Andrew Crockett Memorial Lecture: The Global Financial System, the Real Rate of Interest and a Long History of Boom-Bust Cycles. *

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Abstract

Financial cycles strongly determine real short-term interest rates. Wealth increases rapidly during financial booms, faster than consumption itself. As a consequence, the consumption to wealth ratio declines, as happened in the "Roaring 20s" and the "Exuberant 2000s". In the subsequent busts, savings increase and keep real interest rates low. The related global financial cycle constrains monetary policy independence, even for countries with flexible exchange rates, transforming the Mundellian trilemma into a dilemma. Tackling these issues calls for combinations of monetary and fiscal policy coordination, macro-prudential policies, and possibly capital controls. It also means considering the role of the US as a provider of safe assets, and asking whether a multipolar system would be advantageous.

*Largely based on joint work with Pierre-Olivier Gourinchas and Silvia Miranda-Agrippino. I thank Richard Portes and Hyun Shin for comments.

It is a great honour to give the Third Andrew Crockett Memorial Lecture at the Bank for International Settlements (BIS). Sir Andrew Crockett made many contributions to improve the interactions between the financial system and the real economy from the point of view of economic analysis, by fostering more international cooperation and also by building institutions such as the Financial Stability Forum, now the Financial Stability Board. In the introduction to the "Theory and Practice of Financial stability" (Princeton International Finance Essays, published in April 1997) he reminds us that "monetary and financial stability are of central importance to the effective functioning of a market economy... In extreme cases disruptions in the financial sector can have severe adverse effects on economic activity and even on political structures." This sounds prescient. In this lecture I will pursue this line of thought and ask why real rates have been so low and whether this can be linked to be the functioning or the dysfunctioning of the global financial system. Along the way I will talk of the Global Financial Cycle, the Mundellian trilemma, the exorbitant privilege and exorbitant duty and the New Triffin Dilemma. My philosophy in doing so comes very much from Sir Andrew's view of the world: "In finance as in medicine, pathology is a powerful tool to understand physiology".

1 Real rates: Why are they so low?

Global real and nominal interest rates are low across advanced economies. Levels of economic activity have remained weak across the advanced world. This suggests that the *natural interest rate*, i.e. the real interest rate at which the global economy reaches its potential output has gone down substantially. Understanding whether natural rates are indeed low, for how much longer, and the source of their decline has become a first-order macroeconomic question. In a speech given at the Annual Research Conference of the IMF in 2013, five years after Lehman Brothers collapsed, Larry Summers hypothesized that we had entered into an age of '*secular stagnation*', i.e. an era where output remains chronically below its potential, or equivalently real rates remain above their natural rate (Summers (2015)).

Thanks to the zeal of a large part of the economic profession we now have many potential theories explaining the decline in the natural rate of interest. There is little disagreement that this fall reflects increases in desired savings relative to investment at the global level. Views differ

however concerning the underlying causes of the phenomenon (see for example Eichengreen (2015) and Rachel and Smith (2015) for discussions) and how persistent it is likely to be.[1] On the savings side, demographics may have played a role via a slowdown in fertility, or an increase in life expectancy, but so could an increase in inequality or an emerging market "savings glut". The "savings glut" explanation has multiple components. It originates from the combination of low levels of financial development in Emerging Market Economies and rapid economic growth relative to Advanced Economies (see Bernanke (2005) and Caballero et al. (2008)). Low short term real interest rates can also result from an increased demand for "safe assets" (Caballero and Farhi (2015)). On the investment side, we may witness a trend decrease in productivity as described in the work of Robert Gordon for the United States (see Gordon (2016)) or a decline in the relative price of investment over time, which could reduce natural rates of interest provided the elasticity of the volume of investment to the real interest rate is not too high. Finally, the low real rates may be linked to the aftermath of the great financial crisis that we experienced in 2008-9. Reinhart and Rogoff (2014) show that severe banking crises weigh on economies for many years. This can happen via a number of channels from a higher level of government debt to a private debt overhang limiting investment and lending by the banking sector. An abundant body of empirical evidence documents how households, firms, governments simultaneously attempt to de-lever in order to repair their balance sheet after a major financial shock (see e.g. Mian et al. (2013) and Jordà et al. (2013)). Low growth post crisis could also be linked to the reduced efficiency in the the allocation of resources during the pre-crisis boom times (see Borio et al. (2016)). In this lecture, I will take a historical perspective to discuss why real rates are low and draw a number of tentative lessons for the global financial system looking at secular data.

