The End of Privilege: A Reexamination of the Net Foreign Asset Position of the United States*

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Abstract

The U.S. net foreign asset position declined sharply between 2007 and 2022, and was negative 65 percent of U.S. GDP by the third quarter of 2023. This deterioration primarily reflects a U.S.-specific rise in corporate asset values that inflated the value of U.S. equity liabilities to the rest of the world. To interpret these trends we develop an international macro finance model of flows, stocks, asset valuations, the current account, and the net foreign asset position. We find that the welfare impact of rising asset values for a representative U.S. household has been quite negative given extensive foreign ownership of U.S. corporate equity.

JEL Classification Numbers: F30,F40

Key Words: Current account, Equity Markets, Global Imbalances

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1 Introduction

Figure 1 plots the net foreign asset position and current account of the United States from 1990 to the third quarter of 2023. The net foreign asset position (henceforth, NFA) is measured as the market value of the assets U.S. residents hold abroad minus the market value of U.S. assets held by residents of the rest of the world. The figure shows that over the 1990-2007 period, the United States maintained a relatively small negative net position, despite running sustained and substantial current account deficits. As discussed by Gourinchas and Rey (2007) and Gourinchas, Rey, and Govillot (2017), up until 2007, U.S. residents enjoyed the privilege of being able to borrow from the rest of the world without increasing U.S. net debt thanks to ex post favorable market revaluations of cross-border assets and liabilities.

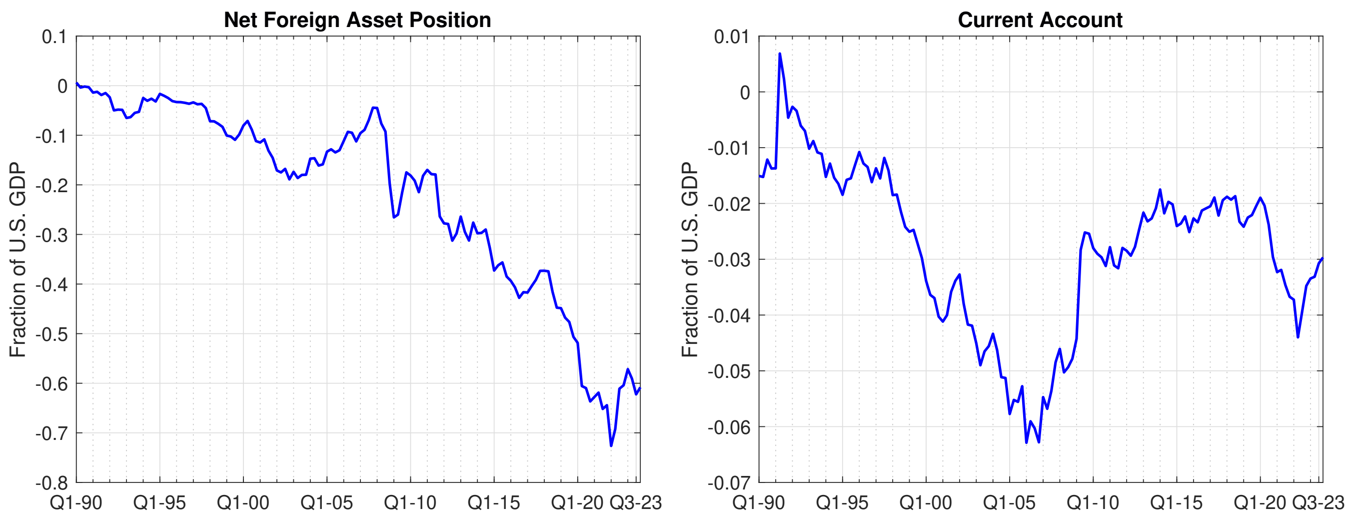


Figure 1: The U.S. Net Foreign Asset Position and Current Account: 1990-2023

In sharp contrast to this prior experience, from 2007 into 2021 the U.S. NFA position declined precipitously — by 60 percentage points of U.S. GDP — before bouncing back somewhat in 2022. And this has occurred despite the fact that U.S. current account deficits have narrowed relative to the early 2000s.

We document that this unprecedented decline in the U.S. NFA position has been driven by a boom in the market valuation of the non-financial assets in U.S. corporations. Because foreigners' gross holdings of equity in U.S. corporations have grown to be very large, this boom has mechanically increased the market value of U.S. liabilities to the rest of the world (henceforth, ROW). There has not been a similar boom in the valuation of corporations in the ROW over this time period, so U.S. residents have not enjoyed a similar revaluation of their gross foreign equity assets. As a result, the net impact of asset revaluations accounts for a large portion of the deterioration in the U.S. NFA position since the Great Recession. In fact, as we show below, the negative impact of these revaluations of gross cross-border equity positions has been so large that the U.S. NFA position is now worse than it would have been if no asset revaluations had occurred at all since 1990. In this sense, any ex post "privilege" that U.S. residents might have previously enjoyed has been erased.[1]

Motivated by these observations, we ask two questions. First, what factors underlie this deterioration of the U.S. NFA position and the boom in the market valuation of U.S. corporations? Second, what do these developments mean for the welfare of U.S. residents?

To answer these two questions, we develop a unified international macro-finance model of flows, stocks and valuations of the U.S. corporate sector and of the U.S. current account and NFA position. The model builds on Farhi and Gourio (2018) and Crouzet and Eberly (2023) but extends those frameworks to an international setting to include international positions and flows.[2] The approach we take to integrating the current account follows the model of intertemporal trade under incomplete markets of Obstfeld and Rogoff (1995), Engel and Rogers (2006), Corsetti and Konstantinou (2012) and many others. Model households in two regions (the U.S. and ROW) trade domestic and foreign equity and risk-free bonds. Firms in both countries enjoy pricing power that translates to rents payable to their shareholders that Karabarbounis and Neiman (2019) refer to as *factorless income*. The size of this factorless income can vary across countries and over time, generating fluctuations in equity valuations relative to value added. Additional sources of time variation in asset values include fluctuations in the equilibrium discount rate applied to future cash flows, fluctuations in expected future growth rates, fluctuations in the replacement cost of capital, and fluctuations in corporate tax rates.

The model is fully tractable. We exploit its tractability to measure the factors driving observed flows, stocks and valuations of the U.S. corporate sector, together with the evolution of the U.S. current account and NFA position, in quarterly data over the period 1990-2023. We saturate the model with interpretable time-varying parameters and compute sequences for parameter values such that the model matches the data period by period. We then

[1] Gourinchas and Rey (2014), Gourinchas, Rey, and Govillot (2017), Chen et al. (2022), Choi, Kirpalani, and Perez (2022), Gourinchas (2023) and many others discuss the role of ex-ante return differentials on U.S. foreign assets and liabilities in shaping the U.S. external position. See Curcuru, Thomas, and Warnock (2013) and Bertaut et al. (2023) for critical reviews of the evidence for an ex-ante difference in expected returns on U.S. foreign assets and liabilities. In our analysis, we do not assume any ex-ante return differential on U.S. assets and liabilities. We focus our analysis on the impact of differences in ex-post realized returns. Other authors have also highlighted the large boom in the value of U.S. assets and its impact on the U.S. NFA position; see, for example, Jiang, Richmond, and Zhang (forthcoming), Milesi-Ferretti (2021), and Milesi-Ferretti (2023).

[2] See also Caballero, Farhi, and Gourinchas (2017), Gutiérrez and Philippon (2017), Eggertsson, Robbins, and Wold (2021), Greenwald, Lettau, and Ludvigson (forthcoming), Corhay, Kung, and Schmid (2021) and others for macrofinance models of the boom in the valuation of U.S. corporations.

simulate counterfactual model scenarios relative to our baseline to study how the factors driving equity values impacted the welfare of U.S. households. We have two main findings.

First, we find that much of the increase in the market valuation of the non-financial assets in U.S. corporations since the Great Recession has been due a dramatic increase in the free cash flow from operations available to pay to owners of firms that is unprecedented in post-WWII data. This measure of corporate income is defined directly from the national accounts as the amount left over from corporate sector value added after deducting payments to labor, taxes (both indirect business taxes and taxes on corporate profits), and investment expenditures on new non-financial assets.[3] We find that changes in the valuation multiple applied to free cash flow have played a much smaller role in driving the increased valuation of U.S. corporations. In our accounting, some of this increase in corporate free cash flow is due to changes in taxes and the share of labor in costs, but the lion's share is due to an increase in the wedge between revenue and total cost, resulting in a large increase in the share of factorless income in U.S. corporate gross value added. This finding is consistent with earlier work by Farhi and Gourio (2018), Barkai (2020), Eggertsson, Robbins, and Wold (2021), and, most relatedly, Greenwald, Lettau, and Ludvigson (forthcoming). In what follows, we refer to the wedge between revenue and total cost as the *output wedge*.[4]

Second, when we use our model to simulate counterfactuals, we find that the welfare implications of these developments driving the increase in valuation of U.S. corporations are dramatically impacted by the observed large increase in gross cross-border equity positions. Specifically, we find that had U.S. residents been the sole owners of U.S. corporations, the observed rise in the output wedge would have had only a small impact on the welfare of a representative U.S. household. This welfare impact would have been small because lower wage income would have been largely offset by higher free cash flow to U.S. households as owners of U.S. corporations.[5] In contrast, given the large cross-border equity positions observed in the data, we find that the observed rise in the output wedge has a large negative impact on the consumption of U.S. residents. The reason is simple: much of the increase in free cash flow of U.S. firms is paid to foreign owners.

[3] In contrast, related measures of corporate income, such as estimates of pure profits (e.g., Barkai 2020) or of corporate earnings (e.g., Greenwald, Lettau, and Ludvigson forthcoming) require imputations of compensation to physical capital or estimates of depreciation.

[4] We use the terminology *output wedge* rather than markup to emphasize that this wedge measures pure profits, i.e., the gap between price and the *average* cost of production factors. It plays the same role as the output distortion in Hsieh and Klenow (2009) and the "markups" in Farhi and Gourio (2018), Baqaee and Farhi (2020), Barkai (2020), and Crouzet and Eberly (2018). It is distinct from the measure of markups of price over *marginal* variable cost which is the focus of, for example, De Loecker, Eeckhout, and Unger (2020).

[5] See, for example, Corollary 1 in Baqaee and Farhi (2020) for a theoretical derivation of this result for a small change in the output wedge in a closed economy. This quantitative finding in our model is obtained given a large increase in the output wedge.

Could the transfer of resources from U.S. residents to foreign equity owners that follows a rise in the U.S. output wedge be interpreted as part of an *ex ante* efficient international risk sharing arrangement? We explore this question in an extended version of the model, and show that the extent of international portfolio diversification that delivers maximal risk sharing is highly sensitive to the nature of country-specific risk. If that risk takes the form of shocks to the U.S. output wedge, then the exposure of U.S. residents to domestic equity appears close to optimal.

We make three principal contributions to the literature.

First, we build a model to provide an integrated accounting of flows, stocks and valuations of the U.S. corporate sector and of the U.S. current account and NFA position. It has long been recognized that the current account and net foreign asset position of a country are impacted not only by changes in capital accumulation but also through changes in asset valuations, both directly through revaluations of existing cross-border asset holdings and indirectly through wealth effects impacting the ratio of consumption to income.[6] While all of these effects are present qualitatively in standard international business cycle models, these standard models typically do not account quantitatively for the large changes in valuations of firms at home and abroad observed in the data. Here, we address this shortcoming of standard international business cycle models by extending the recent macro-finance literature that has been developed to account for large observed changes in the valuation of U.S. corporations. We use this model to better understand the links between changes in asset valuations on the one hand, and current account and NFA dynamics on the other.

Second, we bring additional data to bear on the question of whether the observed increase in the market valuation of the U.S. corporate sector is driven by an increase in cash flows to owners of firms or by a change in the valuation multiple of those cash flows. By including data on the current account in our measurement, we are able, through the model, to separately identify the impact of these factors. Our model-based measurement comes down in favor of a stable ratio of expected free cash flow to the market value of non-financial assets in U.S. corporations over the past decade, as the model requires a relatively stable valuation multiple to account for the relative stability of the U.S. current account balance.

Third, and perhaps most important, as we discuss above, we find that conclusions regarding the welfare costs to U.S. residents of a large increase in the share of corporate value added attributed to factorless income are highly sensitive to the extent of cross-border diversification of equity positions.

One important assumption in our baseline analysis is that the valuation multiple rele-

[6] See, for example, Lane and Milesi-Ferretti (2001), Lane and Milesi-Ferretti (2007) and subsequent updates of these data by these authors, and the discussion of the literature on the current account and NFA position in Gourinchas and Rey (2014).

vant for future factorless income is also the one used to value future labor income. The representative U.S. household in our model can borrow against future labor income, and changes in the discount factor or the long-term expected growth rate therefore impact the current account via their impact on U.S. household human wealth. As discussed in Lustig and Van Nieuwerburgh (2008), the assumption that future factorless income and labor income are valued at the same discount rate may not hold in the data. Moreover, U.S. households may not be able to borrow against future labor income, as in Greenwald, Lettau, and Ludvigson (forthcoming).

To assess the sensitivity of our findings regarding the driving forces behind the boom in U.S. corporate valuation to this assumption, we conduct an array of alternative measurement exercises in which we do not use data on the current account to identify parameter values. Instead we use a measurement procedure similar to that in Farhi and Gourio (2018) and Crouzet and Eberly (2023) to consider a wide range of alternative scenarios for expected future growth rates or for the gap between the discount factor and expected future growth.[7] We find that the conclusion that much of the increase in the market valuation of U.S. corporations over the past decade is due to an increase in the output wedge is robust to this wide range of alternative measurements.

The remainder of the paper is organized as follows. In Section 2 and Appendix A, we present the data we use on the evolution of the U.S. NFA position and current account since 1990, and the flows, stocks, and valuation of the U.S. corporate sector. In Section 3, we describe the international macro-finance model we use to interpret this data. In Section 4 and Appendix C, we describe how we use the model to measure the factors driving the flows, stocks, and valuation of the U.S. corporate sector as well as the U.S. current account and NFA position. We present our baseline findings in Section 5. Section 6 contains our counterfactual exercises to evaluate the welfare impact of changing valuations. Sensitivity analysis is in Section 7.

2 The Evolution of the U.S. Current Account, NFA Position and the U.S. Corporate Sector: 1990-2023

In this section, we review the measurement concepts and data we analyze with our model. We begin with a discussion of the evolution of the U.S. NFA position and then turn to the data on flows, stocks, and valuation of the U.S. corporate sector. Details on the data series used are provided in Appendix A.

[7] We describe how our measurement procedure relates to that used in prior macro-finance papers in greater detail in Appendix D.

2.1 The NFA and its components

The starting point of our analysis is accounting identity (1) below, showing that the change in the NFA position between the end of periods $t-1$ and t is the sum of three components. The first, (CA_t), is the balance of the current account during period t; this term captures net U.S. lending abroad measured as the sum of net exports and net income receipts. The second term, (VA_t), captures the net change in the valuations of the existing assets that compose the gross external positions. The third term, (RES_t), is a residual, which reconciles the changes in the NFA position resulting from measured financial transactions and asset positions with the ones resulting from current account transactions.[8] Thus,

$$NFA_t - NFA_{t-1} = \underbrace{CA_t}_{\text{net lending abroad}} + \underbrace{VA_t}_{\text{valuation effects}} + \underbrace{RES_t}_{\text{residual term}} . \tag{1}$$

Summing (1) from period 1 to period t yields

$$NFA_t = NFA_0 + \underbrace{\sum_{j=1}^{t} CA_j}_{\text{cumulated CA}} + \underbrace{\sum_{j=1}^{t} VA_j}_{\text{cumulated valuations}} + \underbrace{\sum_{j=1}^{t} RES_j}_{\text{cumulated residuals}} , \tag{2}$$

showing that the NFA position in any period can be expressed as the cumulated sums of the three terms described above.

