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Currencies of External Balance Sheets

Cian Allen, Deepali Gautam, and Luciana Juvenal

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Currencies of External Balance Sheets

Prepared by Cian Allen, Deepali Gautam, and Luciana Juvenal*

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ABSTRACT: This paper assembles a comprehensive dataset of the currency composition of countries' external balance sheets for 50 economies over the period 1990–2020. We document the following findings: (i) the US dollar and the euro still dominate global external balance sheets; (ii) there were striking changes in the currency composition across countries since the 1990s, with many emerging markets having moved from *short* to *long* positions in foreign currency, thus moving away from the so-called "original sin"; (iii) financial and trade-weighted exchange rates are weakly correlated, suggesting the commonly used trade indices do not adequately reflect the wealth effects of currency movements, and (iv) the large wealth transfers across countries reduced global imbalances during the global financial crises, but increased them during the COVID-19 crisis.

JEL Classification Numbers:	F20, F31, F41
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Author's E-Mail Address:	callen@imf.org, dgautam@imf.org, ljuvenal@imf.org

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1 Introduction

Understanding the international financial implications of currency movements is a key question in international macroeconomics. As the size of external balance sheets has increased, currency movements, through their impact on capital gains and losses, have played a growing role in the reallocation of wealth across countries. At the same time, the currency composition of the different items of the international investment positions (IIP), for instance equity (portfolio and FDI) and debt, may be important in understanding vulnerability to external shocks.[1]

To improve our understanding of these trends, we assemble a comprehensive and up-to-date dataset of the currency composition of the external balance sheets for 50 economies over the period 1990–2020. This builds on earlier work by Lane and Shambaugh (2010a,b), Bénétrix, Lane, and Shambaugh (2015), and updates and extends Benetrix, Gautam, Juvenal, and Schmitz (2019). An essential refinement in our new dataset centers on the expansion of available official or actual data (as opposed to estimates), made possible thanks to a recent IMF survey to country authorities on the currency composition of the main IIP components.[2] Each item of the IIP is broken down into the US dollar, euro, Japanese yen, Pound sterling, renminbi, domestic currency (if different from the big five), and "other currencies". The data from the survey are complemented by a rich range of other sources of official data.[3]

In this paper, we focus on four main areas. First, we examine the currency composition of global international balance sheets, which emphasizes the dominance of the dollar and the euro. Next, we trace the changes in currency composition of external balance sheets over the recent decades. Third, we analyze the factors driving these trends, including specific balance sheet items and associated macroeconomic factors. Finally, by computing net effective financial exchange rate indices, and resulting valuation changes due to exchange rate and other movements, we highlight how the substantial wealth transfers occurring during the Global Financial Crisis (GFC) and the COVID-19 crisis varied across countries.

Our key findings are described as follows. Despite some prevailing views, the dominance of the dollar and the euro as the main currency of external balance sheets has not decreased in recent years, representing around 50% of the total cross-border holdings. When analyzing long-term dynamics, the cross-country distribution of foreign currency exposures has changed significantly. From 1990 to 2020 there has been a discernible shift towards *long* positions (i.e., larger gross foreign assets in foreign currency than liabilities in foreign currency). This evolution is particularly striking in emerging markets. Most of these economies are now *long* in foreign currency, deviating from traditional views that associate emerging markets primarily with foreign currency debt and minimal foreign assets, exposing them to balance sheet risks during domestic currency depreciations.

[1]The literature has documented emerging markets' reliance on foreign currency borrowing by the government and its associated balance sheet effects, see Eichengreen et al. (2003).

[2]This data will be publicly available along with the publication of this paper.

[3]For instance, the IMF's Coordinated Portfolio Investment Survey (CPIS), the Bank of International Settlements (BIS) international debt issuance statistics, and the banks cross-border positions data reported to the BIS through its Locational Banking Statistics.

Moreover, the post-global financial crisis period has been characterized by very persistent net foreign currency exposures, with most of the adjustment taking place in the lead-up to the financial crisis. However, these aggregate patterns mask considerable heterogeneity across asset class and currency, as emerging markets' net currency exposure in net portfolio debt deteriorated, whereas there were improvements in the currency exposure of FDI and other investment.[4] This can be particularly relevant as foreign currency debt liabilities have been shown to be a strong predictor of crisis (Catão and Milesi-Ferretti 2014; Cubeddu et al. 2023). We show that these patterns are relatively well accounted for by a set of country characteristics established by the literature.

Finally, we construct financially weighted exchange rates and show that they are only weakly correlated with the more commonly used trade-weighted indices. This suggests that trade-weighted exchange rate indices may not be useful in understanding the wealth effects of currency movements. We compare the valuation changes induced by exchange rate movements and other factors (asset prices and other statistical changes) across countries during the GFC and the COVID-19 crisis. While these two episodes of heightened uncertainty were very different in nature, we find that the shift in wealth was substantial and broad-based, with emerging markets experiencing valuation gains in both episodes. Our analysis also suggests that these large wealth transfers during the COVID-19 crisis increased global stock imbalances ("destabilizing" valuation changes) compared to a reduction during the global financial crisis ("stabilizing"). Taken together, these new findings lead us to reassess some of the main characteristics of foreign currency exposures, in particular of emerging markets, and highlight that it is increasingly important to look at both the currency exposures of the different items of the balance sheet (debt and equity), in tandem with the aggregate net exposure of the net international investment position (see, for example, Hale and Juvenal, 2023).

Our work is related to a large body of literature on valuation changes of international balance sheets.[5] First and foremost, it builds on the previously mentioned papers that construct estimates of the currency composition of the net international investment position (NIIP), relying on estimates (Lane and Shambaugh 2010a,b; Bénétrix et al. 2015) and the first iteration of our IMF survey (Benetrix et al. 2019). In a similar fashion to Benetrix et al. 2019, our contribution relative to the papers relying on estimates, is to propose a dataset that is primarily based on actual data. Relative to Benetrix et al. 2019,our dataset offers improvements in terms of country coverage, time period, and but also a different focus. For this paper, a significantly larger number of economies have provided responses to the survey, increasing the accuracy of the dataset, as we extend the coverage to 2020. Moreover,

[4]This was primarily due to increases in foreign currency bank loans and debt issuance of the private sector (in line with Du and Schreger, 2022), as Shin and von Peter (2022) document a decrease in the foreign currency borrowing of governments in emerging markets.

[5]More broadly, this paper is related to pioneering papers documenting the importance of valuation changes in external balance sheet dynamics, for the US (Gourinchas and Rey 2007), or a larger set of countries (Lane and Milesi-Ferretti 2007a). These calculations come with well-documented pitfalls in relation to measurement (Curcuru et al. 2008). See Bertaut et al. (2023) for recent summary of this strand of the literature.

throughout the paper, we emphasize the granularity of the currency composition of the international balance sheet by asset class. A related strand of the literature has focused on the currency composition of specific items of the balance sheet, for instance foreign exchange reserves (Arslanalp et al. 2022; Chinn et al. 2022) or debt liabilities (Shin and von Peter 2022). Relative to these papers, we study the full net international investment position. Moreover, we also contribute to an array of papers that document external adjustments during crisis episodes, and in particular that study the amplifying or stabilizing role of balance sheets (Lane and Milesi-Ferretti 2012; Gourinchas et al. 2012; Forbes et al. 2017; Adler and Garcia-Macia 2018; Bergant 2021; Hale and Juvenal 2023). Relative to these papers, we do a full breakdown of changes in the balance sheet by flows, valuation due to exchange rate movements and other changes (including asset prices and other statistical changes) and contrast the recent COVID-19 crisis and the global financial crisis. More recently, papers have used micro-data to document trends in global capital allocations, highlighting the role of currency of denomination of assets in international portfolios as well as tax havens and offshore financial centers (Maggiori et al. 2020; Milesi-Ferretti et al. 2023; Beck et al. 2023; Florez-Orrego et al. 2023). We view this paper as a complement to those studies.[6] Finally, this paper is related to the literature on dominant currencies in trade (see, for instance, Boz et al. 2022), and the complementarities between currencies of invoicing and global finance (Gopinath and Stein 2018).

It is important to stress from the outset four main data limitations in an exercise of this nature. First, given the large data gaps that can exist, we have made many assumptions in constructing our dataset. These assumptions are thoroughly documented in the subsequent section and associated appendix. Second, we lack precise data on the currency composition of derivative positions. These positions tend to be inadequately measured in the balance of payments data. Therefore, we exclude derivatives from the analysis. Third, our data are at the aggregate level of the economy and, as such, could hide considerable currency mismatches across sectors. Finally, consistent with the balance of payments principles, our data are based on the residency of the investors, which can attribute excessively large holdings to offshore financial or custodial centers (Florez-Orrego et al. 2023).

The paper is organized as follows. Section 2 includes a description of how we constructed the dataset. Then, in Section 3, we document the long-term shifts in the currency composition of international balance sheets and analyse their relationship with macroeconomic aggregates. In Section 4, we use these data to construct net effective financial exchange rate indices and calculate valuation changes attributable to currency fluctuations. As an illustration, we use these metrics to shed light on large wealth transfers across countries in two recent episodes of heightened uncertainty: the GFC and the COVID-19 crisis. Finally, Section 5 concludes.

[6] This paper is also related to the literature studying financial exchange rates (see, for instance, Goldberg and Krogstrup 2023).

2 Data

This paper's dataset builds upon previous contributions by Lane and Shambaugh (2010a) and Bénétrix et al. (2015), which estimated the currency composition of external assets and liabilities for a sample of 117 economies between 1990-2004 and 1990-2012, respectively. In line with Benetrix et al. (2019), our dataset offers significant improvements. We rely on actual data reported to the IMF by national statistical authorities for a sample of 50 economies, reducing the reliance on estimated currency weights. This, along with more granular information, has allowed us to refine estimates and expand coverage.

Our approach involves combining actual data with estimated currency weights to fill in gaps and extend coverage over the period 1990-2020. We focus on a sample of 50 economies, accounting for over 90% of world GDP.[7] Our Appendix provides a detailed description of the methods and data sources used to estimate the currency composition of international balance sheets, highlighting the improvements made compared to earlier work. Financial derivatives are excluded from our analysis due to data collection and methodological issues.

2.1 Data: Actual, Synthetic, and Estimated

Actual data were collected from multiple sources, including an IMF-administered survey to country authorities and the Coordinated Portfolio Investment Survey (CPIS). To address data gaps, "synthetic data" from the Bank of International Settlements (BIS) were used, specifically from International Debt Issuance (IDS) and Locational Banking Statistics (LBS).

The primary actual data source is a survey conducted jointly by the IMF Research and Statistics Departments. This survey solicited data from 1990 onward on key components of the IIP, broken down into the five SDR currencies (i.e., US dollar, euro, Japanese yen, pound sterling, and renminbi), domestic currency, and "other currencies," which bundle up all the other foreign currencies not included in the previous two categories. The survey was voluntary, yielding a 85% response rate for recent years, but data coverage diminishes for earlier periods. For additional survey details, refer to Section A.1 in the Appendix.

To complement the survey data, we used Table 2 of the CPIS, which includes the currency composition of portfolio equity and portfolio debt assets, as well as IDS data from the BIS. We also used the currency of denomination of cross-border positions of banks sourced from the BIS LBS. Tables A1–A3 in the Appendix describe the coverage of actual data for each country.

While we used actual data whenever possible, our final dataset extends the coverage of

[7]The economies are: Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Colombia, Czechia, Denmark, Egypt, Finland, France, Germany, Greece, Guatemala, Hong Kong SAR, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Korea, Malaysia, Mexico, Morocco, Netherlands, New Zealand, Norway, Pakistan, Peru, Philippines, Poland, Portugal, Russia, Singapore, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Thailand, Tunisia, Türkiye, United Kingdom, United States and Uruguay. Data for Russia start in 1993 due to lack of information. We also report data for the Czechia from 1993 onward, as this is when the economy was established.

actual data with synthetic or estimated currency positions. Synthetic data refers to actual data which are good proxies for items of the IIP. For example, BIS international debt issuance is used as synthetic data for portfolio debt liabilities. Banking data from BIS LBS is used as synthetic data for other investment (asset and liabilities). Estimated data refers to estimates of currency weights that rely on the geographical distribution of holdings as a predictor of the currency composition of certain items of the balance sheet, under assumptions described in the Appendix.

The hierarchy for the data construction involves using actual data whenever available, supplementing it with synthetic data, and filling in the remaining gaps with estimates. In Appendix A, we provide a detailed description of the methods used to estimate each item, which include both direct estimation and model-based methods.

2.2 Foreign Assets

The international investment position of a country's assets comprises five main items: portfolio equity, foreign direct investment (equity and debt), portfolio debt, other investment (mainly bank-related), and reserves. To obtain actual data for portfolio equity assets, we relied on the IMF survey and CPIS Table 2 as sources. However, to fill gaps in the data going back in time, we used a method based on geography, as described in Lane and Shambaugh (2010a). The CPIS dataset provides the geographical location of portfolio equity asset holdings for 82 reporting economies and 220 host economies since 2001. This approach assumes that equity issued by a country is denominated in the currency of the host country. For more details about the methodology, please refer to Appendix A.

To obtain a more accurate picture of the currency composition of FDI, we split the equity and debt components. In both cases, actual data are from the IMF survey. In order to fill the gaps when actual data were unavailable, we first obtained the share of equity in FDI from the IMF International Financial Statistics (IFS). As a second step, we used estimated the currency weights of FDI equity, relying on data from Lane and Shambaugh (2010b) for the period between 1990 and 2008, and data from the Coordinated Direct Investment Survey (CDIS) for the years between 2009 and 2020. Similar to our approach for portfolio equity assets, we assumed that direct investment is denominated in the currency of the host country. For FDI debt, we used actual data from the IMF survey whenever available, and we generated proxy data using the currency weights of portfolio debt assets.

Actual data for portfolio debt is sourced from the IMF survey and CPIS Table 2. To expand coverage, we used the estimation method developed by Lane and Shambaugh (2010a), which combines the geography of portfolio debt assets positions from the CPIS with the currency of denomination of host countries' bonds issued in international markets.

Actual data for other investment comes from the IMF survey, with coverage extended backward based on the BIS LBS. Since banking assets are the largest component of other investment, the LBS data provided a useful source to expand coverage and obtain a more comprehensive picture of the currency composition of other investments.

Data on the currency composition of reserves from 1990 to 2017 are sourced from Benetrix et al. (2019). We extend it to cover the period up to 2020 by combining data from multiple non-confidential sources: Central Banks or Ministry of Finance Publications, publicly available IMF Currency Composition of Official Foreign Exchange Reserves (COFER), and Ito and McCauley (2020) data (more details are included in Appendix A).

2.3 Foreign Liabilities

The liabilities side of a country's international investment position comprises four main items: portfolio equity, foreign direct investment (equity and debt), portfolio debt, and other investment (mainly bank-related).

Consistent with our treatment on the asset side, we assumed that portfolio equity and FDI equity liabilities are denominated in the currency of the host country, implying exposure in domestic currency.[8] Whenever actual data on FDI debt was available, we used it from the IMF survey and extended its coverage backwards using proxy weights based on the currency breakdown of portfolio debt liabilities.

Actual data on portfolio debt were obtained from the IMF survey. For most countries, synthetic data for the currency breakdown were sourced from the BIS international debt issuance statistics. This dataset covers all debt securities issued by non-residents and includes a comprehensive breakdown by currency. As with other series, we used actual data whenever available and extended the series using synthetic data. Finally, we assembled other investment liabilities in the same manner as we did for other investment assets.

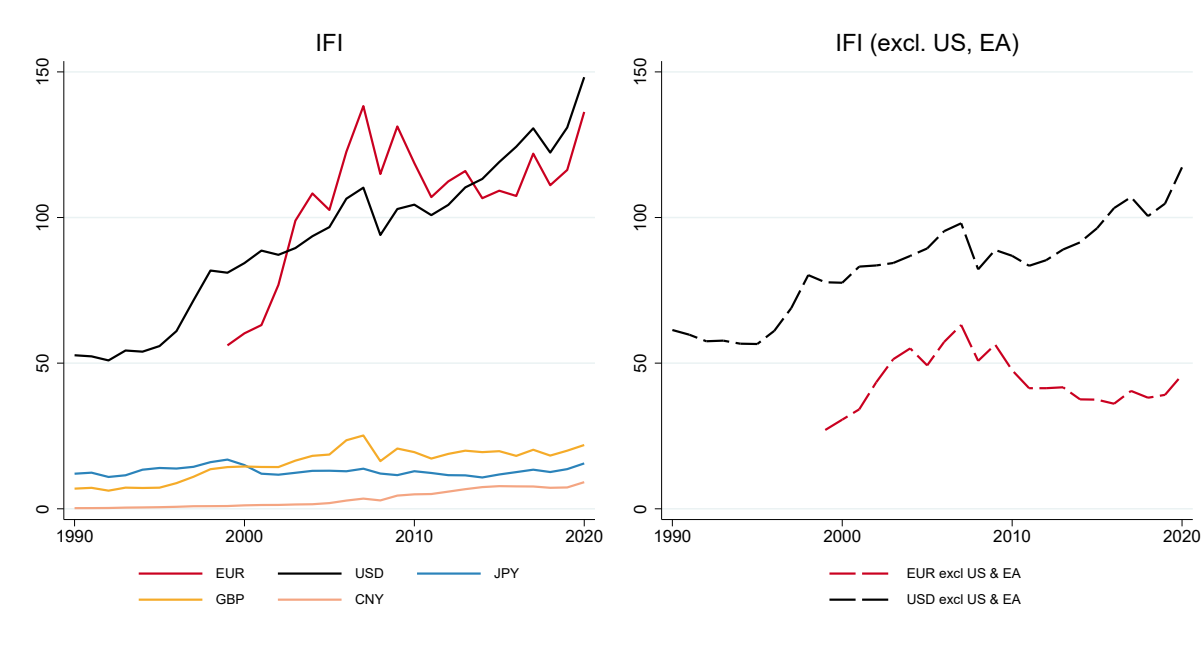
3 Currencies over Time

Lane and Milesi-Ferretti (2003) and Lane and Milesi-Ferretti (2007b) have analyzed the evolution of a measure of international financial integration (IFI) based on cross-border assets and liabilities positions relative to GDP. The authors have documented a significant increase in international financial integration from the 1990s until the global financial crisis and have noted that the pace of integration has been more gradual for emerging markets than for advanced economies. More recently, Lane and Milesi-Ferretti (2018) highlighted that the growth in international financial integration came to a halt in the aftermath of the global financial crisis. This trend is mainly attributed to the decline in cross-border activity by banks in advanced economies.

