Why does bank credit not drive money in Germany (any more)? *

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Abstract

Since the turn of the millennium a gap between credit growth and GDP growth has emerged in Germany. The gap widens with surpluses of the German trade balance to other euro area countries and becomes negative, when surpluses of the trade balance contract. This phenomenon is accompanied by a new pattern of money growth, which is not driven by domestic credit of banks any more but by their net foreign assets. German nonfinancial corporations have rising equity ratios and provide other sectors with funds on a net basis. Moreover, their deposits with German banks have grown at a much stronger pace than their loans. We suspect that German membership in the European monetary union is an important explanation of the changing behavior in the real and financial sector and show the substitution between export cash-flows and domestic credit theoretically in a two-country model of post-Keynesian type, in which the two countries use a common currency.

Keywords: credit creation, non-financial corporations, retained profits, monetary union, German economy

1   Introduction

The recent financial crisis and the subsequent Great Recession resurrected public and professional interest in fundamental questions on the money system. Over the Great Moderation period these concerns took a back seat to a view of monetary policy conducted exclusively by changing interest rates. In academic circles, money and credit aggregates moved away from mainstream economics. Taylor-like rules became the standard approach to model central bank behaviour in the 1990s (see, for example, Svensson 1997), while money and credit aggregates disappeared from the bulk of monetary policy models (see, for example, Woodford 2003) despite the fact that banks create the major part of money in our financial system. Focusing on money and credit aggregates challenged central banks as standard money demand models had difficulties in explaining monetary dynamics on the basis of developments in the traditional determinants, such as output, prices and interest rates. However, a central bank cannot ignore the information from monetary developments in its assessment and policy considerations, though the relevant debate is rather how they should do so.

Besides the dominant neo-classical and New Keynesian mainstream, the post-Keynesian research paradigm allows for a comprehensive modeling of monetary variables in the stock-flow consistent framework. Godley and Lavoie (2007) provide a compendium to these modeling techniques. Beyond the post-Keynesian school of thought, Werner (1997, 2005) was also a distinctive exception in the pre-crisis period. As already claimed long ago by Schumpeter (1917(1956)) Werner repeatedly stresses the fundamental importance of credit creation process and its institutional setup for sustainable growth and financial stability. The financial crisis led to a critical assessment of the current monetary order, which includes a revival of the Chicago Plan (see Benes and Kumhof 2012) and 100 percent reserves as proposed by Fisher (1936). Others try to formulate alternative approaches for considering the modern money system without disregarding its operational characteristics, see for example Roche (2011).

The focus of our analysis is less radical. The starting puzzle is the fact that German credit does not drive German money and that there is a gap between German credit growth and GDP growth. German enterprises were traditionally known for their strong bank dependence and low equity ratios and not surprisingly, bank

credit to the nonfinancial corporate sector was the main driving force of German money growth. Since the turn of the millenium this equity ratios started growing steadily and deposits of nonfinancial corporations increased strongly in relation to bank credit. Current account surpluses, in particular, trade account surpluses, increased, while growth of net foreign assets at German banks increased at an even stronger pace. A major destination of both, the real sector and the financial flows, were other EMU countries. German enterprises provided other sectors with funds on a net basis as their surplus funds in the non-financial corporation sector increased, i.e. the increase of gross investment fell short of the sum of retained earnings and depreciation.[1] Internal financing dominated, while a changing structure of external financing contributed to waning traditional bank credit only to a minor extent.[2]

The driving forces of German money changed. It is not driven by domestic bank credit any more, but by foreign credit. Accordingly, net foreign assets are now the main counterpart of the German contribution to euro area money.

In our work we attempt an inspection of driving factors for German low credit growth in an alternative monetary framework. Despite the importance of export orientation there may be another important reason: German membership in the European monetary union by itself. An unique combination of export competitiveness and a membership in a large monetary union form the frame (common currency, no exchange rates) where domestic credit is partly substituted by current account surpluses surpluses. Hence, in some sense we confirm the conclusions of Koo (2008), who suspects that Germany used its high export performacne to escape a balance sheet recession in the beginning of the millenium. In addition, we point out how operational characteristics of a monetary union can change the credit creation dynamics in the corresponding countries. The rest of the paper is organized as follows: Section 2 establishes the "Puzzle" of German credit growth by identifying a credit gap, which "lacks" respective the observed GDP expansion rate. Section 3 attempts to explain the gap by relating it to German trade

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[1]The main recipients of these funds were German enterprises foreign affiliates, which covered part of their funding needs using the equity capital provided by their parent companies, see Bundesbank (2012).

[2]While the share of market-based external financing has remained virtually unchanged, credit to the corporate sector has gained importance during the periods of economic weakness in the years 2001-03 and 2008-09, see Bundesbank (2012).

surpluses with the Eurozone countries. The next section reconsiders our findings from the European perspective, indicating that the "closing" of German credit gap was, however, hardly possible without participation of the German banking system. Section 5 outlines the substitution mechanics between export cash-flows and domestic credit theoretically in a simple two-country model of post-Keynesian type. The final section concludes.

2   The Puzzle of German Credit Growth

In the last two decades it is hardly possible to find any stable correlations between credit aggregates and aggregated measures of economic activity like GDP in Germany. To illustrate these empirical findings in more detail we compute the results of Granger causality test as well as simple correlations between the growth rates of nominal German GDP and nominal bank credit volume to non-bank firms, see upper plot of Figure 1. The statistics are calculated for different subsamples of the last three decades, the results are displayed in Table 1. In the decade before the German reunification credit growth Granger causes GDP growth and the correlation between them is positive. In the first decade after the reunification there is no significant link between credit and GDP growth in terms of Granger causality. During the last decade the direction of Granger causality changes and the correlation becomes negative.

However, a stable positive relationship between credit and output is crucial for estimating any credit demand or supply equation. Now our intention is to decompose the German credit growth and to extract a component, which is highly correlated with the production dynamics. Finally we demonstrate that the proposed decomposition works well before the reunification and in the first decade after it but fails in the last one.