Figure 2 shows the evolution of the three components in equation (2), each divided by U.S. corporate gross value added (GVA) in quarter t, from 1990 Q1 until 2023 Q3. The figure shows three different phases in the evolution of the U.S. NFA position. During the first phase (1990–2002), the NFA position closely tracked cumulative current account dynamics. During the second phase (2002–2007), the cumulative current account continued to deteriorate, but the NFA position improved, owing to a combination of positive valuation effects and positive statistical discrepancies. This period was the focus of Gourinchas and Rey (2007) and Gourinchas and Rey (2014), who noticed that valuation effects, which increased the value of foreign assets held by U.S. residents relative to the value of U.S. assets held by foreigners, acted as a stabilizing counterweight to growing current account deficits. In the third and final phase (2007–2022), the U.S. NFA position declined substantially, despite a fairly stable (relative to corporate GVA) cumulated current account deficit. Note that by 2020, the U.S. NFA position was *more* negative than cumulated current accounts over the entire 1990 to 2020 period. As is evident in the figure, a large portion of the decline of the U.S. NFA position in this third phase was driven by negative valuation effects, meaning that during

[8] See Curcuru, Dvorak, and Warnock (2008), Section 3, for a discussion of these discrepancies arising from differences in the measurement of international financial flows and positions.

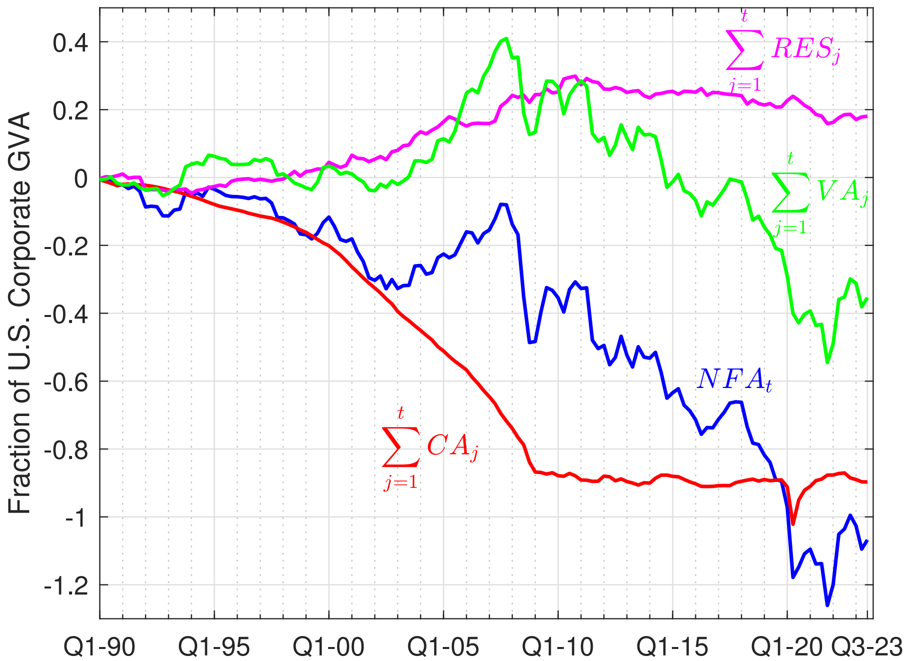


Figure 2: Decomposition of Changes in the U.S. Net Foreign Asset Position as a Share of U.S. Corporate Value Added

this period, U.S. residents experienced consistently lower capital gains on their foreign asset holdings than those enjoyed by ROW residents on their U.S. assets.[9]

2.1.1 Decomposing valuation effects

Since cumulated valuation effects are an important determinant of the evolution of the U.S. NFA position, we now proceed to analyze in more detail the sources and the impacts of these valuation changes. As a matter of accounting, valuation effects are given by

$$VA_t = FA_{t-1} \times g_t^{P^*} - FL_{t-1} \times g_t^P, \tag{3}$$

where FA_{t-1} and FL_{t-1} are gross U.S. net foreign asset and liability positions at the end of $t-1$, and $g_t^{P^*}$ and g_t^P are the net growth rates in the dollar values of those positions between the end of $t-1$ and the end of period t. It is immediate from this expression that there are two necessary conditions for valuation effects to matter quantitatively: (1) gross positions must be large, and (2) the values of foreign assets and foreign liabilities cannot co-move too closely. We now document that both these conditions have been satisfied in the past decade.

[9]Figure A.1 in Appendix A shows that these patterns are also evident in an alternative version of this decomposition using the cumulated current account from financial transactions.

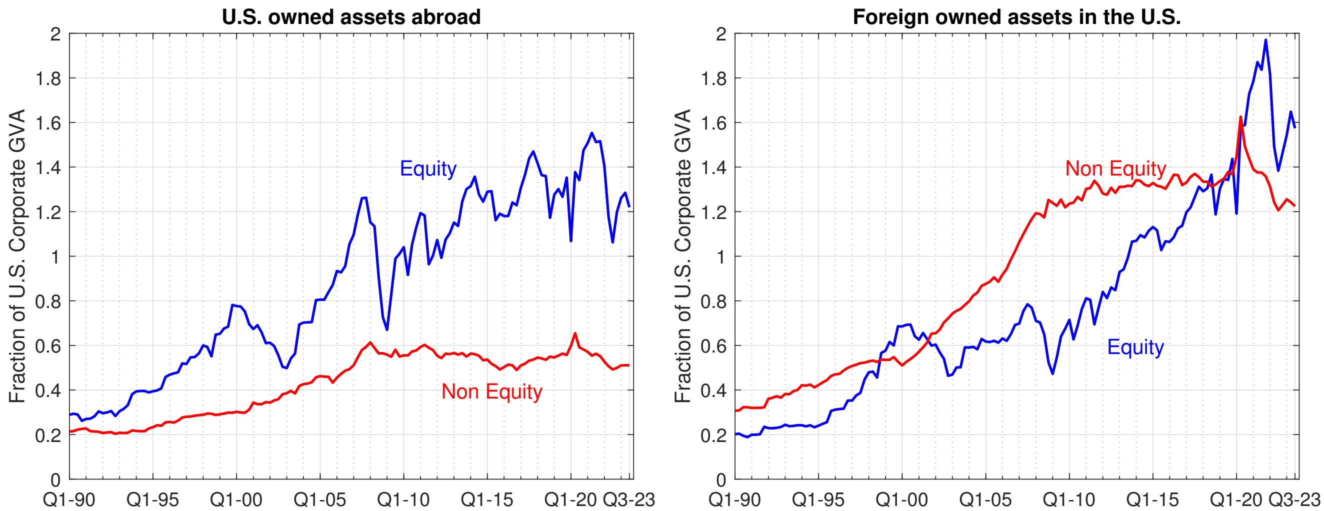


Figure 3: Gross Equity and Non-Equity Positions over U.S. Corporate Value Added

It is useful to divide U.S. foreign positions into two broad categories: equity and non-equity investments. Equity investment includes portfolio investment in corporate equities and the equity component of foreign direct investment (FDI). At the beginning of our sample, when international equity markets were still relatively underdeveloped, FDI was the main component of both inward and outward equity investment, accounting for 80 percent of both positions. Toward the end of our sample, with large and active international equity markets, portfolio and direct equity investment have roughly equal shares. Non-equity assets include debt securities, loans, and currency and deposits. Figure 3 plots the evolutions of these categories of U.S. foreign assets and liabilities as fractions of U.S. corporate GVA.

The first key message from Figure 3 is that by 2007, all the gross positions are large, and thus changes in the prices of the assets composing these positions can potentially generate significant valuation effects. The second key message is that U.S. equity liabilities have grown dramatically since the early 1990s, and U.S. equity liabilities now exceed U.S. equity foreign assets. Thus, changes in the price of U.S. equity that are not matched by identical changes in the price of ROW equity now have much larger effects on the U.S. NFA position than would have been the case in the past.

We now turn to changes in asset valuations. The left panel of Figure 4 decomposes the cumulated valuation effects plotted in Figure 2 into valuation effects arising from equity and non-equity positions. The figure shows that net valuation changes arise almost exclusively from the equity positions. Although in principle both categories are subject to relative valuation changes (due both to price changes and to exchange rate movements for assets denominated in different currencies), these effects are quantitatively much more important

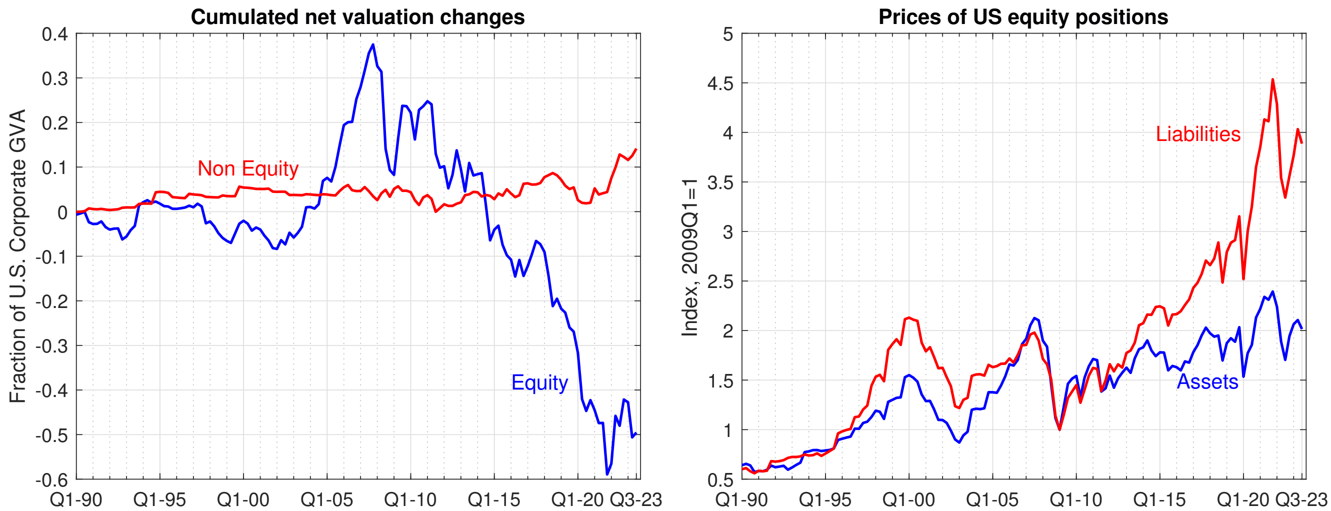


Figure 4: Valuation Effects and Equity Prices

for the equity positions.[10]

Why are equity valuation effects so large? The right panel of Figure 4 plots the price indexes, both in dollar terms, that the BEA uses to revalue U.S. equity assets and liabilities. We have normalized the price indexes so that both are equal to one in the first quarter of 2009. Recall that the equity valuation effects in the left panel of Figure 4 are computed by multiplying the gross equity asset and liability positions plotted in Figure 3 by the growth in these price indexes (equation 3).

In the 1990s, the price of U.S. equity liabilities rose more rapidly than the price of U.S. foreign equity assets. But cumulated valuation effects were small, because gross international equity positions were relatively small in the early part of our sample (Figure 3), so international differentials in equity price dynamics did not translate into large effects on the value of the NFA position.

By the mid 2000s, gross cross-border equity positions were larger, and because equity markets in the ROW outperformed the U.S. during this period, the U.S. NFA position improved.

In the post Great Recession period, gross equity positions were larger still. A dramatic rise in U.S. equity prices over this period applied to very large gross equity liabilities led to a sharp increase in the value of U.S. equity liabilities. In particular, the dollar price of

[10]One reason why valuation effects for non-equity assets are so small is that foreign bonds owned by Americans tend to be dollar-denominated, as are bond liabilities (see Maggiori, Neiman, and Schreger 2020). Regarding the equity valuation effects, in Appendix B.2, we break down the cumulated valuation changes for equity into those coming from FDI equity versus those from portfolio investment in equity; see Figure B.1. Cumulated valuation effects for equity are roughly equally split between the two components.

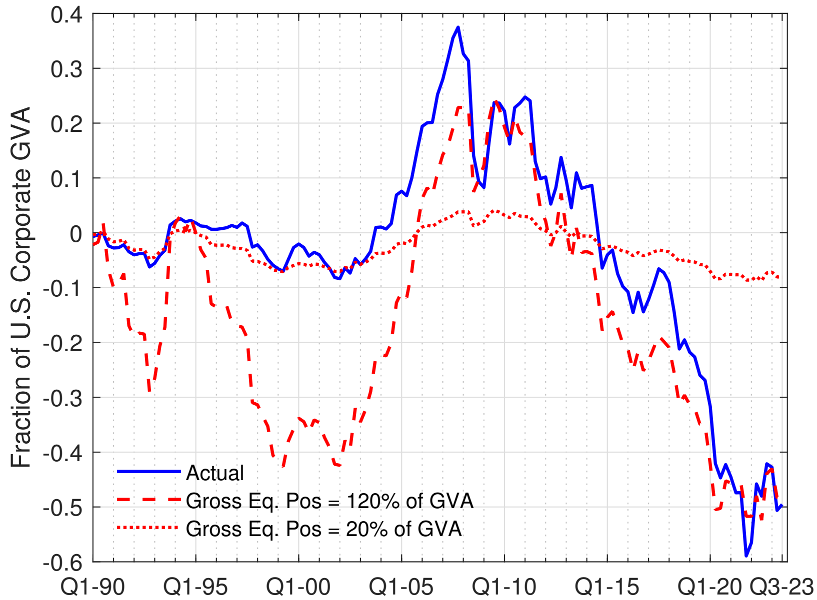


Figure 5: Counterfactual Valuation Effects

U.S. equity liabilities peaked in 2021 at over 4.5 times the price at the end of 2008, while the price of U.S. foreign equity assets rose by only a factor of two. Thus, the value of U.S. foreign equity assets rose by much more than the value of equity liabilities, translating into an unprecedented decline in the U.S. NFA position.

To further illustrate how the size of valuation effects depends on the size of gross equity position, Figure 5 compares actual valuation effects to valuation effects under two counterfactuals that hold fixed the size of gross equity positions at a low value (red dotted line) and a high value (red dashed line). In particular, the dotted (dashed) line shows what valuation effects would have been had equity prices evolved exactly as they did (the right panel of Figure 4) but if U.S. gross equity assets and liabilities had been only 20% (120%) of U.S corporate GVA in every quarter.[11] The dashed line illustrates that valuation effects would have been much larger in the 1990s and early 2000s had gross cross-country equity positions in those years been as large as they were in the subsequent period. The plot also illustrates that the large negative cumulative valuation effects observed in the post Great Recession period mechanically reflect differential equity price movements applied to large gross positions.

To summarize, differential equity price growth matters more for the NFA position when gross international equity positions are large. U.S. equity markets outperformed in the post 2010 period, precisely when it mattered most for the NFA position.

[11]We thank Dan Greenwald for suggesting this plot.

2.1.2 Role of exchange rate movements in equity valuation effects

Do equity valuation changes arise from changes in the local currency price of equity or from movements in exchange rates? In this section we answer this question for the two notable swings in the U.S. net foreign asset position in our sample: the upward swing from 2003 to 2007, and the downward swing from 2010 to 2020 (see Figure 4 above). In Figure 6 we plot three equity price indexes: the first (labeled MSCI USA) is a price index for equity in the United States; the second and third are price indexes for equity in the rest of the world measured in U.S. dollars (MSCI ROW in USD) and in local currency (MSCI ROW in LOC).[12] Focus first on the left panel, which describes the earlier episode. This panel shows that foreign equity performed better than U.S. equity in local currency, but in dollar terms, the foreign equity index substantially outperformed the U.S. index. Depreciation of the U.S. dollar against the basket of currencies that are represented in the rest-of-world equity index accounted for around half of the positive valuation effects experienced by the U.S.[13]

Moving now to the right panel, we can see that the later valuation episode is different. During this period, the U.S. and rest-of-world equity indexes diverge dramatically. Comparing the foreign indexes in local currency and in dollars indicates some appreciation of the U.S. dollar, but this appreciation accounts for only a small portion of the differential in dollar returns. Rather, the dominant factor is that the U.S. equity price index more than tripled over the period, while the rest-of-world local currency price index rose by less than 50 percent.

