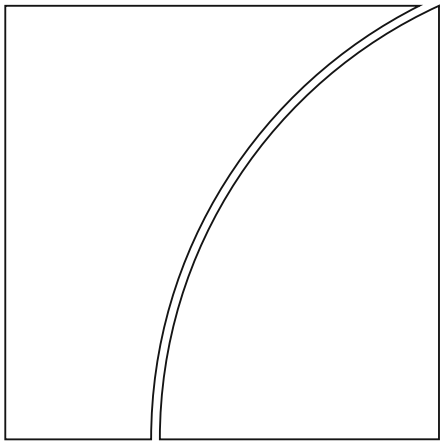

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by Valentina Bruno, Ilhyock Shim and Hyun Song Shin

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Keywords: global liquidity, pricing factor, emerging market, exchange rate.

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Dollar beta and stock returns*

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Abstract

The financial channel of exchange rates operates through changes in risk-taking by investors and is reflected in the response of financial conditions to exchange rate movements. We show that stock returns also reflect the financial channel of exchange rates, with higher local currency stock returns associated with a weaker dollar. The broad dollar index emerges as a global factor, consistent with the financial channel operating through swings in risk-taking by global investors. We introduce the "dollar beta" as the sensitivity of stock returns to swings in the broad dollar index, and show that emerging market stock indices that have a higher dollar beta tend to have higher average returns, implying that the dollar beta is a cross-section risk factor that is priced.

JEL codes: G12, G15, G23
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1 Introduction

Exchange rates affect the economy through both real and financial channels. Deeper global integration of banking and capital market activity has meant that the financial channel of exchange rates has taken on an increasingly important role in recent decades.

The financial channel of exchange rates operates through changes in the risk capacity of market participants and is reflected in the response of financial conditions to exchange rate movements. There is an active and accumulating series of studies (to be reviewed below) that show how capital flows and market conditions fluctuate with swings in exchange rates, where an appreciating local currency is associated with more accommodative local financial conditions.

The contribution of our paper is to show that stock market returns in emerging market economies also reflect the financial channel of exchange rates. Concretely, higher stock returns in local currency terms tend to go hand-in-hand with an appreciation of the local currency against the dollar. When viewed from the perspective of a global investor who evaluates returns in dollar terms, the dollar-denominated returns tend to be an amplified version of the local currency-denominated returns, in the sense that both the gains and losses in local currency are amplified when converted into returns in dollar terms. Thus, contrary to the hypothesis that exchange rate movements will inject noise that tend to smooth stock returns when converted into other currencies, the dollar exchange rate changes tend to *accentuate* returns when measured in dollar terms.

We provide three analytical contributions in laying out our findings more systematically, and thereby providing a more systematic treatment of the role of the financial channel of exchange rates on stock market returns.

First, we introduce a summary measure of the sensitivity of an emerging market economy's stock returns to the dollar exchange rate – the "dollar return multiplier" – which serves as a device for gauging the strength of the financial channel of exchange rates in a country's stock market. The dollar return multiplier is defined as the ratio of the dollar-denominated stock returns to the local currency-denominated stock returns. We show that the dollar return multiplier is larger than 1 in emerging market economies, sometimes substantially

so, meaning that stock returns tend to be positive when the local currency is appreciating against the dollar, while returns tend to be negative when the local currency is depreciating against the dollar. This correlation turns out to be a remarkably robust feature of the data, underlining the attribute of the dollar-denominated returns as being the amplified version of the local currency returns.

Our second analytical contribution is to shed further light on the global factor behind the financial channel of exchange rates by showing that the broad dollar index serves as a summary measure of the global factor in the financial channel. While the dollar return multiplier highlights the role of the bilateral dollar exchange rate, a more systematic panel analysis reveals that it is the *broad dollar index* that plays a more important role. Specifically, when we compare the broad dollar index and the bilateral dollar exchange rate as explanatory variables, it is the broad dollar index that emerges as the more important explanatory variable. In particular, when both the broad dollar index and the bilateral dollar exchange rate enter on the right-hand side of the regression, the bilateral dollar exchange rate turns out to be statistically insignificant or only weakly significant, while the broad dollar index remains highly significant.

Our third analytical contribution is to introduce the concept of the "dollar beta", defined as the sensitivity of stock returns to swings in the broad dollar index. The analogy is with the Capital Asset Pricing Model (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 (Solnick (1974), Adler and Dumas (1983)).

