IMF Working Paper

Coincident Indicators of Capital Flows

Yanliang Miao and Malika Pant

IMF Working Paper

Strategy, Policy, and Review Department

Coincident Indicators of Capital Flows[1]

Prepared by Yanliang Miao and Malika Pant

Authorized for distribution by James Roaf and Reza Baqir

February 2012

Abstract

Capital flows data from Balance of Payments statistics often lag 3-6 months, which renders timely surveillance and policy deliberation difficult. To address the tension, we propose two coincident composite indicators for capital flows that improve upon existing proxies. We find that the most widely used proxy, the capital tracker, often overpredicts net flows by 30 percent. We augment the tracker into a composite indicator by assigning to it a lesser but optimally estimated weight while incorporating other regional and global coincident correlates of capital flows. The proposed composite indicator of net flows outperforms the capital tracker in its original format. To complement the indicator with an even timelier variant, we also utilize the EPFR high frequency coverage of gross bond and equity flows as an indicator on foreign investors' sentiment.

Author's E-Mail Address:ymiao@imf.org; mpant@imf.org

Contents

Coincident Indicators of Capital Flows

Yanliang Miao and Malika Pant

Emerging Markets Division

Strategy, Policy, and Review Department

February 2012

Executive Summary

Timely analysis of capital flows is constrained by lags in the availability of data on capital flows from balance of payments statistics. Such data typically become available 3 to 6 months after the period in question. Given the heightened volatility in global financial markets and capital flows, the delay in the timely availability of information on capital flows renders real time policy deliberation and calibration difficult.

To address the tension between the need for surveillance and the lack of real time data, this paper proposes two coincident composite indicators for capital flows that improve upon existing proxies used in the literature:

- The first indicator provides a timely proxy for *net* capital inflows. It is a based on the difference between the trade balance and the change in international reserves, augmented with other regional and global coincident correlates of capital flows. A simple version of this approach, based only on the trade balance and change in reserves, has been used widely in the literature. However, we show that it typically over-predicts capital flows by about 30 percent.

- The second indicator provides a real time proxy for *gross* bond and equity inflows based on data from Emerging Portfolio Fund Research augmented with regional and global correlates of capital flows in an error correction model.

In practical runs of the models, our composite indicators predict actual flows one to two quarters ahead considerably better than the simple variants used in the literature. At the same time they are simple enough to construct to be easily used in frequent monitoring of economic conditions.

I. INTRODUCTION

Capital flows often pour in as "surges" and "bonanzas" and subsequently escape in "sudden stops" (IMF 2011a; Forbes and Warnock, 2011). Coping with the magnitude and volatility in such flows poses significant policy challenges. In practice, the challenges are further complicated by the lags—often of 3–6 months—in availability and the low frequency of balance of payments data on cross-border flows (Appendix 1). This renders timely surveillance and policy deliberation difficult.

This paper proposes two coincident composite indicators for capital flows, one for net capital flows and one for gross.[2] The proposed indicators are "coincident" in that they provide more timely information on underlying cross-border capital flows using coincident predictors that are available earlier than Balance of Payments data. They are "composite" in that they augment existing simple proxies that have been used in the literature. The first coincident composite indicator (for net capital inflows) is based on monthly merchandise trade balance and the change of international reserves augmented with other predictors. It provides information on *net* capital flows with only moderate lags (usually 1-2 months). The second coincident composite indicator (for gross capital inflows) is based on real time data on equity and bond flows to EMs for registered funds from Emerging Portfolio Fund Research (EPFR) Global, augmented with other predictors in an error correction framework. These two coincident proxies for capital flows, which were first discussed in IMF (2011a), can significantly improve the timeliness of information on capital flows and help in policy analysis. Both proxies will be shortly available on www.imf.org and updated regularly.

In what follows below we provide a brief overview of the use of proxy indicators in the literature on capital flows (Section II), examine the performance of existing proxies (Section III), explain the construction of the coincident composite indicators for net capital flows (Section IV) and for gross bond and equity flows (Section V), and demonstrate how these indicators could be used in practice (Section VI).

II. CAPITAL FLOWS STATISTICS AND THE USE OF PROXIES

Capital flows data in the balance of payments statistics collected by the IMF's Statistics department is one of the most widely used sources of cross border flows. However, the lag in the availability of this data ranges from 3 to 6 months across countries. At the same time, the volatility of capital flows has been on the rise across different types of flows (Broner, Didier, Erce, and Schmukler, 2010; IMF, 2011a and 2011b). The higher volatility in capital flows require careful, timely, and calibrated policy responses which, in turn, have to be predicated on up-to-date information on the size and composition of inflows.

---

[2] Gross inflows refer to changes in portfolio and other liabilities of residents to nonresidents and inward direct investment while net inflows are the sum of foreign direct investment, portfolio, and other investment balances.

Given the lags of data availability, various proxies have been used to get more timely information on capital flows. In the 1990s, scholars first used the changes in international reserves as a proxy for aggregate capital flows (Calvo, Leiderman, and Reinhart, 1993 and 1996; Edwards, 2000). There was certain comfort in doing so when current account balances were low in most countries and the changes in international reserves were thus a fairly good proxy of capital flows. With the increase of trade and current account imbalances in the 2000s, changes in reserves alone could no longer adequately capture capital inflows; the trade balance had to be taken into account in some form. Calvo et al., (2004 and 2008) adopted trade balance minus changes in international reserves as a measure of capital flow reversals (for brevity we refer to this approach of constructing a proxy for capital flows as a capital flows "tracker"). Similar approaches have also been used by Goldman Sachs (2010), Forbes and Warnock (2011), Reinhart and Reinhart (2009), and UBS (2010). Both international reserves and merchandise trade series utilized in the tracker are typically available at a higher frequency (monthly) and have more current availability as compared to other current account items or financial accounts from the balance of payments (BoP). IMF (2011a) discussed the use of these and other proxies for capital flows.

Despite its wide usage, few have checked the effectiveness of the tracker and its different variants in tracking flows in practice. The validity of the tracker is of course based on the accounting identity that:

The Change in Reserves[3] =
$\qquad$ Trade Balance + Income + Transfers (Current Account)
$\qquad$ + Capital and Financial Flows
$\qquad$ + Errors and Omissions

If transfers and interest income are small and errors and omissions negligible, then one can deduct capital flows as the change in reserves minus trade balance. But that can be a big "if"; transfers and particularly remittances may be of significant magnitudes in some countries.

The construction of the tracker in practice is also subject to an additional data constraint. The trade balance in the BoP accounting identity is inclusive of services trade. But data on services trade balance often come in with similar, if not longer than, lags to capital flows and other items in the BoP. As a compromise, the tracker and similar proxies only utilize merchandise trade balance, which further calls into question the often assumed one-to-one relationship between various proxies and net capital flows.

---

[3] Notice that the change in reserves in the BoP accounting identity ideally should exclude valuation effects, e.g., the change caused by the movement of asset prices and exchange rates among reserve currencies. Valuation effects can dominate financial flows in driving changes in reserves, particularly when the stocks of reserve assets are large. The monthly international reserve data, retrieved from the IFS and denominated in USD, unfortunately contain the valuation effects. We try to remove the effects by controlling for asset prices and the euro-dollar exchange rates in subsequent regression analysis.

III. PERFORMANCE OF EXISTING PROXIES

We examine in this section how well an often used simple proxy for net capital flows—constructed as the difference between reserve accumulation and the goods trade balance—predicts actual flows. We find that this simple proxy often over-predicts capital flows. This analysis provides the motivation for us to propose two better proxies in the next section.