2 Historical evidence: The Dynamics of Global Real Interest rates

As usual in economics, taking a step back and looking at long time series allows us to gain valuable insights[2]. Since we use data extending back to the beginning of the 20th century we have to be selective in terms of which country we can study given the lack of data availability. We will

[1] Barro and Sala-i Martin (1990) explores the converse question of why real interest rates were so high in the 1980s. More recently, Laubach and Williams (2003, 2016); Hamilton et al. (2016) and Pescatori and Turunen (2015) attempt to measure the (unobserved) natural rate.

[2] The discussion draws extensively on Gourinchas and Rey (2016a) and Gourinchas and Rey (2016b).

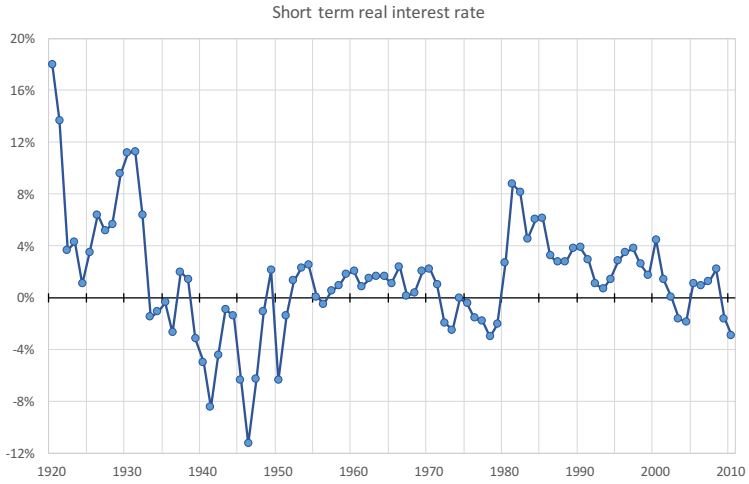

Figure 1: **Real Short term real risk free interest rate, U.S., U.K., Germany and France, 1920-2011 (3 month treasuries, realized CPI inflation).** Source: Gourinchas and Rey (2016a).

approximate the world by France (and we will add to our sample Germany, the US and the UK just in case they would matter as well). The world is therefore approximated by this group of 4 countries (G4) who are and have been home to some of the biggest capital markets over the period considered[3]. Figure 1 reports the short term real risk free rate for our G4 aggregate between 1920 and 2011. We note that the graphs of real rates which we usually see tend to start in 1980, show a trend decline in real rates and miss much of the action in dynamics of the real rate over time. In particular they miss the very low levels of the real rates in the 1930s and 40s.

Since the world can still be thought of as a closed economy despite many recent attempts to increase trade with the outer space we will consider that the world law of motion for wealth is very simple. The world wealth in a certain year depends on the world wealth the year before, decreased by the world consumption during the past year, but increased by the gross real return on world wealth. If the average propensity to consume out of wealth is stationary, simple algebra as shown in Gourinchas and Rey (2016a) allows us to derive a very intuitive and fundamental relation: today's world consumption to wealth ratio is high if either (a) expected future rates of return on wealth are high or (b) expected future aggregate consumption growth is low. This is

[3]We use historical data on private wealth, population and private consumption for the period 1920-2011 for the United States, the United Kingdom, Germany and France from Piketty and Zucman (2014) and Jordà et al. (2016).

Figure 2: **Consumption Wealth Ratio , U.S., U.K., Germany and France, 1920-2011. Source:** Source: Gourinchas and Rey (2016a)**.**

not a causal decomposition: the return on wealth as well as consumption growth are endogenous and interdependent. This is merely a consequence of the aggregate budget constraint of the world economy with no additional assumptions on preferences or consumption or anything else[4]. In turn expected future rates of return on wealth can be decomposed into a risk free real rate and an excess return component. To be plain, by looking at the behaviour of the consumption-wealth ratio over time one can expect to gain some insights on the future fluctuations in the risk free rate, the excess return or future consumption growth (or all of them). Using a simple VAR as in Lettau and Ludvigson (2001), the data will tell us which variables are predictable and at which horizon. Let us therefore now turn to the time series of the consumption-wealth ratio of the G4.

