Dollar Erosion: Understanding the Loss of Reserve Currency Status*

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Abstract

The U.S. dollar depreciated in April 2025 while domestic interest rates rose relative to Euro, the VIX increased, and the convenience yield on 1-year Treasurys fell relative to foreign-currency safe assets. These patterns represent a marked departure from historical correlations. Notably, the decline in the dollar convenience yield predates the April 2025 shock by two years. Our theoretical analysis shows that these movements are consistent with shifts in global demand for U.S. dollar safe assets and the perception that the U.S. may lose its reserve currency status. Using a calibrated model, we find that the loss of demand for dollar safe assets leads to a steady-state depreciation of the real value of the dollar of around 7.6%, decline in U.S. dollar safe asset convenience yield of 0.9%, and an increase in U.S. long-term interest rates of 0.9%.

JEL Codes: E44, F32, G15
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The current U.S. administration is re-engineering the financial and trade linkages that connect the U.S. with the rest of the world. Section 1 of this paper considers the bond and currency market response to the tariff announcements on April 2, 2025. We document the anomalous patterns of the dollar following this announcement which reflected flight away from the dollar rather than flight to the dollar and Treasurys as in previous episodes of global volatility. In short, the dollar was not behaving as the reserve currency. We then document that convenience yields on dollar safe assets – short-term Treasurys and repo – have been eroding over the last 2 years. Seen in this light, the events of April and May punctuated a trend of dollar erosion that predates the tariff shock.

Section 2 uses a calibrated model to compare across two steady states, one where the dollar is the reserve currency of the world and foreign investors pay a premium in line with historical data to own dollar assets, and one where the dollar is no longer the reserve currency of the world. This computation sheds light on two questions: first, it provides an endpoint for bond and currency markets in a hypothetical world where the dollar is no longer the reserve currency; second, it offers an estimate of how appreciated the dollar has been because of its reserve currency status.

There are a number of recent papers on the dollar, tariffs, and the dollar's reserve currency status since the April 2025 shock. On the empirical side, Acharya and Laarits (2025) and Jiang et al. (2025a) document the decrease in Treasury convenience yields after the shock, as well as the rise in U.S. interest rates and depreciation of the dollar. Ostry et al. (2025) and Pinter et al. (2025) further trace out the impact on the dollar and other assets. The findings in these papers are consistent with our empirical results. On the modeling side, Hassan et al. (2025) and Itskhoki and Mukhin (2025) examine how models can shed light on the recent episode. Hassan et al. (2025) ties the increase in U.S. interest rates and the reduction in the dollar's safety premium directly to the tariffs and the reduction of U.S. trade flows. Itskhoki and Mukhin (2025) study optimal tariffs in a model where gross financial positions are relevant and tariffs give rise to valuation effects. Similar to the present paper and the results in Jiang et al. (2024a), they note that a convenience yield on dollar safe assets can lead to a low return on dollar assets and a steady state trade deficit, and likewise the loss of the convenience yield can depreciate the dollar. Our analysis evaluates these possibilities in a quantitative international finance model and goes further than both Jiang et al. (2024a) and Itskhoki and Mukhin (2025).

1 Bond and Currency Markets

1.1 VIX and the Dollar

On April 2, President Trump announced the reciprocal tariffs to be imposed on a long list of countries. On April 4 China retaliated. The VIX, a measure of implied volatility in the U.S. stock market, more than doubled and peaked at 52 on April 8, 2025, up from 22 on April 1. This means that stock investors estimated the annualized volatility of S&P 500 stock returns to be around 52% per annum. Between April 1 and April 21, the U.S. dollar depreciated by 6.5% against the Euro. The depreciation of the dollar was surprising to market participants. Normally, in times of global volatility, such as during the GFC of 2008 and the onset of the pandemic in March 2020, the dollar appreciates as dollar-denominated assets benefit from a flight to safety. Not this time around.

Figure 1 documents this anomalous behavior of the dollar vis-a-vis the VIX. We plot the Euro/USD exchange rate against the VIX across the global financial crisis, the COVID shock, and the tariff shock. In the 2008 and COVID episodes, when VIX spiked, the dollar appreciated in a flight to safety pattern. In the recent episode, VIX spiked and the dollar depreciated.

1.2 Bond Yields and the Dollar

U.S. long-term interest rates rose significantly from April 1 to April 21. The yield spread between 10-year U.S. Treasury bonds and the 10-year German Bund, plotted on the left vertical axis in Figure 2, increased by 48 bps. We also plot the Euro/USD exchange rate against the right vertical axis. All else equal, a higher long-run interest rate on dollar investments should lead investors to shift capital into the U.S. dollar, thus strengthening the dollar. If we use long-run uncovered interest rate parity (UIP) as the benchmark, then, a 48 basis points increase in U.S. long-term yields relative to European yields for 10 years should immediately appreciate the dollar by at least 4.8%.[1] Yet, we observed a 6.5% depreciation, leaving a surprising gap of $6.5\% - (-4.8\%) = 11.3\%$.

1.3 Treasury and Dollar Convenience Yields

Consider a world investor who invests in Euros for one year rolling over their funds at the overnight Euro interbank rate ("€STR"). The investor does a foreign exchange swap to

[1] Long-run uncovered interest rate parity is a good benchmark model for exchange rates if exchange rates are mean-reverting (Lustig, Stathopoulos, and Verdelhan 2019).

FIGURE 1
DOLLAR-VOLATILITY DISCONNECT

Notes: This figure plots the exchange rate (left-axis) against the VIX (right-axis) for the global financial crisis (2008), the COVID shock (2020), and the tariff shock (2025).

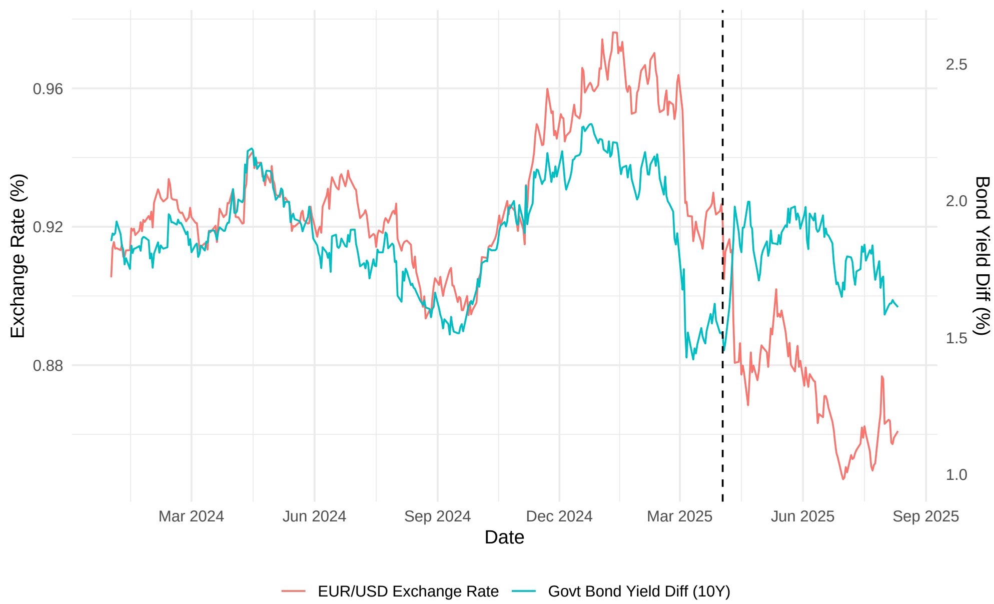

FIGURE 2
DOLLAR-YIELD DISCONNECT

Notes: This figure plots 10-year US-German Government Bond yield difference (right vertical axis) against the Euro/USD exchange rate (left vertical axis).

convert these cash flows at the end of the year into dollars. The package of the investment in the Euro safe asset and the swap is the payoff on a synthetic safe dollar security. We construct the yield spread between this package and that of an investment in the 1-year Treasury bill.

Jiang et al. (2021) construct a closely related spread—the difference between G10 1-year government bond yields, swapped from their local currencies into U.S. dollars, and the 1-year U.S. Treasury bill yield. In their sample from 1988 to 2017, this spread is almost always positive, reflecting a premium ("convenience yield") attached to the safe dollar Treasury bill. They infer, using a model, that world investors paid an average of 2% per annum to hold safe dollar assets. We use this 2% number in our calibrated model.

Turning to Figure 3, we plot the €STR-Treasury spread in red in the recent sample from 2021 to 2025. The vertical blue dashed line on the right is the Liberation day announcement. We can see that the Treasury convenience yield falls on that day. That is, the Treasury yield rises relative to the Euro safe asset rate. This fall in the Treasury convenience yield is also unusual, as Jiang et al. (2021) show that, historically, it rises during periods of financial turmoil.

The red line representing the 1-year Treasury convenience yield turns from positive to

FIGURE 3
TREASURY AND REPO CONVENIENCE YIELDS

Notes: This figure plots the cross-currency Euro/USD basis swap where the reference rates are €STR (Euro secured financing rate) and either the 1-year Treasury bill or SOFR (dollar secured financing rate).

