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Explosive Target balances of the German Bundesbank

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Abstract

Using the recursive unit root test by Phillips et al. (2011) we show that the Target balances of the German Bundesbank have been explosive from the beginning of 2009 to the beginning of 2013. By implementing a full-allotment policy and reducing the required minimum quality of collaterals in October 2008, the European Central Bank (ECB) refinanced credits in the GIIPS countries (Greece, Ireland, Italy, Portugal and Spain) to a large extent. Private capital flowed out of the GIIPS countries, and the German Target claims increased significantly. Using the new test to identify multiple explosive periods by Phillips et al (2013) we find that the German Target claims also became explosive in autumn 2007 when the interbank market broke down for the first time.

JEL Code: C22, E50, E58, F32, F34, H63.
Keywords: Eurosystem, Target, recursive unit root test, explosiveness, hidden debt, German Bundesbank.

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1. Introduction

A topical issue throughout the euro crisis has been central banks' Target balances, "an accounting system hidden in remote corners of the balance sheets of Eurozone's National Central Banks" (Sinn and Wollmershäuser 2012: 468). "Target"[3] describes the European transaction settlement system that the commercial banks of one Eurozone country use to make payments to the commercial banks of another Eurozone country via the national central banks and the European Central Bank (ECB). Target balances describe the claims and liabilities of the individual central banks of the Eurozone vis-à-vis the Eurosystem. The Target balances show the accumulated deficits and surpluses in each country's balance of payments with other countries in the Eurozone. Since mid-2007 the national central banks of the GIIPS countries have largely created and lent money to finance balance-of-payments deficits, while money creation and lending in the core of the Eurozone has decreased. The Eurozone's stock of net refinancing credit moved from the European core countries to the GIIPS countries. The reallocation of refinancing credit describes a public capital flow via the ECB system and can be interpreted as the first euro rescue program (Sinn 2012a, Sinn 2014, Sinn and Wollmershäuser 2012).[4]

Hans-Werner Sinn first drew attention to the increasing Target imbalances in the Eurozone in spring 2011 and has since explored why Target imbalances threaten financial stability (see, e.g., Sinn 2012a). In February 2012, Jens Weidmann, the president of the German Bundesbank, described his concerns about the Target imbalances to Mario Draghi, the president of the ECB, and called for a collateralization of the German Target claims.[5] In March 2014, for example, the German Bundesbank held nominal Target claims of 470 billion euros. If the Eurozone collapsed, the German Bundesbank's basis for these claims would

[3] Trans-European Automated Real-Time Gross Settlement Express Transfer.
[4] Steinkamp and Westermann (2012) describe the Target liabilities of the national central banks as senior lending by the markets similar to the rescue packages from the IMF and the EU (e.g., EFSM/ESM).
[5] See Ruhkamp (2012).

disappear, and the German Bundesbank would probably sustain a loss. Given that the German Bundesbank would request a recapitalization, it is conceivable that the German federal government would have to increase taxes or decrease public pensions to finance the Bundesbank's loss. Alternatively, German government debt would increase (Sinn 2012a, 2012b, 2013). Target balances are thus part of the hidden government debt.

Scholars have investigated whether governments pursue sustainable fiscal policies by testing for stationarity of the real debt level or the debt-to-GDP ratio (e.g., Hamilton and Flavin 1986, Kremers 1988, Wilcox 1989).[6] When the real debt level or the debt-to-GDP ratio contains a unit root, and is thus shown to be nonstationary, experts describe fiscal policies as unsustainable. Scholars also use unit root tests to examine the sustainability of external debt and current account deficits (e.g., Wickens and Uctum 1993). Sustainablity tests have as yet ignored hidden government debt such as the Target balances.

Phillips et al. (2011) have introduced a new recursive unit root test on explosive behaviour, especially to identify asset price bubbles.[7] We use the recursive unit root test by Phillips et al. (2011) to investigate whether the Target balances of the German Bundesbank are explosive.[8] We identify explosive periods in the German Target balance and discuss the events that induced the exploding Target balances. As a robustness test we also employ the new unit root test to identify multiple explosive periods by Phillips et al (2013).

2. Hidden debt

Many studies elaborating on government debt and fiscal sustainability deal with non-contingent explicit debt, i.e. obligations that are based on a particular law or contract and must

[6] See also Chen (2014) and Liu et al. (2014). Other approaches to test for fiscal sustainability include cointegration analysis of expenditures and revenues (see, e.g., Trehan and Walsh 1988) and fiscal reaction functions (see, e.g., Bohn 1998, Bohn 2008, Potrafke and Reischmann 2014). On theoretical considerations of public debt sustainability see, e.g., Bohn (1995, 2007).
[7] See Guerkaynak (2008) for a survey of early econometric tests of asset price bubbles.
[8] Yoon (2012a, 2012b) has employed the PWY test to elaborate on explosive public debt and budget deficit in the United States.

be served in any event, as recorded in the government's accounting system. But governments also have implicit liabilities, i.e. "moral" payment obligations of the government, which arise as a result of public expectations, pressure from interest groups and the role of the state in the society (Polackova 1998). Examples of implicit liabilities include future public pension payment obligations (see, e.g., Auerbach 2009, Oksanen 2005). Explicit and implicit government liabilities may be non-contingent or contingent. Non-contingent (or direct) liabilities give rise to a payment obligation in any event. Contingent liabilities are only realized if a particular event occurs (see, e.g., Polackova 1998, Polackova Brixi and Schick 2002, Giammarioli et al. 2007). Contingent explicit liabilities, contingent implicit liabilities, and non-contingent implicit liabilities that are not recorded in the government's accounting system describe hidden debt, which poses a risk to the sustainability of public finances (Hartwig Lojsch et al. 2011).

