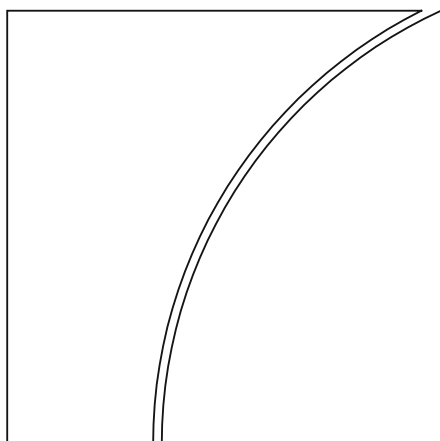




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Triffin: dilemma or myth?

by Michael D Bordo and Robert N McCauley

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Keywords: Triffin dilemma, Foreign exchange reserves, Gold, US current account, Safe assets, World's banker.

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Triffin: dilemma or myth?

Michael D Bordo and Robert N McCauley¹

Abstract

Triffin gained enormous influence by reviving the interwar story that gold scarcity threatened deflation. In particular, he held that central banks needed to accumulate claims on the United States to back money growth. But the claims would eventually surpass the US gold stock and then central banks would inevitably stage a run on it. He feared that the resulting high US interest rates would cause global deflation. However, we show that the US gold position after WWII was no worse than the UK position in 1900. Yet it took WWI to break sterling's gold link. And better and feasible US policies could have kept Bretton Woods going.

This history serves as a backdrop to our critical review of two later extensions of Triffin. One holds that the dollar's reserve role required US current account deficits. This *current account Triffin* is popular, but anachronistic, and flawed in logic and fact. Nevertheless, it pops up in debates over the euro's and the renminbi's reserve roles. A *fiscal Triffin* holds that global demand for safe assets will either remain dangerously unsatisfied, or force excessive US fiscal debt. Less flawed, this story posits implausibly inflexible demand for and supply of safe assets. Thus, these stories do not convince in their own terms. Moreover, each lacks Triffin's clear cross-over point from a stable system to an unstable one.

Triffin's seeming predictive success leads economists to wrap his brand around dissimilar stories. Yet Triffin's dilemma in its most general form correctly points to the conflicts and difficulties that arise when a national currency plays a role as an international public good.

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1. What did Triffin argue and what influence did he have?

In December 1958 the western European countries declared current account convertibility and the Bretton Woods System started to operate. Under Bretton Woods as it had by then evolved, each member country declared its currency's par value in terms of US dollars and had to defend this exchange rate (within 2.5% bands) using foreign exchange market intervention. The United States had declared its par value at \$35 per ounce of gold in 1944.

The Bretton Woods system was an adjustable peg system in which member countries could change their parities in the face of a fundamental disequilibrium (never defined but presumed to be a permanent supply shock). Members used monetary and fiscal policy to maintain full employment and stable prices, but over time such policies aimed at internal balance had to be consistent with the external peg. The IMF could provide temporary finance to members facing current account deficits, ie an excess of net purchases of goods and services from the rest of the world. Bretton Woods also condoned capital controls to limit international capital flows in order to allow independent monetary policy.

As the Bretton Woods System evolved in the 1950s, the US dollar became the primary international reserve asset. The system became a gold-dollar system, reminiscent of the interwar period, when sterling and other currency holdings supplemented official gold holdings. The gold-dollar system arose because growth in the global monetary gold stock was inadequate to finance the growth of world trade and output. This in turn resulted from the post-war choice of parities that put a low *real* price on gold, which restricted gold production. Moreover, the main sources of gold supply at the time, the USSR and South Africa, were unreliable (Gilbert (1966)); Mundell (1996)). The gap between global reserve demand and supply was filled by dollars produced by an accumulation of official short-term claims on the United States from the early 1950s. In contemporary terms, the United States was running US balance of payments deficits under official settlements, as it accumulated liabilities to foreign officials without increasing official assets like gold.

With this background, Robert Triffin testified before Congress in 1959, received a big write-up in *Business Week*, and followed up with his book *Gold and the dollar crisis* (1960). Combining popular persuasion and academic analysis, the book warned that the nascent gold-dollar system was unsustainable and would implode as had happened in 1931 and 1933.

Triffin described his "double dilemma" to the Joint Economic Committee. If the United States eliminated its "overall balance of payments deficits" – its accumulation of short-term liabilities to the rest of the world – it would deprive the world economy of international liquidity needed for the expansion of global trade. If the United States did continue to provide international liquidity, then eventually US policy would be unable to lower interest rates without a run on the gold stock. Either way, deflation and depression threatened.

In effect, Triffin argued, as Feliks Młynarski (1929) had done four years before 1933,² that the gold shortage and the increasing use of the dollar as official reserves would inevitably lead to a run on US gold holdings. This would occur once outstanding dollar liabilities to the rest of the world exceeded the US monetary gold

² Eichengreen (1992, pp 20, 203-204) suggests that it should be called the Młynarski Dilemma.

stock. This run would lead the US monetary authorities to tighten monetary policy, ushering in global deflation and, in the face of nominal rigidities, global depression. Triffin argued that this outcome could only be averted by the creation and issuance of global liquidity in the form of Keynes's bancor (1941) or some other global money. Thus, while the dilemma was posed as two-forked, Triffin's preoccupation was with the fork in which the US dollar continued to provide the world with liquidity until the system broke down in a run on the dollar.

Triffin is remembered for having rightly called the break of the gold-dollar link in 1971 in 1959-60. In the event, overall US external liabilities reached the value of the US monetary gold holdings in 1958 (Graph 1, right-hand panel, blue dotted and red solid lines). US liabilities to *officials* reached that point in 1964 (solid blue and red lines). In 1971, just seven years later, President Nixon broke the dollar's peg to gold.

Triffin did not take into account what became a substantial stock of US dollars held by foreign central banks offshore that made the US position worse according to his analysis. Years later, the growth of the offshore dollar market led Triffin (1978, p 4) to add official eurodollar deposits to dollar reserves held in the United States, an addition subsequently neglected by international economists. This point is not just an historical footnote.

The point is worth elaboration because the same misapprehension that all dollars are held Stateside³ afflicts the more recent versions of Triffin discussed below. Four years after *Gold and the dollar crisis* appeared, the world learned of a stock of \$4.45 billion of dollar bank liabilities outside the United States as of September 1963 (BIS, 1964). Then, the Bank for International Settlements (BIS) upped its estimate to \$6.94 billion (BIS (1965)). Central banks held about half of such offshore dollar deposits (BIS (1966, pp 146-147)), "presumably to obtain higher earnings on these funds" than in the United States (BIS (1964, p 132)). The upshot is that central banks could and did

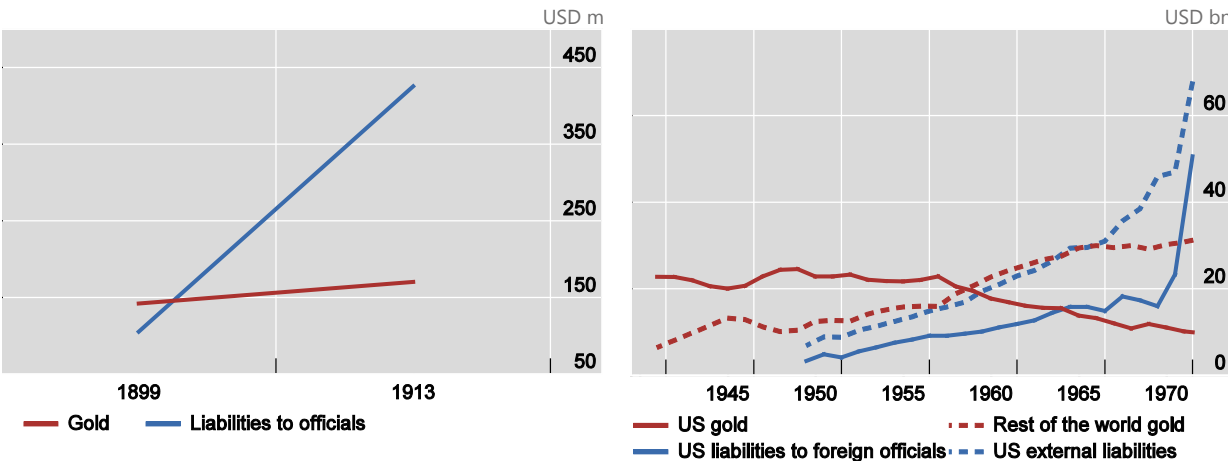
Triffin problem: UK pre-WWI and US post-WWII

Liabilities to officials and holdings of gold

Graph 1

Identified UK liabilities to foreign officials and Bank of England gold, 1899 and 1913

US liabilities to foreign officials and US monetary gold, 1940-1971



Source: Lindert (1969, Table 3 and p 37); Bordo (1993), based on Tables SC-8, columns 1 and 2, and SC-10, column 3 in Gold Commission Report, Washington, DC: US Congress, March 1982; 1972 Supplement to International Financial Statistics.

³ Avdjiev et al (2016) term the fallacy that all firms and currencies are contained by national borders the "triple coincidence" of international finance.

place official foreign exchange reserve holdings in dollar deposits outside the United States as well as in instruments in the United States (which were captured by the US Bureau of Economic Analysis as a US liability).

Taking on board the insight that official dollar foreign exchange reserves can be held outside the United States, the two series cross earlier (Graph 2). In particular, the sum of offshore and onshore official dollar holdings surpassed the value of US gold not in 1964 but rather in 1962.

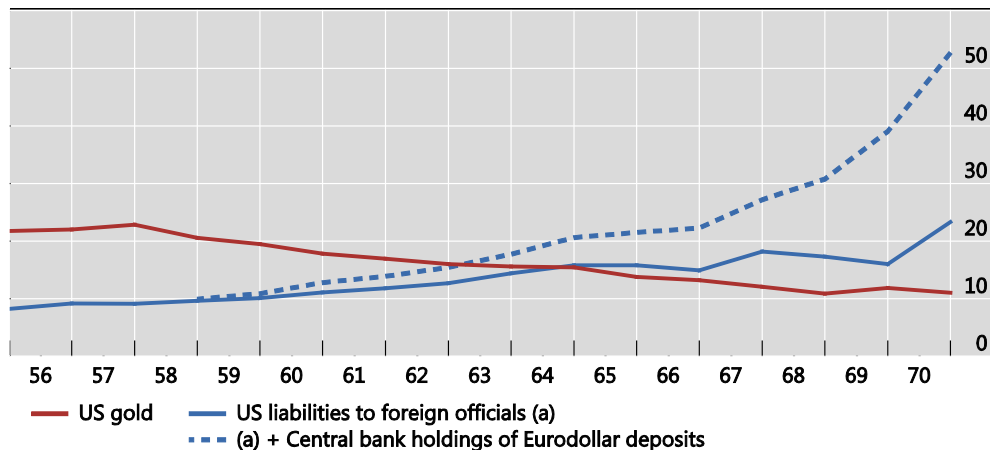
If Triffin is remembered for rightly predicting the breakdown of the gold/dollar link well in advance, what Triffin got wrong is not much remembered. He worried about deflation but the world suffered inflation. Triffin (1978, pp 3-4) recognised this:

Let me also admit, however that I *did* change my mind about the main danger confronting the future of the international monetary system. While my initial diagnosis was seen by central bankers⁴ as placing excessive stress on the first horn of the Triffin Dilemma, the danger of world deflation, my later writings placed increasing stress on the second, the inflationary potential of continuing U.S. deficits...Even so, I was totally wrong in underestimating the duration and the size of the U.S. deficits that foreign central bankers would be willing to absorb, at the cost of an inflationary explosion of world monetary reserves and of a multiple expansion of the money supply in their countries under the traditional system of fractional reserve requirements.