2.1 *What do the fluctuations in the consumption wealth ratio over a century tell us?*

The dotted blue line in Figure 2 reports the log consumption wealth ratio demeaned, for our 4-country aggregate since 1920 (G4). We identify two periods during which the consumption-wealth ratio was significantly depressed: the first one spans the 1930s starting around the time of the Great Depression and ending at the beginning of the 1940s. Not surprisingly, it was in 1939 that

[4]We do need stationarity of the aggregate consumption to wealth ratio and we rule out the fact that the world may be running Ponzi schemes. See Gourinchas and Rey (2016a) for details.

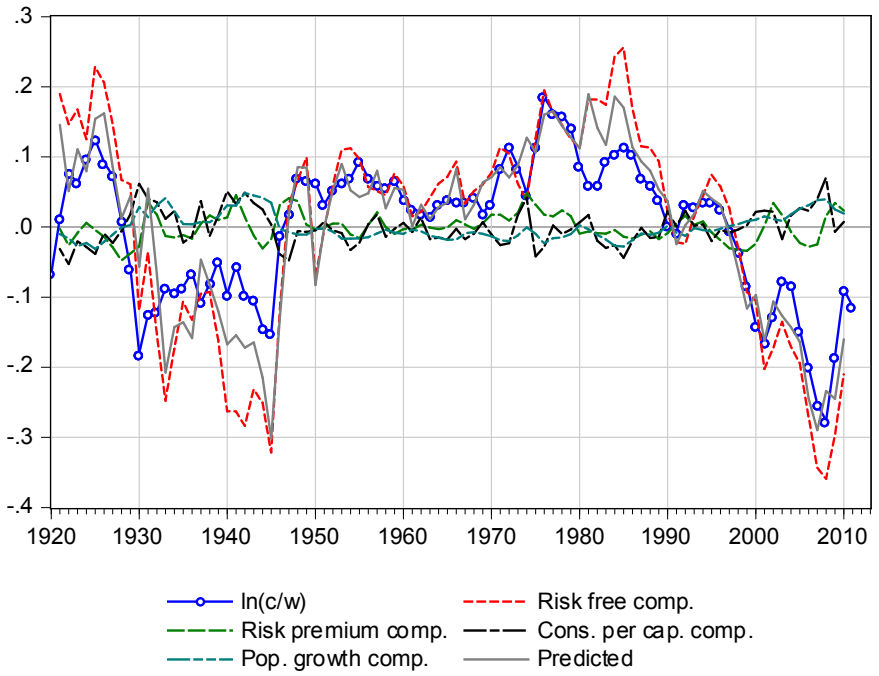

Figure 3: **Consumption Wealth: Real Risk-free rate, Equity Premium, Consumption per capita and Population Growth Components. United States, United Kingdom, Germany and France, 1920-2011**. Source: Gourinchas and Rey (2016a). Note: The graph reports the (log, demeaned) private consumption-wealth ratio together with the risk-free, risk premium, consumption per capita and population growth components.

Professor Alvin Hansen wrote his celebrated article about 'secular stagnation' (Hansen (1939)). The second episode of low consumption-wealth ratio starts in the 1990s. Not coincidentally, it is during this period that Larry Summers revived the idea of secular stagnation (Summers (2015))[5]. From an accounting point of view, a low consumption wealth-ratio can indicate periods of low consumption growth or periods of rapid wealth growth. In both cases (in 1928-29, then in 2007-08), the consumption-wealth ratio decreased dramatically right before a financial crisis, then rebounded during the crisis (1930 and 2009). This suggests that movements in the consumption-wealth ratio are driven largely by the dynamics of wealth during boom-bust episodes. During booms inflated asset valuations lead to very rapid increase in wealth.

Figure 3 shows the consumption wealth ratio in blue, the risk free rate component in red, the risk premium component in green, the consumption growth components (decomposed into population

[5]Perhaps even less coincidentally the consumption-wealth ratio shows a sharp turning point upwards in 2009 when Jaime Caruana starts his tenure as General Manager of the Bank for International Settlements.

growth and per capital consumption growth) in black. The predicted consumption-wealth ratio is in grey. The results are striking. First, we note that the fit of the VAR is very good as evidenced by the grey line tracking very closely the blue line: our empirical model is able to reproduce quite accurately the annual fluctuations in consumption wealth ratios over almost a century of data. Second, most of the movements in the consumption-wealth ratio (the blue line) reflect expected movements in the future risk-free rate (the red line). By contrast, the risk premia, population growth and the per capita consumption growth components are often economically insignificant. It follows that the consumption-wealth ratio today contains significant information on future real risk-free rates. Periods of low consumption-wealth ratios are periods of rapid asset price increases. Our empirical results indicate that these are followed by extended periods of low (or negative) real risk-free interest rates.

