

## II. Financial channels and economic activity in the euro area

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*This section discusses the nexus between financial and macroeconomic developments in the euro area. It draws on key lessons from the literature and provides stylised facts on the main transmission channels through which financial developments have affected real economic activity since the crisis. Macro-financial linkages are investigated from an empirical perspective for the euro area as a whole by looking at four key channels: i) the interest rate channel; ii) the borrower balance sheet channel; iii) the bank balance sheet channel; and iv) the uncertainty channel.*

*Overall, the results suggest that financial variables have significant impact on macroeconomic developments but also that the transmission seems to have changed since the crisis. Notably, the interest rate channel has helped the modest recovery since 2014 by supporting both private and public consumption. The positive boost given to favourable financing conditions in 2015 has been somewhat compensating the adverse effects of the borrower balance sheet channel. The bank balance sheet channel and the uncertainty channel play a particularly important role in capturing the weakness in the current rebound in investment. <sup>(26)</sup>*

### II.1. Introduction

Since the global economic and financial crisis, the linkages between macroeconomic and financial developments have been on the frontline of both research and policy making. The massive dislocations observed during the crisis have forged a broad consensus that shocks originating in the financial sector can have profound effects on real economic activity and vice versa. While the effect of macroeconomic developments on financial conditions is rather straightforward, <sup>(27)</sup> the effect of financial developments on the macroeconomy is more complex and was (until recently) largely omitted in mainstream macroeconomic thinking. The interest rate was the only financial variable included in standard macroeconomic models and only to the extent that it was assumed to influence the decisions of economic agents, while no genuine role was assigned to the financial sector itself. In reality, financial intermediation is subject to numerous *frictions* that can affect macroeconomic developments via diverse *transmission channels*. Given the decisive role of bank credit in financing the euro area economy, shocks originating in the banking sector are of crucial importance.

This section looks at macro-financial linkages in the euro area to shed light on how financial developments may have contributed to disappointing macroeconomic performance in the

recent past. The methodology employed for this purpose is a large-scale Bayesian Vector Autoregression (VAR) that encompasses a wide set of macroeconomic and financial variables. <sup>(28)</sup>

Subsection I.2 discusses the importance of the financial system for the real economy and briefly reviews the relevant economic literature. Subsection I.3 describes the main transmission channels from financial markets to the real economy and defines specific variables that could be used to capture these transmission channels in the euro area. Subsection I.4 presents the results of the empirical analysis particularly some stylised facts on the co-movement between financial variables and economic activity since the crisis.

### II.2. The financial system and the real economy

*Market frictions* are normally understood as a wide range of different bottlenecks that do not allow markets to efficiently clear demand and supply. *Financial frictions* are impediments to the smooth functioning of the financial market that do not allow funds to be channelled effectively from creditors to borrowers. Therefore, they play an important role in the way the financial system affects the real economy. Moreover, the presence of frictions during periods of financial turmoil undermines the effectiveness of monetary policy

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<sup>(26)</sup> This section was prepared by Narcissa Balta and Bořek Vašíček.

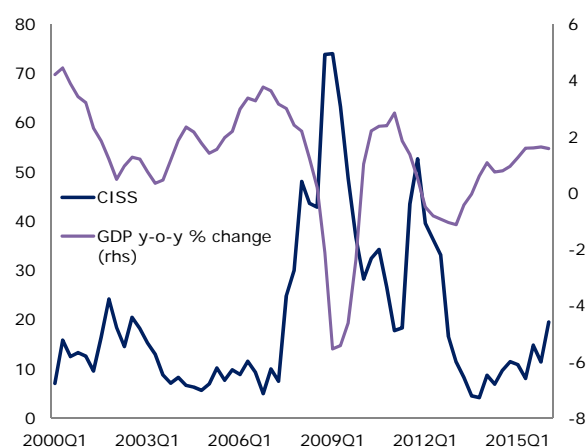
<sup>(27)</sup> Jacobson, T., J. Linde and K. Roszbach (2005), 'Exploring interactions between real activity and the financial stance', *Journal of Financial Stability*, Vol. 1, No. 3, pp. 308–41.

<sup>(28)</sup> Bańbura, M., D. Giannone and M. Lenza (2015), 'Conditional forecasts and scenario analysis with vector autoregressions for large cross-sections', *International Journal of Forecasting*, Vol. 31, Issue 3, pp. 739–756.

transmission and financial sector stability, which via *feedback effects* can have a detrimental impact on macroeconomic developments. For instance, hikes in bank funding costs when money markets stop functioning are likely to be transmitted to the lending rates applied to consumers, which in turn can have a significant drag on both investment and consumption. Also, financial frictions increase the likelihood of financial shocks occurring both from the demand and the supply side.

*Financial shocks* are usually deemed to be very persistent and have amplification effects, in the sense that even small shocks can produce large and long-lasting effects. <sup>(29)</sup> Graph II.1 shows a clear negative correlation between GDP growth and financial distress in the euro area, as measured by the Composite Indicator of Systemic Stress (CISS). <sup>(30)</sup>

Graph II.1: Real GDP growth vs. Composite indicators of systemic stress (2000Q1-2016Q1)



Source: ECB, Eurostat.

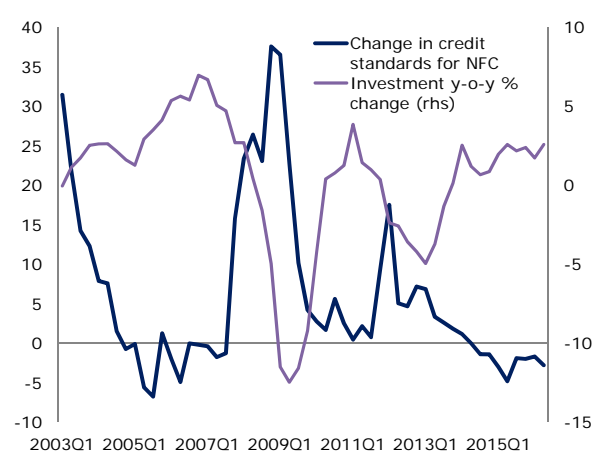
Since the key role of the financial sector consists in funding economic activity, *new credit* is the main channel of transmission between the financial sector and the macroeconomy. Financial shocks occurring on the demand side are usually triggered by an impairment of borrowers' balance sheets,

<sup>(29)</sup> Brunnermeier, M. K., T. Eisenbach and Y. Sannikov (2012), 'Macroeconomics with financial frictions: A survey', *National Bureau of Economic Research Working Paper*, No. 18102.

<sup>(30)</sup> The CISS measures contemporaneous stress in the financial system. It is an aggregate of five market-specific sub-indices. More weight is put when stress prevails in several market segments at the same time, thus tracking financial stress of systemic nature. Holló, D., M. Kremer and M. Duca (2012), 'CISS-a composite indicator of systemic stress in the financial system', *European Central Bank Working Paper*, No. (No. 1426).

which in turn undermines their creditworthiness and their capacity to invest and consume. Financial shocks occurring on the supply side (i.e. those that originate from within the financial sector) normally manifest themselves through tightening of credit conditions and/or credit rationing which, again, impact real economic activity via the investment behaviour of households and non-financial corporations. Graph II.2 shows the negative correlation between credit standards for firms and real investment. <sup>(31)</sup>

Graph II.2: Investment growth vs. credit standards for NFC (2003Q1-2016Q1)



Source: ECB BLS, Eurostat.

