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The Global Distributive Impact of the U.S. Inflation Shock
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The Global Distributive Impact of the US Inflation Shock[*]

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Abstract

We study the global distributive consequences of the "Great Reflation." The conventional wisdom holds that the increases in interest rates resulting from high inflation in the United States will have a negative impact on the rest of the world (and developing countries in particular) due to the reversal of capital flows and higher financing costs. We show that the standard view fails to take into account an important countervailing force: the effect of higher US inflation on the changing real value of nominal US dollar assets and liabilities across countries. Decades of low inflation led to widespread use of dollar-denominated financial instruments with fixed interest rates and long maturities. Unanticipated inflation in the US diminishes the real value of dollar-denominated sovereign debt, both in the US and abroad. For sovereigns other than the US, the gains are equivalent to a debt relief of about $100 billion. On the other hand, the US government gains nearly $2 trillion on its debt and cash liabilities, of which fully one-quarter (over $500 billion) is paid by non-residents.

1   Introduction

Rapid inflation has returned to the United States, suddenly and unexpectedly. In October 2019, the International Monetary Fund's World Economic Outlook (IMF-WEO) forecast that inflation in the US would be 2.4% in 2021 and 2.3% 2022, continuing a downward trend that began in the mid-1980s. However, inflation was 4.7% in 2021 and will be close to 8% in 2022. In this note, we measure the global effects of this unforeseen inflation in the US. Our central argument is that the "Great Reflation" is causing a vast redistribution of wealth because of the changing real value of dollar denominated sovereign liabilities.

Policymakers are rightly concerned about the macroeconomic fate of developing countries as interest rates rise in the U.S. and elsewhere, as similar episodes have led to macroeconomic and debt crises in developing countries in the past. For instance, Pazarbasioglu and Reinhart (2022) argue that:

> Tighter monetary policies in advanced economies are poised to push up international interest rates, which tends to put pressure on currencies and heighten the odds of default. ...Global financial conditions are set to deteriorate as central banks in advanced economies tighten policy to fight unexpectedly persistent inflation pressure.

Similarly, Acosta-Ormaechea et al. (2022) caution that:

> With public debt-to-GDP ratios above pre-pandemic levels and borrowing costs rising amid higher local and global interest rates, countries will need to ensure the sustainability of public finances to help preserve credibility and rebuild fiscal space.

While these concerns are certainly warranted, we contend that this view should also take into account the reason for tightening financial conditions: the increase in US inflation, which in some cases works to the advantage of other countries. Although the policy response to rising inflation in the U.S. (in the form of higher interest rates, for instance), may well generate adverse shocks, their impact is cushioned by the declining real value of dollar-denominated sovereign liabilities, though this decline may take a period of time to take effect.

The worldwide issuance of dollar-denominated debt has grown significantly in the recent

era of global financial integration. Years of low inflation catalyzed the growth of financial assets issued at fixed interest rates and with long maturities. According to the Bank for International Settlements (BIS),[1] international issues of sovereign debt securities at fixed rates and with maturities longer than one year have represented more than 95% of all issues since 2013. Long-run fixed-rate dollar instruments are subject to larger valuation effects than if they had been issued at variable rates or issued at short maturities (as was the common practice prior to the "Great Moderation"). In addition, savings rates in emerging countries and foreign holdings of dollar-denominated assets such as US Treasuries and cash have also grown significantly in the recent era of global financial integration.

In order to illustrate the global effects of the "Great Reflation," we conduct two simple exercises. We first estimate the gains to sovereigns arising from the dilution of the value of long-term fixed-rate debt instruments due to US inflation.[2] The amount of dollar denominated debt issued in international markets is immense, totaling $11.1 trillion globally by the end of 2020, according to the Bank for International Settlements (Eren and Malamud, 2022), of which $1.3 trillion corresponds to non-US long-term fixed rate sovereign securities.[3] In addition, by the end of 2020, $20.7 trillion worth of long-term fixed rate securities had been issued by the US government.[4]

In the first part of the paper we estimate that the dilution of dollar denominated long-term sovereign debt from unexpected inflation in 2021 and 2022 nets countries other than the US over $100 billion. Major winners in absolute dollar terms include middle-income countries like Turkey, Saudi Arabia, Argentina, Mexico, and Indonesia. Relative to the size of their economies, big winners include Oman and Qatar in the Middle East; Jamaica, Panama, and

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[1]Table C3: "Debt securities issues and amounts outstanding, in billions of US dollars." `https://stats.bis.org/statx/srs/table/C3`.

[2]Ideally one would include both liabilities and assets of sovereigns. But data on sovereigns asset holdings are not readily available, and while there is information on dollar assets in central bank reserves, these holdings are typically short term and thus shielded from the effects we discuss here.

[3]The difference between the two figures ($11.1 trillion and $1.3 trillion) corresponds to debt placed by other issuers, such as financial institutions, firms, central banks, and international institutions, as well to floating rate sovereign debt.

[4]See Treasury Bulletin `https://www.fiscal.treasury.gov/files/reports-statements/treasury-bulletin/b2021-3.pdf`.

Uruguay in Latin America; as well as other countries such as Lebanon and Mongolia, all of which gain a one-time "transfer" larger than 2% of GDP.

The biggest issuer of dollar denominated debt is, predictably, the US. We apply the effect of surprise inflation to $20.7 trillion worth of long-term Treasury securities and the $5.2 trillion monetary base and show that the US government's gain from unexpected inflation is nearly $2 trillion.

In the second part of the paper, we analyze the international redistributive effects arising from non-resident holdings of the US government assets. In other words, we ask how much of the $2 trillion gain for the Treasury from the "inflation tax" is paid by US non-residents. Fortunately, there is good information about the foreign holdings of these assets. We can therefore estimate the international distribution of losses arising from longer term US treasuries and cash. We find that high US inflation diminishes the value of these holdings and generates a transfer to the US government from non-residents of about $523 billion (for comparison in 2020 federal government spending on defense was $777 billion and on Medicaid was $447 billion). About one-third of these gains come at the cost of Japan and China, two of the biggest holders of US treasuries. In all, one quarter of US' inflation tax is paid abroad.

Variation in gains and losses comes from the relative importance of sovereign dollar-denominated assets and liabilities. Countries that have significant dollar-denominated liabilities issued in dollars tend to gain (at the expense of other sovereigns and private creditors), while other countries suffer significant losses from their holdings of US treasuries and cash.

