NBER WORKING PAPER SERIES

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Working Paper 34372
http://www.nber.org/papers/w34372

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
October 2025

There is no funding or relevant financial relationships. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

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NBER Working Paper No. 34372
October 2025
JEL No. F30, G11, G12

ABSTRACT

We document that the positive differential on international portfolio returns, one aspect of the U.S. exorbitant privilege, has disappeared in three parts. Part One: U.S. international liabilities used to be mostly in low-return bonds while its international assets were largely in high-returning equities, thus naturally producing a positive return differential. More recently, however, U.S. equity liabilities have increased sharply, reducing this compositional tailwind. Part Two: While the exorbitant privilege literature has focused on expected returns as proxied by the sample arithmetic mean, the geometric mean is also required to produce an unbiased estimate of expected returns. Incorporating geometric means greatly reduces the returns differential. Part Three is a combined switch a) from aggregate to comprehensive security-level data to more accurately calculate returns and b) from expected to actual realized returns that take into account the timing and magnitude of portfolio flows. The combined effect of these changes is that over the past two decades the U.S. portfolio returns differential was not 228 bps but zero, and it is expected to be zero for the next decade.

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Introduction

A sizeable positive differential on international portfolio returns has been a pillar of the U.S. exorbitant privilege since Gourinchas and Rey (2007). While some early estimates of this differential were high due to underlying data issues,[1] the notion that ”the interest that the U.S. must pay on its foreign liabilities is two to three percentage points less than the rate of return on its foreign investments” (Eichengreen 2011, page 4) persists and is incorporated in some form in recent theoretical models such as Maggiori (2017), Gopinath and Stein (2021) and Kekre and Lenel (2024).

While exorbitant privilege is prominent and has become embedded in theoretical models, we document that there have been substantial changes in the U.S. international returns differential.[2] These changes come in three parts. Part One is simply that the nature of U.S. international portfolios has changed, as has been noted - without computing returns differentials - in Atkeson et al. (2025) and Milesi-Ferretti (2021). U.S. international liabilities are much larger than its international assets (Figure 1a). But twenty years ago, international portfolio compositions naturally produced a positive returns differential for the U.S.: Most of its international liabilities were in low-return bonds while its international assets were largely in high-returning equities (Figure 1b). More recently, U.S. equity liabilities increased sharply to match its bond liabilities. This removes a slight tailwind from the U.S. returns differential: Using old liabilities compositions, aggregate data produce a sizeable differential of 228 basis points (bps); the evolving weights reduce the differential by just 38 bps per year over the past 20 years. Changes in the composition of U.S. liabilities have removed a

[1] Other early estimates included Obstfeld and Rogoff (2005), Lane and Milesi-Ferretti (2007), and Meissner and Taylor (2008). See assessments in Lane and Milesi-Ferretti (2009) and Curcuru et al. (2013).

[2] Our focus is on portfolio debt and equity for the period from 2003 to 2022, which is the period that the U.S. has conducted comprehensive and mandatory annual security-level surveys of cross-border portfolio investment. Another important component of cross-border claims and liabilities, direct investment, is excluded from our study as we do not have access to firm-level FDI data. U.S. MNCs' international earnings have persistently exceeded foreign companies' earnings in the US (see, for example, Curcuru et al. 2013).

tailwind.

Parts Two and Three are about expected and realized nominal returns. A portion of the exorbitant privilege literature has focused on expected returns as proxied by the sample arithmetic mean (AM). However, as Jacquier et al. (2003) and Bessembinder et al. (2025) note, AM by itself is a (substantially) upwardly biased estimate of future returns. An unbiased measure is a weighted average of AM and geometric mean (GM), with the weight on GM equaling the ratio of the investment horizon to the sample period. This suggests that the portion of the exorbitant privilege literature focused on expected returns should consider GM in addition to AM. For a horizon equal to the sample length, GM is an unbiased estimate of future buy-and-hold returns.

Part Two shows this by presenting GM, which greatly reduces the returns differential. This must be true for each side of the differential (i.e., U.S. returns abroad and foreigners' returns in the U.S.), because GM is roughly equal to AM less half the variance (Fisher (1966)). And it is also true for the overall differential: Using aggregate data over the past two decades, Part One (the changing portfolio weights) reduced AM from 228 (fixed weights) to 190 bps (actual weights), while switching from AM to GM further reduces the U.S. differential to 64 bps (for a 10-year forecast of 127 bps).

Part Three is a combined switch to higher quality security-level data and actual returns realized by U.S. and foreign investors. Akteson et al. (2025, pages 2151-52) find that the "privilege of...ex post favorable market revaluations" has been undone, that "the ex post privilege that US residents previously enjoyed was erased." Akteson et al. (2025) used aggregate data and focused on the dollar amount of "valuation adjustments", including FDI. We use security-level data and focus on returns of a more narrow set of assets: portfolio equity and bonds.

Switching to comprehensive security-level data reduces the U.S. returns differential to 61 (AM) or negative 45 bps (GM). That is, the bonds and equities held by U.S. and foreign investors produced a buy-and-hold returns differential of negative 45 bps, as the foreign securities held by U.S. investors produce 5.37% annual returns, while the U.S. securities held by foreigners produce annual returns of 5.81%. The average of AM and GM from our 20-year sample provides a 10-year forecast of the future buy-and-hold differential: negative 8 bps.

Neither AM nor GM is a useful measure of realized returns, as they do not take into account the timing of purchases. In fact, Dichev (2007) calls GM "securities" returns, as they are the returns on the securities, but not returns earned by investors (unless they buy and hold for the entire sample). Bessembinder et al. (2025) refers to AM as "cash-account" returns, because to maintain a constant investment amount (and thus earn AM), every period returns must be swept into a cash account that earns a zero rate of return. Neither AM nor GM measures investors' realized returns.

The final step in Part Three is to measure actual "dollar-weighted" returns, computed as internal rates of returns (IRRs) that take into account the timing and magnitude of portfolio flows. In our setting, four components of U.S. and foreign cross-border portfolios are needed to compute IRRs: the market value of initial positions (the initial outlay), period-by-period flows (interim outlays), period-by-period income streams (coupon payments for bonds, dividend payments for equities), and the market value of terminal positions (the final payout). We have security-level data on all four components for the period 2003 to 2022 for U.S. bonds (Treasuries, agencies and corporates), U.S. equities, foreign bonds and foreign equities. Security-level IRRs show a differential that rounds to 0%, as U.S. investors' foreign portfolios earned 5.02% and foreigners' U.S. portfolios earned 5.03%. Over the past two decades, the actual returns earned by U.S. investors on their foreign bond and equity portfolios are no greater than what foreigners earned on their U.S. portfolios.

Larger cash flows - the change from initial to final position, interim net sales and interim income streams - produce larger IRRs. Within-asset-class differences between aggregate and security-level IRRs can be large and owe primarily to income streams in reported U.S. data being too large and, at least for equities, flows being too small. When computing the overall differential (i.e., claims minus liabilities), some within-asset-class differences offset. For example, income streams are greater in aggregate data for every asset class, and when netting the income streams differences largely offset each other. For the overall differential, aggregate data suggests a large U.S. differential (176 bps) because its (net) change in positions is larger and interim flows are smaller. Cash flows computed from the security-level data provide a more accurate picture: a returns differential of zero.

Overall, our results suggest a reassessment of the exorbitant privilege literature. Theoretical papers are embedding a U.S. exorbitant privilege that has disappeared. Akteson et al. (2025) showed this using aggregate data, broader than ours in that in includes FDI, and focusing on the dollar amount of "valuation adjustments". We show this using security-level data, realized "dollar weighted" returns, and AM and GM to form unbiased estimates of future buy-and-hold returns.

The paper proceeds as follows. Section 1 discusses the three returns measures using two datasets. In Section 2 we show the evolution of U.S. international portfolios. In Section 3 we present cash-account and buy-and-hold returns using aggregate data. Section 4 brings in the security-level data and IRRs. Section 5 investigates the source of the sizeable discrepancy between IRR's computed using security-level and aggregate data. Section 6 concludes. An appendix provides additional information on data (collection, quality checks, cleaning, comparison with other sources).

1 Returns Measures and Datasets

We use three returns measures and two datasets. The returns measures are two averages of annual returns - AM and GM - and an explicitily ex post measure (IRR) that takes into account the timing and magnitude of net purchases during the sample period.[3]

We have two source datasets. Aggregate is from BEA. Security-level is from annual security-level surveys of holdings, which are described in greater detail in Section 4 and an Online Appendix (OA).

Both AM and GM start from a calculation of annual returns.

For aggregate data, annual returns are computed from reported positions and flows by assuming that the change in position is equal to flows plus returns. Specifically, following Gohrband and Howell (2013), our aggregate returns measure uses BEA data and the following formula:

$$\mathrm{RTOT}_t = (INC_t + PRCHG_t + XRTCHG_t)/AVGPOS_t \tag{1}$$

where RTOT_t is the total rate of return for year t, INC_t is income payments for year t, PRCHG_t is the change in the investment position caused by a change in price for year t, XRTCHG_t is a change in the investment position caused by a change in exchange rates for year t, and AVGPOS_t is the average investment position for year t, computed by taking the average of the investment position for year t and the investment position for year *t-1*.[4] After forming annual returns series using equation (1), one can easily create AM and GM.

To create the annual returns series using security-level data, note that each security b's total rate of return (ROR) at time t is:

$$\mathrm{ROR}_{b,t} = \frac{C_{b,t} + P_{b,t} - P_{b,t-1}}{P_{b,t-1}} \tag{2}$$

[3]Note that IRR minus GM is a standard measure of timing; if the investor had good timing (e.g., purchasing just before strong returns), IRR would be greater than GM. See, for example, Morningstar's annual Mind the Gap series (https://www.morningstar.com/business/insights/research/mind-the-gap).

[4]INC is from BEA's BOP Table 4.1 "U.S. International Transactions in Primary Income" and Table 4.3 "U.S. International Transactions in Primary Income on Portfolio Investment by Sector". All other components are from the BEA's IIP presentation (https://www.bea.gov/data/intl-trade-investment/international-investment-position).

where:

- $P_{b,t}$: security b's price at time t.
- $C_{b,t}$: security b's dividend or coupon income at time t.
  - Bonds: $C_{b,t} = \text{Coupon rate}_{b,t-1} * \text{Face value bond}_{b,t-1}$.
  - Equity: $C_{b,t} = \text{Dividend per share}_{b,t-1} * \text{Number of shares}_{b,t-1}$; alternatively, using the dividend yield: $C_{b,t} = \text{Dividend yield}_{b,t-1} * \text{Equity market value}_{b,t-1}$.
- $\text{ROR}_{b,t}$: security b's total rate of return at time t.

Standard methodology for the construction of returns indexes weights the returns of each security by its relative size. Analogously, we weight the return on each of the N securities by their size in the investor's portfolio. That is, the weighted average rate of return on the investor's portfolio from year *t-1* to year t, ROR_t, is calculated as follows:

$$\text{ROR}_t = \sum_{b=1}^{N} \omega_{b,t-1} \text{ROR}_{b,t} \quad (3)$$

where $\text{ROR}_{b,t}$ is security b's annual total rate of return (price changes plus interest for bonds or dividend for equities) from year *t-1* to year t. The weight $\omega_{b,t-1}$ is the investor's time *t-1* holdings of the particular security $\text{H}_{b,t-1}$ relative to her total holdings:[5]

$$\omega_{b,t} = \frac{\text{H}_{b,t}}{\sum_{b=1}^{n} \text{H}_{b,t}} \quad (4)$$

For our data, ROR_b provides a series of T annual returns, which can be summarized by calculating AM or GM:

$$\text{GM} = \left(\prod_{t=1}^{T} (1 + \text{ROR}_t) \right)^{\frac{1}{T}} - 1$$

[5] Our weights being at time *t-1* means that the security must exist at time *t-1* to be included in our returns calculations. This is similar to standard index inclusion rules that require the security to have been issued prior to index rebalancing.

IRR is formed using cash flows. Specifically, IRR computed over T periods is:

$$C_0 + \frac{C_1}{(1+\text{IRR})^1} + \frac{C_2}{(1+\text{IRR})^2} + \cdots + \frac{C_T}{(1+\text{IRR})^T} = 0$$

Alternatively:

$$\sum_{t=0}^{T} \frac{\text{C}_t}{(1+\text{IRR})^t} = 0$$

Where:

- C_t: The net cash flow at time t.
  - C_0: Initial investment, computed as the negative of the market value of holdings at initial period 0, which is 2003 in our baseline.
  - C_t: Intermediate distributions and contributions: For all intermediate periods after the initial investment period and before the final payout period: sum of the coupon or dividend payments and net sales (i.e., the negative of net purchases).
  - C_T: Final payout, computed as the sum of the market value of holdings at the end of the sample, which is 2022 in our baseline, and the coupon or dividend payments and net purchases from period T-1 to T.

Using security-level data we can observe all components needed to compute IRR. Using aggregate BEA data, positions and income streams were already mentioned in equation (1); flows are from the BEA's BOP presentation (and will be discussed in greater detail in Section 5).

A simple two-period example of IRRs without income streams, adapted from Dichev (2007), illustrates the cash flows required to compute IRR. Assume an initial purchase of 100 (i.e., a Period 0 outlay, or negative cash flow (CF), of 100) and returns that are +10% in Period 1 and -10% in Period 2. AM is zero and GM is -0.5%, but neither takes into account any purchases or sales before Period 2. Now assume purchases of 50 (another outlay) occurred prior to Period 2's 10% loss. The cash flows associated with this portfolio would be -100 (the initial portfolio, assumed purchased prior to Period 1), -50 (the interim purchase) and a terminal payout of 144 (160 less 10%). Mathematically,

$$\mathrm{CF}_0 + CF_1(1+IRR)^{-1} + CF_2(1+IRR)^{-2} = 0 \tag{5}$$

$$\text{-}100 - 50(1+IRR)^{-1} + 144(1+IRR)^{-2} = 0 \tag{6}$$

IRR in this example is -2.4%, which is lower than GM because of the poor timing of buying 50 just prior to -10% returns. IRR can also be greater than GM, if for example sales occurred prior to the negative returns.

