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FINANCIAL INTEGRATION AND CRISES 2021

Lecture 3

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Current Account Determination

How should the Current Account be determined? A first hypothesis:

- Smoothing consumption against shocks

The intertemporal approach to the Current Account

The CA is part of the solution to the problem of intertemporal allocation of limited resources:

- **The Intertemporal Budget Constraint**

  which introduces to

- **Current account sustainability (or the sustainability of the foreign liability position)**

Reference: SUW Chap. 2

Obstfeld, M. and K. Rogoff (1996) *Foundations of International Macroeconomics*, Chap. 2

CA Deficits worsen the Investment Position

We have seen that

- **CA deficits worsen the Net Investment Position (NIIP):**

  $\Delta NIIP = \Delta A - \Delta L = CA +$ valuation changes

As $CA < 0$ persists, a country accumulates 'net foreign liabilities'

- The issue is whether CA deficits (and Trade deficits) are sustainable (can be maintained) in the long run.
- For instance, whether CA will have to turn into surplus in the US where the CA has been in deficit over the past 40 years.

Can a country run a perpetual Trade deficit?

Main Conclusion

- If a country starts from a foreign liability position, i.e. $\boldsymbol{NIIP < 0}$, (a debtor to the rest of the world), **unless the return on its liabilities is negative**, it must generate $\boldsymbol{TB}$ surpluses currently or at some time in the future to service its foreign liabilities.

Net foreign asset dynamics in nominal terms

- $TB_t^N =$ Trade balance or Net Exports at time t in nominal dollar terms.
- $CA_t^N =$ Current account balance at time t in nominal dollar terms.
- $B_t^N \equiv NIIP_t^N = A_t^N - L_t^N =$ Net foreign asset position <u>at the end of time t</u> (beginning of time <u>$t+1$</u>) in nominal dollar terms.

The NIIP and the Trade balance

Simplifying Assumptions:

- Net capital transfers, i.e. capital account balance = 0
- No valuation changes (it makes the currency of A and L irrelevant)

$$B_t^N - B_{t-1}^N = CA_t^N \qquad (1)$$

- Net current transfers, $NT = 0$,
- Net labor income = 0 → $NI_t^N = i_t B_{t-1}^N$

Net investment income is equal to the return on net foreign assets held at the beginning of period t (ie B at the end of t-1)

$$CA_t^N = TB_t^N + i_t B_{t-1}^N \qquad (2)$$

Combining equations (1) and (2):

$$B_t^N - B_{t-1}^N = TB_t^N + i_t B_{t-1}^N \qquad (3)$$

Accumulation of Net Foreign Assets

- Equation (3) describes the accumulation of net foreign assets in nominal terms:

$$B_t^N = TB_t^N + (1 + i_t)B_{t-1}^N \qquad (3)$$

Net foreign asset dynamics in real terms

- To have the dynamics in real terms, divide by the price level P_t

$$\frac{B_t^N}{P_t} = \frac{TB_t^N}{P_t} + \frac{(1+i_t)P_{t-1}}{P_t}\frac{B_{t-1}^N}{P_{t-1}} \qquad (4)$$

Define the **ex-post** real rate of return r_t and assume is constant: $r_t = r$

- $1 + r_t \equiv \frac{(1+i_t)P_{t-1}}{P_t} = \frac{(1+i_t)}{(1+\pi_t)}$

- Accumulation of net foreign assets in real terms:

$$B_t = TB_t + (1 + r)B_{t-1} \qquad (5)$$

A Two-Period Model

Consider a two-period world: present and future.

- At the end of each period

$$B_1 = TB_1 + (1+r)B_0 \qquad (6)$$

$$B_2 = TB_2 + (1+r)B_1 \qquad (7)$$

- and using (6) in (7):

$$B_2 = TB_2 + (1+r)TB_1 + (1+r)^2 B_0 \qquad (8)$$

- If the world ends in period 2, then $\boldsymbol{B_2}$ **cannot be negative**; nobody would want to hold our liabilities; foreign residents would want to be paid off and consume before the world ends: $B_2 \geq 0$.
- For the same reason $\boldsymbol{B_2}$ **cannot be positive** because having net foreign assets at the end of period 2 is useless, we want be paid and consume:

$$B_2 = 0 \qquad (9) \quad \text{sort of Transversality Condition}$$

Perpetual Trade Deficits

A Creditor country with a positive investment position

- Then we have:

$$(1 + r)B_0 = -TB_1 - \frac{TB_2}{1 + r} \qquad (10)$$

- A country's inital net foreign asset position, B_0, must be equal to the present discounted value of its trade deficits.
- If the initial position is positive, $B_0 > 0$, the TB_i can be negative.
- **The country can afford to run a perpetual trade deficit that is financed by investment income and asset decumulation.**

