Dollar beta and stock returns

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Key questions

- Operating through changes in market participants' risk capacity, the financial channel of exchange rates demonstrates how domestic financial conditions respond to exchange rate movements.

- We investigate whether stock market returns in emerging market economies (EMEs) reflect the financial channel of exchange rates.

- We also consider if the broad dollar index has attributes of a cross-sectional asset pricing factor in EME stock markets, just as the broad dollar index serves as an indicator of the financial channel of exchange rate in other contexts.

Contributions

- The study makes three contributions in laying out the impact of the financial channel of exchange rates on stock market returns.

- First, we introduce "the dollar return multiplier" as the ratio of the dollar-denominated stock returns to the local currency stock returns and show that the dollar return multiplier is typically larger than one.

- Second, we show that the broad dollar index serves as a global factor in determining stock returns, with a stronger dollar being associated with lower stock returns.

- Third, we introduce the notion of the "dollar beta" as the sensitivity of stock returns to swings in the broad dollar index.
  - The dollar beta is a risk factor in the sense that investors who bear dollar risk are compensated with higher expected stock returns.

Key findings

- Our finding that the dollar return multiplier is larger than one in all EMEs implies that the dollar-denominated returns tend to be amplified versions of the local currency returns.

- When both the broad dollar index and the bilateral dollar exchange rate enter as explanatory variables in regressions for stock market returns in EMEs, the broad dollar index remains the more important determinant of stock returns.

- Finally, our finding that EME stock indices with a high dollar beta tend to have higher average returns ties in well with the notion that the broad dollar index is a useful indicator of "risk-on" and "risk-off" sentiment in global stock markets.

    - The analogy is with the CAPM applied to the international context where the market return or aggregate consumption plays the role of a cross-section risk factor that is priced in average stock returns.

Literature review

- Financial channel of exchange rates and the role of the broad dollar index
  - Original sin redux: Carstens and Shin (2019) and Hofmann, Shim and Shin (2020)
  - Hofmann, Shim and Shin (2022) provide a model on risk capacity of global bond investors and show that US dollar index more important than bilateral exchange rate of EME currency against USD in explaining bond flows to EME local currency bond markets and EME local currency bond spreads
  - Dollar index on investment (Avdjiev, Bruno, Koch and Shin (2019)) and the tail risks to GDP growth (Hofmann and Park (2020))
- Dollar as a pricing factor
  - Brusa, Ramadorai and Verdelhan (2014), Verdelhan (2018)
- Relationship bet exchange rates and cross-country equity returns/flows
  - Bohn and Tesar (1996): US investment in foreign equities is primarily driven by return chasing rather than portfolio rebalancing.
  - Hau and Rey (2004, 2006) highlight the equilibrating role of exchange rate changes in international portfolio equity returns and portfolio rebalancing.
  - Camanho, Hau and Rey (2018): evidence in favour of portfolio rebalancing in AEs
  - Koijen and Yogo (2020) incorporate allocation across asset classes as well as across countries. The equilibrium in asset markets then jointly determines asset prices and exchange rates, conditional on central bank policy on short-term rates.

Data and empirical approaches

- Equity return series are from the MSCI country indices, in local currency and in US dollars for 50 EMEs from Jan 2006 to Aug 2021.
    - Incorporation of dividends in the total returns allows us to ensure a consistent dataset across countries.
- Weekly returns computed as the log difference of MSCI country index from Wednesday of a week to Tuesday of the following week.
- Panel regressions
    - 14 Asian EMEs; 50 EMEs in all regions
    - Broad USD index vs bilateral exchange rate vis-a-vis USD
    - Country fixed effects and robust clustered standard errors
    - Control variables at weekly frequency
        - Global level: VIX, US effective federal funds rate, the Aruoba-Diebold-Scotti Business Conditions Index
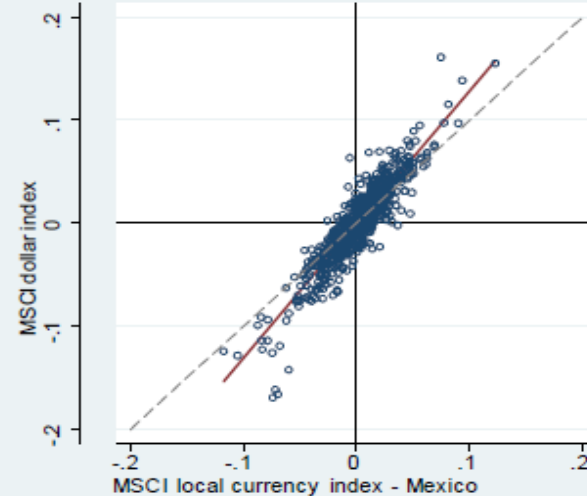   - Country level: GDP growth, inflation, current account deficit, stock market capitalisation
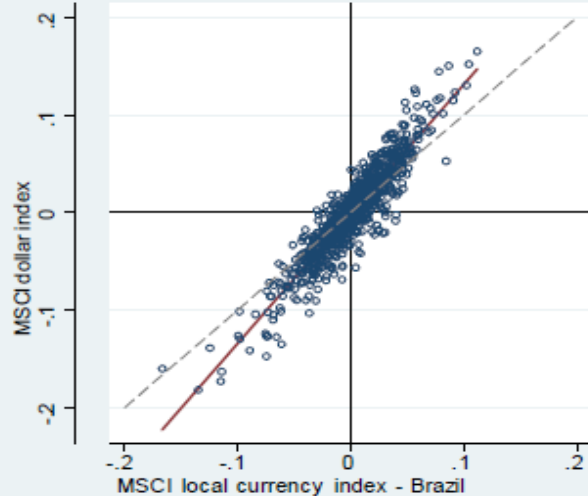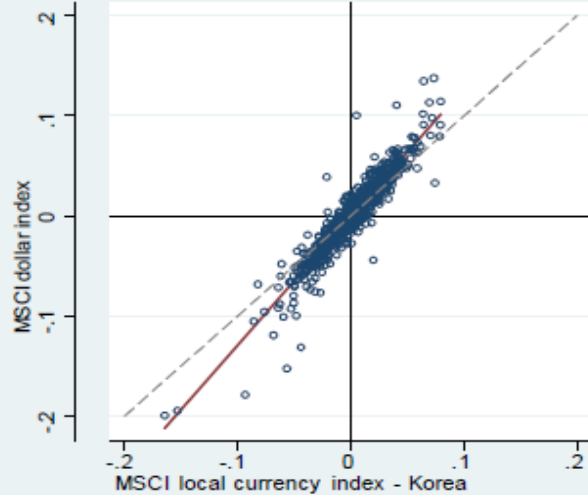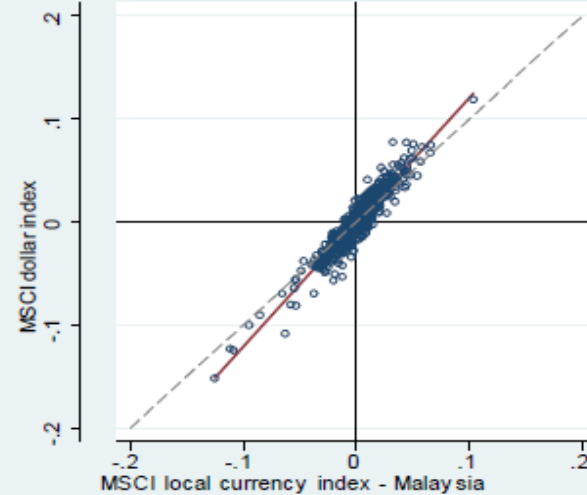
Figure 1: Dollar return multiplier for Brazil, Korea, Mexico and Malaysia

