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GREECE MACRO MONITOR

December 11, 2013

An Empirical Study on the Bank Lending Channel in Greece & the Euro area

Bank credit supply in Greece: determinants, recent developments and outlook

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Preface

This paper constitutes an update on our earlier study on the functionality on the monetary policy transmission mechanism and the bank lending channel in Greece and the euro area (see Monokroussos, M. and D. Thomakos, 2013a, Monetary Policy Transmission Mechanism and Bank Lending Channel in the euro area – Greece case study). The paper presents a cross sectional study on the relation between bank credit and output in the Eurozone, tackling the endogeneity issue in a framework originally proposed by Driscoll (2004) and later applied by L. Cappiello (2010) to the euro area economy. In line with a number of earlier empirical studies, our results provide strong evidence supporting the existence of a banking lending channel in the euro area. Specifically, country-specific money demand shocks have a significant effect on the growth of loans, which effectively implies that the level of bank deposits is indeed a key determinant of loan supply. Furthermore, the supply of bank loans has a significant effect of on GDP and other real economic variables. In more detail, a panel analysis of a group of five euro area countries that have been particularly hit by the sovereign debt crisis (Greece, Portugal, Ireland, Spain and Cyprus) shows that, a 1 percentage point increase in domestic bank loan growth relative to the cross-section average leads, after a quarter, to a rise of between 0.2ppts and 0.47ppts in Greece's real GDP growth above the respective cross-sectional average (and vice versa). Separately, our SVAR model estimates imply that a decline (increase) in the average Greek bank loan interest rate by 1ppt can lead to a cumulative boost (contraction) in real GDP growth by around 0.3ppts over a 4-quarter period. By and far, our empirical results demonstrate the crucial role bank credit can play in the recovery of the Greek economy, following a 5 year-long severe recession. Furthermore, our finding reinforce the need for a close monitoring of credit developments in the context of monetary authorities' ongoing efforts to restore the proper function of the monetary policy transmission mechanism. In line with the said results, our analysis takes a closer look at the determinants and the outlook of bank credit in Greece and argues that, under certain conditions, a switch to positive credit creation is possible from 2015 onwards.

1. Introduction

The 2007-2009 global financial crisis and the ensuing sovereign debt crisis in the Eurozone caused heavy impairments in euro area banks' capital position and restrained their access to wholesale funding. In an effort to contain the ensuing economic recession and alleviate heightened pressures in credit markets, most euro area governments provided in late 2008/early 2009 significant support packages to their national banking systems. In addition, the ECB took powerful initiatives to restore the proper functioning of the monetary policy transmission mechanism and to alleviate credit supply pressures ensuing from acute balance-sheet constraints faced by banks. Among others, these initiatives included aggressive cuts in the Central Bank's key policy rate, the provision of unlimited liquidity to the banking system, a relaxation of collateral requirements for crisis-hit countries and, more recently, the announcement of the OMTs program for outright purchases in secondary sovereign bond markets, under certain conditions.

In Greece, the first support package to the domestic banking system was one the smallest such packages provided by the euro area governments in late 2008/early 2009. It amounted to €28bn and mainly consisted of government guarantees to facilitate domestic banks' access to Eurosystem liquidity operations. However, following the outbreak of the Greek debt crisis in late 2009 and the ensuing wave of downgrades of Greece's sovereign credit ratings, the liquidity position of the domestic banking system suffered a serious blow, as a result of significant deposit outflows, eroding collateral values and the cutoff of domestic banks' access to international wholesale funding markets. In an effort to address these difficulties, three additional support packages (of a total size of €70bn) were offered to Greek banks, in the form of State guarantees to bank bond issues pledged as collateral for access to Euro system liquidity operations.[1] Eventually, and especially after the Greek debt restructuring (PSI), the entire capital position of most domestic banks was virtually wiped out, necessitating the implementation of comprehensive bank resolution and recapitalization program that was successfully completed in the summer of 2013.

Credit growth to households and non-financial corporations in the euro area began to abate towards the end of 2008 (and it still remains in a negative territory), reflecting both a decline in the demand from loans due to the ensuing economic downturn and rising credit supply constrains arising from banks' eroding capital positions and reduced access to wholesale funding. In analyzing the impact of credit on macroeconomic variables such as real GDP and inflation, there are a number of contentious and highly controversial issues that need to be addressed. One such issue concerns the potential endogeneity or reverse causality problem in the relationship between loan supply and output. Namely, is credit availability a determinant of output growth or the former reflects the evolution of the demand for loans and other bank services along the different facets of the business cycle as well as expectations about future economic conditions?

Along with an empirical analysis using a structural vector autoregressive model (SVAR) to examine the functionality of the bank lending channel in Greece, this paper presents a cross sectional study on the relation between bank credit and output in the Eurozone, tackling the endogeneity issue in a framework originally proposed by Driscoll (2004) and later applied by L. Cappiello (2010) to the euro area economy. In more detail, to empirically estimate the relationship between bank credit and output we apply the Driscoll (2004) model to a panel of 12 euro area economies, including: Austria (AT), Belgium (BE), Cyprus (CY), Finland (FI), France (FR), Germany (DE), Greece (EL), Ireland (IE), Italy (IT), the Netherlands (NL), Portugal (PO) and Spain (ES).

In line with a number of earlier empirical studies, our results provide strong evidence supporting the existence of a banking lending channel in the euro area. Specifically, country-specific money demand shocks have a significant effect on the growth of loans, which effectively implies that the level of bank deposits is indeed a key determinant of loan supply. Furthermore, the supply of bank loans has a significant effect of on GDP and other real economic variables. By and far, these finding reinforce the need for a close monitoring of credit developments in the context of monetary authorities' ongoing efforts to restore the proper function of the monetary policy transmission mechanism.

In the case of Greece, a panel analysis of a group of five euro area countries that have been particularly hit by the sovereign debt crisis (Greece, Portugal, Ireland, Spain and Cyprus) shows that, a 1 percentage point increase in domestic bank loan growth relative to the cross-section average leads, after a quarter, to a rise of between 0.2ppts and 0.47ppts in Greece's real GDP growth above the respective cross-sectional average (and vice versa). Separately, our SVAR model estimates imply that a decline (increase) in the average Greek bank loan interest rate by 1ppt can lead to a cumulative boost (contraction) in real GDP growth by around 0.3ppts

[1] The last of these packages (€30bn) remains unutilized in its entirety.

over a 4-quarter period. In our view, the latter results demonstrate the crucial role bank credit can play in the recovery of the Greek economy, following a severe and prolonged domestic recession.

Looking forward, the completion of the Greek bank recapitalization program and the stabilization of domestic bank deposits since mid-2012 are expected to facilitate a gradual improvement in domestic credit conditions in the period ahead. Yet, the need to continue reducing (a still high) dependence on Eurosystem liquidity support is one of the factors restraining a swift return to strong positive credit dynamics post-recapitalization. These considerations render even more pervasively the need to address domestic banks' funding costs.

One significant determinant of domestic banking sector funding costs is the still high domestic deposit rates. These remained among the highest in the euro area, though they have deescalated considerably from their elevated levels reached in the first half of 2012. Notably, the declining trend in domestic deposit rates is expected to continue in the months and quarters ahead as the consolidation of the domestic banking system has eliminated pricing pressures coming from weaker players in need of liquidity. This normalization process could have beneficial effects on domestic GDP, to the extent that it could also help to compress bank loan interest rates and boost credit creation.

The rest of this paper is structures as follows: Chapter 2 provides a brief overview of the literature on monetary policy transmission channels; Chapter 3 discusses the Greek sovereign debt crisis, developments in the domestic banking system and the evolution of deposits and bank credit in the period before and after the sovereign debt crisis; Chapter 4 takes a closer look at bank credit supply in Greece, its evolution and determinants; Chapter 5 discusses our empirical methodology; Chapter 6 presents and analyses the empirical results of our study; and Chapter 7 concludes.

2. Related literature

2.1 Channels of monetary policy transmission

From a policy perspective, monetary policy innovations affect real economic variables via a number of channels. Mishkin (1996) provides a comprehensive analysis on the issue, distinguishing the following channels of monetary policy transmission:

Traditional Interest Rate Channel. The traditional Keynesian ISLM view of the monetary policy transition mechanism postulates that a monetary expansion (contraction) causes a decline (increase) in the real interest rate, which, in turn, increases (lowers) investment spending, leading to an increase (decline) in aggregate demand and a rise (drop) in output.[2,3] The emphasis in the above line of reasoning is on the shift in the real (rather than the nominal) interest rate caused by a monetary policy innovation. The rational here is that in a world of sticky prices, an expansionary monetary policy move, which lowers the nominal policy rate can also lead to a decline in both the short-term and long-term real interest rates, given that the latter is effectively an average of the expected future short rates. These lower real interest rates can then lead to a rise in investment spending and thus, in aggregate output. A notable objection to the tradition Keynesian view on the transmission mechanism of monetary policy is its sole emphasis on only one asset price, namely the interest rate. To address this limitation, more recent stands of research have emphasized other potential channels of monetary policy transmission, ranging from different asset classes such as foreign exchange and equities to the more recent theories of the so-called credit channels.

Exchange Rate Channel. This channel of monetary policy transmission mainly operates through the impact of exchange rate shifts on net exports and also encompasses interest rate effects, as a decline (increase) in the domestic real interest rate makes domestic-currency deposits less (more) attractive relative to foreign currency-denominated deposits. In turn, this leads to a depreciation (appreciation) of the national currency, causing a rise (decline) in net exports and thus, a rise (decline) in aggregate output.[4]

Equity Price Channel. This channel of monetary policy transmission can arguably work though two discrete mechanisms; namely the *Tobin's q* theory and wealth effects on consumption spending. As regards the Tobin's theory of investment (*q* defined as the ratio of the market value of firms to the replacement cost of capital)[5], the theory postulates that when *q* is high, companies have an

[2] This line of reasoning applies to both business investment and consumer spending decisions on durables and housing.
[3] For a comprehensive review of recent research on the interest rate channel of monetary policy transmission see e.g. Taylor (1995).
[4] For more analysis on how the exchange rate channel of monetary policy transmission operates see e.g. Bryan, Hoper and Mann (1993).
[5] See Tobin (1969).

incentive to issue equity for financing investment in plants and equipment, thus boosting aggregate output. On the other hand, when *q* is low, firms do not find it attractive to acquire new investment goods as their market value in now lower than the cost of capital. Instead, if companies want to acquire capital when *q* is low, they can buy another firm cheaply and obtain that firm's existing capital, a process leading to no major increase in investment expenditure. Besides the Tobin's *q* theory of investment, an alternative monetary policy transmission channel via the equity market is through wealth effects on consumption, especially when common stock is a major component of households' financial wealth.[6]

Bank Lending Channel. This channel of monetary policy transmission emphasizes the role of banks in alleviating credit market frictions.[7] This is particularly the case when: (i) there is no perfect substitutability between retail bank deposits and other sources of funding in the liability side of the banks' balance sheets; and (ii) bank lending constitutes a primary source of private sector financing. More specifically, the relevant theory postulates that an expansionary monetary policy boosts bank reserves and deposits, leading to an increase in bank loans to finance higher investment and consumer spending. Despite ample empirical evidence in support of the bank lending channel, a number of authors have raised doubts over its importance and potency, especially in view of the ongoing decline in the traditional bank lending business worldwide.[8] For instance, Driscoll (2004) tests for the presence of a bank lending channel in the U.S. by extending the Bernanke and Blinder (1988) aggregate demand model to a group of small open economies under fixed exchange rates (i.e., the U.S. states). Driscoll finds tha0t state-specific money demand shocks have economically and statistically significant effects on the quantity of loans made by banks in that state. Yet, the author finds little evidence that shocks to the supply of bank loans have significant effects on output. In contrast to the aforementioned, Cappiello et al. (2010) apply the Driscoll (2004) framework to the euro area, providing empirical evidence in favor of the existence of a bank credit channel. The authors attribute the latter result to the much more prominent role banks have in the euro area financial system.[9]

Balance-Sheet Channel. This is another important credit channel, which purportedly arises from the presence of credit market frictions, such as asymmetric information, adverse selection and moral hazard. A schematic description of the way the balance-sheet channel works is as follows: contractionary monetary policy which causes a drop in equity prices decreases the net worth of firms, amplifying the adverse selection and moral hazard problems. The latter is because a decline in net worth erodes the equity holders' stake in their firms, giving them the incentive to undertake riskier projects. In a similar vein, a lower net worth of firms suggests that lenders have less collateral for their loans and thus, losses from adverse selection are higher. These considerations mean that a restrictive monetary policy shock can lead to lower credit availability for financing investment spending. On the other hand, an expansionary monetary policy shock, which causes a rise in firms' equity prices (and also improves their cash flow position as a result of *e.g.* reduced interest payments on short-term debt) can lead to higher credit availability and investment spending, by alleviating the adverse selection and moral hazard problems.

Household Balance-Sheet Channel. The credit channel may also work though the effects of monetary policy changes on households' balance sheets. For instance, a contractionary monetary policy that increases the interest rates may adversely affect consumers' cash flow, leading to a consequent decline in household spending, particularly on durables and housing.

2.2 Monetary policy transmission channels and financial crises

In periods of acute financial crises such as the one experienced in 2007/2008, market activity is disrupted by asymmetric information problems, which severely affect the ability of financial intermediaries to channel funds to the real economy for the exploitation of the most productive investment opportunities.[10] Furthermore, financial crises also inflict severe dysfunctionalities

[6] See e.g. Modigliani (1971).
[7] For comprehensive surveys of the credit channel literature see e.g. Bernanke and Gertler (1995), Cecchetti (1995) and Hubbard (1995).
[8] Among others, Miron, Romer and Weil (1994) and Oliner and Rudebusch (1996) provide empirical evidence supporting the view that the lending channel has, at best, an ambiguous impact on the real economy.
[9] By the end of 2007, bank loans to the private sector amounted to ca 148% of GDP in the euro area, compared to 63% of GDP in the US – see ECB (2008). As noted in L. Cappiello et al. (2010), the aforementioned trends may abstract from the fact that in the US a large part of financial intermediation is not registered on the balance sheet of commercial banks. This is illustrated by, among others, the major role played by the Government-Sponsored Agencies in the U.S. mortgage financing and the much larger volume of off-balance sheet funding by U.S. banks. For instance, by end-2007, the total amount of quoted equity and debt securities issued in the U.S. amounted to 312% of GDP compared to only 166% of GDP in the euro area – see also ECB (2009).
[10] For a comprehensive analysis of the role of asymmetric information in exacerbating financial crises see Mishkin (1991, 1994 and 1996) and Bernanke (1983).

in the monetary policy transmission mechanism, leading to steep increases in market rates.[11] In turn, this increases adverse selection as economic agents who are willing to take biggest risks and therefore to pay the higher interest rates will be the ones most anxious to borrow (Mishkin 1996). Higher interest rates also compress companies' cash flow (*e.g.* due to the ensuing decline in economic activity and higher debt servicing costs), deteriorating their balance sheet position and thus, rendering financial intermediaries less willing to lend to them. They also lead to sizeable stock market declines, lowering the net worth of firms and, again, increasing adverse selection and moral hazard problems in credit markets. Finally, financial crises can instigate an unanticipated decline in the general level of prices which, in turn, leads to a debt-deflation scenario, as sovereign and private debt are denominated in nominal terms[12,13] The economic recession ensuing from a financial crisis can also result in increased uncertainty about the payoffs from debt contracts, making it harder for bank and other financial intermediaries to distinguish good form bad credit risks. Furthermore, deposit withdrawals ensue as depositors find it increasingly difficult to discriminate between banks that have made good versus bad loan. The resulting contraction in deposits and the desire of banks to increase their reserves relative to deposits to protect themselves from the deposit withdrawals leads then to a multiple contraction in loans and deposits and, under a more adverse scenario, to bank failures and panics.