In our context, the dollar beta of a country's stock index is defined as the regression coefficient on that country's stock index return when regressed on the percentage depreciation of the broad dollar index. Thus, a country with a high dollar beta is a country whose stock market rises more with a broad depreciation of the dollar. When we plot the dollar beta of a country's stock index against the average returns over the sample period, we find that emerging market 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. In this sense, the dollar beta emerges

from our analysis as a cross-section asset pricing factor for emerging market economies. To validate this relationship, we conduct the Fama-MacBeth (1973) cross-sectional estimation and find evidence that the dollar beta plays the role of an asset pricing factor that accounts for a significant portion of the cross-sectional variability of local currency-denominated returns. These findings are consistent with the greater heft of global investors in influencing the financial conditions in emerging market economies (EMEs) with less developed capital markets, where fluctuations in global conditions have a disproportionate impact on domestic financial conditions.

This paper connects a recent literature on the financial channel of exchange rates and on the role of the broad dollar index with the earlier literature on exchange rates and stock market returns. The interaction of exchange rates with foreign investment in EME local currency bonds and equities is a prime example of the financial channel of exchange rates, and adds a further dimension to the traditional explanations that focus on EMEs' dollar borrowing as the key component of the financial channel. Bruno and Shin (2017) find that foreign bond issuances in EMEs are driven by carry trade activities. Similarly, Huang, Panizza and Portes (2018) show that riskier firms in China try to boost profitability by issuing dollar bonds and engaging in a specific form of carry trade.

The return-amplifying role of the dollar exchange rate introduces an additional element to the traditional portfolio choice model that treats the exchange rate as an additional source of uncertainty for the investor, but which is priced to compensate investors with fixed, risk-averse preferences. Most directly related to our paper is Brusa, Ramadorai and Verdelhan (2014), who introduce a three-factor international CAPM where a global equity factor denominated in local currencies complemented by two currency factors – the dollar and carry – perform well in pricing the cross-section of asset returns. Verdelhan (2018) shows that the dollar factor also figures in currency returns.

Hau and Rey (2006) and Camanho, Hau and Rey (2018) study portfolio allocation across equity markets and show how the equilibrium jointly determines stock prices and the exchange rate. Koijen and Yogo (2020) develop the portfolio allocation framework further by incorporating 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 that determines short-term rates.

Our approach has more in common with the recent literature that emphasizes the fluctuations in risk-taking by market participants in so-called "risk-on, risk-off" episodes, and the emergence of an associated global factor that drives common movements across risk assets (see Avdjiev, Bruno, Koch and Shin (2019), Avdjiev, Du, Koch and Shin (2019), Lilley, Maggiori, Neiman and Schreger (2019) and Miranda-Agrippino and Rey (2020, 2021)).

Our paper provides further empirical backing for the financial channel of exchange rates by showing that the scope of the financial channel also operates in the stock market. This channel has been especially important for EMEs and for the conduct of monetary policy (Bruno and Shin (2015)). To the extent that the share of foreign investors is large in an EME's equity market, large amounts of portfolio equity inflows or outflows will have a significant impact on domestic equity prices. For example, the foreign ownership of the 13 major Asia-Pacific equity markets averaged 17% and ranged from 7% to 62% in 2017 (de la Cruz et al (2019)). This mechanism is similar to that for original sin redux in Carstens and Shin (2019) and Hofmann, Shim and Shin (2020): as for EME bond markets, EME equity returns are likely to interact more strongly with equity portfolio flows to EMEs with a higher level of foreign ownership in domestic equity markets. Regarding the explanatory role of the broad dollar index, our paper extends earlier studies that examined the emerging market local currency bond markets (Hofmann, Shim and Shin (2020, 2022)), investment (Avdjiev, Bruno, Koch and Shin (2019)) and the tail risks to GDP growth (Hofmann and Park (2020)).

More broadly, our paper brings a new perspective on the relationship between exchange rates and stock market returns. Bohn and Tesar (1996) examine the role of net purchases of foreign equities by US investors in an intertemporal, international capital asset pricing model. Their model yields a natural decomposition of net purchases into transactions that are necessary to maintain a balanced portfolio of securities ("portfolio rebalancing") and net purchases that are triggered by time-varying investment opportunities ("return chasing"). Using monthly data on national equity-market returns and US transactions in foreign equities in 22 countries (including both advanced economies (AEs) and EMEs) from 1980 to 1994,

they show empirical evidence that US investment in foreign equities is primarily driven by the latter effect: US investors tend to move into foreign equity markets where returns are expected to be high and retreat from the markets when predicted returns are low.