Net Liabilities call for Trade surpluses

- **Suppose a country has a net liability position $\boldsymbol{B_0 < 0}$**, then

$$(1+r)NFL_0 \equiv -(1+r)B_0 = TB_1 + \frac{TB_2}{1+r} > 0 \qquad (11)$$

- **A net foreign liability position $\boldsymbol{NFL_0}$ implies that a country must run trade surpluses either currently or in the future.**
- The issue is how far in the future? The consideration of an infinite horizon economy shows that the result can be extended to a more realistic framework but that trade surpluses can, in principle, be postponed far into the future.
- More importantly, **this result extends to the infinite horizon case only if the rate of return is positive** – a relevant concern nowadays

CA sustainability in the 2-period economy

Consider a country with a net liability position, $B_0 < 0$,

From equations (6) and (7) and the transversality $B_2 = 0$:

- $B_2 = CA_2 + CA_1 + B_0 = 0$
- $NFL_0 \equiv -B_0 = CA_1 + CA_2 > 0$

The country must run a CA surplus in at least one period.

- **This result does not extend to an infinite horizon economy;**
  As long as the country partly repays the interests on its liabilities, it can afford limited CA deficits.

A creditor country with positive assets, $B_0 > 0$, can run a perpetual CA deficit:

- $B_0 = -CA_1 - CA_2 > 0 \rightarrow$ with $B_0 > 0$ both CA can be negative

The infinite-horizon economy

- Suppose the economy lasts forever and starts with a net liability position:

$$NFL_1 = (1+r)NFL_0 - TB_1 \qquad (1)$$

- Solve for NFL_0

$$NFL_0 = \frac{TB_1}{(1+r)} + \frac{NFL_1}{(1+r)} \qquad (2)$$

- Shifting eq (2) one period forward we have

$$NFL_1 = \frac{TB_2}{(1+r)} + \frac{NFL_2}{(1+r)} \qquad (3)$$

- Substituting eq. (3) for NFL_1 in eq. (2)

$$NFL_0 = \frac{TB_1}{(1+r)} + \frac{TB_2}{(1+r)^2} + \frac{NFL_2}{(1+r)^2} \qquad (4)$$

- Repeating this iterative procedure T times we have

$$NFL_0 = \frac{TB_1}{(1+r)} + \frac{TB_2}{(1+r)^2} \ldots . + \frac{TB_T}{(1+r)^T} + \frac{NFL_T}{(1+r)^T} \qquad (5)$$

The infinite-horizon economy

To continue take the limit, as $T \to \infty$, of eq. (5)

$$NFL_0 = \frac{TB_1}{(1+r)} + \frac{TB_2}{(1+r)^2} \ldots . + \lim_{T\to\infty} \frac{TB_T}{(1+r)^T} + \lim_{T\to\infty} \frac{NFL_T}{(1+r)^T} \qquad (6)$$

Consider the last term $\lim_{T\to\infty} \frac{NFL_T}{(1+r)^T}$ (7)

It plays the same role of B_2 in the two period economy:

It must be 0, **in particular, it cannot be positive**;

If $\lim_{T\to\infty} \frac{NFL_T}{(1+r)^T} > 0$ Liabilities would grow at a rate equal or greater than r

The country would be borrowing forever to finance both its liabilities and return payments (see next slide); it would borrow more to pay its obligations/debt; i.e. it would play **Ponzi Games**.

No rational foreign investor would make credit to a country playing a Ponzi scheme.