Our dataset provides an opportunity to examine the currency dimension of the IFI measure and analyze how the trends in international financial integration are reflected in the currency breakdown. Of particular interest is to assess the role of the US dollar relative to the euro since these are the two dominant currencies in international finance and trade. The left panel of Figure 1 displays the measure of IFI denominated in US dollars (in black), euros (in red), pound sterling (in yellow), renminbi (in orange), and yen (in blue) for all the

[8] Our access to actual data confirms the validity of this assumption.

Figure 1: International Financial Integration (IFI)



Note: This figure plots our measure of International Financial Integration (IFI), which represents the gross scale of the international balance sheet measured by the sum of total foreign assets and foreign liabilities (in each currency) in percent of GDP. The chart on the left includes the entire sample while the chart on the right excludes the US and the Euro Area in order to quantify the scale of global dominance of the USD and Euro in the world economy. We take the sum of external assets and external liabilities scaled by the weighted average of each country's GDP. EUR denotes euro, USD dollar, JPY Japanese yen, GBP Pound Sterling, and CNY renminbi.

countries in our sample. The right panel includes a measure of IFI in US dollars (dashed black) and euros (dashed red) for a sample of all countries excluding the US and the Euro Area, in order to quantify the scale of global dominance of the US dollar and euro in the world economy. In all cases, the IFI is calculated as the sum of external assets and external liabilities scaled by the weighted average of each country's GDP.

The Figure reveals some noteworthy patterns. The overall trends identified in previous studies such as Lane and Milesi-Ferretti (2003), Lane and Milesi-Ferretti (2007b), and Lane and Milesi-Ferretti (2018) are clearly visible in our findings, highlighting the significant role of the economies in our sample in global finance. The IFI measure has doubled from the early 1990s to 2020, with a decline observed in some currencies in the aftermath of the global financial crisis. Stated differently, as of 2020, around 50% of the total cross-border holdings are denominated in US dollars or euros. In contrast, the Pound sterling (around 4%), the Japanese yen (3%), and the renminbi (2%) only represent a combined 8%.[9] If we only consider foreign currency holdings, the USD and euro shares rise to 77%. These findings emphasize the continued dominance of these two currencies in international finance

[9]The USD represents around 28% of gross assets and 23% of gross liabilities, while the euro accounts for 27% and 21% respectively.

and trade.

When considering all economies in our sample, we observe a rapid expansion of euro-denominated cross-border holdings from 1999 to 2007, followed by a considerable decline after the global financial crisis. In contrast, US dollar positions dropped in 2008 but quickly recovered, showing a clear upward trend and gaining predominance over the euro since 2014. It is worth noting that this shift away from the euro and into the dollar is not exclusive to the US or Euro Area countries. In fact, even when we exclude the US and Euro Area countries, the trend remains present, with an unambiguous dominance of cross-border holdings in US dollars throughout the sample period. We also note that the difference between the IFI measure in dollars (in black) and in euros (in red) has widened since 2007, with US dollar cross-border positions three times larger than those denominated in euros by 2017, increasing even further in 2020 after the peak of the COVID-19 crisis.[10] This highlights the continued dominance of the US dollar in international finance.

The shift away from the euro and into the US dollar, as observed in our dataset, can be attributed to several factors. Euro Area banks have continuously deleveraged from cross-border positions since the global financial crisis, as documented by studies by McCauley et al. (2019) and Emter et al. (2019). This deleveraging was driven by European banks responding to credit losses by retrenching from assets abroad. The uncertainty triggered by the Euro Area sovereign debt crisis also led investors to shift away from euro positions, as shown in Maggiori et al. (2019). Additionally, the US dollar's appreciation and the high liquidity of dollar assets during the global financial crisis further reinforced its dominant role. This is particularly the case since the supply of safe euro-denominated assets is lacking compared to the US dollar, as highlighted by Ilzetzki et al. (2019). A further shift to the US dollar in 2020 may reflect the flight to safety during the COVID-19 crisis (Hale and Juvenal, 2023).

3.1 Evolution of Foreign Currency Exposures

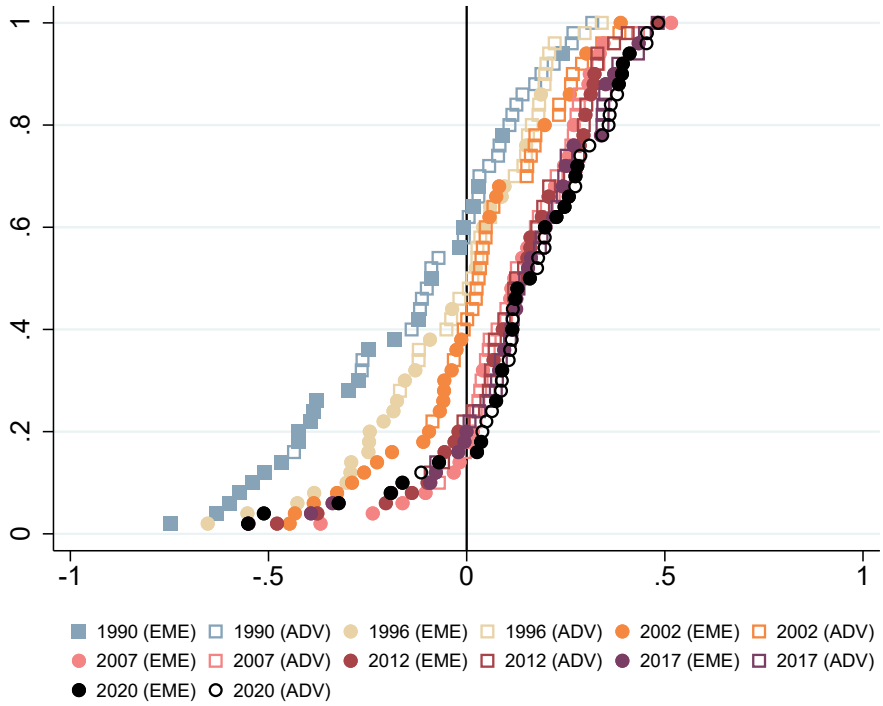
Following Lane and Shambaugh (2010a), we define foreign currency exposure using an indicator that represents net foreign assets denominated in foreign currency as a proportion of total assets and liabilities. This aggregate foreign currency exposure indicator (FX^{AGG}) for each country is computed as follows:

$$\begin{aligned} FX_{i,t}^{AGG} &= \omega_{i,t}^{A} s_{i,t}^{A} - \omega_{i,t}^{L} s_{i,t}^{L} \\ &= \sum_{c} \omega_{i,t}^{A,c} s_{i,t}^{A} - \sum_{c} \omega_{i,t}^{L,c} s_{i,t}^{L} \end{aligned} \tag{1}$$

where $\omega_{i,t}^{A}$ is the proportion of assets denominated in foreign currency, and $s_{i,t}^{A}$ the share

[10] In 2020, cross-border holdings in US dollars or euros excluding these groups represent over 45% of the total.

Figure 2: Aggregate Foreign Currency Exposures: 1990-2020



Note: This figure plots the distribution of net aggregate foreign-currency exposures (FX^{AGG}). Advanced economies have hollow symbols while emerging economies have solid symbols. This index captures the sensitivity of a country's portfolio to a uniform currency movement by which the home currency moves proportionally against all foreign currencies.

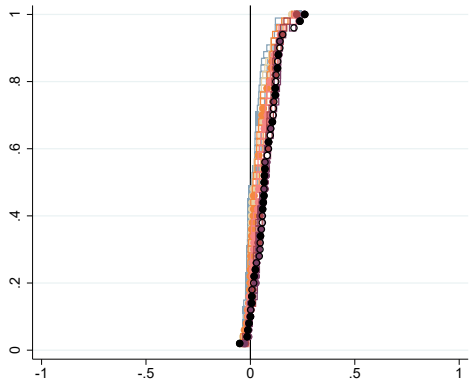
of assets in a country's external balance sheet ($s^A_{i,t} = \frac{A_{i,t}}{A_{i,t}+L_{i,t}}$). Similarly, $\omega^L_{i,t}$ and $s^L_{i,t}$ are defined for liabilities. Each asset class, denoted c, sum to total assets ($\omega^A_{i,t} = \sum_c \omega^{A,c}_{i,t}$).[11] By construction, $s^A_{i,t} + s^L_{i,t} = 1$. A positive FX^{AGG} value implies that a country is long on foreign currency, whereas a negative value implies that it is short on foreign currency. The indicator captures a country's external position's sensitivity to a uniform appreciation or depreciation of its currency relative to all other currencies.

Figure 2 displays the cumulative distribution of FX^{AGG} positions across economies for the years 1990, 1996, 2007, 2012, 2017, and 2020, with distinct categorizations for advanced economies (indicated by hollow symbols) and emerging economies (highlighted by solid symbols). Building upon the findings of Lane and Shambaugh (2010a) and Benetrix et al. (2019), we observe a clear rightward shift toward long foreign currency positions since 1990—a trend that aligns closely with the surge in global financial flows.

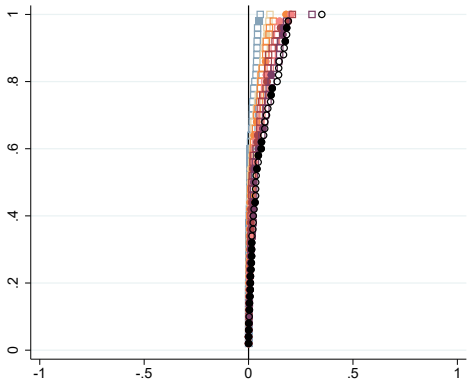
In the first year of our sample, 1990, our sample reveals that a substantial 60% of economies held net negative foreign currency positions. By 2020, this ratio had declined sharply to

[11]Asset class refers to each item of the international investment position: Foreign Direct Investment, Portfolio Equity, Portfolio Debt, Other Investment, and foreign currency reserves.

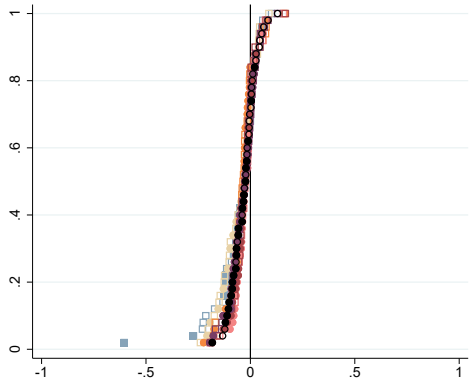
Figure 3: Foreign Currency Exposures by Asset Class: 1990-2020



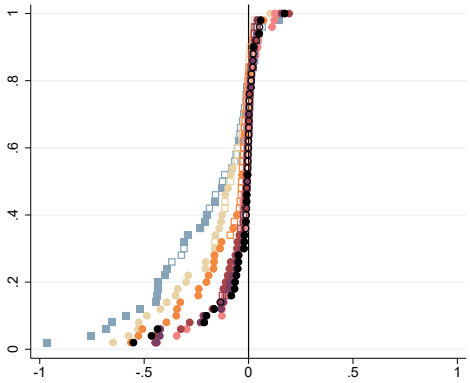
(a) Foreign Direct Investment



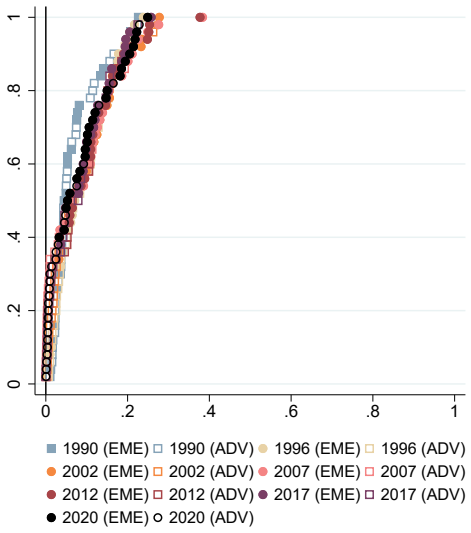
(b) Portfolio Equity



(c) Portfolio Debt



(d) Other Investment



(e) Reserves

Note: This figure plots the distribution of net aggregate foreign-currency exposures (FX^{AGG}). Advanced economies have hollow symbols while emerging economies have solid symbols.

just 14%. This significant transformation in the distribution began ahead of the global financial crisis and subsequently leveled off to some extent. Our analysis attributes the bulk of this change primarily to improvements in other investment positions and portfolio equity. Notably, the accumulation of foreign exchange reserves also contributes to the observed trend, particularly with respect to the 1990s. To provide further granularity, Figure 3 shows FX^{AGG} by asset class, confirming that shifts in other investment—predominantly bank-related—and portfolio equity are the principal factors driving this ongoing evolution.

Examining the evolution of emerging economies (EMEs) reveals a significant shift in their foreign currency positions. In 1990, 20 of the 30 economies with short foreign currency positions were EMEs; by 2020, this number had reduced to 6 out of 7. Three main factors contribute to this improvement. First, a series of current account surpluses led to a favorable increase in the ratio of foreign assets to foreign liabilities. Second, there was a transition in the foreign liabilities portfolio, characterized by a substitution of foreign-currency debt liabilities with equity-type liabilities. Third, the lending strategies of international banks evolved. Prior to the mid-1990s, loans to EMEs were primarily cross-border and denominated in foreign currency. Post-1995, international banks increased local currency lending through their local affiliates, particularly after acquiring EME banks with robust local currency deposits. This strategy mitigated currency mismatch risks (Chui et al., 2018).

Despite improvements, net negative positions in foreign currencies remain primarily concentrated in EMEs, a trend often labeled as "original sin" (Eichengreen et al., 2003). This concentration poses ongoing concerns about EME vulnerability to external shocks, particularly large currency fluctuations. Our analysis indicates a decline in currency mismatches, attributable in part to structural reforms since the 1990s, significant accumulation of foreign assets in the 2000s, and stricter banking regulations (Chui et al., 2016). While the aggregate risk profile has improved, vulnerabilities in portfolio debt due to foreign currency exposure persist. This may be influenced by corporate activities, although our data does not explicitly confirm this. Furthermore, we note a substantial worsening in Portfolio Debt exposures since the Global Financial Crisis (GFC) of 2007/2008 and the Taper Tantrum of 2013, suggesting an increased reliance on foreign-currency denominated debt.

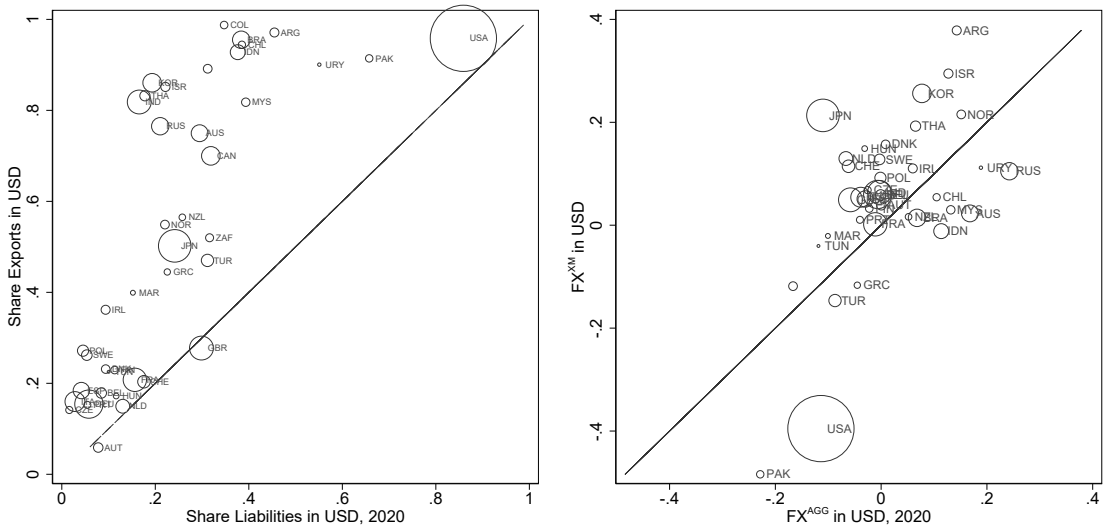
3.2 Link with Aggregate Trade Invoicing

Recent papers have documented the dominant role of the US dollar and the Euro in international trade (Boz et al., 2022). The papers show that most of trade is invoiced in these currencies regardless of the economies transacting. However, the interaction between the currency of trade and of financing is key to study the effects of a depreciation of the domestic currency, with US dollar trade potentially providing a "natural hedge". In this section, we look at the correlation between dominant currencies in trade and finance. It is important to note that we are looking at simple macro correlations that ignore any mismatch at the sector or firm-level.[12,13] Figure 4 (left-hand side) shows that economies with a higher

[12]For papers documenting mismatches at the firm-level, see Casas et al. (2023) and Alfaro et al. (2021).

