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Uncovered equity "disparity" in emerging markets

Ana-Maria Fuertes [a], Kate Phylaktis [a,*], Cheng Yan [b]

[a] Cass Business School, City University London, 106 Bunhill Row, London EC1Y 8TZ, United Kingdom
[b] Essex University Business School, Wivenhoe Park, Colchester CO4 3SQ, United Kingdom

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ABSTRACT

The portfolio-rebalancing theory of Hau and Rey (2006) yields the uncovered equity parity (UEP) prediction that local-currency equity return appreciation is offset by currency depreciation. Vector autoregressive model estimation and tests for eight Asian emerging markets using daily data reveal instead a positive nexus between equity returns and currency returns. The extent of the uncovered equity "disparity" is time-varying and asymmetric since it exacerbates in crises. Our analysis suggests that the UEP failure is primarily due to investors' return-chasing behavior. Robustness checks confirm that this explanation of the uncovered equity "disparity" is more appropriate than existing flight-to-safety or market risk conjectures.

"The increasing size and equity content of current capital flows has not yet inspired a new financial market paradigm for exchange rate theory, in which exchange rates, equity market returns, and capital flows are jointly determined." (Hau and Rey, 2006).

1. Introduction

According to the uncovered equity parity (UEP) hypothesis, international local-currency equity return differentials are perfectly offset by foreign exchange (FX) fluctuations. This testable prediction emanates from the theory of Hau and Rey (2004, 2006) by assuming imperfect FX hedging, imperfectly elastic FX supply and that international investors follow *portfolio rebalancing* strategies; namely, any surge in foreign vis-à-vis domestic equity returns induces investors to repatriate some of their foreign-equity wealth due to a desire to reduce their FX exposure which, in turn, induces the foreign currency to depreciate.[1]

* Corresponding author.
E-mail addresses: A.Fuertes@city.ac.uk (A.-M. Fuertes), k.phylaktis@city.ac.uk (K. Phylaktis), cheng.yan@essex.ac.uk (C. Yan).

[1] The UEP hypothesis can be embedded in the standard no-arbitrage asset pricing theory of Cochrane (2005). This is the route taken in the empirical portfolio analysis of UEP conducted by Cenedese et al. (2015).

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UEP is relevant for at least two reasons. On the one hand, it asserts that foreign net equity flows drive FX returns, which have been notoriously difficult to predict using other macroeconomic variables (for a seminal paper, see, Meese and Rogoff, 1983). On the other hand, from the perspective of international portfolio management, it is also important for global investors, as foreign equity investments inevitably involve FX investments.

The goal of the paper is to test the two underlying mechanisms leading to UEP according to the Hau and Rey (2004, 2006) theory in the context of a sample of eight Asian emerging markets (EMs). For this purpose, we will shed light on the dynamics between capital flows, and equity and FX markets. There are three noteworthy differences between the UEP analysis in our paper and that of extant papers. Firstly, as regards the sample we use net equity flows data reflecting the transactions of *all* foreign investors as opposed to bilateral flows, and the frequency of our equity returns, equity flows and FX returns is daily as opposed to monthly or quarterly.

Secondly, instead of portfolio-based techniques, we utilize reduced-form vector autoregressive (VAR) and structural VAR (SVAR) modeling approaches which can easily control for reverse causality and endogeneity. Through this methodology, we can test the mechanisms towards UEP by contemplating both contemporaneous and lead-lag relationships. The theoretical framework of Hau and Rey (2004, 2006) portrays contemporaneous relationships, but delays may occur, in practice, if investors do not frequently rebalance their portfolios.[2] Delayed responses are acknowledged in the UEP analysis of Curcuru et al. (2014).

Thirdly, after finding that surges in local-currency equity returns come hand-in-hand with local currency appreciation – a positive relationship between local-currency equity return and FX returns in EMs – we conduct various tests seeking to ascertain the specific mechanisms that lead towards what we refer to as uncovered equity "disparity" in EMs.

In the Hau and Rey (2004, 2006) theory, the UEP condition is rationalized using two mechanisms. The first mechanism is driven by the investors' strategy known as *portfolio-rebalancing*; *e*quity investors rebalance away from (toward) countries whose equity/FX markets are performing well (poorly) which induces a negative relationship between local-currency equity returns and net equity flows. However, the empirical literature using monthly or lower frequency data has not yet reached a consensus as to whether foreign investors follow a portfolio-rebalancing, or return-chasing strategy (see e.g., Curcuru et al., 2011, 2014). Our daily data offers a good opportunity to revisit this question, and the results strongly refute this mechanism both when UEP is formalized as a contemporaneous relationship and as a lead-lag relationship: net equity flows respond positively to both current and past local-currency equity returns. Hence, we conjecture that foreign equity investors *chase returns* instead. Decomposing the equity return into its expected and unexpected components, we find that net equity flows are positively driven by expected equity returns, which suggest that the UEP condition fails in the Asian countries sampled predominantly because international equity investors chase returns.

The second mechanism towards UEP is that a decrease (increase) in net equity flows comes hand-in-hand with local currency depreciation (appreciation). Our model estimates and tests support it by suggesting a significantly positive relationship between flows and FX returns.

Altogether the evidence from our investigation indicates that it is the first (not the second) mechanism, as portrayed in the Hau and Rey (2006) theory, which is responsible for the failure of the UEP in EMs. Fig. 1 illustrates this. The top part of the graph (dotted lines) summarizes the two theoretical mechanisms that, according to Hau and Rey's (2006) model, lead towards the UEP prediction. The bottom part of the figure (continuous lines) illustrates the mechanisms suggested by our empirical VAR-based tests for a sample of eight EMs.

Robustness checks suggest that our key finding that the *return-chasing* phenomenon largely drives the uncovered equity "disparity" observed in 8 Asian EMs is not challenged by controlling for flight-to-safety flows. Our daily data allows us further to document that the uncovered equity "disparity" is time-varying and asymmetric. The positive moving correlations between local-currency equity returns and FX returns exhibit an upward trend which, in the context of increasing financial market integration, reinforces the evidence in support of the *return-chasing* hypothesis. The asymmetry aspect refers to the fact that the magnitude of the positive correlations exacerbates in down- versus up-market periods, and in crisis versus non-crisis periods, with the largest correlations observed during the late 2000s Global Financial Crisis (GFC), which ascribes some role to the flight-to-quality mechanism (Cho et al., 2016).

Our paper relates to several strands of the literature. It relates to the handful of studies that just examine the relationship between *local-currency equity returns* and *FX returns* (but not equity flows) to test UEP. The evidence for developed markets is fairly supportive (Hau and Rey, 2004, 2006; Cappiello and De Santis, 2007) [3]while, in contrast, for EMs it has been shown that local currency appreciation follows a bullish local stock market (Kim, 2011; Cho et al., 2016). In a portfolio study for 42 countries, Cenedese et al. (2015) find that FX returns are unrelated to country equity return differentials, and that the positive excess returns of a portfolio strategy that longs (shorts) the country equity indices with better (worse) prospects cannot fully be explained by either standard risk factors or global equity volatility risk.

[2] Delays in the response of capital flows to equity returns are plausible because bank managers of international equity portfolios are usually allowed ten days to rebalance their positions when risk trading limits are exceeded according to the Value-at-Risk (VaR) measure. Over ten days are allowed if there are liquidity constraints.

[3] One notable exception is Campbell et al. (2010) who find unsupportive evidence for commodity-dependent countries such as Australia and Canada. Importantly, they underline the importance of conducting further research with data from EMs at frequency higher than monthly and including the late 2000s financial crisis.

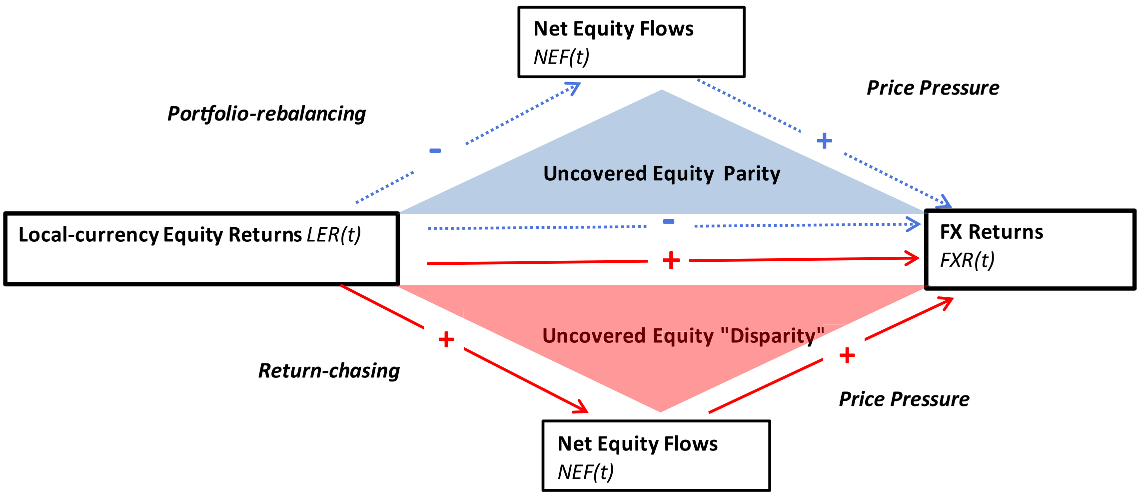

Fig. 1. Uncovered equity parity. The top part (blue) of the graph represents the mechanisms towards the Uncovered Equity Parity (UEP) condition according to the Hau and Rey (2006) theoretical framework. The bottom part illustrates the return-chasing conjecture to explain the failure of UEP. Net equity flows are inflows into the corresponding emerging market (EM) minus outflows. FX returns are daily logarithmic changes (in percent) of the spot rate defined as the US$ price of EM currency, and thus, a positive return indicates EM currency appreciation. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Our paper relates to a strand of literature that examines the reactions of foreign investors to local-currency equity returns. In an intertemporal CAPM framework, Bohn and Tesar (1996) decompose the net purchases of U.S. investors in foreign equity markets into two types of transactions driven by the respective goals of maintaining a balanced portfolio of securities (portfolio-rebalancing) and of exploiting time-varying investment opportunities (return-chasing), while it is an empirical question which one dominates. Their evidence predominantly supports the latter; U.S. investors tend to move into (retreat from) markets where returns are expected to be high (low). Return-chasing has been confirmed by subsequent studies using U.S. bilateral flows (Froot et al., 2001; Griffin et al., 2004; Richards, 2005; Froot and Ramadorai, 2008) and U.S. portfolio holdings data (Froot et al., 2001; Froot and Ramadorai, 2008). The return-chasing hypothesis has been embedded in various theoretical models (Brennan and Cao, 1997; Guidolin, 2005; Albuquerque et al., 2007, 2009; Dumas et al., 2014). Analyzing monthly portfolio holdings, Curcuru et al. (2011, 2014) instead find that U.S. equity investors neither chase equity returns nor buy past losers but rather they just tend to sell past winners – a form of partial portfolio rebalancing. They further argue that this partial rebalancing mechanism is not dictated by a desire to reduce FX exposure but instead by tactical decisions.

A third strand of literature relevant to our paper examines the response of *equity flows* to *currency fluctuations*. Hau and Rey (2004, 2006) argue theoretically that foreign equity investors repatriate part of their foreign equity investment when its relative value increases following either equity or FX market shocks. On the other hand, little evidence suggests that investors rebalance their equity portfolios in reaction to past FX movements (Curcuru et al., 2014). The main rationale for these empirical findings is that foreign equity investors hedge their equity purchases against FX risk. Surveys of investors suggest though that international equity positions are mostly unhedged (e.g., only 8% according to Levich et al., 1999). As argued by Campbell et al. (2010), Curcuru et al. (2014) and Melvin and Prins (2015), this may be because it is hard to establish *ex ante* how much FX risk exposure there is in foreign equity.

Finally, our study relates to a strand of literature that documents the impact of *net equity flows* on *FX returns*. Hau et al. (2010) provide evidence of a downward sloping demand curve in FX markets and show that equity flows arising from the 2001/2002 redefinition of the MSCI Global Equity index affected FX returns. Froot and Ramadorai (2005) argue that currency flows of institutional investors only cause contemporaneous price pressures in FX markets. Market microstructure studies suggest instead that FX order flows can have effects on future FX returns due to private information (e.g., Evans and Lyons, 2002a, b). Bridging macroeconomic and microstructure studies, albeit using low-frequency (monthly) data, Hau and Rey (2004) find that net equity flows and FX order flows are closely aligned, and that net equity flows impact positively on future FX returns. Hau and Rey (2006) and Curcuru et al. (2014) find a positive contemporaneous relation between net equity flows and FX returns.

The paper unfolds as follows. Section 2 presents the data and a preliminary analysis. Sections 3 and 4 examine the first and second mechanisms towards UEP, respectively. Section 5 presents various robustness tests of the return-chasing rationale. A final section concludes.

2. Data, summary statistics and preliminary UEP tests

2.1. Data description

Given that Asian markets have been the focus of a heated debate surrounding the potential destabilizing influence of capital flows, we use as ''laboratory'' for our tests of UEP a cross-section of 8 East Asian EMs.[4] We collect data on *all* foreign equity trades taking place each day, end-of-day equity closing prices and spot rates from the CEIC (http://www.ceicdata.com), *Bloomberg* and *Datastream*. These data enable us to construct daily observations for the three variables of interest: net (inflows minus outflows) equity flows (NEF_{it}), local-currency equity returns (LER_{it}) and FX returns (FXR_{it}) per country $i = 1, \cdots, N$ for each of $t = 1, \ldots, T$ days. The cross-section dimension, $N = 8$, is moderate but economically important.[5]

The start date of our empirical analysis is dictated by equity flow data: January 1, 2008 for India (BSE and NSE), 1463 observations; September 9, 1996 for Indonesia (JSX), 4225 observations; June 30, 1997 for Korea (Kospi), 4281 observations; March 15, 1999 for Korea (Kosdaq), 3656 observations; March 15, 1999 for Philippines (PSE), 3634 observations; January 1, 2001 for Taiwan (TWSE), 3279 observations, and December 1, 1997 for Thailand (SET), 3938 observations. The end-date is December 2013. We winsorize the daily net equity flows (99th percentile) to mitigate the effects of outliers, and scale them by the corresponding daily market capitalizations (from *Bloomberg*) so the net flows are expressed in percentage.