Figure 2: Dollar return multiplier for major EMEs, with 95 percent confidence intervals.

Table 1: **Panel analysis for Asian EMEs.** This table provides regression results for the sample of 14 EMEs in Asia with clustered standard errors by country level. The dependent variab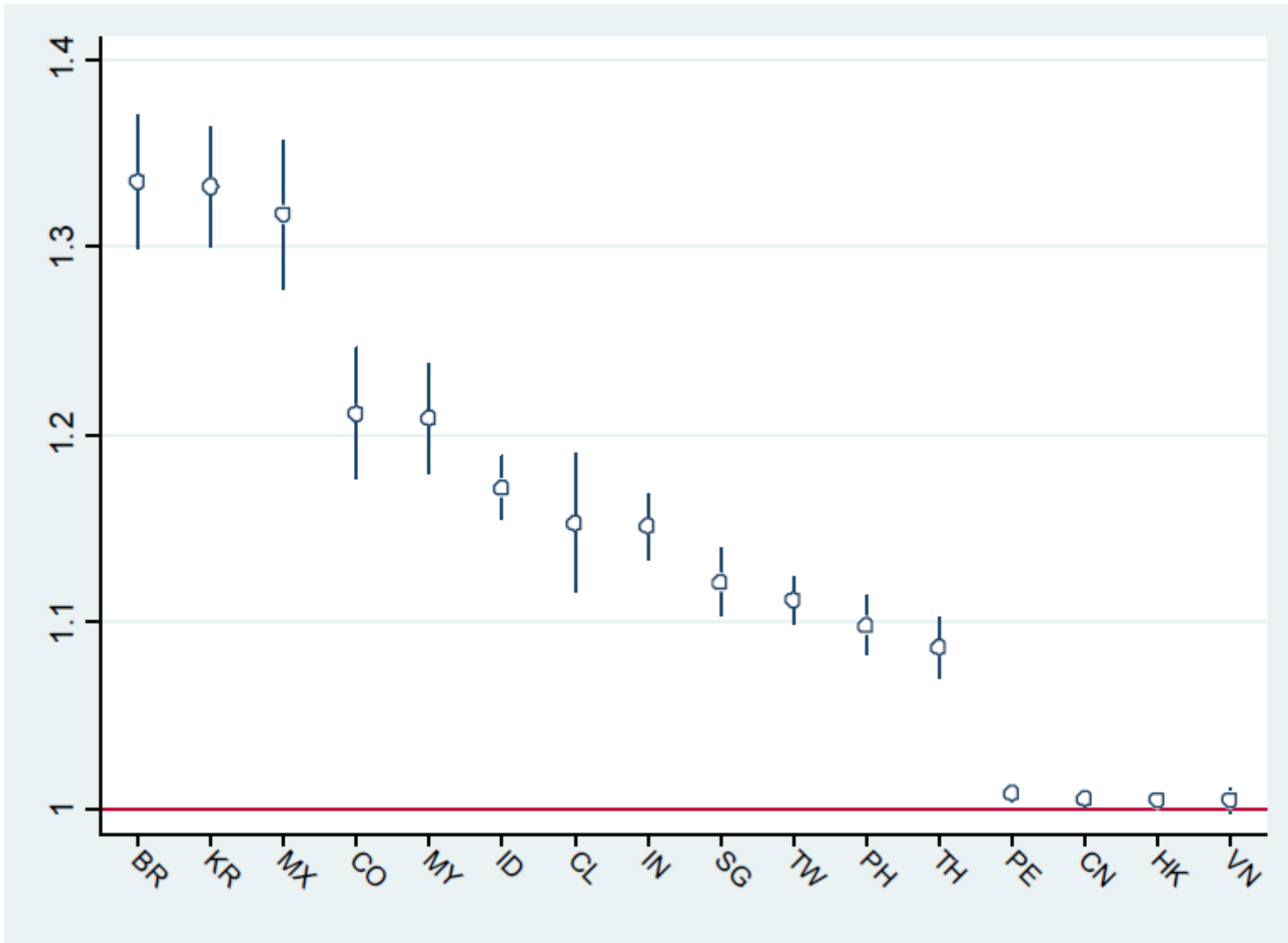le is the weekly log difference of the MSCI country index. Broad is the log difference of the broad dollar index, BER is the log difference of the bilateral exchange rate vis-à-vis the US dollar. VIX is the weekly log difference of the VIX index. US rate is the weekly effective federal funds rate. ADS is the Aruoba-Diebold-Scotti Business Conditions Index. All the weekly data are lagged by one week. Additional control variables at the country level include: GDP growth, Inflation growth, stock market capitalisation and current account deficit. ***, **, and * indicate statistical significance at 1, 5, and 10 per cent, respectively.