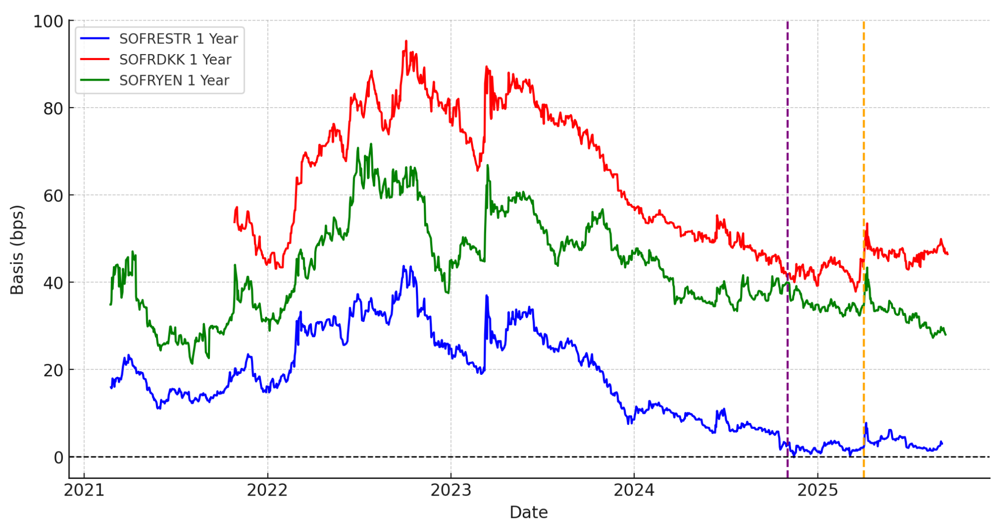

FIGURE 4
CROSS-CURRENCY SAFE ASSET BASIS.

Notes: This figure plots the cross-currency basis swap where the reference rates are ESTR (Euro secured financing rate), DKK LIBOR, Yen unsecured rate versus SOFR (dollar secured financing rate). We plot the time series of different tenors of the swap. We also plot the cross-currency Euro/USD basis based on U.S. Treasury yield and ESTR.

negative in the summer of 2024—an unusual development. Jiang et al. (2021) show that the 1-year Treasury has almost always carried a convenience yield relative to other G10 safe assets, averaging 22 basis points. Seen in this light, the Liberation Day shock punctuates a trend predating both April 2025 and the November 2024 election (green dashed line), in which the safe-asset status of U.S. Treasurys had already been eroding.

The purple line in the figure replaces the Treasury yield with a dollar repo rate, the secured overnight financing rate ("SOFR"). This dollar rate is based on the yield expected from rolling over a dollar investment in SOFR nightly for one year. Thus the measure is of a repo-derived dollar safe asset convenience yield rather than one from the Treasury. We see that this spread has also fallen over the past year, but has remained positive after the liberation day announcement. Indeed it rises upon the liberation day shock perhaps reflecting a shift away from Treasury and into dollar repo.

Figure 4 plots the dollar repo convenience yield against Danish Krone LIBOR (red) and Japanese Yen interbank rate (green) as well as the against the Euro safe rate. Although the levels differ across these currencies, we see that in all cases, the convenience yields on dollar safe assets relative to that of these other currencies have been declining over the past two years.

1.4 Exchange Rate Forecasts

Figure 5 shows forecasts of the Euro/USD exchange rate from the ECB's Survey of Professional Forecasters. The figure includes forecasts from three survey dates, each including forecasts extending over a four-year horizon. The figure shows that as the events of 2025 have transpired, the forecast for the dollar exchange rate fell. Moreover, over the forecast horizon at each of the dates, the dollar has been expected to depreciate.

2 Equilibrium without Reserve Asset Status

The reduction in the convenience yield on 1-year Treasurys starting in 2023 is consistent with investors questioning the reserve asset status of U.S. Treasurys. At longer tenors, the Treasury convenience yields have experienced a secular decline over the past 10 perhaps due to increased fiscal concerns as the Treasury has increased the supply of Treasurys (Jiang, Richmond, and Zhang 2025b). If U.S. Treasurys are no longer viewed as the world's preferred

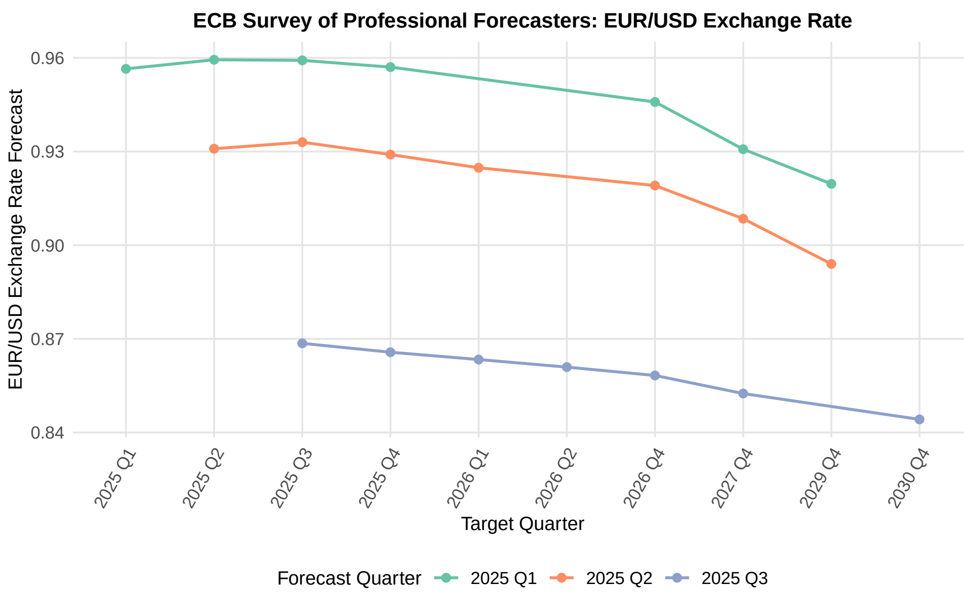

Figure 5
Exchange Rate Forecasts

Notes: This figure plots mean forecasts from the ECB survery of professional forecasters for the Euro vs the Dollar. Each line is a particular forecast date and each point represents the mean forecast for a target quarter as of that forecast quarter.

safe asset[2], then the status of the dollar as the world's reserve currency may be called into question. Coppola, Krishnamurthy, and Xu (2022) argue that the reserve currency has historically been housed in the country with the largest supply of safe and liquid government assets. Shifts in the reserve currency, such as from the Dutch Florin to the British Pound Sterling and from the Pound to the Dollar, occurred when the safety of investments in these government assets was called into question and the convenience yield on these government assets fell (Chen et al. 2025). If this is the case, Coppola, Krishnamurthy, and Xu (2022) predict that the convenience yield on all safe dollar assets – public and private – would fall and the observed fall in the convenience yield on dollar repo is consistent with this prediction. Furthermore, if dollar assets are questioned as the world's reserve asset, then a shock such as that of liberation day, may lead to a flight away from the dollar rather than a flight to the dollar. The event-study evidence around liberation day is also consistent with this hypothesis. Thus, we conclude that the events of the last two years reflect *erosion* in the

[2]If investors around the world grow concerned that their investments in U.S. Treasury bonds may become subject to "sanctions," then they may prefer to own financial instruments that are immune to these threats. Stephen Miran, the chairman of the Council of Economic Advisors, has suggested that foreign investments in Treasurys may be subject to a user fee.

status of the dollar as the world's reserve currency.

We next turn to quantitatively assessing how the asset markets will re-equilibrate in a world where the U.S. is no longer the safe asset provider to the rest of the world. That is, where will exchange rates and interest rates equilibrate in a steady state where the reserve demand for the dollar completely disappears? The answer to this question helps benchmark where the dollar and interest rates may settle after the ups and downs of the last several months. It also sheds direct light on the Miran hypothesis: *"The root of the economic imbalances lies in persistent dollar overvaluation that prevents the balancing of international trade, and this overvaluation is driven by inelastic demand for reserve assets."*[3] How much on average had the dollar been "over-valued" and how much lower have U.S. interest rates been because of the reserve currency status of the dollar?

To answer these questions, we present a calibrated model in which investors have liquidity demand for dollar safe assets which are produced by the U.S. government and private sector. The two special economic ingredients that we include to define the role of the U.S. in the world economy are that, (1) the U.S. net foreign asset position involves a negative position in dollar safe assets and a long position in foreign assets, consistent with the characterization of the gross asset position of Gourinchas and Rey (2007); and, (2) the dollar safe assets carry a convenience yield in line with the estimates in Jiang et al. (2021).

The setup closely follows Jiang (2024); Jiang, Krishnamurthy, and Lustig (2024a), who propose an international real business cycle model with a convenience yield on dollar safe assets to study the U.S. exorbitant privilege and the transmission mechanism for U.S. monetary policy shocks. The world consists of two countries: a home country (the U.S.) and a foreign country. Each produces a distinct consumption good. The model abstracts from nominal frictions: the dollar and the foreign currency represent the respective consumption baskets of home and foreign households, which are composed of both home and foreign goods. Let p_t and p_t^* denote the prices of home and foreign goods in their respective currencies. Let x_t denote the log dollar-foreign real exchange rate, which is the relative price of the home consumption basket in terms of the foreign basket. A higher x_t corresponds to a stronger dollar and a more expensive home consumption basket. For tractability, we study an endowment economy.