US liabilities to foreign officials, their eurodollar deposits and US monetary gold 1955–1970

Billions of US dollars

Graph 2



Note: Central bank holdings of Eurodollar deposits estimated as half of cross-border dollar liabilities of European banks; dollar liabilities of UK banks are used to estimate these for 1958-1962.

Sources: IMF, *International Financial Statistics*; Bank of England (1964); US Bureau of Economic Analysis; BIS (1964–1971); authors' estimates.

⁴ "Notably Dr. Otmar Emminger. See, for instance, his (1973, p 35) Per Jacobsson lecture" [Triffin footnote]. Triffin ascribed the surprising willingness to absorb dollars to "the reluctance to accept the appreciation of its exchange rate that would flow from a country's refusal to accumulate dollars" (p 5).

And what he got right he may have gotten right for the wrong reasons. He posited an inevitable run on the US gold but, as we argue below, different US policies could have left the system to enjoy another equilibrium.

In essence, the Triffin story combined two elements. It extended the mechanical money supply multiplier (Phillips (1920)) to the international sphere. Growing stocks of domestic money and bank credit needed backing with gold or foreign exchange reserves. And it ascribed the limited production of gold to the operation of the commodity theory of money and the gold market (Barro (1979)). In particular, the gold price had been set too low in relation to other prices, discouraging mining.

The mechanical aspect of the Triffin story was carried forward in the first generation speculative attack models of Salant and Henderson (1978) and Krugman (1979). Garber (1993) applied these directly to the collapse of Bretton Woods.⁵

Triffin's story and its prognosis of a run on the US monetary gold stock and a return to the Great Depression was taken to heart by the US government.⁶ After the October 1960 spike in the London gold price to \$40 on the fear that, if John F Kennedy were elected President, he would implement inflationary policies, a number of policies sought to stanch the gold losses that had begun in the 1950s. Indeed, Vice President Coombs of the Federal Reserve Bank of New York joined the December 1960 BIS meetings for the first time (Coombs (1976)) and his boss President Hayes made his first visit to Basel in January 1961. They sought to reassure the European central banks and discussed several of the policies (Toniolo (2005, pp 364 and 372)). Roosa recalled, "in my first conversation with President-elect Kennedy after the announcement of my appointment as his Under Secretary [of the Treasury] for Monetary Affairs in December 1960, he pointed to the relevance of 'Bob Triffin's thinking' for the effort we were then initiating to buttress the dollar's defences" (Triffin (1978, p vi).

These buttresses ultimately reached no fewer than seven. (1) The Gold Pool (1961) saw eight countries jointly intervene to maintain the London gold price close to the \$35 parity price. (2) The General Arrangements to Borrow (GAB, 1961) created an IMF lending facility large enough to offer substantial credit to the United States.⁷ (3) Roosa bonds (1961), US Treasury bonds denominated in deutsche mark and other currencies, were exchanged for dollars to discourage US allies from converting dollars into gold. (4) The Interest Equalization Tax (1963) imposed a tax on capital outflows. (5) Moral suasion sought to limit outflows of bank credit and direct investment. (6) Joint exchange market intervention was undertaken, supported by (7) the creation of the swap lines by the Federal Reserve in 1962 (Bordo et al (2015a)).⁸ Each of these policies had some impact in the short run. Triffin (1978) judged that "these palliatives postponed the day of reckoning much longer than I would have expected but did not

⁵ By contrast Diamond and Dybvig (1983) and Marion (1999) suggest multiple equilibria.

⁶ But not the IMF, or at least not Altman (1961), who contests Triffin's diagnosis and especially his prescription.

⁷ Strange (1976) quipped that the GAB would have been better labelled the Selective Agreement to Lend.

⁸ Martin Gilbert (1968) of the BIS, Jacques Rueff (1972) in French official circles and others (Meltzer (1991)) argued that the problem could have been solved by the United States, unilaterally or in concert with others, doubling the nominal price of gold from \$35 to \$70 per ounce. US officials opposed this move because it would have given a large capital gain to pariah nations South Africa and the USSR. It would also have been a time inconsistent policy and would have induced moral hazard (Bordo (1993)).

prevent it". None could prevent the ultimate collapse of Bretton Woods once the US began following inflationary policies in the mid-1960s (Bordo (1993)).

Triffin was also influential in Europe because his thesis of the technical unsustainability of the gold-dollar link dovetailed nicely with Charles De Gaulle's objection to the US exorbitant privilege. This view took umbrage that the United States did not have to adjust to its balance of payments deficit whereas other countries did (Bordo et al (1995); Eichengreen (2011); McCauley (2015)). Triffin was also influential because his thesis served to bolster the views of Bundesbank head Otmar Emminger (1967, 1973) that US balance of payments deficits were forcing the Europeans to inflate as purchases of dollars to prevent appreciation boosted base money (Bordo (1993)).

Triffin's prognosis also led to efforts by the IMF, G10 and OECD (Working Party 3) to reform the international monetary system by developing a substitute for the US dollar as international reserve asset. Various plans worked to realise the Triffin/Keynes ambition of centralised control over the amount or composition of official reserve assets. These included the Bernstein plan for centralising dollar and sterling reserves with the IMF, which could lend them out. Also proposed was a substitution account to transform dollar reserves into SDRs (McCauley and Schenk (2015)). Finally the SDR (often called paper gold) was agreed in 1969. However, by the time the SDR arrived in 1970, events had falsified Triffin's prediction of deficient global liquidity and deflation. Instead the world suffered from excessive global liquidity and inflation.

Triffin's thesis that the gold dollar standard would inevitably collapse into a 1930s style depression commanded wide but not universal acceptance. Building on Kindleberger (1965), a widely cited article in the *Economist* magazine by Despres et al (1966) posited that the Bretton Woods system did not inevitably have to collapse. They viewed the United States as acting as a global financial intermediary that transformed short-term liabilities (dollar reserve holdings) into long-term assets (eg, direct foreign investments).⁹

Halm (1968) and Farhi and Maggiori (2018) criticised the dissenting view for neglecting liquidity risk inherent in the transformation of long-term assets into short-term liabilities.¹⁰ On the Diamond and Dybvig (1983) view, such a maturity mismatch in domestic banking requires a lender of last resort to counter bank runs. In the international context, Farhi and Maggiori introduce something like a self-fulfilling run on the liabilities of the reserve currency issuer. Kindleberger (1978) took the criticism to heart and looked to central bank cooperation to provide the international lender of last resort.¹¹

⁹ Farhi and Maggiori (2018) offer their model as a bridge between Triffin and Despres et al. However, their reserve currency issuer uses its capacity to produce (possibly) safe liabilities to extract real resources from the rest of the world to consume or to invest at home. On this reading, these authors bridge the current account and safe assets versions of Triffin.

¹⁰ "As far as the 'international banker' is concerned, it is obvious that he cannot count on a one-sided, permanent, and ever-increasing flow of short-term funds from abroad. The flow of short-term capital can reverse itself suddenly for a number of reasons, making the deficit which the minority view considers entirely normal rather problematic. The world banker can suddenly be faced with a liquidity problem or even a liquidity crisis. Then he will have to be able to fall back on very large international reserves" (Halm (1968, p 7)). Or swap lines. For a revival of the international banker interpretation, see Gourinchas and Rey (2007 and 2014)).

¹¹ Kindleberger saw the outline of an international lender of last resort in the swap network that the Fed developed during the Bretton Woods period but that outlasted it. Despite the swaps' short-term

This dissenting view in effect conceived a stable equilibrium, an alternative to Triffin's run, that appropriate US policy could have sustained. Because of its long-run track record of stability and growth of the US economy and financial system by the 1960s, the rest of the world valued the dollar as a vehicle currency, an invoicing currency and as a store of value (Eichengreen (2011)). As long as the US monetary authorities provided the price stability needed to maintain the nominal anchor, this process could have continued indefinitely.¹² The gold dollar standard could eventually have evolved into a pure dollar standard (McKinnon (1969)).

The Triffin thesis very much reflected the environment of the Bretton Woods era – of a pegged exchange rate regime based on the dollar and ultimately gold. Triffin believed that its main defect repeated that of the gold exchange standard of the 1920s and 1930s: the gold shortage from the maladjustment of parities. The weakness of sterling as a reserve asset would return after World War II to haunt the dollar and deflation would return to haunt the world.

In any case, Triffin's legacy remains an important point of reference in the very different environment of a fiat money non-system. In what follows, Section 2 goes back to the gold standard before WWI to question the inevitability of a run on (then the Bank of England's) gold when Triffin's lines cross. Then Section 3 jumps forward to the popular, if often misstated, current account version of the Triffin dilemma that became popular after the US current account deficits set in during the 1980s. Then Section 4 considers the more recently proposed analogy between a global safe assets shortage and the Triffin dilemma. These resuscitated Triffin dilemmas are at best distant relatives of the original and at worst fatally flawed. We conclude in Section 5 with reflections on Triffin's legacy.

2. Bretton Woods and the pre-WWI gold standard facts?

Triffin's view has generally been considered a major success because the Bretton Woods par value system did unravel seven years after US dollar liabilities to foreign officials reached the US monetary gold stock in 1964. The fact that Bretton Woods fell apart seven years after Triffin posited that it would, however, does not explain why it happened. Nor does it answer whether, if the US monetary authorities had not behaved as they did, it would have happened sooner or not at all. Moreover, contrary to Triffin's prediction, the collapse of the Bretton Woods system did not result in another Great Depression and deflation but rather in the Great Inflation. And it is far from obvious that the Bretton Woods system had to end in 1971-73.¹³

Triffin's prediction that the Bretton Woods system would collapse into depression and deflation was based on his interpretation of the interwar experience with the gold exchange standard. The gold exchange standard, established slowly and painfully in the 1920s, following the 1922 Genoa Conference, collapsed after the stock market crash of October 1929 and then sterling going off of gold in September 1931 when central banks around the world, in a scramble for liquidity, converted their

success, Bretton Woods collapsed between 1971 and 1973 amid US inflation and current account deficits (Bordo et al (2015a and 2015b, chapter 4)).

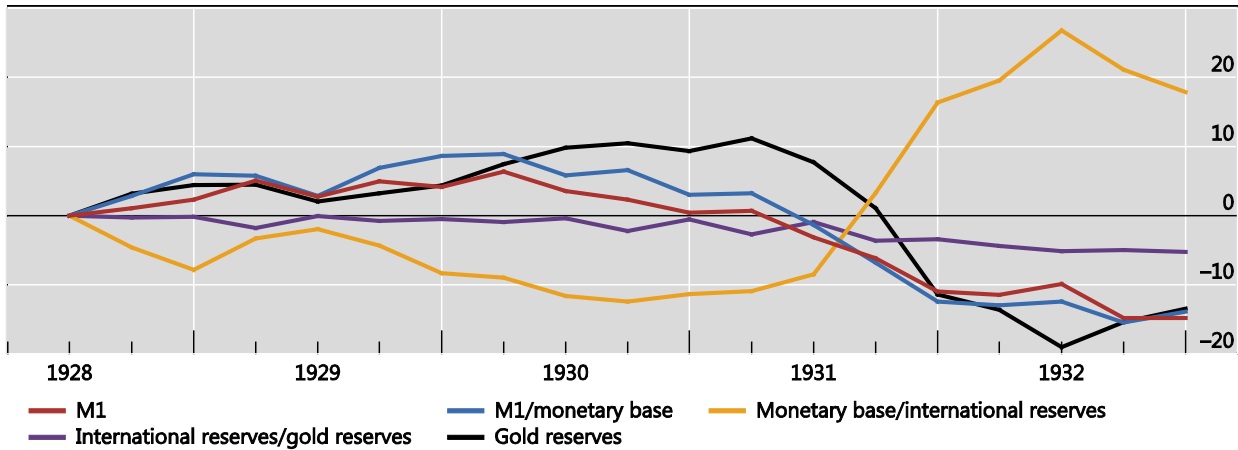
¹² See Genberg and Swoboda (1981) for an emphasis on policies rather than quantities.