	(1)	(2)	(3)	(4)
Sample		EME Asia		
Broad	-0.2780***		-0.2794***	-0.2270***
	[0.0469]		[0.0495]	[0.0539]
BER		-0.1061**	0.0030	0.0159
		[0.0363]	[0.0327]	[0.0384]
VIX				-0.0114***
				[0.0020]
US rate				0.0018
				[0.0175]
ADS index				0.0113
				[0.0138]
GDP growth				0.0190**
				[0.0075]
Inflation				-0.0543***
				[0.0105]
Cur account				-0.0074
				[0.0043]
Market cap				-0.0001
				[0.0001]
Constant	0.1470***	0.1456***	0.1469***	0.3365***
	[0.0006]	[0.0008]	[0.0008]	[0.0765]
Obs.	10,556	10,556	10,556	8,923
R^2	0.004	0.001	0.004	0.010

Table 2: **Panel analysis for All EMEs.** This table provides regression results for the sample of 50 EMEs with clustered standard errors by country level. The dependent variable is the weekly log difference of the MSCI country index. Broad is the log difference of the broad dollar index, BER is the log difference of the bilateral exchange rate vis-à-vis the US dollar. VIX is the weekly log difference of the VIX index. US rate is the weekly effective federal funds rate. ADS is the Aruoba-Diebold-Scotti Business Conditions Index. All the weekly data are lagged by one week. Additional control variables at the country level include: GDP growth, Inflation growth, stock market capitalisation and current account deficit. ***, **, and * indicate statistical significance at 1, 5, and 10 per cent, respectively.

	(1)	(2)	(3)	(4)
Sample		All EMEs		
Broad	-0.2075***		-0.2293***	-0.1627***
	[0.0404]		[0.0393]	[0.0458]
BER		-0.0203	0.0292**	0.0329**
		[0.0156]	[0.0136]	[0.0135]
VIX				-0.0110***
				[0.0018]
US rate				0.0314***
				[0.0114]
ADS index				0.0222***
				[0.0082]
GDP growth				-0.0064
				[0.0066]
Inflation				-0.0201***
				[0.0070]
Cur account				0.0025
				[0.0037]
Market cap				-0.0000
				[0.0001]
Constant	0.0985***	0.0967***	0.0972***	0.1993***
	[0.0006]	[0.0009]	[0.0009]	[0.0372]
Obs.	35,506	35,506	35,506	26,809
R^2	0.002	0.000	0.002	0.005

Exchange rate shocks

- To mitigate endogeneity problems, we use daily data and a BIS database of exchange rate shocks that arise from monetary policy news from the ECB.

- The idea is to isolate shocks in the dollar exchange rate that originate from outside the US, so as to control for domestic macro conditions in the United States that may have a direct impact on the monetary policy decisions of the Federal Reserve.

- We construct a shock measure that is equal to the log change in the exchange rate on days of monetary policy news from the ECB, and zero on the other days.

- Panel regressions where the dependent variable is the daily return of the MSCI country index and the independent variable is either the dollar index shock or the USD bilateral exchange rate shock

- Control variables available at high frequency level, such as the VIX, the Aruoba-Diebold-Scotti Business Conditions Index and oil price

Table 3: Panel analysis with exchange rate shocks. This table provides regression results for the sample of EMEs with clustered standard errors at the country level. The dependent variable is the daily log difference of the MSCI country index. Broad is the log difference of the broad US dollar index, BER is the log difference of the bilateral exchange rate vis-à-vis the US dollar. Both exchange rates are set equal to zero on the days with no monetary policy announcement by the ECB. VIX is the daily log difference of the VIX index. ADS is the Aruoba-Diebold-Scotti Business Conditions Index. Oil price is the change in the Brent oil price. ***, **, and * indicate statistical significance at 1, 5, and 10 per cent, respectively.

Sample	(1)	(2)	(3)	(4)
	EME Asia		All EMEs	
Broad	-0.8871***		-0.8594***	
	[0.0924]		[0.0794]	
Broad (lag)	-0.3833***		-0.1482**	
	[0.0935]		[0.0674]	
BER		-0.9251***		-0.2654**
		[0.1163]		[0.1145]
BER (lag)		-0.3296***		0.0262
		[0.0918]		[0.0455]
VIX	-0.0141***	-0.0142***	-0.0256***	-0.0260***
	[0.0027]	[0.0026]	[0.0041]	[0.0041]
VIX (lag)	-0.0383***	-0.0387***	-0.0230***	-0.0237***
	[0.0034]	[0.0034]	[0.0023]	[0.0024]
ADS	0.0375**	0.0355*	0.0274**	0.0278**
	[0.0172]	[0.0181]	[0.0111]	[0.0112]
ADS (lag)	-0.0391**	-0.0364*	-0.0271**	-0.0262**
	[0.0173]	[0.0180]	[0.0114]	[0.0115]
Oil price	0.0391***	0.0420***	0.0456***	0.0494***
	[0.0051]	[0.0053]	[0.0056]	[0.0059]
Oil price (lag)	0.0210***	0.0230***	0.0101***	0.0118***
	[0.0029]	[0.0030]	[0.0027]	[0.0027]
Constant	0.0005***	0.0005***	0.0004***	0.0004***
	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Observations	21,933	21,933	72,311	72,311
R-squared	0.113	0.113	0.075	0.071

