Safe U.S. Assets and U.S. Capital Flows

Charles Engel
University of Wisconsin – Madison
NBER and CEPR

May 9, 2019

(Very incomplete and preliminary version)

Contact: Department of Economics, University of Wisconsin, 1180 Observatory Drive, Madison, WI 53711. Email: cengel@ssc.wisc.edu. This paper was prepared for Conference on "Global Safe Assets, International Reserves, and Capital Flow"May 20-21, 2019, City University of Hong Kong, Hong Kong, organized by Global Research Unit, Department of Economics & Finance, City University of Hong Kong, and Journal of International Money and Finance. I thank Steve Pak Yeung Wu for excellent research assistance, and for allowing me to dip into the robustness appendix of our joint paper. I also thank Pierre-Olivier Gourinchas for some useful discussions related to this work.

An interesting and well-known fact from the U.S. balance of payments accounts is that while the U.S. is an international net debtor, its net income on its international portfolio is positive. Figure 1 reproduces the dynamics of the U.S. net international asset position from the Bureau of Economic Analysis (2019):

Figure 1

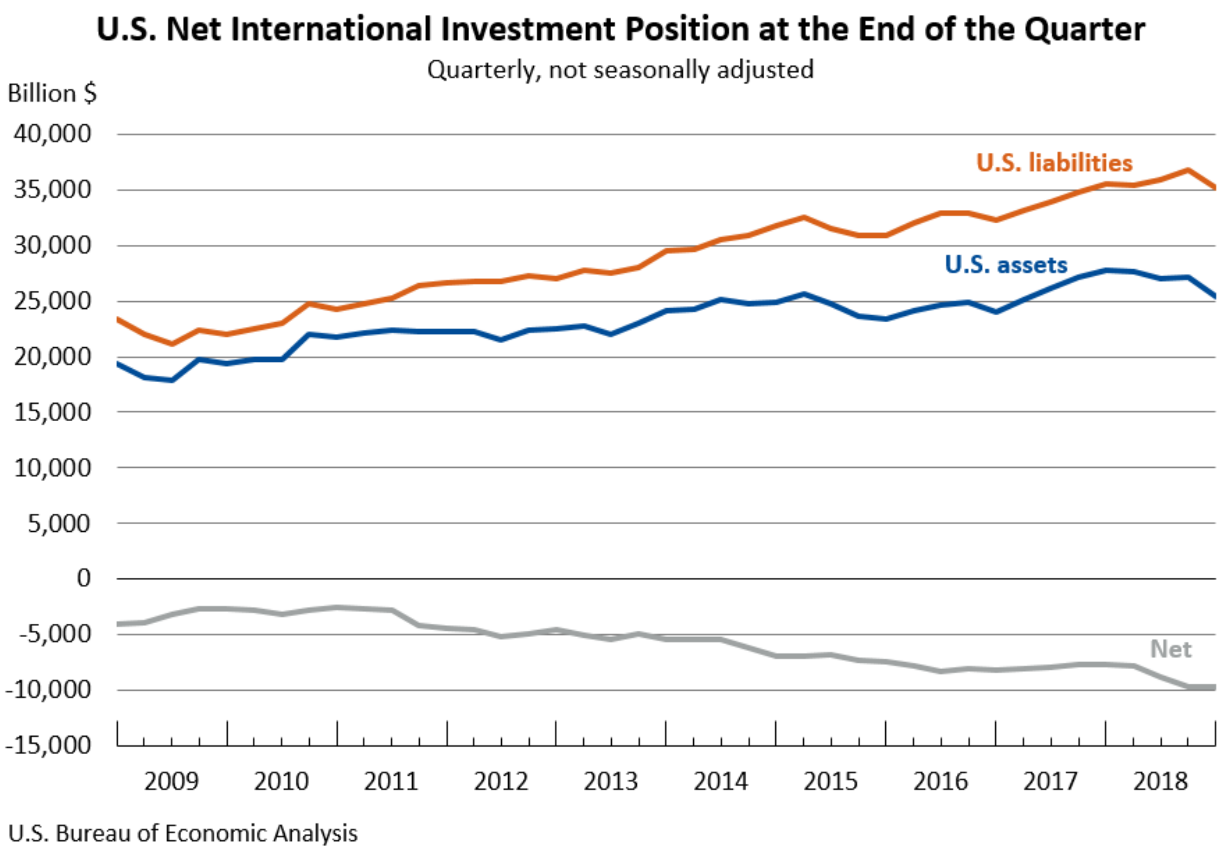
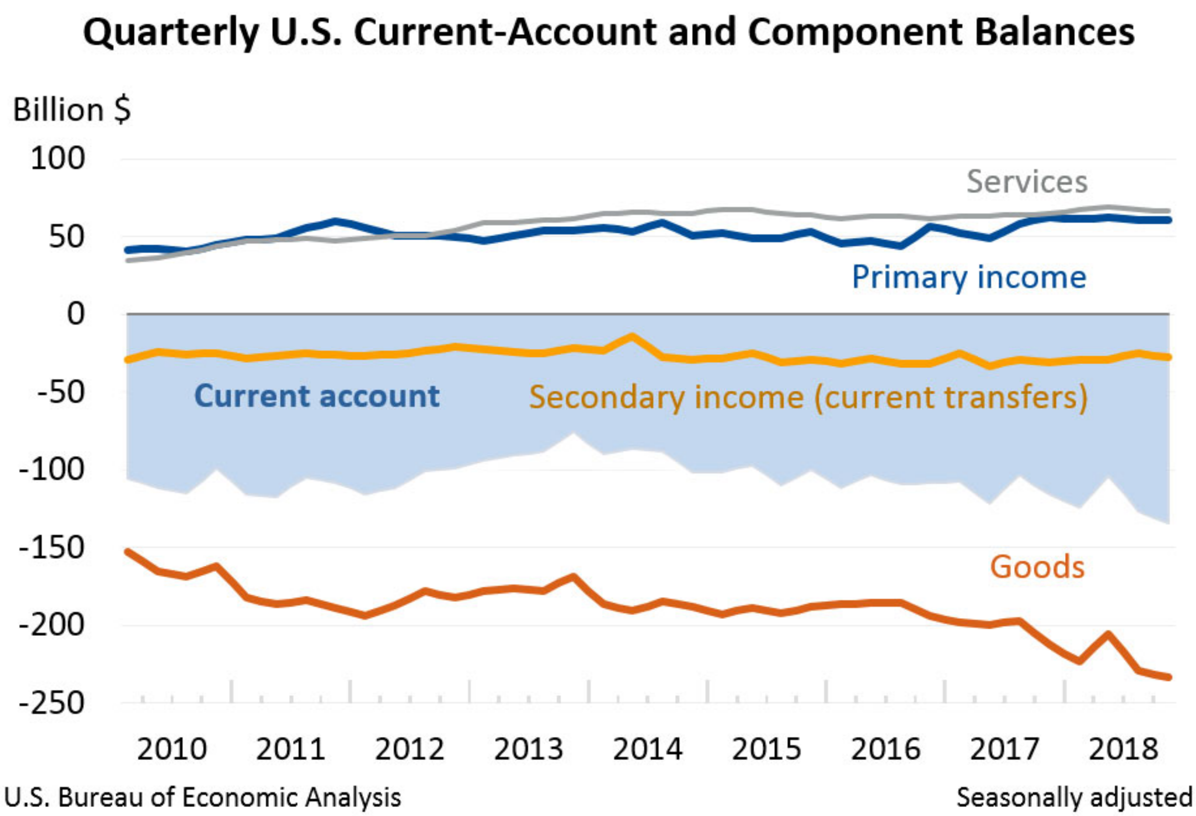


Figure 2, also reproduced from the Bureau of Economic Analysis (2019), shows the components of the U.S. current account balance since 2010. The overall balance has been negative during this entire period, mainly driven by a deficit in goods trade (though also accompanied by a small net negative balance in transfers.) The services component of trade has been in surplus. The overall negative current account balance implies that, absent valuation changes, the U.S. net foreign asset position should be declining. This is consistent with what Figure 1 shows, though Figure 1 also incorporates changes in the values of assets held across borders. One would expect, then, that the net income from abroad for the U.S. is negative. But primary income in Figure 2 – which is almost all net income from foreign investments – is positive for every year in the 2010-2018 period.