¹³ As argued by Bordo and Eichengreen (1998) with their simulations of a model of the gold exchange standard for the interwar period, had the United States maintained a stable monetary policy and low inflation after 1965, the Bretton Woods system may well have lasted another decade or so longer.

foreign exchange holdings into gold. Bernanke (2000) beautifully documents how the global money multiplier based on the ratios of total international reserves (including foreign exchange) to monetary gold, the ratio of the monetary base to international reserves and the ratio of money (M1) to the monetary base, imploded between 1928 and 1932.

Determinants of the "world" money stocks 1928–1932¹

Graph 3



¹ World aggregate includes Canada, France, Germany, Japan, Sweden, the United Kingdom and the United States. Authors' decomposition of gold quantity and distribution is suppressed (ie SHARE (maldistribution of gold) and TOTGOLD (total monetary gold) are summed).

Source: Bernanke with Mihov in Bernanke (2000).

The events that punctuate this implosion include the speculative attack on the Austrian schilling in May 1931, the attack on the Deutsche mark in June 1931, and the attack on sterling in the summer of 1931. Britain departed from gold in September of that year, followed by many countries. Then followed the attack on the dollar in October 1931 and again in the winter of 1933. Finally came the attacks on the Gold Bloc countries in 1935 and 1936, culminating in France's departure from the gold standard in October 1936.

What is remarkable about Graph 2's decomposition is how scant the effect was of the variable emphasised by Triffin, namely the ratio of reserves to gold. This ratio (the inverse of the backing ratio, plotted in purple) was quite stable from mid-1928 until the floating of the pound sterling in September 1931. To be fair to Triffin, Graph 2 includes the United States and the United Kingdom, whereas Triffin (1960, p 55) excluded them. Thus, he reports that the reserve to gold ratio fell by 34% between 1928 and 1932 for a presumably larger sample that excludes the two key currency countries, whereas Bernanke and Mihov's data show only a 5% fall.

In any case, Graph 3 locates the drivers of the monetary contraction elsewhere. For the seven industrial countries, sterilisation tended to hold down M1 growth in 1928-30 as the ratio of base to reserves (green line) fell. In particular, France and the United States did not allow interest rates to fall as they gained gold. Then the money-multiplier (M1/base in red) kicked in after the stock market crash and the onset of financial instability. The reserves to gold ratio and the gold held by these seven countries only fell after sterling's departure from gold in 1931.

The four year collapse of the gold exchange standard was accompanied by deflation of over 30%. Bernanke and James (1991) argued that the deflation interacted with banking panics and sticky wages to propagate the global depression. International financial contagion played an important role (Kindleberger (1973)).

The Triffin view was based on the interwar experience but a puzzle that Triffin was aware of (Triffin (1964, p 6)) was the experience of the classical gold standard 1880-1914 which did not collapse in the way that the interwar regime would (Graph 1, left-hand panel). In many ways the gold standard was a precursor to the gold exchange standard and Bretton Woods because sterling was increasingly substituting for gold in many countries' international reserves. In other words, sterling was acting in many ways as the dollar would in the post WWII period as the dominant international currency serving as a vehicle currency, invoicing currency etc. Lindert (1969) document how many emerging countries began substituting sterling, francs, marks and dollars (US dependencies like the Philippines and Cuba) for gold. More so than the Federal Reserve in 1960, the Bank of England held very low gold reserves (less than 5% of its liabilities), what Clapham termed "a thin film of gold" (Sayers (1976, p 9)).¹⁴

Given these facts why didn't the gold standard dissolve into a deflation/depression as Triffin predicted? Of course the gold standard did collapse in 1914 at the outbreak of WWI as all of the belligerents, in a scramble for gold, quickly staged a fire sale of their foreign assets and almost all of them suspended gold convertibility.¹⁵

There are a number of possible explanations:

1. Because of luck. Perhaps the collapse of the gold standard was just an accident waiting to happen and WWI was the accident (Eichengreen (1985, p 16).
2. Because of ignorance. Lindert (1969) half seriously suggested that the dearth of statistics and the absence of a renowned economist claiming systemic instability obscured any fragility in the gold standard before WWI. ¹⁶ Still, the inadequacy of the Bank of England's gold reserve was a theme in public discussion for 30 years before 1914,¹⁷ A variant stresses persuasive definition and even false belief: if statisticians had not carved an ill-conceived "official settlement balance" out of the US capital account, perhaps there would not have been talk of "deficits" (Kindleberger (1965) and Despres et al (1966)).
3. Because of central bank cooperation. Eichengreen (1992) argued that cooperation between the Bank of England, Bank of France and other European central banks during the big global financial crises of 1890 and 1907 preserved the system. On both occasions the Bank of France, which unlike the Bank of England had massive gold reserves,¹⁸ and aided by other central banks, provided

¹⁴ Hardy (1936) reports that the Bank of England held just 3.4% of official gold in 1913. Triffin (1960) reports that the share of the US share of global gold reserves (outside international institutions) was 51% in June 1959.

¹⁵ With the principal exception of the United States. Britain and France suspended de facto but not de jure. And notably bank panics were avoided. See Silber (2007) and Roberts (2013) for the US and UK cases, respectively.

¹⁶ "There were no balance-of-payments problems fifty years ago because there were no balance-of-payments statistics', Chancellor of the Exchequer's news conference, Washington, D.C., October 3, 1965" (Lindert (1969, p 36).

¹⁷ "It was a commonplace of economists, financial journalists, politicians (notably just about every Chancellor of the Exchequer) Tory or Liberal, bankers themselves...Everybody wrote articles on the subject: the journals of the period are filled with papers on the inadequacy of our reserves" (Goodhart (1972, p 101)).

¹⁸ See Bazot et al (2016).

generous loans to the Bank of England, which may have allowed it to avoid depleting its gold reserves. However, Flandreau (1997) and Bordo and Schwartz (1999) argued that the rescue loans extended by the Bank of France to the Bank of England were only episodic, made on commercial terms and intermediated by the Rothschilds.

4. Because the Bank of England managed the gold standard and by raising its policy "Bank rate"¹⁹ could command whatever gold reserves it needed. Since the City of London was the world's premier money market and commodity market and because many international banks and other financial institutions were based in or had branches in London, the Bank of England could influence policy interest rates across the globe. Lindert (1967, 1969) documents how the Bank of England had stronger pulling power when it raised Bank rate than did the other core country central banks (ie the Bank of France and the Reichsbank).²⁰ Eichengreen (1992) made a key addition to this story by suggesting that the Bank of England could get away with assigning a higher priority to stopping an external drain of gold than to domestic activity and employment because of the limited suffrage at the time in Britain (and elsewhere). In other words, the Bank of England could credibly maintain gold convertibility at the expense of non-voters before WWI but not for long after.

While each of these four explanations has something to it, one that deserves weight centres on credibility. The classical gold standard may have been more successful because of the credibility of the commitment by the Bank of England and other central banks to the gold standard convertibility rule. The rule required that gold standard adherents maintain the fixed prices of their currencies in terms of gold as their primary policy goal. This meant that, except in case of dire emergency such as a major war or financial crisis not of their own making, they would not suspend convertibility and follow expansionary monetary or fiscal policy. In case of a major war or serious financial crisis, the central bank could suspend convertibility temporarily and issue paper money or run fiscal deficits on the understanding that when the emergency passed that convertibility would be restored at the original parity even if this meant running a recession.

There is considerable empirical support for this view. Bordo and Kydland (1995) find evidence for such credibility in the scant rise in the yields of sovereign debt and the scant decline in real cash balances (the inflation tax base) during the British Suspension of 1797 to 1821²¹ and during the WWI suspension of 1914 to 1925. US bond yields and real cash balances behaved similarly during the Greenback suspension during and after the US Civil War from 1862 to 1879. Bordo and MacDonald (2005) find other evidence for the credibility of the gold standard based on the gold points as a target zone. Eichengreen (1985) documents how short-term capital inflows into Great Britain served as a stabilising mechanism during financial crises, in sharp contrast to what happened in the interwar period.

Perhaps the success of the pre-1914 gold standard could have been replicated during the Bretton Woods period had the United States followed sound monetary policies after 1965 (Bordo (1993)). Politically feasible policies like those of the

¹⁹ The Bank of England took years to learn how to control the money market, ie to make the Bank rate effective. See Sayers (1970). See Eichengreen (1987) for the Bank of England as Stackelberg leader.

²⁰ See Tullio and Walters (1996) for a possibly contradictory view. See also Bazot et al (2016).

²¹ See also Bordo and White (1990).

Eisenhower and early Kennedy administrations rather than the guns, butter and easy money policies of the Johnson administration could have made the difference. Moreover, before 1965 the Fed did pay attention to international considerations in setting its policy rates (Bordo and Eichengreen (2013)). Indeed the world may have evolved uneventfully into the pure dollar standard as advocated by McKinnon (1969, 2013).

Thus, although Triffin's prediction proved correct for the gold dollar standard under the Bretton Woods system, he neglected the possibility of credible policy as had been followed in the pre-1914 gold standard.

3. The current account version of Triffin

The shift from fixed to floating exchange rates, from capital account restrictions to capital account openness, from the dominance of official flows to the dominance of private flows, from fear of deflation to fear of inflation and back to fear of deflation has not dimmed the appeal of Triffin-style arguments. With the changes in the international monetary and financial system, a wide range of arguments have claimed the Triffin rubric. To us, key themes in what can be called a Triffin scenario include: unsustainability; national interest vs global interest; liquidity vs confidence and adjustment; and an emphasis on aggregates (not prices).

The most common version of Triffin shifts his thesis from the capital account to the current account.²² It posits that the reserve currency country must run, or at least does run, persistent current account deficits to provide the rest of the world with reserves denominated in its currency (Zhou (2009), Camdessus and Icard (2011), Paul Volcker in Feldstein (2013), Prasad (2013)). "In doing so, it becomes more indebted to foreigners until the risk-free asset ceases to be risk-free" (*Financial Times Lexicon* (no date)).

In 1997, this thesis was stated as a risk for European Monetary Union. Official reserve managers would shift their investments from the dollar to the new euro, forcing the new currency to appreciate and the euro area current account to deteriorate (Bergsten (1997), Alogoskoufis and Portes (1997)). To Paul De Grauwe, this concern evoked Triffin (McCauley (1997, p 41)).

This section first underscores how different this thesis is from the original Triffin thesis. Then follows a review of the evidence that shows that the US current account has been smaller (ie a narrower surplus or a wider deficit) than might be predicted by US fundamentals. However, whether this is owing to the role of the dollar or the size of the US economy or some other factor is not clear. Finally, it discusses the breakdown scenario in this would-be dilemma.

