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Understanding the German criticism of Target

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Abstract

Criticism of the Target system by a group of central European scholars has become a widespread argument against the policies of the European Central Bank and possibly the integrity of the monetary union, and even standard fare in the media and in the political debate in Germany. Most academics and practitioners that have participated in the debate have been dismissive of the German preoccupations. In this paper, I first try and clarify the many remaining misunderstandings about the functioning and implications of the Target system. I propose a simple and unified framework for the study of the workings of the Target system in response to different shocks. I then argue that the German criticism of the Target system is not so unfounded after all, and should be taken seriously, both on theoretical grounds and for its political implications.

1 INTRODUCTION

The monetary union and the European Central Bank are the object of harsh criticism from several quarters. The reasons for these criticisms vary, but in Germany and other countries the Target system is among the most salient. That system is often cited as a serious threat to the very integrity of the monetary union, and its critique by a group of central European scholars has even become standard fare in the media and in the political debate of those countries. [1]

The scholarly debate itself started ten years ago, and despite some heated exchanges (at least by the standards of academia) the views of the participants do not seem to get any closer. The earlier debate was particularly active during the sovereign and banking crisis of 2011-2012, which led to an accumulation of Target claims by the Bundesbank peaking at 730bn euros in the summer of 2014. At the time, a series of papers by academics, including De Grauwe and Ji (2012) and Whelan (2014), together with several contributions particularly in VoxEu.org, argued that most of the criticisms had no basis. It is fair to say that to many academics these contributions appeared to have conclusively shown that the criticisms of the Target system as such were theoretically unfounded.

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[1] It even found a way in the internal debate of the European Central Bank when the then Bundesbank's president Jens Weidmann wrote a letter to Mario Draghi demanding guarantees for Germany's Target claims.

After declining considerably, Target imbalances came back with a vengeance with the start of Quantitative Easing in March 2015: the Bundesbank's net Target claims reached €966bn at the end of 2018, and with the end of QE they declined only slightly to €837bn as of end-October 2019. With the resumption of QE in November 2019 and its subsequent enlargement under the Pandemic Emergency Purchase Program, the net Target claims of Germany increased further, and stood at €1,166bn as of July 2022, the last figure available at the time of writing (September 2022). [2]

Predictably, the increase in Target claims associated with QE has reignited criticism of and worries about the Target system. Conceptually, the key arguments used in this new wave of criticism are largely identical to those of the earlier debate (see e.g. Sinn 2018, 2019 and 2020). The debate does not seem to be anywhere nearer to being settled.

In this paper, I try and clarify the key extant misunderstandings about the working and implications of the Target system. I propose a simple, unified, two-period framework to study the role of the Target system in response to different shocks: in particular, a current account shock, capital flight or a capital repatriation shock, and Quantitative Easing (QE).

To preview, I argue that in essence a central bank's Target claim is like a token that can be purchased and used only in a given store: it is irredeemable, it carries zero remuneration (from the central bank's perspective), and it cannot be used as a medium of exchange to purchase goods or services outside the store. Yet as long as the store exists it commands real resources, and if the store goes bankrupt the loss of the token represents a real loss to its owner, as she must use other resources to purchase the same goods. Similarly, a Target claim is irredeemable, carries zero or even negative remuneration, and cannot be used as a medium of exchange. Still, from the perspective of the country as a whole it can be used within the Eurozone to finance a current account deficit or a capital outflow. If the Eurozone breaks up and the Target claims are defaulted on[3], to achieve the same path of consumption the private sector of the Target creditor must reduce its own net foreign asset position by the amount of defaulted Target claims. In this sense a default on Target claims represents indeed a real loss from the perspective of the creditor country as a whole. Contrary to a widely held position, this conclusion holds regardless of what is the cause of the accumulation of Target claims, whether they are the results of capital flows (which in themselves do not change the net foreign asset position of a country) or of current account surpluses.

I then study perhaps the three main arguments in defense of the Target system. First, the Target system is irrelevant because in its absence a current account surplus or a capital inflow would lead to the accumulation of the same amount of other foreign assets, and the risk facing a creditor depends only on the level of its net foreign asset position. I argue that this cannot be true, because it would imply that all foreign assets are equally risky. Second, Target claims appear as assets on the balance sheet of the creditor central bank; for large creditors, a breakup of the Eurozone with a default on Target claims would imply a large negative equity of new the central bank. Some economists have argued that in a world of fiat money this is irrelevant. I argue that it is not, and more importantly that the default itself is a real loss

[2] For updated monthly data on Target balances of the Eurozone countries, see Westermann and Steinkamp (2022).
[3] When I write of a Target default in this paper, I also assume that this is accompanied by a breakup of the Eurozone and of the entire European System of Central Banks (ESCB), including the euro as a currency. From a purely legal standpoint, and although the instruments governing the ESCB do not address a dissolution of the system, claims and obligations of the national central banks under Art. 6 of the Target2 Guideline (ECB/2012/27) are likely to constitute legal claims. As such, they would have to be included as netting positions in the final settlement between each NCB and the ECB. For the reasons I specify below, I assume instead that a default on Target liabilities is possible as a matter of facts. Despite the opposition of creditors, defaults do occur.

to the creditor country. In addition, a Target default, and the ensuing negative equity of the Bundesbank, could easily be much larger than nearly all the cases of negative equity studied in the literature. This would simply be unexplored territory, both for central bankers and for the public, where psychology could play a bigger role than economics. Third, it has been argued that a default on the Bundesbank's Target claims would be partially offset by a default on its liability for "excessive net issuance of banknotes". I argue that such a default is unlikely, but even if it did occur it would not change the substance of the problem.

A lively debate within the debate has arisen concerning the effective rate of remuneration of Target balances. Because of the sharing of monetary income of the national central banks, the effective remuneration of Target balances is not the statutory remuneration, i.e. the interest rate on the Main refinancing operations. Still, what it is exactly is not straightforward. I distinguish between the effective rate of remuneration, from the perspective of the national central bank, and the social rate of remuneration, from the perspective of the country as a whole. I show that the two can differ, and the former is generally zero or negative under more general assumptions, while the latter can be positive but is negative in the current configurations of interest rates. Thus I reach different conclusions from Sinn (2019) an (2020), who argues that the rate of return to Target balances is positive. I show that the reason for our different conclusions is that he actually calculates the *social* rate of return.

I point out that one alternative variously advanced by both critics and defenders of the Target system, the settlement of Target balances, is nearly impossible to implement in the Eurozone. The parallel with the much cited Interdistrict Settlement Account of the Federal Reserve banks does not hold, for reasons that have gone previously unnoticed. I show that the consequences of settlement in the Federal Reserve system are very different from what Target critics have in mind. In fact, the settlement amount becomes part of the profits that each Reserve bank rebates to the Treasury, hence settlement is effectively irrelevant in the Federal Reserve system.

In addition, if the goal of settlement in the Eurosystem is to insulate the creditor national central bank from the risk of default on its Target claims, settlement should be made in what I call breakup-proof assets, i.e. assets that in turn cannot be defaulted on by the debtor country, like gold or US Treasuries. But with QE, by far the largest component of assets of a national central bank are its own government's bonds, which clearly can also be defaulted on by the debtor country in case of breakup. Quite simply, Target debtors national central banks do not have enough breakup-proof assets to even come close to being able to settle their Target balances. Insisting on the settlement of Target balances with truly breakup-proof assets would almost certainly trigger a breakup of the Eurozone as we know it.

There is widespread consensus – even among participants on the opposite sides of the debate -- that the buildup of Target imbalances has proceeded in four broad stages. First, before the financial crisis, an accumulation of current account deficits by several Southern European countries. Second, the repatriation of German capital after 2008. Third, capital flights from Southern European countries when confidence in their banking systems and government finances deteriorated sharply in 2011-12. Fourth, Quantitative Easing. In the interest of space, I do not repeat this story here, and I refer to the numerous papers that have covered this story.[4]

[4] See, among others, Whelan (2014) and (2017), Sinn (2018), Sinn and Wollmershauser (2012a) and (2012b) DeNederlanscheBank (2016), European Central Bank (2017), and Westermann (2016) and (2017). Although this narrative is by now fairly uncontroversial, it was not always so. In particular, Sinn and coauthors were often interpreted as emphasizing a pure "current account" interpretation of Target balances (see e.g. Cecchetti, McCauley and McGuire 2012) - an incorrect representation of their writings.

Obviously this paper has many antecedents. The debate was sparkled by several contributions by a number of German and Austrian economists. Among the first, and making no pretense at completeness, Sinn and Wollmershäuser (2012a) (issued in 2011 as a working paper) and Sinn (2012a) and (2012b), with initial replies by Buiter, Rahbari, and Michels (2011a) and (2011b), RebelEconomist (2011), Whelan (2011), and Cecchetti, McCauley and McGuire (2012). Recently, Sinn (2019) and especially Sinn (2020), the latter a whole book on Target balances, expanded and systematized the arguments of the critics of the Target system.

Other contributions will be cited in the next sections where relevant. An important one is Whelan (2014), that appeared in *Economic Policy* at the peak of the previous debate on Target balances, with the discussion by Westermann (2014). While the present paper has many overlaps with and builds on that paper, it also differs in its methodology, in its findings, in its focus, and most importantly in its assessment of the Target criticisms. While Whelan (2014) was dismissive of nearly all Target criticisms, I reach more nuanced conclusions, and indeed do find that some of these criticisms are well grounded and should not be taken lightly. Continuing to ignore them might exacerbate and poison the political debate and could jeopardize, rather than reinforce, the integrity of the monetary union, as it will entrench the critics and radicalize the political opposition to the monetary union.