Our paper's principal contribution is to the literature on the currency denomination of sovereign debt (Calvo, 1988; Eichengreen and Hausmann, 1999, 2005; Alfaro and Kanczuk, 2018; Ontonello and Perez, 2019; Ballard-Rosa et al., 2021; Sosa and Sturzenegger, 2021). Although debt denominated in local currency provides a better hedge against negative domestic and external shocks, governments face the temptation to generate inflation and depreciate their currency to reduce the real value of their debt. Calvo (1988) argues that the solution to this time-inconsistency problem is for countries to rely on debt that is denominated in

foreign currency that is not diluted by inflation, though others have pointed out that a reliance on dollar-denominated debt has contributed to severe contractionary balance sheet effects in currency crises (Frankel, 2014).

However, most of the prior research did not contemplate the impact of high inflation in the US i.e. in the currency that was intended to solve the credibility problem. This note highlights how unanticipated nominal shocks in developed countries like the current one in the US (which have become exceedingly rare in recent decades), shape the fortunes of developing country sovereigns in unexpected ways. In addition, our results provide further evidence for the argument made by Reinhart et al. (2015) that advanced economies rely heavily on heterodox measures such as surprise inflation to reduce their debt ratios (and less on running primary surpluses and other orthodox strategies).

More generally, inflation has huge distributive consequences across and within countries. These shocks to the price level in turn can be expected to spark political struggles about how gains and losses in the real value of debts and assets should be shared across countries and groups. Our paper is a first effort at systematically measuring these effects and documenting their quantitative significance, which we hope will serve as a springboard to more fine-grained theoretical and empirical work that extends beyond our focus on dollar-denominated sovereign assets and liabilities.

We begin by setting out conceptually why US inflation influences the burden of US dollar denominated assets globally. Next, we delineate the main financial vehicles that transmit the distributive consequences of US inflation, before presenting our principal empirical results.

2   Why US Inflation Matters

Why does US inflation matter to countries that use other currencies and experience other inflation rates? A helpful starting point is the simple purchasing power parity (PPP) relationship:

$$P_t = EP_t^*, \tag{1}$$

where P_t is the price level in a specific country, and P_t^* is the price level in the US. E is the exchange rate defined as the number of units of currency of that specific country per dollar.

This equation assumes all goods are tradable, or, alternatively, that there are no changes in the real exchange rate. Our relevant shock is an inflation shock in the US, which should change P_t^* without affecting the real exchange rate. Thus our specification, for this particular shock, does not impose any loss of generality (more on this later on).

The equation provides a simple exchange rate equation:

$$E = P_t/P_t^*. \tag{2}$$

This equation states that the exchange rate will move according to the inflation differential. If the local country has higher inflation, its exchange rate will depreciate. But if the US inflation is higher then the currency will appreciate. If

$$GDP_t = P_t Q_t, \tag{3}$$

where GDP_t is local currency nominal GDP, and Q_t is real GDP then

$$\frac{GDP_t}{E_t} = GDP_t^{USD} = \frac{P_t}{E_t} Q_t = P_t^* Q_t, \tag{4}$$

which shows that the local *GDP measured in US dollars* grows at the rate of US inflation. The bottom line is that US inflation will increase the value of GDP in all countries, when measured in dollars, at the tune of the US inflation.[5] With payments fixed for nominal asset and liabilities, the burden or real value of these assets falls by an equivalent amount. This is why it makes sense to look at the change in the real value of dollar denominated assets

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[5]When there is equal inflation in both countries, exchange rates remain unchanged but still nominal GDP in dollars would grow at the US inflation and there would be a decline in the real value of nominal US dollar denominated debt.

and liabilities using the US inflation rate.

3   Transfers from Dollar-Denominated Debt

We focus on sovereign dollar-denominated debt. We concentrate on sovereigns both because of data constraints and because sovereigns are the focus of the policy concerns. Inflation in the US reduces the real value of dollar-denominated government debt issued by other countries, generating a gain for the issuing sovereigns and a loss for the holders of that debt. This effect is stronger when the debt has been issued at fixed rates and with long maturities. Our data on the size, composition, and maturity of dollar-denominated sovereign debt comes from the BIS Debt Securities Statistics[6]. As can be seen in Figure 1, almost all international sovereign debt is issued at fixed rates and with long maturities.[7]

Figure 1: Share of Long Term Fixed-Rate Securities in Total Sovereign International Issues.
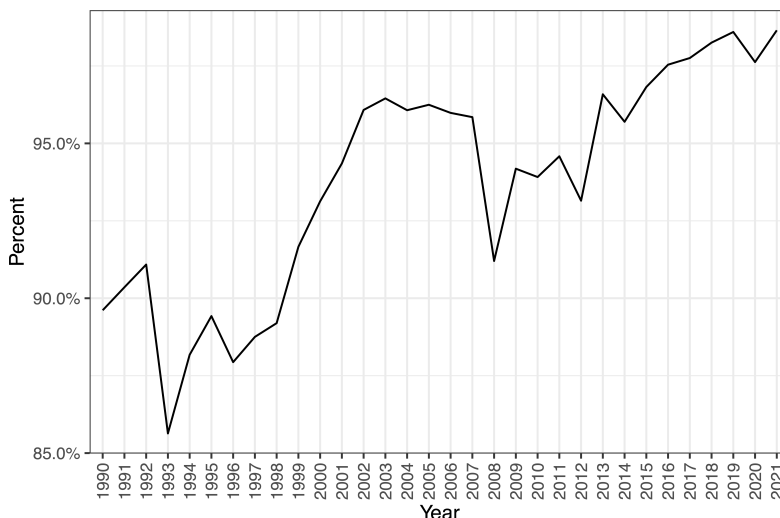
Source: BIS. The share is computed as the total long term fixed-rate securities over the total securities (denominated in all currencies). All data refer to the outstanding issued in the fourth quarter of every year.

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[6]See: `https://www.bis.org/statistics/secstats.html` and `https://www.bis.org/statistics/debt_sec/overviewDebtSec.pdf` for an overview table. Table C3 "Debt securities issues and amounts outstanding, in billions of US dollars" is the primary source for dollar-denominated government debt. The data were accessed at `https://stats.bis.org/statx/srs/table/C3`.

[7]International issues are issues in foreign jurisdictions. These numbers, then, basically exclude issues by the US which are domestic issues even when held by foreigners. We will return to this issue later.

Although the amount of domestic currency debt issues has increased in recent decades,[8] the amount of total long-term fixed rate dollar denominated debt issued by countries other than the US still totalled $1.3 trillion at the end of 2020.

Because interest on debt compensates for *expected* inflation, it is the *unexpected* component of inflation that generates a transfer from creditors to debtors. Therefore our starting point is an assumption about unexpected inflation. The October 2019 IMF-WEO (International Monetary Fund, 2019) projected an inflation rate of 2.4% in 2021 and 2.3% in 2022 for the US (International Monetary Fund, 2019). However, US inflation was 4.7% in 2021 and is currently projected to be 7.7% according to the April 2022 IMF-WEO (International Monetary Fund, 2022). The unanticipated inflation of 7.7% is simply equivalent to the sum of the actual inflation deviation from the forecast inflation over the two years (i.e. 4.7%-2.4% + 7.7%-2.3% = 7.7%).