### Financial frictions have been fully embedded into macroeconomic models only recently

The neglect of financial sector effects in traditional macroeconomic thinking has its foundation in the famous Modigliani-Miller theorem. <sup>(32)</sup> The theorem argues that the way a firm finances its investment (via debt or via equity) has no effect on its value and thus that their investment decisions are driven primarily by macroeconomic conditions (namely, the real interest rate) rather than financial market developments. However, the validity of the theorem hinges on a set of very restrictive assumptions such as perfect information, equal tax treatment for debt and equity etc., which are generally not met in practice. <sup>(33)</sup> Financial

<sup>(31)</sup> Credit standards are measured by the backward looking three months index from ECB Bank Lending Survey (BLS).

<sup>(32)</sup> Modigliani, F. and M. Miller (1958), 'The cost of capital, corporation finance and the theory of investment', *The American Economic Review*, Vol. 48, No. 3, pp. 261-297.

<sup>(33)</sup> Morley, J. (2016), 'Macro-finance linkages', *Journal of Economic Surveys*, forthcoming.

intermediation typically involves asymmetry of information between borrowers and lenders and potentially costly verification of the borrower's financial situation. <sup>(34)</sup>

The first attempts to include financial frictions in macroeconomic models were based on the insight that the cost of external financing very much depends on the borrowers' net worth <sup>(35)</sup> and/or the market value of their collateral. <sup>(36)</sup> In fact, changes in asset prices turn out to be a crucial determinant of both the cost of external financing and the value of collateral. Moreover, a relatively small shock can have a major effect on economic activity through the so-called "financial accelerator", whereby negative feedback loops between lower assets prices, restricted access to credit and lower consumption and investment, significantly amplify and prolong the impact on the real economy. <sup>(37)</sup> Real estate, which is a typical asset used as collateral by both households and firms establishes a tight link between the housing market and the economy as a whole. <sup>(38)</sup>

While the original theoretical contributions did not explicitly model financial intermediaries (assuming direct lending from investors to borrowers), the inclusion of financial intermediaries (i.e. the banking sector) implies that financial frictions can appear also on the lenders' side. <sup>(39)</sup> Specifically, financial intermediaries can become balance sheet constrained in times of economic and financial stress, which affects their funding costs. Such shocks to the lenders' side are usually mitigated by central bank intermediation during crisis times. <sup>(40)</sup>

Despite intensive efforts in recent years, the financial sector is still not fully established as a consolidated part of conventional macroeconomic models. Structural models augmented by a banking sector and financial markets <sup>(41)</sup> typically find that financial factors, such as bank liquidity constraints, are indeed the main drivers of economic fluctuations in both the US and the euro area and that they were the main shock propagator during the global financial crisis. <sup>(42)</sup>

### Empirical evidence on macro-financial linkages

There is now a wide consensus that financial cycles are crucial for understanding business cycle fluctuations. <sup>(43)</sup> Numerous empirical studies evaluate the effects of financial shocks on macroeconomic fluctuations. Importantly, financial factors can both reinforce the transmission of other shocks and be a source of disturbance in their own right.

Credit appears to be one of the most studied financial variables in empirical studies due to its established regularities in terms of boom-and-bust behaviour and its link to financial crises and economic downturns. <sup>(44)</sup> Credit spreads play an important role for capital markets-based systems like the US economy. For example, corporate bond spreads usually increase disproportionately during periods of financial stress (so-called excess bond premiums), which in turn causes economic activity to contract. <sup>(45)</sup> In the euro area, where external financing is mostly bank based, a crucial role is played by bank lending rates and bank lending volumes. Credit supply shocks have been identified

<sup>(34)</sup> Carlstrom, C. T. and T. S. Fuerst (1997), 'Agency costs, net worth, and business fluctuations: A computable general equilibrium analysis', *The American Economic Review*, Vol. 87, No. 5, pp. 893-910.

<sup>(35)</sup> Bernanke, B. and M. Gertler (1989), 'Agency costs, net worth, and business fluctuations', *The American Economic Review*, Vol. 79, No. 1, pp. 14-31.

<sup>(36)</sup> Kiyotaki, N. and J. Moore (1997), 'Credit cycles', *Journal of Political Economy*, Vol. 105, Issue 2, pp. 211-248.

<sup>(37)</sup> Bernanke, B. S., M. Gertler and S. Gilchrist (1999), 'The financial accelerator in a quantitative business cycle framework', *Handbook of Macroeconomics*, Vol. 1, Part C, pp. 1341-1393.

<sup>(38)</sup> Iacoviello, M. and S. Neri (2010), 'Housing market spillovers: evidence from an estimated DSGE model', *American Economic Journal: Macroeconomics*, Vol. 2, No. 2, pp. 125-164.

<sup>(39)</sup> Gertler, M. and N. Kiyotaki (2010), 'Financial intermediation and credit policy in business cycle analysis', *Handbook of Monetary Economics*, Vol. 3, Issue 3, pp. 547-599.

<sup>(40)</sup> Gertler, M. and P. Karadi (2011), 'A model of unconventional monetary policy', *Journal of Monetary Economics*, Vol. 58, Issue 1, pp. 17-34.

<sup>(41)</sup> Christiano, L. J., R. Motto and M. Rostagno (2010), 'Financial factors in economic fluctuations', *European Central Bank Working Paper*, No. 1192.

<sup>(42)</sup> Gerke et al. (2013) and Wieland et al. (2015) provide detailed comparison exercise for different macrofinancial models.

Gerke, R., M. Jonsson, M. Kliem, M. Kolasa, P. Lafourcade, A. Locarno, K. Makarski and P. McAdam (2013), 'Assessing macro-financial linkages: A model comparison exercise', *Economic Modelling*, Vol. 31, pp. 253-264.

Wieland, V., E. Afanasyeva, M. Kuee and J. Yoo (2015), 'New methods for macro-financial model comparison and policy analysis', mimeo.

<sup>(43)</sup> Borio, C. (2012), 'The financial cycle and macroeconomics: what have we learnt?', *Bank for International Settlements Working Papers*, No. 395.

<sup>(44)</sup> Balke, N. S. (2000), 'Credit and economic activity: credit regimes and nonlinear propagation of shocks', *Review of Economics and Statistics*, Vol. 82, No. 2, 344-349.

<sup>(45)</sup> Gilchrist, S. and E. Zakrajšek (2012), 'Credit spreads and business cycle fluctuations', *The American Economic Review*, Vol. 102, No. 4, pp. 1692-1720.

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as important determinants of the increase in lending rates and the decline in lending volumes during the recent crisis. <sup>(46)</sup> Bank lending represents the main transmission mechanism in the euro area.