The Target claims of the German Bundesbank are a contingent implicit liability of the German government. If Germany exits the Eurozone, the remaining Eurozone member countries would hardly be willing to repay the German Target credit and the German Bundesbank would lose its Target claims. If a country with a large Target liability (like any of the GIIPS countries) exits the Eurozone and is not able to honour the liability, the remaining Eurozone countries would have to bear the loss according to their share in the ECB's capital. Germany would have to bear a share of 27 percent of the loss. The capital share, however, is endogenous and depends on how many countries leave the Eurozone. If the Eurozone collapsed, the German Bundesbank would lose its entire Target claims (see Homburg 2012, Cour-Thimann 2013).[9] The Target claims are an implicit liability because the German government would have the "moral" obligation to recapitalize the German Bundesbank in

[9] De Grauwe and Ji (2012) do not believe that the German Bundesbank will experience a loss if the Target debtor countries do not repay their Target liabilities. De Grauwe and Ji (2012) argue that all money in the Eurozone is fiat money, which has a value independent of the corresponding national central bank's assets. In contrast, Sinn (2012b, 2013) maintains that the Target claims do indeed pose a financial risk to the German Bundesbank.

case of a loss of the Target claims (Sinn 2013, Kooths and van Roye 2012). Against the background of the large German Target claims, it is conceivable that German government debt would increase (Sinn 2012a, 2012b, 2013).[10]

3. Data

We use monthly data on the German Target balance compiled by the Ifo Institute. We deflate the nominal values by using the Harmonized Index of Consumer Prices (HICP) of the Eurozone. Figure 1 shows the real German Target balance (in prices of 2005) from January 1999 to March 2014.

The real German Target claims have increased from 20 billion euros in January 1999 to 398 billion euros in March 2014. The German Target claims started to increase in the second half of 2007 when tension in the European interbank market emerged for the first time. Credit flows from the core Eurozone countries into the GIIPS countries decreased and the national central banks of the GIIPS countries had to create money to finance imports. Consequently, the Target liabilities of the GIIPS countries and the German Target claims increased (Sinn 2012a). In October 2008 the financial crisis broke out after the collapse of the investment bank Lehman Brothers. The German Target claims increased further in May 2010, when the sovereign debt crisis in the Eurozone emerged, and in July 2011, when Italy and Spain started to face refinancing difficulties in the sovereign debt markets. Since August 2012 the Target claims have gradually declined following Mario Draghi's announcement that "the ECB is ready to do whatever it takes to preserve the euro" (ECB 2012) and the ECB had started to implement new measures to support troubled Eurozone countries (Cour-Thimann

[10] In July 2012 the rating agency Moody's emphasized the contingent liabilities from the Target claims of the German Bundesbank when considering a downgrading of Germany: "The second and interrelated driver of the change in outlook to negative is the increase in contingent liabilities that is associated with even the most benign scenario of a continuation of European leaders' reactive and gradualist approach to policymaking. […] As the largest euro area country, Germany bears a significant share of these contingent liabilities. The contingent liabilities stem from bilateral loans, the EFSF, the European Central Bank (ECB) via the holdings in the Securities Market Programme (SMP) and the Target 2 balances, and – once established – the European Stability Mechanism (ESM)" (Moody's 2012).

2013). In September 2012 the ECB announced the modalities of the Outright Monetary Transaction (OMT) scheme for buying government bonds to restore confidence in the GIIPS countries. In January 2013 repayments from the three-year longer-term refinancing operations (LTRO) started and reduced the outstanding amount of liquidity of the banks in the Eurozone (see Cour-Thimann 2013). In April 2013 the real German Target claims slightly increased again in the wake of Cyprus' refinancing problems.

Since May 2013 the real German Target claims have decreased. The decrease of the German Target claims indicates that private capital flowed out of Germany in the second half of 2012 and particularly in 2013. The GIIPS countries and Cyprus received intergovernmental fiscal rescue credit. The ECB and the rescue fund ESM promised to buy government bonds of countries with refinancing problems. The OMT and the ESM calmed the markets and private capital flowed back into the GIIPS countries and Cyprus (Sinn 2014).

4. Empirical analysis

4.1 Empirical specification

We employ the recursive unit root test proposed by Phillips et al. (2011) to examine explosive behaviour in the real German Target balance. Phillips et al. (2011) use sequential right-tailed augmented Dickey-Fuller (ADF) tests applied to subsamples with increasing observations (PWY test).[11] Our regression model takes the following form:

$$y_t = \alpha + \delta y_{t-1} + \sum_{i=1}^{k} \Phi_i \Delta y_{t-i} + \varepsilon_t, \text{ for } t = 1, \dots, [rT], \tag{1}$$

[11] Homm and Breitung (2012) evaluate alternative tests for explosive behaviour and show that the PWY test is suitable to investigate explosive behaviour. Homm and Breitung (2012) also show that the PWY test is more robust against multiple breaks than the other tests considered. On the size and power properties of the PWY test, see Phillips et al. (2014).

where y_t denotes the real Target balance in period t, α is an intercept, ε_t describes an error term, and k is the lag order. We follow Phillips et al. (2011) and do not include a time trend.[12] In our baseline model, we estimate equation (1) recursively by gradually enlarging the subsamples with one additional observation. r describes the fraction of the total number of observations T we use in each subsample. In the first subsample we employ a fraction $r_0 = 0.2$ of the total number of observations T=183. The window size of the subsamples r_w expands from r_0 to 1. $r_w = r_0$ thus describes the first subsample (37 observations) and $r_w = 1$ describes the total sample (183 observations). We fix the starting point r_1 of each subsample at 0, so that the end point of each subsample r_2 equals r_w and changes from r_0 to 1 (see Phillips et al. 2013). From equation (1) we obtain the ADF test statistic $ADF_0^{r_2}$. $SADF(r_0)$ is the maximum of $ADF_0^{r_2}$ over $r_2 \epsilon [r_0, 1]$.

$$SADF(r_0) = \sup_{r_2 \in [r_0,1]} \{ADF_0^{r_2}\} \tag{2}$$

We test $H_0: \delta = 1$ against the explosive alternative $H_1: \delta > 1$. We reject H_0 when the $SADF(r_0)$ test statistic is larger than the right-tailed critical values provided by Phillips et al. (2014). To select the optimum lag length we use a sequential testing procedure as proposed by Campbell and Perron (1991). Starting with ten lags we exclude lags that do not turn out to be statistically significant until the last included lag is significant at the 5% level and obtain an optimum lag length of four.[13] In our baseline specification we use the same lag length for each

[12] Phillips et al. (2014: 319) explain: "The empirical regression of the right-tailed unit root test given in Diba and Grossman (1988) is R2 [including a constant and a trend]. This regression has both a constant as well as a deterministic trend. Since the presence of either of these two terms is empirically unrealistic when ρ>1, regression R2 is not suitable for right-tailed unit root testing. By contrast, regression R1 [including a constant and no trend] is empirically more realistic and PWY implemented a right-tailed unit root test using this regression formulation."