2 The Changing Weights of Equities and Bonds in U.S. International Portfolios

With the groundwork laid, we can get to Part One of the exorbitant changes in U.S. international returns: The changing nature of the composition of international portfolios. In the past, large positive estimates of U.S. portfolio returns differentials hinged on two components. One was a within-asset-class differential in which U.S. liabilities (by asset class) had lower returns than U.S. assets. While there was debate about whether this within-asset-class differential existed (see Curcuru et al. (2013) on this), the second component that produced large U.S. differentials - a composition effect - was obvious to anyone who looked at the portfolio data. In particular, as Gourinchas and Rey (2007) noted, a half century ago the U.S. acted as the world's banker, with liabilities largely in low-return bonds (such as U.S. Treasuries) and U.S. assets largely in higher-returning foreign bonds. That morphed into the world's venture capitalist phase, when the U.S. funded a leveraged portfolio by borrowing cheaply (largely through Treasuries) and investing in riskier (foreign) equity. During the world venture capitalist phase, the composition effect of having bond liabilities and equity assets was sizeable, estimated by Curcuru et al. (2010) to increase net U.S. international returns by 158 bps per year from 1994 to 2007.

For a long time the U.S. could count on a sizeable positive composition effect. But the nature of U.S. international portfolios – both what U.S. investors hold abroad and what foreigners hold of U.S. securities – has changed. While U.S. international assets have been predominately in equities - 70% for the past two decades - foreigners' U.S. debt-equity mix has changed dramatically (Figure 1b). Foreigners' U.S. securities holdings had long been skewed toward bonds, with equities comprising about 30% from 1980 through 2011, but more recently foreigners' U.S. equities positions have surged to match their U.S. bonds holdings. U.S. international assets remain tilted towards equities, but U.S. liabilities are no longer tilted towards bonds.

This has removed a slight tailwind. The first columns Table 1 show, using aggregate BEA data for 2003-2022 and equation (1), AMs assuming equities and bonds in U.S. international liabilities stayed at their 2003 weights (column 1) or evolved as they have (column 2). With fixed weights the U.S. returns differentials would have been 228 bps, with actual weights 190bps. The changing nature of U.S. international liabilities reduced the differential by a modest 38bps.

3 AM and GM Returns

Part Two of the exorbitant change is about expected returns. The exorbitant privilege literature, from from Gourinchas and Rey (2007) and Curcuru et al. (2008) through Bertaut et al. (2024), has focused exclusively (to our knowledge) on AM, presumably to get a measure of expected returns. We argue (as does Atkeson et al. (2025)) that ex post measures are also interesting, but also note from Jacquier et al. (2003) both AM and GM are required to obtain an unbiased estimate of future buy-and-hold returns. Part Two of the exorbitant change examines the U.S. returns differential using both AM and GM.

Columns 2 and 3 of Table 1 show AM and GM using BEA data and again applying equation (1). AM suggests a large positive U.S. differential (190 bps per year), while GM is positive but much smaller at 64 bps. As GM is approximately AM less one-half of the variance, the difference comes not from low volatility bond returns - the difference between AM and GM for U.S. and foreign bonds is relatively small - but from equities. For equities, AM exceeds GM by 275 bps per year (for U.S. equity claims) and 143 bps (for U.S. equity liabilities).[6]

Overall, just considering GM greatly reduces the differential. Using aggregate data, a ten-year forecast is 1.27% (the average of AM and GM).

4 International Returns from Security-Level Data

Part Three of the exorbitant change proceeds in two steps. The first is a switch to comprehensive security-level data to get more precise estimates of AM and GM. Using security-level data, GMs are lower - for equities, much lower - than AMs and the U.S. differential is even lower, falling below zero. The second step is to calculate realized returns that incorporate not only the composition of portfolios (an aspect also captured by GM) but also the timing of interim net purchases and income streams.

4.1 Calculating Returns Using Security-Level Data

Since 2003, security-by-security data on U.S. claims and liabilities - the amount U.S. residents hold of every foreign security and the amount foreigners hold of each and every U.S. security - are collected annually by the U.S. Department of the Treasury as part of the TIC reporting

[6]Equation (1) follows Gohband and Howell (2013) and scaled by average of periods t and t-1 positions. As a check, in columns (4) and (5) we scale by t-1 positions; all returns increase, but the takeaways remain.

system.[7] The security-level data underlie the annual TIC reports of foreign holdings of U.S. securities and of U.S. holdings of foreign securities and these data feed into official BEA data on the U.S. international investment position. The main reporters are U.S.-resident custodians (including brokers and dealers), which must report all U.S. securities they hold on behalf of foreign residents (including in their own foreign subsidiaries and affiliates) and all foreign securities held on behalf of U.S. residents. Given the mandatory reporting, the holdings data are comprehensive; they capture the entire foreign portfolio of U.S. securities and the entire U.S. portfolio of foreign securities at the individual security level.

The security-level data are annual since 2003; the liabilities data are reported as of June 30 of each year for each foreign country's holdings of each security while the claims data (U.S. holdings of foreign securities) are reported as of December 31 of each year. The liabilities survey data distinguish between foreign holdings of U.S. Treasuries, U.S. Agencies, U.S. corporate bonds, and U.S. equity; the claims data distinguish between U.S. holdings of foreign bonds and foreign equity. Survey data are reported on a resident basis; that is, on the direct owner of these investments as reported by the custodians, but not the ultimate owner.

We conduct a number of checks. First, to confirm that we have included all securities, we sum the holdings for each asset class and compare to the surveys' published aggregate amounts. They match. The security-level holdings data we use represent the universe, to

[7] Griever, Lee, and Warnock (2001) discuss the origins of the TIC system. Briefly, in the early 1970s public concern about the rise in European and Japanese investors' U.S. investments, as well as about the substantial investable sums accumulated by oil-producing countries, prompted the first modern benchmark survey to measure foreign holdings of U.S. long-term securities as of year-end 1974. It was recognized that without benchmark surveys, the TIC system could not accurately identify the countries that were holding U.S. securities or provide much information on the actual securities being purchased. To address these shortcomings, Congress passed the Foreign Investment Study Act of 1974 (Public Law 93-479), which evolved into the International Investment and Trade in Services Survey Act (22 U.S.C. 3101 et seq.). The latter act stipulates, among other things, that a comprehensive benchmark survey of foreign portfolio investment in the United States be conducted at least once every five years and that information collected under the authority of the act be published for use by the general public and by U.S. government agencies. Such surveys were conducted every 5 years from 1974 through 1999 (with the 1999 survey being conducted in March 2000 to avoid possible Y2K complications). Since 2003 the surveys have been conducted annually.

the extent it is known.

Second, we check and improve on the surveys' prices and payment terms data. We use security identifiers to match the TIC holdings to security-level information on prices and payment terms from other sources. We use ICE Global Index constituent data for a number of different indices for U.S. and foreign bonds; TreasuryDirect for data on Treasury securities; Refinitiv data on foreign securities; and CRSP U.S. Stock database on U.S. and foreign equity. The CRSP U.S. Stock databases also include foreign and multinational companies' securities that are ADRs, cross-listed, or traded on the major stock exchanges (NYSE, NYSE MKT, NASDAQ, and NYSE Arca). Finally, we use Bloomberg Back Office Security-level data to check for any unmatched securities. We use these data sources to check and improve on the prices and payments term data in the claims and liabilities survey, as well as to supplement the survey data when price and payment data are missing. This step also includes taking care of outlier entries and mis-reported pricing. Next, using these newly checked and cleaned survey data, we calculate the total return per security for each survey date and then aggregate these returns per asset class. We then check that these aggregated survey returns are close to the ones reported in the index data for the major asset classes - U.S. bonds, U.S. equity, foreign equity. They are, giving us some confidence about the quality of the price and payment terms data.

Using the security-level data we can calculate annual returns using equations (2) - (4) and then compute AM and GM. Specifically, for securities that span two surveys we observe the security-level returns and each security's weight in the portfolio and so can create annual returns. We assume, as in index returns, that weights change infrequently. For example, the norm for MSCI is to change weights in its global equity indices is in its annual rebalancings. For our study, we allow weights to change on the date we observe them: June 30th for liabilities and December 31st for assets.

AM and GM are shown in Table 1 columns 6 and 7. As with the aggregate data, AMs are larger than GMs, with the difference being greatest for equities (whose returns are more volatile). With AMs, the positive U.S. differential is quite small (61 bps).[8] With GMs, the U.S. differential is negative (45 bps). A 10-year prediction of buy-and-hold returns is the average: negative 8 bps.[9]

Table 1 results are based purely on the composition of international portfolios. Focusing on column (7), we see that the composition of U.S. international portfolios is such that without any trading we would expect U.S. liabilities to pay more than U.S. claims; over the period from 2003 to 2022 the average annual buy-and-hold return on U.S. liabilities was 5.81% (9.67% on equities, 3.15% on bonds), while returns on U.S. claims were 5.37% (5.74% on equities, 3.83% on bonds). These numbers differ from returns calculated using aggregate data (column 2) because we measure returns security-by-security rather than applying aggregate indexes.[10] To the extent the security-by-security information differs from an off-the-shelf index, our security-level returns will differ from returns using BEA's aggregate data.

4.2 Realized Returns

Neither returns measures in Table 1 is a meaningful measure of realized returns, in that one (AM) requires sweeping profits into a zero-return cash account and the other (GM) is only appropriate if all purchases are made at the beginning of the sample and no trading occurs until the end of the sample. In reality, trading occurs: Net purchases are never zero.

[8]Bertaut et al. (2024) use a security-level dataset that is similar ours. Their sample period is slightly different; for 2004-2022 they report arithmetic mean of 0.5%, compared to our reported 0.6% or, for their time period, 0.2%. Ascertaining exactly why our data produces a slightly lower differential is not easy, but it appears to come from a lower estimate of equity claims returns. Tabova and Warnock (2024) also use a portion of the security-level data - that on U.S. Treasury securities - while also assessing domestic investors' returns.

[9]In OA Table 2, we show the variance of each returns series, which range from 3.83 for equity claims to 0.13 for U.S. agency bonds, with variances for bonds uniformly lower than for equities. Also, the variance of income streams is very small, so all of the difference between AM and GM is due to volatility in prices and exchange rates.

[10]See BEA (2024) for its methodology on computing returns and, as will become important below, dividend yields. Each involves using one or more country-level indices, such as the SP500.

We next move to realized returns, as computed using IRRs that take into account beginning and ending positions as well as interim net purchases and income streams.[11] Note that the different timing of the annual surveys means our liabilities portfolios start in June 2003 and end in June 2022, while our asset portfolios start in December 2003 and end in December 2022.[12]

For all bonds (U.S. Treasury bonds, U.S. agency bonds, U.S. corporate bonds, and foreign bonds) we have security-level data on each bond's market value, face value, and coupon yield, as well as flows that we compute from the security-level data; everything is done at the security-level. For U.S. and foreign equities, our analysis is again at the security-level, including interim dividend payments.

We compute IRRs by asset class using the following components, all calculated from security-level data:

- the initial investment, computed as market value of holdings in 2003 (assumed to all be purchased at that time),
- intermediate contributions are net purchases each period from 2004 through 2022,
- intermediate distributions are coupon or dividend payments each period from 2004 through 2022, and
- the final payout is equal to the sum of the market value of holdings at the end of the sample (2022).

For bonds, net purchases are the change in the face value of holdings and coupon payments are calculated as face value times the coupon yield. For equities, net purchases are calculated

[11] On IRRs, described in Section 1.1, see Fabozzi (2014) for a textbook exposition, Dichev (2007) for an application to equities, Tabova and Warnock (2024) for an application to Treasuries, and Bessembinder et al. (2025) for a discussion with respect to other measures.

[12] Identical sample periods are not possible given the timing of the annual surveys. The non-overlapping periods - the second halves of 2003 and 2022 - do not materially impact results as our main points hold if we start the liabilities portfolio a year later (June 2004) or end the assets portfolio a year earlier (December 2021).

by subtracting the valuation change, calculated using security-level price data, from the change in market value of positions; equity dividend payments are calculated as the dividend, reported as dollars per share in both the survey and outside data sources (we use CRSP and Refinitiv), times the number of shares.

Column 1 of Table 2 presents IRRs for equity and bond claims and liabilities. Two observations: Equity returns are higher than bond returns, and U.S. investors did better than foreign investors in their cross-border bond portfolios (3.28% per year for U.S. bond claims vs. 2.68% for U.S. bond liabilities) but worse in their cross-border equity portfolios (5.67% on claims vs. 8.52% on liabilities). Overall, U.S. investors' actual annual returns on foreign bonds and equities was 5.02%, while foreigners earned 5.03% on their U.S. bonds and equities. The ex post U.S. international bond and equity differential rounds to zero.

Did timing produces the zero returns differential? For example, the timing of foreigners' purchases of U.S. bonds and equities could be so good - purchasing just before strong returns, selling before periods of low returns - that the positive returns differential is eroded. However, timing works in the other direction. Specifically, using IRR minus GM (the buy-and-hold return) as a measure of timing and comparing Table 2 column 1 (IRR -0.01) and Table 1 column 7 (GM -0.45) shows that timing added 44 bps to the overall U.S. differential. The differential in timing owes to foreigners' particularly poor timing in U.S. equities (-115 bps per year) and U.S. investors' relatively good timing in foreign equities (-7bps); for bonds, both U.S. and foreign investors lose about 50bps to timing. Even with positive (net) timing, the U.S. portfolio returns differential is zero.

5 Undertanding Security-Level versus Aggregate IRRs

We showed in Table 1 that aggregate and security-level data provide very different estimates of AM and GM, with differences exceeding 100 bps per year. In column 2 of Table 2 we show that IRRs computed using aggregate BEA data - the income and positions data discussed in Section 2 and net purchases from BEA's BOP data - produce a large U.S. differential of 176 bps per year, much higher than the 0% differential produced by security-level data. What explains the difference between aggregate and security-level IRRs?

