Target2 and Cross-border Interbank Payments during the Financial Crisis

Ulrich Bindseil*,
Philippine Cour-Thimann* and
Philipp König**

1. Introduction

In several papers, Hans-Werner Sinn has discussed the change in Target2 (T2) balances in the euro area (see, among others, Sinn 2011a; Sinn and Wollmershäuser 2011). The debate he has triggered has certainly contributed to a better understanding of the functioning of monetary policy in the euro area. However, several of his conclusions and the policy recommendations he has drawn have not remained without objection. In particular the following hypotheses, which we have extracted from Sinn's writings, have provoked controversy.

a) Non-necessity hypothesis

According to this hypothesis, the expansion of the liquidity provision by central banks was unnecessary as of a certain point in time, as it no longer constituted a proper measure to support the banking sector. Sinn argues that the central bank measures, as far as they also targeted sovereign debtors, exacerbated the real problems and benefited only a few asset owners, inter alia because they were not discontinued in time: "surely, there would have been many bankruptcies, but a bankruptcy does not mean that the assets disappear, only that they move to other people. Beneficiaries of the ECB policy were primarily the rich asset owners of the GIPS countries who succeeded in rescuing their assets abroad" (Sinn and Wollmershäuser 2011, 41) Sinn and Wollmershäuser acknowledge that the measures

were justified during the acute peak of the banking crisis in 2008/2009.

In our opinion, this argument underestimates the role of the negative externalities of sovereign funding stress or sovereign default, and the fact that sovereign stability is a precondition for financial stability in general.[1] A sovereign default, and implied corporate and bank defaults are not tantamount to a mere reallocation of assets (as suggested by the above quote), but entail considerable economic costs. As long as destructive funding stress and defaults are merely due to illiquidity (rather than insolvency), these costs can and should be prevented by appropriate central bank interventions. An example of the disaster that can be caused by systemic liquidity crises and the ensuing collapse of banks is the German banking crisis of 1931.

b) Fiscal character hypothesis

According to the fiscal character hypothesis, the T2 balances are not a proper monetary policy measure, but rather a fiscal policy measure: "[…] the Target credits clearly [had] no monetary character […] they are a purely fiscal measure that would have had to be financed out of the budgets of the euro countries by consulting the parliaments" (Sinn and Wollmershäuser 2011, 33).

Here we may point out that the development of the T2 balances is an automatic reflex that mirrors cross-border payment flows between banks in the euro area (corresponding to transactions which are initiated by private entities in most cases) and does not represent a separate policy measure. Furthermore, according to the Treaty on the Functioning of the European Union, the ECB and the European System of Central Banks are responsible for promoting the smooth operation of payment systems in the European currency area (see Section 2.1). Therefore, all developments regarding the T2 system

* European Central Bank.
** Technical University of Berlin.
The paper reflects the opinions of the authors and not necessarily those of the European Central Bank.

[1] These comprise, for example, job losses, increase in depreciation of the accumulated human and social capital, costs of liquidation in the case of a sale of assets, costs of bank customers searching for a new institution (especially in the banking business these costs can be considerable due to the information intensity of the contracts in question).

are the responsibility of monetary policy, and not of fiscal policy.

c) Credit replacement hypothesis

The credit replacement hypothesis can be divided into two parts. The first part basically states that the payment flows reflected in the T2 balances reduce the recourse to central bank refinancing operations of those banks in countries with large T2 claims, whereas they increase banks' recourse in countries with large T2 liabilities. This part of the hypothesis can be easily verified (Sinn and Wollmershäuser 2011).

The second part is more difficult to test because it is purely *counterfactual*. It states that the reduction of the participation in the refinancing operations leads to a reduction in commercial banks granting credit to private customers in the countries in question. Our view is that this part of the hypothesis cannot be substantiated from an economic point of view (Sinn and Wollmershäuser 2011).

In Section 2.3 we deal with the first part of the credit crowding-out hypothesis. Section 3 discusses the second part of the hypothesis.

d) Recommendation to limit the T2 positions

According to this recommendation, the limitation of the T2 positions or a regular, annual settlement by the transfer of gold or foreign exchange would induce the countries with T2 liabilities to reduce their current account deficits. The 'role model' for Sinn and Wollmershäuser (2011) are the supposedly stricter rules of the settlement system between the individual Reserve Banks of the twelve districts of the Federal Reserve System in the United States: "in our opinion, the Eurosystem ought to adopt the rule of the United States, according to which the Target debts are to be serviced annually with marketable assets" (Sinn and Wollmershäuser 2011, 50).

