THE NATIONAL SEGMENTATION OF EURO AREA BANK BALANCE SHEETS DURING THE FINANCIAL CRISIS

A. Colangelo, D. Giannone, M. Lenza, H. Pill and L. Reichlin

October 2016

Abstract: This paper analyses bank balance sheet data in conjunction with macroeconomic and other financial variables. Our aim is to understand the nature of the instability in financial intermediation in the euro area during the recent financial crises. We define "large changes" as significant departures in the actual evolution of balance sheet variables during the crisis from their historical association with the business and financial cycles. In the course of the global 2008-09 financial crisis, such "large changes" were features of the behaviour of cross-border inter-bank flows, both within the euro area and between the euro area and the rest of the world. By contrast, retail assets and liabilities, as well as interbank flows among banks of the same country, did not significantly deviate from historical regularities. Since the euro area sovereign crisis of 2011-12, "large changes" have been more pervasive. In particular, a significant home bias in the sovereign bond market has emerged.

Keywords: Bank balance sheets, non-standard monetary policy, central banks.

JEL codes: E42, E58, F33, F42.

* A. Colangelo, European Central Bank, address: Sonnemannstrasse 20, D-60314 Frankfurt am Main, Germany; email: antonio.colangelo@ecb.europa.eu
D. Giannone, Federal Reserve Bank of New York and CEPR, address: 33 Liberty Street, 10045 New York, USA; e-mail: domenico.giannone@ny.frb.gov
M. Lenza, European Central Bank and ECARES-Université Libre de Bruxelles, address: Sonnemannstrasse 20, D-60314, Frankfurt am Main, Germany; email: michele.lenza@ecb.europa.eu
H. Pill, Goldman Sachs, address: 120 Fleet Street, London EC2A 2BB, United Kingdom.
L. Reichlin, London Business School and CEPR, address: Regent's Park, London NW1 4SA, United Kingdom; e-mail: lreichlin@london.edu.

1. Introduction

The literature on financial crises in emerging markets has documented how, as a crisis takes hold, a "sudden stop" of capital inflows can trigger a sharp decline in international financial integration, with catastrophic implications for domestic credit creation and financial stability, which ultimately spillover into macroeconomic performance (see Calvo and Reinhart, 2000; McKinnon and Pill, 1997,1998; and Caballero, 2009). Recent financial crises – the first since the start of the European monetary union in 1999 – create an opportunity to explore whether such a 'flight from financial integration' also affects a union of developed countries sharing a common currency.

Before the crisis, the interbank market in the euro area had reached a very high level of integration. Moreover, integration in the sovereign bond market has also increased substantially since the introduction of the euro (Reichlin, 2014). The common view was that only the euro area retail banking market remained segmented along national lines to a significant extent (Hartman et al., 2003), notwithstanding the introduction of the common currency back in 1999.

Recent crises are often characterized as reflecting a re-segmentation of euro area financial markets along national lines. This paper aims to document such segmentation, identifying which (if any) market segments were affected and assessing whether the degree of financial segmentation observed is sufficient to suggest a specific fragility of the single currency in the face of financial crises. While it is obvious that the financial crises have affected euro area banks' balance sheets (their funding, and lending, as well as other assets and liabilities), we investigate the extent to which this reflects an abnormal retreat from financial integration rather than balance sheet developments consistent with historical regularities.

We explore this issue by studying the evolution of the aggregate euro area banking sector balance sheet since 2008. We focus on banks because they represent the most important channels for financial flows in the euro area. Roughly three-quarters of external financing for the euro area non-financial corporate sector is intermediated by banks, while the remaining quarter is provided through securities markets. To draw a comparison, in the United States these proportions are reversed.

Our analysis is based on a dataset derived from the aggregate balance sheet of the euro area credit institutions. Given the breakdown available, we can, among other things, distinguish among retail

transactions, wholesale transactions (i.e. inter-bank transactions and transactions vis-à-vis financial intermediaries other than banks) and transactions in sovereign instruments.

Our database also distinguishes among banks' domestic counterparties, counterparties in other euro area countries and counterparties outside the euro area countries when analysing banks' transactions. The geographic distinction of transacting counterparty by residency allows a richer description and understanding of the nature of market fragmentation and offers important insight for policy design, both in the immediate crisis management phase and subsequently when seeking long-term, more fundamental solutions. For example, by acting as an "intermediary of last resort" in the manner described by Giannone et al. (2012), the ECB can substitute intermediation across its own balance sheet for cross-border intra euro area bank transactions, via the creation of the notorious intra-Eurosystem TARGET 2 balances between national central banks (Bindseil et al. 2012). But such central bank intermediation cannot substitute for bank transactions with extra euro area counterparties and, hence, the ECB's balance sheet policies are better able to address tensions in intra euro area markets than tensions in markets that straddle the borders of the euro area.

Our empirical approach starts by modelling the joint behaviour of the euro area banking sector (as represented by the full set of assets and liabilities recorded in its aggregate balance sheet) and the rest of the euro area economy (as captured by standard macroeconomic and financial variables). Changes in banks' balance sheets may reflect changes in general economic conditions (related to the business and financial cycles) and/or constitute permanent or persistent changes stemming from financial stress. We label the former changes as "normal" and the latter changes as "abnormal" relative to historical cyclical behaviour.

To define the "normal" path of bank balance sheets during the crisis period (i.e. after August 2008), we first determine the historical (pre-crisis) correlations between bank balance sheets and the rest of the economy by estimating a model that embodies both the full set of bank balance sheets and variables describing the rest of the economy over the sample to August 2008. We use this estimated model to compute the "normal" component of the evolution of banks' balance sheets by forecasting bank balance behaviour over the period September 2008 – October 2015, conditional on the observed path of macroeconomic variables during that period. By comparing the actual development in bank balance sheets with the model-based counterfactual path defining their "normal" cyclical evolution, we can assess whether bank balance sheet dynamics have been "abnormal" or not.

Concretely, to capture the potentially complex dynamic relationships among macroeconomic time series and the set of bank balance sheet variables, we specify a VAR model encompassing a large set of macroeconomic and financial indicators. The final dataset includes 34 monthly variables in a sample from January 1999 to October 2015. To cope with the large dimension of the model, we estimate it by means of Bayesian techniques, specifying the informative prior distributions described in Litterman (1979) and Doan et al. (1984). As suggested by De Mol et al. (2008) and Banbura et al. (2010), if the variables exhibit relevant co-movement – as ought to be the case with cyclical macroeconomic and financial variables – this estimation strategy is able to control for the estimation error incurred in our very general model while still extracting the salient information from the sample. The parameters that govern the relative weight of the data and the prior beliefs to inform the model coefficients are set according to the theoretically grounded approach suggested in Giannone et al. (2015). Our findings can be summarized as follows.

First, we show that the stress in the euro area interbank market following the failure of Lehman has been almost entirely driven by a seizing up of banks' transactions with non-domestic wholesale counterparties, in particular banks in other euro area countries. Domestic interbank transactions proved much more resilient.

Previous studies have also pointed to weakness in cross-border interbank flows (see, e.g. Abbassi et al., 2015; Garcia-de-Andoain et al., 2014). By distinguishing not only between domestic and cross-border flows but also between intra-euro area and extra-euro area flows, our richer model provides greater insight. Money market tensions after the failure of Lehman in 2008 are better understood as a consequence of financial dis-integration / cross-border re-fragmentation within monetary union, rather than just a generalised breakdown in interbank trading or a collapse in interbank funding from outside the euro area. Fortunately for the stability of the financial system and economy as a whole, the ECB's policy actions – as reflected in the emergence of TARGET 2 balances between euro area national central banks – permitted financial transactions that had taken place in integrated private markets to relocate to central bank intermediaries.

Second, while in the initial phase of the financial crisis, immediately after the collapse of Lehman Bros. in 2008, bank loans to households and non-financial corporations showed some resilience, since the onset of the sovereign and banking crises in 2011 such loans have been significantly weaker than the benchmark we establish on the basis of pre-crisis historical regularities would have suggested.