[13]We also focus on the association between trade and financing in dominant currencies, without making any causal claims.

Figure 4: Currency Composition and Aggregate Trade Invoicing



Note: This figure plots the correlation between the share of exports denominated in USD and the share of total liabilities denominated in USD (left-hand side) and between net aggregate USD exposures (FX^{AGG}) and net trade exposure in USD (FX^{XM}) (right-hand side), based on data availability. Circles sizes are proportional to GDP in US dollars.

share of invoicing in USD (in this case, exports) have a higher share of USD denominated assets and liabilities (with a similar pattern for imports). However, when considering net trade and net balance sheets, this correlation drops drastically. In Figure 4 (right-hand side), we illustrate the relationship between our currency exposure measure (FX^{AGG}) and a corresponding metric for net trade in USD.[14] This implies that, at an aggregate level, and perhaps surprisingly, economies with predominant US dollar-based trade do not necessarily show larger net balance sheet exposures in USD.

3.3 Regression Analysis

In this section, we delineate the relationship between foreign currency exposures — both at an aggregate level and by asset class — and a selection of macroeconomic variables. Following the empirical strategy outlined in Lane and Shambaugh (2010b), we analyze a series of parsimonious regression analyses, opting to use the rich information encompassed within the entire panel dataset, as opposed to confining our investigation to observations at a four-year interval. Our regressions encompass a range of determinants, namely trade and financial openness, macroeconomic risk, prevailing exchange rate regimes, and country size, all to gauge their respective association with foreign currency exposures. Appendix A.4 details the sources of the macro variables used in the regression analysis. Table 1 shows the

[14]This is constructed analogously to FX^{AGG}, with $FX^{XM} = \omega^X s^X - \omega^M s^M$ and ω^X and ω^M the share of exports and imports in USD, s^X and s^M the share of exports and imports in total trade (exports + imports). We use the average USD share by country for imports and exports given data availability in Boz et al. (2022).

Table 1: Determinants of FX^{AGG}

	(1)	(2)	(3)	(4)	(5)
Openness	0.135***	0.138***	0.108***	0.098***	0.111***
	(0.014)	(0.014)	(0.014)	(0.015)	(0.014)
Inflation volatility	0.179	0.165	-0.089	-0.139	0.034
	(0.156)	(0.173)	(0.154)	(0.154)	(0.143)
GDP volatility	1.094**	0.873*	0.712	1.094**	0.539
	(0.490)	(0.488)	(0.465)	(0.441)	(0.403)
NEER volatility	-0.237**	-0.221*	0.008	0.035	-0.092
	(0.120)	(0.133)	(0.123)	(0.121)	(0.109)
cov (GDP, NEER)	-4.226	-7.744**	-9.840**	-10.238***	
	(3.773)	(3.708)	(3.923)	(3.578)	
Log population	0.052***	0.051***	0.049***	0.056***	0.069***
	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)
Institutions	0.800***	0.841***		0.419***	0.526***
	(0.061)	(0.062)		(0.082)	(0.082)
Capital controls	-0.163***	-0.181***		-0.094***	-0.089***
	(0.026)	(0.025)		(0.028)	(0.026)
Peg		-0.041***		-0.001	-0.024**
		(0.012)		(0.012)	(0.010)
EMU		-0.076***		-0.129***	
		(0.011)		(0.012)	
Log GDP per capita			0.145***	0.112***	0.112***
			(0.008)	(0.013)	(0.012)
Reserve currency					-0.494***
					(0.040)
Observations	1,437	1,437	1,442	1,437	1,484
R-squared	0.402	0.440	0.407	0.475	0.498

Notes: Regressions include year fixed effects. Robust standard errors in parentheses. ***, **, and * denote, respectively $p < 0.01$, $p < 0.05$, and $p < 0.1$.

results for aggregate foreign currency exposures while Tables 3 and 2 report the results for individual asset classes: FDI, portfolio equity (PEQ), portfolio debt (PD), other investment (OI), and reserves.

The regression results indicate that higher trade openness is clearly associated with a more positive value of FX^{AGG}: this is true whether more extensive controls are present or not. Furthermore, this positive link is consonant with theoretical frameworks which posit a heightened significance of foreign assets in portfolios as the proportion of imports in domestic consumption is higher (Obstfeld and Rogoff, 2001). In essence, our results echo the foundational argument that there exists a robust linkage between trade openness and foreign currency exposure, underscoring the important role played by international trade in shaping foreign asset allocations.

Turning to volatility indicators, and focusing on FX^{AGG}, the volatility of the nominal effective exchange rate has the expected negative sign in column (1) and (2). The volatility of GDP is significant only in columns (1), (2) and (4) but with a positive sign. Finally, the covariance of output and the nominal effective exchange rate (NEER) enters with a

significant negative sign in columns (2), (3) and (4). Therefore, the relation between the various volatility indicators and FX^{AGG} seems unclear.

Delving into the role of institutional and policy variables for FX^{AGG}, the results indicate that a better institutional environment is associated with a more positive value for FX^{AGG}, while the estimated coefficient on the exchange rate peg is significantly negative. In addition, both capital controls and the EMU dummy are significant. However, the inclusion of GDP per capita as a control in column (4) alters the result for the peg, which becomes insignificant. The evidence from columns (3)-(5) suggests that FX^{AGG} is highly correlated with the level of development: richer countries have a more positive index of foreign-currency exposure (i.e are longer in foreign currency) . It is expected that the ability to issue domestic-currency liabilities and obtain foreign-currency assets is increasing in institutional dimensions that are highly correlated with the level of development. Finally, the estimated coefficient on country size is positive and significant.

The positive association between openness, level of development, country size, capital controls and currency exposures is consistent across asset classes. The relation between inflation volatility and foreign currency exposure in portfolio debt and foreign exchange reserves is negative and significant. Countries with lower inflation volatility have longer foreign currency exposures in portfolio debt and reserves. Instead, the association is positive for FDI and other investment. For portfolio equity, it is insignificant in all specifications except when we control for GDP per capita in columns (8) and (9). GDP volatitlity enters with a positive sign for portfolio debt, other investment, and reserves and with a negative sign in FDI and portfolio equity. The covariance between GDP and the NEER is negative and significant only for portfolio debt. Institutions enter positively in the regressions for FDI, portfolio equity, and other investment, and negatively for portfolio debt and reserves. In turn, capital controls enter negatively in the regressions for all asset classes except reserves.

Table 2: Determinants of Foreign Currency Exposures: FDI and PEQ

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
			FDI					Portfolio Equity		
Openness	0.038***	0.039***	0.030***	0.024***	0.029***	-0.016***	-0.015***	-0.020***	-0.018***	-0.010***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Inflation volatility	0.211***	0.206***	0.128***	0.094***	0.129***	-0.016	-0.019	-0.072***	-0.048*	0.023
	(0.034)	(0.035)	(0.029)	(0.031)	(0.023)	(0.021)	(0.028)	(0.022)	(0.027)	(0.027)
GDP volatility	-0.617***	-0.689***	-0.607***	-0.607***	-0.617***	-0.405***	-0.507***	-0.496***	-0.486***	-0.586***
	(0.103)	(0.099)	(0.091)	(0.089)	(0.083)	(0.083)	(0.095)	(0.078)	(0.092)	(0.089)
NEER volatility	-0.155***	-0.149***	-0.082***	-0.054**	-0.082***	0.027	0.032	0.074***	0.056***	-0.001
	(0.028)	(0.028)	(0.023)	(0.024)	(0.018)	(0.016)	(0.022)	(0.017)	(0.021)	(0.020)
cov (GDP, NEER)	1.812**	0.669	0.457	-0.251		0.632	-0.993*	-0.946**	-1.231**	
	(0.729)	(0.659)	(0.631)	(0.591)		(0.480)	(0.571)	(0.449)	(0.589)	
Log population	0.011***	0.010***	0.011***	0.012***	0.014***	-0.001	-0.002**	-0.003***	-0.002**	-0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Institutions	0.186***	0.201***		0.045***	0.057***	0.185***	0.200***		0.159***	0.160***
	(0.014)	(0.015)		(0.017)	(0.016)	(0.012)	(0.012)		(0.013)	(0.012)
Capital controls	-0.031***	-0.037***		-0.006	-0.007	-0.018***	-0.025***		-0.017***	-0.016***
	(0.006)	(0.006)		(0.006)	(0.005)	(0.005)	(0.005)		(0.005)	(0.005)
Peg		-0.013***		0.002	-0.013***		-0.020***		-0.016***	-0.031***
		(0.003)		(0.004)	(0.003)		(0.002)		(0.003)	(0.002)
EMU		-0.026***		-0.045***			-0.031***		-0.036***	
		(0.004)		(0.004)			(0.003)		(0.003)	
Log GDP per capita			0.037***	0.041***	0.035***			0.025***	0.011***	0.002
			(0.002)	(0.003)	(0.003)			(0.001)	(0.002)	(0.002)
Reserve currency					-0.085***					-0.024**
					(0.015)					(0.012)
Observations	1,437	1,437	1,442	1,437	1,484	1,437	1,437	1,442	1,437	1,484
R-squared	0.294	0.353	0.341	0.421	0.387	0.319	0.463	0.286	0.469	0.421

Notes: Regressions include year fixed effects. Robust standard errors in parentheses. ***, **, and * denote, respectively $p < 0.01$, $p < 0.05$, and $p < 0.1$.

Table 3: Determinants of Foreign Currency Exposures: PD, OI, and reserves

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(3)	(4)	(5)
	Portfolio Debt					Other Investment					Foreign Exchange Reserves				
Openness	0.069***	0.069***	0.066***	0.066***	0.076***	0.026***	0.034***	0.000	0.002	-0.008	0.023***	0.015***	0.034***	0.028***	0.026***
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.009)	(0.010)	(0.009)	(0.010)	(0.009)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)
Inflation volatility	-0.484***	-0.481***	-0.448***	-0.506***	-0.294***	0.753***	0.799***	0.502***	0.555***	0.422***	-0.273***	-0.326***	-0.198***	-0.231***	-0.251***
	(0.097)	(0.097)	(0.093)	(0.098)	(0.107)	(0.118)	(0.123)	(0.103)	(0.103)	(0.090)	(0.055)	(0.051)	(0.046)	(0.046)	(0.039)
GDP volatility	0.762***	0.770***	0.561***	0.788***	0.169	0.713*	0.670*	0.470	0.848**	0.910***	0.656***	0.637***	0.802***	0.568***	0.693***
	(0.152)	(0.153)	(0.144)	(0.152)	(0.134)	(0.377)	(0.386)	(0.342)	(0.337)	(0.307)	(0.166)	(0.147)	(0.145)	(0.136)	(0.125)
NEER volatility	0.377***	0.375***	0.365***	0.395***	0.230***	-0.716***	-0.748***	-0.489***	-0.542***	-0.425***	0.223***	0.261***	0.141***	0.181***	0.194***
	(0.076)	(0.076)	(0.073)	(0.077)	(0.083)	(0.093)	(0.095)	(0.081)	(0.081)	(0.069)	(0.046)	(0.042)	(0.037)	(0.037)	(0.032)
cov (GDP, NEER)	-8.578***	-8.446***	-7.104***	-8.650***		2.168	1.452	-3.201	-0.556		0.528	0.267	1.500	1.050	
	(1.328)	(1.365)	(1.285)	(1.393)		(3.286)	(3.352)	(3.122)	(3.077)		(1.352)	(1.179)	(1.204)	(1.114)	
Log population	0.015***	0.015***	0.013***	0.015***	0.014***	0.022***	0.022***	0.021***	0.026***	0.032***	0.009***	0.009***	0.009***	0.007***	0.013***
	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Institutions	-0.050***	-0.054***		-0.089***	-0.052**	0.721***	0.665***		0.325***	0.351***	-0.216***	-0.146***		-0.013	0.015
	(0.018)	(0.019)		(0.025)	(0.024)	(0.045)	(0.047)		(0.055)	(0.057)	(0.022)	(0.022)		(0.026)	(0.024)
Capital controls	-0.070***	-0.068***		-0.061***	-0.054***	-0.143***	-0.132***		-0.063***	-0.054**	0.096***	0.079***		0.052***	0.046***
	(0.008)	(0.008)		(0.009)	(0.010)	(0.020)	(0.020)		(0.023)	(0.023)	(0.009)	(0.009)		(0.009)	(0.009)
Peg		0.001		0.004	0.007**		-0.025***		0.007	0.018***		0.015***		0.002	-0.006*
		(0.004)		(0.004)	(0.003)		(0.008)		(0.009)	(0.006)		(0.004)		(0.004)	(0.003)
EMU		0.005		0.001			0.038***		-0.004			-0.062***		-0.045***	
		(0.005)		(0.006)			(0.008)		(0.008)			(0.004)		(0.004)	
Log GDP per capita			0.012***	0.009**	0.006			0.133***	0.090***	0.109***			-0.056***	-0.035***	-0.033***
			(0.002)	(0.004)	(0.004)			(0.005)	(0.010)	(0.010)			(0.002)	(0.004)	(0.004)
Reserve currency					0.001					-0.198***					-0.196***
					(0.015)					(0.020)					(0.014)
Observations	1,437	1,437	1,442	1,437	1,484	1,437	1,437	1,442	1,437	1,484	1,437	1,437	1,442	1,437	1,484
R-squared	0.239	0.241	0.202	0.243	0.203	0.484	0.492	0.516	0.538	0.553	0.431	0.501	0.469	0.529	0.540

Notes: Regressions include year fixed effects. Robust standard errors in parentheses. ***, **, and * denote, respectively $p < 0.01$, $p < 0.05$, and $p < 0.1$.

Appendix B reports the regression analysis by splitting the countries into emerging and advanced economies. From this breakdown a few results stand out. Focusing on FX^{AGG}, the positive association between openness and foreign currency exposures remains statistically significant both for emerging and advanced economies (Tables B5 and B8). Inflation volatility is associated with longer positions both for EMEs and advanced economies. By contrast, the relationship between NEER volatility and FX^{AGG} is positive for EMEs and negative in some specifications for advanced economies. Therefore, EMEs that were more prone to valuation losses due to exchange rate depreciations moved to longer positions. As expected, institutions and capital controls play a more predominant role in EMEs. In line with the baseline results for all countries, the former is associated with longer positions while the latter with shorter.

4 Financial Exchange Rates and Valuation Changes

The dataset enables us to construct net effective financial exchange rate indices for all the economies in our sample based on the currency composition of their international balance sheets. This, in turn, allows us to calculate valuation changes in the NIIP attributable to currency fluctuations, as distinct from valuation due to price shifts or other factors. As an illustration, we use these metrics to shed light on large wealth transfers across countries in two recent episodes of heightened uncertainty: the GFC and the COVID-19 crisis.

Let us first define the financial exchange rate indices. Drawing from prior research, we introduce both asset (I^A) and liability (I^L) weighted currency indices as follows:

$$I^A_{i,t} = I^A_{i,t-1} \times (1 + \sum_j \omega^A_{i,j,t} \times \Delta E_{i,j,t}) \quad (2)$$

$$I^L_{i,t} = I^L_{i,t-1} \times (1 + \sum_j \omega^L_{i,j,t} \times \Delta E_{i,j,t}) \quad (3)$$

with $\Delta E_{i,j,t}$ the percentage change in the bilateral exchange rate of the major currencies j in period t (i.e. US dollar, euro, Japanese yen, Pound sterling, renminbi, and other currencies), and ω^A and ω^L the previously defined financial weights. An increase in E is defined as a depreciation of the domestic currency relative to currency j.