In our view, a limitation of T2 positions would call into question the monetary union. A regular settlement has the same effect as a limitation and would basically transform the monetary union into a system of fixed exchange rates in which the solvency of a country would be limited by its stocks of gold and foreign exchange (on this see Bindseil and König 2011). Furthermore, in our view, the description of the Federal Reserve System in this context is not quite correct. The annual settlement of the

Interdistrict balances in the Federal Reserve System does not lead to a neutralizing capital flow. The settlement consists essentially of an adjustment of the relative shares of the twelve Reserve Banks[2] in the stocks of securities booked in the System Open Market Account of the Federal Reserve System. This accounting operation results only in a reallocation of profits and losses between the Reserve Banks. If the Eurosystem were to adopt the rules of the Federal Reserve System, this would indeed reduce the T2 positions in the balance sheets of the central banks, but only as a mere accounting operation and without a reduction of the actual net capital flows *via* the T2 system. This is clearly shown by the data of the Interdistrict balances in the Federal Reserve System. The balances also rose considerably during the financial crisis, and in some cases have reached magnitudes similar to the T2 balances despite the annual offset.[3]

e) Risk hypothesis

This hypothesis implies that the T2 positions represent a source of risk independent from the risks borne by the central bank when it conducts refinancing operations. According to Sinn (2011b), risks related to Target2 liabilities to the GIPS countries do not account for the source of risk related to "the central bank credits in the context of the normal refinancing operations" (translated from "Dabei sind die Kredite der Zentralbank im Rahmen der normalen Geldschöpfungspolitik noch nicht eingerechnet".) The risk hypothesis regarding Target2 balances was convincingly refuted by the Bundesbank. We shall discuss this hypothesis in Section 4 and deal more extensively with the trade-off for a central bank between providing liquidity and taking more risk on its balance-sheet during a crisis.

f) 'Five-minutes to midnight' hypothesis

According to this view (exposed in Sinn and Wollmershäuser 2011, 37–40), the ECB would run out of ammunition at some stage in its rescue measures, because the transfer of Eurosystem credit operations from the core to the periphery would at some stage hit a ceiling, namely when Eurosystem credit to Germany would be zero. At this time, some fundamental further

---

[2] The payment flows between the various Federal Reserve districts result naturally in individual districts having deficit or surplus balances. These balances flow into the Interdistrict Settlement Account that is offset once a year in April (Board of Governors of the Federal Reserve System 2010).
[3] See the time series for the Interdistrict Settlement Accounts under http://alfred.stlouisfed.org.

deterioration and regime shift would occur, with particular inflation dangers.

This paper deals in depth with the credit replacement hypothesis (Section 3) and the risk hypothesis (Section 4), as these concern core aspects of central banking (monetary policy implementation and the lender of last resort function for solvent banks). Section 2 explains the functioning and the economic logic behind the T2 positions by means of a stylized system of financial accounts (for an extensive and more detailed presentation of the balance-sheet logic, see Bindseil und König 2011). Finally, the 'five minutes to midnight' hypothesis is reviewed, also in the light of more recent developments.

2. Target 2

2.1 Background and significance of T2

According to Article 105(2) of the Treaty on the Functioning of the European Union, it is the responsibility of the European Central Bank (ECB) and the European System of Central Banks (ESCB) 'to promote the smooth operation of payment systems'. A smooth functioning of payment flows within the Monetary Union is especially important as it (a) contributes to the stability of the financial system, (b) maintains confidence in the common currency and (c) allows the implementation of a common monetary policy (Bank for International Settlements 2003).

To this end the Eurosystem runs the T2 payments system.[4] T2 permits the business partners of the Eurosystem to conduct payments in unlimited volume as well as to raise intraday credit against eligible collateral. Furthermore, the central banks of the Eurosystem settle their monetary policy operations *via* T2.

All payments *via* T2 are effected in central bank money that the business partners must borrow directly from the central bank against central-bank eligible collateral or in the interbank market. Accordingly, payments and transactions within the currency area are exclusively limited by the private stock of collateral eligible for obtaining central bank liquidity and not as would be the case in a system of fixed exchange

rates, by the stock of foreign exchange of the respective central banks. In this way, T2 makes an essential contribution to the maintenance of the currency union. It provides the tool, as explained by Peter Garber (2010), that irrevocably welds the former national currencies into a common currency.

2.2 The functioning of T2

In order to understand how the changes in T2 positions in the balance sheets of the national central banks come about, it helps to look first at the payment transactions between two banks within one individual country. Payments between banks are brought about either by underlying real transactions or by a mere reallocation of financial instruments. If, for example, a buyer of a good transfers the purchase amount to the seller, then his deposit at his bank is reduced whereas that of the seller increases. If the buyer's bank executes the transfer *via* T2, the bank's reserve deposit at the central bank is reduced, whereas the reserve deposit of the seller's bank is increased. A mere reallocation of financial instruments that also involves a transfer between the accounts of two banks, leads to the same accounting operations in the reserve accounts of the banks at the central bank. None of these transactions lead to a change in the central bank balance sheet, as the banks have merely exchanged reserve deposits among themselves without however changing the total size of the reserve account (a liability of the central bank). What happens now if a comparable transaction takes place between banks from different countries in a common currency area? The following system of financial accounts illustrates this case.