A Ponzi scheme

Assume (current and future) real returns are positive: $r > 0$

- The net foreign liability position, $NFL_0 > 0$, evolves as:

- $$NFL_1 = (1 + r)NFL_0 - TB_1 \qquad (8)$$

- Suppose the country never runs trade surpluses (or deficits), $TB_i = 0$, and keeps borrowing to pay $rNFL_i$. Then, its foreign liabilities grow exponentially at the rate $\boldsymbol{r}$:

- $$NFL_T = (1 + r)^T NFL_0 \qquad (9)$$

- which implies $\lim_{T\to\infty} \frac{NFL_T}{(1+r)^T} = NFL_0 > 0$ (10)

- This country finances its liabilities and related income payments by issuing new liabilities. In other words, this country pays interests by borrowing more: it plays a **Ponzi Game**.

The No-Ponzi game condition

Foreign investors rationality imposes a No-Ponzi game condition

- Foreign investors would never finance a country whose liability position grows exponentially at a rate $\boldsymbol{r}$ and explodes.
- **Investor rationality rules out Ponzi games**

The No-Ponzi game condition thus requires that the liability position grows at a rate lower than $\boldsymbol{r}$

- $$\lim_{T\to\infty} \frac{1}{(1+r)^T} NFL_T \leq 0 \qquad (11)$$

For the same reason, the limit in eq. (11) cannot be negative. We will never finance foreign countries playing a Ponzi scheme against us (we do not want to have a net credit with the rest of the world growing at a rate equal or greater than r). This Transversality condition and condition (11) imply

- $$\lim_{T\to\infty} \frac{1}{(1+r)^T} NFL_T = 0 \qquad (12)$$

A liability position calls for Trade surpluses

Go back to eq. (6)

- $NFL_0 = \frac{TB_1}{(1+r)} + \frac{TB_2}{(1+r)^2} \ldots . + \lim_{T\to\infty} \frac{TB_T}{(1+r)^T} + \lim_{T\to\infty} \frac{NFL_T}{(1+r)^T}$

imposing **No-Ponzi Games + Transversality Condition:** $\lim_{T\to\infty} \frac{NF\ \ _T}{(1+r)^T} = 0$

we have **The Intertemporal Budget Constraint (IBC)**:

- $NFL_0 = \frac{TB_1}{(1+r)} + \frac{TB_2}{(1+r)^2} + \frac{TB_3}{(1+r)^3} + \cdots . + \frac{TB_\infty}{(1+r)^\infty}$ (13)

A country that starts with net foreign liabilities must run trade surpluses, $TB_i > 0$, either in the current or future periods (if $r > 0$).

Intuitively, to rule out Ponzi games we need sufficiently high trade surpluses $TB_i > 0$ in some future period(s).

Note that the IBC involves random variables, TB_S, and must hold for every sequence of shocks, i.e. it must be met with probability =1

Negative returns

Suppose that (current and future) real returns were negative $\boldsymbol{r < 0}$ say because foreign investors are willing to pay for safe treasury services (think of Germany or Switzerland today),

- Again, suppose that the country never runs trade surpluses (or deficits), so that its foreign liabilities evolve as

$$NFL_T = (1+r)^T NFL_0 \qquad (1)$$

- Then, with $1 + r < 1$ liabilities wil decrease over time and tend to zero.
- **In this case Ponzi Games would be feasible**
- Note however that **a Ponzi scheme requires future returns to be negative which is uncertain.** With uncertainty and balanced trade, $\boldsymbol{TB_i = 0}$, the evolution of liabilities, $NFL_T = \prod_{i=1}^{T}(1 + r_i)\, NFL_0$, would depend on uncertain future real returns that may turn out positive in the future.

Limited CA deficits are sustainable

- Even with $r > 0$, **a country can run perpetual, though limited, current account deficits** even if it starts from a net liability position, $NFL_0 > 0$.
- **A country can run a positive trade balance and use it to cover only a fraction, φ, of the income payments on its foreign liabilities**:

$$TB_t = \varphi r NFL_{t-1} > 0 \qquad \text{with } 0 < \varphi < 1$$

so that the CA_t remains in deficit:

$$CA_t = TB_t - rNFL_{t-1} = -r(1-\varphi)NFL_{t-1} < 0$$

- This is possible because the net foreign liabilities evolve as

$$NFL_t = NFL_{t-1} - CA_t = [1 + r(1-\varphi)]NFL_{t-1}$$

- As NFL_t grows at a rate $r(1-\varphi)$ that is lower than r, the No-Ponzi game condition is satisfied.
- Note that $r(1-\varphi)$ is also the rate at which the TB_t must grow.