Households. Each country is populated by a unit mass of identical households and a government. The home households' consumption basket is a CES aggregation of home and

[3] See Miran, A User's Guide to Restructuring the Global Trading System.

foreign goods:

$$c_t = \left[\alpha^{1-\eta} c_{H,t}^{\eta} + (1-\alpha)^{1-\eta} c_{F,t}^{\eta}\right]^{1/\eta}.$$

Households derive utility from consumption and from holding dollar (home) bonds. The bonds provide non-pecuniary benefits captured by a bond-in-utility specification, as in Krishnamurthy and Vissing-Jorgensen (2012); Jiang et al. (2024a). The home households' lifetime utility is

$$\mathbb{E}_0 \left[\sum_{t=0}^{\infty} \delta^t u(C_t)\right], \quad \text{with} \quad C_t \equiv c_t + \frac{1}{1-\sigma}\omega_H (b_{H,t} + d_{H,t})^{1-\sigma},$$

where $u(\cdot)$ satisfies the usual properties. The elasticity of bond demand is $1/\sigma$, $b_{H,t}$ are dollar government bonds while $d_{H,t}$ are dollar private bonds. These bonds have the same payoffs, offer the same convenience benefits, and are perfect substitutes. For simplicity, we assume that foreign bonds offer no convenience benefits, although the data we reviewed in Section 1 does suggest that the convenience yields on Euro safe bonds may have risen in 2025.

Each home household is endowed with $D_{H,t}$ of private dollar bonds.[4] These bonds are backed by the household's resources in the next period. A key assumption is that the household must have positive holdings of the dollar bonds and cannot as a result sell more than $D_{H,t}$ of the bonds:

$$b_{H,t} \geq 0, \qquad d_{H,t} \geq 0.$$

The home households are subject to the following flow budget constraint, expressed in units of the home consumption basket.

$$\begin{aligned} & p_t y_t + D_{H,t} + \exp(r_{t-1})(b_{H,t-1} + d_{H,t-1}) + \exp(r^*_{t-1} - x_t) b_{F,t-1} + g_t = \\ & \quad p_t c_{H,t} + p^*_t \exp(-x_t)(1+\nu_t) c_{F,t} + \exp(r_{t-1}) D_{H,t-1} + (b_{H,t} + d_{H,t}) + \exp(-x_t) b_{F,t}. \end{aligned} \tag{1}$$

The left-hand side captures income from the endowment of home goods, proceeds from selling the bond endowment of $D_{H,t}$, returns on bond holdings from the previous period, and a government transfer g_t. The right-hand side captures consumption expenditures, repayment

[4] Another way to explain the bonds in our model setup is to say that the U.S. endowment is produced from two one-period (full depreciation) types of capital: "bond" capital and "equity" capital. The goods produced by the bond capital is $D_{H,t}$ at date $t+1$. The bond capital also generates liquidity services for the U.S. household. The household can sell some of this bond capital to the foreign investor who also generates liquidity services from the bond capital. But the U.S. household cannot sell more bond capital than it owns; that is, its holdings must be positive.

on the bond endowment and new bond purchases. Households pay a proportional tariff ν_t on the foreign goods in their consumption bundle, which is rebated back to them.

Foreign households are modeled in a similar way. Their lifetime utility is

$$\mathbb{E}_0 \left[\sum_{t=0}^{\infty} \delta^t u\left(C_t^*\right) \right], \quad \text{with} \quad C_t^* \equiv c_t^* + \frac{1}{1-\sigma} \omega_H^* \exp(x_t)(b_{H,t}^* + d_{H,t}^*)^{1-\sigma},$$

which also requires them to have positive holdings of the dollar bonds: $b_{H,t}^* \geq 0$, $d_{H,t}^* \geq 0$. Utility is over the market value of the dollar bonds, expressed in units of the foreign currency:

$$c_t^* = \left[(\alpha^*)^{1-\eta^*} (c_{F,t}^*)^{\eta^*} + (1-\alpha^*)^{1-\eta^*} (c_{H,t}^*)^{\eta^*} \right]^{1/\eta^*}.$$

We allow the elasticity of substitution between home and foreign goods to differ, i.e., $\eta^* \neq \eta$. Doing so allows us to consider the separate impacts of reserve currency status on imports and exports.

The foreign household's flow budget constraint is,

$$\begin{aligned} p_t^* y_t^* + \exp(r_{t-1} + x_t)(b_{H,t-1}^* + d_{H,t-1}^*) + \exp(r_{t-1}^*) b_{F,t-1}^* + g_t^* = \\ p_t^* c_{F,t}^* + p_t \exp(x_t)(1 + \nu_t^*) c_{H,t}^* + \exp(x_t)(b_{H,t}^* + d_{H,t}^*) + b_{F,t}^*. \end{aligned}$$

Foreign households face no portfolio restrictions on short selling their domestic bonds. In equilibrium, they will short-sell foreign bonds and use the proceeds to purchase dollar bonds.

Safe Asset Issuers. Safe dollar bonds consist of the private supply of dollar safe bonds, $D_{H,t}$, and one-period, risk-free bonds $B_{H,t}$ issued by the home government. For simplicity, we assume that the foreign government does not issue bonds.

The home government's net revenue consists of net bond issuance and tariff collection:

$$g_t = B_{H,t} - B_{H,t-1} \exp(r_{t-1}) + \nu_t p_t^* \exp(-x_t) c_{F,t}, \tag{2}$$

which are redistributed to local households via lump-sum transfers. The foreign government's net revenue consists of tariff collection only, i.e., $g_t^* = \nu_t^* p_t \exp(x_t) c_{H,t}^*$, which is also rebated to foreign households.

Market Clearing. The goods markets and the bond markets clear in the usual way:

$$c_{H,t} + c^*_{H,t} = y_t, \qquad c_{F,t} + c^*_{F,t} = y^*_t. \tag{3}$$

$$b_{H,t} + b^*_{H,t} = B_{H,t}, \qquad d_{H,t} + d^*_{H,t} = D_{H,t}. \tag{4}$$

$$b^*_{F,t} + b_{F,t} = 0. \tag{5}$$

The exogenous variables are the goods and bond endowments and tariffs: $(y_t, y^*_t, B_{H,t}, D_{H,t}, \nu_t, \nu^*_t)_{t=0}^{\infty}$. Appendix A.2 provides the full set of endogenous variables and equilibrium conditions.

2.1 Equilibrium and Steady-State Analysis

We start by substituting the government budget (2) into the home household budget (1) to clarify the impact of tariffs and reserve currency status. This yields,

$$\begin{aligned} D_{H,t} + p_t y_t + \exp(r_{t-1})(b_{H,t-1} + d_{H,t-1}) + \exp(r^*_{t-1} - x_t) b_{F,t-1} + B_{H,t} - B_{H,t-1}\exp(r_{t-1}) = \\ p_t c_{H,t} + \exp(-x_t) p^*_t c_{F,t} + \exp(r_{t-1}) D_{H,t-1} + b_{H,t} + d_{H,t} + \exp(-x_t) b_{F,t}. \end{aligned} \tag{6}$$

Tariffs drop out in the budget constraint. We rewrite this expression dropping time subscripts in the steady state:

$$(b_H + d_H)(\exp(r) - 1) + b_F(\exp(r^*) - 1) - (B_H + D_H)(\exp(r) - 1) = pc_H + \exp(-x)p^* c_F - py.$$

Using the home bond market clearing conditions we can further express this as,

$$\underbrace{b_F(\exp(r^*) - 1) - (b^*_H + d^*_H)(\exp(r) - 1)}_{\text{investment income}} = \underbrace{pc_H + \exp(-x)p^* c_F - py}_{\text{trade balance}}. \tag{7}$$

Home is long b_F foreign bonds paying interest rate r^* and short domestic private and government bonds paying interest rate r. If there is a convenience yield on home bonds, then we will see that $r < r^*$, so that the left-hand side reflects the investment income/seigniorage that the U.S. receives on its provision of dollar bonds. The right-hand side is the trade deficit, so that if investment income is positive then there is a trade deficit in steady state.

The net foreign asset position for the foreign household is,

$$NFA_t = d^*_{H,t} + b^*_{H,t} + b^*_{F,t}. \tag{8}$$

In equilibrium $b_{F,t} = -b^*_{F,t}$. Then, in steady state,

$$\underbrace{(b^*_H + d^*_H)\left(\exp(r^*) - \exp(r)\right)}_{\text{seigniorage from gross portfolio}} - \underbrace{NFA(\exp(r^*) - 1)}_{\text{income from net portfolio}} = pc_H + \exp(-x)p^*c_F - py. \tag{9}$$

The second term involving the NFA is standard in models: if the home country has some steady state earnings (payments) from the NFA, then the trade balance will be in surplus (deficit). The first term involving the gross holdings is special to our modeling of the U.S. as safe asset provider to the world.

We are interested in asking how the loss of reserve currency status impacts equilibrium exchange rates and interest rates. This will work through the impact on the seigniorage revenue term $(b^*_H + d^*_H)(\exp(r^*) - \exp(r))$, both via closing the gap in equilibrium between r^* and r, and on reducing in equilibrium the foreign holdings $b^*_H + d^*_H$.