For Taiwan (TWSE), we have equity flows data from Oct 25, 2000 but only used data from January 1, 2001 for two reasons. First, there is Saturday trading in Taiwan on the first, third and fifth Saturdays of each month in 2000. Second, the 75% foreign investment ownership limit was removed at the start of 2001. The number of observations is slightly different for Kosdaq (Korea) and PSE (Philippines), even though the time span is identical, because of a different number of closed stock-market days, for instance, due to bank holidays.[6]

The net equity flows correspond to all foreign countries (and not just the U.S.); that is, they include all the purchases of Asian equities by foreign investors (inflows) minus the purchases of foreign-country equities by Asian investors, which together with the daily sampling frequency, allows for a more reliable investigation of the UEP failure in EMs.

Most previous UEP papers use monthly FX and equity returns data, but not capital flows, such as Cappiello and De Santis (2007), Kim (2011) and Cenedese et al. (2015). Only a few papers include capital flow data in their analysis, but their data sets are less comprehensive for UEP testing as regards the cross-section of countries, sampling frequency and/or time span.

Hau and Rey (2006) use monthly bilateral equity flows between the U.S. and OECD countries from the U.S. Treasury International Capital (TIC) database, and acknowledge the well-known shortcoming that equity transactions in the TIC database are recorded by the nationality of the traders, not the country that originally issued the security. Cho et al. (2016) use quarterly Balance of Payments data from the International Financial Statistics (IFS) reported by the IMF to construct net capital flows, but explicitly note the use of quarterly data may incur information loss relative to finer data (monthly or daily) insofar as the number of observations is reduced, and also because inter-temporal changes in variables within the quarter are netted out, which may mask important dynamic interactions between the variables.

Local-currency equity returns are the daily logarithmic changes (in percentage) of the main capitalization-weighted index of stocks traded on each of the eight EMs. Ideally, UEP should be tested with the time-varying holding weights of individual stocks for every foreign investor, to enable measures of the portfolio returns earned by all foreign investors in the aggregate. Since the directly-measured returns series based on foreign investors' holdings do not exist, the best proxy is the returns of country-level equity indices that comprise the largest and most liquid firms in each country, as foreigners tend to hold these (see Curcuru et al., 2014). We collect daily closing prices for the Bombay Stock Exchange (BSE) Sensitive 30 Index in India, the National Stock Exchange (NSE) CNX Nifty 500 index in India, the Jakarta Stock Exchange (JSX) Composite index in Indonesia, the Kospi and Kosdaq indices in Korea, the Philippine Stock Exchange (PSE) Composite index, the TWSE/TAIEX index in Taiwan, and the Bangkok SET Index in Thailand. These are ''headline'' indices available to investors in real-time and have a large market capitalization (relative to other indices) within each country.

All 8 Asian countries engaged in *de facto* managed-float currency policies over the sample period. Daily FX returns are logarithmic changes of the spot rate from *Datastream*/*Bloomberg* defined as the US$ price of EM currency (a positive return is EM currency appreciation).

2.2. Summary statistics and preliminary UEP tests

We summarize the distribution of dailyNEF_{it},LER_{it} and FXR_{it} observations in Table 1 through the mean, median, standard deviation, autocorrelations up to day five and pairwise contemporaneous correlations. The net equity flows are positive on

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[4] In the choice of cross-section, our paper follows Richards (2005) who focuses on 6 Asian equity markets to examine the relationship between global/emerging market equity returns and all-foreign-investor equity flows.

[5] According to U.S. Treasury International Capital (TIC) database, over the period from 2007 to 2012 (from 1988 to 2006) these 8 markets accounted for over 70 (50) per cent of the sum of the period-average bilateral equity flows of all the EMs (using IMF country classifications of April 2012) vis-à-vis the U.S. scaled by domestic GDP.

[6] Following Froot et al. (2001) and Richards (2005), we do not include net purchases by foreigners of American Depositary Receipts (ADRs), equity futures or other derivatives in the domestic markets. Curcuru et al. (2014) provide a snapshot of the end-2010 amounts of the international positions of U.S. investors and conclude that it is impossible to tell the real currency exposure faced by U.S. investors with publicly available data..

Table 1
Descriptive statistics for equity flows, equity returns and FX returns. The table summarizes the distribution of daily net equity flows (NEF_{it}) and local-currency equity returns (LER_{it}) for eight Asian markets, and the corresponding FX returns (FXR_{it}). All variables are expressed in percentage. NEF_{it} is the buy value (inflow) minus sell value (outflow) by foreign investors as a percentage of the previous-day market capitalization. FXR_{it} is the logarithmic change in the spot rate defined as US$ price of home currency so that positive values indicate EM FX appreciation. The start date for the variables is as indicated in column two. The end date is December 30, 2013. *Indicates statistically significant at the 5% level.

Country	Start Date	Obs	Stock Exchange		Mean	Median	StDev	Autocorrelations			Pairwise Correlations			
								AC(1)	AC(2)	AC(3)	AC(4)	AC(5)	*NEF*	*LER*
India	Jan 1, 2008	1463	BSE	*NEF*	0.0001	0.0001	0.0027	**0.264***	**0.249***	**0.238***	**0.232***	**0.190***		
				LER	0.0028	0.0209	1.7312	0.070	−0.023	−0.031	−0.049	−0.031	*0.295**	
				FXR	−0.0309	−0.0103	0.5970	0.056	−0.055	−0.002	0.042	0.076	*0.196**	*0.465**
India	Jan 1, 2008	1463	NSE	*NEF*	0.0026	0.0031	0.0122	**0.497***	**0.403***	**0.328***	**0.293***	**0.284***		
				LER	−0.0086	0.0433	1.6475	0.095	0.018	0.001	−0.044	−0.034	*0.453**	
				FXR	−0.0309	−0.0103	0.5970	0.056	−0.055	−0.002	0.042	0.076	*0.329**	*0.465**
Indonesia	Sept 9, 1996	4224	JSX	*NEF*	0.0059	0.0020	0.0260	**0.189***	0.119	0.092	0.096	0.065		
				LER	0.0489	0.0998	1.6955	**0.144***	0.020	−0.026	−0.024	−0.020	0.297*	
				FXR	−0.0390	0.0000	1.7235	−0.021	0.083	−0.011	−0.034	−0.029	0.059*	0.201
Korea	June 30, 1997	4080	Kospi	*NEF*	0.0042	0.0012	0.0390	**0.482***	**0.325***	**0.265***	**0.238***	**0.225***		
				LER	0.0243	0.0855	1.9422	0.065	−0.043	−0.018	−0.037	−0.042	0.312*	
				FXR	−0.0043	0.0223	1.0543	0.016	−0.106	−0.006	−0.075	−0.111	0.119*	0.310*
Korea	March 15, 1999	3655	Kosdaq	*NEF*	0.0030	0.0010	0.0292	**0.421**	**0.264***	**0.228***	**0.221***	**0.203***		
				LER	−0.0133	0.1303	2.0533	**0.144**	0.042	0.033	0.022	−0.021	0.197*	
				FXR	0.0042	0.0256	0.7164	−0.021	0.034	−0.037	0.021	−0.030	0.089*	0.293*
Philippines	March 15, 1999	3633	PSE	*NEF*	0.0010	0.0001	0.0127	**0.179***	**0.146***	0.118	0.104	0.089		
				LER	0.0305	0.0351	1.3840	**0.126***	−0.002	−0.045	−0.015	−0.044	0.179*	
				FXR	−0.0037	0.0000	0.4462	−0.029	−0.040	0.027	−0.040	−0.013	0.064*	0.246*
Taiwan	Jan 1, 2001	3226	TWSE	*NEF*	0.0063	0.0057	0.0402	**0.515***	**0.339***	**0.263***	**0.222***	**0.185***		
				LER	0.0185	0.0525	1.4134	0.057	0.017	0.013	−0.015	−0.015	0.516*	
				FXR	0.0032	0.0000	0.2650	0.034	0.017	−0.007	0.023	0.065	0.325*	0.312*
Thailand	Dec 1, 1997	3937	SET	*NEF*	0.0010	−0.0004	0.0299	**0.564***	**0.382***	**0.293***	**0.252***	**0.217***		
				LER	0.0307	0.0336	1.6408	0.075	0.049	−0.004	−0.011	−0.002	0.371*	
				FXR	0.0058	0.0000	0.5286	0.121	−0.034	−0.053	0.025	0.117	0.132*	0.206*

average for all eight Asian EMs; foreign equity investors purchased more EM equity than they sold on average from the mid/late 1990s to 2013. The volatility of the net equity flows (standard deviation) varies across markets from 0.0027% for Philippines to about 15 times as much (0.0402%) for Taiwan.

We confirm the stylized fact that, in contrast with the daily equity/FX returns, the net equity flows exhibit a sizeable positive first-order autocorrelation at 0.40 on average across markets with a very slow decay (see, e.g., Froot et al., 2001; Griffin et al., 2004; Richards. 2005). The slow decay can be ascribed to investors changing their positions gradually possibly to mitigate the market impact and to the heterogeneous information processing speeds of different investor types (Griffin et al., 2004). Only the first-order autocorrelation of equity returns is significant and positive but much lower with a mean of 0.097 across markets. Daily FX returns are essentially independent as suggested by insignificant autocorrelations up to lag order five.

The last two columns show that the correlation between equity returns and net equity flows is substantial and positive, with median 0.304, in line with the literature on equity flows and equity returns (e.g., Froot et al., 2001; Griffin et al., 2004; Richards, 2005). We also find a statistically significant positive contemporaneous correlation between net equity flows and FX returns, albeit smaller, with median 0.125. Finally, the correlation between local-currency equity returns and FX returns is also substantial and positive ranging from 0.201 (JSX) to 0.465 (BSE and NSE), with median 0.301. This piece of evidence is clearly at odds with the UEP prediction that a country's currency tends to appreciate when its stock market is bullish.[7]

We now test the two mechanisms underlying the UEP hypothesis according to the Hau and Rey (2006) *portfolio-rebalancing* theory. Appendix A presents a modified version of their theory that assumes that investors in the aggregate pursue a *return-chasing* strategy instead.

3. Local-currency equity returns and net equity flows

This section provides empirical evidence on the relationship between *local-currency equity returns* and *net equity flows*. In Section 3.1, we directly test the first mechanism towards achieving UEP according to the Hau and Rey (2006) theory: do foreign equity investors pursue *portfolio-rebalancing* strategies? In Section 3.2, we test whether they *return-chase* instead.

3.1. Foreign equity portfolio rebalancing

According to the Hau and Rey (2006) theory, the first mechanism towards UEP requires that foreign equity investors in the aggregate pursue a portfolio-rebalancing strategy. Since the total foreign equity return can be decomposed into a *local-currency equity return* and a *FX return*, our task is twofold. We begin by testing whether foreign equity investors in EMs pursue a portfolio-rebalancing strategy regarding local-currency equity returns. Then we test whether EM equity investors engage in portfolio-rebalancing in response to currency fluctuations.

In order to elucidate how local-currency equity returns, $LER_{i,t}$, affect net equity flows, NEF_{it}, we build on the methodology of Froot et al. (2001), Griffin et al. (2004) and Richards (2005), and estimate bivariate structural autoregressive models (SVAR) to capture their joint dynamics

$$LER_{i,t} = \alpha_1 + \sum_{d=1}^{D} \theta_{1,d} LER_{i,t-d} + \sum_{d=1}^{D} \phi_{1,d} NEF_{i,t-d} + \sum_{d=1}^{D} \gamma_{1,d} FXR_{i,t-d} + u_{i,t}^{LER} \tag{1a}$$

$$NEF_{i,t} = \alpha_2 + \sum_{d=0}^{D} \theta_{2,d} LER_{i,t-d} + \sum_{d=1}^{D} \phi_{2,d} NEF_{i,t-d} + \sum_{d=1}^{D} \gamma_{2,d} FXR_{i,t-d} + u_{i,t}^{NEF} \tag{1b}$$

for each sample country $i = 1,\ldots,N$ using $t = 1,\ldots,T_i$ daily observations. The main parameters of interest are $\theta_{2,0}$ and $(\theta_{2,1},\cdots,\theta_{2,D})'$ to assess the contemporaneous and lead-lag effects, respectively, that relate to the first Hau and Rey (2006) mechanism towards UEP. The model is called 'structural' simply because the contemporaneous relation between local-currency equity returns and net flows is captured by $\theta_{2,0}$, and the error terms are assumed to be unrelated

$$\begin{bmatrix} u_{i,t}^{LER} \\ u_{i,t}^{NEF} \end{bmatrix} \approx \text{N}\left[0,\ \boldsymbol{D}_i^{LER,NEF}\right],\ \text{and}\ \boldsymbol{D}_i^{LER,NEF} = \begin{bmatrix} \sigma_{i,LER}^2 & 0 \\ 0 & \sigma_{i,NEF}^2 \end{bmatrix}$$

In order to avoid omitted-variable bias due to the non-zero contemporaneous relation between FX returns and local-currency equity returns, $corr(LER_{i,t-d}, FXR_{i,t-d}) \neq 0$, as in Griffin et al. (2004), we include lagged FX returns in the bivariate system.[8,9] We estimate the SVARs by maximum likelihood (ML) individually so as to allow for full country heterogeneity. The system eigenvalues have moduli less than one which confirms the stationarity of the SVAR. Using the Hannan–Quinn Information Criterion (HQC), we identify a lag order of five days in line with Griffin et al. (2004) and Richards (2005). The Ljung-Box test is unable to reject the null hypothesis of no residual autocorrelation up to order five at the 5% significance level.

As Table 2 shows, the explanatory power of the equity flows Eq. (1b) ranges from 0.104 (PSE) to 0.516 (TWSE). Against the UEP hypothesis, the *t*-statistic of $\theta_{2,0}$ ranges between 7.65 (Kosdaq) to 25.81 (TWSE) across the eight Asian markets and suggests a significantly positive contemporaneous relation between local-currency equity returns and net flows. Rather than testing for contemporaneous portfolio-rebalancing, Curcuru et al. (2014) argue that U.S. investors may not continuously rebalance their portfolios and therefore, it is pertinent to test for the effect of past local-currency equity returns on the current equity flows. In contrast with Curcuru et al. (2014), our findings do not support the inter-temporal portfolio-rebalancing mechanism either since the cumulative effect of past local-currency equity returns is not negative $\sum_{j=1}^{5} \widehat{\theta}_{2,j} \geq 0$. The Granger

[7] Using the 'fear gauge' (VIX) index as proxy for flight-to-quality, we measured the correlations between FX returns and local-currency equity returns by VIX-stratification, that is, separately on high VIX and low VIX days (using the mean and the median as cutoff points). We thank an anonymous referee for this suggestion. The average correlations are similar in both periods which preliminarily rules out the flight-to-quality rationale for the UEP failure. We revisit this rationale in the robustness tests section..