Net Foreign Assets Position

Consider a country that starts with positive foreign assets, $B_0 > 0$.

As $B_0 = -NFL_0$, its position evolves as

- $$B_1 = (1+r)B_0 + TB_1$$

which can be iterated forward to obtain

- $$B_0 = -NFL_0 = -\frac{TB_1}{(1+r)} - \frac{TB_2}{(1+r)^2} \dots - \lim_{T\to\infty}\frac{TB_T}{(1+r)^T} + \lim_{T\to\infty}\frac{B_T}{(1+r)^T}$$

Then, by imposing No-Ponzi games $\lim_{T\to\infty}\frac{B_T}{(1+r)^T} \geq 0$ and TC $\lim_{T\to\infty}\frac{B_T}{(1+r)^T} = 0$

- $$B_0 = -\frac{TB_1}{(1+r)} - \frac{TB_2}{(1+r)^2} \dots - \frac{TB_\infty}{(1+r)^\infty}$$ **Intertemporal Budget Constraint**

A creditor country with a positive Investment Position can afford to run a perpetual trade deficit that is financed by investment income and asset decumulation.

Sustainability of NFL in the real world

- The analysis carried out so far is not very useful operationally;
  In particular, it makes **the sustainability of a liability position depend on future trade balances (and returns) that are not known.**
- Moreover, the No-Ponzi game condition must hold for any possible sequence and combination of shocks to the trade balance and real returns which is unlikely to be the case in the real world.* For instance, in case of future realizations of particular bad future shocks, the budget constraint could be satisfied by a restructuring of liabilities rather than by a correction of trade deficits.
- **But the IBC suggests that sustainability depends on what we expect future trade balances will be.**

*Remember that the IBC involves random variables and must hold for every sequence of shocks, i.e. it must be met with probability =1.

Sustainability of NFL in the real world

When is a net liability position sustainable?

Silly but true answer:

- **Foreign liabilities are sustainable as long as creditors want to hold them**
- The sustainability of a country's liabilities depends on the willingness of foreign investors to buy/hold them. We assumed that investors stop lending if the country keeps borrowing to pay the interest/dividend on its liabilities. This posed a limit on NFL growth that is known as No-Ponzi game condition.
- It is then useful to immagine a sort of No-Ponzi condition that must hold in expectations (not for any sequence of shocks).
- As future TB_S are not known, investors will have to expect

$$NFL_0 = \frac{E_0 TB_1}{(1+r)} + \frac{E_0 TB_2}{(1+r)^2} + \frac{E_0 TB_3}{(1+r)^3} \ldots . + \frac{E_0 TB_\infty}{(1+r)^\infty}$$

- This suggests that **a liability position is sustainable as long as investors expect the country to run enough trade surpluses at some future dates.**

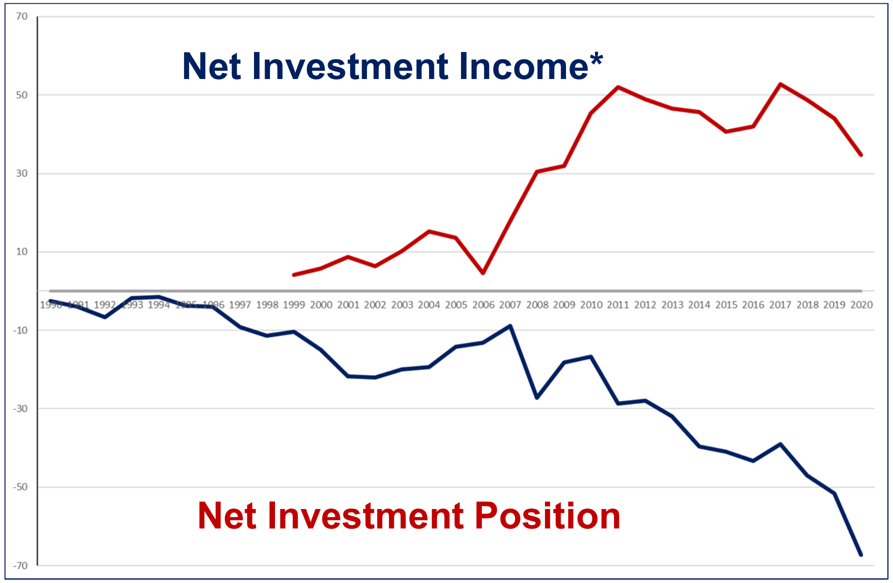
Importance of Expectations

- **The sustainability of a liability position depends on expectations**; on investors' confidence in the country's ability to generate future trade surpluses.
- As $E_0 TB_T = E_0 NX_T = E_0[Y_T - C_T - G_T - I_T]$