The net financial exchange index (I^F) is given by

$$I^F_{i,t} = I^F_{i,t-1} \times (1 + \Delta I^A_{i,t} \times s^A_{i,t} - \Delta I^L_{i,t} \times s^L_{i,t}) \quad (4)$$

A critical consideration is the handling of "other" currencies—those outside of the US dollar, euro, Japanese yen, Pound sterling, and renminbi. While we could exclude these "other" currencies from the index due to a lack of corresponding exchange rate data relative to the

Table 4: Correlation Between Financial and Trade Weighted Exchange Rate

	With Financial Indices			With Trade Indices		
	A, L	A^D, L^D	N^D, N^{EQ}	A, T	L, T	N, T
Full Sample	0.97	0.99	-0.71	0.46	0.48	0.15
Advanced Economies						
Full Sample	0.97	0.98	-0.49	0.45	0.46	0.35
Pre-GFC	0.98	0.99	-0.56	0.52	0.52	0.32
Post-GFC	0.98	0.99	-0.44	0.44	0.43	0.42
Emerging Economies						
Full Sample	0.97	1.00	-0.76	0.49	0.49	-0.26
Pre-GFC	0.99	1.00	-0.87	0.45	0.44	-0.28
Post-GFC	0.98	0.99	-0.89	0.51	0.49	0.27
Creditor Economies	0.97	0.98	0.20	0.51	0.51	0.41
Debtor Economies	0.97	0.99	-0.77	0.44	0.47	0.00

Notes: This table shows the medians of within-country correlations between annual percentage changes in exchange rate indices. A and L denotes the financial exchange rates for gross assets and liabilities, A^D and L^D are gross debt assets and debt liabilities, and N^D, N^{EQ} net debt and net equity. T is the trade weighted exchange and N is the net financial exchange rate. The correlation between A^{EQ} and L^{EQ} is not reported as equity liabilities are denominated in domestic currency. Data cover 1990-2020.

domestic currency, we opt for an inclusive approach. By incorporating "other" currency assets and liabilities in the weights and making assumptions about their exchange rates, our method offers a more comprehensive coverage of the balance sheet. We impute the exchange rate using the average change of major currencies relative to the domestic currency. This approach more closely aligns our measures with published data for selected countries.[15]

Next, we analyse some of the statistical properties of these indices. We look at the within-country correlation of the percentage changes between these indices across country groups over the 1990-2020 period. The pairwise correlation between financial exchange rates for gross assets and liabilities are strikingly close to 1 and positive across all groups of countries, see Table 4, column (1). Comparing the financial exchange rates for gross debt assets and debt liabilities the median correlations are comparably high (column (2)). Moving to the correlation between net debt and net equity, the overall pairwise correlation is negative and quite strong (-0.71), see column (3). It is negative for most country groups, albeit with considerable heterogeneity. The correlation is lower for advanced economies (-0.5) than emerging markets (-0.76). In terms of initial creditor or debtor position, defined on the eve of the global financial crisis, net debt and equity are positively correlated for creditor countries (0.20) and strongly negative for debtor positions (-0.77).

A natural next step is to compare the financial exchange rates with trade-weighted exchanges rates. The comovement between indices can give us an indication if these effects tend to amplify or offset each other. For instance, a negative correlation may mean increase in the

[15]When we compare the resulting valuation effects induced by the exchange rate published by the BEA for the US with our results, we find the a better match when we include "other" currencies in calculation of the financial exchange rate.

trade-weighted (a depreciation), which would tend to increase the current account balance, whereas the financial exchange rate would decrease, leading to a valuation loss. This is the textbook balance sheet risk effects that arise with a domestic currency depreciation. In contrast a positive correlation could indicate an increase in trade change rate (i.e. a depreciation of the domestic currency) which may increase the current account, associated with an increase in the financial exchange rate leading to a valuation gain, amplifying the flow effect.

Table 4 columns (4) to (6) provide median within-country correlations of the percentage change between these indices. We find very large heterogeneity in the comovement between net financial-weighted and trade-weighted exchange rate indices across different cuts of the sample. First, both the median correlation between changes in the trade-weighted index and the asset based and liability based financial-weighted is around 0.5 over the full sample. Second, we see that the median correlation between the net financial exchange rate and the trade-weighted exchange rate is positive but a lot lower (0.15). Third, across income groups, there are striking differences, with a positive correlation in AEs (advanced economies) and a negative correlation in EMEs over the 1990-2020 period. It follows, for instance, that while a depreciation of the trade-weighted index in EMEs may potentially increase net exports, but it is also associated with negative valuation effects induced by the exchange rate. Fourth, the correlation is markedly different in the period before the global financial crisis and after, potentially reflecting the shifts in currency composition highlighted above. Finally, by categorizing economies as either debtors or creditors on the eve of the GFC yields similarly striking differences. Notably, there is no correlation between the trade index and the financial index for debtor economies. Decomposing the correlation between the trade weighted exchange rate and the financial exchange for each item of the balance sheet also yields contrasting results, with positive correlations for equity positions and mostly negative correlation for net debt positions.[16]

In turn, these indices allow us to calculate size of the net valuation effect due to shifts in currency values (VAL^{XR}), given by

$$VAL^{XR}_{i,t} \quad = \quad \Delta I^{A}_{i,t} \times A_{i,t-1} - \Delta I^{L}_{i,t} \times L_{,t-1} \tag{5}$$

where A_i and L_i are foreign assets and liabilities relative to GDP. As these aggregates include foreign assets and liabilities of all currencies, we are implicitly assuming that other currencies move according to the average of the other main SDR currencies. Of course, the value of the external balance sheet also changes due to asset prices changes (and other statistical changes) given by:

$$\Delta NIIP = FA_{i,t} + VAL^{XR}_{i,t} + VAL^{OTH}_{i,t} \tag{6}$$

with $FA_{i,t}$ the financial account (or equivalently the current account balance) and $VAL^{OTH}_{i,t}$

[16]See Table B11 in the Appendix.

the change in valuation due to asset prices and other statistical changes.[17,18] Importantly, this allows us to analyse the contributions of currency movements to the overall change in the international investment position.

To illustrate this, we compare two large episodes of external wealth transfers across countries, namely the acute phases of the GFC and COVID-19.[19] From the onset, it is important to emphasize that these two events are very different in nature — with the global financial crisis orginating in the banking sector, while COVID-19 was a global health shock— but also in terms of external sector dynamics. First, there were no generalised sudden stop of capital flows (or current account adjustments) during the COVID-19 crisis as opposed to during the GFC. Second, a large share of the exchange rate movements associated with a "flight to safety" during COVID-19 was short-lived – mostly in the first part of the year – compared to the longer-lasting changes during the GFC. Third, there were large stock market price gains in the US during COVID-19, contrasting with the generalised losses during the GFC. Thus, the largest valuation gains induced by exchange rate movements were registered in the US during COVID-19 after large but short-lived currency induced losses early in 2020.[20]

While different, these two episodes share some striking similarities in relation to the dynamics of valuation changes (see Table 5).[21] First, both episodes induced large wealth aggregate transfers across countries. Second, in both cases, there were valuation gains in Emerging markets and valuation losses in advanced economies. In addition, creditor economies, defined as the group of countries with net creditor positions on the eve of the global financial crisis, experienced valuation gains, while debtors faced losses. Moreover, the US experienced valuating losses during both events. Fourth, valuation changes induced by exchange rates was systematically smaller in magnitude than valuation due to other movements. We do not find any evidence of systematic offsetting behaviour between valuation changes due to exchange rates and due to other movements. Nonetheless, we do find an intriguing systematic offset between debt and equity within VAL^{XR}.

Valuation changes also display some key differences during these two events. Valuation shifts during COVID-19 were generally of a lesser magnitude than those during the GFC for different country groups. While the US experienced valuation losses in both periods, primarily influenced by VAL^{OTH}, the underlying dynamics varied greatly. During the GFC, losses primarily stemmed from a significant decline in the value of foreign equity assets

[17]See discussion on the pitfalls relating to "other statistical changes" in Curcuru et al. (2008). More recently, using publicly available data for a small group of advanced economies, Hunnekes et al. (2023) find that these statistical discrepancies do not seem to systematically cloud the interpretation of valuation changes.

[18]Using the current account balance assumes the capital account and errors and omissions are equal to zero.

[19]See Hale and Juvenal (2023) for a more detailed discussion on the COVID-19 crisis.

[20]In the first quarter of 2020, the US experienced the largest losses (see Hale and Juvenal, 2023), consistent with its "exorbitant duty".

[21]Table B12 and Table B13 show the same decomposition for the asset and liability side of the balance sheet.

(i.e. holdings of US residents abroad) exceeding the decrease in the value of foreign equity liabilities (i.e. domestic US assets held by foreigners). In contrast, during COVID-19, substantial increase in the value of foreign liabilities surpassed those of foreign assets.[22]

Table 5: COVID-19 versus the Global Financial Crisis: Net Balance Sheet

	FA	Δ NIIP	VAL^{XR}			VAL^{OTH}			VAL^{TOTAL}		
			Total	Debt & FXR	Equity	Total	Debt & FXR	Equity	Total	Debt & FXR	Equity
COVID-19 (2020)											
Full sample	-0.1	-1.4	-0.3	-0.8	0.6	-1.0	0.5	-1.5	-1.3	-0.3	-1.0
Advanced Economies	-0.5	-2.8	-0.8	-1.1	0.3	-1.6	0.5	-2.1	-2.3	-0.5	-1.8
USA	-3.2	-13.3	3.3	-1.4	4.7	-13.3	0.3	-13.6	-10.1	-1.1	-9.0
Emerging Economies	0.6	1.1	0.6	-0.4	1.0	0.2	0.6	-0.6	0.9	0.1	0.4
Creditors Economies	1.3	4.7	-0.7	-0.6	-0.2	4.2	1.9	2.3	3.4	1.3	2.1
Debtors Economies	-1.1	-5.5	0.1	-1.0	1.1	-4.7	-0.4	-4.2	-4.7	-1.5	-3.1
GFC (2008)											
Full sample	-0.8	0.1	0.9	-1.9	2.7	0.6	2.3	-2.3	0.9	0.3	0.5
Advanced Economies	-2.4	-4.3	1.0	-2.2	3.1	-2.3	3.2	-6.4	-2.0	1.0	-3.3
USA	-5.4	-19.5	-2.1	0.9	-3.0	-11.9	1.3	-13.2	-14.1	2.2	-16.3
Emerging Economies	4.1	12.7	0.6	-1.0	1.6	9.3	-0.4	9.8	9.7	-1.7	11.4
Creditors Economies	4.6	10.2	0.3	-5.0	5.3	5.3	4.7	0.5	5.5	-0.3	5.8
Debtors Economies	-4.2	-5.6	1.2	-0.1	1.3	-2.4	0.9	-3.9	-2.0	0.7	-2.6

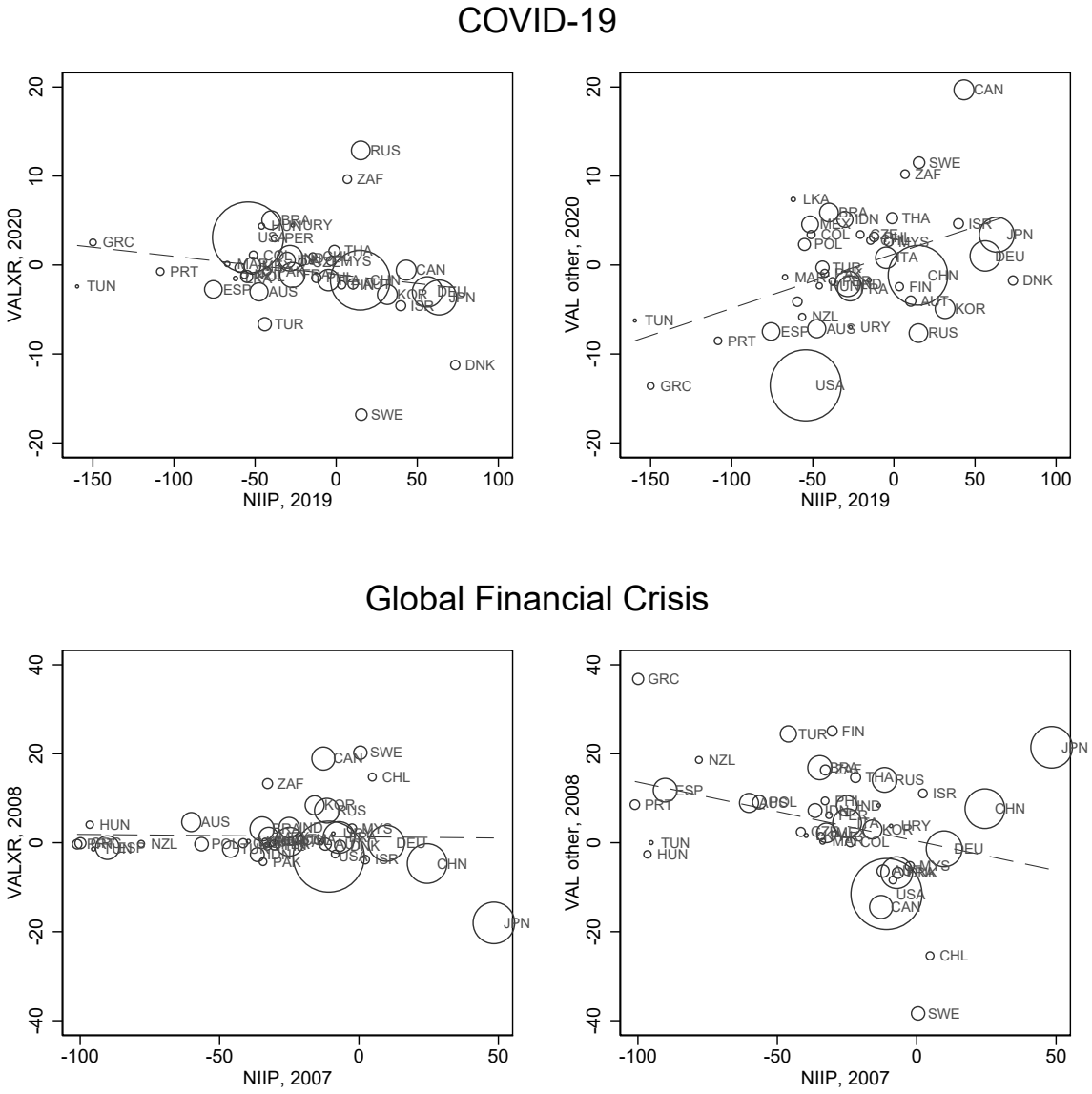
Notes: This table shows the stock-flow reconciliation of the net international balance sheet. Weighted average in percent of group (or economy) GDP. FA represents the financial account; Δ NIIP the change in the net international investment position; VAL^{XR} valuation change induced by exchange rate movements; VAL^{OTH} the change in valuation due to asset prices and other statistical changes; VAL^{TOTAL} the overall change in valuation. These valuation changes are further decomposed into total changes, changes in debt (including foreign exchange reserves) and equity. Creditor and Debtor economies are classified according to being a debtor or creditor of the eve of the global financial crisis.

Furthermore, from a global perspective, these large wealth movements can also play an important role in external adjustment by increasing ("destabilising") or correcting ("stabilizing ") initial external imbalances during these global crises events. For example, Figure 5 shows the scatter plot between valuation changes induced by exchange rate movements and other movements separately during the acute phases of the COVID-19 crisis in 2020 and the GFC in 2008, relative to the pre-crisis net international investment position. First, it shows very little systematic cross-country correlation between VAL^{XR} and initial external imbalances during the two crisis events. In other words, there is little evidence of systematic stabilizing role across countries. [23] Second, there is stark contrast between the correlation of valuation changes due to other movements and initial NIIP during the two episodes. During the GFC, VAL^{OTH} played a stabilising role, with countries with larger creditor positions seeing the largest valuation declines. In contrast, in 2020, there was a strong positive association between pre-crisis net international investment positions and valuation gains due to asset

[22]Refer to Figure B2 for a detailed country-wise breakdown of valuations influenced by exchange rates and the comprehensive change in net balance sheets across both periods.

[23]To study the GFC, we concentrate on 2008 as it saw the largest valuation movements. As documented by Bénétrix et al. (2015) there was some mean reversion of VAL^{XR} in 2009. The authors also find some limited evidence of a limited role for VAL^{XR} in stabilizing the cross-country distribution of net international investment positions.

Figure 5: COVID-19 versus Global Financial Crisis



Note: This figure plots the bivariate relationship between VAL^{XR} and VAL^{OTH} and the lagged net international investment position, scaled by GDP, in 2020 and in 2008. Economies exhibiting extreme values (Argentina, Norway, and financial centers) are not shown. Circles sizes are proportional to GDP in US dollars.

prices, in turn increasing global imbalances.[24] Importantly, these wealth transfers were not fully reversed in the short-term in 2021, similarly to the GFC period.[25] In sum, while these two episodes of heightened uncertainty were very different in nature, they both illustrate some striking patterns of wealth transfers across countries, which in turn can either amplify or dampen these shocks, with important implications for the domestic sector.

5 Conclusion

This paper assembles a comprehensive dataset of the currency composition of the external balance sheets and financial exchange rates for 50 economies over the period 1990–2020. The detailed breakdown of the international balance sheet into each item allowed us to establish several novel stylised facts of relevance to theory and economic policy. First, the US dollar and the euro remain the dominant currencies for global holdings of assets and liabilities. Second, economies have improved their currency exposures over time, with emerging markets no longer displaying the textbook *short* foreign currency position. In addition, we propose financially-weighted exchange rates that, given its weak correlation with the more commonly used trade-weighted indices, can potentially be a more appropriate metric for measuring the wealth effects of currency movements.

Finally, in order to illustrate potential applications of the dataset, we compare the large wealth transfers across countries during the COVID-19 crisis compared to the global financial crisis. We find that while these two episodes were very different in nature, the shift in wealth were substantial and broad-based, with emerging markets experienced valuation gains in both episodes. Our analysis also suggests that these large wealth transfers during the COVID-19 crisis increased global imbalances ("destabilizing" valuation changes) compared to a reduction during the global financial crisis ("stabilizing"). In future research, this dataset can potentially be used to study some unresolved issues in open-economy macroeconomics, and guide the appropriate design of open economy models.

