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Euro area monetary policy and TARGET balances: a trilogy

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Abstract

The growth in TARGET balances after 2009 has given rise to intense academic and public debate. Our paper offers a systematic exposition of the necessary conditions for TARGET balances to emerge and provides a clear link to monetary policy. We show that large TARGET balances can only arise with excess liquidity. The interpretation of TARGET balances therefore depends on the monetary policy context in which excess liquidity is created. We distinguish three phases of TARGET balances growth and propose some easy-to-derive metrics for policy makers and academics to assess developments in TARGET balances. We develop a comprehensive econometric framework to account for relevant factors driving TARGET balances in the different phases. We find that while financial market stress and economic imbalances were the drivers of TARGET balances during the great financial and sovereign debt crises, the implementation of Eurosystem asset purchases was the driving force since March 2015. As excess liquidity is likely to persist on account of higher demand for central bank reserves compared to the pre-crisis period, TARGET balances have the potential to remain sizeable in the future.

JEL Codes: E42, E58, F32

Keywords: TARGET2, asset purchase programme, excess liquidity, balance of payments

Non-technical summary

The introduction of the euro in 1999 made a common payment system infrastructure necessary in order to connect the national payment systems and generate full fungibility of the euro across all Member States of the currency area. The common payment system, known today as TARGET2, served this purpose and its set-up had never received a great deal of public attention. This changed with the start of the sovereign debt crisis in 2009/10 and the emergence of large and persistent “TARGET balances” (accounting positions that indicate that an NCB has received/sent less central bank reserves from/to the other NCBs than it sent to/received from the other NCBs). TARGET balances came to be seen as the primary crisis barometer for the euro area and a harbinger of its future. In this spirit and to date, publications on TARGET have tended to focus on intra-euro area imbalances and their sustainability. This focus, however, can be misleading as it rests on a partial view of what TARGET balances are and ignores their underlying drivers.

In March 2015, the Eurosystem began purchasing euro area government bonds under the public sector purchase programme (PSPP), thereby significantly expanding its asset purchase programme (APP) which began in October 2014. Simultaneously TARGET balances started to rise again and academic and public interest in the topic returned. While some observers have interpreted the renewed increase in TARGET balances as a sign of fragmentation or even capital flight, the general consensus that has emerged over recent years is that the increase in TARGET balances since 2015 can be well explained by the decentralised implementation of Eurosystem asset purchases in conjunction with the financial structure of the euro area.

Against the backdrop of the widely different set of factors driving TARGET balances over the past decade, this paper offers a systematic exposition of the necessary conditions – from the perspective of monetary policy implementation in the euro area – for TARGET balances to emerge. We first derive conditions under which large and persistent TARGET balances can arise and offer academics and policy makers simple metrics to judge the size of actual TARGET balances relative to their potential size given the balance sheet structure of the Eurosystem. We show that large TARGET balances cannot arise without excess liquidity and that the interpretation of TARGET balances crucially depends on the way the excess liquidity has been created. As the creation of excess liquidity is closely connected to monetary policy decisions, it follows that any analysis of the developments in TARGET balances needs to take the monetary policy context into account.

We then turn to the empirical analysis of TARGET balances since the start of the great financial crisis in August 2007. Developments in TARGET balances can be distinguished by three phases (pre-crisis, global financial and sovereign debt crises, and period of asset purchases, consisting of the APP

and pandemic emergency purchase programme (PEPP)) with different drivers in each phase. We find that the 2011-12 episode has many characteristics of a sudden stop event, i.e. we confirm the hypothesis that Member States experienced a funding crisis with sudden withdrawal of private sector funding. Our empirical model of TARGET balances displays good in-sample forecasting properties which, however, do not carry over to the most recent period of increasing TARGET balances since March 2015. Models based on financial market stress or economic imbalances are no longer able to explain the dynamics of TARGET balances, with a significant part of the variation in TARGET balances now being explained by the ECB's asset purchases. The results of our conceptual discussion are fully confirmed by the data, clearly pointing to the latest episode of large TARGET balances being distinct from the crisis period.

1. Introduction

The introduction of the euro in 1999 made a common payment system infrastructure necessary in order to connect the hitherto independent national payment systems and generate full fungibility of the euro across all Member States of the currency area. The common payment system, known today as TARGET2, served this purpose and its set-up is in many ways comparable to the Fedwire system connecting the Federal Reserve Districts in the United States. In an early piece on the proposed “plumbing” of the euro, Garber (1998) argued that TARGET could be the vehicle for speculative attacks on the membership of individual euro area countries. At the height of the sovereign debt crisis in 2011-12, intricate details of euro area “plumbing” re-appeared in the academic debate and stirred significant public interest as TARGET balances came to be seen as the primary crisis barometer for the euro area and a harbinger of its future. In this spirit and to date, research on TARGET has typically focussed on intra-euro area imbalances and their sustainability. This focus, however, can be misleading as it rests on a partial view of what TARGET balances are and ignores their underlying drivers.

One of the few differences of the TARGET system compared with the Fedwire system is that TARGET does not foresee a rebalancing procedure like the Interdistrict Settlement Account (ISA) rebalancing conducted almost every April in the United States (as described by Wolman, 2013 and Whelan, 2014). Absent such an accounting exercise (on this characterisation see Klose and Weigert, 2012), payment imbalances between Eurosystem central banks can give rise to persistent TARGET balances, which are expressed as claims for the receiving countries and liabilities for the sending countries. The economic interpretation of these balances and their implications for the functioning and future of the euro area have been the subject of an entirely new literature.

On one side of the debate stood those who argued that TARGET balances were a stealth bail-out mechanism, supporting unsustainable current account developments as well as weak sovereigns and banks (e.g. Sinn, 2012; Sinn and Wollmershäuser, 2012). On the other side were those who argued that TARGET balances had to be seen as a side product of unconventional monetary policy measures that accommodated the increased demand for central bank intermediation in the face of severe financial market stress (Bindseil and König, 2011; Cour-Thimann, 2013b; Whelan, 2014). The latter group of papers emphasised that TARGET balances are part and parcel of a monetary union with decentralised monetary policy implementation. Common to both sides of the debate was the clear characterisation of TARGET balances as a symptom of financial market stress, fragmentation and unsustainable balance of payments developments. When stress levels subsided, TARGET balances started to decline and so did academic and public interest in the topic.

In March 2015, the Eurosystem expanded its asset purchase programme (APP) as it began purchasing euro area government bonds under the public sector purchase programme (PSPP). Simultaneously – and to the surprise of many observers – previously declining TARGET balances started to rise again and academic and public interest in the topic returned. The key economic questions asked in the more recent contributions to the subject revolve around the interpretation of TARGET balances in the present day. Do they continue to indicate financial market stress or economic imbalances like they did in 2011-12? What are the main driving factors of TARGET balances? What is their relation to the balance of payments? How do the risk-sharing arrangements of the Eurosystem affect the interpretation of TARGET balances (Fuest and Sinn 2018)? While some have interpreted the renewed increase in TARGET balances as a sign of fragmentation or even capital flight (Reinhart, 2019), the general consensus that has emerged over recent years is that the increase in TARGET balances since 2015 can be well explained by the decentralised implementation of the purchases under PSPP in conjunction with the financial structure of the euro area (Eisenschmidt et al., 2017; Whelan, 2017; Hellwig, 2019; Cecchetti, 2018; Deutsche Bundesbank, 2016; Sachverstaendigenrat, 2018) and is therefore different from the 2011-12 episode.

Against the backdrop of the widely different set of factors driving TARGET balances since the global financial crisis, this paper offers a systematic exposition of the necessary conditions – from the perspective of monetary policy implementation in the euro area – for TARGET balances to emerge. We first derive conditions under which large and persistent TARGET balances can arise and offer academics and policy makers simple metrics to judge the size of actual TARGET balances relative to their potential size given the balance sheet structure of the Eurosystem. We show that large TARGET balances cannot arise without excess liquidity and that the interpretation of TARGET balances crucially depends on the way the excess liquidity has been created. As the creation of excess liquidity is closely connected to monetary policy decisions, it follows that any analysis of the developments in TARGET balances needs to take the monetary policy context into account.

We then turn to the empirical analysis of TARGET balances since the start of the great financial crisis in August 2007. Developments in TARGET balances can be distinguished by three phases (pre-crisis, global financial and sovereign debt crises, and period of asset purchases, consisting of the APP and pandemic emergency purchase programme (PEPP)) with different drivers in each phase, closely matching our conceptual discussion in the preceding section. We find that the 2011-12 episode has many characteristics of a sudden stop event, i.e. we confirm the hypothesis that Member States experienced a funding crisis with sudden withdrawal of private sector funding. As during the period following the collapse of Lehman Brothers in 2008, there was a clear case for monetary policy to step in and offer central bank funding to safeguard the transmission of monetary policy in the euro area. Our empirical

model of TARGET balances displays good in-sample forecasting properties which, however, do not carry over to the most recent period of increasing TARGET balances since March 2015. Models based on financial market stress or economic imbalances are no longer able to explain the dynamics of TARGET balances, with a significant part of the variation in TARGET balances now being explained by the ECB's asset purchases. Again, the results of our conceptual discussion are fully confirmed by the data, which clearly point to the latest episode of large TARGET balances being distinct from the crisis period. We conclude with an outlook for the evolution of TARGET balances given structural changes in the demand for excess liquidity since the pre-crisis period.

2. From obscurity to front page news: stylised facts about TARGET balances

A cornerstone of the European Economic and Monetary Union is its payment system, which ensures the full fungibility of the single currency across the euro area. The first-generation payment system, known as TARGET, became operational with the introduction of the euro in January 1999, and it was replaced by a second-generation system (TARGET2) in 2008. This payment system is owned and operated by the Eurosystem and it settles all euro-denominated payments in the form of central bank "reserves", which are essentially the electronic euros that euro area banks hold in accounts with their respective national central banks (NCBs) to fulfil minimum reserve requirements and their general liquidity needs. All net cross-border payments via TARGET2 – whether they are central bank payments, interbank payments or payments made by commercial banks on behalf of customers – are recorded on the balance sheets of the central banks participating in the Eurosystem, which includes all NCBs of euro area member states and the European Central Bank (ECB).