Figure 2



These figures illustrate the "exorbitant privilege" of the U.S., highlighted by Gourinchas and Rey (2007). It must be the case that the rate of return on U.S. investments abroad exceeds the return of foreigners on their investments in the U.S. A back-of-the-envelope calculation suggests the magnitude of the difference in returns: The annual net foreign income receipts for the U.S. in 2018 amounted to $1060 bn. The U.S. net international investment position at the end of 2017 was -$9635 bn, on $36,729 bn in liabilities to foreigners versus $27,094 bn ownership of foreign assets. For example, if the U.S. earned on average a return of 5.0 percent on its investments abroad, then, in order to reconcile these numbers, it must have had to pay only a 0.8 percent return on its assets held by foreigners.

These calculations imply that foreign demand for U.S. assets is driven by demand for safe holdings that have low yields. There has been much attention paid to the provision of "safe assets" to global financial markets, particularly in the form of U.S. dollar-denominated government assets. However, there seems to be no consensus on the meaning of "safe". As Humpty Dumpty is alleged to have said, "When I use a word, it means just what I choose it to mean – nothing more nor less." A natural meaning that has been explored prominently is the traditional finance definition of low risk – nominal dollar assets are safe because they provide a good hedge against adverse global developments. (See, for example, Gourinchas et al. (2010), Maggiori (2017) and, Farhi and Maggiori (2018).) In fact, dollar assets can earn less than the return on riskless assets, because their returns are negatively correlated with the world business cycle. In particular, they provide insurance against major global economic "disasters".

While empirical evidence certainly provides evidence to support that notion of safety, there is another sense in which U.S. nominal bonds are safe – a notion that is closely related to liquidity. In this meaning, an asset is safe when there is no private information about the asset's value. Gorton (2017) states: "A safe asset is an asset that is (almost always) valued at face value without expensive and prolonged analysis. By design, there is no benefit to producing (private) information about its value, and this is common knowledge." Because the asset can be traded at face value without costly investigation, the asset is liquid. Investopedia (Nickolas, 2018) defines liquid assets as: "cash on hand or an asset that can be readily converted to cash. An asset that can readily be converted into cash is similar to cash itself because the asset can be sold with little impact on its value."

U.S. government assets are especially liquid, and they are valued for their liquidity. These assets are liquid first because there is very little chance that the U.S. government will default on its sovereign obligations. Because debt is issued in nominal terms, there is a risk of partial default through inflation, but the Federal Reserve has been perceived to be strongly independent of political influences and strongly committed to low inflation. In addition, there are network externalities. One reason that dollar government assets are readily accepted at face value, without "expensive and prolonged analysis" is that investors throughout the world are familiar with these assets. They are familiar because the assets are widely held for their liquidity – the asset is valuable because of the network externalities.

Because the U.S. earns positive income on its portfolio position, its ability to service its net international debt position is not in question. The U.S. can run current account deficits indefinitely, borrowing on net from the rest of the world year after year, because its net earnings on its portfolio are positive. It is my contention that the difference between the yield on the foreign assets held by the U.S. and the return on U.S. assets held by foreigners is not entirely a reflection of the greater riskiness of the U.S. foreign investments. That is, the analogy of the U.S. as the "world's investment banker" (Gourinchas and Rey, 2007) is not entirely accurate. To some extent, this difference in returns reflects the liquidity premium or "convenience yield" on U.S. government assets held abroad. Krishnamurthy and Vissing-Jorgensen (2012) and Nagel (2016) study the convenience yield on U.S. Treasury assets. del Negro et al. (2018) find that convenience yields account for the long-run drop in global real interest rates.

The exorbitant privilege of the U.S., then, is linked to the liquidity of its government assets. Indeed, Appelbaum (2019) notes that in 2018, the U.S. exported \$65.3 bn of currency! Most of that currency held abroad is in the form of one-hundred dollar bills. As that article notes, it costs the U.S. Treasury only 14.2 cents to print a one-hundred dollar bill, so the seignorage gain from this export is enormous. Of course, these bills are valued not only for their liquidity, but also their anonymity. However, the general point remains, which is the U.S. is able to maintain a consistent deficit in goods, and enjoy higher consumption as a result, because it can produce nominal assets – currency and Treasury bills, notes and bonds – that are valued over and beyond the monetary yield on those assets.

Recent studies have linked the convenience yield to exchange rate behavior. Engel (2016) presents a simple New Keynesian model to illustrate how the liquidity yield can account simultaneously for the uncovered interest parity puzzle and the excess volatility of exchange rates in response to interest rate changes. Valchev (2017) also studies a model in which the convenience yield plays a role in accounting for exchange-rate puzzles. More directly, Engel and Wu (2018) and Jiang et al. (2018) find a direct link empirically between the U.S. convenience yield and the value of the dollar: the higher the yield, reflecting greater liquidity demand for U.S. government assets, the stronger the dollar. Indeed, Engel and Wu (2018) find this connection generalizes beyond the U.S. For each of the G10 currencies, a greater relative convenience yield strengthens the currency. We will return to this finding in discussing the possibility of other countries capturing some of the U.S.'s exorbitant privilege.

This paper links these findings. On the one hand, the exorbitant privilege of the U.S. leads to a financial account surplus, as the U.S. exports its liquid assets. In turn, the real appreciation of the dollar precipitated by the liquidity yield increases U.S. demand for traded goods, sustaining the current account deficit.

Section 1 presents a very simple model of this interaction. Section 2 presents some evidence that the convenience yield of the U.S. strengthens the dollar in real terms. In turn, evidence is presented connecting the part of the real exchange rate driven by the convenience yield to the U.S. trade balance. While the U.S. clearly must gain from the income transfer from abroad, section 3 discusses some potential pitfalls of the sustained low interest rates and current account imbalances. The discussion in this paper throughout is mainly focused on "normal times" – the times in between global financial crises. The conclusions section 4 addresses how the analysis might be extended to help explain some puzzles regarding the behavior of capital flows and the dollar during crises.

1. Model

This model illustrates the role of the liquidity premium in generating a current account deficit and financial account surplus. The model is very stripped down, and is clearly not meant to be a quantitative model.

There are two countries in the model. The U.S. is the home country, and the rest of the world is the foreign country. The foreign country faces a portfolio choice in the initial period – it can invest in productive assets or safe U.S. bonds. The productive assets are costly to liquidate, while there is no cost to cashing in the U.S. bonds in the second period and using the proceeds for consumption.

Foreign country

Foreign households get utility from consumption of traded goods and nontraded goods in period 0. For simplicity, in period 1, there is no consumption or production of the nontraded goods. Consumers maximize:

(1) $U = \ln\left(C_{T,0}^{*}\right) + \ln\left(C_{N,0}^{*}\right) + \ln\left(C_{T,1}^{*}\right).$

The consumption notation is straightforward. The functional form is chosen for algebraic convenience.

In the initial period, the foreign household chooses a portfolio of U.S. bonds, *B*, and the productive asset, K^* with $K^* \geq 0$. We also assume $B \geq 0$ -- the foreign country can lend to the U.S. at the interest rate *r*, but it cannot borrow from the U.S. at that rate. Only the U.S. will be able to issue the liquid asset. We will solve the unrestricted optimization problem below, but assume that the streams of initial endowments in the U.S. and the rest of the world are such that the U.S. is a debtor in period 0. That is, we will ignore the corner solution of $B = 0$.

U.S. bonds pay a gross interest rate of $1 + r$ in units of the tradeable good. This interest rate will be determined in equilibrium.

The asset K^* can be thought of as a unit of capital, and is produced from the nontraded good. Foreign households receive an endowment of nontraded output in the initial period, $Y_{N,0}^{*}$, Each unit of capital produces μ units of the traded good in period 1. The capital depreciates entirely, or is otherwise worthless since there is no consumption of the nontraded good in period 1. The initial price of a unit of nontraded goods in units of the traded good is p_0^* . Hence the gross return in units of traded goods on K^* is $\frac{\mu}{p_0^*}$.