Our sample consists of 40 major EMs that have continuous quarterly balance of payments data coverage from 1995Q2 to 2011Q1.[4] The 40 EMs in the sample are grouped into four regions: 10 in Asia, 11 in Latin America, 13 in Emerging Europe, and six other EMs.[5] The EM sample and data coverage shrinks when analyzing EPFR flows due to their limited country-level coverage. A detailed list of our sample coverage of EM capital tracker and EPFR flows is in Appendix 2.

Capital flows to EMs during the sample period witnessed two systemic crises—the Asian/Russian and the recent global crisis—and arguably three waves of inflow surges (IMF, 2011a). Despite large volatilities of net flows, EMs as a whole have, for most of the period covered, been net receivers of capital flows except during crisis times (Figure 1). Nevertheless, there is no obvious trend in net flows to all EMs or to different regional groups. Standard unit root tests on all EM aggregate and the four regional aggregates all reject the null hypothesis that net flows containing a unit root (Table 1).

Figure 1. Net capital flows into emerging markets

---
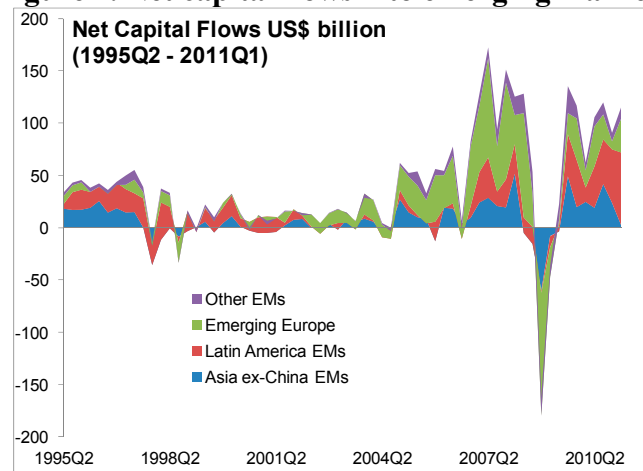
[4] Our sample is thus a subset of the 48 EMs covered in the IMF (2011a) capital flows policy paper. Eight EMs are excluded for data reasons: Dominican Republic and Egypt due to unavailability of quarterly data; Armenia, Bosnia, Guatemala, Jamaica, Paraguay and Serbia due to problematic quality of BoP coverage such as large errors and omissions.

[5] Asia EMs include China, India, Indonesia, Korea, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand, and Vietnam; Emerging Europe includes Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Kazakhstan, Latvia, Lithuania, Poland, Romania, Russia, Turkey, and Ukraine; Latin America EMs include Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Mexico, Peru, Uruguay, and Venezuela; and Other EMs include Israel, Jordon, Lebanon, Morocco, South Africa, and Tunisia.

Table 1. Summary statistics: net capital flows

Variable: Net Inflows (US$ mn) 1995Q2 2011Q1	All EMs	Asia EMs-ex China	Emerging Europe	Latin America EMs	Other EMs
Mean	41,662	7,330	15,024	13,733	5,575
Standard Deviation	51,564	16,959	29,256	16,094	6,232
ADF test - t stat [1]	-4.31 ***	-4.62 ***	-5.28 ***	-4.25 ***	-3.32 *
OLS [2]					
Constant	11,696 ***	440	6,203 ***	7,669 ***	-2,856 ***
	(3779.6)	(1391.65)	(2328.72)	(1348.8)	(674.35)
Capital tracker	0.72 ***	0.51 ***	0.75 ***	0.96 ***	0.80 ***
	(0.05)	(0.05)	(0.07)	(0.09)	(0.09)
R Square	0.78	0.68	0.66	0.64	0.78

1/ Augmented Dickey fuller test
***, ** & * denote rejecting the null hypothesis that there is a unit root at the 1%, 5% and 10% level of confidence.
2/ OLS regression regressing net flows on co a constant and the capital tracker. Robust standard errors in parenthesis.
***, ** & * denote statistical significance at the 1%, 5% and 10% level of confidence.

As a first test of the empirical relevance of the tracker, we plot for selected EMs actual net capital flows series against the computed tracker (Figure 2). The good news is that the tracker is in general highly correlated with the underlying capital flows: the two series tend to move together and the tracker in most cases predicts the direction of net flows if not the exact magnitude. But the tracker appears to be more volatile than actual flows: its peaks and troughs consistently overshoot those of the underlying flows (Figure 2). As we will show later, the same overshooting pattern of the tracker can be observed for EMs as a whole and for regional EM aggregates.

When we run a simple ordinary least squares (OLS) regression of aggregate net flows to all EMs on the aggregate tracker for 1995Q2-2011Q1, we find that a one dollar increase in the tracker is associated with an increase of about 70 cents in actual capital flows. In other words, using the plain vanilla version of the tracker as a proxy would overestimate flows to EMs by 30 percent. The same pattern is observed when the OLS regressions are estimated over different regional subsamples (table 1).[6]

---

[6] In European EMs a one dollar rise in the tracker is associated with an increase of 75 cents in the underlying flows; in Asia 51 cents, in Latin America 96 cents, and in other EMs 80 cents.

Figure 2: Capital flow tracker and net capital flows (US$ bn)
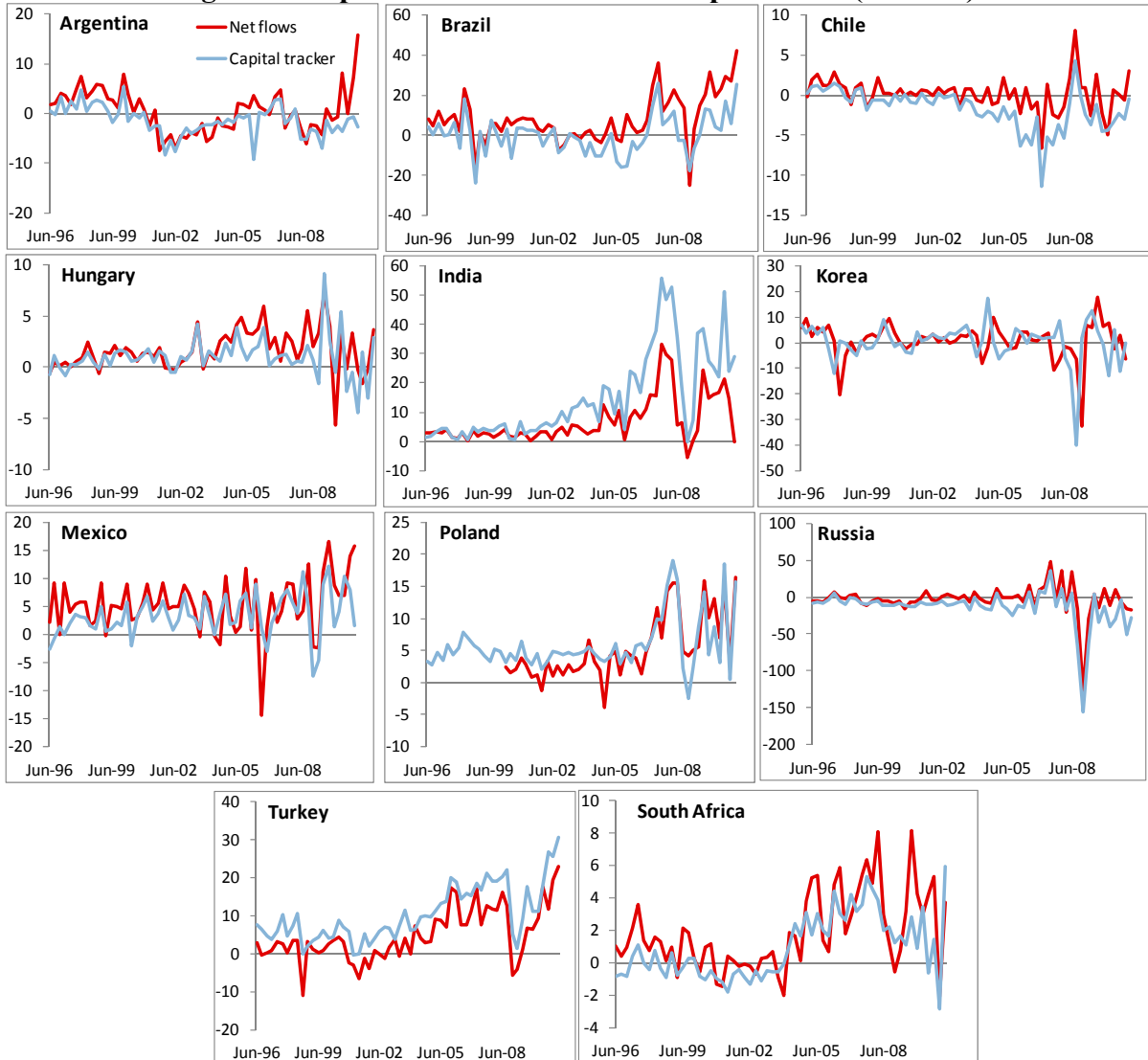
Source: IFS, Haver and Fund staff calculations.