2 THE TARGET SYSTEM: A SIMPLE EXAMPLE

Target is a real-time cross-border settlement system used by Eurozone central banks, and also by a few non-Eurozone ones. The details are technical, but for our purposes the basic features of the system are simple. [5] Target records the claims and liabilities of each National Central Bank ("NCB") of the Eurosystem vis à vis the ECB, generated by the transfer of deposits and reserves between the banking systems of Eurozone countries.

Pablo lives in Spain and has a deposit account at BBVA; Kurt lives in Germany and has a deposit account at Commerzbank. Both countries are members of the Eurozone, and each has its own central bank. Pablo buys a car from Kurt for 10 euros. The German current account balance improves by 10 euros, and Germany as a whole accumulates 10 euros of net foreign assets. Which sector gets the net foreign assets depends on how the current account transaction is settled. Table 1 describes two alternatives.

In row 1 Kurt is paid on his deposit account at Commerzbank. BBVA debits Pablo's deposit account for 10 euros, and then instructs the Bank of Spain to transfer ownership of 10 euros of reserves from its account at the Bank of Spain to Commerzbank's account at the Bundesbank: Commerzbank then credits Kurt's deposit account for 10 euros. Commercial banks' reserves are a liability of their NCB: if the process stopped here, the Bundesbank would suffer a decline in its net worth by 10 euros and the Bank of Spain would see its net worth increase by the same amount. To avoid this, a claim for 10 euros on the ECB is booked on the balance sheet of the Bundesbank, and correspondingly a liability of 10 euros to the ECB is booked on the balance sheet of the Bank of Spain. These are the net Target claims of the two central banks.

[5] Perhaps the best, simple introduction to the Target system is Jobst, Handig, and Holzfeind (2012). Strictly speaking, what I call here "Target system" is really "Target2", the second generation of the settlement system, that started operations in November 2007.

Notice that in all this process neither Kurt nor Commerzbank accumulate an asset vis à vis Pablo or BBVA: the current account surplus of Germany manifests itself as changes in the Target claims of the two central banks. Neither Kurt nor Commerzbank enter in contact with their Spanish counterparts, only with their own NCB.

This is not always the case, and as a consequence not all current account transactions generate a change in Target claims. In row 2, Kurt also holds a deposit account at BBVA[6] and is credited 10 euros directly on that Spanish account; therefore, in this case no deposit "crosses the border" and no reserve is transferred across NCBs. In contrast to the previous case, the German private sector accumulates a claim directly on its Spanish counterpart, without any involvement of the two NCBs.

In sum, if deposits "cross the border" within the Eurozone, a Target claim is generated; if not, private claims are generated.

Table 1: A current account transaction

BBVA		**Bank of Spain**		**Bundesbank**		**Commerzbank**	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
ΔReserves at Bank of Spain = -10	**Δ**Pablo's deposit = -10	**Δ**Net Targett claim = -10	**Δ**Reserves of BBVA = -10	**Δ**Net Target claim = +10	**Δ**Reserves of Commerzbank = + 10	**Δ**Reserves at Bundesbank = +10	**Δ**Kurt's deposit = +10
ΔReserves at Bank of Spain = 0	**Δ**Pablo's deposit = -10 **Δ**Kurt's deposit = +10	**Δ**Net Target claim = 0	**Δ**Reserves of BBVA = 0	**Δ**Net Target claim = 0	**Δ**Reserves of Commerzbank = 0	**Δ**Reserves at Bundesbank = 0	**Δ**Kurt's deposit = 0

A current account transaction - a sale of *goods and services* by a German entity to a Spanish entity - is not the only reason why a Target claim of the Bundesbank could arise. A capital account transaction – a sale of German *assets* to a Spanish entity (a "capital flight" from Spain), or a sale back to a Spanish entity of Spanish assets previously bought by a German entity (a "capital repatriation" to Germany) - also generate a Target claim if these transactions are ultimately settled via a transfer of deposits and reserves.

3 Accumulation of Target balances and the consequences of a Euro breakup

3.1 Preliminaries

If the monetary union were irreversible, the Target system would be hardly relevant: after all, nobody tracks the net positions of the different quarters of Paris vis à vis each other, because it is inconceivable that they will have different currencies in the foreseeable future. But a breakup of the Eurozone is not

[6] For simplicity I assume that Kurt's Spanish deposit is at the same bank where Pablo has an account. But it could be at the Spanish branch of Commerzbank, or really at any Spanish depository institution.

inconceivable: during the government debt crisis of 2011-12 quite a few economists on both sides of the Atlantic argued that the monetary union was untenable.

The key question therefore is: in case of a Eurozone breakup, does it really matter what the size of the Target balances is? In this section I consider the implications for this question of each of the three cases when a Target claim arises. To preview, the answer is "yes" - a different answer than that of most non-German speaking economists. To understand it, it will be useful to consider a very simple framework.

I assume a two-country Eurozone, with Germany the Target creditor and Spain the Target debtor. In each country I consider four sectors: the non-bank private sector, consisting of households, non-financial companies, and non-depository financial institutions; the banking system, consisting of depository institutions with reserve accounts at the Eurosystem; the national central bank (NCB); and the national government. The first two together constitute the private sector; the last two together constitute the public sector.

One must specify the treatment of the assets and liabilities of central banks and of the private sectors after a breakup. I assume that in case of breakup the Target debtor reneges on its Target liability. A NCB recognizes its liabilities towards banks based in its own jurisdiction; hence, the reserves of the domestic banks remain on the balance sheet of the domestic NCB, as they are now. Similarly, on the asset side the refinancing operations to domestic banks and the assets held outright (virtually all issued by domestic entities, whether the private sector or the government) remain on the balance sheet of the domestic NCB.[7]

An implicit partial default on the foreign liabilities of the private sector of the Target debtor is possible because of the likely depreciation of the currency of the Target debtor after a breakup. I assume that no selective retaliatory default by the private sector of the Target creditor country occurs in response to a Target default of the debtor country.

3.2 A CURRENT ACCOUNT SURPLUS OF GERMANY

Assume that at time 0 the two countries start with a balanced current account and zero net foreign assets [8] At time 1 Kurt experiences a preference shock: he wants to postpone 10 euros of consumption to time 2; coincidentally, Pablo experiences the opposite shock. Hence, Germany runs a current account surplus of 10 euros at time 1, and a current account deficit of the same amount at time 2. Table 2 displays the changes in each period, *relative to the previous time period*, of the assets and liabilities of the various sectors of Germany. The last two columns display the change in the net foreign assets (NFAs) of the country as a whole, and the stock of the NFAs, respectively. Because this is a two-country Eurozone, the mirror image of this table would represent the outcome in Spain: just invert the signs of all items.

[7] Some assets, like the periphery government debt purchased via the Securities Market program and the small ECB share of the Large Scale Asset Purchase programs, are currently recorded in the balance sheet of the ECB. In case of a breakup they would presumably be allocated to the former members according to some criterion, like the capital keys. There might be a question whether, say, the Spanish government will want to recognize its debt that ends up at the Bundesbank via the distribution of the ECB holdings of the Securities Market program and the like.

[8] For simplicity, in these numerical examples I assume that all interest rates are and remain equal to 0. Obviously in general, in a fully developed model of a two-country union, this would require a rather extraordinary coincidence of shocks. Below I discuss the issues that arise in a more realistic environment with non-zero interest rates. These issues are potentially important, and have been at the forefront of the debate on the Target system, but are of negligible importance relative to the issues I highlight here.

As already shown above in Table 1, at time 1 the Bundesbank increases its Target balances by 10 euros (first row of Table 2). The German NFAs increase by the same amount in the form of Target claims. At time 2 Germany runs a current account deficit, and the opposite happens: the Bundesbank draws down its Target claim and Germany goes back to a zero NFA position (second row of Table 2). At the end of the process, Kurt has been able to postpone consumption by 10 euros and the NFA position of all German sectors is back to 0, its value before the current account shock.

Now suppose the monetary union breaks up at the end of period 1, after Germany's current account surplus has generated a Target claim, and Spain does not recognize the Target liability of its NCB to the ECB. What happens at time 2 is now illustrated in the third row of Table 2, instead of the second row. The Bundesbank starts time 2 without the Target claim, but on the liability side it still has the higher reserves acquired at time 1. Its accounting capital falls. Some defenders of the Target system have argued that this is not a problem, as it is basically a reflection of an alleged purely accounting property of Target claims: in an era of fiat money central bank capital is irrelevant anyway. I discuss the issue of central bank capital in section 4, but the problem with this position is that it stops too soon: it focuses on the central bank and misses the more important issue of what happens to the private sector and the country as a whole.

Table 2: A current account surplus of A

		Kurt		Commerzbank		ΔNFA of private sector	Bundesbank		ΔNFA of Bundesbank	ΔNFA of Germany	NFA of Germany
		A	L	A	L		A	L			
t=1		ΔD = 10		ΔR = 10	ΔD = 10	0	ΔT= 10	ΔR = 10	ΔT= 10	ΔT= 10	10
t=2		ΔD = -10		ΔR = -10	ΔD = -10	0	ΔT= -10	ΔR = -10	ΔT= -10	ΔT= -10	0
t=2 & breakup		ΔD = -10			ΔF = 10 ΔD = -10	-ΔF = -10	ΔT= -10		ΔT= 10	-ΔF= -10 ΔT= -10	-10

"A": assets; "L": liabilities; "D": Kurt's deposit account at Commerzbank; "R": Commerzbank's reserves at Bundesbank; "T": Target balances of Bundesbank; "F": BBVA's account at Commerzbank; "NFA": Net foreign assets. The change represented by "Δ" is relative to the previous period; thus, both rows 2 and rows 3 represent changes relative to time 1.