The intra-Eurosystem assets and liabilities on the balance sheets of these central banks arising from payments via TARGET(2) are known as "TARGET balances". At the end of each business day, all bilateral positions between the NCBs are netted out, leaving each NCB with a single accounting position vis-à-vis the ECB. TARGET balances reflect the accumulated net positions of each central bank since 1999. A positive TARGET balance denotes a net claim (or asset) and a negative balance denotes a net liability. The total TARGET balance is the sum of all claims, or equivalently, of all liabilities.

TARGET balances received little attention during the first decade of the euro, likely because they were very limited in size and fairly stable. The dynamics of TARGET balances changed with the start of the global financial crisis in August 2007. The intensification of the crisis in late 2008 was accompanied by strongly increasing TARGET balances, which peaked during the euro area sovereign debt crisis in mid-2012 (Figure 1).

[Figure 1]

Following the announcement of Outright Monetary Transactions (OMT) in August 2012, TARGET balances decreased significantly. They began to steadily increase again during the APP, particularly after the commencement of the PSPP, and reached new peak levels in 2018. TARGET balances started to moderate at the end of 2018 when net asset purchases by the Eurosystem ended. An upward trend in TARGET balances resumed in late 2019 following the recommencement of net purchases under the APP, which accelerated after purchase volumes picked up substantially with the launch of the PEPP in late March 2020. At the end of 2020, Germany had the largest TARGET claim in nominal terms (€1,136 billion) while Luxembourg had the largest claim relative to GDP (414%). Sizeable TARGET liabilities had accumulated on the balance sheets of the ECB, Italy and Spain (Table 1). Although TARGET balances at the end of 2020 were sizeable for several countries when compared with GDP or banking sector assets, they remained small as a share of the total value of transactions processed in TARGET2, which averaged €1.8 trillion per day in 2020 (European Central Bank, 2021). In the case of Germany, for example, the TARGET claim of the Bundesbank at the end of 2020 was around 0.5% of the value of Germany's contribution to total transactions by value in TARGET2 that year (Figure 2).

[Table 1]

[Figure 2]

3. Mechanics of TARGET balances

The mechanics of TARGET balances can be understood through the lens of two accounting frameworks: central bank balance sheets and the balance of payments. Section 3.1 illustrates the impact of the decentralised implementation of monetary policy in the euro area on the balance sheets of NCBs and explains how TARGET balances are affected by different types of open market operations. We make a novel contribution to the literature by deriving quantitative constraints for TARGET balances under different monetary policy regimes. Section 3.2 reviews the role of TARGET balances in the balance of payments.

3.1. TARGET balances and the central bank balance sheet

As discussed at length by Whelan (2014) and Eisenschmidt et al. (2017), the decentralised structure of the Eurosystem creates a need to account for cross-border flows of central bank reserves, which in turn may give rise to TARGET balances. Commercial banks participate in open market operations

through, and hold reserves on accounts with, their local NCB. Each Eurosystem central bank participates in TARGET2 and net cross-border payments in TARGET2 are recorded on the balance sheets of these central banks. When a central bank of the Eurosystem receives more payments in TARGET2 than it sends on a given day, it records an increase in its TARGET claim or a reduction in its TARGET liability.

From an accounting perspective, TARGET balances are booking entries which ensure that each Eurosystem central bank's assets equal its liabilities. TARGET balances essentially reflect mismatches between the quantity of reserves created by a central bank and the quantity of reserves deposited by commercial banks at that central bank. A TARGET liability indicates that the reserves on the liabilities side of the central bank's balance sheet are below the value of reserves that it originated on the assets side of its balance sheet, while a TARGET claim indicates that the reserves on the liabilities side of the central bank's balance sheet are above the value of reserves that it originated. It follows from this definition that the quantity of reserves in the banking system ultimately constrains the size of TARGET balances.

These concepts are illustrated below through a series of stylised central bank balance sheets. For simplicity, we begin by assuming the following: there are only two NCBs in the Eurosystem (e.g. Banco de España and Deutsche Bundesbank). Their assets consist only of monetary policy assets and their liabilities consist only of the liquidity needs of the banking system. Liquidity needs equal the sum of banks' minimum reserve requirements and net autonomous factors, which are items on the central bank's balance sheet that affect the liquidity position of the banking sector but are unrelated to monetary policy (e.g. banknotes in circulation and government deposits). Akin to pre-crisis operating procedures, we also begin by assuming that the amount of reserves provided to the banking system by the Eurosystem is calibrated to exactly meet the aggregate liquidity needs (i.e. liquidity conditions are neutral and there is no excess liquidity).

In our first example, Spanish and German banks fulfil their domestic liquidity needs by participating in open market operations via Banco de España and Deutsche Bundesbank, respectively. Both NCBs create just enough reserves to fulfil these liquidity needs and the reserves they create remain on their respective balance sheets. No cross-border payments occur and there are no TARGET balances (Figure 3).

[Figure 3]

Our second example assumes a complete mismatch between the quantity of reserves created and deposited at the respective NCBs. In this extreme scenario, Banco de España creates all the reserves in the banking system via monetary policy operations and these reserves are all deposited at Deutsche

Bundesbank except for the quantity of reserves needed by Spanish banks to fulfil their minimum reserve requirements. As this scenario entails cross-border reserve flows from Spain to Germany, Banco de España records a TARGET liability and Deutsche Bundesbank records a TARGET claim. The TARGET balances are at the ceiling implied by the total quantity of liquidity provided to the banking system less the minimum reserve requirements of the central bank originating the reserves. In this example, the ceiling is equal to the liquidity needs of the German and Spanish banking sectors, less the minimum reserve requirements of the Spanish banking sector (Figure 4). In order for the TARGET balances to increase further, additional reserves would have to be provided to the banking system – but this would bring the system into a situation of excess liquidity, which did not exist pre-crisis.

[Figure 4]

The extreme constellation of the second example is very unlikely to materialise in the real world. Autonomous factors have an inherent domestic orientation: there will always be demand for banknotes by domestic residents and deposits of national treasuries tend to be held at their respective NCBs. Thus in practice, the maximum size of the total TARGET balance in the absence of excess liquidity will always be well below the ceiling described above, which is also borne out empirically in the pre-crisis period, when TARGET balances averaged 25% of their hypothetical ceiling level (Figure 5 and Figure 6).

[Figure 5]

[Figure 6]

The financial crisis and its aftermath led to dramatic changes in the conduct of monetary policy in the euro area. In response to severe impairments in the interbank money market, the Eurosystem introduced fixed-rate tender procedures with full allotment in October 2008, thereby accommodating all demand in central bank credit operations against eligible collateral. Banks substituted market-based sources of funding with Eurosystem funding, resulting in a large demand-driven increase in excess liquidity (via credit operations).⁴ As the reserves borrowed by commercial banks from their respective NCBs were used for cross-border payments, large TARGET balances emerged (Figure 5). The total TARGET balance relative to the ceiling implied by Eurosystem liquidity provision peaked at around 85% in November 2011 (Figure 6), one month prior to the first 3-year longer-term refinancing operation

⁴ This was complemented by some supply-driven liquidity injections via outright monetary policy operations. These consisted of the first two covered bond purchase programmes and the Securities Markets Programme (SMP).

(LTRO), while the actual total TARGET balance and excess liquidity peaked at the height of the sovereign debt crisis in mid-2012 (Figure 5). At that time, TARGET liabilities were particularly large in Greece, Ireland and Portugal – the countries in EU/IMF adjustment programmes – and, to a lesser extent, in Spain and Italy. TARGET claims accumulated in countries with high credit ratings, namely Germany, the Netherlands and Luxembourg (Figure 1 and Table 1).

To illustrate the mechanics of TARGET balances during the crisis years, we return to the stylised two-NCB example. Over this period, banks in stressed countries (e.g. Spain) participated in Eurosystem credit operations more than banks in non-stressed countries (e.g. Germany) and the Eurosystem allotted more reserves than required to meet the structural liquidity needs of the banking system, resulting in excess liquidity. This is reflected in the stylised balance sheets of Banco de España and Deutsche Bundesbank in Figure 7. Monetary policy assets are larger in Spain, while excess liquidity has accumulated in Germany. Bank A domiciled in Spain borrows €10 in a credit operation. At the time of implementation of this monetary policy operation, Banco de España records an increase in monetary policy assets and an increase in reserve liabilities as it credits the central bank reserve account of Bank A (not shown). There is no cross-border payment and no change in TARGET balances. Assuming that Bank A uses those reserves to repay an interbank loan from Bank B based in Germany, the composition of Banco de España's liabilities will change. Bank A's reserve account is debited by €10 and Banco de España's TARGET liability increases by €10 when it transfers the funds to Germany. Deutsche Bundesbank's TARGET claim increases by €10 on the assets side of its balance sheet and excess liquidity increases on the liabilities side as the reserve account of Bank B is credited.

[Figure 7]

Following the announcement of OMT in August 2012, excess liquidity declined as market fragmentation receded and banks deleveraged. This decline in excess liquidity came alongside a decline in TARGET balances, reflecting the intrinsic link between the two time series.

Against the backdrop of disinflationary pressures, the Eurosystem introduced credit easing measures in mid-2014. These consisted of a third covered bond purchase programme, an asset backed-securities purchase programme and targeted longer-term refinancing operations. By early 2015, the APP was stepped up substantially with the start of the PSPP. This led to a supply-driven increase in excess liquidity and – to the surprise of many observers – a renewed increase in TARGET balances (Figure 1 and Figure 5). While some commentators interpreted this renewed increase as a sign of persistent financial market fragmentation and even capital flight (e.g. Reinhart, 2019; Westermann, 2017), others

pointed to the mechanics of APP implementation and associated portfolio rebalancing as an explanation (Eisenschmidt et al., 2017; Auer and Bogdanova, 2017; Whelan, 2017).