2.3 Sovereign debt crisis and recent developments in the euro area banking system

A recent Bank of International Settlements (BIS) report on financial crisis and the banking system provides a comprehensive overview of the impact of the global financial crisis (2007-2009) and the ensuing sovereign debt crisis in the euro area (2010- 2012) on bank funding conditions[14]. In what follows we provide a brief summary of certain important topics and findings highlighted in the said report.

In normal times, banks fund themselves through a wide range of financial instruments, from both retail and wholesale sources. Accounting for most of the former sources are customer deposits, predominantly from households. The latter mainly consist of funding from private markets, used to supplement customer deposits in financing bank operations. On the short end, wholesale funding includes interbank loans, with a prominent role for short-term US dollar funding and other short-term debt, most notably repurchase agreements (repos) and commercial paper (CP), as well as certificates of deposit. At longer maturities, banks issue medium-term notes (MTNs) and bonds. In addition to deposit and wholesale funding, banks can access central bank liquidity and raise capital, much of which consists of equity. During the past few decades, the composition of bank funding has changed significantly owing to various structural developments. First, financial markets and banks became strongly interconnected. Banks improved their risk-hedging abilities through financial markets and opened new avenues of funding, such as the "originate-to-distribute" securitisation model. Second, the rapid growth of investment banking activity, both by pure investment banks and universal banks, led to a growing reliance on wholesale funding, especially at short maturities. Third, financial globalisation let banks tap funding markets beyond national borders, promoting the rapid growth of international interbank US dollar markets on which banks from various countries became heavily dependent. In all of this, changes to supervisory and regulatory frameworks often played a crucial role. The funding pattern that emerged from these structural changes underwent unprecedented dislocations during the 2007–09 global financial crisis. This acted as a catalyst for major adjustments in banks' business and funding models – adjustments that, in many cases, were reinforced by the subsequent euro area crisis. While the 2007–09 episode was predominantly a banking crisis, the euro area's problems have centred on strongly interconnected sovereign and banking crises.

As the global financial crisis (2007-2009) and the ensuing sovereign debt crisis in the euro area (2010- 2012) have dramatically demonstrated, in periods of severe stress in global financial markets even highly rated banks can struggle to access wholesale funding markets, including those for secured financing. In more detail the BIS (2013) report points to the following key trends in the main funding segments of euro area banks during the recent crisis. First, banks reduced their interbank unsecured liabilities and securitisations. As a corollary, they relied more on secured sources of financing, in particular covered bonds, which have become the main instrument of longer-term wholesale funding for the banks of several euro area countries. Second, direct and indirect funding support from both governments and the Eurosystem has been crucial in stabilising funding conditions during

[11] For instance, the the Libor-OIS spreads in the inter-bank money market reached historical peaks following the collapse of U.S. investment bank Lehman Brothers in September 2008.
[12] Fisher (1933) and Mishkin (1978).
[13] Mishkin (1991) documents that most financial crises in the U.S. have began with a sharp increase in interest rates, a collapse in stock prices and a sharp rise in uncertainty after the start of a recession. As a result of the ensuing deterioration in business conditions and uncertainty about their banks' health, depositors then began to withdraw their funds from the banks, leading to bank failures and panics.
[14] "*Financial crises and bank funding: recent experience in the euro area*" BIS Working Papers No 406, March 2013.

episodes of severe market stress. Third, at the height of the crisis, funding markets in the euro area became increasingly segmented according to bank nationality, as the access of banks to specific funding instruments was no longer determined primarily by their standalone credit rating but by their country of origin. Fourth, various institutional investors that had become important sources of funding for euro area banks, such as US money market funds, sharply reduced their exposure as the crisis deepened. Finally, an increasing fraction of bank debt from the most crisis-hit countries has been retained by the issuing banks. In several episodes of extreme market turbulence, banks retained most of their bond issuance, as the investment appetite of their traditional investor base had faded and the bonds were eligible as collateral for ECB liquidity operations.

3. Greek sovereign debt crisis and domestic banking system

3.1 Liquidity support packages and bank recapitalization program

In Greece, the first support package to the domestic banking system was one the smallest such packages provided by the euro area governments in late 2008/early 2009. It amounted to €28bn (or less than 12% of GDP) and mainly consisted of government guarantees to facilitate domestic banks' access to Eurosystem liquidity operations. The relatively small size of Greece's first support scheme was actually a testament of the relatively strong capital position enjoyed by Greek banks, especially the four *systemically-important* ones, in the period leading to the global financial crisis.[15] That is chiefly because most of them had generally avoided imprudent lending practices and had very limited exposure to the so-called *toxic assets* that eventually brought down a number of U.S. and European banks.[16,17]

Yet, following the outbreak of the Greek debt crisis in late 2009 and the ensuing wave of downgrades of Greece's sovereign credit ratings, the liquidity position of the domestic banking system suffered a serious blow, as a result of significant deposit outflows, eroding collateral values and the cutoff of domestic banks' access to international wholesale funding markets. In an effort to address these difficulties, three additional support packages (of a total size of €70bn) were offered to Greek banks, in the form of State guarantees to bank bond issues pledged as collateral for access to Euro system liquidity operations.[18] Eventually, and especially after the Greek debt restructuring (PSI), the entire capital position of most domestic banks was virtually wiped out, necessitating the implementation of comprehensive bank resolution and recapitalization program that was successfully completed in June 2013. The said program was implemented in the context of the second bailout agreement on Greece reached with the troika of official lenders in Q1 2012[19,20]

The domestic banking sector recapitalization was successfully completed in June 2013, in accordance with the BoG requirements (a minimum core tier 1 capital ratio of 9% of risk-weighted assets as of end march 2013) and the recapitalization framework laid out in Greek Law 3864/2010 and the Cabinet Act 38/2012. Three out of the four systemic banks, National Bank of Greece, Alpha Bank and Piraeus Bank, exceeded the 10% minimum requirement of private investment in the capital increase process (thereby, remaining under private management control), with the Hellenic Financial Stability Fund (HFSF) covering the remaining amount through the issue of common shares. The fourth systemic bank, Eurobank, opted for full recapitalization via the HFSF.

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[15] Here, the term systemically-important bank refers to: Piraeus Bank, Eurobank Alpha Bank and National Bank of Greece.

[16] At the end of 2011, total bank lending to Greece's (non-financial) private sector stood at slightly less than 125%-of-GDP, pretty close to the corresponding EU average. Furthermore, the share of consumer loans to total private-sector bank loans was around 13%

[17] For instance, note the following NY Times report of March 19, 2012, quoting a number of BlackRock managers who have been engaged in a diagnostic exercise of Greek bank loan portfolios commissioned by the Bank of Greece to help determine the recapitalization needs of the domestic banking system: *"Jessica Tan and Charles Hatami, two of BlackRock's day-to-day managers in Greece, said that they were surprised by both the quality of the data and the results. Most institutions, they said, did not lend recklessly, as the United States banks did during the real estate boom"* and *"The consumer lending market is relatively new in Greece, and they were disciplined in their approach," Mr. Phillips of BlackRock said. "Unlike other countries, the Greek consumer is not debt laden."*
http://dealbook.nytimes.com/2012/03/19/in-greek-crisis-a-little-known-adviser-with-outsize-influence/

[18] The last of these support packages (€30bn) was utilized by Greek banks only partially. Furthermore, the banks that made use of the package (for a total amount of ca15bn) to secure liquidity from the Eurosystem (via Bank of Greece's ELA facility) did not roll-over corresponding maturities of short-term bonds coming due in late 2012/early 2013. As a result, the said package remains at this point unutilized. As regards the 2nd and 3rd of the aforementioned support packages (total size of €40bn), Greek banks that made use of these packages are expected to only partially roll-over corresponding corporate bond maturities coming due in the coming 12-15 months.

[19] For a comprehensive analysis of the structure and modalities of the Greek bank recapitalization programme see *e.g. Greece Macro Monitor, "Greek banking sector recapitalization and restructuring Program modalities, progress already made and next steps", Eurobank Research, Jan. 25, 2013.*

[20] As per Bank of Greece's *"Report on the Recapitalisation and Restructuring of the Greek Banking Sector"* published in December 2012, the capital needs for the four biggest domestic lenders were estimated at €27.5bn with the following allocation: National Bank of Greece: 9,756mn; Eurobank: €5,839mn; Alfa Bank: €4,571mn; and Piraeus Bank: €7,335mn.

Looking ahead, domestic banks will have to undertake a new stress test exercise by end-2013, based on end-June 2013 bank-related data and updated macro scenarios. The said exercise will update domestic banks' capital needs and will be conducted by the Bank of Greece (BOG) under the oversight of a steering committee comprise of representatives from the EC/ECB/IMF troika and EBA. As part of this strategy, Greek authorities have already engaged Black Rock consultant to conduct a new asset quality review of domestic banks. According to recent press reports, the said review has already been submitted to the BoG and the latter is expected to inform banks about any additional capital requirements they may have by late 2013/early 2014.

In addition, the updated MoU (July 2013) envisages additional initiatives for the development of a comprehensive banking sector strategy aiming to safeguard financial stability including, among others, improved management of non-performing loans (NPLs). To this end, the BoG, in consultation with domestic banks and EC/ECB/IMF experts, has committed to issue by end-2013 a time-bound framework for banks to facilitate settlement of borrower arrears.[21]

Separately, the BoG, committed in the context of the last troika review (July 2013) to complete, in cooperation with official lenders, a comprehensive strategy for the domestic banking system addressing, among others, options and operating steps for the HFSF to proceed with the disposal of the shares to the private sector of the core banks that were not able to remain under private management control. To this end, domestic authorities have already undertaken the necessary initiatives for the prompt disposal of a "substantial" Eurobank equity to private investors by end-March 2014, aiming to secure a swift return of the bank to private management control.

3.2 Trends in domestic bank deposits and loans in the period before and after the outbreak of the global financial crisis

Resident and non-resident deposits in the domestic banking system have been on a prolonged rising trend since the country's entry into the euro area in January 2001, with their total value peaking in H2 2009, before embarking on a declining path following the outbreak of the Greek sovereign crisis in the last quarter of that year. More specifically, total deposits and repos of domestic household and non-financial corporations in domestic monetary financial institutions (MFIs) excluding the Bank of Greece hit a record high of around €237.8bn in September 2009, but declined precipitously in the following months and quarters, reflecting, among others, increased uncertainty of depositors about the outlook of the domestic economy, heightened fears about a distortedly sovereign debt default (and "GREXIT") scenario as well as the ensuing domestic economic downturn that forced domestic households and businesses to tap their existing pool of savings for financing current consumption and operating expenditure. According to BoG data, total domestic private (non-financial) sector deposits to domestic MFIs hit a multi-year low of ca€150.6bn at the end of H1 2012, amid increased political uncertainty ahead of the June 2012 national election.[22] The massive withdrawal of domestic bank deposits following the outbreak of the sovereign debt crisis hit the Greek banking system in a particularly challenging period, characterized by a recessionary domestic environment, rising non-performing loans[23] and eroded collateral values for ECB financing. Furthermore, the liquidity position of the domestic banking system came under additional pressure after a stream of downgrades of Greece's sovereign credit by international rating agencies inevitably affected the ratings of domestic banks, halting their access to interbank funding markets. Faced with this particularly adverse environment Greek banks had to navigate through a particularly difficult environment, having in addition to pay back considerable amounts in the form of maturing liabilities to third parties (wholesale funding); and, most importantly, to maintain a sizeable (pre-PSI) exposure in Greek sovereign debt. The said exposure was in the form around €15bn invested in T-bills and c. €43bn invested in medium- and long-term government paper. In view of these developments, and in a move to prevent a sharp contraction of domestic credit, authorities decided (as we have already noted) to extend and broaden the special government support program for bank liquidity that was introduced in late 2008 (N.3723/2008). These steps along with the sizeable Eurosystem liquidity support to domestic banks (facilitated by a further loosening in ECB's collateral acceptance criteria for Greek sovereign bonds) have prevented a much sharper contraction in bank credit that could significantly exacerbate the domestic recession. The latter is especially relevant, given the overwhelming dependence of domestic households and businesses on banks for financing relative to alternative sources of funding. Domestic deposit dynamics have stabilized since June 2012, reflecting considerable progress made by the new coalition government in bringing the country's stabilization program back on track and satisfying all necessary prerequisites for the resumption of official (EFSF/IMF) funding to Greece. This favorable process was reinforced by the 26/27 November 2012 Eurogroup

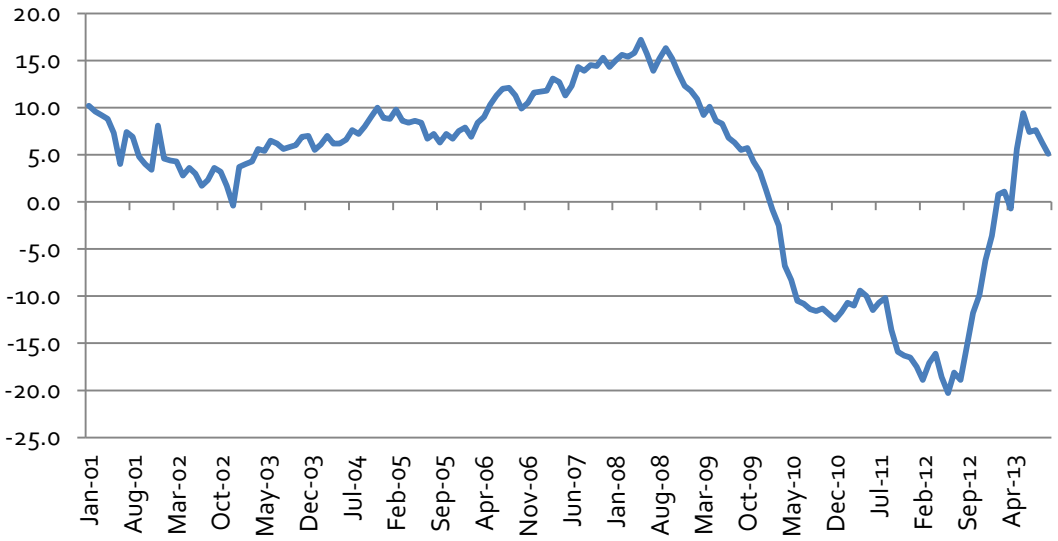
[21] As per the latest EU Commission report on Greece (July 2013), NPLs in Q1 2013 reached €63.6bn or 29% of total bank loans, up from 24.2% at end-2012 with 60% of them attributed to the corporate sector.
[22] In the 2-week period leading to the June 2012 election, some €15bn of deposits left the domestic banking system.
[23] Industry-wide NPLs in the Greek banking system stood at c. 29% in March 2013 compared to 7.7% at the end of 2009.

announcement of additional relief measures aiming to improve the sustainability of Greek public debt as well as additional progress made in reducing the fiscal deficit and offsetting considerable competitiveness losses accumulating in the post EMU-entry period. In what follows, we elaborate further on the most recent developments as regards domestic monetary conditions, with a particular focus on the period after the June 2012 Greek national election.