After the breakup, the two countries have moved to a flexible exchange rate regime.[9] When Kurt enjoys the 10 euros of consumption that he had postponed from time 1, Commerzbank debits his deposit account for 10 euros, and wires 10 euros to BBVA, either by crediting BBVA's account at Commerzbank or through the intermediation of a correspondent bank, that has accounts with both banks; BBVA in turn credits Pablo's deposit account for the same amount. Kurt's position is the same as it would have been if the Eurozone had not broken up; but BBVA's account at Commerzbank has increased by 10 euros. For Germany, this is to be added to the loss of 10 euros of Target claims: thus after the breakup the German NFA position worsens by 20 euros, relative to time 1, instead of 10 euros; the stock of NFAs at the end of time 2 is negative by 10 euros (third row), instead of 0 (second row).

[9] Therefore, I abstract from changes of the nominal exchange rate after the breakup. These might change the amounts of the examples below, but they are unlikely to reverse the qualitative conclusions.

The default of the Spanish Target liability does have real consequences for Germany. Effectively, the country as a whole has lost a foreign asset, the Target claim, that it would have used to "pay" for the current account deficit at time 2, and must incur an extra net foreign liability (the 10 euro increase in BBVA's account at Commerzbank) to do that.

Thus, a Target claim can best be understood as a token: it costs real resources to purchase, it cannot be cashed in, and it can be spent only in a given store to purchase certain items. If that store goes bankrupt or stops recognizing the token, other real resources must be used to purchase the same items. In the same vein, a Target claim is a foreign asset that can be accumulated for instance via a current account surplus, and can be used to pay for a current account deficit later, but only within the Eurozone. As long as all countries remain in the monetary union there is no problem; but if in the meantime the monetary union breaks up and the Target claims are no longer recognized, the private sector must pay for the same current account deficit by decreasing its non-Target foreign assets or increasing its foreign liabilities; the German private sector, and the country as a whole, is poorer in a real sense.

3.3 A CAPITAL INFLOW TO GERMANY

Table 3 illustrates the case of a capital inflow to Germany. At time 1 (first row) Kurt's company issues a bond worth 10 euros to Pablo, who pays with a transfer of deposits and ultimately of reserves.[10] The mechanics are exactly like in the case of a current account transaction, except that the object sold by Kurt is a bond instead of a good or service. The Bundesbank ends up with a Target claim of 10 euros; but as the German private sector's NFA position declines by 10 euros due to the issuance of Kurt's bond, the NFA position of Germany as a whole does not change.

Suppose the bond issued by Kurt has a maturity of one year. At time 2, the reverse process occurs, and effectively Germany "uses" the Target claim to repay the bond (second row). Again the NFA position of Germany as a whole is unchanged, while that of its private sector has gone back to 0.

Table 3: A capital inflow to Germany

		Kurt		Commerzbank		ΔNFA of private sector	Bundesbank		ΔNFA of Bundes bank	ΔNFA of Germany	NFA of Germany
		A	L	A	L		A	L			
t=1		ΔD = 10	ΔB = 10	ΔR = 10	ΔD = 10	-ΔB = -10	ΔT= 10	ΔR = 10	ΔT = 10	-ΔB = -10 ΔT = 10	0
t=2		ΔD = -10	ΔB = -10	ΔR = -10	ΔD = -10	-ΔB = 10	ΔT= -10	ΔR = -10	ΔT = -10	-ΔB = 10 ΔT = -10	0
t=2 & breakup		ΔD = -10	ΔB = -10		ΔF = 10 ΔD = -10	-ΔB = 10 -ΔF = -10	ΔT= -10		ΔT = -10	-ΔB = 10 -ΔF = -10 ΔT = -10	-10

"A": assets; "L": liabilities; "D": Kurt's deposit account at Commerzbank; "B"; bond issued by Kurt's company and sold to Pablo; "R": Commerzbank's reserves at Bundesbank; "T": Target balances of Bundesbank; "F": BBVA's account at Commerzbank; "NFA": Net foreign assets. The change represented by "Δ" is relative to the previous period; thus, both rows 2 and rows 3 represent changes relative to time 1.

[10] If instead the bond is issued by Commerzbank, there would still be a transfer of reserves offset by an accumulation of a Target claim, but there would be no creation of deposits.

If the monetary union breaks up and the Target claim defaults at the end of time 1 (third row of Table 3), Kurt repays the bond by having Commerzbank debit his account for 10 euros and credit BBVA's account at Commerzbank (again, possibly more indirectly via a correspondent bank); in turn, BBVA credits Pablo's deposit for 10 euros. No exchange of reserves has occurred.

Once again, to achieve the same level of consumption, the German private sector had to increase its net foreign liabilities (i.e., credit BBVA's account at Commerzbank at the correspondent bank) in lieu of the lost Target claim. Again, the loss of the Target claim is a real loss.

A comparison of Table 2 and Table 3 also sheds light on an issue that has caused considerable misunderstandings in the initial phases of the debate. Suppose that a country (like Spain before the financial crisis) runs a current account deficit for 10 euros and receives capital inflows for 10 euros. Its accumulation of net Target balances would be 0, as the Target liability caused by the current account deficit would be offset by the Target claim caused by the capital inflow. This shows that there is no necessary connection between current accounts and changes in Target balances: what matters is the combination of current account imbalances and private capital flows.

3.4 A CAPITAL REPATRIATION TO GERMANY

The case of capital repatriation is similar: instead of issuing a bond (i.e., increasing his foreign liability) to Pablo, Kurt sells back a Spanish asset he had previously bought: this could be for instance a deposit at BBVA, which he wants to move to Commerzbank.

Suppose at time 1 Kurt runs a current account surplus because, like in Table 1, he wants to postpone consumption to the future (first row of Table 4). Differently from the first row of Table 1, he is credited 10 euros on his BBVA account in Spain instead of being paid 10 euros on his Commerzbank account. Thus, his NFA position increases by 10 euros but no Target claim is accumulated by the Bundesbank.

At time 2 a preference or regulatory shock occurs, and Kurt decides he wants to "repatriate" his 10 euros from the BBVA account to his Commerzbank account (second row). This is exactly like a capital inflow (first row of Table 3) except that instead of increasing his foreign liability Kurt reduces his foreign assets. The result is the same: an accumulation of a Target claim by the Bundesbank, offsetting the reduction in foreign assets owned by Kurt. Effectively, Germany is replacing a private foreign asset with a Target claim.

At time 3, Kurt wants to enjoy the consumption he postponed from period 1 and runs a current account deficit (first row of Table 4, which is identical to the second row of Table 2). This, as we know, would lead to a decumulation of the Target claims of the Bundesbank by 10 euros, taking the NFA position of Germany back to 0.

But suppose that at the end of time 2 the Eurozone breaks up. If at time 3 Kurt wants to run the same current account deficit, Commerzbank must now credit BBVA's account at Commerzbank for 10 euros. Its NFA position, and that of the country as whole, deteriorates further by 10 euros. The end result is a negative NFA position of Germany by 10 euros.

Table 4: A capital repatriation to Germany

		Kurt		Commerzbank		ΔNFA of private sector	Bundesbank		ΔNFA of Bundes bank	ΔNFA of Germany	NFA of Germany
		A	L	A	L		A	L			
t=1		$\Delta D_B = 10$				$\Delta D_B = 10$			0	$\Delta D_B = 10$	10
t=2		$\Delta D_B = -10$ $\Delta D = 10$		$\Delta R = 10$	$\Delta D = 10$	$\Delta D_B = -10$	$\Delta T = 10$	$\Delta R = 10$	$\Delta T = 10$	$\Delta D_B = -10$ $\Delta T = 10$	10
t=3		$\Delta D = -10$		$\Delta R = -10$	$\Delta D = -10$	0	$\Delta T = -10$	$\Delta R = -10$	$\Delta T = -10$	$\Delta T = -10$	0
t=3 & breakup		$\Delta D = -10$			$\Delta F = 10$ $\Delta D = -10$	$-\Delta F = -10$	$\Delta T = -10$		$\Delta T = -10$	$-\Delta F = -10$ $\Delta T = -10$	-10

"A": assets; "L": liabilities; "D": Kurt's deposit account at Commerzbank; "D_B"; Kurt's deposit account at BBVA; "R": Commerzbank's reserves at Bundesbank; "T": Target balances of Bundesbank; "F": BBVA's account at Commerzbank; "NFA": Net foreign assets. The change represented by "Δ" is relative to the previous period; thus, both rows 2 and rows 3 represent changes relative to time 1.