  sustainability depends on future output, $E_0 Y_T$, that is, on **growth prospects**; on **fiscal restraint**, low $E_0 G_T$ and high $E_0 T_T$; on the **productivity of investment**, on how I_T impacts on Y_{T+1}.
- **A change in expectations can trigger a crisis**: investors will not be willing to hold the country's liabilities and will refuse to buy new debt or roll over the existing one.
- Even though the analysis is not operationally useful, it teaches an important lesson: **expectations are crucial for sustainability**!

What about the US debt?

- The US have been a net debtor to the rest of the world for the past 30 years, The net liability position is huge: 67% of GDP in 2020. By contrast the US net investment income is positive at 0.9% (1.2% in 2019) (See SUW 1.7 page 33).
- **The US is receiving payments on its net liabilities!**



At the end of 2020 foreign liabilities reached 14 trillion dollars equal to 67% of GDP

*To realize the graph, data on net investment income are multiplied by 40

Source: FRED Data https://fred.stlouisfed.org

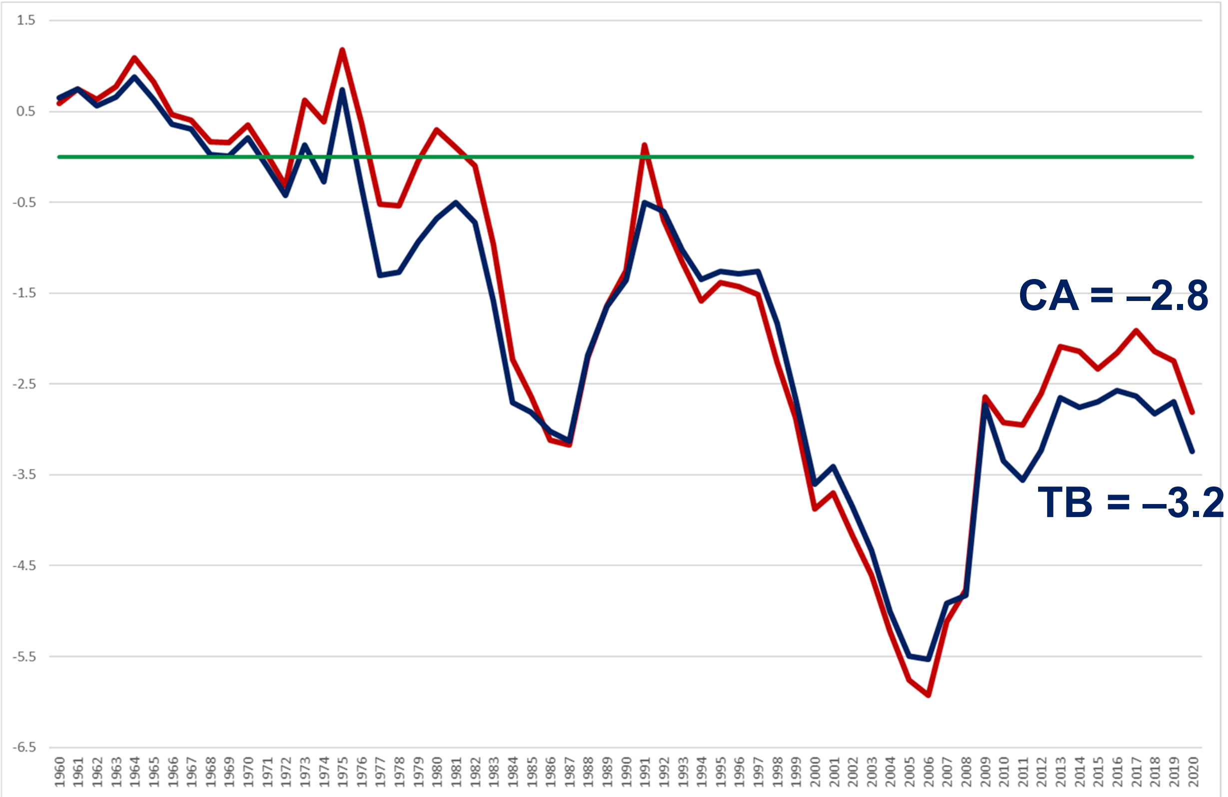
US Trade deficits exceed CA deficits

In 2019 the TB deficit was 2.7% of GDP while the CA deficit was 2.2%

The difference, 0.5% of GDP, comes from **positive net investment income for 1.2%** minus 0.1% deficit in labor income and a 0.7% deficit in transfers.