A number of assumptions are made for the sake of simplicity. The system of financial accounts reflects the case of a currency area without a minimum reserve requirement so that we can assume that reserve holdings of the banks at the central bank are zero. Private households in the currency area own equity of amount E that they hold in the form of real assets, banknotes as well as sight deposits with the commercial bank. We also assume that both countries are identical so that banknotes and bank balance-sheets are equally large.

The example shows a reallocation of deposits of amount z from banks in country 2 to banks in country 1. If, for example due to a financial crisis, the interbank markets collapse or become segmented to such an extent that the banks in country 2 no longer have

Household			
Assets	$E - D^{Bank1}$ $D^{Bank2} - B$	Equity	E
Banknotes	B		
Deposits in bank 1	$D^{Bank1} + z$		
Deposits in bank 2	$D^{Bank2} - z$		

Firm			
Assets	$D^{Bank1} + D^{Bank2} + B$	Credits of banks	$D^{Bank1} + D^{Bank2} + B$

Bank 1 (country 1)			
Credits to firm	$D^{Bank1} + B/2$	Deposits of household	$D^{Bank1} + z$
		CB credits	$B/2 - z$

Bank 2 (country 2)			
Credits to firm	$D^{Bank1} + B/2$	Deposits of household	$D^{Bank2} - z$
		CB credits	$B/2 + z$

Consolidated central bank balance sheet (National central banks 1 & 2)			
Credits to banks	B	Banknotes	B

National central bank 1			
Credits to bank 1	$B/2 - z$	Banknotes	$B/2$
T2 claim	z		

National central bank 2			
Credits to bank 2	$B/2 + z$	Banknotes	$B/2$
		T2 liability	z

access, then the corresponding liquidity outflows can only be compensated by taking recourse to the central bank refinancing operations. This, however, does not change the consolidated central bank balance-sheet of the currency area, similarly to the above-mentioned case of a purely national transaction (as long as $z < B/2$, which is assumed here).

Let us now split the central bank's balance sheet in two separate balance-sheets of the countries' respective national central banks. We further assume that the national central banks are responsible for their respective banking systems, as is the case in the euro area (European Central Bank 2011a, Ch. 2). In order to balance the national central bank balance sheets, an intra-central-bank position must be introduced for accounting purposes. In our simple model, these positions are synonymous with the T2 positions in the balances of the national central banks of the Eurosystem.

T2 balances are thus created by the settlement of cross-border financial transactions between banks of the euro area (see also European Central Bank 2011b). In the balance sheets of the national central banks the T2 positions are consistently booked as 'intra-Eurosystem liabilities'. At the end of each business day these positions are aggregated (Eurosystem-wide) and consolidated. Correspondingly, each national central bank has either a claim (a positive T2 balance) or a liability (a negative T2 balance) *vis-à-vis* the ECB as the central counterparty.

2.3 Increase in T2 positions and open market operations during the crisis

During the present crisis, considerable changes have occurred in the euro area in the T2 positions in the balance sheets of the national central banks of different countries. In particular, in the balance sheet of the Deutsche Bundesbank a significant claim of several hundreds of billion euros has built up, whereas the central banks in countries threatened by a sovereign debt crisis are showing considerable T2 liabilities. At the same time, the share of the latter in the refinancing operations of the Eurosystem rose from an average 13.5 percent in the period before the crisis to about 60 percent at the end of 2010. These developments form the core of the first part of the credit replacement hypothesis mentioned in Section 1. Yet, what triggered these developments?