The asset K^* is illiquid. This is modeled simply as a cost in period 1 of disposing of the asset. We assume the cost is given by $\frac{\delta}{2} p_0^* K^* \left(\frac{K^*}{Y_{N,o}^*} \right)$, where $\delta > 0$ is a cost parameter. The functional form, again, was chosen for algebraic simplicity but can be given an economic interpretation. The cost is incurred in period 1, and is in units of the tradeable good. The greater the value of the asset in period 0, $p_0^* K^*$, the higher the liquidation cost. But the costs are also increasing as the share of nontraded output devoted to the illiquid asset, $\frac{K^*}{Y_{N,o}^*}$, increases. The salient assumption is that there are increasing costs in the amount invested in the asset. Ultimately, the household puts a limit on the amount invested in K^*, even though in equilibrium the gross return $\frac{\mu}{p_0^*}$ is greater than *r*. δ is the key parameter in this model. An increase in δ means that the real asset is less liquid, or, relatively speaking, U.S. bonds are more liquid. We are interested in how an increase in δ affects equilibrium returns, the initial trade balance, and the initial real exchange rate.

The initial budget constraint is given by:

(2) $$p_0^* C_{N,0}^* + C_{T,0}^* = Y_{T,0}^* + p_0^* Y_{N,0}^* - B - p_0^* K^*$$

$Y_{T,o}^*$ is the foreign household's endowment of the traded good in period 0. In period 1, the foreign households consume only the traded good. Their spending on the traded good must equal their production of the traded good, plus the gross returns on the loans to the U.S., less the liquidation costs for the productive asset which are borne in units of the traded good. We have:

(3) $$C_{T,1}^* = \left(1+r\right)B + \mu K^* - \frac{\delta p_0^* \left(K^*\right)^2}{2Y_{N,o}^*}.$$

The foreign household chooses $C_{N,0}^*$, $C_{T,0}^*$, $C_{T,1}^*$, B, and K^* to maximize utility given in equation (1), subject to the constraints in (2), and (3).

From the first-order conditions, we derive:

(4) $$p_0^* C_{N,0}^* = C_{T,0}^*$$

(5) $$C_{T,1}^* = \left(1+r\right)C_{T,1}^*$$

(6) $$R^* - \left(1+r\right) = \frac{\delta K^{*,}}{Y_{N,0}^*},$$ where

(7) $$R^* \equiv \frac{\mu}{p_0^*}.$$

This last condition says that the gross return on the real asset exceeds that on the U.S. bonds by an amount due to the marginal liquidation cost. This gap represents the convenience yield on the U.S. bonds.

In equilibrium, households must allocate the nontraded endowment between consumption and the capital good:

(8) $$Y_{N,0}^{*} = C_{N,0}^{*} + K^{*} .$$

Equations (2)-(8) allow us to solve for $C_{N,0}^{*}$, $C_{T,0}^{*}$, $C_{T,1}^{*}$, B, K^{*}, R^{*} and p_{0}^{*} in terms of *r* and the exogenously given endowments.

Home country (U.S.A.)

The households in the home country have utility functions similar to those of the residents of the foreign country:

(9) $$U = \ln\left(C_{T,0}\right) + \ln\left(C_{N,0}\right) + \ln\left(C_{T,1}\right),$$

The consumption variables are defined analogously to those in the foreign country. To keep matters simple, the home households receive endowments $Y_{N,0}$, $Y_{T,0}$, and $Y_{T,1}$. It faces the budget constraints:

(10) $$p_0 C_{N,0} + C_{T,0} = Y_{T,0} + p_0 Y_{N,0} + B ,$$

(11) $$C_{T,1} = Y_{T,1} - \left(1 + r\right) B .$$

The first-order conditions are given by:

(12) $C_{T,0} = p_0 C_{N,0}$

(13) $C_{T,1} = (1+r) C_{T,0}$.

Equations (10)-(13) allow us to solve for $C_{T,0}$, $C_{N,0}$, $C_{T,1}$, and B in terms of r.

Equilibrium

Equating the bond supply from the home country and the bond demand from the foreign country allows us to solve for r. The equilibrium requires equations (2)-(8) hold for the foreign country, and equations (10)-(13) for the foreign country, along with the bond market equilibrium condition. We assume the endowments and parameters are such that in equilibrium, $B > 0$.

Liquidation costs and liquidity return

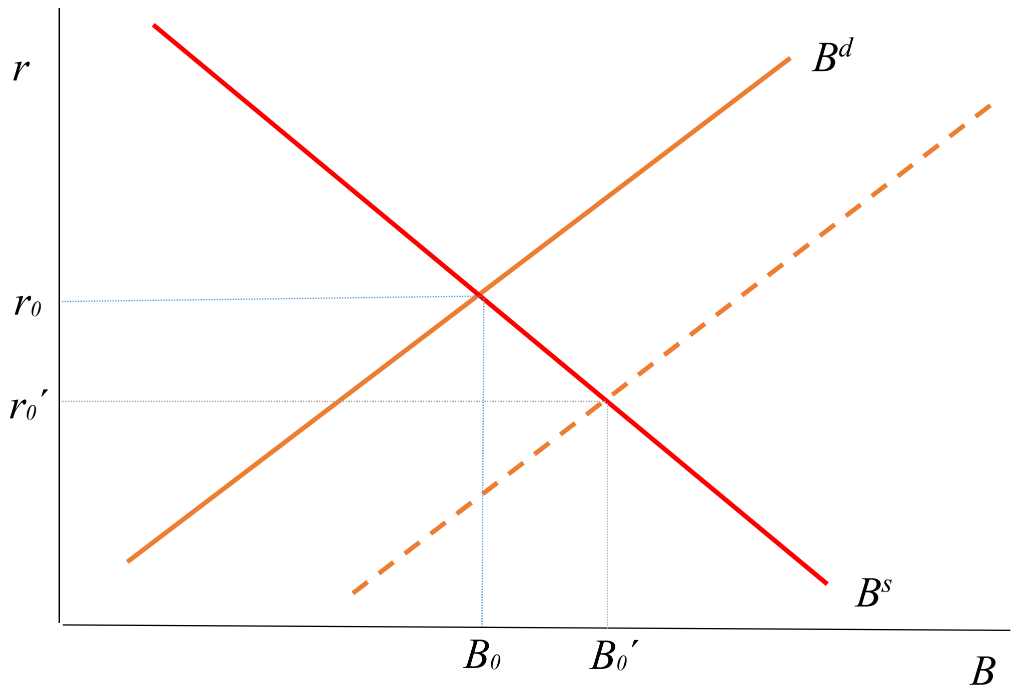
We are interested now in the effects of an increase in the cost of liquidating the asset K^*. An increase in δ reduces the liquidity of K^*. That will lead foreign households to prefer to shift their portfolio away from K^* and toward the liquid bond, B. In order to induce home residents to borrow more (to supply greater B), the return on the liquid bond, r, falls. In the foreign country, there is an increase in the supply of the nontraded good available for consumption, as the amount used for K^* is reduced. Consumption demand for the nontraded good in the foreign country falls, *ceteris paribus*, because households postpone consumption until period 1. Hence, p_0^* falls. In the home country, the increase in borrowing leads to higher consumption of both traded and nontraded goods, *ceteris paribus*, which drives up p_0. The real exchange rate, p_0 / p_0^*, increases.

The Appendix derives algebraically the results: $\frac{dr}{d\delta} < 0$, $\frac{dB}{d\delta} > 0$, $\frac{dp_0^*}{d\delta} < 0$, and $\frac{dp_0}{d\delta} > 0$. Here, we can illustrate these findings graphically.

Figure 3 shows the supply by the home country, and demand from the foreign country, for B as a function of r, holding the prices of nontraded goods constant.

Figure 3

Market for Liquid Bond, *B*



The demand for the liquid bond is upward sloping, as the foreign country purchases more as the return to the bond increases; and, similarly, the home country supplies more of the bond (i.e., borrows more) the lower the interest rate. When there is a reduction in the liquidity of the foreign real investment, so δ increases, the foreign household will rebalance its portfolio from K^* to B. The increase in demand for the bond will drive down *r* and increase the equilibrium amount of borrowing by the home country. In other words, an increased liquidity demand for the home-country bond leads to capital inflows, increasing the financial account surplus in period 0.