The evidence available indicates that the impact of financial shocks on the macroeconomy is ‘state dependent,’ i.e. the response of economic activity, inflation and credit to financial shocks is stronger during periods of stress. This is well documented for both the euro area and the US. <sup>(47)</sup> Moreover, during periods of high systemic stress, financial shocks tend to have both a larger magnitude and a greater impact on real activity. <sup>(48)</sup> Notably, a single indicator of systemic stress, such as the CISS for the euro area, has been found to explain a significant part of macroeconomic developments, especially due to episodes of elevated systemic stress such as the global financial crisis and the euro area debt crisis. <sup>(49)</sup>

While studies on financial and business cycle have been popular for some time, there has been much less investigation into macro-financial linkages between countries. Existing evidence indicates that such linkages exist but their intensity varies both across time and across countries. Specifically, it has been documented that the observed heterogeneity is mainly due to country-specific characteristics, which lead to international spillovers having a differentiated impact across countries. <sup>(50)</sup> Such heterogeneity seems also to be present within the euro area.

### II.3. Transmission channels from financial to macro developments

In spite of the broad consensus about the existence of macro-financial linkages, the identification of *the transmission channels* is still a subject of debate. There are different ways to classify the channels through which the financial sector might affect macroeconomic developments. The important distinction applied in this section is whether the linkages are related to the balance sheets of borrowers or lenders. At the same time, the financial channels are also closely related to monetary transmission, which affects their functioning. <sup>(51)</sup> This subsection aims to better define the individual transmission channels in the euro area.

The **interest rate channel** illustrates how money market rates affect the overall financing costs of the banking sector, the price of credit and, consequently, consumption and investment decisions. This channel is closely related to monetary policy decisions, as they directly affect the funding costs of banks. Moreover, at the zero lower bound, when the central bank uses other instruments besides short-term interest rates to conduct monetary policy, this channel is more complex and difficult to assess.

Thus, in the analysis below, the interest rate channel will be captured by variables that are affected by monetary policy decisions (Graph II.3). In the euro area, the most frequently used indicator, directly affected by the ECB’s policy rates, is the *short-term interbank interest rate* (EONIA). While the effect of monetary policy actions on short-term rates is rather quick, there is also a delayed effect on long-term interest rates. The *long-term rates* are of specific relevance in the current time as short-term rates are at the zero lower bound and monetary policy aims to affect long rates directly. While long-term rates are commonly defined by the yield on respective sovereign bonds, in the euro area, this applies to a pool of euro area sovereigns. As the yields diverge across sovereigns since the global financial crisis, long-term rates in the euro area have become disconnected from short-term rates. Since the ECB has employed diverse unconventional measures that affect the

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<sup>(46)</sup> Moccero, D. N., M. D. Parigi and L. Maurin (2014), ‘Financial Conditions Index and identification of Credit Supply Shocks for the Euro Area’, *International Finance*, Vol. 17, Issue 3, pp. 297-321.

<sup>(47)</sup> Hubrich, K. and R. J. Tetlow (2015), ‘Financial stress and economic dynamics: the transmission of crises’, *Journal of Monetary Economics*, Vol. 70, pp. 100-115.

Prieto, E., S. Eickmeier and M. Marcellino (2016), ‘Time variation in macro-financial linkages’, *Journal of Applied Econometrics*, forthcoming.

Silvestrini, A. and A. Zaghini (2015), ‘Financial shocks and the real economy in a nonlinear world: a survey of the theoretical and empirical literature’, *Journal of Policy Modeling*, Vol. 37, pp. 915-929.

<sup>(48)</sup> Hartmann, P., K. Hubrich, M. Kremer and R. J. Tetlow (2015), ‘Melting down: Systemic financial instability and the macroeconomy’, mimeo.

<sup>(49)</sup> Kremer, M. (2015), ‘Macroeconomic effects of financial stress and the role of monetary policy: a VAR analysis for the euro area’, *International Economics and Economic Policy*, Vol. 13, Issue 1, pp. 1-34.

<sup>(50)</sup> Ciccarelli, M., E. Ortega and M. T. Valderrama (2016), ‘Commonalities and cross-country spillovers in macroeconomic-financial linkages’, *The BE Journal of Macroeconomics*, Vol. 16, Issue 1, pp. 231-275.

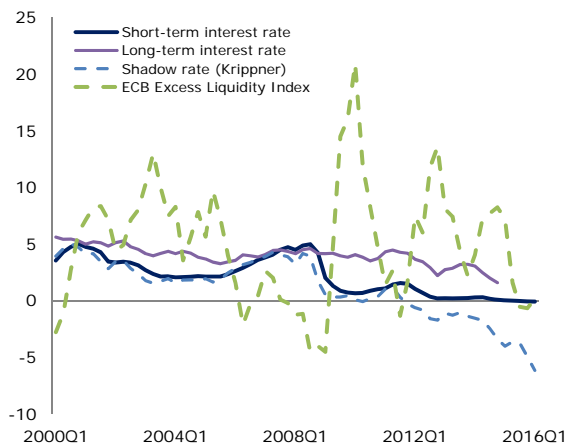
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<sup>(51)</sup> See for instance, Basel Committee on Banking Supervision (2011): ‘The transmission channels between the financial and real sectors: a critical survey of the literature’, *BCBS Working Paper*, No. 18.

financial system, additional measures need to be used to track their effect, namely *the shadow rate*, which is a factor model-based estimate of the short-term interest rate unconstrained by the ZLB. <sup>(52)</sup> Likewise, the *excess liquidity* defined as the liquidity held by the euro area banking sector in excess of the aggregate needs arising from minimum reserve requirements and autonomous factors, is another quantitative-based indicator of the monetary policy stance, as it is driven by the ECB's refinancing operations.

Graph II.3 shows the dynamics of the variables described above in the period Q1-1996 - Q1-2016, which suggest that monetary conditions have been very supportive in recent years. While short-term interest rates attained the ZLB, monetary easing through unconventional measures is reflected in a significant decline in the shadow rate as well as long-term rates.

Graph II.3: **Interest rate channel**  
(2000Q1-2016Q1, %)



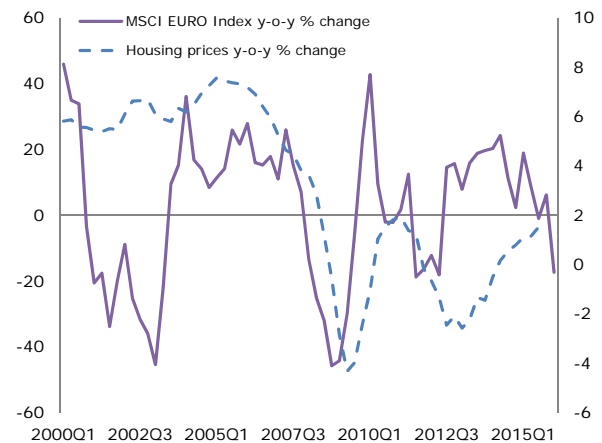
Source: Eurostat, Bloomberg, Reserve Bank of New Zealand.