For this purpose we adopt the framework proposed by Werner (1997) and explained in more detail in Werner (2005), called the quantity theorem of disaggregated credit. Werner builds his analysis on the well-known quantity theory of money, arguing that an increase of output, expressed in terms of number and value of transactions in an economy in a given period (Q), can only be achieved by the
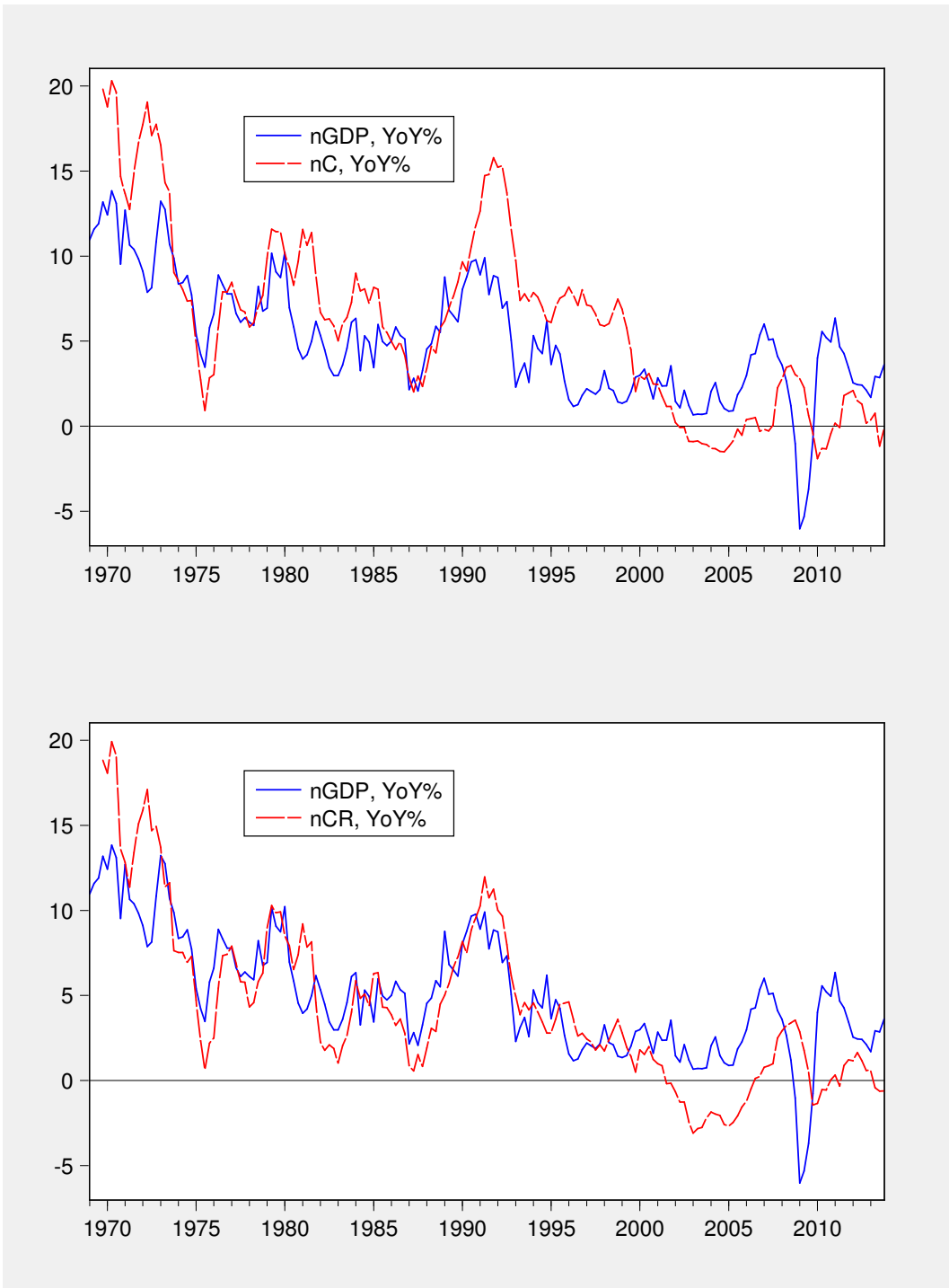
Figure 1: Nominal GDP growth (nGDP), nominal bank credit (for non-banks, nC) growth, productive credit growth (nCR) in Germany, yoy-rates (notional stocks used to calculate credit growth rates). Source: Deutsche Bundesbank.

Period	Granger causality		Correlation
	C → GDP	GDP → C	
1980 - 1990	**0.04**	0.59	0.55
1991 - 2001	0.94	0.56	0.73
2002 - 2012	0.66	**0.09**	-0.25

Table 1: p-values of Granger causality tests (columns 2, 3) and estimated correlations between nonimal GDP and nominal bank credit (for non-bank firms) growth, all data in yoy-rates. All test are computed in EViews, Granger tests are performed with 4 lags.

corresponding expansion of money stock in circulation (M),

$$MV = PQ, \tag{1}$$

where V is the money velocity and P the price level. However, the traditional quantity theory exposed a rather bad performance in terms of the money velocity in the past. Economic theory postulates a constant money velocity, but this is empirically not the case, since a trending money velocity was required in order to balance two sides of the quantity equation.

Werner (1997, 2005) claims, however, that the quantity equation in its emirical form with the gross domestic product as output measure actually is not an equation since the money stock in circulation is also used in transactions, which are not measured by the GDP, for example, most of financial transactions. For this reason, if the number of non-GDP transactions increases, for example due to a financial market boom, the estimated money velocity has to decrease, otherwise the equation is not balanced. In order to balance the equation we should use a money measure that is only used for GDP transactions, however no such measure exists because it is hardly possible to differentiate between deposits for GDP and deposits for non-GDP purposes. Hence, Werner proposes to change the balance sheet side considering credit aggregates. This change is appropriate since banks expand the size of both sides of their balance sheets by granting loans and creating deposits simultaneously. However, only bank loans or other form of bank investments are considered, because investments by non-bank institutions do not constitute creation of new means of payments but only a redistribution of available means

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of payments in the economy. Typically banks are required to report information about borrowers if they lend. This information could be used to discriminate between credit aggregates for different purposes, thus enabling us to approximate credit for GDP and non-GDP uses.

First, Werner (1997) formulates the Quantity Equation in terms all economic transactions

$$CV = PQ, \tag{2}$$

where C, V, P and Q denote credit, money velocity, price level and the total number of transactions respectively. Second, GDP-based and non-GDP transactions are separated, so that Q is replaced by real GDP Y. However, credit, money velocity and price level are replaced as well, linking new measures to the GDP

$$C^Y V^Y = P^Y Y, \tag{3}$$

with C^Y, V^Y and P^Y denoting credit for GDP-based transactions, money velocity in the real economy and finally the GDP deflator. Assuming a constant money velocity and considering growth rates instead of levels the equation can be simplified considerably as follows

$$\Delta c_t^Y = \Delta y_t^N, \tag{4}$$

where y_t^N and c_t^Y are nominal GDP and credit for GDP transactions in logs respectively. Since nominal GDP series are available for most countries, the main task reduces to finding appropriate measures of credit aggregate for productive purposes.

Now we apply the framework of the quantity theorem of disaggregated credit to study the credit growth in Germany. First, a measure of credit aggregate for productive purposes has to be found. An obvious choice for the productive credit aggregate is bank credit granted to non-bank firms. Since housing credit and mortgages of private households are often used for non-GDP transactions like buying land or already existing real estate, we do not include them in our productive credit measure. Furthermore, consumption credit usually played only a minor role in Germany, so that we do not include it until now as well. The results turned out to be robust also after including consumption credit.

Growth rates of nominal GDP and bank credit for non-financial firms are plot-

ted in the upper subplot of Figure 1. We see that even though the one-to-one relationship between credit and production growth seems to be fulfilled, this is a very rough approximation, since rather large and persistent deviations from the postulated equations are observed. In particular, there are two subsequent periods, where we observe a significant gap between the credit and GDP growth: (a) the decade after the German reunification as well as (b) the subsequent decade which is mainly characterized by the existence and functioning of the European Monetary Union.