Dollar beta

- Dollar beta defined as the sensitivity of stock returns to swings in the broad dollar index.
  - In particular, we examine the relationship between the MSCI index return in local currency and the US dollar.
  - Each beta is estimated using a moving window of one year of data, with one coefficient estimated per week
- Dollar betas tend to be negative over the sample period
  - Strongly negative during periods of financial stress or crises, such as the GFC, the euro area debt crisis and March 2020.
  - At other times, the dollar betas tend to be relatively moderate, and can even dip into positive territory during non-crisis times.
- EME stock indices that have a high dollar beta tend to have higher average returns, suggesting that investors who hold stocks in a high dollar beta stock market are compensated for the higher risk by a higher average return.
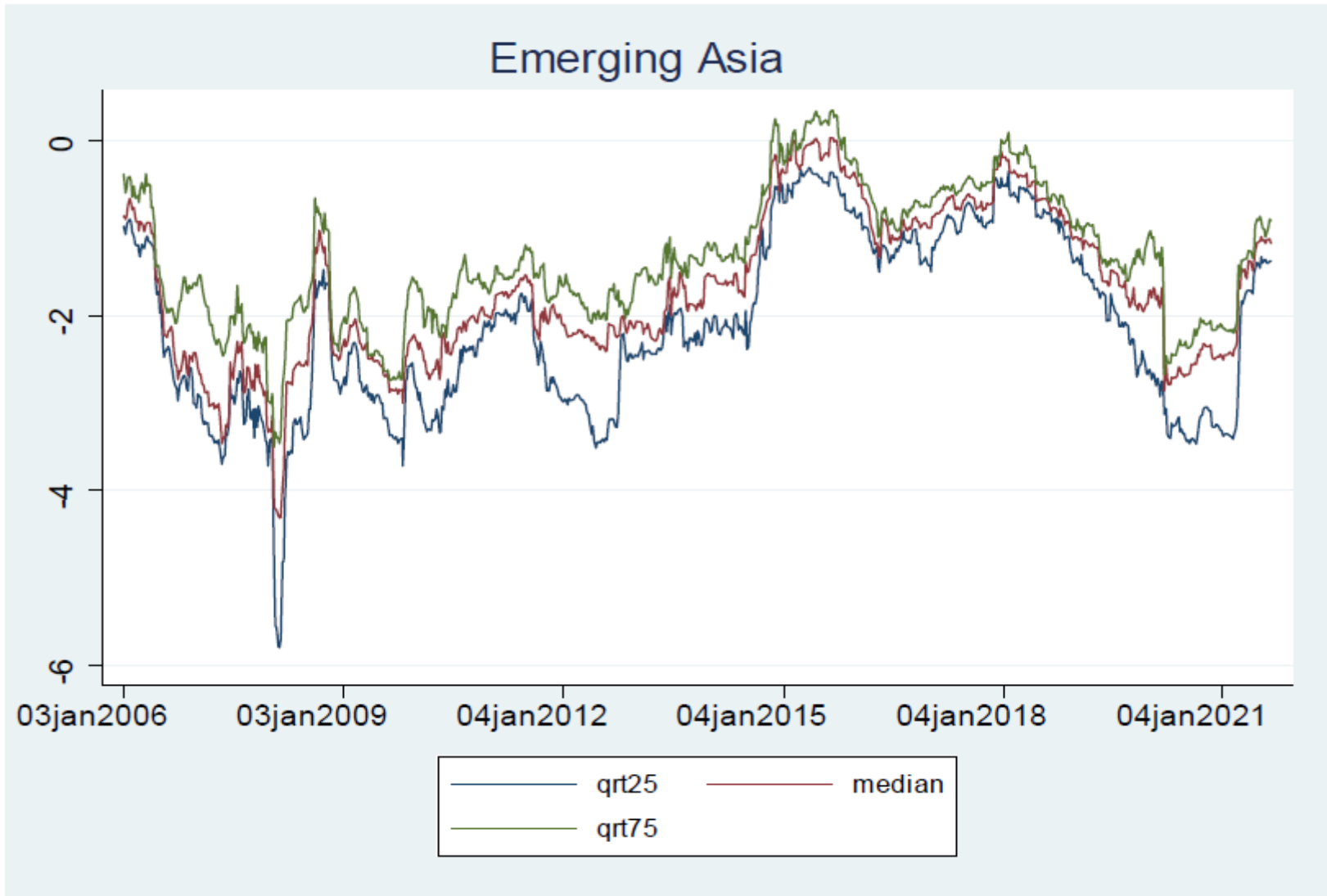 - Dollar beta is a cross-section asset pricing factor for EMEs.
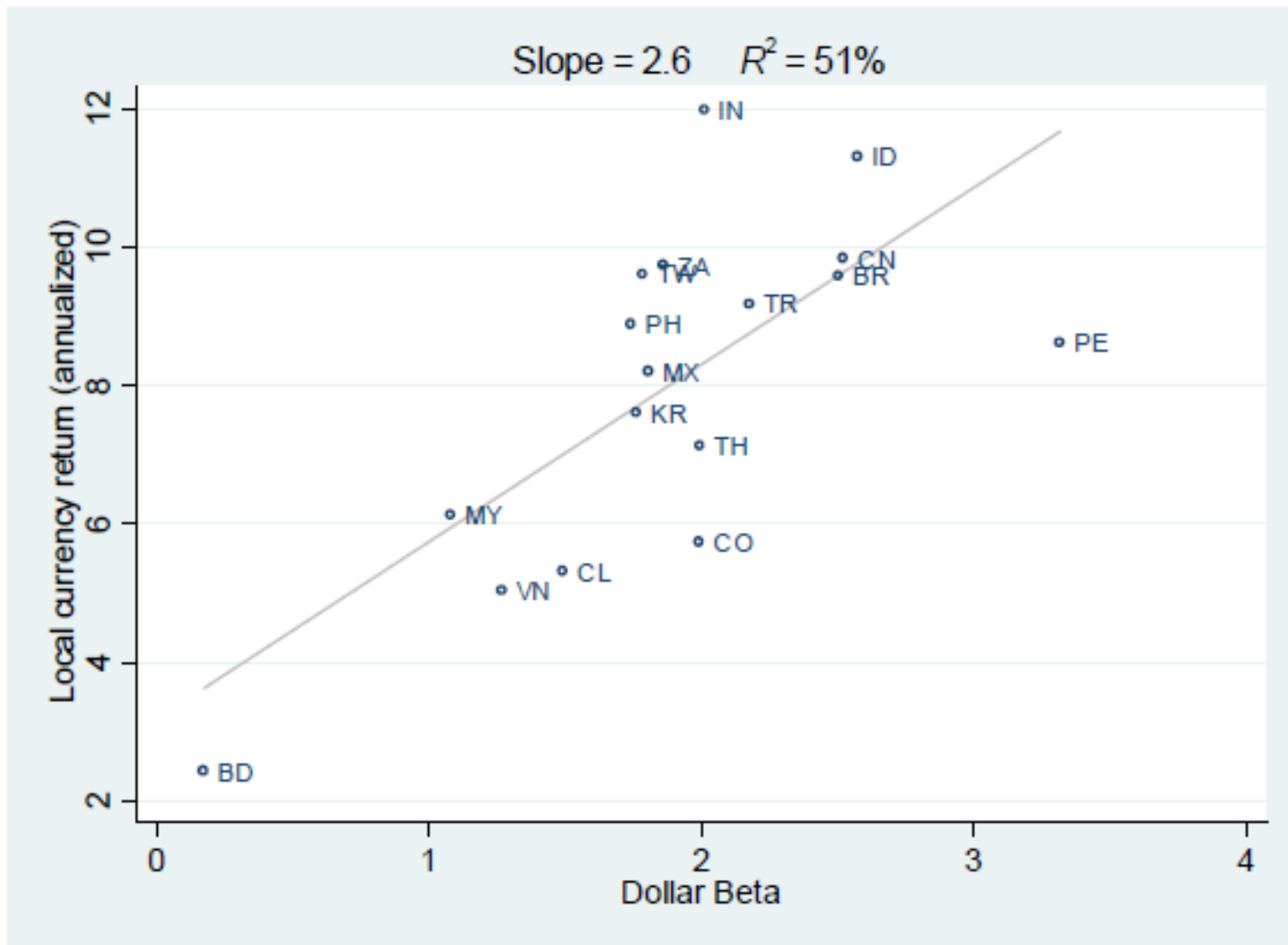
Figure 3: **Rolling dollar beta**

