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How Expected Inflation Distorts the Current Account and the Valuation Effect*

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Abstract

We show that the current account balance (CA) is systematically distorted by an *inflation effect*, which arises because income on foreign-issued debt is recorded as nominal interest in the currency of denomination. Since nominal interest includes compensations for expected inflation, increases in the latter must impact the CA. Guided by the relevant international accounting rules, we impute the *inflation effect* for 50 economies between 1991 and 2017. When adjusting for the *inflation effect*, the absolute value of yearly CAs drops by 0.13% of GDP on average. Over the full period, the reduction is sizable 22.85% of initial GDP for the average country (26.4% for the U.S.). As the flip-side of the CA distortions, the *inflation effect* contributes systematically to the well-known valuation effect of net foreign assets, of which about a twelfth is accounted for between 1991 and 2017 for the average country and well over half for the U.S.

Keywords: inflation, current account, valuation effect
JEL Classification: F30, F32

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Ideally, the current account should measure the change in an economy's net real claims on foreigners. In practice, however, [it is] measured in nominal terms...

Obstfeld and Rogoff 1996, p.18

1 Introduction

The two principle components of a country's current account balance (CA) are net exports and net income on foreign investment. The CA indicates how much a country saves abroad (when positive) or indebts itself vis-á-vis foreigners (when negative) and is readily used to identify global imbalances or 'unfair currency practices'.[1] Academic work on the CA and global imbalances abounds.[2]

This paper shows how expected inflation – a genuinely nominal variable – systematically distorts the CA. The first part of our paper shows that this distortion, which we call the *inflation effect*, arises because international accounting rules require the CA to record nominal interest income instead of real income (whence our initial quote). The second part shows that the inflation effect is large, that it systematically distorts the CA and thus contributes the well-known *valuation effect*, i.e., the difference between the CA and the change in net international investment positions.

The first part draws on the IMF's Balance of Payments and International Investment Position Manual, or BPM (IMF 2009) to discuss and formalize the relevant international accounting rules. According to these accounting rules, interest on investment in foreign debt instruments is recorded nominally in the currency of denomination and therefore includes compensations for expected inflation. This compensation is larger for higher foreign inflation, even converting it to domestic currency in which the CA is recorded.

The mechanism of the *inflation effect* is quickly exemplified through a hypothetical world economy of two countries, trading riskless bonds; the first country has an inflation rate of zero and the second of 100%. Under perfect foresight, bonds of both countries yield identical real returns (normalized to zero) but local nominal rates of return differ by 100 percentage points. The inflation differential requires that the currency of the second country depreciates by the factor 2. In that world, the first country collects returns to its foreign investments of 100% when expressed in foreign and of 50% when

[1] See, for example Lane and Milesi-Ferretti (2007b). Policy makers use the CA as a measure of 'external competitiveness' (e.g., IMF (2017)) and to define "unfair currency practices" (see U.S. Trade Facilitation and Trade Enforcement Act of 2015 and the Trade Act of 1974 – Congress (2016)).

[2] See Gourinchas and Rey (2014) and for a comprehensive literature review and Kehoe, Ruhl, and Steinberg (2018) and Ikeda and Phan (2019) for recent contributions.

converted in domestic currency (100% times the factor of depreciation). These returns appear as receivables in the first country's CA.[3] At the same time, the country's own nominal returns are zero and its CA is positive. The mirror image with a negative CA applies to the second country. Finally, in an alternative world with zero inflation throughout, both CAs would be zero. We call the obvious difference between the positive-inflation and the zero-inflation benchmark the *inflation effect*, which distorts recorded income on cross-border investments and thus the CAs.

The flip-side of the *inflation effect* for the CA is a compensating change in the intensively studied *valuation effect*, defined as the difference between change in a country's Net International Investment Position (NIIP) and its CA.[4] In our example above with positive inflation, the first country suffers real valuation losses on the principle of its foreign investment, when expressed in domestic currency, since the exchange rate change shrinks the value of the principle by half. By shifting value from the principle to investment income, the *inflation effect* systematically affects the CA and the *valuation effect* simultaneously, decreasing the one at the expense of the other.

It may appear disconcerting *per se* that inflation systematically impacts the CA. Whether or not these distortions are of practical relevance, however, is an empirical question. Our paper therefore assesses how *inflation effect* distorts international investment income as recorded in the CA in a set of 50 countries for the years 1991 to 2017.[5] Doing so, we proceed in three steps. First, we show that the key mechanics that drive the *inflation effect* surface in the BOP data: expected foreign inflation correlates systematically with the BOP-measured rate of returns, defined as recorded income over gross initial investment positions. In accordance with the accounting rules, the correlation is strong for debt instruments but weak for non-debt assets.

Second, we adjust the CAs for the countries in our sample by inferring their CAs that would arise under zero inflation.[6] The absolute value of the adjustments are economically important. They reduce the absolute value of the yearly CA by a moderate 0.13% of GDP (from 3.95% to 3.82%) on

[3]Real valuation losses on the principle guarantee that real returns are zero.

[4]Changes in net foreign assets unexplained by the CA are valuation changes by definition – see Gourinchas and Rey (2014). Of course, the *inflation effect* leaves the NIIP unchanged. In the words of Lane and Shambaugh (2010), "if all foreign assets were single-period foreign-currency bonds and all foreign liabilities were single-period domestic-currency bonds, uncovered interest rate parity would mean that all predictable movements in exchange rates would be exactly offset by shifts in net investment income."

[5]Time and country coverage is imposed by data restrictions.

[6]We thus approach the ideal measurement of the CAs, mentioned by Obstfeld and Rogoff (1996) in our initial quote.

average. Over the whole period, however, the adjustments are large and reduce the absolute size of the cumulate CA by about one seventh for the average country (from 156.47% to 133.62%).[7]

Third, we show that the *inflation effect* systematically inflates the *valuation effect*. While our yearly adjustments of the valuation effects reduce its absolute value marginally from 6.62% to 6.59% of GDP, the contributions are large at longer horizons: over the full period, adjusting for the *inflation effect* reduces the magnitude of the valuation effect from 86.47% of initial GDP to 79.16% or a twelfth of its absolute value.

The adjustments for the U.S. are particularly pronounced: while the yearly CA deficit reduces from 2.84% to 2.31% of GDP for the average year, the cumulative CA reduces by 26.4% of initial GDP, from 120.74% to 94.34% over the whole period. Accordingly, the cumulative valuation effect reduces from 45.21% of initial GDP to 18.81%, or by well over one half. The case of the U.S. also illustrates that the importance of the *inflation effect* increased in recent years, because the decline in expected inflation was overcompensated by an increase of cross-border holdings of debt instruments.

This paper connects to several literatures. First and foremost, we add to the literature that highlights measurement problems of cross-border investment and interest payments. Previous work has explored various sources of such problems, such as unmeasured fractions of foreign assets (Hausmann and Sturzenegger 2007), inconsistent reporting procedures (e.g., Curcuru, Dvorak, and Warnock 2008) and unreported assets due to tax avoidance (Zucman 2013). Close to our paper are Fischer, Groeger, Sauré, and Yeşin (2019) and Adler, Garcia-Macia, and Krogstrup (2019), who show that even under spotless reporting of the CA, international accounting principles generate systematic distortions.[8] Fischer, Groeger, Sauré, and Yeşin (2019) emphasize that the particular treatment of retained earnings of Portfolio Investment implies a systematic distortion for the recorded CA, primarily of financial centers. Adler, Garcia-Macia, and Krogstrup (2019) lay out a general framework of external accounts to reflect a wider range of measurement problems and estimate the various CA adjustments.[9] In line with these

[7]The fact that the absolute value of yearly CAs changes little due to the adjustment does not contradict the observation that the absolute value of the cumulative CA changes a lot. This is quickly exemplified: imagine a country that has a recorded CA of -10 in each year of a given decade so that the average absolute value of the CA is 100. If the adjustment changes the CA to $+10$ every second year, the absolute value of yearly adjustments is unchanged but the cumulative CA drops to zero.

[8]Just as the effects in these two papers, the *inflation effect* is therefore independent of the often large *errors and omissions*, which necessarily arise in reality under imperfect statistical reporting.

[9]In their empirical assessments, the authors confirm that distorting effects of inflation can be large. Our paper goes beyond Adler, Garcia-Macia, and Krogstrup (2019) by

papers, our study focuses on issues arising due to accounting rules.

By documenting the systematic effect of expected inflation on the CA, our paper also connects to the literature on global imbalances.[10] In search of the drivers of the CA, the early paradigm of intertemporal trade has proven little explanatory power (e.g., Nason and Rogers 2006, Chinn and Prasad 2003, Gruber and Kamin 2007, and Chinn and Ito 2008) and recent theoretical work has focused on determinants like financial openness, government budget balances and precautionary savings (Caballero, Farhi, and Gourinchas 2008, and Mendoza, Quadrini, and Rios-Rull 2009, Alfaro, Kalemli-Ozcan, and Volosovych 2008), economic stability and fiscal policy (Lane and Perotti 1998 and Fogli and Perri 2006). Depending on the understanding of CA's drivers, different views on the sustainability of CA deficits, the stability of the global financial system and potential un-orderly adjustments of global imbalances arise. For example, by revising previous measures of the 'exorbitant privilege', Curcuru, Dvorak, and Warnock (2008) interpret their "finding of a relatively small returns differential between U.S. claims and liabilities means that one stabilizing aspect of the current international economic system is weaker than previously believed." By showing how expected inflation accounts for part of the global imbalances and that, in particular, part of the U.S. CA deficit is an artifact of the large negative U.S. net foreign position of debt instruments, our paper suggests that global imbalances are, on the contrary, less pronounced than usually perceived and the international economic system may be stronger than suggested. At the same time, our findings support the views expressed in Borio and Disyatat (2011) and Lane and Milesi-Ferretti 2009 who advocate a more holistic approach of global imbalances the narrow focus on CAs. Borio and Disyatat (2011) suggest the use of stocks measures (gross foreign assets positions) instead of the CA to identify the risks of global imbalances.[11] Lane and Milesi-Ferretti 2009 document that "price and exchange rate valuation gains arising from asset price developments and the U.S. dollar depreciation are still key to understanding the stability of the U.S. external position", which suggests that suggest that the CA alone allows only an partial assessment of global imbalances. We add to this literature by highlighting a mechanical but novel accounting effect as a determinant of the CA. Also, we provide additional

tightly linking our methodology to the BPM accounting rules, by appropriately relying on expected (instead of realized) inflation in the quantitative assessment and by assessing the systematic link between inflation on the valuation effect.

[10] The literature typically understands global imbalances as the sum of CA deficits and surpluses. For work related to the Great Financial Crisis, see, e.g., Bernanke 2005, Roubini and Setser 2005 and Laibson and Mollerstrom 2010).

[11] This point is discussed in Milesi-Ferretti and Razin 1996 already. See also Sauré (2017) and the references therein.

arguments for a mindful use of the CA as a measure of global imbalances, suggesting that stock-based measures may constitute a more reliable metric, as advocated by Borio and Disyatat (2011).

An important part of the literature on global imbalances has focused on the valuation effect and its determinants (e.g., Lane and Milesi-Ferretti 2007b and Gourinchas and Rey 2014 and the references therein).[12] Our paper connects to these studies by highlighting the systematic effect of expected inflation on the valuation effect. Our contribution differs from earlier work in that it does not describe novel characteristics of external rebalancing (as done in Lane and Shambaugh 2010 and Bénétrix, Lane, and Shambaugh 2015) but instead exposes a pure accounting distortion. We also relate to prominent studies like Gourinchas and Rey (2007a) and Devereux and Sutherland (2010) that emphasize the distinction between expected and unexpected returns to foreign assets. Gourinchas and Rey (2007a) show that part of external adjustments of cyclical fluctuations materialize through differential rates of returns on foreign assets, which are, in turn, partly driven by expected exchange rate changes. While Gourinchas and Rey (2007a) focus on unanticipated fluctuations around long-term trends, our *inflation effect* rests on the deterministic component of inflation and materializes in a deterministic setup. Devereux and Sutherland (2010) use a real open macro model with incomplete markets and highlight the distinction between predictable and unpredictable valuation changes. In their framework, expected gains must equalize across countries at first order, expected valuation gains must be hence small (of higher order).[13] Our *inflation effect* conceptually differs from these effects, as it merely changes the split of otherwise deterministic returns into recorded income and valuation effect, leaving real returns unaffected.

The remainder of the paper is structured as follows. Section 2 gives an overview of the international accounting principles, which induce a link between expected inflation and the CA. Section 3 formalizes the basic argument, thus laying the ground for our empirical and counterfactual exercises reported in Section 4. Section 5 concludes.

[12] Amidst the growth of gross foreign asset positions, Lane and Milesi-Ferretti (2007b) were among the first to observe that "[d]ifferences between changes in net foreign assets and the current account balance are quite persistent in many countries." Gourinchas and Rey (2014) observe that "the current account represents an increasingly imperfect measure of the change in a country's net foreign asset position."