Recall that there are three components of an IRR calculation: the change in positions (ending versus initial), interim net purchases (which are outlays) and interim income streams (from dividends or coupons). IRRs will be larger with some combination of a greater change in positions (from initial to ending), more interim net sales (i.e., less interim net purchases) and more interim income streams. Our security-level components differ from BEA's published aggregates in the following ways, illustrated in Figures 2 (for liabilities) and 3 (for assets) and summarized in the right panel of Table 2 (where numbers are expressed as BEA minus security-level and divided by twenty to get annual averages):

- Within asset classes, for all asset classes except bond liabilities, aggregate IRR is greater than security-level IRR because in the aggregate data income streams and net sales are greater. (For bond liabilities, higher aggregate income streams are offset by a smaller change in position.) Aggregating to total claims and total liabilities, income streams are still behind the difference between aggregate and security-level IRRs, with claims flows (especially equity claims) also play a role.
    - For flows, we compute flows from security-level information described above (change in face value for bonds, change in market value of positions less valuation changes for equities), whereas BEA transactions data, prior to 2013, were primarily based on TIC S flows, which were so inaccurate that they were discontinued in 2023. Since 2013 BEA imputes transactions from the reported TIC positions, which requires an estimation of valuation changes based on aggregate indexes.[13] The

[13]For more details on the relationship between BEA and TIC S flows, relevant for flows prior to 2013,

middle graphs of Figures 2 and 3 show that for bond (both liabilities and assets), flows differ but not systematically, whereas for equities security-level inflows (both liabilities and assets) are larger than BEA-reported flows. This is also apparent in column (5) of Table 2, where we report the negative of flows - net sales - so the sign for cash flows is the same as the other components. For equities, BEA net sales are $35 - $55 billion a year larger than (i.e., net flows are smaller than) estimates based on security-level data.

– For within asset class income streams (Figures 2 and 3, bottom graphs, and column 6 of Table 2), BEA data are persistently greater than our security-level income streams; for example, $44 billion a year for equity claims. We consider our security-level investment income to be accurate because 1) we observe the coupon or dividend for each security in the investors' portfolios so we do not need to make any assumptions about the maturity structure or other compositional factors of the portfolios, 2) for equities we observe the many investment funds to which BEA applies market-level dividend yields (e.g., SP500 dividend yields), although such funds do not pay dividends and 3) the security-level data includes face values of positions for bonds and number of shares for equities so coupons and dividends can be applied to these positions rather than to market value positions. These are important advantages over estimations based on aggregate positions data, which are only available at the market value and thus aggregate index coupon and dividend data are applied to aggregate market value positions, over-counting income streams.[14]

see Bureau of Economic Analysis (2019). For details on how BEA imputes flows since 2013, see Bureau of Economic Analysis (2023).

[14] We do not take lightly the fact that our income streams are much lower than BEA's and so investigated. For U.S. and foreign equities, much of the difference can be attributed to holdings in investment funds and limited partnerships (coded as 3 or 4 in the annual reports) that, based on our searches through Morningstar and the web, do not pay dividends. However, BEA applies market dividend yields to the dollar amount of all equity holdings: common and preferred stock, for which a market yield might be appropriate, and

- For the overall differential (i.e., claims minus liabilities):
  - Some within-asset-class differences offset. Specifically, while income streams are greater in aggregate data for every asset class, when computing the overall differential the income streams differences largely offset each other.
  - For the overall differential, differences in the change in positions are important. Though the change in positions differences are small within each asset class, they add $16 billion a year to claims cash flows and subtract $27 billion from liabilities cash flows for an overall (assets minus liabilities) difference of $43 billion. Net sales are also larger in the aggregate data, more so for claims than liabilities (for a net of $31 billion per year).

6 Conclusion

That U.S. investors earn substantially more on their foreign securities than foreigners earn on their U.S. securities has been a fundamental part of the exorbitant privilege notion. But it is no longer true. Yes, aggregate data gives the appearance of a positive U.S. returns differential, because it overcounts income streams and, for equities, undercounts net purchases. But high-quality security-level data show that over the past two decades foreigners have earned no less on their U.S. portfolios than U.S. investors earned on their foreign portfolios, and expectations for a 10-year horizon are a U.S. returns differential of negative 8 bps. For now, the exorbitant privilege of a large positive international returns differential has disappeared.

investment funds. For bonds, most of the differerence is due to BEA's application of market (index) yields to the dollar amount of holdings; calculating coupon payments at the security-level is more accurate.

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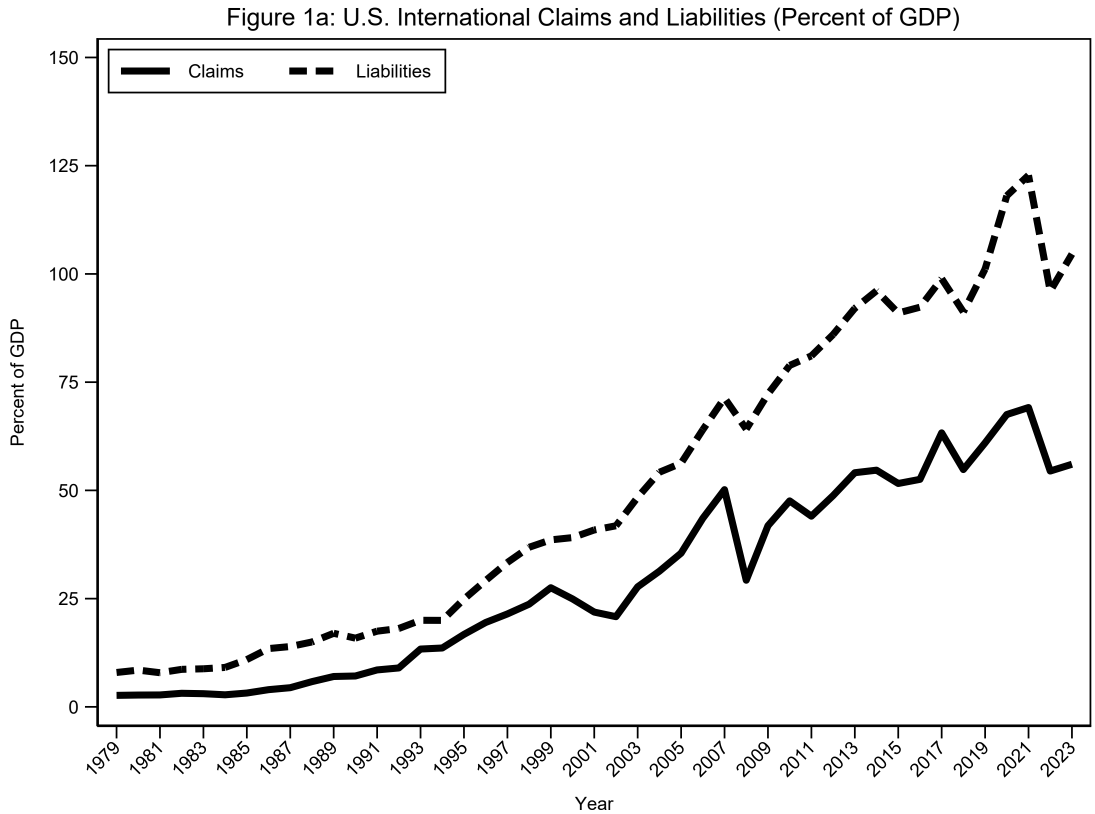
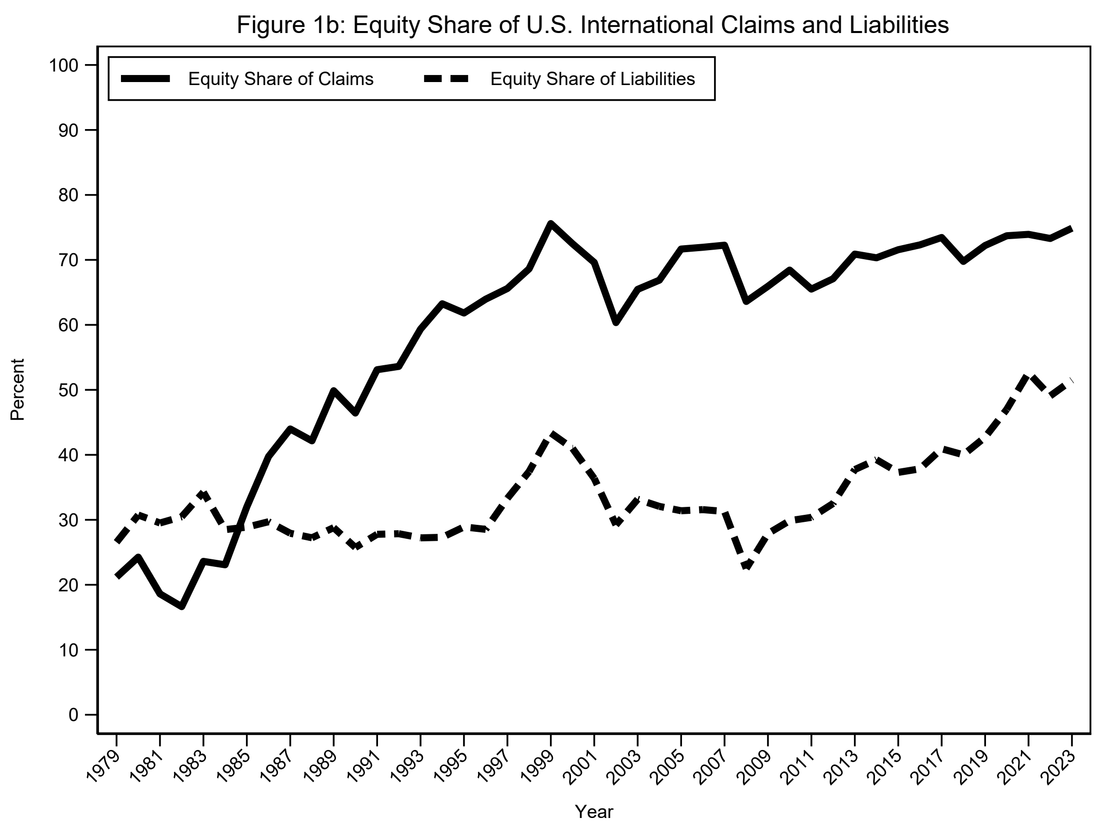
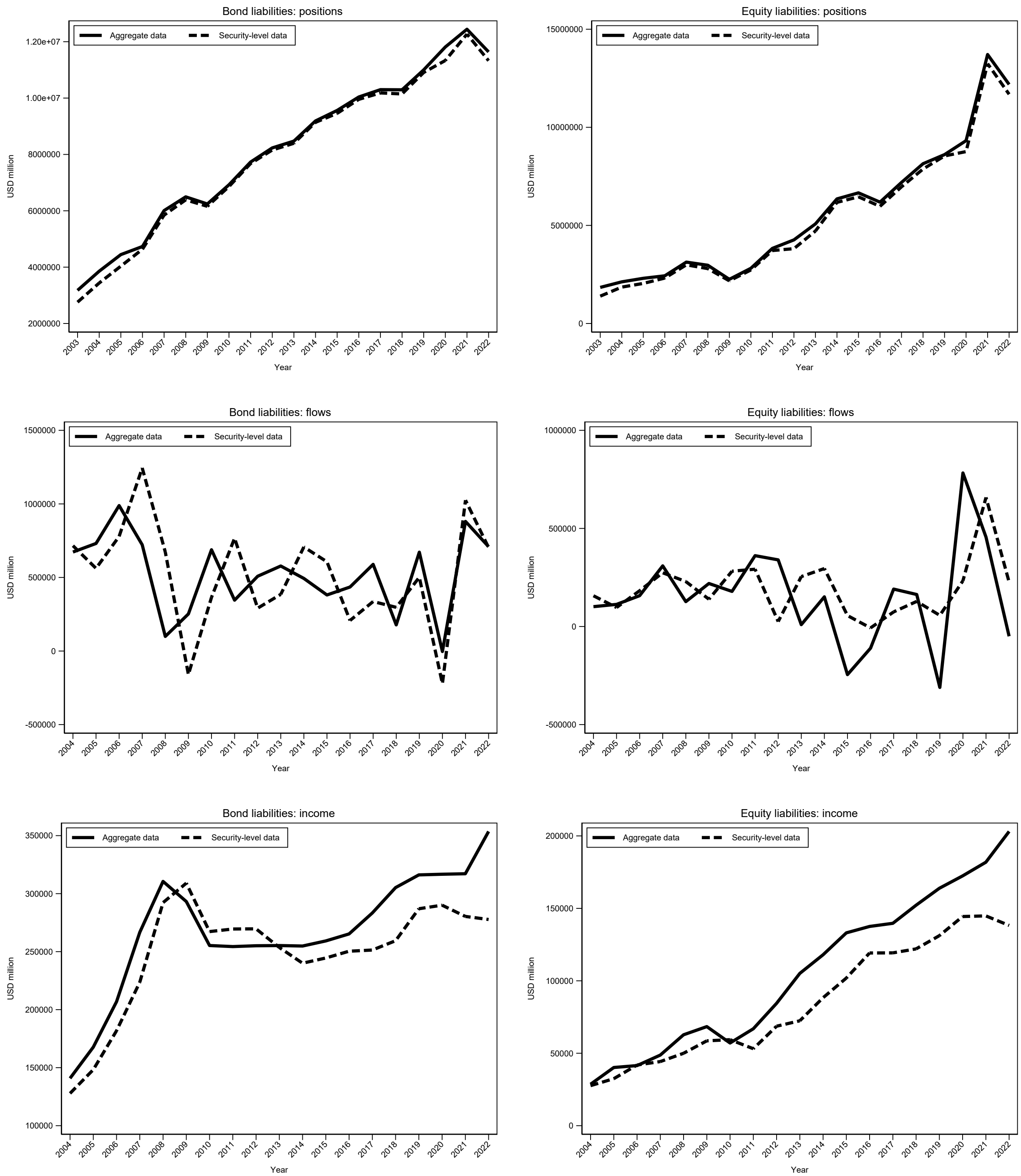
Figure 1: U.S. International Claims and Liabilities (1979-2023)