The previous figure suggests a minor role for exchange rate movements in driving the recent collapse in the U.S. net foreign asset position. However, U.S. investors buying foreign equity do not necessarily hold the MSCI ROW index. To more precisely assess the role of exchange rate movements on net equity revaluations we turn to Table 1.3 of the "International Investment Position" data provided by the BEA, which breaks down valuation changes in all components of U.S. foreign assets and liabilities into a part accounted for by exchange rate changes and a part that reflects local currency price movements. In Table 1 we use these data to decompose changes in equity valuations into these two components for our two

[12] The indexes are the Morgan Stanley Capital Index (MSCI) U.S. Price Index, and the MSCI All Country World Price Index ex USA, which comprises stock market indexes for 22 developed economies and 27 emerging markets, weighted by market capitalization, in dollars and in local currency. Bertaut et al. (2023) show that the MSCI indexes closely track the valuation changes reported by the BEA in the International Investment Position tables. These indices are available from the MSCI website: see `https://www.msci.com/end-of-day-data-search`.

[13] See Bureau Of Economic Analysis (2014) for more discussion of how valuation changes reflect a mix of changes in the prices of the underlying assets, and changes in exchange rates when assets and liabilities are denominated in different currencies. Note that the revaluation of ROW equity in the United States arises solely because of changes in the price of U.S. equity, as these assets are valued in dollars.

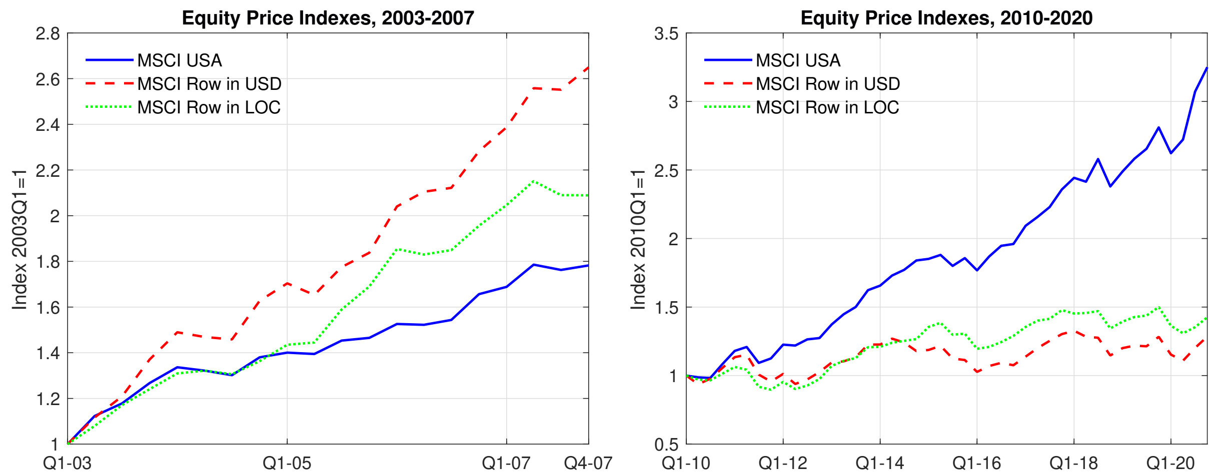


Figure 6: Two Valuation Episodes

sub-periods:[14]

In the first sub-period, the U.S dollar was depreciating, and dollar depreciation amplified the dollar value of U.S. equity abroad. This exchange-rate-driven revaluation improved the U.S. net foreign asset position by 15.8 percent of U.S. corporate gross value added (GVA), out of a total revaluation of the net equity position of 40.4 percent of GVA. Thus, confirming the impression from Figure 6 above, exchange rate movements accounted for a large part of total equity revaluation.

Between 2010 and 2020, dollar appreciation led to a decline in the dollar value of U.S. foreign equity assets cumulating to 10.1 percent of corporate GVA. However, the dominant driver of net equity revaluation in this period was the sharp increase in the value of U.S. equity liabilities, cumulating to 103.6 percent of corporate GVA, for which exchange rate movements obviously play no role. Thus, dollar appreciation accounted for only about one sixth of the total net decline in the U.S. net equity position over this period.

2.1.3 Measurement of cross border positions and income flows

We have relied on data from the Integrated Macroeconomic Accounts to measure cross border asset positions on a residence basis. However, all estimates of cross-border asset positions, including those in the IMA, are subject to a range of measurement challenges. Many of these arise due to the difficulties in dividing up the activities of multinational corporations into components attributable to their subsidiaries resident in different countries. Bertaut,

[14]For each sub-period we cumulate the revaluation of U.S equity assets and U.S. equity liabilities that are accounted by exchange rate movements and price changes and divide them by U.S. corporate gross value added at the end of the period.

Table 1: Impact of exchange rate movements on equity revaluations

		2003-2007	2010-2020
(1)	Revaluation of U.S. equity abroad	62.6	41.3
	(1a) contribution of exchange rate movements	15.8	-10.1
	(1b) contribution of changes in local currency prices	46.8	51.4
(2)	Revaluation of foreign equity in U.S.	22.3	103.6
(3)	Revaluation of net U.S. foreign equity = (1)-(2)	40.4	-62.3

Changes in value expressed as percentages of U.S. corporate gross value added.
Source: Author calculations based on BEA International Investment Position Table 1.3.

Bressler, and Curcuru 2019 provides an excellent overview of the difficulties in measuring corporate activity on a residence basis and in measuring cross-border equity positions.[15] Households shelter wealth in low tax offshore jurisdictions (Zucman 2013), and firms use subsidiaries in the same places to raise capital (Coppola et al. 2021), muddying the official map of cross-border positions. Another issue specific to closely held foreign direct investment equity is uncertainty over appropriate market valuation.

A separate but related set of measurement concerns has to do with the fact that while the U.S. net foreign asset position is large and negative, U.S. primary income from abroad as measured in the current account remains positive (see, e.g., Curcuru, Thomas, and Warnock 2013 and Guvenen et al. 2022).

In Appendix B, we provide more discussion of the literature on these measurement issues. In Appendix B.3 we explore the sensitivity of our model exercises to smaller estimates of gross cross border equity positions using an adjustment based on Bertaut, Bressler, and Curcuru (2019).

2.2 Flows, stocks, and valuation of the U.S. corporate sector

We have shown that changes in U.S. equity values play a very important role, in an accounting sense, in explaining changes in the U.S. NFA position. We will build an economic model to interpret the causes and welfare consequences of these valuation effects. That model will incorporate a range of additional data that we now describe. We first define measurement concepts that are consistent across the model and data for flows including value added, taxes, labor compensation, investment, earnings, and free cash flow. We then discuss our measurement of stocks, including the reproduction value of the stock of capital in the corporate sector, and the value of corporations. Our primary measure of income to firm owners,

[15] See also Avdjiev et al. (2018) and Lane (2020).

which we label "free cash flow," is the natural one in the context of our model: value-added minus the sum of labor compensation, investment and taxes paid. Our primary valuation measure is the aggregate value of the corporate sector's non-financial assets which generate this income, which we label "enterprise value." We will interpret these broad empirical measures for corporate income and valuation through the lens of a model in which firms are 100 percent equity-financed. In doing so we are implicitly assuming that corporate valuation is independent of how firms are financed.[16]

2.2.1 Flows in the U.S. Corporate Sector

We use Tables S.5 and S.6 of the Integrated Macroeconomic Accounts to measure the flows and balance sheets of the U.S. corporate sector. Table S.5 presents data for the non-financial corporate business sector, and Table S.6 presents data for the financial business sector. The overwhelming portion of foreign portfolio and direct investment into the United States is directed toward these two sectors. We combine these two accounts into an aggregated corporate sector. The national accounts follow the residence principle. Thus, the value added of U.S.-resident affiliates of foreign multinationals is counted as part of U.S. value added, while the value added by U.S.-owned businesses abroad is not.

The gross value added (GVA) of these sectors is divided into four categories of income in Tables S.5 and S.6: consumption of fixed capital (depreciation), compensation of employees, taxes on production and imports less subsidies, and net operating surplus. We measure the *earnings* of the corporate sector as net operating surplus less current taxes on income and wealth. We measure the free cash flow of the corporate sector as net operating surplus less current taxes on income and wealth less net capital formation. Free cash flow corresponds to the after-tax cash flow from operations of corporations resident in the United States that is available to be paid out to investors in the debt and equity of those corporations. In the data, only some of this cash flow is actually paid out to investors, while the rest of it is used to acquire, on net, financial assets (as accounted for in Tables S.5 and S.6). Thus, our empirical measure of free cash flow corresponds to what dividends would be if firms were 100 percent equity financed and maintained no financial assets.

In Figure 7, we examine the ratio of our measure of free cash flow to U.S. corporate sector GVA. We see that this ratio has risen substantially over the past 14 years, compared with the period before 2007. This increase in payouts arises from a combination of reductions in taxes, labor compensation, and investment as ratios to corporate gross value added. The path for earnings reported by Greenwald, Lettau, and Ludvigson (forthcoming) in their Figure 4b

[16]Introducing corporate debt finance in our model would not impact model enterprise value, because our model features no frictions that would break Modigliani-Miller.

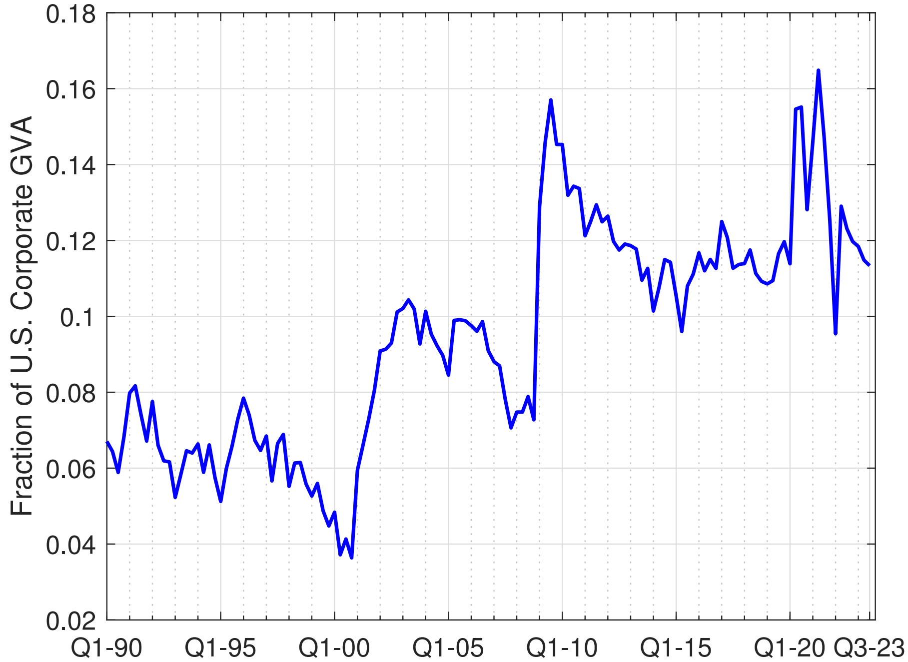


Figure 7: U.S. Corporate Free Cash Flow to Owners, Ratio to Corporate Value Added

looks broadly similar to our series for free cash flow. But note that their earnings measure subtracts depreciation from gross operating surplus, while our cash flow concept subtracts investment, which they do not model. In Appendix A.3 Figure A.4 we document a similar increase in free cash flow when restricting attention to the non-financial corporate sector. In common with Greenwald, Lettau, and Ludvigson (forthcoming) and Atkeson, Heathcote, and Perri (2023) we will argue that rising U.S. earnings are central to explaining rising U.S. corporate valuations. Our novel argument, relative to those papers, is that this rise in valuations also drives the U.S. NFA position.

2.2.2 Valuation and capital in the U.S. corporate sector

We now describe how we measure the enterprise value of the non-financial assets held by U.S. resident corporations, where these assets generate the free cash flow described above. To measure enterprise value we make several adjustments to the balance sheet data for the corporate sector presented in Tables S.5 and S.6. The following stylized balance sheet for the U.S. corporate sector is useful for organizing our discussion of these adjustments.[17]

[17]Recall that this balance sheet is an aggregate of both U.S. firms with overseas subsidiaries (i.e., the parent firm is in the U.S.) and U.S.-resident subsidiaries of foreign multinationals.

Corporate Sector Balance Sheet

Assets	Liabilities
Non-financial assets	Equity
(replacement or enterprise value)	(measured at market value)
Financial assets	Financial liabilities
(includes U.S. FDI in ROW)	(debt, bank loans, etc., including ROW FDI in U.S.)

Our specific aim is to value the non-financial assets held by U.S. resident corporations, corresponding to the first entry in the left column of this balance sheet. We consider two measures of this value. The first of these is a measure of the *replacement value* of these non-financial assets. This measure is reported directly in the Integrated Macroeconomic Accounts.

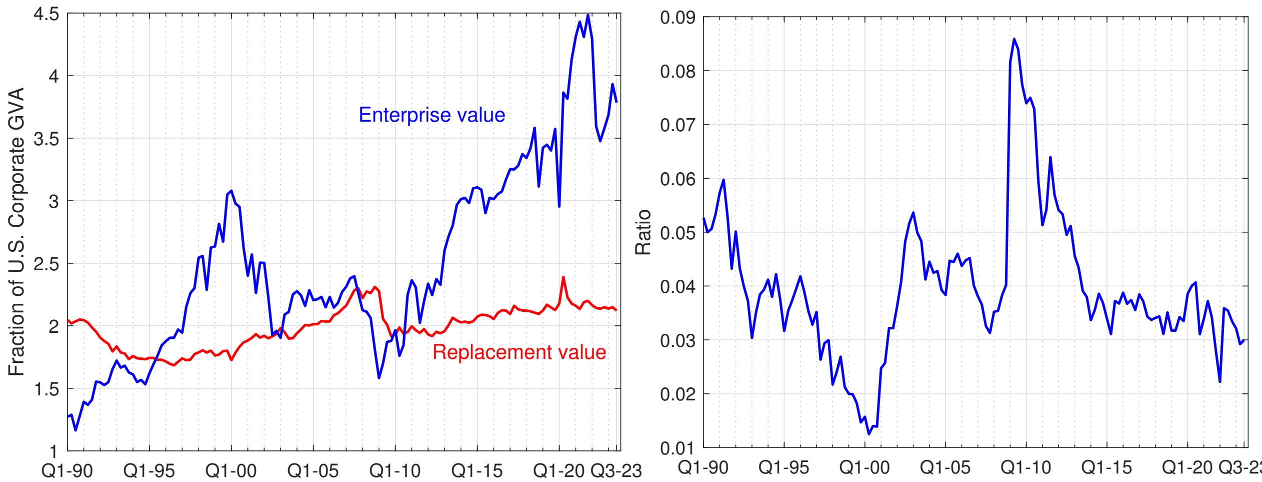
The second *enterprise value* measure captures the value that financial markets attach to corporate non-financial assets located in the United States. It is measured as the sum of the market value of resident corporations' equities plus the value of their financial liabilities (both on the right side of the balance sheet above) less the value of financial assets on the left side of this balance sheet.[18,19]

The financial assets of these firms, listed as the second entry on the left side of this balance sheet, include the usual financial instruments as well as the debt and equity components of U.S. parent firms' foreign direct investment abroad. The financial liabilities of these firms, listed as the second item on the right side of this balance sheet, include the usual financial instruments plus the debt and equity components of the direct investment of foreign parent firms into their U.S. subsidiaries. Excluding U.S. FDI in the rest of the world from enterprise value but including rest of world FDI into the United States aligns our measure of U.S. enterprise value with the residence principle.

In Figure 8a, we show the ratio of enterprise value to value added for the U.S. corporate sector (blue line) and the ratio of the replacement value of the stock of capital in those corporations to value added (red line). The figure indicates that the capital-output ratio has been quite stable over time, while the enterprise value of U.S. corporations has risen dramatically. A direct implication of the divergence between these two lines is that Tobin's Q for the U.S. corporate sector, measured as the ratio of enterprise value to replacement value of the capital

[18] Note that it would not be appropriate to equate the value of U.S.-located firms to the value of equity alone, because some fraction of firms' future cash flow is pledged to debt holders and bank lenders, and thus some fraction of firm value is reflected in the value of those liabilities.