3.1 Current account Triffin versus Triffin

As applied to the United States, the current account version of Triffin runs as follows. The global accumulation of dollar reserves requires the United States to run a current account deficit. Since desired reserves rise with world nominal GDP, which is growing

²² This shift is not altogether surprising given what Borio (2016) calls "the centrality of the current account in international economics". See also Borio and Disyatat (2015).

faster than US nominal GDP, the growth of dollar reserves will raise US external indebtedness unsustainably. Either the United States will not run the current account deficits, leading to an insufficiency of global reserves. Or US indebtedness will rise without limit, undermining the value of the dollar and the reserves denominated in it.

As stated, the current account Triffin differs substantially from the original Triffin. The original Triffin was about an accumulation of *capital account* flows into a stock of liabilities that would eventually surpass the value of the US monetary gold stock; it had nothing to do with the current account.

Empirically, it is worth noting at the outset that this current account version of Triffin is completely ahistorical. The United States was running current account surpluses when Triffin wrote. Swoboda (2012) reminded participants in a conference on Triffin: "In fact the United States had a positive current as well as trade account in the post-war period until 1970; these accounts turned negative in 1971 and 1972, but the current account then became positive again until 1980. The issue then was not that the United States could run current account deficits 'without tears' but that its 'exorbitant privilege' allowed it to borrow short at low cost in order to acquire long-term claims on the rest of the world".²³

The fact that dollar reserves could grow in the 1960s in the absence of US current account deficits underscores an important distinction between nets and grosses in international finance (Borio (2016)). Countries can and do borrow from or sell equity to the world to accumulate foreign exchange reserves. India is a case in point with substantial reserves, notwithstanding substantial current account deficits.

Taking it on its own terms, the current account version of Triffin raises two related questions. It requires that countries accumulate foreign exchange reserves as a purposive activity. For instance, authorities may observe sudden reversals of capital flows and seek to build up a cushion of reserves. This raises the question, first, do countries really accumulate dollar reserves as a purposeful, precautionary activity? Or rather do they do so as a by-product of desired current account surpluses?²⁴ A second, is whether the parallel is well taken in the sense that the horns of the dilemma are sharp and systemic breakdown threatens?

US current accounts are clearly linked to those in the rest of the world thanks to the N-1 problem. Aliber (2016, p 126) argues that, just as there are only N-1 exchange rates, there can be only N-1 independently determined current accounts. If the rest of the world runs current account surpluses, then the United States must run deficits. In Aliber's phrase, the US economy supplies consistency to the rest of the world. One could cite, for instance, the widening of the US current account deficit in the wake of the Asian financial crisis, when a sudden reversal of capital flows forced current account deficits in East Asia to swing sharply into surpluses. Triffin's system-wide perspective is conveyed by the N-1 and his theme of unsustainability by sufficiently large current account deficits.

However, the Triffin version of the current account requires that the rest of the world runs current account surpluses for a particular reason, namely to acquire dollar

²³ Although Garber (1996) judged that "Triffin had the better of the argument", Kindleberger (1985, p 295) wrote that the "cogency of that position [of Kindleberger, Despres and Salant] has been thoroughly undermined by the fact that the United States has now developed a real [that is, current account] deficit". This implied for Kindleberger that the world's banker is eating its capital. On the theme of the US economy as world banker, see Gourinchas and Rey (2007, 2014).

²⁴ This was Triffin's interpretation of the explosion of reserves in the 1970s; see footnote 4 above.

reserves as international liquidity. There is an alternative interpretation of dollar reserve growth as a consequence of a growth strategy that implies US deficits not because of the role of the dollar, but rather the size of the United States.

In the Bretton Woods II argument of Dooley et al (2004), emerging market economies seek to run current account surpluses to create jobs out of an unlimited supply of labour (the Lewis (1954) model). Current accounts may feed official international reserves as a by-product, but these are not desired in themselves. On this view, a succession of economies, China today, others tomorrow, make for persistence in the US current account deficit. The US economy is the counterpart owing to its size.²⁵ Because the accumulation of dollar reserves is the means to the current account surplus (“vendor financing”), Dooley et al (2004) suggest the system is sustainable.

Even if the precautionary interpretation of dollar reserve accumulation is accepted, there is the question of the power of the analogy. Both horns of the would-be dilemma of the US current account are less pointed than the original.²⁶

One horn of Triffin’s dilemma was the threat to the cornerstone of the Bretton Woods system; by comparison, the threat of US indebtedness is more amorphous. The link of the US dollar to gold defined the system and Triffin drew attention to the clear cross-over point between global official claims on the United States and the value of the US monetary gold stock. Once these lines cross, the breakdown of the system is possible or even, on some interpretations, inevitable – an accident waiting to happen. By contrast, US policy does not assign any particular role to the net external indebtedness of the US economy. Moreover, as argued below, it is not clear at what point US external indebtedness might be seen as a problem.

The other horn of Triffin’s dilemma was the threat of global deflation; by comparison, the risk posed by, in some sense insufficient dollar reserves, is much less obvious. For Triffin, absent sufficiently rapidly growing US external liabilities, the world would plunge into deflation and depression. But central banks do not depend on growing foreign exchange reserves to keep their money supplies growing. This was powerfully demonstrated in 2015-16 by China, which saw its foreign exchange reserves fall from \$4 trillion to \$3 trillion, but where M2 and credit growth continued to grow smartly at double-digit rates.

Thus the analogy between the current account variant of Triffin’s dilemma and the original one suffers from severe limitations. Still, the widespread embrace of the proposition that the reserve role of the dollar has forced the United States to run current account deficits makes it a hypothesis worth considering. Moreover, it bears

²⁵ Large size implies that a given dollar shift in the US current account is smaller than the same shift would be relative to any other economy. See Cooper (2009) for the view that the size of the US economy (in particular its financial markets), rather than the dollar’s international role, is critical.

²⁶ Jeanne (2012) has a general equilibrium model for the current account variant of Triffin that points to low returns on foreign exchange reserves, but no dilemma and no sense of unsustainability. He assumes that the rest of the world seeks to accumulate reserves and, implausibly, must run current account surpluses to gain them. In his two-period model, desired current account surpluses in period one lead to dollar appreciation and US deficits. In the second period, with the intertemporal budget constraint respected, dollar depreciation leads to US surpluses. Returns on reserves, as measured in domestic consumption, are lower, the larger the reserve accumulation. Apart from posing no dilemma, the model has a problematic relationship to the facts. In practice, a run-down of reserves by emerging market economies in 2008 and 2015 accompanied domestic currency depreciation and thus exchange rate gains.

on the prospects for the renminbi as a reserve currency: must China's current account surpluses turn to deficits for the renminbi to play a major role as reserve currency?

3.2 The dollar's reserve role and US current account deficits

The hypothesis that the dollar's role has led to wider US current account deficits is not easily tested. The finding that the US current account deficit is larger than one would expect from underlying variables like income level, demographics, and so on, leaves open the question of why this is so.

Economists have recently taken various empirical approaches to the link between the reserve role of the dollar and US current accounts. Fratianni (2012) and Steiner (2014) have approached the question by examining the link between the growth of foreign exchange reserves and current account balances, the first focusing on the US balance of payments, the second at the country level and then aggregating. Building on Chinn and Ito (2007), Chinn et al (2014) take a more indirect approach. They report a panel analysis of current accounts and interpret the pattern of wider-than-predicted observed US current account deficits as reflecting the US dollar's reserve role. In what follows, we summarise our literature review (Bordo and McCauley (2016))) and contribute by analysing the relationship between US current account errors in Chinn et al (2014) and Gruber and Kamin (2007), on the one hand, and dollar reserve increases, on the other.

Fratianni (2012) argues that US current account deficits have increased US liabilities to foreign officials (Table 1). Conceding the point of Cohen (2012) only in theory, he claims: "In theory ...the increase in the supply of reserve assets need not be associated with a current account deficit. However, it has happened for the United States since the 1980s". In columns 1 and 2, a negative association is evident in 1973-1980: US external liabilities to foreign officials grew substantially *notwithstanding the US current account surpluses*. In 1960 Triffin questioned the sustainability of precisely this combination! Fratianni notes that "For the other periods, the association has been

US current accounts and US official foreign exchange reserves

In billions of US dollars, cumulated over periods

Table 1

Period	(1) Cumulative current account	<i>Memo: % GDP</i>	(2) BEA US official liabilities	<i>Memo: COFER change in US dollar reserves</i>	<i>Memo: reserve financing % = -(1)/(2)</i>
1973-1980	4	0.1	116	148	
1981-1985	-252	-1.3	17	11	7%
1986-1990	-607	-2.4	163	230	27%
1991-1995	-367	-1.1	279	364	76%
1996-2000	-1,200	-2.7	212	558	18%
2001-2007	-4,279	-4.9	2,048	2,905	48%
2008-2010	-1,517	-3.4	1,432	1,475	94%
2011-2014	-1,676	-2.6	1,050	1,582	63%
Sum: 1973-2014	-9,894	-2.1	5,317	7,274	54%

Source: Adapted and extended by authors on the basis of Fratianni (2012).

positive, often strongly so". However, in 1981-85, when the dollar was strong, dollar reserves grew slightly as US current account deficits widened massively.²⁷

In any case, Fratianni summarises [our updates in brackets]: "From the end of the Bretton Woods regime to 2010 [2014], the United States has supplied \$4.2 [\$5.3] trillion of reserve assets to the ROW, with an average yearly financing ratio ...of 51% [54%]. "in sum, a large fraction of US current-account deficits has been financed with dollar liquidity creation, thus establishing an empirical association between excessive US spending and world liquidity".²⁸

There are two major problems with this argument. First, a sceptic will not be convinced by a juxtaposition of two lines in the balance of payments; the analysis reported below may be more robust. Second, it assumes that only *US liabilities* can provide *US dollar* reserves.²⁹ In fact, as noted above, borrowers resident outside the United States widely use the dollar to denominate debts that are in turn largely held by non-resident creditors (McCauley et al (2015a,b)). For example, the Chinese central bank can hold a dollar bond of a German agency that in turn has a dollar claim on an emerging market government.

The memorandum column labelled Cofer in Table 1 suggests that this latter problem is not only one in principle, but also in practice.³⁰ This column reports an estimate of the change in dollar reserves derived from the IMF data on the currency composition of reserves.³¹ Additions to dollar reserves in the period 1973-2015 well exceeded the increase in BEA-reported liabilities to officials. In particular, estimates based on the IMF data suggest that dollar reserves grew by about \$2 trillion more than the BEA data. This cannot reflect just undercounting of official assets in the United States by the BEA – instead global dollar reserves can be and have been built up through claims on non-US residents.

Steiner (2014) "empirically tests the Triffin dilemma ["in its modern version"], according to which reserve currency status systematically lowers the [US] current account balance". Like Gagnon (2012, 2013) he finds a positive relationship between reserve accumulation and current accounts for emerging market economies. He also finds that after 1970 global reserve accumulation contributes significantly to US deficits, even instrumenting reserve increases (to address endogeneity), finding that official dollar demand adds at least dollar for dollar to US deficits. Conceptually, the study is flawed by its implicit assumption that only the United States can borrow dollars, whereas a significant proportion of dollar reserves are invested in dollar obligations of non-US residents, as just discussed.