Figure 4: **Dollar beta and Returns.** Beta is transformed into positive values (i.e. beta is multiplied by -1) for ease of exposition.

Fama and McBeth two-step procedure

- We run the Fama-MacBeth cross-sectional regressions of the weekly returns in local currency on the estimated dollar beta and a constant.

- We find that the slope coefficient with Newey-West corrected standard errors is positive and statistically significant with a p-value of 0.081 after removing extreme outliers.

- This evidence supports our finding that the dollar beta plays the role of an asset pricing factor on the cross-section variability of local currency-denominated returns.
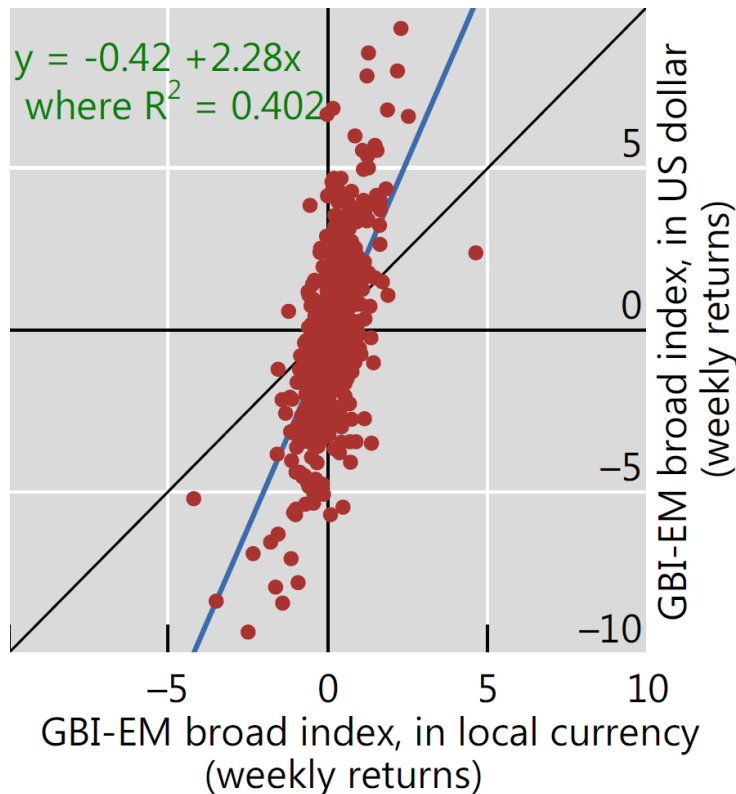
Extensions

- Orthogonalised components of dollar exchange rates
  - As in Hofmann, Shim and Shin (2020), we can consider using residuals from a regression of the broad dollar index on the bilateral exchange rate and vice versa in horse race regressions.

- Advanced economy stock returns?
  - Dollar return multiplier > 1 in all major AEs, except Japan and Switzerland
  - Dollar beta for AEs exhibit similar time series behaviour but less volatile than that of EMEs

- EME local currency bonds
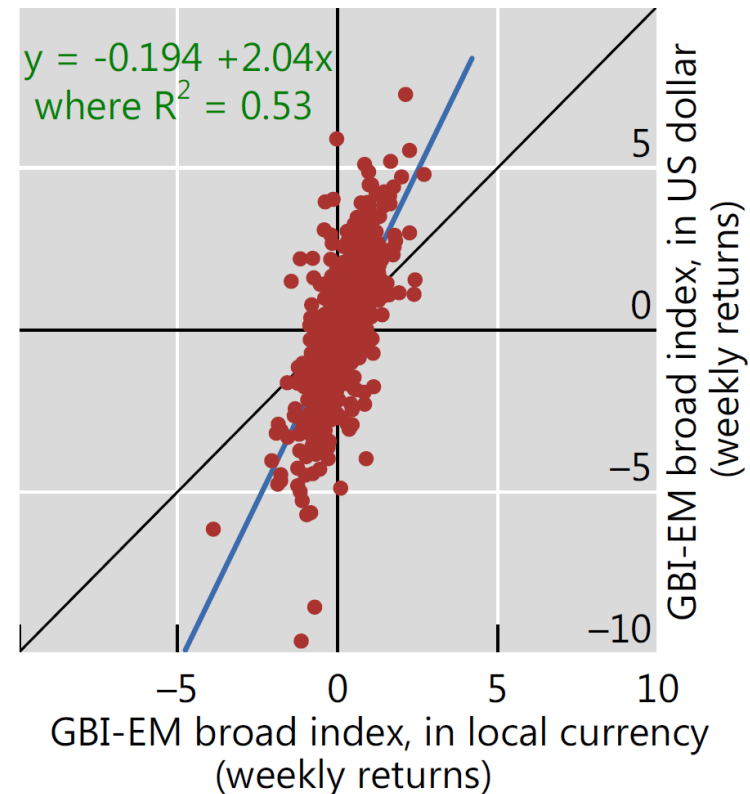 - Dollar return multiplier
  - Dollar beta