[8] The SVAR model of Hasbrouck (1991) controls instead for the contemporaneous effect of net flows on returns since in order to assess how past flows affect returns. As pointed out by Ulku and Weber (2014), the setup in Hasbrouck (1991) is reasonable under a tick-data dealer system without frictions. However, at daily or less frequent sampling the flows may also be affected by contemporaneous returns due to intra-period feedback trading (**Brenan and Cao, 1997). We consider the Hasbrouck (1991) model in the robustness tests section of the paper.

[9] We did not adopt a trivariate modeling approach because, as emphasized by Hau and Rey (2004), the appropriate ordering of the variables in the present context is far from obvious and the choice might affect the results. Nevertheless, we examine the results from a panel trivariate VAR system in the robustness tests section.

Table 2
Impact of local-currency equity returns on foreign net equity flows. This table reports estimates of the coefficients of equity flows in the bivariate structural vector autoregressive (SVAR) model, Eq. (1b), estimated individually by maximum likelihood (ML). Using lag order 5, we report the cumulative coefficient of the past local-currency equity returns ($\sum_{j=1}^{5}\widehat{\theta}_{2,j}$) with significance t-statistic in parenthesis, and Granger causality test p-values for the null hypothesis that past local-currency equity returns do not affect the current flows (no causality). The last three rows report three model diagnostics: adjusted-R^2, Ljung-Box test p-values for the null hypothesis of no residual autocorrelation up to day five, and ARCH-LM test p-values for the null hypothesis of no autocorrelation in the squared residuals up to day five. For each estimated coefficient we report in parenthesis t-statistics based on heteroskedasticity robust standard errors; *, ** and *** indicates significant coefficient at the 10%, 5% and 1% level, respectively.

	BSE (India)	NSE (India)	JSX (Indonesia)	Kospi (Korea)	Kosdaq (Korea)	PSE (Philippines)	TWSE (Taiwan)	SET (Thailand)
LER	0.0004***	0.0030***	0.0041***	0.0055***	0.0021***	0.0015***	0.0136***	0.0055***
	(7.68)	(11.37)	(15.20)	(14.94)	(7.65)	(8.06)	(25.81)	(17.91)
LER(t − 1)	0.0003***	0.0016***	0.0020***	0.0049***	0.0018***	0.0012***	0.0036***	0.0044***
	(4.72)	(6.67)	(5.83)	(12.60)	(6.17)	(7.87)	(6.69)	(13.23)
LER(t − 2)	0.0000	0.0000	0.0006**	−0.0010***	−0.0012***	0.0005***	0.0006	−0.0009***
	(−0.51)	(0.07)	(2.05)	(−2.93)	(−4.36)	(3.63)	(1.11)	(−2.83)
LER(t − 3)	0.0000	0.0001	0.0003	−0.0002	−0.0007***	0.0005***	0.0007	−0.0007**
	(−0.91)	(0.48)	(1.12)	(−0.47)	(−2.60)	(3.01)	(1.38)	(−2.57)
LER(t − 4)	−0.0001	−0.0004	−0.0005	−0.0003	0.0000	0.0003*	−0.0004	−0.0010***
	(−1.28)	(−1.79)	(−1.64)	(−0.75)	(−0.08)	(1.84)	(−0.75)	(−3.55)
LER(t − 5)	0.0000	−0.0002	−0.0001	−0.0005	−0.0002	0.0001	−0.0005	−0.0007***
	(0.75)	(−1.10)	(−0.31)	(−1.35)	(−0.97)	(0.74)	(−1.05)	(−2.92)
Cumulative coefficient	0.0002	0.0011**	0.0023***	0.0029***	−0.0003	0.0026***	0.0040***	0.0011*
	(1.64)	(2.24)	(3.35)	(3.36)	(−0.57)	(7.68)	(3.44)	(1.69)
Granger causality test	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diagnostics:								
Adj. R^2	0.253	0.514	0.149	0.391	0.253	0.104	0.516	0.479
Ljung-Box test	0.881	0.230	0.996	0.057	0.351	0.510	0.916	0.081
ARCH test	0.230	0.000	0.431	0.000	0.000	0.955	0.000	0.000

causality tests strongly reject the null hypothesis that past local-currency equity returns do not cause equity flows, $H_0 : \theta_{2,1} = \theta_{2,2} = \ldots = \theta_{2,D} = 0$, with small p-values below 0.001. The contrast between these results and those in Curcuru et al. (2014) may be due to the fact that our flows reflect all foreign investors, not just U.S. investors.

Fig. 2 plots the dynamic response of net equity flows to a one-standard deviation shock in local-currency equity returns using the general impulse response functions (GIRFs) of Pesaran and Shin (1998) that are invariant to the ordering of the variables in the SVAR; hence, no assumptions are required on the sequencing of shocks. Confirming our previous results, we find a strong *positive* response of net equity flows to a same-day shock (and previous day's shock) in the local-currency equity return which is not reversed ten days after.

Next, we examine whether foreign investors in EM equity rebalance in response to FX fluctuations. For this purpose, we formulate a similar structural SVAR model for FX returns and net equity flows including local-currency equity returns as a control variable

$$FXR_{i,t} = \alpha_1 + \sum_{d=1}^{D}\gamma_{1,d}FXR_{i,t-d} + \sum_{d=1}^{D}\phi_{1,d}NEF_{i,t-d} + \sum_{d=1}^{D}\theta_{1,d}LER_{i,t-d} + u_{i,t}^{FXR} \tag{2a}$$

$$NEF_{i,t} = \alpha_2 + \sum_{d=0}^{D}\gamma_{2,d}FXR_{i,t-d} + \sum_{d=1}^{D}\phi_{2,d}NEF_{i,t-d} + \sum_{d=1}^{D}\theta_{2,d}LER_{i,t-d} + u_{i,t}^{NEF} \tag{2b}$$

with the following assumptions for the error terms

$$\begin{bmatrix} u_{i,t}^{FXR} \\ u_{i,t}^{NEF} \end{bmatrix} \approx \text{N}\left[0,\ \boldsymbol{D}_i^{FXR,NEF}\right],\ \boldsymbol{D}_i^{FXR,NEF} = \begin{bmatrix} \sigma_{i,FXR}^2 & 0 \\ 0 & \sigma_{i,NEF}^2 \end{bmatrix}$$

The contemporaneous (and lead-lag) responses of the equity flows to the FX returns are captured, respectively, by the parameters $\gamma_{2,0}$ and $\left(\gamma_{2,1}, \cdots, \gamma_{2,D}\right)'$. The appropriate lag order D according to the HQC criteria is five days. Table 3 reports the estimation results.

The explanatory power of Eq. (2b) ranges from 0.096 (Thailand) to 0.577 (Philippines). Albeit not as strong as in the previous case, there is evidence of a positive association between contemporaneous FX returns and foreign equity flows with significance t-statistics ranging from 1.26 (Indonesia) to 16.14 (Taiwan). However, the past FX returns have a muted effect on the current equity flows as borne out by the small coefficient estimates and large p-values of the Granger causality test; thus, the null hypothesis that none of the previous FX returns (from day t-1 to t-5) influence the equity flows on day t cannot

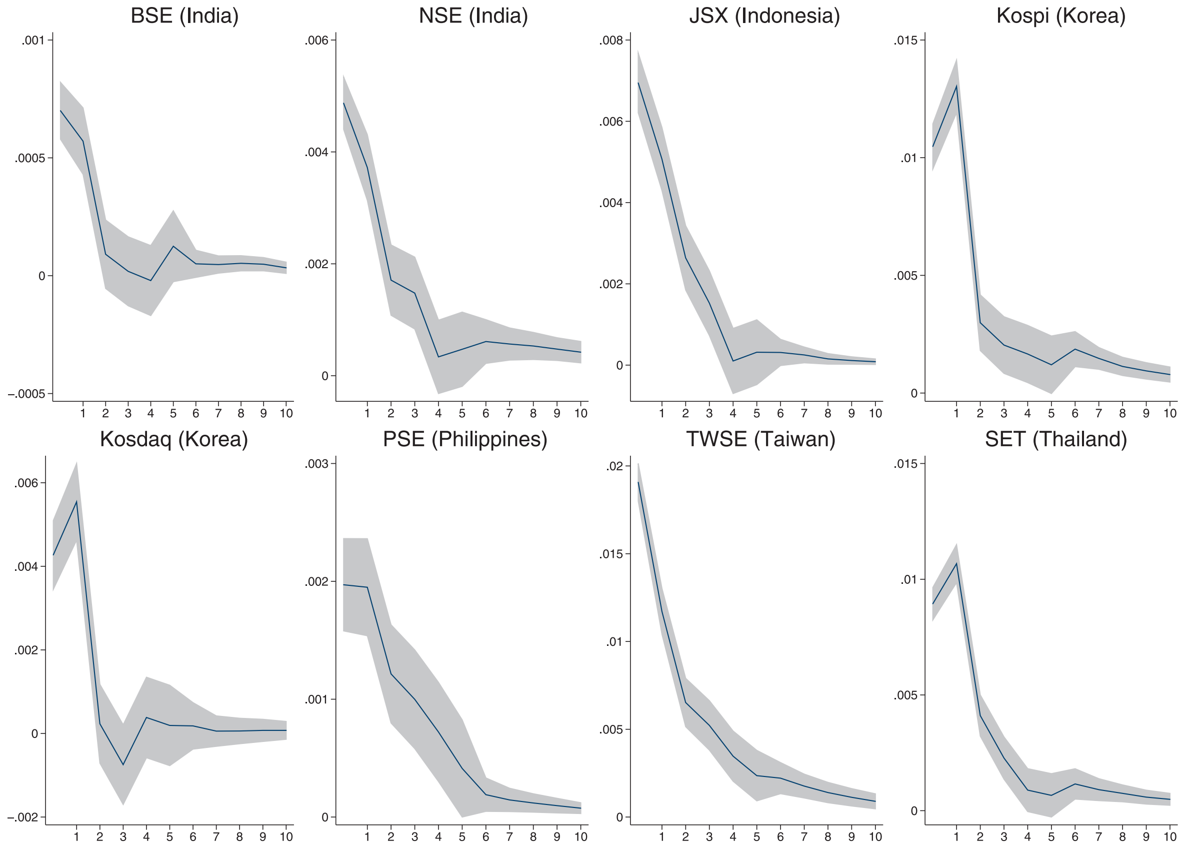

Fig. 2. Generalized impulse responses of foreign net equity flows to local-currency equity returns shocks. This figure shows the dynamic response of net equity flows to a one-standard deviation shock in local-currency equity returns using the generalized impulse response function approach of Pesaran and Shin (1998). The estimates are obtained from model (1), a bivariate structural vector autoregressive (SVAR) model of foreign net equity flows and local-currency equity returns with FX returns as an exogenous variable. The VAR model with five lags is estimated for each market separately using daily data from various starting dates to the end of 2013. The grey area is 95% confidence intervals based on asymptotic heteroskedasticity robust standard errors.

be rejected. Fig. 3 plots the GIRFs that can be interpreted as the projected future evolution of net equity flows ($NEF_t, NEF_{t+1}, \ldots, NEF_{t+10}$) in response to a one-standard-deviation shock to the FX return (FXR_t). The shock has a significantly positive contemporaneous effect which dies off very quickly in one or two days.

To sum up, the findings indicate that foreign net equity flows (all foreign investors) to EMs respond *positively* to contemporaneous and past shocks to local-currency equity returns, and also to contemporaneous shocks to FX returns. This evidence stands against the notion that foreign equity investors pursue portfolio rebalancing strategies in response to total portfolio return changes (driven by equity or FX shocks) as suggested by the Hau and Rey (2006) theory of UEP. We find little evidence that the flows react to past currency movements, which endorses the findings for U.S. equity investors in Curcuru et al. (2014). The mild sensitivity of foreign equity flows to currency movements suggests that foreign equity investors in EMs use predominantly FX as a vehicle (Goldberg and Tile, 2008; Devereux and Shi, 2013).

3.2. Foreign equity return chasing

The above results suggest that the first mechanism behind the UEP prediction (portfolio-rebalancing) is not in place in Asian EMs. In order to provide firmer evidence on this issue, we now address the question of what drives the positive correlation between local-currency equity returns and foreign net equity flows. The literature has put forward two explanations that we can term as return-chasing versus macroeconomic news/sentiment hypotheses. Since both these two explanations stress the contemporaneous relationship, we focus on the contemporaneous relationship in this subsection, but note that the contemporaneous relationship may cause inter-temporal relationship since flows are seriously autocorrelated.

The return chasing hypothesis states that foreign investors increase their holdings of equities with relatively high expected total equity returns (Bohn and Tesar, 1996). According to the macroeconomic news/sentiment hypothesis, good (bad) news about the local-currency equity returns lead to positive (negative) returns which cause flows into (out of) equity markets (Ben-Rephael et al., 2011), or its counterpart in FX markets (Love and Payne, 2008).

Table3

Impact of FX returns on foreign net equity flows. This table reports estimates of the coefficients of equity flows in the bivariate structural vector autoregression (SVAR) model, Eq. (2b), estimated individually by maximum likelihood (ML). Using a lag order of 5, we report the cumulative coefficient of the past FX returns ($\sum_{j=1}^{5}\widehat{\gamma}_{2,j}$) with significance *t*-statistic in parenthesis, and the Granger causality test *p*-values for the null hypothesis that the past FX returns do not affect the current flows (no causality). The last three rows report three model diagnostics: adjusted-R^2, Ljung-Box test *p*-values for the null hypothesis of no residual autocorrelation up to day five, and ARCH-LM test *p*-values for the null hypothesis of no autocorrelation in the squared residuals up to day five. For each estimated coefficient, we report in parenthesis *t*-statistics based on heteroskedasticity robust standard errors; *, ** and *** indicates significant coefficient at the 10%, 5% and 1% level, respectively.