We then apply this percentage of unexpected inflation (7.7%) to the total stock of long-term, fixed-rate dollar denominated sovereign debt at the end of 2020. Figure 2a and Figure 2b show our estimate of transfers to sovereigns. Figure 2a shows the absolute value in dollar terms while Figure 2b shows the values as a share of GDP for all countries except the United States (which is included in the bottom panel of Figure 2). All data and their availability for each country is reported in the appendix.

Although the issuance of dollar debt was originally thought to be a mechanism for tying the hands of sovereigns that otherwise faced the temptation to use inflation to reduce their debt obligations, US inflation now provides a means of debt dilution through, as it were, the back door. Argentina, Brazil, Indonesia, Mexico, Turkey, Saudi Arabia, the United Arab Emirates, Qatar, and Canada are some of the biggest beneficiaries of this debt dilution by absolute dollar value, with each country securing a windfall that exceeds $4 billion. Excluding the US, the gains across all countries amounts to $100 billion, a number on the scale of total annual foreign aid flows.

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[8]See BIS Table C4 "Central and general government debt securities markets; Long-term, all markets, amounts outstanding in billions of US dollars at end-2021." `https://www.bis.org/statistics/c4.pdf`.

Figure 2: Effect of Unexpected Inflation on Value of Sovereign Liabilities
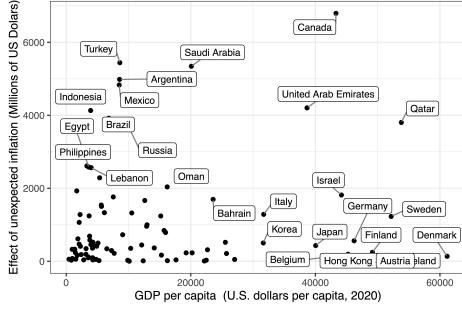
(a) Effect in nominal terms, excl. USA.
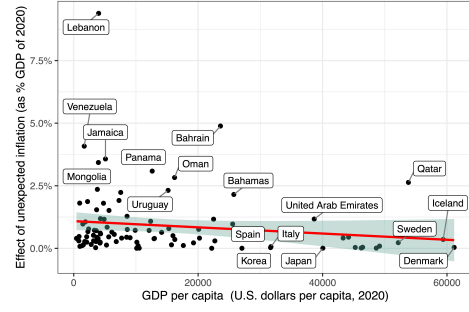
(b) Effect as % of GDP, excl. USA.
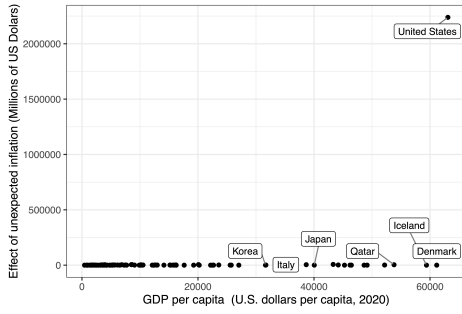
(c) Effect in nominal terms, incl. USA.
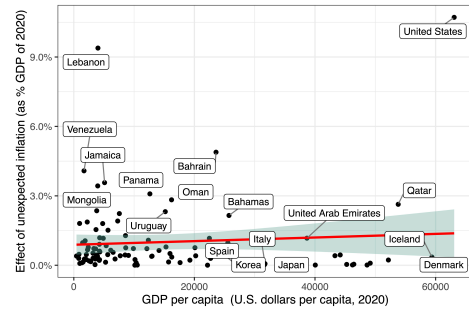
(d) Effect as % of GDP, incl. USA.

Source: BIS Table C3 "Debt securities issues and amounts outstanding, in billions of US dollars" and IMF-WEO (for forecast and actual inflation). The effect of unexpected inflation corresponds to the product between the stock of long-term fixed-rate securities denominated in US-dollars and the 7.7% unexpected inflation. Figures for the US include Treasury securities and monetary base.

If we focus on the impact as a percentage of GDP (in 2020), which provides a more appropriate measure of the effects, we see that the effect is larger for poorer countries. As share of GDP the biggest beneficiary is Lebanon (9.4% of GDP). Other major winners are countries such as Venezuela, Jamaica, Panama, Oman, Bahrain, and Qatar.

The United States does not appear in the graphs in the top panel because most US debt is issued in the domestic market, and the BIS focuses on issues in the international market (i.e. in a jurisdiction that is not that of the issuing country). Thus, we need to add US government dollar liabilities, that is the full amount of long term US treasuries issued at fixed rates, as well as the money base (which in the US is obviously denominated in dollars)

to get a complete picture. By the end of 2020, long term fixed rate US securities totalled $20.7 trillion. This includes notes, bonds, and nonmarketable debt held by the public of $14.6 trillion,[9] plus $6.1 trillion of nonmarketable debt held by government agencies which we assume is long term debt.[10] The monetary base at the end of 2020 added an additional 5.2 trillion.[11]

To compute the effects, we use the same methodology outlined above and used for non-US sovereign debt, except we now also consider the full impact of inflation on the US dollar money base. As prices in US dollars increase, the real value of these cash holdings diminishes. Unlike debt holders who receive interest, cash holders are not compensated for inflation and the government fully charges the "inflation tax" on them. Therefore we apply actual inflation in 2021 and 2022 (12.4%) to the money base. The results (including both treasury securities and cash holdings) are presented in Figure 2c and Figure 2d.

As might be expected, the gain for the US is enormous. US inflation is a tax on dollar assets and the US government is by far the biggest issuer of dollar denominated liabilities in the world. In dollar terms, the US has shaved about $2 trillion in the purchasing power of its liabilities in 2021 and 2022. This is equivalent to a gain of 10.7% of GDP for the US Treasury.

A significant portion of US debt is held by the Federal Reserve,[12] so there is a discussion to be had on whether these holdings should be netted out. To the extent that Fed losses are passed on to the holders of the US monetary base, they should not be netted out (if we are computing the effect for the Treasury). But if we consider the Fed as part of a consolidated government balance sheet then it could be argued the losses on these holdings should be subtracted from the gains to the Treasury. Netting out the 4.3 trillion of Fed holdings of

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[9]See table FD2 in the Treasury Bulletin `https://www.fiscal.treasury.gov/files/reports-statements/treasury-bulletin/b2021-3.pdf`.

[10]See Table FD1 in the Treasury Bulletin `ttps://www.fiscal.treasury.gov/files/reports-statements/treasury-bulletin/b2021-3.pdf`.