[13] The Akaike Information Criterion and the Schwarz Bayesian Information Criterion also select an optimum lag length of four. Ng and Perron (1995) show that the lag selection based on sequential tests has less size distortion and similar power compared to information-based rules.

subsample. Inferences do not change when we select the optimum lag length separately for each subsample.

4.2 Results

Table 1 shows the values of the ADF_0^1 and $SADF(r_0)$ test statistics when we use 0 to 10 lags. ADF_0^1 corresponds to the standard ADF test over the full sample. When we apply the standard ADF test, the test statistics show that the real German Target claims have been explosive when using zero to two lags. We can reject the null hypothesis $H_0: \delta = 1$ at the 5% significance level. When using three to ten lags, however, we cannot reject the null hypothesis $H_0: \delta = 1$ (column 2). Standard unit root tests have difficulties in detecting periodically collapsing bubbles (Evans 1991, Phillips et al. 2011). The $SADF(r_0)$ test statistics show that the real German Target claims have been explosive: we can reject the null hypothesis $H_0: \delta = 1$ at the 1% significance level for all lag lengths (column 3).

To determine when the real German Target balance became explosive we follow Phillips et al. (2011) and compare the $ADF_0^{r_2}$ test statistics of the subsamples with their corresponding right-tailed critical values. We calculate the right-tailed critical values of the ADF test for every subsample using the formula $cv = ln(ln(rT))/100$ (Phillips et al. 2011). The critical values range between 0.013 and 0.016 (rT ranges between 37 and 183). The critical values are close to the 4% significance critical value of the standard ADF test provided by Phillips et al. (2011).[14] Our results indicate that the real German Target balance became explosive for the first time in January 2009 and exuberance peaked in June 2012. In March 2013, the real German Target balance was no longer explosive. In April 2013 the real German Target balance became explosive again. Since September 2013 the real German Target balance has not been explosive any more (see Figure 2).

[14] The 4% critical value for the ADF test estimated by Phillips et al. (2011) is 0.01.

4.3 Robustness tests

We have also employed the PWY test using rolling regressions with a fixed window width. We have run each regression on a subsample of $r_W = 40\%$ of the full sample (i.e., 73 observations) and with the initialization date rolling forward. The test based on forward rolling regressions indicates that the real German Target balance became explosive in December 2008.[15] We also find explosive behaviour in the real German Target balance in December 2007. Using rolling regressions, we do not find explosive behaviour in the real German Target balance since January 2013 (see Figure 3).

The PWY test is especially effective for time series with a single explosive period. If a time series includes more than one explosive period, the PWY test may fail to identify the existence of explosive periods (Phillips et al. 2013). To deal with multiple periods of exuberance, Phillips et al. (2013) propose a rolling window regression procedure (PSY test) which uses recursive right-tailed ADF tests with flexible window widths.[16] The PSY test performs a SADF test on backwards expanding subsamples with the end point of each subsample fixed at r_2 and the start point r_1 varies from 0 to $r_2 - r_0$. The backward SADF statistic (BSADF) describes the maximum value of the ADF statistic over the interval from r_1 to r_2.

$$BSADF_{r_2}(r_0) = \sup_{r_1 \in [0, r_2 - r_0]} \{ADF_{r_1}^{r_2}\} \quad (3)$$

To determine the explosive periods we compare the BSADF statistics with the critical values of the SADF test. We use the 95% SADF critical value sequence, which we obtained from

[15] Alternatively we use moving subsamples of 30% and 50% of the whole sample (55 and 92 observations) and obtain very similar results (see also Table 2).
[16] Etienne et al. (2014) apply the PSY test to identify price bubbles in agricultural futures markets.

Monte Carlo simulations with 2,000 replications (Phillips et al. 2013).[17] We find two explosive periods: October 2007 to September 2008 and January 2009 to December 2012 (see Figure 4). The PWY test with increasing observations does not identify the explosive period from October 2007 to September 2008. Our findings are in line with Phillips et al. (2013) who show that the PWY test with increasing observations may fail to find explosive periods in samples with multiple explosive periods.

Table 2 shows the explosive periods which we obtained in our different test procedures.

5. Conclusion

Using the new unit root tests by Phillips et al. (2011) and Phillips et al. (2013) we show that the Target balances of the German Bundesbank became explosive in autumn 2007 and at the beginning of 2009.

In autumn 2007 the interbank market broke down for the first time, the first commercial banks (e.g., Northern Rock) began to teeter, and interbank risk premia for the GIIPS countries rose sharply. The German Target claims increased sharply because credit flows from the core Eurozone countries into the GIIPS countries decreased and the national central banks of the GIIPS countries had to create money to finance imports.

In October 2008 the ECB implemented a full-allotment policy to facilitate bank lending after the outbreak of the financial crisis and the collapse of the interbank market. The ECB provided any amount of credit to the commercial banks when the commercial banks were able to offer adequate collateral. The ECB also reduced the required minimum quality of collaterals from A- to BBB- in autumn 2008 to enable the commercial banks to use the full-

[17] We obtain the critical value for the PSY test using Monte Carlo simulations under the null hypothesis of no explosiveness, assuming normally distributed errors. We generate 2,000 series of random walks and employ the PSY test on each series. We use the 95% quantiles of the test statistics as the 95% critical values.

allotment facility, undercutting market conditions.[18] The commercial banks of the GIIPS countries used the extra refinancing credit to replace the flow of credit from abroad that had financed the current account deficits and to redeem their maturing stocks of interbank credit. The net payment orders from the GIIPS countries to Germany that resulted from the extra refinancing credit induced the exploding Target balances (Sinn and Wollmershäuser 2012, Sinn 2012a, 2012b).