In contrast to credit operations, the APP directly affects TARGET balances at the time of implementation whenever the counterparty to the transaction is located in another jurisdiction than the purchasing central bank. As discussed by Eisenschmidt et al. (2017), around 80% of Eurosystem asset purchases by volume involved cross-border payments during the implementation of the APP. This reflects the concentration of large international banks in particular financial centres.⁵ In addition to cross-border payments and the ensuing increase in TARGET balances during the implementation of the APP, subsequent portfolio rebalancing (Bergant et al., 2020) led to further cross-border payments and persistence of TARGET balances over recent years.

To illustrate the mechanics of TARGET balances during the APP period, we present a final set of stylised central bank balance sheets. Under the APP, both Banco de España and Deutsche Bundesbank purchased securities on a large scale. Hence, both central banks recorded increases in their monetary policy assets. In our example, Banco de España and Deutsche Bundesbank buy Spanish and German government bonds, respectively, from a large investment bank located in London. This investment bank accesses TARGET2 via Germany. For Deutsche Bundesbank, the settlement of the transaction is a domestic payment: they credit the account of the local subsidiary or branch of the investment bank. For Banco de España, the settlement entails a cross-border payment to the investment bank's reserve account at Deutsche Bundesbank. The APP thereby mechanically increases the TARGET balances of these NCBs (Figure 8). In contrast to credit operations, which are TARGET-balances neutral at implementation and only indirectly affect TARGET balances if private sector agents make cross-border payments using the reserves created by the operations, Eurosystem asset purchases directly give rise to cross-border payments during the implementation of monetary policy.

[Figure 8]

Hinting at the role of the APP in explaining the dynamics of TARGET balances following the sovereign debt crisis are the developments in the TARGET liabilities of the ECB and Greece. In contrast to credit operations, which are solely conducted by NCBs, the ECB participated in APP purchases. In conducting these purchases, the ECB created reserves on its balance sheet. As commercial banks can only hold reserves on accounts with NCBs, all of the reserves created by the ECB during the

⁵ Around 50% of APP purchases by volume were from counterparties resident outside the euro area, most of which were concentrated in London. These non-euro area banks have historically accessed TARGET2 via the Deutsche Bundesbank and, to a lesser extent, De Nederlandsche Bank, contributing to a build-up in the TARGET claims of these countries.

implementation of the APP ended up on the balance sheets of NCBs. For this reason, the steady increase in the ECB’s TARGET liability during the APP period was entirely mechanical. Greek government bonds were excluded from the APP due to their credit ratings, thereby representing a “natural experiment” in the context of the APP-driven expansion of TARGET balances. Hence, the Bank of Greece did not make large-scale cross-border payments for government bonds like other NCBs did over the APP period and it consequently did not experience a renewed increase in TARGET balances. However, Greek government bonds were eligible for the PEPP and Bank of Greece recorded an increase in TARGET liabilities from 2020 after purchases began (Figure 1).

Regardless of the drivers of TARGET balances, which can vary over time, the balances are capped by the amount of reserves provided to the banking system. Specifically (and absent changes in other net financial assets), the sum of aggregate liquidity needs and excess liquidity (less the smallest minimum reserve requirement in the banking system) is the ceiling for the total TARGET balance. Large and persistent TARGET balances in dimensions reached in recent years therefore require large levels of excess liquidity.

A simple algebraic representation of the balance sheets of all NCBs in a currency union with i NCBs (without the complicating factor of a central entity like the ECB) and no autonomous factors is contained in equation (1) below.

$$\sum_i MPO + \sum_i TA = \sum_i (CA - MRR + DF) + \sum_i MRR + \sum_i TL \quad (1)$$

MPO stands for monetary policy operations, TA and TL denote TARGET assets and liabilities, CA are banks’ current accounts at the central bank, MRR are minimum reserve requirements and DF are banks’ recourse to the deposit facility. Note that banknotes (and other autonomous factors) can have an impact on TARGET balances, as can FX interventions. We abstract from these complications here because neither of these factors are major drivers of TARGET balances in the context of the Eurosystem.

We note that the term $\sum_i (CA - MRR + DF)$ represents total excess liquidity of the currency union. Manipulation of (1), using the simplifying assumption of a concentration of all TARGET liabilities of the currency union at one NCB (NCB 1) leads to (2):

$$TL = \sum_2^i MRR + \sum_2^i EL \quad (2)$$

Equation (2) has two important implications. First, TARGET balances in a currency union without excess liquidity are limited to the sum of the reserve requirements of all the NCBs with TARGET assets

and, second, large (and growing) TARGET balances can only exist under a regime of excess liquidity, as minimum reserve requirements tend to be small and relatively static.

3.2. TARGET balances and the balance of payments

As discussed by Auer (2014), Cour-Thimann (2013a) and Eisenschmidt et al. (2017), changes in TARGET balances of euro area countries reflect net cross-border payments and are hence recorded in euro area countries' balance of payments and international investment position (BoP). Eisenschmidt et al. (2017) provide a detailed accounting framework on the recording of TARGET balances in the BoP.

This framework shows that changes in TARGET balances – no matter if they originate from a demand-induced provision of reserves (such as during the sovereign debt crisis) or from a supply-driven injection of reserves (such as under the APP and PEPP) – must be mirrored in other components of the BoP. However, there is no time-invariant causal link between changes in TARGET balances and specific components of the BoP. Eisenschmidt et al. (2017) show that certain empirical regularities between specific BoP components and changes in TARGET balances were present during the crisis period, but not before or afterwards. Prior to the financial crisis, when liquidity conditions in the euro area were neutral and TARGET balances were small, very large flows in the other BoP components – partly stemming from current account deficits, but mainly from private financial flows – were observed without notable changes in TARGET balances (Figure 9).

[Figure 9]

During the sovereign debt crisis, a substantial part of the liquidity provided by the Eurosystem to banks in TARGET liability countries was used for external transactions related to the current account deficits and the collapse in private financial inflows, thereby leading to an increase in TARGET liabilities. Correspondingly, the euro area countries with the largest TARGET claims (Germany, Luxembourg and the Netherlands) received foreign inflows, while recording a surplus in the current account.

By contrast, since the launch of the PSPP in March 2015, there have been no indications of unsustainable BoP developments across euro area countries.⁶ In fact, BoP developments have followed broadly similar patterns across TARGET claim and liability countries. While foreign investors have reduced their exposure to debt securities in TARGET liability countries, this has been on a markedly

⁶ In spring 2018, Italy experienced a short-lived episode of net sales of domestic debt securities by foreign investors.

smaller scale than during the sovereign debt crisis and in a similar fashion to that seen in TARGET claim countries. In addition, following the external adjustment process in TARGET liability countries over the past decade, current account balances have registered surpluses since the start of the APP, as has continued to be the case in TARGET claim countries.

Moreover, residents from both country groups have rebalanced towards foreign debt and equity securities, while recording inflows into domestic equities (Bergant et al., 2020). International portfolio rebalancing is a normal feature of sizeable central bank asset purchase programmes (Cœuré, 2017) which, in combination with the underlying financial structure of the euro area, has contributed to the persistence of TARGET balances following the immediate impact of APP/PEPP implementation.⁷ Overall, the developments in the euro area balance of payments during the APP/PEPP period were not reflective of crisis-induced external flows indicating sudden stops or capital flight.

4. Empirical analysis

4.1. Empirical strategy

Against the background of the stylised facts and mechanics behind TARGET balances, which revealed two distinct episodes of rising balances, we proceed with a formal econometric analysis of the determinants of developments in euro area Member States' TARGET balances.

We start by estimating a reduced-form panel-data econometric model with the goal to establish the determinants of TARGET balances over the time period 2007Q4 to 2014Q4. We then employ our panel model for in-sample forecasting of model-implied TARGET balances which closely follow developments in actual TARGET balances over this period. Subsequently, we apply the same method for in-sample forecasting of TARGET balances during the APP/PEPP period from 2015Q1 to 2020Q4. This analysis reveals that our benchmark model, which proved to be appropriate for the global financial crisis and sovereign debt crisis periods, cannot explain developments in TARGET balances during the APP/PEPP period. Instead, the decisive factor in explaining developments in TARGET balances during this period is the de-centralised implementation of the APP and PEPP.

In our econometric analysis, we exploit the fact that developments across euro area Member States were very heterogeneous during 2007Q4 to 2014Q4. This allows for formally testing the role of different

⁷ Apart from the impact of the APP on euro area countries' capital flows, there is also an impact on the composition of the corresponding stocks (i.e. the international investment position). For instance, in the case depicted in Section 3.1, Spain records a reduction in its external portfolio debt liabilities (due to net sales of government bonds by foreign investors to Banco de España), while external other investment liabilities of Spain increase in line with larger TARGET liabilities vis-à-vis the ECB. Hence, there is a change in the sectoral composition of Spain's external liabilities from the government to the central bank. In addition, the risk profile of Spain's overall external liabilities changes as TARGET liabilities do not carry any rollover and maturity risks, in contrast to government bonds.

factors put forward as determinants of TARGET balances. We thus take a broader perspective than the econometric analyses of Auer (2014) and Eisenschmidt et al. (2017), which focus on merely establishing correlations between changes in TARGET balances and BoP items. Specifically, we estimate

$$\Delta\text{Target}_{i,t} = \alpha' \mathbf{X} + \mu_i + \gamma_t + \epsilon_{it} \quad (3)$$

where $\Delta\text{Target}_{i,t}$ is the quarterly change in a country's TARGET balance (as a percentage of GDP). Our model takes an encompassing perspective on the country-specific factors potentially driving TARGET balances. Specifically, matrix \mathbf{X} includes variables capturing balance of payments and banking sector developments as well as sovereign risk and the business cycle. We include a country's quarterly current account balance (as a percentage of GDP) which was found to be a significant correlate of changes in TARGET balances during the sovereign debt crisis (Auer, 2014; Eisenschmidt et al., 2017). During this period, current account deficits (and collapsing private financial inflows) were associated with rising TARGET liabilities in some euro area countries, while countries with current account surpluses and private financial inflows (such as Germany) experienced an increase in their TARGET claims. As shown in Section 3.1, this mechanism applied in case the liquidity that banks obtained via the Eurosystem's refinancing operations was subsequently used (in part) for cross-border transactions.