²⁷ This is reflected in the last column, dubbed the "percentage of reserve financing", which comes in at 7%. If the dollar was strong in the early 1980s and the US current account went into substantial deficit for the first time in the century, it is hard to pin either on weakly growing dollar reserves.

²⁸ As stated, Fratianni seems to lean away from the Triffinesque idea that demand for dollar reserves drove the US current account deficit towards the Rueffian idea that lax policy in the United States drove the current account deficit and imposed the dollar reserves on the rest of the world. See Balakrishnan et al (2009).

²⁹ Avdjiev et al (2016) characterises this as part of a fallacious "triple coincidence" in much international finance that assumes that the use of even the US dollar is neatly confined within national borders.

³⁰ See McCauley (2005) and McCauley and Rigaudy (2011) on offshore holding of US dollar reserves.

³¹ The estimate makes the not-necessarily correct, but hard-to-avoid, assumption that the currency composition of allocated reserves is the same as the currency composition of unallocated reserves. The distinction arises mostly as a result of the mainland Chinese authorities not reporting the currency composition of their reserves to the IMF until very recently (and still partially).

A very different empirical approach is to estimate the determinants of current account surpluses and deficits in a panel of economies and then to draw inferences from the pattern of estimation errors for the US current accounts. In what they call a forensic investigation of global imbalances, Chinn et al (2014) find that the US current account is always less than predicted. The analysis eschews the proximate determinants in standard export and import equations, namely domestic and external demand and the exchange rate, in favour of factors considered to more deeply determine saving and investment. Thus, US fiscal policy, demographics (as captured with young and old dependency ratios), US net external liabilities, GDP per capita, US financial development (as captured by the ratio of domestic credit to GDP), US capital account openness (as measured by the Chinn-Ito index) and US legal development jointly and consistently over-predict the US current account.

The misses are substantial and are larger from the mid-1990s through 2008. In Graph 3, upper left-hand panel, their gap between predicted and observed ranges from about 1% of US GDP in the 1970s, to over 2% in the first half of the 1980s and about 3% in the second half of the 1980s. Official transfers to the United States in connection with the First Gulf War helped to narrow the gap to about 2% in 1991-95. Then, the gap widens again to 3% in 1996-2005, only to contract again in the Great Financial Crisis in 2006-08. Strikingly, a regression that in general performs pretty well, with an R-squared of about one-half for 101 sample countries and of about two-thirds for 23 industrial countries, predicts US current account *surpluses* until the early 2000s, while the actual current account went into substantial deficit in the early 1980s. The authors ascribe this to the international role of the dollar, or in their term, the exorbitant privilege.

Do the variations in their estimation error track measured dollar reserve growth? Such tracking would suggest that the fitted relationships are over-predicting US current accounts, dollar reserves are growing. In Graph 4, upper right-hand panel, we plot the Chinn et al (2014) US current account misses against the estimated increase in dollar reserves, both as a share of US GDP. The relationship is not very telling.

In Graph 4, lower-left-hand panel, we plot the US current account estimation errors for a shorter time span from Gruber and Kamin (2007). Again, there is not much relationship to the change in estimated US dollar reserves as a fraction of US GDP.

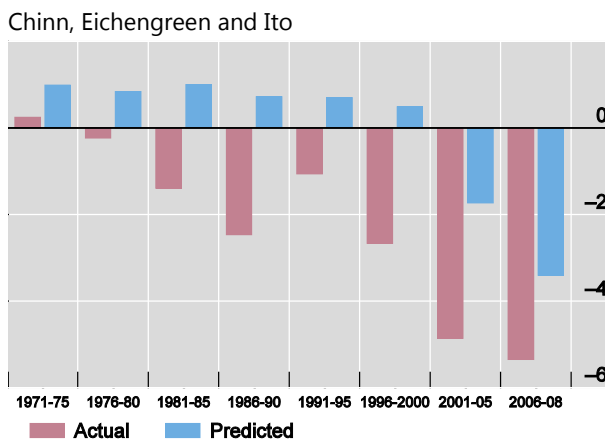
A related approach is that of Bayoumi and Saborowski (2014) and Bayoumi et al (2015). The former find that the counterpart of a diminishing portion of reserve accumulation in countries with capital controls is the US current account deficit. Building on Gagnon (2012, 2013), the latter use instruments for official reserve accumulation and find significant and substantial effects on current accounts. Though the United States and euro area are left out of the estimation, application of the fitted parameters suggests that 2.6 percentage points of GDP of the US current account deficit in 2007 (about a third of the overall deficit that year) owed to reserve accumulation elsewhere (Bayoumi et al (2015, Table 8)). Bergsten and Gagnon (2017) report similar results and propose US retaliation in kind through US reserve accumulation.

US current account and dollar reserve growth

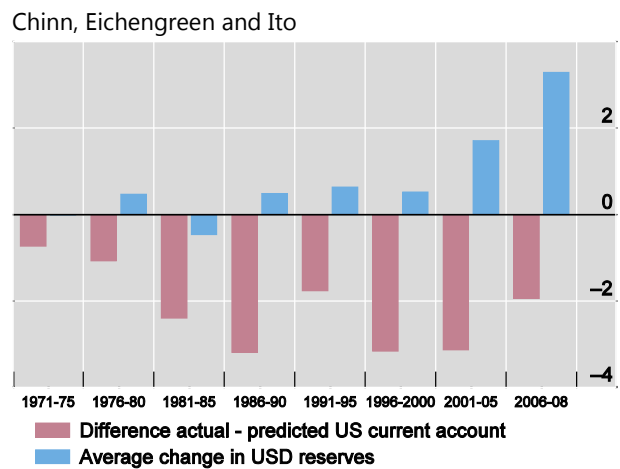
In percent of US GDP

Graph 4

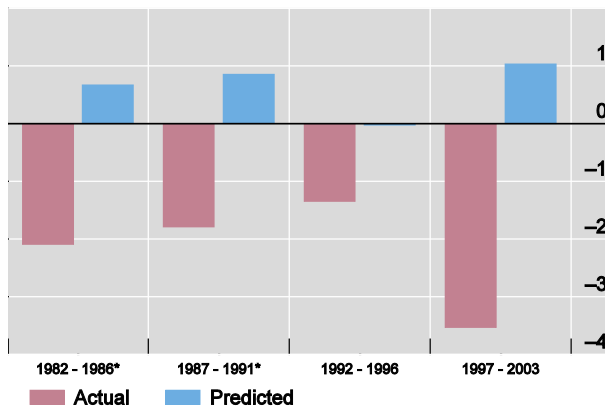
Actual and predicted current account



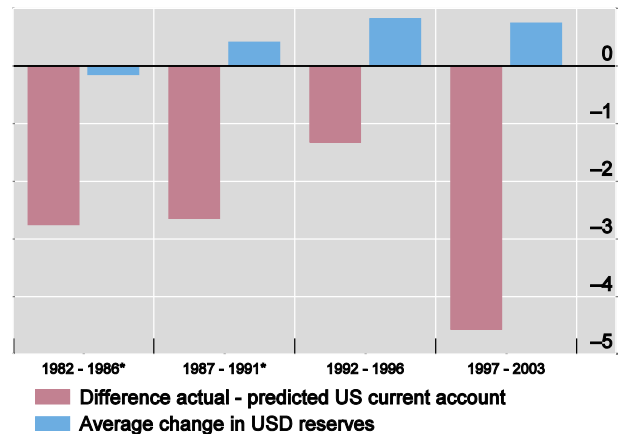
Current account errors and dollar reserve growth



Gruber and Kamin



Gruber and Kamin



Source: Chinn et al (2014); Gruber and Kamin 2007; IMF, Composition of foreign exchange reserves (Cofer) database; national data; authors' calculations.

3.3 What is the systemic breakdown?

If one does accept the current account version of Triffin, is one led to a Triffinesque conclusion that the international monetary and financial system is unstable? The more instability, the greater the likeness to the Triffin original.

Above we cast doubt on the monetary instability that might arise from insufficient growth of dollar foreign exchange reserves. Nowadays, central banks can expand money supplies without them. As for financial instability, markets shook in early 2016 on the impression that China's reserves were running down fast. While it is often assumed that foreign exchange reserves need to grow with domestic money stocks to assure financial stability, the idea that financial instability would result from *stable* reserves in Mainland China, Japan, the euro area and Switzerland (which hold half of world reserves), seems most unlikely. So in this section, we concentrate on the consequences of the United States running current account deficits and accumulating net external liabilities.

Evidence can be cited on both sides. On the one hand, the US current account deficits over the last 35 years have led to a deterioration of the US external asset position. A small net positive claim on the rest of the world has turned into a net international liability position of \$7.3 trillion at the end of 2015. This is equivalent to -41% of US GDP.³² Clearly, it would seem, the United States cannot increase its net liability to the rest of the world by 1% of GDP per annum indefinitely.

On the other hand, there is cross-sectional evidence that economies can take on much larger net international liabilities than the United States has done, without necessarily lowering their credit standing. In particular, Australia carries a substantially larger burden of net external liabilities than the US economy while retaining a top country and sovereign rating (IMF (2015a)).³³

Moreover, there is the puzzling observation that the US economy is still earning net investment income from the rest of the world despite its net international liabilities. The BEA estimates US net international investment income in 2015 was \$193 billion, a credit. In other words, the official data show the US economy earning a net 1.1% of GDP based on a -41% of GDP position! However one interprets this (Heath (2007), Gourinchas and Rey (2014), McCauley (2015)), the US negative net position does not seem to be spiralling in the manner that one might expect from the size of the current account deficits shown in Table 1.

Thus, the US external position may be on an unsustainable path, but any instability does not seem imminent. We say "*may*" because unpublished work at the Federal Reserve Board suggests that the US current account deficit is no longer unsustainable.³⁴ In any case, Australia suggests that any instability arising from the accumulation of US current account deficits could be some distance away, and the low yields on foreign direct investment in the United States serves to push out the day of reckoning.

Nevertheless, the question remains: what is the breakdown scenario? What is the nature of the instability, implied by an international monetary and financial system that may require or permit unsustainable US current account deficits?

A host of papers in the mid-2000s assessed the implications of an unsustainable US current account deficit and envisioned a dollar crisis or at least a hard landing for the US economy. In particular, a sudden stop of financing was analysed in papers by Setser and Roubini (2005), Summers (2004), Obstfeld and Rogoff (2005) and Krugman (2007). The result would be depreciation of the dollar, higher long-term bond yields and unemployment in the United States as resources only slowly flowed from nontraded to the traded goods sectors.³⁵

³² The dollar's trend depreciation between 2002 and 2011 (brutally interrupted in late 2008) served to obscure the trend. As noted by Tille (2003), the US net international investment position improves with dollar depreciation owing to US investors' borrowing of dollars from the rest of the world to invest in foreign currency assets. However, dollar appreciation exposes the trend: it lifted the value of US net external liabilities by \$1.5 trillion or 8% of US GDP in 2014 (BIS (2015, Chapter V, p 96).

³³ Bertaut et al (2008) identified five industrial economies with net international liabilities in excess of 60%: Australia and New Zealand, still highly rated, and Greece, Portugal and Spain, which have since suffered crises.

³⁴ This work updates Bertaut et al (2008), who projected that the US net external liabilities would rise from 20% of GDP to 60% of GDP by 2020

³⁵ Dissents included Debelle and Galati (2005), Croke et al (2006) and Bertaut et al (2008).