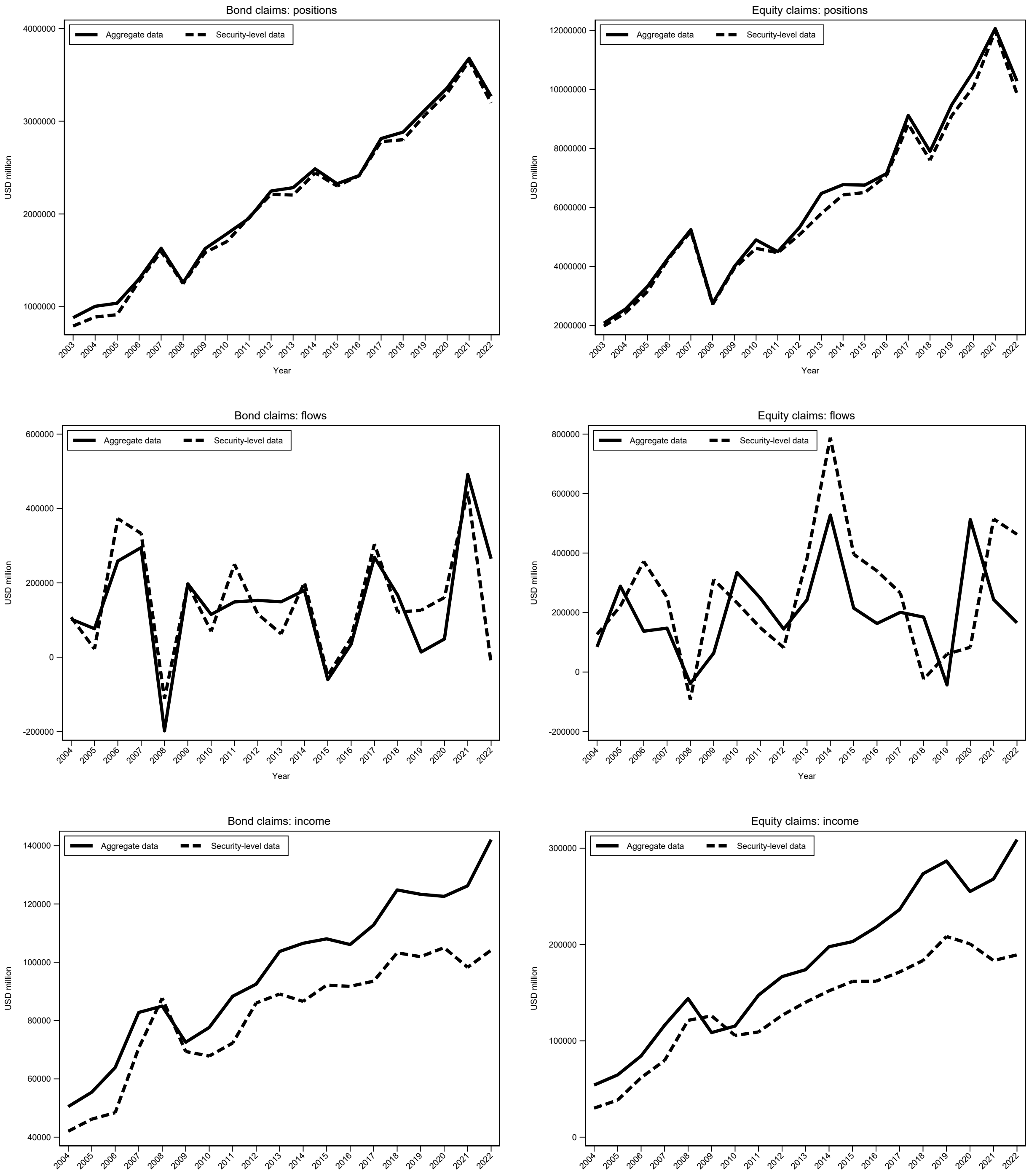
Note: In this and all subsequent exhibits claims refer to U.S. investors portfolios of foreign securities and liabilities refer to foreigners portfolios of U.S. securities. Source data: BEA U.S. International Investment Positions and U.S. Nominal GDP.

Figure 2: U.S. Liabilities: Positions, Flows and Income Streams (USD millions)



Aggregate data flows are BEA estimated transactions plus other changes. Data are as of end-June of each year, except for aggregate data flows, which are as of end-December of each year. Aggregate data positions for 2003-2005 are aslo as of December as the BEA started publishing quarterly positions in 2006. Source data: BEA U.S. International Investment Positions and Balance of Payments for aggregate data series; and authors' calculations based on TIC annual survey data for the security-level series.

Figure 3: U.S. Claims: Positions, Flows and Income Streams (USD millions)



Aggregate data flows are BEA estimated transactions plus other changes. Data are as of end-December of each year. Source data: BEA U.S. International Investment Positions and Balance of Payments for aggregate data series; and authors' calculations based on TIC annual survey data for the security-level series.

Table 1: Average annual returns (%), 2003-2022

	Aggregate Data					**Security-level Data**	
	Average positions			Lagged positions		Lagged positions	
	AM	AM	GM	AM	GM	AM	GM
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Equity claims	7.77	7.77	5.02	10.31	8.18	7.74	5.74
Equity liabilities	8.09	8.09	6.46	9.98	8.52	10.76	9.67
Bond claims	4.43	4.43	4.19	4.95	4.68	3.99	3.83
Bond liabilities	2.68	2.68	2.56	2.89	2.78	3.23	3.15
Corp. bonds & Agencies	3.09	3.09	2.90	3.35	3.16	4.15	4.05
Corp. bonds						4.19	4.05
Agencies						3.89	3.83
Treasuries	2.38	2.38	2.27	2.59	2.48	2.60	2.51
Total claims	6.91	6.91	5.33	8.72	7.37	6.61	5.37
Total liabilities	4.63	5.02	4.69	5.60	5.28	6.00	5.81
Total differential	**2.28**	**1.90**	**0.64**	**3.12**	**2.09**	**0.61**	**-0.45**

Notes: The table shows average annual returns over the period 2003-2022, measured as the arithmetic (AM) and geometric means (GM), using BEA data ("Aggregate") in columns (1)-(5) and TIC security-level data in columns (6)-(7). In column (1) the liabilities equity - bond ratio is fixed at the 2003-2004 level of 56 percent.

Table 2: Internal Rates of Return (IRRs) with decomposition, 2003-2022

	IRR		**Aggregate minus Security-Level**			
	Security-level Data	Aggregate Data	Cumulative Cash Flow	Change in Position	Cumulative Net Sales	Cumulative Income Streams
	(1)	(2)	(3)	(4)	(5)	(6)
Equity claims	5.67	7.87	115.4	16.8	54.99	43.6
Equity liabilities	8.52	8.72	58.9	-0.25	35.5	23.7
Bond claims	3.28	4.35	18.5	-0.96	5.0	14.4
Bond liabilities	2.68	2.50	-10.3	-26.8	-6.8	23.3
Corp. bonds & Agencies	3.49	3.16	-11.4	-10.9	-11.2	10.7
Corp. bonds	3.58					
Agencies	3.25					
Treasuries	1.87	1.87	1.1	-15.9	4.4	12.6
Total claims	5.02	6.92	133.9	15.9	60.0	58.0
Total liabilities	5.03	5.16	48.6	-27.0	28.7	47.0
Total differential	**- 0.01**	**1.76**	85.3	42.9	31.4	11.0

Notes: The left panel shows internal rates of return (IRRs) over the period 2003-2022, expressed as an annual percent, using security-level data in (1) and aggregate (BEA) data in (2). The right panel shows differences, for the entire 20-year sample period, in aggregate and security-level data on the change in positions, cumulative net sales and cumulative income streams (in billions of USD, expressed as annual average).

Online Appendix for Exorbitant Changes in Three Parts*

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This version: September 26, 2025

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1 Table of Contents

2 Data Collection, Matching, and Dealing with Incomplete Records

2.1 FRBNY and Board Data collection and quality checks

A sample reporting form for the 2022 claims survey (SHC) is in Appendix A of the survey instructions: `https://ticdata.treasury.gov/resource-center/data-chart-center/tic/Documents/shca2022in.pdf`.[1] The reporting form shows that information collected from the TIC reporters includes:

- the US$ amount of holdings (at the security level), reported at fair value;
- For equities: number of shares held (at the security level).
- For bonds: face value, issue and maturity dates (at the security level).

The teams at FRBNY and the Federal Reserve Board of Governors thoroughly check the data on market value positions at the reporter level, at the country of holder level, as well as for all reporters altogether, as these are the main statistics reported in the annual TIC survey reports.

Because market value of holdings are reported for both equities and bonds, as are the number of shares for equities and the face value of bonds, the data contain an implied price for every security (holdings divided by shares for equities, market value divided by face value for bonds). Therefore, a price return can be calculated using the entire universe of the claims and liabilities holdings. FRBNY does not import vendor pricing data.

Bond coupons and equity dividends, needed to compute total returns, are not reported in the TIC survey data. After receiving the reporters' data on positions, FRBNY adds coupon

[1]The sample reporting form for the liabilities survey (SHL) is also available on the Treasury TIC website: Appendix A in `https://ticdata.treasury.gov/resource-center/data-chart-center/tic/Documents/shla2020in.pdf`

and dividend data at the security level using outside data sources (currently Intercontinental Exchange (ICE)).

Additional information collected from TIC reporters:

- security ID (CUSIP codes are suggested; if the CUSIP is not available, ISIN, CINS, Common code or SEDOL);
- security description ("Briefly describe the security, providing any relevant descriptive information available. Ideally, this would include, but is not restricted to: (a) for preferred stock, the annual dividend; (b) for debt securities, the interest rate, if any, whether it is stripped interest only (IO) or principal only (PO), convertibility, and currency of denomination; (c) for floating rate notes, how the interest is calculated (e.g., Libor plus 1.5); and (d) for depositary receipts, a description of the underlying security)";
- security type:
  - Type 1: common stock, including restricted common shares.
  - Type 2: preferred stock, including participating preference shares, nonparticipating preference shares, convertible preferred stock, and restricted preferred shares.
  - Type 3: shares of funds, including funds that invest primarily or exclusively in money market instruments and in long-term debt, exchange traded funds, open-end and closed-end mutual funds, and unit investment trusts.
  - Type 4: all other types of equity, including foreign-resident limited partner ownership of U.S.-resident limited partnerships and any other form of equity not specified in security types 1, 2, and 3.
  - Type 5: commercial paper, including asset-backed commercial paper.

- Type 6: long-term and short-term negotiable certificates of deposits, including negotiable bank notes and negotiable deposit notes issued by U.S. institutions, including U.S. branches of U.S. or foreign banks.
- Type 7: convertible debt securities, including convertible bonds and zero- coupon convertible debt.
- Type 8: bonds and notes that do not provide interest payments, such as discount notes.
- Type 9: "straight debt" bonds or notes that: (1) cannot be converted to equity securities, (2) provide interest payments, (3) have not been stripped (i.e., not an IO or PO), and (4) do not give the owner a claim against the cash flows generated by the underlying assets (i.e., ABS).
- Type 10: components of stripped securities, including the IO and PO components.
- Type 11: all debt other than asset-backed securities that is not covered in types 5-10, including short-term sovereign debt securities.
- Type 12: short-term and long-term securities that represent securitized interests in a pool of assets and give the investor a claim against the cash flows generated by the underlying assets.

Some of the above-listed security-level characteristics are out of the scope of the data cleaning, checking and vetting process.

2.2 Additional data matching and cleaning for this paper

For this paper we do additional merges with vendor data (Refinitiv, ICE, CRSP) on coupons and dividends, as well as with vendor provided pricing data to verify and clean the implied prices in the raw data. The match level is not perfect, but we take extra steps to clean the raw TIC data to improve the matching rate, including 1) cleaning up the reporter security codes to get valid ISIN or CUSIP codes that can then be used for the merge with outside data sources and 2) extracting security characteristics from the "description" field to fill in information that is otherwise unavailable or incomplete in the coupon and dividends fields of the raw data.

While the raw TIC security-level data includes implied security price, we double check that these prices track closely ICE, Refinitiv, or CRSP data prices and when they do not we use the vendor reported price. Finally, for securities with no information on dividends or coupons, we check against Morningstar secuity-level data for a final verification. For the securities for which we do not have a match with any outside data, we use the implied price from the reported positions.

Merging the survey data with price data ensures we are using the correct pricing information for all securities. This step is necessary since the survey data are checked internally mostly for the aggregated by reporter and country of issue or holder market values, and the security-level data have not been used widely for research. After verifying and correcting the pricing, coupon, and dividend data, we drop outliers beyond the 1st and 99th percentile by year and asset class; this step does not have a noticeable effect on the sample, but ensures outliers are not affecting the results.

In this paper we calculate all returns within the same sample to ensure the average mean return (AM), geometric mean return (GM), and the internal rate of return (IRR) are comparable. When we drop outlier observations, all returns are based on that smaller sample. Outliers are usually due to inaccurate prices for some securities that we could not match with outside data sources to verify the accuracy of the security characteristics. Some securities' IDs are reporter specific (although reporters are urged to not use internally generated identifiers) and cannot be matched with vendor data. For most asset classes these outliers lie outside the 1st or 99th percentile per year. Dropping these outlying observations reduces our sample only slightly and is necessary since the data are security-level data that have not gone through prior extensive cleaning of the security characteristics crucial for the accurate calculation of returns.

Our final sample covers 98 percent of the total reported value for liabilities and 97 percent for claims. The majority of the gap between reported totals and our final sample is not due to our cleaning of the data but to synthetic securities created and added by staff to the raw reporter data. For example, for claims, synthetic securities contribute 2 percent out of the 3 percent gap. Synthetic securities in the raw security-level data are created to correct for the difference in the number of reporters in annual and benchmark (conducted every fifth year) surveys: the total adjustment is small relative to the total market value.[2] By definition, synthetic securities cannot be matched to outside data to obtain security characteristics; they do not have a valid implied price either since they are entered only with an assumed market value and no number of shares or face value. Therefore, we drop synthetic securities from the final sample.

Finally, we drop short-term securities (those with less than one year of original maturity) and focus on long-term securities.

2.3 Details on security-level income and flows calculations

Income: Bond income from the security-level data is calculated as coupon * face value of the positions; equities income is calculated as the dollar dividend per share * number of shares.[3] Because face values for bonds and number of shares for equities are reported in the security-level data, we are able to directly measure income streams and income returns.