We also add three banking sector variables to our model, starting with the quarterly change in volume-weighted bank-level credit default swaps (CDS). We thus measure bank risk by the default risk priced into CDS. For each country, we compute an average banking sector CDS spread across all banks for which CDS spreads are available (weighted by the respective bank's share in a country's total banking assets). Perceptions of bank risk can affect a bank's access to funding as higher bank risk tends to be reflected in less deposits and market-based funding. In the context of TARGET balances, a country with higher banking sector risk may be more prone to experience cross-border deposit/market-based funding outflows, leading to an increase in the country's TARGET liability in an environment of full allotment policies (Cecchetti et al., 2012). To further account for this mechanism we also include the quarterly change in foreign deposits (as a share of total deposits). In case of a crisis, cross-border deposit outflows may arise which in turn may lead to an increase in a country's TARGET liabilities. Perceived safe-haven countries on the other hand may benefit from outflows from stressed countries, leading to increases in TARGET claims, via larger foreign deposits (Whelan, 2017). To control for the impact of changes in the size of a country's banking sector we include the quarterly change in the banking sector's total assets (as a percentage of GDP). Changes in banking sector assets may be associated with changes in TARGET balances, for instance in a context of deleveraging.

As a measure of sovereign risk, we include the change in the spread between 10-year sovereign bond yields and the 10-year euro area overnight index swap (OIS) rate (which is interpreted as a risk-free rate). In a crisis situation in which there is flight to safety, we would expect countries with higher sovereign-OIS spreads to experience greater outflows and higher TARGET liabilities (Auer and Bogdanova, 2017). In the absence of a crisis, when investors are risk-neutral, one might expect greater inflows to countries with higher sovereign/OIS spreads to the extent that there is search for yield (Bergant et al., 2020). We further include real GDP growth (in quarter-on-quarter percentage terms) to control for cross-country differences in the economic cycle.⁸

Our baseline estimations also feature country fixed effects (μ_i) to control for unobserved cross-country heterogeneity, time fixed effects (γ_t) to capture time-specific factors affecting all euro area countries (such as the ECB's monetary policy measures as well as global economic and financial developments) and robust standard errors.⁹ All explanatory variables are constructed relative to a quarterly (GDP-weighted) country sample average. We choose this approach as a euro area country's TARGET balance is by definition measured relative to the other euro area countries. Hence, a country's TARGET balance is not only determined by domestic characteristics, but also by "foreign" factors, i.e. developments in the other euro area countries. This is very much in the spirit of the IMF's *External Balance Assessment Methodology* (Phillips et al., 2013) in which a country's current account balance and real exchange rate can only be assessed relative to the "rest of the world".¹⁰

Our baseline country sample comprises Austria, Belgium, France, Germany, Greece, Italy, the Netherlands, Portugal and Spain. While we would have preferred to include all eleven original euro area countries and Greece, this was precluded by data availability.¹¹

4.2. Empirical results

4.2.1. Regression analysis

Table 2 presents the empirical results of equation (3) with the baseline estimation for the period 2007Q4 to 2014Q4 in column (1). The results show a significant positive coefficient for the current account balance. This finding is in line with Auer (2014) and Eisenschmidt et al. (2017) despite the fact that our specification includes additional explanatory variables. The positive coefficient implies that

⁸ All variables are sourced from the ECB's Statistical Data Warehouse, with the exception of bank-level CDS which are based on Datastream.

⁹ We also present estimation results with only one set of fixed effects included.

¹⁰ Employing GDP weights also has the advantage to account more accurately for a country's impact on the rest of the sample.

¹¹ Finland and Luxembourg could not be included in the analysis due to the absence of bank-level CDS data. Data on sovereign-OIS spreads are also unavailable for Luxembourg. Ireland represents an exceptional country across many dimensions and we include it in alternative estimations, but not the baseline.

relatively larger current account surpluses (or lower deficits) are associated with larger increases in TARGET claims (or lower increases in TARGET liabilities). Hence, during the period 2007Q4 to 2014Q4, BoP developments played a significant role in explaining the developments in euro area countries' TARGET balances. Columns (2) and (3) reveal that this link is more due to within-country dynamics as in the specification without country fixed effects (column 3) the coefficient on the current account balance almost halves in magnitude.

Changes in bank-level CDS prove to be significant with a negative sign throughout columns (1) to (3). Thus, there is strong evidence that rising banking sector risk and funding stress was associated with larger increases in TARGET liabilities (or lower increases in TARGET claims). This is in line with the literature, in which there is consensus that during the financial and sovereign debt crises the rise in TARGET balances was also a symptom of banking sector stress. Our findings are also consistent with declining TARGET balances following the OMT announcement which led to a significant improvement in bank funding conditions. The change in foreign deposits (as a share of total deposits) fails to be statistically significant in our estimations. This might be due to other sources of bank funding (including deposits by domestic residents) being more important for overall bank funding conditions in stressed countries. We obtain a significant negative coefficient on the change in banks' total assets. This result implies that countries with relatively faster-shrinking banking sector assets witnessed larger increases in TARGET claims. A possible interpretation may be that banking sectors undergoing faster deleveraging had lower funding needs (including from the Eurosystem) and hence experienced lower increases in TARGET liabilities.

[Table 2]

The change in the spread between 10-year sovereign bond yields and the 10-year OIS rate is consistently significant with a negative sign. This is in line with the “flight to safety” hypothesis according to which countries with rising relative sovereign-OIS spreads experience greater outflows and higher TARGET liabilities, while TARGET balances shrunk in the post-OMT period when sovereign spreads declined markedly in stressed countries. Real GDP growth on the other hand fails to be a significant determinant of TARGET balances.

As a robustness check, we re-estimate equation (3) in column (4), but do not express the explanatory variables relative to the GDP-weighted country sample average. This delivers very consistent results with generally slightly larger coefficients in absolute terms. In column (5) we include Ireland in the country sample: while the banking sector and sovereign-OIS spread results persist, the current account turns insignificant. This result is not surprising and validates our initial decision to exclude Ireland:

precisely this variable is strongly affected by the actions of large multinational enterprises and hence makes it difficult to link to domestic macroeconomic developments in the case of Ireland.¹²

In sum, our regression analysis for the period 2007Q4 to 2014Q4 reveals that rising current account deficits, worsening bank and sovereign funding conditions and stronger growth in banking sector assets were associated with faster increases in TARGET liabilities, while the opposite developments were associated with faster increases in TARGET claims.

In column (6), we apply our model to the APP period (2015Q1 to 2020Q4). During this period a markedly different picture emerges: out of the set of the previously significant explanatory variables only the change in banks' total assets is significant (albeit with a different, i.e. positive, sign). Moreover, the change in foreign deposits and real GDP growth turn significant with a positive sign.¹³ In column (7), we do not include 2020, i.e. we stop the analysis before the onset of the pandemic and the commencement of the PEPP. Strikingly, none of the explanatory variables are significant in this “pure” APP period, suggesting that during the pandemic, slightly different dynamics emerged between the set of explanatory variables and TARGET balances.

Overall, in line with our priors, our benchmark regression model (column 1) performs well in the crisis period (with an R2 of 33%), while it cannot explain to a similar extent the dynamics of TARGET balances during the APP/PEPP period (with R2s of 24% and 12% in columns 6 and 7, respectively) when rising balances were largely seen as resulting from the de-centralised implementation of the asset purchases.¹⁴

4.2.2. In-sample forecasting based on model-implied TARGET balances

As a next step, we further employ our benchmark model (column 1) to derive model-implied TARGET balances (by means of in-sample forecasting techniques). Starting with the results for the largest TARGET liability countries, in Figure 10 we show that the model-implied TARGET balances follow rather closely the actual balances: across all countries our model predictions are in line with the actual dynamics observed over the period 2007 to 2012 when TARGET liabilities hit their peak. Up to around mid-2011 our estimations predicted a somewhat steeper increase in TARGET liabilities

¹² The Irish Central Statistics Office developed two supplementary indicators (GNI* and CA*) to “clean” the national data from certain operations related to mobile international assets and global firms re-domiciling their headquarters to Ireland. However, these are not available at the frequency and for the sample period covered in our data.

¹³ As a robustness exercise, we test if there was a significant impact on TARGET balances during this period from (1) swap lines to foreign countries provided by the Eurosystem during the pandemic; (2) bridge LTROs offered by the Eurosystem in 2020 and (3) the tiering of the deposit facility since 2019. Our results show that none of these factors had a significant impact on euro area countries' TARGET balances.

¹⁴ To clearly isolate the differences between the two periods we exclude Greece from the country sample for the APP/PEPP period, as its sovereign bonds were not eligible to be purchased as part of the APP/PSPP and only became eligible for the PEPP in 2020. Furthermore, Greece experienced a renewed episode of financial stress during the summer of 2015.

compared with the actual series, particularly for Italy and Spain. Subsequently, actual TARGET liabilities increased rapidly, bringing them very close to the model-implied balances and even somewhat overshooting in the case of Spain, while increasing less than estimated for Greece. This likely reflects the additional excess liquidity introduced with the 3-year LTROs in November 2011, for which the take-up was particularly high in Italy and Spain. The decline in TARGET liabilities following the announcement of OMT in August 2012 is also visible in the model-implied TARGET balances. For Spain and Portugal in particular the actual and model-implied balances converge substantially until the end of 2014.

[Figure 10]

Figure 11 focuses on the mirror image, i.e. the developments in the countries with the largest TARGET claims: Germany and the Netherlands. Similarly, the model-implied balances are somewhat above the actual balances until end-2011, before they converge in 2012. This reveals that our empirical framework captures well how relative developments in economic fundamentals translated into TARGET balances over the crisis period. Our estimates predict however a further increase in model-implied TARGET claims until end-2014, while the actual balances were declining post-OMT, especially in the case of the Netherlands. We find several explanations for this divergence: first, the banking sectors in Germany and the Netherlands experienced some idiosyncratic developments in this period which the model cannot capture. For instance, in preparation for the comprehensive stress tests ahead of banking union, repayments of 3-year LTRO funds were advanced in these countries. Second, some of our explanatory variables did not adjust significantly in relative terms for Germany and the Netherlands over this period. For instance, while the current account balances improved in the TARGET liability countries, they even increased further in the claim countries.