The effect of the portfolio shift toward the liquid asset is that households in the foreign country consume less of the traded good in period 0, while households in the home country consume more. From equations (4) and (12), it is clear that holding prices (p_0^* and p_0) constant, there must be a reduction in consumption demand for the foreign nontraded good and an increase in demand for the home nontraded good. In addition, in the foreign country, the decline in demand for K^* leaves a greater supply of the nontraded good available for consumption. Hence, p_0^* falls, while p_0 rises. The market for the foreign nontraded good is depicted in Figure 4.

Figure 4

Market for the Nontraded Good in the Foreign Country

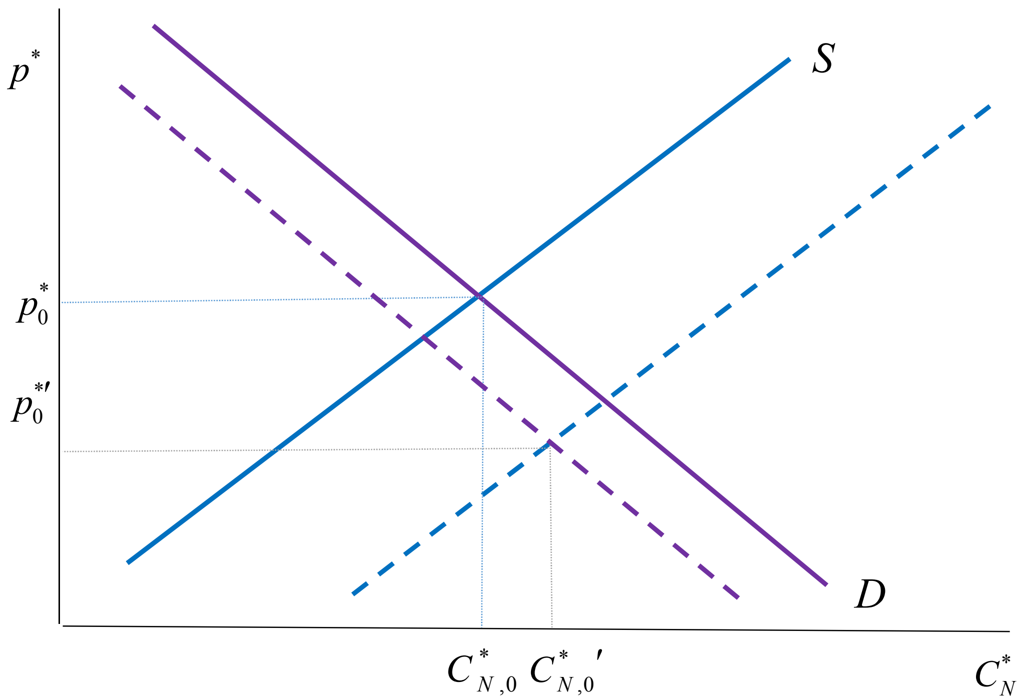


Figure 4 represents the supply and demand for the foreign nontraded good that is available for consumption. That is, on the supply side, it is the endowment, $Y_{N,0}^*$, less the amount devoted to the illiquid asset, K^*. The supply schedule is upward sloping because, for a given level of productivity, μ, the return on K^* (given by $R^* = \frac{\mu}{p_0^*}$) is decreasing in p_0^*, so $S = Y_{N,0}^* - K^*$ is increasing in p_0^*. Demand for consumption of the nontraded good is decreasing in its price. As noted above, when the liquidity of K^* falls, there is an increase in the supply available for consumption, as well as a decrease in consumption demand, resulting in a drop in p_0^*.

The model is very simple, and there is at least one extension that would be insightful – allowing the home households to hold the foreign illiquid asset. If the cost of liquidating the asset were specific to the asset, then the composition of the portfolios of the home and foreign households would not be fully determined. As long as both assets earned the same rate of return in equilibrium, only the total holdings of K and B would be determined, but not their split between home and foreign households (subject to the constraint that only the home country can borrow at the interest rate paid on liquid assets.) However, if the cost of liquidation of K were specific to the owner of the asset, then the portfolios would be determined. In that case, there would be more total K held in equilibrium than in the baseline model presented here, because of the increasing costs of liquidation. That is, it is cheaper to liquidate a given amount of K if that amount is split between two investors that have separate costs of liquidation. This extension would be useful in accounting for an observation in Gourinchas et al. (2010) that is discussed in the conclusions section.

2. Empirical Support

Engel and Wu (2018) and Jiang et al. (2018) explain dollar exchange rate movements. Engel and Wu (2018) additionally find that the government bond convenience yield is powerful in accounting for the monthly exchange rate changes of each of the G10 currencies (euro, U.K. pound, Japanese yen, Canadian dollar, Swiss franc, Australian dollar, New Zealand dollar, Swedish krona, Norwegian krone.)

Engel and Wu estimate the following regression, for each of the G10 currencies, using fixed effects, for the period January 1999 – December 2017:

$$(14) \qquad s_t - s_{t-1} = \beta_1 q_{t-1} + \beta_2 \left(\eta_t - \eta_{t-1}\right) + \beta_3 \left(i_t - i_t^* - \left(i_{t-1} - i_{t-1}^*\right)\right) + \beta_4 \eta_{t-1} + \beta_5 \left(i_{t-1} - i_{t-1}^*\right) + z_{j,t}$$

where the intercept terms have been suppressed. Here, s_t is the log of the home currency price of foreign currency (for example, Swiss francs per Swedish krona), measured on the last day of the month. i_t is each country's 12-month government bond yield, and i_t^* is the "foreign" 12-month yield (for each of the remaining nine currencies.) q_t is the log of the real exchange rate, defined as $q_t = s_t + p_t^* - p_t$, where the log of the home (foreign) consumer price index is denoted p_t (p_t^*). The interest rate differential and the lagged real exchange rate are conventional determinants of nominal exchange rate movements, and have had some limited success in correlating with those changes for the major currencies.

They important new variable in this empirical work is η_t, the measure of the liquidity or convenience yield of government bonds in the home country relative to the foreign country. Engel and Wu's baseline measurement assumes that covered interest rate parity holds, so the market interest rates (i.e., the non-governmental interest rates) are equal to the log of the forward premium:

$$i_t^m - i_t^{m*} = f_{t,t+1} - s_t$$

The liquidity yield in the home country is given by $i_t^m - i_t$. A larger spread implies that the government bond is valued more for its non-pecuniary liquidity attributes, increasing $i_t^m - i_t$. In turn, the theory posits that an increase in the liquidity yield is associated with a stronger currency (a lower s_t), *ceteris paribus,* because of the greater demand for the home country's liquid government bonds. We have:

(15) $$\eta_t = \left(i_t^m - i_t\right) - \left(i_t^{m*} - i_t^*\right) = f_{t,t+1} - s_t + i_t^* - i_t \,.$$

The forward rates are also last-day-of-the-month, one-year rates.

The major takeaway from Engel and Wu's study is that the estimated parameters β_1, β_2, and β_3 are all found to be negative for each of the G10 currency panel regressions, and with strong statistical significance. This finding holds not only for the entire 1999-2017 sample, but also for the two subsamples, 1999-2007, and 2008-2017. It holds up well also when returns on one-month, rather than one-year, government securities are used (with the corresponding one-month ahead forward exchange rates.) The relative convenience yield continues to be an important explanatory variable even after controlling for sovereign default premiums and deviations from covered interest rate parity (as in Du, et al., 2018) When supplies of government bonds and measures of global uncertainty are used as instruments for the convenience yields, the fundamental results are unchanged. Moreover, Engel and Wu show that the findings are not driven by a few currencies. For example, if rather than using the relative liquidity yield as defined in (15), if the regression includes instead the home and foreign liquidity yield separately, the home liquidity yield still uniformly has significant explanatory power.

Interestingly, after controlling for the liquidity yields, the traditional explanatory factors for exchange rate movements turn out to have strong statistical significance as well, across all of the G10 currencies.

There are two important conclusions to be drawn from this. First, it may well be that the source of the U.S.'s exorbitant privilege arises from the demand for U.S. Treasury assets (rather than from U.S. assets as a whole.) Second, the fact that each of the G10 currencies strengthens when the relative convenience yield on its government securities increases indicates that the specialness of the dollar arises more, perhaps, from the network externalities of a single dominant global liquid asset, rather than some special characteristic of dollar assets that allows them to be demanded even at lower interest rates.