In order to refine the productive credit measure we consider also bank credit for non-banks subject to different industry branches. The overall series of bank credit for non-banks exhibits a rising GDP-to-credit ratio. It turns out that this is mainly due to the credit granted to the business services branch. The ratio of credit for business services firms to its own value added is strongly rising until the last decade. The branch of financial services (non-banks) features very high and erratic credit growth rates as well. Hereupon we remove these two components from the overall bank credit to non-banks and compare it with the GDP growth rates again, see the lower plot in Figure 1. It is easy to see that the approximation resemble the GDP growth between 1973 and 2000 very closely. However, the subtraction of financial and business services credit from the total bank credit volume for non-bank firms enlarges the gap between the productive credit series and GDP growth even more. Moreover, the new credit growth series keeps its negative correlation with the GDP growth during the Great Recession and the subsequent recovery.

In addition, we performed some robustness checks by testing whether other liability components of non-banks are sufficient to close the gap between credit and production growth in the last decade. We considered the credit volumes of non-banks from the German flow of funds, which include credit granted to non-banks from abroad as well as credit granted by other non-banks. Further, bonds issued by non-banks as well as their total liabilities were considered. However, none of these modifications turned out to be sufficient to close the gap between nominal GDP and liability growth of non-banks - the shape of the series remained qualitatively the same in all cases.

3 The Ebb and Flow of Retained Profits

There seems to be a gap between credit growth of non-bank firms and German GDP growth. A possible solution is foreign credit, which can drive domestic money growth. Foreign credit, however, does not provide financing for domestic firms, but financing of those who purchase goods and services from domestic firms. We rewrite the equation in the following way

$$\Delta c_t^Y + g_t = \Delta y_t^N, \tag{5}$$

where g_t denotes the credit gap. Indeed if we consider the consolidated balance sheet of the German banking system and compute the quotient between the volume of all bank deposits of non-bank firms and bank credit granted to non-bank firms, the corresponding picture supports the view stated in Equation 5. As shown in Figure 2 the deposit volume expanded with a higher rate than the credit borrowed by non-bank firms since the start of the millenium. Consequently there was no evident shortage of money, which could hinder the expansion of economic activity.

At the turn of the millenium a continuing improvement of the German export performance relative to the other member states was under way. Many argue that the widening trade and current account surpluses reflect structural reforms initiated in the early 2000s, which boosted German competitiveness. Surpluses, however, in particular grew to Southern member states of EMU such as Greece, Portugal, Italy and Spain. Furthermore, money creation in Germany changed considerably. This suggests that German membership in the European monetary union was also important. While domestic credit to non-banks was the driving force of money creation in Germany before the monetary union, net foreign assets became the dominating counterpart of the German contribution to money in the euro area. In Figure 3 (upper plot) we present money growth in Germany and the contribution of the main counterparts to money growth from 1990 to 2012.[3] Figure 3 gives evidence that the pattern of money creation changed considerably with the start of the monetary union. Furthermore, an analysis of national contributions

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[3] A direct comparison of the two periods is difficult due to statistical breaks and changes in the definition of money and to the fact that currency as part of money cannot be nationally earmarked in a monetary union any more. Furthermore, net foreign assets in Germany include interbank claims in the euro area and also TARGET-balances of the Bundesbank, which did not exist before monetary union.

to money and its counterparts in the euro area shows that credit creation has increasingly shifted to southern European countries, namely to Spain, before the outbreak of the crisis (see Deutsche Bundesbank 2013, p. 51).

Thus if current account and trade balances are widening, the demand for domestic credit is expected to decrease. The credit gap g_t defined in Equation 5 is positive and the corresponding credit aggregates tend to contract given some GDP level. This is what we observe in the upper plot of Figure 4. Absolute seasonal differences of German trade balances relative to the European Union (where the Eurozone constitutes the bulk of dynamics and other countries are closely related to it) are fitting the credit gap quite well.[4] The resemblance is especially close at the trough of the Great Recession. Here the credit gap becomes negative, the trade balance contracts rapidly and more domestic credit is demanded in order to compensate for the shortage of inflowing liquidity. It is worth mentioning why we have to differentiate the trade balance. Since the whole economy is expanding, only a growing trade balance can compensate the positive credit gap. Consequently if trade balance stops widening, credit contraction has to revert providing necessary funds for the expanding economy. This is what we observe just before the outbreak of the financial crisis.

Next we check whether the credit gap g_t is only resembled by current account and trade imbalance with European countries. In the lower plot of Figure 4 absolute seasonal differences of German trade balance relative to all non-EU countries and the credit gap are compared. A visual inspection shows that the comovement is not as pronounced as in the EU case. Even more striking are the corresponding correlations, computed for 2000-2013 period: 0.78 for the upper plot and 0.20 for the lower plot. There is virtually no significant correlation between the credit gap and the trade balance dynamics relative to the non-EU countries.

We can draw the following conclusion: if a competitive country is a member in a monetary union and is running a significant current account surplus with other members of the monetary union, then differences between domestic and foreign credit creation can more easily fade away. If export revenues are strongly increasing, non-financial firms finance themselves via retained profits which tend to

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[4]We amalgamed the Eurozone and non-EMU EU-countries into one group, since the Eurozone dynamics dominates in absolute terms and the trade balance with the non-EMU part is closely correlated with the EMU. The non-EMU part of the European Union has also strong financial links with the Eurozone.

substitute domestic credit. If export revenues sharply decrease due, for example, to some unexpected transitory shock, the firms demand more domestic credit in order to bridge the recession. In such an economy the credit dynamics is supposed to be anticyclical relative to GDP, increasing retained profits correspond with decreasing domestic credit demand. This is in contrast to the standard case where increasing domestic credit creation stimulates production expansion and retained profits.

4   Money Creation in the EMU Perspective

According to the evidence German export firms demand less domestic credit and finance higher production from retained profits, when export revenues are high, at least inside a monetary union. The missing link between GDP growth and credit growth seem to be changes in retained profits, but this is not the end of the story, because also retained profits ultimately need a source of financing. Export revenues of German firms are import expenditures abroad, which are financed by foreign credit to foreign nonbanks. The funding for the foreign credit business increasingly took place abroad, but inside EMU. An important reason for the increase of cross-border funding of European banks was the start of the monetary union, or presumably and more precisely, the misinterpretation of what a monetary union means for the pricing of credit risk. We suspect that an underpricing of credit risk unduly eased financing conditions and fostered cross-border flows. Thereby, foreign banks could fund themselves in the converging EMU financial market, for example, by interbank borrowing or by issuing bank securities.[5]

Financing conditions considerably eased with the start of the monetary union in EMU countries, because there was no exchange rate risk any more inside EMU and market participants also decreased their pricing of credit risk, last but not least, because they did not believe in the no bail-out clause of the EU treaty. This expectation, however, can change rapidly. Two examples support this evidence. For short-term funding in the euro area the spreads between rates for collateralized and uncollateralized interbank transactions (as measured, for example, by Euribor

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[5]Not only banks but also special purpose vehicles (SPVs) funded themselves abroad. When the access of SPVs to capital markets deteriorated, banks bought the securities issued by "their" SPVs and thereby assumed the risk formerly held off balance sheet.