The **borrower balance sheet channel** reflects the fact that it is the net worth of borrowers that determines the external finance premium, i.e. the opportunity cost of borrowing over using internal savings. In other words, it is the value of borrowers' collateral that affects their credit conditions. As indicated above, fluctuations in

asset prices can affect the ability of non-financial corporations and households to borrow, and thus their investment and spending decisions. While monetary policy commonly does not target asset prices, its actions can affect the valuation of assets used as collateral, which affects the credit available for investment and consumption spending. <sup>(53)</sup> Whereas the previous discussion focuses on the demand side of credit, the borrower balance sheet channel affects also the supply of credit. Namely, weak borrower balance sheets might induce credit rationing by the lenders, and affect overall credit conditions.

The borrower balance sheet channel can be captured mainly by variables that reflect the risks related to the balance sheets of firms and households as borrowers from the banking sector or from capital markets. While there are no readily available direct measures of the quality of private balance sheets comparable across countries, asset prices can be considered as indicative of their quality, as they give the value of collateral for loans and of equity. Therefore, *house prices* and *stock prices* are generally used in the analysis to track this channel.

Graph II.4: **Borrower balance sheet channel**  
(2000Q1-2016Q1)



Source: Bloomberg, BIS.

Graph II.4 suggests that developments in house prices and stock prices have been quite

<sup>(52)</sup> There different shadow rates available; all being subject of significant model uncertainty. The shadow rate used is based on Krippner (2012) and available from the Reserve Bank of New Zealand website. Krippner, L. (2012), 'Measuring the stance of monetary policy in zero lower bound environments', *Economics Letters*, Vol. 118, Issue 1, pp. 135-138.

<sup>(53)</sup> There is empirical evidence, especially for the US, stressing the importance of asset prices and different credit spreads as leading indicator of economic activity, e.g. Stock and Watson (2003). Stock, J. H. and M. W. Watson (2003), 'Forecasting output and inflation: the role of asset prices', *Journal of Economic Literature*, Vol. 41, No. 3, pp. 788-829.

disconnected in recent years. Specifically, while house prices only started to recover in 2014, stock prices peaked in early 2015 and experienced a downward correction since then.

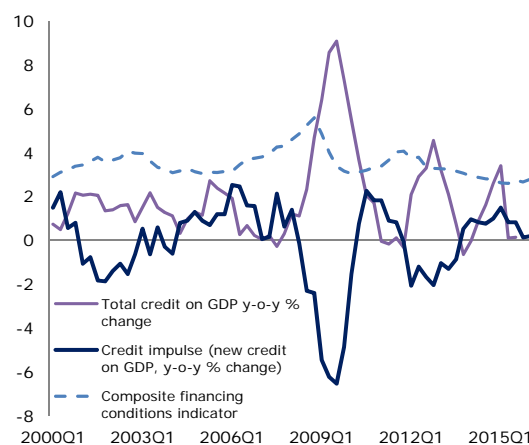
The **bank balance sheet channel** relates to the fact that how much a bank lends depends on its own balance sheet and the different risks involved in its business model. External developments (including monetary policy actions, but also longer-term factors such as financial regulation and innovations in the banking sector) may affect bank liabilities (the supply of loanable funds and also bank funding costs), and in turn, assets (supply of credit, and the lending cost).<sup>(54)</sup> Bank lending is determined by banks' business models; it usually increases with the increase in leverage in the economy, while deleveraging episodes may significantly hamper lending activities. This makes leverage highly pro-cyclical.<sup>(55)</sup> Importantly, the impact of bank balance sheets on the real economy can be more pronounced in the euro area than in capital-market based systems as alternative forms of financing are relatively undeveloped.

The bank balance sheet channel can thus be illustrated by variables such as banking leverage, the stock of non-performing loans, banks' funding costs, or the price of Credit Default Swaps (CDS). However, reliable data for the euro area are relatively short, available only for the period since the beginning of the crisis. Indeed, the lack of knowledge about the quality of bank balance sheets was an important aspect of the euro area financial crisis and a reason for the implementation of the Asset Quality Review (AQR) by the ECB in 2014. Therefore, for the analysis in this section, measures which directly track the supply of credit have been used instead.<sup>(56)</sup> Namely, the flow of credit as measured by the *credit impulse* (i.e. the change in new credit granted by the banking sector as a percentage of GDP), the stock of credit on banks' balance sheet as measured by *total economy credit as a percentage of GDP*, and the price of credit, as measured by the *Composite Financing Conditions Indicator (CFCI)* for non-financial corporations,

which (assuming a constant mark-up) proxies bank funding costs.<sup>(57)</sup>

Graph II.5 shows that there is a negative correlation between the credit impulse and credit as a percentage of GDP. Thus, during downturns the flow of new credit declines, while the ratio of credit to GDP increases due to the collapse of GDP. The credit impulse indicator shows that the supply of new credit has been fairly limited since the onset of the global financial crisis. The *CFCI* tracks the ECB policy rates rather closely with the exception of the euro area sovereign debt crisis episode (2011-2012), when financing costs increased due to idiosyncratic increases in some Member States, reflecting financial market fragmentation.

Graph II.5: **Bank balance sheet channel**  
(2000Q1-2016Q1)



Source: Capital Economics, BIS, DG ECFIN.

While the previous channels are related to the quality of balance sheets either on the borrower or the lender side, some shocks can originate in the overall financial system. Examples are liquidity shocks or confidence shocks. These shocks work both via the balance sheets but also by directly altering agents' decisions through precautionary motives affecting both investment and consumption behaviour. These mechanisms are defined as the **uncertainty channel**.<sup>(58)</sup>

<sup>(54)</sup> Bernanke, B. and A. Blinder (1988), 'Credit, money, and aggregate demand', *the American Economic Review*, Vol.78, No. 2, pp. 435-439.

<sup>(55)</sup> Adrian, T. and H. S. Shin (2010), 'Liquidity and leverage', *Journal of Financial Intermediation*, Vol. 19, Issue 3, pp. 418-437.

<sup>(56)</sup> In practice, the lending volumes and rates can be affected both by supply and demand side.

<sup>(57)</sup> For more details on CFCI calculations, see European Commission (2013), "Drivers of diverging financing conditions across Member States", *Quarterly Report on the Euro Area*, Vol.12, No.1.