Less attention was given to the global implications. Tille (2003) and Gourinchas and Rey (2014) would highlight the loss of wealth in the rest of the world from dollar depreciation. In effect, the dollar's decline not only works through expenditure-switching effects but also by redistributing wealth from the rest of the world to US residents. While this might dampen the expenditure-reducing effects of the dollar's depreciation to some extent, it would bring the ratio of US net international liabilities to GDP down quickly (the opposite of the 2014 change described in the footnote above).

In addition to such redistribution of wealth between the US residents and the rest of the world, there would be redistribution within the rest of the world to the non-bank borrowers outside the United States that owe \$10 trillion to their creditors, mostly outside the United States. Firms with dollar debts would have reduced leverage and greater ability to borrow and to invest. The net effect of redistribution from dollar weakness across the rest of the world might be to offset some of the wealth loss involved in the redistribution from the rest of the world to US residents.

These cross-cutting effects do not obviously add up to a point of instability in the international monetary and financial system akin to the break of the dollar/gold link in 1971. To get to that point one needs a standstill in US debt payments to the rest of the world, or some such sudden materialisation of US country risk.

In summary, even if one accepts that the US dollar's role has forced the United States to run current account deficits, and that these have put US international indebtedness on an unsustainable path, it is far from obvious that this imparts an instability to the international monetary and financial system that deserves an association with Triffin. The debt dynamics are themselves less vicious than they might be owing to the low returns that the rest of the world earns on its direct investment in US-based businesses. Moreover, were US indebtedness to rise to too high a level, market prices, especially US long-term interest rates and the dollar's exchange rate, would adjust. This might be a hard landing, as widely feared in the mid-2000s, but this would not necessarily rise to the level of systemic breakdown.

3.4 The current account version of Triffin: conclusions

The dollar standard under floating exchange rates does not obviously have a problem that is all that Triffinesque. In principle, the rest of the world does not require US current account deficits to accumulate dollar reserves, and in practice dollar claims on non-US residents appear to have played a substantial role. While the US current account deficits have been larger than one might expect from US characteristics, it is not at all clear that these are to be explained by the international role of the dollar rather than the US economy's size or the liquidity of its financial markets.

Moreover, there is nothing like a clear cross-over point when the system breaks down. If at some stage the financing of the US net external liabilities stops being easy, prices might move in uncomfortable fashion. But instability of the system of the kind that Triffin predicted for Bretton Woods would not obviously be involved. Only a US Treasury default that impaired the major global reserve asset would rise to the level of the end of the gold/dollar link under Bretton Woods.

The implication often drawn – that the renminbi cannot be a reserve currency unless China runs a current account deficit – does not follow. Even if the empirical work reviewed is taken to have demonstrated that the international role of the dollar has indeed led to wider US current deficits, this linkage of China's current account to

the future of the renminbi as an international currency is not only conceptually but also factually flawed (He (2012)). Before 1980, gross flows allowed dollar reserves to grow, without any US current account deficit including through the financing of non-US current account deficits in the dollar. And renminbi reserves holdings reached one percent of global reserves by the end of 2014 (IMF (2015b)), notwithstanding ongoing Chinese current account surpluses.

4. Fiscal or “safe assets” version of Triffin

Compared to the current account version of the Triffin dilemma, the fiscal version is of more recent vintage. Moreover, it is always understood as an analogy rather than stated as a misinterpretation. As with the current account version, the unsustainability is about how a stock of debt cannot rise indefinitely in relation to the flow with which to service it. Unlike the original Triffin dilemma with its hard-edged cross-over point between stocks of assets and liabilities, the fiscal version of Triffin has a fuzzier point of instability and ambiguity of what happens when the fiscal debt reaches too high a level.

Jeanne (2012) summarises Farhi et al (2011) and Obstfeld (2011)³⁶, the “modern species of Triffin dilemma” (Obstfeld (2013): “As international reserves are primarily composed of US government debt, and the share of the US in the economy is shrinking, the US progressively loses its fiscal capacity to satisfy the rest of the world’s demand for international liquidity [ie demand for US Treasury securities]. Thus, there is a dilemma between the objective of satisfying the global demand for international liquidity, which requires a secular increase in the ratio of US government debt to US GDP, and the objective of maintaining US government debt safe, which requires stabilizing this ratio”.

Just what is the downside if there is under-production of safe assets? Recall that for Triffin, deflation and depression loomed if the United States did not allow dollar liabilities to pile up or if US policy tightened in the face of a speculative attack on its gold stock. Farhi et al (2011) offer a cocktail. Private agents may attempt to fabricate their own safe assets and fail, as with the subprime crisis, leading to financial instability (see also Gorton et al (2012), Gorton (2017) and Caballero et al (2017b)). Firms may issue short-term debt as a substitute for safe debt, with resulting financial fragility. Caballero and Farhi (2013) emphasise that, with an increasing imbalance between the supply of and demand for safe assets, the spread between safe asset yields and risky asset yields would widen, and at the zero lower bound, the economy would fall into a safety trap. There, monetary policy could become ineffective in setting risky asset yields at the appropriate level and output would fall to reduce the demand for safe assets.³⁷ Caballero et al (2016) suggest that currency wars can be understood as attempts to redistribute the output decline in a world of safe asset yields stuck at zero.

Producing safe assets through fiscal deficits results in higher government debt, and ultimately deprives the government of the fiscal capacity to respond to shocks with conventional fiscal policy or with other means to add to the stock of safe assets. At the limit would be the Hobson’s choice between default and a surprise inflation to

³⁶ See also Caballero et al (2017b, p 38).

³⁷ Recent observations of negative government bond yields may make the safety trap less likely.

reduce government debt to a level consistent with the tax base. Leeper and Walker (2011) describe the fiscal theory of the price level, which foresees the inflation outcome.

This fiscal Triffin raises questions both on the demand and supply sides. Portes (2012) is an early and rare dissenting view. The following subsections take the questions up, first demand, then supply. Then follows an historical analogy that extends Bordo and McCauley (2017).

4.1 Demand for safe assets

Farhi et al (2011) anchor the demand for safe assets in reserve accumulation by emerging market economies. The idea is that reserves need to grow with the relatively fast nominal GDP growth of emerging markets. Some have modelled the demand as if some portion of M2 is by behaviour, if not by law, backed by foreign reserves, that is, safe assets. This argumentation is quite Triffinesque, but is it realistic?

To recap, there has been a long-running argument over how to interpret the build-up of reserves by emerging market economies. One side sees it as purposive behaviour, hoarding for precautionary purposes. If the precautionary demand depends on some combination of imports, short-term debt or M2, then it is plausible that desired reserves, and thus safe asset demand, grows with nominal GDP. Obstfeld et al (2009, 2010) find M2/GDP a powerful determinant of foreign exchange reserves as a proportion of GDP and interpret the relationship as insurance against financial instability arising from a domestic run ("drain") from M2 into foreign exchange.

Another side, however, sees the build-up as a side-effect of currency management.³⁸ On this view, the safe asset story gained adherents during the dollar's depreciation from 2002 to 2011. It might be expected to lose adherents when the dollar appreciates, and reserves are drawn down in the absence of a flight from M2.

Into 2013, a shortage of safe assets could be seen as looming as the stock of dollar reserves might approach the stock of US Treasury securities outstanding (Graph 5). Through that year, the US Treasury was running up its debt fast enough to accommodate the growth of US dollar foreign exchange reserves. But Treasury debt growing at double-digit rates and US (nominal) growth at single-digit rates pushed consolidated US government debt from 57.8% of GDP to 96.9% of GDP in 2007-13.³⁹

So it was easy to imagine the lines in Graph 5 converging. One had to anticipate that the red line would flatten out to a growth rate no higher than the 4% or so US growth rate. If emerging market economies were to grow at 6% per annum, and their acquisition of safe dollar assets kept pace, then safe assets could suffer a shortage. Indeed, the IMF (2012) projected the demand for safe assets to rise on the back of a projected 61% rise in global foreign exchange reserves by the end of 2016. Such double-digit growth would have exceeded global growth, and even more US growth. Official foreign exchange reserves would have reached \$18 trillion and dollar reserves about \$12 trillion. In this case, a sharp rise in the blue line on Graph 5 would have approached the slowly rising red line. They could have crossed within a decade. Shades of Graphs 1 and 2 above!

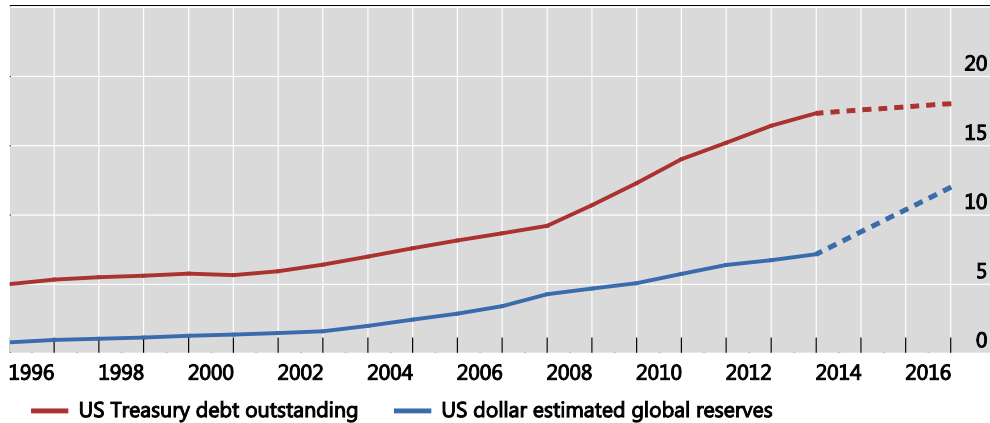
³⁸ This was Triffin's interpretation of the explosion of reserves in the 1970s; see footnote 4 above.

³⁹ However, the Federal Reserve absorbed much Treasury debt in this period. Federal Reserve selling of its Treasuries would leave a larger supply of Treasury debt available to reserve managers.

US Treasury debt and US dollar official FX reserves, 2013¹

Outstanding amounts, in trillions of US dollars

Graph 5



¹ Dashed lines represent projections.

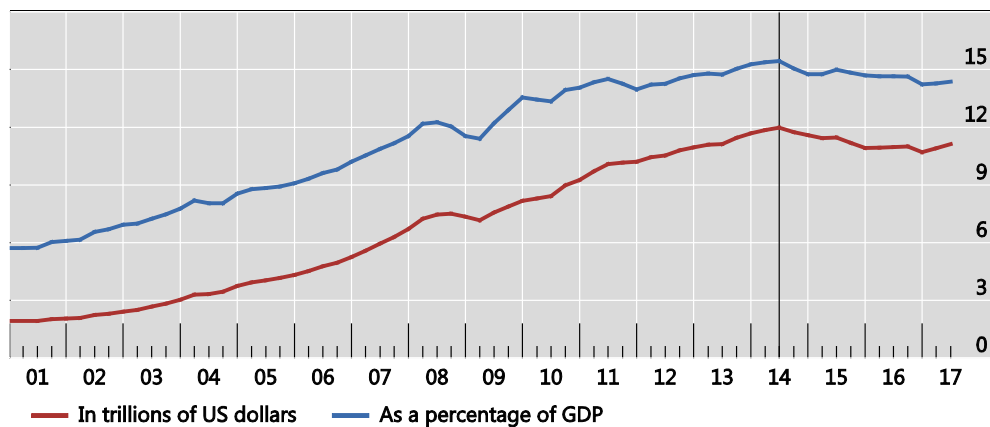
Sources: IMF, Currency Composition of Official Foreign Exchange Reserves and International Financial Statistics; US Department of the Treasury; BIS calculations.