[Figure 11]

Overall, our model-implied balances closely track the actual TARGET balances, in particular for TARGET liability countries and for TARGET claim countries until 2012, thereby providing evidence for the appropriateness of our model.

Next, we use our benchmark estimates for in-sample forecasting of TARGET balances during the APP/PEPP period, based on column 6 in Table 2. This approach sheds additional light on the question of whether the rise in TARGET balances during the APP/PEPP period signals a renewed crisis or whether it is due to the mechanics of APP/PEPP implementation and associated portfolio rebalancing.

Focusing first on the largest TARGET liability countries (Figure 12), we find clear evidence for the APP/PEPP implementation hypothesis. The model-implied TARGET balances of Spain in particular but also Italy and to a lesser extent Portugal move very differently from the actual balances. In all three cases there is a substantial and widening gap between the model-implied and actual balances. In the case of Spain for instance, our model predicts TARGET liabilities of less than €300 bn in the final quarter of 2020, compared with actual TARGET liabilities of more than €500 bn. This suggests that in the absence of the APP/PEPP, the increase in Spain’s TARGET liability would have been substantially lower, *ceteris paribus*, over the period 2015 to 2020. The developments in Portugal and Italy are similar, with the model-implied TARGET liabilities somewhat increasing for Italy, while even decreasing for Portugal, reflecting the developments in economic and financial sector fundamentals.

[Figure 12]

Analysing the largest TARGET claim countries, Germany and the Netherlands (Figure 13), we find again clear evidence for the APP/PEPP implementation hypothesis. While our model-implied results predicted a decline in TARGET claims of both countries until end-2020 (to less than €300bn for Germany and to a small liability position in the case of the Netherlands) actual balances stood at more than €1,100bn for Germany and at around €50bn for the Netherlands in the last quarter of 2020. Clearly these dynamics failed to be captured by our econometric model as they reflect – mirroring the developments in TARGET liability countries – the settlement of APP operations via the Deutsche Bundesbank and De Nederlandsche Bank. These cross-border payments, due to the sales of APP-eligible assets by non-resident counterparties as well as subsequent portfolio rebalancing (Bergant et al., 2020), mechanically increased the TARGET claims of Germany and the Netherlands.

[Figure 13]

To further support our assertion that the rise in TARGET balances during the APP/PEPP period reflects largely the mechanics of the implementation of asset purchases, we estimate another panel model in which we regress the gap between the quarterly change in the actual TARGET balance and the quarterly change in the model-implied TARGET balance (i.e. the “forecast error”) on the “APP/PEPP settlement-implied TARGET balance”. This simulated TARGET balance exclusively includes cross-border payments in TARGET which directly result from the implementation of the APP/PEPP. These are recorded using highly granular transaction-level APP/PEPP purchase data and information on the

location of the TARGET account used by the APP/PEPP counterparty (i.e. by the seller of securities to the Eurosystem).

The results in Table 3 provide strong evidence that the mechanics of APP/PEPP implementation were the key driver of TARGET balances during the APP/PEPP period. Across the different fixed effects specifications, there is a highly significant and positive link between the change in settlement-implied TARGET balances and the “forecast error” derived from the estimation reported in column 6 of Table 2. Our empirical analysis hence confirms that APP/PEPP implementation is the crucial factor driving TARGET balances during this period. The subsequent portfolio rebalancing by euro area investors towards non-euro area securities was largely intermediated by TARGET claim countries, thereby leading to a persistent effect of the settlement channel on TARGET balances (Eisenschmidt et al., 2017).

[Table 3]

5. Conclusion and policy implications

The analysis presented in this paper underscores the need to analyse TARGET balances in the context of monetary policy decisions. Without excess liquidity, there is very limited scope for TARGET balances to emerge. The creation of excess liquidity in turn is the consequence and by-product of a monetary policy decision – be it the introduction of the fixed-rate tender procedure with full allotment in October 2008 to counter heightened liquidity risk in interbank markets (Eisenschmidt and Tapking, 2009); the conduct of very long-term refinancing operations (3-year LTROs in December 2011 and March 2012) to offer banks a funding alternative in a situation in which maturing bank bonds could no longer be rolled-over; or be it the decision to embark on a large-scale asset purchase programme (like the APP, which was expanded in March 2015) in order to provide additional monetary policy accommodation at the effective lower bound. Depending on the monetary policy case behind the emergence of excess liquidity, the interpretation of changes in TARGET balances can differ markedly.

Our empirical analysis reinforces this point. While the 2011-12 sovereign stress episode clearly contained elements of a sudden stop in the balance of payments, monetary policy as well as subsequent structural reforms and adjustment programmes were instrumental in reducing macroeconomic imbalances and financial market stress, allowing TARGET balances to decline again. Likewise, the increase in TARGET balances since 2015 cannot be attributed to macroeconomic imbalances or a new bout of financial market stress; it is almost entirely driven by the decentralised implementation of the ECB’s asset purchase programmes.

Central bank balance sheets are unlikely to return to their status-quo-ante before the financial crisis. New prudential regulations, changing funding practices in state treasuries and demand for safe assets could structurally increase the demand for central bank reserves.¹⁵ Additionally, there is increased uncertainty about demand for central bank reserves in a post-crisis world, increasing the relative attractiveness of a floor system over the corridor system which was the standard operating procedure before the crisis. The Federal Reserve's January 2019 communication about monetary policy implementation and balance sheet normalisation is living proof of all these statements.¹⁶ These factors are also relevant in the euro area context, hence structural excess liquidity could remain a feature of the ECB's balance sheet in the future.

Our analysis offers insight into how these developments could be expected to affect the evolution of TARGET balances. Additional demand for excess liquidity and the operation of a floor system are factors that would be associated with excess liquidity becoming a permanent feature of the implementation of monetary policy, as the Federal Reserve currently predicts for the case of the US. In this world, relatively large TARGET balances would become a permanent feature too, in particular in the presence of strong financial centre effects (see Eisenschmidt et al., 2017), while their interpretation would likely again be very different from the 2011-12 episode.

¹⁵ See for example Kedan and Ventula Veghazy (2021) for a discussion of the implications of the Liquidity Coverage Ratio on demand for central bank reserves.

¹⁶ In January 2019, the Federal Reserve indicated that it would indefinitely operate in a floor system, accommodating all financial institutions' demand for reserves and injecting a buffer on top of that in order to keep money market rates aligned with the target federal funds rate. See Federal Reserve (2019).

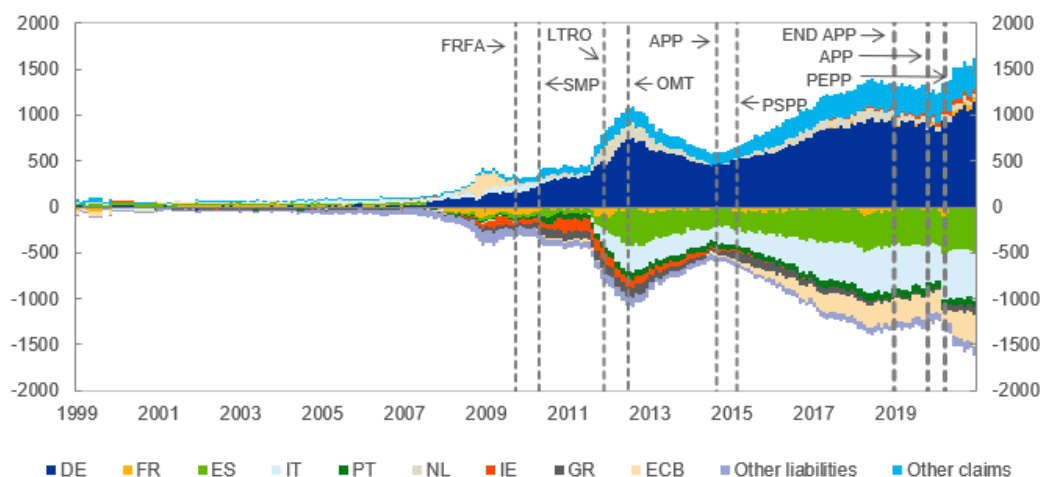
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Figures and tables

Figure 1. TARGET balances of selected euro area countries, billions of euros



Source: European Central Bank.

Notes: The chart reflects the TARGET balances of selected euro area NCBS and the ECB. Positive (negative) figures indicate TARGET claims (liabilities) of the respective central bank. All figures are in billions of euros and are end-of-month values. The first observation is January 1999 and the last observation is December 2020. FRFA stands for the fixed-rate full allotment policy effective from 15 October 2008, SMP stands for the Securities Markets Programme launched in May 2010, LTRO denotes the allotment of the first 3-year longer-term refinancing operation in December 2011, OMT stands for the Outright Monetary Transactions announced in August 2012, APP stands for the asset purchase programme that was conducted between October 2014 and December 2018 and which recommenced in November 2019, PSPP stands for the public sector purchase programme that started in March 2015 and PEPP stands for the pandemic emergency purchase programme that was initiated in March 2020.