	BSE (India)	NSE (India)	JSX (Indonesia)	Kospi (Korea)	Kosdaq (Korea)	PSE (Philippines)	TWSE (Taiwan)	SET (Thailand)
FXR	0.0007***	0.0058***	0.0006	0.0037***	0.0029***	0.0017**	0.0421***	0.0035***
	(6.29)	(10.86)	(1.26)	(3.25)	(4.51)	(2.04)	(16.14)	(3.52)
FXR(t − 1)	0.0002*	0.0014***	−0.0004	−0.0004	0.0002	0.0007	0.0032	0.0013
	(1.77)	(2.94)	(−0.77)	(−0.37)	(0.30)	(1.28)	(1.29)	(1.37)
FXR(t − 2)	0.0001	0.0006	−0.0004	0.0006	−0.0012	−0.0004	0.0013	−0.0002
	(0.89)	(1.15)	(−1.10)	(0.62)	(−1.82)	(−0.82)	(0.51)	(−0.26)
FXR(t − 3)	0.0003*	0.0004	−0.0000	−0.0009	0.0004	0.0003	−0.0047	0.0000
	(1.96)	(0.67)	(−0.04)	(−0.84)	(0.49)	(0.54)	(−1.96)	(0.05)
FXR(t − 4)	0.0001	0.0000	−0.0002	0.0001	−0.0005	−0.0002	0.0001	0.0001
	(0.79)	(0.01)	(−0.43)	(0.05)	(−0.75)	(−0.51)	(0.03)	(0.10)
FXR(t − 5)	0.0000	0.0002	−0.0001	0.0002	0.0001	−0.0002	−0.0002	−0.0018
	(0.15)	(0.33)	(−0.29)	(0.25)	(0.22)	(−0.32)	(−0.09)	(−2.12)
Cumulative coefficient	0.0007**	0.0025	−0.0010	−0.0010	−0.0010	0.0002	−0.0003	−0.0006
	(2.75)	(2.35)	(−1.16)	(−0.36)	(−0.67)	(0.17)	(−0.05)	(−0.33)
Granger causality test	0.145	0.053	0.829	0.844	0.546	0.551	0.310	0.207
Diagnostics:								
Adj. R^2	0.209	0.431	0.168	0.391	0.371	0.577	0.273	0.096
Ljung-Box test	0.961	0.404	0.996	0.3909	0.305	0.448	1.000	0.263
ARCH test	0.272	0.000	0.325	0.000	0.000	0.863	0.002	0.000

Since the total equity return can be decomposed into a local-currency equity return and an FX return as formalized in Eq. (1), in order to test the return-chasing hypothesis, we further decompose the local-currency equity returns and FX returns into two components: expected and unexpected. A stronger (weaker) effect of the expected component than the unexpected component on the flows represents evidence in favor of the return-chasing (macroeconomic news/sentiment) hypothesis. It is not uncommon in the literature to proxy macroeconomic news or shocks to sentiment as the unexpected component of returns (e.g., Campbell, 1991; Engle and Ng, 1993). Although macroeconomic news or shocks to sentiment about asset returns may contain both an expected component and an unexpected component, it should be only the unexpected component that affects asset returns and capital flows (Ross et al., 1999).

The expected local-currency equity returns for day *t* conditional on the available information up to day $t-1$ are obtained as a combination of past local-currency equity returns, past net equity flows and past FX returns weighted by the parameters of the SVAR equation (1a) as

$$LER^{e}_{i,t} \equiv E(LER_{i,t}|I_{t-1}) = \widehat{\alpha}_1 + \sum_{d=1}^{D}\widehat{\theta}_{1,d}LER_{i,t-d} + \sum_{d=1}^{D}\widehat{\phi}_{1,d}NEF_{i,t-d} + \sum_{d=1}^{D}\widehat{\gamma}_{1,d}FXR_{i,t-d} \tag{3}$$

and the unexpected returns are the model's residuals $LER^{u}_{i,t} \equiv LER_{i,t} - LER^{e}_{i,t}$.

Likewise, the expected FX returns for day *t* conditional on the available information up to day $t-1$ are obtained as a combination of past local-currency equity returns, past net equity flows and past FX returns weighted by the parameters of the SVAR equation (2a) as

$$FXR^{e}_{i,t} \equiv E(FXR_{i,t}|I_{t-1}) = \widehat{\alpha}_1 + \sum_{d=1}^{D}\widehat{\gamma}_{1,d}LER_{i,t-d} + \sum_{d=1}^{D}\widehat{\phi}_{1,d}NEF_{i,t-d} + \sum_{d=1}^{D}\theta_{1,d}FXR_{i,t-d} \tag{4}$$

and unexpected returns are the model residuals $FXR^{u}_{i,t} \equiv FXR_{i,t} - FXR^{e}_{i,t}$. In the robustness tests section we obtain the (un)expected returns using reduced-form VAR models instead.

We consider a version of the SVAR model which replaces the local-currency equity return in Eq. (1b), denoted $LER_{i,t}$, by its expected component, $LER^{e}_{i,t}$, and unexpected component$LER^{u}_{i,t}$with coefficients $\theta^{e}_{2,d}$ and $\theta^{u}_{2,d}$, respectively. Likewise, we replace the FX returns in Eq. (2b) by it expected component, $FXR^{e}_{i,t}$, and unexpected component,$FXR^{u}_{i,t}$, with coefficients $\gamma^{e}_{2,d}$ and $\gamma^{u}_{2,d}$, respectively. The estimates are shown in Table 4.

The findings indicate that net equity flows are affected by both the expected and unexpected local-currency equity returns. However, the relative size of the coefficients reveals that the average change in the flows in response to a unit increase in the expected local-equity return is much larger than the counterpart response to a unit increase in the unexpected local-equity return; this suggests that the *return-chasing* hypothesis dominates the *macroeconomic news/sentiment*

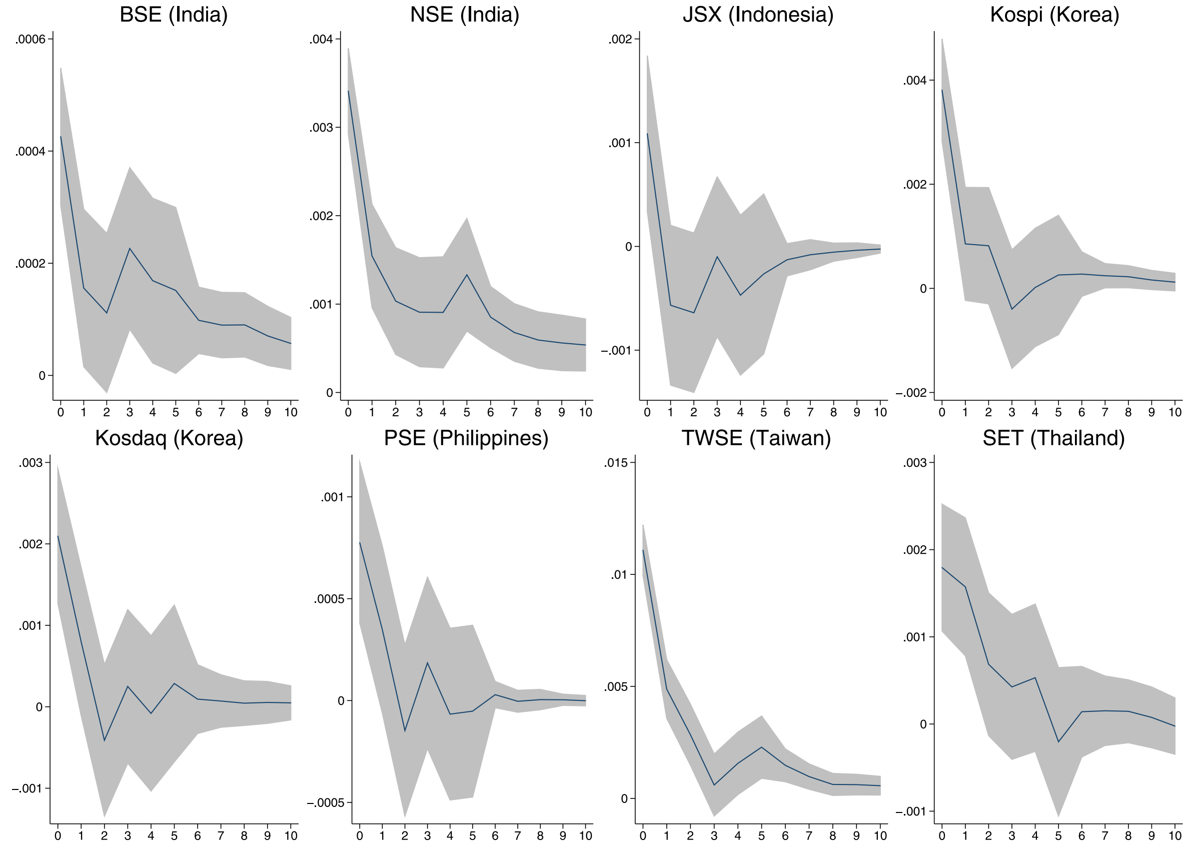

Fig. 3. Generalized impulse responses of foreign net equity flows to FX return shocks. This figure shows the responses of foreign net equity flows to a one-standard-deviation innovation in FX returns using the generalized impulse response function approach of Pesaran and Shin (1998). The estimates are obtained from model (2), a bivariate structural vector autoregressive (SVAR) model of foreign net equity flows and FX returns with local-currency equity returns as an exogenous variable. The VAR model with five lags is estimated for each market separately using daily data from various starting dates to the end of 2013. The grey area is 95% confidence intervals based on asymptotic heteroskedasticity robust standard errors.

Table 4

Expected and unexpected effects of returns on net equity flows. This table shows in Panel A the estimated coefficient of the regressor $LER_{i,t}$ in the SVAR model (1b) entered as two separate regressors, an expected component, and an unexpected component. The decomposition is achieved via the SVAR model (3). Panel B shows the estimated coefficient of the regressor $FXR_{i,t}$ in the SVAR model (2b) entered as two separate regressors, an expected component and an unexpected component. The decomposition is achieved via the reduced-form VAR model (5). The models are estimated individually per country by ML. For each coefficient we report *t*-statistics (in parenthesis) based on heteroskedasticity robust standard errors; *, ** and *** denote significant at the 10%, 5% and 1% level, respectively.

	BSE (India)	NSE (India)	JSX (Indonesia)	Kospi (Korea)	Kosdaq (Korea)	PSE (Philippines)	TWSE (Taiwan)	SET (Thailand)
Panel A. Impact of local equity returns on flows								
ExpectedLER	0.0018***	0.0122***	0.0172***	0.0303***	0.0172***	0.0073***	−0.0188	0.1128***
	(3.98)	(3.70)	(7.49)	(7.89)	(7.26)	(5.28)	(−0.78)	(9.68)
UnexpectedLER	0.0004***	0.0030***	0.0042***	0.0055***	0.0021***	0.0015***	0.0137***	0.0056***
	(7.13)	(10.81)	(15.21)	(14.86)	(7.67)	(8.03)	(25.85)	(18.61)
Panel B. Impact of FX returns on flows								
ExpectedFXR	−0.0003	0.0026	−0.0001	−0.0011	−0.0083	−0.0025	0.0868**	0.0092*
	(−0.23)	(0.45)	(−0.03)	(−0.25)	(−0.47)	(−0.39)	(2.41)	(1.68)
UnexpectedFXR	0.0007***	0.0058***	0.0006	0.0037***	0.0029***	0.0017**	0.0423***	0.0041***
	(6.30)	(10.86)	(1.27)	(3.32)	(4.50)	(2.03)	(16.16)	(4.34)

hypothesis in local-currency equity markets. Table 4 (Panel B) shows that net equity flows are almost exclusively affected by the unexpected FX returns, positively, but not by the expected component. This leads us to conclude that the macroeconomic news/sentiment hypothesis dominates the return-chasing hypothesis in FX markets. Thus, while foreign equity investors chase local-currency equity returns they do not chase FX returns which is not surprising given the consensus view that FX exchange rate returns remain nearly unpredictable out-of-sample.[10] Overall, the evidence supports our conjecture that return-chasing drives the positive association between local-currency equity returns and flows. As a by-product, our paper contributes with evidence from EMs to the literature on the macroeconomic news/sentiment hypothesis (e.g. Love and Payne, 2008; Ben-Rephael et al., 2011).

4. Impact of net equity flows on FX returns

Finally, we examine the relation between net equity flows and FX returns to elucidate whether foreign net equity flows do positively influence FX returns, in line with the second mechanism towards the UEP prediction according to the Hau and Rey (2006) theory. Using now SVAR models we can disentangle contemporaneous from for lagged effects.

We estimate the following bivariate SVAR model for FX returns and net equity flows

$$FXR_{i,t} = \alpha_2 + \sum_{d=0}^{D} \phi_{2,d} NEF_{i,t-d} + \sum_{d=1}^{D} \gamma_{2,d} FXR_{i,t-d} + \sum_{d=1}^{D} \theta_{2,d} LER_{i,t-d} + u_{i,t}^{FXR} \tag{5a}$$

$$NEF_{i,t} = \alpha_1 + \sum_{d=1}^{D} \phi_{1,d} NEF_{i,t-d} + \sum_{d=1}^{D} \gamma_{1,d} FXR_{i,t-d} + \sum_{d=1}^{D} \theta_{1,d} LER_{i,t-d} + u_{i,t}^{NEF} \tag{5b}$$

and the parameters of interest are $\phi_{2,0}$ and $(\phi_{2,1}, \cdots, \phi_{2,D})'$. The error assumptions are

$$\begin{bmatrix} u_{i,t}^{FXR} \\ u_{i,t}^{NEF} \end{bmatrix} \approx \mathrm{N}\left[0,\ \boldsymbol{D}_i^{FXR,NEF}\right],\ \boldsymbol{D}_i^{FXR,NEF} = \begin{bmatrix} \sigma_{i,FXR}^2 & 0 \\ 0 & \sigma_{i,NEF}^2 \end{bmatrix}$$

The last term of each of the two equations in this SVAR model accommodates the influence of lagged local-currency equity returns following the extant literature on flows and FX rates (Hau and Rey, 2004; Froot and Ramadorai, 2005; Love and Payne, 2008).

Table 5 reports the estimation results for the daily FX returns Eq. (5a). Most of the influence of foreign net equity flows on FX returns is contemporaneous and positive – the estimates of the coefficient $\phi_{2,0}$ range from 1.6877 (SET) to 43.5621 (BSE). The adjusted-R^2 of Eq. (3) is low, ranging from 0.009 (PSE) to 0.135 (NSE), but such a finding is neither controversial nor surprising as FX returns are challenging to predict in- and out-of-sample (see, e.g. Love and Payne, 2008). Reversals are also suggested as some of the coefficients of past flows are negative. The Granger-causality test does not reject the null hypothesis that past flows do not Granger-cause current FX returns with the exception of Taiwan.[11] In a nutshell, we find evidence only of a contemporaneous (positive) effect of foreign net equity flows on FX returns, that is, the positive impact of the flows on the FX rate dissipates very quickly.

Fig. 4 graphs the dynamic evolution of FX returns to a one-standard-deviation shock in the foreign net equity flows using GIRFs. We find a positive significant same-day response of the FX returns to a shock in flows, but the responses of FX returns become insignificant from the next trading day for Indonesia (JSX), Korea (Kospi), Korea (Kosdaq) and Philippines (PSE). Overall, foreign net equity flows have a strong contemporaneous positive influence on FX returns, endorsing the second mechanism towards UEP of the Hau and Rey (2006) theory.