In other words, the magnitude of capital flows is often less than that of the tracker would indicate. We thus suspect there might be, on average, an offsetting pattern among individual components of the current account: remittances, merchandise trade, services, and official transfers. For example, if a country/region is hit badly by a shock that negatively affects its trade balance, it may receive a relatively large transfer of grants and remittances. Likewise, if a country runs a large merchandise trade deficit (surplus), its citizens may have less (more) foreign exchange receipts to spend traveling abroad, resulting in a services balance that compensates for merchandise deficit (surplus). Indeed, a negative correlation between the services trade and merchandise trade is observed for nine out of the 10 selective EMs (text figure).
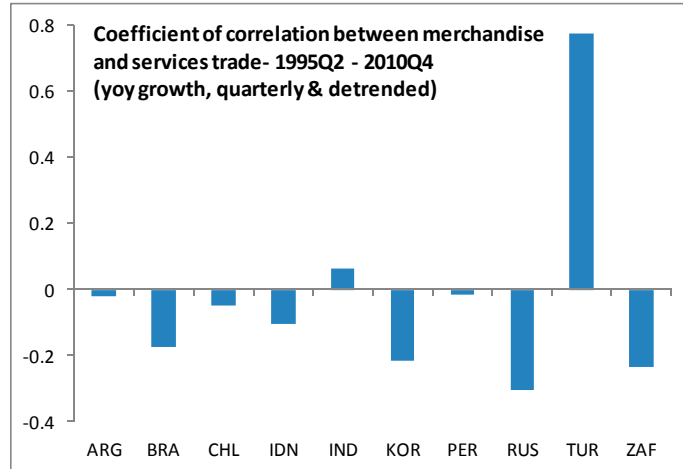
Source: IFS, Haver and Fund staff calculations.

IV. A COINCIDENT INDICATOR FOR NET CAPITAL INFLOWS

Given that the simple capital flows tracker discussed in the previous section typically overshoots underlying net capital flows, we augment the tracker into a composite indicator of capital inflows in two ways. Firstly, recognizing that a one dollar rise in the tracker often is associated with less than one dollar increase in net flows, we reassess the weight of the capital tracker based on OLS regressions. Secondly, we incorporate other important global and EM-wide push and pull predictors of capital flows such as the VIX index (a measure of investors' risk aversion) and the US 10 year bond price index.[7] On pull factors, we include the Morgan Stanley Composite Index (MSCI) measuring regional equity prices. To control for possible valuation effects arising from exchange rate movements of reserve currencies, we also include the euro-dollar exchange rate. All these correlates are available on a more timely basis than Balance of Payments data.

For the all EM and the four regional net flows, we estimate the following equation:

$$Y = a + b \cdot X + c \cdot Z + \varepsilon \tag{1}$$

where Y denotes net capital flows (in level), X the regional aggregate capital tracker discussed in the previous section, and Z a vector of control variables including the VIX index, the US 10 year bond price index, the EUR/USD exchange rate, and the MSCI regional indices.

The results are summarized in table 2. All coefficients carry the expected signs and are statistically significant in most cases: flows to EMs generally abate when investors' sentiment sours; flows to EMs rise with equity markets. The inclusion of global and regional

---

[7] Alternatively, one could include either the US 10 year bond interest rate or the 3-month T-bill rate. Choosing to include bond price as a control here, however, has the added benefit of controlling for potential valuation effects, if any, due to bond price movements.

controls has two effects: 1) it increases the overall goodness-of-fit across different subsamples if one compares the implied adjusted R-squares of regressions with these additional controls (table 2) to those without (table 1); 2) it further reduces the magnitude of correlation between the capital tracker and actual net flows as the added push and pull factors gain explanatory power. The latter is surprising and suggests that these controls have important predictive power for capital flows and parts of the current account excluded from the merchandise trade balance (and hence the tracker) may be correlated with these controls.

Table 2. A coincident indicator for net capital flows based on the capital tracker

Dependent Variable: Net Inflows (US$ mn) 1995Q2-2011Q1	All EMs	Asia ex-China EMs	Emerging Europe	Latin America EMs	Other EMs
Constant	-12,580	16,835	-58,206	-37,552	31,519 ***
	(62995.25)	(27713.27)	(38187.2)	(29581.39)	(10469.85)
Capital flows tracker	0.49 ***	0.55 ***	0.51 ***	0.92 ***	0.72 ***
	(0.06)	(0.06)	(0.07)	(0.1)	(0.12)
VIX index	-1,486 ***	-549 ***	-742 ***	-89.68	114.57 **
	(406.3)	(154.96)	(265.84)	(165.17)	(56.18)
MSCI Equity Index	1.37 ***	-12.71	111.27 ***	0.00	0.84
	(0.35)	(12.08)	(20.04)	(0)	(5.53)
US10 yr Bond Price Index	180	-102	429.98	283	-205.79 ***
	(460.27)	(184.47)	(265.2)	(265.2)	(67.06)
Exchange rate (EUR/US$)	12,679	14,471	14357.6	12,507	-13397.12 ***
	(27895.71)	(12235.93)	(16763.46)	(12465.7)	(4930.36)
R Square	0.84	0.76	0.81	0.64	0.82
No. of Observations	63	63	63	63	63

Notes: The table presents results of an OLS model over the all EM and the 4 regional aggregates between 1995Q2 and 2011Q1.
Robust standard errors in parenthesis.
***, ** & * denote statistical significance at the 1%, 5% and 10% level of confidence.