Moreover, we find only weak evidence for the view that productivity growth or demographic forces are key secular drivers of the real risk free rates since neither per capita consumption growth nor population growth seem to matter much. If productivity or population growth were the main drivers of the consumption wealth ratio, we would expect to find significantly negatively correlated contributions of the consumption components with the real interest rate component (see Gourinchas and Rey (2016a)). While we find a negatively correlated contribution, it is economically small -and also not very robust. Taken together these results suggest that the consumption-wealth ratio is driven mostly by the dynamics of wealth during boom-bust episodes. Exuberance drives up asset prices and wealth during boom times. Saving propensities increase in the aftermath of financial crises, as agents attempt to repair their balance sheets (see e.g. Mian et al. (2013)). In equilibrium this needs to be offset by a decline in the real rate. This increase in savings propensity may translate into an increased demand for safe assets.

To summarize, we find that at any point in time over the last century, the aggregate consumption-to-wealth ratio contained a great deal of information about *future* short term real rates. In effect, we extract the historical information encoded in households' decisions to consume out of wealth. The consumption-to-wealth ratio tends to be abnormally low following periods of rapid increases in wealth, as in the Roaring 1920s and the Exuberant 2000s. In the subsequent bust, asset prices collapse, financial constraints bind, and households, firms and governments simultaneously attempt to de-leverage. The return on wealth tends to be low or negative and this low return on wealth is

traceable in large part to future low real risk-free rates. Hence our view is that real rates are low because we have just lived through the largest boom-bust cycle since the Great Depression. Using our model we can also predict that the short term real risk free rates are expected to remain low for an extended period of time.

3 Global Financial Cycle and International Monetary System

Our empirical results do not support directly the view that low real interest rates are currently the result of low expected future productivity or demographic forces though to be fair they do not constitute a formal test of these hypotheses. Instead, they point us towards the boom/bust cycles, both in the 1930s and now. Therefore, we view these empirical results as very much in line with interpretations of recent events emphasizing the Global Financial Cycle (Reinhart and Rogoff (2009), Rey (2013), Miranda-Agrippino and Rey (2015), Bruno and Shin (2015), Borio (2017)). We certainly need to understand more fully the crisis periods in which financial constraints may be binding and amplifying the shocks hitting the economy leading to deleveraging and depressed aggregate demand as in Eggertsson and Krugman (2012); Guerrieri and Lorenzoni (2011)) and most papers in the macro-finance literature. But this puts also front and centre the importance of understanding the boom phase, which is really planting the seeds of the downturn. Cheap financing and high asset valuations may encourage risk-taking and leverage (see for example Borio and Lowe (2002)).

3.1 *The Mundellian Trilemma*

The Global Financial Cycle is the co-movements of gross capital flows, credit growth, risky asset prices and leverage. It constrains monetary policy independence, including for countries with flexible exchange rates[6]. This transforms the Mundellian trilemma into a dilemma as explained in Rey (2013). The trilemma misleads us by assuming that domestic monetary and financial conditions shaping the macroeconomic situation of a country can be conveniently summarized by this one single variable, the short-term interest rate. If that were the case, the extra degree of freedom gained through exchange-rate flexibility would indeed be enough to neutralize any effects of foreign financial conditions on the domestic macroeconomy. Yet, in a world of globalized finance

[6]The discussion draws extensively on Rey (2013) and Rey (2016).

with different types of capital flows and financial market imperfections, key countries' monetary policies affect other countries' monetary conditions and financial stability in several ways. Financial imbalances may arise. Or the presence of foreign financing may lead to powerful balance sheet effects that will alter the transmission channel of domestic monetary policy. In such a world, letting the exchange rate float is not enough to insulate the domestic economy, even for a large country, from global factors and permit monetary policy independence.