[2] For details on these synthetic securities, see the annual claims and liabilities reports on the Treasury TIC website `https://home.treasury.gov/data/treasury-international-capital-tic-system-home-page/tic-forms-instructions/securities-c-annual-cross-us-border-portfolio-holdings`.

[3] For equities, we also calculated security-level income as the dividend yield * market value of the holdings as a robustness check; the results are identical.

Flows: We calculate bond flows directly from the security-level data as the annual difference in face values. For the newly issued and newly added to the portfolio bonds, the corresponding inflow is the value of these newly added bonds. For equities we use the security-level data to calculate flows as the annual difference in the number of shares per security times the current price of the security: $\text{Flow}_{i,t} = \Delta_{i,t}(\text{Reported Shares}) * \text{Price}_{i,t}$.

2.4 Details on data merges and returns calculations per asset class

Equity Liabilities:

- Data: We merge the security-level data with CRSP data which cover all listed securities, and is therefore not limited to SP500. The match share is just over 86 percent of the market value on average for the entire period, with some years close to 91 percent.

Equity Claims:

- Data: We merge the survey data with Refinitiv data on prices and dividends. The match rate is around 80 percent, based on the securities' market value.

- Index return: We compared our retruns with the return of the FTSE All World Excluding the U.S. index. The average index GM is 7.98 versus 7.74 in our baseline. If we limit our sample to the securities that are matched to the Refinitiv data, the GM is closer to the index value at 7.89.

- Positions: The main gap between the reported total position and the aggregated security-level data is for 2013 when a technical adjustment to the aggregate positions was done internally to reflect differences in the reporting panel when the new monthly SLT form was introduced.

- Income: To reconcile the large gap in income with that reported by the BEA, we checked that the Refinitiv zero dividend stocks are reported are zeros to make sure the missing dividends are truly missing in the data. We also checked the data against Morningstar for securities with zero dividends in our data. From the security names, issuer, and description provided in the TIC data, along with the info in Morningstar, we confirmed that the securities with zero dividends are indeed those that do not pay dividends: these are mostly type 3 or 4 equity (e.g., funds, limited partnerships). We also checked that the unmatched securities are such that they do not pay dividends, including cash and gold funds, as well as some private funds and hedge funds that we manually also checked using funds-specific public information.We are confident that the income gap with the BEA is not due to missing dividends in the security-level data.

Bond Claims and Liabilities:

- Data: We merge the raw security-level data with ICE index constituents data as well as with Refinitiv security-level data to get price and coupon data. We use constituent data on a number of different ICE indices. The list below includes all index data used in the paper (including for both U.S. and foreign bonds):
  - C0A0, H0A0, M0A0, DQG0, CABS, COCO, ER00, HE00, UR00, JC00, U0A0, ER00, HE00, UR00, JC00, F0C0, AUC0.These data cover securities issued on the domestic as well as on Eurobond markets.
  - For claims the ICE constituent files are download as of 12/31 of each year, while for liabilities, the downloads are as of 06/30 of each year to match the dates of the TIC claims and liabilities reports, respectively.
  - The unmatched securities are then merged with Refinitiv data.
  - Missing coupons: For corporate bonds, both assets and liabilities data, with missing coupon data, we need to find out if the bond is a zero coupon bond or the

coupon data are truly missing as this affects the calculation of the income streams. We addressed this in the following manner. For both assets and liabilities surveys,we looked at the bonds with missing coupons and adjusted as follows:

  * Sometimes coupon rates are included in the bond description and issuer description text fields among other information about the bonds.We extracted coupon rates when listed in these descriptions and added this info to the coupon field. This also included some zero coupon bonds.
  * Variable rate bonds: Used those same description fields and identified the variable rate bonds using key words in these descriptions. Where coupon was still missing, replaced by Libor + 25bps on the assumption that the largest were issued by the largest banks and so do not likely have a large spread.
  * Additional adjustments for missing coupons: The data contained some Japanese sovereign bonds with neither coupon data nor other usable information. For these bonds we merged the data with Japan's 10-year sovereign yields and replaced the instances with missing coupons in the original data.
  * Any still missing coupons were replaced by the 50th percentile coupon in the resulting sample.

- The final data for bond claims has coupon values for close to 90 percent of the reported market value over the entire period; in multiple years coupons available are available for 94-95 percent.

- Returns: The price return includes exchange rate changes, since the price is in dollars. There is no readily available aggregate foreign bond index to compare the results with, but our AM is close to the Bertaut et al (2024) returns (using their shorter sample, our return is 3.5 vs 3.9 in theirs). Bertaut et al also include index returns, although it is not clear which index or a composite of other indices are used. These index returns differ substantially from the security-level returns in BCFG and in our calculations. It is also unclear if Bertaut et al include short-term bonds, so it is difficult to directly compare the results.

U.S. Agency Securities and Corporate Bond Liabilities:

- BEA data are not available separately for corporate bonds and Agencies. Thus, in this online appendix the individual series for corporate bonds and agencies are compared with BTBJ data (described in the next section; red lines in all the charts).

- The security-level data are merged with ICE constituent data indices C0A0 and H0A0 (U.S. corporate bonds IG and HY, respectively), ABS/MBS and Agency indices (M0A0, DQG0, CABS, COCO).

Treasuries:

- Income: To take into account bi-annual coupon payments, we calculate year t income streams as the average of year t and t-1: $\text{Income}_t = (\text{Income}_{t-1} + \text{Income}_t)/2$, where $\text{Income} = \text{Coupon} * \text{Face Value}$ for all securities, except TIPS.

- TIPS: The security-level data allow us to accurately calculate income for TIPS where the principal (and therefore the coupon payment) is adjusted for inflation. For each year, we apply the coupon to the inflation-adjusted principal for each TIPS security.

- TIPS cash flows for IRR calculations: The income portion of the intermediate period cash flows is the inflation adjusted coupon payment (coupon * inflation-adjusted principal). The final period payout includes the inflation adjustment to the position since the reported market value of the positions do not include an inflation adjustment, while investors' payout at maturity includes it.

TIPS details:

Per the TIC survey instructions (`https://ticdata.treasury.gov/resource-center/data-chart-center/tic/Documents/shla2025in.pdf`), reported holdings in the survey data do not include inflation adjustments, so to accurately calculate TIPS income streams from the security-level data we do the following:

- We merge the survey data with TreasuryDirect and Fed's SOMA portfolio data and apply the security-level inflation adjustment factor from these two datasets to the face value positions in our survey data to get inflation adjusted face values.[4]

- We apply the coupon rates, which are fixed for TIPS, to the inflation adjusted face values of the positions, as calculated above, to get the TIPS income for each year in our sample. This income is used in the calculation of the total return ROR as well as for the interim periods income streams for th IRR calculations.

- For IRR's final period cash flow, we also use the above income. Importantly, for that final period we add the inflation adjustment to the position, which is calculated in the first step above, using the inflation adjustments ratios from the TreasuryDirect and Fed's SOMA data.

- Our calculations thus allow us to have separate series for the coupon payment component of the income from TIPS (a flow measure) and the inflation adjustment to the position payment (stock measure).

BEA's calculation of TIPS income:

- BEA does not report income separately for TIPS. It is included in the income for all long-term Treasury securities. Therefore we cannot directly compare our estimate

[4] One can use either dataset to calculate an inflation adjustment per security. We used both datasets for robustness purposes.

with BEA's, but the differences in methodologies as well as in the aggregate Treasury income streams allow us to draw some conclusions. BEA's long-term Treasury income series includes the following two components:

- Coupon income based on the TIC surveys, which is the fixed coupon rate times the principal. Because the reported survey positions are not adjusted for inflation, for TIPS this is only the coupon income based on the original principal, not on the inflation adjusted part of the principal.
- "Inflation compensation" payments on TIPS that are computed by taking the ratio of foreign holdings of TIPS relative to total TIPS outstanding and apply it to the amount by which the total principal value of all TIPS securities in circulation (not just maturing TIPS securities) changed due to inflation. This latter series is the "Int. Expense Inflation Compensation (TIPS)" series reported on the Treasury Department website, under "Interest expense on public issues; accrued interest expense". This series is also used in the U.S. National Accounts (NIPA) when compiling the total estimate on federal interest paid series.

3 Text Associated with Exhibits

OA **Figures 1a and 1b** use the security-level data and dollar amounts, whereas main text Figures 1a and 1b used BEA's IIP data (to show a longer time span) and scaled by GDP.

Figures 2 and 3 show positions, flows and income streams for foreigners' portfolios of U.S. corporate and agency bonds.

Figure 2, for U.S. corporate bonds, shows:

- The sum of our security-level corporate bond positions is very close to the reported amount from the annual surveys, suggesting that our coverage is "fine".[5]

[5]Coverage would be less than fine if entries in the security-level survey include amount invested but

- Our corporate bond flows are close to BTBJ estimates.[6] BEA does not report corporate bond flows.

- Since 2014 our security-level coupon payments are lower than BEA's reported amounts. For all bonds, BEA estimates interest payments from a debtor basis - for example, the amount of interest paid by the U.S. Treasury on its bonds - then scales by the weight of foreign holdings (in total holdings). See BEA (2024, item 13.32 on page 128). Thus, if foreign investors' bond portfolios have coupon payments lower than the market average, BEA estimates will be inaccurate. Our security-level income streams for U.S. corporate bonds (and U.S. agency bonds, because BEA does not report these separately) are lower than BEA's by $10.7 billion per year (main paper, Table 2).

Figure 3, for U.S. agency bonds, shows our agency bonds positions, flows and coupon payments are quite close to the reported survey amount, BTBJ and BEA (respectively).

Figure 4, for U.S. Treasury bonds, shows:

- Our security-level positions are nearly identical to BEA's and the reported survey amounts, suggesting that our coverage is fine.

- Our flows are pretty close to BEA's and when they differ they are in line with BTBJ.

- Our Treasury coupon payments are substantially lower than BEA's. Two reasons: (1) As noted regarding U.S. corporate bonds (above), BEA multiplies total interest paid by the U.S. Treasury on its bonds by the share held by foreigners. This does not take into account the maturity structure of foreigners' holdings, which are lower than the duration of Treasury indices (because foreign governments tend to hold lower duration

do not include price information and/or the search by FRBNY and us found no reasonable price and/or coupon/dividend yields. Those occur, but as the figure shows and as discussed in Section 2, are small in value terms.

[6] BTBJ is Bertaut and Tryon (2007) spliced with Bertaut and Judson (2014).

Treasury bonds). (2) BEA appears to overstate TIPS income streams.[7] Overall, BEA's income streams on foreigners' Treasuries portfolios are $12.6 billion per year larger than ours (main paper, Table 2).

Figure 5 sums the components from Figures 2, 3 and 4.

Figure 6, for equity liabilities, shows that:

- Our security-level positions are nearly identical to BEA's and the reported survey amounts, suggesting that our coverage is fine.
- Our flows are reasonably close to BEA's.
- Our income streams are substantially lower than BEA's, which applies SP500 dividend to all foreign holdings. For common and preferred stock, that approach should be fine. But by the end of our sample, Type 3 and 4 equities (see previous section for a description) such as fund shares and limited partner ownership were 24 percent of equity liabilities. Most of these do not pay dividends - we confirmed by searching Morningstar for the largest of these (25 percent of total) and found non-zero dividends for a single entity. For equity liabilities, the majority of missing dividend data is from industry SIC code 5259 which is "other investment pools and funds": feeder fund interests, limited partnership interests, and some in private equity or real estate. In 2021 "other investment pools and fund" were 87% of the unmatched sample. (The problem is id's that make it difficult to match.) By applying SP500 dividends to Types 3 and 4 holdings, BEA's equity income streams likely overstate.

Figure 7, for bonds claims, shows that:

[7] See point 13.33 on page 129 of BEA (2024), which states that "BEA estimates the inflation compensation received by foreign residents by multiplying the total inflation compensation received by all investors by the ratio of foreign holdings of TIPS from the SHL(A) survey to total investor holdings of TIPS." We have confirmed this with BEA. The TIPS inflation compensation income stream should not be based on the cumulative inflation compensation, but the change in that figure.

- Our security-level positions are nearly identical to BEA's and the reported survey amounts, suggesting that our coverage is fine.
- Our flows are reasonably close to BEA's
- Our income streams are substantially lower than BEA's. We are pretty confident we have found most coupon yields; as noted in the previous section, our data has coupon values for close to 90 percent of the reported market value over the entire sample.

Figure 8, for equity claims, shows that:

- Our security-level positions are nearly identical to BEA's and the reported survey amounts, suggesting that our coverage is fine.
- Our flows are reasonably close to BEA's.
- Our income streams are substantially lower than BEA's. This is due in part to BEA's application of dividends from MSCI indexes. For foreign advanced economies, BEA creates one index from "seven country and two regional [MSCI] indexes" and applies to all equity claims AEs. For EMEs, three regional MSCI indexes are folded into one index and applied to all holdings of EME equities. These MSCI index dividends also apply to Types 3 and 4 equities, which were 18 percent of equity by the end of our sample. Again, a Morningstar search of the largest found no dividends for the vast majority of these Types 3 and 4 holdings.

Figure 9 shows the annual returns series for equity, bonds and total for both liabilities (top graph) and claims (bottom graph). Recall that liabilities are calendar year while claims are July-June. The graphs show that for liabilities total returns were similar to bond returns early in the sample and over time have become more like equity returns, whereas for claims total returns were similar to equity returns throughout the sample.

Table 1 shows IRRs using the security-level data and aggregate data, as in the paper's Table 2, but if we substitute security-level income streams with aggregate (i.e., BEA) income streams (col. 3), flows with BEA flows (col. 4) or flows with BTBJ flows (col. 5). We see that the large discrepancy between aggregate and security-level IRRs is mostly due to BEA's income streams being larger (would move the security-level IRR from -0.01 to 0.56) and BEA's flows being smaller (would move IRR from -0.01 to 0.79).

Table 2 shows, using security-level data, that GM is roughly equal to AM minus one-half the variance. Also that the variance of bond returns is minimal, as is the variance of income streams. Note that for bonds, whether claims or liabilities, volatility is low and so AM and GM are similar. For equities, which for claims includes exchange-rate changes, volatility is higher, so the gap between AM and GM is larger.