[19] Our enterprise value concept is roughly similar to the concept of enterprise value used as a valuation benchmark for individual companies and is closely related to that used in Hall (2001). It is also similar to the measures of the market values of the non-financial assets of U.S. non-financial and financial corporations presented in Table B1 of the *Financial Accounts of the United States*.



(a) Enterprise and Replacement Values

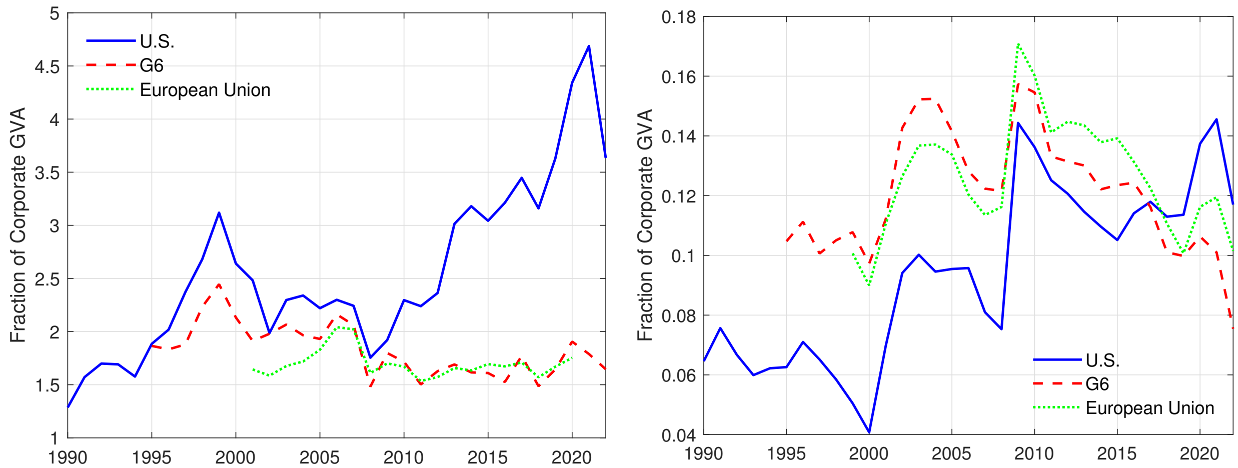
(b) Free Cash Flow to Enterprise Value Ratio

Figure 8: Values and Cash Flow, U.S. Corporate Sector

stock, has risen substantially over the past decade. Figure A.3 in Appendix A.3 plots the same series for the non-financial corporate sector, and shows that the dynamics for valuations are very similar to those for the entire corporate sector. Figure A.5 in Appendix A.3 shows that the time path for the market value of equity for the non-financial corporate sector tracks enterprise value closely, but is lower by around 50 percent of GDP, indicating that corporate financial liabilities exceed financial assets (see the stylized balance sheet above).

In Figure 8b, we construct a measure of the payout yield for the U.S. corporate sector based on the ratio of the free cash flow to firm owners to our measure of the enterprise value of this sector. What is striking about this figure is that the ratio of free cash flow to enterprise value has not changed much for most of the past decade, relative to the period before 2007. Thus, it appears that a substantial portion of the increase in the ratio of the enterprise value of U.S. corporations to GVA can be accounted for by an increase in the ratio of free cash flow to GVA.

We now document that the sharp increases in corporate enterprise value and payouts just described are U.S.-specific phenomena and that similar increases have not occurred in the rest of the developed world. In Figure 9a, we plot, for the period 1990–2022, corporate sector enterprise values and free cash flows for the United States, for an aggregate of the other G6 countries, and for the European Union. The figure highlights the divergence between the ratios in the United States and in the rest of the world. Since the Great Recession, the ratio of enterprise value to GVA in the United States rose from 2 to over 4.5, while the ratio abroad was essentially constant over the same time span. Figure 9b shows that the diverging patterns in corporate sector enterprise value are mirrored by diverging paths in free cash flow.



(a) Corporate Enterprise Value

(b) Corporate Cash Flow

Figure 9: Values and Cash Flow, U.S., G6 and European Union

From 2007 to 2022, the ratio of free cash flow to GVA in the United States nearly doubled, while abroad this ratio over the same period was largely unchanged. A natural interpretation is that differential dynamics of free cash flow are key to explaining the differential behavior of U.S. and foreign equity markets.[20]

3 Model

We now develop a simple international macro finance model of flows, stocks and valuations of the U.S. corporate sector and of the U.S. current account and NFA position. We use this model to measure the factors driving observed flows, stocks and valuations of the U.S. corporate sector, the U.S. current account, and the U.S. NFA position over the period from 1990 through the third quarter of 2023. Then, we conduct counterfactual exercises relative to this model baseline to consider how these driving factors impacted the welfare of U.S. households.

The model has two regions: a domestic economy we think of as the United States, and a foreign economy that stands in for the rest of the world. Each region is populated by a continuum of identical households. Heterogeneous firms in each economy produce a contin-

[20]Details on how we constructed data in Figure 9 are in Appendix A.5. This evidence that outside the United States, corporate free cash flow has not risen relative to GVA is consistent with other studies. See, for example, Lequiller and Blades (2014, Chapter 3), Philippon (2019, Chapter 5), and Gutiérrez and Philippon (2023). Gutiérrez and Piton (2020) find evidence of labor's share declining much more in the United States than in other advanced economies. In contrast, De Loecker and Eeckhout (2021), using the Worldscope dataset of firm financial statements, argue that markups and profits have risen in Europe as well as in the United States.

uum of non-tradable intermediate varieties. These intermediates are combined to produce a single composite final good that is traded internationally and used for consumption and investment. Intermediates-producing firms enjoy pricing power and hence earn factorless income. Households receive labor income, dividends from holdings of corporate equity both in their region of residence and abroad, and interest income from a risk-free bond that is traded internationally.

In our baseline model specification, we assume that foreign households are risk-neutral and that their rate of time preference determines the cost of capital for firms worldwide. That assumption allows us to characterize equilibrium allocations in closed form and to illustrate the economic mechanisms at work as transparently as possible. We also assume that both countries produce and consume the same final good, so the terms of trade and the real exchange rate in the model will always be equal to one. Recall that exchange rate movements account for only a small portion of the valuation effects in the NFA position between 2010 and 2022. In Appendix F, we discuss a generalization of the model in which domestically and foreign produced goods are imperfect substitutes, in which case shocks to monopoly power and/or productivity have the potential to affect the terms of trade.

3.1 Intermediate-Goods Firms

In each country there is a unit mass of different intermediate varieties indexed by $i \in [0, 1]$. Let Y_{it} denote total production of variety i at date t. Domestic output of the final good is given by

$$Y_t = \left(\int_0^1 Y_{it}^{\left(\frac{\varepsilon-1}{\varepsilon}\right)} di \right)^{\frac{\varepsilon}{\varepsilon-1}}, \tag{4}$$

where $\varepsilon > 1$ is the elasticity of substitution in production between different varieties.

Output can be consumed domestically, exported, or transformed into investment. Thus,

$$C_t + G_t + Q_t X_t + NX_t = Y_t,$$

where C_t is private consumption, G_t is public consumption, $Q_t X_t$ is investment expenditure in units of final output, and NX_t is net exports. Investment goods augment the capital stock in the standard way:

$$K_{t+1} = (1 - \delta_t) K_t + X_t,$$

where δ_t is a time-varying depreciation rate. The replacement value of the capital stock at the end of period t in units of final consumption is denoted by $Q_t K_{t+1}$, where this replacement value evolves over time according to

$$Q_tK_{t+1} = Q_{t-1}K_t + (Q_t - Q_{t-1})K_t - \delta_t Q_t K_t + Q_t X_t, \tag{5}$$

where $Q_{t-1}K_t$ is the replacement value of the capital stock at the end of period $t-1$, $(Q_t - Q_{t-1})K_t$ is revaluation of installed capital between $t-1$ and t, and the term $\delta_t Q_t K_t$ corresponds to consumption of fixed capital in units of the final consumption good at t.

Both countries produce the same final good. Thus, if we use asterisks to denote foreign variables, the world resource constraint is

$$C_t + C_t^* + G_t + G_t^* + Q_t X_t + Q_t^* X_t^* = Y_t + Y_t^*.$$

Within each country there are two sorts of firms that can produce a given variety of intermediate good: a single leader firm with productivity z_{Ht}, and a fringe of identical follower firms, each with productivity $z_{Lt} \leq z_{Ht}$. An intermediate firm with productivity z_t that rents capital k_t and labor l_t produces output y_t, given by

$$y_t = z_t k_t^{\alpha_t} \left(Z_t l_t\right)^{1-\alpha_t},$$

where Z_t is aggregate labor productivity common to all firms, and where α_t is a time-varying parameter determining the relative importance of capital versus labor in production costs. The production technologies for leader and follower firms are common across all intermediate varieties in the United States. We denote the corresponding productivities in the ROW by z_{Ht}^*, z_{Lt}^*.

Bertrand price competition between the leader firm and the follower firms for each variety determines the markup of price over marginal cost charged by the leader firm, as in Bernard et al. (2003), Atkeson and Burstein (2007), and Peters (2020). Specifically, let R_t and W_t denote the domestic rental rates for capital and labor in the U.S. These factor prices, together with firm productivity z_t, determine intermediate firms' unit cost. Intermediate firms pay a proportional tax at rate τ_t on sales. Because these firms have no intermediate inputs, this can be interpreted as a value added tax. The leader firms for each variety move first and set a price p_{it}. If these firms did not face any latent competition from follower firms, they would solve the standard monopolistic competition profit maximization problem, and the after-tax price would be a markup over marginal (and average) cost of $\varepsilon/(\varepsilon - 1)$. However, the leader firm also recognizes that if it sets its price above the marginal cost of the firm with productivity z_{Lt}, then latent competitors will be able to profitably enter and will in fact corner the market. Thus, the leader firm effectively faces an additional constraint on pricing, one that ensures that competitors do not enter and the leader retains a 100 percent market share. Given these constraints on pricing, the equilibrium output wedge μ_t between after-tax revenues relative to total costs is given by

$$\mu_t = \frac{(1-\tau_t)p_{it}}{cost_t(z_{Ht})} = \min\left\{\frac{\varepsilon}{\varepsilon-1}, \quad \frac{cost_t(z_{Lt})}{cost_t(z_{Ht})} = \frac{z_{Ht}}{z_{Lt}}\right\}, \tag{6}$$

where $cost_t(z_{Ht})$ is the unit cost of production at t for a leader firm. We assume that $\frac{z_{Ht}}{z_{Lt}} < \frac{\varepsilon}{\varepsilon-1}$ for all t so that the output wedge is always driven by the threat of potential competition, $\mu_t = \frac{z_{Ht}}{z_{Lt}}$.

Note that because all varieties are symmetric, equilibrium prices, output wedges, labor, capital and output are identical across varieties: $p_{it} = P_t$, $k_{it} = K_t$, $l_{it} = L_t$, and

$$y_{it} = Y_{it} = Y_t = z_{Ht} K_t^{\alpha_t} \left(Z_t L_t\right)^{1-\alpha_t}. \tag{7}$$

Without loss of generality, we normalize $P_t = 1$ for all t. In our baseline model, we also assume exogenous and fixed labor supply, and normalize $L_t = 1$.

Tax payments by intermediate goods firms fund government purchases: $G_t = \tau_t Y_t$.

Since the production function for final output in equation (4) has constant returns to scale, in equilibrium, final output is equal to the pre-tax revenue of intermediate goods firms. After-tax revenue from intermediate firms is divided between wage payments to labor, rental payments to capital, and factorless income, which we denote by Π_t. The share of pre-tax output accruing as factorless income to owners of intermediate goods firms is

$$\frac{\Pi_t}{Y_t} = \left(\frac{\mu_t - 1}{\mu_t}\right)(1-\tau_t), \tag{8}$$

while the shares going to labor and capital are

$$\frac{W_t L_t}{Y_t} = \frac{(1-\alpha_t)}{\mu_t}(1-\tau_t), \tag{9}$$

$$\frac{R_t K_t}{Y_t} = \frac{\alpha_t}{\mu_t}(1-\tau_t), \tag{10}$$

and the remaining share τ_t goes to taxes.

3.2 Investment Firms

In addition to intermediates-producing firms, a second set of competitive firms holds and rents out capital and makes investment choices. These competitive capital-managing firms choose investment to maximize the expected present value of their dividends. Dividends from these firms are given by

$$D_{Xt} = R_t K_t - Q_t X_t = R_t K_t - Q_t K_{t+1} + Q_t(1 - \delta_t) K_t. \tag{11}$$

Investment firms discount cash flow one period ahead at rate r^*_{t+1}. At each date t, given K_t, they choose K_{t+1} to solve

$$\max_{K_{t+1}} \left\{ -Q_t K_{t+1} + \frac{1}{1 + r^*_{t+1}} \mathbb{E}_t \left[R_{t+1} K_{t+1} + (1 - \delta_{t+1}) Q_{t+1} K_{t+1} \right] \right\}$$

where the interpretation is that purchasing one more unit of new capital at t reduces current dividends by the price of capital Q_t, but generates additional rental income R_{t+1} and a resale value of undepreciated capital $(1 - \delta_{t+1}) Q_{t+1}$ in the next period.

The first-order condition to this problem is

$$Q_t = \frac{1}{1 + r^*_{t+1}} \mathbb{E}_t \left[R_{t+1} + (1 - \delta_{t+1}) Q_{t+1} \right]. \tag{12}$$

In our model, we assume that all firms are financed entirely by equity and have no financial assets. Thus, the measure of aggregate dividends paid by U.S. firms in the model corresponds to a measure of free cash flow from operations available to be paid to all investors in the firm:

$$D_t = \Pi_t + D_{Xt}, \tag{13}$$

and likewise for foreign dividends. The measure of firm value V_t in the model corresponds to the market valuation of these free cash flows from operations.

We refer to the after-tax net operating surplus of firms in our model as the *earnings* of these firms. These earnings are given by

$$E_t = (1 - \tau_t) Y_t - W_t K_t - \delta_t Q_t K_t \tag{14}$$

Note that our measure of aggregate dividends D_t is equal to our measure of earnings E_t less net investment $Q_t X_t - \delta_t Q_t K_t$, as is standard.

The profit maximization problems for foreign firms mirror those for domestic ones. Foreign technology parameters are mostly identical to domestic ones, with the exceptions of the intermediate firm productivity values, z^*_{Ht} and z^*_{Lt} (and thus the output wedge $\mu^* = z^*_{Ht}/z^*_{Lt}$), and the replacement cost of capital, Q^*_t.

3.3 Households

Lifetime utility for the domestic representative infinitely lived household is given by

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \left(\frac{1}{1+\rho} \right)^t \log(C_t), \tag{15}$$

where ρ is the constant rate of time preference.

The assets in this economy are shares in domestic and foreign firms and a one period nominal bond. Domestic households enter period t owning a fraction λ_{t-1} of shares in domestic firms (foreign households own fraction $1 - \lambda_{t-1}$) and a fraction λ^*_{t-1} of foreign firms. They also enter period t with B_t units of bonds, which pay interest at rate r^*_t. Each period households buy new domestic and foreign shares at prices V_t and V^*_t, and bonds B_{t+1} at a price normalized to one. The interest rate between t and $t+1$, r^*_{t+1}, is known at date t (bonds are risk-free) and is the same rate used by firms to discount future cash flows. The flow budget constraint for the domestic representative household is

$$C_t + (\lambda_t - \lambda_{t-1})V_t + (\lambda^*_t - \lambda^*_{t-1})V^*_t + B_{t+1} = W_t L_t + \lambda_{t-1} D_t + \lambda^*_{t-1} D^*_t + (1 + r^*_t) B_t. \tag{16}$$

Foreign households are symmetric to domestic ones, except that we assume they have linear utility ($u^*(C^*_t) = C^*_t$) and a time-varying discount factor ρ^*_t. The foreign discount factor between t and $t+1$, ρ^*_{t+1}, is known at t.