BANK FOR INTERNATIONAL SETTLEMENTS

Borrowing in domestic currency has not insulated EMEs from swings in financial conditions: high "dollar return multiplier"
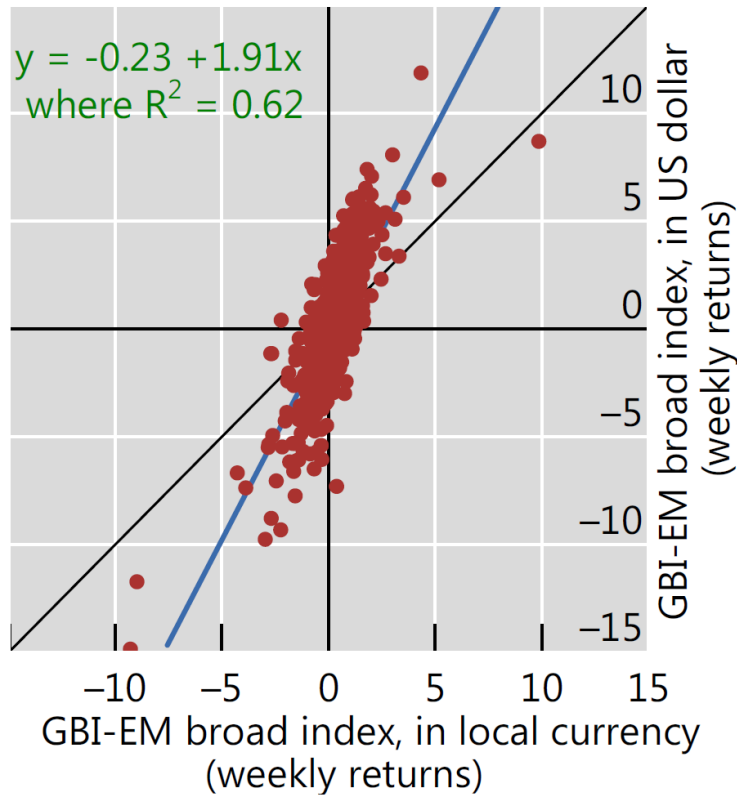

Brazil

$y = -0.42 + 2.28x$
where $R^2 = 0.402$

GBI-EM broad index, in US dollar (weekly returns)

GBI-EM broad index, in local currency (weekly returns)

Mexico

$y = -0.194 + 2.04x$
where $R^2 = 0.53$

GBI-EM broad index, in US dollar (weekly returns)

GBI-EM broad index, in local currency (weekly returns)

H_0: $\beta = 1$; t-value: BR: 11.35; t-value: MX: 13.35
Sample period: weekly data from Jan 2010 to Aug 2021

South Africa

$y = -0.23 + 1.91x$
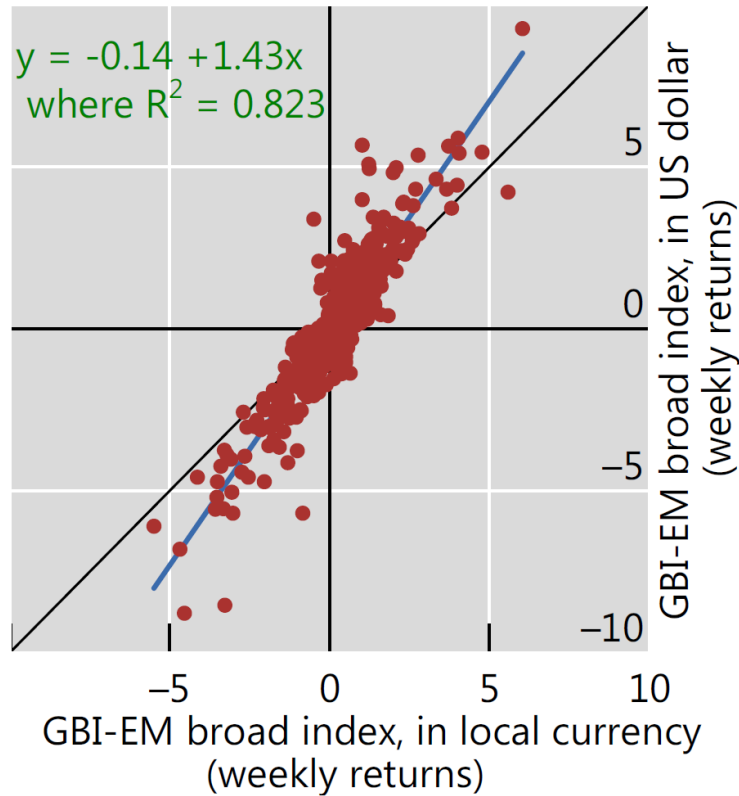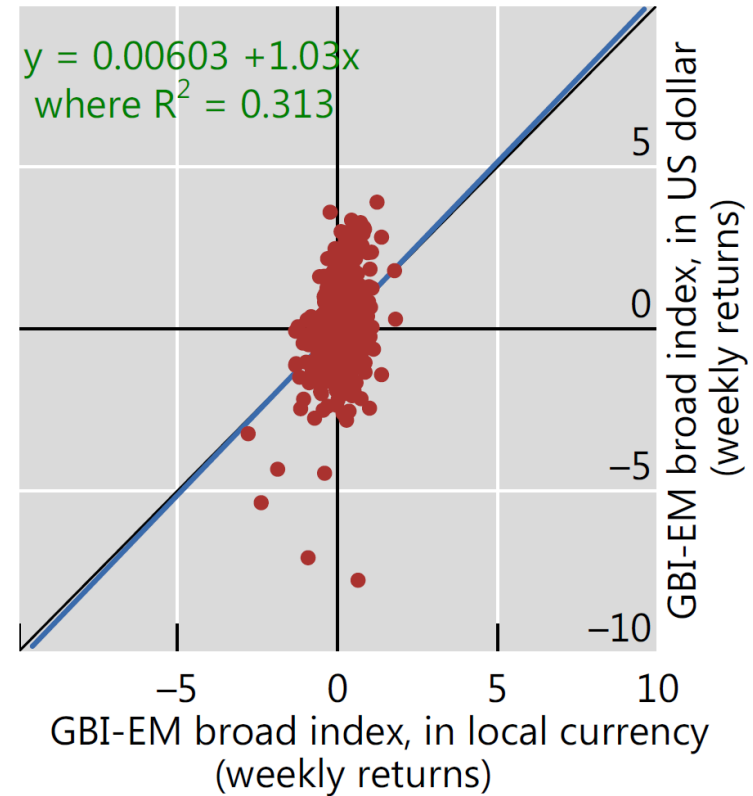where $R^2 = 0.62$