The real German Target claims have decreased since autumn 2012 because intergovernmental fiscal rescue credit was being paid out to the crisis countries and the OMT and the ESM had calmed the markets. Private capital flowed back into the crisis countries. According to our findings the explosive period of the real German Target balance ended at the beginning of 2013.

One issue is whether the decreasing Target claims of the German Bundesbank and the decreasing Target liabilities of the GIIPS countries indicate that governments are pursuing sustainable fiscal policies. When the Target claims of the German Bundesbank decrease, German hidden government debt decreases. The decreasing Target liabilities of the GIIPS countries imply that capital is flowing back to the GIIPS countries. In Spain, however, the new capital was mainly invested in newly issued government bonds (Westermann 2013). Public debt in Spain increased (see Figure 5). Increasing public debt gives rise to new risks to fiscal sustainability in the GIIPS countries.

In March 2013, the European Union and the International Monetary Fund put together a rescue package for Cyprus. The rescue package included a levy on bank deposits. When creditors do not trust in bank deposits in the crisis countries, capital is likely to flee from the crisis countries, and the German Target claims are likely to increase (Boysen-Hogrefe 2013).

[18] Since 2010 the ECB has even suspended a minimum credit rating for debt instruments issued or guaranteed by crisis countries (see Eberl and Weber 2014).

Consequently, in April 2013 the real German Target claims increased again. In May 2013 the real German Target claims continued to decrease.

When fiscal policies in the crisis countries are not sustainable new European rescue packages might be needed. New rescue packages pose a risk to the sustainability of public finances in Germany.

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References

Auerbach, A. J., 2009. Long-term objectives for government debt. FinanzArchiv 65, 472-501.

Bohn, H., 1995. The sustainability of budget deficits in a stochastic economy. Journal of Money, Credit and Banking 27, 257-271.

Bohn, H., 1998. The behavior of U.S. public debt and deficits. Quarterly Journal of Economics 113, 949-963.

Bohn, H., 2007. Are stationarity and cointegration restrictions really necessary for the intertemporal budget constraint? Journal of Monetary Economics 54, 1837-1847.

Bohn, H., 2008. The sustainability of fiscal policy in the United States, in: Neck, R., Sturm, J.-E. (Eds.), Sustainability of Public Debt. MIT Press, Cambridge, pp. 15-49.

Boysen-Hogrefe, J., 2013. Target2-Positionen nähern sich (vorerst) wieder an. Wirtschaftsdienst 93, April 2013.

Campbell, J. Y., Perron, P., 1991. Pitfalls and opportunities: What macroeconomists should know about unit roots, in: Blanchard, O., Fischer, S. (Eds.), NBER Macroeconomics Annual 6. MIT Press, Cambridge, pp. 141-220.

Chen, S.-W., 2014. Testing for fiscal sustainability: New evidence from the G-7 and some European countries. Economic Modelling 37, 1-15.

Cour-Thimann, P., 2013. Target balances and the crisis in the euro area. CESifo Forum 14 (Special Issue).

De Grauwe, P., Ji, Y., 2012. What Germany should fear most is its own fear. An analysis of Target2 and current account imbalances. CEPS Working Document No. 368, September 2012.

Diba, B., Grossman, H. I., 1988. Explosive rational bubbles in stock prices? American Economic Review 78, 520-530.

Eberl, J., Weber, C., 2014. ECB collateral criteria: A narrative database 2001-2013. Ifo Working Paper No. 174, February 2014.

ECB, 2012. Verbatim of the Remarks made by Mario Draghi. Speech by Mario Draghi, President of the European Central Bank at the Global Investment Conference in London, 26 July 2012, http://www.ecb.europa.eu/press/key/date/2012/html/sp120726.en.html (accessed on 11/10/2013).

Etienne, X. L., Scott, H. I., and Garcia, P., 2014. Bubbles in food commodity markets: Four decades of evidence. Journal of International Money and Finance 42, 129-155.

Evans, G. W., 1991. Pitfalls in testing for explosive bubbles in asset prices. American Economic Review 81, 922-930.

Fuller, W. A., 1996. Introduction to Statistical Time Series. John Wiley, New York.

Giammarioli, N., Nickel, C., Rother, P., Vidal, J.-P., 2007. Assessing fiscal soundness: Theory and practice. ECB Occasional Paper Series No. 56, March 2007.

Guerkaynak, R. S., 2008. Econometric tests of asset price bubbles: Taking stock. Journal of Economic Surveys 22, 166-186.

Hamilton, J. D., Flavin, M. A., 1986. On the limitations of government borrowing: A framework for empirical testing. American Economic Review 76, 808-819.

Hartwig Lojsch, D., Rodríguez-Vives, M., Slavik, M., 2011. The size and composition of government debt in the euro area. ECB Occasional Paper Series No. 132, October 2011.

Homburg, S., 2012. Notes on the Target2 dispute. CESifo Forum (Special Issue), 50-54.

Homm, U., Breitung, J., 2012. Testing for speculative bubbles in stock markets: A comparison of alternative methods. Journal of Financial Econometrics 10, 198-231.

Kooths, S., van Roye, B., 2012 Nationale Geldschöpfung im Euroraum. Kieler Diskussionsbeiträge Nr. 508/509, June 2012.

Kremers, J. J. M., 1988. Long-run limits on the US federal debt. Economics Letters 28, 259-262.

Liu, T.-Y., Su, C.-W., Jiang, X.-Z., 2014. Is fiscal policy stationary in China? A regional study by local government. Economic Modelling 37, 492-499.

Moody's, 2012. Moody's changes the outlook to negative on Germany, Netherlands, Luxembourg and affirms Finland's Aaa stable rating. Global Credit Research, 23 July 2012, http://www.moodys.com/research/Moodys-changes-the-outlook-to-negative-on-Germany-Netherlands-Luxembourg--PR_251214?lang=de&cy=ger (accessed on 04/10/2013).