In 2020 the TB and CA deficits reached 3.2% and 2.8% respectively

CA and NX in the US - percent of GDP 1970-2020



Source: US Bureau of Economic Analysis www.bea.gov

The Return Differential

There are two explanations for the large positive US net investment position:

- **Dark Matter**: Value of US foreign assets is underestimated: BoP accounts fail to consider entrepreneurial and brand capital but this can only be part of the story since it cannot explain a debt of 67% of GDP (see the discussion in SUW 1.7.1 p.33-35)
- **Return Differential**: the return on US foreign assets exceeds the return on its liabilities, so that the overall return on the net liability position is negative; i.e. $r^{US} < 0$.
- **Debt Sustainability would be ensured by balanced trade, $\boldsymbol{TB_t = 0}$**, because, with a negative return, the debt would decrease overtime (provided large negative valuation changes are not recurrant).

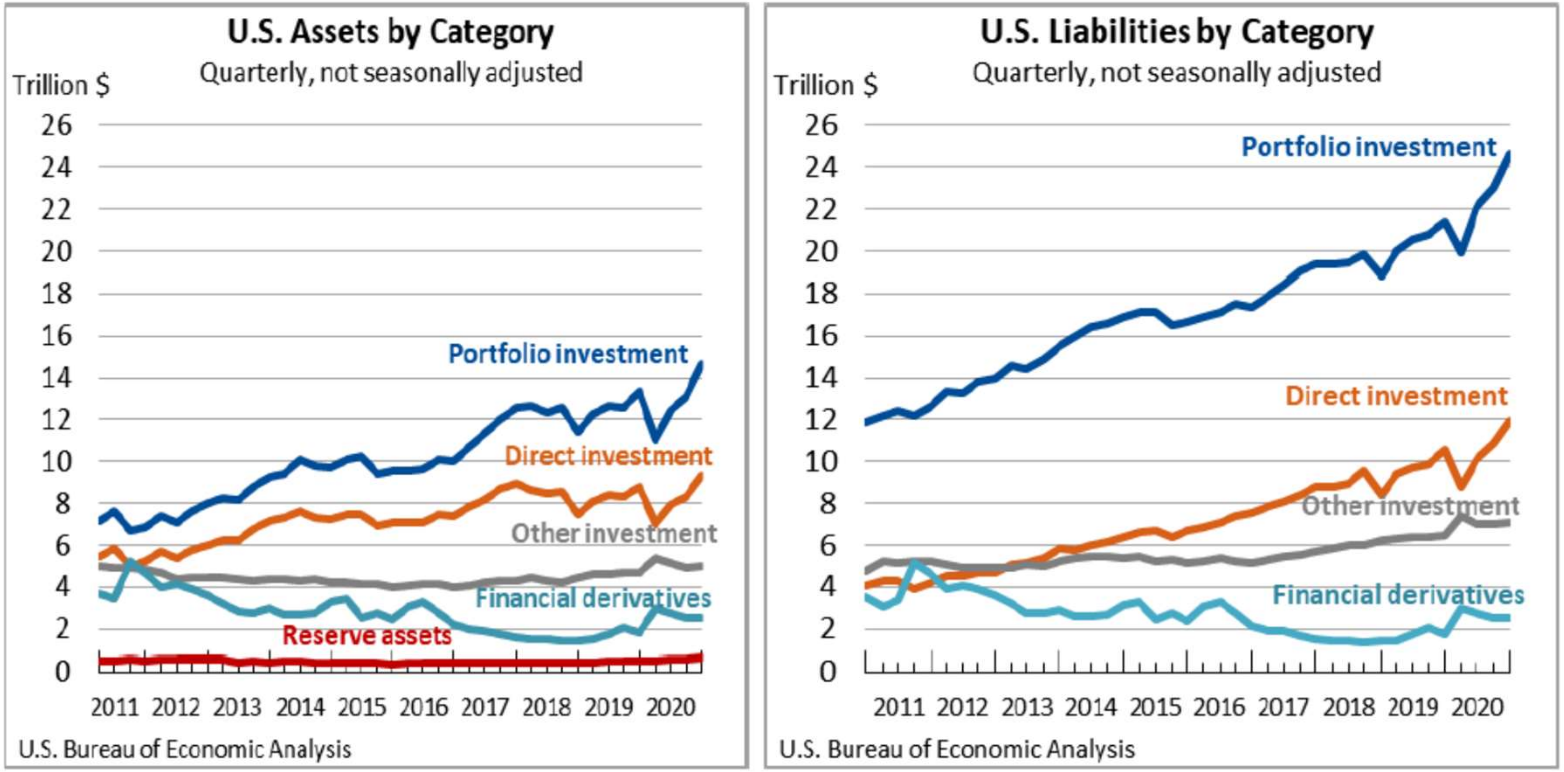
(Note: this is true even considering negative but limited net transfers)