<sup>(58)</sup> Bloom (2009) point to uncertainty shocks (that might be related but also unrelated to the financial system) as a crucial driver of economic dynamics. Recently, Caldara et al. (2016) argue for the needs to distinguish uncertainty shocks from financial shocks, while both of them are important source of macroeconomic

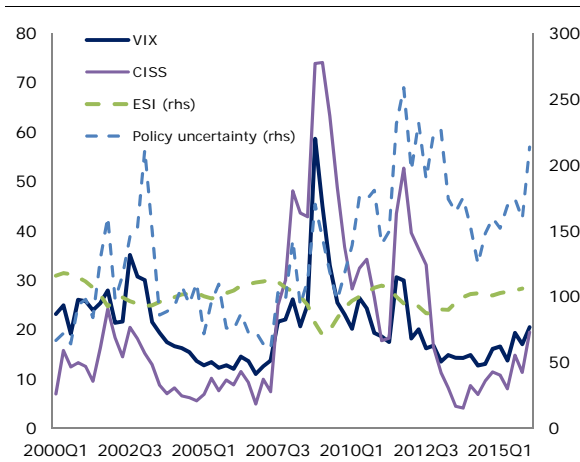
The uncertainty channel is captured by variables reflecting the different types of uncertainty that can affect the economy. One type is commonly related to increased volatility in financial markets. Given a high degree of global interconnectedness, the euro area economy can be affected by uncertainty related to global financial developments, which is usually measured by the implied volatility of S&P 500 index options (VIX).<sup>(59)</sup> The euro area specific stress in the financial system is measured through the ECB's Composite Indicator of Systemic Stress (CISS).

Another type of uncertainty is linked to swings in business and consumer confidence. Variations in the confidence of euro area households and non-financial firms are illustrated through the European Commission's confidence indicator, the Economic Sentiment Indicator (ESI), which is based on data collected through business and consumer surveys. However, the indicator exhibits a very high contemporaneous correlation with actual GDP growth, indicating that its dynamics are likely to reflect very accurately economic conditions rather than information related to exogenous changes in confidence.

Finally, unexpected outcomes of economic policy decisions can lead to policy uncertainty, which in turn can have adverse effects on the savings and investment behaviour of firms and households. Policy uncertainty is illustrated through an indicator based on newspaper coverage of uncertainty-generating events.<sup>(60)</sup>

Graph II.6 indicates that there is an apparent co-movement among these indicators, even if they measure different types of uncertainty. While economic sentiment has been gradually improving and uncertainty related to financial markets has eased, the policy uncertainty affecting the euro area is still relatively high.

Graph II.6: Uncertainty channel  
(2000Q1-2016Q1)



Source: Chicago Board of Exchange, ECB, www.policyuncertainty.org.

#### II.4. Financial developments and economic activity

This sub-section provides stylised facts on the transmission channels defined above and show whether and how financial developments have affected the real side of the euro area economy since the crisis (namely consumption, investment, unemployment and long-term interest rates).

While financial variables are available in real time, macroeconomic variables are normally released with lags. Therefore, conditioning macroeconomic forecasts on observed financial developments (i.e. a projection of macro variables on the observed paths of financial variables) can improve forecasts, as more informative data are taken into account. Several empirical studies have shown that financial variables can improve macroeconomic forecasts.<sup>(61)</sup>

The methodology underlying this section is a large-scale Bayesian VAR with 35 macroeconomic

fluctuations separately; the Great Recession was likely outcome of the toxic interaction between the two.

Bloom, N. (2009), 'The impact of uncertainty shocks', *Econometrica*, Vol. 77, Issue 3, pp. 623-685.

Caldara, D., C. Fuentes-Albero, S. Gilchrist and E. Zakrajšek (2014), 'The macroeconomic impact of financial and uncertainty shocks', *European Economic Review*, forthcoming

<sup>(59)</sup> The VIX is calculated by the Chicago Board Options Exchange (CBOE).

<sup>(60)</sup> Baker, S. R., N. Bloom and S. J. Davis (2015), 'Measuring economic policy uncertainty', *National Bureau of Economic Research Working Paper*, No. 21633. Data source: [www.policyuncertainty.com](http://www.policyuncertainty.com).

<sup>(61)</sup> Stock and Watson (2003) provide a seminal contribution on the role of financial variables, namely asset prices, for GDP and inflation forecast concluding that different financial variables allow macroeconomic forecasting in different times. Espinosa et al. (2012) document using standard VAR approach that financial variables improve GDP forecast for the euro area, especially in the real time when numerous financial variables are available ahead of the macroeconomic releases.

Stock, J. H. and M. W. Watson (2003), 'Forecasting output and inflation: the role of asset prices', *Journal of Economic Literature*, Vol. 41, No. 3, pp. 788-829.

Espinoza, R., F. Fornari and M. J. Lombardi (2012), 'The role of financial variables in predicting economic activity', *Journal of Forecasting*, Vol. 31, No. 1, pp. 15-46.

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and financial variables. <sup>(62)</sup> The model is estimated for the sub-period Q1-2000 - Q4-2011 which covers both normal and crisis times, but does not include some of the most important unconventional monetary policy measures. Given the estimated past correlations, a counterfactual path for the macroeconomic and financial variables (i.e. a distribution of conditional forecasts) can be obtained for the entire period, Q1-2000 - Q4-2015, conditional on observed real GDP and inflation, in the baseline case. The deviations of the observed developments of financial variables from this counterfactual path can be interpreted as evidence of instability in the relationship between financial variables and economic activity (as measured by GDP growth and inflation) since the crisis.

Subsequently, the conditional set from the baseline case (including only real GDP and inflation) is extended by financial and uncertainty variables corresponding to each transmission channel described above. <sup>(63)</sup>

### Some recent developments are puzzling

Graph II.7 shows the counterfactual paths of the main GDP components, producer prices, the unemployment rate and the long-term interest rate conditional on observed economic activity (real GDP and inflation). It also shows the conditional forecasts for the balance sheet variables of households and firms, when only real GDP and inflation are taken into account in the conditioning set.

The results suggest that private consumption was unusually low during the period of the euro area debt crisis and deleveraging (2012-2013), while it overshot during the recent recovery (from 2014 onward). Investment behaved in line with historical correlations during both downturn episodes (2008-2009 and 2012-2013) and was weak during the deleveraging phase because overall output growth was weak. However, its recent recovery (since 2014) has been more subdued than what the pace of economic activity would have predicted; the observed investment path is positioned on the lower tail of the distribution of conditional forecasts). <sup>(64)</sup>

Large deleveraging pressures in the public sector have led to a significant decline in the euro area aggregate government consumption over the period 2011-2012. However, this decline had almost been reversed by the end of 2014, with public consumption starting to overshoot from 2015 onwards (relative to its counterfactual path obtained through conditioning on output growth), reflecting the aggregate euro area fiscal stance, which started to turn mildly expansionary.

Moreover, the results show that several variables capturing price and balance sheet developments are still at odds with historical patterns. In particular, producer prices, house prices, long-term interest rates and loans to firms and households undershoot the distribution of the conditional forecasts. On one side, this underlines that the recent recovery is characterized by a historically low inflation environment and loose monetary conditions pushing the long-term rates down. On the other side, the ongoing balance sheet adjustment is translating into very weak credit dynamics due to unprecedented deleveraging pressures.

Graph II.8. illustrates the zero lower bound constraint on monetary policy rates and the subsequent break in the correlation of economic activity with the two measures of monetary policy

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<sup>(62)</sup> Alternative strand of literature using rich set of data in order to nowcast or forecast employs dynamic factors models where data dimension is reduced in a first step by factor estimation, with common factors being consequently used in the forecasting exercise, see e.g. Giannone et al. (2008). Bellego and Ferrara (2012) find using factor-augmented probit model that financial variables allow tracking better recession periods in the euro area (in the pre-crisis period) with optimal lead of financial variables over recession of around one year.