[13] At first glance, our empirical results provide a nominal counterpart to that statement, as the components of the CA predicted by expected inflation constitute a small part of valuation changes.

2 International Accounting Principles

This section summarizes the international accounting rules relevant for income on foreign investment, drawing on the IMF's Balance of Payments and International Investment Position Manual (IMF 2009), henceforth BPM. This manual is the central reference for international balance of payment reporting, including those for the CA.

The inflation effect on the recorded CA, which the current paper focuses on, arises due to the specific accounting rules for interest-bearing instruments, so-called *Debt Instruments*.[14,15] These *Debt Instruments* largely consist of deposits, loans, and debt securities, all of which generate *Interest*.[16]. This *Interest* is an important component of the CA and it is computed according to the BOP Manual as follows.

Components of Accruing Interest. The CA records *Interest* accruing on *Debt Instruments*, which consists of two components, actual interest payments and valuation gains. This *Interest* "is recorded as accruing continuously over time to the creditor on the amount outstanding" (BPM 11.49). For example, zero-coupon bonds generate positive interest each year before maturity. A particularly simple accounting rule applies to the important class of traded debt instruments, the interest on which "is determined using the original yield-to-maturity" (BPM 11.52).

Such interest is calculated in nominal value, which requires a specification of the reference currency. The BPM specifies the use of currencies as follows.

Currency of Denomination. Generally, *Interest* on *Debt Instruments* is defined in nominal terms in the currency in which the underlying financial contract is specified. Specifically, interest on the sub-category "[d]omestic-currency-denominated fixed-rate instruments [...] is the difference between the sum of all debtor's payments and the funds the creditor makes available to the debtor." Interest on the next sub-category of "foreign currency fixed rate instruments" is defined in parallel, while "foreign currency is used as the currency of denomination." For those debt instruments, "[i]nterest expressed in foreign currency is to be converted into the domestic currency at the midpoint market exchange rate for the periods in which the interest accrues."

[14]Throughout this section, all expressions in italic are technical terms as defined in the BPM

[15]According to the BPM, "[d]ebt instruments are those instruments that require the payment of principal and/or interest at some point(s) in the future" – see BPM 5.31.

[16]In rare cases, *Debt Instruments* also generate *Other investment income*

For interest on the remaining sub-category of index-linked instruments the BPM specifies that these "...debt instruments with both the amount to be paid at maturity and periodic payments linked to a foreign currency are classified and treated as though they are denominated in that foreign currency". (See BPM 11.50)

For any of these *Debt Instruments* issued or linked to foreign currency, the nominal returns are "converted into the [reporting country's] currency at the mid-point market exchange rate for the periods in which the interest accrues" (BPM 11.50). In sum, whenever foreign *Debt Instruments* are denominated in a foreign currency, their interest is typically computed in that foreign currency and subsequently converted into local currency.

Apart for *Debt Instruments*, other classes of Financial Instruments contribute to cross-border investment, generating further types of investment income. For completeness and comparison, we also review the accounting rules of income to other investment classes. The BOP Manual distinguishes between two additional broad classes of Financial Instruments: *Equity and Investment Fund Shares* and *Other Financial Assets and Liabilities.* The first of these two classes generates specific types of returns: *Equity* generates *Dividends*, *Reinvested Earnings* or *Distributed Income of Quasi-Corporations*, while *Investment Fund Shares* generate *Dividends* and *Reinvested Earnings.*The only income-generating asset in the remaining class of financial instruments, *Other Financial Assets and Liabilities* is *Monetary Gold*, which we will neglect in the following.[17]

Other Income. Apart from *Interest*, the BOP Manual defines three types of investment income (BOP 11.8): *Dividends* and *Reinvested Earnings*, which differ somewhat in their accounting rules.

Regarding the date of recording, *Dividends* are recorded at the time the shares go ex-dividend (BPM 11.31) and can arise from either Direct Investment (DI) or Portfolio Investment (PI) (BPM 11.32). Reinvested earnings are recorded in the period in which they accrue (BOP 11.43), are excluded from income on PI but included in income on DI.[18]

The BOP Manual gives little indication regarding the role of exchange rates and currencies for the calculation procedures of these types of income. The manual explicitly excludes "any realized or unrealized holding gains or losses... [which] may arise from valuation changes, including exchange-rate-related gains and losses..." (BOP 11.44) and thus precludes a direct impact

[17] Returns to this asset class is obviously unaffected by the paper's argument.

[18] For more information on reinvested earnings, see Fischer, Groeger, Sauré, and Yeşin (2019).

of exchange rates on retained earning through these valuation effects. Otherwise, it remains does not specify the role of currencies or the exchange rate in the accounting rules, leaving open it procedures applied by the relevant national authorities involve currencies and whether exchange rates may affect the current account.

In sum, the accounting rules of the BPM give rise to the following general rule. Income on foreign investment in Debt Instruments is computed in nominal terms in the currency of denomination (or issuing currency) and subsequently converted into the currency of the reporting country. This rule of thumb does not apply to the other financial asset classes such as *Equity and Investment Fund Shares*.

The next sections assess the implications of the mentioned accounting rules for debt instruments.

3 Inflation Effects and the CA

This section shows that the international accounting rules described above can systematically distort a country's CA. The distortions arise because higher inflation implies higher nominal income on *Debt Instruments*. An increase in foreign (domestic) inflation thus yields an increase in interest on foreign assets (liabilities) and consequently affects the net foreign investment income that enters the CA.

To formalize the argument, consider two countries, indexed by i and j, each issuing debt in form of bonds denominated in the respective local currency. These bonds are issued in $t = 1$, are traded internationally and pay fixed nominal interest and mature in $t = 2$. Inflation rates between period 1 and 2 in the two countries, denoted by π_i and π_j, are perfectly anticipated but generally differ across countries. Frictionless international capital markets ensure that real riskless rates of return, ρ, equalize across countries and the Fisher equation $(1 + r_i = (1 + \rho)(1 + \pi_i))$ dictates that nominal bond yields in the high inflation country are higher than nominal bond yields in the low inflation country.

We now compute net interest on country i's foreign assets in $t = 2$ as recorded in country i's CA according to the BPM accounting rules. As discussed in Section 2, the calculation of asset income consists of two steps. First, the nominal value of interest on foreign (country j's) assets is recorded in foreign currency and then, second, converted into local currency. Nominal interest on foreign liabilities is directly computed in local currency (and currency conversion is obsolete). Net foreign investment income – which is equal to the CA in our example – thus equals interest on foreign assets minus interest on foreign liabilities, both expressed in local (country i's) currency.

Bond purchases made in period $t = 1$ yields interest in period $t = 2$. We denote $p_{j,t}$ as the bond price issued by country j in period t and I_j the bond's interest payments, all denominated in country j's currency. The nominal interest rate in country j' currency is then[19]

$$1 + r_j = (p_{j,2} + I_j)/p_{j,1} = [(I_j + p_{j,2} - p_{j,1})/p_{j,1}] + 1. \tag{1}$$

The way we have expressed the rate of return to foreign assets encapsulates the two components as decribed in the accounting rules above: the term in the squared brackets reflects nominal returns, consisting of interest payments (e.g., for fixed income instruments) and bond-price changes (e.g., for zero-coupon bonds). Together, both components constitute income, denoted in the issuing country's (country j's) currency.

For the reporting in country i's CA, the expression in the squared brackets in (1), however, is converted into country i currency. Before turning to the currency conversion, we notice that in our deterministic setting real returns equalize throughout countries:

$$(1 + r_i)\,(1 + \Delta_{ij}) = 1 + r_j \tag{2}$$

where $1 + \Delta_{ij}$ is the factor of exchange rate appreciation between period $t = 1$ and $t = 2$ and $\Delta_{ij} > 0$ indicates an appreciation of country i's currency. Together, both equations above yield the gross rate of return

$$1 + r_i = \frac{(I_j + p_{j,2} - p_{j,1})/p_{j,1}}{1 + \Delta_{ij}} + \frac{1}{1 + \Delta_{ij}}. \tag{3}$$

On the left hand side of this equation, r_i stands for the nominal interest rate country i's must pay on its liabilities (the *payables*). On the right hand side, the first fraction reflects country i's income on foreign assets of foreign assets (of its *receivables*). It is the nominal rate of return on country i's assets in the foreign currency, yet converted into local currency.

We next observe that the exchange rate change is

$$1 + \Delta_{ij} = (1 + \pi_j)/(1 + \pi_i)\,. \tag{4}$$

[19] In the two-period setup, there is no risk of confusion and we drop time indices on interest I and the rate of return r to safe notation.

so that equations (1), (3) and (4), combined with the Fisher Equation $1 + r_j = (1+\rho)(1+\pi_j)$, yields

$$1 + r_i = \left[(1+\rho)(1+\pi_i) - \frac{1+\pi_i}{1+\pi_j}\right] + \frac{1+\pi_i}{1+\pi_j}. \quad (5)$$

Just as for equation (1), we observe that the term in square brackets corresponds to country i's income on foreign assets. In contrast to (1), however, it is expressed in country i's currency and thus corresponds to *receivable* as reported in the CA. The last term on the right hand side reflects the valuation effect on the principal, induced by the expected exchange rate movements, as described, e.g., in Lane and Milesi-Ferretti (2007b) and does not affect country i's CA.

Now, we turn from rate of returns to the value of interest income. Denoting country i's gross bilateral foreign assets into country j with IIP_{ij}^A (A for assets) and the corresponding investment income with I_{ij}^A, we express country i's income on bilateral foreign assets expressed in its national currency as

$$I_{ij}^A = IIP_{ij}^A \cdot \left[(1+\rho)(1+\pi_i) - \frac{1+\pi_i}{1+\pi_j}\right]. \quad (6)$$

Interest payments on country's bilateral foreign liabilities (the *payables*), expressed in local currency, are simply

$$I_{ij}^L = IIP_{ij}^L \cdot r_i = IIP_i^L \cdot [(1+\rho)(1+\pi_i) - 1], \quad (7)$$

where IIP_{ij}^L stand country i's bilateral foreign liabilities.

For later use, we state the following first-order approximations of (6) and (7) for small rates of real returns and inflation,

$$I_{ij}^A \approx IIP_{ij}^A [\rho + \pi_j] \quad (8)$$

$$I_{ij}^L \approx IIP_{ij}^L [\rho + \pi_i], \quad (9)$$

conveniently underscoring our observation summarized in the introduction: up to a mild simplification, i.e., first-order approximation, the CA records nominal interest income instead of real interest income. Country i's bilateral net international investment income is then:

$$NII_{ij} = IIP_{ij}^A \cdot \left[(1+\rho)(1+\pi_i) - \frac{1+\pi_i}{1+\pi_j}\right] - IIP_{ij}^L \cdot [(1+\rho)(1+\pi_i) - 1] \quad (10)$$

or, in its approximated version,

$$NII_{ij} = IIP_{ij}^{A} \cdot [\rho + \pi_j] - IIP_{ij}^{L} \cdot [\rho + \pi_i] \tag{11}$$

Equation (10) and its linearized version (11) capture the mechanics of the *inflation effect*, through which expected inflation impacts the CA. These mechanics decompose into three parts. First, positive foreign inflation increases the receivable income on foreign assets and thus tends to overstate the net investment income and thus the CA. Second, positive domestic inflation increases the payable income on foreign liabilities and thus tends to understate the net investment income and thus the CA. Third, both effects are leveraged by the magnitude of gross foreign assets and liabilities: the first (second) effect is larger in absolute value, the larger the underlying foreign asset (liabilities). In particular, a commensurate increase in foreign and domestic inflation increases the CA if the corresponding NIIP is positive and decreases the CA if the NIIP is negative. In combination, these three factors constitute our *inflation effect* for the CA.

As pointed out in our discussion of equations (1) and (5), the distorting *inflation effect* on the CA has an offsetting counterpart that affects the valuation effect. The next section's empirical assessment below will highlight both mechanics of the *inflation effect* and its empirical relation to the valuation effect.

In sum, foreign inflation may shift value between a country's start-of-period foreign assets and liabilities on the one hand and its CA on the other. Before closing this section, we reiterate that this *inflation effect* relies on the anticipated component of inflation, since in the presenc eof uncertainty, the crucial no-arbitrage condition (2) must hold in expectations. We will return to the distinction between the expected and unexpected components of inflation in our discussion in Section 4.3.3.

4 Quantitative Assessment

This section shows that within a set of 50 countries that is defined by data availability, the *inflation effect* on the CA is economically significant. We start by defining the key variables to capture the logic the inflation effect in the data. Doing so, we perform a basic consistency checks in our dataset, showing that inflation correlates systematically with the yields implied by the returns, as recorded in the BOP.