At the start of the crisis there were disruptions, and subsequently a complete drying up of the money supply and capital markets in the euro area. Increased uncertainty regarding the future liquidity demand
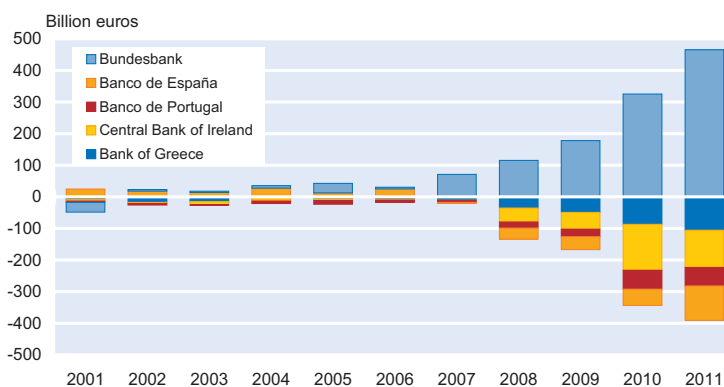
and an increased risk of default led to rising liquidity and risk premia along the entire yield curve and to a reduction of the transaction volumes in the interbank market. Banks began to hoard liquidity instead of offering their surpluses in the market (Holthausen and Pill 2010). This exacerbated the smooth reallocation of liquidity among the banks. As both the banks' liquidity demand and the liquidity supply of the central bank are relatively interest-inelastic, liquidity hoarding leads, for a given liquidity supply, to sharp fluctuations in short-term interest rates and thus to strong fluctuations around the central bank's main refinancing rate (usually the mid-point of the interest corridor).[5] In such a situation, the central bank can rely on special measures to counteract a systemic liquidity crisis and a self-fulfilling confidence crisis in the entire banking sector by decisively reducing the probability that individual banks become illiquid.[6] In particular, the Eurosystem has temporarily allowed unlimited access to central bank liquidity against eligible collateral. This effectively led to a reduction of uncertainty regarding the future demand for liquidity and reduced interest premia in money markets. This implies that from the point at which the liquidity deficiency of the banking sector could no longer be reallocated *via* the market, the Eurosystem assumed the role of the interbank market maker: when the banks with liquidity surpluses deemed the difference between market rates and the ECB's deposit facility rate no longer sufficient to offset the expected counterparty default risk, they deposited their excess liquidity with the deposit facility. By way of the deposit facility, the Eurosystem thus automatically substituted for the loss of a sufficiently creditworthy demand side.[7] On the other hand, the Eurosystem substituted for the supply side shortfall by providing additional liquidity to banks with a liquidity deficit

within the scope of its special measures and *via* the main refinancing operations. In this way the Eurosystem acted as an 'interbank market maker'.

When, in the course of the crisis, financial markets became increasingly segmented along national borders, the intermediation activity of the central bank began to exert an effect on the T2 positions in the national central bank balance sheets. The banks in countries threatened by sovereign debt crises started to lose the confidence of investors and thus access to private refinancing possibilities. This resulted in strong net outflows of private capital and deposits. Private depositors, lenders and capital providers started to withdraw funds from the banks in crisis-hit parts of the currency area or decided not to renew loans in order to invest the funds at banks in less affected parts of the euro area. Investors prefer banks in those countries, whose banking systems are considered trustworthy and whose fiscal situation seems to give their governments sufficient leeway for possible interventions and recapitalisations of the banking sector. Therefore, during the crisis financial capital flowed in net in the direction of banks in the safe havens of the European currency area, thereby leading to the creation of considerable T2 balances. Figure 1 shows that since 2008 there has been a massive increase in the T2 claims of the Bundesbank, while in the most affected countries, large T2 liabilities have emerged in the books.

To prevent liquidity-caused bank breakdowns and thereby ensure a proper transmission of the ECB interest-rate decisions with a view to maintaining price stability, the Eurosystem had to close the emerging refinancing gap of the solvent banks in these

[5] In this case, the control of the market interest rate will become increasingly difficult. As the risk and liquidity premia increase significantly along the yield curve, the transmission of interest-rate decisions of the central bank to the aggregate economy of the euro area will be limited by the banking system as a whole, and will thereby also threaten the maintenance of price stability over the medium term.

[6] After the interbank market had dried up in August 2007 and in the wake of the collapse of Lehman Brothers in September 2008, the ECB took temporary non-standard measures (European Central Bank 2010).

[7] Alternatively, the central bank can also actively absorb excessive liquidity, by auctioning fixed-term deposits, for example, or by issuing debt instruments. The corresponding instruments of the ESCB are described in European Central Bank (2011, Ch. 2).

Figure 1

T2 liabilities of selected national central banks in the euro area

Billion euros

Note: End-of-period data. Latest observation: October 2011. For the Central Bank of Ireland the monthly data are for a somewhat broader item than the T2 balance reported annually in its Annual Report (the difference of about 17 billion euros was subtracted to obtain the data shown at end-October 2011).
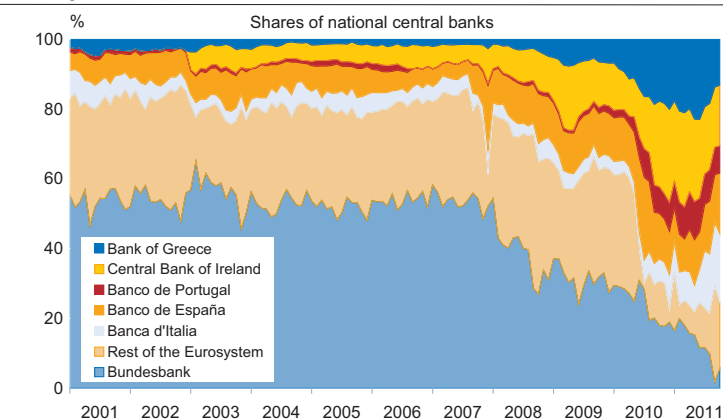
Sources: National central banks.