This does not mean that flexible exchange rates have no purpose, they do and they help external adjustments of countries following large macroeconomic shocks as emphasized in Obstfeld and Taylor (2017). But this means that flexible exchanges rate cannot insulate economies from the global financial cycle, in particular during the boom phase of the cycle. As analysed by Hyun Shin and his co-authors (Bruno and Shin (2015), Hofmann et al. (2016)) and by Portes and Vines (1997) an appreciation of the exchange rate during the boom phase may strengthen capital flows and encourage more lending. Furthermore as emphasized in 2012 by Jaime Caruana in his speech on "policy making in an interconnected world" (Caruana (2012)) the depreciation of higher-yielding currencies tends to happen fast during episodes of stress in global asset markets, and many emerging market economies have found this destabilizing. Again Andrew Crockett had it right when he wrote in his 2001 speech that "the financial industry is unlike other sectors in that the feedback mechanism from supply to price is less effective, or even perverse. In a traditional industry, an expansion in supply puts immediate downward pressure on price, squeezing profit margins, reducing the incentives to invest and encouraging exit from the industry. In the financial sector, the price that falls when the supply of credit increases is the interest rate. This has the effect of pushing up asset values and appearing to strengthen the balance sheets of borrowers and intermediaries alike. Rising asset values encourage leverage and credit expansion contributing to further increases in credit growth." The factors triggering the initial expansion of credit may be benign but it is the mechanism through which excess credit growth takes hold and propagates cross border that should be much more under scrutiny (see Passari and Rey (2015)). Rey (2013), Bruno and Shin (2015), Rey (2016) and Miranda-Agrippino and Rey (2015) find that the monetary policy of the US is one of the drivers of the Global Financial Cycle. The dollar is an important funding currency globally and many financial intermediaries draw on short-term dollar credit and issue floating-rate

dollar debt, so US monetary policy has an immediate cash flow effect[7]. Because of the presence on many balance sheets of dollar-denominated assets or dollar linked-assets around the world, US monetary policy affects the net worth of banks, asset managers, households, corporates and their ability to borrow via collateral effects. International investors appear subject to sharp swings in sentiment: during "risk-on" periods financial capital flows across boundaries, leading to increases in risky asset prices and more leverage. This process can reverse sharply during high-volatility "risk-off" periods. U.S. monetary policy is one of the determinants of the fluctuations of aggregate risk aversion in the markets (see Bernanke (2017) for a discussion). Monetary policy may in turn be accommodating fluctuations in natural rates stemming from underlying structural forces.

3.2 The international monetary system.

As discussed earlier, one of these underlying structural forces may be the increased demand for reserve assets driving equilibrium real interest rates down. As described in the paper "Exorbitant privilege and exorbitant duty" (Gourinchas et al. (2010)), the country at the centre of the international monetary system acts as the world insurer and global liquidity provider. As such, its external balance sheet is remarkable, featuring large amounts of liquid safe gross external liabilities such as government bonds and large amounts of risky mostly illiquid gross external assets such as FDI and equities. The center country typically has a large long net position in risky assets and a large short net position in safe liabilities. This asymmetric composition of assets and liabilities explains partly the excess returns that the US earns on its external position, which is in the order of 1.5 to 3% per annum. But this *exorbitant privilege* (see Gourinchas and Rey (2007)) comes with an *exorbitant duty*. In times of global stress the value of the external assets of the U.S., dominated by risky investment, plummets while the value of its liabilities remains stable or even appreciates. This amounts to a large wealth transfer from the US, the reserve currency issuer, to the rest of the world. Figure 4 shows the large drop of the US net external asset position during the 2007Q4 -2009Q1 period. This corresponds to a valuation loss in the amount of about 13% of US GDP! This episode is not unique. In times of global stress, the US net foreign asset position incurs valuation losses. As the centre country provides insurance to the rest of the world, its gross liabilities can be large relative to its own economic size.

[7]For a thorough discussion on the role of the dollar see Robert Mc Cauley and Shusko (2015)

And when the relative economic size of the insurer goes down compared to the size of the rest of the world, the real rate of interest goes down, as the world becomes on average more risk averse (see Gourinchas et al. (2010) and Hall (2016)). So the decline in the world real rate may be the conjugation of two factors, possibly connected: a low frequency boom-bust cycle and a trend linked to the decrease of the relative size of the US (main issuer of safe assets) in the world.