Note that because foreign households have linear utility, the world interest rate is pinned down at

$$r^*_{t+1} = \rho^*_{t+1} \tag{17}$$

for all dates t.

3.4 Expectations

Equilibrium investment in capital and the valuation of the future streams of dividends for U.S. and foreign firms depend on expectations of future realizations of the parameters of the model. We assume that households and firms make decisions taking as given forecasts for the evolution of all model parameter values very similar to those assumed in the transition experiment in Farhi and Gourio (2018). We assume households perceive no uncertainty around these forecasts.

We now describe these forecasts. At each date t, model agents

1. Observe the one-period-ahead discount rate, $r^*_{t+1} = \rho^*_{t+1}$. They expect $\mathbb{E}_t[r^*_{t+j}] = r^*_{t+1}$

for all $j \geq 2$.

2. Perfectly forecast one-period-ahead growth in global labor productivity, g_{t+1}. Thus, $\mathbb{E}_t\left[Z_{t+1}/Z_t\right] = Z_{t+1}/Z_t = 1 + g_{t+1}$.

3. Expect global productivity to grow at a constant rate from period $t+1$ onward. We denote the future expected trend growth rate at t by $\bar{g}_{t+1}$. Thus, $\mathbb{E}_t\left[Z_{t+j}/Z_{t+j-1}\right] = 1 + \bar{g}_{t+1}$ for all $j \geq 2$. Note that we do not impose $\bar{g}_{t+1} = g_{t+1}$.

4. Perfectly forecast next period values for leader and follower productivities in the two economies, $z_{H,t+1}$ and $z_{L,t+1}$ and $z^*_{H,t+1}$ and $z^*_{L,t+1}$. In addition, we assume that they expect these values to persist: $\mathbb{E}_t[z_{H,t+j}] = z_{H,t+1}$, $\mathbb{E}_t[z_{L,t+j}] = z_{L,t+1}$, $\mathbb{E}_t[z^*_{H,t+j}] = z^*_{H,t+1}$ and $\mathbb{E}_t[z^*_{L,t+j}] = z^*_{L,t+1}$ for all $j \geq 2$. Thus, agents expect constant output wedges, μ_{t+1} and μ^*_{t+1}, from period $t+1$ on.

5. Perfectly forecast next period values for the technological parameters α_{t+1} and δ_{t+1} and the tax rate τ_{t+1}. In addition, they expect these parameter values to persist: $\mathbb{E}_t[\alpha_{t+j}] = \alpha_{t+1}$, $\mathbb{E}_t[\delta_{t+j}] = \delta_{t+1}$ and $\mathbb{E}_t[\tau_{t+j}] = \tau_{t+1}$ for all $j \geq 2$.

6. Expect no changes in the relative prices of investment goods: $\mathbb{E}_t[Q_{t+j}] = Q_t$ and $\mathbb{E}_t[Q^*_{t+j}] = Q^*_t$ for all $j \geq 1$.

To summarize, each period t agents receive news about the cost of capital r^*_{t+1} at t and values of other model parameters that will be realized at $t+1$. They treat these parameters as if they followed a random walk. That is, their expectations for the values of these parameters at dates $t+j$ are equal to the value that they expect at $t+1$.

3.5 Asset Pricing

Firm value V_t in the model can be decomposed into the ex-dividend value of claims to investment producing firms, plus the value of claims to profits from intermediate goods firms. As is standard in a model with constant returns to scale and no investment adjustment costs, equation (12) implies that the present value at t of dividends from capital-managing firms from $t+1$ on is equal to the expected replacement value of capital in the next period. That is, $V_{Kt} = Q_t K_{t+1}$.

The ex-dividend price of a share of all domestic intermediate-good-producing firms is the expected present value of the future stream of monopoly profits these firms will earn. Given our assumptions, agents know at t the parameters determining profits at $t+1$, Π_{t+1}. They expect the share of income corresponding to after-tax profits to remain constant from $t+1$

onward, and they expect income (and thus profits) to grow at constant rate $\bar{g}_{t+1}$. They discount future profit income at a constant rate r^*_{t+1}. Thus,

$$V_{\Pi t} = \mathbb{E}_t \left[\sum_{j=1}^{\infty} \frac{\Pi_{t+j}}{(1+r^*_{t+1})^j} \right] = \frac{\Pi_{t+1}}{r^*_{t+1} - \bar{g}_{t+1}}. \tag{18}$$

Thus, the market price of all domestic firms is given by[21]

$$V_t = V_{Kt} + V_{\Pi t} = Q_t K_{t+1} + \frac{\Pi_{t+1}}{r^*_{t+1} - \bar{g}_{t+1}}. \tag{19}$$

3.6 Balance of Payments Accounting

We now consider our model's implications for the current account and the U.S. NFA position. The current account is defined as national savings minus investment, where national savings is comprised of household saving plus government saving plus corporate saving. In our model, the government runs a balanced budget period by period, and corporate saving is identical to corporate investment. Thus, the model current account is identical to household saving. The change in the NFA position of the U.S. in the model is the sum of the current account and the revaluations of cross-border asset holdings of households in the United States and in the ROW.

We now solve for the savings of U.S. households. The representative U.S. household at each date t chooses a sequence for consumption to maximize utility (15), subject to a lifetime budget constraint. Given that this household has logarithmic utility, it consumes a constant fraction of its lifetime wealth inclusive of current income. That is, at each date t,

$$C_t = \frac{\rho}{1+\rho} Wealth_t, \tag{20}$$

where household wealth at t inclusive of current income is given by

$$Wealth_t = W_t L_t + H_t + \lambda_{t-1} D_t + \lambda^*_{t-1} D^*_t + \lambda_{t-1} V_t + \lambda^*_{t-1} V^*_t + (1 + r^*_t) B_t. \tag{21}$$

Here H_t denotes human wealth excluding current labor earnings and is given by

$$H_t \equiv \frac{W_{t+1} L_{t+1}}{r^*_{t+1} - \bar{g}_{t+1}}. \tag{22}$$

U.S. household saving is the difference between households' current income and consump-

[21] In our model, firms issue no debt, and thus V_t is both the market value of equity and enterprise value. If we were to introduce corporate debt, equation (19) would still be the expression for enterprise value.

tion. Using the expression for consumption in equation (20), we obtain a formula for the model current account:

$$CA_t = \frac{1}{1+\rho}\left[\left(\frac{D_t}{V_t}-\rho\right)\lambda_{t-1}V_t + \left(\frac{D_t^*}{V_t^*}-\rho\right)\lambda_{t-1}^*V_t^* + (r_t^*-\rho)B_t + \left(\frac{W_tL_t}{H_t}-\rho\right)H_t\right]. \tag{23}$$

This expression is intuitive. It compares the current income yield on each type of asset (both financial and human) owned by the household to the household's rate of time preference and then takes a weighted aggregate of these quantities, where the weights are given by the beginning of period values of each type of asset held by the household. Domestic households will save out of dividend income on domestic and foreign equity if the current income yield on those assets exceeds their rate of time preference ρ. They will save out of bond income if the real interest rate exceeds ρ. And they will save out of labor income if the income yield on human wealth (current earnings relative to the future value of human wealth) exceeds ρ.

This formula (23) reduces to a simple expression on a balanced growth path. Specifically, suppose the economy is on a balanced growth path, with a constant interest rate $\bar{r}^*$ and constant growth rate $\bar{g}$. On that path, the ratios D_t/V_t, D_t^*/V_t^*, and W_tL_t/H_t are constant and equal to $(\bar{r}^*-\bar{g})/(1+\bar{g})$. It follows that if ρ satisfies $1 = \frac{1}{1+\rho}\frac{1+\bar{r}^*}{1+\bar{g}}$, then the balanced growth path current account will be $CA_t = \frac{1}{1+\rho}(\bar{r}^*-\rho)B_t = \bar{g}B_t$.

Off a balanced growth path, formula (23) captures the effects of business cycle shocks that lead to fluctuations in investment and corresponding fluctuations in D_t and D_t^*. This formula also captures the effects of changes in the discount rate r_{t+1}^* and expected future growth rate $\bar{g}_{t+1}$, which would also impact equilibrium current income yields on assets. When using our model for measurement, we match observed income yields on financial assets D_t/V_t and D_t^*/V_t^* from the data as described below. We derive how shocks to parameters impact the current account in our model in Appendix E.

The change in the end of period model net foreign asset position between $t-1$ and t is given by the sum of the current account and asset revaluations:

$$NFA_t - NFA_{t-1} = CA_t + \lambda_{t-1}^*\left(V_t^*-V_{t-1}^*\right) - (1-\lambda_{t-1})\left(V_t - V_{t-1}\right), \tag{24}$$

where the final terms capture revaluations of foreign equity assets and liabilities. We refer to the term $\lambda_{t-1}^*\left(V_t^*-V_{t-1}^*\right)$ as the revaluation of U.S. equity assets in the ROW and the term $(1-\lambda_{t-1})\left(V_t-V_{t-1}\right)$ as the revaluation of U.S. equity liabilities to the ROW.

The flow of capital must finance the current account, so we finally have

$$CA_t = B_{t+1} - B_t + (\lambda_t^* - \lambda_{t-1}^*)V_t^* - ((1-\lambda_t)-(1-\lambda_{t-1}))V_t. \tag{25}$$

3.7 Equilibrium

An equilibrium is a set of sequences for the world interest rate $\left\{r^*_{t+1}\right\}_{t=0}^{\infty}$, for stock prices $\{V_t, V^*_t\}_{t=0}^{\infty}$, for investment prices $\{Q_t, Q^*_t\}_{t=0}^{\infty}$, and for domestic and foreign factor prices $\{R_t, W_t\}_{t=0}^{\infty}$ and $\{R^*_t, W^*_t\}_{t=0}^{\infty}$ such that when households and firms take these prices as given and solve their maximization problems with the expectations described above, all markets clear. Because bonds are in zero net supply, bond market clearing requires $B_{t+1} + B^*_{t+1} = 0$.

4 Using the Model for Measurement

We use our model to measure the factors driving flows, stocks, and valuation of the U.S. corporate sector and the U.S. current account and net foreign asset position in two steps.

In the first step, we use data from the Integrated Macroeconomic Accounts (IMA) to construct model-consistent series for flows, stocks, and valuation of the U.S. corporate sector, and for the U.S. current account and net foreign asset position. Specifically, we use the data in IMA Tables S5, S6, and S9 to construct quarterly series from 1990 Q1 through 2023 Q3 for corporate value added Y_t, taxes $\tau_t Y_t$, compensation of labor $W_t L_t$, consumption of fixed capital $\delta_t Q_t K_t$, investment expenditure $Q_t X_t$, end of period reproduction value of capital $Q_t K_{t+1}$, end of period enterprise value V_t, the current account CA_t, the NFA position NFA_t, U.S. gross equity holdings in the ROW $\lambda^*_t V^*_t$, ROW gross holdings of equity in U.S. corporations $(1 - \lambda_t)V_t$, as well as the gross flows and revaluations of these equity positions. We obtain data on monetary dividends paid on U.S. equity in the ROW $\lambda^*_{t-1} D^*_t$ from the NIPA. We have reviewed much of these data in Section 2. We provide detailed information on the data sources and construction of these variables in Appendix A.

Note that these data imply measures of Gross and Net Operating Surplus and dividends from operations paid by U.S. resident corporations as in equations (11), (13), and (14). Thus, these data summarize standard valuation metrics, including the ratio of the value of U.S. resident corporations to GDP (the Buffett ratio) V_t/Y_t, the end of period reproduction value of capital to output ratio $Q_t K_{t+1}/Y_t$, Tobin's Q measured as the ratio of the market valuation of the firm to the reproduction value of its capital stock $V_t/Q_t K_{t+1}$, the current dividend yields of U.S. and ROW equity D_t/V_t, D^*_t/V^*_t, and the U.S. earnings yield, E_t/V_t.

In the second step, we choose sequences of model parameters such that, as an equilibrium outcome, our model exactly reproduces the observed time series for all these data: the macro aggregates, the corporate valuations, and the current account. Specifically, we fix the rate of time preference for U.S. households, ρ, to a constant value and solve analytically for sequences of parameters so that the model replicates the data items listed in the first step exactly for every quarter from 1990 Q1 through 2023 Q3. The twelve time-varying parameters are: (i) the discount rate for valuing the corporate sector r^*_{t+1}, (ii) the growth rate of aggregate productivity from $t+1$ on that is expected in period t, $\bar{g}_{t+1}$, (iii) the tax rate τ_t, (iv) the depreciation rate δ_t, (v-vi) domestic and foreign output wedges μ_t and μ^*_t, (vii) labor's share of costs $(1-\alpha_t)$, (viii-ix) domestic and foreign replacement costs for capital Q_t and Q^*_t, (x) the growth rate of productivity between t and $t+1$, g_{t+1}, and (xi-xii) the gross cross-border equity positions λ^*_t and $(1-\lambda_t)$.

We summarize the procedure for choosing these parameters here and provide a comprehensive explanation in Appendix C.[22] We describe how our measurement procedure relates to that used in prior macro-finance papers in detail in Appendix D.

We set the constant rate of time preference for U.S. households ρ to be consistent, on a balanced growth path, with the sample average of the current dividend yield on U.S. corporations D_t/V_t.

The evolution of the capital price Q_t, the depreciation rate δ_t, the tax rate τ_t, the productivity growth rate g_{t+1} from t to $t+1$, and foreign ownership of U.S. equity $(1-\lambda_t)$ are almost directly pinned down by data. In particular, the productivity growth rate g_{t+1} is set equal to observed annualized quarterly growth in real U.S. corporate value added, τ_t is set to match the share of corporate income going to taxes, and δ_t is set to match capital consumption. The sequence for Q_t is chosen to ensure that equation (5), which links investment and depreciation flows to changes in the replacement value of capital, holds exactly at each date. The sequence for $(1-\lambda_t)$ is simply the ratio of U.S. equity liabilities relative to the enterprise value of the U.S. corporate sector.

Next, we turn to parameter values for the rest of the world. For our analysis, the only starred variables (besides r^*_{t+1}) that matter for the dynamics of U.S. consumption (equation 20), the U.S. current account (23), and the U.S. net foreign asset position (24) are (i) U.S. holdings of foreign equity, λ^*_t, (ii) foreign equity valuations, V^*_t, and (iii) foreign free cash flow, D^*_t. We set the path for λ^*_t to replicate the path for U.S. foreign equity assets relative to U.S. corporate enterprise value. We set the series for μ^*_t and Q^*_t to replicate the time series for V^*_t and D^*_t. We assume that the time paths for all other rest-of-world parameters (α^*_t, δ^*_t, τ^*_t, g^*_{t+1}, $\bar{g}^*_{t+1}$) are identical to their counterparts for the United States. Note that our choice to make μ^*_t and Q^*_t the particular parameters whose time paths differ relative from their counterparts in the United States is arbitrary; any combinations of rest-of-world parameter sequences that replicate the observed paths for $V^*_t$and D^*_t will deliver identical time paths for all model observables.

[22]In particular, for simplicity, in the body of the paper we have described the model in real terms. The data are in fact presented in nominal terms. We discuss the impact of inflation on our procedure for choosing parameters in Appendix C.

Four parameter series remain: α_t, μ_t, r^*_{t+1}, and $\bar{g}_{t+1}$. We set time paths for these four parameters to target four empirical times series: (i) labor's share of income, $W_t L_t / Y_t$, (ii) end of period value of capital, $Q_t K_{t+1}$, (iii) the observed valuation of the corporate sector in excess of the replacement cost of capital, $V_t - Q_t K_{t+1}$, and (iv) the U.S. current account. These four parameters are identified in a recursive and intuitive fashion.

First, given a value for the rate of time preference ρ, all of the terms in the current account equation (23) are directly observed in data except for the value H_t of human wealth from $t+1$ on, which is given in equation (22).[23] This expression for human wealth is simply the ratio of labor compensation in period $t+1$ to $r^*_{t+1} - \bar{g}_{t+1}$. Because compensation is assumed to be known one period in advance, equations (22) and (23) can be used to directly identify $r^*_{t+1} - \bar{g}_{t+1}$. As a quantitative matter, human wealth H_t is very large relative to the other components of wealth in equation (23). It follows that small fluctuations in $r^*_{t+1} - \bar{g}_{t+1}$ translate into large fluctuations in the current account. Because the actual current account is not particularly volatile, we will see that our quantification points to a near-constant time path for $r^*_{t+1} - \bar{g}_{t+1}$.