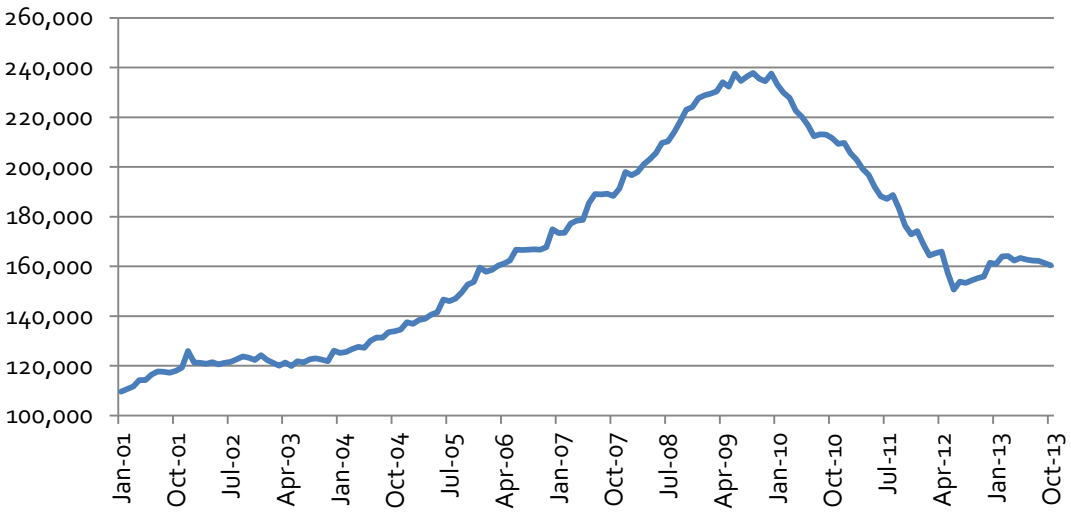
3.2.1 Broad monetary aggregates & components

After July 2012 there has been a gradual decline in the annual pace of contraction of Greece's M3 monetary aggregate (excluding coins and banknotes in circulation), mainly on the back of a bounce of domestic private-sector deposits from the lows reached ahead of last summer's national election (Graphs 1.1 & 1.2). M3 growth has shifted into a positive territory since last February, standing at +5.1% YoY in October 2013 (latest available data).

Graph 1.1 - Greece's M3 excluding currency in circulation (YoY, %)



Graph 1.2 – Euro-denominated deposits & repos of domestic households & non-financial corporations in Greek MFIs excluding the BoG (e.o.p outstanding balances in EURmn)

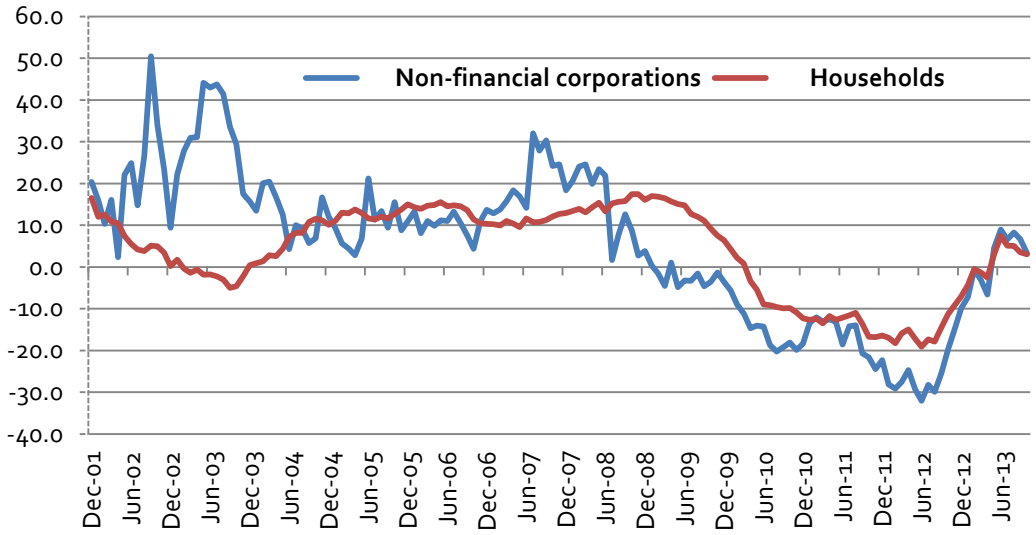


Source: BoG

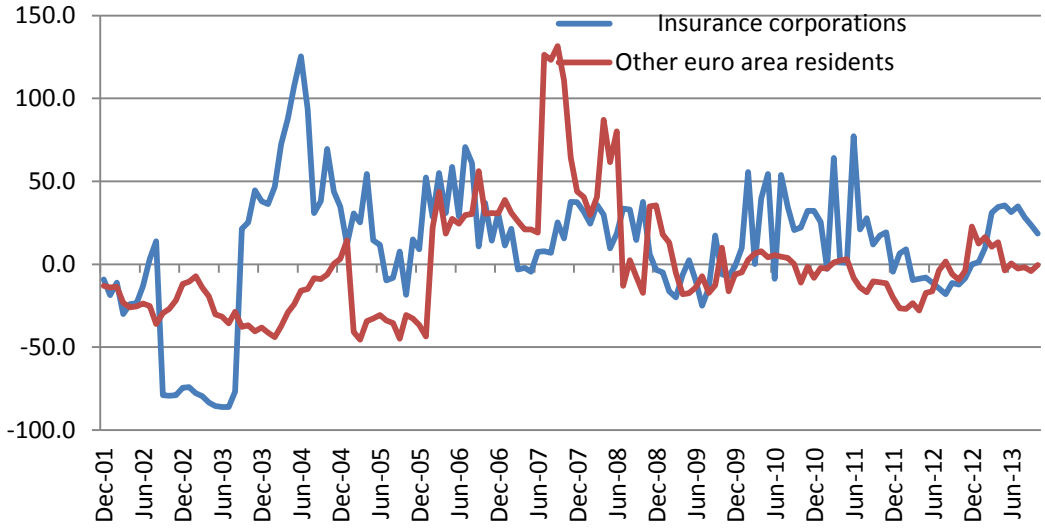
3.2.2 Bank deposits

The annual rate of change of deposits of both domestic households and non-financial corporations to the domestic MFIs excluding the BoG (Graph 1.3) remained in a negative territory throughout 2012 and in the first in the first four months of this year, before shifting into a positive territory afterwards for the first time since early 2010 (3.1% & 3.3% YoY, respectively in October 2013). Separately, domestic bank deposits by other euro area residents and insurance corporations exhibited mostly positive growth year-to-October 2013 (Graph 1.4).

Graph 1.3 – Euro-denominated deposits & repos of domestic households & non-financial corporations in Greek MFIs excluding the BoG (e.o.p outstanding balances, YoY %)



Graph 1.4 – Euro-denominated deposits & repos of insurance corporations & other euro area residents in Greek MFIs excluding the BoG (e.o.p outstanding balances, YoY %)

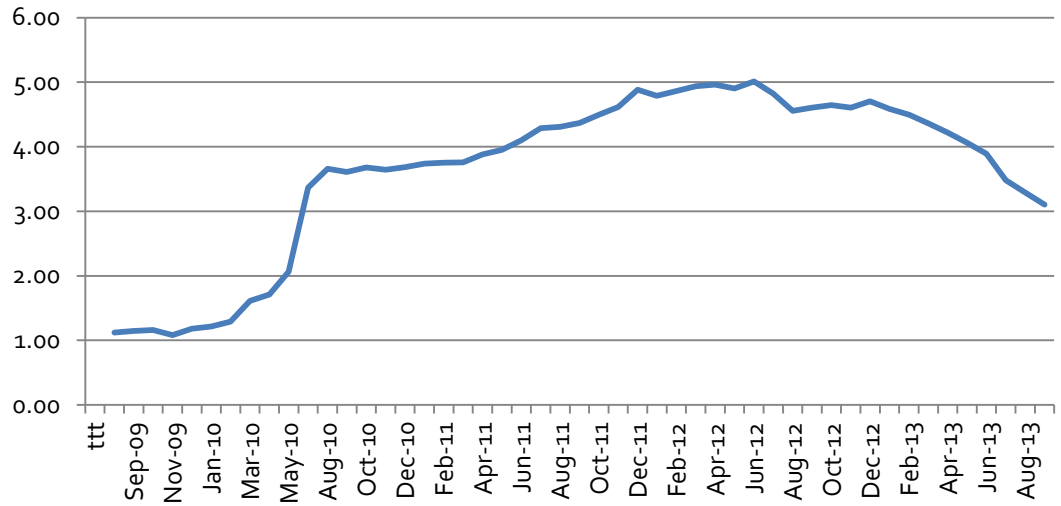


Source: BoG

The notable bounce in domestic bank deposits over the period July 2012-March 2013 can be mainly attributed to retreating investor uncertainty as regards the domestic political environment and the risk of a "GREXIT" scenario following the summer 2012 election. The aforementioned view is especially relevant as deposit interest rates have been on a declining path since the second half of last year, while domestic businesses and households continued to tap their existing pools of savings so as to meet current spending needs and increased tax obligations. As noted in Bank of Greece's annual monetary policy report 2012-2013, the bounce in domestic bank deposits since July 2012 has mainly taken the form of cash (banknotes) re-deposited to the domestic banking

system and, to a lesser extent, repatriated deposits from financial institutions outside Greece.[24] After recording a steep upward trend following the eruption of the Greek sovereign debt crisis, interest rates on domestic bank deposits have embarked on a gradual de-escalation since H2 2012, albeit from quite elevated levels. Indicatively, the interest rate on new euro-denominated deposits with agreed maturity of up to 1-year declined by ca 200bps between July 2012 and September 2013 (latest available data), remaining though among the highest in the euro area (Graph 1.5).

Graph 1.5 – Interest rates on new euro-denominated deposits with agreed maturity up to 1 year



Source: BoG

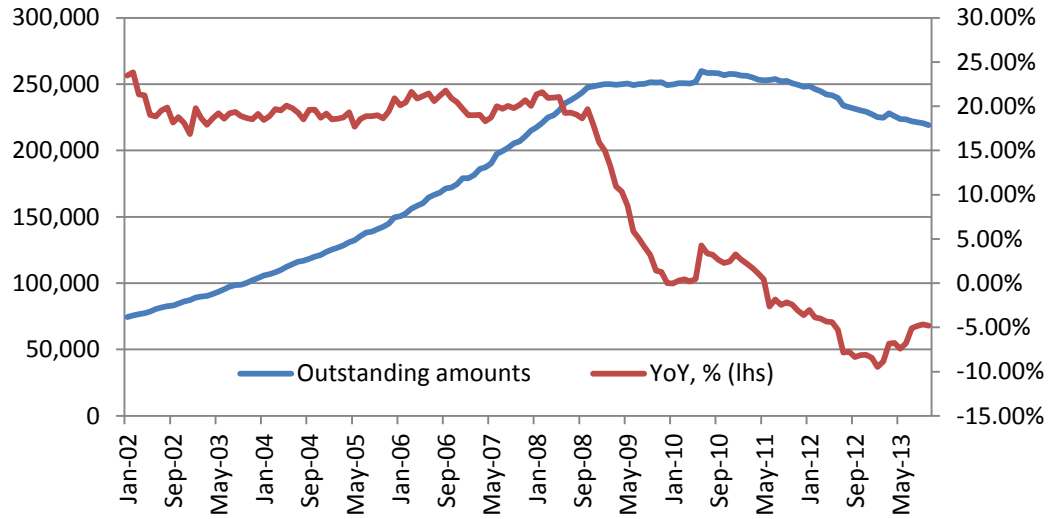
Main factors contributing to the aforementioned development include, among others: (i) the partial reversal of deposit outflows after the summer 2012 national election; and (ii) the successful completion of the bank recapitalization & resolution program in June 2013, which reduced dramatically the number of domestic lenders to effectively 4 systemic banks and a small fully-recapitalized, privately-controlled lender from over 15 banks operating in the domestic market in the pre-crisis period. Note that during the most severe facet of the Greek sovereign debt crisis (late 2011 to mid-2012) a number of smaller players facing severe liquidity shortages were forced to adopt highly aggressive strategies to attract much-needed deposits, by offering above-market interest rates on prospective depositors.

3.2.3 Domestic bank credit

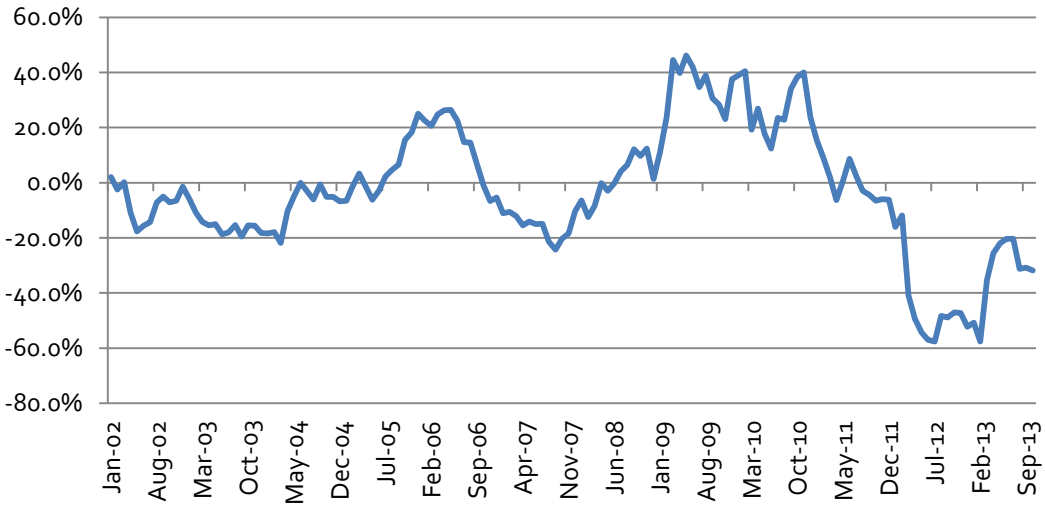
Throughout 2012 and in the first ten months of this year, the annual rate of change of the outstanding stock of bank credit to the domestic economy remained in a negative territory, coming in at -4.8% YoY in October 2013 (Graph 1.6). Over the same period, the annual growth of outstanding credit to the general government recorded significant fluctuations, but decelerated significantly overall, currently standing in a negative territory (Graph 1.7).