The portfolio rebalancing effects are examined in Hau and Rey (2004), who show that a larger wealth share held in foreign assets after either foreign equity-market excess returns or a foreign currency appreciation, may trigger a reallocation of equity investment away from the foreign country to the United States and a simultaneous dollar appreciation. Moreover, they show that portfolio flow shocks into the foreign country directly depreciate the dollar and create foreign-equity excess returns.

More closely related to our paper is Hau and Rey (2006), who use data for 17 OECD countries and find that higher returns in the home equity market relative to the foreign equity market are associated with a home currency depreciation, highlighting the equilibrating role of exchange rate changes in international portfolio returns. They further find that net equity flows into the foreign market are positively correlated with a foreign currency appreciation. Camanho, Hau and Rey (2018) use disaggregated fund-level holdings in quarterly frequency by internationally invested equity funds domiciled in the United States, the United Kingdom, the Eurozone and Canada for the period of 1999–2015 and find evidence in favour of portfolio rebalancing behavior. They find that net equity inflows are associated with local currency appreciation. Finally, using international holdings data, Koijen and Yogo (2020) estimate a demand system for three asset classes across 36 countries (20 AEs and 16 EMEs) from 2002 to 2017. They find that macroeconomic variables and policy variables such as short-term rates, debt quantities and foreign exchange reserves account for 55% of the variation in exchange rates, and that among the remaining 45% of the variation, latent demand of North American and European AEs substituting across asset classes accounts for 16%.

The outline of our paper is as follows. In Section 2, we describe data used for empirical analysis. In Section 3, we illustrate how we calculate the dollar return multiplier and show the cross-country distribution of the multiplier for stock markets in a large number of EMEs. In Section 4, we conduct a more systematic empirical investigation of the relationship between dollar exchange rates (or exchange rate shocks) and stock returns by running weekly and

daily predictive regressions. In Section 5, we describe time-varying correlations between stock returns and the broad dollar index and show the relationship between the average stock return and the dollar beta. Finally, Section 6 concludes and provides policy implications.

2 Dollar return multiplier

Our equity return series are drawn from the MSCI country indices, both in local currency and in US dollar terms for 50 EMEs from January 2006 to August 2021. Incorporation of dividends in the total returns allows us to ensure a consistent dataset across countries. We use weekly returns for our analysis, and returns are computed as the log difference of the MSCI country index from Wednesday of a week to Tuesday of the following week.

As an illustration of the main theme of our paper, Figure 1 plots the relationship between stock market returns denominated in local currency and in US dollars for four countries – Brazil, Korea, Mexico and Malaysia. The horizontal axis measures the weekly return in local currency terms, while the vertical axis measures the weekly return in US dollar terms. The 45 degree line is the benchmark. If the dollar exchange rate were uncorrelated with the underlying stock returns, we would expect the observations to lie along the 45 degree line, albeit in a noisy way. Any systematic difference in returns would show up in the deviation of the slope of the scatter chart away from the 45 degree line.

The slope of the scatter chart in Figure 1 is our measure of the *dollar return multiplier*, defined as the ratio of the dollar-denominated stock returns to the local currency stock returns.

Figure 1 shows in a striking way that in all four economies illustrated, the dollar return multiplier is significantly greater than 1. The dollar return multiplier is in the range of 1.2 to 1.3 in all four economies, and the null hypothesis that the slope is equal to 1 is rejected decisively (the t-statistics are close to 20 in the case of Brazil and Korea, and about 15 for Mexico and Malaysia).

The interpretation of the dollar return multiplier in Figure 1 can be best conveyed by splitting each panel into the left- and right-hand segments of the scatter chart. On the right-hand side of each panel, both local currency returns and dollar returns are positive,