Second, given $r^*_{t+1} - \bar{g}_{t+1}$, the time path for the output wedge parameter μ_{t+1} is identified from corporate valuations in excess of the replacement cost of capital, via equation (18). Recall that those valuations depend on μ_{t+1} via the expression for the expected share of profits in income, (8), which in turn generate asset valuations in proportion to the valuation multiple $(r^*_{t+1} - \bar{g}_{t+1})^{-1}$.[24]

Third, given a path for μ_t, the evolution of labor's share of income identifies the path for α_t via equation (9).

Finally, given values at each date for α_{t+1} and μ_{t+1}, the evolution of the capital stock identifies the path for the discount factor r^*_{t+1} via the firm's first-order condition for investment, equation (12). In particular, given α_{t+1}, μ_{t+1}, and τ_{t+1}, and the observed capital output ratio at $t+1$, all of which are assumed to be known at t, agents can forecast the $t+1$ rental rate for capital, R_{t+1}. In addition, $\mathbb{E}_t[Q_{t+1}] = Q_t$ and δ_{t+1} is assumed known at t. Because all the components of the expected return to investment are known, the investment first-order condition can be used to identify the discount rate that rationalizes firms optimally choosing the observed end of period reproduction value of the capital stock $Q_t K_{t+1}$.

[23]This equation does involve the lagged value of the cost of capital r^*_t and the stock of bonds carried into the period B_t. We construct series for r^*_t and B_t iteratively, using equations (23) and (25) to determine the stock of bonds carried into the next period, B_{t+1}. See Appendix C for further details.

[24]Note that, in our model, μ_{t+1} is determined by the ratio of the firm-specific productivity of the leader firm to that of the follower firm $z_{H,t+1}/z_{L,t+1}$ for each intermediate good. We set the firm-specific productivity $z_{H,t+1}$ each period so that U.S. output in the model at $t+1$ is equal to $Z_{t+1} = (1 + g_{t+1})Z_t$. We will follow the same procedure for the ROW. Thus, the values for model output in the U.S. and the ROW are identical at each date t.

There are parallels between this identification logic and the analysis of Lustig and Van Nieuwerburgh (2008). They start by noting that consumption growth is (i) much less volatile than stock returns, and (ii) only weakly correlated with stock returns. They conclude that innovations to human wealth cannot be very volatile, and must move inversely with innovations to financial wealth. In our model, output wedge shocks drive the lion's share of valuation volatility. But those shocks naturally generate negative co-movement between financial and human wealth. And human wealth is not too volatile as long as fluctuations in $r^* - \bar{g}$ are small.

Note that in our model and measurement exercise, we abstract from value added created in the government sector and in the non-corporate private sector, which is important for residential housing. We have also abstracted from demographic factors relevant to the current account in an overlapping generations framework, as discussed in Auclert et al. (2021). To the extent that these omitted factors impact the U.S. current account, they are implicitly captured in our model measurement in our estimates for $r^*_{t+1} - \bar{g}_{t+1}$, because the valuation multiple for human wealth is the only unknown in our equation (23) for the current account.

To sum up, our parameterized model replicates exactly quarterly series for the following times series of the U.S. corporate sector: value added, gross and net investment, labor earnings, taxes paid, cash flow payable to firm owners (defined as in equation 13), the Buffett ratio, the replacement cost of capital, and the dividend and earnings yields. Figures C.2 and C.3 in Appendix C.7 plot these series.

5 Baseline Results

Figure 10 plots some of the key parameter sequences derived from our measurement procedure.[25] The top left panel plots (in blue) the model-implied sequence for r^*_t (annualized), while the top right panel shows the sequence for trend growth $\bar{g}_t$ alongside actual quarterly growth g_t, both also annualized. The estimated sequence for trend growth is much less volatile than the actual quarterly growth rate series, but some correlation between the two is apparent. The sequence for r^*_t shown in Figure 10 declines substantially over the past decade. However, our measurement procedure implies that the sequence for the discount rate r^*_t tracks the trend growth rate series series closely, so that the difference between the two (the red line in the top left panel of Figure 10) fluctuates very little.

The bottom left panel shows the model-implied time series for the output wedge for the U.S. corporate sector, μ_t; the path for share of factorless income $(1 - \tau_t)(\mu_t - 1)/\mu_t$ looks similar. The share of capital in costs, α_t, shown in the bottom right panel, exhibits some

[25] Figure C.1 plots time series for all parameter values.

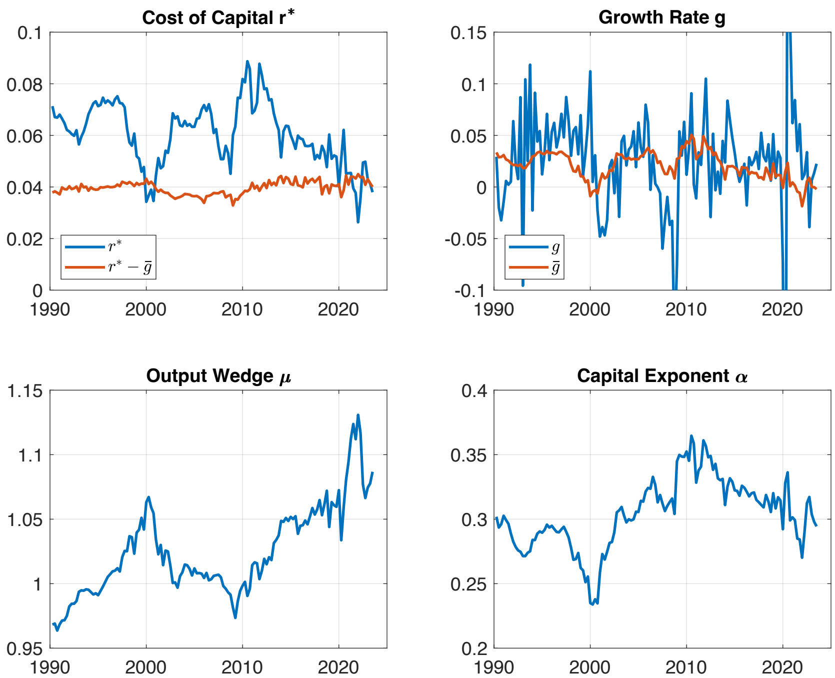


Figure 10: Estimated Times Series for Key Parameters

fluctuations which are inversely correlated with those in μ_t, but features no clear long-run trend.

To understand why the model measurement procedure produces these time paths for parameters, recall the logic of the recursive identification scheme outlined above.

First, the reason that we find a stable valuation multiple for factorless income is rooted in our requirement that the model match the observed current account sequence for the United States. The current account is highly sensitive to changes in the ratio of current labor income to human wealth, because the value of human wealth, H_t, is large. Moreover, H_t is inversely proportional to $r^*_{t+1} - \bar{g}_{t+1}$ (see equation 22). Thus, large changes in $r^*_{t+1} - \bar{g}_{t+1}$ would imply large changes in desired U.S. consumption and counterfactually large swings in the current account. Put differently, the observed current account is a data moment that provides sharp identification for expected trend growth.[26]

Second, consider first the model's implications for changes in the discounted present value of firms' future factorless income, V^{Π}_t. Because the valuation multiple $(r^*_{t+1} - \bar{g}_{t+1})^{-1}$ applied to expected future factorless income is quite stable, the model attributes the majority of the observed fluctautions in this component of firms' valuation to fluctuations in the *quantity*

[26]This logic is also present in Aguiar and Gopinath (2007) who argue that the current account swings in emerging markets can be used to identify changes in expected growth.

of factorless income Π_{t+1}. Changes in measured taxes explain some of the model-inferred path for factorless income, but the rest is attributed to latent changes the output wedge, μ_t. Thus, the identified series for the output wedge μ_t closely tracks the V_t^{Π} component of valuation. For example, the output wedge spikes in the tech boom of 2000, when valuations were temporarily elevated. Note that because the valuation multiple for factorless income is quite stable, the decline in the discount rate that the model identifies in the post 2010 period does not account for much of the observed runup in asset valuations in excess of the replacement cost of capital over that period: future expected profits are discounted at a lower rate, but are also expected to grow more slowly, with the two effects offsetting.

Our series for the output wedge μ_t can be compared to other estimates for profitability, such as Figure 8 in De Loecker, Eeckhout, and Unger (2020) and Figure 3 in Barkai (2020). All show rising profitability since 1990, albeit with somewhat different timing.[27]

Third, given the path for μ_t that replicates the observed path for the value of claims to factorless income, α_t must fluctuate to match the observed path for labor's share of income. If labor's share is not moving, α_t must move inversely with μ_t, so that a rise in profit's share of income is offset by a decline in capital's share. That inverse co-movement is apparent in Figure 10. For example, as μ_t rises around 2000 to replicate the tech stock boom, α_t simultaneously falls so that labor's share is relatively stable, as in the data. In the 2000's, α_t rises to allow the model to replicate a declining labor share. After 2010, labor's share is relatively flat, but the estimated profit share is rising, so α_t must decline to offset a rising path for μ_t.

Finally, consider the path for r_t^*. Recall that this path is such that the model reproduces the observed path for the replacement value of installed capital in U.S. resident corporations. That value has been quite stable over time, relative to corporate value added (see Figure 8a). That stability emerges naturally in the proto-typical stochastic growth model in which all structural parameters are constant, and fluctuations are driven by transitory productivity shocks. But in our model, shocks to α_{t+1} and μ_{t+1} translate into fluctuations in the expected rental rate for capital. All else equal those shocks would translate into changes in firms' desired capital stock, relative to value added. Thus, the model infers offsetting changes in the discount rate. For example, in the post 2010 period, a declining path for α_t and a rising output wedge μ_t both work to depress expected rental income from capital. But the actual replacement value of capital relative to value added did not fall over this period. The model

[27] Barkai (2020) estimates profit's share of value added by imputing a series for the rate of return on capital given which he can infer capital costs. Profit's share under his approach is value-added minus the sum of compensation of employees, capital costs, and taxes. Our approach is different, in that we use observed valuations to infer profit's share of income, and capital's share of income is then value-added minus the sum of compensation of employees, profits, and taxes.

rationalizes that finding by inferring that the discount rate used by investors must have declined.

Note that this logic re-frames the conventional narrative on the relationship between investment and interest rates. That narrative has has been that investment has been surprisingly weak in recent decades given low estimates for the cost of capital (see, e.g., Gutiérrez and Philippon 2023). In the context of our model, in contrast, investment appears surprisingly *strong*, given that we have estimated that a rising profit share and a rising labor income share have both been squeezing income to capital. The model makes sense of this surprisingly strong investment by inferring a declining cost of capital.

One interesting observation from valuation data is that while the U.S. corporate dividend yield exhibits no long term trend, there is a downward trend in the earnings yield (see Figure C.3). What explains this difference between these two standard valuation metrics? In our model, the expected forward dividend yield is $(r^*_{t+1} - \bar{g}_{t+1})$, as in the Gordon growth formula:

$$r^*_{t+1} - \bar{g}_{t+1} = \frac{\mathbb{E}_t[D_{t+1}]}{V_t}. \tag{26}$$

We define earnings similarly to dividends, except that depreciation is subtracted from gross operating surplus instead of investment. Thus, the expected forward earnings to price ratio is also $(r^*_{t+1} - \bar{g}_{t+1})$ for monopolists, for whom there is no distinction between earnings and dividends. But for investment firms, the expected earnings yield is r^*_{t+1}. The expected earnings yield for the entire economy is a weighted average of the ratios for the two firm types, with weights given by their shares in total enterprise value:

$$\frac{\mathbb{E}_t\left[E_{t+1}\right]}{V_t} = (r^*_{t+1} - \bar{g}_{t+1})\frac{V_t^{\Pi}}{V_t} + r^*_{t+1}\frac{Q_t K_{t+1}}{V_t}.$$

Note that when trend growth is positive, the forward earnings yield will exceed the forward dividend yield (as is evident in Figure C.3). The intuition is that in a growing economy, investment exceeds depreciation, so cash flow payable to investors is less than earnings. This equation also explains why the expected earnings yield in model and data declines over time, even absent trends in r^*_{t+1} or $\bar{g}_{t+1}$. In particular, as the share of monopolist firms in total enterprise value rises over time, the aggregate expected earnings yield puts more weight on the lower value $(r^*_{t+1} - \bar{g}_{t+1})$ for monopolist firms and less weight on the higher value r^*_{t+1} for investment firms.

Figure 11 plots one of the main results in our paper. The top left panel is the U.S. current account relative to corporate sector value added, which the model is calibrated to perfectly replicate. The U.S. current account deficit widened steadily through the 1990s and early 2000s, before moderating during the Great Recession. The other panels of the figure

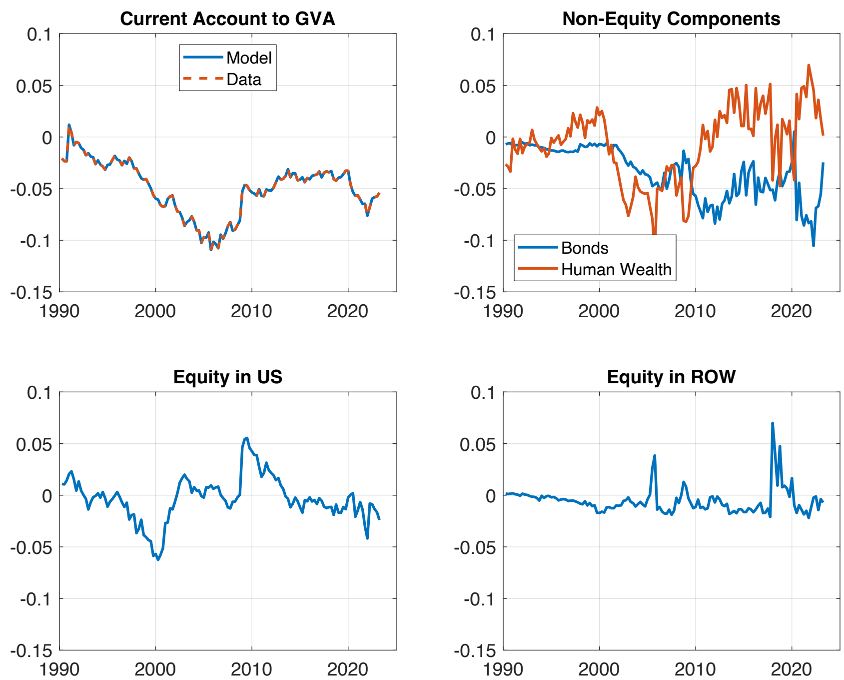


Figure 11: Current Account Decomposition

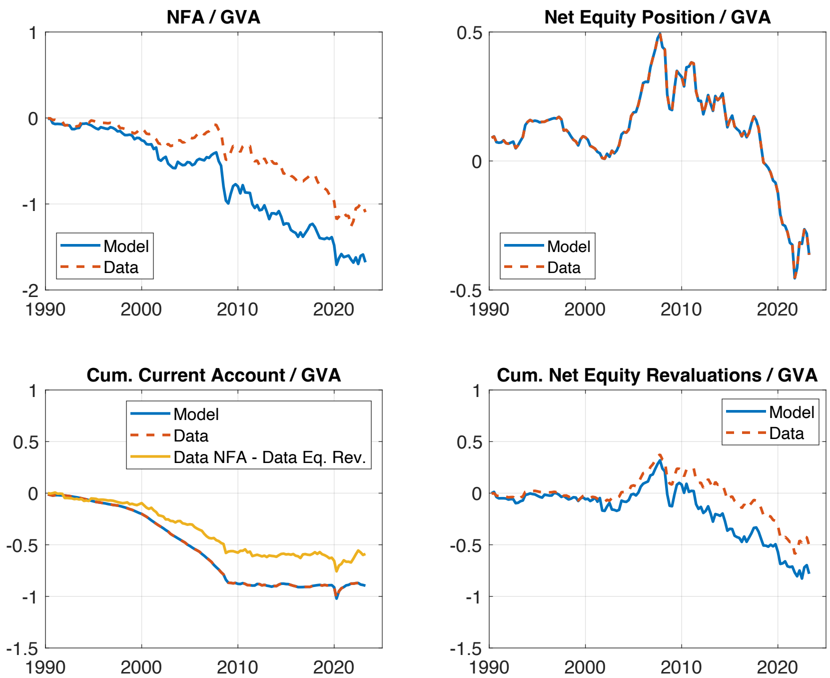


Figure 12: NFA Dynamics

decompose the model current account series following equation (23). The decline in the U.S. current account during the 1990s is primarily attributed to declining dividend yields on U.S. equity, which led U.S. households to borrow from the rest of the world. However, when U.S. asset values fall during the dot-com bust, that dividend yield rises, which, all else equal, would have pushed the current account back toward balance. The model rationalizes the continuing observed decline in the current account via rising expected growth (see Figure 10), which depresses $r^*_{t+1} - \bar{g}_{t+1}$, raising the value of human wealth and stimulating ongoing borrowing. A high dividend yield on U.S. equity during the Great Recession helps explain why the current account narrowed around this time. Thereafter, slowing expected growth reduces the value of human capital, which is why current account deficits remain modest even as the dividend yield on U.S. equity declines.