This implies that, despite the strong worldwide tensions in the banking sector during the initial phase of the financial crisis, credit flows to the private sector were largely insulated from interbank tensions in the aftermath of Lehman's failure in September 2008. This result signals the success of the ECB's initial policy response (on the evaluation of the effects of the ECB liquidity policy on the euro area credit markets see Lenza et al., 2010). It is only in the second phase of the crisis, as disruptions in the Euro area markets intensified with sovereign and banking dislocations becoming more central, that the flow of loans to the real economy was disrupted.

Third, we find that banks built-up unusually large holdings of sovereign debt during this second sovereign phase of the crisis, possibly reflecting substitution away from loans to the private sector. Overwhelmingly, this build-up reflected an accumulation of domestic sovereign debt. The deepening of banks' home bias in the sovereign bond market is therefore characteristic of a second wave of financial dis-integration / market fragmentation from early 2011 onwards. This second wave lay behind the emergence of a "diabolic loop" between bank and sovereign balance sheets. In any jurisdiction the sovereign market plays a key role because sovereign bonds, being liquid and "safe", are a good source of collateral.

Before 2010, the markets considered a sovereign default within the euro as a very unlikely event and priced sovereign bonds similarly across countries, irrespective of differences in their fiscal positions. Sovereign spreads were very narrow. This perception changed dramatically with the onset of the Greek sovereign crisis in 2010. Since then, not only has the market started to differentiate among countries, at some point it also started to price the possibility of a break-up of euro area or exit of specific countries (introducing so-called redenomination or convertibility risk).[1] The reaction to the advent of such risk was an emergence of a strong home bias in sovereign debt holdings. With fear of contagion and the emergence of redenomination risk, the liquidity and safety properties of sovereign bonds in some jurisdictions have disappeared. However, rather than a flight to safer German bonds, banks have opted for their own domestic bonds (Angelini et al., 2014; Battistini et al., 2013; Garicano and Reichlin, 2014), leading to a rising correlation between bank and sovereign risk. Whatever the underlying behaviour, the resulting increased correlation of bank and sovereign risk – an

[1] See ECB (2014) for an extensive discussion and survey of the literature on the determinants of sovereign bond yields before and after the sovereign debt crisis.

intensification of the "diabolical loop" mentioned above – is another important aspect of the vulnerability of a monetary union to financial crises.

The previous literature on the evolution of bank balance sheets during the crisis has focused on specific aspects of individual or aggregate bank balance sheets (e.g. interbank transactions) largely in isolation, capturing the relationship among a handful of bank level and macroeconomic variables. In this paper, we provide an encompassing assessment of the whole aggregate euro area bank balance sheet and of its relationship with a large set of variables describing the rest of the economy. Compared with the existing literature, this strategy allows us to draw a more consistent picture of the developments in the various elements of the bank balance sheets. Moreover, our model is quite general and able to capture, to a greater extent than existing studies, the historical regularities linking bank balance sheets with the rest of the economy. From this perspective, the counterfactual exercise we conduct is more informative than existing analysis about the stylized facts linking bank balance sheets and the rest of the economy and, hence, also able to more accurately define "abnormal" deviations from those stylized facts.

The remainder of the paper is organised as follows. In Section 2, we describe the dataset, we illustrate the design of the analysis and the related econometric methodology. Section 3 presents the results and Section 4 provides a discussion of the results and their implications. A more detailed illustration of the data and their transformation is also presented in the annex.

2. Data and econometric methodology

2.1 The dataset

Our analysis exploits data on the aggregate balance sheet of euro area Monetary Financial Institutions (MFIs), excluding the Eurosystem. The statistics are compiled in a fully harmonised manner under the requirements of Regulation ECB/2013/33[2] and cover asset and liability positions of MFIs with granular breakdowns in terms of instrument categories, sector and residency of counterparties, and original maturity.

[2] Regulation (EC) No XX/2013 of the ECB of 24 September 2013 concerning the balance sheet of the monetary financial institutions sector (Recast), OJ L 15, 7.11.2013, p. 14.

Data are collected by national central banks (NCBs) from reporting agents resident in their jurisdictions based on the 'host country' residency approach and relate to the solo accounts of the institutions. In other words, the focus is not on 'banks' but rather on the individual branches and subsidiaries that operate in euro area countries. The concepts underlying MFI balance sheet statistics are based on international statistical standards, which guaranty the international comparability of the statistics and ensure a sound methodological background.

For the purposes of this paper, balance sheet variables are aggregated in such a way as to distinguish assets and liabilities by instrument, by sector and by residency of the counterparty.[3] In particular, on the assets side we consider loan and deposit claims, and holdings of securities, separately identifying debt securities from equity instruments, where relevant. In turn, on the liabilities side we distinguish between deposit and loan liabilities and debt securities issued.

In terms of area of residency, a distinction is made (when relevant) between domestic and non-resident counterparties, with a further split between intra-euro area and extra-euro area. Intra-euro area positions are then broken down between inter-bank, other wholesale (financial corporations other than banks), retail (non-financial corporations and households) and government, as applicable. This approach allows us to analyse the behaviour of domestic inter-bank loans as opposed to the corresponding intra-euro area cross-border activity.

INSERT FIGURE 1 HERE

Figure 1 shows developments in the intra-euro area interbank market, including MFI positions with respect to the Eurosystem. Starting from 1999, these positions steadily increased over time, accelerating in periods preceding the inception of the financial crisis. Domestic positions kept increasing, although at a slower pace, between Q3 2007 and Q3 2008, flattened out with the Lehman's episode, and then remained stable, with some signs of contraction emerging only in 2014. Intra-euro area cross-border positions followed similar patterns until Lehman's default, when they started to contract significantly before stabilising in 2015. Positions with the Eurosystem have gained importance since the start of the financial crisis in 2007. After the failure of Lehman, banks relied on the ECB rather than the market as a source of liquidity, given the dysfunctionality of the private

[3] The data used in the paper relate to notional stocks, which are constructed based on measure of transactions and therefore are corrected for series breaks arising, e.g., from mergers and acquisitions or changes in the classification of counterparties (see the annex for further discussion).

interbank market. Once the immediate post-Lehman disruptions had been overcome, a period of 'normalisation' followed. But from fall 2011, when new tensions associated with the sovereign and banking crises emerged, the launch of the Eurosystem's 3-year long-term refinancing operations again boosted reliance on ECB operations.

Similarly, MFI holdings of domestic government debt securities can be distinguished from the holdings of government debt securities issued in other euro area countries. Figure 2 shows that the share of intra-euro area cross-border holdings of government debt securities steadily increased until end-2005 and then decreased slightly until Lehman's failure. From that point forward, however, MFIs started to increase their holdings of domestic government debt securities significantly, albeit with some signs of stabilisation in this trend from 2013 onwards.

INSERT FIGURE 2 HERE

The annex provides a more comprehensive description of each balance sheet indicator considered, as well as detailed information about data source and data adjustments. However, we note that this paper only takes into account claims and liabilities of MFIs to the extent they are recorded on balance sheet; e.g. implicit guarantees (and other off-balance sheet exposures and transactions) are not considered in our analysis.

In order to study the association of the balance sheet variables with the rest of the economy, we have included in the model macroeconomic indicators for both the euro area and the US. For the euro area, we consider industrial production and unemployment, prices for goods and assets and interest rates at different maturities. For the US, we include industrial production, consumer prices and the Federal Funds rate. The variables are all available at the monthly frequency and the sample ranges from January 1999 to October 2015. For further information on these variables, see the annex.