This section takes a somewhat different tack than Engel and Wu (2018), but it is related. Here we are concerned only with the U.S., and take the "foreign" country variables to be an average of the variables for the other nine of the G10 currency countries. We begin with a reduced-form vector autoregression in three variables: the real exchange rate, q_t, where an increase indicates a real U.S. depreciation; the relative convenience yield, η_t; and, the U.S. minus the foreign one-year government bond yield, i_t^R. The reduced-form VAR is written as:

(16) $$\begin{bmatrix} q_t \\ \eta_t \\ i_t^R \end{bmatrix} = A + B \begin{bmatrix} q_{t-1} \\ \eta_{t-1} \\ i_{t-1}^R \end{bmatrix} + u_t,$$

where A is a 3x1 vector of constants, B is a 3x3 vector of parameters, and u_t is a 3x1 vector of regression errors.

The first panel in Table 1 reports the regression coefficients and standard errors for each row of this VAR. All three variables show considerable persistence.

Table 1

VAR for U.S. Real Exchange Rate, Convenience Yield and Interest Rates

Reduced Form VAR Estimates					
Dependent Variable		Intercept	q_{t-1}	η_{t-1}	i_{t-1}^{R}
q_t		-0.53903 (0.0047)	0.9340 (0.0298)	-6.7735 (2.4955)	0.2203 (0.5153)
η_t		0.00152 (0.0002)	0.0006 (0.0012)	0.6064 (0.0988)	0.0254 (0.0204)
i_t^R		0.00327 (0.0004)	0.0038 (0.0023)	0.3138 (0.1922)	0.9383 (0.0397)
Structural VAR Estimates					
E Matrix					
			q_t	η_t	i_t^R
q_t			1	11.4383	2.8642
η_t			0	1	-0.0599
i_t^R			0	0	1
F Matrix					
		Constant			
q_t		-0.02709			
η_t		0.00133			
i_t^R		0.00327			
G Matrix					
			q_{t-1}	η_{t-1}	i_{t-1}^{R}
q_t			0.9518	1.0616	3.1984
η_t			0.0004	0.5876	-0.0308
i_t^R			0.0038	0.3138	0.9383

Quarterly, 1999:I – 2017:IV. Standard errors of parameter estimates are in parentheses. Structural VAR estimates refer to the equation in the text.

We next recast this as a structural VAR by orthogonalizing the error terms. We will assume the system is triangular: q_t depends contemporaneously on η_t and i_t^R. Then η_t depends on i_t^R contemporaneously, but not q_t. And i_t^R doesn't depend on either q_t or η_t contemporaneously. This is the structure that arises in the dynamic New Keynesian model in Engel and Wu (2018). In that paper, the interest rate is the instrument of monetary policy, which responds to economic conditions with a one-period lag. The liquidity yield is a function of the current interest rate, as in Nagel (2018). There is a positive relationship. The logic is that a tightening of monetary policy, for example, by an open market operation, reduces the amount of money in the system and increases the amount of short-term government securities. There is less of the most purely liquid asset, money, held by the public, so government securities are more highly valued for their liquidity. Finally, the real exchange rate responds contemporaneously to both the interest rate and the liquidity yield.

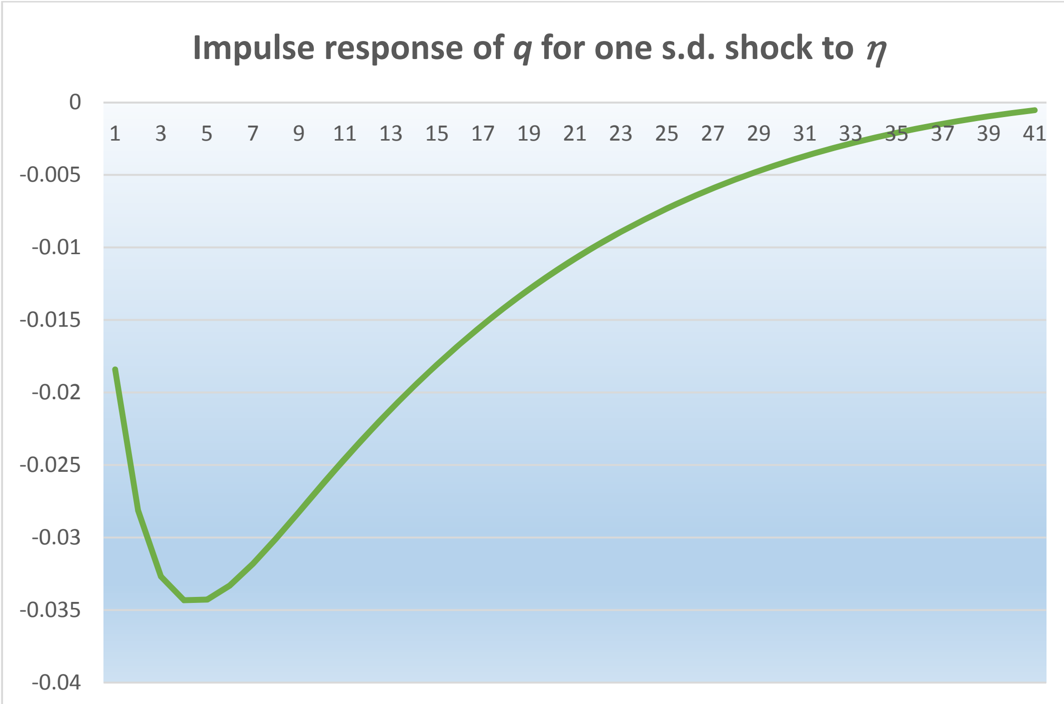
We can write the orthogonalized system as:

$$(17) \qquad E\begin{bmatrix} q_t \\ \eta_t \\ i_t^R \end{bmatrix} = F + G\begin{bmatrix} q_{t-1} \\ \eta_{t-1} \\ i_{t-1}^R \end{bmatrix} + \varepsilon_t .$$

Here, the matrix E is upper triangular. Table 2 reports the coefficient estimates of this orthongonalized system. The effect of a unit shock to η_t on q_t according to that table is -11.4383. To interpret this, note that one standard deviation of η_t is measured to be 0.00161, so a one-standard deviation shock that increases the relative liquidity yield on U.S. Treasury bonds leads to an initial impact on the real exchange rate of -0.0184, or in another words, a 1.84% real appreciation.

Figure 5 plots the impulse response function of q_t for a one-standard deviation increase in η_t. The maximum impact of the shock to the liquidity return comes in the third and fourth month after the initial shock, at approximately a 3.4% real appreciation.

Figure 5



Next, we turn to the impact of the liquidity yield on the current account, working through its effects on the real exchange rate. We consider a recursive system, where the financial market variables affect the trade balance only through their effect on the real exchange rate. That is, we impose exclusion restrictions, so that the dynamics of the current account are not directly influenced by the interest rates and convenience yields. The VAR reported in Table 1 can be considered a first-stage of a dynamic two-stage least squares system. We take the fitted values of the real exchange rate from that system, denoted $\hat{q}_t$ as exogenous inputs into the dynamic system for the current account.

We estimate a model of the current account to GDP ratio for the U.S. (denoted ca_t) and the HP-filtered GDP, y_t. We estimate the reduced form VAR:

$$(18) \quad \begin{bmatrix} ca_t \\ y_t \end{bmatrix} = Q + R \begin{bmatrix} ca_{t-1} \\ y_{t-1} \end{bmatrix} + S\hat{q}_t + T\hat{q}_{t-1} + w_t ,$$

Table 2 reports the coefficients and standard errors from this VAR.