[11]See `https://fred.stlouisfed.org/series/BOGMBASE`.

[12]See Table OFS1 in the Treasury Bulletin `https://www.fiscal.treasury.gov/files/reports-statements/treasury-bulletin/b2021-3.pdf`.

long term US treasuries at the end of 2020,[13] the net gain for the US Treasury falls to 9.1% of GDP. Government agents' $6.1 trillion holdings in short and long-run treasuries need not be netted out because most of these holdings are held in pension programs, social security trusts, and the like, whose beneficiaries, such as retirees, need not include the government.[14] This gain is equivalent to non-conventional tax income. Accounting for this "inflation tax" implies that the US government actually ran much smaller deficits over the years 2021 and 2022 than a straightforward examination of the nominal figures would suggest, though the gain to the government accrues in the main from taxing with the inflation tax residents rather than non-residents, and may lead to higher interest rates on new debt issues in the future.

Needless to say, our computation measures the reduction in the real value of liabilities arising from the inflation surprise in 2021 and 2022. It is just a matter of extrapolating or multiplying this number by the amount that each reader believes inflation will remain above its expected value at the time of issue. The final dilution could thus be far larger than what we report here.

To summarize, the nominal shock of unexpected inflation in the US generates significant gains to sovereign states that have issued long-term fixed-rate debt denominated in US dollars. Some of the largest "winners" (as a share of GDP) are poorer countries. Although US inflation, interest rate hikes, and inflation in the rest of the world may lead to turmoil in financial markets, over the medium term, as currencies adjust to their PPP exchange rates, a number of countries in the developing world stand to gain substantially.

3.1   Foreign transfers to the US from US inflation

In this section, we ask how much of the gains to the Treasury are actually paid by non-residents of the US (rather than by residents). In other words, to what extent is inflation transferring income from the rest of the world to the US? It is possible to estimate this

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[13]See `https://fred.stlouisfed.org/series/RESPPALGUONNWW`.
[14]See table FD-3 in the Treasury Bulletin.

transfer to the Treasury because unlike the case for other countries, data are available on the individual country holdings for the two categories of US liabilities that are most exposed to inflation: long-term US treasuries and cash. We use the same methodology discussed previously for the US (which considers both the unexpected inflation on US treasuries and full inflation on cash holdings).

At the end of 2020, $7 trillion worth of US treasuries were held by non-residents of the US, of which $6 trillion had long-term maturities, according to the Treasury Information Capital (TIC) System.[15] Figure (3) shows the share of treasuries held by foreigners over recent years.

Figure 3: Foreign Holdings of Long-Term U.S. Securities
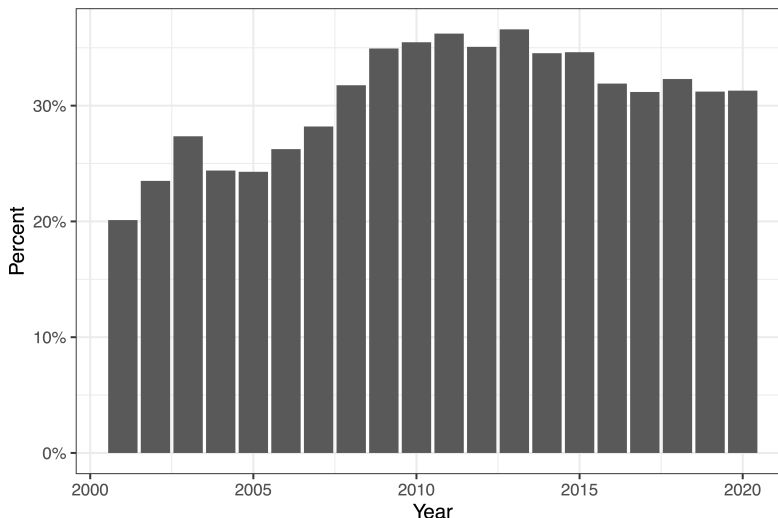
Source: Treasury Information Capital (TIC) System. The data correspond to foreign holdings of long term US Securities as fraction of the total long term US Securities.

Approximately $947 billion worth of dollar bills were held abroad at the end of 2020, according to the US Federal Reserve (Bertaut et al., 2019).[16] Current estimates of cash holdings by country are not available. We follow prior research (United States Department of the Treasury (2006)) that computed country-wise cash holdings based on field work and

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[15]See https://ticdata.treasury.gov/resource-center/data-chart-center/tic/Documents/slt3d.txt.

[16]See line 38 in `https://www.federalreserve.gov/releases/z1/20220310/html/l204.htm` and `https://www.federalreserve.gov/econres/notes/feds-notes/the-international-role-of-the-u-s-dollar-20211006.htm`.

cash shipments to each destination in 2006. To reach an allocation by country in 2020 we proportionally increase the individual 2006 country estimates by the increase in the holdings of cash abroad from 2006 to 2020 as reported by the Federal Reserve. This allows us to assign 55% of the total to individual countries. Figure 4 shows the evolution of cash holdings in the last decades estimated by Judson (2017). Notice that most of the cash holdings abroad are in $100 bills, which suggests that individuals use them as store of value rather than for liquidity services.

Figure 4: Total amount of US currency abroad
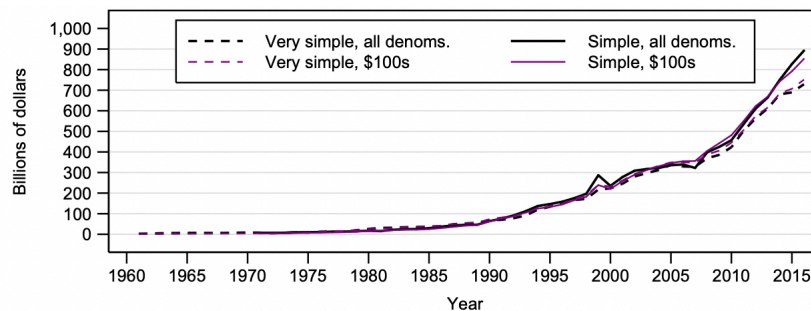
Source: Judson (2017).

With these data we can compute the losses accruing to countries from their holdings of US liabilities. Figure 5a and Figure 5b plot the unexpected inflation effect from the holdings of long term Treasuries both in dollar values and as a percentage of GDP. The overall losses add up to $406 billion of US dollars. Of these losses 29%, is accounted by Japan and China, which are big holders of US treasuries. The largest losses in terms of GDP correspond to East Timor (33% of GDP) and Luxembourg (16% of GDP); Hong Kong, Ireland, and Bahamas are also major losers.

When considering both the effect on Treasuries and cash in Figure 5c and Figure 5d the gains for the US Treasury (at the expense of non-residents) rises to $523 billion. Thus, fully one-quarter of the "inflation tax" is levied on non-residents abroad.