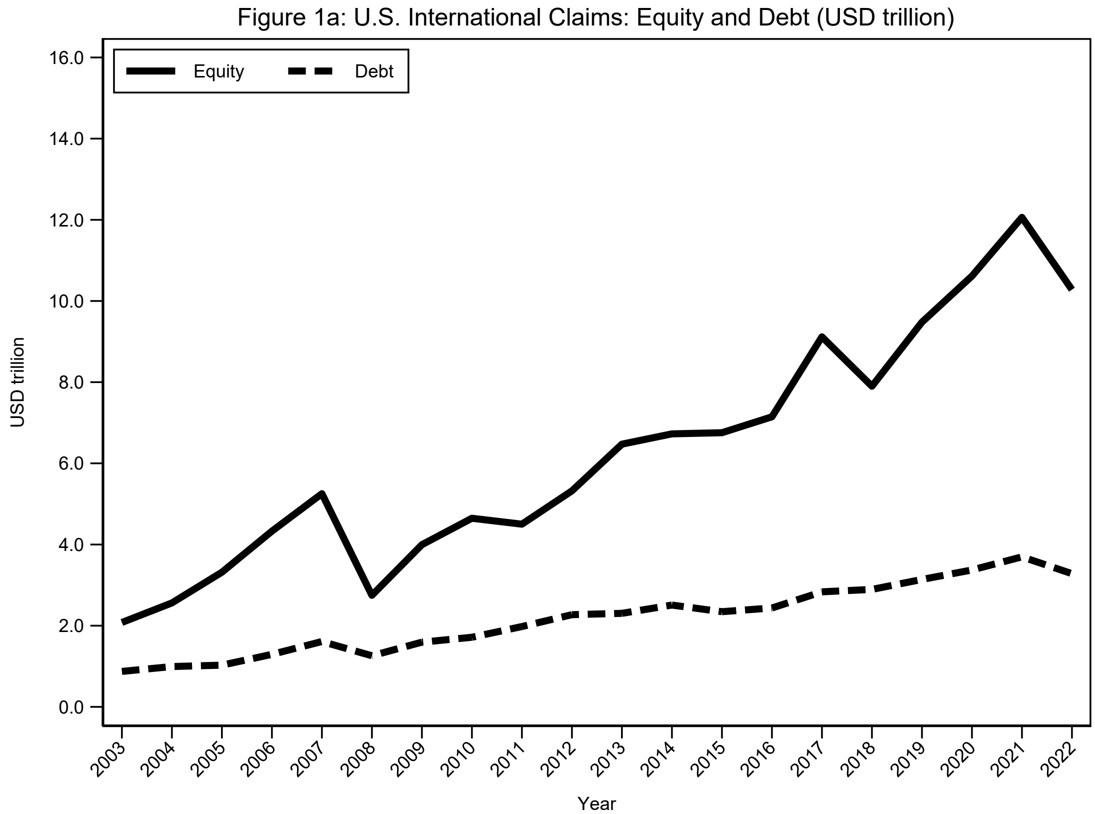
References

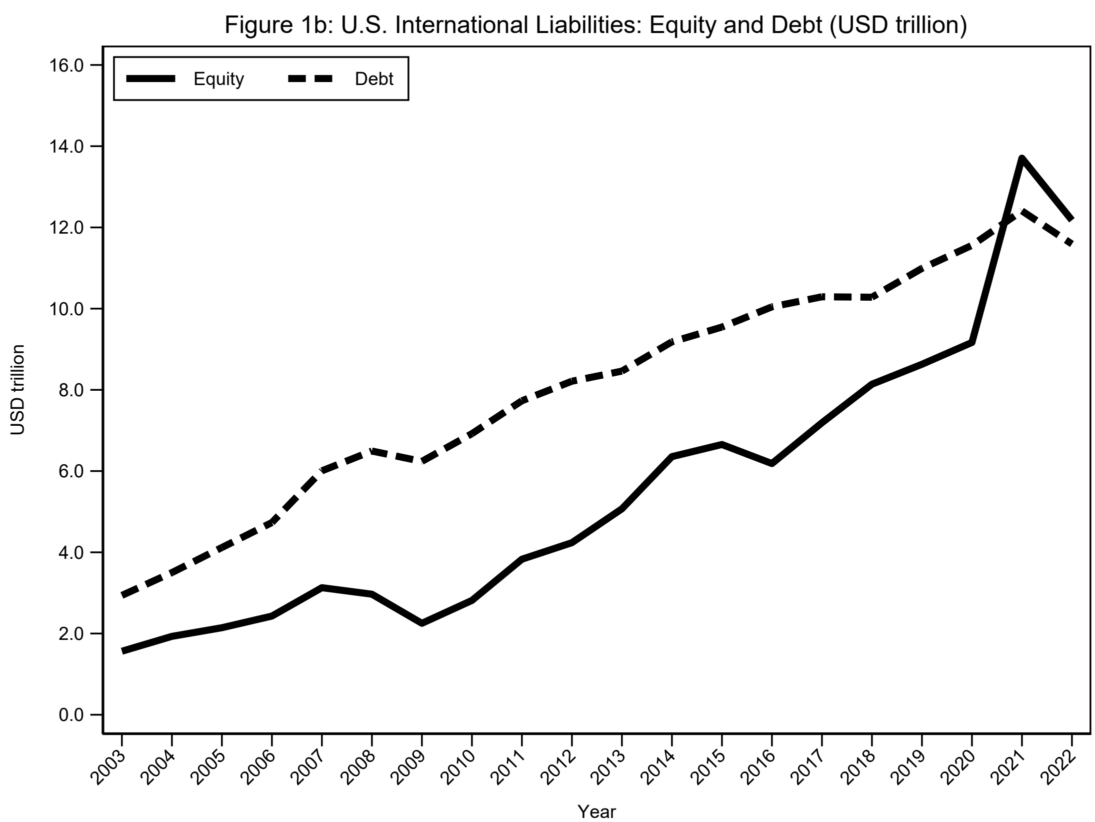
Bureau of Economic Analysis (2024). U.S. International Economic Accounts: Concepts and Methods. https://www.bea.gov/resources/methodologies/us-international-economic-accounts-concepts-methods

Bertaut, Carol C., and Ruth A. Judson (2014). Estimating U.S. Cross-Border Securities Positions: New Data and New Methods. International Finance Discussion Papers 1113. Board of Governors of the Federal Reserve System (U.S.).

Bertaut, Carol C., and Ralph W. Tryon (2007). Monthly Estimates of U.S. Cross-Border Securities Positions. International Finance Discussion Papers 910. Board of Governors of the Federal Reserve System (U.S.).

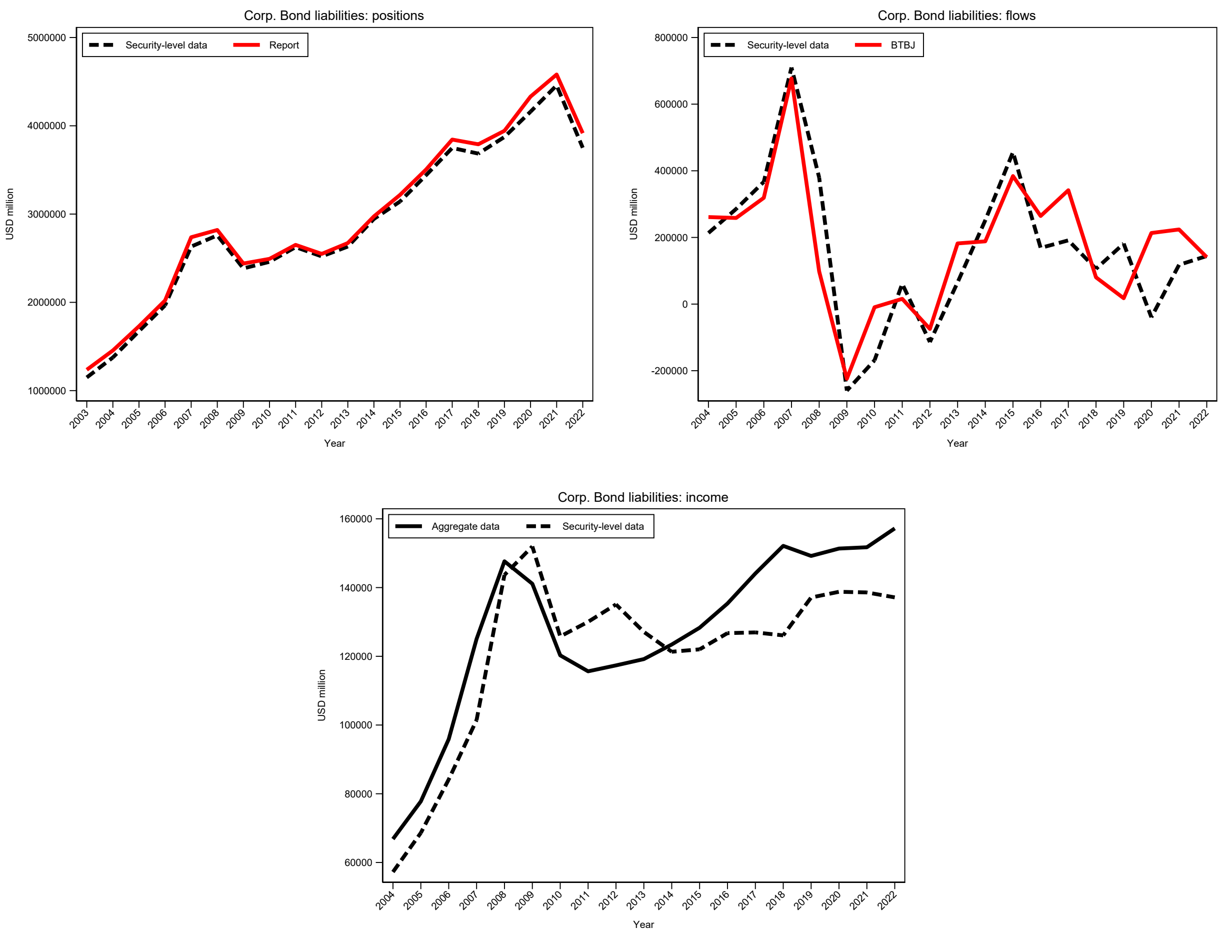
Figure 1: U.S. International Claims and Liabilities (2003-2022), USD trillion





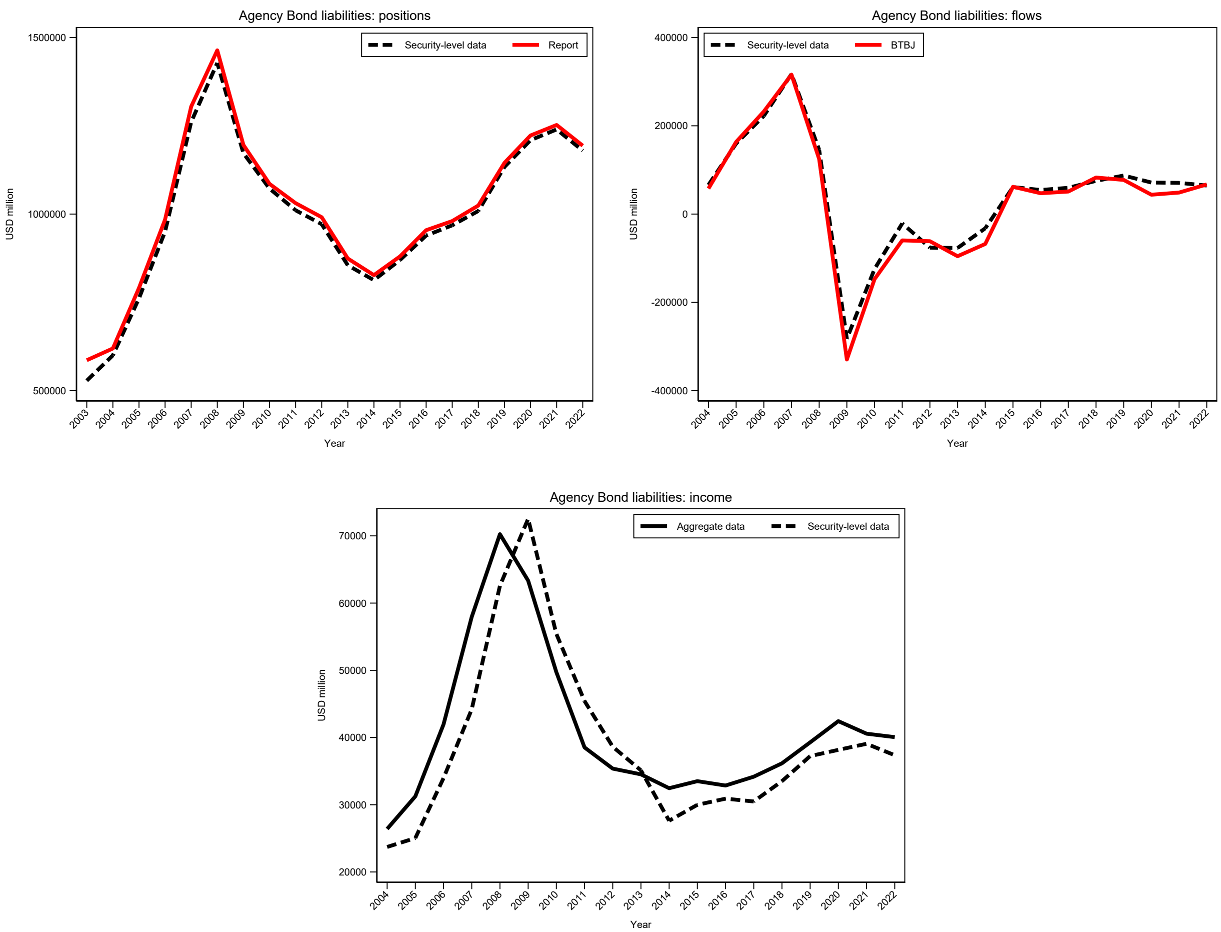
Note: In this and all subsequent exhibits claims refer to U.S. investors portfolios of foreign securities and liabilities refer to foreigners portfolios of U.S. securities. Source data: TIC annual security-level data.