Ng, S., Perron, P., 1995. Unit root tests in ARMA models with data-dependent methods for the selection of the truncation lag. Journal of the American Statistical Association 90, 268-281.

Oksanen, H., 2005. Public pensions and the national accounts and public finance targets. Journal of Pension Economics and Finance 4, 291-312.

Phillips, P.C.B., Wu, Y., Yu, J., 2011. Explosive behavior in the 1990s NASDAQ: When did exuberance escalate asset values? International Economic Review 52, 201-226.

Phillips, P. C. B., Shi, S.-P., Yu, J., 2013. Testing for multiple bubbles: Historical episodes of exuberance and collapse in the S&P 500. Cowles Foundation Discussion Paper No. 1914, September 2013.

Phillips, P. C. B., Shi, S.-P., Yu, J., 2014. Specification sensitivity in right-tailed unit root testing for explosive behavior. Oxford Bulletin of Economics and Statistics 76, 315-333..

Polackova, H., 1998. Contingent government liabilities. World Bank Policy Research Working Paper 1989, October 1998.

Polackova Brixi, H., Schick, A., 2002. Government at Risk – Contingent Liabilities and Fiscal Risk. Oxford University Press, New York.

Potrafke, N., Reischmann, M., 2014. Fiscal transfers and fiscal sustainability. Journal of Money, Credit and Banking, forthcoming.

Ruhkamp, S., 2012. Die Bundesbank fordert von der EZB bessere Sicherheiten. Frankfurter Allgemeine Zeitung, 29 February 2012, http://www.faz.net/aktuell/wirtschaft/schuldenkrise-die-bundesbank-fordert-von-der-ezb-bessere-sicherheiten-11667413.html (accessed on 10/10/2013).

Sinn, H.-W., 2012a. Die Target Falle. Hanser, Munich.

Sinn, H.-W., 2012b. Target losses in case of a euro break-up. CESifo Working Paper No. 3968, October 2012.

Sinn, H.-W., 2013. Die Target-Verluste im Fall des Auseinanderbrechens des Euro – eine Replik auf De Grauwe und Ji. ifo Schnelldienst 1/2013, January 2013.

Sinn, H.-W., 2014. The Euro Trap. Oxford University Press, Oxford.

Sinn, H.-W., Wollmershäuser, T., 2012. Target loans, current account balances and capital flows: the ECB's rescue facility. International Tax and Public Finance 19, 468-508.

Steinkamp, S., Westermann, F., 2012. On Creditor Seniority and Sovereign Bond Prices in Europe. CESifo Working Paper No. 3944, September 2012.

Trehan, B., Walsh, C. E., 1988. Common trends, the government's budget constraint, and revenue smoothing. Journal of Economic Dynamics and Control 12, 425-444.

Westermann, F., 2013. Sind fallende TARGET2-Salden ein Zeichen der Stabilisierung? Ökonomenstimme, 8 February 2013, http://www.oekonomenstimme.org/artikel/2013/02/sind-fallende-target2-salden-ein-zeichen-der-stabilisierung/ (accessed on 04/10/2013).

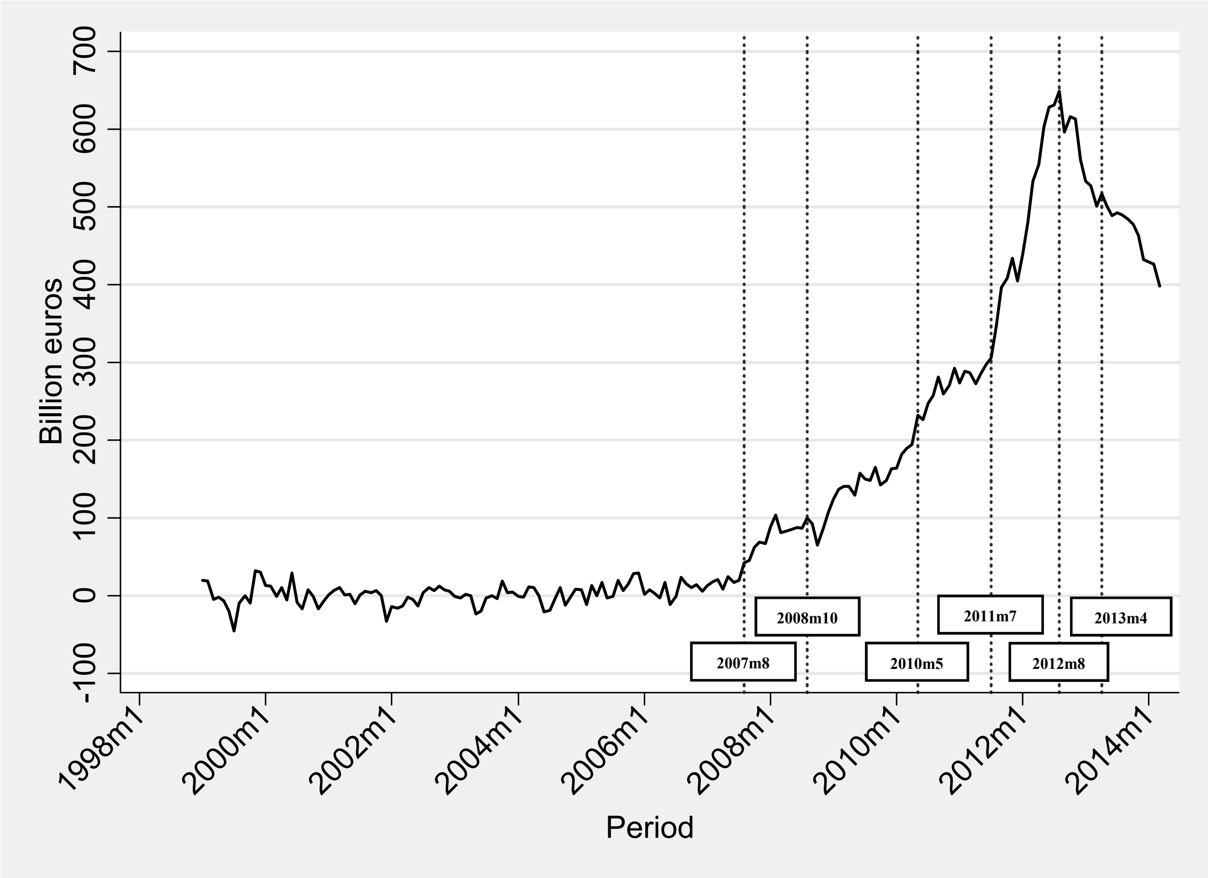
Wickens, M. R., Uctum, M., 1993. The sustainability of current account deficits. Journal of Economic Dynamics and Control 17, 423-441.