In the event, China's economy grew without additional foreign exchange reserves. As noted, Chinese reserves shrank from near \$4 trillion to \$3 trillion before stabilising in 2017. A significant share of China's reserve drawdown reflects the reversal of various forms of carry trades after the renminbi peaked against the dollar in early 2014. McCauley and Shu (2016) highlighted both the repayment of foreign currency debt by the Chinese corporate sector and the liquidation of renminbi deposits held outside the mainland in Hong Kong SAR, Macao SAR, Chinese Taipei, Korea and Singapore. China's money supply and bank credit continued to rise at double-digit rates through the reserve drawdown.

The demand for safe assets that was interpreted as the secular result of precautionary demands from economies with underdeveloped financial markets and risk of a domestic run on the currency now looks more cyclical. The "demand" could prove the temporary result of carry trades amid a long cycle of dollar depreciation that lasted, with an interruption in 2008, from 2002 to 2011.

Global foreign exchange reserves¹: "peak reserves"?

Graph 6



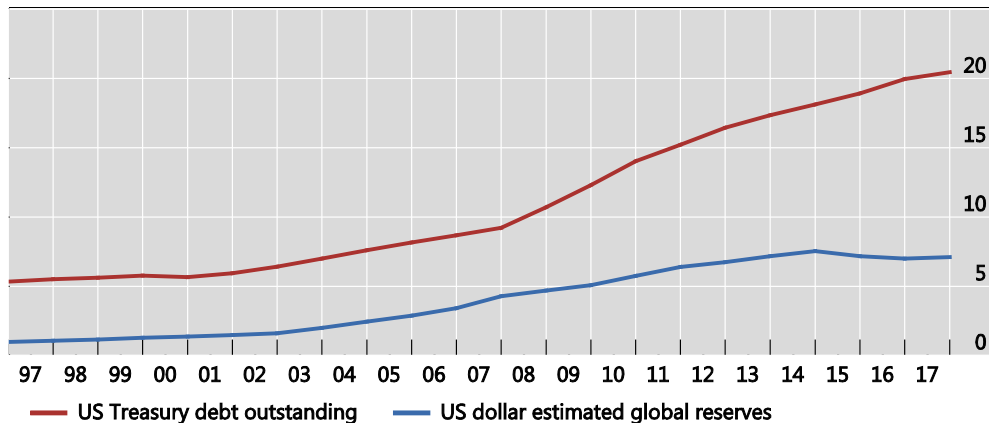
¹ The vertical line represents the maximum level of FX reserves in the last 18 years.

Sources: IMF, Currency Composition of Official Foreign Exchange Reserves, International Financial Statistics and World Economic Outlook.

US Treasury debt and US dollar global official FX reserves¹

Outstanding amount, in trillions of US dollars

Graph 7



¹ Reserves information up to 2017Q2 and US Treasury data up to October 2017.

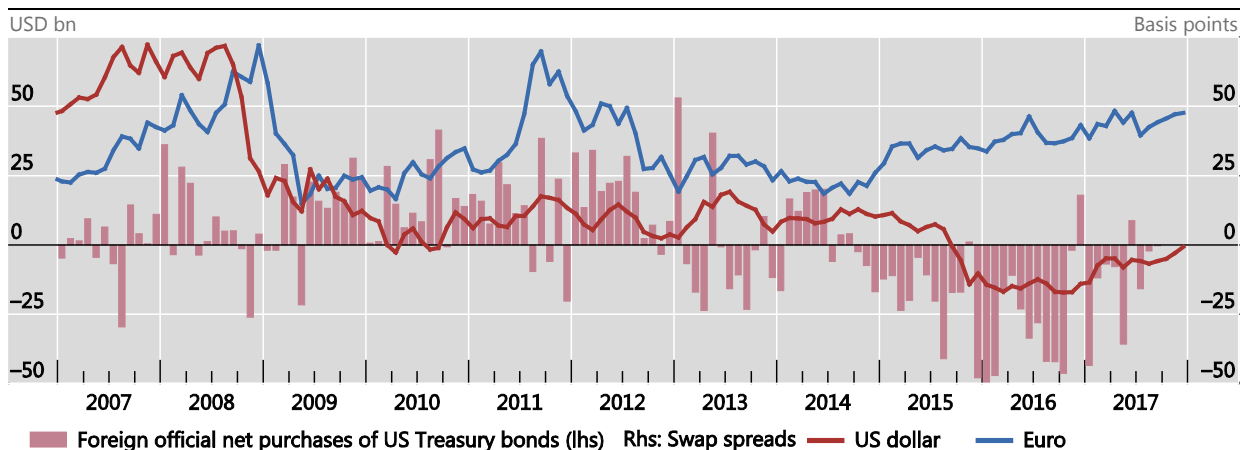
Sources: IMF, Currency Composition of Official Foreign Exchange Reserves, International Financial Statistics; US Department of the Treasury; BIS calculations

Revisiting the simplest rendering of the global safe-asset shortage (Graph 7), holdings of dollar reserves has fallen while US Treasury securities outstanding have continued to grow. Rather than the red line flattening and the blue line rising, the reverse has occurred.

Moreover, price developments have falsified one of the predictions of the safe-asset shortage story. As noted, one of the manifestations of the shortage is a wide gap between the yields on safe assets, on the one hand, and those on less safe assets, on the other. Graph 8 shows the reverse: in the US dollar market, the yield on the generic private yield, on the fixed leg of interest rate swaps, fell *below* that on the US Treasury of the same maturity in 2015. To give them their due, Caballero et al (2017a) recognise that such spreads do not support their story.

As it happens, a demand-side story, the sale by emerging market official reserve managers of US Treasury securities was one of the most frequently given explanations of this oddity in the US dollar bond market (Clark and Mann (2016)). As official investors turned sellers of US Treasury bonds (red bars below the zero line in Graph 8), the difference between the generic private rate in 10-year interest rate swaps, on the one hand, and the 10-year Treasury bond, on the other, became negative. Again, this is the opposite of the prediction of Caballero and Farhi (2013) for a secular widening of the spread between safe securities and risky ones (Summers (2016)). (At writing, the swap spread has approached zero, even as global foreign exchange reserves have resumed growing in 2017.) Is there a glut of safe assets?

In sum, facts have not been kind to the idea that the growth of emerging market economies requires an accumulation of safe assets that must come up short against a supply that ultimately can only grow with advanced economies. With the dollar's appreciation in 2014, global foreign exchange reserves were drawn down. Accordingly, the lines representing safe-asset demand and supply are not going to cross any time soon.



¹ Monthly average of daily observations.

Sources: Bloomberg, Datastream; BIS calculations.

4.2 Supply of safe assets

On the supply side, the assumption that only fiscal deficits can add to the supply of safe assets is too limiting. It is not just the private sector that can try and repeatedly fail to fabricate safe assets. Governments can and do try, and while success depends on institutional strength, they are not fated to fail. Governments can create safe assets out of domestic cash streams or out of foreign cash streams. The argumentation below focuses on the US dollar, but the points have broader application.

Operational definitions of safe assets tend to overlook the sources of supply discussed below. Gorton et al (2012) and Carlson et al (2016) identify only (dollar) safe assets of US obligors. Andolfatto and Williamson (2015) add only US agency and private asset-backed securities to prime government bonds (recently restricted to the US, German and French governments), and claim that US agency bonds lost their safety *after* the US government explicitly backed them in conservatorship—when the government backing became explicit! Eichengreen (2016) adds the debt of supranational organisations to that of top-rated OECD governments, but not agencies, including ones guaranteed by top-rated governments (eg KfW).

Our operational definition of a safe asset is a fixed income claim that a central bank holds in its official foreign exchange reserves. It is helpful to obtain a top-down view on the importance of such claims that are not produced by a government running fiscal deficits. For the US dollar, are official reserves held in the dollar all invested in US Treasury securities?

The answer is a resounding no. This answer can be confidently given, even given the uncertainties regarding the total official foreign exchange reserves held in the dollar, on the one hand, and the amount of such invested in US Treasury securities, on the other. Graph 9 adds to Graph 7 the holdings of US Treasuries reported by the Bureau of Economic Analysis based on the annual survey by the US Treasury, Federal Reserve Bank of New York and the Board of Governors (2017).⁴⁰ This survey drills

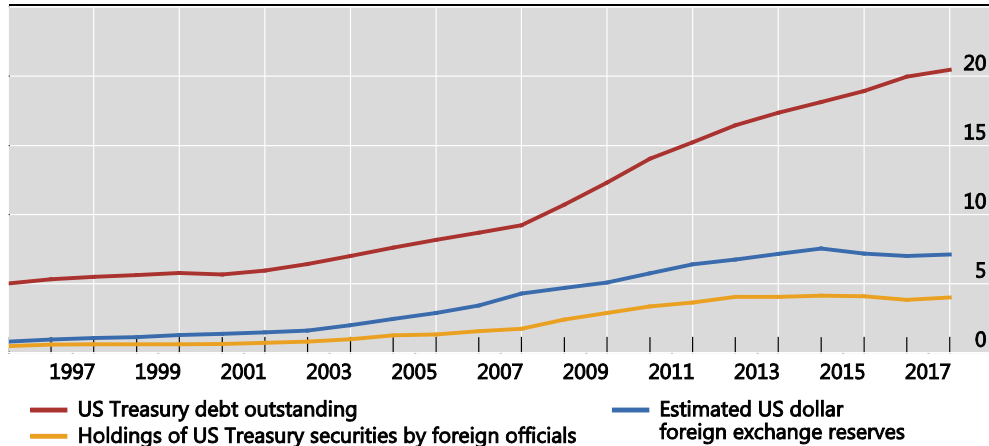
⁴⁰ Compare to Figure 8.4 in Obstfeld (2013), which juxtaposes global reserves and US and euro area general government debt.

down with custodians to identify ultimate owners, but still might miss some holders. Nevertheless, the gap between (estimated) official foreign exchange holdings in the dollar and official holdings of US Treasuries is very substantial. It narrowed after the

US Treasury debt outstanding, US dollar reserves and official Treasury holdings¹

In trillions of US dollars

Graph 9



¹ Reserves information up to 2017Q2 and US Treasury data up to October 2017.

Sources: IMF, Currency Composition of Official Foreign Exchange Reserves, International Financial Statistics; US Bureau of Economic Analysis; US Department of the Treasury; BIS calculations.

Great Financial Crisis, as official reserve managers reassessed the risk of US agency securities and bank deposits. But out of an estimated \$7 trillion of dollar reserves, more than \$2 trillion appears to be invested in something other than US Treasury securities.

If official foreign exchange reserve holdings in the US dollar not invested in US Treasury securities are important, what are they invested in?⁴¹ Domestically, governments can put their support, and ultimately their taxing power, behind securities backed by private cash flows. **Mortgage backed securities**, the underlying mortgages of which are guaranteed by Fannie Mae and Freddie Mac are prominent examples (recognised by Gorton et al (2012)). Before 2008, such securities were widely held by central banks (McCauley and Rigaudy (2011)). In the event, the institutional arrangements for these two agencies proved to be not robust, and the implicit Treasury backing had to become explicit. Central banks continue to hold agency paper, more the mortgage-backed securities than the debentures. (Under Treasury conservatorship, however, these agencies are producing such profits that it is hard for the government to forego the revenues entailed by any privatisation scheme.)