[24] See also Lane and Milesi-Ferretti (2012) and Bergant (2021) who document stabilising role of overall valuation changes relative to the initial balance sheets.

[25] Hale and Juvenal (2023) also note that valuation changes did not play a stabilizing role relative to contemporaneous capital flows in 2020.

References

Adler, G. and D. Garcia-Macia (2018). The stabilizing role of net foreign asset returns. IMF Working Papers 2018/079, International Monetary Fund.

Alfaro, L., M. Calani, and L. Varela (2021, June). Granular Corporate Hedging Under Dominant Currency. NBER Working Papers 28910, National Bureau of Economic Research, Inc.

Arslanalp, S., B. Eichengreen, and C. Simpson-Bell (2022). The stealth erosion of dollar dominance and the rise of nontraditional reserve currencies. *Journal of International Economics 138*, 103656.

Baba, C., R. Cervantes, S. M. Darbar, A. Kokenyne, and V. V. Zotova (2022). New measures of capital flow restrictions — AREAER indices. mimeo.

Beck, R., A. Coppola, A. Lewis, M. Maggiori, M. Schmitz, and J. Schreger (2023). The Geography of Capital Allocation in the Euro Area. SocArXiv rzwd2, Center for Open Science.

Benetrix, A., D. Gautam, L. Juvenal, and M. Schmitz (2019). Cross-border currency exposures. IMF Working Papers 2019/299, International Monetary Fund.

Bergant, K. (2021). The role of stock-flow adjustment during the global financial crisis. *Journal of International Money and Finance 110*, 102261.

Bertaut, C., S. Curcuru, E. Faia, and P. O. Gourinchas (2023). The global (mis)allocation of capital. mimeo.

Boz, E., C. Casas, G. Georgiadis, G. Gopinath, H. Le Mezo, A. Mehl, and T. Nguyen (2022). Patterns of invoicing currency in global trade: New evidence. *Journal of International Economics 136*, 103604. NBER International Seminar on Macroeconomics 2021.

Bénétrix, A. S., P. R. Lane, and J. C. Shambaugh (2015). International currency exposures, valuation effects and the global financial crisis. *Journal of International Economics 96*(S1), 98–109.

Casas, C., S. Meleshchuk, and M. Y. Timmer (2023, August). The Dominant Currency Financing Channel of External Adjustment. IMF Working Papers 2023/164, International Monetary Fund.

Catão, L. A. and G. M. Milesi-Ferretti (2014). External liabilities and crises. *Journal of International Economics 94*(1), 18–32.

Chinn, M. D., H. Ito, and R. N. McCauley (2022). Do central banks rebalance their currency shares? *Journal of International Money and Finance 122*(C), 102557.

Chui, M., E. Kuruc, and P. Turner (2016). A new dimension to currency mismatches in the emerging markets - non-financial companies. BIS Working Papers 550, Bank for International Settlements.

Chui, M., E. Kuruc, and P. Turner (2018). Leverage and currency mismatches: Non-financial companies in the emerging markets. *The World Economy 41*(12), 3269–3287.

Cubeddu, L., S. Ahmed Hannan, and P. Rabanal (2023). External financing risks: How important is the composition of the international investment position? *Journal of International Money and Finance 131*, 102772.

Curcuru, S. E., T. Dvorak, and F. E. Warnock (2008). Cross-Border Returns Differentials. *The Quarterly Journal of Economics 123*(4), 1495–1530.

Du, W. and J. Schreger (2022). Sovereign Risk, Currency Risk, and Corporate Balance Sheets. *The Review of Financial Studies 35*(10), 4587–4629.

Eichengreen, B., R. Hausmann, and U. Panizza (2003). The pain of original sin. In B. Eichengreen, R. Hausmann, and U. Panizza (Eds.), *Debt denomination and financial instability in emerging-market economies*. University of Chicago Press Economics Books.

Eichengreen, B. J. and D. J. Mathieson (2000). The currency composition of foreign exchange reserves; retrospect and prospect. IMF Working Papers 00/131, International Monetary Fund.

Emter, L., M. Schmitz, and M. Tirpák (2019). Cross-border banking in the eu since the crisis: What is driving the great retrenchment? *Review of World Economics (Weltwirtschaftliches Archiv) 155*(2), 287–326.

Florez-Orrego, S., M. Maggiori, J. Schreger, Z. Sun, and S. Tinda (2023). Global Capital Allocation. SocArXiv 5s6n3, Center for Open Science.

Forbes, K., I. Hjortsoe, and T. Nenova (2017). Current Account Deficits During Heightened Risk: Menacing or Mitigating? *Economic Journal 0*(601), 571–623.

Goldberg, L. S. and S. Krogstrup (2023, January). International Capital Flow Pressures and Global Factors. NBER Working Papers 30887, National Bureau of Economic Research, Inc.

Gopinath, G. and J. C. Stein (2018, April). Banking, trade, and the making of a dominant currency. NBER Working Papers 24485, National Bureau of Economic Research, Inc.

Gourinchas, P.-O. and H. Rey (2007). From World Banker to World Venture Capitalist: US External Adjustment and the Exorbitant Privilege. In *G7 Current Account Imbalances: Sustainability and Adjustment*, NBER Chapters, pp. 11–66. National Bureau of Economic Research, Inc.

Gourinchas, P.-O., H. Rey, and K. Truempler (2012). The financial crisis and the geography of wealth transfers. *Journal of International Economics 88*(2), 266–283. NBER Global.

Hale, G. and L. Juvenal (2023). External balance sheets and the covid-19 crisis. *Journal of Banking & Finance 147*, 106570. Special Issue: The Impact of Global Pandemic on Financial Markets and Institutions.

Hunnekes, F., M. Konradt, M. Schularick, C. Trebesch, and J. Wingenbach (2023). Exportweltmeister germany's foreign investment returns in international comparison. Working Paper 03/2023, Graduate Institute of International and Development Studies, International Economics Department.

Ilzetzki, E., C. Reinhart, and K. Rogoff (2019). Why is the euro punching below its weight? mimeo.

Ilzetzki, E., C. M. Reinhart, and K. S. Rogoff (2021, October). Rethinking Exchange Rate Regimes. NBER Working Papers 29347, National Bureau of Economic Research, Inc.

Ito, H. and R. N. McCauley (2020). Currency composition of foreign exchange reserves. *Journal of International Money and Finance 102*(C), 102104.

Lane, P. R. and G. M. Milesi-Ferretti (2003). International financial integration. *IMF Staff Papers 50*, 82–113.

Lane, P. R. and G. M. Milesi-Ferretti (2007a, December). A global perspective on external positions. In *G7 Current Account Imbalances: Sustainability and Adjustment*, NBER Chapters, pp. 67–102. National Bureau of Economic Research, Inc.

Lane, P. R. and G. M. Milesi-Ferretti (2007b, November). The external wealth of nations mark II: Revised and extended estimates of foreign assets and liabilities, 1970-2004. *Journal of International Economics 73*(2), 223–250.

Lane, P. R. and G. M. Milesi-Ferretti (2008, August). International investment patterns. *The Review of Economics and Statistics 90*(3), 538–549.

Lane, P. R. and G. M. Milesi-Ferretti (2012). External adjustment and the global crisis. *Journal of International Economics 88*(2), 252–265. NBER Global.

Lane, P. R. and G. M. Milesi-Ferretti (2018). The External Wealth of Nations Revisited: International Financial Integration in the Aftermath of the Global Financial Crisis. *IMF Economic Review 66*, 189–222.

Lane, P. R. and J. C. Shambaugh (2010a, March). Financial exchange rates and international currency exposures. *American Economic Review 100*(1), 518–540.

Lane, P. R. and J. C. Shambaugh (2010b). The long or short of it: determinants of foreign currency exposure in external balance sheets. *Journal of International Economics 80*(1), 33 – 44. Special Issue: JIE Special Issue on International Macro-Finance.

Maggiori, M., B. Neiman, and J. Schreger (2019, May). The rise of the dollar and fall of the euro as international currencies. *AEA Papers and Proceedings 109*, 521–26.

Maggiori, M., B. Neiman, and J. Schreger (2020). International Currencies and Capital Allocation. *Journal of Political Economy 128*(6), 2019–2066.

Martin, P. and H. Rey (2004). Financial super-markets: size matters for asset trade. *Journal of International Economics 64*(2), 335–361.

McCauley, R. N., A. S. Bénétrix, P. M. McGuire, and G. von Peter (2019). Financial deglobalisation in banking? *Journal of International Money and Finance 94*(C), 116–131.

Milesi-Ferretti, G. M., K. Bergant, and M. Schmitz (2023, February). Cross-Border Investment in Emerging Market Bonds: Stylized Facts and Security-Level Evidence from Europe. CEPR Discussion Papers 17946, C.E.P.R. Discussion Papers.

Obstfeld, M. and K. Rogoff (2001, December). The Six Major Puzzles in International Macroeconomics: Is There a Common Cause? In *NBER Macroeconomics Annual 2000, Volume 15*, NBER Chapters, pp. 339–412. National Bureau of Economic Research, Inc.

Portes, R. and H. Rey (2005). The determinants of cross-border equity flows. *Journal of International Economics 65*(2), 269–296.

Shin, H. S. and G. von Peter (2022, December). Overcoming Original Sin. *Journal of Globalization and Development 13*(2), 411–433.

A Data

The main sources of data to compile this dataset are a survey from statistical authorities on the currency of denomination of each component of the international investment position (IIP) and the currency composition of portfolio equity and portfolio debt assets reported to the CPIS. To expand the coverage of the dataset, we filled the gaps using "synthetic data" from the Bank of International Settlements (BIS) and estimation methods. Synthetic data refer to actual data that are not exactly the same indicator as the items of the IIP. Due to methodological and collection issues financial derivatives are excluded from the analysis. The dataset covers the period 1990 to 2020. Data for Russia start in 1993 due to lack of information. In turn, data for the Czechia is from 1993 because that is the year in which the country was formed following the split of Czechoslovakia.

Our estimation methodology builds upon the work of Lane and Shambaugh (2010a) and Bénétrix et al. (2015), incorporating a number of improvements. Our dataset leverages superior data sources and refines some of the estimation methods, while also adding a novel dimension to foreign direct investment (FDI) by dividing it into equity and debt components, which has become increasingly relevant since the global financial crisis.

The data appendix is structured into four sections. Section A1 provides an overview of the data sources and coverage of the actual data. Section A2 outlines the methods used to generate the estimated data.

A.1 Actual Data

One of the main improvements in this dataset consists in the incorporation of actual data on the currency composition of the IIP. These are obtained from a variety of sources: (i) a survey sent by the IMF to country authorities; (ii) the Coordinated Portfolio Investment Survey (CPIS); (iii) data on international debt issuance available through the BIS International Debt Statistics; (iv) data of banks' cross-border positions reported to the BIS and available in its Locational Banking Statistics (LBS). In what follows we describe each of the sources of actual data and the years of coverage in detail.

A.1.1 IMF Survey to Authorities

The actual data for this dataset was collected through a survey conducted by the IMF Research Department in collaboration with the Statistics Department. The survey was sent to the authorities of 52 economies, which are part of the External Balance Assessment and/or the External Sector Report.[1] These economies, which include both emerging and advanced economies, represent over 90 percent of the world's GDP.

[1]The economies are: Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Colombia, Czechia, Denmark, Egypt, Finland, France, Germany, Greece, Guatemala, Hong Kong SAR, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Korea, Malaysia, Mexico, Morocco, Netherlands, New Zealand, Norway, Pakistan, Peru, Philippines, Poland, Portugal, Russia, Singapore, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Thailand, Tunisia, Türkiye, United Kingdom, United States and Uruguay. Costa Rica and Saudi Arabia are excluded due to lack of data.

The survey requested data from 1990 on the main components of the International Investment Position (IIP), broken down into five SDR currencies (i.e. US dollar, euro, Japanese yen, Pound sterling, and renminbi), domestic currency (when different from the five SDRs), and "other currencies," which comprise all other currencies not included in the previous two categories. Legacy currencies pre-1999 that are not the domestic currency of the country analyzed, were included in the "other currencies" category.

The response rate was 85%, with partial submissions also accepted. The level of granular and complete data submitted varied. For recent years, around 60% of the economies in the sample reported some data, with coverage becoming more limited as the years go back in time.

Whenever available, actual data were used in the construction of the final dataset, except for the component of financial derivatives, which was not used due to a lack of synthetic data and limited coverage. All data were labeled as public unless the country authorities objected to its disclosure.

A.1.2 CPIS

The CPIS collects information on cross-border holdings of portfolio equity and portfolio debt securities for reporter economies in relation to host economies. As of December 2022, 82 economies reported core data to CPIS. The currency of denomination of portfolio equity and portfolio debt assets is included in Table 2 of CPIS, which is an encouraged item aimed at increasing the granularity of the CPIS data. A total of 57 economies reported to CPIS Table 2 as of December 2022.

For a number of economies in our dataset, we used actual data on the currency composition of portfolio equity and portfolio debt assets sourced from CPIS Table 2. We only used this data for the countries that did not provide the data breakdown in the survey, or for countries that classified the data as confidential. Whenever possible, we used data from the survey.

A.1.3 Synthetic Data

The synthetic data in this dataset correspond to the BIS International Debt Issuance Statistics and Locational Banking Statistics (LBS). Although these data series do not match the estimates in the International Investment Position (IIP), they serve as a proxy for portfolio debt liabilities and other investments (assets and liabilities), respectively.

BIS International Debt Issuance Statistics are compiled by the BIS from a security-by security database. The dataset covers all debt securities issued by non-residents, i.e. for those cases in which primary market issuance is outside the issuer's country of residence. These data include a comprehensive breakdown by currency.

The BIS LBS includes cross-border positions of banks (aggregated at country-level) *vis-à-vis* bank and non-banks in counterpart countries. The data cover up to 36 reporters in the most recent part of the sample. The cross-border positions are further categorized based on the

currency of denomination, including the US dollar, euro, Japanese yen, Pound sterling, and renminbi, the domestic currency of the reporting country, and other currencies not listed.[2]

A.2 Combining Actual, Synthetic, and Estimated Data

In this section, we outline how we expand the coverage of actual data with synthetic and estimated currency positions. We also detail the methodologies used to estimate each component of the International Investment Position (IIP).

A.2.1 Foreign Assets

The asset side of a country's external balance sheet encompasses five primary components: portfolio equity, foreign direct investment (including equity and debt), portfolio debt, other investment (primarily related to banks), and foreign currency reserves. To create a time series for each component for each country, we used estimation methods and synthetic data to supplement the available actual data. In what follows we summarize the approach followed to compile data for each component of the IIP. Table A1 provides a summary of the years in which actual data, synthetic data, and estimation methods were utilized for each component.

Portfolio Equity

The main source for the currency composition of portfolio equity is the actual data from the IMF Survey and Table 2 of the IMF's CPIS, where available. For countries without data from these sources, we employ an improved version of the Lane and Shambaugh (2010) methodology. Specifically, we use the geographical location of cross-border positions as the most accurate predictor for the currency of denomination of portfolio equity assets. To achieve this, we use the CPIS dataset, which includes the geographical distribution of portfolio equity assets for 82 reporting economies and 220 host economies since 2001.

Our approach is based on two main assumptions. Firstly, we assume that equity issued by a country is denominated in the currency of that country, meaning US stocks are denominated in US dollars, Japanese stocks in Japanese yen, and so on.[3] Secondly, we exclude holdings issued in offshore financial centers, following Lane and Milesi-Ferretti (2008). This involves removing offshore financial centers, which are typically characterized by close to balanced net foreign asset positions. By doing so, we implicitly assume that securities issued in offshore centers follow the global currency distribution.

In cases where country pairs are absent from the CPIS dataset or where the data coverage is restricted to a maximum of three years, we rely on estimates provided by Benetrix et al. (2019). Our methodology involves implementing a gravity-based model of bilateral equity

[2]Post-2017 we do not have information on the share of cross-border bank positions in renminbi. We therefore calculated it as a residual by fixing the share of other currencies to 2017. In our sample we observe that this share is rather constant for the sample period.

[3]Note that the information reported in the IMF survey confirms the validity of this assumption.

holdings that draws from the work of Lane and Shambaugh (2010a).[4] Table A1 shows the years for which actual and estimated data were used for portfolio equity assets.

Foreign Direct Investment

To distinguish between the equity and debt components of Foreign Direct Investment (FDI), we estimate their currency composition separately, following the approach taken in Benetrix et al. (2019).

For the equity component of FDI, we begin by using the actual currency weights obtained from the IMF Survey. In the event of incomplete data, we use estimates consistent with the method used for portfolio equity. Specifically, we assume that the equity component of FDI is denominated in the currency of the host country. From 1990 to 2008, we follow the same data source as Benetrix et al. (2019). For the period of 2009 to 2020, we utilize the data from the IMF Coordinated Direct Investment Survey (CDIS), which includes outward and inward stocks of direct investment for 108 and reporting economies, respectively.