3.5 QUANTITATIVE EASING

Target critics frequently argue that an excessively loose monetary policy pursued by the ECB after the financial crisis has exacerbated Target imbalances by creating a large liquidity that fuels capital flows and therefore Target imbalances. One frequently cited example is the two large Long Term Refinancing Operations of December 21, 2011 and February 29, 2012, which totaled almost €1tn. The reserves they created ended up disproportionately on the balance sheets of Italian and Spanish banks. In turn, the banks used large parts of the extra liquidity to buy back their domestic governments' bonds held by foreign banks: in other words, the whole operation amounted to a large capital repatriation to Germany and other countries. In fact, the combined Target liabilities of Italy and Spain nearly doubled from December 2011 to June 2012, from €366bn to €723bn; over the same period, the Target claims of Germany increased by almost the same amount, from €363bn to €751bn.[11]

This is not the place to assess the pros and cons of the monetary policy implemented by the ECB since the financial crisis. However, it is important to note that the Large Scale Asset Purchase Programs ("Quantitative Easing", or "QE", for short) can have a mechanical effect on the size of Target balances.

QE in the Eurozone started in earnest in March 2015 with the Public Sector Purchase program, which initially purchased €50bn of government bonds monthly, up to €80bn in May 2016, to decline back to €10bn by December 2018. During that period, the Target claims of the Bundesbank increased from €513bn to €966bn. In January 2019 QE purchases were suspended, to be resumed in November 2019, albeit for smaller amounts (€20bn monthly). In that periods, the Target claims of the Bundesbank declined to €837bn in October 2019, to start increasing again in November 2019: again note the perfect coincidence with the timing of QE purchases. The Target claims of the Bundesbank then grew further in

[11] Sinn and coauthors frequently cite two more instruments, ANFA and ELA, that allegedly allow national NCBs to create "their own monetary base" and increase the risk to other countries for two reasons: because they might increase the risk of needing to recapitalize the NCB that has issued them if the assets it gets in exchange default, and because they fuel capital flights and higher Target imbalances. But these instruments are quantitatively marginal, and have been used extensively only by few countries on few occasions.

June 2020, immediately after the start of the Pandemic Emergency Purchase Program in March 2020, and reached a new peak of €1,261bn in December 2021.

In itself, QE does not have to create large Target imbalances. Each NCB purchases assets, mostly government bonds of its own country, and in proportion to its own capital key (the Pandemic Emergency Purchase program allows more leeway as to proportions). These government bonds are carried on the books of the NCB that purchases them.[12] Thus, absent major rebalances of the nationality of the portfolios by the sellers of the assets, there are no reasons to expect large Target imbalances resulting from QE.

QE generated large Target claims of Germany and other core countries because many of the periphery government bonds purchased by periphery central banks were sold by German entities as part of a capital repatriation strategy, or even by entities headquartered outside the Eurozone but with a correspondent bank (or a branch, in the case of a bank) located in Germany. The mechanics are shown in Table 5. When the Bank of Spain buys 10 euros of Spanish government bonds from a German hedge fund, a German bank like Commerzbank first purchases the Spanish government bonds from the hedge fund and pays with deposits; Commerzbank then sells these bonds to the Bank of Spain, which instructs the Bundesbank to credit the reserve account of Commerzbank for 10 euros. Thus the Bundesbank has extra liabilities for 10 euros in banks' reserves, but an equivalent amount of extra Target claims. Germany as a whole has swapped 10 euros of a foreign asset, the Spanish government bonds, for 10 euros of another foreign asset, the Target claim. The result for Germany is like a repatriation of foreign assets, except that the seller is now the German hedge fund instead of Kurt (compare Table 5 to the second row of Table 4). [13]

Table 5: Effects of QE on Germany

	German hedge fund		Commerzbank		ΔNFA of private sector	Bundesbank		ΔNFA of Bundes bank	ΔNFA of Germany	NFA of Germany
	A	L	A	L		A	L			
t=1	ΔG = -10 ΔD = 10		ΔR = 10	ΔD = 10	ΔG = -10	ΔT= 10	ΔR = 10	ΔT= 10	ΔG = -10 ΔT= 10	0

"A": assets; "L": liabilities; "G": Spanish government bonds sold by a German hedge fund to Commerzbank, and resold to the Bank of Spain; "D": hedge fund's deposit account at Commerzbank; "R": Commerzbank's reserves at Bundesbank; "T": Target balances of Bundesbank; "NFA": Net foreign assets. The change represented by "Δ" is relative to the previous period; thus, both rows 2 and rows 3 represent changes relative to time 1.

Thus, QE can be thought of as a repatriation of capital to Germany and the other core countries. And like in that case, if a breakup of the Eurozone occurs Germany comes up short of 10 euros of foreign assets.[14]

[12] A small proportion, 8 percent of all QE purchases, is bought directly by the ECB and held on its books.

[13] For more details on the impact of QE on Target balances, see Deutsche Bundesbank (2016), Auer and Bogdanova (2017), Castillo and Varela (2017), and European Central Bank (2016) and (2017).

[14] Table 5 can also be used to interpret Sinn's statement that "*QE can therefore be seen as a process of retroactively financing prior current account deficits with overdraft credit from the Eurosystem*" (Sinn 2016 p. 28). In the table, G is liabilities of the Spanish government that were bought by the German hedge fund in the past and in equilibrium contributed to finance Spain's current account deficits. With QE, the German hedge fund effectively sold these foreign assets to the Bank of Spain, generating a corresponding increase in reserves at the Bundesbank, which in turn received a Target claim. Thus, Germany as a whole has lost this marketable foreign asset and has replaced it with a Target claim, what Sinn calls "overdraft credit from the Eurosystem".

Thus, an increase in Target liabilities arises mechanically when a NCB buys its QE assets from financial institutions located in the Eurozone but outside that NCB's country, or even located outside the Eurozone. In fact, 80 percent of assets purchased in QE programs have been sold by non-domestic counterparties of the NCB making the purchase, and about 50 percent by counterparties outside the Eurozone. Many of these non-Eurozone counterparties are located in the United Kingdom (which does not participate directly in the Target system), and have correspondent banks in Germany (see European Central Bank 2017).[15]

4 THREE DEFENSES OF TARGET

Thus, the size of the Target balance does matter: if the Eurozone breaks up and Target debtors default, this represents a real loss to the Target creditor. In this section I discuss three objections to this conclusion.

4.1 TARGET CLAIMS ARE AS RISKY AS ANY OTHER FOREIGN ASSET

Some Target defenders argue that the Target system has nothing to do with the risk a country is facing: what matters is its NFA position, not its composition. This is best understood in the case of a capital repatriation, where as we have seen private foreign assets are replaced by an official foreign asset, the Target claim, without changing the NFA position of the country.

For instance, Dullien and Schieritz (2012) argue that in case of a Eurozone breakup even private foreign assets would default to some extent. De Grauwe and Ji (2012) go further, and argue that they are equally likely to default as Target claims: " […] *First, it is true that by holding large foreign claims, a country can take a risk. This risk will materialize when some of the foreign debtors default on their debt. Second, the Target2 claims of Germany are not a good indicator of this risk. Put differently, when in 2010 the Target2 claims started to increase dramatically, this did not change the risk Germany was facing. As we have made clear, the Target liabilities have increased mainly as a result of speculative flows. The latter do not change the net claims of Germany on the rest of the eurozone – only the composition of these claims and liabilities*" (De Grauwe and Ji 2012, p. 10).

The same argument would extend to the case of a current account surplus: while it would be true that by increasing the NFA position of country it increases the risk it is facing, this would have nothing to

[15] Note that in some cases, like Spain and Italy, the decline in holdings of Spanish and Italian government bonds by foreign residents has been limited during QE. For instance, between March 2015 and October 2019 holdings of Italian public debt by the Bank of Italy increased from 5.8 to 19.6 percent; holdings by nonresidents fell from 39.4 to 35.1 percent, i.e. one third of the QE purchases. *Prima facie*, this seems to contradict the explanation above. But QE can cause an accumulation of Target claims via an indirect portfolio rebalancing channel. A domestic resident that sells Italian bonds to the Bank of Italy under the Public Sector Purchase Program might decide to re-invest the proceeds in, say, a US bond. This rebalancing too might take place via German banks, thus reinforcing the Target implications of QE (see European Central Bank 2017).

do with the increase in Target balances and with the Target system *per se*, since the composition of the stock of NFAs, De Grauwe and Ji argue, is irrelevant.

However, the statement that the risk faced by Germany depends only on the overall NFA position of the country as a whole and not on its composition simply cannot be true (except so to speak on a set of measure zero): it would imply that all foreign assets and liabilities, whether private or official, including Target claims, are always equally risky.

On the contrary, *conditional on a Euro breakup* a default on the Target liabilities of the debtor country is perfectly within the realm of possibilities, and even likely: it requires the decision of just a handful of policymakers in the government. Target claims are irredeemable, cannot be used as a medium of exchange, and as I show below have a zero or negative effective remuneration: politicians of the Target debtor could argue, perhaps not exactly in good faith, that they are liquidating the market value of such an asset, which is 0. In doing so they could even cite the widespread view among academics that Target claims are just an accounting device. In contrast, a full default on all the foreign liabilities issued by the private sector of the Target creditor would require a coordination mechanism that is hard to envision.[16]

Moreover, in turbulent times it is easy to imagine a self-reinforcing mechanism. As the probability of a breakup increases, the private sector of the Target creditor would like to repatriate its capital; this increases the Target liabilities of the Target debtor, and therefore the incentives of the latter to renege on them and to break out of the Eurozone.