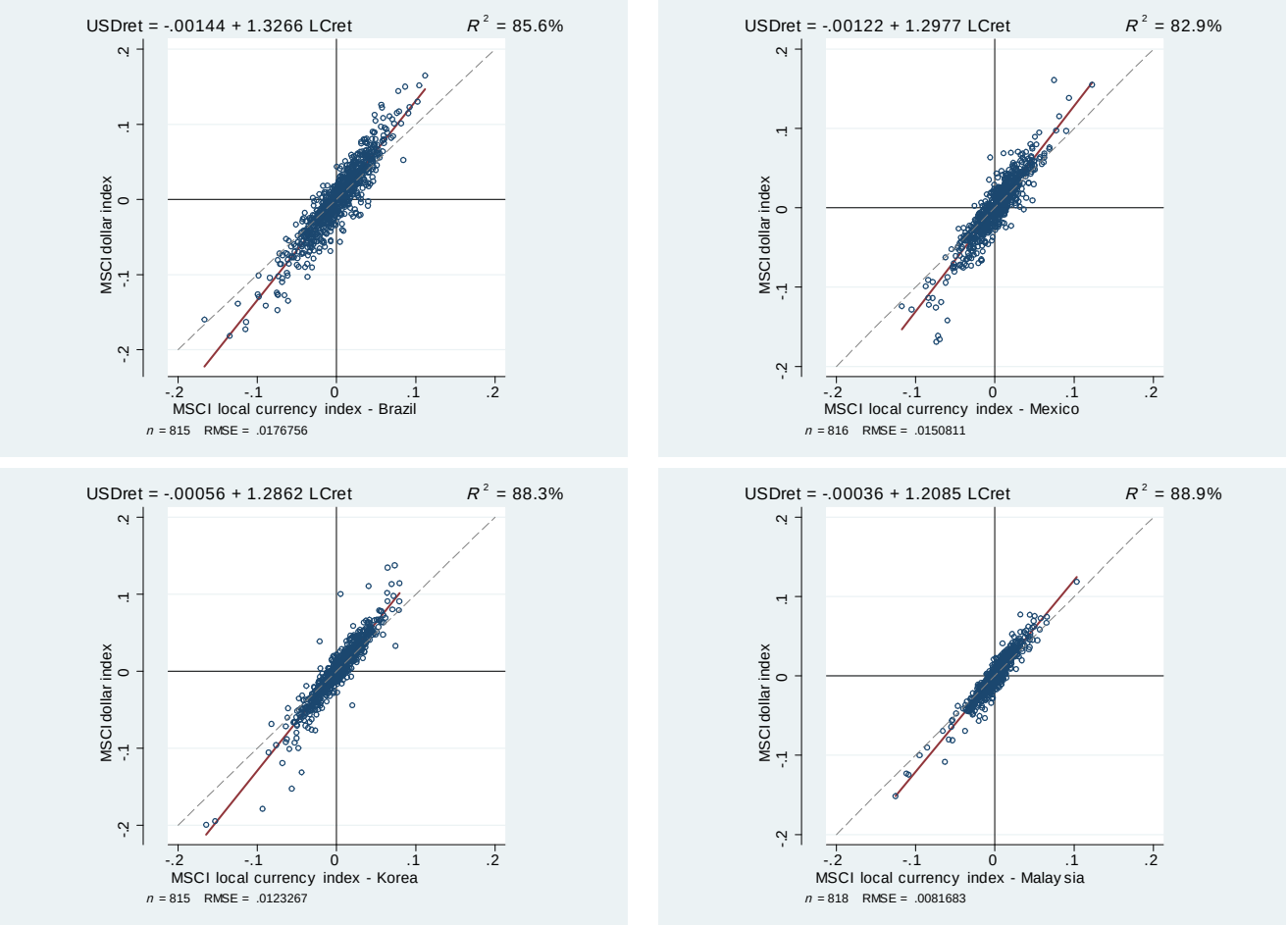

Figure 1: **Dollar return multiplier for Brazil, Korea, Mexico and Malaysia**

indicating realized states of the world when financial conditions are accommodative and stock returns are positive. In these states of the world, dollar returns tend to be higher than local currency returns, implying that investors gain both on the exchange rate change and on a high stock return in local currency terms. In other words, local currency stock returns are high when the local currency is appreciating against the dollar. Higher stock returns and currency appreciation go hand-in-hand.

The findings for Brazil, Korea, Mexico and Malaysia turn out to be in line with other EMEs. Figure 2 shows the dollar return multiplier for a selection of large EMEs, ordered by the magnitude of the dollar return multiplier. We summarise our findings by plotting the dollar return multiplier together with the error bands for ± 2 standard deviations of the slope of the scatter chart.

We see that the dollar return multiplier is significantly greater than 1 in almost every case, and with narrow standard error bands. The dollar return multipliers shown in Figure 2 underline how a stronger dollar is associated with diminished risk-taking and "risk-off" episodes in stock markets, so that lower stock returns in local currency terms are associated with even lower returns in dollar terms. In other words, low stock returns tend to go hand-in-hand with a stronger dollar.