Exhorbitant Privilege

- Research on this topic has identified that the U.S. income balance remains positive primarily because returns on U.S. foreign direct investment (FDI) in other countries and on foreign financial assets that the U.S. government and residents hold far exceed returns from foreigners' FDI in the U.S. or their holdings of U.S. assets. Why?
- The U.S. dollar is the world's reserve currency, which benefits the U.S., for example, in terms of low interest payments. And foreigners hold financial reserves in the form of high-quality assets to use as a buffer in case of financial distress. By and large, these high-quality, safe assets are denominated in U.S. dollars (for example, U.S. bonds), which are in high demand and pay relatively low returns. Economists have coined a term for this benefit the U.S. enjoys: exorbitant privilege.

https://fredblog.stlouisfed.org/2017/04/exorbitant-privilege-and-the-income-puzzle-in-the-u-s/

The (Different) composition of US Assets and Liabilities – 2011-2020



Source: US Bureau of Economic Analysis www.bea.gov

A negative return on net foreign liabilities

- Consider the interest/income payments on net foreign liabilities $NFL_t = L_t - A_t$ where L are liabilities and A assets:

Return on net liabilities or net investment income (paid)

- Return = $i_L L_t - i_A A_t$ (1) net investment income paid
- Return = $i_L L_t - i_L A_t + i_L A_t - i_A A_t$ (2)
- Return = $i_L (L_t - A_t) - (i_A - i_L) A_t$ (3)

- The usual way to compute the average nominal rate of return on net liabilities is to divide the return by net foreign iabilities

Rate of return

- $i^{US} = \frac{\textbf{Return}}{L_t - A_t} = i_L - (i_A - i_L)\frac{A_t}{L_t - A_t}$ (4)

- A_t (136% of GDP) is large relative to $L_t - A_t$ (51% of GDP =187-136) so that the nominal rate i^{US} is negative for $i_A \geq 1.38\ i_L$

Note $i_A - i_L$ must be larger to generate a net Investment Income of 1.2%

Is the US debt Sustainable?

- As the return on US net liabilities is negative, $i^{US} = -2.5\%$, the US can afford to run trade deficits without increasing its liabilitiy position relative to GDP.