The top left panel of Figure 12 plots the NFA position predicted by the model against the actual position. The top right panel plots the net equity position, which matches the data by construction. The NFA position in the model reflects cumulative current accounts (bottom left panel) plus cumulative equity revaluations (bottom right panel).

There are three reasons why the model does not perfectly replicate the data path for the NFA position. The first is that the equity liability revaluations in the model are not identical to those reported in Table S9 in the Integrated Macroeconomic Accounts. Recall that we infer our own series for the revaluation of ROW holdings of U.S. equity based on our estimated series for the value of the U.S. corporate sector. Note, however, that the difference between the two revaluation series is small (bottom right panel). The second reason is that the model does not feature any non-equity valuation effects, while there are such effects in the data (see Figure 4). The third and most important reason is that in the data accounting identity (equation 1), there is a residual term which is not in the model. This residual term, which incorporates the statistical discrepancy between the current account and net foreign asset purchases, contributed to a significant improvement in the U.S. NFA position in the 2000s, which our model cannot replicate (see Figure 2).[28]

5.1 Expected versus unexpected shocks

Our focus is on the impact of changes in asset values and returns on the current account and the NFA position. Some portion of the changes in asset valuations seen in the data are due simply to anticipated factors — as an economy grows and as it invests in more physical capital, the value of its corporations would be expected to grow as well. Other changes in asset valuations are due to the arrival of news that makes realized returns differ from expected returns. We now decompose changes in the U.S. NFA position into anticipated and unanticipated factors.

Given the information available to households in period $t-1$ about model parameters, they expect returns on all assets between $t-1$ and t to be equal to r_t^*. Then, at each date t, these households receive further news about future output wedges, growth, and other parameters, and this news generates dynamics both in the current account and in asset values. Specifically, let e_t and e_t^* denote excess real returns (realized minus expected return) to domestic and foreign equity in period t:

$$e_t = \frac{D_t + V_t}{V_{t-1}} - (1 + r_t^*), \qquad e_t^* = \frac{D_t^* + V_t^*}{V_{t-1}^*} - (1 + r_t^*).$$

In the model, these excess returns are due to news about parameters from $t+1$ onward that leads agents to expect a different present value of dividend income at t relative to what they expected at $t-1$.

[28] The combined impact of non-equity revaluations and the residual term can be seen by comparing the cumulative actual current account in the data (which the model perfectly replicates) to the hypothetical current account series that would obtain in the data absent a residual term and absent non-equity revaluations. That hypothetical series is plotted in yellow in the bottom left panel of Figure 12.

In Appendix G, we show that the evolution of the U.S. net foreign asset position in our model can be decomposed as follows:

$$NFA_t - NFA_{t-1} = \underbrace{\frac{r_t^* - \rho}{1+\rho} NFA_{t-1}}_{(1)} + \underbrace{\left(\frac{r_t^* - \rho}{1+\rho} - \bar{g}_t\right) V_{t-1}}_{(2)} + \underbrace{\left(\frac{\frac{W_t L_t}{H_t} - \rho}{1+\rho}\right) H_t}_{(3)} \quad (27)$$

$$-\underbrace{(Q_t X_t - \mathbb{E}_{t-1}[Q_t X_t])}_{(4)} - \underbrace{\frac{\rho}{1+\rho} \lambda_{t-1} e_t V_{t-1}}_{(5)} - \underbrace{\frac{\rho}{1+\rho} \lambda_{t-1}^* e_t^* V_{t-1}^*}_{(6)} - \underbrace{e_t (1 - \lambda_{t-1}) V_{t-1}}_{(7)} + \underbrace{e_t^* \lambda_{t-1}^* V_{t-1}^*}_{(8)}$$

Terms (1) and (2) capture savings motives that are predictable at $t-1$. Term (1) indicates that the NFA position will tend to grow at rate $(r_t^* - \rho)/(1+\rho)$. Note that on a balanced growth path, this term is equal to the growth rate $\bar{g}$, implying a stable NFA to GDP ratio.[29] The second term is the contribution to the NFA from expected returns to domestic equity. Term (3) is the current account contribution to national saving from a yield on human capital exceeding ρ.

The remaining terms capture the impact of shocks at t to asset values and returns. Term (4) captures deviations of investment at date t from investment expected at $t-1$: if information revealed at t spurs unexpected domestic investment, the U.S. will fund that extra investment by borrowing from abroad. Terms (5) and (6) capture the impact of excess equity returns at t on desired consumption and thus the current account. Terms (7) and (8) capture the direct effect of excess returns on the NFA position: here excess returns to domestic equity reduce the NFA position by inflating U.S. liabilities, while excess returns to foreign equity improve the position. On a balanced growth path, terms (2) through (8) are all zero.

Figure 13 uses equation (27) to decompose the change in the NFA position relative to the start of our sample period (1990) into the cumulative values of each of the eight labeled terms. The cumulative value for each term is plotted relative to value added at date t. The message from the plot is that over the entire sample period, there are three key drivers of the decline in the U.S. NFA position.

Quantitatively, the most important driver is that starting around the end of the Great Recession, positive excess returns on U.S. equities have inflated U.S. equity liabilities (shown in the purple line in the right panel of Figure 13). These excess returns account for a decline in the NFA position of over 100 percent of corporate value added, though some of this effect was unwound in 2022 as U.S. asset values declined. Note that, at high frequency, excess

[29] In particular, if $1 = \frac{1}{1+\rho} \frac{1+r^*}{1+\bar{g}}$, then $\frac{r^* - \rho}{1+\rho} = \bar{g}$.

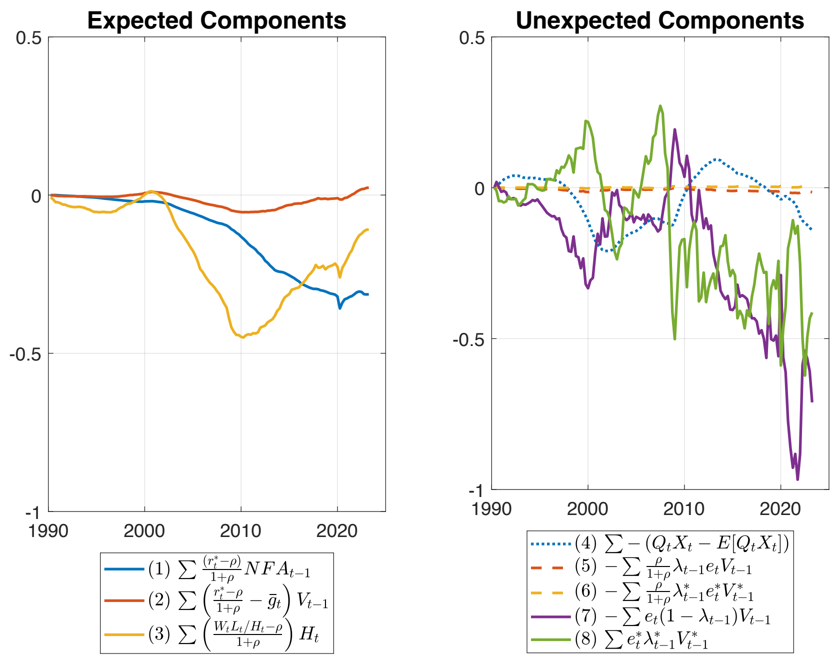


Figure 13: NFA Decomposition

returns to domestic and foreign equity tend to work in opposite directions, reflecting high frequency co-movement across global equity markets. For example, in 2022 we see that poor U.S. equity market performance reduced U.S. equity liabilities (purple line), but poor ROW market performance simultaneously reduced the value of U.S. foreign equity assets (green line).

The second important driver of the U.S. NFA position is that during the 2000s, a low income yield on human capital fueled current account deficits (shown in the yellow line in the left panel of Figure 13.) The third key driver is that as the NFA position has widened, the fact that the interest rate exceeds the rate of time preference has fueled further borrowing (the blue line in the left panel).

6 Counterfactuals

In Section 4, we used our model to measure the factors driving observed flows, stocks and valuations of the U.S. corporate sector, together with those driving the evolution of the U.S. current account and NFA position in quarterly data over the period 1990 through 2023. This measurement exercise establishes a baseline path for model parameters that accounts for the evolution of this broad collection of data over this three-decade time period. We now use the model to conduct counterfactual exercises relative to this model baseline to consider how these changes in parameters impacted the welfare of U.S. households. Our particular focus is on the question of how the large increase in gross cross-border equity positions observed in recent decades impacts the welfare implications of the large increase in the output wedge μ_t measured in our baseline over the course of the last decade. To address this question, we simulate the model for three specific counterfactual paths for parameters.

In the first, we solve for the counterfactual equilibrium of the model with no cross-border equity positions. To do so, we set the share of U.S. firms owned by U.S. residents to $\lambda_t = 1$ and the share of ROW firms owned by U.S. residents to $\lambda_t^* = 0$, leaving all other parameter values unchanged. In this counterfactual exercise, the paths of output, labor compensation, capital, investment, and the market valuation of the U.S. corporate sector are all the same as in the baseline calibration. That is because, in our model, the distribution of the ownership of firms across U.S. and ROW households does not impact the equilibrium discount rate r_t^* or equilibrium production and investment decisions. In this counterfactual exercise, the paths for U.S. consumption and for the current account are different from those in the baseline because now U.S. households enjoy more of the unexpected capital gains on their now larger holdings of equity in U.S. corporations. Our baseline model, together with this counterfactual exercise, gives us two paths for the consumption of U.S. households with a large increase in μ_t: one with and one without observed gross cross-border equity positions.

In the second counterfactual exercise, we solve for the equilibrium of the model when z_{Lt} is set equal to z_{Ht} for all t, leaving all other parameter values unchanged. In this counterfactual exercise, with this alternative path for the productivity of follower firms, we have $\mu_t = 1$ for all t. This counterfactual exercise gives us predictions for how allocations would have evolved if U.S. leader firms had experienced the same path for productivity but had not enjoyed a large increase in their power to price above cost, all under the assumption that cross-border equity share holdings $(1 - \lambda_t)$ and λ_t^* had evolved as in the baseline.

In the third counterfactual exercise, we solve for the equilibrium path for consumption of U.S. households when we set the share of U.S. firms owned by U.S. residents to $\lambda_t = 1$, the share of ROW firms owned by U.S. residents to $\lambda_t^* = 0$, and $z_{Lt} = z_{Ht}$ for all t so that $\mu_t = 1$ for all t.

With these three counterfactuals, we can compare the paths of output and consumption given the baseline path for the output wedge μ_t against the paths of output and consumption with $\mu_t = 1$. And we can perform this comparison twice: once under the baseline data-consistent paths for gross equity positions $(1 - \lambda_t)$ and λ_t^*, and once for a counterfactual world in which cross-border equity positions are always zero. We use these counterfactual

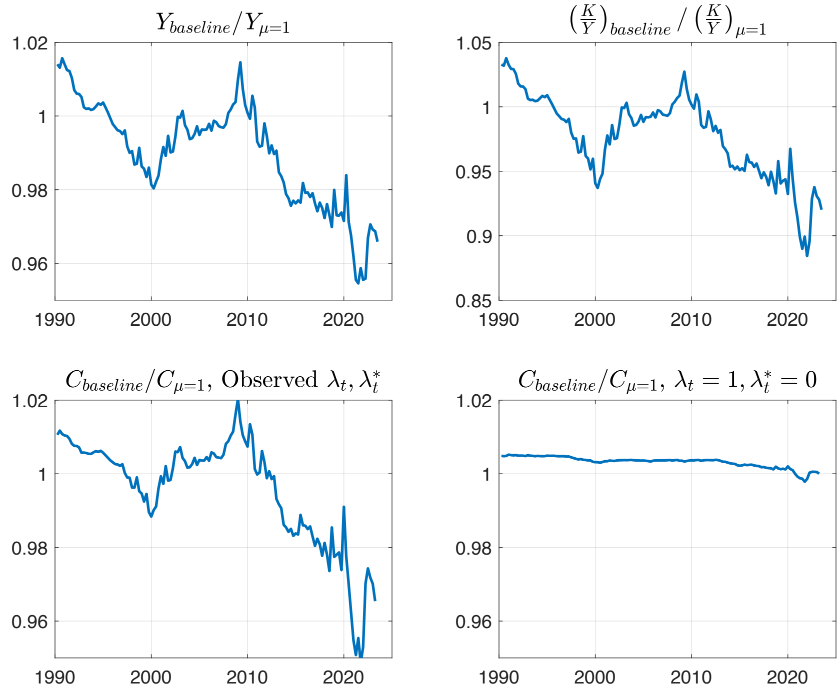


Figure 14: Effect of Output Wedges on Y, K/Y, and C. Effect on C Shown with Actual Path for Diversification, and Zero Diversification Counterfactual.

simulations to study how international equity diversification changes the welfare implications of a rise in the ratio between revenue and cost μ_t, which is the key driver of rising U.S. asset valuations in our analysis.

We show these results in Figure 14. In the top left panel of this figure, we show the ratio of the path of U.S. output in our baseline to that in our counterfactuals with $z_{Lt} = z_{Ht}$ for all t so that $\mu_t = 1$ for all t. As noted above, the path for output implied by our model is not impacted by assumptions about the extent of international diversification of equity holdings $(1 - \lambda_t)$ and λ_t^*. Hence, there is only one line in this top panel. We see in this figure that the increase in μ_t over the past decade has had a large negative impact on the path of output relative to the counterfactual with $\mu_t = 1$ at all dates. In our model, since labor is supplied inelastically and the path for leader firm productivity is the same in the baseline and the counterfactual simulation, this decline in output is entirely due to the impact of increases in μ_t on the accumulation of physical capital; the negative impact on the model capital to output ratio is plotted in the top right panel of the figure. In this regard, we confirm the findings of Gutiérrez and Philippon (2017) that the big increase in the valuation of U.S. firms in our baseline is associated with comparatively weak investment.

In the bottom panels of Figure 14, we show how the impact of a rising output wedge on the consumption (and thus welfare) of U.S. households is mediated by the dynamics of international equity diversification.

First, consider the impact of the large estimated increase in the output wedge μ_t in a world with no cross-border equity holdings (bottom right panel). Here we plot the ratio of the path of U.S. household consumption in our baseline (in which μ_t is generally rising) to consumption in the counterfactual with $z_{Lt} = z_{Ht}$ for all t (so that $\mu_t = 1$ for all t) under the assumption that cross-border equity holdings $(1 - \lambda_t)$ and λ_t^* are always zero in both model simulations. It is clear that a large increase in the output wedge μ_t in the U.S. has only a modest impact on U.S. consumption, notwithstanding the large impact of this increase in the output wedge on U.S. output shown in the top panel. The intuition for this result is straightforward. First, the income that U.S. households lose from lower labor compensation when μ_t goes up is mostly offset by a rise in the factorless income that they receive in dividend payments from firms. Second, the decline in investment that drives down equilibrium output also implies a period of elevated cash flow to shareholders, and that extra income can be invested abroad, and used to replace lower future domestic income. The finding that a rise in μ_t has only a small negative impact on consumption is analogous to the result that an increase in output wedges starting from an efficient equilibrium has no first-order impact on welfare in a closed economy. In Appendix H we prove that if we start from a zero output wedge, the impact on consumption from a marginal shock to μ_t is nil when there is zero foreign ownership of U.S. equity.