A notable feature of our finding on the dollar return multiplier is how robustly the data reflect the impact of the dollar exchange rate. To the extent that all countries are affected by the dollar exchange rate in such a uniform way, an approach that investigates the role of a common global factor in driving financial conditions would appear to be a promising approach, as argued by Miranda-Agrippino and Rey (2020, 2021). This is the next step of the analysis, to which we now turn.

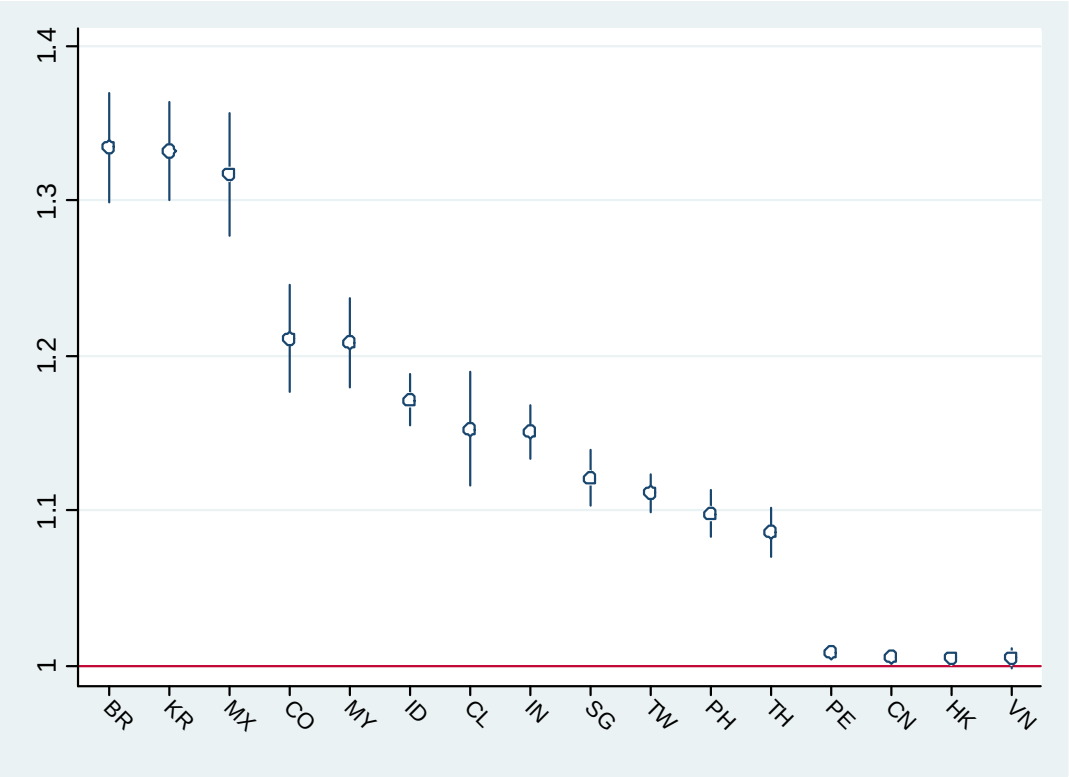

Figure 2: **Dollar return multiplier for major EMEs, with 95 percent confidence intervals.**

3 Panel analysis

Having found that the bilateral exchange rate of each stock market vis-à-vis the US dollar plays a consistent role as a risk-taking indicator, we investigate the role of the broad dollar index as a global factor. We do so by conducting panel regressions to assess the association between exchange rates and local currency stock returns, but with a special focus on the broad dollar index.

The broad dollar index has been identified in a number of applications as a good indicator of the risk-taking channel of exchange rates in a variety of settings.

In the case of cross-border bank lending, Bruno and Shin (2015) posit a mechanism surrounding decisions of global banks that manage a diversified loan portfolio in dollars to borrowers, some of whom have currency mismatches and thus face exposure to an appreciation of the dollar. In such a context, a broad-based appreciation of the dollar raises the weight of the tail of the credit loss distribution facing the global bank. For a global bank that manages the size of its loan book by maintaining its economic capital according to a Value-at-Risk (VaR) rule, the increase in the tail risk goes hand-in-hand with a contraction of the loan portfolio, thereby leading to diminished cross-border bank lending and tighter credit conditions more broadly.