In a next step, we compute an adjusted CA for each country, defined as the CA that would arise if inflation were zero throughout. These adjustments of the CAs are large, especially over the longer horizons: for the average country, they explain about the seventh part of the cumulated CAs in absolute value and the twelfth part of the gap between the cumulated CA and the change in Net International Investment Position.[20]

4.1 Data, Definitions and Consistency Checks

The purpose of this section is to define our main variables in the data and to show that the relation (6) implied by BPM accounting rules holds in standard BOP data. In other words, domestic and foreign expected inflation impact the rate of return, as implied by standard macroeconomic aggregates. We stress that our econometric ambitions are modest: we do not establish causality but simply show that the data are broadly consistent with equation (6).

Our main data sources are threefold: Bénétrix, Gautam, Juvenal, and Schmitz (2020) provide international investment positions, simultaneously disaggregated by debt instruments and other assets and by the five currencies USD, EUR, JPY, GBP, CNY, and a residual class. This breakdown by currency and asset class is particularly important, since, first, expected inflation rates are specific to currencies and, second, the accounting rules in Section 2 specify the calculation of interest by currency precisely for *Debt Instruments*.[21] The second data source is the IFS from the IMF, which is provides income on a country's foreign assets and liabilities. Third, Datastream, which provides expected inflation. Combining these data, the sample consists of 50 countries and spans the period from 1991 to 2017.[22] Other data sources are from standard sources, and we refer the reader to Appendix A for a detailed description.

To test whether equation (6) correctly reflects recorded income, we define country i's BOP-measured rate of return on foreign assets over the corresponding start-of-period foreign assets as $R_{ij,t} = I^A_{ij,t}/IIP^A_{ij,t-1}$ so that equation (6) becomes, adding time indices,

$$R_{ij,t} = (1+\rho_t)(1+\pi_{i,t}) - \frac{1+\pi_{i,t}}{1+\pi_{j,t}}. \tag{12}$$

where i indexes the reporting country, j the denomination currency, and t the year.Since ρ and π are small, we will estimate the first order approxi-

[20]We relegate potential distinctions between inflation and expected inflation in our theoretical setup to the discussion in Section 4.3.3.

[21]We also conduct an analysis based on a geogrphical breakdown of the assets in an earlier version of this paper. While results can change substantially for individual countries, the overall direction of the results is qualitatively similar.

[22]We exclude observations with expected inflation above or below 15%.

mation of (12)

$$R_{ij,t} = \rho_t + \pi_{j,t} \tag{13}$$

Ideally, our empirical test of (12) would exploit the variation of the BOP-measured $R_{ij,t}$ for each dyade ij. However, BOP data only record country i's investment income aggregated over all foreign countries, without a breakdown by geography or denomination currency.[23] We therefore interpret the index j in our model above simply as the rest of the world (ROW), so that $R_{ij,t}$ in equation (12) is the rate of return of country i in year t, i.e., its income on foreign assets over its start-of-period stocks of foreign assets

$$R_{i,t} = \frac{\sum_j I_{ij,t}}{\sum_j IIP_{ij,t-1}}, \tag{14}$$

where the index j is dropped. The sums in the numerator and the one in the denominator of (14) are readily available from recorded CA and IIP, so that we can take (14) as the observable BOP-measured rate of return to be used in our empirical tests.[24]

We stress that our theory suggests that (12) holds for *Debt Instruments* but not for other types of asset. To test equation (12), we therefore define the rate of return $R_{i,t}$ separately for *Debt Instruments*, labeled $R^D_{i,t}$ and for all other assets, which we simply label *Non-Debt*, $R^E_{i,t}$.

Having defined BOP-measured rates of returns for country i's invest-

[23] There is a disaggregation over asset classes, which we will exploit in turn.

[24] The BOP-implied rate of return is affected by the following issue that arises because the IIP and interest income are converted to USD are different exchange rates. Specifically, the IIP is, as all positions, "converted at the rate prevailing on the balance sheet date" (BOP 3.104), i.e., by end-of-period nominal exchange rates, while interest income is converted "at the mid-point market exchange rate for the periods in which the interest accrues," as cited in Section 2. When the difference of mid-point and end-of-period exchange rates are unexpected and random, they merely add noise to the rate of return, leaving our exercise noisy but unbiased. In case of large differentials of expected inflation, however, these differences may grow systematic and non-negligible. We argue that the latter case is not relevant for our sample, because the differential of expected local and ROW inflation is small: on average its absolute value is 0.6% and exceeds 10% for three observations only (all for Russia). A related issue concerns the question whether positions are reported at market value or at face value, the treatment of which is not uniform in the BPM6. The BPM6 specifies that "positions of financial assets and liabilities should, in general, be valued as if they were acquired in market transactions on the balance sheet reporting date" (BOP 3.84) but defines important exceptions for "[l]oan positions [which] are recorded at nominal value" (BOP 3.86). In practice, different countries apply different procedures – see IMF (2003) for the case of FDI – and even for the important case of the U.S. treatment differs by asset class: short-term debt, long-term debt and FDI debt are valued in distinct ways, since "[m]arket values are the basis for [...] long-term marketable debt securities; book values are the basis for direct investment; and face values are the basis for most other types of assets, especially short-term instruments and nonmarketable forms of indebtedness." (BEA, 1990, p. 21). We cannot adjust for these differences within the scope of this paper but concede that the resulting adjustments can be influenced by national accounting procedures and that their accuracy may thus differ across countries. We would like to thank Philip Lane for pointing out these conceptual issues.

ments, we need to define the corresponding expected inflation for the rest of the world. We do so by taking the weighted average of the rest of the world's expected inflation rates:

$$\bar{\pi}_{i,t}^{A} = \sum_{j} \omega_{ij,t-1}^{A} \pi_{j,t}, \tag{15}$$

where the weights $\omega_{ij,t-1}^{A}$ correspond to the start-of period (or lagged end-of-period) positions of foreign assets. Specifically, $\omega_{ij,t-1}^{A}$ correspond to country i's foreign assets in *Debt Instruments* denominated in currency j, expressed as a share of total foreign assets in *Debt Instruments*.[25] Through the country-specific weights in (14), $\bar{\pi}_{i,t}^{A}$ differs across investor countries i and thus requires an index i.[26] The superscript A indicates that the weights correspond to foreign assets, but we define the corresponding

$$\bar{\pi}_{i,t}^{L} = \sum_{j} \omega_{ij,t-1}^{L} \pi_{j,t}, \tag{16}$$

with weights computed through the currency composition of foreign liabilities accordingly. In our consistency check below, we also use ROW-inflation computed through weights according to *Non-Debt* assets and liabilities (but we suppress an additional index).

With these definitions, we test the log-linearized version of (12), simply replacing π_j with $\bar{\pi}_i$:

$$\ln(R_{i,t}^{X,A}) = \alpha + \beta_1 \ln(1 + \bar{\pi}_{i,t}^{A}) + \beta_2 \ln(1 + \pi_{i,t}) + \gamma contr_{i,t} + \varepsilon_{i,t}, \tag{17}$$

where i and t index countries and years, respectively. $\pi_{i,t}$ is country i's (expected) inflation rate, as in equation (12). The superscript $X = D, N$ indicates that we measure the BOP-measured rates of return to *Debt* and to *Non-Debt* instruments. According to (12) and (13) we expect the coefficient on $\pi_{j,t}$ to be one and the coefficient on $\pi_{i,t}$ to be close to zero.

When estimating (17), we control for real return, as suggested by (12) and (13), which we proxy by the one-year interest rate on U.S. Treasury Bills minus U.S. expected inflation. In addition, we control for the following variables: rest-of-the-world sovereign credit scores, real GDP growth and growth of the stock market, which are all weighted averages, defined in parallel to equation (15).

[25] These data are reported in Bénétrix, Gautam, Juvenal, and Schmitz (2020).

[26] We restrict expected inflation and inflation to stay within the bounds of ±15% and returns on foreign investment to stay between ±10%. We also exclude the years when countries adopted the Euro for Euro Area countries.

Table 1 reports the regression results. In Columns I to III, the regressor *ROW inflation* is defined according to (15) and computed based on is expected inflation, in Columns IV to VI it refers to realized inflation. In each of the sets, the three columns correspond to OLS, random effects and fixed effects estimations, respectively.[27] Robust standard errors are clustered at the country level.

The top panel of Table 1 reports results for returns on *Debt Instruments* ($R^D_{i,t}$) as the dependent variable.[28] The coefficient of interest is the one on the rate of return on expected rest-of-world inflation (*ROW inflation*), which is predicted in (13) to be one. In all three specifications (Columns I to III), the estimates are close to 0.8 and significantly different from zero. Also, they are only different from unity at marginal levels of significance in Columns (II) and (III). Similarly, coefficient on the real returns are positive and significant. However, they fall short of the predicted magnitude of one. Both variables that appear in the linearized equation (13) thus have the predicted sign and, while somewhat reduced in magnitude, are in line with our assumptions and theory.[29]

The coefficient on the control variable $\pi_{i,t}$ is positive, small in magnitude and insignificant in all three regressions. Both observations are as predicted in (12). In particular, own inflation does not seem to first order impact the BOP-measured rate of return.[30] Finally, none of the three other control variables – rest-of-the-world sovereign credit scores, real GDP growth and stock market growth – is significant.

Columns IV to VI show that the estimated coefficients on ROW *realized* inflation are positive and significant in all three specifications, but the coefficient drops by more than half relative to the correct specification in Columns I to III. This finding, too, is consistent with model (13). In particular, it supports the view that surprise components of inflation do not contribute to the effects outlined in the previous section, but instead blur the positive relation between expected inflation and nominal interest payments, thus introducing attenuation bias that reduces the magnitude of the estimated coefficient.[31]

Finally, the bottom panel of Table 1 reports estimations using rates of

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[27] In all specifications, the Hausman specification test indicates that the FE specification is preferable over the RE specification.

[28] For these asset types, the definition of expected rest-of-world inflation rate in equation (15) corresponds closely to the BOP-measured rate of return in equation (14).

[29] The reduced magnitude may stem from an attenuation bias resulting from mismeasurement of the expected inflation or ROW weights in the case of ROW inflation.

[30] It is quick to check that equation (12) predicts a positive second-order impact of $\pi_{i,t}$.

[31] These results also highlight that correcting income on foreign debt instruments through realized inflation (Adler, Garcia-Macia, and Krogstrup 2019 proxy expected inflation by past realized inflation) will likely result in an imprecisely inferred *inflation effect*.

Table 1: Returns and Inflation

Indep. Var. (ROW Weighted Average):	Expected Inflation			Inflation		
	(I)	(II)	(III)	(IV)	(V)	(VI)
	OLS	RE	FE	OLS	RE	FE
Dep. Var.: Returns on Foreign Assets						
Debt						
ROW inflation	0.795***	0.794***	0.798***	0.318***	0.288***	0.283***
	(0.103)	(0.113)	(0.118)	(0.0358)	(0.0427)	(0.0456)
Own inflation	0.00403	0.0382	0.0498	0.0162	0.0443	0.0510
	(0.0213)	(0.0318)	(0.0401)	(0.0203)	(0.0277)	(0.0330)
Real Returns	0.585***	0.561***	0.555***	0.580***	0.555***	0.549***
	(0.0368)	(0.0387)	(0.0407)	(0.0392)	(0.0405)	(0.0419)
ROW Credit Score	-0.00316	-0.00255	-0.00232	0.00268	0.00298	0.00315
	(0.00260)	(0.00232)	(0.00227)	(0.00189)	(0.00199)	(0.00204)
ROW Eq. Ind. Growth	-0.00190	-0.00354	-0.00389	0.00205	0.000267	-0.000117
	(0.00319)	(0.00280)	(0.00280)	(0.00387)	(0.00359)	(0.00358)
ROW RGDP Growth	-0.0384	-0.0115	-0.00490	-0.105***	-0.0855**	-0.0810**
	(0.0315)	(0.0283)	(0.0283)	(0.0383)	(0.0364)	(0.0365)
Observations	820	820	820	868	868	868
R-squared	0.597	0.646	0.647	0.565	0.611	0.611
Non-Debt						
ROW inflation	-0.102	-0.0966	-0.0982	0.142	0.162**	0.167**
	(0.170)	(0.144)	(0.147)	(0.0997)	(0.0739)	(0.0755)
Own inflation	-0.185***	-0.167***	-0.171**	-0.171***	-0.128**	-0.126*
	(0.0623)	(0.0635)	(0.0747)	(0.0581)	(0.0561)	(0.0635)
Real Returns	-0.0200	-0.0465	-0.0465	-0.0147	-0.0428	-0.0445
	(0.0686)	(0.0624)	(0.0633)	(0.0730)	(0.0640)	(0.0649)
ROW Credit Score	0.00874	0.00953**	0.00957**	0.00551	0.00468	0.00438
	(0.00694)	(0.00394)	(0.00390)	(0.00624)	(0.00322)	(0.00316)
ROW Eq. Ind. Growth	0.0449***	0.0400***	0.0394***	0.0486***	0.0465***	0.0462***
	(0.00957)	(0.00798)	(0.00823)	(0.0107)	(0.00889)	(0.00920)
ROW RGDP Growth	-0.219**	-0.152**	-0.147**	-0.239*	-0.188**	-0.182**
	(0.0979)	(0.0634)	(0.0654)	(0.120)	(0.0758)	(0.0787)
Observations	780	780	780	809	809	809
R-squared (within)	0.106	0.096	0.096	0.093	0.093	0.093

Note: $^{***}p < .01$, $^{**}p < .05$, $^{*}\ p < .10$. Standard errors are shown in brackets and are clustered at the country level. Returns are gross and logged. The sample comprises 44 countries (45 countries in the debt regression with actual inflation) and spans the period from 1991 to 2017. Excluded from the sample are inflation and expected inflation rates above 15% and below -15%, as well as foreign investment returns above 10% and below -10%. It additionally excludes "Euro-adoption" years for Euro-Area countries. See Appendix A for variable definitions as well as further sample description.

return on *Non-Debt* instruments. As discussed in Section 2, the positive effect of expected ROW inflation cannot be expected to materialize in this asset category. Accordingly, the coefficients on expected ROW inflation reported in the bottom panel are close to zero and insignificant for expected ROW inflation (Columns I - III). As expected, there is no clear connection between foreign expected inflation on the one hand and the rate of return on foreign investment in equities and other non-debt instruments on the other. The case is slightly different for ROW realized inflation, which is positive and significant in Columns V and VI, yet relatively small in magnitude as well.[32]

Overall, our estimations are intuitively appealing and support our assumptions and simple linear model (13). Most importantly for our current exercise, they suggest that inflation rates strongly impact the BOP-measured rate of return of foreign investment. Just as implied by the BPM6 accounting rules discussed in Section 2, or expected foreign (rest-of-world) inflation correlate with measured returns nearly one-to-one within the asset category *Debt Instruments*. This association becomes weaker or non-existent for BOP-measured rates of return of other asset types or if expected inflation is replaced with realized inflation.