- Eurepo 3M-spreads) is a proxy for the price of credit risk, which banks consider as a benchmark. The average spread measured in basis points remained in single digits pre-crisis and presumably, banks only added very small margins in order to price the individual credit risk of their counterparties. During the crisis, however, the spread swiftly reached three digit numbers and many banks drastically decreased credit limits to counterparties indicating that this funding source not only dried up due to lower demand at higher rates but also due to credit rationing. Though the average spread has declined again, market participants may expect that spreads will never return to their low pre-crisis level.

Second, spreads of sovereign bond yields serve as a benchmark for longer term financing in the financial market and for indicating sovereign credit risk. The spreads of Italian, Portuguese and Spanish 10-year-government bond yields to German bunds, for example, averaged at about 400 basis points in the mid-1990s[6], before they rapidly converged to a much lower level in the run-up to the monetary union. During monetary union, but pre-crisis, a period which in retrospective is often called the honey moon, the spreads averaged at lower double digit numbers until the collapse of Lehman in September 2008. During the European sovereign debt crisis they increased rapidly to levels of the mid-1990s again or even higher. Starting from mid 2012 spreads declined rapidly within a few months, which some relate to Draghi's famous "whatever it takes" speech and the following OMT-announcement of the European Central Bank, though spreads in retail interest rates remain elevated compared to Germany and other so called "core countries".

Given the fact that the pricing of credit risk in the euro area is drastically re-adjusted whenever market sentiments change, the market for pricing credit risk may not always efficiently deal with information and reflect it in the price immediately.[7]

The behavior of banks in Germany also changed with the developments of financing conditions in the monetary union. As shown in Figure 3 (lower plot) their net foreign assets to abroad and denominated in domestic currency surged to above 1 trillion euro in the early 2000s, while ranging between 100 and 200 billion

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[6]Averages of daily spreads from mid-1994 to mid-1996.

[7]Behavioral finance has supplemented the efficient market hypothesis and recognizes that individuals neither are able to process the full set of information at the same time nor evaluate it systematically and rationally as assumed by the extremely strict assumptions of a homo economicus, see Barberis and Thaler (2003) for a survey.

euro during the decade before the start of the monetary union. The development was mainly driven by increasing assets towards EMU countries, in particular Southern European countries, though the latest developments are heavily influenced by changes in liabilities to Britain. Net foreign assets denominated in Euro have halved again since they peaked in 2008. The crisis has heightened the risk awareness of banks and suddenly changed financing conditions. Accumulated trade surpluses, however, continue, because funding from the Eurosystem partly substituted the lack of funding from sources in the private sector. Large and diverging TARGET balances at national central banks in the Eurosystem are a symptom of this asymmetric provision of central bank liquidity in the Eurosystem and signal an alternative reaction to sudden stops of private capital inflows than sharp exchange rate depreciations.[8]

We conclude that the start of the monetary union greatly facilitated financing in EMU countries, which fostered domestic credit booms in some of them and export booms in others, namely in Germany. This contributed to the gap between GDP growth and credit growth in Germany. Credit of foreign banks to foreign non-banks creates money that finances trade between Germany and its export destinations and that eventually increases wealth of exporting firms. Assuming that (at least part of) the wealth is held on accounts at banks in Germany, the banks receive additional funding via the export revenues of their customers, which they can invest abroad. Pre-crisis, increasing net foreign assets of banks in Germany have refinanced foreign credit expansion and have contributed to the easing of financing conditions. This has been partly substituted by public cross border claims, i.e. TARGET balances of the Bundesbank, during the crisis. Generally speaking, credit still creates money, though it is not necessarily domestic credit that creates

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[8]The start of the monetary union is just one of many factors influencing structural changes in the banking sector. In an environment of decreasing levels of interest rates in developed economies, stronger de-regulation and higher competition in the financial sector, the traditional sources of banks' earnings from interest business, became unsatisfactory and were gradually substituted by banks' earnings from commission business and own account trading. The start of the monetary union offered new profit opportunities of banks that were increasingly put under pressure from these structural developments. Additionally, some special developments at Landesbanks, such as the lifting of state guarantees, which eventually took place in mid 2005, for ensuring the institutions' solvency (Anstaltslast) and for indemnifying depositors (Gewährträgerhaftung) triggered large scale issuance of bank securities shortly before and a corresponding search for yield for the new funding, which was increasingly taking place in EMU countries.

	North HHs	North Govt.	North CB	Σ^N
Deposits	$+H_h^N$		$-H^N$	0
Bills	$+B_h^N$	$-B^N$	$+B_{cb}^N$	0
Wealth	$-V_h^N$	$+V_g^N$	$+NFA^N$	0
Σ	0	0	0	0

Table 2: Northern part of the balance sheet matrix. Southern part can be derived by exchanging the index.

the domestic, i.e. the national contribution to money in the euro area. The easing of financing conditions, higher net foreign assets of banks in Germany and stronger foreign credit creation reinforced each other. Eventually, it should be kept in mind that the strongly changing price for credit risk lies at the heart of these developments and could be based on a misperception of the financial sector that yet has not found a fundamental value.

5 A Small Two-Country Model

The goal of the current section is to demonstrate how the negative short-run link between output and credit in the presence of export trade surpluses outlined above can be resembled even in the context of a simplistic stock-flow consistent model. For this purpose we adopt a slightly changed version of the model OPEN introduced by Godley and Lavoie (2007) in their section 6.6. The model OPEN comprises four economic sectors and two countries. The sectors are households, producers, government and central bank. The countries trade with each other. However, due to the assumption of two different currencies the central banks hold gold reserves which enable import transactions. If the trade is not balanced, the country with trade deficit loses gold reserves and the one with trade surpluses accumulates them. The unbalanced trade can continue as long as the central bank of the deficit country is willing or able to provide gold reserves for import transactions.

For our purposes we abandon the assumption of two currencies, but maintain the framework of two countries with two central banks, which allows to mimic the institutional setup of the Eurozone to some extent. Bearing in mind that in our simplistic model the domestic banking system is amalgamated with the

central bank, the trade deficits are financed by incurring net foreign liabilities in domestic currency. Inside the model this process can continue ad infinitum while the system approaches a non-stationary steady-state, since no endogenous stabilising mechanisms are considered forcing both countries towards a balanced trade path. Cross border transactions between the two countries are settled by changes in net foreign positions at their balance sheets. In contrast to gold, which is the international means of payments in section 6.6 of Godley and Lavoie (2007), increasing net foreign assets of the trade surplus country are financial assets with a liability as their counterpart and are not limited by physical quantity. We outline the main equations and features of the model. For a more detailed treatment of post-keynesian models Godley and Lavoie (2007) is probably the best reference available currently.

First, consider the balance sheet matrix of the model, which is presented in Table 2. The balance sheet matrix comprises of a nothern and southern part, however, due to their analogy and in order to save the space only the northern part is put into the table. The households allocate their wealth in non-interest-bearing deposits and interest-bearing bills. The bills are issued by the government. The central bank purchases government bills and injects high powered money (assumed in forms of deposits) into the economy. If the corresponding country runs trade surpluses, the central bank accumulates net foreign assets. In case of trade deficit net foreign liabilities are accumulated. Finally, the household wealth is the sum of government bills and net foreign assets.