2.2 The design of the empirical exercise

The aim of our quantitative exercise is to identify those changes in balance sheet's behaviour since 2008 which are larger in size than what could have been expected, given the historical association of the bank balance sheets with macroeconomic variables and the evolution of those variables during the crises. In other words, "large" for us is a change which goes beyond what could be rationalised by macroeconomic dynamics seen during the post-Lehman 'Great Recession' and the subsequent European sovereign and banking crises. In our view, a "large" change signals exceptional financial

disruption leading to exceptional changes in banks' behaviour. To give a precise meaning to the concept of "large change", we use the pre-crisis part of the sample as a "benchmark" against which we compare the more recent behaviour during the financial crises.

More specifically, we compare the observed path of key bank balance sheet items with predictions based on a dynamic model of the joint behaviour of bank balance sheet and macroeconomic variables in the pre-crisis sample. In constructing the predictions we condition on: (1) the economic relationships prevailing before the Lehman collapse (reflected in the model parameters estimated using the data until August 2008); (2) the pre-crisis history of all variables; and (3) the observed outcomes of the subset of variables representing the macroeconomic environment until the end of the sample (i.e. using as conditioning assumptions macro variables in our data set; these capture real economic conditions, short term interest rates and consumer and production price inflation in both the euro area and the U.S.).

If the observed path of bank balance sheet variables since Lehman's failure lies out of the forecast distributions, the observed developments in the banking sector during the financial crisis are difficult to reconcile with those in the rest of the economy. Potentially, this may be due to structural changes in the financial sector brought about by the crisis. By contrast, the finding of no significant change is evidence that, although larger in size, the shocks that affected the euro area economy during the financial crises are similar in nature to those that drove the economy in the preceding ten years. Moreover, the transmission of these shocks has not changed substantially. In other words, if the observed and simulated paths are similar, we interpret this as evidence that the relative importance of real and financial shocks has remained the same through the financial crisis, at least once one has conditioned on policies and, in particular, on the introduction of non-standard monetary policy measures by the ECB.

It is important to notice that, since banks' balance sheets and macroeconomic developments are jointly determined in general equilibrium, the conditional predictions should not be interpreted as solely driven by the macroeconomic shocks but also by those financial shocks that significantly influenced macroeconomic conditions. By conditioning on real economy variables, we ensure that we capture the size of the shocks that would have caused the recent recession, if it were due to the shocks that have typically generated recessions in the euro area. For example, if credit shocks were traditionally associated with a recession, we would be implicitly conditioning on our characterisation

of credit shocks since September 2008 in order to assess whether the impact of such shocks and credit dynamic more generally have been in line with historical regularities.

As a caveat, it should stressed that, since our "normal" is based on predictions of a model estimated using only pre-crisis data, uncertainty can be substantial, especially for longer horizons. As a consequence, we will be not be able to detect all the abnormal dynamics, but only the very "large" differences between the actual data and the counterfactual.

2.3 The econometric model

Using the data set described in sub-section 2.1 and in the annex, we estimate an empirical model of the euro area economy. Let X_t be the vector including the n variables (all variables are in log-levels, except for variables expressed in rates that are in levels). In particular, we estimate a VAR model with p (=13) lags:

$$X_t = A_0 + A_1 X_{t-1} + A_2 X_{t-2} + \ldots + A_p X_{t-p} + e_t$$

where e_t is a normally distributed multivariate white noise with covariance matrix Σ.

The large dimension (n=34 and p=13) of our VAR model implies that we face an issue of overfitting due to the large number of parameters ("curse of dimensionality"). We address this issue by shrinking the model's coefficients toward those of the naïve and parsimonious random walk with drift model, $X_{it} = \delta_i + X_{i,t-1} + e_{it}$. De Mol et al. (2008) and Banbura et al. (2010) have shown that this approach reduces estimation uncertainty without introducing substantial bias, hence providing a parsimonious but reliable estimate of the complex dynamic interactions among the macro, monetary and financial variables included in the data set. This is achieved thanks to the tendency for economic time series to co-move over the business cycle, which creates scope for the data to point "massively" in the same direction against a naïve prior model that does not allow for any dynamic interaction.

Inference is based on the framework developed by Giannone et al. (2015). For Σ, the covariance matrix of the residuals, we specify an Inverse Wishart with scale parameter given by a diagonal matrix. The degrees of freedom are set to $d = (n+2)$, the minimum number that guarantees the existence of the prior mean of Σ, which is equal to $\Psi/(d-n-1) = \Psi$. Conditional on the covariance matrix of the innovations, we specify a Gaussian prior for the constant A_0 and the autoregressive coefficients ($A_1 \ldots A_p$) which is centred on the Random Walk with drift model. More precisely, we

specify a flat prior for the constant term, while for the autoregressive coefficients we postulate two priors: the Minnesota and the sum-of-coefficients priors originally proposed by Litterman (1979) and Doan et al. (1984) respectively. For the Minnesota prior, the means and variances are defined as follows:

$$- E[(A_1)] = I_{n,} \text{ while } E[(A_2)] = \ldots = E[(A_p)] = \mathbf{0}_{n,n}$$

$$- Cov[(A_s)_{ij},(A_r)_{hm}] = \lambda^2 \Sigma_{ih}/(s^2 \Psi) \text{ if } m = j \text{ and } r = s, \text{ zero otherwise.}$$

The factor $1/s^2$ is the rate at which the prior variance decreases with increasing lag length, capturing the prior belief that dependence is less strong for longer lags. The ratio Σ_{jj}/Ψ_{ii} accounts for the different scale and variability of the data. Finally, the key hyperparameter is λ, which controls the scale of all the prior variances and covariances, and effectively determines the overall tightness of this prior. For $\lambda = 0$ the posterior equals the prior and the data do not influence the estimates. If $\lambda \rightarrow \infty$, on the other hand, posterior expectations coincide with the OLS estimates. In order to understand the intuition underlying the "sum-of-coefficient prior", it is useful to rewrite the VAR equation in error correction form:

$$\Delta X_t = A_0 - (I_n - A_1 - \cdots - A_p)Y_{t-1} + B_1 \Delta Y_{t-1} + \cdots + B_{p-1} \Delta Y_{t-p+1} + e_t$$

The prior for $\Pi = (I_n - A_1 - \cdots - A_p)$ is centered around zero and can be easily implemented using dummy observations. The tightness of this additional prior is controlled by the hyperparameter μ. As μ goes to infinity the prior becomes flat. If, instead, μ goes to 0, the prior becomes dogmatic and we approach the case of a model with data transformed in differences, which implies the presence of a unit root in each equation. Intermediate cases imply a sort of "inexact differencing".

Summing up, the setting of these priors depends on the hyperparameters λ, μ and ψ, which reflect how informative the prior distribution is for the model's coefficients. These parameters are usually set on the basis of subjective considerations or rules of thumb. We instead follow the theoretically grounded approach proposed by Giannone et al. (2015). This involves treating the coefficients of the prior as additional parameters, in the spirit of hierarchical modelling. As hyper priors we use proper

but almost flat distributions.[4]

The counterfactual exercise described in broad terms in sub-section 2.2, is performed as follows. We simulate the model's parameters from their full posterior density, accounting also for the estimation uncertainty of the hyper-parameters controlling the prior tightness. This approach is implemented using a simple Markov chain Monte Carlo algorithm. In particular, we use a Metropolis step to draw the low dimensional vector of hyperparameters. Conditional on a value of the hyperparameters, the VAR coefficients can then be drawn from their posterior, which is Normal- Inverse-Wishart.[5] Since we are interested in conditioning on the economic relationships prevailing before the Lehman collapse, the posterior is computed using the data until August 2008.

For any given draw of the model's parameters from their posterior density, the draws from the counterfactual exercise are computed as conditional forecasts in which the conditioning information is given by: (1) the pre-crisis history of all variables in the model; (2) the macroeconomic developments observed during the crisis; and (3) the observed outcomes of the subset of variables representing the macroeconomic environment until the end of the sample in October 2015. The conditional forecasts are obtained using the algorithm developed in Banbura et al. (2015). The procedure exploits the fact that the Vector Autoregressive model can be cast in a state-space form. Hence, the conditional forecasts can be drawn using a simulation smoother.[6]

3. Results

Table 1 reports the results of our exercise. We focus on a few important dates in our sample. As a reference, we provide a picture of our stylised bank balance sheet in 1999 (average levels over the year, in terms of euro billions), the outset of monetary union and the beginning of our sample. We then show the data for the crisis years (2008 – 2015, average levels over the years, in terms of euro billions), which is the sample over which the empirical exercise is carried out.

