Symposium Article

Macroeconomic Implications of Financial Frictions in the Euro Zone

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A macroeconomic model that explicitly incorporates financial sector influences is estimated. A survey of lending standards in the Eurozone countries is informative about aggregate economic activity. I also ask whether policy rate shocks influence lending standards, and whether these standards also have an effect on monetary policy. Briefly, the paper finds that inclusion of indicators of financial frictions in standard macromodels is essentials. Some of the results also suggest that in 2011–2012, the European Central Bank made financial conditions worse by not only raising the policy rate but by implementing a very gradual reduction in monetary conditions over the next 2 years.
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INTRODUCTION

The news from Europe is scarcely getting better. The decision by the European Central Bank (ECB) in September 2014 to provide further support to stimulate lending in the Eurozone, following earlier such attempts by the ECB to ease the sovereign debt crisis, is further indication of the central bank's concern that real economic activity remains weak. Although, the unemployment rate in the Eurozone is down slightly from its peak at 12% reached in September 2013, it remains, as this is written, well-above levels experienced since the euro was introduced. Germany, the economic powerhouse of the Eurozone economy in recent years, is forecast to slow down to 1.3% in 2015, according to the

December 2014 Economist Poll of Forecasters down from earlier forecasts that were more optimistic. (http://www.economist.com/news/economic-and-financial-indicators/21635492-economist-poll-forecasters-december-averages) Real GDP growth in the other major Eurozone economies of France, Italy, and Spain is even lower with forecasts of below 1% through 2015. It is worth adding that real GDP growth forecasts in recent years have tended to be on the optimistic side. As growth forecasts are perilously close to negative territory, with little indication that policymakers will loosen fiscal policy in the foreseeable future, there is added burden on monetary policy to deliver the Eurozone from its low growth predicament.

The 'global financial crisis' (GFC) of 2008–2009 has reminded the profession about the connection between credit conditions, financial stability, and economic performance that were previously forgotten but have now become an integral part of central bank thinking in the past few years. As a result, policymakers are now more aware than ever of the importance of understanding the links between credit market conditions and real economic activity.

Until recently, the notion that there were frictions in the financial system that would hamper the monetary transmission mechanism was dismissed as unnecessary in empirical macromodels. Now, however, policymakers and academics are searching for ways to quantify the extent to which these frictions can impact aggregate economic outcomes. This has led to considerable research of late across the globe. One example the demonstrates the importance central banks attach to the role of the financial sectors in macroeconomic outcomes is ECB's Macro-prudential Research Network (MaRs; https://www.ecb.europa.eu/home/html/researcher_mars.en.html).

The purpose of this paper is to describe a simple model to investigate the macroeconomic implications of financial frictions in the Eurozone. In particular, I argue that a survey of lending standards in the Eurozone countries is informative about aggregate economic activity in the single currency area.

The difficulty, as will be explained below, is that the relevant data remain relatively scarce thereby rendering difficult the estimation of a more elaborate model specification incorporating credit frictions. Indeed, the availability of data is further limited since credit conditions for only a selection of Eurozone members are published.[1] There exists, however, an interim proxy to overcome the problem, at least until more ample data become available. Nevertheless, the proxy is no substitute for more credit standards data.

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[1] Indeed, data from only a very few so-called periphery countries are available making it impractical to perform a proper test of differences between the two groups of economies.

I am especially interested in the empirical significance and magnitude of two channels through which lending standards are linked to the real side of the economy and monetary policy. These are defined as the real and financial channels of monetary policy. Next, I ask whether policy rate shocks influence lending standards, and whether these standards also have an effect on monetary policy? If statistically significant macroeconomic effects are found, and are robust, then macro-models need to be augmented with an indicator to proxy financial frictions.

The paper begins with the observation that a crucial element at stake in the storm brewing in Europe since 2010 is the connection between credit availability and real economic conditions. The essence of the framework is the recognition that 'sentiment', as represented by how loan officers view the ease or tightness of overall credit conditions, represents a potentially important element in the transmission of shocks from the financial sector, notably the crucial bank lending channel, to the real economy.[2]

The rest of the paper proceeds as follows. First, I provide a brief literature review. I then go on to provide a description of the framework used to think about how the real and financial sectors of economies might be linked to each other and how lending standards data can be potentially informative. The framework recognizes a determinant of macroeconomic conditions, long known to economists, that credit availability and monetary policy are intertwined and that both can have significant effects on the real economy. Crucially, however, it is the views of lenders that determines how smoothly financial markets function and their views about whether lending standards are tighter or looser that have the potential to produce real economic effects.

Next, some suggestive evidence is presented. Briefly, the paper finds that inclusion of indicators of financial frictions in standard macromodels is essential. Some of the results also suggest that in 2011–2012, the ECB made financial conditions worse by not only raising the policy rate but by implementing a very gradual reduction in monetary conditions over the next 2 years. The paper concludes with a summary and possible policy implications.