Figure 2
Liquidity provision in monetary policy operations throughout the Eurosystem

Shares of national central banks

- Bank of Greece
- Central Bank of Ireland
- Banco de Portugal
- Banco de España
- Banca d'Italia
- Rest of the Eurosystem
- Bundesbank

Note: End-of-month data. Latest observation: October 2011.

Sources: National central banks and ECB.

countries. Figure 2 shows this very clearly. The share of the BuBa (which was traditionally the largest) in the refinancing operations of the Eurosystem has significantly declined since the start of the sovereign debt crisis. In the meantime, the shares of the national central banks of Greece, Ireland and Portugal have increased considerably.

The balance sheets of the national central banks of Greece, Ireland and Portugal show a higher supply of liquidity on the asset side, whereas on the liability side they display reduced reserve accounts of the commercial banks as well as larger T2 liabilities *vis-à-vis* the ECB. As the outflows from those countries induce increases in the reserve accounts of the banks in the recipient countries, they thus reduce the need for those banks to participate in the refinancing operations of the Eurosystem. Minimum reserves and factors of liquidity needs can be met to a large extent out of the inflows *via* the T2 system. The balance sheets of the respective national central banks in the target countries show a markedly reduced liquidity supply on the asset side and a T2 claim *vis-à-vis* the ECB.

3. Credit crowding-out hypothesis

Whereas the last Section 2.3 described the empirical part of the credit replacement hypothesis, this section will deal with the second part of this hypothesis. As already mentioned in Section 1, the second part basically deals with a *Gedankenexperiment (thought experiment),* since the question of whether lending to private customers would have been larger or smaller if there had not been any T2 balances cannot be

answered. In our opinion, Sinn fails to provide a theoretical explanation in his papers as to why a bank's participation in the refinancing operations of the central bank constitutes the decisive determinant of lending to private customers and why there is crowding out of credit when the participation in these operations is reduced due to T2 inflows.[8]

As explained above, T2 balances are created by cross-border payment flows between banks in the euro area. These affect, of course, the allocation of central bank liquidity between individual national central banks of the euro area. This does not imply, however, that T2 liabilities, resulting from a relatively large supply of liquidity to banks in some countries, have a negative effect on lending to private households and businesses in other countries.[9] Lending by commercial banks to private customers is not limited by central bank credit, but depends on internal risk management, the creditworthiness of the customer, the present state of the economy, etc. In addition, commercial banks need a certain amount of liquidity to accommodate autonomous factors of liquidity needs, to settle financial transactions and to meet their minimum reserves. If a commercial bank experiences inflows through financial transactions, it will need less central bank credit to maintain its business activity and for its liquidity management, and therefore can reduce its participation in the open market operations of the Eurosystem. It is not evident why inflows *via* the T2 system will result in fewer loans to commercial customers being made in the corresponding recipient countries. On the contrary, banks in countries with net capital inflows (i.e. in countries whose central banks have T2 claims) will *ceteris paribus* have a greater tendency to grant credit than banks in countries suffering from net capital outflows. Banks that receive inflows are in a much more comfortable financing situation since they receive deposits, have wide access to capital markets and do

[8] See e.g. Sinn and Wollmershäuser (2011). The assumption of a relationship between T2 balances and lending was also refuted by other authors (see e.g. Buiter, Michels and Rahbari 2011; Whelan 2011).
[9] It is a fact that before the financial crisis the BuBa had total intra-Eurosystem liabilities of a two-digit billion figure. Besides the T2 balance, these resulted primarily from a higher-than-proportionate (as compared with the BuBa's share in the ECB's capital) demand for paper money by the business partners of the BuBa. At this time nobody imagined that such intra-Eurosystem liabilities could have a negative effect on lending in other countries (Jobst 2011).

not need to pledge their collateral to obtain central-bank liquidity. For such banks, the likelihood of becoming illiquid is almost zero, so that in terms of liquidity risk management, lending to the private sector can be expanded. The situation is completely different for banks in countries suffering from capital and deposit outflows. Since banks in these countries have impaired access to the capital market and since central-bank refinancing is difficult to expand given a limited pool of available eligible collateral, it becomes difficult, from a liquidity and risk management perspective to extend credit to the private sector.

4. Risk hypothesis

4.1 Trade-off between liquidity provision and risk assumption

Liquidity provision during financial crises is always risky. The BuBa already correctly pointed out that T2 balances do not represent an independent source of risk, but rather constitute an effect of risks created for the Eurosystem by monetary policy operations and other, notably private, transactions (Deutsche Bundesbank 2011). In this section we shall therefore restrict the discussion to the general role of the central bank in financial crises and the associated risks.

The trade-off between containing a systemic liquidity crisis and an increased risk-exposure by the central bank was already discussed by 19th century authors. Jeremiah Harman (Governor of the Bank of England 1816–1818), so frequently quoted since Walter Bagehot, argued that the extraordinary assistance granted by the Bank of England during the financial crisis of 1825 was always given under the accompanying condition that the financial security of the central bank was guaranteed: "we lent […] by every possible means consistent with the safety of the Bank" (cited in Bagehot 1999, 193).