Table 3 contains the transaction matrix for the northern country, however, all columns sum to zero only if the southern part is considered as well. In particular, northern exports and imports correspond to southern imports and exports respectively. The same holds for net foreign assets and liabilities. Government expenditures constitute the core of the model and correspond to autonomous consumption in models without government sector, since $G = 0$ implies that all other model variables converge to zero as well. The government finances expenditures primarly by taxes. The recurrent fiscal deficits are firstly covered by selling bills to households. If households do not demand the required amount of bills, they will be purchased by the central bank. This is how new money is injected into monetary circuit of the model. If the government runs fiscal surpluses or households demand more bills than needed, the government liabilities to the central bank are settled

	HHs	Prod.	Govt.	CB	Σ^N
Consumption	$-C^N$	$+C^N$			0
Govt. Exp.		$+G^N$	$-G^N$		0
North Exports		$+X^N$			$+X^N$
South Exports		$-M^N$			$-M^N$
GDP	$+Y^N$	$-Y^N$			0
Int. Payments	$+r_{-1}B^N_{h-1}$		$-r_{-1}B^N_{-1}$	$+r_{-1}B^N_{cb-1}$	0
CB Profits			$+r_{-1}B^N_{cb-1}$	$-r_{-1}B^N_{cb-1}$	0
Taxes	$-T^N$		$+T^N$		0
Δ Deposits	$-\Delta H^N_h$			$+\Delta H^N$	0
Δ Bills	$-\Delta B^N_h$		$+\Delta B^N$	$-\Delta B^N_{cb}$	0
ΔNFA				$-\Delta NFA^N$	$-\Delta NFA^N$
Σ	0	0	0	0	0

Table 3: Northern part of the transaction matrix. Southern part can be derived by exchanging the index and rearranging exports and imports.

to that extent. This is how the money is brought out of the circuit and destructed.

All model equations are adopted from Godley and Lavoie (2007) and are documented in the appendix. We need only four behavioral equation for the model closure: consumption function, import and tax function and portfolio decision function. The households hold non-interest-bearing deposits because of the transaction motive. In order to keep the setup as simple as possible the north and the south posses equal model coefficients but the import prospensities:

$$M^i = \mu^i Y^i. \tag{6}$$

If $\mu^N = \mu^S$, the trade is balanced and the system reaches a stationary steady-state with zero fiscal deficit and zero level of net foreign assets and liabilities, since

$$\Delta NFA^N = X^N - M^N. \tag{7}$$

If $\mu^N > \mu^S$, the north runs trade and fiscal surpluses, which is offset by equal trade and fiscal deficits in the south, since government expenditures are exogenous. Due to fiscal surplus the northern government pays back its debt to the central bank. First, the balance sheet size of the northern central bank remains constant since the diminishing stock of bills on the assets side is offset by the growing stock of net foreign assets, see Figure 7. An asset swap takes place so that the balance

sheet size of the central bank in the north remains stationary in the non-stationary steady-state. If the stock of bills is depleted on the asset side, increasing net foreign assets and increasing government deposits, which are negative holdings of bills at the central bank, lead to balance sheet growth.

Surpluses of the north correspond to deficits in the south financed by issuing new central bank money. Since the stock of bills owned by households converges to a constant level, the central bank purchases additional bills permanently and the asset side of its balance sheet expands. On the liabilities side the growing stock of bills is compensated by growing net foreign liabilities (Figure 7) while the stock of money remains stationary. Hence, the non-stationary steady-state in the south leads to non-stationary balance sheet growth of the banking system.

Our simulation exercise starts from a stationary steady-state, where all co-efficient in the north equals to the southern coefficients. Since the government expenditures levels are also identical, all model variables converges to same levels in the north and in the south, see Figures 5 and 6 before 2000. After 2000 the import prospensity of the south, μ_S, is increased carrying the system to a new non-stationary steady-state. However, all model variables exept the stock of government bills (B^i), the stock of government bills purchased by the central bank (B_{cb}^i) and the net foreign assets (NFA^i) remain stationary, see Figures 5 and 6 between 2000 and 2006. Then the government expenditures in the south are ex-ogenously reduced for a period of two years, while the government expenditures in the north remain constant. Subsequently this shock causes transitory output losses in both countries. The households also reduce their holdings of bills and non-interest-bearing deposits adjusting the lower GDP level. Nevertheless, the government debt in the north reacts in the exactly opposite way - it is increasing. The reason for this negative relation between government indebtness and output in the north is the exogeneity of government expenditure. Since G^N remains constant while export revenues are falling due to weaker import demand in the south, the northern fiscal balance switches into negative area and the government is forced to finance its expenditures by issuing new bills.

We bear in mind that the central bank can be considered as a proxy for the whole domestic banking system in our simplistic monetary circiut. It is also rea-sonable to view the government and producers as including also all private firms which have access to credit via government bills, where the taxes partly play the

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role of retained profits. Under these assumption the analogy of our simple model outcome to the empircal findings stated above becomes obvious. Since the northern firms expect the demand shock in the south to be transitory and as long as they believe in their "business strategy", they react to the output decreases by going deeper into debt maintaining the necessary level of money in the monetary circuit, which resembles the negative correlation between GDP and credit flow to the non-bank firms in German data.

6 Conclusions

Since the turn of the millenium the pattern of money and credit changed in Germany. Domestic credit did not drive "domestic" money, or more precisely, the national contribution to euro area money. We argue that the start of the monetary union had an impact as it triggered an easing of financing conditions, which facilitated credit booms abroad and current account surpluses in Germany. German export firms demand less domestic credit and finance higher production from retained profits, when export revenues are high. Foreign credit to foreign non-banks developed as an important source of financing for trade surpluses and GDP growth and contributed to the gap between GDP growth and credit growth in Germany. Increasing net foreign assets of banks in Germany have refinanced foreign credit expansion and thereby, fostered the easing of financing conditions. During the crisis, though, this has been partly substituted by public cross border claims, i.e. TARGET balances of the Bundesbank. The experience of credit, GDP growth and current account surpluses in Germany supports the fact that export surpluses are not an imbalance of savings and investment, but rather an imbalance of financing and investment. The financing of credit booms abroad may fuel further easing of financing conditions. Financing conditions channel the flow of credit and depend on the risk awareness of market participants. Keeping in mind that the pricing of credit risk may be less efficient than commonly believed, credit creation may also be suboptimal. Thus, the question remains whether the new paradigm of money and credit will be sustainable. Can countries, which maintain ongoing surpluses in their trade balances, achieve much the same objective of enhancing their economic growth and employment as long as they ensure that their debtors can finance their trade deficit (see Kaldor 1978)? Answers probably lie beyond

pure economic reasoning.

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A   Model Equations and Parameters

EViews modeling tool was used for solving the model and generating the graphs.