4.2 Adjusting for Expected Inflation

This section documents the magnitude of the *inflation effects* in three steps. First, motivated by our insights from Section 3, Section 4.2.1 defines an adjusted CA that would be recorded in a counterfactual world with no inflation. Second, given the adjusted CAs for our set of countries, Section 4.3 then assesses the magnitude of the *inflation effect*. Third, Section 4.3.2 shows that the *inflation effect* contributes systematically to the valuation effect. Additionally, we illustrate and discuss the properties of the adjusted cumulative CA and its relationship with the changes in the NIIP for eight selected economies.

4.2.1 Adjusting the Current Account

To gauge the effect of expected inflation on the CA, we define the adjusted CA of country i as its CA that would be recorded in a world of zero inflation. Motivated by our discussion in Section 2, we adjust the CA for the *inflation effect* of foreign assets in the financial instrument *Debt Instruments*. We

[32]The coefficient may pick up the part of the positive association between growth and inflation, which is mot measured through stock market growth, the coefficient of which is significant and positive.

restate the approximation in equation, adding superscripts to indicate *Debt Instruments* (8)

$$I_{ij}^{A,D} = IIP_{ij}^{A,D}\left[\rho + \pi_j\right]$$

where i indexes the reporting country and j the denomination currency. In a world with zero inflation this term would simply be $IIP_{ij}^{A,D}\rho$ so that our adjusted CA will subtract the amount $IIP_{ij,t}^{A,D}\pi_{j,t}$ from the CA as recorded. Summing over adjustments of all foreign currencies and introducing time indices, the total adjustment on the asset side is

$$\Delta_{i,t}^{A} = \sum_j IIP_{ij,t}^{A,D}\pi_{j,t} = IIP_{i,t-1}^{A,D}\bar{\pi}_{i,t}^{A}, \tag{18}$$

where $IIP_{i,t-1}^{A,D}$ stands for country i's aggregate foreign assets of *Debt Instruments* at the start of year t (i.e., lagged) and $\bar{\pi}_{c,t}$ is defined in (15).Similarly, based on equation (9) we need to adjust country i's expenses on foreign liabilities of *Debt Instruments* by adding

$$\Delta_{i,t}^{L} = \sum_j IIP_{ij,t}^{L,D}\pi_{j,t} = IIP_{i,t-1}^{L,D}\bar{\pi}_{i,t}^{L} \tag{19}$$

to country i's recorded CA.

Country i's adjusted CA is then readily defined as the officially recorded CA minus the *inflation effect* (18) of income on foreign assets in equation plus the *inflation effect* (19), stemming from income on foreign liabilities in equation,

$$\widetilde{CA}_{i,t} = CA_{i,t} - \Delta_{i,t}^{A} + \Delta_{i,t}^{L}. \tag{20}$$

Equation (20) defines how we adjust the CA for expected inflation and illustrates the principle effects of expected inflation. First, the adjusted CA is decreasing in foreign expected inflation ($\bar{\pi}_{i,t}$) and increasing in domestic expected inflation ($\pi_{i,t}$). We observe, however, that the differential between foreign and domestic inflation is not the only determinant of the sign of the adjustment because inflation rates interact with the magnitude of foreign asset ($IIP_{i,t}^{A,D}$) and liabilities ($IIP_{i,t}^{L,D}$). In fact, an equal increase in foreign and domestic inflation induces a downward adjustment whenever the net position of *Debt Instruments* $NIIP^D = IIP^{A,D} - IIP^{L,D}$ is positive and an upward adjustment whenever $NIIP^D$ is negative.

The *inflation effect*, i.e., the object $\Delta_{i,t}^{A} - \Delta_{i,t}^{L}$ can thus arise through two, possibly antagonistic, forces: first, because of a differential between domestic and foreign inflation ($\pi_{i,t} - \bar{\pi}_{i,t}$) and second, for a given level of (non-zero) expected inflation in all countries, because of an unbalanced net position in *Debt Instruments* ($NIIP^D \neq 0$).

4.2.2 Adjusting the Valuation Effect

While a country's CA indicates its net savings abroad, the match between the changes in net international investment positions (NIIP) is not perfect. The difference between the CA and changes in NIIP is defined as the *valuation effect* of foreign assets and liabilities, the increasing importance of which is well recognized in the recent literature.[33] Formally, the *valuation effect* for country i and the period between t_0 and t_1 is

$$VAL_{i,t_0,t_1} = \Delta NIIP_{i,t_0,t_1} - \sum_{\tau=t_0+1}^{t_1} CA_{i,\tau} \tag{21}$$

where $\Delta NIIP_{c,t_0,t_1} = NIIP_{c,t_1} - NIIP_{c,t_0}$. As the *inflation effect* defined above impacts the CA, it must impact the valuation effect as well, because the measurement of international investment positions $NIIP$ remains unaltered. It is indeed easy to determine the role of the *inflation effect* for the *valuation effect* by cumulating $NIIP$ changes and the adjusted CA, $\widetilde{CA}$, similar to in equation (21), our adjustment is

$$\widetilde{VAL}_{i,t_0,t_1} = \Delta NIIP_{i,t_0,t_1} - \sum_{\tau=t_0+1}^{t_1} \widetilde{CA}_{i,\tau}. \tag{22}$$

By definition, $\widetilde{VAL}$ equals the standard valuation effect minus the (accumulated) *inflation effect*. By comparing equations (21) and (22) over different time horizons, we will assess whether the *inflation effect* contributes systematically to the valuation effect.[34]

4.3 Results of Adjustment

Having defined the *inflation effect* for assets $\Delta^A_{i,t}$ (through (18)) and for liabilities $\Delta^L_{i,t}$ (through (19)), we show that the adjustments of the CA and the valuation effect through equations (20) and (22) are important in the sense

[33]For example, the U.S.'s persistently negative CA has not resulted in a commensurate decrease of its NIIP – see, e.g., Bénétrix, Lane, and Shambaugh (2015) or Gourinchas and Rey (2014) and the references therein.

[34]It may be suitable to address the recurring concern whether our adjustments of the CA for the *inflation effects* require a simultaneous adjustment of the NIIP and changes therein. The answer is negative. The sum of the *inflation effect* and its impact on the valuation effect is zero by definition. This observation also highlights the distinction of our contribution to earlier work that focused on measurement errors of various balance of payment items, e.g., Curcuru, Dvorak, and Warnock (2008), Hausmann and Sturzenegger (2005), or Zucman (2013). In contrast to these studies, our work concerns the recording of accruing value in distinct accounting categories, not potential mistakes in data collection.

Table 2: Recorded and Adjusted Current Accounts – Absolute Values

	Year-on-Year						Cumulative in 2017	
	$\lvert CA \rvert$			$\lvert \widetilde{CA} \rvert$			$\lvert \sum CA \rvert$	$\lvert \sum \widetilde{CA} \rvert$
Country	Mean	Min	Max	Mean	Min	Max		
Argentina	2.89	0.34	8.97	3.13	0.32	12.95	39.06	29.65
Australia	4.33	2.11	7.52	3.13	0.57	5.87	183.76	130.81
Austria	2.48	1.36	4.49	2.92	1.32	4.93	33.08	38.29
Belgium	1.68	0.08	4.52	1.62	0.06	4.65	18.40	5.41
Brazil	2.13	0.00	4.24	2.35	0.25	3.89	72.66	52.20
Canada	2.25	0.13	3.87	2.01	0.10	3.40	48.82	16.26
Chile	2.55	0.13	5.18	2.47	0.10	4.86	80.52	72.81
China	3.21	0.22	9.95	2.81	0.75	9.12	445.73	368.25
Colombia	2.96	0.67	6.34	2.91	0.36	6.27	122.80	114.53
Czech Republic	2.82	0.22	6.16	2.96	0.24	6.29	80.62	85.22
Denmark	3.71	0.53	8.88	4.13	0.71	8.60	140.45	152.49
Egypt	2.80	0.06	9.01	2.62	0.31	8.16	36.16	7.03
Finland	3.76	0.72	9.37	3.53	0.20	9.67	75.71	80.45
France	0.98	0.01	3.40	0.75	0.04	3.04	6.71	11.86
Germany	3.90	0.37	8.59	4.06	0.14	8.37	115.63	118.20
Greece	5.27	0.12	14.49	4.60	0.01	12.88	201.11	169.92
Guatemala	3.92	0.19	6.76	3.97	0.21	7.14	163.89	162.05
Hong Kong	6.93	1.39	15.01	3.47	0.09	7.79	198.35	56.06
Hungary	5.08	0.26	10.62	5.14	1.27	8.70	121.01	73.76
India	1.53	0.11	5.00	1.18	0.06	4.59	101.04	67.17
Indonesia	2.45	0.02	4.84	2.54	0.00	7.35	11.20	27.68
Ireland	2.88	1.01	5.56	13.05	8.58	17.88	13.90	181.62
Israel	2.57	0.28	5.40	2.20	0.31	4.75	61.03	48.69
Italy	1.58	0.16	3.32	1.46	0.01	3.12	0.26	13.52
Japan	2.76	0.75	4.68	1.96	0.46	3.32	64.35	41.62
Malaysia	8.65	1.98	16.85	8.51	1.94	16.90	458.78	435.32
Mexico	2.16	0.36	6.73	1.65	0.14	5.55	79.80	53.86
Morocco	2.98	0.08	9.74	3.03	0.03	9.65	117.55	115.78
Netherlands	5.58	1.74	10.84	5.78	1.17	11.93	227.99	234.13
New Zealand	3.71	0.78	7.72	1.86	0.07	5.20	82.81	38.48
Norway	9.06	0.00	16.17	9.25	0.27	16.03	395.99	394.29
Pakistan	3.35	0.11	9.21	2.92	0.03	8.68	120.64	94.41
Peru	3.72	0.03	8.67	3.23	0.45	7.70	156.87	133.70
Philippines	3.03	0.08	6.08	2.61	0.14	6.34	41.42	66.39
Poland	3.46	0.02	7.35	3.05	0.08	7.03	149.27	114.47
Portugal	5.27	0.11	11.92	5.21	0.13	10.59	187.15	160.29
Russia	5.58	0.03	17.45	8.04	0.07	32.03	177.17	205.64
Singapore	17.17	6.95	27.13	12.51	4.09	21.03	1291.60	933.01
South Africa	2.44	0.02	5.80	2.34	0.17	5.59	94.04	74.02
South Korea	2.96	0.18	10.73	2.80	0.14	10.92	178.25	157.56
Spain	3.44	0.06	9.48	3.29	0.28	8.22	100.82	73.32
Sri Lanka	3.80	0.37	9.54	2.95	0.24	8.47	216.93	163.17
Sweden	4.45	0.33	8.21	5.40	0.82	9.60	159.24	199.10
Switzerland	8.80	2.37	14.70	6.82	0.08	13.18	301.43	28.00
Thailand	5.39	0.32	12.49	5.03	0.38	13.71	125.28	106.64
Tunisia	4.79	0.93	10.25	4.34	0.10	10.12	265.09	240.05
Turkey	3.16	0.17	8.93	3.11	0.63	8.16	172.03	112.02
United Kingdom	2.56	0.09	5.27	2.03	0.09	5.01	100.92	80.23
United States	2.84	0.05	5.92	2.31	0.30	5.11	120.74	94.34
Uruguay	1.79	0.02	5.69	1.90	0.19	5.80	65.57	47.03
All Countries	3.95	0.00	27.13	3.82	0.00	32.03	156.47	133.62