[24] According to BoG data, between July 2012 and February 2013 around €10bn in the form of banknotes were deposited in the domestic banking system, while repatriated household and corporate deposits via foreign financial institutions reached €3.7bn.

Graph 1.6 – Bank credit to the domestic private sector i.e., corporations & households (e.o.p outstanding amounts in EURmn & YoY, % change)



Graph 1.7 – Bank credit to the general government (YoY, %)



Source: BoG

Although credit growth to the domestic economy remains in a negative territory, recent developments paint a more encouraging picture as regards the capacity of the domestic banking system to finance the real economy in the period ahead. Among others: **(i)** the annual pace of contraction of bank credit to the domestic private sector has been on a decelerating trajectory in recent months (Graph 1.6). This improvement manly reflects the gradual return of deposits to the domestic banking system since mid-2012 and the ongoing stabilization of financial conditions following the completion of the bank recapitalization and resolution program in June 2013. On a less encouraging note, the said development partially reflects a major drive by domestic banks to reschedule non-performing private sector loans, by providing, among others, significant loan maturity extensions; **(ii)** bank credit to certain important sectors of the domestic economy has actually recorded positive annual growth in recent months (Table 1); **(iii)** some signs of relaxation in domestic bank lending conditions have been reflected in the most recent quarterly surveys conducted by the Eurosystem, manly as a result of improving borrower expectations about future economic prospects; and **(iv)** as we noted earlier, funding conditions facing domestic banks have improved considerably in recent months. Besides the significant decline in deposits rates since mid-2012, the dependence of Greek banks on Eurosystem liquidity has declined considerably in recent months (Graph 1.8). Another factor contributing the aforementioned developments is market funding secured by domestic banks through repo (and, in certain instances, outright sale) transactions of EFSF paper acquired in the context of the bank recapitalization program and the sovereign debt buyback operation conducted in late 2012. It should be noted that the gradual reduction of Greek

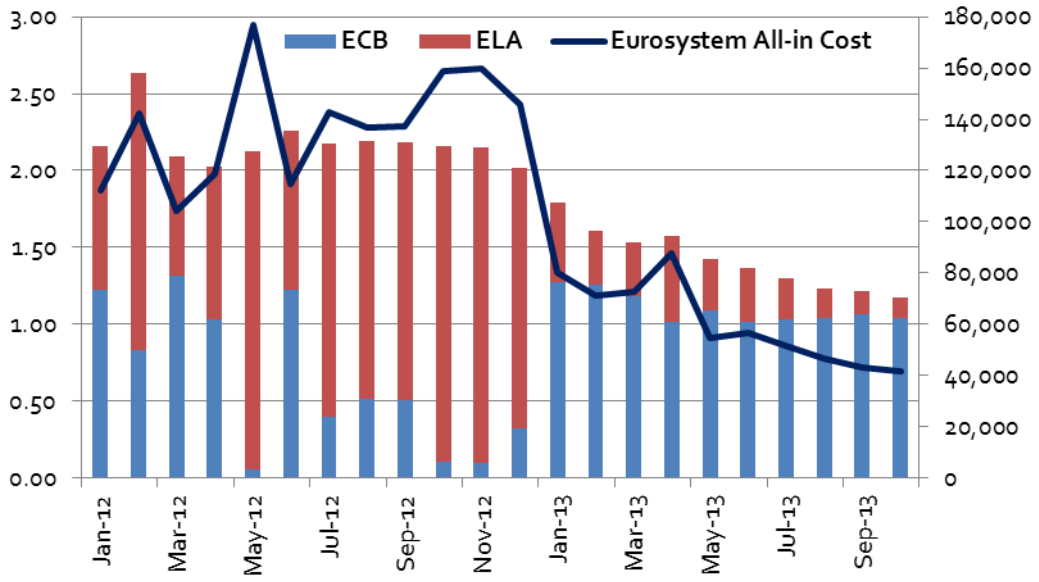
banks' dependence on Eurosystem liquidity constitutes a key target of the present MoU agreed with the troika of official lenders. The need to reduce further this (still-high) dependence represents one of the major supply-side headwinds currently inhibiting the ability of banks to finance the domestic economy.

Table 1 – Bank credit to key sectors of the Greek economy (outstanding amounts, YoY %)

	2006	2007	2008	2009	2010	2011	2012	Jan-Oct 2013
Agriculture	4.1%	6.7%	16.7%	2.8%	-48.0%	-2.5%	-29.7%	13.1%
Manufacturing, Mining and Quarrying	8.8%	10.1%	15.8%	-8.4%	6.5%	-3.6%	-5.3%	-3.8%
Electricity, Gas and Water Supply	5.8%	43.5%	30.2%	14.3%	28.2%	15.0%	2.2%	-5.3%
Construction	26.8%	28.2%	35.2%	1.6%	-1.0%	-6.8%	-2.5%	4.3%
Trade	11.2%	16.7%	19.2%	1.6%	-24.4%	-2.6%	-10.2%	-5.0%
Accommodation and food service activities (Tourism)	10.4%	22.6%	19.5%	4.6%	0.0%	-1.7%	3.8%	3.2%
Shipping	8.3%	21.8%	23.2%	-1.9%	74.4%	2.9%	-30.9%	0.4%
Real estate activities						28.6%	0.6%	-5.3%
Professional, scientific, technical, administrative and support activiies						0.7%	-22.1%	-2.1%
Other	26.8%	23.9%	23.7%	6.9%	-56.0%	-29.7%	-10.9%	-8.0%

Source: BoG

Graph 1.8 – Eurosystem funding to Greek banks (rhs: outstanding amounts in EURmn; lhs: all-in cost of funds in ppts)*

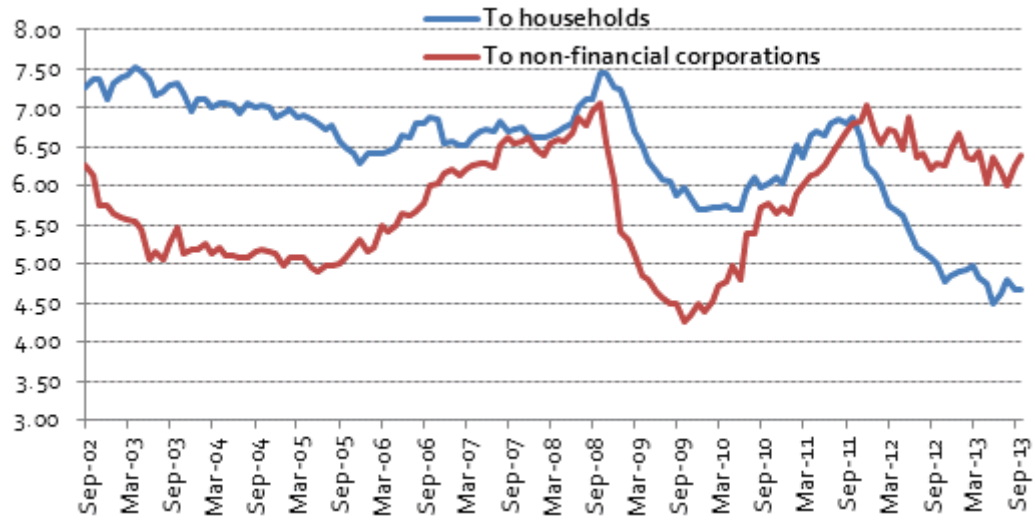


Source: BoG
(*) The peak in outstanding amounts reached in Feb 2012 reflects an artificial boost in corresponding balances due to the PSI and the relatively large amounts re-deposited to the ECB by Greek banks.

The nominal interest rates on new bank loans to the domestic private sector (households and businesses) have been on a decelerating path in recent months (Graph 1.9). The aforementioned trend has been particularly pronounced for new loans to individuals and individual non-profit institutions (*i.e.*, households), with the average interest rate across all different loan types in this broad category declining by ca 150bps between January 2012 and October 2013 (latest available data). Over the same period,

the average interest rate on new loans to non-financial corporations declined by ca 35bps, while, in real terms, there has actually been an increase in most categories of private sector loans.

Graph 1.9 – Bank interest rates on new euro-denominated loans to euro area residents (in ppts)



Source: BoG

4. Bank credit supply in Greece: *key determinants, their recent evolution and some preliminary proposals to facilitate credit creation in the domestic economy*

Bank funding

- Deposit balances: The upward trend in domestic private-sector bank deposits between July 2012 and March 2013 has stalled lately, with the corresponding outstanding balances broadly stabilizing over the past 6 months. On a more positive note, the latter period has seen an increase in the deposit balances of State-related entities. Overall, domestic resident deposits to Greek MFIs (excluding the BoG) recorded a cumulative increase of c. 12% (or €18.8bn) over the period July 2012 to October 2013 (latest available data).
- Central bank funding. The total amount of funding taken from the ECB and the ELA facility has gone down significantly in the past 18 months. Over that period, central bank funding to the domestic banking system has declined by c. 50%, whereas total ELA funding has gone down by more than 90%, currently standing at sub-€10bn levels (graph 1.8). In our view, the system could broadly eliminate its ELA dependence in the not too distant future. However, significant funding-related headwinds still exist, especially taking into account the recently enacted ECB rules, which envisage a termination, from March 2015 onwards, of the collateral eligibility of government guaranteed notes in ECB liquidity provision operations. As per a recent IMF report, central bank funding to the Greek banking system is expected to decline towards 15% of total bank liabilities by 2017.[25]
- Banking system wholesale funding: Renewed access to wholesale funding markets by Greek banks could significantly improve liquidity conditions in the domestic economy.
- Further rating upgrades expected: Further upgrades of the credit ratings of the Hellenic Republic and the domestic baking system would further improve wholesale funding terms for Greek banks (issuance and repo transactions). Rating upgrades of existing assets in bank balance sheets would also improve market valuations and thus, increase the liquidity that can be sourced via the repo markets.

[25] IMF Country Report No. 13/155, "Greece Selected Issues", June 2013.

Banking system leverage

- Banking system deleveraging: Process still ongoing
- Industry-wide Loans-to-Deposits ratio: At much healthier levels now than in the recent past (c. 112.5% currently vs. highs near 135.5% in early 2012 - see Graph 1.10 in Appendix I)

Banks' capital adequacy

- Bank recapitalization & resolution program: All systemically-important domestic banks have been recapitalized.
- New BlackRock exercise: Results to be announced in late 2013/early 2014.
- Capital raising: Capital raising exercises like the one announced recently by Eurobank (for an amount of €2bn approximately) can improve the system's capacity to absorb losses and, at the same time, allow an increase in risk-weighted assets.[26]

Bank profitability

- Cost of deposits: Interest rates on domestic bank deposits have deescalated significantly from their elevated levels reached in the first half of 2012 (Graph 1.5). Greek deposit rates remain among the highest in the euro area, but their declining trend is expected to continue in the period ahead as the consolidation of the domestic banking system has eliminated pricing pressures coming from weaker players in need of liquidity.
- Cost of risk: Provisions and thus, cost of risk, are currently on a declining trend, as attested by the relevant Bank of Greece data (Graph 1.11 – Appendix I).
- Central Bank funding costs: The latest cut in the ECB's key policy rate has further reduced ECB and ELA funding costs for Greek banks (Graph 1.8).
- Other short-term funding costs: Repo costs on EFSF notes and various other assets held by Greek banks continue to deescalate. Repo costs currently stand between 5bps and 10bps above the ECB funding cost facing Greek banks
- Operating costs: Opex costs remain on a declining path, with Greek banks having reduced their operating costs by around 25% over the last few years. The voluntary exit schemes being currently implemented by the four systemic Greek banks should further reduce operating expenditure in the period ahead.
- Domestic banking system consolidation: The ongoing process of consolidation in the domestic banking system is expected to result in significant cost savings, making the system more lean and cost efficient
- Operating income: Loan income is going down, but at a slower pace compared to deposit costs.
- More efficient handing of NPLs: In the context of the present economic adjustment program, domestic banks are increasingly dealing with NPLs in a more standardized and efficient way, freeing up resources that can be used to identify and seize new credit opportunities.

Other important sources/determinants of liquidity in the domestic economy

- Corporate issuance in international capital markets: In recent months, a number of Greek corporates have issued bonds, meeting strong demand from abroad. The continuation of this trend could help to free up liquidity in the domestic economy and the banking system (Table 1a – Annex I).
- Improving balance-of-payments dynamics: The expected elimination of the current account deficit this year is a supportive factor for the dynamics of domestic bank deposits.
- IFI funding: Constitutes another supportive factor for domestic liquidity conditions.
- Foreign investment: FDI could become a very important source of liquidity for the domestic economy, especially in view of a significant number of foreign direct investments announced recently.[27]

Some preliminary thoughts/proposals on ways to boost bank credit to the real economy

- Economy needs a positive credit shock: It is our strong conviction that a positive credit shock would greatly accelerate the recovery of the Greek economy, allowing a swifter resumption of positive and sustainable growth rates. The results of our

[26] See relevant press released published recently by the Hellenic Financial Stability Fund (HFSF)
http://www.hfsf.gr/files/press_release_20131114_en.pdf

[27] Eurobank Global Markets Research *"Greece Macro Monitor – Foreign Direct Investment in Greece: Recent Trends & Outlook"*, 23 September 2013.

empirical studies presented in the later part of this document provide strong quantitative support to the aforementioned view. Furthermore, in a recent analysis on credit conditions in Greece, the IMF staff argues that *creditless* recoveries are significantly weaker than normal economic recoveries (see IMF Country Report No. 13/155, "Greece Selected Issues", June 2013).