Bagehot himself was of the opinion that an increased provision of liquidity by central banks during a financial crisis would be necessary and useful to minimise the financial risks of the central banks. Only in this way could a financial meltdown and the accompanying massive losses of the central bank be prevented. To this extent, social motives and positive externalities of central bank policy would not be necessary conditions for an active provision of liquidity by central banks during financial crises.

Bagehot (1999, 199) went on to state: "making no loans as we have seen will ruin it [Bank of England]; making large loans and stopping, as we have also seen, will ruin it. The only safe plan for the Bank [of England] is the brave plan, to lend in a panic on every kind of current security, or every sort on which money is ordinarily and usually lent. This policy may not save the Bank; but if it does not, nothing will save it".

More recent presentations also argue that the assumption of financial risks by state authorities in a financial crisis is unavoidable and useful. For example, Buiter and Sibert (2007) write: "dealing with a liquidity crisis and credit crunch is hard. Inevitably, it exposes the central bank to significant financial and reputational risk. The central banks will be asked to take credit risk (of unknown) magnitude onto their balance sheets and they will have to make explicit judgments about the creditworthiness of various counterparties. But without taking these risks the central banks will be financially and reputationally safe, but poor servants of the public interest".

One must note here, however, that the principal willingness to assume financial risks does not mean that this should not be done with the greatest caution and continuously optimised risk control measures. Here we must contradict Buiter und Sibert (2007) decisively when they say that credit risks of 'unknown magnitude' ought to be taken.

4.2 Conceptual relationship

The trade-off discussed in the previous section can be formalised in a simple partial model (for a more thorough presentation, see Bindseil 2011). The ability to refinance (funding liquidity) of the banking sector may be represented by the following well defined function

$$L = L(M,X),$$

where $L_M > 0$ and $L_X > 0$. Let M be an index describing central bank policy and X a measure for the exogenous factors that determine the individual and systemic stability of the financial system. Assume that the stability is the greater the bigger X and that X_1 is the value before the crisis and X_2 the value that triggers a crisis, i.e. $X_1 > X_2$.

Further, let R be a measure for the risks taken by the central bank (e.g. the Value at Risk to a given confi-

dence interval for a given time horizon). We assume that R is a well-defined function of X and M,

$R = R(M, X)$,

where $R_M > 0$ and $R_X > 0$. Let the objective function of the central bank be given by

$U = U(R, L)$

where we assume that $U_R < 0$ and $U_L > 0$.

Let us write the optimal central bank policy for a given value of X as $\widetilde{M}(X)$. The line $EF1$ in Figure 3 represents the efficient frontier for all combinations of L and R for value X_1 (before the crisis), where point A denotes the optimum, i.e. the point

$$\left(L\left(\widetilde{M}(X_1), X_1\right), R\left(\widetilde{M}(X_1), X_1\right)\right),$$

for a given objective function of the central bank. Consider an exogenous shock, so that $X = X_2$, which shifts the 'efficient frontier' to $EF2$. The important question now regards the position of point

$$\left(L\left(\widetilde{M}(X_1), X_2\right), R\left(\widetilde{M}(X_1), X_2\right)\right),$$

i.e. the point after eruption of the crisis, but before the reaction of the central bank. Let us assume that the efficient point, which the central bank wants to reach in the crisis, corresponds to point B.

The following four cases may now be distinguished, depending on the measures that are required to reach the efficient point B:

- Point B: no need to adjust, i.e.

$$\left(L\left(\widetilde{M}(X_1), X_2\right), R\left(\widetilde{M}(X_1), X_2\right)\right) =$$
$$\left(L\left(\widetilde{M}(X_2), X_2\right), R\left(\widetilde{M}(X_2), X_2\right)\right)$$

This case seems rather implausible. In fact, there is hardly a central bank that, after the eruption of a serious financial crisis, would not adjust its financial market transactions and its risk management.
- Point C: adjustment of measures to provide additional liquidity (increase of L) and simultaneously assume greater risks (increase of R):

$$L\left(\widetilde{M}(X_1), X_2\right) < L\left(\widetilde{M}(X_2), X_2\right)$$

and

$$R\left(\widetilde{M}(X_1), X_2\right) < R\left(\widetilde{M}(X_2), X_2\right)$$

This is probably the case that e.g. Buiter und Sibert (2007) consider normal.
- Point D: adjustment of measures to provide more liquidity, but assume fewer risks:

$$L\left(\widetilde{M}(X_1), X_2\right) < L\left(\widetilde{M}(X_2), X_2\right) \quad \text{and}$$
$$R\left(\widetilde{M}(X_1), X_2\right) > R\left(\widetilde{M}(X_2), X_2\right)$$