Note: Yearly CAs in percent of real GDP. Cumulative CAs over the period 1991-2017 (except for Austria, Belgium, Greece, Ireland, Japan and New Zealand, whose initial observed period are in 2005, 2002, 2000, 2005, 1996, and 2000, respectively) are in real terms and measured in percent of initial real GDP. The numbers in the row "All Countries" correspond to the respective statistic given at the top of the column. In the final three columns, the cross-country mean is reported. ROW Inflation is calculated as the average expected inflation in the first quarter with real GDP shares in ROW GDP as weights. ROW GDP contains all countries excluding the five major currency issuers as well as the country under study.

that they are large and, in addition, systematic, i.e. they do not merely add to error and omissions in the BOP. To that aim, we operationalize the computation of the adjutments (18) and (19) as follows. In our sample of 50 countries, we compute $\Delta^A_{i,t}$ and $\Delta^L_{i,t}$ based on the assets and liabilities debt positions $IIP^D_{i,t}$ and computing $\bar{\pi}_{i,t}$ as defined in (15), where the weights ω_{ij} are defined through the currency decomposition of debt instruments.[35] As in Section 4.1, we use the currencies USD, EUR, JPY, GBP and CHY and the respective CPI inflation rates. For the positions in all other currencies (ROW) we use the GDP-weighted average inflation rates. This adjustment seems to be a natural and conservative practical implementation of our adjustment.[36]

With these definition, we observe that over all countries and years, the absolute value of our baseline adjustments (i.e., $|\Delta^A_{i,t} - \Delta^L_{i,t}|$) is a sizable 0.23% of GDP on average, with a maximum of 29.8% for Russia in 1994 (and a minimum of virtually 0% for Chile in 2006). The average is quite large, especially when compared to the average CA, the absolute values of which stands at 3.95% of GDP.

4.3.1 The CA – recorded and adjusted

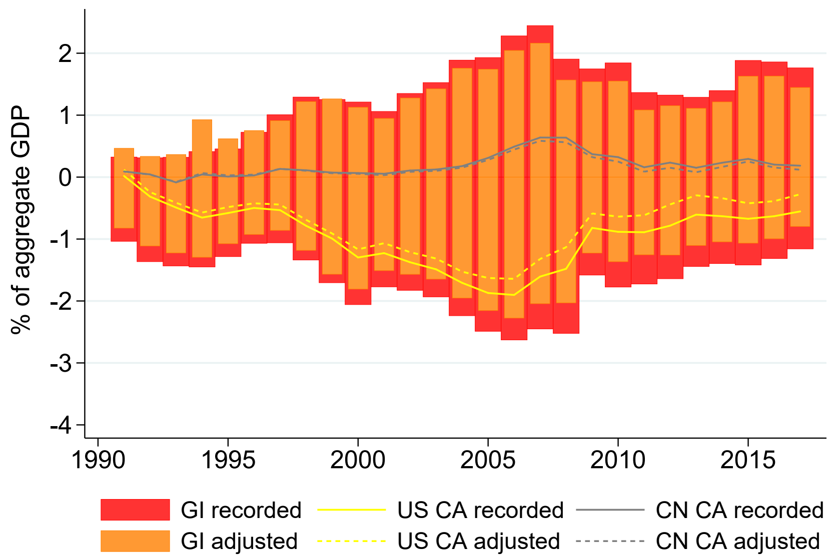
To assess the role of the *inflation effect* for the CA, we compare the absolute values of the recorded $CA_{i,t}$, and the adjusted CA, $\widetilde{CA}_{i,t}$, as defined in (20). We point out that the direction of the adjustment is not clear *a priori*: the *inflation effect* adds a component to the CA that may systematically increase or decrease its absolute magnitude.

Table 2 summarizes these values. Within our sample, the absolute value of the recorded $CA_{i,t}$ is on average 3.95% of GDP, with a maximum of 27.13% (Singapore in 2007) and a minimum of 0.00% (Norway in 1998). When adjusting for the inflation effect, the average absolute value drops somewhat to 3.82 % of GDP (maximum of 32.03% Russia in 1994; minimum 0.00 Indonesia in 1993). Over the long run, the differences become more pronounced: cumulating the recorded CA over the whole period between 1991 and 2017, the absolute value is 156.47% of initial GDP for the average country, while the according number for the cumulated adjusted

[35]As discussed in footnote 24, the question whether positions are reported in market, book or face value may influence our adjustment. In particular, the higher the reported debt positions (e.g., the face value of sovereign debt is larger than its market value in the presence of high default risk.), the higher our gross adjustments on foreign assets and liabilities.

[36]Conservative in the sense that the bulk of debt from emerging market economies, that is not issued in the major currencies, is likely to be issued in domestic currencies and thus subject to higher inflation, which would imply larger adjustments.

Figure 1: Global Imbalances – recorded and adjusted



Note: The adjusted CAs are computed according to equation (20). The sample contains 50 countries, data for some countries begin after 1990. See Appendix Table A1 for details. Data Sources: Bénétrix, Gautam, Juvenal, and Schmitz (2020), Datastream, IMF, WB, own calculations.

CA is 133.62% of initial GDP. This reduction amounts to about one seventh $((156.47 - 133.62)/156.47 \approx 1/7)$.[37]

We have observed that the adjustment tends to reduce the absolute size of the CA for the average country. This implies that the global imbalances, measured as the sum of absolute values of all countries' CA, tend to shrink when correcting for the *inflation effect*. This fact is illustrated in Figure 1, which plots the sum of all CA surpluses and all CA deficits (expressed as a share of aggregate GDP) for our sample over the period 1991 to 2017.[38] The red bars indicate the recorded CA, the orange bars the adjusted ones, so that the total length of the colored bars indicate the magnitude of the respective global imbalances. Both, CA surpluses and deficits tend to decline in magnitude due to the adjustment, and so do global imbalances overall in most years: the recorded (adjusted) global imbalances stand at 3.27 percent (2.93 percent) of initial GDP, peak at 4.91 percent (4.32 percent) in 2006 to drop back to 2.92 percent (2.24 percent) in 2017. In the average year, they are reduced by the adjustment from 3.52 to 2.97 or by about one sixth. Also,

[37] As explained in Footnote 7 in the introduction, there is no logical discrepancy between the small yearly adjustments and the large adjustments over longer horizons because changes refer to absolute values.

[38] The sample is unbalanced, since data for Austria, Belgium, Greece, Ireland, Japan and New Zealand, whose coverage start in 2005, 2002, 2000, 2005, 1996, and 2000, respectively.

the contraction of global imbalances in the wake of the Global Financial Crisis were more pronounced when measured through the adjusted CAs: from their peak in 2006 to trough in 2013, the recorded global imbalances contracted by 44 percent, while the adjusted global imbalances contracted by 49 percent during the same period.

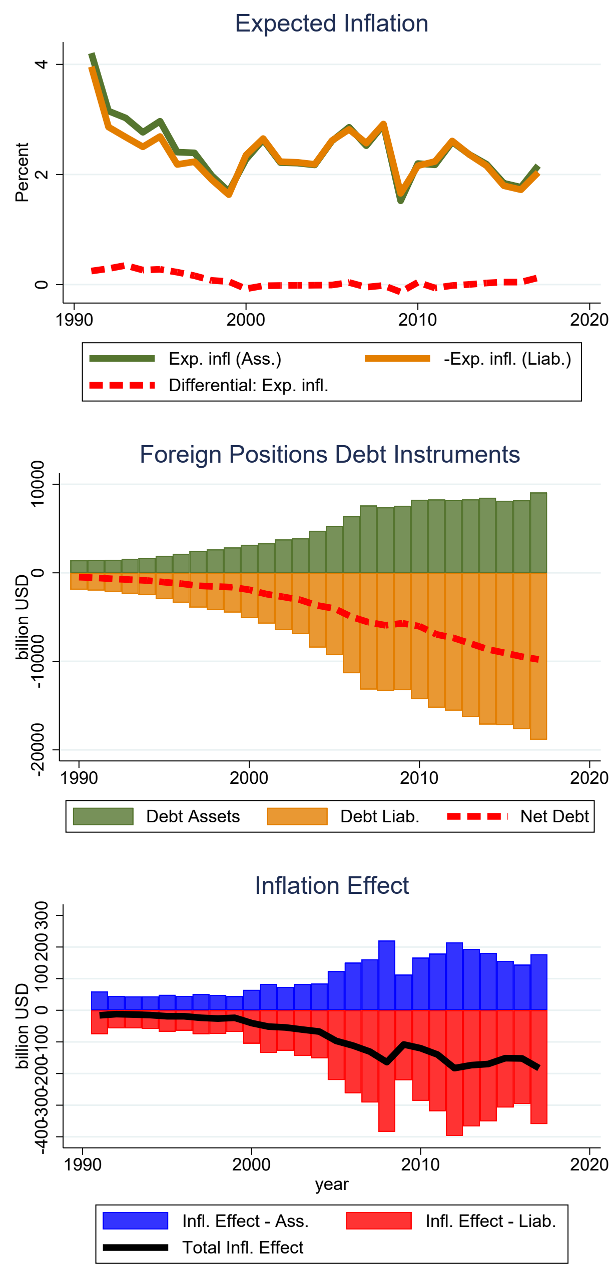
Finally, Figure 1 also plots the CAs as recorded (solid lines) and adjusted (dashed lines) for the two large contributors U.S. (yellow line) and China (grey line). While the CA surplus of China is barely reduced due to our adjustment (from 0.26 to 0.22% of world GDP in the average year), the CA deficit of the U.S. shrinks substantially, from an average of 1.13% of world GDP to 0.89% when adjusted. In 2017 it is reduced by half and stands at 0.27 instead of 0.54 percent. We will discuss the reasons for this strong correction the following section in connection with the valuation effect.

The U.S. CA proves to be subject to pronounced adjustments. Figure 2 therefore plots the two components driving the adjustment for the U.S. – expected inflation and gross debt positions (as expressed in (18) and (19)) – along with the CA adjustment itself. The figure illustrates how the growing importance of the *inflation effect* comes about. The top panel shows that the expected inflation for the currency baskets of U.S. debt assets (15) and debt liabilities (16) trended down over the entire period. This trend by itself would imply that distortions from expected inflation were reduced over time. The reduction in the *inflation effect*, however, was countered by the fast increase in gross debt asset positions, shown in the middle panel. Since the *inflation effect* is proportional to the product of expected inflation and gross debt positions, the fast growth of the latter over-compensated the decrease of the former, leading to an overall rise of the *inflation effect*, as plotted in the bottom panel.

The middle panel of Figure 2 also documents a marked decrease in the U.S.'s net foreign asset position of debt. Without this widening of net liabilities, the *inflation effect* would have been small, because expected inflation on assets from (18) and liabilities from (19) were essentially the same so that their effects cancel if assets and liabilities balance. Indeed, as the differential of *expected inflation* is zero (owing to the fact that much of the U.S. debt liabilities are denominated in USD) the *inflation effect* is non-zero only if net positions are unbalanced. As soon as gross liabilities exceed gross assets, the overall *inflation effect* turns negative.

In the case of the U.S., the overall negative effect adds to the CA deficit so that adjusting for the effect leads to and upward correction of the CA (see Figure 1). Over the past decades the U.S become in the words of Gourinchas and Rey (2007b) the world's 'venture capitalist', supplying safe assets (*Debt*

Figure 2: Elements of the Inflation Effect for the U.S.



Note: The adjusted CAs are computed according to equation (20). The sample contains 50 countries, data for some countries begin after 1990. See Appendix Table A1 for details. Data Sources: Bénétrix, Gautam, Juvenal, and Schmitz (2020), Datastream, IMF, WB, own calculations.

Instruments) to the rest of the world in return to risky assets (*Equity*). These developments generated not only a risk premium that adds to the U.S. CA (as analyzed in Gourinchas and Rey (2007a)) but simultaneously imply that the U.S. CA became more and more distorted downward by the *inflation effect*, making its CA deficit appear larger than it actually would in the absence of (expected) inflation.