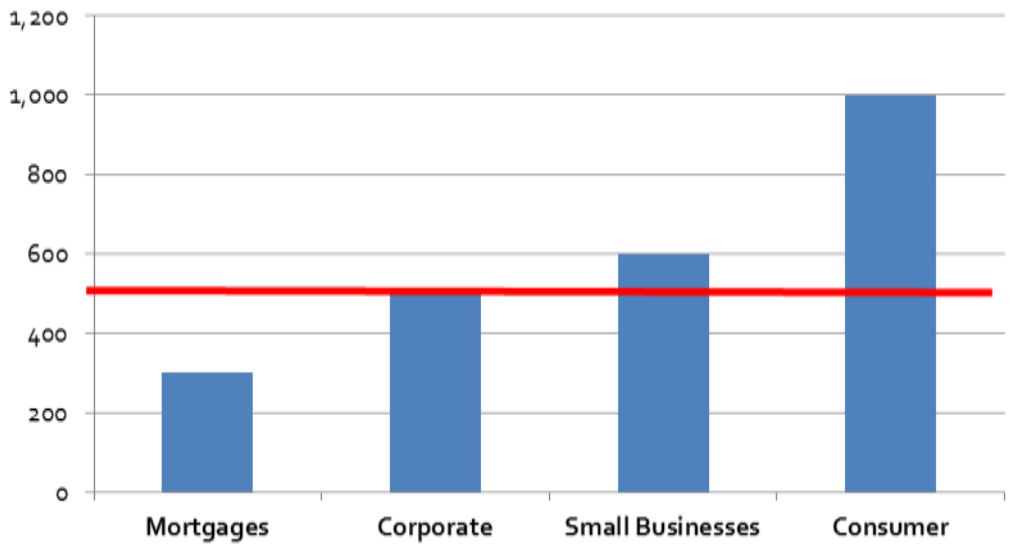
- Greek banking system's loans-to-deposits ratio already down significantly; a further aggressive (and speedy) reduction of that ratio might prove counterproductive: As we have explained already, the domestic banking system's ongoing deleveraging has already reduced the industry-wide loans-to-deposit ratio to 112.5% currently from highs near 135.5% reached in early 2012. In relation to the argument above (i.e., "Economy needs a positive credit shock"), we claim here that authorities should not opt for a further aggressive (and speedy) de-escalation of the loans to deposit ratio. Indeed, with the country's current account presently in a balanced position, the provision of new credit might not significantly deteriorate the loan to deposit ratio, as part of new credit would mainly circulate in the domestic economy, boosting investment growth and export revenues and thus, facilitating FDI and the return of deposits from abroad.
- Encourage large domestic corporations to tap international funding markets: Large domestic corporations, which have the critical size to become borrowers in the international bond markets, should be encouraged to use this liquidity channel. Increased corporate borrowing from abroad would free-up liquidity in the banks' balance sheets, which could then be used to finance small and medium-sized enterprises (SMEs) in key sectors of the domestic economy that continue to face limited access to bank credit.
- Consider change of management rules for liquidity balances of pension funds and other State-related entities held at the Central Bank: Currently, a number of domestic pension funds and other State-related entities keep their liquidity balances with the Central Bank (Bank of Greece). If management rules for these balances were to be altered, then the ensuing (freed-up) liquidity could be used in a more efficient and productive way i.e., by channeling this extra liquidity to the real economy via the Greek banking system.
- Mobilize part of EFSF notes currently held by the HFSF: The Hellenic Financial Stability Fund (HFSF) is currently estimated to hold EFSF notes worth between €10bn and €11bn. In our view, this is a significant liquidity source that is currently unutilized. One possibility would be to lend a part of these notes to the Greek banks and allow them to use the notes as collateral in the international repo markets. Using the ensuing proceeds Greek banks could partly reduce their ECB dependence, fund new State investment projects or provide credit to state guaranteed entities.
- Banks should opt for a swift resumption of access to wholesale funding markets / EMTN cost argument: According to our preliminary calculations, a €10bn increase in domestic banks' wholesale funding would be equivalent to an increase of their total liabilities by around 5% to 6%. This means that even if the banks were to raise market funding at a cost of, say, Euribor +500bps (a fair assumption to be made in the present trajectory, though this cost could rapidly deescalate thereafter), the total funding cost for the system as a whole would increase by only 15bps.[28] However, if banks succeed in bringing down their deposit cost by another 15bps, this would broadly offset the higher wholesale funding cost, while leaving banks with additional liquidity of €10bn that could be used to boost credit to the real economy. An Additional argument supporting the latter view is that Greek banks need to start building up their credit curves as soon as possible so as to facilitate the market's price discovery process on Greek credit debt.

Bank loan spreads vs. wholesale funding costs

As a final point to this section, Graph 1.12 below compares the wholesale cost of funding for Greek banks and the interest rates charged on different categories of private-sector loans. Both funding cost and loan interest rates are expressed here as a spread to 3m euribor. For the sake of simplicity, wholesale funding cost is assumed to equal c. 3m euribor + 500bps, a rate deemed to be not far from what would be realised should Greek banks tap the wholesale markets for long-term funding (say, tenors up to 3 years) under present conditions. The loan interest rates presented in Graph 1.12 (again, as spread over 3m euribor) constitute authors' estimates and pertain to respective industry-wide averages. The message we basically want to communicate in the graph below is as follows: Taking into account the potential cost of new wholesale funding, there are certain types of new lending that could be justified on the basis of spread income. That is, any new lending should, preferably, not strain the system's capital base i.e., it should have a positive net interest income contribution. From the graph below, it is obvious that consumer, small business and corporate loans could be the targeted loan space (from a strict profitability standpoint), as they are yielding spreads close to or even higher than the expected cost of wholesale funding.

[28] Average costs of deposits is currently around Euribor + 250bps.

Graph 1.12 - Bank loan spreads vs. Wholesale funding costs (in bps)



Source: Eurobank Global Markets Research

5. A model for analyzing the banking lending channel in Greece and the euro area

5.1 Empirical methodology

To empirically test the existence of a bank lending channel in the euro area we utilize an aggregate demand model initially proposed by Driscoll (2004).[29] Specifically, we apply the said model to estimate the relationship between bank credit and output in a panel of 12 euro area economies, (see *Data and Empirical Results* section). In brief, the empirical methodology used consists of the follows three steps:

Step 1. Prepare data and derive demeaned variables.
Step 2. Run country-specific OLS regressions of relevant monetary aggregates (M2 or M3) on real income (real GDP) and deposit interest rates.
Step 3. Run OLS panel regression of real GDP growth on loans growth, instrumenting loans with money demand shocks *i.e.*, estimated regression errors from Step. 2.

For a formal presentation of the Driscoll (2004) model see Appendix II at the end of this document.

5.2 SVAR model - Greece case study

This section discusses briefly the second empirically methodology presented in this paper, which aims to take a closer look at the functionality of the monetary transmission mechanism and the intermediation role of banks in the Greek economy. Our case study utilizes a structural vector autoregressive model (SVAR) for modeling the pass-thought of monetary policy shocks to domestic retail loan rates and the real economy. Note that the SVAR framework has been extensively utilized in the literature to study the mechanism of monetary policy transmission and the effects on monetary policy innovations on real economic variables[30].

Our baseline specification comprises of the following vector of endogenous variables:

$$Y_t = [\, y_t, p_t, MM_t, RR_t]$$

[29] For a panel study on the banking lending channel in the euro area utilizing the Driscoll (2004) model see L. Cappiello et al. (2010)
[30] For earlier contributions utilizing the SVAR model see e.g. Cottarelli and Kourelis (1994), Borio and Firtz (1995), Mojon (2005) and Donnay and Degryse (2001).

where y_t is real GDP, p_t is the GDP deflator, MM_t depicts a money market rate and RR_t is the domestic retail loan rate. The Cholesky decomposition is used to recover the structural shocks of the primitive SVAR system, even though, with quarterly data, the within period effects cannot be ruled out.[31] The ordering of endogenous variables associated with the aforementioned identification strategy is as follows: real GDP, GDP deflator, money market rate and the retail loan rate. The lags of the SVAR system in our empirical study are selected by applying the usual information criteria *i.e.*, Akaike and Schwarz.

6. Data and empirical results

6.1 Panel study for analyzing the banking lending channel in the euro area

The panel study presented in this section constitutes the empirical counterpart of the Driscoll (2004) model we summarized in the previous section. The study comprises of the following 12 euro area countries: Austria (AT), Belgium (BE), Cyprus (CY), Finland (FI), France (FR), Germany (DE), Greece (EL), Ireland (IE), Italy (IT), the Netherlands (NL), Portugal (PO) and Spain (ES).[32] The data series utilized herein are observed at quarterly frequency and span the period Q1 2003 to Q2 2013. [33] The sources of the panel variables are Eurostat, ECB and the respective national central banks. The relevant notation and definition of variables is a follows:

Real GDP (2005 prices), y
GDP deflator (2005=100), p
Annualized deposits rates (non-financial corporations and households in domestic MFIs; up to 1-year maturity), rd
Loans to domestic households and businesses (nominal outstanding amounts in EURs), l
Monetary aggregates excluding currency in circulation, $M2$ and $M3$[34,35]
Our loans (l) and monetary ($M2$ and $M3$) variables constitute *real* balances (respective nominal values are deflated with the corresponding GDP deflator indices). Note that all aforementioned variables (except of the deposit rate) enter our panel study in logs and they are demeaned with their respective cross-sectional mean as explained in Appendix III.

As a first step, we estimate the money demand equation for each of the euro area countries under examination. The results of this first step are reported in ***Table 1*** of ***Appendix III.***

The second step of our analysis encompasses a regression of loan growth on real GDP growth and the money demand shocks, e^{M2} and e^{M3} estimated in the previous step (see ***Table 2*** of ***Appendix III***). As the said table suggests, contemporaneous and 3rd-lag money demand shocks derived from M2 are statistically significant (Panel 2.1 of Table 2). The same applied for money demand shocks derived from M3 (Panel 2.2 of Table 2). The interpretation of the estimated coefficient of the OLS panel regressions presented in Table 2 – Appendix III is as follows:

An assumed change in the residual e^{M2}_{it} (as estimated from M2) at a rate of 1ppt above the corresponding cross-sectional mean would induce a 0.045% increase in the growth of loans above the cross-sectional average loan growth, as reflected by the estimated coefficient of e^{M2}_{it} in the Panel 2.1 of Table 2. This effectively implies that the level of bank deposits is indeed a significant determinant of loan supply, which, in turn, constitutes an important precondition for the existence of a banking lending channel. That is, a large value of e^{M2}, which effectively indicates a larger amount of deposits in the banking system, provides the means for banks to supply more loans.

As a final step, we run panel regressions of real GDP growth on loans growth instrumented with the money demand shocks used in the previous step (see ***Table 3*** of ***Appendix III***). As demonstrated by panel 3.1 of Table 3 (Appendix III) the coefficient of loan

[31] For a more thorough discussion of the problem of potential simultaneity arising in this particular setting see e.g. Donnay and Degryse (2001).
[32] For the rest of the euro area economies *i.e.*, Estonia, Luxembourg, Malta, Slovenia and Slovakia there are no adequately-long time series for the variables included in our panel study and thus, we exclude them from our analysis.
[33] The time period examined in our study is after all of the countries included herein have joined the euro area. This broadly prevents our results from being biased by any structural breaks in the estimated empirical relationships due to euro adoption.
[34] For the period after-Q4 2007, M2 and M3 data for Cyprus constitute authors' estimates, as the Central Bank of Cyprus discontinued publishing statistics for the monetary aggregates following the country's entry into the euro area (January 2008).
[35] In line with Demetriades and Hussein (1996) and others, we subtract money in circulation from both monetary aggregates M2 and M3. The reason is to get a more relevant measure of financial debt (and banks' deposit liabilities), especially because, in some cases, M2 and M3 may contain a relatively large portion of currency outside banks and thus, a change in any of these aggregates may in fact reflect the level of monetization of the economy.

growth variable (Δl_{it}) is statistically significant, has the theoretically-correct sign (positive) and implies a significant effect of bank loans on GDP. In additional to the instrumental variables (IV) panel regression that includes all 12 euro area countries examined in the present study, we run to additional IV panel regressions including: (i) the so-called PIGS economies (Portugal, Ireland, Greece and Spain) plus Cyprus i.e., 5 euro area countries in total; and (ii) Greece and Cyprus, i.e., 2 euro area economies. The respective empirical results of the panel regressions (i) and (ii) are depicted in Panel 3.2 and Panel 3.3 of Table 3 (Appendix III). For the purpose of the present paper, we consider the empirical results of the latter regressions as being more representative than the 12-country IV panel regression, given the economies included in the reduced cross-section regressions were these that have been more severely affected by the euro area sovereign debt crisis.[36]

The Δl_{it} variables in these two IV panel regressions enter in lags as the respective contemporaneous coefficients were found to be insignificant. Focusing on Greece and Cyprus (Panel 3.3 of Table 3), the interpretation of the estimated coefficients is as follows: A 1ppt decrease (increase) in one of these countries' loan growth relative to the two-country average causes, after a quarter, a decline (rise) of around 0.2ppts in that country's GDP growth below (above) the corresponding two-country average.

Overall, our results support the existence of a banking lending channel in the euro area. First, country-specific money demand shocks have a significant effect in the growth of loans; this effectively implies that the level of bank deposits is indeed a determinant of loan supply, which, in turn, constitutes this first key precondition for the existence of a banking lending channel. Second, the supply of bank loans has a significant effect of a country's GDP, which constitutes the second important precondition for the existence of a banking lending channel.

6.2 SVAR model – Greece case study

This section discusses the data used and the empirical results of the application of our SVAR model for examining the functionality of the monetary policy transmission mechanism in Greece. The data series utilized herein are observed at quarterly frequency and span the periods: Q1 2000 to Q1 2013. The sources of the data are Eurostat, ECB and Bank of Greece. The relevant notation and definition of variables is as follows:

Real GDP (2005 prices), ***y***
GDP deflator (2005=100), ***p***
Money market rate (EONIA), ***MM***
Retail loan rate, ***RR***, representing the annualized interest rate on euro-denominated new loans from domestic MFIs to domestic households & non-financial corporations.

The empirical results of our SVAR model for Greece are depicted in Appendix IV. Our baseline specification is a 4-variable SVAR, comprised of the following endogenous variables: real GDP, ***y***, GDP deflator, ***p***, EONIA, ***MM*** and retail loan rate ***IRHB***. Tables 1.1 & 1.2 of Appendix IV present the full SVAR model results for our baseline specification (in log levels and log changes, respectively). The number of lags is 2 (selection based on Akaike and Schwarz criteria) and the included "crisis" dummy, ***D08***, takes the value of 0 over the period Q1 2000-Q4 2008 and 1 otherwise.

The impulse-response functions of our baseline SVAR specifications in log levels and in log changes are depicted in Graphs 1.1 & 1.2 (Appendix IV), respectively.[37] Note that Graph 1.2 (Annex IV) portrays the *cumulative* response of real GDP growth to 1 standard deviation (S.D.) shock to the retail loan rate. Furthermore, a 2-variable SVAR model is estimated, including the following two endogenous variables, ***EONIA*** and ***IRHB*** as well as the crisis dummy, ***D08***. Graphs 2.1-2.3 (Appendix IV) depict the impulse responses of the 2-variable SVAR, estimated over full sample Q1 2000 - Q1 2013 and over the periods Q1 2000 – Q4 2008 and Q1 2009 – Q1 2013, respectively.