GBI-EM broad index, in US dollar (weekly returns)

GBI-EM broad index, in local currency (weekly returns)

Turkey

$y = -0.365 + 1.68x$
where $R^2 = 0.704$

GBI-EM broad index, in US dollar (weekly returns)

GBI-EM broad index, in local currency (weekly returns)
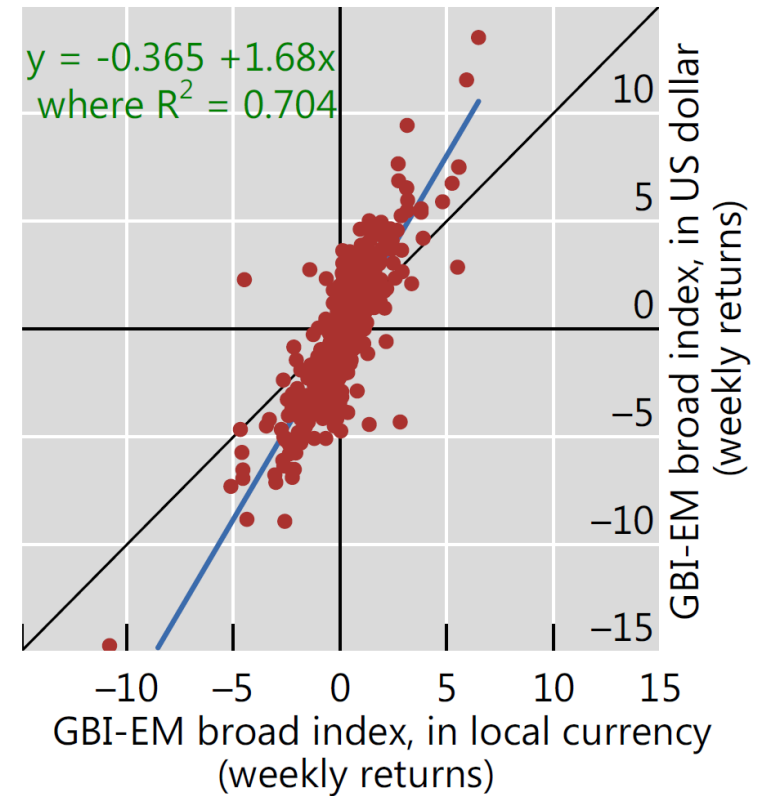
$H_0: \beta = 1$

t-value: ZA: 14.96; t-value: TR: 15.45

Indonesia

$y = -0.14 + 1.43x$
where $R^2 = 0.823$

Korea

$y = 0.00603 + 1.03x$
where $R^2 = 0.313$

GBI-EM broad index, in US dollar (weekly returns)

GBI-EM broad index, in local currency (weekly returns)
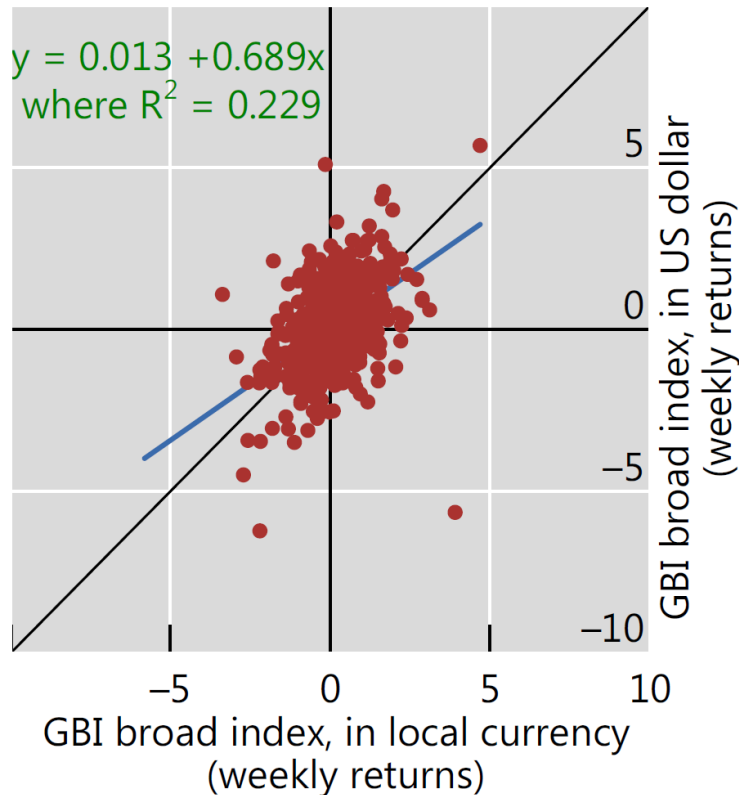
$H_0: \beta = 1$