As for the debt component of FDI, we use actual data from the IMF Survey, which indicates that the currency distributions of the debt and equity components of FDI are significantly different. Given that FDI debt accounts for up to 40% of total FDI in some countries, we estimated it separately. When available, we used actual data and extended the coverage backwards utilizing portfolio debt assets as a proxy for the synthetic series. Table A1 provides the details of the years for which actual and estimated/synthetic data were employed in constructing the currency composition of FDI assets.

Portfolio Debt

For portfolio debt assets we expand the coverage of actual data from the IMF Survey, CPIS Table 2, using a multi-step approach (see Lane and Shambaugh, 2010a) that combines the geography of portfolio debt asset positions with the currency of denomination of host countries' bonds issued in international markets. First, we use the bilateral positions of portfolio debt holdings provided by CPIS. Second, we combine this with the currency distribution of debt issued by the source countries, from the BIS International Debt Statistics database. For instance, if country A (the source country) has portfolio debt holdings in countries B, C and D (host countries), the currency of denomination of those positions will be determined by how much B, C and D issued in each currency. Those bilateral positions broken down by currency are then consolidated for each source country. Importantly, the currency distribution of the host countries used is net of the positions in US dollars held by US residents, positions in euros held by Euro Area countries and in Japanese yen held by Japanese residents. This is to take into account that investors in these countries tend to hold a disproportion amount of international debt assets in their own currency. To do this, we use data on holdings from the US Treasury's Report on the US Portfolio Holdings of Foreign Securities, the ECB and the Bank of Japan, respectively.

As a final step, these synthetic data are used to expand the time-series coverage of actual

[4]It is worth noting that other studies such as Lane and Milesi-Ferretti (2008), Portes and Rey (2005), and Martin and Rey (2004) have also provided theoretical and empirical backing for the use of this approach.

data.

Other Investment

Information from the survey on other investment assets is available for 23 economies for a number of years (see Table A1 for details). For 2018-2020 we complement the survey results with data on aggregate and bilateral country-level cross-border bank positions gathered from the restricted Bank for International Settlements' (BIS) dataset on Locational Banking Statistics (LBS). For earlier years we source the data from Benetrix et al. (2019) which was also obtained from the BIS.

Reserves

In constructing the currency composition of reserves assets, we rely on the data compiled by Bénétrix et al. (2015) for the period spanning 1990 to 2012, supplemented by Benetrix et al. (2019) covering 2012 to 2017 as well as our own extension for the years 2017 to 2020.[5] In what follows we describe the method used to obtain reserves data from 2017-2020.

To obtain a more comprehensive picture of the currency composition of reserve assets between 2017 and 2020, we combine actual data with estimates, as summarized in Table A2. The main sources for updating the currency composition of reserve data between 2017-2020 is the actual data from the IMF Survey, the IMF's International Reserves and Foreign Currency Liquidity (IRFCL) (these countries are Australia, Belgium, Brazil, Canada, Chile, Finland, Germany, Ireland, Israel, Mexico, Morocco, the Netherlands, Norway, Peru, , Portugal, Sweden, Switzerland, and Uruguay); complete or partial data from Central Bank or Ministry of Finance publications (including China, Colombia, Italy, Poland, Russia, the United Kingdom, and the United States).[6] We also make use of the ECB's publication "The International Role of the Euro" which provides the share of reserves denominated in euro for certain countries (including Czechia, Denmark, Poland, Sweden, and Norway).

For estimated data, we rely on Ito and McCauley (2020) dataset as well as the IMF's Currency Composition of Official Foreign Exchange Reserves (COFER) shares. Ito and McCauley (2020) have collected information from central banks' annual reports, financial statements, and other publicly available information and other publicly available sources to create a sample dataset for various economies during the period spanning 1999 to 2020. In cases where only partial information is available, we refer to COFER, which reports the total breakdown of SDR and non-SDR currencies in reserves. By combining this information with initial currency weights, we extrapolate currency weights for economies where no other data is available.

Having obtained our updated series spanning the period from 2017 to 2020, we proceed to interpolate it with our prior dataset. The methodologies to interpolation the currency

[5] Bénétrix et al. (2015) construct a series based on estimated coefficients from Eichengreen and Mathieson (2000).

[6] For some countries, we only have partial information for some years or currencies. For instance, China's State Administration of Foreign Exchange (SAFE) only reports the share of USD in the country's reserves in 2014-2016.

of denomination of the reserves are similar to what is described in Benetrix et al. (2019). Specifically, we linearly interpolate the weights in the dataset starting from the five-year window preceding the availability of data from Benetrix et al. (2019). In cases where certain countries have improved estimated data (as in the instances of Tunisia, Philippines, and New Zealand), we use a longer time period for interpolation. For other economies where no updated data is available, we maintain the currency weights constant over the 2017-2020 period.

A.3 Foreign Liabilities

The liabilities component of a country's international investment position is comprised of four items: portfolio equity, foreign direct investment (which includes equity and debt components), portfolio debt, and other investment (mainly bank-related).

Consistent with the approach taken on the asset side, we assume that portfolio equity and FDI equity liabilities are denominated in the currency of the host country. This assumption implies that the exposure is in domestic currency.[7]

For FDI debt, we used actual data from the IMF survey whenever it was available, and extended its coverage to earlier years using the currency breakdown of portfolio debt liabilities as synthetic weights.

We obtained actual data on portfolio debt from the IMF Survey. We obtained synthetic data for the currency breakdown from the BIS international debt issuance statistics. This dataset covers all debt securities issued by non-residents and includes a comprehensive breakdown by currency. We followed the same methodology as the other series, using actual data whenever available and extending the series using synthetic data. Finally, the construction of other investment liabilities followed a similar approach to that of other investment assets. Table A3 details the breakdown between actual and synthetic data.

[7]Note that access to actual data confirms the validity of this assumption.

Table A1: Assets: Actual, Estimated, and Synthetic Data

Country	FDI Equity		FDI Debt		Porfolio Equity		Portfolio Debt		Other Investment	
	Actual Data	Estimated Data	Actual Data	Synthetic data	Actual Data	Estimated Data	Actual Data	Estimated	Actual Data	Synthetic data
ARG	2006-2020	1990-2005		1990-2020	2006-2020	1990-2005	2006-2020	1990-2005	2006-2020	1990-2005
AUS		1990-2020		1990-2020		1990-2020		1990-2020		1990-2020
AUT	2006-2020	1990-2005	2006-2020	1990-2005	2001-2020	1990-2000	2001-2020	1990-2000	2006-2020	1990-2005
BEL	2013-2020	1990-2012	2013-2020	1990-2012	2013-2020	1990-2012	2013-2020	1990-2012	2013-2020	1990-2012
BRA		1990-2020		1990-2020	2013-2020	1990-2012	2013-2020	1990-2012		1990-2020
CAN		1990-2020		1990-2020	2014-2020	1990-2013	2014-2020	1990-2013	2015-2020	1990-2014
CHE	2000-2020	1990-1999	2000-2020	1990-1999	2000-2020	1990-1999	2000-2020	1990-1999	2000-2020	1990-1999
CHL		1990-2020		1990-2020	2002-2009	1990-2001, 2010-2020	2007-2009	1990-2006, 2010-2020		1990-2020
CHN		1990-2020		1990-2020		1990-2020		1990-2020		1990-2020
COL	1996-2020	1990-1995	2004-2020	1990-2003	2001-2020	1990-2000	1996-2020	1990-1995	1996-2020	1990-1995
CZE	2013-2020	1993-2012	2013-2020	1993-2012	2013-2020	1993-2012	2013-2020	1993-2012	2013-2020	1993-2012
DEU	2013-2020	1990-2012	1990-2020		1990-2020		1990-2020		2012-2020	1990-2011
DNK	2005-2020	1990-2004	2005-2020	1990-2004	2001-2020	1990-2000	2001-2020	1990-2000	2005-2020	1990-2004
EGY		1990-2020		1990-2020	2005-2018	1990-2004, 2019-2020	2005-2018	1990-2004, 2019-2020		1990-2020
ESP	2012-2020	1990-2011	2012-2020	1990-2011	2001-2020	1990-2000	2001-2020	1990-2000	2012-2020	1990-2011
FIN		1990-2020		1990-2020	2013-2020	1990-2012	2006-2020	1990-2005	2015-2020	1990-2014
FRA	2008-2020	1990-2007	2008-2020	1990-2007	2001-2020	1990-2000	2001-2020	1990-2000	2008-2020	1990-2007
GBR		1990-2020		1990-2020		1990-2020		1990-2020		1990-2020
GRC		1990-2020		1990-2020	2001-2020	1990-2000	2001-2020	1990-2000		1990-2020
GTM	2013-2020	1990-2012	2013-2020	1990-2012	2013-2020	1990-2012	2013-2020	1990-2012	2013-2020	1990-2012
HKG	2017-2020	1990-2016	2017-2020	1990-2016	2017-2020	1990-2016	2017-2020	1990-2016	2017-2020	1990-2016
HUN	2008-2020	1990-2007	1999-2020	1990-1998	1999-2020	1990-1998	1999-2020	1990-1998	1999-2020	1990-1998
IDN		1990-2020		1990-2020	2001-2020	1990-2000	2001-2020	1990-2000		1990-2020
IND		1990-2020		1990-2020	2004-2020	1990-2003	2013-2020	1990-2012		1990-2020
IRL		1990-2020		1990-2020		1990-2020		1990-2020		1990-2020
ISR		1990-2020		1990-2020	2001-2020	1990-2000	2001-2020	1990-2000		1990-2020
ITA	2008-2020	1990-2007	2008-2020	1990-2007	2001-2020	1990-2000	2001-2020	1990-2000	2008-2020	1990-2007
JPN		1990-2020		1990-2020	2001-2020	1990-2000	2001-2020	1990-2000		1990-2020
KOR	2002-2020	1990-2001		1990-2020	2001-2020	1990-2000	2001-2020	1990-2000	2002-2020	1990-2001
LKA		1990-2020		1990-2020		1990-2017		1990-2020		1990-2020
MAR		1990-2020		1990-2020		1990-2020		1990-2020		1990-2020
MEX		1990-2020		1990-2020	2003-2020	1990-2002	2003-2020	1990-2002		1990-2020
MYS		1990-2020		1990-2020	2001-2020	1990-2000	2001-2020	1990-2000		1990-2020
NLD	2015-2020	1990-2014	2015-2020	1990-2014	2003-2020	1990-2002	2009-2020	1990-2008	2015-2020	1990-2014
NOR		1990-2020		1990-2020		1990-2020		1990-2020		1990-2020
NZL		1990-2020		1990-2020		1990-2020		1990-2020		1990-2020
PAK		1990-2020		1990-2020	2002-2020	1990-2001	2012-2020	1990-2011		1990-2020
PER		1990-2020		1990-2020	2015-2020	1990-2014	2015-2020	1990-2014		1990-2020
PHL		1990-2020		1990-2020	2007-2020	1990-2006	2007-2020	1990-2006		1990-2020
POL	2010-2020	1990-2009	2010-2020	1990-2009	2001-2020	1990-2000	2004-2020	1990-2003	2010-2020	1990-2009
PRT		1990-2020		1990-2020	2001-2020	1990-2000	2001-2020	1990-2000		1990-2020
RUS	2016-2020	1993-2015	2016-2020	1993-2015	2001-2020	1993-2000	2001-2020	1993-2000	2016-2020	1993-2015
SGP		1990-2020		1990-2020		1990-2020		1990-2020		1990-2020
SWE		1990-2020	2013-2020	1990-2012		1990-2020	2003-2020	1990-2002		1990-2020
THA	2006-2020	1990-2005	2006-2020	1990-2005	2004-2020	1990-2003	2004-2020	1990-2003	2006-2020	1990-2005
TUN		1990-2020		1990-2020		1990-2020		1990-2020		1990-2020
TUR	2014-2020	1990-2013	2014-2020	1990-2013	2013-2020	1990-2012	2013-2020	1990-2012	2014-2020	1990-2013
URY	2011-2020	1990-2010	2011-2020	1990-2010	2001-2020	1990-2000	2001-2020	1990-2000	2011-2020	1990-2010
USA		1990-2020	2020	1990-2019		1990-2020	2003-2020	1990-2002		1990-2020
ZAF		1990-2020		1990-2020	2012-2020	1990-2011	2012-2020	1990-2011		1990-2020

Notes: Actual data for FDI equity, FDI debt and other investment are from the IMF Survey. Actual data for portfolio equity and portfolio debt are from the IMF Survey and CPIS Table 2. Country names are reported as ISO codes.

Table A2: Reserves Assets: Actual and Estimated Data

Country	Reserve Assets	
	Actual Data	Estimated Data
ARG		1990-2020
AUS	2016-2020	1990-2015
AUT		1990-2020
BEL	2008-2020	1990-2007
BRA	2016-2020	1990-2015
CAN	2008-2020*	1990-2007
CHE	2010-2020	1990-2009
CHL	1998-2020*	1990-1997
CHN	2014-2016*	1990-2013
COL	2010-2020*	1990-2009
CZE	2010-2020*	1993-2009
DEU	2010-2020	1990-2009
DNK	2013-2020*	1990-2012
EGY		1990-2020
ESP	2010-2017	1990-2009
FIN	2016-2020	1990-2015
FRA	2016-2020*	1990-2015
GBR	2008-2020*	1990-2007
GRC		1990-2020
GTM		1990-2020
HKG		1990-2020
HUN		1990-2020
IDN		1990-2020
IND		1990-2020
IRL	2016-2020	1990-2015
ISR	2016-2020	1990-2015
ITA	2010-2020	1990-2009
JPN		1990-2020
KOR		1990-2020
LKA		1990-2020
MAR	2016-2020	1990-2015
MEX	2020	1990-2019
MYS		1990-2020
NLD	2010-2020	1990-2009
NOR	2013-2020*	1990-2012
NZL		1990-2020
PAK		1990-2020
PER	2010-2020*	1990-2009
PHL		1990-2020
POL	2010-2020*	1990-2009
PRT	2016-2020	1990-2015
RUS	2013-2020*	1993-2012
SGP		1990-2020
SWE	2010-2020*	1990-2009
THA		1990-2020
TUN		1990-2020
TUR		1990-2020
URY	2010-2020	1990-2009
USA	2010-2020*	1990-2009
ZAF		1990-2020

Notes: Actual data for Reserves are from IMF Survey, IRFCL, and country Authorities. * indicate partial information for some of the years. Country names are reported as ISO codes.

Table A3: Liabilities: Actual and Synthetic Data

Country	FDI Debt		Portfolio Debt		Other Investment	
	Actual Data	Synthetic data	Actual Data	Synthetic data	Actual Data	Synthetic data
ARG	2006-2020	1990-2005	2006-2020	1990-2005	2006-2020	1990-2005
AUS		1990-2020		1990-2020		1990-2020
AUT	2006-2020	1990-2005	2006-2020	1990-2005	2006-2020	1990-2005
BEL	2013-2020	1990-2012	2013-2020	1990-2012	2013-2020	1990-2012
BRA		1990-2020		1990-2020		1990-2020
CAN		1990-2020	2015-2020	1990-2014	2015-2020	1990-2014
CHE	2000-2020	1990-1999	2000-2020	1990-1999	2000-2020	1990-1999
CHL		1990-2020		1990-2020		1990-2020
CHN		1990-2020		1990-2020		1990-2020
COL	2000-2020	1990-1999	2000-2020	1990-1999	2000-2020	1990-1999
CZE	2013-2020	1993-2012	2013-2020	1993-2012	2013-2020	1993-2012
DEU	1997-2020	1990-1996	1990-2020		2012-2020	1990-2011
DNK	2005-2020	1990-2004	2005-2020	1990-2004	2005-2020	1990-2004
EGY		1990-2020		2002-2020		1990-2020
ESP	2012-2020	1990-2011	2012-2020	1990-2011	2012-2020	1990-2011
FIN		1990-2020	2006-2020	1990-2005	2015-2020	1990-2014
FRA	2008-2020	1990-2007	2008-2020	1990-2007	2008-2020	1990-2007
GBR		1990-2020		1990-2020		1990-2020
GRC		1990-2020	2004-2020	1990-2003		1990-2020
GTM	2013-2020	1990-2012	2013-2020	1993-2012	2013-2020	1990-2012
HKG	2017-2020	1990-2016	2017-2020	1990-2016	2017-2020	1990-2016
HUN	1999-2020	1990-1998	1999-2020	1990-1998	1999-2020	1990-1998
IDN		1990-2020	2010-2020	1990-2009	2010-2020	1990-2009
IND		1990-2020		1990-2020		1990-2020
IRL		1990-2020		1990-2020		1990-2020
ISR		1990-2020		1990-2020		1990-2020
ITA	2008-2020	1990-2007	2008-2020	1990-2007	2008-2020	1990-2007
JPN		1990-2020	2014-2020	1990-2013		1990-2020
KOR		1990-2020	2002-2020	1990-2001	2002-2020	1990-2001
LKA		1990-2020		1990-2020		1990-2020
MAR		1990-2020		1996-2020		1990-2020
MEX		1990-2020		1990-2020		1990-2020
MYS		1990-2020		1990-2020		1990-2020
NLD	2015-2020	1990-2014	2009-2020	1990-2008	2015-2020	1990-2014
NOR		1990-2020		1990-2020		1990-2020
NZL		1990-2020		1990-2020		1990-2020
PAK		1990-2020		1993-2020		1990-2020
PER		1990-2020		1990-2020		1990-2020
PHL		1990-2020	2006-2020	1990-2005		1990-2020
POL	2010-2020	1990-2009	2010-2020	1990-2009	2010-2020	1990-2009
PRT		1990-2020		1990-2020		1990-2020
RUS	2016-2020	1993-2015	2016-2020	1993-2015	2016-2020	1993-2015
SGP		1990-2020		1990-2020		1990-2020
SWE	2013-2020	1990-2012	2013-2020	1990-2012		1990-2020
THA	2006-2020	1990-2005	2006-2020	1990-2005	2006-2020	1990-2005
TUN		1990-2020		1990-2020		1990-2020
TUR	2014-2020	1990-2013	2014-2020	1990-2013	2014-2020	1990-2013
URY	2011-2020	1990-2010	2011-2020	1990-2010	2011-2020	1990-2010
USA	2020	1990-2019		1990-2020		1990-2020
ZAF		1990-2020		1990-2020		1990-2020

Notes: Actual data are from IMF Survey. Portfolio equity liabilities and FDI equity liabilities are denominated in the currency of the host country and were therefore excluded from the table. Country names are reported as ISO codes.

