38)	

Notes: "p" refers to the number of lags used in the VAR regression, determined by the Bayes Information Criterion. The row "p-val" refers to the p-value of a F-test that right-hand side regressors are jointly zero. The sample period is January 2011 to August 2020.

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