This "bank lending channel" has been further explored in a number of applications. Avdjiev, Bruno, Koch and Shin (2019) establish a "triangle" relationship between a stronger dollar, diminished cross-border bank flows and more subdued investment in EMEs and attribute this relationship to the bank lending channel. In a related context, Avdjiev, Du, Koch and Shin (2019) explore the implications for capital market conditions of the bank lending channel on the emergence of deviations of forward rates from covered interest parity. They find that a stronger dollar (as measured by the broad dollar index) is associated with wider deviations from covered interest parity. More broadly in a macro context, Hofmann and Park (2020) find that the tail risk of GDP growth, as measured through quantile regressions, is highly sensitive to the broad dollar exchange rate.

In the case of the local currency sovereign bond market, Hofmann, Shim and Shin (2022) outline a mechanism which operates through the fluctuations in the economic risk capital of

the investor. If the investor's numeraire currency is the dollar, or if the investor follows a dollar-based return index, a broad-based appreciation of the dollar implies a commensurate decline in the economic capital of the portfolio investor, so that a VaR rule for portfolio allocation implies a contraction of holdings.

For our application to the stock market, a mechanism that is directly applicable to portfolio investors may be more appropriate. In that sense, the channel outlined in Hofmann, Shim and Shin (2022) may be more appropriate than the global banking channel utilised in earlier papers. However, for leveraged investors, the global banking channel would also be a potent factor when we gauge risk appetite. In any case, both the portfolio risk measures and the dollar funding channels would appeal to the broad dollar index as the appropriate risk factor.

Empirically, it turns out that the broad dollar index emerges as an important explanatory variable playing the role of a global factor in the description of stock returns in EMEs. In line with the calculation of the return multiplier, we use weekly data from the MSCI indices over the period from January 2006 to August 2021. The results are tabulated in Tables 1 and 2 for the sample of Asian EMEs and all EMEs, respectively.[1]

As our first exercise, we start by regressing the log difference of the MSCI index on the log difference of the broad US dollar index (Broad, column 1) or of the bilateral exchange rate vis-a-vis the dollar (BER, column 2) in a panel specification with country fixed effects and robust clustered standard errors. The exchange rates are lagged by one week.

In order to shed further light on the role of the two exchange rates for equity returns, we run a set of "horse-race" regressions that include both exchange rates (column 3). We then add various control variables at weekly frequency at the global level (VIX, US effective federal funds rate, the Aruoba-Diebold-Scotti Business Conditions Index) and at the country level (GDP growth, inflation, current account deficit, stock market capitalisation) in lieu of

[1] The 14 economies constituting the sample of Asian EMEs are: Bangladesh, China, Hong Kong SAR, Indonesia, India, Korea, Sri Lanka, Malaysia, the Philippines, Pakistan, Singapore, Thailand and Chinese Taipei. The sample of 50 EMEs consists of the 14 Asian EMEs plus the following countries: United Arab Emirates, Argentina, Bosnia and Herzegovina, Bulgaria, Bahrain, Brazil, Botswana, Chile, Colombia, the Czech Republic, Egypt, Ghana, Croatia, Hungary, Israel, Jamaica, Jordan, Kuwait, Cayman Islands, Kazakhstan, Lithuania, Morocco, Mauritius, Mexico, Nigeria, Oman, Peru, Poland, Qatar, Romania, Russia, Saudi Arabia, Tunisia, Turkey, Trinidad and Tobago, Ukraine and South Africa.

country fixed effects (column 4).

Table 1 shows results for the sample of 14 emerging Asian economies. As expected, both the broad dollar index and the bilateral dollar exchange rate enter with highly negative coefficients. Column 1 shows that a 1% appreciation of the broad dollar index is associated with a decline in returns by 0.278% on average per week, at the 1% statistical significance level. The association between a 1% appreciation of the bilateral exchange rate and country returns is negative and statistically significant. However, the economic magnitude of the coefficient on the bilateral exchange rate is only around one third that on the broad dollar index (column 2). Furthermore, the coefficients on Broad and BER are statistically different with a p-value of 0.013, indicating that the broad dollar index has greater explanatory power.

Importantly, when we include both the broad dollar index and the bilateral exchange rate together in the same specification, we observe that the broad dollar index knocks out the statistical significance of the bilateral exchange rate (column 3), thus illustrating the role of the broad dollar index as a global factor in the description of stock returns in emerging Asia. The results are confirmed when we add macro control variables (column 4). The VIX index, inflation rate and GDP growth are statistically significant and with the expected sign. Taken together, these results point to the financial channel as another channel that amplifies or attenuates the effect coming from other global factors for EMEs.