At the bottom of each cell, in parenthesis, the table reports the 2.5% and 97.5% percentiles of the

---

4 As hyperpriors for λ, μ we choose Gamma densities with mode equal to 0.2, 1 and standard deviations equal to 0.4, 1 respectively. Our prior on ψ, i.e. the prior mean of the main diagonal of Σ, is an Inverse- Gamma with scale and shape equal to $(0.02)^2$.

5 See Giannone et al. (2015) for the details of the MCMC algorithm.

6 In this paper, we use the simulation smoother described in Carter and Kohn (1994).

counterfactual forecast distributions. Any development of the variables outside those percentiles is identified as being 'unlikely' given the historical regularities estimated in the pre-crisis sample and, hence, it could reflect relevant changes in the nature of financial intermediation. For the sake of easy reading, we mark the observed figures in red when they turn out to be lower than the 2.5% percentile of the conditional forecast distribution and in blue if, instead, they turn out to be higher than the 97.5% percentile of the conditional forecast distribution. Figures 3 and 4 capture the same results in graphical form.

INSERT TABLE 1 and FIGURES 3 and 4 HERE

Starting from the liability side, the first striking element is the resilience of retail deposits. None of the two crises seems to have been characterized by a run on bank deposits. The stress in bank funding is revealed by the collapse of banks' debt liabilities and, as many have observed (e.g. Heider et al., 2009), that of the inter-bank market. The latter, however, is mainly driven by cross-border activity, while the domestic inter-bank flows have remained relatively resilient. This result is line with the conclusions of an analysis of bank-level data by Abbassi et al. (2013, 2015). Both the intra and extra euro area inter-bank deposits decline unusually during the crisis. Financial integration within the euro area is revealed to be fragile, as fragile as integration across the boundaries of the single currency area.

One open issue is the extent to which transactions within banking groups influence these results. Data distinguishing intra-group inter-bank positions are available (for the dataset used in this paper) only since July 2014. These data are not used in our model, as they do not cover the key crisis period. Moreover, these data do not distinguish between positions among banks of the same group within one country and transactions between banks within the same group that take place across euro area borders (i.e. between domestic and intra-euro area non-resident transactions). Data shows that intra-group positions account for about 50% of inter-bank positions in the euro area and have remained rather stable since July 2014. If we take the view that intra-group transactions are less affected by the breakdown of financial integration within the euro area, the implication is that transactions between unrelated institutions were even more adversely affected than what can be argued by looking at our data. Our assumption seems to the supported by the findings of Reinhardt and Riddiough (2014), which show that intra-group funding remains stable during periods of heightened risk.

The data also imply that (especially in the immediate aftermath of Lehman's failure) banks' reliance

on the Eurosystem as a source of funding has increased. This is consistent with our view that central bank intermediation substituted for the decline in interbank market activity. The ECB balance sheet was able to step in as intermediary of last resort at a cost, however, of creating large TARGET 2 (im)balances.

The response of bank assets to the crisis was initially (i.e. in the immediate post-Lehman period) more muted than on the liability or funding side. The one exception to this observation is the behaviour of MFIs loans to non-resident intra- and extra-euro area bank counterparties, but this is simply the other side of the collapse in cross-border interbank transactions. The level of retail loans (i.e. loans to households and non-financial corporations) only becomes 'unusual' (in the sense of falling below the 2.5% percentile of our counterfactual simulation) in 2011, when the sovereign and banking crises hit the euro area. The unusual collapse of the loan-to-deposit ratio or of the ratio of loans to M3 is a characteristic of the recession experienced during the euro area sovereign crisis. Reichlin (2014) interprets this fact as a signal of the declining effectiveness of ECB liquidity policies to sustain credit to the real economy.

The other striking characteristic on the asset side is the unusual increase of domestic government bonds holding and the decrease of the non-resident component. The motivations behind the strengthening of such home bias are the subject of ongoing debate (Acharya and Steffen, 2015). On the one hand, the 'risk-shifting' view sees banks buying the sovereign debt of the country where they are resident on the basis that the correlation of bank and sovereign and bank risk within a single country is anyway so high that a sovereign default would cause the bank to fail. In that context, buying high yielding domestic bonds is a form of 'gambling on resurrection': if there is a sovereign default, the bank would anyway fail, but in the absence of a default, the carry yield on the sovereign would pay. On the other hand, the "moral suasion" view sees banks buying domestic sovereign debt under pressure from their own regulators (who at the time of the sovereign and banking crisis in 2011/12 were still national rather than pan-Euro area institutions) at a time when other investors are running on sovereign debt. This represents a form of financial repression, as banks during the crisis are inevitably vulnerable to such regulatory pressures (Becker and Ivashina, 2014).

Taken together, the developments described above reflect how the fragmentation of euro area interbank markets along national lines following the failure of Lehman extended to a fragmentation of government debt markets once the sovereign crisis took root. The response of the banks to these events intensified the vicious interaction between bank and sovereign balance sheets. The

consequence of risk aversion is a strong home bias within the currency union, a potential weakness of the euro area financial system. These dynamics obviously affect those segments of the markets that, with the establishment of the euro, had become more integrated: the inter-bank and the sovereign market.

Interestingly, the fragmentation of the inter-bank market along national lines was the consequence of the global recession of 2008, while that of the sovereign markets developed later, as a consequence of the euro area specific recession associated with the sovereign and banking crises. The 2008 crisis exposed countries to a powerful "sudden stop" reminiscent of emerging market crises even if, in the case of the euro, most of these transactions are in the local currency. The second crisis, on the other hand, caused a crisis of confidence in the single currency itself (the so-called "redenomination risk") which induced banks to invest in their own sovereigns.

The ECB was successful in facing the first wave of nationalization which affected the inter-bank market by replacing, via TARGET2, euro area non-domestic transaction and managed in this way to support retail lending activity (see Peersman, 2011 and Giannone et al. 2012, for a quantitative assessment on this point). The second wave of market re-segmentation in the sovereign debt market was linked to a crisis of confidence in the currency itself. This proved harder to combat with the tools available to the ECB at the time. Although sovereign spreads markedly decreased after the announcement in 2012 that the central bank was ready to implement Outright Monetary Transactions (OMT), the home bias in the sovereign market has persisted, as has the correlation of risk between banks and sovereign. In this situation, loans collapsed more than what would have been expected given cyclical conditions. Facing this problem would require the full implementation of a banking union and the institution of a resolution mechanism for debt crises.

4. Discussion and conclusions

An important message of our paper is to emphasise that the European experience of the financial crisis has two distinct phases, which coincide with the timing of the "double dip" recessions in economic activity. This contrasts with the experience in other areas, such as the United States or the United Kingdom, where the financial crisis following the failure of Lehman was the single, definitive event.

Financial fragmentation is central to both phases of the crisis in the euro area, but takes different forms during the two episodes. The initial "sudden stop" following the failure of Lehman was associated with a drying up of cross-border bank wholesale funding (on the liability side of banks' balance sheets), which led to private funding becoming overwhelmingly domestic. The drying up of cross-border inter-bank funding was not solely or mainly from sources outside the euro area: intra-euro area cross-border wholesale flows also seized up. It was only during the second phase of the euro area crisis from late 2010 – at which point governments were (in some cases) called upon to support banks while domestic banks increased their holdings of domestic sovereign debt as foreign investors withdrew – that a more vicious interaction between bank and sovereign balance sheets emerged.