We will impose that the $NFA = 0$ in the steady state which simplifies the exposition. Then, we can rewrite, (7) as,

$$\underbrace{(b^*_H + d^*_H)(\exp(r^*) - \exp(r))}_{\text{investment income}} = \underbrace{pc_H + \exp(-x)p^*c_F - py}_{\text{trade balance}}. \tag{10}$$

which clarifies that in the steady state, the seigniorage revenue from foreign demand for dollar bonds ("exorbitant privilege") funds the trade balance.

Intertemporal Euler equations pin down interest rates. First for the home investor:

$$\begin{aligned} 1 - \omega_H(b_{H,t} + d_{H,t})^{-\sigma} &= \mathbb{E}_t\left[\delta \frac{u'(C_{t+1})}{u'(C_t)} \exp(r_t)\right], \\ 1 &= \mathbb{E}_t\left[\delta \frac{u'(C_{t+1})}{u'(C_t)} \exp(-\Delta x_{t+1} + r^*_t)\right], \end{aligned}$$

and second for the foreign investor,

$$\begin{aligned} 1 &= \mathbb{E}_t\left[\delta \frac{u'(C^*_{t+1})}{u'(C^*_t)} \exp(r^*_t)\right], \\ 1 - \omega^*_H(b^*_{H,t} + d^*_{H,t})^{-\sigma} &= \mathbb{E}_t\left[\delta \frac{u'(C^*_{t+1})}{u'(C^*_t)} \exp(\Delta x_{t+1} + r_t)\right]. \end{aligned}$$

In the steady state, the Euler equations simplify and give,

$$1 - \omega_H(b_H + d_H)^{-\sigma} = 1 - \omega^*_H(b^*_H + d^*_H)^{-\sigma} = \delta \exp(r) \tag{11}$$

$$1 = \delta \exp(r^*) \tag{12}$$

We see that if $\omega_H, \omega_H^* > 0$ then $r^* > r$. We also see that if ω_H^* falls — that is foreign demand for dollar bonds falls — then r rises. This is an effect that has played out in the world as analyzed in Section 1.

Households' intra-temporal consumption choices give,

$$\frac{c_{H,t}}{c_{F,t}} = \frac{\alpha}{1-\alpha}\left(\frac{p_t}{p_t^* \exp(-x_t)(1+\nu_t)}\right)^{1/(\eta-1)}, \tag{13}$$

$$\frac{c_{F,t}^*}{c_{H,t}^*} = \frac{\alpha^*}{1-\alpha^*}\left(\frac{p_t^*}{p_t \exp(x_t)(1+\nu_t^*)}\right)^{1/(\eta^*-1)}, \tag{14}$$

with price indices satisfying

$$p_t = \alpha^{1-\eta}\left[\frac{\alpha^{1-\eta}c_{H,t}^\eta + (1-\alpha)^{1-\eta}c_{F,t}^\eta}{c_{H,t}^\eta}\right]^{(1-\eta)/\eta},$$

$$p_t^* = (\alpha^*)^{1-\eta^*}\left[\frac{\alpha^{1-\eta^*}(c_{F,t}^*)^{\eta^*} + (1-\alpha^*)^{1-\eta^*}(c_{H,t}^*)^{\eta^*}}{(c_{F,t}^*)^{\eta^*}}\right]^{(1-\eta^*)/\eta^*}.$$

From this equation system, we can see the economics of what will happen if we set ω_H^* to zero. From equation (10) we see that b_H^* and d_H^* will go to zero reducing the investment income/reserve currency seigniorage of the U.S. In turn, the trade balance must fall. Since the home households' purchasing power declines while the foreign households' purchasing power rises, in order to clear (13) and (14), the foreign goods which are preferred by the foreign households must rise in price relative to the home goods. Thus, to equilibrate the goods market with a lower trade balance for home, the dollar must depreciate. The extent of the depreciation depends on the elasticity of imports and exports to the exchange rate, which are parameterized by η and η^*.

2.2 Quantification

We consider a range of parameter values to quantify the impact of the loss of reserve currency status on interest rates, exchange rates, and external imbalances. Our baseline calibration assumes that the U.S. dollar bond (both private and government) enjoys a 2% convenience yield, which is consistent with the estimates in Jiang et al. (2021). Koijen and Yogo (2020) estimate a smaller magnitude convenience yield of 1.41% using an international asset demand system and the appendix presents results based on calibrating to their estimates. There is evidence that the private bond has a smaller convenience yield than the goverment bond (Krishnamurthy and Vissing-Jorgensen 2012). We are setting aside this difference based on the result from Jiang et al. (2021) that the bulk of the convenience yield stems from safe bonds whose payoffs are in dollars.

We choose σ to target the semi-elasticity of the bond convenience yield with respect to the log quantity of bonds based on results in Krishnamurthy and Vissing-Jorgensen (2012). More precisely, Table 1 of the paper reports that a one log point increase in debt/GDP ratio leads do a decline in the AAA-Treasury spread of 0.89 basis points. They also report that the convenience yield of Treasury bonds relative to AAA corporate bonds is 0.47% in their sample (i.e. AAA bonds also carry a convenience yield). For our computation what is important is the overall convenience yield on Treasury bonds not the relative convenience yield. Given our estimate of a 2% convenience yield on Treasurys, we scale up the semi-elasticity by 200/47, or approximately 4×0.89. To target this empirical estimate, we perturb the steady state by increasing the home bond supply by 1% in log terms. When the bond curvature parameter σ is equal to 1.75, we obtain the desired semi-elasticity as found in the data.[5]

We use data from the Federal Reserve's Flow of Funds to estimate the total supply of U.S. safe debt and the portion held by foreign investors, calibrating our model to values from Q4 2016. The asset classes we classify as safe debt include Treasury securities, agency securities, commercial paper, and net short-term bank liabilities. When calculating total supply, we exclude holdings by the Federal Reserve from these four categories.

When we consider short-term bank liabilities to be safe U.S. dollar assets we include four types of issuers: U.S.-chartered depository institutions, foreign banking offices, banks in U.S.-affiliated areas, and credit unions. For each of these banking sectors, we compute net short-term liabilities by subtracting short-term assets from short-term liabilities.

To measure foreign holdings, we use the Flow of Funds data on foreign asset holdings across the relevant categories. Based on these calculations, the total supply of safe U.S. dollar assets amounts to 150% of GDP in Q4 2016, with foreign investors holding 30% of that total. These estimates inform ω_H and ω_H^*

On the trade side, we present two calibrations. We presents results for $\eta = \eta^* = 1/3$ following Itskhoki and Mukhin (2021). There is empirical evidence of a higher import elasticity in the U.S. for foreign goods relative to the export elasticity for U.S. goods (Chinn 2004). We also present a calibration with $\eta = 2/3, \eta^* = 1/3$.

We use 2016 U.S. data to target (import+export/GDP) $\times$ final-goods-ratio of 9.83%, which implies a home bias parameter α of 0.95. Note that imports and exports in the data

[5] Alternatively, to target the Koijen and Yogo (2020) estimates we need a σ of 3.17 instead of 1.75, or a more inelastic demand curve. Appendix A.3 reports the numerical results using this parameter value. The convenience yield response in the scenario of convenience loss is greater.

Variable	Notation	Value
Primitive Parameters		
Time discount factor	δ	0.975
Risk aversion	γ	2.0
Home elasticity of substitution	η	1/3
Foreign elasticity of substitution	η^*	1/3
Targets		
Annual convenience yield		2%
U.S. bond/GDP ratio	$B_{H,t} + D_{H,t}$	150%
Share held by foreign investors	$(b^*_{H,t} + d^*_{H,t})/(B_{H,t} + D_{H,t})$	30%
Net foreign assets/GDP	NFA_t	0%
Import+Export/GDP		9.83%
Implied Parameters		
Home Bias	α	0.95
Bond curvature	σ	1.75
Home bond preference	ω_H	6.19%
Foreign bond preference	ω^*_H	1.41%

Notes: The model is simulated at the quarterly frequency. We report annualized values for the discount factor and convenience yield.

include both final goods and intermediate input goods, while consumption in our model is final goods. We calibrate based on a 50% ratio of intermediate goods to total goods following Itskhoki and Mukhin (2021).

2.3 Convenience Loss

Tables 1 and 2 and present the first set of results. In both of these tables, we present a baseline calibrated as described above. We then compute a counterfactual where we set $\omega^*_H = 0$, capturing a scenario where foreign demand for dollar safe assets disappears. Note that we maintain the U.S. (home) demand for U.S. dollar assets at ω_H as in the baseline. In Table 1, we set $\eta = 1/3$, $\eta^* = 1/3$ while in Table 2 we set $\eta = 2/3, \eta^* = 1/3$. In both cases, the drop in foreign demand for dollar bonds increases U.S. interest rates.[6] The rise occurs because the U.S. investor reabsorbs the dollar bonds and, given downward sloping demand, requires a higher interest rate. The interest rate rises by about 90 bps. In both cases, the dollar depreciates. We see that the trade balance closes from -0.90% to zero, reflecting the

[6]The foreign interest rate is not reported and remains unaffected at 2.5% (the discount factor) because we do not consider that loss of demand for dollars may result in a rise in demand for foreign currency bonds.

loss in the exorbitant privilege. In the case of Table 1, the foreign reserve demand implies a change in the dollar of 7.62%. When we increase the U.S. trade elasticity, as in Table 2, the impact on the dollar is as expected smaller at 4.43%. The higher trade elasticity means that the exchange rate has to adjust less to accommodate the change in the trade balance.