Table 2

U.S. Current Account Dynamics

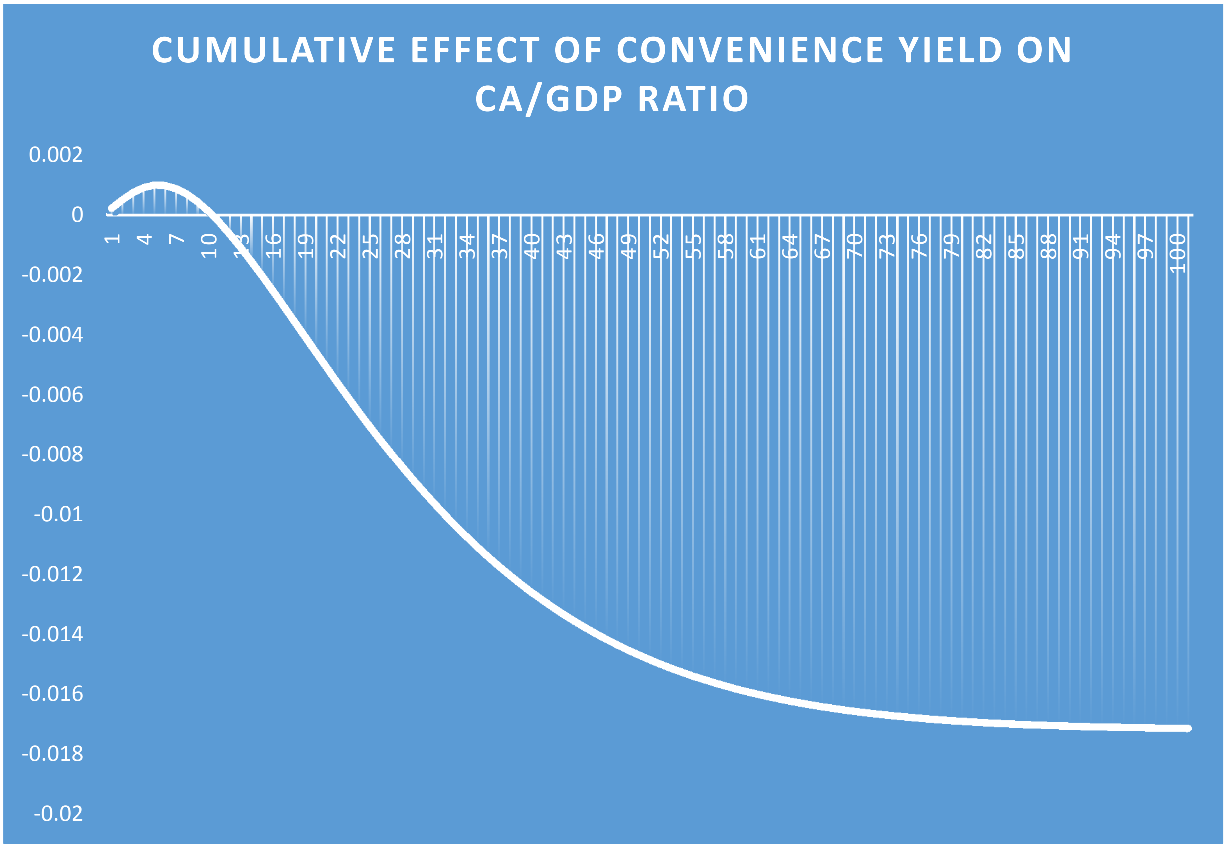
Dependent Variable		ca_{t-1}	y_{t-1}	$\hat{q}_t^R$	$\hat{q}_{t-1}$
ca_t		0.9348 (0.0349)	-0.0419 (0.0374)	-0.0148 (0.0099)	0.0188 (0.0099)
y_t		-0.0416 (0.0533)	0.8892 (0.0572)	0.0206 (0.0151)	-0.0150 (0.151)

Quarterly, 1999:I – 2017:IV. Standard errors of parameter estimates are in parentheses.

The question we are interested in here is how the current account balance of the U.S. is affected not by a one-time shock to the relative liquidity premium, η_t, but instead how a permanent change in the average value of that variable affects the current account. Specifically, Figure 6 plots the impulse response of the U.S. current account to a structural shock to η_t in equation (17) at time 0 that is permanent and that has the property that η_t changes from zero to its actual sample average (of 20.3 basis points) in the long run. In other words, referring to the estimates of the *F* matrix in Table 1, we consider a permanent structural shock to η_t equal to 0.00133.

The figure shows that the influence of the relative liquidity premium on U.S. Treasury bonds has a substantial impact on the current account to GDP ratio. The overall U.S. current account deficit is roughly 5 percent of GDP, and Figure 4 shows that the influence of the liquidity premium contributes ultimately an effect on the current account of 2 percent of GDP. That is, absent the effects of the "exorbitant privilege", the current account deficit would be 40 percent smaller. Figure 4 also shows that it takes a long period of time for these effects to be fully felt. The initial impact of a real appreciation is to lead to a current account surplus, which mimics the well-known J-curve effect of exchange-rate changes. The full influence of the change in the mean of the liquidity premium is felt only after around eight years.

Figure 4



3. Implications

The U.S. experiences a welfare gain because it is able to issue "safe assets" that permit the U.S. to borrow at below-market interest rates. In this section, I discuss under what circumstances other countries might be able to exploit some of these gains from being an issuer of a safe asset. I also consider some possible drawbacks to the exorbitant privilege – how the privilege may in fact be a gift horse.

We have noted above that there are certain properties that safe government assets possess. There is little chance of default on the assets, and, because governments issue assets in nominal terms, there is not much risk that the value of the assets will be reduced by unexpected inflation. Most of the higher income countries in the world satisfy these conditions – there have been relatively few instances of default on government bonds in high income countries in the past fifty years, and inflation globally has been quite low in these countries since the 1990s.

Another important aspect of a liquid asset arises from network externalities. If we consider two equally promising candidates for the exorbitant privilege, an investor will prefer the bond that other investors also hold. If there is a need for liquidity in order to backstop uncertain price changes in other assets in the investors' or financial institutions' portfolio, the ease with which the liquid asset can be sold is a primary consideration. We have noted that under Gorton's (2017) definition of a safe asset, an important characteristic is the lack of private information about the value of the asset. However, another factor must be the search costs for finding a buyer. The thicker the market for the security, the lower the transactions costs for selling it. Hence, there are liquidity gains from choosing the asset of one country to be the liquid asset that is widely held. Once the asset of one country has established itself as the prime safe asset, it will be difficult to dislodge.

However, there are other factors that play into the desirability of one asset as the choice of international investors for liquidity. He, et al. (2019) present a model of safe asset determination that explores how market factors and economic fundamentals can influence which country gets to enjoy the exorbitant privilege.

In the first place, the fact that the U.S. or any other country that can issue safe bonds pays an interest rate below the market rate so that bondholders can earn a convenience yield implies a tradeoff. On the one hand, investors value the liquidity, but on the other, they pay for it by having to accept a lower rate of interest on the government bond. If we consider two competing countries that can offer equally safe bonds, investors would prefer the one with the lower price (the higher rate of interest.) Holding demand for safe assets constant, the country that can supply more safe government bonds will pay a higher interest rate in equilibrium. In turn, that will mean investors prefer the bonds from the country with the largest supply. If Belgium, for example, were the world's supplier of safe assets, that country could offer its debt at a very low interest rate.

While an increase in the supply of assets drives down its price when the government bonds are truly safe, the higher supply also raises the likelihood of default. He, et al. (2019) then highlight a tradeoff: When the demand for safe assets is high, investors favor the country that can supply the assets plentifully at a lower price. But when the demand for safe assets slacks off, having a large supply may be detrimental if it heightens the likelihood of default. In that case, investors prefer the country with the bonds that are relatively less likely to default. Indeed, as the demand for safe assets falls, investors might prefer to switch toward the country with the stronger fundamentals even if it currently pays a lower interest rate.

There are a couple of "relatives" that matter in this analysis. First, when we talk about the likelihood of default, what matters it the country's ability to service its debt. For a given fiscal structure, large countries can service more debt. That is, we can more or less scale up the amount of sovereign debt a country can issue for a given probability of default by the size of the country. This implies that larger countries have a natural advantage. For two countries with an equal probability of default, the larger one can supply more of the safe asset, and therefore it will sell at a lower price.

Also, the relative fiscal capacity of two competing countries is what matters for the investors that demand safe assets, according to the model of He, et al. (2019). In a period of global uncertainty, when the possibility of default rises for all countries, investors will still prefer the asset of the country that has the relatively most appealing characteristics on the price/safety dimension.