From the policy perspective, the distinction between these two phases of the crisis begs an important question. Liquidity and bank funding measures taken to address the first phase may have enabled bank behaviour – notably an accumulation of domestic sovereign debt – that, through exacerbating the "diabolic loop", deepened the second phase. Of course, that is not to say these measures should not have been implemented: without them, a catastrophic financial collapse threatened immediately post-Lehman. But the experience demonstrates that crisis measures, although necessary, need to be complemented by longer-term structural efforts to deal with the underlying problems. Arguably it was the failure to use the time bought by the ECB's post-Lehman crisis response to implement deeper regulatory and governance reforms in the euro area (in general, and in the European banking system in particular) that laid the basis for the second phase of the crisis.

References

Abbassi, P., F. Bräuning, F. Fecht, F. and J. L. Peydró, (2015). "Cross-Border Liquidity, Relationships and Monetary Policy: Evidence from the Euro Area Interbank Crisis," CEPR Discussion Papers 10479.

Abbassi, P., F. Fecht, and P. Weber (2013). "How stressed are banks in the interbank market?," Deutsche Bundesbank discussion paper no. 40/2013.

Acharya, V.V. and S. Steffen (2015). "The greatest carry trade ever? Understanding Eurozone bank risks," *Journal of Financial Intermediation* 115, pp. 215-236.

Angelini, P., G. Grande and F. Panetta (2014). "The negative feedback loop between banks and sovereigns," Banca d'Italia occasional paper no. 213.

Banbura, M., D. Giannone and M. Lenza (2015). "Conditional Forecasts and Scenario Analysis with Vector Autoregressions for Large Cross-Sections," International Journal of Forecasting 31(3), pp. 739-756.

Banbura, M., D. Giannone and L. Reichlin (2010). "Large Bayesian VARs," *Journal of Applied Econometrics* 25, pp. 71-92.

Battistini, N., Pagano, M., and S. Simonelli (2013). "Systemic risk, sovereign yields and bank exposures in the euro crisis," CSEF University of Naples.

Becker, B. and V. Ivashina (2014). "Financial repression in the European sovereign debt crisis," Swedish House of Finance research paper no. 14-13.

Bindseil, U.,P. Cour-Thimann and P. König (2012). "Target2 and Cross-border Interbank Payments during the Financial Crisis," CESifo Forum, Ifo Institute - Leibniz Institute for Economic Research at the University of Munich, vol. 13(SPECIALIS), pp. 83-92, 02.

Caballero, R.J. (2009) "Sudden financial arrest," IMF Mundell-Flemming lecture, MIT Department of Economics working paper no. 09-29.

Calvo, G.A. and C. Reinhart (2000). "When capital inflows come to a sudden stop: Consequences and policy options" in P. Kenen and A. Swoboda (eds.) Reforming the international monetary and financial system, Washington, DC: International Monetary Fund, pp. 214-265.

Carter, C. K. and R. Kohn (1994). "On Gibbs sampling for state-space models," *Biometrika 81,* pp. 541-553.

Colangelo, A. and M. Lenza (2012), "Cross-border banking transactions in the euro area", *IFC Bullettin 36*.

De Mol, C., Giannone, D. and L. Reichlin (2008). "Forecasting using a large number of predictors: Is Bayesian shrinkage a valid alternative to principal components?," *Journal of Econometrics*, Elsevier, vol. 146(2), pages 318-328, October.

Doan, T., R. Litterman, and C. A. Sims (1984). "Forecasting and conditional projection using realistic prior distributions," *Econometric Reviews* 3, pp. 1-100.

ECB (2014). "The determinants of euro area sovereign bond yield spreads during the crisis". Monthly Bulletin Article, May 2014 (pp. 67-83).

ECB (2007), Monetary financial institutions and markets statistics sector manual, ECB: Frankfurt, see http://www.ecb.europa.eu/pub/pdf/other/mfimarketstatisticssectormanual200703en.pdf

Garcia-de-Andoain, C., P. Hoffmann and S. Manganelli (2014). "Fragmentation in the Euro overnight unsecured money market," *Economics Letters*, vol. 125(2), pages 298-302.

Garicano, L. and L. Reichlin (2014). "A safe asset for Eurozone QE: A proposal," http://www.voxeu.org/article/safe-asset-eurozone-qe-proposal.

Giannone, D., M. Lenza, H. Pill and L. Reichlin (2012). "The ECB and the interbank market," *Economic Journal* 122, pp. 467-486.

Giannone, D., M. Lenza and G. Primiceri (2015). "Prior selection for vector autoregressions," *Review of Economics and Statistics* 97(2), pp. 436-451.

Giannone, D., M. Lenza and L. Reichlin (2012). "Money, Credit, Monetary Policy and the Business Cycle in the Euro Area," Working Papers ECARES ECARES 2012-008, ULB -- Universite Libre de Bruxelles.

Hartmann, P., A. Maddaloni and S. Manganelli (2003). "The euro area financial system: structure, integration and policy initiatives," ECB working paper no. 230.

Heider, F., M. Hoerova and C. Holthausen (2009). "Liquidity hoarding and interbank market spreads: The role of counterparty risk," ECB work paper no. 1126.

Lenza, M., H. Pill and L. Reichlin (2010). "Monetary policy in exceptional times," *Economic Policy* 62, pp. 295-339.

Litterman, R. (1979): "Techniques of forecasting using vector autoregressions," Federal Reserve of Minneapolis Working Paper 115.

McKinnon, R.I. and H. Pill (1997). "Credible economic liberalizations and overborrowing," *American Economic Review* 87(2), pp. 189-193.

McKinnon, R.I. and H. Pill (1998). "The overborrowing syndrome: Are East Asian economies different?" in R. Glick (ed.) Managing capital flows and exchange rates: Lessons from the Pacific Basin, Cambridge University Press, pp. 322-355.

Peersman, G. (2011). "Macroeconomic effects of unconventional monetary policy in the euro area," CEPR discussion paper no. 8348.

Reichlin, L. (2014). "Monetary policy and banks in the euro area: The tale of two crises," *Journal of Macroeconomics* 39, pp. 387-400.

Shin, H-S. and K. Shin (2011). "Procyclicality and monetary aggregates," NBER working paper no. 16836.

Reinhardt, D. and S.J. Riddiough (2014). "The two faces of cross-border banking flows: an investigation into the links between global risk, arms-length funding and internal capital markets," Bank of England Working Paper 498.

DATA ANNEX

Our dataset includes 22 bank balance sheet variables and 12 macroeconomic and financial variables of the euro area. All variables are available at the monthly frequency and the sample ranges from January 1999 to October 2015. The bank balance sheet series are from the dataset on Monetary Financial Institutions (MFIs) balance sheet statistics compiled by the European Central Bank. The macroeconomic and financial block of the database consists of variables drawn from the Statistical Data Warehouse of the European Central Bank.

As regards the balance sheet data, the aggregations we use in the data analysis are constructed from the main instrument categories, by grouping sectors of the counterparties to yield information on MFI positions vis-à-vis euro area residents, and specifically the Eurosystem, other MFIs, financial corporations other than MFIs, the government sector, firms and households, and the rest of the world. Special attention is paid to the so-called euro area wholesale lending market, which is defined as the lending market where MFIs operate along with financial intermediaries other than MFIs. Those consist of insurance corporations, pension funds, non-MMF investment funds, other financial intermediaries (including captive financial institutions and money lenders) and financial auxiliaries.

In addition, MFI balance sheet statistics allow the split between intra-euro area domestic and cross-border positions, and we take these breakdowns into account when studying inter-MFI positions. With this respect it is worth stressing that the operational framework of the Eurosystem provides that monetary policy operations are always conducted via the relevant NCB; the resulting positions are thus to be considered, by definition, domestic.