Giannone, D., L. Reichlin, L. and D. Small (2008), 'Nowcasting: the real-time informational content of macroeconomic data', *Journal of Monetary Economics*, Vol. 55, Issue, 4, pp. 665–676.

Bellégo, C. and L. Ferrara (2012), 'Macro-financial linkages and business cycles: A factor-augmented probit approach', *Economic Modelling*, Vol. 29, pp. 1793-1797.

<sup>(63)</sup> For more details on the methodology see Box IV.1 in European Commission (2015), 'Investment dynamics in the euro area since the crisis', *Quarterly Report on the Euro Area*, Vol. 14, No 1, pp. 35-43.

Bañbura, M., D. Giannone and M. Lenza (2015), 'Conditional forecasts and scenario analysis with vector autoregressions for large cross-sections', *International Journal of Forecasting*, Vol. 31, Issue 3, pp. 739–756.

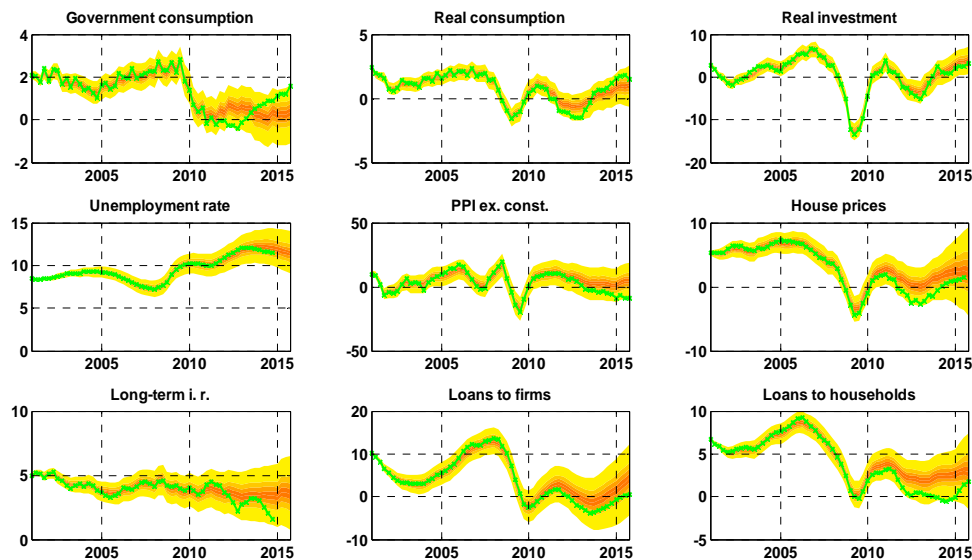
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<sup>(64)</sup> There is some relative instability in the estimated correlations over the sample period, notably pre-crisis vs crisis years. However, it does not significantly affect the result on the unusual weakness in investment recovery since 2014. The article 'Investment dynamics in the euro area since the crisis', *Quarterly Report on the Euro Area*, Vol. 14, No 1, pp. 35-43, found that estimating the past correlations only with the sample for the pre-crisis period, the amplitude of the investment fall during the first downturn (2008-2009) would also be slightly underestimated by the conditional forecasts.



Graph II.7: **Conditional forecasts based on real GDP and inflation (1)**  
(2000Q1-2015Q4, y-o-y % growth)

### Misalignments of financial and real variables with output growth since the crisis



(1) Shades of orange: distribution of the conditional forecasts in the BVAR in levels, excluding the lower and higher 5% quantiles. Green line: actual values. The variables are all reported in terms of annual percentage changes, except for the unemployment rate and the long-term interest rate, which are in levels. Conditioning assumptions: real GDP and HICP.  
*Source:* DG ECFIN, MATLAB codes replication files of the methodological paper (Banbura et al., 2015).

rates since 2012. Among all variables, the consumer and business confidence indicator (ESI) comes out as having the strongest contemporaneous correlation with economic activity during the crisis.

In the consecutive analysis, the conditioning dataset (including only real GDP and inflation in the baseline) is augmented by financial variables corresponding to each transmission channel.

#### ... different channels play an important role at different stages since the crisis

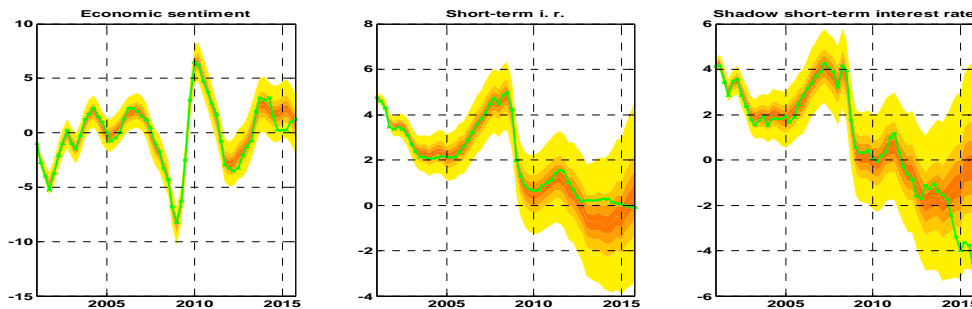
**The interest rate channel** (Graph II.9., upper panel) seems to better account for the pattern of consumption during the recent recovery (compared to the baseline). This channel, which reflects mainly monetary conditions, suggests that monetary easing implemented since 2014 by means of additional unconventional measures (namely the targeted long-term refinancing operations (TLTRO), the asset-backed securities purchasing program (ABSPP) and the forthcoming public

securities purchase program (PSPP)), have translated into a further decline in the long-term interest rate and the shadow policy rate. It also reflects an increase in excess liquidity, which has had a very benign effect on the recent recovery. However, producer prices developments (PPI) still appear unusually subdued. Likewise, including information capturing the interest rate channel does not help explain the dismal performance of consumption during the deleveraging phase (2012-2013) or the persistent weakness of credit dynamics. Therefore, these developments seem to be determined also by drivers other than monetary conditions.

**The borrowers balance sheet channel** (Graph II.9., lower panel) captures in turn the exceptional deleveraging developments of 2012/2013 but clearly underestimates the pace of the recent recovery. This finding suggests that strained balance sheets of households and firms represented the main weight on the recovery at the time of euro area sovereign debt crisis. However, whereas a mild recovery started in the euro area in 2014, private

Graph II.8.: **Conditional forecasts based on real GDP and inflation (1)**  
*(2000Q1-2015Q4, y-o-y % growth)*

**Business and consumer confidence and short-term interest rates**



(1) Shades of orange: distribution of the conditional forecasts in the BVAR in levels, excluding the lower and higher 5% quantiles. Green line: actual values. The variables are all reported in terms of annual percentage changes, except for the unemployment rate and the long-term interest rate, which are in levels. Conditioning assumptions: real GDP and HICP. *Source:* DG ECFIN, MATLAB codes replication files of the methodological paper (Banbura et al., 2015).

balance sheets still did not improve much. In fact, when the borrower balance sheet channel is taken into account, observed consumption overshoots the conditional forecast even by a higher margin than in the baseline scenario and real investment seems to be on the upper side as well. This suggests that the borrower balance sheet channel should have led to more subdued dynamics of both consumption and investment than what has been observed in 2014 and 2015, indicating that other channels have been somewhat compensating the adverse effects of this channel.