4.3.2 The Valuation Effect – recorded and adjusted

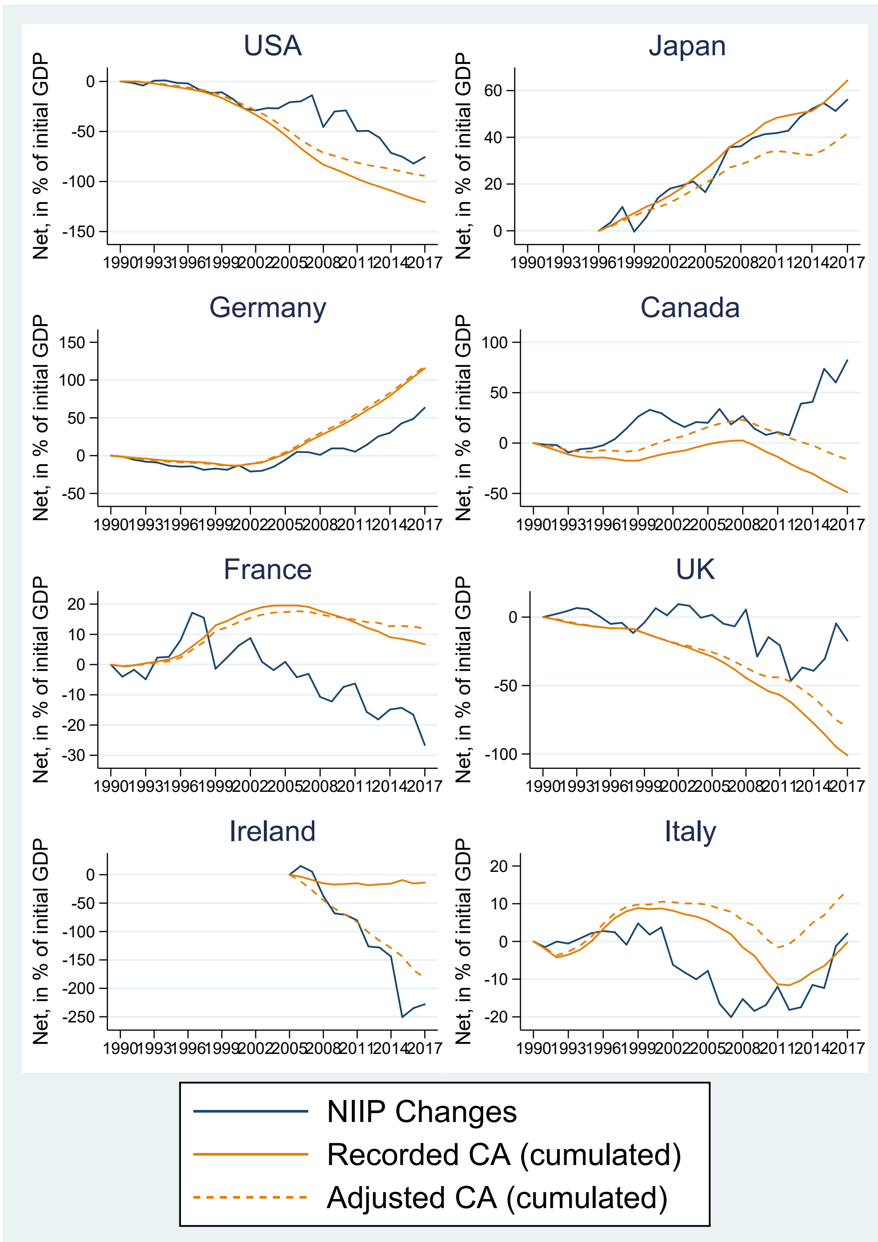
Since the *inflation effect* distorts the recorded CA, it must also affects the differential between the CA and changes in the NIIP, i.e., the *valuation effect*. Here again, the direction of the adjustment is not clear *a priori*: the *inflation effect* may systematically increase or dampen the *valuation effect* for any given country. Given the prominence of the valuation effect in the recent literature (highlighted prominently in Gourinchas and Rey 2014), we investigate whether or not the *inflation effect* systematically contributes to the *valuation effect*. We will investigate yearly adjustments, but also accumulate the CA and the adjusted CA over time. Cumulation over the full horizon will reveal whether the *inflation effect* only generates noise that averages out over time or if it systematically dampens or magnifies a country's valuation effect.

We begin with a description of the adjustments for a subset of eight countries in our sample: the G7 countries plus Ireland.[39] Figure 3 reports the cumulative CA as recorded and the cumulated adjusted CA, as defined in (21) and (22), together with the changes in NIIP.[40] The top left panel shows the change in the U.S. NIIP (blue line), the U.S. cumulated CA as recorded (solid orange line) and the U.S. cumulated adjusted CA (dashed orange line) for the U.S. for the period 1990 to 2017. Accordingly, the cumulated valuation effect is the difference between the yellow and the blue solid line. We refer to the difference between the blue and the dashed yellow line as the adjusted cumulated valuation effect. The three variables are expressed as a share of initial (year 1990) GDP. Just as documented in Gourinchas and Rey (2014), all three lines move together in the 1990s, but the cumulated valuation effect widens after 2000 and amounts to roughly 45.21% of initial GDP in 2017 ($-120.74 - (-75.53)\%$). By contrast, the adjusted cumulated valuation effect is moderate and stands only at about 18.81%-points in 2017 – a decrease of well over half ($(45.21 - 18.81)/45.21 \approx 0.58$). For the U.S.,

[39]Ireland takes a prominent role in the current policy debate because of its current account surplus, see Treasury 2019, pp.6-7.

[40]Due to data availability, the plot starts in 2006 for Ireland. See also Table A1 in the appendix.

Figure 3: Cumulated Current Account and Net International Investment Position - recorded and adjusted



Note: The adjusted CAs are computed according to equation (20). All variables are real (deflated by the GDP deflator) and expressed in terms of initial GDP. Data Sources: Bénétrix, Gautam, Juvenal, and Schmitz (2020), Datastream, IMF, WB, own calculations.

large part of the cumulated valuation effect is thus accounted for by the *inflation effect*.

As discussed in connection with Figure 2, the *inflation effect* is driven by two factors – differences in foreign and domestic inflation and large, unbalanced gross foreign positions in *Debt Instruments* – and in the case of the U.S., the upward adjustment is fully driven by latter component. The large negative NIIP in the asset class *Debt Instruments* (see Gourinchas and Rey (2014)), implies that adjustments on U.S. liabilities are larger than adjustments on U.S. assets, making the adjusted CA less negative and thereby shrinking the valuation effect.

A similar logic applies to the other countries that show an upward adjustment of the cumulative CA: in recent years, Canada, France, Italy, and the U.K have larger inflation abroad than at home, but their net liability positions in *Debt Instruments* are large enough so that the adjustment for the inflation effect is positive overall.[41] In contrast, Ireland, and Japan show a systematic downward adjustment. The reasons are mixed: for Japan, the adjustment is driven by larger inflation abroad than at home and a large positive net *Debt* position. Ireland has a mixed inflation differential over the sample period and a positive net debt position throughout. In years in which inflation is larger at home, the surplus in assets overcompensates this effect, generating a downward adjustment throughout.[42]

The examples of the U.S., Ireland, Canada, and the U.K. show that the inflation effect can increase the gap between the change in NIIP and cumulative CAs in the long run so that adjusting for it reduces the valuation effect. At the same time, France and Japan show that the adjustment may increase it. The *inflation effect* may thus contribute systematically to the valuation effect in either direction. We next assess to what extent there is a systematic reduction or amplification of the valuation effect in our full set of countries.

Specifically, we investigate whether the valuation effect VAL defined in (21) falls or rises in magnitude when adjusted for the *inflation effect* ($\widetilde{VAL}$ from equation (22)). We will compare both measures over short term (year-to-year) and over long horizons (1991-2017). Table 3 provides a summary of (the absolute value of) these variables. The average yearly valuation effect

[41]For Canada and the U.K, the negative gap between the change in NIIP and the cumulative CA in 2017 shrinks from 131.08% to 98.52% of initial GDP and from 83.74% to 63.03%, respectively. For Germany, France and Italy, the positive gap increases, respectively from 52.18% to 54.75%, from 33.32% to 38.47% and from 2.34% to 11.44%.

[42]The *inflation effect* plays an important role for Ireland's valuation losses, which take a prominent place in the investigation of Lane et al. (2011). We do not over-emphasize these finding, however, since the Irish BOP is plagued with uncertainties, especially when it comes to FDI positions – see IMF (2003) and Lane et al. (2011).

Table 3: Recorded and Adjusted Valuation Changes

	Year-on-Year						Cumulative in 2017	
	$\|VAL\|$			$\|\widetilde{VAL}\|$			$\|\sum VAL\|$	$\|\sum \widetilde{VAL}\|$
Country	Mean	Min	Max	Mean	Min	Max		
Argentina	4.35	0.01	31.23	4.39	0.15	30.75	56.02	46.61
Australia	6.91	0.37	22.70	6.60	0.07	24.06	102.68	49.73
Austria	2.38	0.48	5.07	2.42	0.73	5.51	10.50	15.70
Belgium	5.43	0.00	19.45	5.33	0.04	20.45	8.43	32.24
Brazil	5.70	0.09	20.67	5.84	0.08	20.68	32.41	11.94
Canada	6.00	0.01	20.60	5.66	0.34	19.85	131.08	98.52
Chile	3.44	0.00	11.26	3.46	0.08	11.26	44.89	37.18
China	2.38	0.02	9.79	2.17	0.04	9.66	272.15	194.67
Colombia	2.43	0.05	8.78	2.42	0.04	8.22	37.74	29.47
Czech Republic	4.15	0.49	9.16	4.13	0.58	9.07	15.98	20.58
Denmark	4.22	0.24	12.57	4.29	0.21	13.05	10.21	22.25
Egypt	4.07	0.29	22.78	4.31	0.21	23.97	98.04	127.17
Finland	13.98	0.20	94.91	14.12	0.51	94.94	45.20	49.94
France	3.54	0.29	17.59	3.56	0.19	17.22	33.32	38.47
Germany	2.95	0.16	9.41	2.98	0.26	9.53	52.18	54.75
Greece	9.73	0.00	43.58	9.86	0.28	41.97	33.24	2.05
Guatemala	3.22	0.04	13.38	3.23	0.03	13.21	126.69	124.85
Hong Kong	28.71	1.24	56.89	31.35	0.12	61.75	474.96	617.25
Hungary	7.03	0.36	22.54	6.59	0.65	24.78	71.75	24.50
India	2.81	0.23	10.96	2.79	0.23	10.99	29.67	63.54
Indonesia	9.27	0.07	86.21	9.50	0.21	89.27	44.59	83.47
Ireland	21.40	3.18	79.57	18.95	2.18	64.58	214.11	46.39
Israel	5.01	0.79	18.44	4.94	0.04	18.48	87.22	99.55
Italy	2.95	0.09	7.75	3.01	0.16	8.13	2.34	11.44
Japan	3.38	0.04	13.08	3.51	0.20	12.72	8.20	14.53
Malaysia	7.74	0.37	22.90	7.52	0.43	21.93	443.05	419.59
Mexico	4.64	0.53	14.65	4.47	0.12	16.47	24.63	1.32
Morocco	2.51	0.01	8.84	2.44	0.03	8.61	17.52	19.29
Netherlands	7.58	0.20	28.67	7.47	0.17	28.05	157.88	164.01
New Zealand	8.17	0.06	19.07	7.68	0.32	21.62	74.51	30.18
Norway	10.19	0.57	32.90	10.16	0.51	32.86	39.48	41.18
Pakistan	2.77	0.27	8.59	2.66	0.00	7.94	63.59	37.36
Peru	4.14	0.10	17.23	3.88	0.03	15.75	100.92	77.76
Philippines	4.33	0.00	12.81	4.17	0.14	14.33	32.07	57.04
Poland	6.37	0.02	20.76	5.76	0.15	16.00	26.54	8.26
Portugal	7.05	0.06	20.61	6.91	0.29	22.61	31.84	4.98
Russia	8.81	0.14	19.96	9.69	1.04	27.43	150.09	178.56
Singapore	20.75	0.66	87.85	21.28	0.47	80.02	178.44	180.14
South Africa	6.10	0.08	28.54	6.05	0.01	28.41	118.59	98.57
South Korea	4.07	0.09	16.11	3.98	0.10	16.30	112.58	91.89
Spain	5.34	0.16	16.64	5.45	0.12	16.27	41.13	68.63
Sri Lanka	3.71	0.04	9.95	3.56	0.06	8.75	49.34	4.43
Sweden	5.74	0.63	17.19	6.20	0.26	18.62	119.37	159.23
Switzerland	11.81	1.11	27.23	11.10	0.08	24.33	188.77	115.34
Thailand	6.85	0.38	26.55	6.74	0.12	27.77	125.32	106.68
Tunisia	6.15	0.06	15.12	6.27	0.37	15.82	18.73	43.78
Turkey	5.58	0.24	24.78	5.92	0.40	23.85	13.33	46.67
United Kingdom	6.47	0.05	20.31	6.35	0.28	20.23	83.74	63.05
United States	4.43	0.14	14.25	4.40	0.52	15.37	45.21	18.81
Uruguay	4.31	0.55	21.42	4.03	0.04	21.47	23.08	4.53
All Countries	6.62	0.00	94.91	6.59	0.00	94.94	86.47	79.16

Note: Yearly valuation changes in percent of real GDP. Cumulative valuation changes over the period 1991-2017 (except for Austria, Belgium, Greece, Ireland, and New Zealand, whose initial observed period are in 2005, 2002, 2000, 2005, and 2000, respectively) are in real terms and measured in percent of initial real GDP. The numbers in the row "All Countries" correspond to the respective statistic given at the top of the column. In the final three columns, the cross-country mean is reported. ROW Inflation is calculated as the average expected inflation in the first quarter with real GDP shares in ROW GDP as weights. ROW GDP contains all countries excluding the five major currency issuers as well as the country under study.