Figure 2: Corporate Bond Liabilities: Positions, Flows and Income Streams (USD millions)



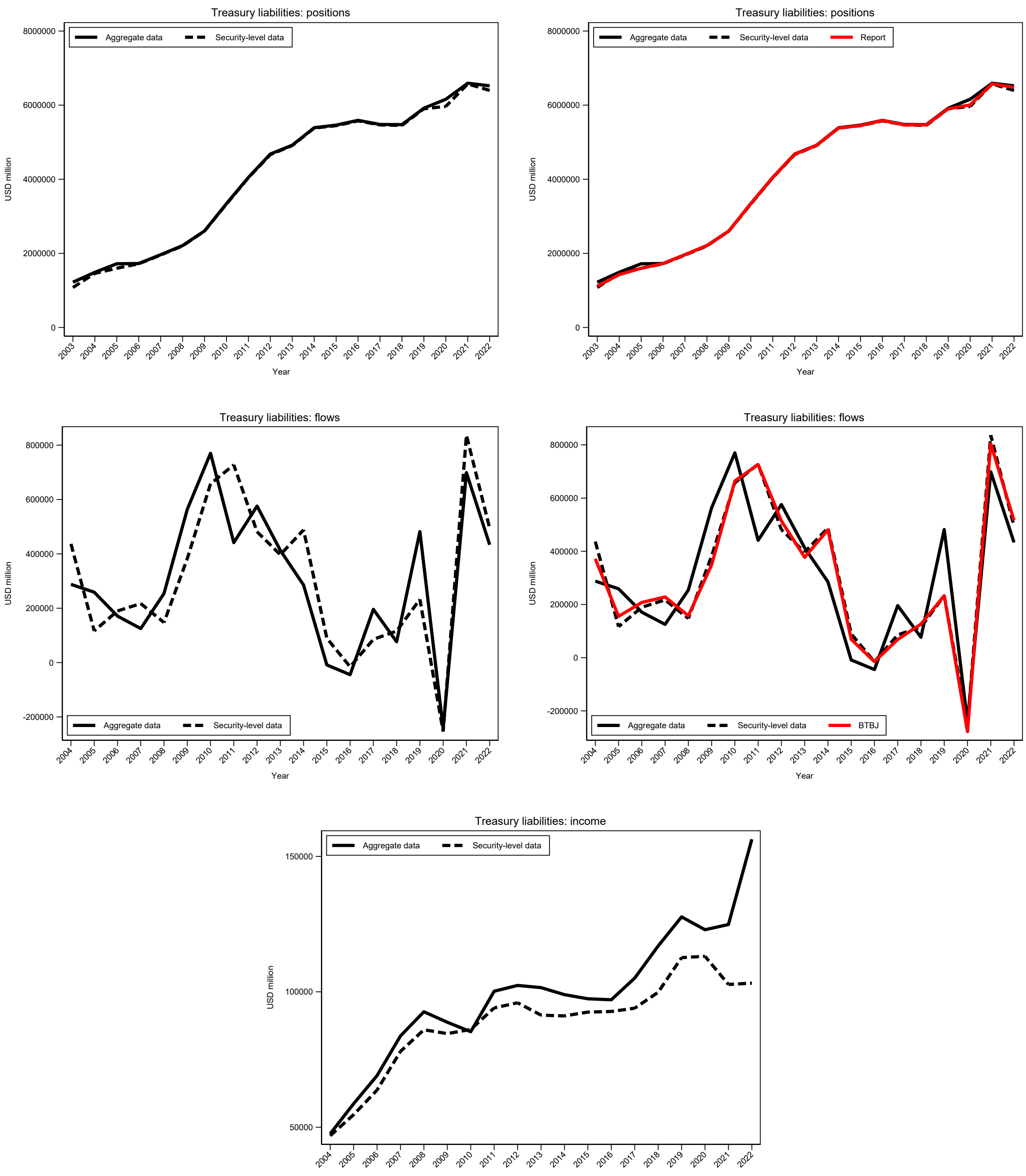
Report refers to reported position in the Survey report (aggregated security-level data). BTBJ flows are BTBJ estimated transactions plus other changes.

Figure 3: Agency Bond Liabilities: Positions, Flows and Income Streams (USD millions)



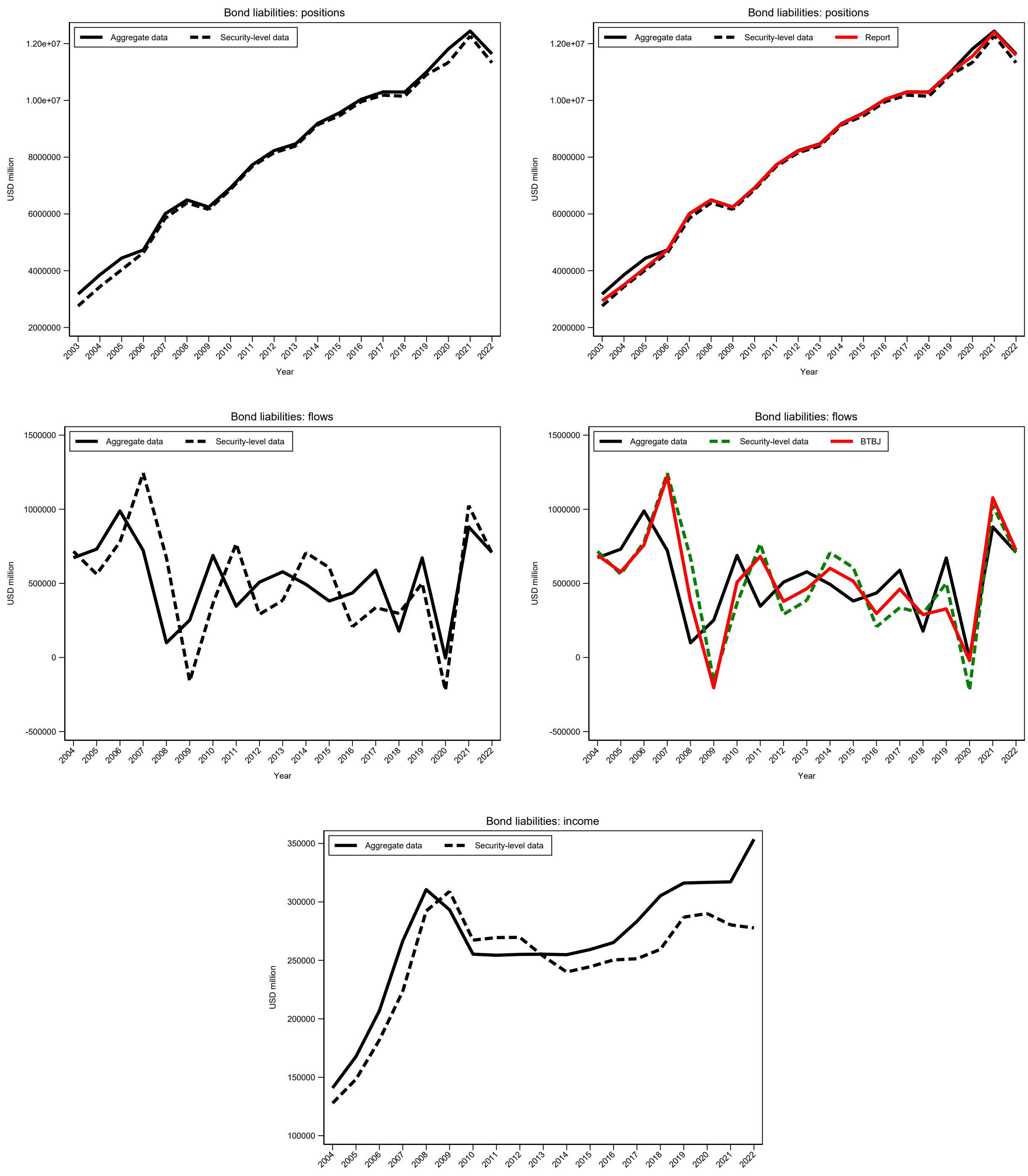
Report refers to reported position in the Survey report (aggregated security-level data). BTBJ flows are BTBJ estimated transactions plus other changes.

Figure 4: Treasury Bond Liabilities: Positions, Flows and Income Streams (USD millions)



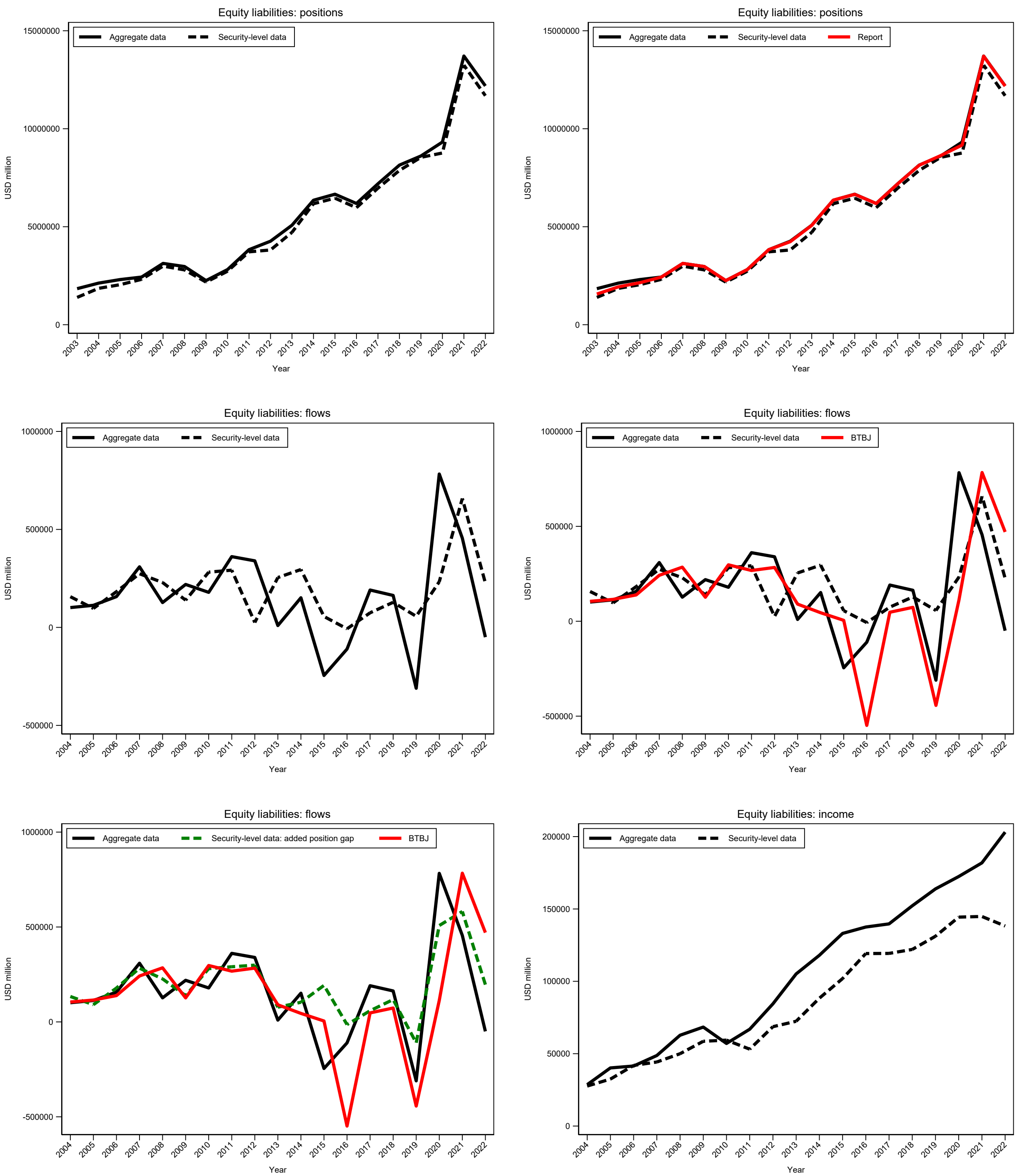
Report refers to reported position in the Survey report (aggregated security-level data). BTBJ flows are BTBJ estimated transactions plus other changes.