A.1   Transaction matrix

Nominal gross domestic product (GDP):

$$Y^N = C^N + G^N + X^N - M^N \tag{8}$$

$$Y^S = C^S + G^S + X^S - M^S \tag{9}$$

Exports and imports:

$$X^N = M^S \tag{10}$$

$$X^S = M^N \tag{11}$$

Nominal disposable income of households:

$$YD^N = Y^N - T^N + r_{-1}B_{h-1}^N \tag{12}$$

$$YD^S = Y^S - T^S + r_{-1}B_{h-1}^S \tag{13}$$

Wealth of households:

$$\Delta V_h^N = YD^N - C^N \tag{14}$$

$$\Delta V_h^S = YD^S - C^S \tag{15}$$

Deposits hold by households:

$$H_h^N = V_h^N - B_h^N \tag{16}$$

$$H_h^S = V_h^S - B_h^S \tag{17}$$

Government bills hold by households:

$$\Delta B^N = (G_N + r_{-1}B_{-1}^N) - (T^N + r_{-1}B_{cb-1}^N) \tag{18}$$

$$\Delta B^S = (G_S + r_{-1}B_{-1}^S) - (T^S + r_{-1}B_{cb-1}^S) \tag{19}$$

Government bills hold by the central bank:

$$\Delta B^N_{cb} = \Delta B^N - \Delta B^N_h \tag{20}$$

$$\Delta B^S_{cb} = \Delta B^S - \Delta B^S_h \tag{21}$$

Net foreign assets:

$$\Delta NFA^N = X^N - M^N = -(X^S - M^S) = -\Delta NFA^S \tag{22}$$

High powered money issued by the central bank:

$$\Delta H^N = \Delta B^N_{cb} + \Delta NFA^N \tag{23}$$

$$\Delta H^S = \Delta B^S_{cb} + \Delta NFA^S \tag{24}$$

$$H^N + H^S = H \tag{25}$$

$$H^N_h + H^S_h = H_h \tag{26}$$

$$H_h = H \qquad \text{(redundant or hidden equation)} \tag{27}$$

A.2   Behavioral equations

Import demand functions:

$$M^N = \mu^N Y^N \tag{28}$$

$$M^S = \mu^S Y^S \tag{29}$$

Tax functions:

$$T^N = \theta^N (Y^N + r_{-1} B^N_{h-1}) \tag{30}$$

$$T^S = \theta^S (Y^S + r_{-1} B^S_{h-1}) \tag{31}$$

Consumption functions:

$$C^N = \alpha^N_1 YD^N + \alpha^N_2 V^N_{h-1} \tag{32}$$

$$C^S = \alpha^S_1 YD^S + \alpha^S_2 V^S_{h-1} \tag{33}$$

Asset allocation of households:

$$\left(\frac{B_h^N}{V_h^N}\right) = \lambda_0^N + \lambda_1^N r - \lambda_2^N \left(\frac{YD^N}{V_h^N}\right) \tag{34}$$

$$\left(\frac{B_h^S}{V_h^S}\right) = \lambda_0^S + \lambda_1^S r - \lambda_2^S \left(\frac{YD^S}{V_h^S}\right) \tag{35}$$

A.3 Model parametrization

$$\mu^N = \mu^S = 0.2 \quad \text{for } t < 2000Q1 \tag{36}$$

$$\mu^N = 0.2 \text{ and } \mu^S = 0.21 \quad \text{for } t \geq 2000Q1 \tag{37}$$

$$G^N = 20 \tag{38}$$

$$G^S = 20 \quad \text{for } t < 2006Q1 \text{ and } t > 2007Q4 \tag{39}$$

$$G^S = 15 \quad \text{for } 2006Q1 \leq t \leq 2007Q4 \tag{40}$$

$$\alpha_1^N = \alpha_1^S = 0.6 \qquad \alpha_2^N = \alpha_2^S = 0.4 \qquad \theta_1^N = \theta_1^S = 0.2 \tag{41}$$

$$\lambda_0^N = \lambda_0^S = 0.635 \qquad \lambda_1^N = \lambda_1^S = 5 \qquad \lambda_2^N = \lambda_2^S = 0.01 \tag{42}$$
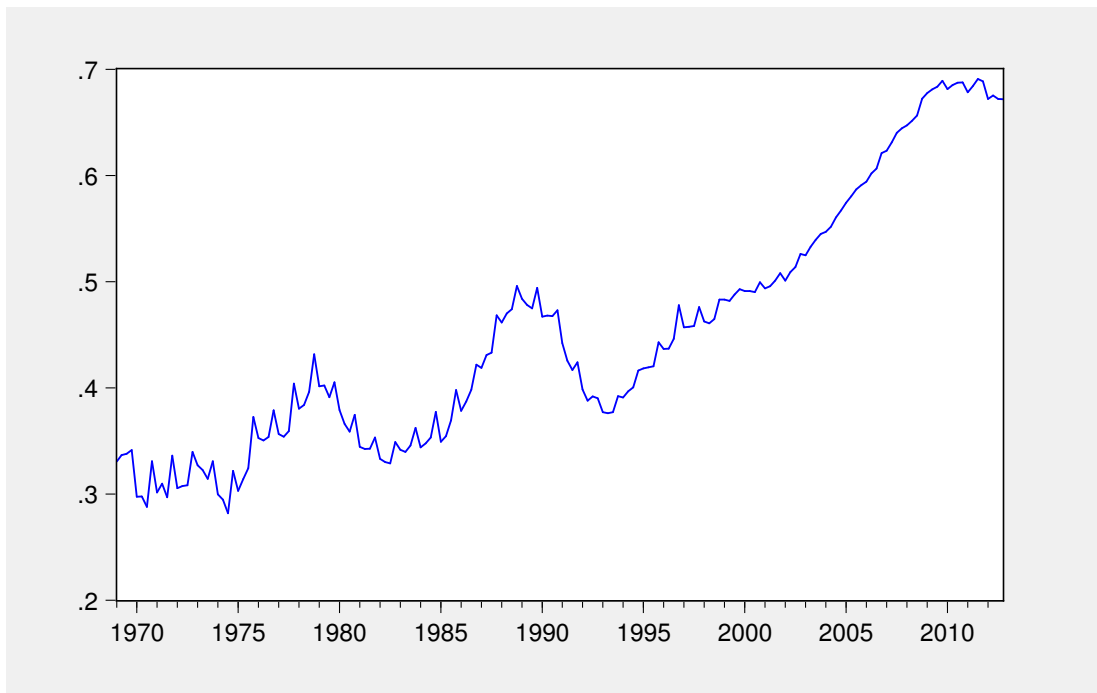
$$r = 0.025 \tag{43}$$