4.2 A DEFAULT ON TARGET CLAIMS IS COSTLESS IN A FIAT MONEY REGIME

Target claims are part of the conventional capital of a central bank.[17] Given how thinly capitalized central banks are, after a breakup with default on its Target claims the central bank of the creditor country could well find itself with negative capital. For instance, at the end of 2021 the capital plus revaluation account of the Bundesbank was €176bn, while its Target claims amounted to €1,261bn (see 2021 *Bundesbank Annual Report*, pp. 47 and 63).

Views on the monetary policy consequences of a large decline in central bank capital differ sharply depending on the professional role: "*If you ask monetary economists whether we should care if a central bank's capital level falls below zero (even for an extended period of time), most will say no. Pose the same question to central bank governors, and the answer in nearly every case will be yes.*" (Cecchetti and Schoenholtz 2015).

[16] A partial default of the private sector of the debtor country could occur implicitly in the likely event of a depreciation of the new currency of the debtor country, if its liabilities in euros are redenominated in the new currency.

[17] One could ask: how is it possible that something that is not a claim to any stream of resources (in fact, as I show below, it generally has a negative effective rate of return), that is not marketable and is irredeemable – how is it possible that it is counted as an asset of the central bank? The reason, as we have seen, is precisely that it offsets a liability, the flow of reserves associated with a transfer of deposits. A nominal token too carries zero interest, it is irredeemable and not marketable, and yet it has value in a real sense, as long as one spends it in the store that sold it.

Probably the best illustration of the view of monetary economists is this quote by Whelan: "[…] *a central bank operating a fiat currency could have assets that fall below the value of the money it has issued – the balance sheet could show it to be 'insolvent' – without having an impact on the value of the currency in circulation. A fiat currency's value, its real purchasing power, is determined by how much money has been supplied and the factors influencing money demand, not by the central bank's stock of assets.*" (Whelan 2014 p. 111).

Central bankers view it differently. To them, a large negative accounting capital is unexplored territory, where psychological factors might play an equal or more important role than rational economic factors, as envisaged in this quote by the then governor of the Bank of Japan Fukui "[in the event of negative capital t]*he central bank might either run into difficulties in conducting its policy or other business operations, or might cause the view to spread that it will, and eventually it will become difficult to maintain public confidence in the currency.*" (Fukui, 2003, cited in Cukiermann (2006), p.5).

One way to rationalize the central bankers' view is the following. Conventional capital plus the stock of non-interest bearing liabilities of the central bank equals the present value of the central bank's dividends to the government less the present value of seigniorage.[18] If conventional capital falls because of a decline in assets, either the present value of dividends to the government must fall, and could even become negative, or the present value of seigniorage must increase. The former case could imply negative dividends to the government, i.e. subsidization of the central bank by the government; this could imperil the independence of the central bank, or cause its independence to be *perceived* to be imperiled. The latter case could force the departure from the inflation target of the central bank. Either way, central bankers dislike the outcome.

For better or worse, there is little doubt that the reaction of central bankers to a negative equity position of their central bank would be almost invariably "immediate recapitalization". The 2018 ECB Convergence report, pp. 25-26, writes: "[. . .]*the event of an NCB's net equity becoming less than its statutory capital or even negative would require that the respective Member State provides the NCB with an appropriate amount of capital at least up to the level of the statutory capital within a reasonable period of time*". The German Constitutional court has also affirmed the principle that the Bundesbank should not operate with negative capital.

Most monetary economists would probably reply that a recapitalization, besides being unnecessary because a central bank can operate with negative capital, would anyway be costless, a mere book-keeping item: "*However, even if it is decided after a break-up that the Bundesbank should be provided with assets from the Federal government for recapitalization purposes, rather than being hugely costly, this recapitalization would have no impact on either the net asset position of the German state or its flow of net income. Let's assume the German government recapitalizes the Bundesbank by providing it with an interest-bearing government bond. While the government's gross debt will increase, the government bond becomes an asset of the Bundesbank, so the total public net debt does not change, while the higher net interest income arising from these assets would increase the amount the Bundesbank could return in dividends to the German government by the same amount, resulting in no change in the total flow of income for the public sector.*" (Whelan 2014 p. 111)

This statement is correct but can easily be misinterpreted. A recapitalization is to a first approximation neutral from the perspective of the private sector, in that it involves a flow of resources

[18] This assumes for simplicity that the interest-paying reserves and the assets of the central bank pay the same interest rate.

within the consolidated public sector (the combination of the government and the central bank) and does not change the net asset position of the private sector: tax receipts are transferred from the government to the central bank, and the same amount comes back to the government in the form of higher dividends from or lower subsidies to the central bank. By the same logic, shredding domestic government bonds held by the central bank is also neutral.

But shredding Target claims, or any foreign asset, is not neutral for the private sector. A recapitalization is neutral *conditional on* net foreign assets of the central bank having been lost; but as we have seen the loss of these net foreign assets itself is a *real* loss. This key distinction has not always been clear in the discussion. A default on the Target claims of Germany is not a purely nominal or accounting phenomenon: as we have seen, it is a loss of *real* resources for the German taxpayer, irrespective of what caused the accumulation of Target claims in the first place.

4.3 The Bundesbank's Target claims should be set against its "excessive banknotes" liabilities

One could argue that a default on the Bundesbank's Target claims would be partially offset by a default on its liability for "excessive net issuance of banknotes". This may or may not be correct, as I show below; but first let us briefly outline what this liability is about (more on this in Appendix B).[19]

Banknotes are put in circulation (retired) by the NCBs, mostly when commercial banks convert reserves into cash (cash into reserves). The Eurosystem has data on the net issuance (issuance less retirement) of banknotes by each NCB, but not the amount effectively circulating in each country. It estimates the latter by applying each NCB's capital key to the total net amount of banknotes issued by all NCBs of the Eurosystem; this is the amount of banknotes "allocated" to each NCB.

When the net issuance of banknotes by a NCB is larger than its allocated amount, a corresponding liability is booked on the balance sheet of that NCB: the logic is the same as that behind Target balances. Suppose the Bundesbank buys 10 euros of interest bearing assets by issuig 10 euros of reserves, and then converts these reserves into banknotes; these banknotes are then exported abroad, for instance by Kurt going to Spain and paying Pedro with cash. The assumption is that eventually these banknotes are deposited at BBVA and the latter converts them into reserves at the Bank of Spain. If the process stopped here, the Bundesbank would have acquired assets for 10 euros and gotten rid of 10 euros of liabilities, while the Bank of Spain would have acquired 10 euros of liabilities without any increase in its assets. This would affects the accounting capital of the two NCBs, much like in the case of payments via deposits. To avoid this, a "Net liability related to the allocation of euro banknotes within the Eurosystem" for 10 euros is booked on the balance sheet of the Bundesbank, and a corresponding net claim is booked on the balance sheet of the Bank of Spain.[20] The Bundesbank also pays interest, at the main refinancing rate, on this liability (although it comes back through the mechanism of pooling of monetary income, see section 5 and Appendices A and B).

[19] For a clear exposition of the issue see e.g. Handig and Holzfeind (2007) and Deutsche Bundesbank (2018).

[20] Recall that the Eurosystem cannot measure the amount of banknotes circulating in a country, hence it estimates it by assuming that it is proportional to the capital key of that country's NCB.

For historical reasons, Germany is a large "exporter" of banknotes, i.e. it issued much more banknotes than its allocated amount. Hence, the Bundesbank's balance sheet shows a large "Net liability related to the allocation of euro banknotes within the Eurosystem": at end of 2021 it was €510bn, against Target claims for €1,261 bn (see 2021 Bundesbank annual report, pp. 47 and 62).

It could be argued that this liability should be set against the Bundesbank's large Target claims when evaluating the effects of a Eurozone breakup. For instance, Whelan (2017) has argued that in case of a breakup Germany is likely to renege on its excess banknotes liabilities. In this case, a breakup would cause a decline in its capital not by the 1,261bn euros of Target claims, but by 751bn (i.e. 1,261bn-510bn) euros.

It is possible that a post-breakup Bundesbank could choose to default on its book liability for excessive banknotes issuance, as doing so would increase its conventional capital and the banknotes it has issued would continue to circulate, either in Germany or abroad. However, one can think of a scenario where the breakup of the Eurozone would further increase the demand for D-marks as a safe asset, and the seigniorage that goes with this (see Whelan 2017). A default on the book liability generated by the excessive issuance of banknotes by the Bundesbank before the breakup, while technically compatible with an increased in the demand for D-Marks after the breakup, could pose reputational problems. It is unlikely that the post-breakup Bundesbank will be willing to run the risk of incurring such a loss of reputation, and forgo the increased seigniorage.

5 THE RATE OF REMUNERATION OF TARGET BALANCES

Much ink has been spilled on the issue of the actual remuneration of Target balances. Oddly enough, this seemingly straightforward question turns out to be more than a little tricky. The ambiguities arise from the nature of Target balances, and from the peculiarities of the profit sharing formula for the Eurozone NCBs. I distinguish the *effective rate of return* to Target balances, defined as the rate of return from the perspective of a NCB, and the *social rate of return*, i.e. from the perspective of the country as a whole. This distinction is not present in the literature, and its absence is at the root of some misunderstanding.

In this section, I give the basic intuition underlying the calculation of the two rates of return, and calculate them under simplifying assumptions; I show that both are 0 under a symmetry assumption. In Appendix A I derive them formally and compute them under the more general assumptions of Sinn (2019) and (2020); I show that they are usually 0 or negative.