t-value: ID: 16.06; t-value: KR: 0.287

Dollar return multiplier for selected AEs

United Kingdom

$y = 0.013 + 0.689x$
where $R^2 = 0.229$

Sweden
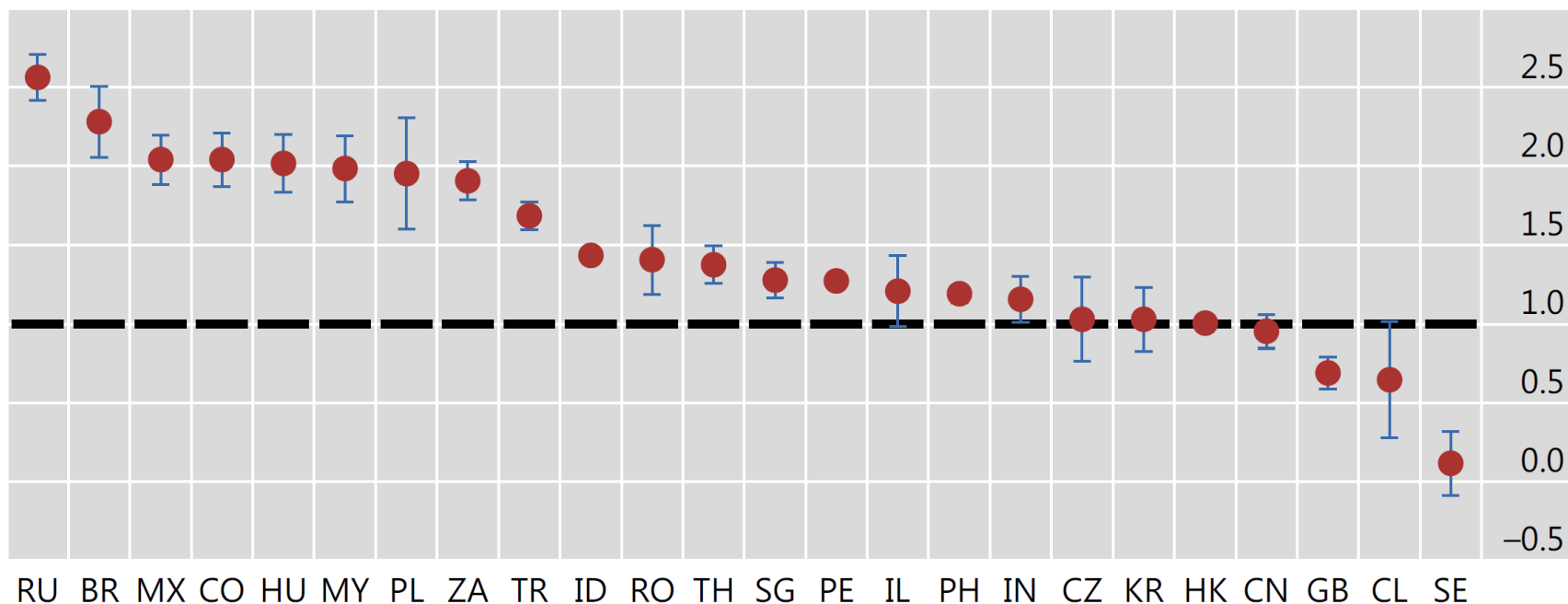
$y = 0.0272 + 0.115x$
where $R^2 = 0.00452$
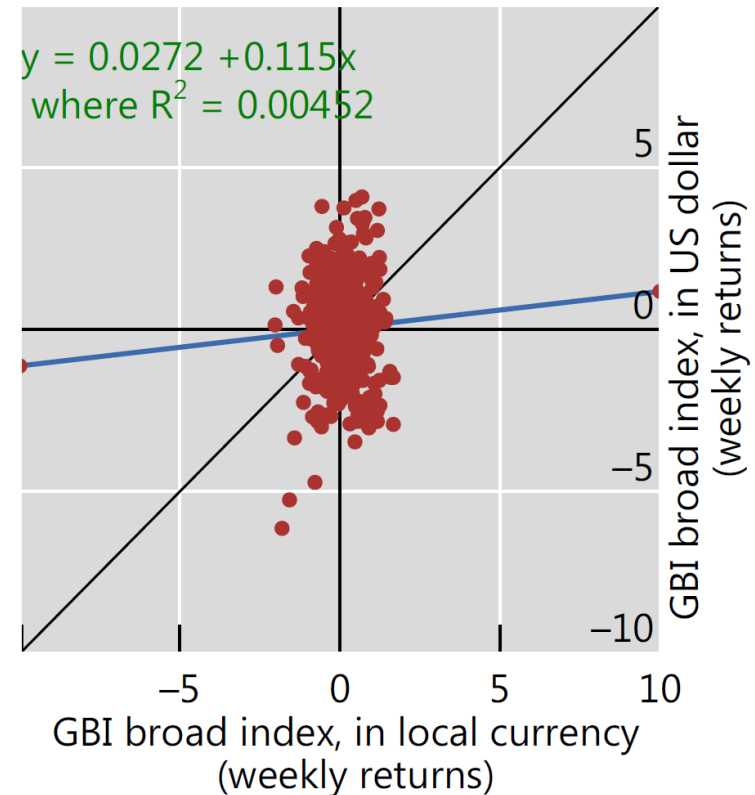
$H_0: \beta = 1$

t-value: GB: -6.059 ; t-value: SE: -8.661

Dollar return multiplier for local currency government bonds[1]

Legend:
● Duration multipliers
— ±2 standard deviations

X-axis categories: RU BR MX CO HU MY PL ZA TR ID RO TH SG PE IL PH IN CZ KR HK CN GB CL SE

Y-axis values: 2.5, 2.0, 1.5, 1.0, 0.5, 0.0, −0.5

[1] Slope of the fitted line for the US dollar returns on EME local currency government bonds against local currency returns.

Sources: JPMorgan Chase; BIS.