Net safe asset providers may face a variant of the old 'Triffin dilemma' (Triffin (1960)). The gold value of the dollar is no longer fixed, but we may still live in a Triffin world (see Farhi et al. (2011); Obstfeld (2011); Maggiori et al. (2016)). In the 1960s, the source of the problem was the mismatch between the amount of gold held by the US Federal Reserve (the 'backing' of the dollar) and the outstanding dollars held abroad. Similarly, there is a growing asymmetry today between the fiscal capacity of the United States (the 'backing' of US Treasury bills) and the stock of reserve assets held abroad—in other words, the US gross external debt. Beyond the exchange rate regime, it is the ability to provide liquidity in times of global economic stress that defines the issuer of the reserve currency. The large external balance sheet exposure of the US can generate potentially large valuation losses in the event of a global crisis, as documented previously. As the exposure keeps growing, it could even threaten the fiscal capacity of the safe asset provider, or the loss absorbing capacity of its central bank, leading to a run equilibrium[8].

4 Policy discussion and research agenda

The thrust of this lecture is to emphasize the important role of Global Financial Cycles in fluctuations in real rates and in potentially destabilizing the real economy. One implication is that academic research and modeling should focus a lot more on the boom phase of the financial cycles, and not only on the downturns where capital market frictions amplify shocks. Amplification mechanisms have been so far the main focus of most of the macro-finance literature[9]. Yet it is essential that we understand what caused the excesses of the Roaring 20s and of the Exuberant 2000s. And there I suspect that some type of mispricing of risk plays a fundamental role during boom times, whether due to risk-shifting as in Allen and Gale (2000)or because of behavioural bias as in Nicola

[8]This is conditional on having an alternative international currency to run into. For further discussions see Maggiori et al. (2016). For alternative views see Portes (2012) and Bordo and McCauley (2017).

[9]Exceptions are Martinez-Miera and Suarez (2014), Boissay et al. (2016) and Coimbra and Rey (2017)who focus on the boom phase as well (see also Challe et al. (2013) and DellAriccia et al. (2014)) .

et al. (2012). It is likely that substantial pockets of moral hazard existed and still exist in the financial system via explicit or implicit guarantees or because of opacity. As Andrew Crockett wrote, "moral hazard means that risk-taking which is the essence of financial intermediation will not be properly priced." I could not agree more and am pursuing precisely this avenue of research in some recent work (Coimbra and Rey (2017)) where we model intermediaries with different risk taking abilities who end up exploiting differentially their option value of defaults. This generates systemic fragility in certain states of the world.

4.1 Monetary policy coordination

From the point of view of policy, we should consider a range of options to weaken the potency of the Global Financial Cycle and increase financial stability. One could for example attempt to coordinate monetary policies better in particular among the large currency areas. Monetary policy coordination and liquidity provision during the crisis have played an important role in averting a second Great Depression and the central banking community deserves great credit for this. It would be desirable for large currency areas to internalize more the spillovers and spill-backs of their national policies or even to work on new global rules of the game for the international monetary system that would help instill greater discipline in national policies, as advocated by Rajan (2016). But if history is of any guidance, putting in place effective international cooperation among the main central banks to internalize international spillovers on a more continuous basis still seems out of reach. And there are some reasons for that: international cooperation on monetary spillovers may conflict with the domestic mandates of central banks. International financial stability and domestic activity and inflation targets may be at odds, at least in the short to medium run.

Furthermore the management of aggregate demand in systemically important economies has important consequences for economic activity in the rest of the world. This is a major consideration discussed at length by Ben Bernanke in his Mundell Fleming Lecture (Bernanke (2017)). Tradeoffs are complex and policy action will most likely remain biased towards national priorities[10]. Jaime Caruana in his 2012 speech on "Policymaking in an interconnected world" (Caruana (2012)) nev-

[10]Policy coordination was a major theme in international macroeconomics in the 1980s (see, e.g. Buiter and Marston (1985) and Bryant and Portes (1987)). The G7 summits of 1986 (Tokyo) and 1987 (Venice) emphasized multilateral surveillance. To this day, however neither the economic analysis nor the policy pronouncements have had any observable effect on actual monetary policies.

ertheless points towards important steps we could take. He writes: "I believe that an international perspective is essential if we are to correctly assess the impact of central bank policies on global outcomes." And he gives the following example: "The price dynamics in commodity markets could be taken as a signal of global demand pressure rather than being considered by central banks as a supply shock for each of them." Making progress, Caruana writes, would "require central banks to better appreciate, internalize and share the side effects that arise from individual monetary policies. This will require a shift to a more global analytical approach, one that seeks to factor in collective behaviour, interactions and feedback effects. This would also help us to better frame international cooperation."[11] This seems highly sensible.