Countries known to be major holders of dollar currency, such as Cambodia, Argentina, and Russia, emerge as significant losers of unexpected inflation in the US. Argentina and

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Cambodia suffer a loss that is larger than 3% of GDP.

More developed economies suffer the largest losses when we consider holdings of US Treasuries. The same pattern holds broadly when we include losses stemming from holdings of cash, but now a number of poorer countries also appear as major losers. As a share of GDP, East Timor, Luxembourg, Cambodia, Hong Kong, Argentina, Taiwan, Belgium, Singapore, and Ireland suffer the largest losses. As can be seen, the costs spread across rich and poor countries alike.

Figure 5: Redistribution to US from other countries' holdings of long-term US Treasury securities and cash
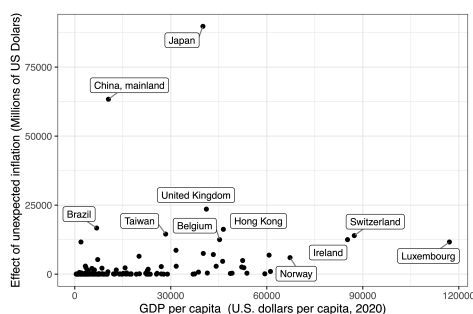
(a) Losses on long term Treasury holdings
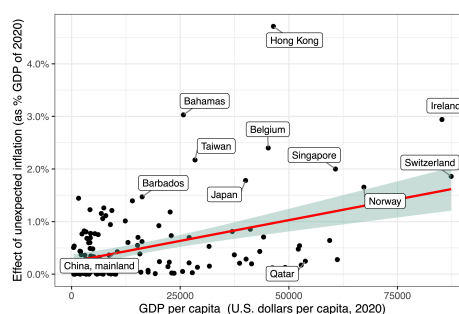
(b) Losses on Treasury holdings as % of GDP
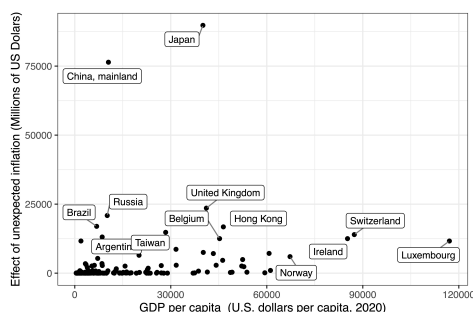
(c) Losses Treasury holdings and dollar cash holdings
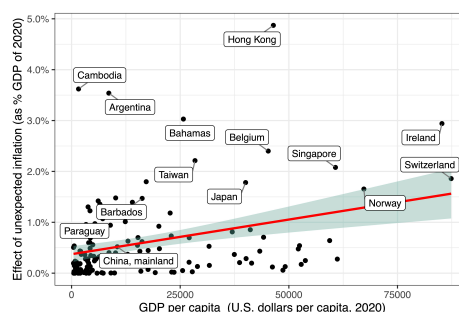
(d) Losses on Treasury and dollar cash holding - % of GDP.

Sources: Treasury Information Capital System and Federal Reserve for Treasury holdings and Judson (2017), Bertaut et al. (2019) and US Federal Reserve for cash holdings. Panel b and d excludes two outliers: East-Timor and Luxembourg

3.2 Caveats

Several caveats apply, particularly to the results relating to non-US countries. First, note that we are estimating the effects of the inflation shock as if it would not persist in the future. If inflation takes time to come down, the reduction in the real value of the stock of existing debt may be much larger than the relatively conservative estimates we have computed here (even if marginal rates on new debt issuances rise).

Take the case of a long term 30 year bond with a fixed coupon of 2%, roughly equivalent to US inflation. If US inflation jumps to an average of 3% the real value of that bonds fall from par to 82% but if inflation goes up to 5% the real value of the bond falls to half.[17] Therefore, if inflation remains elevated, the effects can be larger than those presented here. Our computation is conservative because it only factors in the excess inflation *that has already occurred at the end of 2022* as if no additional unexpected inflation were to take place, which need not be the case. Thus, both higher future inflation and, crucially, maturities on existing long term debt are relevant to assessing the total impact that the US inflation spike will ultimately have.

Our results also assume that there is inflation only in the US, though inflation has risen in other parts of the world. Sovereigns that have issued debt in their own currencies will gain from the reduction in the real value of their outstanding liabilities even if they or their residents lose on their holdings of US debt (and these gains could exceed their losses on US treasuries). Thus, our estimates should be thought of as applying to the specific impacts of US inflation rather than the distributive consequences of global inflation in general. Nevertheless, we believe our estimates are still relevant because they bring attention to the declining value of sovereign debt stocks, an issue that has not received attention, because of the prevalence of dollar-denominated assets, and because the biggest benefits in some cases accrue to low-income countries that are thought to be at greatest risk

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[17]Just change the price series in $\sum_1^{29} \frac{c_t}{(1+p_t)} + \frac{100}{1+p_{30}}$, where c_t is the 2% coupon and the p_t the price level in period t.

in the current environment.

A more subtle concern relates to the fact that, in the short term, real exchange rates may change as a result of interest rate hikes. In our analysis, by assuming PPP i.e. that inflation differentials are fully reflected in exchange rates, we discarded such realignments. However, in the short run, PPP may not hold. For example, recent interest rate hikes have led to significant short-run appreciation of the dollar, which actually decreases the US dollar denominated GDP of other countries. However, this change is short-run and likely to be transitory; it is a robust empirical regularity that the currency of countries with relatively high rates of inflation depreciate their nominal exchange rates (Taylor and Taylor, 2004). We can therefore interpret our results as the eventual effect of unanticipated US inflation even if it does not reveal itself in the short run.

In the case that inflation in other countries is also higher than anticipated, it would still be the case that the real value of the dollar debt of those countries will be diluted. Consider, for example, the case where US inflation is at 8% and inflation in other countries is also at 8%. Exchange rates will be unchanged, but the nominal value of foreign GDP in dollars will grow at 8%, therefore the real value of sovereign debt issued in dollars will still decline at the rate of US inflation.

In our computation we have ignored holdings of US dollar denominated assets by central banks. These holdings may imply a loss to sovereigns, thereby reducing the gains computed in our first exercise. We have ignored these holdings because it is difficult to find data on both the maturities and currency denomination of those assets. However, central banks frequently hold their assets as short term instruments, so the omission may not be significant for our results. On the other hand, the second exercise includes all long term treasuries held by foreigners, so the holdings of central banks will be included in our estimates of the gains accruing to the US and losses abroad.

Our computations do not consider debts issued by multilateral financial institutions like the World Bank and IMF. The reason for this is that most multilateral debt issued is at

variable rates (with a very small fraction of concessional loans at fixed rates).