This case may also be plausible. Here the central bank takes measures that improve the supply of liquidity, and at the same time it succeeds in reducing the total risk by special protective measures.
- Point E: adjustment of measures so that less liquidity is provided and fewer risks are taken:

$$\left(L\left(\widetilde{M}(X_1), X_2\right) > L\left(\widetilde{M}(X_2), X_2\right) \quad \text{and}$$
$$R\left(\widetilde{M}(X_1), X_2\right) > R\left(\widetilde{M}(X_2), X_2\right)$$
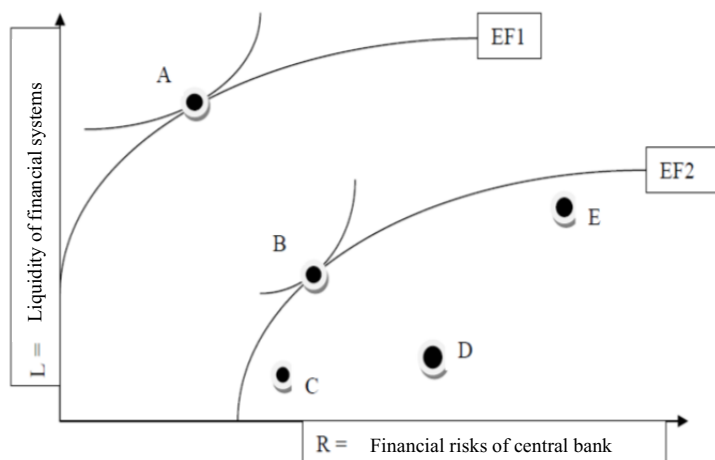
This corresponds to the case of a conservative central bank that lowers its risks at the expense of a further deterioration of bank liquidity.

It is not clear beyond doubt at which of the above points the central bank is located after the outbreak of a crisis and consequently which measures must be taken in order to reach the efficient point. Therefore, the answer to this question also depends on the respective perception of the role of the central bank, i.e. on the concrete form given to the objective function above. The T2 debate shows that in the euro area no consensus has been reached to date on this question.

Whether the financial risks taken by the governments and the central bank in the present crisis are indeed appropriate and optimally solve the trade-off between the support of financial market stability and the assumption of financial risks is therefore not easy to assess. There is no basis, however, for claiming that the ECB has acted without full awareness of the relevant trade-offs, and especially in terms of responsible and conservative risk management.

Figure 3
Liquidity provision and risk assumptions

Source: Author's conception.

In our view, the comparison between the ECB's current euro area – internal measures with the Bank of England's measures in 1992, or for that matter, any central bank measure that aims at defending a currency peg, is far-fetched. The crucial point is that maintenance of the common currency does not depend on the central bank's stock of foreign exchange reserves. As some of us have stated elsewhere (Bindseil and König 2011), comparing monetary policy in a currency union with monetary policy under a pegged exchange rate regime is not correct.

5. Five minutes to midnight?

Sinn and Wollmershäuser (2011, 37–40) go so far as to compare the shift in Eurosystem credit operations from the euro area core countries to the periphery countries with foreign exchange interventions that central banks undertake to prevent their own currency from devaluing. Today's ECB reminds them of the Bank of England in 1992 when the latter failed to defend the pound and as a consequence England left the ERM. Sinn and Wollmershäuser claim that the ECB's "[…] stock of ammunition is also limited" (p. 37). In their view, extrapolating the trend in Eurosystem credit operations and Target2 balances "[…] confirms the statement that if this trend continues, crowding out will lead to the end of the credit replacement business of the ECB in about two years, i.e. in 2013, as there will be no more central bank credit in Germany or the other euro countries that could be shifted to the GIPS [...] the ECB is under enormous pressure to prevent this from happening" as "the automatic sterilisation of the increase in the money supply coming from the GIPS by reducing the refinancing operations in the core countries would no longer be possible" (p. 38). For Sinn and Wollmershäuser, the core problem is then that "[t]he main refinancing rate would just be a short-term rate for risky banks with dubious collateral, and apart from that there would be a well-functioning interbank market between safe banks with a correspondingly lower interest rate. This would be a disaster for the functioning of the ECB and its ability to carry out the policies to which it is legally obliged, in particular the ability to keep inflation under control" (p. 39).