5. Additional tests

5.1. Time-varying and asymmetric uncovered equity disparity

Our analysis of eight Asian EMs based on all foreign investors' recorded trades suggests that the first mechanism towards UEP, namely, portfolio rebalancing as portrayed in the Hau and Rey (2006) model, is not present in the aggregate of investors. Instead, we find evidence in favor of the return-chasing mechanism. Could the UEP failure in EMs be attributed to any other phenomenon? To the best of our knowledge, two explanations that have been entertained in prior studies are global volatility risk, which can be related to flight-to-safety effects (Cenedese et al., 2015; Cho et al., 2016) and market risk (Kim, 2011). We examine both of them in turn.

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[10] Using the Ilzetzki et al. (2018) FX flexibility index that takes values from 1 (tightly-managed float) to 15 (loose float), we gauged the type of managed float used by the 8 Asian EMs. The mean value of the index over the sample period ranges from 9.27 for India to 11.13 for Thailand. We did not observe any correspondence between the variation observed in the FX flexibility across the 8 countries and the extent of the responsiveness (lack thereof) of their net equity flows to expected FX returns, and to expected local-currency equity returns (shown in Table 4). Thus, we conclude that the equity return chasing (and absence of FX return chasing) is not influenced by the currency management. We thank an anonymous referee for this suggestion..

[11] This weak evidence may be due to the information loss in net equity flows. Compared to order flows, net equity flows convey no information about the signs of the trade, that is, the initiated side of the trades.

Table 5
The impact of foreign net equity flows on FX returns. This table reports the coefficient estimates of the FX return in the bivariate structural vector autoregression (SVAR) model, Eq. (5b), estimated by maximum likelihood (ML). Using lag order 5, we report the cumulative coefficient of the past foreign net equity flows (and significance *t*-statistic in parenthesis), Granger causality test *p*-values for the null hypothesis that past foreign net equity flows do not affect the current returns (no causality). The last three rows report three model diagnostics: adjusted-R^2, Ljung-Box test *p*-values for the null hypothesis of no residual autocorrelation up to day five, and ARCH-LM test *p*-values for the null hypothesis of no autocorrelation in squared residuals up to day five. For each estimated coefficient, we report *t*-statistics (in parenthesis) based on heteroskedasticity robust standard errors; *, ** and *** indicates significant at the 10%, 5% and 1% level, respectively.

	BSE (India)	NSE (India)	JSX (Indonesia)	Kospi (Korea)	Kosdaq (Korea)	PSE (Philippines)	TWSE (Taiwan)	SET (Thailand)
NEF	43.5621***	21.2250***	2.9853	3.8110***	2.2904***	2.3451**	2.5504***	1.6877***
	(5.02)	(11.52)	(1.28)	(5.00)	(5.01)	(2.41)	(16.32)	(3.72)
NEF(t − 1)	−0.4243	0.2740	−0.6430	−0.4534	0.1959	−0.1110	−0.3673*	0.7547
	(−0.05)	(0.13)	(−0.34)	(−0.49)	(0.42)	(−0.18)	(−1.95)	(1.43)
NEF(t − 2)	3.6588	−3.7913*	1.0246	0.0577	−0.0997	0.2214	0.0895	−0.2845
	(0.51)	(−1.79)	(0.70)	(0.06)	(−0.15)	(0.31)	(0.51)	(−0.55)
NEF(t − 3)	0.2993	−3.2410*	3.2043	0.7694	1.0405*	0.3501	−0.0247	−0.8580**
	(0.03)	(−1.70)	(1.21)	(0.92)	(1.75)	(0.49)	(−0.14)	(−2.03)
NEF(t − 4)	−12.6648**	−0.3834	−2.3369	0.6496	−0.5049	0.5519	−0.3917**	0.3250
	(−2.11)	(−0.22)	(−1.08)	(0.71)	(−0.89)	(0.67)	(−2.22)	(0.64)
NEF(t − 5)	−3.7902	−3.5390**	0.3108	−0.5422	−0.1243	0.9432	−0.1176	0.1753
	(−0.57)	(−2.11)	(0.20)	(−0.68)	(−0.25)	(1.41)	(−0.71)	(0.48)
Cumulative coefficient	−12.9212	−10.6807**	1.5598	0.4811	0.5075	1.9556	−0.8118**	0.1125
	(−0.80)	(−2.49)	(0.35)	(0.24)	(0.40)	(1.23)	(−2.06)	(0.11)
Granger causality test	0.351	0.000	0.597	0.925	0.521	0.644	0.015	0.357
Diagnostics:								
Adj. R^2	0.045	0.135	0.024	0.052	0.014	0.009	0.116	0.049
Ljung-Box test	1.000	0.997	0.990	0.251	1.000	1.000	1.000	0.998
ARCH test	0.000	0.000	0.000	0.000	0.000	0.163	0.000	0.000

In order to assess the extent to which the failure of UEP relates to the flight-to-safety mechanism we begin by adding the U.S. equity market option-implied volatility index (VIX), also known as the 'fear index' or 'fear gauge', as control variable in our models. The motivation for this is that a correspondence has been found in the literature between the VIX and aggregate flight-to-safety flows – namely, in states of the world when the VIX is very high, which signals a heightened risk perception, flight-to-safety flows are triggered (for recent papers, see e.g., Adrian et al., 2017, Baele et al., 2018). Thus, we re-specify Eqs. (1a)–(1b) as follows

$$LER_{i,t} = \alpha_1 + \sum_{d=1}^{D} \theta_{1,d} LER_{i,t-d} + \sum_{d=1}^{D} \phi_{1,d} NEF_{i,t-d} + \sum_{d=1}^{D} \gamma_{1,d} FXR_{i,t-d} + \sum_{d=1}^{D} \lambda_{1,d} X_{i,t-d} + u_{i,t}^{LER} \quad (1a')$$

$$NEF_{i,t} = \alpha_2 + \sum_{d=0}^{D} \theta_{2,d} LER_{i,t-d} + \sum_{d=1}^{D} \phi_{2,d} NEF_{i,t-d} + \sum_{d=1}^{D} \gamma_{2,d} FXR_{i,t-d} + \sum_{d=1}^{D} \lambda_{2,d} X_{i,t-d} + u_{i,t}^{NEF} \quad (1b')$$

where the additional exogenous variable $X_{i,t}$ is the VIX; and we modify in a similar manner equations (2a)–(2b) and (5a)–(5b). The results, reported in Table 6, suggest that the return-chasing rationale emanating from our earlier analysis is not challenged by the VIX inclusion.

Since expected US equity volatility (the VIX) is not necessarily identical as expected global equity volatility[12] we control for the *flight-to-quality* phenomenon in another way by splitting our sample into global *up* and *down* days according to the sign of the MSCI World index returns. Focusing on EM conditions, we divide the sample into and *up* and *down* days according to the MSCI EM index returns, and local-currency equity returns (LER_{it}). Although the correlations between FX and local-currency equity returns (Table 7, Panel A) are stronger in *down* periods suggesting that flight-to-safety may influence the extent of the uncovered equity "disparity"; however, they are always positive and so flight-to-safety cannot fully explain the UEP failure.

Finally, in order to accommodate the *flight-to-quality* mechanism (towards explaining the UEP failure) yet in another manner, we split the sample into a subperiod comprising the Asian Financial Crisis and Dotcom Crisis (from various starting dates to Oct 9, 2002), two non-crisis subperiods (one from Oct 10, 2002 to Aug 8, 2007, and the other one from Jul 26, 2012 to Dec 30, 2013), and a late 2000s GFC subperiod (from Aug 9, 2007 to Jul 26, 2012).[13] As Panel B of Table 7 shows, the correlation between FX returns and local-currency equity returns is again somewhat stronger in *crisis* than *non-crisis* periods with the

[12] For instance, Cenedese et al. (2015) find that while global equity volatility risk successfully explains the cross-section of international equity portfolios, the VIX does not.

[13] On July 26, 2012 the then ECB president Mario Draghi gives his strongest defense yet of the Euro, prompting markets to rally (http://www.theguardian.com/business/2012/aug/07/credit-crunch-boom-bust-timeline).

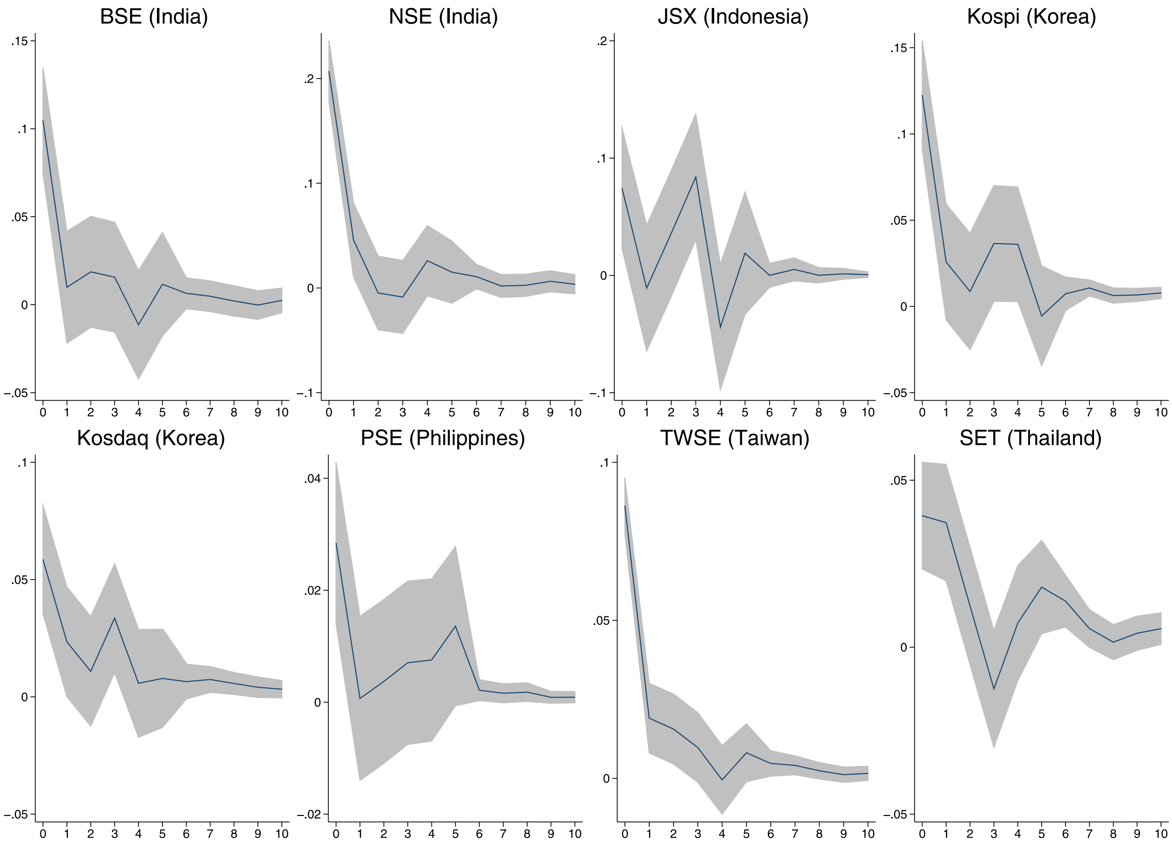

Fig. 4. Generalized impulse responses of FX returns to foreign net equity flows shocks. This figure shows the responses of FX returns (FXR) to a one-standard-deviation innovation in foreign net equity flows using the generalized impulse response function approach of Pesaran and Shin (1998). The estimates are obtained from model (5), a bivariate structural vector autoregressive (SVAR) model of foreign net equity flows and FX returns with local-currency equity returns as an exogenous variable. The VAR model with five lags is estimated for each market separately using daily data from various starting dates to the end of 2013. The grey area is 95% confidence intervals based on asymptotic heteroskedasticity robust standard errors.

strongest correlation observed in the late 2000s GFC, which suggests that the flight-to-quality may have played some role towards the UEP failure. However, the pervasive positive correlations in all subperiods suggest that it cannot fully explain the UEP failure.

Using data for 4 EMs (Singapore, Korea, Malaysia and Thailand), it is argued by Kim (2011) that the positive correlation between FX and local-currency equity returns in EMs might be explained by market risks due to incomplete institutional reforms, weak macroeconomic fundamentals, volatile economic conditions, shallow financial markets and imperfect market integration. This potential market-risk explanation for the failure of UEP in our cross-section of eight Asian EMs is not fully convincing, for the following two reasons.

On the one hand, if market risk has affected the aforesaid correlation, we should observe a gradually decreasing correlation over time, as market risk (following the liberalization of financial markets) ought to have decreased gradually along the path of market integration. In contrast, up to 2012 we find a clear upward trend in the positive correlation between local-currency equity returns and FX returns for all eight EMs using 250-trading-day (one calendar year) moving correlations as shown in Fig. 5. This upward trend is not challenged when we use 125-trading-day (half a year), 63-trading-day (one calendar quarter) or 21-trading-day (one calendar month) estimation windows. However, the upward trend supports our return-chasing explanation as it becomes increasingly safer and easier for the foreign investors to chase returns in the context of financial market integration as this reduces the aforementioned market risks. The reversal of the trend after 2012 may be due to the temporary imposition of capital controls by the EMs to manage the influx of capital flows following the Quantitative Easing (QE) programs in advanced economies, especially in the U.S. (see, e.g., Ostry et al., 2010).

On the other hand, Kim (2011) suggests that the magnitude of the correlations in relatively more developed EMs (Singapore and Korea), which is generally associated with less market risk, should be smaller than the ones in relatively less developed EMs (Malaysia and Thailand). However, as reported earlier the full sample period correlations obtained for the relatively more developed Kospi, Kosdaq and TWSE markets (0.310, 0.293 and 0.312, respectively) are larger than those

Table 6
Model estimates controlling for the fear gauge (VIX). This table reports the coefficient estimates of the SVAR model after controlling for the US equity market option-implied volatility (VIX) index. Panels from A to D correspond to Tables from 2 to 5, respectively, although for brevity, we omit the cumulative coefficient, Granger causality test *p*-values and diagnostics. For each estimated coefficient, we report *t*-statistics (in parenthesis) based on heteroskedasticity robust standard errors; *, ** and *** indicates significant at the 10%, 5% and 1% level, respectively.