When analysing developments in MFI loans to firms and households, we also take into account the impact of loan securitisation (and other loan transfers) on MFI balance sheets.[7]

On this basis, the variables employed in the empirical analysis in the main text are:

Bank assets

- *Loans to euro area firms and households*
- *Loans to euro area government*
- *Deposit and loan claims on the Eurosystem*
- *Domestic loans to MFIs*
- *Intra-euro area cross-border loans to MFIs*
- *Other euro area wholesale loans* (This series covers both domestic and intra-euro area cross-border positions vis-à-vis insurance corporations, pension funds, non-MMF investment funds, other financial intermediaries (including captive financial institutions and money lenders) and financial auxiliaries.)
- *Loans to non-euro area residents*
- *Domestic holdings of government debt securities*
- *Intra-euro area cross-border holdings of government debt securities*

  Holdings of euro area MFI securities
- *Holding of securities issued by the euro area private sector*

[7] While loans to other counterparties can also be object of securitisation activities, these are not reflected in the paper as they are assumed to have lower magnitude compared to the impact securitisation has on loans to non-financial sectors.

- *Holdings of debt securities issued by non-euro area residents*
- *Holdings of equity issued by non-euro area residents*
- *Remaining assets*

Bank liabilities

- *Deposits of euro area firms and households*
- *Deposits of euro area government*
- *Deposit and loan liabilities to the Eurosystem*
- *Domestic deposits from MFIs*
- *Intra-euro area cross-border deposits from MFIs*
- *Other euro area wholesale deposits* (This series includes deposits and loan liabilities of euro area MFIs (excluding the Eurosystem) vis-à-vis euro area financial intermediaries other than MFIs,i.e. insurance corporations, pension funds, non-MMF investment funds, other financial intermediaries and financial auxiliaries. Long-term deposits vis-a-vis FVCs are however excluded from our exercise as they are usually fictionally imputed to the MFI balance sheet as a balancing liability when loan securitisation activities (or other loan sales) do not result in the de-recognition of the assets.)
- *Deposits from non-euro area residents*
- *Debt securities issued*

The macroeconomic and financial block

- *Industrial production (euro area)*
- *Harmonized Index of Consumer prices (euro area), HICP*
- *Unemployment rate (euro area)*
- *Producer price index (euro area), PPI*
- *Three months Euribor rates (euro area)*
- *Industrial production (US)*
- *Consumer price index (US), CPI*
- *Federal Funds rate (US)*
- *DJ Eurostoxx (stock prices)*
- *Sovereign bond yields, two years maturity (euro area)*
- *Sovereign bond yields, five years maturity (euro area)*
- *Sovereign bond yields, ten years maturity (euro area)*

The data enter the VAR model in annual log-levels (i.e. 12*log) except the rates (i.e. the Euribor, the Federal Funds rate, the sovereign bond yields and the unemployment rate) which enter the model in levels.

More details on the construction of the data series are available in the web appendix.

Table 1a: Bank balance sheet items – liabilities and assets

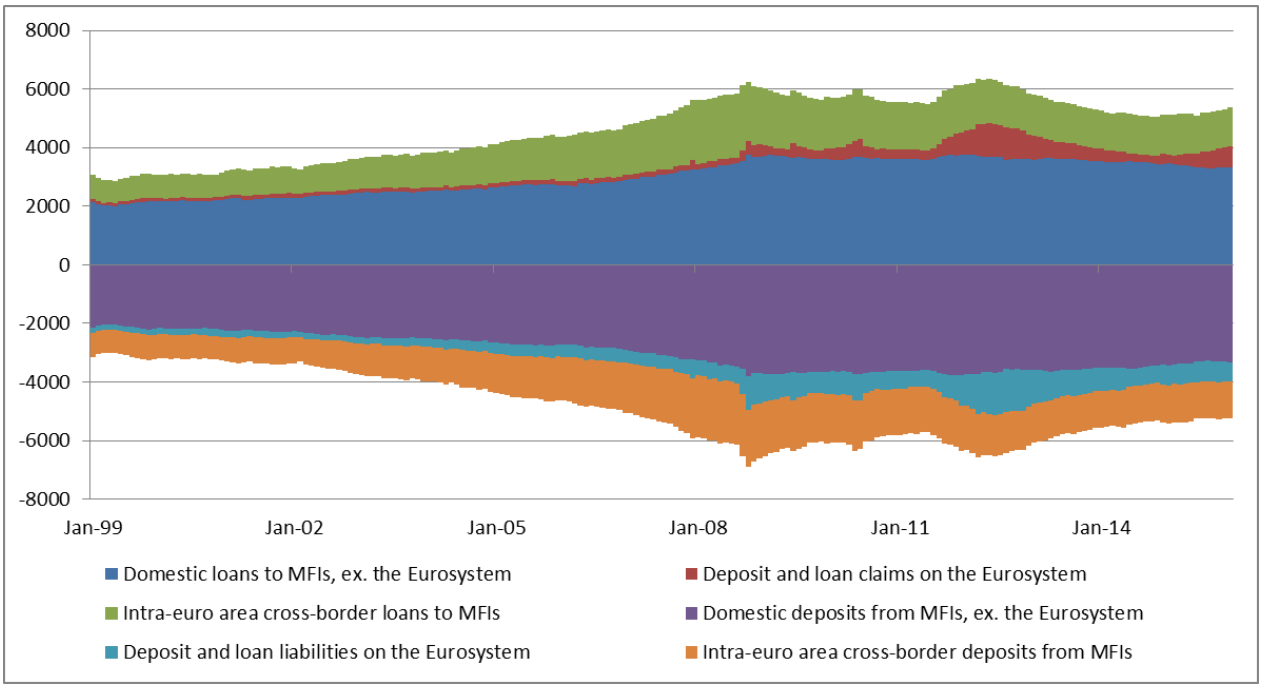
LIABILITIES	1999	2008	2009	2010	2011	2012	2013	2014	2015
Deposits of euro area firms and households	4239.4	6736.6	7044.1	7257.4	7468.1	7673.3	7983.3	8222.2	8423.4
		(6656.0 - 6780.4)	(6629.4 - 7547.8)	(6826.0 - 8199.3)	(6932.4 - 9007.2)	(6977.1- 9580)	(7207.1- 10495.0)	(7319.0 - 11622.0)	(7409.0 - 12939.6)
Deposit of euro area government	220.3	390.6	426.4	419.2	462.7	476.6	474.2	474.6	503.3
		(348.1- 393.7)	(213.8 - 551.4)	(185.2 - 674.3)	(153.3 - 932.3)	(130.9 - 1203.4)	(102.5 - 1408.8)	(79.3 - 1909.7)	(60.6 - 2773.1)
Deposit and loan liabilities to the Eurosystem	195.2	700.6	817	726.7	687.8	1351.5	934.6	684.4	684.1
		(489.1- 589.2)	(263.5 - 932.0)	(229.4 - 1298.7)	(174.5 - 2048.2)	(164.0 - 3291.9)	(146.5 - 5031.0)	(113.1- 7728.0)	(78.6 - 12376.1)
Domestic deposits from MFIs	2108.2	3480.6	3689.1	3660.9	3664.8	3642.3	3583.9	3487.6	3344.4
		(3363.2 - 3475.7)	(3258.9 - 4020.8)	(3292.0 - 4404.4)	(3273.1- 4953.6)	(3343.6 - 5458.5)	(3321.6 - 5946.1)	(3233.0 - 6693.9)	(3119.3 - 7520.9)
Intra-euro area cross-border deposits from MFIs	813.9	2066.4	1744.3	1645.1	1574.3	1419.6	1297.9	1271.3	1290.6
		(2076.0 - 2217.2)	(1969.0 - 2919.0)	(2090.1- 3581.3)	(1948.5 - 4296.8)	(2115.0 - 5378.9)	(2274.1- 6920.0)	(2258.4 - 8852.6)	(2205.5 - 11433.1)
Other euro area wholesale deposits	908.7	2589.1	2790.4	2865.7	2969.3	2869.6	2764.5	2593.2	2641.3
		(2504.1- 2599.4)	(2322.8 - 3121.8)	(2471.4 - 3834.3)	(2599.6 - 4822.5)	(2645.1- 5619.5)	(2785.3 - 6928.3)	(2830.4 - 8755.9)	(2845.2 - 11166.5)
Deposits from non-euro area residents	1623.3	4209.7	3661.6	3594.1	3403.6	3182.9	2824.5	2665.8	2726.4
		(4190.8 - 4401.4)	(3609.3 - 4910.5)	(3671.2 - 5671.8)	(3711.4 - 6833.2)	(3636.9 - 7520.9)	(3761.7 - 8939.4)	(3800.6 - 10926.0)	(3838.7 - 13684.0)
Debt securities issued	2407.4	5229.9	5306.4	5257.1	5220.1	5232.9	4873.5	4531.6	4222.3
		(5237.6 - 5325.4)	(5178.0 - 5848.0)	(5451.5 - 6523.4)	(5810.6 - 7466.5)	(6146.2 - 8374.2)	(6413.4 - 9223.5)	(6733.2 - 10498.8)	(6939.9 - 11916.8)