We construct a composite indicator $\hat{Y}$ of net flows based on the estimated coefficients of equation (1) denoted by "hat" below:

$$\hat{Y} = \hat{a} + \hat{b} \cdot X + \hat{c} \cdot Z \qquad (2)$$

The panel chart (Figure 3) below plots the composite index alongside the original capital tracker and net flows series for all EMs and different regional groups between 2006Q1 and 2011Q1. Four quarter moving averages of all series are taken to control for data irregularity and seasonality. In virtually every group of EMs, the proposed composite indicator outperforms the capital tracker in approximating the underlying flows. The improved goodness-of-fit arises from two sources: 1) the coefficient on the capital tracker is no longer constrained to be one and is optimally estimated; and 2) the inclusion of proxies for global liquidity conditions and regional EM MSCI index that affect capital flows to EMs across the board.

Figure 3. Net flows, capital tracker, and composite indicators (US$ bn)

Net flows   Net Flows: 4 quarter moving average
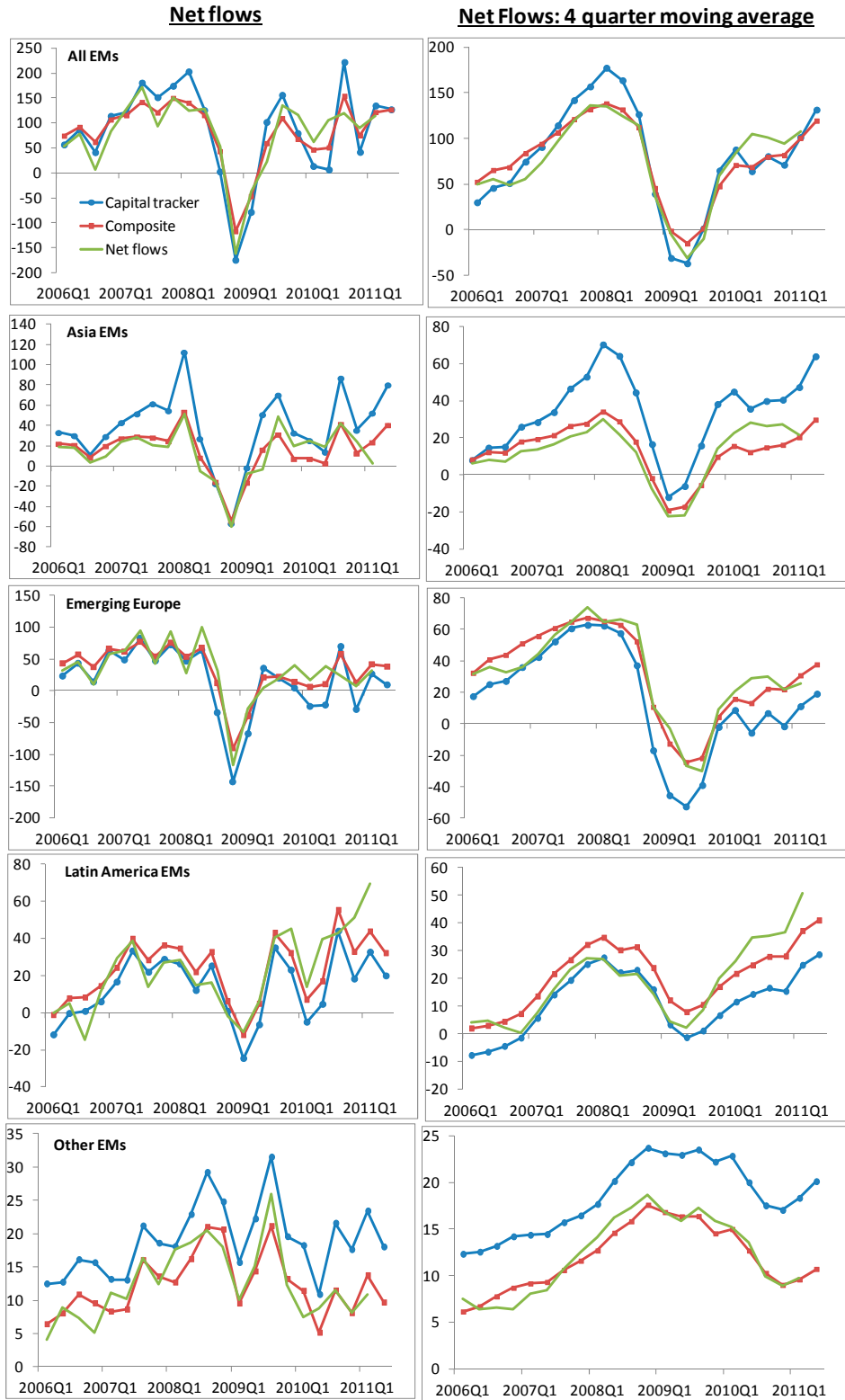
Source: IFS, Haver and Fund staff calculations.

To test for the stability of the estimated coefficients in constructing the composite indicator, we perform robustness checks by varying both the sample length and the estimation techniques. We re-estimate the same OLS regressions of equation (1) but limit the sample to one to four quarters less than the whole time period. The estimated coefficients and the resulting composite indicator remain remarkably stable. The results are presented subsequently in the context of testing the one-period-ahead forecast accuracy of the composite indicator. As a further robustness check, we also conduct panel estimations with country fixed effects of net capital flows over the capital tracker and global and regional controls. The panel results (available upon request) once again confirm the less than one-to-one relationship between the tracker and the underlying flows.

V.   EPFR AND PROXIES FOR GROSS PORTFOLIO FLOWS

Despite its usefulness, the composite indicator proposed in the previous section based on merchandise trade and reserves may still lag behind the need of real time policy calibration. The ultimate constraint is that trade data are often themselves only available with a delay, albeit moderate. A timelier alternative is to use information from Emerging Portfolio Fund Research (EPFR) Global that provides weekly and monthly data on equity and bond country flows. Approximately 70 percent of money invested in the funds tracked by EPFR is from institutional investors such as pension funds and insurance companies that invest their money though mutual funds, exchange traded funds, closed-end funds, and variable annuity funds/insurance linked funds. Thus, the information in EPFR is a subset of all portfolio flows to EMs; it covers only one class, albeit important, of institutional investors and does not cover all EM destinations of flows.[8] In addition, EPFR data are gross flows and only cover the liabilities side of portfolio flows in the standard balance of payments presentation.

We first collect country specific equity and bond flows covered in the EPFR and then build regional aggregates as in section III. Figure 4 below shows a comparison between EPFR and BoP data by all EM and regional aggregates. The coverage of equity flows for our sample of EMs is more comprehensive and goes back to 2001Q1 while that of bond flows only starts at 2004Q2. As expected, the magnitudes for EPFR reported flows are much smaller than gross capital flows recorded in the BoP (note the scales on the two sides of each panel are different). For EMs as a whole, EPFR reported flows cover about half of BoP reported portfolio equity inflows and around an eighth of BoP reported portfolio bond inflows for the sample of 34 EMs. Because of its timeliness and coverage of gross flows, however, EPFR data provides a real time microscope to study foreign investor sentiment. The trend in EPFR data for equities and bonds can be a leading indicator of BoP recorded capital flows for most time periods, although there can be important differences for some periods for some regions (e.g. Emerging Europe and Other EMs in 2005−07).