This experiment provides a theoretical grounding to understand the events of April and May 2025. Any perceived loss of reserve currency status should be expected to both increase U.S. long-term interest rates and depreciate the dollar.

However, this statement comes with a caveat: our model and hence our computation is for the long-run real exchange rate; any shifts in the price level due to inflationary concerns can also be expected to impact the trajectory of the dollar. Likewise, any shifts in monetary policy along a transition path to a new steady state will also impact the dollar today. Thus our model sheds light on one element of the dollar depreciation of April and May 2025.

2.4 Tariff and Convenience Loss

Next, we consider a case where the U.S. and the foreign country impose a 50% tariff on each other's goods and the U.S. loses its convenience status. While at present many estimates place the tariff rate around 15%, numbers in the range of 50% are discussed in policy discussion, and we illustrate this case noting that effects are roughly linear in the tariff.

The results are reported in Tables 3 and 4. The baseline is as above, with the case of no tariffs and U.S. dollar bonds enjoying a convenience yield. The convenience loss case now sets $\omega_H^* = 0$ and sets the tariff at 50%.

The results with symmetric elasticities in Table 3 reflect the same depreciation in the dollar and rise in interest rates as in our baseline case with no tariffs. The symmetric tariff closes the trade balance but has no separate impact on asset prices. The impact on asset prices is due to the asymmetry of the U.S. losing the exorbitant privilege, which is the same magnitude of seigniorage loss in Tables 1 and 2.

In the case of asymmetric elasticities of Table 4, we see that, somewhat surprisingly, the dollar appreciates in this scenario. Interest rates still rise as the U.S. has to absorb the bond sales of foreign investors. The dollar appreciation can be understood as follows. With $\eta > \eta^*$, the model needs a stronger level of the dollar in order to make imports equal to exports in the high-tariff steady state. In particular, when reserve asset demand disappears, the U.S. no longer earns seigniorage from foreigners, so in steady state the trade balance must be zero. With $\eta > \eta^*$, U.S. import demand is more price-sensitive than foreign demand for U.S. goods. Under the tariff scenario, U.S. households must reduce their imports of foreign goods even more. To produce the zero trade balance, the model needs a relative-price tilt: a

	Baseline	Convenience Loss	Difference
Log Dollar FX (%)	7.62	-0.00	-7.62
Conv Yield (%)	2.00	1.08	-0.92
Seigniorage/GDP (%)	0.90	0.00	-0.90
Debt Held Abroad/GDP (%)	45.00	0.00	-45.00
Dollar Interest Rate (%)	0.53	1.45	0.92
Trade Balance/GDP (%)	-0.90	0.00	0.90
Import/GDP (%)	5.37	5.11	-0.26
Export/GDP (%)	4.47	5.11	0.65
H Goods Consumed by H (%)	95.53	94.89	-0.65
F Goods Consumed by F (%)	94.16	94.89	0.73
NFA/GDP (%)	0.00	0.00	0.00

Table 1
Steady-State Results in Baseline Elasticity Calibration

Notes: The model is calibrated at the quarterly frequency. Trade elasticity $\eta = \eta^* = 1/3$ (Itskhoki and Mukhin 2021). The convenience yield and interest rate are annualized.

	Baseline	Convenience Loss	Difference
Log Dollar FX (%)	4.43	0.00	-4.43
Conv Yield (%)	2.00	1.07	-0.93
Seigniorage/GDP (%)	0.90	0.00	-0.90
Debt Held Abroad/GDP (%)	45.00	0.00	-45.00
Dollar Interest Rate (%)	0.53	1.46	0.93
Trade Balance/GDP (%)	-0.90	0.00	0.90
Import/GDP (%)	5.37	4.85	-0.52
Export/GDP (%)	4.47	4.85	0.38
H Goods Consumed by H (%)	95.53	95.15	-0.38
F Goods Consumed by F (%)	94.36	95.15	0.79
NFA/GDP (%)	0.00	0.00	0.00

Table 2
Steady-State Results with High and Asymmetric Trade Elasticity

Notes: The model is simulated at the quarterly frequency. Baseline parameter values, with $\eta = 2/3$, $\eta^* = 1/3$. The convenience yield and interest rate are annualized.

	Baseline	Convenience Loss	Difference
Log Dollar FX (%)	7.62	0.00	-7.62
Conv Yield (%)	2.00	1.11	-0.89
Seigniorage/GDP (%)	0.90	0.00	-0.90
Debt Held Abroad/GDP (%)	45.00	0.00	-45.00
Dollar Interest Rate (%)	0.53	1.42	0.89
Trade Balance/GDP (%)	-0.90	-0.00	0.90
Import/GDP (%)	5.37	2.85	-2.52
Export/GDP (%)	4.47	2.85	-1.62
H Goods Consumed by H (%)	95.53	97.15	1.62
F Goods Consumed by F (%)	94.16	97.15	3.00
NFA/GDP (%)	0.00	0.00	0.00

Table 3
Steady-State Results with High Tariffs and Convenience Loss; Baseline Elasticity

Notes: The model is simulated at the quarterly frequency. Trade elasticity of $\eta = \eta^* = 1/3$ and 50% tariffs. The convenience yield and interest rate are annualized.

	Baseline	Convenience Loss	Difference
Log Dollar FX (%)	4.43	15.72	11.30
Conv Yield (%)	2.00	1.09	-0.91
Seigniorage/GDP (%)	0.90	0.00	-0.90
Debt Held Abroad/GDP (%)	45.00	0.00	-45.00
Dollar Interest Rate (%)	0.53	1.44	0.91
Trade Balance/GDP (%)	-0.90	-0.00	0.90
Import/GDP (%)	5.37	2.09	-3.28
Export/GDP (%)	4.47	2.09	-2.38
H Goods Consumed by H (%)	95.53	97.91	2.38
F Goods Consumed by F (%)	94.36	97.52	3.16
NFA/GDP (%)	0.00	0.00	0.00

Table 4
Steady-State Results with High Tariffs and Convenience Loss; High and Asymmetric Elasticity

Notes: The model is simulated at the quarterly frequency. Baseline parameter values of $\eta = 2/3$, $\eta^* = 1/3$ and 50% tariffs. The convenience yield and interest rate are annualized.

stronger dollar that (i) makes foreign goods cheaper for U.S. households (raising U.S. imports despite tariffs) and (ii) makes U.S. goods more expensive for foreigners (reducing exports).

This comparison underlines that the asset price movements in April and May of 2025 were unlikely due to the direct impact of the tariffs and more likely due to the impact that the liberation day announcements have had on the erosion of safe asset status of dollar assets.

2.5 Doubling U.S. Debt

Over the last 15 years the U.S. Treasury debt outstanding has more than doubled. Jiang et al. (2025b) present evidence that the increase in Treasury debt has led to a decrease in the convenience yield on Treasurys. We examine the impact of a doubling of U.S. debt $(B_H + D_H)$ on interest rates and exchange rates in our model.

Table 5 presents this case for our baseline calibration. As expected, the convenience yield falls and interest rates rise by about 1.40%. The doubling also has an impact on exchange rates. Given lower convenience yields and symmetric bond demand for U.S. and foreign households, the foreign investor purchases double the amount of dollar safe assets. However, as the convenience yield more than halves, the seigniorage revenue to the U.S. falls and hence the dollar depreciates by 3.15%.

This result is sensitive to the elasticity of the bond demand function since it depends on the relative change in foreign quantities versus the dollar convenience yield. In Table 6 we calibrate our model to Koijen and Yogo (2020)'s estimates of a higher σ (more inelastic demand) than our baseline. In this case, the convenience yield falls more, 1.78% vs 1.40%, causing the seigniorage revenue to fall more and thereby resulting in a larger dollar depreciation.

2.6 Present Value of Exorbitant Privilege

The fall in the value of the dollar and rise in U.S. interest rates imply an effective loss of "wealth" of the U.S. household. We can size the impact of the scenario on wealth by computing the lost present value of exorbitant privilege when $\omega_H^* = 0$. Given that the U.S. bond enjoys a convenience yield of 2%, and that the foreign investors hold $150\% \times 30\% = 45\%$ of U.S. GDP in dollar bonds, the U.S. earns a seigniorage revenue of $45\% \times 2\% = 0.90\%$ of GDP per year. We can compute the present value of this claim to translate it into a "wealth" equivalent. In our model, the discount rate is 2.5% and we could use this rate to compute the present value. However, we step outside our model for this computation and take the more relevant case where the stream is risky and the discount rate reflects GDP risk. We take two approaches.

	Baseline	Double Debt Level	Difference
Log Dollar FX (%)	7.62	4.47	-3.15
Conv Yield (%)	2.00	0.60	-1.40
Seigniorage/GDP (%)	0.90	0.54	-0.36
Debt Held Abroad/GDP (%)	45.00	90.00	45.00
Dollar Interest Rate (%)	0.53	1.94	1.40
Trade Balance/GDP (%)	-0.90	-0.54	0.36
Import/GDP (%)	5.37	5.26	-0.11
Export/GDP (%)	4.47	4.72	0.26
H Goods Consumed by H (%)	95.53	95.28	-0.26
F Goods Consumed by F (%)	94.16	94.47	0.31
NFA/GDP (%)	0.00	0.00	0.00

TABLE 5
STEADY-STATE RESULTS

Notes: We compare the steady-state values in our baseline calibrated model with those in an economy where the debt level is doubled. The model is calibrated at the quarterly frequency. The convenience yield and interest rate are annualized.