Wilcox, D. W., 1989. The sustainability of government deficits: implications of the present-value borrowing constraint. Journal of Money, Credit and Banking 21, 291-306.

Yoon, G., 2012a. War and peace: Explosive U.S. public debt, 1791-2009. Economics Letters 115, 1-3.

Yoon, G., 2012b. Explosive U.S. budget deficit. Economic Modelling 29, 1076-1080.

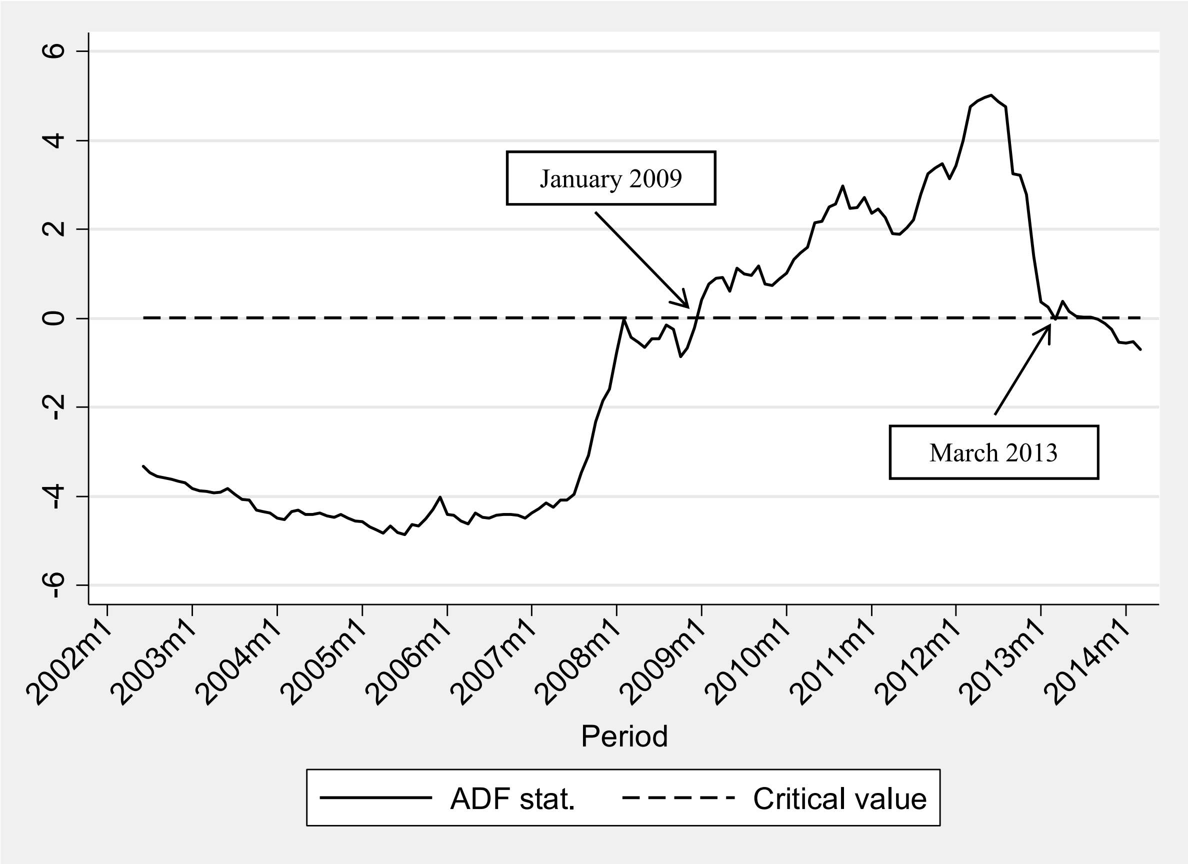
Figure 1: Real German Target balance in billion euros



Note: Positive values of the Target balance describe a Target claim. Real values (in prices of 2005) were calculated with the Harmonized Index of Consumer Prices (HICP) of the euro area.