A.4 Data Sources for Regression Analysis

Table A4: Data Sources Macro Variables

Variable	Definition	Source
Openness	Openness [(Export+Import) / (2XGDP)]	World Economic Outlook
Inflation volatility	Consumer Price Index, rolling standard deviation using 15-year window	Information Notice System (INS)
GDP volatility	Real GDP growth, rolling standard deviation using 15-year window	World Economic Outlook
NEER volatility	Change in NEER, rolling standard deviation using 15-year window	Information Notice System (INS)
cov (GDP, NEER)	Covariance between GDP growth and change in NEER	World Economic Outlook, Information Notice System (INS)
Log population	Log of population	UN World Population Prospects, 2019 Vintage
Institutions	Political Risk Rating	International Country Risk Guide (ICRG)
Capital controls	Capital Controls Index, FARI	IMF (Baba et.al., 2022)
Peg	Float if coarse classification 3, 4, 5; Peg otherwise	Ilzetzki et al. (2021)
EMU	Euro Area Dummy variable	Dummy=1 if country belongs to Euro Area
Log GDP per capita	Log of Real GDP in PPP terms, per capita, in PPP international currency	World Economic Outlook
Reserve currency	Share of the country's currency held as FX reserves by central banks worldwide	IMF, COFER

Notes: This table shows the datasources for the variables used in Section 3.3. NEER is the nominal effective exchange rate, FARI denotes Financial Account Restriction Index.

B Additional Results

Table B5: Determinants of FX^{AGG} (EMEs)

	(1)	(2)	(3)	(4)	(5)
Openness	0.212***	0.214***	0.206***	0.164***	0.162***
	(0.044)	(0.044)	(0.036)	(0.044)	(0.044)
Inflation volatility	0.077***	0.076***	0.067***	0.087***	0.076***
	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)
GDP volatility	0.122	0.143	-0.228	-0.268	0.075
	(0.175)	(0.182)	(0.199)	(0.195)	(0.168)
NEER volatility	2.720***	2.629***	1.207*	1.888***	0.900
	(0.627)	(0.646)	(0.652)	(0.631)	(0.588)
cov (GDP, NEER)	-0.163	-0.177	0.153	0.168	-0.103
	(0.134)	(0.140)	(0.164)	(0.153)	(0.130)
Log population	-10.737***	-11.388***	-19.038***	-13.966***	
	(3.720)	(3.826)	(4.409)	(3.818)	
Institutions	1.182***	1.157***		0.942***	1.039***
	(0.115)	(0.116)		(0.122)	(0.120)
Capital controls	-0.212***	-0.209***		-0.183***	-0.148***
	(0.036)	(0.036)		(0.036)	(0.035)
Peg		-0.018		0.019	0.010
		(0.016)		(0.016)	(0.017)
Log GDP per capita			0.181***	0.110***	0.085***
			(0.019)	(0.020)	(0.020)
Reserve currency					12.645***
Observations	692	692	693	692	715
R-squared	0.468	0.469	0.413	0.491	0.489

Notes: Regressions include year fixed effects. Robust standard errors in parentheses. ***, **, and * denote, respectively $p < 0.01$, $p < 0.05$, and $p < 0.1$.

Table B6: Determinants of Foreign Currency Exposures: FDI and PEQ (EMEs)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
			FDI					Portfolio Equity		
Openness	0.038***	0.039***	0.030***	0.024***	0.029***	-0.016***	-0.015***	-0.020***	-0.018***	-0.010***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Inflation volatility	0.211***	0.206***	0.128***	0.094***	0.129***	-0.016	-0.019	-0.072***	-0.048*	0.023
	(0.034)	(0.035)	(0.029)	(0.031)	(0.023)	(0.021)	(0.028)	(0.022)	(0.027)	(0.027)
GDP volatility	-0.617***	-0.689***	-0.607***	-0.607***	-0.617***	-0.405***	-0.507***	-0.496***	-0.486***	-0.586***
	(0.103)	(0.099)	(0.091)	(0.089)	(0.083)	(0.083)	(0.095)	(0.078)	(0.092)	(0.089)
NEER volatility	-0.155***	-0.149***	-0.082***	-0.054**	-0.082***	0.027	0.032	0.074***	0.056***	-0.001
	(0.028)	(0.028)	(0.023)	(0.024)	(0.018)	(0.016)	(0.022)	(0.017)	(0.021)	(0.020)
cov (GDP, NEER)	1.812**	0.669	0.457	-0.251		0.632	-0.993*	-0.946**	-1.231**	
	(0.729)	(0.659)	(0.631)	(0.591)		(0.480)	(0.571)	(0.449)	(0.589)	
Log population	0.011***	0.010***	0.011***	0.012***	0.014***	-0.001	-0.002**	-0.003***	-0.002**	-0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Institutions	0.186***	0.201***		0.045***	0.057***	0.185***	0.200***		0.159***	0.160***
	(0.014)	(0.015)		(0.017)	(0.016)	(0.012)	(0.012)		(0.013)	(0.012)
Capital controls	-0.031***	-0.037***		-0.006	-0.007	-0.018***	-0.025***		-0.017***	-0.016***
	(0.006)	(0.006)		(0.006)	(0.005)	(0.005)	(0.005)		(0.005)	(0.005)
Peg		-0.013***		0.002	-0.013***		-0.020***		-0.016***	-0.031***
		(0.003)		(0.004)	(0.003)		(0.002)		(0.003)	(0.002)
EMU		-0.026***		-0.045***			-0.031***		-0.036***	
		(0.004)		(0.004)			(0.003)		(0.003)	
Log GDP per capita			0.037***	0.041***	0.035***			0.025***	0.011***	0.002
			(0.002)	(0.003)	(0.003)			(0.001)	(0.002)	(0.002)
Reserve currency					-0.085***					-0.024**
					(0.015)					(0.012)
Observations	1,437	1,437	1,442	1,437	1,484	1,437	1,437	1,442	1,437	1,484
R-squared	0.294	0.353	0.341	0.421	0.387	0.319	0.463	0.286	0.469	0.421

Notes: Regressions include year fixed effects. Robust standard errors in parentheses. ***, **, and * denote, respectively $p < 0.01$, $p < 0.05$, and $p < 0.1$.

Table B7: Determinants of Foreign Currency Exposures: PD, OI, and reserves (EMEs)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(3)	(4)	(5)
	Portfolio Debt					Other Investment					Foreign Exchange Reserves				
Openness	0.052***	0.050***	0.042***	0.061***	0.062***	0.039	0.041	0.031	-0.017	-0.019	0.083***	0.079***	0.103***	0.089***	0.089***
	(0.010)	(0.010)	(0.010)	(0.011)	(0.012)	(0.035)	(0.035)	(0.027)	(0.032)	(0.031)	(0.016)	(0.017)	(0.014)	(0.017)	(0.016)
Inflation volatility	0.010***	0.010***	0.005***	0.008***	0.005***	0.039***	0.038***	0.036***	0.051***	0.046***	0.026***	0.027***	0.022***	0.025***	0.022***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
GDP volatility	-0.441***	-0.454***	-0.314***	-0.368***	-0.206**	0.762***	0.779***	0.365***	0.307**	0.358***	-0.405***	-0.437***	-0.319***	-0.360***	-0.260***
	(0.094)	(0.092)	(0.087)	(0.094)	(0.103)	(0.138)	(0.141)	(0.133)	(0.134)	(0.124)	(0.054)	(0.053)	(0.058)	(0.056)	(0.046)
NEER volatility	0.815***	0.867***	0.840***	1.022***	0.677***	1.867***	1.798***	0.534	0.949**	0.704	0.658***	0.794***	0.896***	0.933***	0.671***
	(0.165)	(0.164)	(0.154)	(0.168)	(0.144)	(0.506)	(0.515)	(0.500)	(0.464)	(0.434)	(0.199)	(0.197)	(0.196)	(0.196)	(0.171)
cov (GDP, NEER)	0.334***	0.342***	0.237***	0.270***	0.147*	-0.696***	-0.707***	-0.348***	-0.312***	-0.345***	0.339***	0.360***	0.263***	0.296***	0.212***
	(0.073)	(0.071)	(0.068)	(0.073)	(0.081)	(0.107)	(0.109)	(0.107)	(0.105)	(0.096)	(0.046)	(0.043)	(0.050)	(0.046)	(0.037)
Log population	-5.142***	-4.767***	-2.574***	-4.230***		-0.294	-0.789	-8.957***	-3.743		-5.345***	-4.376***	-4.938***	-3.892***	
	(1.213)	(1.186)	(0.955)	(1.127)		(3.436)	(3.456)	(3.312)	(3.024)		(1.458)	(1.272)	(1.308)	(1.229)	
Institutions	-0.135***	-0.120***		-0.076***	-0.049*	1.016***	0.997***		0.752***	0.766***	0.029	0.066*		0.106***	0.148***
	(0.026)	(0.026)		(0.026)	(0.027)	(0.088)	(0.089)		(0.091)	(0.090)	(0.034)	(0.035)		(0.037)	(0.033)
Capital controls	-0.036***	-0.038***		-0.044***	-0.037***	-0.149***	-0.146***		-0.116***	-0.090***	0.004	-0.002		-0.007	-0.001
	(0.010)	(0.010)		(0.010)	(0.011)	(0.032)	(0.032)		(0.032)	(0.032)	(0.010)	(0.010)		(0.011)	(0.010)
Peg		0.011***		0.003	0.001		-0.014		0.029**	0.023*		0.027***		0.020***	0.018***
		(0.004)		(0.004)	(0.004)		(0.011)		(0.012)	(0.013)		(0.005)		(0.005)	(0.005)
Log GDP per capita			-0.025***	-0.023***	-0.031***			0.173***	0.127***	0.119***			-0.024***	-0.021***	-0.027***
			(0.004)	(0.006)	(0.006)			(0.013)	(0.014)	(0.015)			(0.005)	(0.007)	(0.007)
Reserve currency					2.801***					2.557*					2.958***
					(0.602)					(1.399)					(0.946)
															0.001
Observations	692	692	693	692	715	692	692	693	692	715	692	692	693	692	715
R-squared	0.207	0.216	0.199	0.239	0.195	0.479	0.480	0.450	0.534	0.524	0.334	0.367	0.353	0.377	0.371

Notes: Regressions include year fixed effects. Robust standard errors in parentheses. ***, **, and * denote, respectively $p < 0.01$, $p < 0.05$, and $p < 0.1$.

Table B8: Determinants of FX^{AGG} (Advanced)

	(1)	(2)	(3)	(4)	(5)
Openness	0.174***	0.116***	0.116***	0.070***	0.065***
	(0.014)	(0.013)	(0.015)	(0.014)	(0.015)
Inflation volatility	0.029***	0.030***	0.030***	0.028***	0.054***
	(0.005)	(0.005)	(0.004)	(0.005)	(0.006)
GDP volatility	-1.190	-0.361	11.100***	5.365	12.638***
	(3.413)	(3.660)	(3.461)	(3.795)	(3.456)
NEER volatility	-2.124***	-0.709	-1.298**	-0.279	0.473
	(0.593)	(0.499)	(0.657)	(0.513)	(0.553)
cov (GDP, NEER)	19.483***	0.405	19.550***	4.396	0.339
	(3.141)	(3.204)	(3.010)	(3.277)	(3.067)
Log population	-17.958**	-23.815***	-0.696	-10.184	
	(8.370)	(7.587)	(8.596)	(7.862)	
Institutions	0.025	0.032		-0.239**	-0.183*
	(0.097)	(0.090)		(0.101)	(0.101)
Capital controls	-0.082*	-0.078		-0.048	-0.055
	(0.044)	(0.049)		(0.048)	(0.038)
Peg		-0.025**		-0.004	-0.053***
		(0.012)		(0.012)	(0.011)
EMU		-0.115***		-0.117***	
		(0.012)		(0.011)	
Log GDP per capita			0.213***	0.178***	0.252***
			(0.024)	(0.027)	(0.027)
Reserve currency					-0.395***
					(0.037)
					-0.009
Observations	745	745	749	745	769
R-squared	0.311	0.458	0.360	0.489	0.513

Notes: Regressions include year fixed effects. Robust standard errors in parentheses. ***, **, and * denote, respectively $p < 0.01$, $p < 0.05$, and $p < 0.1$.

Table B9: Determinants of Foreign Currency Exposures: FDI and PEQ (Advanced)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
			FDI					PEQ		
Openness	0.048***	0.021***	0.030***	0.004	0.012**	-0.003	-0.025***	-0.029***	-0.043***	-0.031***
	(0.004)	(0.004)	(0.005)	(0.005)	(0.006)	(0.005)	(0.004)	(0.005)	(0.004)	(0.004)
Inflation volatility	0.013***	0.014***	0.012***	0.013***	0.019***	-0.004**	-0.005***	-0.007***	-0.005***	-0.005***
	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)
GDP volatility	-2.491*	-2.519**	-0.198	-0.450	1.169	-2.953***	-2.443***	-1.508	-0.192	-0.378
	(1.413)	(1.212)	(1.406)	(1.304)	(1.294)	(1.039)	(0.710)	(0.932)	(0.714)	(0.780)
NEER volatility	-1.107***	-0.612***	-0.891***	-0.457***	-0.271	-0.785***	-0.186	-0.529***	-0.017	-0.133
	(0.177)	(0.153)	(0.201)	(0.155)	(0.203)	(0.189)	(0.161)	(0.160)	(0.128)	(0.132)
cov (GDP, NEER)	3.337***	-2.960***	4.077***	-1.518	-0.832	5.370***	-2.891***	7.535***	-1.322*	0.602
	(0.978)	(1.140)	(0.829)	(1.104)	(1.253)	(0.815)	(0.779)	(0.689)	(0.692)	(0.797)
Log population	0.194	-0.877	4.618**	4.047*		-1.167	-4.135***	4.074**	1.223	
	(2.061)	(2.264)	(1.989)	(2.280)		(1.950)	(1.582)	(1.921)	(1.408)	
Institutions	0.099***	0.108***		0.010	0.033	0.260***	0.259***		0.153***	0.131***
	(0.034)	(0.029)		(0.033)	(0.033)	(0.028)	(0.019)		(0.019)	(0.020)
Capital controls	-0.031**	-0.022		-0.011	-0.018	-0.058***	-0.060***		-0.048***	-0.042***
	(0.014)	(0.013)		(0.013)	(0.012)	(0.011)	(0.010)		(0.010)	(0.009)
Peg		0.022***		0.030***	-0.009**		-0.026***		-0.018***	-0.039***
		(0.005)		(0.005)	(0.004)		(0.004)		(0.004)	(0.003)
EMU		-0.066***		-0.066***			-0.036***		-0.037***	
		(0.005)		(0.005)			(0.004)		(0.004)	
Log GDP per capita			0.073***	0.064***	0.074***			0.118***	0.070***	0.073***
			(0.007)	(0.009)	(0.009)			(0.008)	(0.008)	(0.008)
Reserve currency					-0.113***					-0.029**
					(0.019)					(0.012)
Observations	745	745	749	745	769	745	745	749	745	769
R-squared	0.203	0.387	0.249	0.419	0.314	0.361	0.596	0.444	0.637	0.580

Notes: Regressions include year fixed effects. Robust standard errors in parentheses. ***, **, and * denote, respectively $p < 0.01$, $p < 0.05$, and $p < 0.1$.