The **bank balance sheet channel** (Graph II.10., upper panel) improves the forecast of investment since 2014 and reduces the uncertainty around the median for some variables such as consumption, unemployment and long-term interest rate. The good fit of investment dynamics indicates a strong correlation of investment with total economy credit developments both in terms of flows and stocks.

Interestingly, the bank balance sheet information, namely the total economy credit as percentage of GDP (including credit to public sector), the private sector credit impulse and the price of credit for the private sector, cannot capture the weak observed dynamics of outstanding loans to firms and households. This shows that the private deleveraging process has been much stronger than the public sector deleveraging, making private credit developments disconnected from GDP

growth.<sup>(65)</sup> Therefore, while the recovery in real activity has been rather weak, the private credit dynamics have been even weaker. Furthermore, the modest recovery does not facilitate passive deleveraging (a decrease in the relative debt burden due to a growing economy, i.e. denominator effect) and feeds the active deleveraging (a decrease of absolute level of debt, i.e. nominator effect).

Finally, the current long-term interest rate seems very low even when the financing costs for non-financial corporations (which also attained historical minima) are taken into account. This underlines the importance of the ECB’s measures that imply very easy financing conditions in the foreseeable future.

Last but not least, the **uncertainty channel** (Graph II.10.) seems to improve the conditional forecast over the baseline in the same spirit as the bank balance sheet channel. For example, there is a good fit of investment, indicating a strong correlation of investment with confidence and financial stress measures. Equally, the rebound in private consumption seems to be well captured by the uncertainty channel, indicating that the recent decrease in financial markets stress has also been an important driver for consumption. However, in general, the uncertainty channel is likely to be implicitly included in the bank balance sheet

<sup>(65)</sup> GDP is a denominator of the credit indicators in bank balance sheet channel.

channel. For example, in periods of high uncertainty, bank funding costs increase (bank balance sheet channel) and firms with weaker balance sheets cannot obtain credit for new loans (borrower balance sheet channel).

Overall, the findings above suggest that while there is clear evidence of the transmission of monetary policy measures on financial variables and from financial variables to consumer lending rates, the evidence on the effects on real activity is more complex, with different channels playing an important role at different stages of the crisis. The interest rate channel has helped the modest recovery since 2014 by supporting both public and private consumption growth and by partially compensating the balance sheet channel for both borrowers and banks. The results in Graph II.9. (lower panel) can be interpreted as showing that in the absence of massive monetary easing, given the high level of debt in the economy and the wealth effects associated with house and asset prices decreases, both private and public consumption growth could have been much more subdued than what it is currently observed.

Graph II.10. (both panels) illustrate the importance of the bank balance sheet and the uncertainty channel for capturing investment dynamics. Weak investment growth is well captured both by credit developments as captured through the bank balance sheet channel and confidence effects through the uncertainty channel. Real economic activity, as measured by GDP growth, while playing an important role, does not seem to fully explain the subdued growth in investment since 2014 (Graph II.7.).

## II.5. Conclusions

The section discusses the nexus between financial and macroeconomic developments, drawing some

lessons from the literature and providing some stylised facts on the main transmission channels through which financial developments have affected real economic activity since the crisis.

While there is clear evidence of the transmission of monetary policy measures on financial variables and from financial variables to consumer lending rates, the evidence on the effects on real activity is more complex, with different channels playing an important role at different stages of the crisis.

The state of private balance sheets seems to have significantly contributed to the poor performance of consumption during the euro area debt crisis and high debt levels still weigh on growth. However, given the still high level of debt, the current mild recovery should be seen as a rather positive outcome. The analysis suggests that easy monetary conditions seem to represent an important driver of the current recovery. Another driver seems to be the balance sheets of banks, which have gradually improved and allow better transmission of easy monetary conditions to the lending rates.

Given the still high levels of debt in the economy and the wealth and confidence effects associated with house and asset prices corrections, both private and public consumption growth could have been much more subdued than what it is currently observed, were it not for the exceptional easing of monetary conditions.

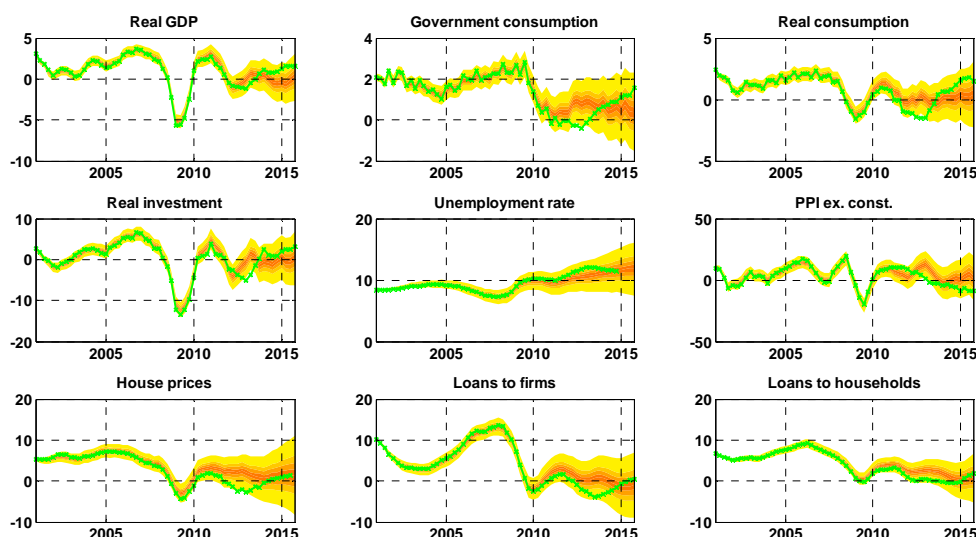
Unfortunately, the recovery is still not strong enough to facilitate the deleveraging process. The stock of debt and the ongoing deleveraging combined with adverse confidence effects still represent major impediments for a stronger recovery in investment. Consequently, there is a need to implement policy measures that allow dealing effectively with the debt overhang, notably, an effective framework for non-performing loans resolution.