Suppose a current account shock occurs that leads to an increase in net Target claims by ΔT_t. As we have seen, this is accompanied by an increase in excess reserves by the same amount, $\Delta E_t = \Delta T_t$. *Per* ECB regulations, Target balances are remunerated at the reference interest rate i_r, essentially the main refinancing operations rate. Thus, the "monetary income" of the domestic NCB changes by $i_r \Delta T_t - i_e \Delta E_t = (i_r - i_e)\Delta T_t$, where i_e is the interest rate on excess reserves. The monetary income of all NCBs is pooled and then distributed to each NCB according to its capital key. Thus, if α is the capital key of the domestic NCB, the change in income accruing to the domestic NCB after pooling is

$$\alpha[(i_r - i_e)\Delta T_t + (i_r - i_e)\Delta T_t^*] = 0 \qquad (1)$$

where ΔT_t^* is the change in Target balances in the rest of the Eurozone and $\Delta T_t = -\Delta T_t^*$.

The *social rate of return* to Target balances does not include flows of interest payments between the domestic central bank and domestic entities, such as interest on reserves and interest paid on domestic assets held by the central bank. It is the rate of return to the country as a whole. The country as a whole receives an extra $i_r \Delta T_t$ of remuneration on Target balances, pays it into the pool, and receives its share α of the change in the pool, which is 0. Thus, the social rate of return is also 0.

In Appendix A I show that under the more general conditions of Sinn (2019) and (2020) the effective rate of return can be negative, while the social rate of return can be positive (but it is negative in the current configurations of interest rates). Thus I reach different conclusions from Sinn (2019) and (2020), who argues that the effective rate of return to Target balances is positive.[21] I show that the reason for our differences is that what he calls the effective rate of return is indeed the social rate of return.

6 A TARGET SYSTEM WITH SETTLEMENT?

A typical proposal by many Target critics is an alternative monetary arrangement: a monetary union in which Target balances are settled periodically, say every six or twelve months, using marketable assets. A point that has not always been appreciated in the debate is that settlement serves a purpose only if made with assets whose value cannot be manipulated by the Target debtor, such as gold or debt instruments issued by a reliable non-Eurozone debtor in a stable currency. I call these "breakup-proof" assets, to indicate that a Target debtor cannot threaten to default on these assets in case of a Euro breakup.[22] In a Target system with settlement, a persistent negative Target position would lead to the depletion of the pool of breakup-proof assets of the NCB of that country.

Note that this is essentially the same outcome one would get in a fixed exchange rate regime where current account imbalances lead to transfers of breakup-proof assets, like gold or foreign exchange, between central banks. In fact, one could argue that a settlement system combines the advantages of a monetary union (the near-irrevocability of exchange rates, and all other advantages of a monetary union, including political ones) with the advantages of a fixed exchange rate regime (a built-in mechanism for the automatic correction of current account imbalances and capital flights, and the insulation of the leading country from default of the followers).

The Target critics have frequently argued that the Federal Reserve system is a monetary union with the equivalent of Target system with settlement, and have proposed that the Eurozone should imitate the Federal Reserve's arrangement. However, the consequences of settlement in the Federal Reserve system are very different from what Target critics have in mind. In fact, the settlement amount becomes part of the profits that each Reserve bank rebates to the Treasury, hence settlement is effectively irrelevant in the Federal Reserve system. One could argue that it is no settlement at all, in the sense that this term is widely understood.

The Interdistrict Settlement Account ("ISA") is an item on the balance sheet of each Reserve bank. Exactly like the Target system, it records transfers of payments between two commercial banks in

[21] Sinn 2020 p. 77 does note that it is probably negative under the current configuration of interest rates.

[22] Of course, the assumption here is that the breakup occurs after the settlement. In real life settlements would occur periodically, presumably every year, hence the Target debtor would have an incentive to break immediately before a settlement, *de facto* defaulting on one year's worth of Target liabilities. It remains true that settlement would prevent default on the stock of Target liabilities accumulated before the year preceding the breakup.

two different districts as an interdistrict claim (liability) of the Reserve bank of the payee (payer).[23] And like in the Eurosystem, the recent increase in ISA balances is associated with the Quantitative Easing program of the Fed. The purchases of QE assets are conducted by the New York Fed for all Reserve banks; as a consequence the New York Fed gets an ISA claim. Similarly, the Bundesbank gets a Target claim when it buys Spanish government bonds for the Bank of Spain from a hedge fund with an account at a German-based bank,

Differently from the Target system, the ISA balances are settled each year. In the past, the settlement occurred by transfers of the gold certificates accounts of the Reserve banks.[24] Nowadays, it occurs via changes in the share of the System Open Market Account holdings (SOMA: basically, all the asset purchased via open market operations) allocated to each Reserve bank.[25]

Arguably, the point of settling the ISA balances is that, theoretically, a Reserve bank with a negative balance receives a smaller share of the SOMA portfolio, hence less seigniorage. However, all earnings generated in the Fed system are remitted to the Treasury after paying the stockholders:[26] in fact, in 2020 the Fed system remitted earnings to the Treasury for $86,890mn after paying dividends for $386mn (see Federal Reserve System 2020, p. 54). Settlement simply changes the nominal distribution of profits, which however are almost entirely transferred to the government anyway. As long as a Reserve bank earns enough profits to cover its operating expenditures, the settlement of ISA balances is irrelevant.[27]

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[23] For an introduction to the ISA, see e.g. Koning (2012), Wolman (2013) and Board of Governors (2019), sections 5.00 and 40.70

[24] The gold certificate account is an item on the asset side of each Reserve bank, and represents a claim on the gold held by the US Treasury.

[25] Assume that the ISA balances at the end of period t-1 have all been settled, so that the ISA balance of Reserve bank j during period t, $ISA_{j,t}$, is all due to transactions during time t. Let $V_{j,t}$ be the allocation of SOMA holdings to Reserve bank j at the beginning of period t, and $V'_{j,t+1}$ be the theoretical allocation at the end of period t. Abstracting from asymmetries in the allocation of banknotes, $V'_{j,t+1}$, is determined by

$$V'_{j,t+1} = V_{j,t} + ISA_{j,t}$$

Thus, $V'_{j,t+1} - V_{j,t}$ can be regarded as the theoretical settlement of the Reserve bank j. The actual settlement $V_{j,t+1} - V_{j,t}$ is based on the allocation $V_{j,t+1}$, which is equal to $V'_{j,t+1}$ adjusted to reflect the fact that total SOMA holdings at the end of period t might have changed relative to the beginning of the period:

$$V_{j,t+1} = V'_{j,t+1}\frac{V_{t+1}}{V_t}$$

The expressions above are a simplification, because they do not take into account asymmetries in the allocation of banknotes. The correct expression for $V'_{j,t+1} - V_{j,t}$ is:

$$V'_{j,t+1} - V_{j,t} = ISA_{j,t} - N_{j,t}\left(\frac{G_t}{N_t} - \frac{G_{j,t}}{N_{j,t}}\right)$$

where N represents banknotes in circulation and G gold certificate accounts (see Wolman 2013).

[26] Reserve banks are required to compensate their stockholders (depository institutions) at 6%, or, in the case of a stockholder with assets of more than $10bn, at the yield of the 10-year Treasury note auctioned at the last auction (see Board of Governors of the Federal Reserve System, Federal Reserve Act, Section 7).

[27] In practice it might be irrelevant even if earnings were less than operating expenditures. As shown by Konig (2012), the Fed has the right to suspend the settlement of ISA balances, and it did so on at least two occasions in the past, in the thirties of the last century.

Even disregarding this, the Federal Reserve arrangement of settlement would not be replicable in the Eurosystem. The Fed's open market operations concern almost exclusively federal government and agency debt; therefore, Reserve banks can use nearly all the Fed assets to settle their ISA imbalances: it is virtually impossible for a Reserve bank to run out of such assets. This is because settlement in the Federal Reserve system was not meant to be a protection against a breakup of the United States – simply a non-issue in the US - but a system to allocate profits equitably (although, as we have just seen, even this is a purely nominal operation).

In the Eurosystem, the goal of settlement would not be to ensure an equitable distribution of profits among NCBs: this goal would be already achieved by the current Target system, provided Target balances were remunerated at the "correct" interest rate (an issue that is subject to debate, as we have seen in section 5). Rather, the goal of settlement in the Eurosystem would be to insulate the creditor NCBs from the risk of default by the debtor NCBs in case of breakup.

For this to happen, settlement must occur with breakup-proof assets: almost by definition, these assets cannot be issued by a public entity of the debtor country, and maybe not even by its private sector. Virtually all proposals of settlement that have been put forward conflict with the requirement that the assets used for settlement should be breakup-proof. Sinn (2012b) proposes to collateralize the Target balances with senior claims to state-owned real estate or future tax revenues. In case of a breakup these claims could be easily reneged on. Whelan (2014) proposes instead to use the collateral used in refinancing operations and from the Securities Market Program. However, the former consists mostly of domestic assets that would be redenominated in the currency of the debtor country; the latter are mostly government bonds, which suffer from the same problem and, as we have seen, are certainly not breakup-proof. Since Whelan wrote his paper, the much larger Public Sector Purchase Program and Pandemic Emergency Purchase Program have put trillions of government debt on the books of NCBs. But they too are unusable for settlement, for the reasons we have seen.