Finally, we have focused on transfers arising from sovereign debt. However, governments account for only about one-quarter of the $4.2 trillion of dollar-denominated debt issued in emerging markets. The distributive impact of US inflation is thus more far-reaching than what we have estimated here. We leave it to future work to arrive at estimates of the scope of gains and losses for private creditors and debtors.

4 Conclusion

We have considered the global distributive consequences of unanticipated inflation in the United States. The overall impact on the real value of sovereign liabilities is substantial and the largest beneficiary is the US Treasury. The dilution in the real value of Treasury liabilities is on the order of $2 trillion, or close to 10% of US GDP. One-quarter of the inflation tax is levied abroad, particularly on large holders of US Treasury securities, including Japan and China, and countries whose residents hold significant stocks of dollar cash, such as Russia and Argentina. Over the last two years, the US has thus effectively received a transfer from the rest of the world of over $500 billion. But sovereigns other than the US also secure substantial windfalls from the dilution of their dollar-denominated debt. The decline in the real value of non-US sovereign debt arising from unexpected inflation in 2021 and 2022 amounts to $100 billion, with a number of poor countries experiencing significant gains relative to their GDP. These gains come at the expense of private creditors and other sovereigns.

A key implication of our findings is that the widely anticipated turmoil in emerging market sovereign debt may be mitigated by the inflation windfall accruing to many developing countries. In addition, nominal US interest rates thus far have not risen as much as US inflation, so real interest rates have actually fallen relative to their level two years ago. This distinguishes current policy from the 1980s, when real interest rates rose substantially, thereby precipitating the international debt crisis.[18] Seen from the perspective of sovereign

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[18]We thank Jeff Frankel for alerting us to this point.

debt issuers, the current international environment is therefore more benign than in the past. It is well known that unanticipated inflation benefits debtors at the expense of creditors, but our work highlights the surprising set of winners and losers and the sheer size of the ongoing gains to sovereigns.

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A Unexpected Inflation Effect by Country

Table 1: Long-term, fixed rate dollar-denominated international debt securities outstanding (IDS), issued by the general government and unexpected inflation effect by country

	Long-term fixed-rate dollar IDS	Unexpected inflation effect	Unexpected inflation effect (%GDP)
Albania	259.00	19.94	0.13
Angola	8000.00	616.00	1.06
Argentina	64714.00	4982.98	1.28
Armenia	1000.00	77.00	0.61
Aruba	378.00	29.11	1.17
Austria	600.00	46.20	0.01
Azerbaijan	1250.00	96.25	0.23
Bahamas	2769.00	213.21	2.15
Bahrain	22035.00	1696.69	4.89
Barbados	215.00	16.55	0.35
Belarus	4450.00	342.65	0.56
Belgium	2500.00	192.50	0.04
Bermuda	3860.00	297.22	
Bolivia	2500.00	192.50	0.52
Brazil	50881.00	3917.84	0.27
Bulgaria	38.00	2.93	0.00
Cameroon	750.00	57.75	0.14
Canada	88225.00	6793.32	0.41
Chile	12977.00	999.23	0.40
China	17200.00	1324.40	0.01
Colombia	29705.00	2287.28	0.85
Costa Rica	5800.00	446.60	0.72
Cote d'Ivoire	5332.00	410.56	0.67
Croatia	4750.00	365.75	0.64
Denmark	1777.00	136.83	0.04
Dominican Republic	22895.00	1762.91	2.23
Ecuador	19533.00	1504.04	1.51
Egypt	33510.00	2580.27	0.71
El Salvador	7538.00	580.43	2.36
Ethiopia	1000.00	77.00	0.08
Finland	3191.00	245.71	0.09
Gabon	3809.00	293.29	1.91
Georgia	500.00	38.50	0.24
Germany	7300.00	562.10	0.01
Ghana	16627.00	1280.28	1.87
Guatemala	5830.00	448.91	0.58
Honduras	2400.00	184.80	0.78
Hong Kong SAR	2000.00	154.00	0.04
Hungary	10250.00	789.25	0.51

Source: BIS, IMF-WEO and US Federal Reserve. Long-term, fixed rate dollar-denominated international debt securities outstanding (IDS), issued by the general government. Data on long term fixed-rate securities come from the Bank for International Securities Table C3: "Debt securities issues and amounts outstanding, in billions of US dollars." (`https://stats.bis.org/statx/srs/table/C3`). Forecast and actual inflation is taken from the IMF-WEO 2019 and 2022. Data on the US comes from the Treasury (`ttps://www.fiscal.treasury.gov/files/reports-statements/treasury-bulletin/b2021-3.pdf.`) and Federal Reserve (`https://fred.stlouisfed.org/series/BOGMBASE`). The effect of the unexpected inflation over the outstanding long term fixed-rate debt, is the product between 7.7% and the total outstanding, except US (explained in the main text). Unexpected inflation effect (% GDP): ratio of the unexpected inflation effect and the nominal GDP for 2020. Empty rows correspond to missing information for nominal GDP. Table continues on next page.

Long-term, fixed rate dollar-denominated international debt securities outstanding (IDS), issued by the general government and unexpected inflation effect by country (Appendix Table 1 contd.)

Country	Long-term fixed-rate dollar IDS	Unexpected inflation effect	Unexpected inflation effect (%GDP)
Iceland	1000.00	77.00	0.36
Indonesia	53650.00	4131.05	0.39
Iraq	4659.00	358.74	0.21
Israel	23589.00	1816.35	0.45
Italy	16700.00	1285.90	0.07
Jamaica	6477.00	498.73	3.57
Japan	5594.00	430.74	0.01
Jordan	6750.00	519.75	1.19
Kazakhstan	9447.00	727.42	0.43
Kenya	6100.00	469.70	0.46
Korea	6525.00	502.43	0.03
Kuwait	4092.00	315.08	0.30
Laos	450.00	34.65	0.19
Latvia	500.00	38.50	0.11
Lebanon	33304.00	2564.41	9.39
Lithuania	3000.00	231.00	0.41
Malaysia	4600.00	354.20	0.11
Maldives	350.00	26.95	0.72
Mexico	62747.00	4831.52	0.44
Mongolia	5928.00	456.46	3.43
Morocco	4500.00	346.50	0.30
Mozambique	727.00	55.98	0.40
Namibia	1250.00	96.25	0.91
Nigeria	13846.00	1066.14	0.25
Oman	26468.00	2038.04	2.83
Pakistan	4300.00	331.10	0.11
Panama	21633.00	1665.74	3.09
Papua New Guinea	500.00	38.50	0.16
Paraguay	5360.00	412.72	1.16
Peru	17296.00	1331.79	0.65
Philippines	33923.00	2612.07	0.72
Poland	10950.00	843.15	0.14
Portugal	108.00	8.32	0.00
Qatar	49400.00	3803.80	2.63
Romania	12468.00	960.04	0.38
Russia	47287.00	3641.10	0.25
Rwanda	400.00	30.80	0.30
Saudi Arabia	69394.00	5343.34	0.76
Senegal	3100.00	238.70	0.97
Serbia	2838.00	218.53	0.41
Seychelles	169.00	13.01	1.08
Slovakia	3000.00	231.00	0.22
Slovenia	6750.00	519.75	0.97
South Africa	20000.00	1540.00	0.46
Spain	640.00	49.28	0.00
Sri Lanka	16150.00	1243.55	1.54
Suriname	675.00	51.98	1.80
Sweden	15963.00	1229.15	0.23
Tajikistan	500.00	38.50	0.47
Trinidad and Tobago	2200.00	169.40	0.79
Tunisia	1500.00	115.50	0.27
Turkey	70660.00	5440.82	0.76
Ukraine	8950.00	689.15	0.44
United Arab Emirates	54590.00	4203.43	1.17
United States	25895147[19]	2238631.819	10.71
Uruguay	16111.00	1240.55	2.32
Uzbekistan	2110.00	162.47	0.27
Venezuela	25050.00	1928.85	4.08
Vietnam	1253.00	96.48	0.03
Zambia	4250.00	327.25	1.81