Note: Euro billions, yearly averages. Red (blue) indicates figures below (above) the 2.5 (97.5)% percentile of the forecast distribution. 2.5% and 97.5% percentiles in parenthesis.

ASSETS	1999	2008	2009	2010	2011	2012	2013	2014	2015
Loans to euro area firms and households	4525.5	9339.1	9596.4	9683.7	9915.8	9965.1	9874.5	9802.6	9894.3
		(9270.9 - 9350.3)	(9223.8 - 9929.7)	(9571.4 - 10788.7)	(10198.2 - 12083.5)	(10632.0 - 13140.8)	(11017.1 - 14217.6)	(11478.5 - 15793.1)	(11852.1 - 17514.7)
Loans to euro area government	972.7	977.3	998.3	1088.4	1165.6	1159.5	1110.4	1093.4	1107.5
		(961.0 -985.1)	(901.9 - 1088.8)	(883.0 - 1151.1)	(847.9 - 1221.6)	(803.1 - 1259.6)	(781.0 - 1327.3)	(740.1 - 1418.8)	(701.4 - 1538.8)
Deposit and loan claims on the Eurosystem	104.2	278.1	326	408.9	452.5	1020.4	575.6	322.9	467.3
		(173.5 - 237.6)	(58.0 - 553.7)	(38.6 - 767.1)	(22.7 - 1677.2)	(11.3 - 20154.4)	(6.5 - 2763.9)	(3.7 - 5215.9)	(1.9 - 10166.2)
Domestic loans to MFIs	2094.3	3461.1	3669.8	3626.5	3653.6	3664.6	3596.3	3498.9	3361.6
		(3344.2 - 3458.3)	(3219.7 -3986.2)	(3241.4 - 4374.3)	(3202.1 - 4931.3)	(3247.2 - 5403.7)	(3215.3 - 5966.6)	(3121.8 - 6647.4)	(2989.8 - 7440.9)
Intra-euro area cross-border loans to MFI	796.7	2127.4	1823.5	1697.6	1625.5	1490.3	1360.1	1320.1	1354.3
		(2134.4 - 2276.8)	(2021.0 - 2963.9)	(2119.9 - 3604.2)	(2010.7 - 4314.6)	2196.6 - 5437.4)	(2362.1 - 6922.0)	(2337.0 - 8862.7)	(2282.3 - 11407.3)
Other euro area wholesale loans	358.7	1155.6	1169.3	1189.5	1244.2	1249.3	1259.8	1206.6	1248.5
		(1111.6 - 1172.8)	(921.9 - 1377.9)	(943.3 - 1575.5)	(980.6 - 2194.9)	(936.7 - 2502.7)	(920.1 - 2935.6)	(894.6 - 3655.7)	(857.8 - 4679.5)
Loans to non-euro area residents	1208.2	3601.8	3093.4	3049	3105	3027.4	2908.2	3015.6	3025.5
		(3554.2 - 3754.3)	(3434.3 - 4944.8)	(3597.3 - 6040.6)	(3435.2 - 7114.6)	(3682.1 - 8847.6)	(3984.4 - 11309.0)	(4098.6 - 15078.0)	(4310.9 - 20779.9)
Domestic holdings of government debt securities	921.3	631.7	765.6	899	975.4	1194.4	1305.6	1292.9	1270.7
		(621.0 - 648.3)	(570.8 - 784.9)	(551.5 - 869.8)	(503.6 - 957.7)	(454.4 - 9915)	(439.8 - 1100.3)	(390.2 - 1204.1)	(342.4 - 1332.9)
Intra-euro area cross-border holdings of government debt securities	302.6	483.6	539.6	518.4	439.3	375.9	388.8	435	476.4
		(476.4 - 507.2)	(451.3 - 727.6)	(463.4 - 929.5)	(428.7 - 1111.1)	(395.6 - 1272.2)	(421.6 - 1680.6)	(382.3 - 2058.6)	(335.3 - 2526.8)
Holding of euro area MFI securities	1013.1	2269.2	2482	2392.7	2298.4	2448.1	2294.9	2084.6	1888.4
		(2235.7 - 2296.4)	(2072.9 - 2502.1)	(2146.6 - 2797.5)	(2281.6 - 3329.3)	(2330.8 - 3699.8)	(2327.3 - 4013.1)	(2337.0 - 4505.7)	(2304.5 - 5086.4)
Holding of securities issues by the euro area private sector	666.6	2014.9	2270.1	2288.6	2266.5	2211	2204.1	2118.8	2086.6
		(1954.2 - 2052.4)	(1699.3 - 2425.0)	(1720.2 - 2859.0)	(1832.1 - 3754.5)	(1737.9 - 4154.8)	(1754.1 - 4868.7)	(1671.3 - 5797.5)	(1563.2 - 6970.7)
Holding of debt securities issued by non-euro area residents	292.9	1224	1154.6	1078.1	970.9	916.4	855.4	877.1	932.1
		(1234.7 - 1291.5)	(1224.9 - 1720.6)	(1322.6 - 2156.5)	(1406.0 - 2761.0)	(1548.1 - 3570.1)	(1652.8 - 4427.8)	(1772.1 - 5944.1)	(1879.9 - 8130.8)
Holding of equity issued by non-euro area residents	91.7	298.7	284.6	298.9	301.5	292.5	317.3	316.9	335.1
		(284.5 - 310.4)	(192.2 - 402.0)	(167.9 - 480.9)	(152.3 - 658.4)	(144.6 - 890.9)	(111.5 - 949.4)	(98.8 - 1360.4)	(83.9 - 1999.4)
Remaining assets	1611.1	3737.6	3829.8	3936.4	3766	4732.3	3961.3	3555.9	4013.8
		(3473.3 - 3681.8)	(2911.0 - 4532.9)	(2855.1 - 5356.5)	(2781.3 - 6691.2)	(2715.0 - 7985.2)	(2540.0 - 9057.6)	(2476.2 - 11877.1)	(2336.1 - 15628.8)

Note: Euro billions, yearly averages. Red (blue) indicates figures below (above) the 2.5 (97.5)% quantile of the forecast distribution. 2.5% and 97.5% percentiles in parenthesis.