Figure 2: The quotient of deposits and bank credit volume hold respectively borrowed by non-bank firms. Source: Deutsche Bundesbank.
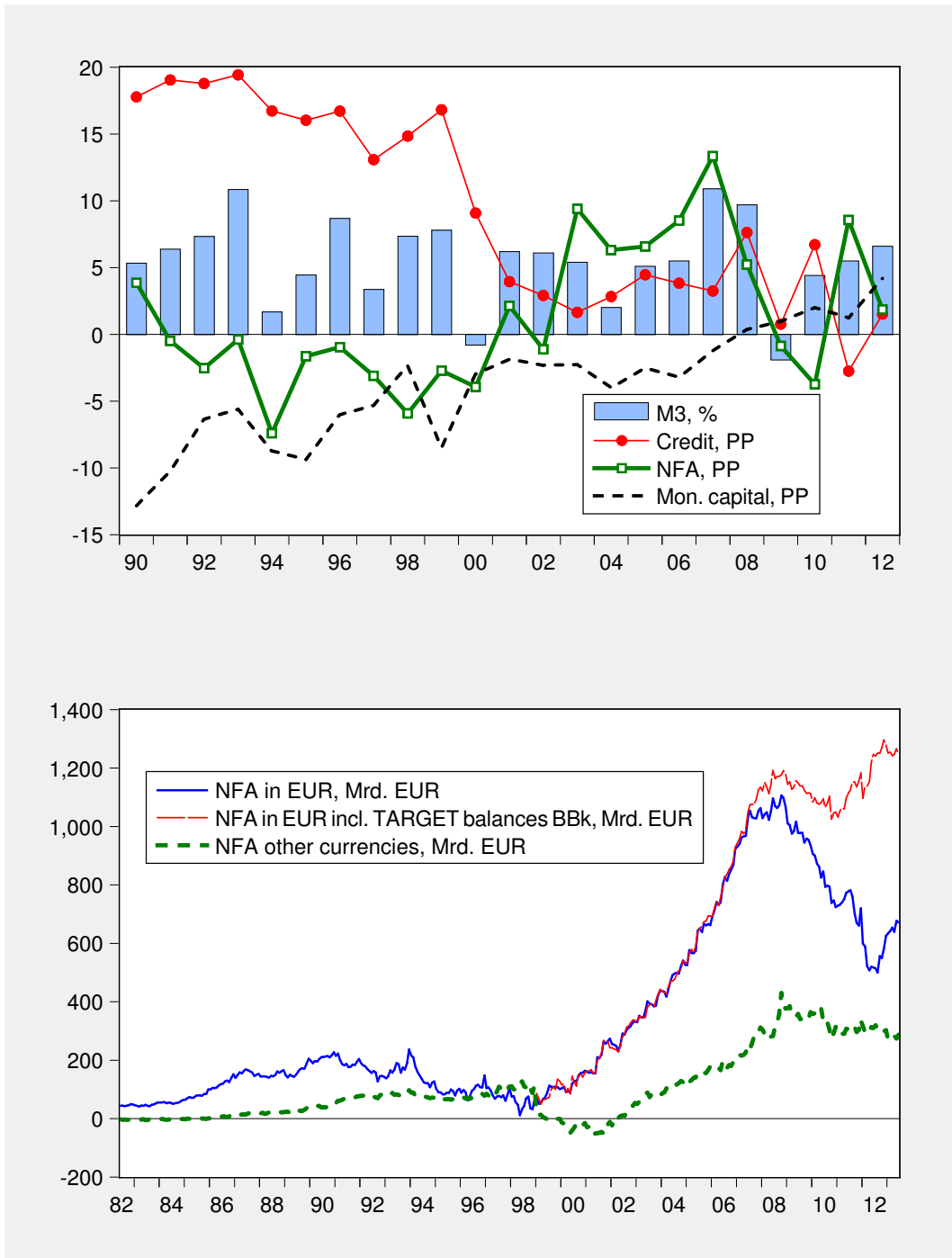
Figure 3: Annual money growth rates in Germany and contributions of main counterparts (upper plot), net foreign claims and TARGET-balances of the Bundesbank (lower plot). In the upper plot NFA denotes net foreign assets outside the euro area, but including inter-MFI claims (deposits minus loans) in the euro area since 1999. Credit before EMU is only credit to German nonbanks, but thereafter, it is credit to nonbanks in the euro area.
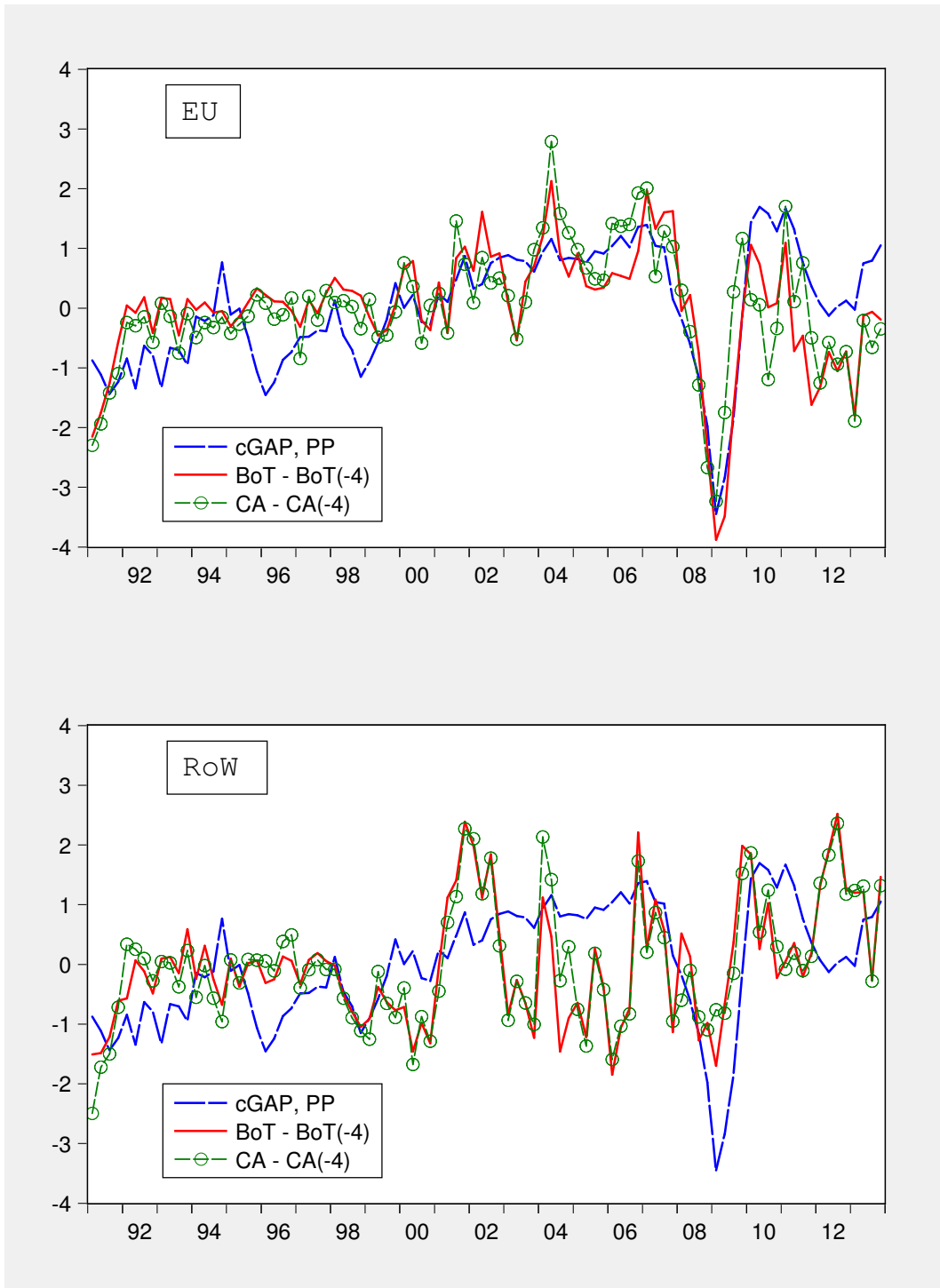
25