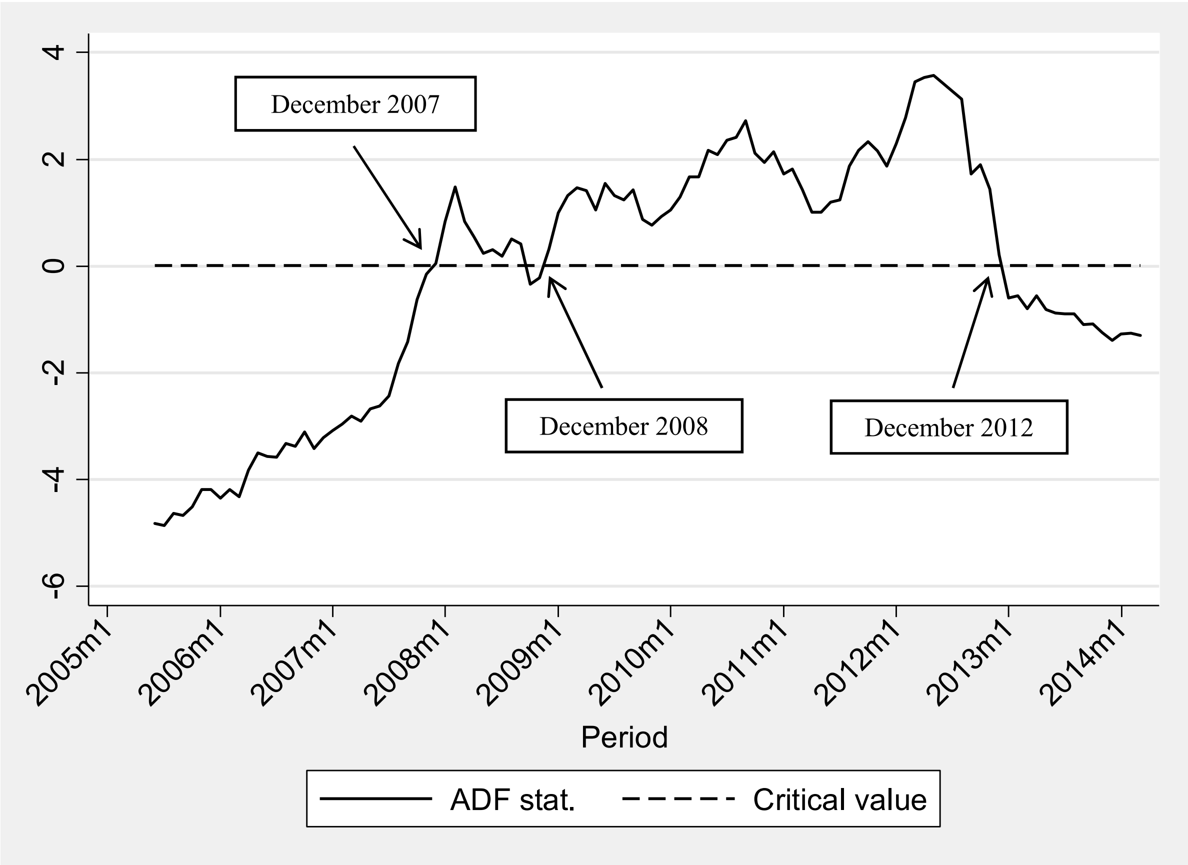
Sources: Ifo Institute, Eurostat, own calculations.

Figure 2: $ADF_0^{r_2}$ test statistics for the real German Target balance



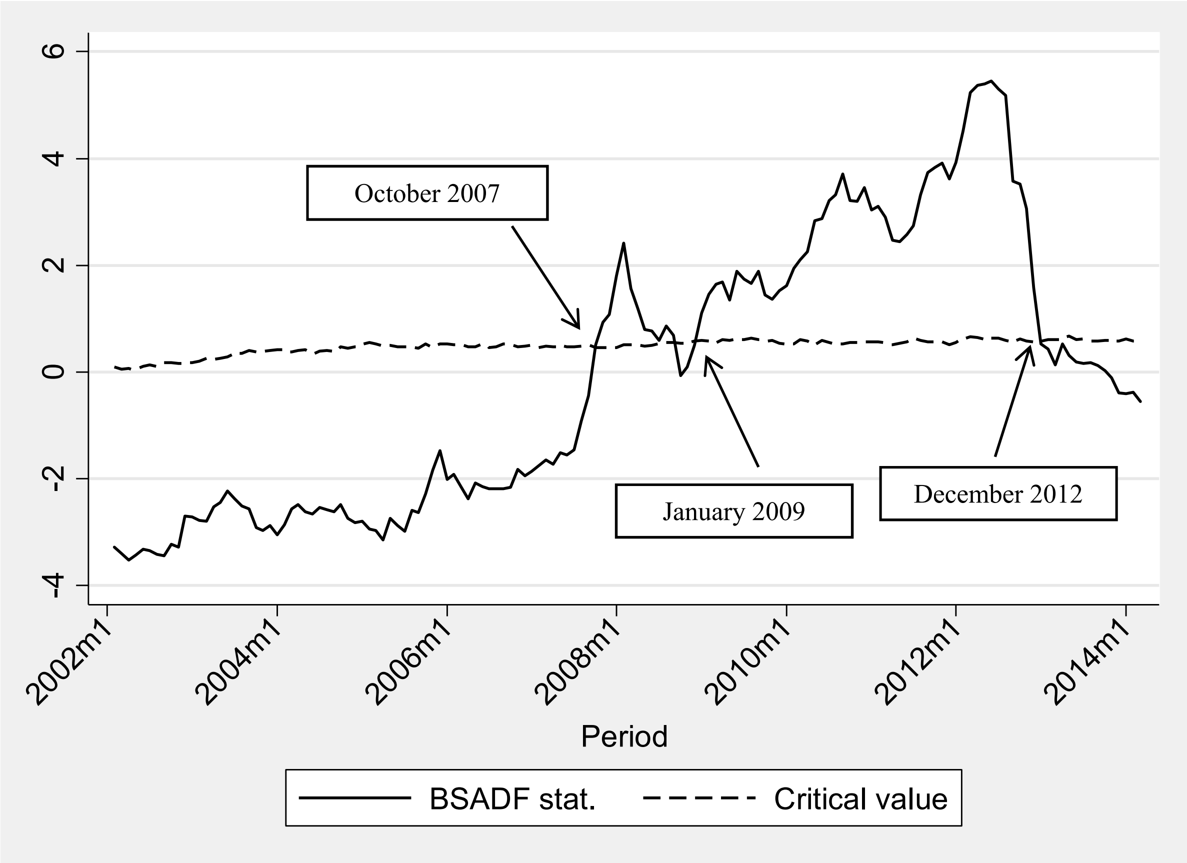
Note: Time series of $ADF_0^{r_2}$ test statistics for the real German Target balance from June 2002 to March 2014. The $ADF_0^{r_2}$ test statistics were obtained from forward recursive regressions ($r_0 = 0.2$) with four lags. The first observation is in January 1999.