---

[8] Flows not captured in the EPFR data are investments from hedge funds, proprietary trading desks of foreign brokers and investment banks, foreign insurance companies investing their excess cash, and wealthy individuals and individual companies purchasing company stocks for strategic reasons or to invest excess cash. For more information on the coverage of the EPFR data, one can access its website http://www.epfr.com/

Figure 4. Balance of payments flows vs. EPFR flows (US$ bn)
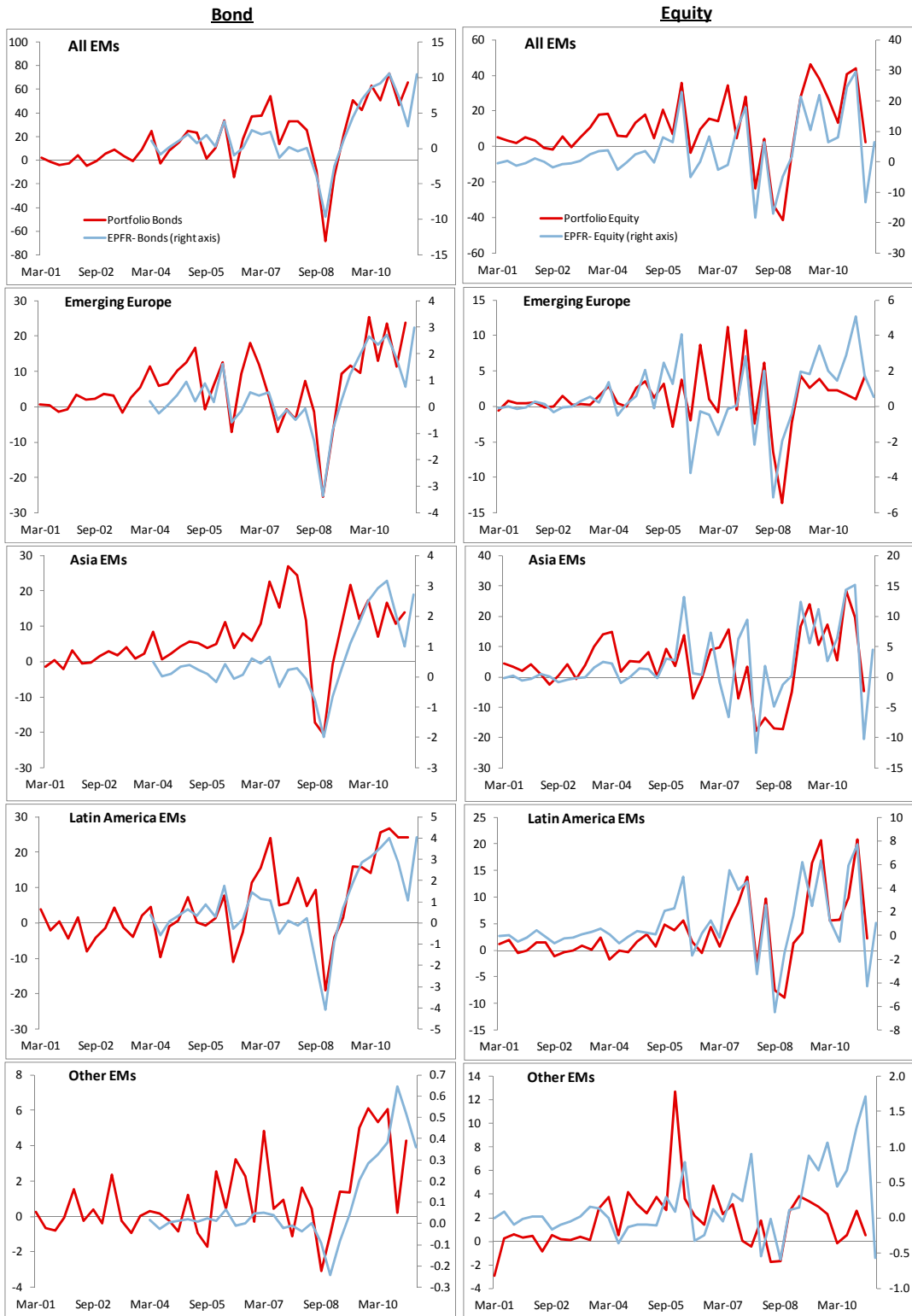
Source: IFS, Haver and Fund staff calculations.

Since EPFR tracks gross flows only, the data are more likely to contain unit roots than net flows. The augmented dickey fuller (ADF) test indicates that bond flows to most regions and all EMs and equity flows to certain regions contain a unit root (table 3). Further ADF tests on the residuals from regressions of BoP gross bond/equity flows over EPFR flows indicate that the two sources of flows are co-integrated over the sample period of EPFR data coverage.

Table 3: Unit root test results: BoP portfolio flows & EPFR flows

Variable	Sample period	All EMs	Asia EMs	Emerging Europe	Latin America EMs	Other EMs
BOP Portfolio Flows: Bonds	2004Q2 - 2011Q1	-2.86	-3.73 **	-3.07	-3.29 *	-5.48 ***
EPFR: Bonds		-1.9	-4.28 **	-2.17	-2.03	-0.95
BOP Portfolio Flows: Equity	2001Q1 - 2011Q1	-3.5 *	-2.89	-6.25 ***	-4.15 **	-4.36 ***
EPFR: Equity		-5.93 ***	-5.84 ***	-2.65	-5.82 ***	-5.13 ***

This table presents the t statistics of the augmented dickey fuller unit root test.
***, ** & * denote rejecting the null hypothesis that there is a unit root at the 1%, 5% and 10% level of confidence.

We can thus use an error correction model (ECM) to capture both the long run relationship and the short-run dynamics between BoP flows and the corresponding EPFR flows. We first define the error correction term as:

$$\varepsilon = Y - \beta \cdot X \tag{3}$$

where ε is the error from a regression of portfolio inflows, Y, on EPFR flows, X, and β is the co-integrating coefficient. Then we define an ECM model as:

$$dY_t = a + b \cdot (\varepsilon_{t-1}) + c_1 \cdot (dX_t) + c_2 \cdot (dZ_t) \tag{4}$$

In the error correction model (ECM) of Equation (4), we regress the change of portfolio inflows (bond and equity separately) on the long term deviations from Equation 3, change in EPFR series and the three control variables (VIX, US 3-month Treasury bill rate, and MSCI). Note that ε_{t-1} is the equilibrium error term from the previous period, assuming that the deviations from long run equilibrium are corrected gradually through a series of partial short run adjustments. The coefficient "b" on the error correction term measures the speed of adjustment of the endogenous variable towards the equilibrium.

We run equations (3) and (4) separately for equity and bond over the same regional groups as in section IV.[9] Tables 4a and 4b summarize the regression results. In each specification, a rise in the EPFR flows is positively and significantly associated with an increase in the BoP portfolio flows. The exact magnitude of the rise in BoP flows, however, varies dramatically between equity flows and bond flows: the response of BoP bond flows to one dollar rise in EPFR flows is much bigger than that of BoP equity flows. This reflects mainly the more limited coverage of EPFR bond flows as compared to EPFR equity flows. In addition, the

---

[9] The estimation sample period shrinks to 2001Q1-2011Q1 for equities and 2004Q2-2011Q1 for bonds due to the limited availability of the EPFR data. We also omit the MSCI index from controls for bond flows as the latter is not generally susceptible to equity market fluctuations.

speed of adjustment toward long-run equilibrium, captured by the coefficient of the error correction term, is in general faster in equity flows than in bond flows, reflecting the more liquid and developed status of equity markets than bond markets in emerging markets.

Based on estimated coefficients of equation (4), we construct composite indicators for portfolio bond and equity flows respectively (figures 5a and 5b). In almost every case presented, the composite indicator based on EPFR and global controls outperforms a simple proportional rescale of EPFR in approximating the underlying BoP bond and equity flows. The prediction power of the composite EPFR indicator is evident in the high goodness-of-fit: R-squares of 0.77 and 0.84 respectively for bond and equity flows to all EMs.