	Baseline	Double Debt Level	Difference
Log Dollar FX (%)	7.62	1.66	-5.96
Conv Yield (%)	2.00	0.22	-1.78
Seigniorage/GDP (%)	0.90	0.20	-0.70
Debt Held Abroad/GDP (%)	45.00	90.00	45.00
Dollar Interest Rate (%)	0.53	2.31	1.78
Trade Balance/GDP (%)	-0.90	-0.20	0.70
Import/GDP (%)	5.37	5.17	-0.20
Export/GDP (%)	4.47	4.96	0.50
H Goods Consumed by H (%)	95.53	95.04	-0.50
F Goods Consumed by F (%)	94.16	94.74	0.58
NFA/GDP (%)	-0.00	0.00	0.00

TABLE 6
STEADY-STATE RESULTS WITH MORE INELASTIC BOND DEMAND

Notes: We compare the steady-state values in our baseline model with those in an economy where the debt level is doubled. The model is calibrated at the quarterly frequency. We calibrate to a more inelastic bond demand curve ($\sigma = 4.38$) from Koijen and Yogo (2020). The convenience yield and interest rate are annualized.

In our first approach, we note that the exercise is identical to that done in Jiang et al. (2024b) where the computation is of the present value of the stream of fiscal surpluses, where the fiscal surplus is cointegrated with GDP (and hence as risky as GDP). Following that paper, we use a risk-adjusted discount rate of 4.68% (which includes a 3% risk premium on GDP claims) and a growth rate of 2.95% per year, which leads to a discount rate of $4.68\% - 2.95\% = 1.73\%$. Then, the present value of the exorbitant privilege is

$$\frac{seigniorage}{r-g} = \frac{0.90\%}{1.73\%} = 52\%$$

of U.S. GDP or roughly \$15 trillion in today's dollars. The U.S. has an "asset" worth \$15 trillion and the dividend on this asset finances part of the trade balance. If reserve demand for the dollar was to disappear, then the U.S. would effectively lose \$15 trillion of wealth.

The previous computation is based on Jiang et al. (2024b) estimates of r and g from historical data (sample from 1947–2020). In our second approach, we are interested in computing the current present value, so the appropriate strategy is to estimate discount and growth rates prospectively. To do so, we follow 2025 AQR's capital market assumptions for major asset classes. We use AQR's current estimates from `www.aqr.com`. For U.S. large cap equities, they assume a dividend yield of $3.3\% - 1.8\% = 1.5\%$, based on a discount rate of 3.3% and a growth rate of 1.8%. Using their prevailing U.S. risk-free rate (U.S. cash return) of 1.7%, this corresponds to an equity risk premium of 1.6%. Assuming that the GDP claim is 2/3 as risky as the equity claim, the GDP risk premium is $1.6\% \times 2/3 = 1.07\%$. So, the $r-g$ for the GDP claim is $1.7\% + 1.07\% - 1.8\% = 0.97\%$. The present value of the exorbitant privilege is

$$\frac{seigniorage}{r-g} = \frac{0.90\%}{0.97\%} = 93\%$$

or roughly \$29 trillion.

2.7 Valuation Effects in the Gross Asset Position

In the previous exercises, we assumed that the U.S. had zero net foreign assets (NFA), both in the baseline and in the new steady state after the loss of reserve currency status. This assumption suppresses an impact that will arise along the transition to the new steady state. Even with a zero NFA, the U.S. is net long foreign assets and short U.S. dollar assets. Thus, as the dollar depreciates in the transition to the new steady state the NFA will change from zero to a positive value in the new steady state. This effect will dampen the loss of seigniorage we have studied.

We include this valuation effect and redo our estimates. Specifically, we take the investors' holdings of foreign bonds as calibrated in the baseline, and let the exchange rate adjust to the new steady-state value $\tilde{x}_t$ to derive the new NFA level:

$$\widetilde{NFA}_t(\tilde{x}_t) = b_{F,t} \exp(-\tilde{x}_t) - (b^*_{H,t} + d^*_{H,t}). \tag{15}$$

After these profits or losses are realized, we allow the investors to re-optimize their portfolio allocations, taking the new wealth levels and the new NFA as given.

Note that at the new steady state, the U.S. will no longer be running a seigniorage long/short position. Rather, since $\widetilde{NFA}_t > 0$ when $\tilde{x}_t < 0$, the U.S. will earn r^* on this asset position. To solve for the new exchange rate, we solve for the fixed point:

$$\underbrace{(\exp(r^*) - 1)\widetilde{NFA}(\tilde{x})}_{\text{income from net portfolio}} = pc_H + \exp(-\tilde{x})p^* c_F - py. \tag{16}$$

Table 7 presents the results. The dollar still depreciates; the impact is 6.95% rather than the baseline effect of 7.62%. The reason is that the NFA moves up to 3.25% because of the dollar depreciation and this in turn means the trade balance in the new steady state becomes −0.08 rather than zero. In this way, the currency position embedded in the U.S. NFA position provides a natural hedge that partially dampens the effect of the loss of seigniorage.

	Baseline	Convenience Loss	Difference
Log Dollar FX (%)	7.62	0.67	-6.95
Conv Yield (%)	2.00	1.08	-0.92
Seigniorage/GDP (%)	0.90	0.08	-0.82
Debt Held Abroad/GDP (%)	45.00	0.00	-45.00
Dollar Interest Rate (%)	0.53	1.45	0.92
Trade Balance/GDP (%)	-0.90	-0.08	0.82
Import/GDP (%)	5.37	5.13	-0.24
Export/GDP (%)	4.47	5.05	0.59
H Goods Consumed by H (%)	95.53	94.95	-0.59
F Goods Consumed by F (%)	94.16	94.83	0.67
NFA/GDP (%)	0.00	3.25	3.25

Table 7
Steady-State Results with Endogenous NFA Adjustments

Notes: The model is calibrated at the quarterly frequency. The convenience yield and interest rate are annualized. We set initial NFA to 0.

3 Conclusion

The dollar depreciated in April 2025 while interest rates in the U.S. rose relative to Euro, and the convenience yield on 1-year Treasurys fell relative to foreign currency safe assets. The decline in the dollar convenience yield predates the April 2025 shock. Our theoretical analysis clarifies that these moves are consistent with shifts in demand for U.S. dollar safe assets and the perception that the U.S. may lose its reserve currency status. Our calibrated model offers guidance on how much a loss of reserve demand for dollar assets will impact interest rates and the real value of the dollar.

The analysis also indicates that tariffs and loss of reserve demand interact in nuanced ways. To return to Figure 2, the persistent dollar depreciation is most consistent with a future in which the tariffs may not be very high but the U.S. loses its reserve currency status. The U.S. could lose its reserve currency status because of perceived loss of safety of Treasury bonds, fears of fiscal dominance, or fears of capital controls. While the tariff announcement of April 2, 2025 has led these fears to surface, the direct impact of tariffs may or may not be the central factor.

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Appendix

A Model Derivations

A.1 Decisions

Within-period Consumption Choice. Given the amount of final consumption goods, home households choose intermediate good composition to minimize the cost, i.e.,

$$\min_{c_{H,t}, c_{F,t}} p_t c_{H,t} + p_t^* \exp(-x_t)(1+\nu_t) c_{F,t},$$

s.t.

$$c_t = \left[\alpha^{1-\eta} c_{H,t}^{\eta} + (1-\alpha)^{1-\eta} c_{F,t}^{\eta}\right]^{1/\eta} \tag{A.1.1}$$

The Lagrangian is

$$\mathcal{L} = -p_t c_{H,t} - p_t^* \exp(-x_t)(1+\nu_t) c_{F,t} + \zeta\left[\left[\alpha^{1-\eta} c_{H,t}^{\eta} + (1-\alpha)^{1-\eta} c_{F,t}^{\eta}\right]^{1/\eta} - c_t\right],$$

which implies the first order condition

$$\begin{aligned} -p_t + \zeta c_t^{1-\eta} \alpha^{1-\eta} c_{H,t}^{\eta-1} &= 0, \\ -p_t^* \exp(-x_t)(1+\nu_t) + \zeta c_t^{1-\eta} (1-\alpha)^{1-\eta} c_{F,t}^{\eta-1} &= 0. \end{aligned}$$

To pin down the lagrangian multiplier, note that the FOCs can be restated as

$$c_{H,t} = p_t^{1/(\eta-1)} \zeta^{1/(1-\eta)} \alpha c_t \tag{A.1.2}$$

$$c_{F,t} = (p_t^* \exp(-x_t)(1+\nu_t))^{1/(\eta-1)} \zeta^{1/(1-\eta)} (1-\alpha) c_t \tag{A.1.3}$$

i.e.,

$$\frac{c_{H,t}}{c_{F,t}} = \frac{\alpha}{1-\alpha}\left(\frac{p_t}{p_t^* \exp(-x_t)(1+\nu_t)}\right)^{1/(\eta-1)}.$$