In addition, the bilateral exchange rate loses its statistical significance in some specifications. Overall, these results show the importance of the broad dollar index as a global factor that is associated with stock market returns.

Table 2 replicates the above specifications for the sample of all EMEs with qualitatively similar results. Also, the coefficients on the bilateral exchange rate for all EMEs have a lower economic magnitude or smaller statistical significance than those for emerging Asian economies. As a robustness check, we examine the primacy of the broad dollar index over the bilateral dollar exchange rate by running country-by-country regressions and confirm that the absolute value of the coefficient on the broad dollar index is typically larger than that on the bilateral dollar exchange rate.

In order to mitigate endogeneity problems, we engage in an additional exercise using daily

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 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	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

data and employ a specification similar to Hofmann, Shim and Shin (2020) that uses a BIS database of exchange rate shocks that arise from monetary policy news from the European Central Bank (ECB). The idea is to isolate shocks in the dollar exchange rate that originate from outside the United States, 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.

Specifically, 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. We run a panel specification where the dependent variable is the daily return of the MSCI country index and the independent variable is either the broad dollar index or the US bilateral exchange rate. We also use control variables that are available at high frequency level, such as the VIX, the Aruoba-Diebold-Scotti Business Conditions Index and oil price. For all the variables, we look at the contemporaneous association, as well as one day lag. All specifications include country fixed effects and standard errors clustered at the country level.

Table 3 reports results for the sample of Asian EMEs (columns 1 and 2) and all EMEs (columns 3 and 4). During the days with monetary policy shocks, the coefficients on the broad dollar index are significantly larger than those on BER for the sample of all EMEs. Overall, these results confirm the importance of the broad dollar index even after controlling for equity volatility, business condition changes and oil price changes.

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.

	(1)	(2)	(3)	(4)
Sample	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

4 Dollar Beta and Returns

Having established the important role of the broad dollar index as a global risk factor for stock market returns, we investigate whether the broad dollar index has attributes of a cross-section asset pricing factor. 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.

To investigate this question, we introduce the concept of the "dollar beta", defined as the sensitivity of stock returns to swings in the broad dollar index. In our context, emerging market 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. In this sense, the dollar beta emerges from our analysis as a cross-section asset pricing factor for EMEs.

In particular, we examine the relationship between the MSCI index return in local currency and the US dollar. We find a strong correlation between the broad US dollar index and the MSCI local currency indexes.

As a preliminary exercise, we plot (annual) rolling dollar betas for each country's local currency MSCI return against the log return on the broad US dollar index for the major Asian EMEs. Each beta is estimated using a moving window of one year of data, with one coefficient estimated per week. To simplify the chart for expositional reasons, in Figure 3 we show the upper and lower quartiles, and the median values for the sample of Asia EMEs. Figure 3 reveals that the dollar betas tend to be negative over the sample, with the size of the effect being especially negative during periods of financial stress or crises, such as during the Great Financial Crisis (GFC) and the euro area debt crisis, as well as the more recent period of financial turbulence during the pandemic. At other times, the dollar betas tend to be relatively moderate, and can even dip into positive territory during non-crisis times.

To explore the property of the dollar beta as a cross-section asset pricing factor, we examine the cross-section relationship between the average MSCI country index return and the country's dollar beta. Figure 4 plots this cross-section relationship for a sample of major EMEs.