Table 4a. A coincident indicator for portfolio bond flows based on EPFR

Dependent Variable: D(BOP Portfolio Inflows: Bond) 2004Q2 - 2011Q1					
	All EMs	Asia EMs	Emerging Europe	Latin America EMs	Other EMs
Constant	8151.6 **	2186.91	3666.08 **	2323.21 *	463.2
	(3487.88)	(1609.21)	(1501)	(1339.29)	(375.3)
D(EPFR: Bond flows)	6.27 ***	8.24 ***	6.91 ***	3.78 ***	13.66 ***
	(1.2)	(2.75)	(1.69)	(1.27)	(4.71)
D(VIX index)	-605.74	-169.01	-74.3	-271.85	8.73
	(436.42)	(234.03)	(217.49)	(199.07)	(53.83)
D(US 3month Treasury bill rate)	-12299.11 *	-4939.06	1849.57	-6798.68 *	-190.62
	(7147.11)	(3659.61)	(3082.99)	(3588.93)	(844.74)
Error correction term (t-1)	-0.72 ***	-0.48 **	-1.02 ***	-0.81 ***	-1.02 ***
	(0.23)	(0.17)	(0.23)	(0.26)	(0.22)
Long term relationship					
EPFR: Bond flows (t-1)	7.47 ***	7.9 ***	7.88 ***	5.96 ***	9.64 ***
	(0.91)	(2.3)	(0.97)	(0.78)	(1.66)
R Square	0.77	0.50	0.70	0.68	0.57
No. of Observations	27	27	27	27	27

Notes: The table presents results of an error correction model over 5 regional aggregates between 2004Q2 and 2011Q1. Robust standard errors in parenthesis.
***, ** & * denote statistical significance at the 1%, 5% and 10% level of confidence.

Table 4b. A coincident indicator for portfolio equity flows based on EPFR

Dependent Variable: D(BOP Portfolio Inflows: Equity) 2001Q1 2011Q1					
	All EMs	Asia EMs	Emerging Europe	Latin America EMs	Other EMs
Constant	3069.66 *	1303.78	182.16	577.79	1301.23 ***
	(1601.13)	(1284.61)	(545.78)	(590.21)	(409.15)
D(EPFR: Equity flows)	1.14 ***	0.77 ***	1.31 ***	1.22 ***	1.54 **
	(0.11)	(0.17)	(0.21)	(0.14)	(0.57)
D(VIX index)	-315.71	-222.28	-90.36	-25.35	81.29
	(281.39)	(212.96)	(88.39)	(90.85)	(57.12)
D(US 3month Treasury bill rate)	1311.38	1891.54	-1292.18	-1186.68	2226.03 **
	(3254.07)	(2752.85)	(1210.43)	(1138.93)	(821.1)
D(MSCI Equity Price Index)	0.85	10.01	35.12 *	0.0 **	23.0 *
	(0.56)	(29.21)	(18.43)	(0)	(12.37)
Error correction term (t-1)	-0.78 ***	-0.71 ***	-0.82 ***	-0.78 ***	-0.88 ***
	(0.15)	(0.17)	(0.16)	(0.14)	(0.15)
Long term relationship					
EPFR: Equity flows (t-1)	1.85 ***	1.59 ***	1.23 ***	1.96 ***	2.38 ***
	(0.18)	(0.25)	(0.29)	(0.21)	(0.87)
R Square	0.84	0.58	0.75	0.83	0.58
No. of Observations	39	39	39	39	39

Notes: The table presents results of an error correction model over 5 regional aggregates between 2001Q2 and 2011Q1. Robust standard errors in parenthesis.
***, ** & * denote statistical significance at the 1%, 5% and 10% level of confidence.
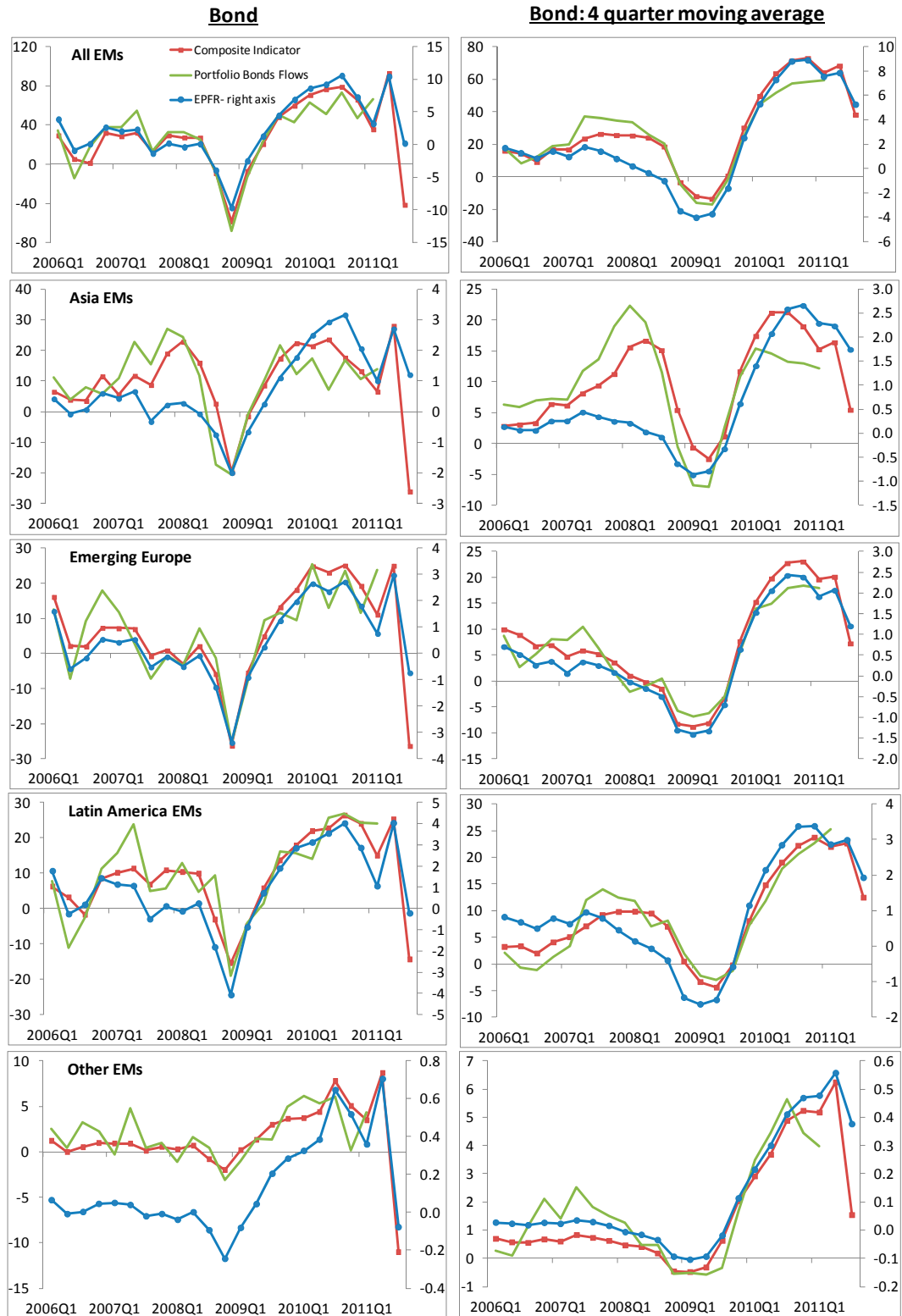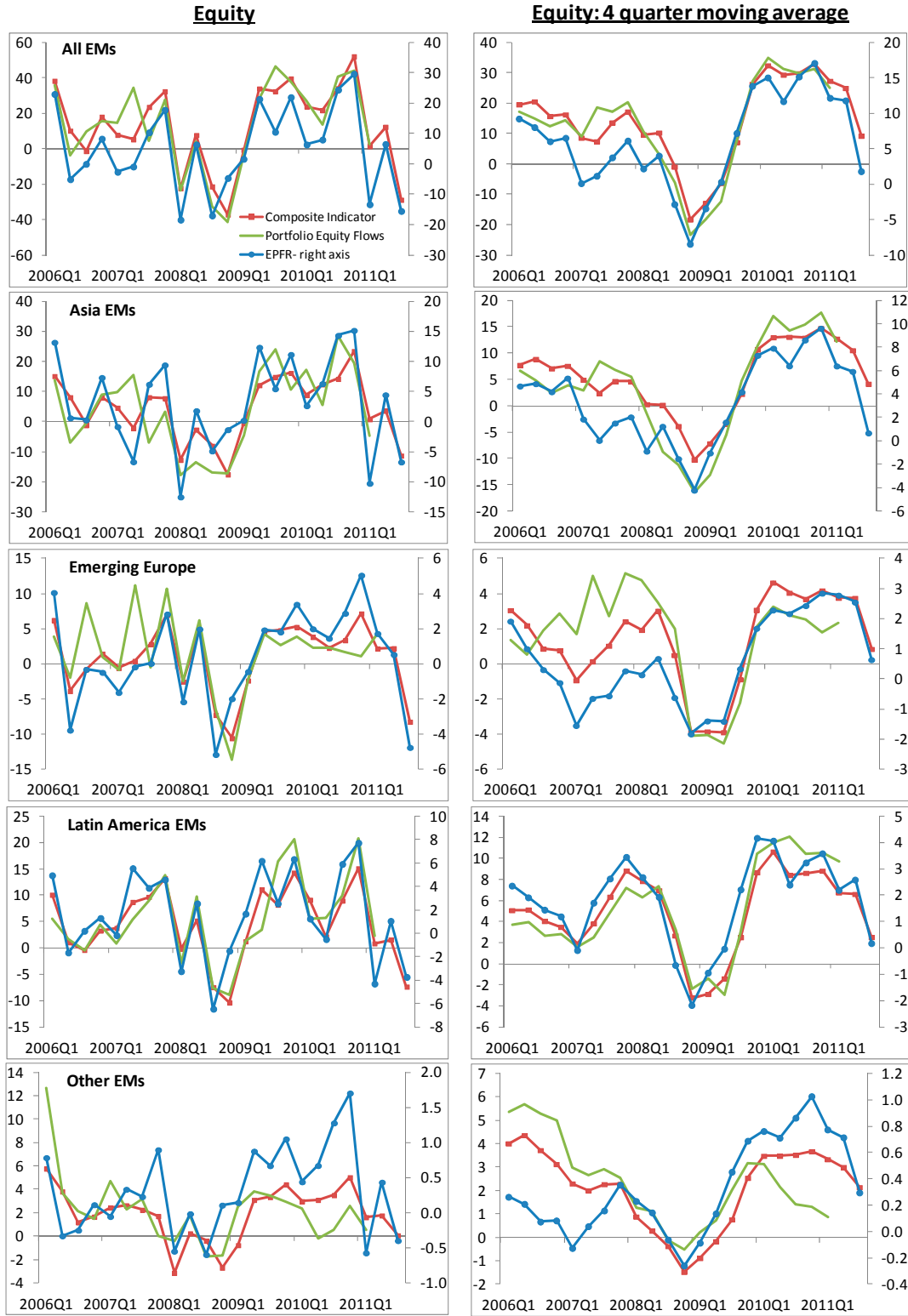
Figure 5a. BoP portfolio flows, EPFR and composite indicator: Bond (US$ bn)