4.2 Other tools

Other policies to deal with the Global Financial Cycle and the "dilemma" are to take actions directly aimed at the main source of concerns (excessive leverage and credit growth). We could i) use micro and macro prudential tools and fiscal policy tools in a cyclical fashion to keep credit growth in check during upturns and favour credit creation during the downturns with a specific attention to the housing market; the counter-cyclical buffer is an example but symmetrical use requires that the buffer be loaded ex ante; ii) use prudential tools and fiscal tools to decrease structurally the elasticity of credit creation and leverage to changes in the cost of funds. iii) use capital flow management tools to reinforce prudential instruments either cyclically or structurally. We are already putting in place some of these measures. Enlightened practice will probably require a convex combination of these tools guided by aggressive stress-testing. Depending on the source of financial instability and institutional settings, the use of capital management tools as a partial substitute for macro-prudential measures should not be discarded.

4.3 New Triffin Dilemma

Finally from a longer term perspective this lecture touched upon the stability of the international monetary system and the possibility of being faced by a New Triffin Dilemma due to the shrinking of the economic size of the hegemon relative to the rest of the world. If that analysis is of merit then

[11] See also Eichengreen and et al. (2011) calling for an international and transparent forum of discussions on these issues.

more thoughts should be given to the emergence of a multipolar international monetary system with China and Europe playing a more important role (see Farhi et al. (2011); Maggiori et al. (2016)). This could give further impetus to a number of initiatives aiming at developing euro-area safe assets, whether red/blue bonds (see Von Weizsäcker and Delpla (2010)); ESBies (see Brunnermeier et al. (2011)); or CDOs (see Corsetti et al. (2016)). A more multipolar system would increase the supply of reserve assets and be stabilizing. But of course we cannot rule out that such a system would see an increased likelihood of large portfolio shifts and large volatility.

4.4 Conclusion

In summary, I will leave the last word to Jaime Caruana who in his address to the 2015 IMF conference on Rethinking Macroeconomic Policy (Caruana (2015)) called upon all of us to keep an eye on global liquidity and to go beyond a strictly national perspective. I quote him "This takes more than just keeping one's own house in order; it will also require contributing to keeping the neighbourhood in order.... An array of possibilities then presents itself in terms of the depth of international policy cooperation, ranging from extended local rules to new global rules of the game." I agree, and I hope we will be ambitious.

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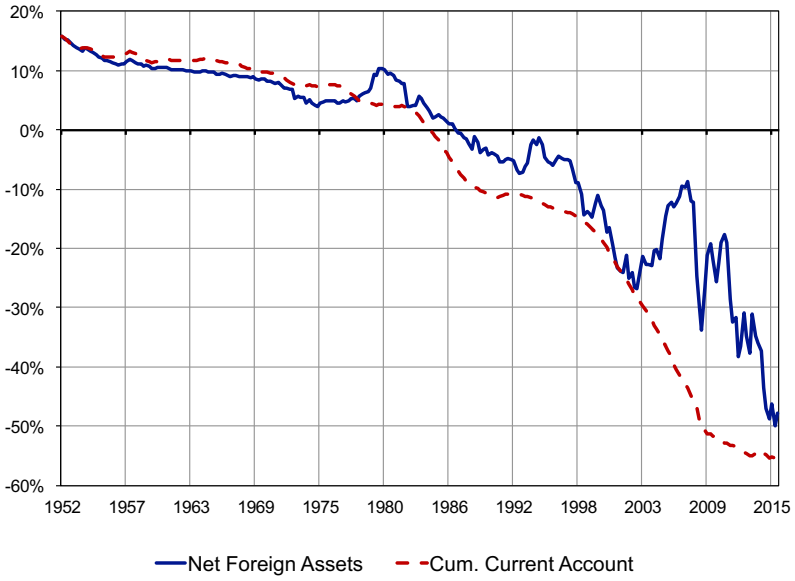

Figure 4: **United States Net Foreign Asset Position and Cumulated Current Account, 1952-2015**. Note: The graph shows the U.S. net foreign asset position as a fraction of U.S. output and the counterfactual obtained by cumulating current account balances since 1952Q1. Source: Gourinchas et al. (2010).