	BSE (India)	NSE (India)	JSX (Indonesia)	Kospi (Korea)	Kosdaq (Korea)	PSE (Philippines)	TWSE (Taiwan)	SET (Thailand)
Panel A: Impact of local-currency equity returns on foreign net equity flows								
LER	0.0004***	0.0028***	0.0042***	0.0055***	0.0021***	0.0015***	0.0136***	0.0055***
	(7.10)	(10.23)	(15.32)	(14.98)	(7.67)	(8.08)	(25.75)	(17.88)
LER(t − 1)	0.0003***	0.0013***	0.0020***	0.0050***	0.0018***	0.0012***	0.0036***	0.0044***
	(3.48)	(5.37)	(5.84)	(12.70)	(6.21)	(8.02)	(6.65)	(13.23)
LER(t − 2)	−0.0000	−0.0000	0.0006**	−0.0009***	−0.0012***	0.0005***	0.0006	−0.0009***
	(−0.79)	(−0.07)	(2.10)	(−2.78)	(−4.31)	(3.46)	(1.13)	(−2.82)
LER(t − 3)	−0.0001	0.0001	0.0003	−0.0001	−0.0007**	0.0005***	0.0007	−0.0007**
	(−1.03)	(0.38)	(1.16)	(−0.33)	(−2.55)	(2.98)	(1.38)	(−2.57)
LER(t − 4)	−0.0001	−0.0004	−0.0005	−0.0003	−0.0000	0.0003*	−0.0004	−0.0010***
	(−1.19)	(−1.56)	(−1.63)	(−0.64)	(−0.05)	(1.86)	(−0.73)	(−3.54)
LER(t − 5)	0.0000	−0.0002	−0.0001	−0.0004	−0.0002	0.0001	−0.0005	−0.0007***
	(0.90)	(−0.81)	(−0.30)	(−1.18)	(−0.93)	(0.72)	(−1.04)	(−2.89)
Panel B: Impact of FX returns on foreign net equity flows								
FXR	0.0007***	0.0054***	0.0006	0.0037***	0.0029***	0.0018**	0.0422***	0.0035***
	(6.23)	(10.34)	(1.28)	(3.26)	(4.51)	(2.06)	(16.12)	(3.52)
FXR(t − 1)	0.0002	0.0012**	−0.0004	−0.0004	0.0002	0.0006	0.0033	0.0013
	(1.54)	(2.38)	(−0.74)	(−0.39)	(0.28)	(1.23)	(1.35)	(1.36)
FXR(t − 2)	0.0001	0.0003	−0.0004	0.0006	−0.0013*	−0.0004	0.0014	−0.0002
	(0.49)	(0.56)	(−1.08)	(0.64)	(−1.85)	(−0.78)	(0.57)	(−0.26)
FXR(t − 3)	0.0002*	0.0002	−0.0000	−0.0009	0.0003	0.0003	−0.0045*	0.0000
	(1.74)	(0.44)	(−0.01)	(−0.85)	(0.47)	(0.63)	(−1.89)	(0.04)
FXR(t − 4)	0.0001	0.0001	−0.0002	0.0000	−0.0005	−0.0003	0.0002	0.0001
	(0.76)	(0.10)	(−0.43)	(0.04)	(−0.80)	(−0.52)	(0.09)	(0.09)
FXR(t − 5)	0.0000	0.0002	−0.0001	0.0002	0.0001	−0.0001	−0.0001	−0.0018**
	(0.20)	(0.42)	(−0.30)	(0.24)	(0.17)	(−0.19)	(−0.02)	(−2.12)
Panel C: Expected and unexpected effects of local-currency equity returns and FX returns on foreign net equity flows								
LER^e	0.0004	0.0014	0.0172***	0.0298***	0.0171***	0.0075***	−0.0190	0.1149***
	(0.63)	(0.38)	(7.50)	(7.95)	(7.20)	(5.46)	(−0.80)	(9.74)
LER^u	0.0004***	0.0029***	0.0042***	0.0055***	0.0021***	0.0015***	0.0137***	0.0056***
	(6.96)	(10.19)	(15.33)	(14.90)	(7.69)	(8.05)	(25.78)	(18.57)
FXR^e	0.0001	0.0029	0.0001	−0.0011	−0.0085	−0.0024	0.0896**	0.0092*
	(0.13)	(0.54)	(0.03)	(−0.25)	(−0.49)	(−0.37)	(2.48)	(1.67)
FXR^u	0.0007***	0.0054***	0.0007	0.0038***	0.0029***	0.0018**	0.0423***	0.0041***
	(6.23)	(10.34)	(1.29)	(3.33)	(4.51)	(2.05)	(16.14)	(4.34)
Panel D: The impact of foreign net equity flows on FX returns								
NEF	42.1698***	20.6322***	3.0373	3.8439***	2.2838***	2.3721**	2.5564***	1.6879***
	(4.89)	(10.96)	(1.30)	(5.03)	(5.02)	(2.43)	(16.32)	(3.71)
NEF(t − 1)	0.9713	0.8785	−0.5831	−0.4416	0.1987	−0.0980	−0.3622*	0.7560
	(0.12)	(0.42)	(−0.30)	(−0.47)	(0.42)	(−0.16)	(−1.92)	(1.43)
NEF(t − 2)	4.8298	−3.5220	1.0491	0.0803	−0.1202	0.2201	0.0943	−0.2878
	(0.69)	(−1.62)	(0.71)	(0.09)	(−0.18)	(0.31)	(0.54)	(−0.56)
NEF(t − 3)	1.8655	−2.9477	3.2123	0.7434	1.0554*	0.3561	−0.0210	−0.8638**
	(0.18)	(−1.51)	(1.21)	(0.88)	(1.78)	(0.49)	(−0.12)	(−2.04)
NEF(t − 4)	−10.6338*	−0.1429	−2.3290	0.6570	−0.5219	0.5522	−0.3873**	0.3200
	(−1.80)	(−0.08)	(−1.07)	(0.71)	(−0.91)	(0.68)	(−2.19)	(0.63)
NEF(t − 5)	−3.3353	−3.3703**	0.2914	−0.5244	−0.1231	0.9488	−0.1131	0.1752
	(−0.51)	(−1.96)	(0.19)	(−0.65)	(−0.25)	(1.42)	(−0.68)	(0.48)

for the less developed JSX, PSE and SET markets (0.201, 0.246 and 0.206, respectively).[14] Again, this fact supports our return-chasing explanation as the relatively more developed EMs are more attractive to the foreign investors in terms of chasing returns.

5.2. Robustness tests

Now we carry out various robustness tests to tackle some possible concerns associated with the (1) use of local-currency equity returns, (2) model estimation with short-horizon returns and flows, (3) regional co-movement, (4) model specifica-

[14] The Kospi, Kosdaq and TWSE market capitalization in 2001 (expressed in billion USD) at 2.32, 9.85 and 2.08, respectively, is notably higher than that that of JSX, PSE and SET at 0.38, 0.07 and 1.05, respectively.

Table 7
Robustness checks on correlations. This table shows in panels A and B the contemporaneous correlations between FX returns (FXR_{it}) and local-currency equity returns (LER_{it}) during up and down periods, and during crisis and non-crisis periods, respectively. The largest correlation among up (crisis) periods and down (subsequent non-crisis) periods in each of the panels is highlighted in bold. Panel C shows the correlations between FXR_{it} and local-currency equity return differentials, $LERD_{it}$, defined using different foreign equity market benchmarks. * indicates that the correlation coefficient is significant at the 5% level or better.

Panel A: Correlations between FX returns and local-currency equity returns in up and down market periods

	MSCI World index		MSCI EM index		Local-currency equity market	
	returns > 0 (*up* period)	returns < 0 (*down* period)	returns > 0 (*up* period)	returns < 0 (*down* period)	LER > 0 (*up* period)	LER < 0 (*down* period)
BSE (India)	0.3962*	**0.4184***	0.3044*	**0.3711***	0.2838*	**0.3627***
NSE (India)	0.3873*	**0.4334***	0.2989*	**0.3794***	0.2492*	**0.3665***
JSX (Indonesia)	0.2039*	**0.2088***	0.1179*	**0.1472***	0.1988*	**0.2365***
Kospi (Korea)	0.2258*	**0.2707***	0.1604*	**0.2513***	0.2203*	**0.2782***
Kosdaq (Korea)	0.2273*	**0.2783***	0.1083*	**0.2809***	0.1737*	**0.2538***
PSE (Philippines)	**0.3401***	0.2383*	**0.2404***	0.1830*	0.1843*	**0.1890***
TWSE (Taiwan)	0.2530*	**0.2688***	0.1981*	**0.2263***	0.1694*	**0.1879***
SET (Thailand)	0.1584*	**0.2017***	**0.1489***	0.1294*	**0.2006***	0.1437*

Panel B: Correlations between FX returns and local-currency equity returns in crisis and non-crisis periods

	Asian, Dotcom Crises (before Oct 9, 2002)	*Non-crisis (Oct 10, 2002 to Aug 8, 2007)*	*Late 2000s GFC (Aug 9, 2007 to Jul26, 2012)*	*Non-crisis (after Jul 27, 2012)*
BSE (India)	–	–	–	0.5111*
NSE (India)	–	–	–	0.5135*
JSX (Indonesia)	0.1832*	**0.3872***	**0.3895***	0.2283*
Kospi (Korea)	**0.2331***	0.1810*	**0.5394***	0.4514*
Kosdaq (Korea)	**0.1811***	0.1667*	**0.5067***	0.2271*
PSE (Philippines)	**0.2104***	0.1832*	**0.3346***	0.1792*
TWSE (Taiwan)	0.1378*	**0.2472***	**0.4187***	0.3821*
SET (Thailand)	**0.2148***	0.1235*	0.2814*	**0.2975***

Panel C: Contemporaneous correlations between FX returns and local-currency equity return differentials (LERD)

	S&P500	*Nasdaq*	*Phil. Semiconductor*	*MSCI World*
BSE (India)	0.2433*	0.2322*	0.1652*	0.1905*
NSE (India)	0.2239*	0.2138*	0.1482*	0.1677*
JSX (Indonesia)	0.1254*	0.1001*	0.0628*	0.1282*
Kospi (Korea)	0.2073*	0.1731*	0.1217*	0.1942*
Kosdaq (Korea)	0.1599*	0.1254*	0.0867*	0.1178*
PSE (Philippines)	0.1139*	0.0866*	0.0494*	0.0585*
TWSE (Taiwan)	0.1712*	0.1490*	0.1014*	0.1241*
SET (Thailand)	0.1429*	0.1101*	0.0574*	0.1136*

tion, (5) changes in financial wealth, (6) use of bilateral spot exchange rates, and (7) method used to measure (un)expected returns.

5.2.1. Local-currency equity returns

Our analysis is based on local-currency equity returns whereas Hau and Rey (2006) use return differentials between the U.S. and foreign stock markets. This is because Hau and Rey (2006) build their theory in a world of two countries and an exogenous setting of portfolio-rebalancing regarding return differentials. A more realistic setting is multi-country but then it is not obvious which country benchmark to use (Richards, 2005, p. 8) especially when, as in our paper, the equity flows include the trades of *all* the foreign investors.[15] Using local-currency equity return differentials (LERD) with the S&P 500, Nasdaq, Philadelphia Semiconductor Index, MSCI world Index as benchmarks, we show in Table 7 (Panel C) that the correlations between FXR_{it} and $LERD_{it}$ remain positive. The estimation results for our (S)VAR models with LERD replacing the LER variable, which are omitted for brevity, do not alter our key findings.

5.2.2. Model re-estimation with short-horizon returns and flows

One of the distinctive aspects of our empirical analysis from extant ones is the use of daily data instead of monthly and/or quarterly data. One might be concerned that the results from our analysis are driven by the positive significant autocorrelation in daily flows for most of the markets in Table 1 (i.e., the slow-moving capital phenomenon). To address this concern, we aggregate our daily data into weekly and monthly (the autocorrelations in equity flows are still significantly positive) and re-estimate our models. The results are shown in Tables 8 and 9, respectively. UEP is still refuted (according to Panels A, B

[15] For instance, Kim (2011) finds significant different results using Japan rather than the U.S. as a benchmark economy. Cho et al. (2016) also find significant different results once Japan is included.

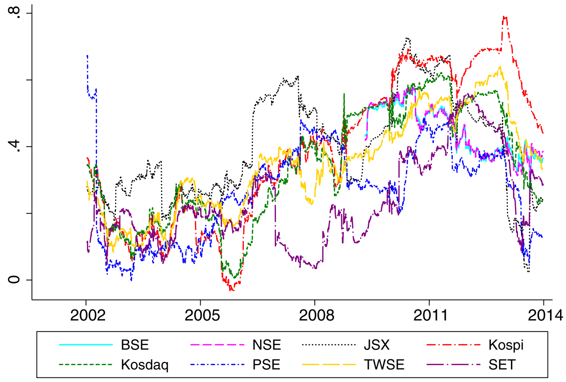

Fig. 5. Correlation between local-currency equity returns and FX returns. The figure plots the 250-trading-day moving correlation between the local-currency equity return and FX return for each of 8 Asian markets: BSE (India), NSE (India), JSX (Indonesia), Kospi (Korea), Kosdaq (Korea), PSE (Philippines) TWSE (Taiwan), SET (Thailand).

and D) but the return-chasing explanation/rationale is concealed (in Panel C) which mirrors the evidence in Griffin et al. (2004, Fig. 3). This analysis confirms that the evidence of return-chasing behavior, as driver of the UEP failure, is revealed more clearly with disaggregate daily data.

5.2.3. Regional co-movement

There may be a common regional effect in the flows and returns of our 8 Asian countries. Unreported results suggest a strong country co-movement in the flows, FX returns and local-currency equity returns, with an average pairwise correlation of 0.25 between their net equity flows, 0.35 (FX returns) and 0.43 (local-currency equity returns). We also find that the first principal component is able to explain 37%, 49% and 56% of the total variation in net flows, FX returns and local-currency equity returns, respectively, which suggests that there are regional/global co-movements within net equity flows, FX returns, and local-currency equity returns. We take the co-movements into account by employing a fixed-effects panel-VAR regression. Fig. 6 presents the impulse response functions of the panel trivariate VAR.

The results confirm our previous key finding that local-currency equity returns have a positive influence on net equity flows and that net equity flows also positively affect FX returns.