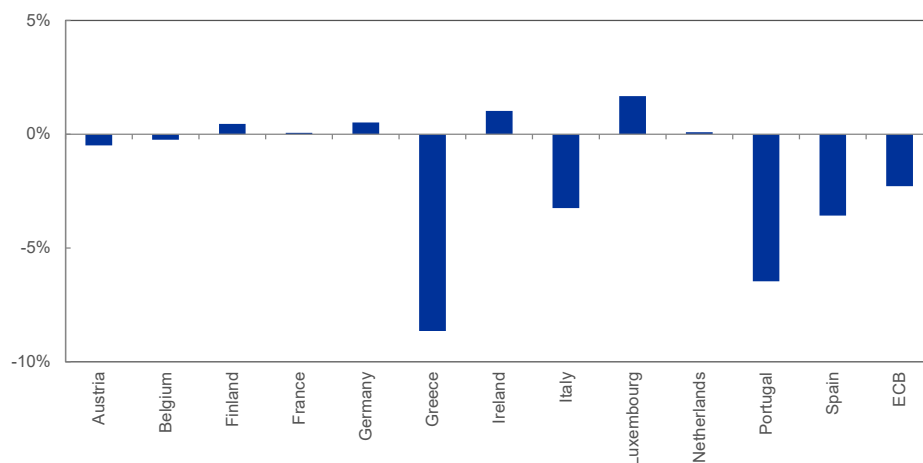
Table 1. TARGET balances in billions of euros and as a share of GDP and banking sector assets for the twelve countries that had adopted the euro by 2002

	July 2012			December 2014			December 2020		
	TRGT ^a	%GDP ^b	%BSA ^c	TRGT	%GDP	%BSA	TRGT	%GDP	%BSA
Austria	-41.0	-13.2	-4.1	-30.1	-9.3	-3.4	-37.4	-9.4	-3.9
Belgium	-41.1	-10.9	-3.5	-12.4	-3.1	-1.1	-65.9	-13.8	-5.9
Finland	59.1	29.9	9.1	19.7	9.7	3.4	49.5	20.6	7.1
France	4.0	0.2	0.1	-17.0	-0.8	-0.2	58.3	2.4	0.6
Germany	727.2	27.0	8.4	460.8	16.4	5.9	1136.0	32.7	12.7
Greece	-105.0	-51.7	-24.0	-49.3	-27.4	-12.4	-80.3	-43.8	-23.9
Ireland	-94.1	-54.8	-7.6	-22.7	-12.7	-2.1	46.1	12.9	3.3
Italy	-280.1	-17.0	-6.6	-208.9	-13.0	-5.2	-516.0	-28.7	-13.4
Luxembourg	124.0	279.8	12.1	105.1	214.0	10.9	259.3	413.5	20.8
Netherlands	130.4	20.1	5.2	19.4	2.9	0.8	38.4	4.7	1.5
Portugal	-72.5	-41.2	-12.8	-54.6	-32.0	-12.4	-80.2	-37.4	-19.4
Spain	-423.3	-39.8	-11.7	-189.9	-18.6	-6.4	-500.0	-40.2	-17.3
ECB	33.2			-22.7			-336.8		

Sources: European Central Bank; Eurostat.

Notes: ^a TARGET balance in billions of euros; a positive (negative) figure indicates TARGET claims (liabilities) of the respective country's NCB. ^b TARGET balance as a share of domestic GDP. ^c TARGET balance as a share of banking sector assets domiciled in the respective country.

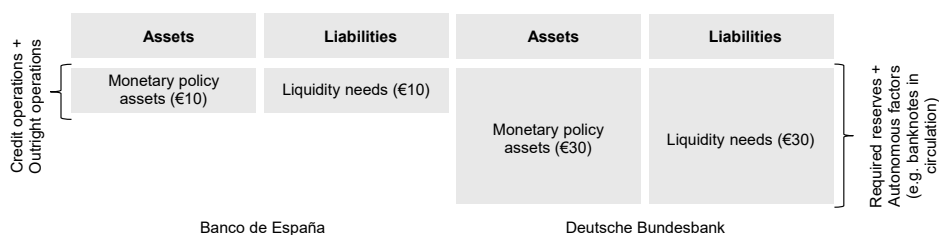
Figure 2. TARGET balances as a share of the total annual value of transactions processed in TARGET2 by central bank, percentages



Source: European Central Bank.

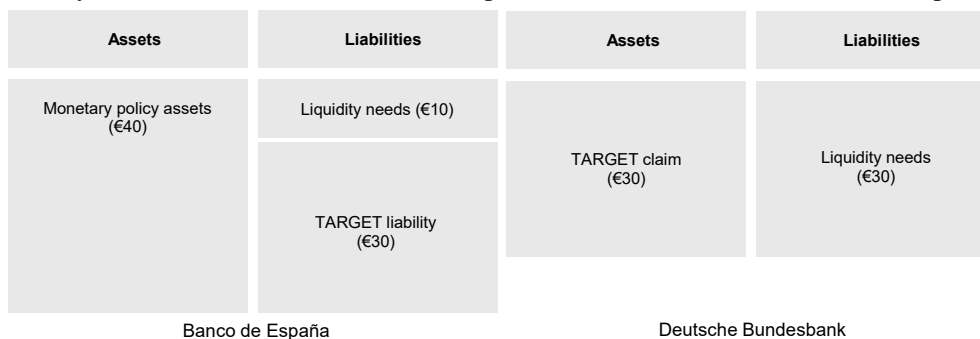
Notes: The chart shows the nominal value of the central bank’s TARGET balance at end-2020 as a share of the total value of payments processed in TARGET2 by the respective central bank in 2020.

Figure 3. Stylised balance sheet of Banco de España and Deutsche Bundesbank: Example 1



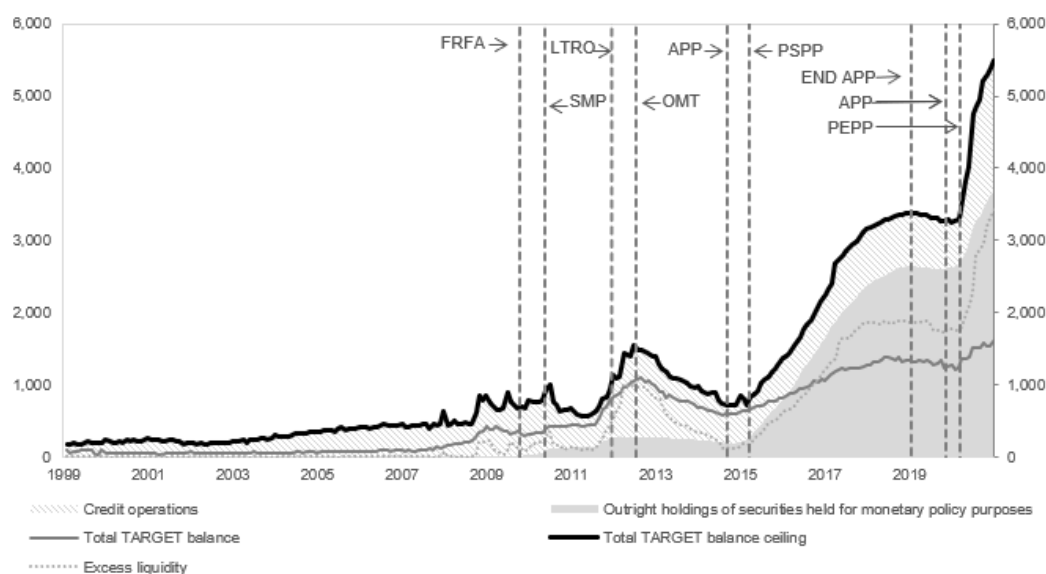
Notes: Banco de España and Deutsche Bundesbank provide liquidity to their respective banking sectors to fulfil domestic liquidity needs. There are no cross-border payments.

Figure 4. Stylised balance sheets of Banco de España and Deutsche Bundesbank: Example 2



Notes: Banco de España originates all the reserves in the banking sector via monetary policy operations. All of these reserves except the amount needed by Spanish banks to fulfil their minimum reserve requirements end up on commercial banks’ accounts at Deutsche Bundesbank.

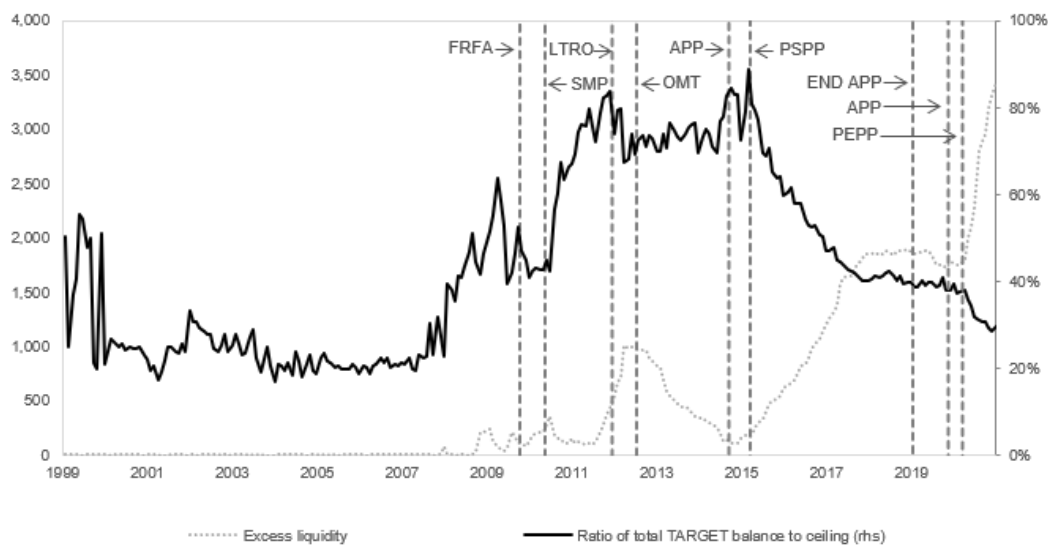
Figure 5. Eurosystem monetary policy operations, total TARGET balance (actual and ceiling) and excess liquidity, billions of euros



Source: European Central Bank.

Notes: Credit operations consist of main refinancing operations and longer-term refinancing operations. Outright holdings of securities held for monetary policy purposes consist of securities purchased under the covered bond purchase programmes, the SMP, the APP and the PEPP. The chart shows gross liquidity provided to the banking system, which is the sum of structural liquidity needs (i.e. autonomous factors and minimum reserve requirements), excess liquidity and liquidity temporarily drained via fine-tuning operations. Reserves created via non-monetary policy portfolios are excluded from the chart. The total TARGET balance ceiling is the sum of gross liquidity provision less the smallest country-level minimum reserve requirement in the respective month. The figure shows end-of-month values except for excess liquidity, which is expressed as end-of-month 30-day moving averages. The sample extends from January 1999 to December 2020. FRFA stands for the fixed-rate full allotment policy effective from 15 October 2008, SMP stands for the Securities Markets Programme launched in May 2010, LTRO denotes the allotment of the first 3-year longer-term refinancing operation in December 2011, OMT stands for the Outright Monetary Transactions announced in August 2012, APP stands for the asset purchase programme that was conducted between October 2014 and December 2018 and which recommenced in November 2019, PSPP stands for the public sector purchase programme that started in March 2015 and PEPP stands for the pandemic emergency purchase programme that was initiated in March 2020.