Sinn (2014, pp. 329 and ff. and 2020 p. 125) proposes settlement in gold, perhaps obtained by selling covered bonds or state property, or in European safe assets, backed by gold or state property. Both assets are breakup-proof, but neither proposal seems realistic. For instance, in March 2021 the Bank of Italy had €113bn of gold and €51bn of claims on non-Euro area residents denominated in foreign currency, against a Target liability of €516bn.[28] Obtaining the remaining amount of gold necessary to settle its Target liabilities by selling hundreds of billions of state property is simply not feasible.[29]

7 CONCLUSIONS

Quite simply, Target debtors NCBs do not have enough breakup-proof assets to even come close to being able to settle their Target balances. Insisting on the settlement of Target balances with truly breakup-proof assets would almost certainly trigger a breakup of the Eurozone as we know it. On the

[28] See the 2021 Annual Report of the Bank of Italy, Table a3.1.

[29] Note that Sinn 2020, p. 125, rules out using QE assets to settle Target account not because they are not breakup proof, but because "[s]uch assets were typically overvalued, being bought way above the market price".

other hand, accepting non-breakup-proof assets in settlement of the Target balances would not solve the problem of the risk faced by large Target creditors.

The fact is that the Target system lacks a mechanism for the automatic correction of imbalances. Within the Eurozone, a country could experience indefinite capital outflows or current account deficits and indefinite accumulation of Target liabilities. Thus, the current Eurozone arrangement is somehow vulnerable to large accumulation of Target imbalances. One might want to let some supernational authority, perhaps the European Commission, decide the maximum amount of Target balances a country is allowed to accumulate. This would be a process subject to an enormous amount of uncertainty and judgment calls, and prone to endless litigation. Thus, no alternative to the Target system is realistically available.

To what extent the accumulation of large Target balances by some countries in some periods is a serious problem in reality is debatable. In this paper, I have described a sort of upper bound to the potential losses of a large Target creditor in case of a disorderly breakdown with full default on Target liabilities.

8 APPENDIX A

In this appendix I relax the simplifying assumption made in section 5 regarding the flow budget constraint of the central bank following the shock to Target balances, and add the assumptions of Sinn (2019).

The complete resource constraint of the central bank is

$$(H_{t+1} - H_t) + (R_{t+1} - R_t) + (E^M_{t+1} - E^M_t) + (E^T_{t+1} - E^T_t) + i_a A_t + i_r T_t + NMIR_t = \\ = (A_{t+1} - A_t) + i_r R_t + i_e E_t + i_r (H_t - C_t) + (T^T_{t+1} - T^T_t) + (T^B_{t+1} - T^B_t) + D_t \quad (2)$$

The left hand side of this expression represents the "resources" of the NCB, while the right hand side represents the "use" of these resources. I adopt the following timing convention. An asset or a liability indexed with the time period t is evaluated at the beginning of period t, or equivalently at the end of period t-1. Interest on an asset or liability is paid at the end of the period, based on the value of the asset or liability at the beginning of the period.

H_t is the stock of currency at the beginning of year t, hence $H_{t+1} - H_t$ is issuance of new currency; similarly, $(R_{t+1} - R_t)$ is issuance of new required reserves, and $(E_{t+1} - E_t)$ is the change of excess reserves. [30] It is useful to distinguish between $E^M_{t+1} - E^M_t$, i.e. the change in excess reserves which represents a counterpart to monetary operation, i.e. a counterpart to to the change in monetary assets $A_{t+1} - A_t$ (see below); and $E^T_{t+1} - E^T_t$, the change in excess reserves associated with an exogenous change in Target balances, the term $T^T_{t+1} - T^T_t$ on the right hand side. By issuing new currency or reserves, the central bank creates means of payment with which it can command resources.

A_t is monetary assets of the central bank: it includes assets purchased outright, mostly via QE programs, and the current stock of refinancing operation; all are at their value as of January 1 of year t, or December 31 of year t-1. These assets are assumed to have a maturity of one year for simplicity. I assume that they are remunerated at the average rate i_a, [31] hence $i_a A_t$ is interest on these assets, received by the central bank on December 31 of year t. [32]

T_t represents net Target claims at the beginning of year t, remunerated at the reference rate i_r [33]; thus, $i_r T_t$ is the remuneration of net Target claims, received at the end of year t. This remuneration is a book entry, and is recorded on the Target account of the NCB: thus it contributes to the item $T^B_{t+1} - T^B_t$ on the right hand side (see below).

[30] Formally the Eurosystem maintains a distinction between excess reserves and the deposit facility. Excess reserves are remunerated at 0 or the deposit facility rate, whichever is lower. The deposit facility rate was zero or negative from July 2012 until September 2022; hence during this period there was no difference between excess reserves and the deposit facility, although the two were still recorded separately in the Eurosystem balance sheets. When the deposit facility rate is positive, excess reserves are different and of course tend to be very small. I will use the term "excess reserves" to denote the sum of excess reserves and of the balance of the deposit facility.

[31] Sinn (2019) ands (2020) does not make a distinction between assets held outright and refinancing operations, and assumes that all central bank assets earn the reference interest i_r. However, they earn the same *imputed* interest rate in the calculation of the monetary income paid (see expression (3)), but they can earn different interest rates in the calculation of the actual interest income earned (see the NCB's resource constraint (2)).

[32] In the Eurosystem, these consist of Main Refinancing Operations, Long Term Refinancing Operations, and Targeted Long Term Refinancing Operations. All are essentially repurchase agreements. The first are virtually nil currently.

[33] See Annex II of Decision ECB/2016/36.

$NMIR_t$ represents "net monetary income received" from the Eurosystem via the pooling of interest income received and paid; this too is a book entry which is recorded on the Target account of the NCB and contributes to the item $T^B_{t+1} - T^B_t$ on the right hand side. The net monetary income received, $NMIR_t$, is defined as the difference between the monetary income received from the pool, MIR_t, and the monetary income paid into the pool, MIP_t, as described below.

The right hand side of (2) represents the "uses" of the resources. These are the addition to the stock of assets $A_{t+1} - A_t$; the interest paid on required reserves $i_r R_t$[34] and on excess reserves, $i_e E_t$; the interest paid on the excessive issuance of banknotes, $i_r(H_t - C_t)$, where C_t is the estimate of the banknotes in circulation (see section 4.3 and Appendix B); the dividends paid to the Treasury (the distributed profits of the NCB), D_t; and the change in net Target claims. This can be divided into two parts. The first, $T^T_{t+1} - T^T_t$, records the changes in net Target claims due to the reasons discussed in section 3 (current account shocks, capital flights or capital repatriation, QE purchases). The second, as mentioned above, records as a book entry the monetary income received or paid by the NCB, $NMIR_t$, and the interest received or paid on net Target balances, $i_r T_t$.

I now describe how the two terms MIR_t and MIP_t are calculated. First, each NCB pays into the "pool" of income an imputed return from its assets, calculated using the reference interest rate i_r. From this, the NCB subtracts the interest paid on reserves and on the excessive issuance of banknotes. Thus the monetary income paid into the pool by the domestic NCB is

$$MIP_t = i_r(A_t + T_t) - i_r R_t - i_e E_t - i_r(H_t - C_t) \quad (3)$$

The monetary income paid by all NCBs is pooled and redistributed to each NCB according to its capital key. Letting an asterisk denote the other countries in the Eurosystem, and letting α denote the capital key of the domestic NCB, the monetary income it receives is calculated as

$$MIR_t = \alpha(MIP_t + MIP^*_t) \quad (4)$$

Therefore

$$NMIR_t = \alpha(MIP_t + MIP^*_t) - MIP_t \quad (5)$$

Note that $i_r(H_t - C_t) = -i_r(H^*_t - C^*_t)$ (see Appendix B) and $T_t = -T^*_t$, hence

$$NMIR_t = \alpha[i_r(A_t + A^*_t) - i_r(R_t + R^*_t) - i_e(E_t + E^*_t)] - MIP_t \quad (6)$$

We now have the elements to calculate the *effective rate of return* to Target balances. Suppose that at the beginning of year t Target balances increase unexpectedly and exogenously by $\Delta T^T_t > 0$. The *effective rate of return* to Target balances to the central bank is defined as the change in net interest income and net monetary income received following the unexpected and exogenous change in Target balances

[34] Required reserves are remunerated at the average of the reference rate during the maintenance period.

$$ERT_t \equiv \frac{i_a \Delta A_t + i_r \Delta T_t^T - i_e \Delta E_t - i_r \Delta R_t + \Delta NMIR_t}{\Delta T_t^T} \quad (7)$$

In this Appendix, the difference from the analysis of the main text is that, following Sinn (2019) and (2020), I assume that the initial shock to Target balances can give rise to second round effects on assets and reserves of the central bank. Indeed, for ease of comparison from now on the assumptions are the same as in Sinn (2019), except otherwise noted. As we have seen, the initial inflow ΔT_t^T is initially associated with an increase in excess reserves ΔE_t^T by the same amount. Only a fraction γ of this extra reserves remains as reserves; the fraction $1-\gamma$ is used by banks to reduce the "monetary assets" A_t of the central bank, i.e. to reduce their exposure to refinancing operations or to buy back some central bank assets. [35] Sinn (2019) also assumes that of the fraction γ that persists as reserves, a fraction μ goes into required reserves, while the remaining part $1-\mu$ goes into excess reserves. Because required reserves are a minimal fraction of new deposits and reserves, for simplicity I assume $\mu = 0$ and therefore $\Delta R_t = 0$. Formally

$$\Delta E_t = \gamma \Delta T_t^T; \ \Delta A_t = -(1-\gamma)\Delta T_t^T; \quad (8)$$

Note that the assumption that γ can be less than 1 is debatable. A commercial bank cannot buy central bank assets held outright (i.e., essentially QE assets) on its own initiative; rather, it is the Eurosystem that must decide to sell its assets. In addition, in a symmetric configuration, as assumed here, this would mean that the foreign central bank, experiencing a negative Target shock and a decline in reserves, *buys* assets from its banking system. Two central banks, one selling assets and the other buying assets outright, would be inconsistent with the Eurosystem monetary policy. Still, for the sake of comparison with Sinn (2019) I will follow his assumptions.