Source: IFS, Haver and Fund staff calculations.

**Figure 5b. BoP portfolio flows, EPFR and composite indicator: Equity (US$ bn)**

Source: IFS, Haver and Fund staff calculations.

VI. APPLYING THE INDICATORS TO GAUGE CAPITAL FLOWS

The ultimate test of the validity of our proposed composite indicators lies in whether they help predict the magnitude of actual capital flows in a real time setting. In this section we examine how well projected flows, given information available at time t, stack against the size of actual flows available subsequently. We apply our proposed indicators in a real time fashion between 2010Q2 and 2011Q1 when many EMs in our sample received surges of capital inflows. We begin by rerunning the models up to 2010Q1 and calculate their one-quarter-ahead forecast for flows in 2010Q2. We perform this sequentially by moving the estimation and forecast period one quarter ahead to get the real time forecasts for each of the quarters between 2010Q3 and 2011Q1.

Figure 6 compares the 1-step-ahead forecast of underlying flows using, respectively, the composite indicator and EPFR equity and bond flows. Several results are worth highlighting. Firstly, the out of sample forecasts almost always overlap with the coincident indicators constructed based on information available in the whole sample period. Indeed, the coefficients estimated for the one-period ahead forecast in a truncated sample, say ending in 2010Q1, are fairly close to those derived based on the full sample until 2011Q1, which confirms the robustness of the regression results. Secondly, the one-step-ahead forecasts are closely aligned with realized flows data made available only at a subsequent date. This corroborates the relevance of our proposed composite indicators based on the capital tracker and the EPFR flows. Last but not least, based on information available at end 2011Q3, our EPFR based models project an ongoing sharp decline of bond and equity flows into emerging markets.