See explanatory note on previous page.

B   Foreign Holdings of US Currency/Cash

Table 2: US currency held by foreigners

Country	Currency holdings 2006	Currency holdings 2020 (Estimated)	Inflation surprise	Inflation surprise (%GDP)
Argentina	50000	105222.22	13047.56	3.35
Belarus	3000	6313.33	782.85	1.28
Brazil	1000	2104.44	260.95	0.02
Bulgaria	1000	2104.44	260.95	0.37
Cambodia	2000	4208.89	521.9	2.07
Chile	250	526.11	65.24	0.03
China	50000	105222.22	13047.56	0.09
Colombia	2000	4208.89	521.9	0.19
Dominican Republic	1500	3156.67	391.43	0.5
Ecuador	1000	2104.44	260.95	0.26
Egypt	1000	2104.44	260.95	0.07
El Salvador	1000	2104.44	260.95	1.06
Hong Kong	2000	4208.89	521.9	0.15
Indonesia	2000	4208.89	521.9	0.05
Korea	15000	31566.67	3914.27	0.24
Latvia	500	1052.22	130.48	0.39
Lithuania	500	1052.22	130.48	0.23
Mexico	5000	10522.22	1304.76	0.12
Panama	2000	4208.89	521.9	0.97
Peru	5000	10522.22	1304.76	0.64
Paraguay	100	210.44	26.1	0.07
Philippines	2000	4208.89	521.9	0.14
Poland	1000	2104.44	260.95	0.04
Romania	2000	4208.89	521.9	0.21
Russia	80000	168355.56	20876.09	1.41
Singapore	1000	2104.44	260.95	0.08
South Africa	2000	4208.89	521.9	0.16
Taiwan	1000	2104.44	260.95	0.04
Thailand	250	526.11	65.24	0.01
Turkey	10000	21044.44	2609.51	0.36
Vietnam	3000	6313.33	782.85	0.23
Others	201900	424887.33	52686.03	

Source: Judson (2017), Bertaut et al. (2019) and US Federal Reserve. The currency holding is expressed in millions of US dollars estimated in 2006. The currency holdings in 2020 results from using the aggregate growth rate of foreign currency holdings between 2006 and 2020 to update the 2006 information (see main text for additional information). The unexpected inflation effect is the product between the sum of US inflation in 2021 and 2022 (from IMF-WEO) and the currency holdings in 2021.

C   Holdings of US Treasuries and Unexpected Inflation Effect by Country

Table 3: Impact of unexpected inflation on value of Treasury security holdings by country

Country	Long term fixed rate Treasuries holdings	Unexpected inflation effect	Unexpected inflation effect (%GDP)
Afghanistan	1400	107.8	0.54
Albania	475	36.58	0.24
Algeria	0	0	0
Andorra	304	23.41	0.81
Angola	1359	104.64	0.18
Anguilla	85	6.54	
Antigua and Barbuda	248	19.1	1.39
Argentina	758	58.37	0.02
Armenia	803	61.83	0.49
Aruba	74	5.7	0.23
Australia	30518	2349.89	0.17
Austria	3293	253.56	0.06
Azerbaijan	6797	523.37	1.23
Bahamas	3898	300.15	3.03
Bahrain	82	6.31	0.02
Bangladesh	0	0	0
Barbados	893	68.76	1.47
Belarus	126	9.7	0.02
Belgium	162539	12515.5	2.4
Belize	24	1.85	0.12
Bermuda	36816	2834.83	
Bhutan	5	0.38	0.02
Bolivia	97	7.47	0.02
Botswana	623	47.97	0.32
Brazil	217006	16709.46	1.15
British Indian Ocean Territory	0	0	
British Virgin Islands	26860	2068.22	
Brunei	1086	83.62	0.7
Bulgaria	67	5.16	0.01
Burma	161	12.4	
Cambodia	4723	363.67	1.44
Canada	92384	7113.57	0.43
Cape Verde	80	6.16	0.36
Cayman Islands	69849	5378.37	
Chile	19774	1522.6	0.6
China, mainland	822937	63366.15	0.43
Colombia	27039	2082	0.77
Cook Islands	4	0.31	
Costa Rica	1354	104.26	0.17
Croatia	1468	113.04	0.2
Curacao	364	28.03	
Cyprus	89	6.85	0.03
Czech Republic	23323	1795.87	0.73
Denmark	12810	986.37	0.28
Dominica	89	6.85	1.26
Dominican Republic	2681	206.44	0.26
East Timor	8043	619.31	32.56
Ecuador	151	11.63	0.01
Egypt	2235	172.1	0.05
El Salvador	607	46.74	0.19
Estonia	86	6.62	0.02

Source: Federal Reserve and IMF-WEO. All expressed in millions of dollars. The effect of the unexpected inflation is the product between 7.7% and the total long term fixed-rate Treasuries holdings. Unexpected inflation effect (% GDP): Ratio of the Unexpected inflation effect and the nominal GDP for 2020. Empty rows correspond to missing information for nominal GDP.

Impact of unexpected inflation on value of Treasury security holdings by country (Appendix Table 3 contd.)