Figure 5: Bond Liabilities: Positions, Flows and Income Streams (USD millions)



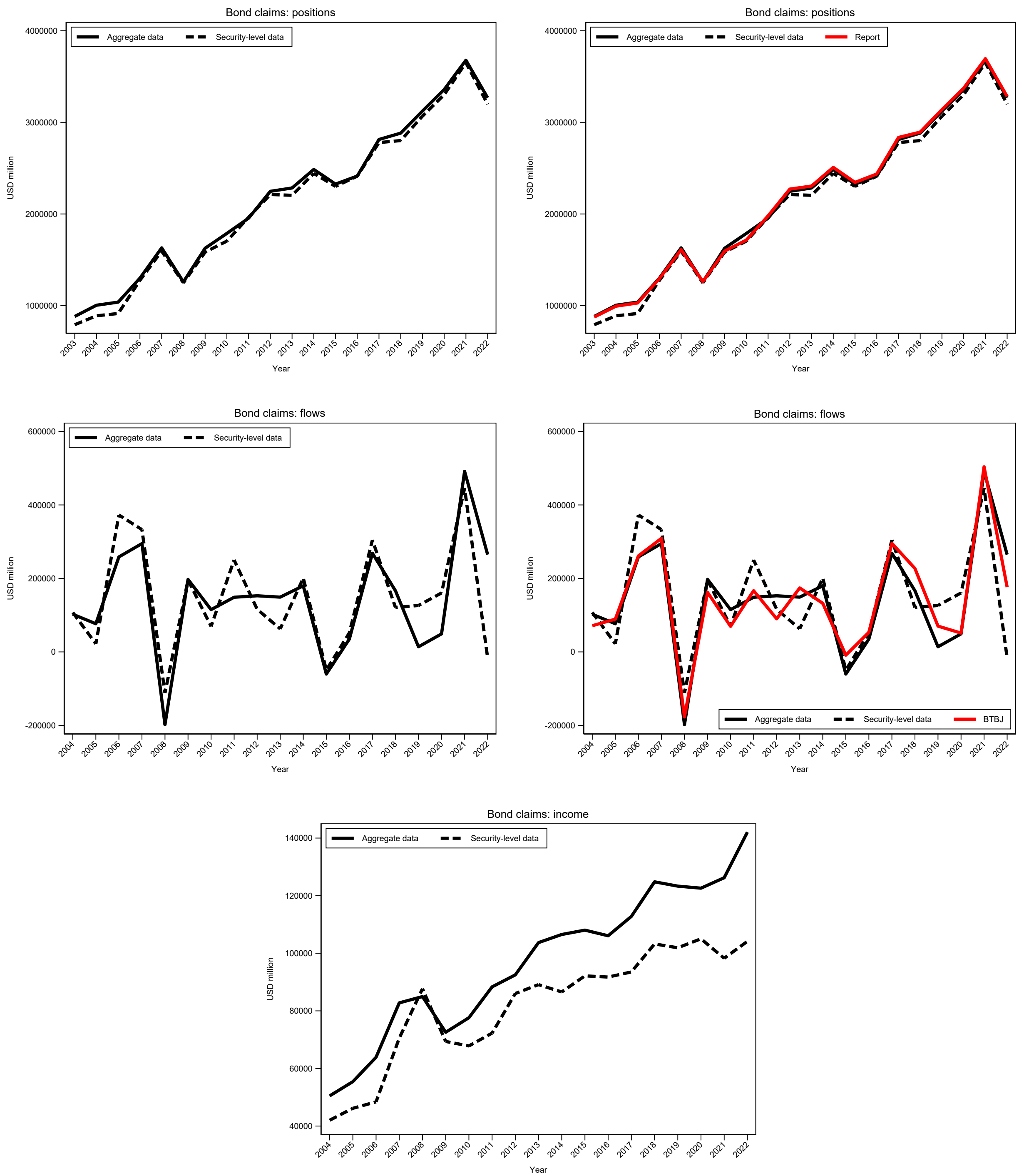
Report refers to reported position in the Survey report (aggregated security-level data). BTBJ flows are BTBJ estimated transactions plus other changes.

Figure 6: Equity Liabilities: Positions, Flows and Income Streams (USD millions)



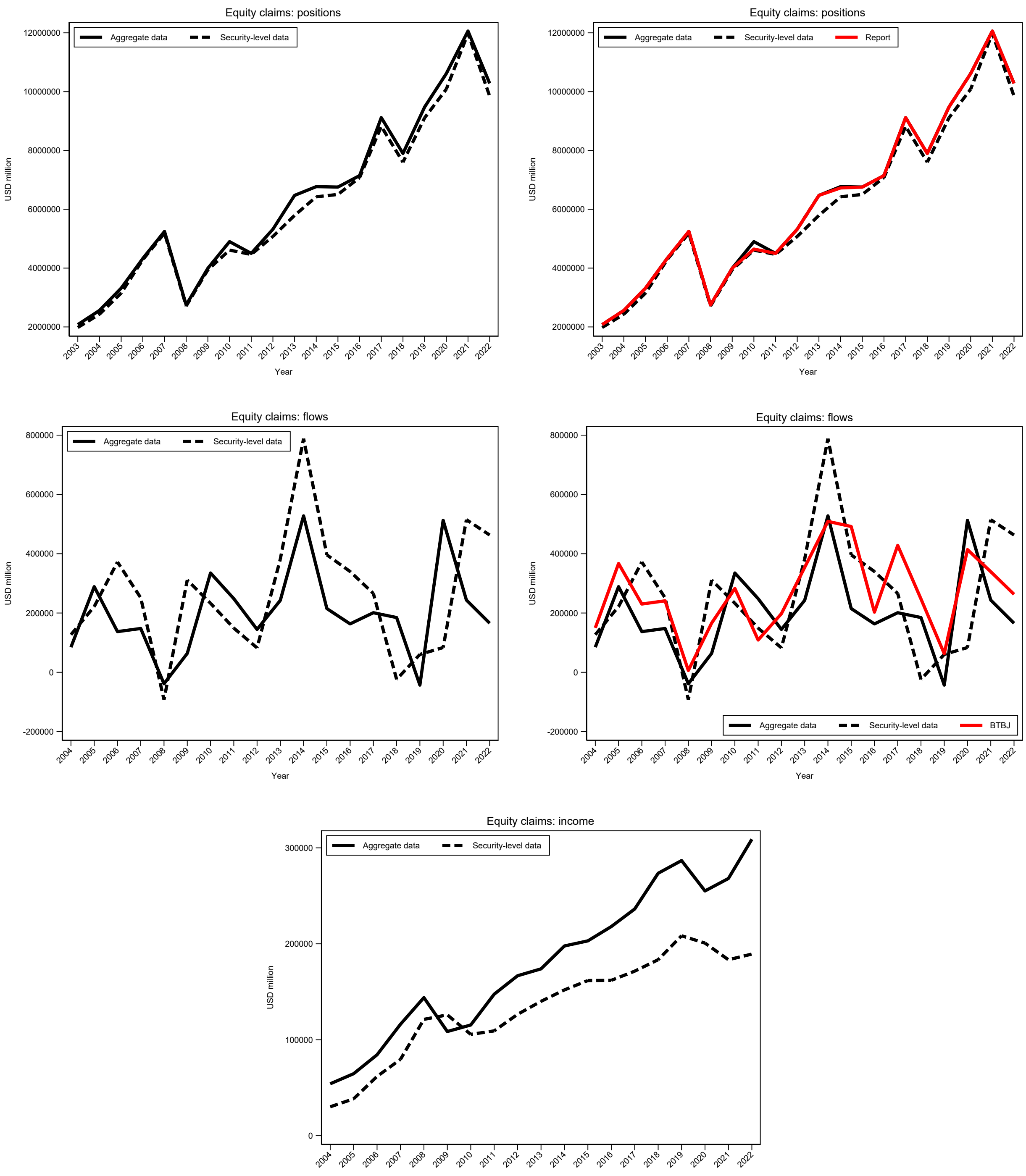
Report refers to reported position in the Survey report (aggregated security-level data). Aggregate data flows are BEA estimated transactions plus other changes. BTBJ flows are BTBJ estimated transactions plus other changes.

Figure 7: Bond Claims: Positions, Flows and Income Streams (USD millions)



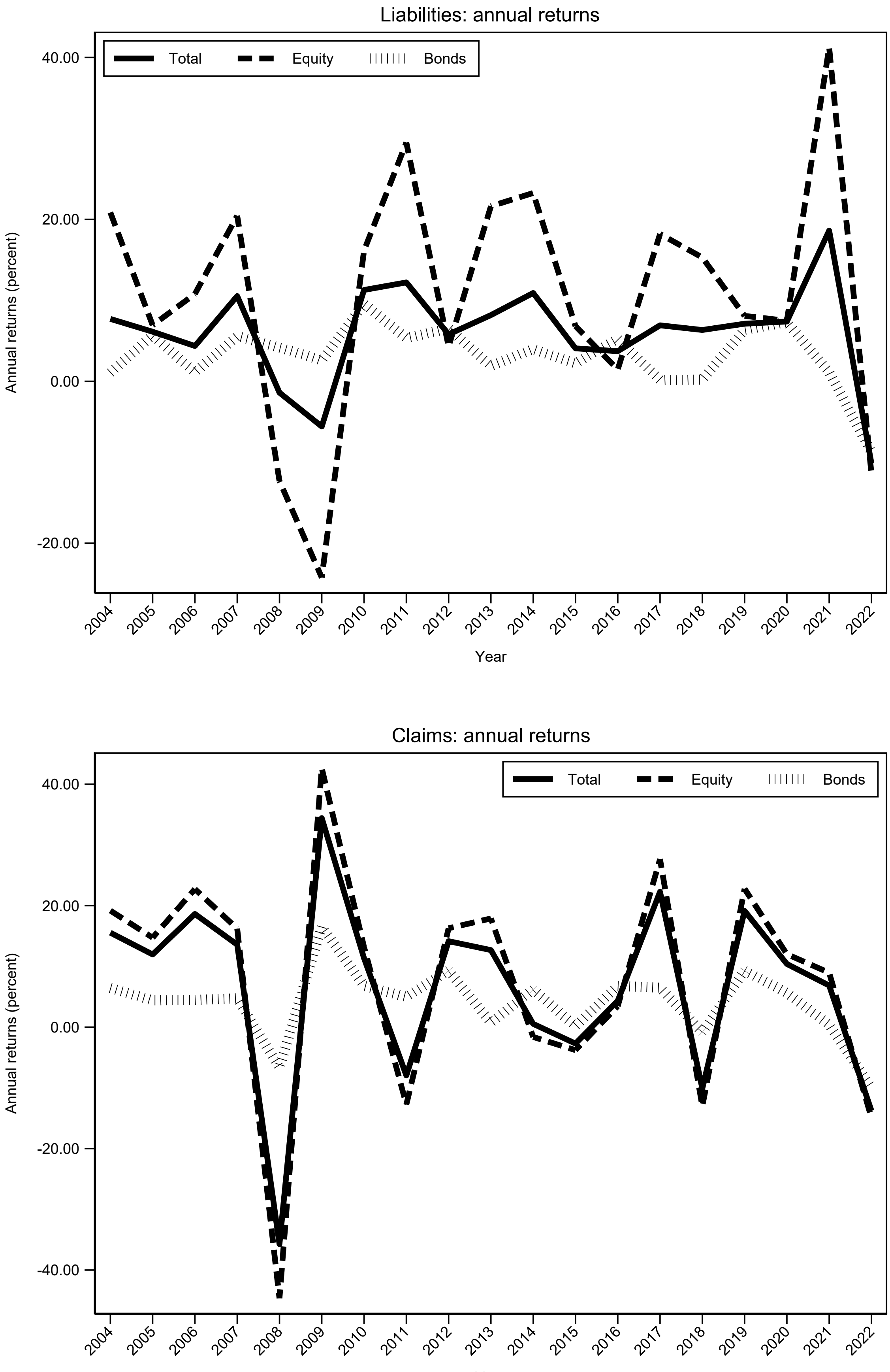
Report refers to reported position in the Survey report (aggregated security-level data). Aggregate data flows are BEA estimated transactions plus other changes. BTBJ flows are BTBJ estimated transactions plus other changes.

Figure 8: Equity Claims: Positions, Flows and Income Streams (USD millions)



Report refers to reported position in the Survey report (aggregated security-level data). Aggregate data flows are BEA estimated transactions plus other changes. BTBJ flows are BTBJ estimated transactions plus other changes.

Figure 9: Annual Returns per Asset Class



The figures plot the annual returns per asset class (top: liabilities; bottom: claims), calculated using the security-level data.

Table 1: Internal Rates of Return (IRRs), 2003-2022

			Security-level Data with:		
	Security-level Data	Aggregate Data	Aggregate Data Income	Aggregate Data Flows	BTBJ Flows
	(1)	(2)	(3)	(4)	(5)
Equity claims	5.67	7.87	6.54	6.97	5.52
Equity liabilities	8.52	8.72	8.89	9.23	9.68
Bond claims	3.28	4.35	4.16	3.79	3.81
Bond liabilities	2.68	2.50	2.93	2.64	2.79
Corp. bonds & Agencies	3.49	3.16	3.73	3.34	3.65
Treasuries	1.87	1.87	2.14	1.99	1.97
Total claims	5.02	6.92	5.88	6.12	5.08
Total liabilities	5.03	5.16	5.33	5.33	5.61
Total differential	**-0.01**	**1.76**	**0.56**	**0.79**	**-0.52**

Notes: The left panel shows internal rates of return (IRRs) over the period 2003-2022, expressed as an annual percent, using security-level data in (1) and aggregate (BEA) data in (2). The right panel shows the IRRs with security-level data, but substituting income with aggregate (BEA) data income in (3), or substituting flows with aggregate (BEA) data flows in (4), or substituting flows with aggregate BTBJ estimated flows in (5).

Table 2: Average annual returns (%): price and income returns, 2003-2022

	AM ROR			GM ROR			AM - GM		
	Total	Price + ER	Income	Total	Price + ER	Income	Total	Price + ER	Income
Equity claims	7.74	5.37	2.37	5.74	3.35	2.37	1.99	2.01	0.00
var	*3.83*	*3.73*	*0.00*						
Equity liabilities	10.76	8.91	1.84	9.67	7.82	1.84	1.08	1.09	0.00
var	*2.38*	*2.36*	*0.00*						
Bond claims	3.99	-0.30	4.29	3.83	-0.45	4.29	0.16	0.16	0.00
var	*0.35*	*0.32*	*0.01*						
Bond liabilities	3.23	-0.27	3.50	3.15	-0.34	3.50	0.07	0.07	0.00
var	*0.16*	*0.14*	*0.01*						
Corp. bonds & Agencies	4.15	-0.19	4.34	4.05	-0.28	4.33	0.10	0.09	0.00
var	*0.21*	*0.19*	*0.01*						
Corp. bonds	4.19	-0.30	4.50	4.05	-0.44	4.49	0.14	0.14	0.00
var	*0.30*	*0.28*	*0.01*						
Agencies	3.89	-0.04	3.93	3.83	-0.10	3.93	0.06	0.05	0.00
var	*0.13*	*0.11*	*0.00*						
Treasuries	2.60	-0.10	2.70	2.51	-0.18	2.70	0.09	0.08	0.01
var	*0.19*	*0.16*	*0.01*						
Total claims	6.61	3.74	2.87	5.37	2.48	2.87	1.25	1.26	0.00
var	*2.47*	*2.39*	*0.00*						
Total liabilities	6.00	3.08	2.92	5.81	2.88	2.92	0.19	0.20	0.00
var	*0.41*	*0.42*	*0.01*						
Total differential	0.61	0.66	-0.05	-0.45	-0.40	-0.05			

Notes: The table shows total average annual returns over the period 2003-2022 as well as their components (price + exchange rate returns and income returns), measured as the arithmetic (AM) and geometric means (GM). The left panel shows the arithmetic mean returns (AM), the middle panel shows the geometric mean returns (GM), and the right panel shows the difference between AM and GM returns. The table also shows the variance of the returns ("var"), in italics.