[36] With the exception of Spain, all of these economies are currently under a formal stabilization progarmme agreed with the EC/ECB/IMF troika of official lenders.

[37] Cointegration tests conducted with the baseline specification show that there are multiple cointegrating vectors. Given the size of the sample that we have available we treat the issue of cointegration with some caution and, because of the above multiplicity, we do not impose the cointegrating restrictions during estimation. Our results below, that is the estimated impulse responses, are robust to this approach and do not change either quantitatively or qualitatively by using the unrestricted VAR without cointegration. The validity of our approach is further enhanced by the analysis we have conducted in first differences, where we found the same shape of the (cumulative) impulse responses as the unrestricted levels VAR model.

As demonstrated by our empirical results (Tables 1.1 & 1.2 – Appendix IV), the estimated coefficients of the lagged loan interest rate in the respective baseline GDP equations have the correct sign (negative) and are statistically significant. Moreover, the crisis dummy, *D08*, is significant in the SVAR model in which real GDP and GDP deflator enter in log differences. As regards the estimated impact of exogenous changes in the loan interest rate on real GDP, the numerical interpretation of the estimated impulse-response functions is a follows:

An exogenous increase (decrease) in the loan rate equivalent to 1 standard deviation (1.58 percentage points in our study) causes a 1-year ahead cumulative decline (rise) in real GDP by ca 0.49 percentage points (ppts), with the full impact of the shock realized over a 4-quarter period.

Practically, if one assumes that deposit rates in Greece decline by 2 percentage points and this leads to a decline in the average loan rate by, say, 1ppts, then this can lead to a cumulative boost in real GDP growth of ca 0.3ppts over a 4-quarter period. If the decline in the average loan rate is, instead, 2ppts, then the cumulative boost to real GDP growth reaches around 0.6ppts over a 4-quarter period.

As to the functionality of the monetary policy transmission mechanism in Greece, our empirical results from estimating the 2-variable SVAR model[38] show that around 44% of a given exogenous shock in the EONIA rate are transmitted within a year to the average rate on domestic FMI loans to households and businesses. Over a 16-quarter period (i.e., 4 years) the cumulative pass-through reaches around 64.7% (Table 2 of Appendix IV).

Earlier empirical studies have documented the existence of an incomplete pass-through of monetary policy shocks to domestic loan rates, with the speed of adjustment varying widely across the euro area economies and depending on such country-specific characteristics as the degree of competition in the domestic loans market and the relative size of financial intermediaries. For instance, estimating a 2-variable SVAR model similar in structure with that utilized in our study, Donnay and Degryse (2001) document a 1-year-ahed cumulative pass-through in Greece that reaches 77% for the interest rate on short-term loans to businesses and 68% in the case of long-term loans to businesses over the period 1980-2000.[39]

Although in our model the inclusion of the crisis dummy, ***D08***, controls for the impact of the global financial crisis (and the ensuing Greek sovereign debt crisis) on the functionality of the monetary policy transmission mechanism, we have also estimated the corresponding pass-through rates in two sub-periods of our full sample, namely, Q1 2000-Q4 2008 and Q1 2009-Q1 2013 (estimates available upon request). Not surprisingly, our results document a significant decline in the pass-through rate in the period following the outbreak of the global financial crisis.

7. Concluding remarks and brief discussion of policy implications

The present paper employs two discrete empirical methodologies to examine the existence of a banking lending channel in the euro area and to assess the functionality of the monetary policy transmission mechanism in Greece in the period before and after outbreak of the 2007/2008 global financial crisis.

To empirically estimate the relationship between bank credit and output we apply an aggregate demand model initially proposed by Driscoll (2004) in a panel of 12 euro area economies, including: Austria (AT), Belgium (BE), Cyprus (CY), Finland (FI), France (FR), Germany (DE), Greece (EL), Ireland (IE), Italy (IT), the Netherlands (NL), Portugal (PO) and Spain (ES).

In line with a number of earlier empirical studies, see *e.g.* L. Cappiello et al. (2010), our results provide strong evidence supporting the existence of a banking lending channel in the euro area. Specifically, country-specific money demand shocks have a significant effect on the growth of loans, which effectively implies that the level of bank deposits is indeed a key determinant of loan supply. Furthermore, the supply of bank loans has a significant effect of on GDP and other real economic variables.

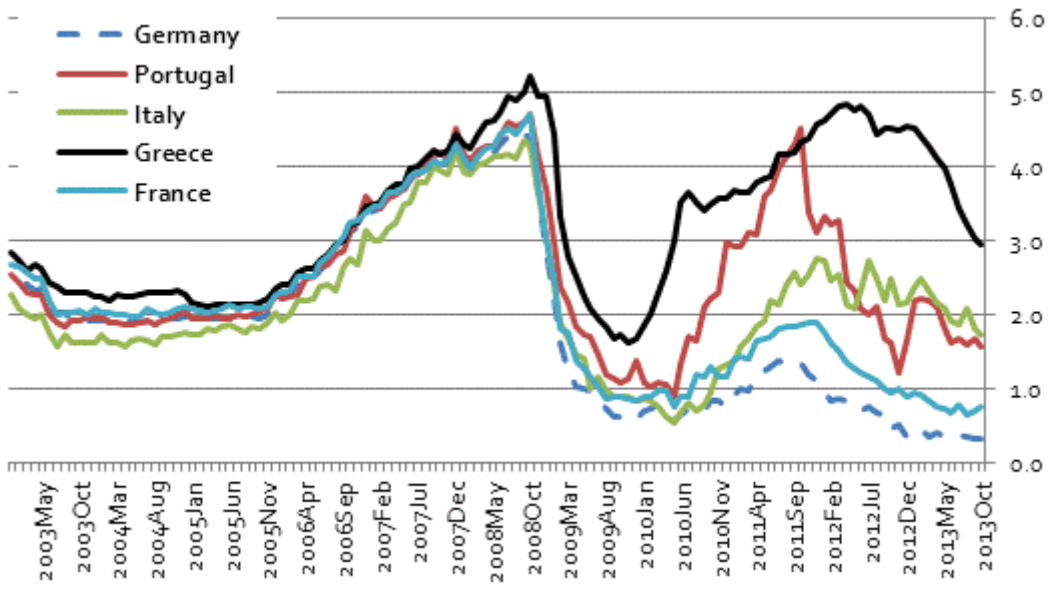
[38] 2-variable SVAR includes EONIA and IRHM as endogenous variables and the crisis dummy, Do8, as exogenous.
[39] This was actually among the highest estimated pass-through rates in the euro area.

By and far, these finding reinforce the need for a close monitoring of credit developments in the context of monetary authorities' ongoing efforts to restore the proper function of the monetary policy transmission mechanism.

In the case of Greece, a panel analysis of a group of five euro area countries that have been particularly hit by the sovereign debt crisis (Greece, Portugal, Ireland, Spain and Cyprus) shows that, a 1 percentage point increase in domestic bank loan growth relative to the cross-section average causes, after a quarter, a rise of between 0.2ppts and 0.47ppts in Greece's real GDP growth above the respective cross-sectional average (and vice versa).Separately, our SVAR model estimates imply that a decline (increase) in the average Greek bank loan interest rate by 1ppt can lead to a cumulative boost (contraction) in real GDP growth by around 0.3ppts over a 4-quarter period.

In our view, the latter results demonstrate the crucial role bank credit can play in the recovery of the Greek economy, following a prolonged and severe domestic recession.

Graph 1.13
Annualized interest rates (up to 1yr maturity) on deposits of non-financial corporations & households in domestic MFIs.
(Source: ECB)



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Appendix I – Graphs & Tables

Graphs 1.10 – Greek banking system Loans-to-deposits ratio

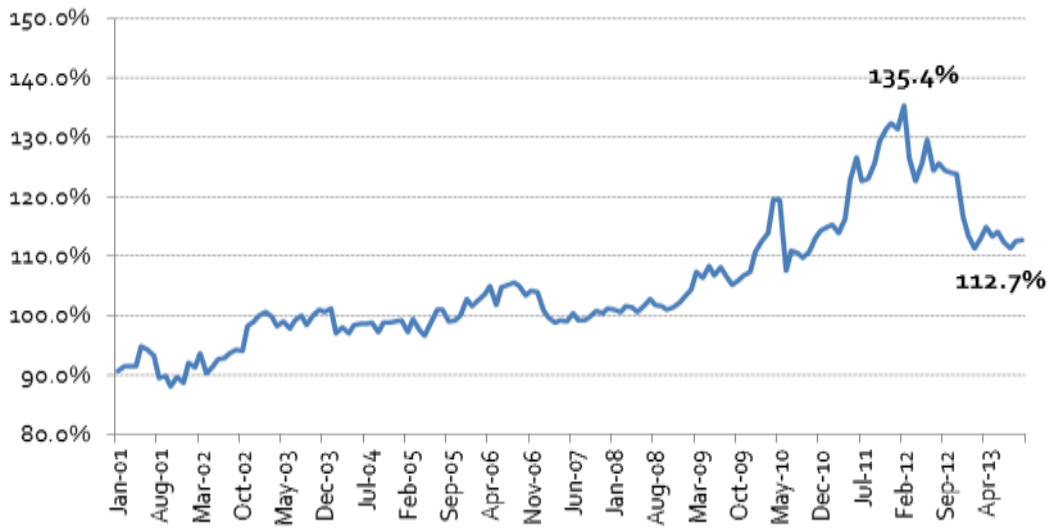
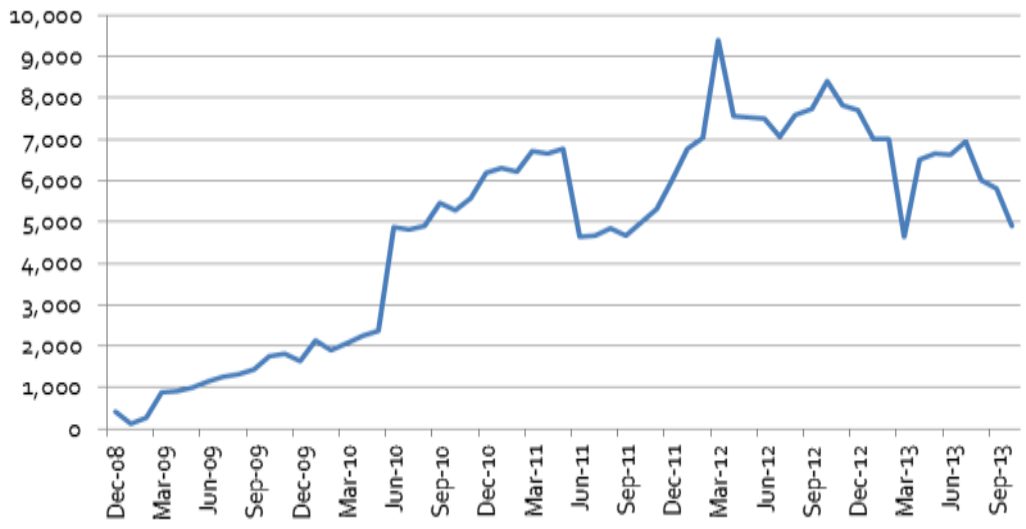


Table 1a – Greek corporate bond issuance

Issuer	Sector	Credit Rating (Moody's / S&P)	Maturity	Coupon (%)	Indicative Offer Price	Yield to Maturity (%)	Yield to Maturity as of their original Issue Date (%)	Issue Date	Issue Price
OTE PLC	Telecommunications	B2 / BB-	4/8/2014	7.25	102.143	0.527	7.43	4/8/2012	99.674
OTE PLC	Telecommunications	B2 / BB-	2/12/2015	7.25	105.831	2.14	6.52	2/12/2008	99.705
OTE PLC	Telecommunications	B2 / BB-	5/20/2016	4.625	103.506	3.101	4.74	11/21/2006	99.2
OTE PLC	Telecommunications	B2 / BB-	2/7/2018	7.875	113.622	4.261	8	2/7/2013	99.493
TITAN GLOBAL FINANCE PLC	Building Materials	#N/A N/A / BB- /*+	1/19/2017	8.75	112.933	4.255	8.75	12/19/2012	100
HELLENIC PETROLEUM FINAN	Oil&Gas	#N/A N/A /	5/10/2017	8	106.989	5.714	8	5/10/2013	100
FRIGOGLASS FINANCE BV	Machinery-Diversified	B1 / BB-	5/15/2018	8.25	104.964	6.926	8.25	5/20/2013	100
INTRALOT FINANCE LUXEMBU	Entertainment	B1 / B+	8/15/2018	9.75	109.731	7.253	10	8/8/2013	99.027
SB MINERALS FINANCE/SB I	Mining	(P)B3 / B+	8/15/2020	9.25	109.072	7.494	9.25	8/8/2013	100

Graphs 1.11 – Greek banking system annualized provisions (EURmn)



Source: BoG, Eurobank Global Markets Research

Appendix II
A model for analyzing the banking lending channel in the euro area

A model for analyzing the banking lending channel in the euro area

This section provides a brief description of a model initially proposed by Driscoll (2004) to derive a testable equation for the bank lending channel.[40] In this paper we apply the aforementioned model to estimate the relationship between bank credit and output in a panel of 13 euro area economies, including Greece and Cyprus (see section *Panel Study- Data and Empirical Results* in this document).

The model extends the Bernanke and Blinder (1988) aggregate demand model, assuming that the economy is comprised of M states, $i = 1,..,M$, sharing a common currency and monetary policy.[41] The economy is populated by investors who have a portfolio choice between bank deposits and bonds. The interest rate on bank deposits, rd, can vary from one member state to another, but bonds bear the same interest rate, r, across states. In this stylized model, the common monetary authority can change the aggregate quantity of money, but it cannot target the quantity of money in a specific state. For each state, i, the equilibrium money demand and supply equation can be written as follows:

$$m_{it} - p_{it} = \gamma y_{it} - \delta(r_t - rd_{it}) + e_{it} \qquad (1)$$

where $m_{it} - p_{it}$ represents real money balances, y_{it} is real income and e_{it} depicts the state-specific shock to money demand. In this Keynesian framework, real income equals aggregate expenditure, which can be disaggregated into consumption (private and public), investment and net exports. Assuming now that government spending is given and net exports depend on the exogenous exchange rate, consumption and investment will inversely depend on the interest rates on bonds and loans, r_t and ρ_{it}, respectively. Again, loan interest rates can vary from one member state to another, though bonds bear the same interest rate across states. Then, in equilibrium, the following equation holds:

$$y_{it} = -\theta r_t - a\rho_{it} + z_{it} \qquad (2)$$

where z_{it} represents state-specific shocks to aggregate demand.
Supply of bank loans a function of the interest rate on bonds and loans and also depends on real money balances, given that deposits are assumed to be a major source of financing for banks that cannot be perfectly substituted by other funding sources.[42] Next, the loan supply, ls_{it}, and loan demand, ld_{it}, equations can be written as follows:

$$ls_{it} = -\lambda r_t + \mu\rho_{it} + \beta(m_{it} - p_{it}) + w_{it} \qquad (3.1)$$

$$ld_{it} = rr_t - \chi\rho_{it} + \omega y_{it} + u_{it} \qquad (3.2)$$

where w_{it} and u_{it} represents state-specific shocks to loan supply and loan demand, respectively.