Governments prefer to issue debt denominated in their own currency. As Engel and Park (2018) have recently noted, debt in the borrower's currency has a natural insurance aspect. During times of recession, a country would like to follow expansionary monetary policy to exploit the Phillips curve. However, that will likely lead to a depreciation of the currency. If debt is issued in local currency, that depreciation is beneficial to the country – the real value of the debt repayment is lowered. However, if the debt is issued in foreign currency, the value of payment in foreign currency terms does not change depending on the state of the economy. Hence, even in economic downturns, the government is obligated to raise funds to pay its sovereign debt obligations.

The conclusion is that debt issued in the sovereign's currency is less likely to be defaulted on because of this natural insurance aspect to the debt. Indeed, it is sometimes claimed that local-currency debt has no risk of default because of this possibility of inflating away its value through expansionary monetary policy. This claim itself is surely inflated. Inflation is costly to the health of the economy. It is certainly plausible that there may be circumstances where governments prefer outright default rather than very high inflation/currency depreciation to relive its external debt obligations. Nonetheless, it is certainly true that the probability of default on domestic currency debt is lower than if the government could issue only foreign-currency debt.

Why would lenders buy debt issued in the borrower's currency? Isn't the temptation to inflate/depreciate so large that the debt would not be valued by international lenders? Clearly we see that is not the case in practice, because almost all of the advanced countries and an increasing number of emerging markets are able to sell debt internationally that is denominated in their local currency. We have already noted that it is costly for the domestic economy when governments incur too much inflation. If lenders anticipate a higher average inflation in a given country, they can insist on a higher nominal interest rate to compensate.

As Engel and Park (2018) argue, the distortionary effects of inflation are not the only check on the sovereign borrower's temptation to debase the currency. The very threat of losing the ability to borrow in local currency itself is a strong deterrent to overinflation. Because countries value the ability to borrow in local currency, they often will not abuse the privilege.

One might conclude that the countries that are able to issue debt in their own currency must be the ones that have demonstrated a history of low inflation. However, Eichengreen and Hausmann (1999) found that past economic performance is not useful in predicting which countries are able to issue local-currency debt. There is little correlation between the amount of such debt held abroad and the average inflation rates, or the volatility of inflation, or the worst recent inflation results in borrowing countries. Eichengreen and Hausmann conclude that the countries that are forced to borrow in foreign currency are victims of some original sin for which they are not responsible. The unwillingness of lenders to accept debt in local currency from these countries has been self-perpetuating.

Engel and Park (2018) offer a possible explanation for this mystery of original sin. Poor inflation performance in some countries may reflect the fact that the policymakers perceive there to be low costs to inflation. For example, without being able to commit to an independent monetary policy, short-sighted politicians (or, more precisely, politicians that do not believe they need to make policy in the long-run interests of the economy) might have an inflationary bias. On the other hand, for some countries, more volatile inflation may represent an optimal monetary policy with a high degree of commitment. Countries that are subject to a lot of shocks (such as economies that are geared toward commodity exporting) might find the need for more active demand management. Or, countries that have a flatter Phillips curve, so the output cost of inflation is relatively low, might find it more beneficial to more actively exploit the inflation/unemployment tradeoff.

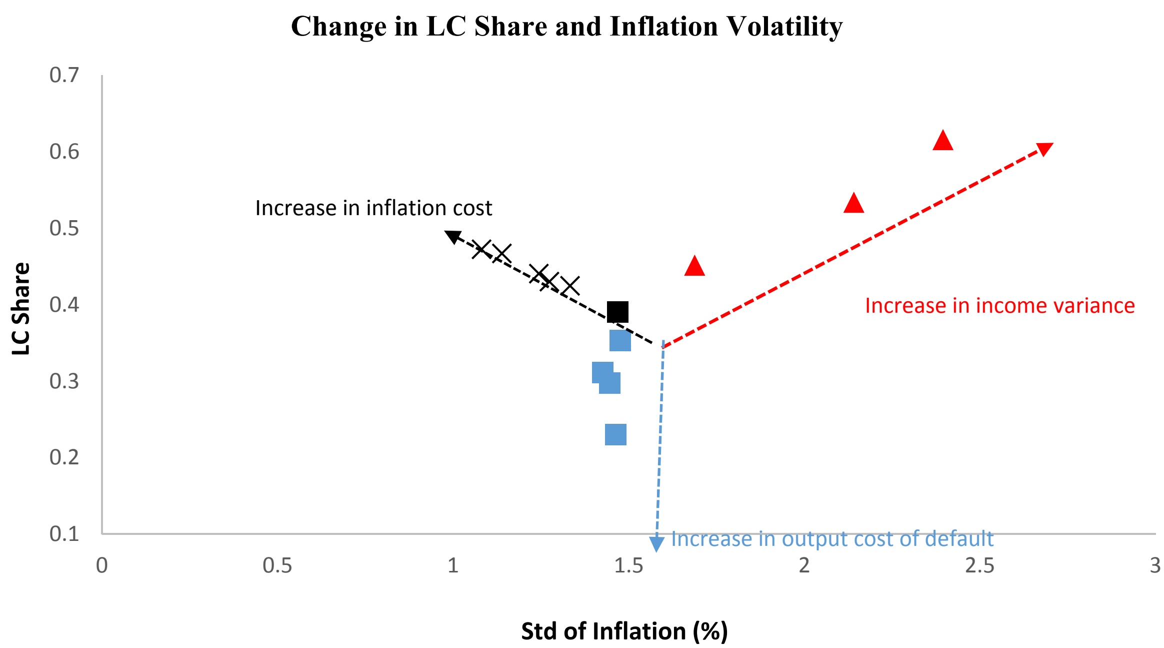
These latter countries might be good candidates for issuing debt in their local currency. The volatility of inflation is important to them because they want to be able to exploit active monetary policy. The average rate of inflation is not relevant, as noted above, because investors can levy higher nominal interest rates to compensate for higher expected inflation. The key is whether the policymakers are committed to stable demand management.

Engel and Park (2018) find that since 2000, there is a strong correlation between adoption of inflation-targeting by central banks, and the ability to sell debt internationally whose payoff is in the sovereign's currency. This appears to be independent of the actual relative inflation performance of the countries. The adoption of inflation targeting signals to markets that monetary policy is being set with some independence from the needs of the fiscal authorities to finance spending.

Hence, we can conclude that another feature of safe asset provision is that countries must be able to demonstrate some ability, and some need, to commit to stable monetary policy. Figure 5, which is borrowed directly from Engel and Park (2018) illustrates this point in the context of their model. The vertical axis plots the share of foreign-held debt issued by the sovereign that is denominated in the local currency. The horizontal axis shows the equilibrium standard deviation of inflation in the country. The lines that are plotted show how changing various deep parameters of the economy affect the ability of the country to issue safe, local-currency debt, starting from a baseline point calibrated to match Peru's economic performance.

On the one hand, a higher cost of inflation will certainly reduce inflation volatility and increase the share of debt that can be issued in local currency. That is illustrated by the black vector that points toward the northwest, indicating that lower inflation volatility and higher local-currency debt shares go together as inflation costs increase. On the other hand, as the volatility of shocks hitting the economy increases, the local-currency share of debt increases while inflation volatility actually increases. This is represented by the vector in red that points toward the northeast. When the country experiences more volatile shocks, it accepts higher inflation volatility as the cost of stabilizing consumption. But because lenders perceive that having the ability to issue local-currency debt is more valuable to the country as its output shocks become more volatile, they are willing to hold more local-currency debt. Finally, the blue vector illustrates the effects of increasing costs of outright default. While the cost of default has little effect on inflation performance, it is well-known that ex ante a country will benefit from stricter penalties in the event of outright default. If the economic cost of outright default is higher, lenders will be willing to lend more, and at a lower interest rate, to the sovereign. This actually increases the relative value of foreign currency denominated debt – when the cost of default is high, and outright default is less likely, the borrower will shift its portfolio more toward the low-cost foreign-currency denominated debt and away from the local-currency debt despite the latter's self-insurance properties.

Figure 6
Scatterplots of Volatility of Inflation and Average LC Share



We next turn from the question of how a country might be able to capture some of the exorbitant privilege enjoyed by the U.S. to the issue of whether the benefits of the privilege are truly unambiguous.