Hence,

$$\begin{aligned}\frac{p_t c_{H,t}}{p_t^* \exp(-x_t)(1+\nu_t) c_{F,t}} &= \frac{\alpha}{1-\alpha}\left(\frac{p_t}{p_t^* \exp(-x_t)(1+\nu_t)}\right)^{\eta/(\eta-1)} \\ &= \frac{\alpha^{1-\eta}}{(1-\alpha)^{1-\eta}}\left(\frac{c_{H,t}}{c_{F,t}}\right)^{\eta} \qquad \text{(A.1.4)}\end{aligned}$$

Substituting equation (A.1.2),(A.1.3) into (A.1.1) yield

$$c_t = \left[\alpha^{1-\eta}(p_t^{1/(\eta-1)}\zeta^{1/(1-\eta)}\alpha c_t)^{\eta} + (1-\alpha)^{1-\eta}\left((p_t^* \exp(-x_t)(1+\nu_t))^{1/(\eta-1)}\zeta^{1/(1-\eta)}(1-\alpha)c_t\right)^{\eta}\right]^{1/\eta}$$

Further simplification gives

$$\zeta^{1/(1-\eta)} = \left[\alpha p_t^{\eta/(\eta-1)} + (1-\alpha)\left(p_t^* \exp(-x_t)(1+\nu_t)\right)^{\eta/(\eta-1)}\right]^{-1/\eta}$$

Substituting back into equation (A.1.2), (A.1.3)

$$\begin{aligned} c_{H,t} &= \frac{\alpha p_t^{1/(\eta-1)}}{\left[\alpha p_t^{\eta/(\eta-1)} + (1-\alpha)\left(p_t^* \exp(-x_t)(1+\nu_t)\right)^{\eta/(\eta-1)}\right]^{1/\eta}} c_t, \\ c_{F,t} &= \frac{(1-\alpha)\left(p_t^* \exp(-x_t)(1+\nu_t)\right)^{1/(\eta-1)}}{\left[\alpha p_t^{\eta/(\eta-1)} + (1-\alpha)\left(p_t^* \exp(-x_t)(1+\nu_t)\right)^{\eta/(\eta-1)}\right]^{1/\eta}} c_t \end{aligned}$$

Then we have

$$p_t c_{H,t} + p_t^* \exp(-x_t)(1+\nu_t) c_{F,t} = c_t,$$

which implies

$$p_t = \alpha^{1-\eta} c_{H,t}^{\eta-1} \left[\alpha^{1-\eta} c_{H,t}^{\eta} + (1-\alpha)^{1-\eta} c_{F,t}^{\eta}\right]^{(1-\eta)/\eta},$$

$$p_t^* \exp(-x_t)(1+\nu_t) = (1-\alpha)^{1-\eta} c_{F,t}^{\eta-1} \left[\alpha^{1-\eta} c_{H,t}^{\eta} + (1-\alpha)^{1-\eta} c_{F,t}^{\eta}\right]^{(1-\eta)/\eta}$$

Simplifying this expression yields

$$p_t = \alpha^{1-\eta} \left[\frac{\alpha^{1-\eta} c_{H,t}^{\eta} + (1-\alpha)^{1-\eta} c_{F,t}^{\eta}}{c_{H,t}^{\eta}}\right]^{(1-\eta)/\eta}$$

$$p_t^* \exp(-x_t)(1+\nu_t) = (1-\alpha)^{1-\eta} \left[\frac{\alpha^{1-\eta} c_{H,t}^{\eta} + (1-\alpha)^{1-\eta} c_{F,t}^{\eta}}{c_{F,t}^{\eta}}\right]^{(1-\eta)/\eta}$$

Likewise, we can derive similar expressions for the foreign ones:

$$p_t^* = (\alpha^*)^{1-\eta^*} \left[\frac{(\alpha^*)^{1-\eta^*} {c_{F,t}^*}^{\eta^*} + (1-\alpha^*)^{1-\eta^*} {c_{H,t}^*}^{\eta^*}}{{c_{F,t}^*}^{\eta^*}}\right]^{(1-\eta^*)/\eta^*}$$

$$p_t \exp(x_t)(1+\nu_t^*) = (1-\alpha^*)^{1-\eta^*} \left[\frac{(\alpha^*)^{1-\eta^*} {c_{F,t}^*}^{\eta^*} + (1-\alpha^*)^{1-\eta^*} {c_{H,t}^*}^{\eta^*}}{{c_{H,t}^*}^{\eta^*}}\right]^{(1-\eta^*)/\eta^*}$$

Intertemporal Solution Households' intertemporal budget constraint is

$$D_{H,t} + p_t y_t + \exp(r_{t-1})(b_{H,t-1} + d_{H,t-1}) + \exp(r^*_{t-1} - x_t) b_{F,t-1} + g_t = \\ c_t + \exp(r_{t-1}) D_{H,t-1} + b_{H,t} + d_{H,t} + \exp(-x_t) b_{F,t}.$$

The Lagrangian is

$$\mathbb{E}_0 \Bigg[\sum_{t=0}^{\infty} \delta^t u \left(c_t + \frac{1}{1-\sigma} \omega_H (b_{H,t} + d_{H,t})^{1-\sigma} \right) \\ + \sum_{t=1}^{\infty} \zeta_t (D_{H,t} + p_t y_t + \exp(r_{t-1})(b_{H,t-1} + d_{H,t-1}) + \exp(r^*_{t-1} - x_t) b_{F,t-1} + g_t \\ - c_t - \exp(r_{t-1}) D_{H,t-1} - b_{H,t} - d_{H,t} - \exp(-x_t) b_{F,t}) \Bigg]$$

Let $C_t = c_t + \frac{1}{1-\sigma} \omega_H (b_{H,t} + d_{H,t})^{1-\sigma}$

The first-order conditions w.r.t. c_t, $b_{H,t}$ and $b_{F,t}$ are:

(Note that the first order condition w.r.t. $d_{H,t}$ duplicates $b_{H,t}$)

$$\delta^t u'(C_t) - \zeta_t = 0,$$

$$\mathbb{E}_t \left[\delta^t u'(C_t) \omega_H (b_{H,t} + d_{H,t})^{-\sigma} - \zeta_t + \exp(r_t) \zeta_{t+1} \right] = 0,$$

$$\mathbb{E}_t \left[-\exp(-x_t) \zeta_t + \exp(r^*_t - x_{t+1}) \zeta_{t+1} \right] = 0$$

which give the implied Euler Equation:

$$1 - \omega_H (b_{H,t} + d_{H,t})^{-\sigma} = \mathbb{E}_t \left[\delta \frac{u'(C_{t+1})}{u'(C_t)} \exp(r_t) \right],$$

$$1 = \mathbb{E}_t \left[\delta \frac{u'(C_{t+1})}{u'(C_t)} \exp(r^*_t - \Delta x_{t+1}) \right]$$

Similarly, the foreign household's Lagrangian is defined as

$$
\begin{aligned}
\mathbb{E}_0 \Bigg[& \sum_{t=0}^{\infty} \delta^t u \left(c_t^* + \frac{1}{1-\sigma} \omega_H^* \exp(x_t)(b_{H,t}^* + d_{H,t}^*)^{1-\sigma} \right) \\
& + \sum_{t=1}^{\infty} \zeta_t^* (p_t^* y_t^* + \exp(r_{t-1} + x_t)(b_{H,t-1}^* + d_{H,t-1}^*) + \exp(r_{t-1}^*) b_{F,t-1}^* + g_t^* \\
& - c_t^* - \exp(x_t) b_{H,t}^* - \exp(x_t) d_{H,t}^* - b_{F,t}^*) \Bigg]
\end{aligned}
$$

Define $C_t^* = c_t^* + \frac{1}{1-\sigma}\omega_H^* \exp(x_t)(b_{H,t}^* + d_{H,t}^*)^{1-\sigma}$. Then, we have

$$
\begin{aligned}
1 &= \mathbb{E}_t \left[\delta (\frac{u'(C_{t+1}^*)}{u'(C_t^*)}) \exp(r_t^*) \right], \\
1 - \omega_H^* (b_{H,t}^* + d_{H,t}^*)^{-\sigma} &= \mathbb{E}_t \left[\delta (\frac{u'(C_{t+1}^*)}{u'(C_t^*)}) \exp(r_t + \Delta x_{t+1}) \right]
\end{aligned}
$$

A.2 Macro Synthesis

There are 15 endogenous variables in each period t:

$$
(c_t, c_{H,t}, c_{F,t}, b_{H,t}, b_{F,t}, p_t, c_t^*, c_{H,t}^*, c_{F,t}^*, b_{H,t}^*, b_{F,t}^*, p_t^*, r_t, r_t^*, x_t)_{t=0}^{\infty}.
$$

The model implies the following 16 equations in each period, one of which is redundant. These 16 equations include 2 consumption aggregation equations,

$$
\begin{aligned}
c_t &= \left[\alpha^{1-\eta} c_{H,t}^{\eta} + (1-\alpha)^{1-\eta} c_{F,t}^{\eta} \right]^{1/\eta}, \\
c_t^* &= \left[(\alpha^*)^{1-\eta^*} (c_{F,t}^*)^{\eta^*} + (1-\alpha^*)^{1-\eta^*} (c_{H,t}^*)^{\eta^*} \right]^{1/\eta^*},
\end{aligned}
$$