Figure 6. Excess liquidity and ratio of total TARGET balance to ceiling, billions of euros and percent



Source: European Central Bank.

Notes: The sample extends from January 1999 to December 2020. FRFA stands for the fixed-rate full allotment policy effective from 15 October 2008, SMP stands for the Securities Markets Programme launched in May 2010, LTRO denotes the allotment of the first 3-year longer-term refinancing operation in December 2011, OMT stands for the Outright Monetary Transactions announced in August 2012, APP stands for the asset purchase programme that was conducted between October 2014 and December 2018 and which recommenced in November 2019, PSPP stands for the public sector purchase programme that started in March 2015 and PEPP stands for the pandemic emergency purchase programme that was initiated in March 2020.

Figure 7. Stylised balance sheets of Banco de España and Deutsche Bundesbank: Example 3 (crisis period)

Banco de España		Deutsche Bundesbank	
Assets	Liabilities	Assets	Liabilities
Monetary policy assets (€40)	Liquidity needs (€10)	Monetary policy assets (€10)	Liquidity needs (€30)
	TARGET liability (€30)	TARGET claim (€30)	Excess liquidity (€10)
↑ + €10	↑ + €10	↑ + €10	↑ + €10

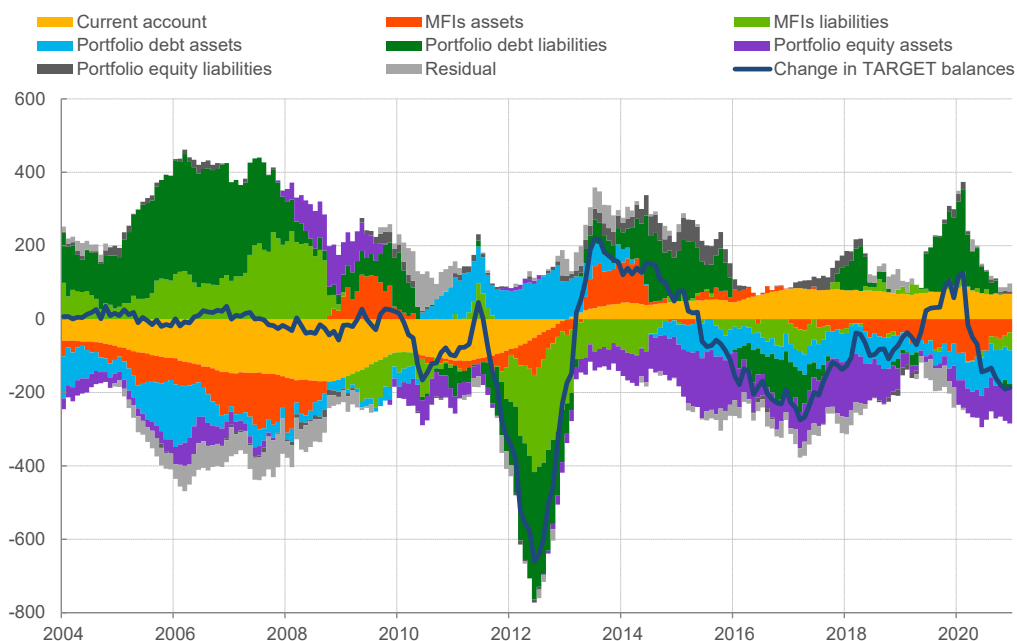
Notes: A Spanish commercial bank borrows €10 from Banco de España. This commercial bank then transfers €10 to a German commercial bank.

Figure 8. Stylised balance sheet of Banco de España and Deutsche Bundesbank: Example 4 (APP period)

Banco de España		Deutsche Bundesbank	
Assets	Liabilities	Assets	Liabilities
Monetary policy assets (€40)	Liquidity needs (€10)	Monetary policy assets (€10)	Liquidity needs (€30)
	TARGET liability (€30)	↑ + €10	Excess liquidity (€10)
↑ + €10	↑ + €10	TARGET claim (€30)	
		↑ + €10	↑ + €20

Notes: Banco de España and Deutsche Bundesbank purchase assets under the APP worth €10 from a counterparty that accesses TARGET2 via Germany.

Figure 9. Changes in TARGET balances and main components of the balance of payments in the countries with the largest TARGET liabilities



Source: European Central Bank.

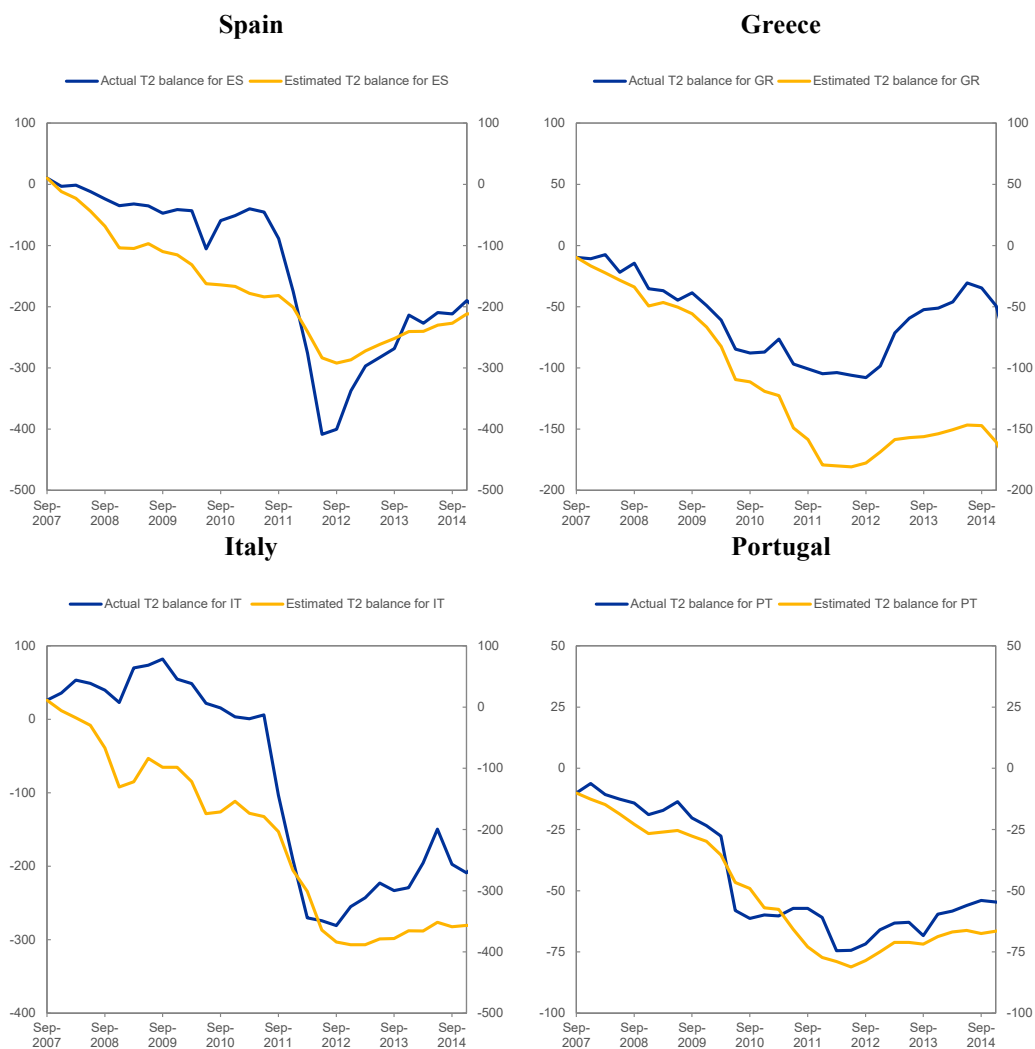
Notes: 12-month changes in TARGET balances; 12-month moving sum of monthly balance of payments transactions; EUR billions. TARGET liability countries include Italy, Spain and Portugal. Decomposition based on Eisenschmidt et al. (2017). “Assets” refer to gross outflows, i.e. investment abroad by domestic residents, while “liabilities” refer to gross inflows, i.e. investment by non-residents in the domestic economy. A negative value for assets indicates a net increase in foreign assets by domestic residents. A negative value for liabilities indicates a net reduction of domestic assets by foreign residents. A positive value for the current account indicates a surplus. The last observation is December 2020.