The model of section 1 demonstrates that the current account deficit of the U.S. is supported by a "misaligned" currency. In real terms, the dollar is stronger than it would be in the absence of its exorbitant privilege. The persistent trade deficits turn production away from the export sector and toward nontraded goods, thereby pushing up the price of nontradables. From a global standpoint, this production allocation might not be the most efficient for tradable goods. Even from the U.S. perspective, there may be drawbacks to the expansion of nontraded output, such as construction and services, and the expense of the export sector.

It has been argued, for example by Davis and Harrigan (2011) and Amiti and Davis (2011), that jobs in the export sector are "good jobs". There is some empirical evidence to support the claim that these jobs pay an efficiency wage. That is, workers in manufacturing exports earn a higher wage than workers with comparable characteristics that have jobs in the nontraded sector. Cosar, et al. (2016) produce evidence from Colombia that greater international integration in the goods market increases wage inequality within the country. Helpman, et al. (2017) find within-industry evidence that workers in export industries earn higher wages than workers in non-exporting firms.

The emphasis in the latter two papers is on the role of trade in increasing income inequality. But trade deficits per se might have the pernicious effect of eliminating the higher paying export jobs without the compensation of higher wages for the non-export sector. That is, a conjecture is that the trade deficit works to skim the best jobs off the top. While trade restrictions have a primary effect of shifting jobs from the export sector to the import-competing sector, trade deficits shift jobs from the traded sector to the nontraded sector. This is an area that requires further research, especially for U.S. workers. The political debate certainly characterizes lost export jobs as costly, even in an era of full employment.

A second possible drawback to the exorbitant privilege is that it could indirectly actually contribute to financial instability. As global demand for U.S. government assets increases, the yields on those assets declines and their price increases. This may lead to a "search for yield", leading financial institutions in the U.S. to take on riskier positions.

This greater search for yield could be the result of the incentives of managers of the banks and other financial institutions. The reward structure often gives the incentive to earn higher profits, as a way for the stockholder-principals to motivate greater effort from the manager-agents. But it is difficult for the principals to independently assess the riskiness of the portfolios of the financial institutions, so the managers might lean toward a risky portfolio with high expected returns.

A second reason why the increase in the price of government bonds may lead to riskier lending in the U.S. is that it might relax balance sheet constraints. Regulators often put restrictions on the size of the financial institutions' assets relative to net worth, and on the share of assets that are risky. The stock market might assess the riskiness of the financial institution by similar criteria. An increase in the value of safe U.S. government assets, driven by demand from outside the U.S., relaxes both types of constraints, and therefore encourages riskier lending.

An important area of future research is to quantify the "gift horse" aspects of the U.S.'s exorbitant privilege. How harmful are the loss of jobs in the export industry? To what extent is the search for yield within the U.S. intensified by low interest rates on safe government securities?

4. Conclusions

In this paper, I have tried to link at least a part of the persistent U.S. current account deficit to the convenience yield on government bonds. Empirical evidence supports the claim that a higher convenience yield leads to a stronger dollar. In turn, an appreciation of the dollar is associated with, after some time, greater current account deficits. This is consistent with the claim that the U.S. enjoys an exorbitant privilege, in that it can borrow from abroad at low interest rates, while earning relative high returns on its own foreign investments.

The literature has argued that the demand for U.S. assets arises because of their insurance attributes – they maintain their value in times of crisis. While this undoubtedly is one important source of demand for dollar bonds, the argument engenders a puzzle. Why does the demand for U.S. assets increase during a crisis? It seems like buying insurance after the disaster has already happened. Here, I argue that the increase in demand arises because during a crisis, certain U.S. assets become more valuable for their liquidity. Globally, financial institutions – banks, and the entire shadow banking industry - rely on short-term funding in dollars. During times of greater uncertainty, these financial institutions increase their demand for safe, liquid dollar assets as a buffer stock.

An extended version of the simple model presented above may account for the empirical fact noted in Gourinchas, et al. (2010). During the global financial crisis, the value of U.S. holdings of foreign assets fell steeply, but the value of foreign holdings of U.S. assets did not decline. The logic of the model is that the demand for liquidity from U.S. bonds may rise during crisis times, and foreign illiquid assets may lose value as the demand for liquidity increases.

These issues deserve further study in a more carefully micro-founded model of asset liquidity, embedded in a quantitative DSGE model. If indeed, U.S. government bonds are especially valued for their safety and liquidity, and that in turn contributes to the continuing U.S. current account deficits, then there are many important policy questions to explore.

References

Amiti, Mary, and Donald R. Davis. 2011. "Trade, Firms, and Wages: Theory and Evidence." Review of Economic Studies 79, 1-36.

Appelbaum, Binyamin. 2019. "America's Most Profitable Export: Money." The New York Times. March 9, 2019.

Bureau of Economic Analysis. 2019. "U.S. International Transactions, 4th Quarter and Year 2018." March 27, 2019.

Cosar, A. Kerem; Nezih Guner; and, James Tybout. 2016. "Firm Dynamics, Job Turnover, and Wage Distributions in an Open Economy." American Economic Review 106, 625-663.

Davis, Donald R., and James Harrigan. 2011. "Good Jobs, Bad Jobs, and Trade Liberalization." Journal of International Economics 84, 26-36.

del Negro, Marco; Domenico Giannone; Marc P. Giannoni; and, Andrea Tambalotti. 2018. "Global Trends in Interest Rates." Journal of International Economics, forthcoming.

Du, Wenxin; Joanne Im; and Jesse Schreger. 2018. "US Treasury Premium." Journal of International Economics 112, 167-181.

Eichengreen, Barry, and Ricardo Hausmann, R. 1999. "Exchange Rates and Financial Fragility." New Challenges for Monetary Policy, Federal Reserve Bank of Kansas City, 329-368.

Engel, Charles. 2016. "Interest Rates, Exchange Rates and the Risk Premium." American Economic Review 106, 436-474.

Engel, Charles, and JungJae Park. 2018. "Debauchery and Original Sin: The Currency Composition of Sovereign Debt." Department of Economics, University of Wisconsin – Madison, working paper.

Engel, Charles, and Steve Pak Yeung Wu. 2018. "Liquidity and Exchange Rates: An Empirical Investigation." National Bureau of Economic Research, working paper no. 25397.

Farhi, Emmanuel, and Matteo Maggiori. 2017. "A Model of the International Monetary System." Quarterly Journal of Economics 133, 295-355.

Gorton, Gary. 2017. "The History and Economics of Safe Assets." Annual Review of Economics 9, 547-586.

Gourinchas, Pierre-Olivier, and Hélène Rey. 2007. "From World Banker to World Venture Capitalist: U.S. External Adjustment and the Exorbitant Privilege." In Richard H. Clarida, ed., G7 Current Account Imbalances: Sustainability and Adjustment (University of Chicago Press), 11-55.

Gourinchas, Pierre-Olivier; Hélène Rey; and, Nicolas Govillot. 2010. "Exorbitant Privilege and Exorbitant Duty." Department of Economics, University of California – Berkeley, working paper.

He, Zhiguo; Arvind Krishnamurthy; and, Konstantin Milbradt. 2019. "A Model of Safe Asset Determination." American Economic Review 109, 1230-1262.

Helpman, Elhanan; Oleg Itskhoki; Marc-Andreas Muendler; and, Stephen Redding. 2017. "Trade and Inequality: From Theory to Estimation." Review of Economic Studies 84, 357-405.

Jiang, Zhengyang; Arvind Krishnamurthy; and Hanno N Lustig. 2018. "Foreign Safe Asset Demand and the Dollar Exchange Rate." Stanford University Graduate School of Business Research Paper No. 18-16.

Krishnamurthy, Arvind; and Annette Vissing-Jorgensen. 2012. "The Aggregate Demand for Treasury Debt." Journal of Political Economy 120, 233-267.

Maggiori, Matteo. 2017. "Financial Intermediation, International Risk Sharing, and Reserve Currencies." American Economic Review 107, 3038-3071.

Nagel, Stefan. 2016. "The Liquidity Premium of Near-Money Assets." Quarterly Journal of Economics 131, 1927-1971.

Nickolas, Steven. 2018. "What Investments are Considered Liquid Assets?" Investopedia. https://www.investopedia.com/ask/answers/032715/what-items-are-considered-liquid-assets.asp (Updated April 3, 2018.)

Valchev, Rosen. 2017. "Bond Convenience Yields and Exchange-Rate Dynamics." Department of Economics, Boston College.