2 household budget conditions are

$$
\begin{aligned}
D_{H,t} + p_t y_t + \exp(r_{t-1})(b_{H,t-1} + d_{H,t-1}) + \exp(r_{t-1}^* - x_t) b_{F,t-1} + B_{H,t} - B_{H,t-1} \exp(r_{t-1}) = \\
p_t c_{H,t} + \exp(-x_t) p_t^* c_{F,t} + \exp(r_{t-1}) D_{H,t-1} + b_{H,t} + d_{H,t} + \exp(-x_t) b_{F,t},
\end{aligned}
$$

$$p_t^* y_t^* + \exp(r_{t-1} + x_t)(b_{H,t-1}^* + d_{H,t-1}^*) + \exp(r_{t-1}^*) b_{F,t-1}^* =$$
$$p_t^* c_{F,t}^* + \exp(x_t) p_t c_{H,t}^* + \exp(x_t)(b_{H,t}^* + d_{H,t}^*) + b_{F,t}^*,$$

2 goods market clearing conditions

$$c_{H,t} + c_{H,t}^* = y_t,$$
$$c_{F,t} + c_{F,t}^* = y_t^*,$$

3 bond market clearing conditions

$$B_{H,t} = b_{H,t} + b_{H,t}^*,$$
$$D_{H,t} = d_{H,t} + d_{H,t}^*,$$
$$0 = b_{F,t} + b_{F,t}^*,$$

4 within-period consumption choices

$$\left[\alpha^{1-\eta} c_{H,t}^{\eta} + (1-\alpha)^{1-\eta} c_{F,t}^{\eta}\right]^{1/\eta - 1} \alpha^{1-\eta} c_{H,t}^{\eta-1} = p_t,$$
$$\left[\alpha^{1-\eta} c_{H,t}^{\eta} + (1-\alpha)^{1-\eta} c_{F,t}^{\eta}\right]^{1/\eta - 1} (1-\alpha)^{1-\eta} c_{F,t}^{\eta-1} = p_t^* \exp(-x_t)(1+\nu_t),$$
$$\left[(\alpha^*)^{1-\eta^*} (c_{F,t}^*)^{\eta} + (1-\alpha^*)^{1-\eta^*} (c_{H,t}^*)^{\eta^*}\right]^{1/\eta^* - 1} (\alpha^*)^{1-\eta^*} (c_{F,t}^*)^{\eta^*-1} = p_t^*,$$
$$\left[(\alpha^*)^{1-\eta^*} (c_{F,t}^*)^{\eta^*} + (1-\alpha^*)^{1-\eta^*} (c_{H,t}^*)^{\eta^*}\right]^{1/\eta^* - 1} (1-\alpha^*)^{1-\eta^*} (c_{H,t}^*)^{\eta^*-1} = p_t \exp(x_t)(1+\nu_t^*),$$

and 4 Euler equations

$$1 - \omega_H (b_{H,t} + d_{H,t})^{-\sigma} = \mathbb{E}_t \left[\delta \frac{u'(C_{t+1})}{u'(C_t)} \exp(r_t)\right],$$
$$1 = \mathbb{E}_t \left[\delta \frac{u'(C_{t+1})}{u'(C_t)} \exp(-\Delta x_{t+1} + r_t^*)\right],$$
$$1 = \mathbb{E}_t \left[\delta \frac{u'(C_{t+1}^*)}{u'(C_t^*)} \exp(r_t^*)\right],$$
$$1 - \omega_H^* (b_{H,t}^* + d_{H,t}^*)^{-\sigma} = \mathbb{E}_t \left[\delta \frac{u'(C_{t+1}^*)}{u'(C_t^*)} \exp(\Delta x_{t+1} + r_t)\right].$$

The households' optimal consumption choices also imply

$$p_t c_{H,t} + p_t^* \exp(-x_t)(1+\nu_t)c_{F,t} = c_t,$$

a useful identity that will be used in the analysis.

A.3 Additional Results: Koijen and Yogo (2020) Bond Calibration

In this section, we calibrate the bond demand elasticity based on Koijen and Yogo (2020)'s empirical estimate, which requires a higher curvature parameter σ. Specifically, Koijen and Yogo (2020) report a mean demand elasticity of 3.2 for long-term bonds. Assuming an average duration of 5 years, this implies that a 1% log change in debt quantity is associated with $100/(5 \times 3.2) = 6.25$ basis point change in bond convenience yield. Moreover, Koijen and Yogo (2020) report a convenience yield estimate of 1.41% for the U.S. dollar. To match these moments, the bond curvature parameter is set to $\sigma = 4.38$, reflecting a more inelastic demand curve.

The results are in Tables A.1, A.2, A.3, and A.4. The calibration with the Koijen and Yogo (2020) estimates looks broadly similar. Because we adopt a lower steady-state value of the convenience yield in the steady-state, the effects of losing reserve currency status on the seigniorage revenue and the dollar exchange rate are smaller. However, because the bond curvature parameter is higher, the interest rate effects are significantly larger.

	Baseline	Convenience Loss	Difference
Log Dollar FX (%)	5.61	-0.00	-5.61
Conv Yield (%)	1.47	0.31	-1.16
Seigniorage/GDP (%)	0.66	0.00	-0.66
Debt Held Abroad/GDP (%)	45.00	0.00	-45.00
Dollar Interest Rate (%)	1.06	2.22	1.16
Trade Balance/GDP (%)	-0.66	0.00	0.66
Import/GDP (%)	5.25	5.06	-0.19
Export/GDP (%)	4.59	5.06	0.48
H Goods Consumed by H (%)	95.41	94.94	-0.48
F Goods Consumed by F (%)	94.41	94.94	0.52
NFA/GDP (%)	-0.00	0.00	0.00

TABLE A.1
STEADY-STATE RESULTS WITH BASELINE

Notes: The model is calibrated at the quarterly frequency. Trade elasticity $\eta = \eta^* = 1/3$ (Itskhoki and Mukhin 2021) and bond curvature and convenience yield from Koijen and Yogo (2020). The convenience yield and interest rate are annualized.

	Baseline	Convenience Loss	Difference
Log Dollar FX (%)	3.25	-0.00	-3.25
Conv Yield (%)	1.47	0.31	-1.16
Seigniorage/GDP (%)	0.66	-0.00	-0.66
Debt Held Abroad/GDP (%)	45.00	0.00	-45.00
Dollar Interest Rate (%)	1.06	2.22	1.16
Trade Balance/GDP (%)	-0.66	0.00	0.66
Import/GDP (%)	5.25	4.87	-0.38
Export/GDP (%)	4.59	4.87	0.28
H Goods Consumed by H (%)	95.41	95.13	-0.28
F Goods Consumed by F (%)	94.56	95.13	0.57
NFA/GDP (%)	0.00	-0.00	-0.00

TABLE A.2
STEADY-STATE RESULTS WITH HIGH AND ASYMMETRIC TRADE ELASTICITY

Notes: The model is simulated at the quarterly frequency. Baseline parameter values, with $\eta = 2/3$, $\eta^* = 1/3$, and bond curvature and convenience yield from Koijen and Yogo (2020) The convenience yield and interest rate are annualized.

	Baseline	Convenience Loss	Difference
Log Dollar FX (%)	5.61	0.00	-5.61
Conv Yield (%)	1.47	0.34	-1.13
Seigniorage/GDP (%)	0.66	0.00	-0.66
Debt Held Abroad/GDP (%)	45.00	0.00	-45.00
Dollar Interest Rate (%)	1.06	2.19	1.13
Trade Balance/GDP (%)	-0.66	-0.00	0.66
Import/GDP (%)	5.25	2.82	-2.43
Export/GDP (%)	4.59	2.82	-1.76
H Goods Consumed by H (%)	95.41	97.18	1.76
F Goods Consumed by F (%)	94.41	97.18	2.77
NFA/GDP (%)	-0.00	0.00	0.00

Table A.3
Steady-State Results with High Tariffs and Convenience Loss

Notes: The model is simulated at the quarterly frequency. Trade elasticity $\eta = \eta^* = 1/3$ (Itskhoki and Mukhin 2021) and bond curvature and convenience yield from Koijen and Yogo (2020). The convenience yield and interest rate are annualized.

	Baseline	Convenience Loss	Difference
Log Dollar FX (%)	3.25	15.72	12.46
Conv Yield (%)	1.47	0.32	-1.15
Seigniorage/GDP (%)	0.66	0.00	-0.66
Debt Held Abroad/GDP (%)	45.00	0.00	-45.00
Dollar Interest Rate (%)	1.06	2.21	1.15
Trade Balance/GDP (%)	-0.66	0.00	0.66
Import/GDP (%)	5.25	2.10	-3.15
Export/GDP (%)	4.59	2.10	-2.49
H Goods Consumed by H (%)	95.41	97.90	2.49
F Goods Consumed by F (%)	94.56	97.51	2.95
NFA/GDP (%)	0.00	0.00	0.00

Table A.4
Steady-State Results with High Tariffs and Convenience Loss; High and Asymmetric Elasticity

Notes: The model is simulated at the quarterly frequency. Baseline parameter values, with $\eta = 2/3$, $\eta^* = 1/3$, and bond curvature and convenience yield from Koijen and Yogo (2020). The convenience yield and interest rate are annualized.