Country	Long term fixed rate treasuries holdings	Unexpected inflation effect	Unexpected inflation effect (%GDP)
Federated States of Micronesia	32	2.46	0.6
Finland	4553	350.58	0.13
France	97625	7517.12	0.29
Gabon	1	0.08	0
Gambia	0	0	0
Germany	60481	4657.04	0.12
Ghana	3287	253.1	0.37
Gibraltar	14	1.08	
Greece	1788	137.68	0.07
Grenada	164	12.63	1.21
Guatemala	6971	536.77	0.69
Guernsey	5407	416.34	
Guyana	7	0.54	0.01
Haiti	202	15.55	0.11
Holy See (Vatican)	12	0.92	
Honduras	2368	182.34	0.77
Hong Kong	211055	16251.24	4.71
Hungary	769	59.21	0.04
Iceland	1799	138.52	0.64
India	151402	11657.95	0.44
Indonesia	20052	1544	0.15
Iraq	13221	1018.02	0.6
Ireland	162506	12512.96	2.94
Isle of Man	847	65.22	
Israel	37327	2874.18	0.71
Italy	37468	2885.04	0.15
Jamaica	602	46.35	0.33
Japan	1165857	89770.99	1.78
Jersey	1314	101.18	
Jordan	744	57.29	0.13
Kazakhstan	81	6.24	0
Kenya	5677	437.13	0.43
Korea, South	112373	8652.72	0.53
Kuwait	16267	1252.56	1.18
Kyrgyzstan	5	0.38	0
Latvia	169	13.01	0.04
Lebanon	2	0.15	0
Lesotho	44	3.39	0.16
Liberia	58	4.47	0.15
Libya	2050	157.85	0.82
Liechtenstein	197	15.17	
Lithuania	1750	134.75	0.24
Luxembourg	151290	11649.33	15.89
Macau	1222	94.09	0.37
Macedonia	0	0	0
Madagascar	858	66.07	0.51
Malawi	49	3.77	0.03
Malaysia	11092	854.08	0.25
Maldives	2	0.15	0
Malta	255	19.63	0.13
Marshall Islands	11	0.85	0.35
Mauritania	197	15.17	0.19
Mauritius	515	39.66	0.36
Mexico	28166	2168.78	0.2
Moldova	1162	89.47	0.78
Monaco	320	24.64	
Mongolia	279	21.48	0.16
Montserrat	27	2.08	
Morocco	4181	321.94	0.28
Mozambique	354	27.26	0.19
Namibia	41	3.16	0.03

See explanatory note on previous page.

Impact of unexpected inflation on value of Treasury security holdings by country (Appendix Table 3 contd.)

Country	Long term fixed rate treasuries holdings	Unexpected inflation effect	Unexpected inflation effect (%GDP)
Nepal	151	11.63	0.03
Netherlands	64122	4937.39	0.54
New Zealand	5398	415.65	0.2
Nicaragua	26	2	0.02
Nigeria	3907	300.84	0.07
Norway	77798	5990.45	1.65
Oman	5802	446.75	0.62
Pakistan	436	33.57	0.01
Palau	8	0.62	0.24
Panama	1488	114.58	0.21
Papua New Guinea	41	3.16	0.01
Paraguay	2213	170.4	0.48
Peru	20038	1542.93	0.75
Philippines	37787	2909.6	0.8
Poland	29853	2298.68	0.39
Portugal	4254	327.56	0.14
Qatar	4644	357.59	0.25
Romania	4895	376.92	0.15
Russia	17	1.31	0
Rwanda	316	24.33	0.24
Saint Kitts and Nevis	229	17.63	1.8
Saint Lucia	198	15.25	0.94
Saint Vincent and the Grenadines	126	9.7	1.11
Saudi Arabia	84225	6485.32	0.92
Serbia and Montenegro	1688	129.98	
Seychelles	158	12.17	1.01
Sierra Leone	0	0	0
Singapore	89663	6904.05	2
Sint Maarten	7	0.54	
Slovakia	146	11.24	0.01
Slovenia	358	27.57	0.05
Solomon Islands	5	0.38	0.02
South Africa	4929	379.53	0.11
Spain	35709	2749.59	0.21
Sri Lanka	2505	192.88	0.24
Sudan	0	0	0
Suriname	22	1.69	0.06
Swaziland	47	3.62	
Sweden	33524	2581.35	0.48
Switzerland	181496	13975.19	1.86
Taiwan	188726	14531.9	2.17
Tajikistan	52	4	0.05
Tanzania	1842	141.83	0.22
Thailand	68672	5287.74	1.06
Trinidad and Tobago	1944	149.69	0.7
Tunisia	300	23.1	0.05
Turkey	2067	159.16	0.02
Turks and Caicos Islands	89	6.85	
Uganda	474	36.5	0.1
Ukraine	5664	436.13	0.28
United Arab Emirates	9701	746.98	0.21
United Kingdom	306011	23562.85	0.85
Uruguay	3809	293.29	0.55
Vanuatu	7	0.54	0.05
Venezuela	67	5.16	0.01
Vietnam	30335	2335.8	0.68
Zambia	137	10.55	0.06

See explanatory note on previous page.

D Long-Term Fixed Rate Share of Outstanding Securities Issued in International Markets

Table 4: Share of Fixed Rate Long Term Securities in Total Outstanding Securities

	Total securities outstanding	Fixed rate long-term outstanding	% of the total
1990-Q4	242534	217340	89.61
1991-Q4	249998	225884	90.35
1992-Q4	290710	264800	91.09
1993-Q4	429835	392009	91.2
1994-Q4	576787	528301	91.59
1995-Q4	588932	536938	91.17
1996-Q4	629517	566117	89.93
1997-Q4	684019	619252	90.53
1998-Q4	701393	635739	90.64
1999-Q4	722708	669497	92.64
2000-Q4	799535	752896	94.17
2001-Q4	798639	770053	96.42
2002-Q4	838606	815916	97.29
2003-Q4	867508	845992	97.52
2004-Q4	923944	894862	96.85
2005-Q4	933602	904704	96.9
2006-Q4	928609	895373	96.42
2007-Q4	921584	893268	96.93
2008-Q4	945492	923492	97.67
2009-Q4	1085720	1060532	97.68
2010-Q4	1205697	1180957	97.95
2011-Q4	1309323	1286819	98.28
2012-Q4	1461578	1443820	98.79
2013-Q4	1558730	1538992	98.73
2014-Q4	1688254	1667368	98.76
2015-Q4	1672330	1651482	98.75
2016-Q4	1857450	1834662	98.77
2017-Q4	2076828	2043242	98.38
2018-Q4	2190702	2165718	98.86
2019-Q4	2309988	2292504	99.24
2020-Q4	2668666	2656282	99.54
2021-Q4	2846174	2840936	99.82

Source: BIS Debt Securities Statistics. Securities issued in international markets, denominated in US dollars. Total securities outstanding includes all terms and all rate type.