Table 2. Determinants of changes in TARGET balances

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	2007Q4-2014Q4	2007Q4-2014Q4	2007Q4-2014Q4	2007Q4-2014Q4	2007Q4-2014Q4	2015Q1-2020Q4	2015Q1-2019Q4
Current account (% of GDP)	0.520** (0.173)	0.573*** (0.146)	0.315** (0.142)	0.557** (0.183)	0.107 (0.441)	-0.0928 (0.459)	-0.0766 (0.468)
Change in volume-weighted average bank-level CDS	-0.0377*** (0.00999)	-0.0358** (0.0118)	-0.0377*** (0.00984)	-0.0386*** (0.0102)	-0.0561*** (0.0154)	-0.00446 (0.00361)	-0.00642 (0.00478)
Change in foreign deposits as a share of total	-10.89 (12.01)	-8.790 (13.03)	-10.46 (8.452)	-12.03 (12.01)	-10.27 (8.292)	35.30* (17.55)	13.57 (18.06)
Change in MFI assets (% of GDP)	-0.0442* (0.0212)	-0.0401* (0.0198)	-0.0444** (0.0218)	-0.0540** (0.0223)	-0.0727** (0.0225)	0.0697*** (0.0192)	0.0341 (0.0436)
Change in the spread between 10Y sovereign bond and 10Y EA OIS	-0.0280** (0.0110)	-0.0290*** (0.00801)	-0.0294** (0.0145)	-0.0288** (0.0111)	-0.0334** (0.0136)	-0.0484 (0.0273)	-0.00856 (0.0191)
Real GDP growth	-0.0811 (1.215)	0.332 (1.180)	-0.466 (1.081)	-0.260 (1.259)	-2.296 (1.514)	2.935** (1.171)	-2.586 (2.338)
Observations	256	256	256	256	285	192	160
R-squared	0.334	0.238	0.338	0.332	0.307	0.243	0.115
Country FE	Yes	Yes	No	Yes	Yes	Yes	Yes
Time FE	Yes	No	Yes	Yes	Yes	Yes	Yes
Rel. to GDP-weighted averages	Yes	Yes	Yes	No	Yes	Yes	Yes
No. of countries	9	9	9	9	10	8	8

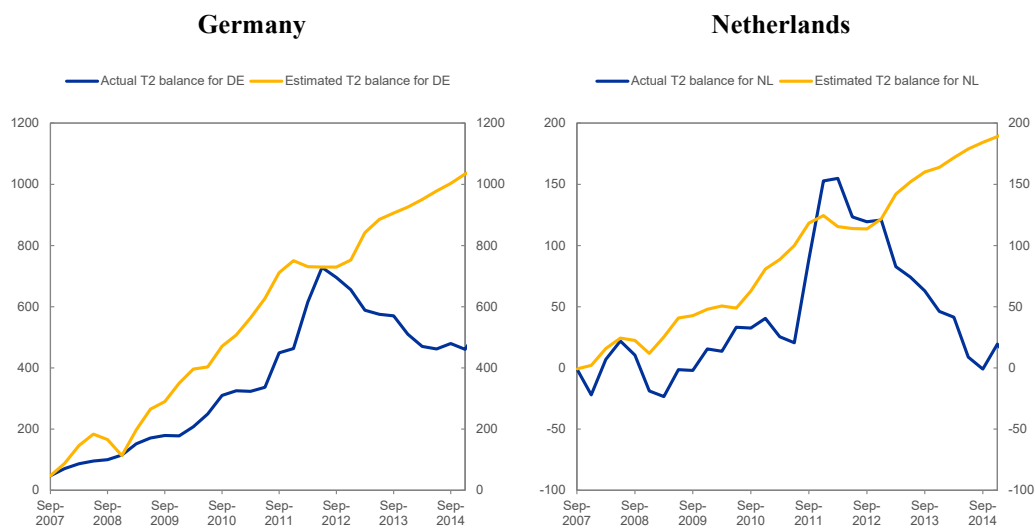
Notes: Data are at quarterly frequency. Columns (1)-(5) cover the period 2007Q4-2014Q4 (2009Q1-2014Q4 for Austria). Column (6) covers the period 2015Q1-2020Q4. Column (7) covers the period 2015Q1-2019Q4. The dependent variable is the change in TARGET2 balance (% of GDP). Columns (1)-(4) include Austria, Belgium, Germany, Spain, France, Greece, Italy, Netherlands and Portugal. Column (5) includes Ireland in the list of countries in (1)-(4). Column (6) and (7) excludes Greece from the list of countries in (1)-(4).

Figure 10. TARGET balances of selected TARGET liability countries: actual and in-sample forecasts during the crisis



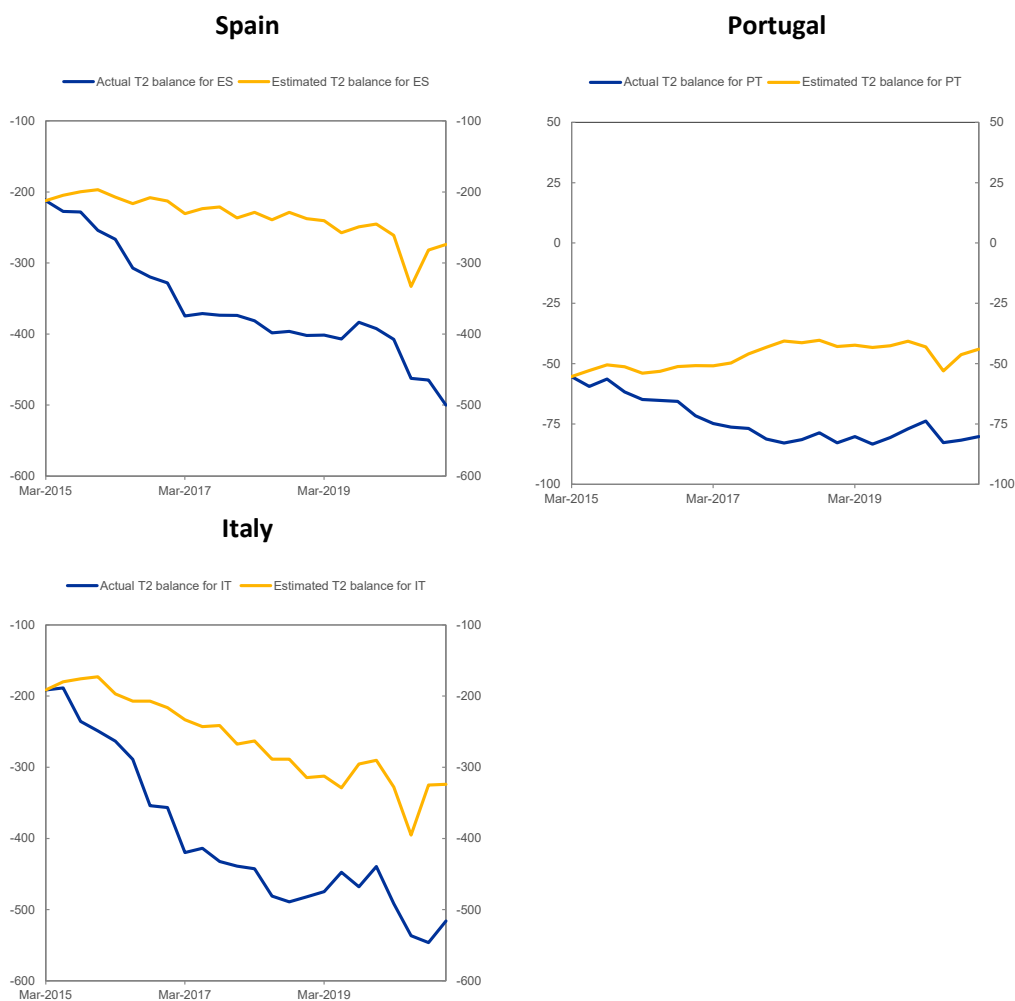
Notes: The in-sample forecasts of TARGET balances are based on the regression results shown in Table 2, column 1 and obtained by converting them to euro billions and cumulating the quarterly changes since 2007Q3. The last observation is 2014Q4.

Figure 11. TARGET balances of selected TARGET claim countries: actual and in-sample forecasts during the crisis



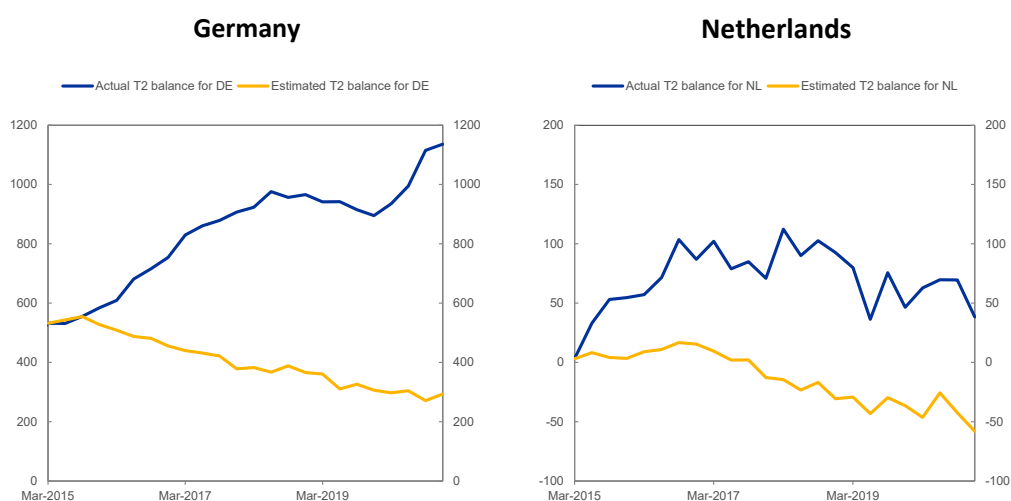
Notes: The in-sample forecasts of TARGET balances are based on the regression results shown in Table 2, column 1 and obtained by converting them to euro billions and cumulating the quarterly changes since 2007Q3. The last observation is 2014Q4.

Figure 12. TARGET balances of selected TARGET liability countries: actual and in-sample forecasts during the APP period



Notes: The in-sample forecasts of TARGET balances are based on the regression results shown in Table 2, column 6 and obtained by converting them to euro billions and cumulating the quarterly changes since 2015Q1. The last observation is 2020Q4.

Figure 13. TARGET balances of selected TARGET claim countries: actual and in-sample forecasts during APP period



Notes: The in-sample forecasts of TARGET balances are based on the regression results shown in Table 2, column 6 and obtained by converting them to euro billions and cumulating the quarterly changes since 2015Q1. The last observation is 2020Q4.

Table 3. The role of APP-implied TARGET balances in explaining the “forecast-error” of the benchmark model

	(1)	(2)	(3)
Change in APP-implied balance	0.437*** (0.0924)	0.465*** (0.0919)	0.556*** (0.0876)
Observations	216	216	216
R-squared	0.396	0.369	0.435
Country FE	Yes	No	Yes
Time FE	No	Yes	Yes
No of countries	9	9	9

Notes: Data are in quarterly frequency covering the period 2015Q1-2020Q4. The dependent variable represents the gap between the actual and predicted change in TARGET2 balance (% of GDP), where the predicted value is derived from the baseline estimation in the period 2015Q1-2020Q4 (Table 2, column 6).

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