5.2.4. Model specification

We reverse the order of the variables in each VAR model, consider up to 40 days of lags as in Froot et al. (2001), or 1-day lagged capital flows (since capital flow data may suffer from a slight publication delay). Furthermore, following extant studies, to take into account other factors that may influenced the net equity flows, we use as exogenous variable X_{it} in Eqs. (1a')–(1b'), (2a')-(2b') and (5a')-(5b'), the latter being the similarly modified equations of (2a)–(2b) and (5a)–(5b) an in (1a')–(1b') the S&P 500 index, Nasdaq index, Philadelphia Semiconductor index, MSCI World index and MSCI EM index returns (see, e.g., Richards, 2005; Ulku and Weber, 2014). The inclusion of the S&P500, MSCI World and MSCI EM index returns allows further controlling for portfolio rebalancing effects, and the former two also for behavioural (sentiment-driven) effects. The Nasdaq index and Philadelphia Semiconductor index returns are pertinent because the two Korean markets and the Taiwan market are technology-intensive and possibly influenced by global technology shocks. The results (unreported to preserve space but available from the authors upon request) do not challenge our prior key findings.

5.2.5. Changes in financial wealth

Our analysis is subject to the potential criticism that net equity flows are also influenced by changes in financial wealth (Curcuru et al., 2011). To control for this effect, like most studies about the interaction between international capital flows and domestic equity returns (Froot et al., 2001; Griffin et al., 2004; Richards, 2005), we scaled the flow data by local equity market capitalization. We also attempted to control for the changes in financial wealth of investors by normalizing our flows variable by trading volume instead of local equity market capitalization, or by scaling flows by the average of absolute flows of the previous 21/63/125/250 trading days. The key results are essentially unchanged and hence, omitted to preserve space.

5.2.6. Use of bilateral exchange rates

Next we recalculate the FX returns using the effective exchange rate or price of each EM's currency in terms of a global basket of currencies (from the Bank for International Settlements). Unreported results show that our key findings are qualitatively unchanged, as one might expect, given the stylized fact that foreign EM equity investors predominantly use the U.S. dollar as a vehicle (see Goldberg and Tile, 2008; Devereux and Shi, 2013, and references therein).

Table 8
Model estimates based on weekly data. Panels A to D are the weekly-data counterparts of Tables 2–5, respectively, although for brevity, we omit the cumulative coefficient, the *p*-values of the Granger causality test and the model diagnostics. For each estimated coefficient, we report *t*-statistics (in parenthesis) based on heteroskedasticity robust standard errors. *, ** and *** indicates significant coefficient at the 10%, 5% and 1% level, respectively.

	BSE (India)	NSE (India)	JSX (Indonesia)	Kospi (Korea)	Kosdaq (Korea)	PSE (Philippines)	TWSE (Taiwan)	SET (Thailand)
Panel A: Impact of local-currency equity returns on foreign net equity flows								
LER	0.0009***	0.0058***	0.0063***	0.0152***	0.0053***	0.0037***	0.0249***	0.0154***
	(8.21)	(9.49)	(5.34)	(12.89)	(6.86)	(9.09)	(11.90)	(12.83)
LER(t − 1)	0.0000	−0.0004	−0.0009	0.0007	−0.0012	0.0017***	0.0043*	−0.0001
	(0.13)	(−0.49)	(−0.90)	(0.55)	(−1.58)	(4.30)	(1.74)	(−0.07)
LER(t − 2)	0.0000	0.0003	0.0019*	−0.0010	−0.0007	−0.0005	−0.0006	−0.0033***
	(0.07)	(0.61)	(1.78)	(−0.83)	(−1.02)	(−1.24)	(−0.34)	(−3.00)
LER(t − 3)	−0.0001	−0.0003	−0.0001	−0.0029**	−0.0008	−0.0002	−0.0015	−0.0014
	(−0.95)	(−0.51)	(−0.11)	(−2.24)	(−1.25)	(−0.54)	(−0.67)	(−1.53)
LER(t − 4)	0.0003*	0.0007	−0.0012	−0.0001	−0.0013*	0.0002	−0.0013	−0.0018**
	(1.90)	(1.29)	(−1.44)	(−0.10)	(−1.87)	(0.54)	(−0.75)	(−2.01)
LER(t − 5)	−0.0001	−0.0012**	0.0002	−0.0032***	−0.0005	−0.0004	−0.0021	−0.0008
	(−0.32)	(−2.08)	(0.29)	(−2.82)	(−0.87)	(−1.03)	(−1.30)	(−0.78)
Panel B: Impact of FX returns on foreign net equity flows								
FXR	0.0021***	0.0149***	0.0031*	0.0050	0.0094***	0.0064***	0.0911***	0.0171**
	(7.94)	(12.10)	(1.91)	(0.77)	(4.12)	(3.71)	(9.01)	(2.20)
FXR(t − 1)	0.0003	0.0028	−0.0014*	0.0043	−0.0021	0.0008	−0.0176*	−0.0018
	(0.72)	(1.58)	(−1.69)	(0.87)	(−0.84)	(0.55)	(−1.66)	(−0.72)
FXR(t − 2)	0.0000	−0.0009	−0.0014	−0.0007	0.0013	−0.0009	−0.0094	−0.0046
	(0.00)	(−0.53)	(−1.19)	(−0.10)	(0.57)	(−0.53)	(−1.11)	(−1.22)
FXR(t − 3)	0.0003	−0.0007	−0.0002	−0.0002	−0.0025	0.0005	−0.0019	−0.0005
	(0.73)	(−0.39)	(−0.30)	(−0.03)	(−1.09)	(0.36)	(−0.22)	(−0.12)
FXR(t − 4)	−0.0002	−0.0015	0.0001	−0.0026	0.0051**	0.0005	0.0043	0.0001
	(−0.59)	(−0.85)	(0.10)	(−0.48)	(2.28)	(0.32)	(0.49)	(0.02)
FXR(t − 5)	0.0004	0.0032*	−0.0008	−0.0003	0.0011	0.0008	0.0062	−0.0032
	(0.95)	(1.82)	(−1.25)	(−0.04)	(0.52)	(0.55)	(0.67)	(−1.23)
Panel C: Expected and unexpected effects of local-currency equity returns and FX returns on foreign net equity flows								
LER^e	−0.0007	0.0071*	0.0097***	−0.0080	−0.0061	−0.0111**	−0.0027	−0.0087
	(−0.63)	(1.75)	(2.70)	(−0.69)	(−1.01)	(−2.45)	(−0.10)	(−1.11)
LER^u	0.0009***	0.0059***	0.0063***	0.0152***	0.0054***	0.0036***	0.0244***	0.0152***
	(7.94)	(8.99)	(5.32)	(12.84)	(6.74)	(8.79)	(11.25)	(12.54)
FXR^e	0.0009	0.0082	0.0137**	−0.0058	−0.0301**	−0.0083	−0.0335	0.0276**
	(0.29)	(0.44)	(2.57)	(−0.58)	(−2.03)	(0.78)	(−0.41)	(2.02)
FXR^u	0.0021***	0.0149***	0.0031*	0.0050***	0.0095***	0.0062***	0.0904***	0.0234***
	(7.87)	(12.09)	(1.90)	(0.77)	(4.16)	(3.67)	(8.28)	(5.41)
Panel D: The impact of foreign net equity flows on FX returns								
NEF	76.5990***	22.3631***	10.1998***	3.1783***	3.2778***	4.6288***	1.8880***	2.8527***
	(4.68)	(10.02)	(2.86)	(2.87)	(4.31)	(3.97)	(8.95)	(4.89)
NEF(t − 1)	−26.4313*	−9.6782**	−5.6038*	−0.1445	0.0956	0.3872	−0.4727*	−0.1476
	(−1.85)	(−3.80)	(−1.76)	(−0.09)	(0.10)	(0.34)	(−1.70)	(−0.20)
NEF(t − 2)	27.4909	5.4526*	1.8768	−0.3514	−0.4702	−1.9962	0.1088	−0.8639
	(1.51)	(1.73)	(0.53)	(−0.30)	(−0.60)	(−1.49)	(0.41)	(−1.43)
NEF(t − 3)	−4.6349	−5.6869*	−3.9664**	−0.6183	0.5117	−1.1041	−0.1511	−1.4092
	(−0.32)	(−1.92)	(−2.06)	(−0.37)	(0.55)	(−0.87)	(−0.57)	(−0.83)
NEF(t − 4)	−2.9983	−1.1361	−0.7383	0.5439	−1.3332	0.8289	0.1072	0.2724
	(−0.27)	(−0.38)	(−0.29)	(0.24)	(−1.25)	(0.69)	(0.43)	(0.40)
NEF(t − 5)	−17.5168*	0.2580	3.2420	1.9748	−0.3442	0.4618	−0.2138	0.5471
	(−1.68)	(0.11)	(1.59)	(1.03)	(−0.47)	(0.43)	(−0.94)	(0.95)

5.2.7. Expected and unexpected return decomposition

Following Richards (2005), we estimate the expected local-currency equity returns for day $t+1$ conditional on the available information on day t using the reduced-form VAR(5) model

$$LER_{i,t} = \alpha_2 + \sum_{d=1}^{5}\phi_{2,d}NEF_{i,t-d} + \sum_{d=1}^{5}\theta_{2,d}LER_{i,t-d} + \varepsilon_{i,t}^{LER} \tag{6a}$$

$$NEF_{i,t} = \alpha_1 + \sum_{d=1}^{5}\phi_{1,d}NEF_{i,t-d} + \sum_{d=1}^{5}\theta_{1,d}LER_{i,t-d} + \varepsilon_{i,t}^{NEF} \tag{6b}$$

Table 9
Model estimates based on monthly data. Panels A to D are the monthly-data counterparts of Tables 2–5, respectively, although for brevity, we omit the cumulative coefficient, the Granger causality test *p*-values, and the model diagnostics. For each estimated coefficient, we report *t*-statistics (in parenthesis) based on heteroskedasticity robust standard errors. *, ** and *** indicates significant coefficient at the 10%, 5% and 1% level, respectively.

	BSE (India)	NSE (India)	JSX (Indonesia)	Kospi (Korea)	Kosdaq (Korea)	PSE (Philippines)	TWSE (Taiwan)	SET (Thailand)
Panel A: Impact of local-currency equity returns on foreign net equity flows								
LER	0.0020***	0.0099***	0.0098***	0.0240***	0.0088***	0.0060***	0.0390***	0.0222***
	(3.11)	(3.50)	(3.72)	(6.89)	(3.91)	(5.43)	(8.16)	(7.46)
LER(t − 1)	0.0002	−0.0005	−0.0017	−0.0070	−0.0057**	0.0005	−0.0016	−0.0078**
	(0.29)	(−0.25)	(−0.96)	(−1.11)	(−2.38)	(0.43)	(−0.31)	(−2.41)
LER(t − 2)	0.0003	−0.0021	−0.0012	−0.0080*	−0.0006	0.0011	−0.0019	0.0026
	(0.47)	(−0.81)	(−0.56)	(−1.85)	(−0.29)	(0.97)	(−0.44)	(0.71)
LER(t − 3)	−0.0001	0.0021	−0.0008	−0.0037	0.0032	−0.0003	−0.0018	−0.0025
	(−0.22)	(0.69)	(−0.41)	(−1.04)	(1.40)	(−0.27)	(−0.23)	(−0.96)
LER(t − 4)	0.0003	0.0026	−0.0016	0.0005	−0.0008	0.0003	0.0011	0.0010
	(0.36)	(0.95)	(−0.84)	(0.12)	(−0.40)	(0.29)	(0.21)	(0.33)
LER(t − 5)	0.0002	−0.0001	−0.0005	−0.0030	−0.0010	0.0003	0.0032	−0.0031
	(0.19)	(−0.03)	(−0.19)	(−0.79)	(−0.51)	(0.22)	(0.75)	(−1.14)
Panel B: Impact of FX returns on foreign net equity flows								
FXR	0.0035**	0.0233***	−0.0006	0.0187	0.0170***	0.0078*	0.1369***	0.0728
	(2.25)	(4.68)	(−0.12)	(1.58)	(2.99)	(1.81)	(7.30)	(6.33)
FXR(t − 1)	0.0012	0.0023	0.0001	−0.0167	0.0143**	−0.0015	−0.0007	−0.0002
	(1.05)	(0.38)	(0.04)	(−1.42)	(2.17)	(−0.35)	(−0.03)	(−0.02)
FXR(t − 2)	0.0011	−0.0016	−0.0015	−0.0134	−0.0009	0.0003	−0.0308	−0.0159
	(0.74)	(−0.27)	(−0.54)	(−1.34)	(−0.17)	(0.06)	(−1.38)	(−1.38)
FXR(t − 3)	−0.0020	−0.0112	0.0032	0.0014	0.0010	−0.0030	−0.0189	0.0093
	(−1.49)	(−1.98)	(1.19)	(0.10)	(0.17)	(−0.78)	(−0.76)	(0.91)
FXR(t − 4)	0.0000	−0.0035	−0.0005	0.0021	−0.0044	0.0011	−0.0311	−0.0072
	(−0.02)	(−0.53)	(−0.10)	(0.23)	(−0.79)	(0.30)	(−1.28)	(−0.84)
FXR(t − 5)	0.0011	−0.0056	0.0007	0.0028	0.0016	0.0032	−0.0289	−0.0052
	(0.55)	(−0.70)	(0.29)	(0.33)	(0.34)	(1.00)	(−1.11)	(−0.53)
Panel C: Expected and unexpected effects of local – currency equity returns and FX returns on foreign net equity flows								
LER^e	0.0017	0.0143	0.0072	−0.0071	0.0207	0.0134	0.0241	−0.0022
	(1.15)	(1.55)	(0.82)	(−0.35)	(1.64)	(1.75)	(0.58)	(−0.13)
LER^u	0.0017**	0.0108**	0.0097***	0.0257***	0.0093***	0.0057***	0.0424***	0.0234***
	(2.64)	(2.13)	(3.67)	(7.47)	(4.21)	(5.32)	(8.62)	(7.25)
FXR^e	0.0068**	0.0237	−0.0076	0.0596	0.0058	−0.0071	0.3466**	0.0927
	(2.21)	(1.01)	(−0.53)	(1.64)	(0.16)	(−0.38)	(2.44)	(0.80)
FXR^u	0.0028*	0.0239***	−0.0008	0.0397***	0.0178***	0.0070*	0.1367***	0.0756***
	(1.91)	(4.61)	(−0.16)	(4.41)	(2.87)	(1.66)	(7.26)	(6.20)
Panel D: The impact of foreign net equity flows on FX returns								
NEF	71.3630***	16.1213***	−1.5253	2.5607**	2.6742**	4.7474**	1.9200***	3.1308***
	(2.76)	(4.28)	(−0.19)	(2.28)	(2.23)	(2.13)	(5.76)	(6.20)
NEF(t − 1)	14.0030	−0.5413	−2.1196	−0.6341	−2.2351	0.1261	0.0186	−0.9512*
	(0.58)	(−0.14)	(−0.37)	(−0.30)	(−1.40)	(0.05)	(0.05)	(−1.89)
NEF(t − 2)	−11.0657	−7.6721	3.7889	0.3630	1.5208	0.4479	0.1010	0.6672
	(−0.51)	(−1.55)	(0.53)	(0.27)	(1.29)	(0.19)	(0.25)	(1.10)
NEF(t − 3)	−30.0519	−2.5177	3.3327	−0.0616	−1.9325	−0.5336	−0.6266	−0.7144
	(−1.30)	(−0.36)	(0.48)	(−0.06)	(−1.55)	(−0.22)	(−1.32)	(−1.05)
NEF(t − 4)	−11.6880	3.4788	−11.1947	−0.4067	0.2779	0.3355	−0.2487	0.6537
	(−0.51)	(0.83)	(−1.71)	(−0.27)	(0.22)	(0.14)	(−0.72)	(0.98)
NEF(t − 5)	−5.6023	−4.8374	8.6153	0.4548	1.1784	−0.2767	−0.6611	−0.694
	(−0.27)	(−1.31)	(1.48)	(0.27)	(1.15)	(−0.13)	(−1.78)	(−1.20)

with error term assumptions

$$\begin{bmatrix} \varepsilon_{i,t}^{LER} \\ \varepsilon_{i,t}^{NEF} \end{bmatrix} \approx \mathrm{N}\left[0,\ \Sigma_i^{LER,NEF}\right],\ \Sigma_i^{LER,NEF} = \begin{bmatrix} \sigma_{i,LER}^2 & \rho_{i,NEF,LER}\sigma_{i,NEF}\sigma_{i,LER} \\ \rho_{i,NEF,LER}\sigma_{i,NEF}\sigma_{i,LER} & \sigma_{i,NEF}^2 \end{bmatrix}$$

to obtain the expected returns as $E_t(LER_{i,t}|I_{t-1}) = \widehat{LER}_{i,t}$, and unexpected returns as $\widehat{\varepsilon}_{i,t}^{LER}$.