Graph II.9: **Conditional forecasts based on variables capturing the interest rate channel and borrower balance sheet channel (1)**  
*(2000Q1-2015Q4, y-o-y % growth)*

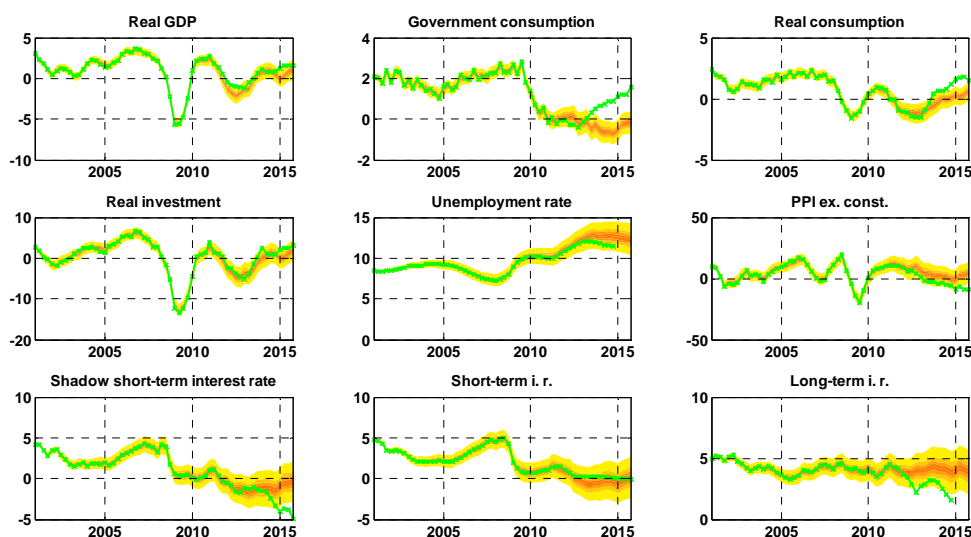
**Interest**

**rate**

**channel**



**Borrower balance sheet channel**

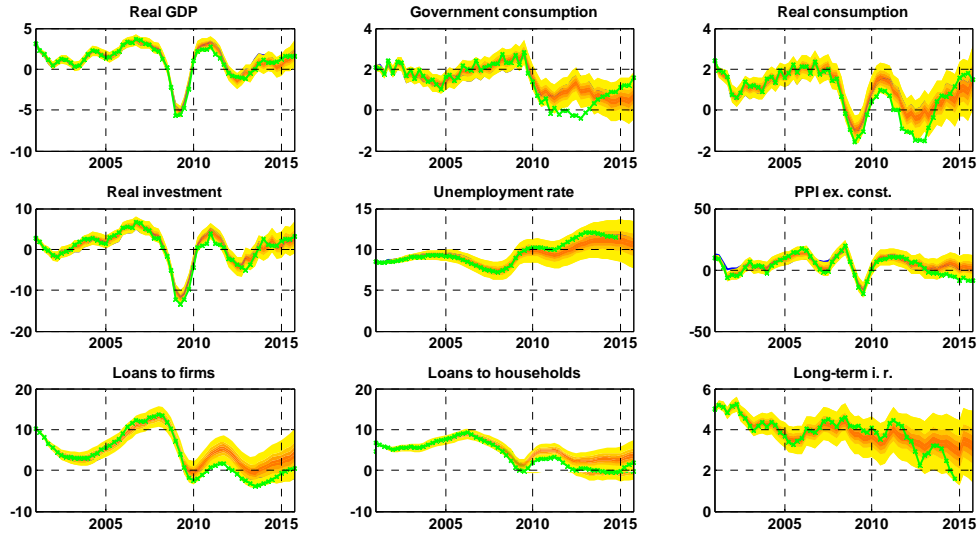


(1) Shades of orange: distribution of the conditional forecasts in the BVAR in levels, excluding the lower and higher 5% quantiles. Green line: actual values. The variables are all reported in terms of annual percentage changes, except for the unemployment rate and the long-term interest rate, which are in levels. Conditioning assumptions interest rate channel: ESI, HICP, the short-term interest rate, the long-term interest rate, the shadow interest rate, and the ECB excess liquidity measure. Conditioning assumptions borrower balance sheet channel: ESI, HICP, house prices, stock prices, and outstanding loans to households and firms. Due to the high contemporaneous correlation between real GDP growth and the ESI indicator, the ESI indicator contains the same forecasting information as real GDP. ESI indicator is used in the conditioning set instead of real GDP variable in order to also illustrate conditional forecasts for real GDP.

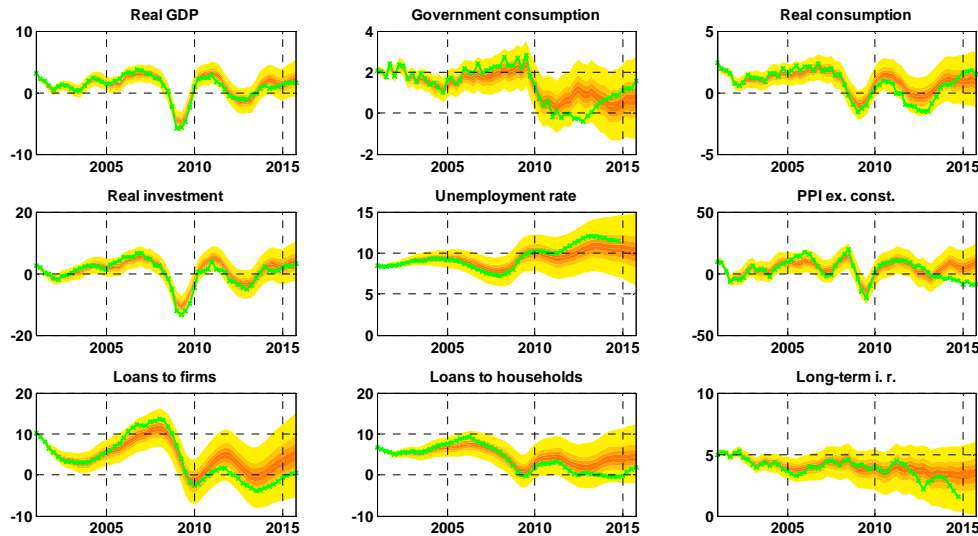
*Source:* DG ECFIN, MATLAB codes replication files of the methodological paper (Banbura et al., 2015).

Graph II.10: **Conditional forecasts based on variables capturing the bank balance sheet channel and uncertainty channel (1)**  
*(2000Q1-2015Q4, y-o-y % growth)*

**Bank balance sheet channel**



**Uncertainty channel**



(1) Shades of orange: distribution of the conditional forecasts in the BVAR in levels, excluding the lower and higher 5% quantiles. Solid black line: point estimate of the conditional forecasts in the BVAR in differences, which is computed as the median of the distribution of the conditional forecasts in this model. Green line with crosses: actual values. The variables are all reported in terms of annual percentage changes, except for the unemployment rate and the long-term interest rate, which are in levels. Conditioning assumptions for the bank balance sheet channel: ESI, HICP, the credit impulse, the private credit volumes (debt-to-GDP ratio), and bank lending rates for households and firms (CFCI). Conditioning assumptions uncertainty channel: ESI, HICP, the policy uncertainty indicator, the CISS and the VIX. Due to the high contemporaneous correlation between real GDP growth and the ESI indicator, the ESI indicator contains the same forecasting information as real GDP. ESI indicator is used in the conditioning set instead of real GDP variable in order to also illustrate conditional forecasts for real GDP.

*Source:* DG ECFIN, MATLAB codes replication files of the methodological paper (Banbura et al., 2015).