In a symmetric configuration, where each coefficient has the same value in the two countries, and given that $\Delta T_t^T = -\Delta T_t^{T*}$, we have $\Delta E_t = -\Delta E_t^*$ and $\Delta A_t = -\Delta A_t^*$; from (6) it follows that

$$\Delta NMIR_t = -\Delta MIP_t \quad (9)$$

From (3), (8) and (9) and the assumption that the excessive issuance of banknotes is not affected by the Target shock

$$\Delta NMIR_t = -(i_r - i_e)\gamma \Delta T_t^T \quad (10)$$

I assume that no further exogenous change in the Target balances is expected to occur in t+1, i.e. in expression (2) $T_{t+1}^T - T_t^T = 0$. From the assumption that outright purchases of assets are determined by the Eurosystem we also have $\Delta\left(E_{t+1} - E_t\right) = 0$, $\Delta(R_{t+1} - R_t) = 0$, $\Delta(A_{t+1} - A_t) = 0$. From (2) it

[35] Sinn (2019) also allows for a fraction λ of the fraction $1-\gamma$ that does not remain as reserves to flow into term deposits at the NCB (which are not part of the monetary base, hence reduce reserves) and a fraction $1-\lambda$ to be used to reduce monetary assets. I assume $\lambda = 0$ as term deposits were used for substantial amounts (up to a maximum of €220bn) only between 2011 and mid-2014 to "sterilize" the effects on the monetary base of the purchases of government bonds under the Security Market Program. Since then they have not been used.

follows that the numerator on the r.h.s of (7) is equal to $\Delta(T^B_{t+1} - T^B_t) + \Delta D_t$, which can be interpreted as the sum of distributed and undistributed profits of the NCB.

$$i_a \Delta A_t + i_r \Delta T^T_t - i_e \Delta E_t + \Delta NMIR_t = \Delta(T^B_{t+1} - T^B_t) + \Delta D_t \tag{11}$$

Making the usual assumption of a symmetric configuration, i.e. of equality of all coefficients in the two countries, from (8) and (10)

$$i_a \Delta A_t + i_r \Delta T^T_t - i_e \Delta E_t + \Delta NMIR_t = -(i_a - i_r)(1-\gamma)\Delta T^T_t \tag{12}$$

Therefore in the more general case

$$ERT_t = (i_r - i_a)(1-\gamma) \tag{13}$$

If, as Sinn (2019) assumes, $i_r = i_a$, the *effective rate of return* to Target balances is 0. If $\gamma = 1$, again it is 0. Otherwise, since in general $i_r < i_a$, it is negative.

The *social rate of return* differs from the effective rate of return because all flows between the NCB and domestic entities are netted out, hence:

$$SRT_t = \frac{\Delta NMIR_t + i_r \Delta T^T_t}{\Delta T^T_t} = i_r - (i_r - i_e)\gamma \tag{14}$$

which is positive at the time of writing (September 2022) , as $i_r = 1.25$ percent and $i_e = 0.75$ percent, but was negative for a decade before that date, during which $i_r = 0$ and $i_e =< 0$. This is the same expression as in Sinn (2020) p. 75, excepts that I assume $\mu = \lambda = 0$.[36]

These are the returns to Target balances under my definitions of these returns and Sinn's (2019) assumptions on how the assets and liabilities of the NCB change after the Target shock. Sinn (2019) finds a different expression for the return to Target balances, for two reasons: he assumes $i_a = i_r$, and he defines the primary income subject to pooling as

$$MIP^S_t = i_r(A_t + M_t) - i_r R_t - i_e E_t \tag{15}$$

where the superscript "S" stands for "Sinn", i.e. compared to (3) he does not include the terms $i_r \Delta T_t$ nor $i_r(H_t - C_t)$.[37] It follows from (3), (9) and (14) that

$$\Delta NMIR^S_t = \Delta NMIR_t + \Delta T^T_t \tag{16}$$

[36] Sinn (2020) p. 77 too acknowledges that the expression can be negative given the current configuration of interest rates in the Eurozone.

[37] Article 3 of ECB Decision ECB/2016/36 states that "The amount of each NCB's monetary income shall be determined by measuring the actual income that derives from the earmarkable assets recorded in its books". Annex II lists among the "earmarkable assets" the "Net intra-Eurosystem claims resulting from TARGET2 transactions remunerated at the reference rate" and "Net intra-Eurosystem claims on euro banknotes in circulation", and similarly for the liabilities (which also obviously include banknotes in circulation). Article 2 of the same Decision states intra-Eurosystem balances on euro banknotes in circulation are remunerated at the reference rate.

He then defines the (marginal) effective rate of interest of Target balances as

$$ERT_t^S = \frac{\Delta NMIR_t^S}{\Delta T_t^T} \tag{17}$$

which from (14) and (16) is actually the *social rate of return* to Target balances. Note that $\gamma = 0$ is the case of Fuest and Sinn (2018), in which case ERT_t^S is i_r.

9 APPENDIX B

The term $i_r(H_t - C_t)$ in the NCB's resource constraint (2) represents the interest paid on "Net liabilities related to the allocation of euro banknotes within the Eurosystem" (liability item 9.2 in the balance sheet of the Bundesbank). This item arises for the following reason. Banknotes are put in circulation by the NCBs; however some banknotes can then flow to other countries; this item estimates these flows of banknotes between countries, and their effects on the profit and loss accounts of their NCBs. The logic is similar to that behind Target balances.

It is useful to think of banknotes being put in circulation when Kurt in Germany wants to convert €10 of deposits at Commerzbank into banknotes. Commerzbank gets €10 of banknotes from the Bundesbank, and reduces its reserves accordingly. Thus, for the Bundesbank this simply means replacing €10 of reserves with €10 of banknotes on the liability side. Suppose now Kurt goes to Spain and spends the €10 of banknotes there. Again, it is useful to think as these €10 of banknotes being deposited at BBVA; subsequently, BBVA wants to convert the cash into reserves. The Bank of Spain has thus destroyed €10 of banknotes and issued €10 of reserves, the opposite than the Bundesbank. At the end of the process, the Bundesbank has €10 less of reserves on the liability side, and the Bank of Spain has €10 more of reserves. This would affect the accounting capital of the two NCB, much like in the case of payments via deposits. In that case, a Target claim (liability) is booked on the balance sheet of the NCB of the payee (payer). Similarly, in the case of a payment via banknotes a "Net claim (liability) related to the allocation of euro banknotes within the Eurosystem" is booked on the balance sheet of the Bank of Spain (the Bundesbank).

How does the Eurosystem estimate the amount of banknotes that flow between countries? The Eurosystem has data on the banknotes issued and retired by each country, but not the amount effectively circulating in each country. It estimates the latter by applying the ECB capital keys to the total net amount of banknotes issued by all NCBs of the Eurosystem.

In terms of the notation above, H_t is the amount of banknotes issued by the Bundesbank, while C_t is the banknotes circulating in Germany. Therefore, C_t and C_t^* are calculated as

$$C_t = \alpha(H_t + H_t^*); \quad C_t^* = (1 - \alpha)(H_t + H_t^*) \tag{18}$$

where α is the capital key of the Bundesbank. From (2), if $H_t - C_t$ is positive, the Bundesbank is debited that amount under the item "Net liabilities related to the allocation of euro banknotes within the

Eurosystem" and booked the amount $i_r(H_t - C_t)$ in its profits and loss account. The rationale is that by issuing H_t of banknotes the Bundesbank is able to buy interest-paying assets for the same amount; if afterwards the amount $H_t - C_t$ of banknotes leaves the country, the Bundesbank finds itself with an amount $H_t - C_t$ of assets, on which it is assumed to earn a return i_r, which do not have a counterpart in a liability. The complete expression of the payment into the pool, MIP_t, is expression (3), repeated here for convenience:

$$MIP_t = i_r(A_t + T_t) - i_r R_t - i_e E_t - i_r(H_t - C_t) \tag{19}$$

As already mentioned in Appendix A, expression (19) is the same as in Sinn (2019) except that he does not include $i_r T_t - i_r(H_t - C_t)$ on the r.h.s. The pooled interest on the net liabilities and claims related to the allocation of euro banknotes within the Eurosystem is

$$i_r(H_t - C_t) + i_r(H_t^* - C_t^*) = 0 \tag{20}$$

and neither NCB receives any interest from this pool. Thus, the contribution of this component to the term MIR_t is 0. On the other hand, this component reduces the amount MIP_t that the Bundesbank, with an excess of issuance over circulation of banknotes, pays into the pool by $i_r(H_t - C_t)$. Thus, the term $NMIR_t$ is increased by $i_r(H_t - C_t)$. From the r.h.s. of the resource constraint (2) the Bundesbank is booked the profit $i_r(H_t - C_t)$. The net effect on the profit and loss account of the Bundesbank is 0.

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