Table B10: Determinants of Foreign Currency Exposures: PD, OI, and reserves (Advanced)

	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
			PD					Other					reserves		
Openness	0.076***	0.076***	0.064***	0.065***	0.048***	0.017***	0.021***	0.016***	0.013***	0.010*	0.039***	0.024***	0.040***	0.033***	0.033***
	(0.006)	(0.007)	(0.008)	(0.008)	(0.008)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)
Inflation volatility	0.015***	0.015***	0.018***	0.015***	0.026***	0.010***	0.010***	0.008***	0.010***	0.013***	-0.005***	-0.004***	-0.000	-0.004***	0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
GDP volatility	-2.884	-2.689	2.636	-1.310	5.346**	4.962***	4.952***	3.079	5.920***	5.586***	1.105	1.253	5.651***	0.125	-0.488
	(2.317)	(2.339)	(2.255)	(2.491)	(2.084)	(1.722)	(1.702)	(1.999)	(1.666)	(1.721)	(1.416)	(1.480)	(1.325)	(1.539)	(1.546)
NEER volatility	0.424	0.503	0.658*	0.606*	0.588**	-0.249	-0.313	-0.346*	-0.240	-0.075	-0.374*	-0.047	-0.189	-0.131	0.334
	(0.315)	(0.309)	(0.349)	(0.325)	(0.294)	(0.190)	(0.191)	(0.176)	(0.185)	(0.195)	(0.197)	(0.187)	(0.189)	(0.192)	(0.219)
cov (GDP, NEER)	3.470	2.238	2.081	3.199	-2.719	-2.352*	-1.527	0.027	-0.852	-0.837	10.032***	5.673***	6.302***	4.887***	4.440***
	(2.141)	(2.363)	(2.102)	(2.307)	(2.321)	(1.210)	(1.476)	(1.284)	(1.586)	(1.786)	(1.104)	(1.187)	(1.013)	(1.144)	(1.051)
Log population	-32.886***	-33.668***	-27.668***	-30.384***		-2.223	-2.045	-4.123*	0.261		18.683***	17.466***	22.317***	14.781***	
	(5.176)	(5.302)	(5.566)	(5.817)		(2.159)	(2.152)	(2.157)	(2.166)		(3.366)	(3.184)	(3.718)	(3.298)	
Institutions	-0.183***	-0.186***		-0.251***	-0.227***	0.131***	0.130***		0.084**	0.078*	-0.283***	-0.281***		-0.227***	-0.189***
	(0.039)	(0.041)		(0.047)	(0.044)	(0.031)	(0.031)		(0.036)	(0.041)	(0.026)	(0.024)		(0.026)	(0.029)
Capital controls	-0.009	-0.012		-0.005	-0.032	-0.104***	-0.105***		-0.100***	-0.087***	0.112***	0.114***		0.108***	0.117***
	(0.024)	(0.024)		(0.024)	(0.020)	(0.020)	(0.020)		(0.021)	(0.021)	(0.016)	(0.016)		(0.017)	(0.015)
Peg		-0.016**		-0.011	0.007		-0.002		0.002	0.012**		-0.001		-0.005	-0.025***
		(0.008)		(0.008)	(0.005)		(0.004)		(0.004)	(0.005)		(0.005)		(0.005)	(0.004)
EMU		0.006		0.005			0.007*		0.007*			-0.030***		-0.030***	
		(0.008)		(0.008)			(0.004)		(0.004)			(0.005)		(0.004)	
Log GDP per capita			0.029*	0.043**	0.096***			0.048***	0.030***	0.041***			-0.057***	-0.035***	-0.043***
			(0.016)	(0.017)	(0.015)			(0.008)	(0.010)	(0.011)			(0.009)	(0.009)	(0.009)
Reserve currency					-0.115***					-0.034***					-0.101***
					(0.020)					(0.012)					(0.012)
Observations	745	745	749	745	769	745	745	749	745	769	745	745	749	745	769
R-squared	0.335	0.340	0.301	0.346	0.327	0.330	0.334	0.262	0.344	0.346	0.485	0.544	0.394	0.553	0.533

Notes: Regressions include year fixed effects. Robust standard errors in parentheses. ***, **, and * denote, respectively $p < 0.01$, $p < 0.05$, and $p < 0.1$.

Table B11: Financial and Trade Weighted Exchange Rate, Detailed Decomposition

	All (including FXR)	All (excluding FXR)	All FDI	All Portfolio	All Debt	All Equity	All debt (including FXR)
Full Sample	0.15	-0.10	0.32	-0.09	-0.35	0.46	-0.27
Advanced Economies							
All	0.35	0.23	0.41	0.22	-0.28	0.48	-0.19
Pre-GFC	0.32	0.10	0.46	0.12	-0.29	0.56	-0.22
Post-GFC	0.42	0.40	0.44	0.33	-0.14	0.44	-0.07
Emerging Economies							
All	-0.26	-0.39	0.26	-0.24	-0.51	0.40	-0.38
Pre-GFC	-0.28	-0.38	0.18	-0.25	-0.47	0.40	-0.35
Post-GFC	0.27	0.02	0.33	-0.10	-0.37	0.49	0.15
Creditor	0.41	0.28	0.48	0.34	0.01	0.49	0.29
Debtor	0.00	-0.17	0.27	-0.19	-0.37	0.41	-0.33

Notes: This table shows the medians of within-country correlations between annual percentage changes in the different components of the financial exchange rate and the trade weighted index. Data cover 1990-2020.

Table B12: COVID-19 versus the Global Financial Crisis: Gross Assets

	FA Assets	Δ Assets	VAL^{XR}			VAL^{OTH}			Total VAL		
			Total	Debt & FXR	Equity	Total	Debt & FXR	Equity	Total	Debt & FXR	Equity
COVID-19 (2020)											
Full sample	7.6	19.0	-0.1	-0.6	0.6	12.1	5.7	6.2	12.0	5.1	6.7
Advanced Economies	9.2	26.6	-1.4	-1.7	0.3	18.7	9.1	9.6	17.3	7.4	9.9
USA	4.4	10.7	5.2	0.5	4.7	1.1	0.7	0.5	6.3	1.2	5.1
Emerging Economies	4.3	5.5	2.3	1.3	1.0	-1.1	-1.0	-0.1	1.4	0.4	0.9
Creditors Economies	9.4	21.0	-1.0	-0.9	-0.2	12.6	6.6	5.9	11.5	5.8	5.8
Debtors Economies	6.3	17.7	0.6	-0.4	1.1	11.8	5.1	6.3	12.4	4.5	7.4
GFC (2008)											
Full sample	2.8	-21.0	7.9	5.2	2.7	-31.2	-9.4	-22.7	-23.5	-4.2	-20.0
Advanced Economies	0.6	-29.6	9.3	6.2	3.1	-38.1	-11.0	-29.0	-29.3	-4.8	-25.8
USA	-2.2	-33.6	-3.2	-0.1	-3.0	-28.2	3.1	-31.4	-31.4	3.0	-34.4
Emerging Economies	9.9	3.6	3.8	2.2	1.6	-9.5	-4.5	-4.5	-5.7	-2.4	-3.0
Creditors Economies	3.9	-17.0	14.9	9.6	5.3	-35.8	-14.3	-21.5	-20.8	-4.6	-16.2
Debtors Economies	2.2	-23.3	4.0	2.7	1.3	-28.3	-6.4	-23.4	-25.2	-4.0	-22.1

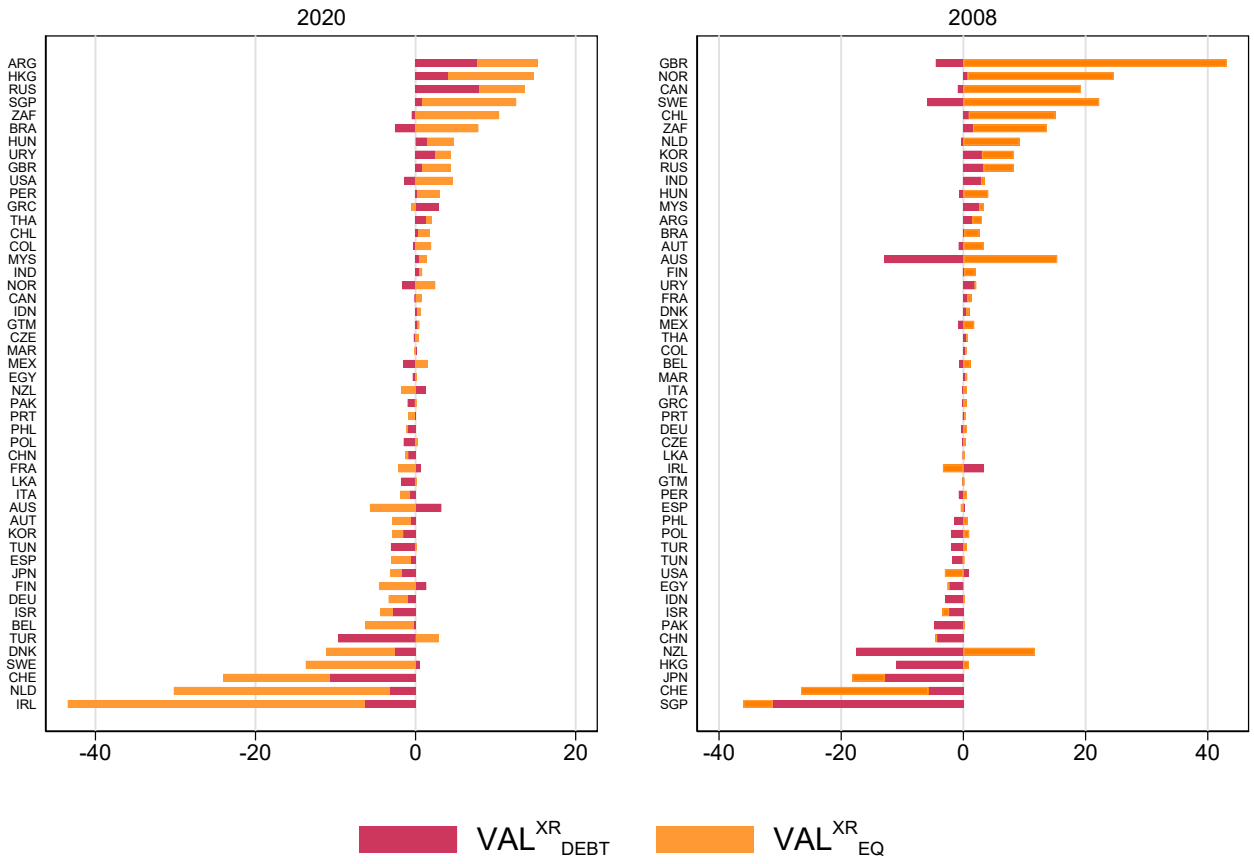
Notes: This table shows the stock-flow reconciliation of the asset side of the international balance sheet. Weighted average in percent of group (or economy) GDP. FA assets represents the asset side of the financial account; Δ Assets the change in the gross international asset position; VAL^{XR} valuation change induced by exchange rate movements; VAL^{OTH} the change in valuation due to asset prices and other statistical changes; VAL^{TOTAL} the overall change in valuation. These valuation changes are further decomposed into total changes, changes in debt (including foreign exchange reserves) and equity. Creditor and Debtor economies are classified according to being a debtor or creditor on the eve of the global financial crisis.

Table B13: COVID-19 versus the Global Financial Crisis: Gross Liabilities

	FA Liabilities	Δ Liabilities	VAL^{XR}			VAL^{OTH}			Total VAL		
			Total	Debt & FXR	Equity	Total	Debt & FXR	Equity	Total	Debt & FXR	Equity
COVID-19 (2020)											
Full sample	7.6	20.4	0.2	0.2	0.0	12.6	4.9	7.7	12.8	5.1	7.7
Advanced Economies	9.7	29.3	-0.6	-0.6	0.0	20.3	8.6	11.7	19.6	7.9	11.7
USA	7.6	24.0	1.9	1.9	0.0	14.4	0.4	14.1	16.4	2.3	14.1
Emerging Economies	3.9	4.4	1.7	1.7	0.0	-1.2	-1.7	0.5	0.5	0.0	0.5
Creditors Economies	8.2	16.3	-0.3	-0.3	0.0	8.4	4.8	3.7	8.1	4.5	3.7
Debtors Economies	7.3	23.2	0.5	0.5	0.0	15.4	5.0	10.4	15.9	5.5	10.4
GFC (2008)											
Full sample	4.1	-21.1	7.1	7.1	0.0	-31.7	-11.5	-20.8	-24.7	-4.5	-20.8
Advanced Economies	3.6	-25.3	8.4	8.4	0.0	-36.6	-14.2	-23.1	-28.2	-5.8	-23.1
USA	3.2	-14.2	-1.0	-1.0	0.0	-16.3	1.9	-18.2	-17.4	0.8	-18.2
Emerging Economies	5.6	-9.1	3.2	3.2	0.0	-18.2	-3.9	-14.1	-15.0	-0.7	-14.1
Creditors Economies	-0.8	-27.1	14.6	14.6	0.0	-41.0	-19.0	-22.0	-26.4	-4.4	-22.0
Debtors Economies	7.0	-17.7	2.8	2.8	0.0	-26.3	-7.1	-20.1	-23.7	-4.5	-20.1

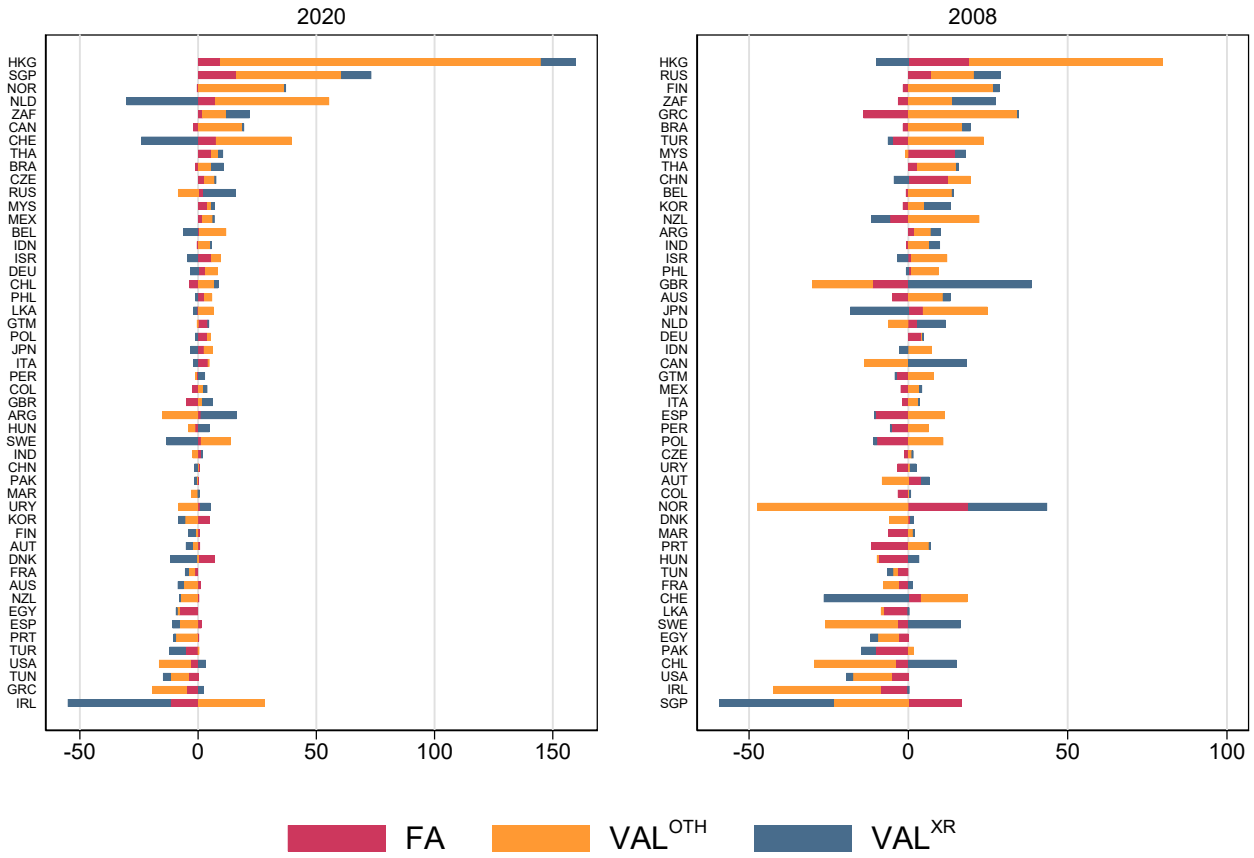
Notes: This table shows the stock-flow reconciliation of the liability side of the international balance sheet. Weighted average in percent of group (or economy) GDP. FA Liabilities represents the liability side of the financial account; Δ Liabilities the change in the gross international liabilities position; VAL^{XR} valuation change induced by exchange rate movements; VAL^{OTH} the change in valuation due to asset prices and other statistical changes; VAL^{TOTAL} the overall change in valuation. These valuation changes are further decomposed into total changes, changes in debt (including foreign exchange reserves) and equity. Creditor and Debtor economies are classified according to being a debtor or creditor on the eve of the global financial crisis.

Figure B1: COVID-19 versus the Global Financial Crisis: VAL^{XR} by Economy



Note: This figure represents valuation changes due to exchange rate movements on debt (VAL^{XR}_{DEBT}) and equity (VAL^{XR}_{EQ}), in percent of GDP. Results for 2020 are on the left panel, while 2008 is on the right panel.

Figure B2: COVID-19 versus the Global Financial Crisis: Δ NIIP by Economy



Note: This figure represents the overall change of the international balance sheet decomposed into flows (FA), valuation change induced by exchange rate movements (VAL^{XR}), and valuation changes due to asset prices and other statistical changes (VAL^{OTH}), in percent of GDP. Results for 2020 are on the left panel, while 2008 is on the right panel.

PUBLICATIONS

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