Now consider the impact of the same increase in μ_t under our baseline parameterization, in which cross-border equity holdings match those in the data. Specifically, the bottom left panel of Figure 14 plots the path for U.S. household consumption in our baseline relative to that in our counterfactual with $z_{Lt} = z_{Ht}$ for all t (so that $\mu_t = 1$) under the assumption that cross-border equity holdings $(1-\lambda_t)$ and λ_t^* evolve as in our baseline calibration. Now, we see a large negative impact of the increase in μ_t on equilibrium consumption. In fact, the additional decline in consumption relative to a world with a zero output wedge is quantitatively similar to the associated decline in output. The reason is that now the income that U.S. households lose from a decline in the share of labor compensation in output is not largely offset by an increase in dividends that they receive as owners of firms, because foreign households receive a large share of those increased dividends. As a result, U.S. households have less wealth (both in absolute terms and relative to output) than they would have had absent cross-border equity holdings, leading them to reduce consumption. Thus, the negative welfare implications of an increase in U.S. firms' market power for U.S. households are dramatically magnified in the presence of large foreign ownership of U.S. equity.

6.1 Diversification

Is the *ex post* redistribution to foreign households that occurs when U.S. factorless income increases following the Global Financial Crisis desirable from an *ex ante* risk sharing perspective?

In the model we have explored to this point, agents perceive zero risk. Thus, as long as domestic equity, foreign equity and bonds offer the same expected return, agents are indifferent about their portfolio choices. This indifference allowed us to focus on an equilibrium in which portfolios match those observed in the data.

We now consider a model extension in which households perceive risk, and in which risk-sharing considerations dictate a unique portfolio choice. We consider two alternative cases: one in which there are fluctuations in μ_{t+1} that do not impact aggregate income Y_{t+1}, and a second in which there are conventional shocks to productivity Z_{t+1} that translate into fluctuations in Y_{t+1} without impacting the output wedge μ_{t+1}.[30] We abstract here from all other shocks, and retain the assumption that foreign investors are risk neutral. Thus, bonds and foreign equity pay a constant return r^*, and agents expect constant future productivity growth at rate $\bar{g}$. We will assume $1 + \rho = (1 + r^*)/(1 + \bar{g})$.

Consider first the experiment with shocks to μ_{t+1}. We model risk as follows. Let $\kappa_t = (\mu_t - 1)/\mu_t$ denote the share of after-tax income accruing to monopoly profits. At each date t agents receive news about κ_{t+1} :

$$\kappa_{t+1} = \kappa_t + \varepsilon_{\kappa,t},$$

where the news shock $\varepsilon_{\kappa,t}$ is drawn from a distribution with mean zero. These news shocks have two implications for domestic agents. First, a positive value for $\varepsilon_{\kappa,t}$ signals higher future profits, and will result in an immediate increase in the value of domestic equity. Second, the same shock signals a decline in labor's share of after-tax income, $(1 - \kappa_t)(1 - \alpha)$, and thus lower future labor income. In this environment, what portfolios are chosen in equilibrium?

Proposition 1: Consider the environment just described. At date 0, for any initial state, equilibrium allocations have the following properties: (i) $\lambda_t = (1-\alpha)$, and (ii) $C_{t+1}/C_t = 1+\bar{g}$ for all $t \geq 0$.

Proof: See Appendix H.

The logic for this result is that a news shock that increases the expected share of income

[30] In the first case, we assume that changes in μ_{t+1} reflect changes in the ratio of productivities of leader to follower firms $z_{H,t+1}/z_{L,t+1}$ with the property that equilibrium output at t+1 is unaffected; see footnote 24 and equation 33.

accruing to owners of firms by one percentage point reduces the share of income accruing to labor by $(1-\alpha)$ percentage points. When domestic households own exactly fraction $(1-\alpha)$ of domestic firms, the shock has no impact on their expected flow income, or on the sum of their human plus financial wealth. Thus, this portfolio delivers perfect insurance, in that domestic consumption grows at the trend growth rate, and is independent of the realized path for κ_t. Equilibrium portfolios are home-biased (assuming $\alpha < 0.5$) because shocks that reduce labor income will simultaneously generate excess returns to domestic equity.

Compare this result to equilibrium portfolio choice in a conventional model in which κ is constant, but in which there are news shocks about output growth. In particular, suppose that

$$Z_{t+1} = (1+\bar{g})\varepsilon_{Z,t} Z_t,$$

where the news shock $\varepsilon_{Z,t}$ is drawn from a distribution with mean one.

Proposition 2: Consider the environment just described. At date 0, for any initial state, equilibrium allocations have the following properties: (i) $\lambda_t = -\frac{(1-\alpha)(1-\kappa)}{\kappa}$, and (ii) $C_{t+1}/C_t = 1+\bar{g}$ for all $t \geq 0$.

Proof: See Appendix H.

Thus, if risk takes the form of conventional uncertainty about the path for country-specific TFP, the model predicts that households should short domestic equity. The logic is that, in this case, shocks to domestic labor income are positively correlated with returns to domestic equity, so a large short position is required to insulate households against those shocks (see also Baxter and Jermann, 1997).

To summarize, in economies with risk, country-specific shocks generate country-specific excess returns to equity. The pattern of international equity diversification determines how those excess returns impact the net foreign asset position. In equilibrium, equity portfolio choice is designed to provide insurance against labor income risk, which cannot be insured directly.

We conclude this section by returning to the question we started with. In the period following the Great Recession, our calibration attributes excess returns to U.S. equity to unexpected increases in the share of factorless income accruing to the owners of U.S. firms, which translated into *ex post* redistribution to foreign investors. Can those transfers be interpreted as part of an *ex ante* optimal risk sharing arrangement? Interestingly, our estimated value over this period for the labor exponent in production, $1-\alpha_t$, is close to our measure of the share of U.S. equity that is domestically-owned, λ_t (see Figure C.1 in Appendix C). Thus, if the key macro risk investors worried about over this period was risk to the factorless income share κ_t, then Proposition 1 suggests that diversification has perhaps been close to optimal, and *ex post* transfers to foreign shareholders may have been *ex ante* efficient. However, a complete quantitative assessment of the optimal extent of diversification for U.S. households is beyond the scope of this paper. Such an assessment would require modeling the complete set of shocks that drive aggregate fluctuations, and specifying the joint stochastic process for those shocks, including how domestic shocks co-move with their foreign counter-parts (see, for example, Coeurdacier, Kollmann, and Martin, 2007 and Heathcote and Perri, 2013).

7 Sensitivity Analysis

We now consider the extent to which our measurement of the discount rate r^*_{t+1} and the parameters μ_{t+1} and α_{t+1} derived from that estimate are sensitive to our use of equation (23) and data on the current account in our measurement procedure.

We do so for two reasons. First, recall that measurement procedure identifies $r^*_{t+1} - \bar{g}_{t+1}$ from the U.S. current account. However, prior papers such as Farhi and Gourio (2018) and Crouzet and Eberly (2023) do not consider the implications of their models for the current account and instead use data on historical growth rates to estimate $\bar{g}_{t+1}$. Second, one might consider an alternative model structure that does not have a representative U.S. household. For example, Greenwald, Lettau, and Ludvigson (forthcoming) consider a model in which there are two types of U.S. households, one that earns labor income and consumes that income every period (living hand-to-mouth), and another that owns all financial assets. If we were to make a similar assumption, our model's implication for the current account (equation 23) would not include the terms involving current labor compensation $W_t L_t$ and the level of human wealth H_t, since the households earning labor income would contribute nothing to the aggregate saving rate.

To conduct our sensitivity analysis, we consider four alternative measurement procedures in which drop equation (23) for the current account and instead introduce an alternative auxiliary assumption about either expected growth $\bar{g}_{t+1}$ or the expected dividend yield $r^*_{t+1} - \bar{g}_{t+1}$. Specifically, we calculate the model implied paths for r^*_{t+1}, μ_{t+1}, and α_{t+1} under the auxiliary assumptions that

1. $r^*_{t+1} - \bar{g}_{t+1}$ is constant at the average of D_{t+1}/V_t over the 1990-2023 time period;

2. $\bar{g}_{t+1}$ is equal each quarter to the median 10-year GDP growth forecast in the Survey of Professional Forecasters;[31]

[31] We linearly interpolate these data to develop a quarterly series for $\bar{g}_{t+1}$.

3. $\bar{g}_{t+1}$ is set equal to the trend from an HP filtered series of quarterly growth rates of U.S. corporate GVA; and

4. the expected dividend yield $r^*_{t+1} - \bar{g}_{t+1}$ is equal to the realized dividend yield D_{t+1}/V_t each period.

We show the results for $r^*_t, \bar{g}_t, \mu_t$, and α_t under these four alternative measurement scenarios in Figure 15. We include in this plot (in green) the values of these parameters that we obtain in our baseline measurement exercise in which our model with a representative U.S. household replicates the path for the current account.

Note, first, that the series for $r^*_t, \bar{g}_t, \mu_t$, and α_t that we obtain under the assumption that $r^*_{t+1} - \bar{g}_{t+1}$ is constant at the average of D_{t+1}/V_t over the 1990-2023 time period (blue) are so close to their counterparts in the baseline calibration (green) that it is difficult to distinguish the two alternative measurements in the figure. The reason for this similarity is that $r^*_{t+1} - \bar{g}_{t+1}$ *is* close to constant in our baseline calibration.

The time paths for $\bar{g}_{t+1}$ under the other specifications vary widely. Nonetheless, these alternative measurement procedures produce time series for other parameter values that are similar to those in our baseline specification, outside of the years around the peak of the dot-com boom in 2000 and the stock market boom in the last few years of our sample.

To understand this, note that when Tobin's Q is equal to one, the calibration procedure will deliver an output wedge, μ_{t+1} equal to one, independent of the values for r^*_{t+1} and $\bar{g}_{t+1}$. In that case, r^*_{t+1} and α_{t+1} are identified solely from labor's share and from the Euler equation for investment (equations 9 and 12) and because neither of those equations involves future trend growth, the imputed values for r^*_{t+1} and α_{t+1} are independent of $\bar{g}_{t+1}$. That is why the paths for r^*_{t+1} and α_{t+1} are similar across alternative models for expected growth in periods when Q (and thus μ_{t+1}) is close to one. The further we move away from Q=1, the larger is the impact of $\bar{g}_{t+1}$ on the imputed value for μ_{t+1}, which translates into larger impacts on the estimated values for α_{t+1} and r^*_{t+1}. For example, the SPF growth forecast in 2000 (the red line in the top-right panel) was quite strong compared to our baseline parameterization. Thus, that model requires a smaller output wedge μ_{t+1} to match observed valuations in 2000, which in turn calls for a higher value for α_{t+1} to match labor's share. Because a higher α_{t+1} implies higher rental income from capital, the imputed cost of capital r^*_{t+1} is also higher.

While different models for trend growth $\bar{g}_{t+1}$ deliver generally similar estimates for other model parameters, they generate wildly different predictions for the dynamics of the U.S. current account and thus the U.S. net foreign asset position. The reason is that the value of human wealth and thus desired consumption are very sensitive to the valuation multiple $(r^*_{t+1} - \bar{g}_{t+1})^{-1}$. Thus, in the context of our model, the baseline path for $\bar{g}_{t+1}$ is strongly

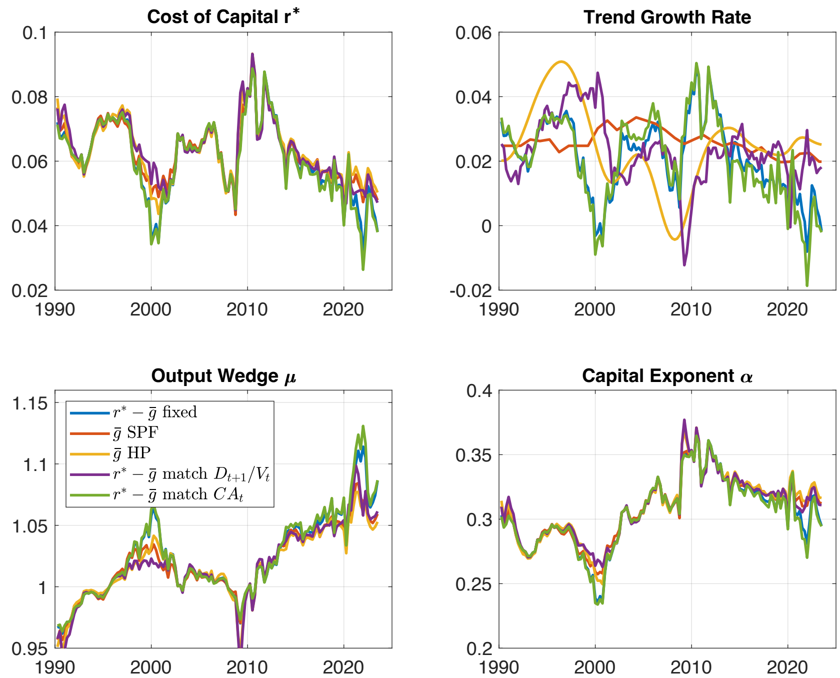


Figure 15: Sensitivity to Trend Growth Model

preferred to the alternatives we have considered.

8 Conclusion

Cross-border asset holdings have grown very large in recent decades. These large gross positions open the door to new channels for shocks to propagate internationally, especially shocks that affect asset values. Gourinchas and Rey (2014) showed that changes in asset values play a quantitatively important role, in an accounting sense, in driving the dynamics of the NFA position. We show that that finding extends with even more force in recent data: the unprecedented decline in U.S. NFA position since the Great Recession is primarily driven by a boom in the value of corporate equity that foreigners own in the United States.

We have presented a simple international macro-finance model to measure and interpret the factors driving changes in value of the U.S. corporate sector and the U.S. current account and NFA position over the period 1990-2023. Our model extends previous macro-finance models used for similar measurement exercises in integrating the evolution of the current account. In doing so, we reinforce previous findings that increases in the cash flows to firm owners, rather than changes in the valuation multiple of those cash flows, account for much of the increase in the value of the U.S. corporate sector over the past decade. Indeed, the share of U.S. corporate GVA available as free cash flow to owners of corporations has reached levels not previously seen in post-WWII data.

Our model extends previous work in international macroeconomics in developing an accounting of observed changes in the U.S. current account and NFA position that incorporates quantitatively realistic fluctuations in asset values. We find that the direct impact of changes in the valuation of the U.S. corporate sector on the U.S. NFA position through its mechanical impact on the valuation of ROW equity holdings in the U.S. has been large over the past decade, while the indirect impact of these developments on the current account through induced changes in the wealth to income ratio for U.S. households has been quite small.

Through the lens of our model, a rising share of factorless income in the United States is a key driver of rising U.S. asset valuations. This rise would not have mattered much for U.S. households absent foreign ownership of U.S. equity. But given high observed ROW ownership of U.S. firms, the rise in U.S. equity values during the 2010s was associated with a large increase in the portion of free cash from U.S. firms accruing to foreign owners, and a large consumption loss for American households.

While our model provides a transparent framework for interpreting macro and financial data, maintaining tractability required assuming risk-neutral foreign investors and an exogenous world interest rate. Modeling risk and risk aversion explicitly would introduce asset specific risk premia, generating an additional possible driver of valuations. We make some progress in that direction in Atkeson, Heathcote, and Perri (2023). Relatedly, in a fully general equilibrium multi-country setting, shocks in all countries would drive the current account, valuation effects, and NFA dynamics. Constructing and estimating such a model is an important avenue for future research.

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