Outside the United States, **supranationals and state agencies** can and do create safe assets, even ones denominated in the US dollar. While supranationals like the World Bank, IFC, Asian Development Bank, and the Inter-American Development Bank enjoy some backing from the US government, among other creditworthy

⁴¹ Historically, dollar reserves were invested in bankers' acceptances, which the original Federal Reserve Act exempted from reserve requirements in order to make it as competitive instrument as possible (LaRoche (1993)). The Federal Reserve Bank of New York added its signature to this two-(private)-signature paper to provide a short-term investment for foreign central banks in the 1920s, when there were few Treasury bills. Thus, trade bills were turned into safe assets.

governments, governments outside the United States can also back issuers of dollar securities. A state agency KfW enjoys the guarantee of the German government and has over a \$100 billion of dollar bonds outstanding. These are widely held by official reserve managers, who look to pick up yield vis-à-vis US Treasury bonds by accepting lower liquidity. On the basis of “callable capital” (World Bank), government guarantees (KfW), and subnational taxing power (Canadian provinces), AAA-rated dollar assets are produced by non-US residents. The reserve-issuing country does not enjoy a monopoly on the production of safe assets even in its own currency.⁴²

Banks in general, and non-US banks in particular, also produce safe assets, judging from the investment behaviour of official reserve managers.⁴³ Before the Great Financial Crisis, reserve managers had about a seventh of their identified dollar reserves in bank deposits, mostly in non-US banks (McCauley and Rigaudy (2011)). By the early 1980s, such deposits were larger than official holdings of Treasury bills. Doubtless there was some too-big-to-fail thinking at work, and doubtless the fears, if not the outcomes, of 2007-08 disturbed that thinking. The result was a flight away from banks to inter alia, US Treasury bills (McCauley and McGuire (2009)), that has since partially reversed.⁴⁴

Production of safe assets, particularly in a foreign currency, needs to be done with care. Government guarantees that are not supervised produce moral hazard and turn a possibly self-financing business into a call on the government’s taxing power. Ironically, official reserve managers reduced their holding of Fannie and Freddie obligations when the bazooka was fired, that is, when the US Treasury in effect took over the agencies. Official reserve managers appear to be awaiting new legislation for the agencies before fully rebuilding their position.

And it is possible to spread the net too wide. Thus when Jeanne (2012) suggests that all US nonfinancial debt,⁴⁵ including corporate bonds, could serve as safe assets, he has gone too far – although one could imagine a carefully constructed securitisation to create *some* safe assets out of corporate bonds.

The key point is that none of these safe assets, US agency bonds, supranational and non-US agency dollar bonds, or bank deposits, strictly depends on the financing of government deficits. To be sure, all give rise to contingent liabilities for the US or other governments and so a fiscal element remains in the background. But clearly contrary to this fiscal version of Triffin, it can be argued that safe assets production does not depend on US fiscal deficits.

⁴² See Fahri and Maggiori (2018) for competition between different issuers offering safe assets denominated in different currencies. See He et al (2018) for a game theoretic treatment of the choice of reserve assets between two contenders.

⁴³ See Bertaut et al (2014) for the role of foreign banks as providers of safe assets in the private US fixed income portfolio.

⁴⁴ According to the BIS locational international banking statistics, cross-border liabilities denominated in the dollar to central banks peaked before the Great Financial Crisis at about \$800 billion, then declined to about \$400 billion and have since recovered to about \$600 billion. See http://stats.bis.org/statx/srs/tseries/LBS_D_PUB/Q.S.L.A.USD.A.5J.A.5A.M.5J.N?t=a8&c=&m=F&p=20172&i=3.6.

⁴⁵ Jeanne (2012) notes that these have grown as rapidly as the rest of the world GDP.

4.3 Historical analogy: safe assets and Empire

An important historical parallel is practice and law in Britain under the classical gold standard that created safe assets out of colonial and Commonwealth securities. Let us be clear at the outset that there are plenty of historical parallels that have nothing to do with empire. Domestic government-related financial institutions that issue safe assets are not an invention of the last century. Nor are government guarantees of infrastructure finance: the State of Maryland guaranteed a 5% return on Baltimore and Susquehanna railroad securities as early as 1833 and the practice quickly spread to Europe, first Poland and then France (Irwin (2007, p 14). Indeed it was the “plan so successfully introduced by the French Government” that was cited in 1844 as a precedent for Indian railway financing (MacPherson (1955, p 180)). Empire was not necessary for state-supported safe assets, now or then.

The finding of a considerable literature⁴⁶ is that the spreads on colonial and Commonwealth bonds were lower than they might have been. Recent research has established that they were also less responsive to credit fundamentals.

The institutional devices to transform what might have been risky bonds into safe assets were as varied as the current practice reviewed above. The return on bonds that financed the Indian railroads benefitted from a Parliamentary **guarantee**, an extraordinary departure from laissez faire in Nineteenth Century Britain. The resulting “safe securities” found investors among “widows, barristers, clergymen, spinsters, bankers and retired army officers” (MacPherson (1955, p 181)). The Bank of England’s **discounting** policy, which went beyond UK government debt in its definition of gilt-edged securities and thereby made foreign securities safer, is emphasised by Flandreau (2013). The definition of appropriate assets for **trustees** – safe assets for widows, orphans and parsons – played a role as well. Various institutional arrangements sought to mitigate the moral hazard.

The upshot is that there is no hint of a safe asset shortage from Ricardo through Marshall to Keynes. And the reason is that the Empire found ways of turning cash flows outside the United Kingdom proper into safe assets.

4.4 The safe assets version of Triffin: conclusions

In sum, the safe assets version of the Triffin dilemma posits an implausibly inflexible demand for and an equally implausibly inflexible supply of safe assets. On the demand side, the assumption that emerging markets need safe foreign assets to support their domestic money and credit growth is an anachronism lifted from Młynarski and Triffin. Indeed, the world economy may have experienced “peak reserves” in 2014. The Chinese economy managed to continue to grow with double-digit increases in money and credit even as it lost a cool \$1 trillion of reserves between 2014 and 2016. On the supply side, the US Treasury has plenty of competition among various government-backed entities in providing safe dollar assets, whether housing agencies at home, supranational and regional organisations, sovereigns or provincial borrowers abroad and their agencies or even banks that are not demonstrably not too big to fail. Nor is the US Treasury in an historically unique position: the UK

⁴⁶ Bordo and Rockoff (1996), Bordo et al (1999), Obstfeld and Taylor (2003), Ferguson and Schularick (2006), Accominotti et al (2010, 2011), Flandreau (2013), and Chavez and Flandreau (2015). DeCecco (1984), however, observes a wide margin between India’s long-term borrowing cost and its short-term investment return.

Treasury faced the competition of colonial and Commonwealth borrowers as gilt-edged securities under the gold standard before WWI – competition recognised by and supported by the Bank of England.

5. Legacy of Triffin

Issues arising from one country's supplying most of the world's reserve currency have not gone away. Most recently, non-US banks suffered a dollar shortage in 2008-09 (McGuire and von Peter (2009)) and the Federal Reserve supplied dollars to other central banks with selective open-handedness, breaking with history (Bordo et al (2015a)). Zhou's (2009) call for more pluralism in the international monetary and financial system and renewed efforts for collective control over the supply of reserve assets inevitably invoked Triffin. The Triffin dilemma as stated by Padoa-Schioppa (2011) is certainly correct – and perhaps a truism: "there is an irremediable contradiction between the issuing country's *internal* domestic requirements and the external requirements of the world using it".⁴⁷

Triffin's visceral aversion to what Kindleberger called US leadership and political scientists call US hegemony may have led him to overstate its instability. He well knew that the Bank of England operated with a "thin film of gold". In our view, it took not the crossing of Triffin's lines but rather bad US policy – a war fought on cheap money – to undo Bretton Woods and to derail a gradual shift to a dollar standard.

The shift from fixed to floating currencies, from capital controls to free capital flows, from the dominance of official flows to the dominance of private flows, from fear of deflation to fear of inflation and back to fear of deflation has not dimmed the appeal of Triffin-style arguments. If we remember Triffin's prediction regarding the dollar/gold link, we must equally remember his prediction of deflation, not inflation.

Does the dollar standard in which the Federal Reserve interprets its mandate as assuring the dollar's "convertibility" only in the sense of its bearing a stable relationship to a basket of US goods and services have a Triffin style problem? We are not persuaded.

If the US external accounts are on an unsustainable trajectory, it is not clear whether the dollar's role, the size of the US economy or the breadth, depth and liquidity of its financial markets are to be blamed. What we know for sure is that the US current account is wider than panel regressions would predict. In any case, it is hard to get excited about the US net liability position if it is still generating net investment income. US trade deficits might make political mischief, might be economically harmful, but they are not (yet) turning into a vicious cycle with debt service adding to debt.

Similarly, if the US Treasury's debt is on an unsustainable trajectory, it is hard to blame the demand for safe assets from foreign exchange reserve managers. The assumption that emerging markets need safe foreign assets to support their domestic money and credit growth is anachronistic. Indeed, the world economy may have experienced "peak reserves" in 2014. In any case, on the supply side, the US Treasury has plenty of competition among various government-backed entities in providing

⁴⁷ See also Mateos y Lago et al (2009); IMF (2010); Bini Smaghi (2011). Padoa-Schioppa goes against the grain of studies that claim that each country keeping its house in order leads to a global optimum: Oudiz and Sachs (1984); Obstfeld and Rogoff (2002).

safe assets, whether housing agencies at home, or supranational and regional organisations, sovereigns and provincial borrowers and their agencies abroad. We draw the parallel to the competition of colonial and Commonwealth borrowers as gilt-edged securities under the gold standard before WWI.

While there is much to argue with Triffin and those who invoke his dilemma, there is no arguing the dilemmas posed by a national currency that is used globally as store of value, unit of account and means of payment. "The reserve currency is a global public good, provided by a single country, the US on the basis of domestic needs" (Campanella (2010)). Padoa-Schioppa emphasises the awkwardness of national control from a global perspective. But the global use of the dollar can pose dilemmas to the United States. How should the Federal Reserve respond to instability in the markets for \$10.7 trillion in dollar debt of nonbanks *outside the United States* or in a like amount of forward contracts requiring dollar payments?⁴⁸ The central bank ignores such instability at the peril of possible turmoil in US dollar markets that does not stop at the border – even if the floating rate index for dollar debts is brought back from London to New York.⁴⁹ Yet the Federal Reserve responds to such instability at the peril of seeming to overreach its mandate.⁵⁰

Issues arising from one country's supplying most of the world's reserve currency are not going away.

⁴⁸ See McCauley et al (2015a, b), the BIS global liquidity indicators: <https://www.bis.org/statistics/gli.htm?m=6%7C333>; and Borio et al (2017).

⁴⁹ Federal Reserve Board of Governors (2017).

⁵⁰ Foulis (2015) suggests both technical and political constraints on the Fed's backstop of eurodollars. "Could the Fed save the day again? It would be a lot harder than last time. The offshore archipelago is almost twice as large as it was in 2007 and is growing fast, so any rescue would have to be on a much larger scale. The mix of countries involved is tilting away from America's allies. The banks in question are less likely to have subsidiaries in New York that can borrow directly from the Fed or are viewed as palatable by the American legal system. The consequences could be dire..."

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