We use a similar reduced-form bivariate VAR(5) model for $(FXR_{i,t}, NEF_{i,t})'$ to decompose $FXR_{i,t}$ into its expected part, $E_t(FXR_{i,t}|I_{t-1}) = \widehat{FXR}_{i,t}$, and unexpected part $\widehat{\varepsilon}_{i,t}^{FXR}$. The results are omitted here for brevity, as they are quite similar to the ones in Table 4 using the estimated expected and unexpected returns using the former SVAR equations (3) and (4).

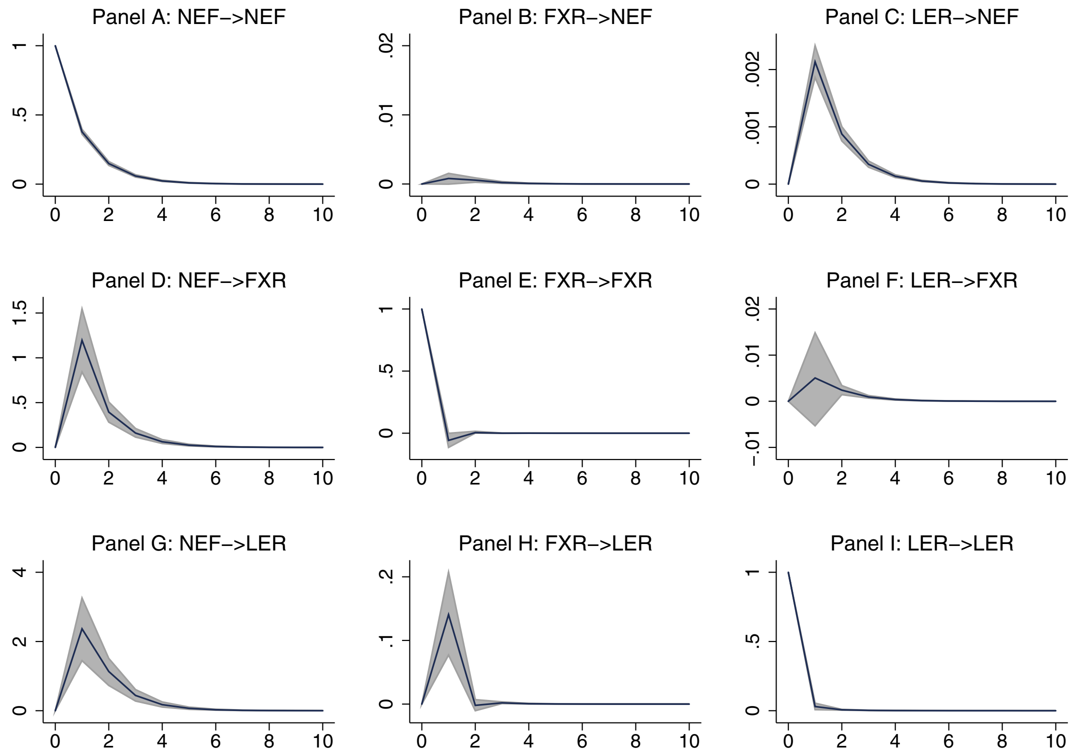

Fig. 6. Generalized impulse response functions from a tri-variate panel-VAR system. This figure shows the responses of net equity flows, FX returns (FXR) and local-currency equity returns (LER) to a one-standard-deviation innovation in flows in panels A, D, and G, respectively; the responses of net equity flows, FX returns and local-currency equity returns to a one-standard-deviation innovation in FX returns in panels B, E, and H, respectively; and the responses of flows, FX returns and local-currency equity returns to a one-standard-deviation innovation in local-currency equity returns in panels C, F, and I, respectively. The impulse response functions are obtained from a fixed-effects trivariate unbalanced panel-VAR with five lags estimated using daily data. The grey area is 95% confidence intervals based on asymptotic heteroskedasticity robust standard errors.

6. Conclusions

Using daily data on net equity flows, local-currency equity returns and FX returns for eight Asian emerging markets (EMs) we investigate the Uncovered Equity Parity (UEP) condition by testing, in turn, the two underlying mechanisms suggested by the Hau and Rey (2006) model.

Although we find evidence supportive of the second mechanism underlying the UEP – a significant positive nexus between net equity flows and FX returns – the first mechanism is not supported on two accounts. First, foreign EM equity investors in the aggregate do not respond to FX movements, suggesting that they mainly use EM currencies as an equity investment vehicle. Second, foreign EM equity investors tend to pursue return-chasing strategies, which induces a positive nexus between local-currency equity returns and FX returns. Subjecting our analysis to various robustness tests, the key finding that the *return-chasing* phenomenon largely drives the uncovered equity "disparity" in the 8 Asian EMs remains unchallenged.

We also show that the failure of UEP is time-varying and asymmetric. There is an upward trend in the positive correlation between local-currency equity returns and FX returns which, in the context of the ongoing financial market integration, is consistent with the return-chasing hypothesis but at odds with the market-risk explanation. The UEP failure is asymmetric in that is exacerbated in market downturns and crisis periods, especially during the late 2000s GFC.

Our findings have important implications. Policymakers' attention should not just be on either equity, or FX markets separately, but on the interconnections between these two markets and capital flows. The current turmoil in the equity and FX markets in EMs, which has been accompanied by huge capital outflows from EMs is a reminder of the importance of examining their dynamics jointly. From the viewpoint of international investors in EM equity markets, better FX hedging strategies may be helpful as FX movements do not offset local-currency equity returns but add additional risks to the total EM investment portfolio.

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Appendix A. The Hau and Rey (2006) UEP model adapted to return-chasing

The model is based on the same framework of Hau and Rey (2006) but under the different assumption that international investors chase returns rather than rebalance their portfolios. Bohn and Tesar (1996) decompose the net foreign purchases of U.S. investors as portfolio-rebalancing and return-chasing ones, but it is an empirical question which one dominates. This appendix is not intended to be a complete description of the UEP; more details can be found in Hau and Rey (2006). Instead, we distil the essence of their theoretical framework and modify their approach to address the failure of UEP in EMs from the perspective of return-chasing.

Return-chasing means that when the domestic holdings of equity yield dividends or changes in price, foreign investors will buy more domestic equity rather than repatriate their capital gains. Since Hau and Rey (2006) assume that all dividends are repatriated under their portfolio-rebalancing assumption, without loss of generality we assume that the amount of domestic equity the foreign investors will buy is as the same as their capital gains. Hence, we modify Hau and Rey (2006, p282) Eq. (2) as follows:

$$dQ_t = K_t^f D_t^f dt - E_t K_t^{h*} D_t^h dt + dK_t^f P_t^f - E_t dK_t^{h*} P_t^h \tag{A.1}$$

adopting similar notation as in Hau and Rey (2006); $K_t = (K_t^h, K_t^f)$ and $K_t^* = (K_t^{h^*}, K_t^{f^*})$ denote the equity portfolio of home and foreign investors respectively; superscript h and f denote home and foreign equity respectively; *D, E, P* and *dQ* denote dividend flows, FX rate in foreign currency price of domestic currency, equity price and equity flows out of the home country measured in foreign currency respectively. Therefore, assuming return-chasing as opposed to portfolio-rebalancing alters the sign of the first two terms vis-à-vis the counterpart equation in Hau and Rey (2006). Linearizing the above equation yields an FX market clearing condition:

$$\kappa dE_t = (E_t - \bar{E})\bar{K}\bar{D}dt + (\bar{E}K_t^{h*} - K_t^f)\bar{D}dt + (\bar{E}D_t^h - D_t^f)\bar{K}dt + (\bar{E}dP_t^h - dP_t^f)\bar{K} \tag{A.2}$$

where upper bars denote steady-state values and κ is the price elasticity of the excess (relative to the steady-state value $\bar{E}$) supply of currency. Following the reasoning in Hau and Rey (2006), we have that: (i) on the one hand, equity prices have the following representation:

$$P_t^h = p_0 + p_F F_t^h + p_\Delta \Delta_t + p_\Lambda \Lambda_t \tag{A.3}$$

$$P_t^f = p_0 + p_F F_t^f - p_\Delta \Delta_t - p_\Lambda \Lambda_t \tag{A.4}$$

$$E_t = 1 + e_\Delta \Delta_t + e_\Lambda \Lambda_t \tag{A.5}$$

where the F is the fundamental value, which denotes the expected present value of the future discounted dividend flows; Δ is the relative dividend flows of the two countries; and Λrepresents a weighted average of past relative dividend innovations, and (ii) on the other hand the home and foreign dividends follow independent Ornstein-Uhlenbeck (OU) processes:

$$dD_t^h = \alpha_D\left(\bar{D} - D_t^h\right)dt + \sigma_D dW_t^h \tag{A.6}$$

$$dD_t^f = \alpha_D\left(\bar{D} - D_t^f\right)dt + \sigma_D dW_t^f \tag{A.7}$$

with identical variance σ_D and the same rate of mean-reversion given by α_D.

The fundamental values of (home and foreign) equities are given by:

$$F_t^h = \varepsilon_t \int_{s=t}^{\infty} D_s^h e^{-r(s-t)} ds = \frac{D_t^h}{\alpha_D + r} + \frac{\alpha_D}{r(\alpha_D + r)}\bar{D} \tag{A.8}$$

$$F_t^f = \varepsilon_t \int_{s=t}^{\infty} D_s^f e^{-r(s-t)} ds = \frac{D_t^f}{\alpha_D + r} + \frac{\alpha_D}{r(\alpha_D + r)} \bar{D} \tag{A.9}$$

Hence the instantaneous changes in equity prices and the differential are:

$$dP_t^h = \frac{\alpha_D p_F \left(\bar{D} - D_t^h\right)}{\alpha_D + r} + \frac{\alpha_D p_F}{(\alpha_D + r)} dw_t^h + (\alpha_D p_\Delta - z p_\Lambda)\Delta_t + (\sigma_D p_\Delta - p_\Lambda) dw_t \tag{A.10}$$

$$dP_t^f = \frac{\alpha_D p_F \left(\bar{D} - D_t^f\right)}{\alpha_D + r} + \frac{\alpha_D p_F}{(\alpha_D + r)} dw_t^f - (\alpha_D p_\Delta - z p_\Lambda)\Delta_t + (\sigma_D p_\Delta - p_\Lambda) dw_t \tag{A.11}$$

$$dP_t^h - dP_t^f = \left[2(\alpha_D p_\Delta - z p_\Lambda) - \frac{\alpha_D p_F}{\alpha_D + r}\right]\Delta_t + \left(\frac{\alpha_D p_F}{\alpha_D + r}\right) dw_t \tag{A.12}$$

The market clearing condition $(K_t^h - K_t^{h*} = 1,\ K_t^f - K_t^{f*} = 1)$ implies that

$$K_t^{h*} - K_t^f = \frac{1}{\rho}(m_\Delta \Delta_t - m_\Lambda \Lambda_t) \tag{A.13}$$

Normalizing $\bar{E}$ to 1, and plugging (A.12) and (A.13) into (A.2), we obtain

$$\begin{aligned} \kappa dE_t = &\ (E_t - 1)\bar{K}\bar{D}dt + \tfrac{1}{\rho}(m_\Delta \Delta_t - m_\Lambda \Lambda_t)\bar{D}dt + \Delta_t \bar{K} dt \\ &+ \bar{K}\left[2(\alpha_D p_\Delta - z p_\Lambda) - \tfrac{\alpha_D p_F}{\alpha_D + r}\right]\Delta_t + \bar{K}\left(\tfrac{\alpha_D p_F}{\alpha_D + r}\right) dw_t \end{aligned} \tag{A.14}$$

and by differentiation of (A.5) we further obtain

$$dE_t = (z e_\Lambda - \alpha e_\Delta)\Delta_t + (\sigma e_\Delta + e_\Lambda) dw_t \tag{A.15}$$

Combining (A.14) and (A.15), it follows that

$$(\sigma e_\Delta + e_\Lambda) = \frac{\bar{K}}{\kappa}\left(\frac{\alpha_D p_F}{\alpha_D + r}\right) > 0 \tag{A.16}$$

Hau and Rey (2006) demonstrate that the correlation between local-currency equity returns and FX return is $\varepsilon_t\left(dE_t dR_t^h\right)/dt = (\sigma e_\Delta + e_\Lambda)(f_D \sigma_D + 2(p_\Delta \sigma_D + p_\Lambda))$ with $(f_D \sigma_D + 2(p_\Delta \sigma_D + p_\Lambda)) > 0$. Hence, it follows that $\varepsilon_t\left(dE_t dR_t^h\right) > 0$ when *return-chasing* prevails.

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