Figure 6. One-quarter-ahead forecast of composite indicators (US$ bn)
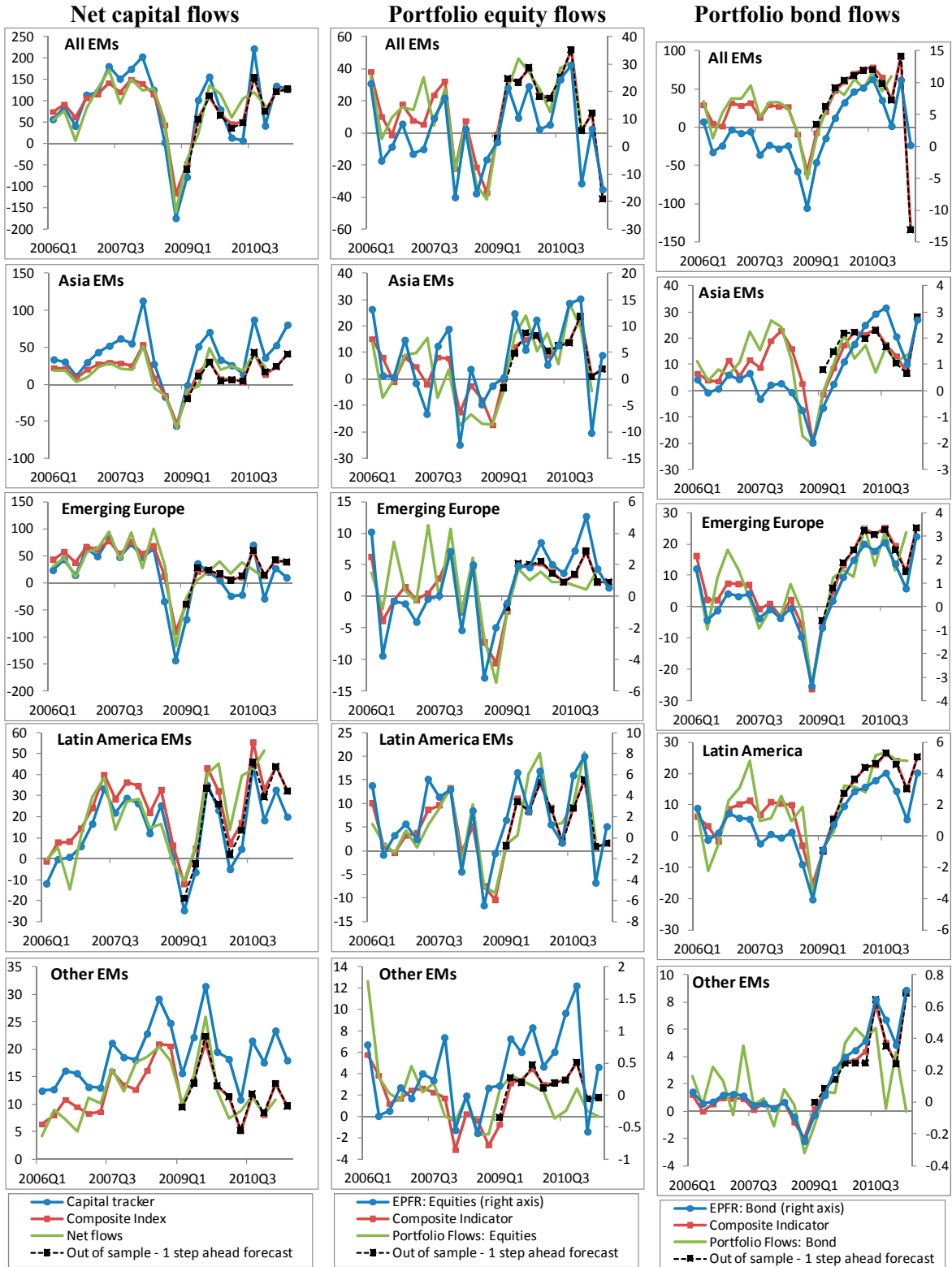
Source: IFS, Haver and Fund staff calculations.

VII. CONCLUSION

We investigate in the paper the relevance of the often used proxies for net capital inflows and find that the conventional one-to-one relationship does not exist between the often used capital tracker and the underlying flows. We propose an augmented version of the tracker assigning a lesser weight on the tracker itself while incorporating other important global and regional factors affecting liquidity conditions. The proposed new coincident composite indicator of net capital flows to EMs outperforms the capital tracker in its original format. To complement the coincident indicator with an even timelier variant, we also utilize the EPFR high frequency coverage of bond and equity flows as an indicator on foreign investors' sentiment. The long run relationship between BoP portfolio flows and EPFR flows (the latter being part of the former) enables us to establish proxies for both bond and equity flows based on error correction models.

Appendix 1: Lags of BoP and merchandise trade data in selected EMs

	Balance of Payments		Merchandise Trade	
	(Lag, in months, unless specified otherwise)	Frequency	(Lag, in months, unless specified otherwise)	Frequency
Brazil	25 days	monthly	25 days	monthly
China	2	quarterly	8 days	monthly
Colombia	3	quarterly	1.5	monthly
Indonesia	3	quarterly	1	monthly
Romania	1.5	monthly	1.5	monthly
Russia	3	quarterly	2	monthly
South Africa	3	quarterly	1	monthly
Thailand	3	quarterly	1.5	monthly
Turkey	2	monthly	1	monthly

Appendix 2: EM sample coverage of the capital tracker and the EPFR

	Capital tracker (1995Q2-2011Q2)	EPFR: Equity 1/ (2001Q1-2011Q3)	EPFR: Bonds 2/ (2004Q2- 2011Q3)
Asia	China India Indonesia Korea Malaysia Pakistan Philippines Sri Lanka Thailand Vietnam	China India Indonesia Korea Malaysia Pakistan Philippines Sri Lanka Thailand Vietnam	China India Indonesia Korea Malaysia Pakistan Philippines Sri Lanka Thailand Vietnam
Latin America	Argentina Brazil Chile Colombia Costa Rica Ecuador El Salvador Mexico Peru Uruguay Venezuela	Argentina Brazil Chile Colombia Mexico Peru Venezuela	Argentina Brazil Chile Colombia Mexico Peru Venezuela
Emerging Europe	Bulgaria Croatia Czech Republic Estonia Hungary Kazakhstan Latvia Luthania Poland Romania Russia Turkey Ukraine	Bulgaria Czech Republic Estonia Hungary Kazakhstan Luthania Poland Romania Russia Turkey Ukraine	Bulgaria Czech Republic Hungary Kazakhstan Luthania Poland Romania Russia Turkey Ukraine
Other EMs	Israel Jordan Lebanon Morocco South Africa Tunisia	Israel Jordan Lebanon Morocco South Africa Tunisia	Israel Lebanon South Africa Tunisia

1/ Costa Rica, Croatia, Ecuador, El Salvador, Latvia and Uruguay (6 countries) are excluded due to unavailabilty of data.

2/ Costa Rica, Croatia, Ecuador, El Salvador, Esttonia, Jordon, Latvia, Morocco and Uruguay (9 countries) are excluded due to unavailabilty of data.

References:

Broner, Fernando, Tatiana Didier, Aitor Erce and Sergio Schmukler. (2010). "Financial Crises and International Portfolio Dynamics." Mimeo.

Calvo, Guillermo, Alejandro Izquierdo, and Luis-Fernando Mejía. (2004). "On the Empirics of Sudden Stops: The Relevance of Balance-Sheet Effects." NBER Working Paper 10520.

Calvo, Guillermo, Alejandro Izquierdo, and Luis-Fernando Mejía. (2008). "Systemic Sudden Stops: The Relevance of Balance-Sheet Effects and Financial Integration." NBER Working Paper 14026.

Calvo, Guillermo, Leonardo Leiderman, and Carmen Reinhart. (1993). "Capital Inflows and Real Exchange Rate Appreciation in Latin America: The Role of External Factors." *IMF Staff Papers* 40(1): 108–151.

Calvo, Guillermo, Leonardo Leiderman, and Carmen Reinhart. (1996). "Inflows of Capital to Developing Countries in the 1990s." *Journal of Economic Perspectives* 10(2): 123-139.

Forbes, Kristin J., and Francis E. Warnock. (2011). Capital Flow Waves: Surges, Stops, Flight and Retrenchment. Mimeo.

Goldman Sachs. (2010). "A 'Wall of Money' to EM." September 10, 2010.

International Monetary Fund (IMF). (2011a). "Recent Experiences in Managing Capital Flows: Cross-Cutting Themes and Possible Policy Framework," IMF Board Paper prepared by the Strategy, Policy, and Review Department (Washington).

International Monetary Fund (IMF). (2011b). International Capital Flows: Reliable or Fickle? *World Economic Outlook*. April, chapter 4: 125-163.

Reinhart, Carmen and Vincent Reinhart. (2009). "Capital Flow Bonanzas: An Encompassing View of the Past and Present," in Jeffrey Frankel and Francesco Giavazzi, eds. *NBER International Seminar in Macroeconomics 2008.* Chicago: Chicago University Press.

Sebastian, Edwards. (2000). Capital Flows, Real Exchange Rates, and Capital Controls: Some Latin American Experiences. In: NBER Chapters. *RePEc:nbr:nberch:6169.*

UBS. (2010). "Global Liquidity Primer." October 28, 2010.