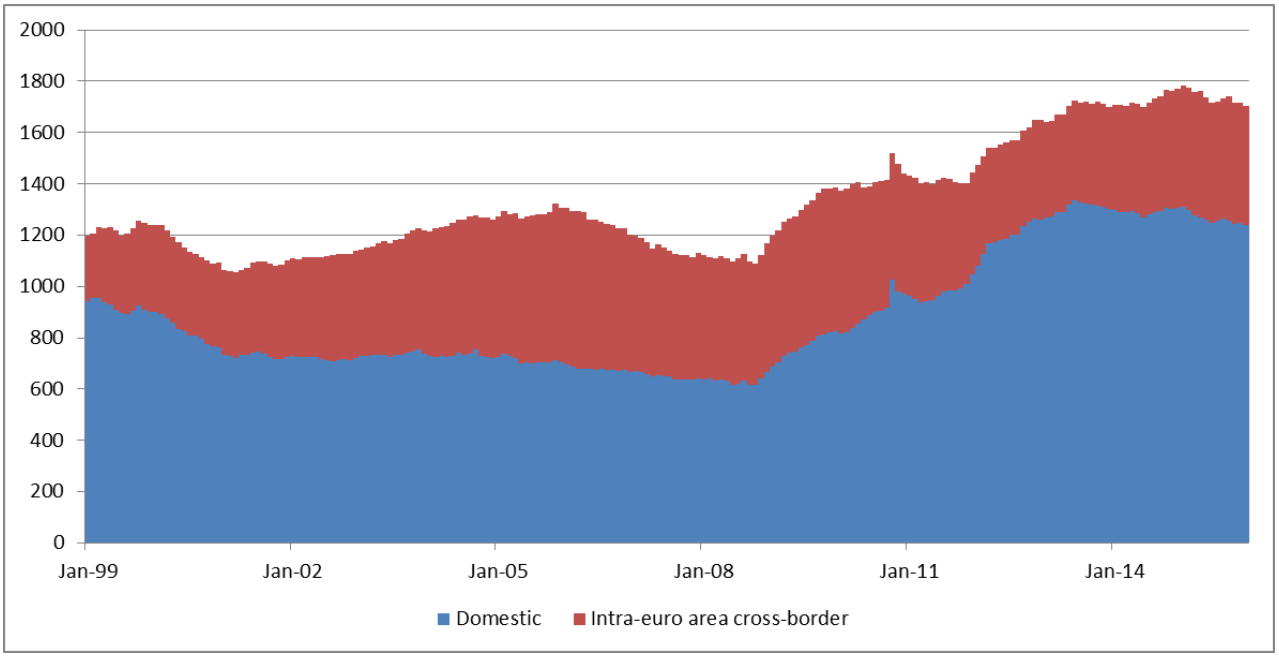
Figure 1: Intra-euro area inter-MFI loans



Source: ECB

Note: Euro billions; notional stocks.

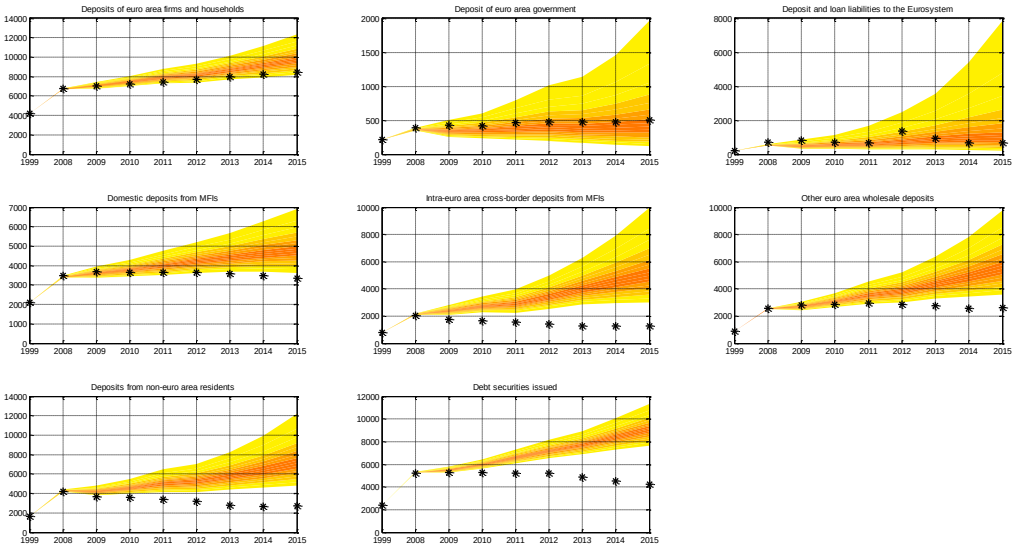
Figure 2: Holdings of euro area government debt securities



Source: ECB

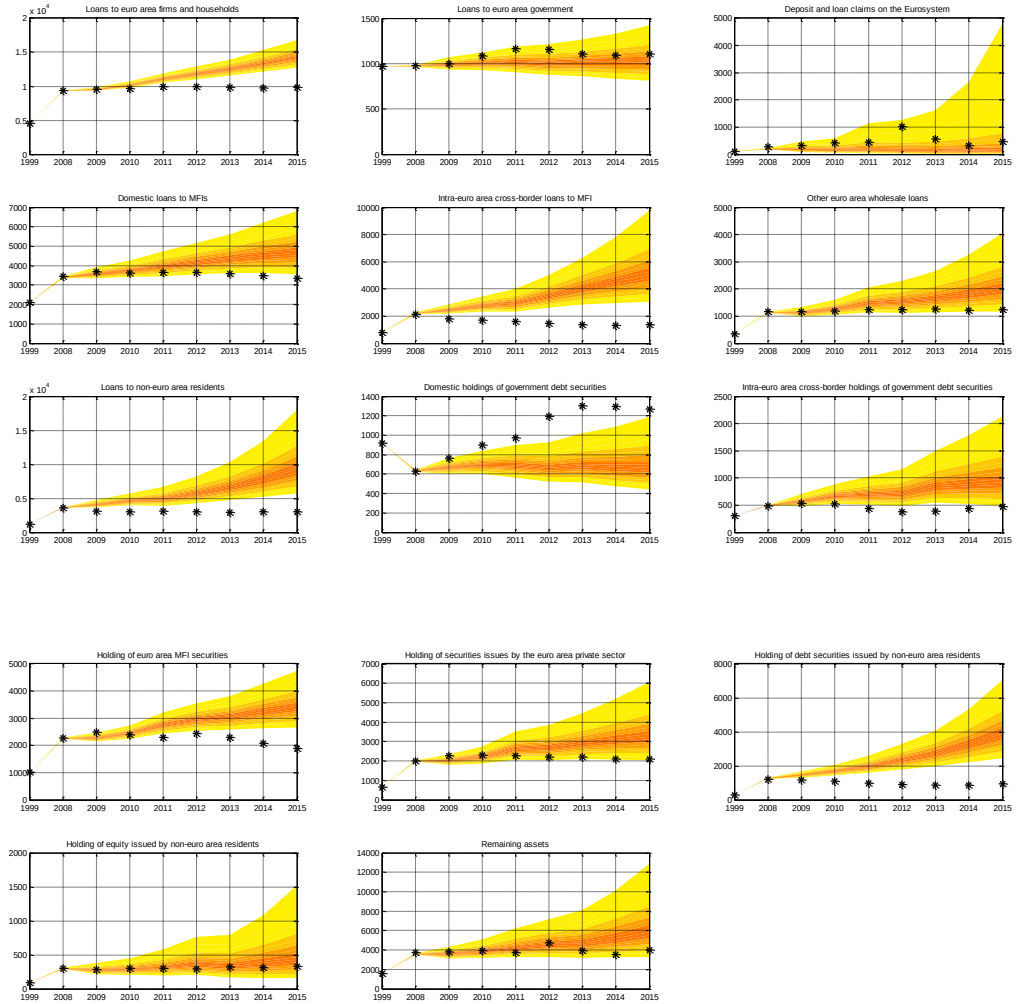
Note: Euro billions; notional stocks.

Figure 3: Observed evolution of bank liabilities relative to counterfactual



Note: Euro billions, yearly averages. The stars indicate the observed outcomes. The conditional forecast distribution (trimming the upper and lower 2.5% of the distribution) is represented in shades of orange.

Figure 4: Observed evolution of bank assets relative to counterfactual



Note: Euro billions, yearly averages. The stars indicate the observed outcomes. The conditional forecast distribution (trimming the upper and lower 2.5% of the distribution) is represented in shades of orange.