Figure 4: Credit Gap in PP (cGAP) vs. absolute seasonal differences of balances of trade (BoT) and current accounts (CA) with the EU (upper plot) and the Rest of the World (RoW, lower plot), all data normalized. Source: Deutsche Bundesbank.
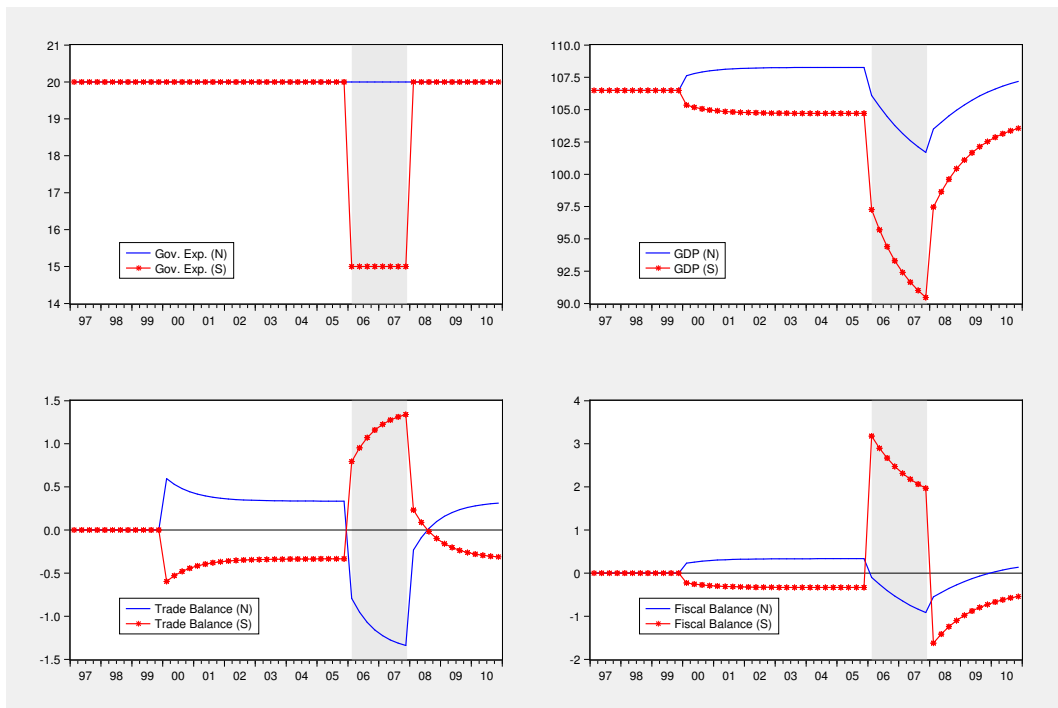
26

Figure 5: The effect of an exogenous demand shock in the south (temporary reduction of government expenditure, 2006Q1-2007Q4) on economic activity. Starting from a zero trade balance steady-state the system approaches a new steady-state after an increase (2000Q1) of the import prospensity in the south.
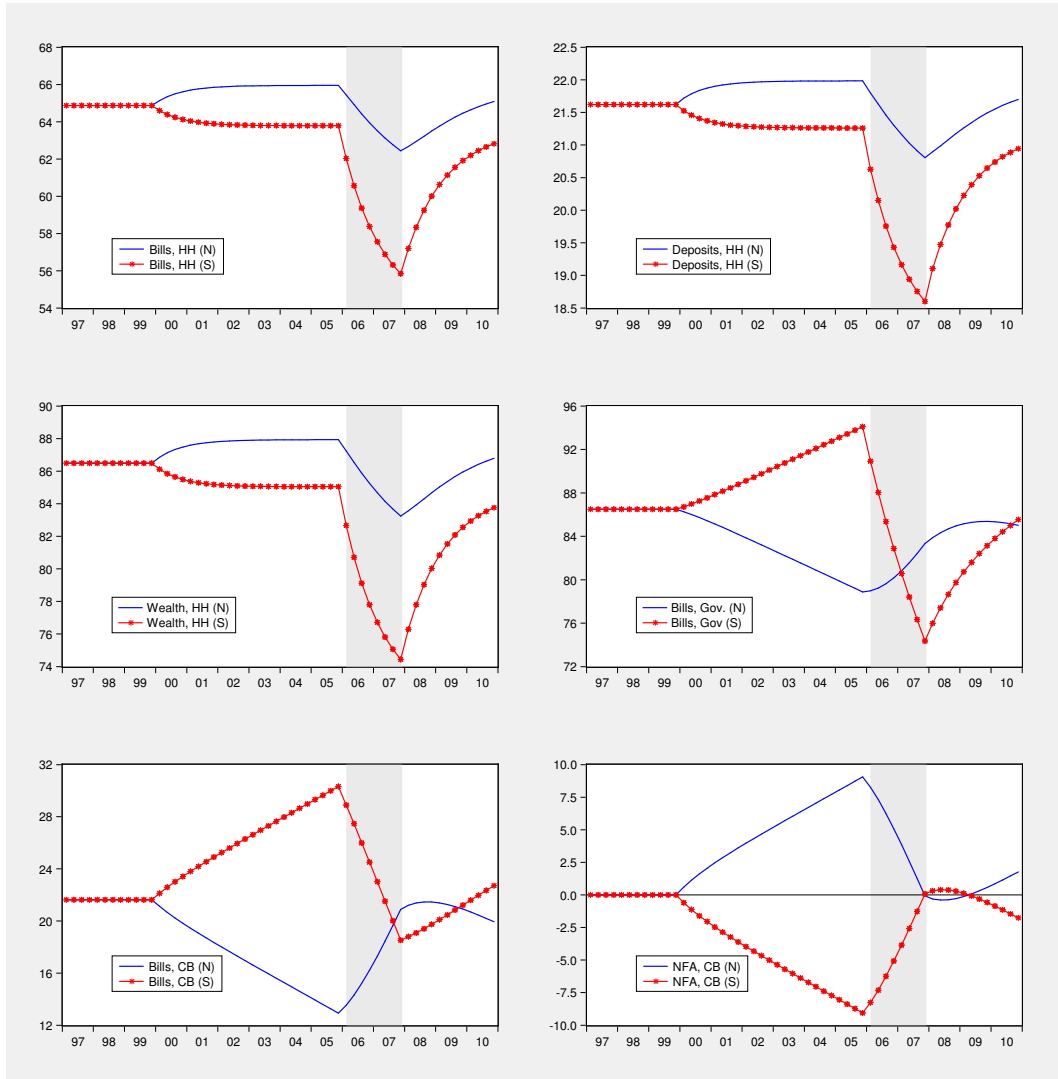
Figure 6: The effect of an exogenous demand shock in the south (temporary reduction of government expenditure, 2006Q1-2007Q4) on flow of funds. Starting from a zero trade balance steady-state the system approaches a new (non-stationary) steady-state after an increase (2000Q1) of the import prospensity in the south. NFA denotes Net Foreign Assets.

CB (N)

Assets   Liabilities

B_{cb}^N

NFA^N

H^N

CB (S)

Assets   Liabilities

B_{cb}^S

H^S

NFL^S

Figure 7: Balance sheet structure of the northern and southern central banks in the non-stationary steady-state with non-zero trade balances.