Table 4: The Current Account and the Net International Investment Position - Cross Country Analysis

Dep. Var.:	Total NIIP Change		Year-to-Year NIIP Change	
	(I)	(II)	(III)	(IV)
Recorded Current Account	0.752***		0.725***	
(in percent of initial/current GDP)	[0.092]		[0.101]	
Adjusted Current Account		0.881***		0.775***
(All Debt)		[0.167]		[0.120]
Constant	-3.651	-5.800	0.028	-0.040
	[15.114]	[16.792]	[0.370]	[0.403]
Observations	50	50	1274	1274
R2	0.726	0.647	0.120	0.118
Coeff. test p-value	0.009	0.481	0.009	0.066

Note: ***$p < .01$, **$p < .05$, * $p < .10$. Standard errors are shown in brackets and are clustered at the country level. "Total NIIP Change" indicates change in a country's net international investment position from a reference year (usually 1990) to 2017, expressed in 2000 USD and in terms of initial (reference) GDP. "Year-to-Year NIIP Change" indicates a country's year-to-year change in its net international investment position, in percent of GDP. The recorded and adjusted current accounts are cumulated over the relevant period for each column (i.e reference period to 2017 in columns I and II, and for the current period for columns III and IV). See Appendix A for variable definitions as well as further data and sample description. The coefficient test p-values refer to an F-test with the null hypothesis of the respective coefficient on the CA variable being equal to 1.

as recorded is 6.62% of GDP in absolute value. On a yearly basis, the impact of the *inflation effects* on the average valuation effect seems to be minimal. However, the picture is different when looking at longer horizons: over the full period, the *inflation effect* reduces the cumulative valuation effect by 7.31% of initial GDP (from 86.47% to 79.16%) for the average country, or almost a twelfth. Just like a slow trend under strong noise, the inflation effects surfaces over longer horizons. When part of the noise washes out, a substantial share of what the literature identifies as a *valuation effect* of NIIP actually turns out to be our *inflation effect.*

Figure 4 visualizes how adjustments of the *inflation effect* generally bring the cumulated CA closer to changes of NIIP in our full sample.[43] In the figure, the blue dots correspond to a country's cumulated CAs as officially recorded in the national Balance of Payments Statistics. The red dots,

[43] Due to data availability, the change is computed over a shorter time period for some countries. See Table A1 in the Appendix.

instead, correspond to the adjusted CAs. Deviations from the 45 degree line (solid line) reflect from valuation effects. The figure includes the fitted lines for the officially recorded and the adjusted CA, showing that the cumulated adjusted CA is closer to the 45-degree line than the recorded counterparts.[44] The estimates corresponding to the plot are based on the model

$$\Delta_{1991,2017}\ niip_c = \alpha + \beta \sum_{\tau=1991}^{2017} ca_{c,\tau} + \gamma \Delta_{1991,2017} e_{c,usd} + \varepsilon_c, \tag{23}$$

where $\Delta_{1991,2017}$ indicates changes between the initial period and 2017, $niip$ and ca are the $NIIP$ and the CA normalized by country c's 2000 GDP and $e_{c,usd}$.[45] The results are reported in Columns I and II of Table 4 and corroborate the message emerging from Figure 4. The estimate of β is positive and significant (0.752) in the specification with the recorded cumulative CA (Column I), yet the p-value in the last row clearly rejects that the slope is one. The coefficients in the specifications with the cumulative *adjusted CA* (Column II), increase to 0.881 and the hypothesis that the slope differs from one cannot be rejected.[46]

As documented in Table 3 above, our adjustment of the CA seems more strongly linked to the valuation effects when looking at longer horizons. Nevertheless, we also estimate the relation (23) of year-to-year changes. The corresponding results, reported in Columns III and IV of Table 4, are qualitatively similar to those in the first three columns but less pronounces. Again, the coefficient on the cumulative CA as recorded (Column III) is 0.725 and thus smaller than the corresponding coefficient on the cumulative adjusted CA (Columns IV), 0.775, and the hypothesis that the latter is different from one is rejected only with marginal significance.[47]

Overall, our adjustments tend to compress the valuation effect, i.e., the differences between the CA and the change in NIIP. In that sense, a large part of the valuation effect actually appears to be an inflation effect.

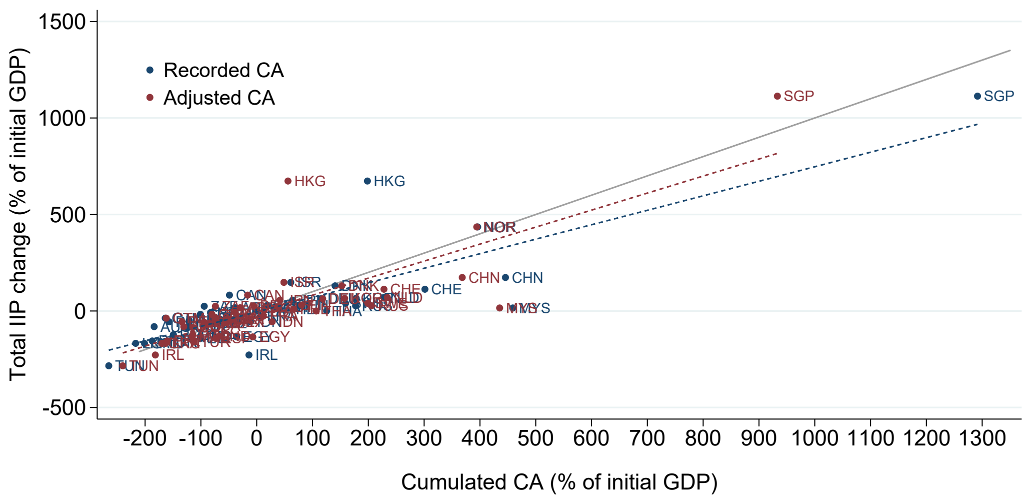
[44] Figure B1 plots the sample excluding the outliers Singapore and Hong Kong. In this sample, the effect of the adjustments for the fitted line is less pronounced.

[45] The time period differs some countries due to data availability. See Appendix Table A1 for details.

[46] Applying a simple z-score test, we find that the coefficients are significantly different from each other at the 10% level.

[47] The coefficient on the adjusted CA is marginally significantly different from one at the 10% level and is not statistically different from the recorded CA coefficient using a simple z-score test. Table C1 reports the results for parallel regressions that exclude Singapore and Hong Kong. As suggested by Figure B1, the differences between the coefficients reported and adjusted shrinks for this sample.

Figure 4: Cumulated Current Accounts and Net International Investment Position Changes - CA Adjustment based on Debt Positions



Note: Adjusted CA is computed using equation (20) based on debt positions. All variables are real, i.e. expressed in 2000 USD, and in terms of initial GDP. Data Sources: Bénétrix, Gautam, Juvenal, and Schmitz (2020), Datastream, IMF, WB, own calculations.

4.3.3 Expected vs. surprise components of inflation

When calculating the *inflation effect* based on equation (20), we have relied on expected inflation, thus discarding the unexpected component of inflation. This choice is dictated by our theoretical foundation. Specifically, the assumption of uncovered interest parity, equation (2), reflects only the expected component of inflation.[48] While exchange rate changes clearly induce valuation gains and losses on foreign investment and thus impact the real returns, only the expected component is compensated for by promised returns on debt instruments.

To make the distinction between expected and unexpected components of inflation explicit, we consider a two-period, n-country world with an uncertain exchange rate but deterministic returns to assets otherwise. Riskless nominal returns to country k's bonds, expressed in local currency, are defined just as in (1)

$$1 + r_k = [(I_k + p_{k,2} - p_{k,1})/p_{k,1}] + 1$$

The uncovered interest parity requires

$$1 + r_i = \frac{r_j}{1 + \Delta_{ij}^e} + \frac{1}{1 + \Delta_{ij}^e} \tag{24}$$

where superscript e indicates the expected component of inflation under the information set of period 1. As above, Δ stands for the exchange rate change. Realized exchange rate changes are

$$1 + \Delta_{ij} = 1 + \Delta_{ij}^e + \Delta_{ij}^s$$

where superscript s indicates the surprise component. Consider now an investor in i who invests in a riskless bond of country j. The nominal return in the currency of country j is fully known but the exchange rate changes have a risky component. We label the realized return from this investment, expressed in country i's currency, by r_{ij}. It satisfies

$$\begin{aligned} 1 + r_{ij} &= \left[\frac{r_j}{1 + \Delta_{ij}}\right] + \left[\frac{1}{1 + \Delta_{ij}}\right] \\ &\approx [r_j] + \left[1 - (\Delta_{ij}^e + \Delta_{ij}^s)\right] = \left[r_i + \Delta_{ij}^e\right] + \left[1 - (\Delta_{ij}^e + \Delta_{ij}^s)\right] \end{aligned}$$

Taking expectations, this equation obviously simplifies to $E(r_{ij}) = r_i$, since the surprise component of the exchange rate change is zero. As discussed

[48] If we added explicitly an uncertain component of inflation in our framework, equation (2) would hold in expectation and consequently π in (1) would stand for expected inflation.

in connection with equations (1) and (5), however, the term in the first squared brackets reflects precisely the BOP-measured rate of return, which thus corresponds to (12):

$$R_{ij}^{BOP} = r_i + \Delta_{ij}^e,$$

while the term in the second squared brackets reflects the valuation change due to exchange rate changes, which now decomposes into an expected component and an unexpected one.

Relating this last equation to the Fisher Equation $1+r_i = (1+\rho)(1+\pi_i^e)$ in its linearized form

$$r_k \approx \rho + \pi_k^e$$

and replacing the expected component of inflation with expected inflation differential

$$1 + \Delta_{ij}^e = \frac{1+\pi_j^e}{1+\pi_i^e} \approx 1 + \pi_j^e - \pi_i^e$$

yields for the BOP-recorded rate of return

$$R_{ij}^{BOP} = r_i + \Delta_{ij}^e = \rho + \pi_i^e + \pi_j^e - \pi_i^e = \rho + \pi_j^e$$

Adding time indices, this shows that that $\pi_{j,t}$ in equations (12) and (13) specifically refers to the expected component of inflation.

While recent work has acknowledged the importance of exchange rate changes for the valuation effect (e.g., Lane and Milesi-Ferretti 2007a, Gourinchas and Rey 2007a, Lane and Shambaugh 2010, and Bénétrix, Lane, and Shambaugh 2015), our paper highlights the distinct importance of its expected component. Our approach echoes the distinction between anticipated and unanticipated real returns of foreign investment, thus pursued in Devereux and Sutherland (2010). The authors build a general equilibrium model of portfolio choice to decompose both components and report that expected valuation gains must be small under reasonable parameter values. Contrary to Devereux and Sutherland (2010), our paper highlights the role of expected inflation from a mere accounting perspective, showing that expected inflation leaves the real returns to foreign investment unchanged but distorts the CA at the expense the valuation effect.

Regarding the magnitude of the *inflation effect*, part of our findings are in line with Lane and Shambaugh (2010). Describing the core functioning of our *inflation effect*, Lane and Shambaugh (2010) state that exchange rate changes are possibly "simply offsetting expected returns and the total financial impact on NFA [...] is not materially affected". Summarizing their analysis of year-to-year returns, they conclude, however, that "this is not the empirically relevant scenario."[49] We concur with this assessment in the sense that NIIP remains unaffected by the *inflation effect* and that its yearly contributions to the CA and the valuation effect are small. However, we also document that these small yearly effects are systematic and accumulate to economically significant values over longer horizons. The impact of expected inflation for the cumulated CA and valuation effects are large, in particular for the prominent example of the U.S., which sees its large CA deficit substantially and systematically reduced in recent years.

5 Conclusion

This paper shows that inflation can systematically affect the current account balance (CA). It starts by summarizing the relevant accounting rules laid out in the IMF's Balance of Payments Manual. Our main contribution is to highlight, theoretically and empirically, the positive link between the rate of expected inflation, nominal interest rates and the recorded return of foreign investment. This *inflation effect* for the CA can be large, especially for countries with inflation that substantially differs from that of its typical investment destination or countries with large net foreign positions in debt instruments. Our empirical part shows that the according adjustments to the CA are about 0.24 % of GDP for the average country and year. When measured in absolute values and cumulated over the whole period, the CA is reduced by one seventh for the average country (from 156.47% of initial GDP to 133.62%). Accordingly, global imbalances (the sum over the absolute values of all countries' CAs) are smaller than previously thought and adjust 3.53% of world GDP to 2.96% in the average year. In 2017, the adjustment amounts to two fifths. The adjustments of the CA have a flip-side, affecting the well-known valuation effect on net international investment positions. When adjusting the cumulated valuation effect for the period 1991 to 2017, it shrinks by 7.7% of GDP, or a twelfth, for the average country. For the U.S., it drops by well over half from 45.21% to 18.81% of initial GDP. Part of the valuation effect thus appears to be an artefact of the *inflation effect*. These findings shed new light on the assessment of the sustainability of the U.S. CA deficit and suggest, more broadly, that the use of the CA as an indicator of global imbalances and as a policy tool may be problematic and requires careful interpretation.