In order to distinguish between the banking lending channel (i.e., effects of bank loans on a state's real economy) and the interest rate channel (i.e., common monetary policy effects on a state's real economy), Driscoll (2004) de-means each relevant model variable, x_{it}, with its cross sectional mean:

$$x^*_{it} = x_{it} - M^{-1}\Sigma_i x_{it} \text{ for } i = 1,\ldots,M.$$

The system of equations (1) – (3.2) then becomes:

[40] For a panel study on the banking lending channel in the euro area utilizing the Driscoll (2004) model see L. Cappiello et al. (2010)
[41] One can think of this framework as representing the euro area economy and its Member States.
[42] In the euro area banking sector balance sheet, private, non-financial sector deposits constitute around one-third of total MFI liabilities and thus, they represent the most important source of bank founding.

$$m^*_{it} - p^*_{it} = \gamma y^*_{it} + \delta rd^*_{it} + e_{it} \quad (4)$$

$$y^*_{it} = a\rho^*_{it} + z_{it} \quad (5)$$

$$ls^*_{it} = -\mu\rho^*_{it} + \beta(m^*_{it} - p^*_{it}) + w_{it} \quad (6.1)$$

$$ld^*_{it} = -\chi\rho^*_{it} + \omega y^*_{it} + u_{it} \quad (6.2)$$

Note that, by de-meaning the variables entering the model equations, we remove the possible impact of monetary policy changes on bond yields (interest rate channel). Furthermore, by assuming that $Corr(e_{it}, u_{it}) = Corr(e_{it}, z_{it}) = 0$, we also solve the endogeneity between money demand shocks and real income.[43] Here, we effectively allow money demand shocks, e_{it}, to be independent from real income and loan demand and, instead, depend on other factors such as preferences and/or institutional arrangements. If the aforementioned conditions hold, then one can show - *i.e.*, by solving equations (4) – (6.2) for real income and loans - that although country-specific money shocks are uncorrelated with output, they continue to be correlated with loans. That effectively means that money demand shocks can be used as instruments in estimating the relation between real income and loans.

The model above offers a pretty straightforward framework to empirically test for the existence of a banking lending channel in the euro area, and that is in fact the topic of the next section of our paper. Specifically, the empirical methodology used consists of the follows three steps:

Step 1. Prepare data and derive demeaned variables
Step 2. Run country-specific OLS regressions of relevant monetary aggregate (e.g. M2 or M3) on real income (real GDP) and deposit interest rates
Step 3. Run OLS panel regression of real GDP growth on loans growth, instrumenting loans with money demand shocks (i.e., estimated regression errors from Step. 2).

[43] For the more detailed analysis on how to tackle the endogeneity issue in the model above, see Driscoll (2004)

Appendix III

Panel study on the banking lending channel in the euro area

Table 1 – Estimation of money demand equation errors

Sub table 1.1 - M2 regression on real GDP (y) and deposit rates (rd)

Method: Pooled EGLS (Cross-section weights); Sample: 2003Q1 2012Q4; 40 included observations; Cross-sections included: 12; Total pool (balanced) observations: 480; Linear estimation after one-step weighting matrix

Dependent variable: *M2*

	Estimated coefficients of explanatory variables*	
	y	***rd***
Belgium	**1.383**	**0.070**
Germany	**1.240**	**0.051**
Ireland	**1.393**	**0.083**
Greece	**1.379**	**0.039**
Spain	**1.284**	**0.056**
France	**1.240**	**0.042**
Italy	**1.265**	**0.027**
Cyprus	**1.804**	**0.031**
Netherlands	**1.359**	**0.049**
Austria	**1.340**	**0.057**
Portugal	**1.414**	**0.030**
Finland	**1.313**	0.006

(*) quarterly frequency data spanning the period Q1 2003-Q4 2013; all variables are computed as deviations from their cross-sectional mean; except of the ***rd*** coefficients for Finland (insignificant) and Cyprus (significant at the 10% confidence level), all other coefficients are significant at the 1% confidence level,

Sub table 1.2 - *M3* regression on real GDP (*y*) and deposit rates (*rd*)

Method: Pooled EGLS (Cross-section weights)

Sample: 2003Q1 2012Q4; 40 included observations

Cross-sections included: 10, Total pool (balanced) observations: 400

Linear estimation after one-step weighting matrix

Dependent variable: *M3*

	Estimated coefficients of explanatory variables**	
	y	***rd***
Germany	**1.351**	**0.018**
Ireland	**1.523**	**0.109**
Greece	**1.548**	-0.008
Spain	**1.431**	**0.011**
France	**1.383**	**0.024**
Italy	**1.393**	-0.002
Netherlands	**1.495**	-0.001
Austria	**1.483**	**0.022**
Portugal	**1.572**	-0.008
Finland	**1.491**	-0.003

(**) quarterly frequency data spanning the period Q1 2003-Q4 2013; all variables are computed as deviations from their cross-sectional mean; all ***y*** coefficients are significant at the 1% confidence level; significance level of the ***dr*** coefficients is as follows: Ireland, France and Austria all significant at the 1% level, Germany and Spain significant at 10%; Finland, Italy, Netherlands, Greece and Portugal all insignificant. Sub table 1.2 contains 10 countries (2 less than Sub table 1.1) due to the lack of availability of M3 data for Belgium and Cyprus

Table 2 – OLS panel regressions of loan growth on GDP growth and money demand shocks

Panel 2.1 – OLS panel regression of loan growth (Δl) on GDP growth (Δy) and money demand shocks from M2 (e^{M2})

Dependent Variable: Δl_t
Method: Panel EGLS (Cross-section weights)
Sample (adjusted): 2004Q2 2012Q4
Periods included: 35, cross-sections included: 12;
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Δy_{t-3}	0.243720	0.106378	2.291062	0.0225
Δy_{t-4}	0.487751	0.106126	4.595955	0.0000
e^{M2}_{t}	0.045647	0.021583	2.114921	0.0350
e^{M2}_{t-3}	-0.069278	0.021851	-3.170484	0.0016
R-squared	0.099793			

Panel 2.2 – OLS panel regression of loan growth (Δl) on GDP growth (Δy) and money demand shocks from M3 (e^{M3})

Dependent Variable: Δl_t
Method: Panel EGLS (Cross-section weights)
Sample (adjusted): 2004Q2 2012Q4
Periods included: 35; Cross-sections included: 10
Total panel (balanced) observations: 350
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Δy_{t-3}	0.261721	0.108341	2.415730	0.0162
Δy_{t-4}	0.464046	0.107993	4.297008	0.0000
e^{M3}_{t}	0.050048	0.026538	1.885922	0.0601
e^{M3}_{t-3}	-0.091170	0.026074	-3.496562	0.0005
R-squared	0.116396			

OLS panel regressions 2.1 & 2.2 of loan growth on GDP growth and money demand shocks from M2 (sub-table 1.1) and M3 (sub-table 1.2); quarterly frequency data spanning the period Q1 2003-Q4 2013; all variables are computed as deviations from their cross-sectional mean; Panel 2.1 includes the entire group of euro area countries (12 in total) examined in our study, while panel 2.2 excludes Belgium and Cyprus, from which there are no data available for the M3 monetary aggregate. Lag orders of right hand-side variables in panels 2.1 & 2.2 has been selected to ensure significant of estimated coefficients at the 5% confidence level.

Table 3 – Instrumental variable (IV) panel regressions of GDP growth on loan growth

Panel 3.1 – IV panel regression of GDP growth (Δy) on loan growth (Δl), instrumenting loans with money demand shocks (i.e., estimated regression errors from Table 1 – Appendix III).

Dependent Variable: **Δy**
Method: Panel Two-Stage EGLS (Cross-section weights)

Sample (adjusted): 2003Q4 2012Q4
Cross-sections included: 12
Total panel (balanced) observations: 444
Iterate weights to convergence
White period standard errors & covariance (d.f. corrected)
Instrument specification: C DY(-1 TO -2) EM2(0 TO-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Δy_{t-2}	0.228086	0.140907	1.618692	0.1062
Δl_t	0.759274	0.330228	2.299243	0.0220
Δl_{t-1}	-0.610630	0.364002	-1.677543	0.0941

IV panel regression on GDP growth and loan growth instrumented with money demand shocks from M2 (Sub-Table 1.1 – Appendix III); quarterly frequency data spanning the period Q1 2003-Q4 2013; all variables are computed as deviations from their cross-sectional mean; panel includes the entire group of euro area countries (12 in total) examined in our study;.

Panel 3.2 – IV panel regression of GDP growth (Δy) on loan growth (Δl), instrumenting loans with money demand shocks (i.e., estimated regression errors from Table 1 – Appendix III). Panel includes five euro area countries (Greece, Ireland, Spain, Portugal & Cyprus).

Dependent Variable: **Δy**
Method: Panel Two-Stage EGLS (Cross-section weights)
Date: 06/07/13 Time: 13:09
Sample: 2003Q1 2012Q4 IF VAR01="EL" OR VAR01="CY" OR VAR01="ie"
OR VAR01="es" OR VAR01="po"
Periods included: 37
Total panel (balanced) observations: 74
Iterate weights to convergence
White period standard errors & covariance (d.f. corrected)
Instrument specification: C DY(-1 TO -2) EM2(0 TO-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Δy_{t-1}	0.109863	0.023607	4.653745	0.0000
Δl_{t-1}	0.466829	0.065937	7.079902	0.0000
Δl_{t-2}	-0.288961	0.101976	-2.833609	0.0060

Panel 3.3 – IV panel regression of GDP growth (Δy) on loan growth (Δl), instrumenting loans with money demand shocks (i.e., estimated regression errors from Table 1-Appendix III). Panel includes two euro area countries (Greece & Cyprus).

Dependent Variable: Δy
Method: Panel Two-Stage EGLS (Cross-section weights)
Sample: 2003Q1 2012Q4 IF VAR01="EL" OR VAR01="CY"
Periods included: 37
Cross-sections included: 2
Total panel (balanced) observations: 74
White period standard errors & covariance (d.f. corrected)
Convergence achieved after 6 weight iterations
Instrument specification: C DY(-1 TO -2) EM2(0 TO-2)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Δy_{t-1}	0.233345	0.124123	1.879944	0.0642
Δl_{t-1}	0.204065	0.037219	5.482890	0.0000

IV panel regression on GDP growth and loan growth instrumented with money demand shocks from M2 (Sub-table 1.1 – Appendix III); quarterly frequency data spanning the period Q1 2003-Q4 2013; all variables are computed as deviations from their cross-sectional mean; panel 3.2 includes five countries of the euro area periphery (including Greece & Cyprus), while panel 3.3 only includes Greece and Cyprus.

Appendix IV
SVAR model results - Greece case study

Table 1 – SVAR baseline specification (real GDP and GDP deflator in log levels)

Vector of endogenous variables: ***[Y, P, EONIA, IRHB]***, where **Y** depicts log (s.a. real GDP), **P** is log (s.a. GDP deflator), **EONIA** is the interbank money market rate utilized in our study & **IRHB** represents the annualized interest rate on euro-denominated new loans from domestic MFIs to domestic households & non-financial corporations. The data series utilized herein are observed at quarterly frequency and span the periods: Q1 2000 to Q1 2013. The sources of the data are Eurostat, ECB and Bank of Greece. Crisis dummy, ***D08***, takes the value of 0 over the period Q1 2000 – Q4 2008 and 1 otherwise.

Vector Autoregression Estimates
Sample (adjusted): 2000Q3 2013Q1
Included observations: 51 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LOG(Y_SA)	LOG(P_SA)	EONIA/100	IRHB/100
LOG(Y_SA(-1))	0.655357	0.014876	0.033881	-0.010433
	(0.13971)	(0.09615)	(0.04316)	(0.01861)
	[4.69086]	[0.15472]	[0.78493]	[-0.56063]
LOG(Y_SA(-2))	0.322745	0.055009	-0.021583	0.000770
	(0.14327)	(0.09860)	(0.04427)	(0.01908)
	[2.25264]	[0.55791]	[-0.48759]	[0.04033]
LOG(P_SA(-1))	0.127038	0.435481	0.090393	0.042985
	(0.19167)	(0.13190)	(0.05922)	(0.02553)
	[0.66281]	[3.30154]	[1.52649]	[1.68372]
LOG(P_SA(-2))	-0.194807	0.467147	-0.102536	-0.036717
	(0.18829)	(0.12958)	(0.05817)	(0.02508)
	[-1.03459]	[3.60503]	[-1.76257]	[-1.46397]
EONIA(-1)/100	0.911325	0.443087	0.961775	0.414012
	(0.63112)	(0.43433)	(0.19499)	(0.08406)
	[1.44398]	[1.02017]	[4.93251]	[4.92496]
EONIA(-2)/100	-0.560038	-0.295250	-0.259641	-0.267806
	(0.46203)	(0.31796)	(0.14274)	(0.06154)
	[-1.21213]	[-0.92857]	[-1.81891]	[-4.35168]
IRHB(-1)/100	-2.518758	-0.484877	0.287013	0.887984
	(0.92276)	(0.63503)	(0.28509)	(0.12291)
	[-2.72959]	[-0.76355]	[1.00675]	[7.22470]
IRHB(-2)/100	1.377686	0.360605	-0.132578	-0.211113
	(0.74328)	(0.51152)	(0.22964)	(0.09900)
	[1.85352]	[0.70497]	[-0.57733]	[-2.13238]
C	0.517070	0.031051	-0.022062	0.046371
	(0.23094)	(0.15893)	(0.07135)	(0.03076)
	[2.23899]	[0.19538]	[-0.30921]	[1.50749]
D08	-0.014857	0.008943	-0.003322	0.001793
	(0.01268)	(0.00873)	(0.00392)	(0.00169)
	[-1.17179]	[1.02500]	[-0.84802]	[1.06180]
Adj. R-squared	0.979130	0.991029	0.926118	0.968748

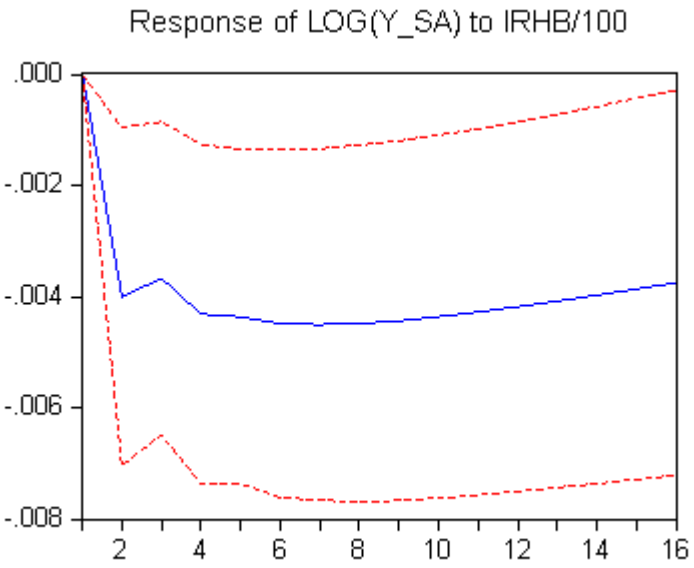
Table 1.1 – SVAR (real GDP and GDP deflator in log change)