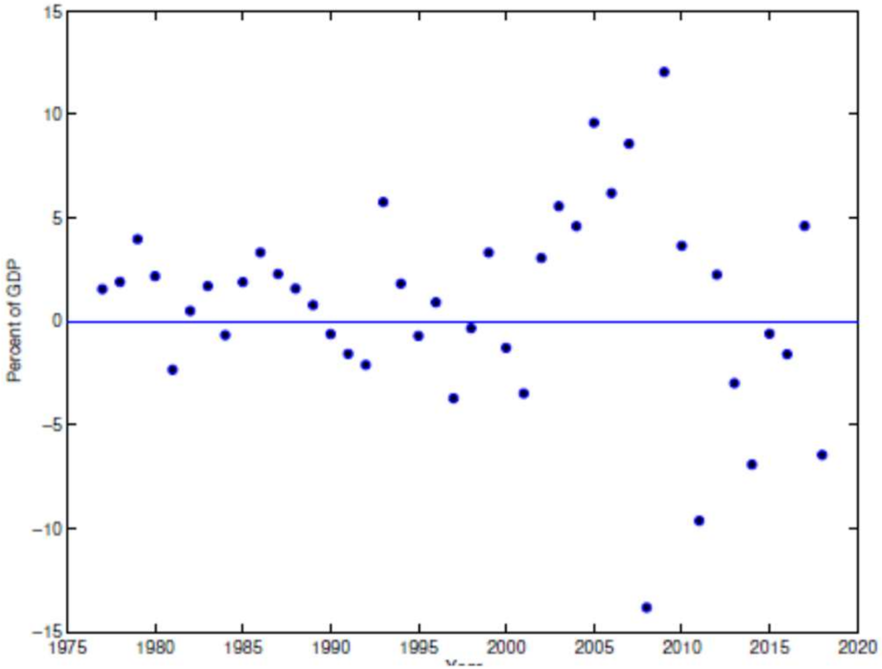
In terms of GDP (define X =net transfers+labor income; VAL=valuation change)

- $$\frac{NFL_t^N}{Y_t^N} = \frac{(1+i_t^{us})Y_{t-1}^N}{Y_t^N}\frac{NFL_{t-1}^N}{Y_{t-1}^N} - \frac{TB_t^N}{Y_t^N} - \frac{X_t^N}{Y_t^N} - \frac{VAL_t^N}{Y_t^N} \quad (1) \qquad t = 2019$$
- $$\frac{(1+i_t^{us})Y_{t-1}^N}{Y_t^N} = \frac{(1+i_t^{us})}{(1+g_t^N)} \approx 1 + i_t^{us} - g_t^N \quad (2)$$
- $$Nfl_t = (1 + \ i_t^{us} - g_t^N)Nfl_{t-1} - Tb_t - x_t - V_t \quad (3)$$
- $$\Delta Nfl_t = \underset{-1.2}{i_t^{us} nf_{t-1}} - \underset{-1.8}{g_t^N Nfl_{t-1}} - \underset{+2.7}{Tb_t} - \underset{+0.7}{x_t} - V_t = \underset{+2.2}{-Ca_t} - \underset{-1.8}{g_t^N Nfl_{t-1}} - V_t \quad (4)$$

- Absent valuation changes **a stable liability position would have required the trade deficit not to exceed 2.3%**. But valuation changes are volatile. There were: 4% of GDP losses in 2019; 6.5% losses in 2018; 4% gains in 2017.

Large valuation gains and losses

Valuation Changes in the US NIIP - percent of GDP 1977-2018



Note the Loss of 14% in 2008 and the Gain of 12% in 2009.

Non-flow changes overshadow the effect on the NIIP of the CA deficits (4.7% in 2008; 2.7% in 2009).

Valuation changes are even larger in terms of GDP for small financially open economies like Belgium, Ireland and Switzerland.

Data Appendix

US Balance of Payments and NIIP 2018-2020

	2019	2019	2020	2020	2019	2020
Exports goods and services	2 528 262		2 127 254		%GDP	%GDP
Imports goods and services	3 105 127		2 808 954			
Trade Balance - million		**-576 865**		**-681 700**	**-2.7**	**-3.3**
Investment income received	1 128 966		952 148			
Investment income paid	880 562		761 297			
Investment income net		**248 404**		**190 851**	**1.2**	**0.9**
Labor income received	6 725		6 166			
Labor income paid	18 785		15 443			
Labor income net		**-12 060**		**-9 277**	**-0.1**	**0.0**
Current transfer receipts	141 984		142 040			
Current transfer payments	281 689		289 124			
Current transfer net		**-139 705**		**-147 084**	**-0.7**	**-0.7**
Current Account Balance		**-480 226**		**-647 210**	**-2.2**	**-3.1**
	2018	**2019**	**2020**	**18 %GDP**	**19 %GDP**	**20 %GDP**
Foreign Assets - billion	25233.8	29152.8	32156.0	122.4	136.0	153.6
Foreign Liabilities - billion	34908.2	40203.3	46248.1	169.4	187.6	220.9
Net Investment Position	**-9 674**	**-11 051**	**-14 092**	**-47.0**	**-51.6**	**-67.3**
GDP billion	**2018**	20612	**2019**	21433	**2020**	20937