[49] At the same time, the authors state "currency-induced valuation shocks [...] can be substantial, are not quickly reversed, and explain a significant fraction of aggregate valuation shocks."

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Appendix

A Data

For our CA adjustments, we draw on three main data sources (i) Bénétrix, Gautam, Juvenal, and Schmitz (2020) provides data on international investment positions, disaggregated by currency (USD, EUR, JPY, GBP, CHY, the domestic currency and a residual basket), separately for *Debt Instruments* and other assets, (ii) the IMF's Balance of Payment Statistics (BOPS) for information on the recorded CA, and (iii) Datastream for expected inflation. GDP data to normalize CA values come from the World Bank. The data from Bénétrix, Gautam, Juvenal, and Schmitz (2020) constitute the backbone of our final sample and simultaneously impose the most severe data restriction, covering 50 countries for the period 1990 - 2017. See Table A1 for detailed information about data coverage by country.

For our regression results presented in Table 1, we additionally use data on investment income from (BOPS) and (realized) CPI inflation data from the World Bank. For further control variables, we use data from the IMF's International Financial Statistics (IFS) to compute real GDP growth and equity index growth. Data on credit ratings comes from Datastream. Market yields on U.S. treasury securities from FRED (St. Louis Fed) is used to calculate the real rate of return. This section provides more detail on data use and treatment in the present paper.

Table A1: Data Sources and Coverage

Country	Bntrix et al. (2020)	CA/Inv. Inc. (IMF BOPS)	Exp. Inflation (Datastream)	GDP (World Bank)	CPI (World Bank)	Real GDP Growth (IMF IFS)	Equity Index Growth (IMF IFS)	Credit Ratings (Datastream)	Treasury Sec. Yields (FRED)
Argentina	1990-2017	1990-2018	1991-2017	1989-2018	2018-2019	1951-2015	1991-2016	1980-2016	-
Australia	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1960-2015	1958-2016	1980-2016	-
Austria	1990-2017	2005-2018	1991-2017	1989-2018	1989-2019	1965-2016	1950-2016	1980-2016	-
Belgium	1990-2017	2002-2018	1991-2017	1989-2018	1989-2019	1954-2016	1950-2016	1980-2016	-
Brazil	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1964-2011	1991-2016	1980-2016	-
Canada	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1950-2016	1956-2016	1980-2016	-
Chile	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1961-2016	1990-2016	1980-2016	-
China	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1979-2012	1990-2016	1980-2016	-
Colombia	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1969-2010	1952-2016	2005-2016	-
Czech Republic	1993-2017	1993-2018	1991-2017	1990-2018	1992-2019	1991-2016	1998-2016	1992-2016	-
Denmark	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1967-2016	1995-2016	1980-2016	-
Egypt	1990-2017	1990-2018	1991-2007, 2010-2017	1989-2018	1989-2018	1983-2015	-	1987-2016	-
Finland	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1961-2016	1950-2016	1980-2016	-
France	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1951-2016	1950-2016	1980-2016	-
Germany	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1961-2016	1970-2016	1980-2016	-
Greece	1990-2017	1990-97, 99-2018	1991-2017	1989-2018	1989-2019	1950-2016	1993-2016	1980-2016	-
Guatemala	1990-2017	1990-2018	-	1989-2018	1989-2019	1952-2015	-	2005-2016	-
Hong Kong	1990-2017	1998-2018	1991-2017	1989-2018	1989-2019	1962-2016	1990-2016	1980-2016	-
Hungary	1990-2017	1990-2018	1991-2017	1991-2018	1989-2019	1971-2015	2000-2016	1990-2016	-
India	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1951-2016	1950-2016	1980-2016	-
Indonesia	1990-2017	1990-2018	1991-2016	1989-2018	1989-2019	1959-2016	1995-2016	1980-2016	-
Ireland	1990-2017	2005-2018	1991-2017	1989-2018	1989-2019	1950-2016	1950-2016	1980-2016	-
Israel	1990-2017	1990-2018	1992-2017	1989-2018	1989-2019	1969-2016	1950-2016	2005-2016	-
Italy	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1971-2016	1950-2016	1980-2016	-
Japan	1990-2017	1996-2018	1991-2017	1989-2018	1989-2019	1956-2016	1950-2016	1980-2016	-
Malaysia	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1971-2016	1980-2016	1980-2016	-
Mexico	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1950-2016	1978-2016	1980-2016	-
Morocco	1990-2017	1990-2018	1992-95, 1998-2006, 2009-17	1989-2018	1989-2019	1965-2014	2000-2016	2005-2016	-
Netherlands	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1957-2016	1950-2016	1980-2016	-
New Zealand	1990-2017	2000-2018	1991-2017	1989-2018	1989-2019	1955-2015	1960-2016	1980-2016	-
Norway	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1967-2016	1950-2016	1980-2016	-
Pakistan	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1954-2016	1960-2016	2005-2016	-
Peru	1990-2017	1990-2018	2000-2017	1989-2018	1989-2019	1951-2015	1988-2016	2005-2016	-
Philippines	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1959-2016	1952-2016	1980-2016	-
Poland	1990-2017	1990-2018	1991-2017	1990-2018	1989-2019	1981-2014	1993-2016	1988-2016	-
Portugal	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1979-2016	1988-2016	1980-2016	-
Russia	1993-2017	1994-2018	1991, 1993-2017	1989-2018	1993-2019	1996-2014	1998-2016	1989-2016	-
Singapore	1990-2017	1990-2018	1991-2006, 2008-16	1989-2018	1989-2019	1961-2016	1985-2016	1980-2016	-
South Africa	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1951-2016	1960-2016	1980-2016	-
South Korea	1990-2017	1990-2018	-	1989-2018	1989-2019	1954-2016	1972-2016	1980-2016	-
Spain	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1955-2016	1961-2016	1980-2016	-
Sri Lanka	1990-2017	1990-2018	1992-97, 1999-2017	1989-2018	1989-2019	1966-2014	2001-2015	2005-2016	-
Sweden	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1951-2016	1950-2016	1980-2016	-
Switzerland	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1950-2015	1989-2016	1980-2016	-
Thailand	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1951-2016	1997-2016	1980-2016	-
Tunisia	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1962-2014	-	2005-2016	-
Turkey	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1968-2015	1986-2016	1980-2016	-
United Kingdom	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1950-2016	1950-57, 1963-2016	1980-2016	-
United States	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1950-2016	1950-2016	1980-2016	1978-2020
Uruguay	1990-2017	1990-2018	1991-2017	1989-2018	1989-2019	1956-2015	-	2005-2016	-

Returns on investment. We define country i's nominal yearly rate of return on foreign assets as total yearly receipts on foreign assets over initial foreign asset positions in USD, as given in equation (14). To compute this ratio, we use the IMF's BOPS database, which records annual income on foreign assets and liabilities in the current account in the asset class *Debt Instruments* and divide those by lagged end-of-period stocks of cross-border investment (assets and liabilities) in the International Investment Position (IIP) from Bénétrix, Gautam, Juvenal, and Schmitz (2020).

Expected and Realized Inflation. Expected inflation, as defined in equations (15) and (16), is calculated using data from the World Economic Survey (WES), available on Datastream. It is defined as a Q1 average expert forecast of CPI inflation for the current year. To construct ROW expected inflation for each country, we apply the yearly currency weights of each country's IIP for the currencies classified in Bénétrix, Gautam, Juvenal, and Schmitz (2020). For the residual currency basket (i.e. those that do not issue one of the major currencies), we take averages using real GDP weights of the remaining countries. We thus compute $\bar{\pi}_{it}^{A}$ for assets and $\bar{\pi}_{it}^{L}$ for liabilities, both for debt and for non-debt positions separately. For realized inflation, we use CPI inflation data from the World Bank and apply the same aggregation method as for expected inflation.

Control variables. We construct **real returns** as follows. From FRED, we download monthly data on market yields on U.S. Treasury securities at 1-year constant maturity, quoted on investment basis. We take the January value of each year and subtract U.S. Q1 expected inflation.
Provided by the IFS, we have **real GDP growth**, and **equity indices**.[50] The average **credit score** variable represents the average annual credit rating given to a country by leading credit rating agencies (with a range between 0 and 20 , where an AAA rating = 20). We normalize rate rating to values between 0 and 1. Ratings come from Datastream and are provided by Oxford Economics.[51] Where applicable, the ROW averages of these variables are computed similarly to the inflation and expected inflation ROW averages.

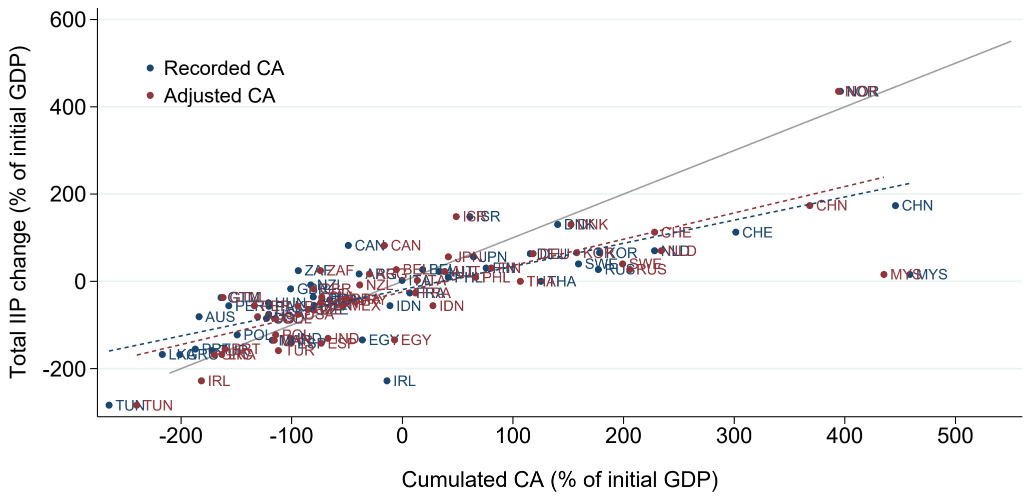
[50] Depending on availability, one of the following equity index variables is used: LONSH_EOP_IX or FPE_IX.

[51] Data for New Zealand is directly computed from the historical ratings series available on the New Zealand debt management office website: https://www.nzdmo.govt.nz/about-us/credit-ratings.

CA Adjustments. We take recorded CA values from the BOPS. The adjustment terms given by equations (18) and (19) are computed using expected ROW inflation, which is constructed as described above. International investment positions are from Bénétrix, Gautam, Juvenal, and Schmitz (2020). For the tables and graphs presenting our results, we normalize recorded and adjusted CA as well as Net IIP using real GDP from the World Bank.

B Additional Figures

Figure B1: Cumulated Current Accounts and Net International Investment Position Changes - CA Adjustment excl. Hong Kong and Singapore



Note: The adjusted CA is computed using equation (20), based on debt instruments. All variables are real, i.e. expressed in 2000 USD, and in terms of initial GDP. Data Sources: Bénétrix, Gautam, Juvenal, and Schmitz (2020), Datastream, IMF, WB, own calculations.

C Additional Tables

Table C1: The Current Account and the Net International Investment Position - Cross Country Analysis - excl. Hong Kong and Singapore

Dep. Var.:	Total NIIP Change		Year-to-Year NIIP Change	
	(I)	(II)	(III)	(IV)
Recorded Current Account	0.531***		0.548***	
(in percent of initial/current GDP)	[0.112]		[0.052]	
Adjusted Current Account		0.604***		0.624***
(All Debt)		[0.127]		[0.072]
Constant	-18.979	-24.149**	-0.375	-0.517**
	[11.410]	[10.291]	[0.264]	[0.227]
Observations	48	48	1228	1228
R2	0.583	0.625	0.079	0.102
Coeff. test p-value	0.000	0.003	0.000	0.000

Note: $^{***}p < .01$, $^{**}p < .05$, $^{*}\ p < .10$. Full sample excluding Hong Kong and Singapore. Standard errors are shown in brackets and are clustered at the country level. "Total NIIP Change" indicates change in a country's net international investment position from a reference year (usually 1990) to 2017, expressed in 2000 USD and in terms of initial (reference) GDP. "Year-to-Year NIIP Change" indicates a country's year-to-year change in its net international investment position, in percent of GDP. The recorded and adjusted current accounts are cumulated over the relevant period for each column (i.e reference period to 2017 in columns I and II, and for the current period for columns III and IV). See Appendix A for variable definitions as well as further data and sample description. The coefficient test p-values refer to an F-test with the null hypothesis of the respective coefficient on the CA variable being equal to 1.