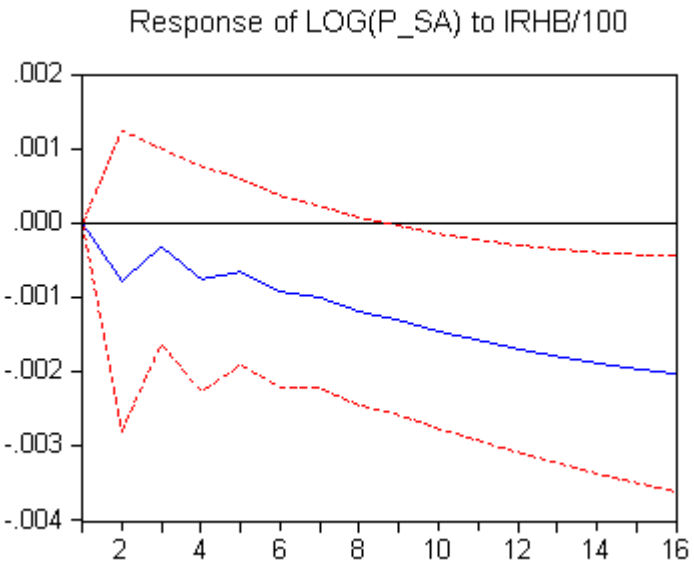
Vector of endogenous variables: ***[Y, P, EONIA, IRHB]***, where **Y** depicts Δlog (s.a. real GDP), **P** is Δlog (s.a. GDP deflator), **EONIA** is the interbank money market rate utilized in our study & **IRHB** represents the annualized interest rate on euro-denominated new loans from domestic MFIs to domestic households & non-financial corporations. The data series utilized herein are observed at quarterly frequency and span the periods: Q1 2000 to Q1 2013. The sources of the data are Eurostat, ECB and Bank of Greece. Crisis dummy, ***D08***, takes the value of 0 over the period Q1 2000 – Q4 2008 and 1 otherwise.

Vector Autoregression Estimates
Sample (adjusted): 2000Q4 2013Q1
Included observations: 50 after adjustments
Standard errors in ( ) & t-statistics in [ ]

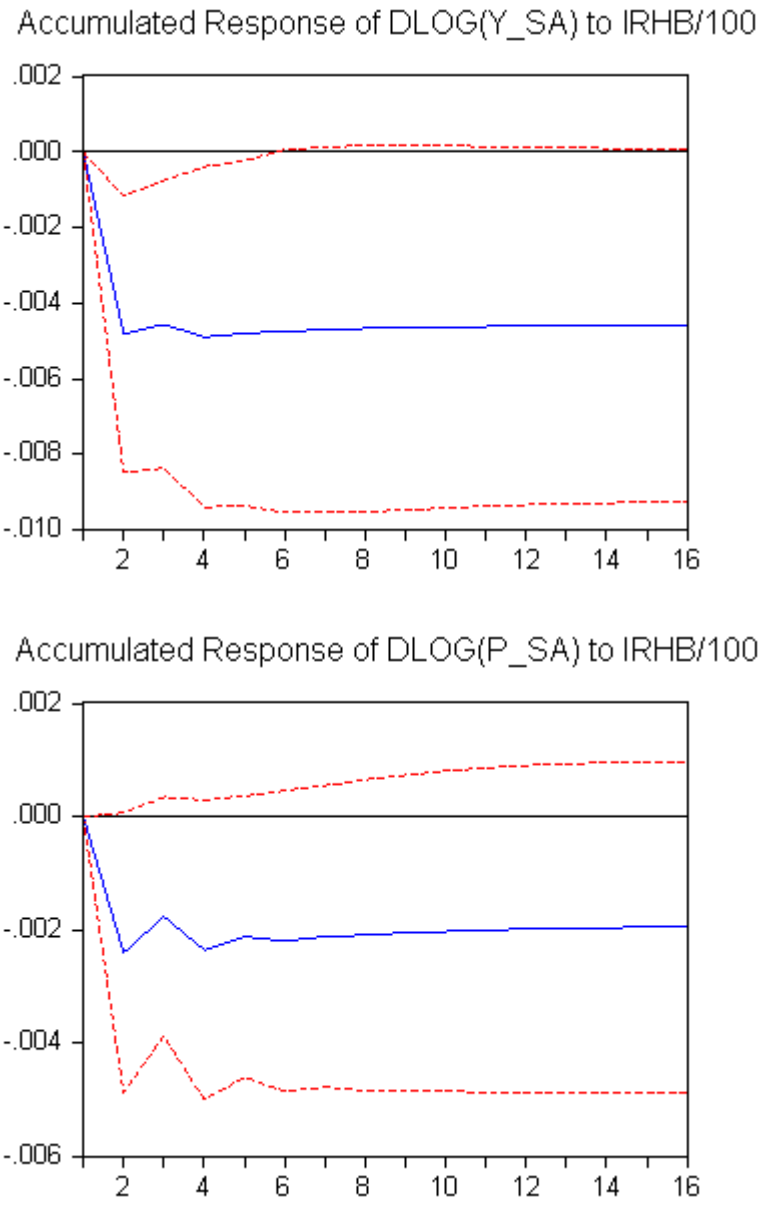
	DLOG(Y_SA)	DLOG(P_SA)	EONIA/100	IRHB/100
DLOG(Y_SA(-1))	-0.289668	0.010849	0.026794	-0.007800
	(0.15128)	(0.10371)	(0.04473)	(0.01998)
	[-1.91477]	[0.10461]	[0.59903]	[-0.39046]
DLOG(Y_SA(-2))	-0.035281	0.000900	-0.013990	-0.007711
	(0.16159)	(0.11077)	(0.04778)	(0.02134)
	[-0.21833]	[0.00812]	[-0.29281]	[-0.36134]
DLOG(P_SA(-1))	0.113322	-0.530300	0.130622	0.034466
	(0.22514)	(0.15434)	(0.06657)	(0.02973)
	[0.50334]	[-3.43600]	[1.96223]	[1.15928]
DLOG(P_SA(-2))	-0.013096	-0.067063	0.040729	0.003572
	(0.23034)	(0.15790)	(0.06810)	(0.03042)
	[-0.05686]	[-0.42472]	[0.59804]	[0.11743]
EONIA(-1)/100	0.447787	0.613480	0.969729	0.364845
	(0.63189)	(0.43317)	(0.18683)	(0.08344)
	[0.70865]	[1.41626]	[5.19035]	[4.37232]
EONIA(-2)/100	-0.400878	-0.070253	-0.262562	-0.273674
	(0.49549)	(0.33966)	(0.14650)	(0.06543)
	[-0.80906]	[-0.20683]	[-1.79219]	[-4.18259]
IRHB(-1)/100	-2.800557	-1.395366	0.306752	0.939714
	(1.02734)	(0.70426)	(0.30376)	(0.13567)
	[-2.72602]	[-1.98133]	[1.00985]	[6.92666]
IRHB(-2)/100	1.991061	0.785292	-0.145603	-0.204953
	(0.71245)	(0.48839)	(0.21065)	(0.09408)
	[2.79469]	[1.60791]	[-0.69120]	[-2.17844]
C	0.059439	0.033651	-0.003091	0.013714
	(0.02260)	(0.01549)	(0.00668)	(0.00298)
	[2.63005]	[2.17205]	[-0.46260]	[4.59528]
D08	-0.031191	0.001010	-0.004883	0.001499
	(0.01033)	(0.00708)	(0.00306)	(0.00136)
	[-3.01827]	[0.14254]	[-1.59802]	[1.09832]
R-squared	0.512015	0.362990	0.935650	0.955684

Graph 1.1 – Impulse responses (SVAR model in log levels)
Response to Cholesky one S.D. innovations +/-2 S.E.

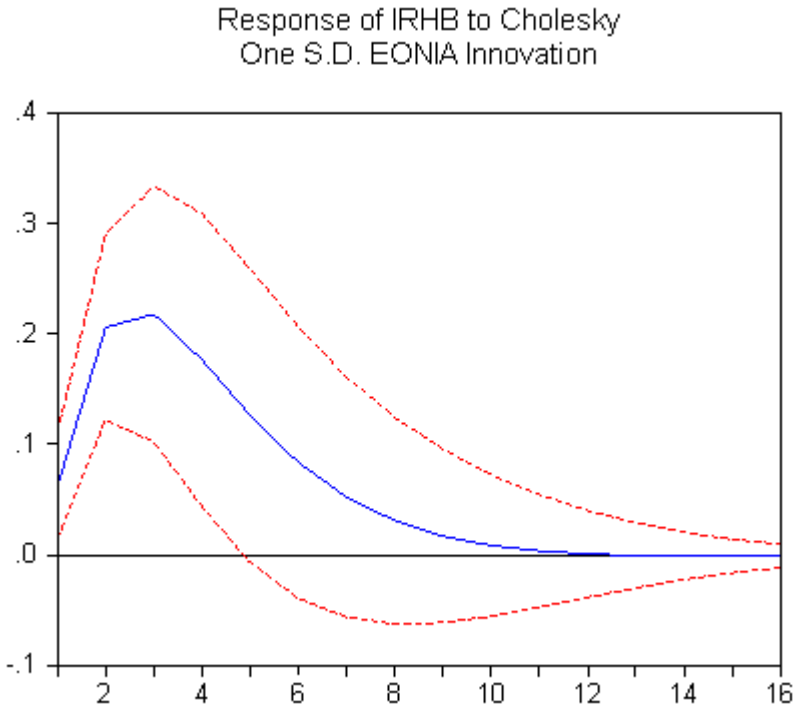




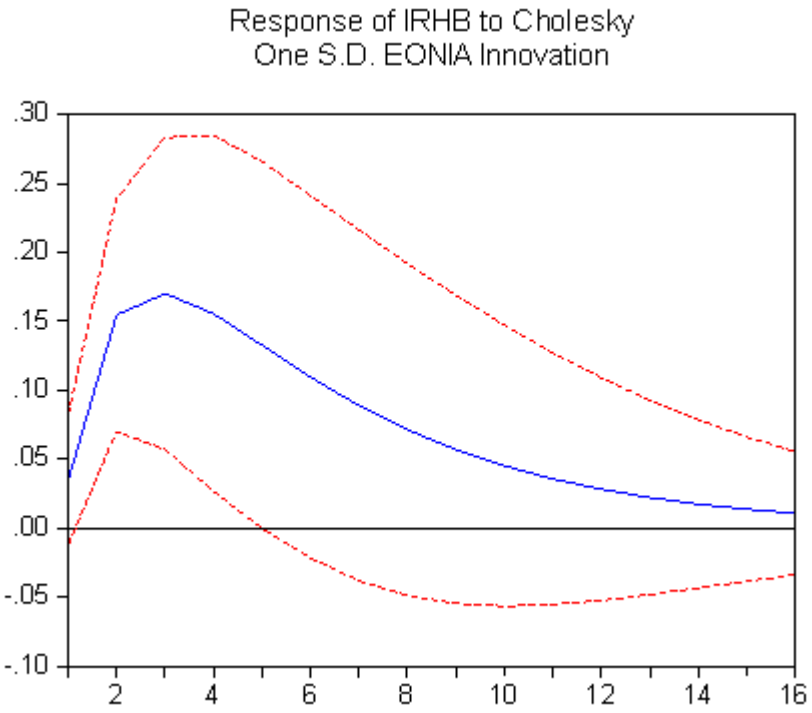
Graph 1.2 – Cumulative impulse response (SVAR model in log changes)
Response to Cholesky one S.D. innovations +/-2 S.E.



Graph 2.1: Impulse responses of 2-variable SVAR (full sample Q1 2000-Q1 2013) (EONIA and domestic retail loan rates)



Graph 2.2: Impulse responses of 2-variable SVAR (sample Q1 2000-Q4 2008) (EONIA and domestic retail loan rates)



Graph 2.3: Impulse responses of 2-variable SVAR (sample Q1 2009-Q1 2013) (EONIA and domestic retail loan rates)

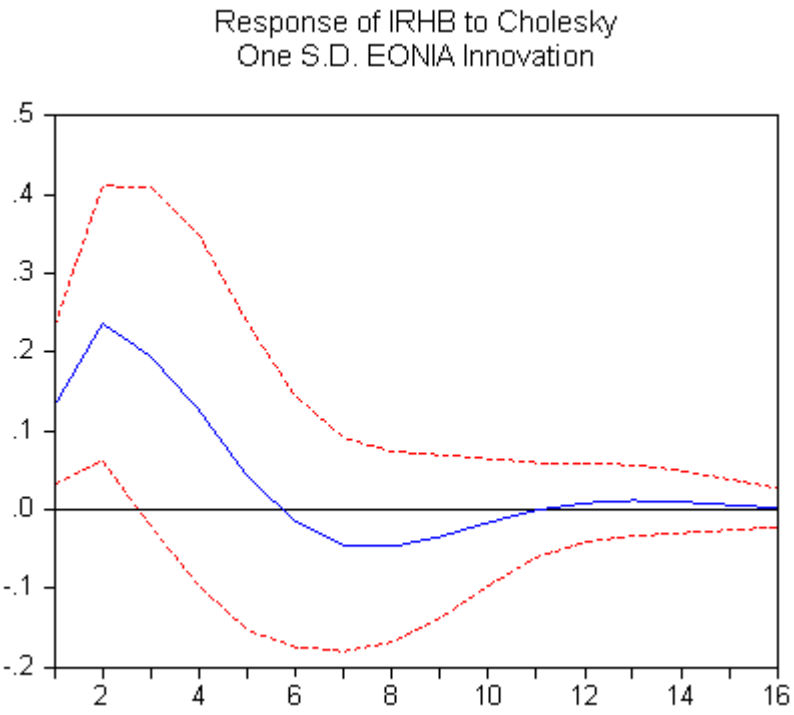


Table 2

Estimated pass-through of EONIA rates to domestic loan rates (in percentage points) SVAR esitmated over full-sample (Q1 2000 - Q1 2013)	
# of quarters ahead	**Pass-through**
1	4.1%
2	17.7%
3	32.1%
4	43.8%
5	52.1%
6	57.6%
7	61.1%
8	63.1%
9	64.2%
10	64.7%
11	64.9%
12	65.0%
13	64.9%
14	64.8%
15	64.8%
16	64.7%

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