For the sake of exposition, we can replicate Sinn and Wollmershäuser's scenario in the system of financial accounts that was already used above. What they call 'midnight' is then tantamount to an increase of z above $B/2$. In this case, the cash-rich Bank 1 will no longer need to borrow from the central bank. Rather, it will put its excess funds $z-B/2$ into the central bank's deposit facility. Indeed, the interest rate in the interbank market that has previously taken place between cash-rich banks (those in the country perceived as safe haven) drops to the deposit facility rate (it should be noted that in this case, market volumes will be rather small because all banks in the safe haven country will have excess funds and hence there will be in principle no gains from trade). While one may lament the state of the money market in this case, it is not correct to claim that the central bank would no longer be able to implement its desired monetary policy and to keep inflation in check. For example, in order to tighten its monetary policy stance, it just needs to raise the deposit facility rate. Moreover, the central bank can also rely on other tools in order to absorb liquidity and to control the overnight rate: (i) issue debt certificates; (ii) collect term deposits, (iii) remunerate excess reserves, or (iv) raise the minimum reserve requirements. All these tools are fairly standard today and have long been part of central bank's tool boxes all over the world. Currently, almost all large central banks (be it the Federal Reserve, the Bank of England, the Bank of Japan, the Riksbank, the Swiss National Bank, etc.) operate in such a scenario and face a banking system with a considerable liquidity surplus (often due to so-called 'Large Scale Asset Purchase Programmes' or large foreign reserves).

None of these central banks has had any problems in controlling inflation (i.e. no problems relating to this particular way of implementing monetary policy).

While Sinn and Wollmershäuser (2011) forecasted 'midnight' (i.e. our *'z = B/2'*) to arise in 2013, Sinn noted later[10] that "[…] in September 2011, the Bundesbank's stock of refinancing loans, net of its deposit facilities *vis-à-vis* German banks, turned negative for the first time in history. The ECB's shifting of refinancing credit *via* the Target system has therefore already hit the limit, three years earlier than the trend of the past three years would have suggested". Sinn argues further that "with this, the eurozone has entered dangerous territory. Deposit facilities count as central bank money and have inflationary potential, given that the German banks could withdraw those funds at any time. If they do, more than the Target balances could be exploding in Europe". It is not clear to us, how German banks can actually withdraw these funds at any time, and why they should do so. The overall level of excess funds deposited with the Bundesbank is not under the control of German banks. It is a mere result of the intra-euro area cross border capital flight and of the other positions in the Bundesbank balance sheet. The only possibilities to reduce these excess funds would be either to withdraw them in the form of banknotes and then to keep these banknotes in vaults, or to ship them back to the crisis-hit countries by lending to their banks, respectively by purchasing assets there. From an economic point of view, the former does not make sense. The latter should be seen as a positive development as it would revert the excess liquidity flows and would contribute to boosting confidence in the euro area's crisis-hit countries.

References

Bagehot, W. (1999), *Lombard Street – A Description of the Money Market,* New York: Wiley.

Bank for International Settlements (2003), *Payment Systems in the Euro Area,* Basel.

Bindseil, U. (2011), "Theory of Monetary Policy Implementation", in: Mercier, P. and F. Papadia (eds.), *The Concrete Euro – Implementing Monetary Policy in the Euro Area,* Oxford: Oxford University Press.

Bindseil, U. and Ph. König (2011), *The Economics of Target2 Balance,* SFB 649 Working Paper, 35.

Board of Governors of the Federal Reserve System (2010), *Financial Accounting Manual for Federal Reserve Banks,* Section 40.40 SOMA Participation, Revision Set 50, December.

Buiter, W., J. Michels and E. Rahbari (2011), "TARGETing the Wrong Villain", *CitiBank Global Economics View.*

Buiter, W. und A. Sibert (2007), "The Central Bank As the Market Maker of Last Resort", *VoxEU.org,* 13 August.

Deutsche Bundesbank (2011), *Monthly Report* 3, Frankfurt am Main.

European Central Bank (2010), "The ECB's Response to the Financial Crisis", *Monthly Bulletin* 11, Frankfurt am Main.

European Central Bank (2011a), *The Implementation of Monetary Policy in the Euro Area – General Documentation on Eurosystem Monetary Policy,* Frankfurt am Main.

European Central Bank (2011b), "TARGET2 Balances of National Central Banks in the Euro Area", *Monthly Bulletin* 10, Frankfurt am Main.

Garber, P. (2010), *The Mechanics of Intra-euro Area Capital Flight,* Economics Special Report Deutsche Bank Global Markets Strategy, Frankfurt am Main.

Holthausen, C. and H. Pill (2010), "The Forgotten Markets – How Understanding Money Markets Helps Us to Understand the Financial Crisis", *ECB Research Bulletin* 9, 2.

Jobst, C. (2011), "A Balance Sheet View on TARGET – and Why Restrictions on TARGET Would Have Hit Germany First", *VoxEU.org*, 19 July.

Sinn, H.-W. (2011a), "Neue Abgründe", *WirtschaftsWoche* 8, 35.

Sinn, H.-W. (2011b), "Tickende Zeitbombe", *Süddeutsche Zeitung,* 2 April.

Sinn, H.-W. and T. Wollmershäuser (2011), *Target Loans, Current Account Balances and Capital Flows: The ECB's Rescue Facility,* Ifo Working Paper 3500.

Whelan, K. (2011), "Professor Sinn Misses the Target", *VoxEU.org*, 9 June.

---

[10] See "Italy's Capital Flight", 25 October 2011 on www.project.syndicate.org.