Figure 3: $ADF_0^{r_2}$ test statistics for the real German Target balance (rolling regressions)



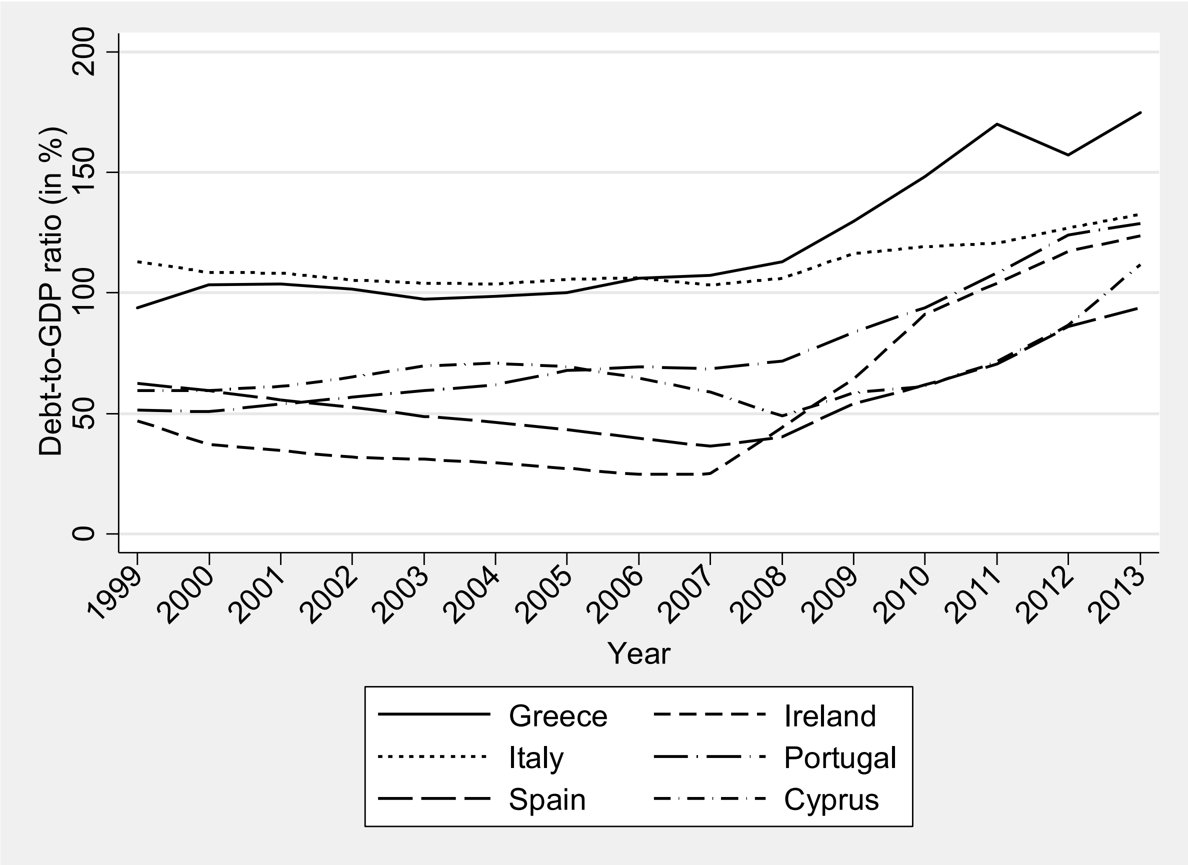
Note: Time series of $ADF_0^{r_2}$ test statistics for the real German Target balance from June 2005 to March 2014. The $ADF_0^{r_2}$ test statistics were obtained from rolling window regressions (73 observations in each regression) with four lags. The first observation is in January 1999.

Figure 4: $BSADF_{r_2}(r_0)$ test statistics for the real German Target balance



Note: Time series of $BSADF_{r_2}(r_0)$ test statistics for the real German Target balance from February 2002 to March 2014. The $BSADF_{r_2}(r_0)$ test statistics were obtained from rolling window regressions with flexible window widths and four lags. The first observation is in January 1999.

Figure 5: Debt-to-GDP ratios in the GIIPS countries and Cyprus, 1999-2013



Source: Eurostat, own calculations.

Table 1: $\mathbf{ADF_0^1}$ and $\boldsymbol{SADF(r_0)}$ test statistics for the real German Target balance

(1)	**(2)**	**(3)**
Lags	**Test statistics**	
	ADF_0^1	$SADF(r_0)$
10	-0.643	5.251***
9	-0.844	4.671***
8	-0.714	4.368***
7	-0.916	4.328***
6	-0.980	5.076***
5	-0.723	5.400***
4	-0.698	5.014***
3	-0.662	4.910***
2	-0.210**	5.908***
1	-0.003**	5.591***
0	0.004**	4.716***
Upper tail critical values		
1%	0.62	1.86
5%	-0.07	1.30
10%	-0.42	0.97

Note: $\mathbf{ADF_0^1}$ and $\boldsymbol{SADF(r_0)}$ test statistics for the German real Target balance for lag orders 0-10. The table also reports the corresponding critical values of the $\mathbf{ADF_0^1}$ test taken from Fuller (1996) for 250 observations and of the $\boldsymbol{SADF(r_0)}$ test taken from Phillips et al. (2013) for 200 observations. The sample period is January 1999-March 2014. *** and ** denote test statistics at the 1% and 5% significance level.

Table 2: Explosive periods of the real German Target balance

(1)	(2)	(3)	(4)	(5)
PWY test	**PWY test (rolling regressions)**			**PSY test**
	30%	40%	50%	
	2007m11-2008m9	2007m12-2008m9	2008m1-2008m9	2007m10-2008m9
2009m1-2013m2	2008m12-2012m11	2008m12-2012m12	2008m12-2012m12	2009m1-2012m12
2013m4-2013m8				

Note: Explosive periods of the real German Target balance using four lags. Column (2) shows the result of the recursive PWY test with increasing observations. Columns (3)-(5) show the results for the PWY test with rolling window regressions with fixed window widths of 30%, 40% and 50% of the whole sample (55, 73 and 92 observations in each regression). Column (6) shows the results for the PSY test with rolling window regressions with flexible window widths.

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