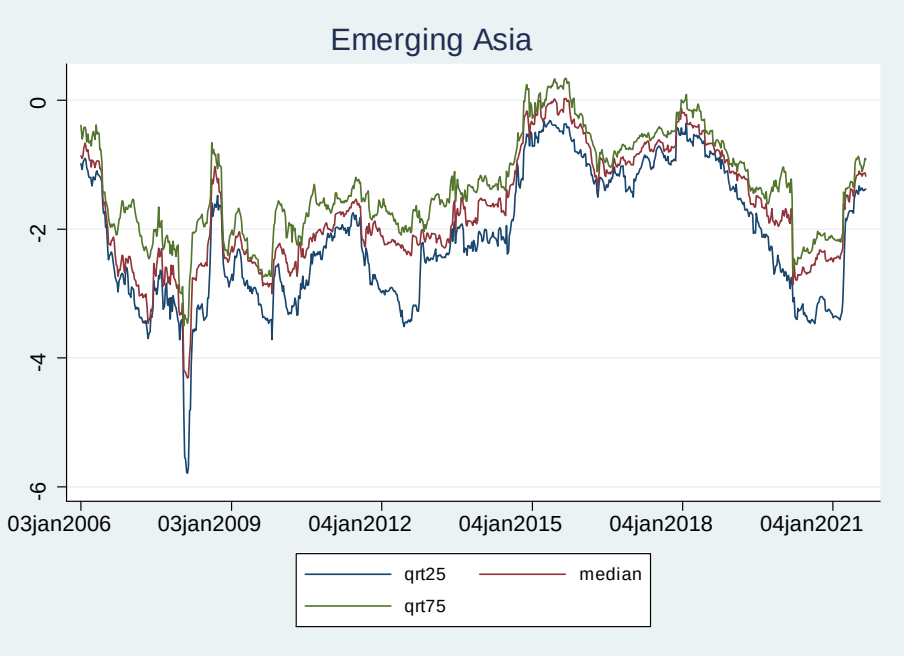

Figure 3: **Rolling dollar beta**

If the dollar is a risk factor priced in the cross section of equity returns, we would expect to see a positive relationship between a country's average equity return and the country's dollar beta, as a high dollar beta stock market would be associated with higher average returns to compensate for the greater risk-taking of investors. The analogy with the CAPM is that the high dollar beta stock markets are those that bear more of the systematic global risk factor, thereby limiting the extent to which investors can diversify away from portfolio risk. Figure 4 shows that the dollar beta takes on the attributes of a cross-section risk factor that is priced in average stock returns for EMEs, suggesting that investors who hold stocks in a high dollar beta stock market is compensated for the higher risk by a higher average return.

We validate the relationship shown in Figure 4 through the two-step procedure in Fama and MacBeth (1973). Specifically, 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 0.81 after removing extreme outliers. We take

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

this evidence as supporting our main finding that the dollar beta plays the role of an asset pricing factor that accounts for a significant portion of the cross-section variability of local currency-denominated returns.

5 Concluding remarks

This paper has provided three main contributions to the analysis of the financial channel of exchange rates via stock markets. First, as a measure of the strength of the financial channel of exchange rates across stock markets, we introduce the dollar return multiplier defined as the ratio of the dollar-denominated stock returns to the local currency stock returns. We show that the multiplier is larger than 1 – the dollar-denominated returns tend to be amplified versions of the local currency returns – in all EMEs in our sample economies included in the MSCI indexes.

Second, when both the broad US dollar index and the bilateral dollar exchange rate enter as explanatory variables in regressions for stock market returns, the broad dollar index is a more important explanatory variable than the bilateral exchange rate for EMEs. This finding is consistent with the financial channel of exchange rates operating in EME local currency sovereign bond markets.

Finally, the dollar beta, defined as the sensitivity of stock returns to swings in the broad dollar index, takes on the attributes of a cross-section asset pricing factor. In particular, 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.

These findings hold a number of policy implications for EMEs to the extent that the financial channel of exchange rates holds broader implications for the conduct of monetary policy and considerations for macro stabilisation frameworks. The mutually reinforcing relationship between an appreciation of the US dollar and domestic financial conditions via both local currency bond yields and stock market returns suggests that monitoring of exchange rates as a gauge of global financial conditions may be a useful complement to other market indicators for surveillance purposes.

More broadly, the development of capital markets that reduce the sensitivity of financial conditions to exchange rate fluctuations could be expected to contribute to the moderation of the financial channel of exchange rates, thereby providing greater scope for domestically-oriented policies.

During periods of acute stress, the channels of propagation of stress may also be mitigated somewhat through financial stability-oriented interventions in financial markets directly. Central banks do not normally intervene in domestic equity markets through the direct purchase of stocks. However, as in the bond market, central banks and financial authorities may need to monitor the size of foreign investment in local stock markets and the characteristics of investors (i.e. collective investment vehicles subject to redemption shocks, or strategic or long-term investors) and conduct stress tests.

In some instances, financial authorities in some EMEs encouraged domestic institutional

investors to step in to purchase stocks (for instance in Korea in March 2020, which established a stock market stabilisation fund by having both private financial institutions and securities industry organisations as participants, but which was unwound in April 2020). Between 1987 and 2003, the Thai government set up several stock market stabilisation funds operated jointly by the Ministry of Finance and the Stock Exchange of Thailand.

More broadly still, the development of monetary policy frameworks have also increasingly recognised the role of the financial channel of exchange rates, as noted in BIS (2020, 2021) and IMF (2020). A better understanding of the mechanisms behind the financial channel of exchange rates can be expected to contribute to further strengthening of EME policy frameworks, as emphasised in BIS (2019).

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