BRIEF LITERATURE REVIEW

While credit availability is believed to affect the real economy (Blinder and Stiglitz, 1983), the dynamics are quite perplexing since asymmetric information can lead to rationing, potentially manifesting itself as a 'non-price' element

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[2] This is not to suggest that other elements are not present or potentially important. However, surveys of the kind used in the empirical work to follow are one of the few available reliable quantitative indicators of credit conditions.

of credit conditions (Stiglitz and Weiss, 1981). Credit conditions are also believed to be directly linked to financial stability (eg, see Taylor, 2012, and references therein).

The importance of non-price credit conditions for financial stability has long been deemed critical, as emphasized by Roosa (1951), Jaffee and Stiglitz (1990), as well as in the Stiglitz and Weiss (1981) credit rationing model. Fuerst (1994) further refines Roosa's availability doctrine by defining two distinct components, namely credit rationing, a common phenomenon in virtually all credit markets, and a role for monetary policy which can impact the supply of credit. Credit markets do not reach equilibrium solely on the basis of price. Moral hazard and adverse selection problems in the presence of imperfect information (Blanchard and Fischer, 1989) are the usual culprits. These problems lead credit markets to use a non-price element (eg, lending standards) to reach equilibrium.

Owens and Schreft (1991) suggest that the monetary policy authority, at least in the United States, takes the view that, as the cost of available funds increases, interest rates applied to bank loans lag changes in non-price lending standards. Therefore, information on banks' non-price lending standards helps explain the impact that monetary policy has on the banking sector. Bernanke and Blinder (1992) empirically demonstrate that a reduction in available funds cause banks to sell off securities in the short run. However, in the long run, securities are replenished resulting in a decrease in loans. Hence, it is important to understand the transmission mechanism between changes in available funds and loan availability.

Increasingly, central banks rely on surveys of lending conditions. For example, Murray (2012) highlights the informative role played by the Bank of Canada's Senior Officer Loan Survey in helping set the course of monetary policy. A comparable US survey, also called the Senior Loan Officers Survey, is closely watched by the Fed. In the euro zone, the Bank Lending Survey (BLS) not only asks about lending conditions according to the type of loan (eg, commercial, mortgage, household credit) but also deals with perceptions about the state of loan demand. The information from these surveys combined with several other macroeconomic variables can be used to examine, for example, how changes in lending standards, a proxy for sentiment among issuers of credit, interact with the rest of the economy.

There has been relatively little research on the influence of loan officers' views and how the lending standards they enforce might influence aggregate economic outcomes. De Bondt *et al.* (2010; also see references therein) use the Eurozone bank lending survey data to examine whether there is a connection with aggregate output. Spillover effects within the eurozone are effectively ignored as is the possibility of a two-way relationship between bank officers'

perceptions and macroeconomic outcomes. Moreover, their sample ends before the euro area financial crisis erupts (ie, 2009Q2). There are a few studies for the United States and Canada (eg, Lown *et al.*, 2000; Lown and Morgan, 2006; Siklos and Lavender, 2015) but such data have not been widely used because surveys have only recently been introduced in several countries (Japan is an exception).

Beyond contagion type effects there exists considerable interdependence between the advanced industrial economies and their financial systems (Forbes, 2012). The bottom line then is that the current macroeconomic challenges faced by the single currency area may well have potentially large, and negative, economic consequences for the global economy. Bernanke (2012a), shortly before he stepped down as Chair of the FOMC, noted the potential for a shock from Europe to further restrain US economic growth. Indeed, the Fed Chairman goes on to remark that the resulting ' … strains are most problematic for the Europeans, of course, but through global trade and financial linkages, the effects of the European situation on the US economy are significant as well.' (op.cit., p. 17) Approximately 3 months later, Bernanke (2012) repeated the Fed's concern over developments in Europe while allowing that the European Central Bank has taken some steps to ease the burden on sovereigns. 'A prominent risk at present – and a major source of financial headwinds over the past couple of years – is the fiscal and financial situation in Europe. This situation, of course, was not anticipated when the US recovery began in 2009.'

While the now famous declaration in 2012 by the ECB President, Mario Draghi, [3] that the program to notionally purchase sovereign Eurozone member state debt under specific conditions, known as the Outright Monetary Transactions policy,[4] calmed financial markets it did nothing to reinvigorate economic growth in the single currency area. By early 2015, the threat of deflation was added to the woes confronting the ECB and is the proximate cause for the September 2014 program of long-term refinancing operations, among other new initiatives announced by the central bank as well as a version of quantitative easing introduced in January 2015.

As Draghi (2014) points out '(R)estoring a functioning transmission mechanism, notably in bank lending, is instrumental … [it] reaches the final borrowers and thereby supports real incomes, …'. Loan officers are critical in this process if the ECB's policies are to succeed.

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[3] 'Within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough', Extract from remarks Draghi made in London, 26 July 2012. See http://www.ecb.europa.eu/press/key/date/2012/html/sp120726.en.html.

[4] This is the policy whereby the ECB undertakes to purchase, in secondary markets, the sovereign debt of Eurozone member states, provided they meet strict conditions. See the press release at http://www.ecb.europa.eu/press/pr/date/2012/html/pr120906_1.en.html.

A SIMPLE FRAMEWORK FOR EXPLORING REAL-FINANCIAL LINKS

By now it is well known that economists have been criticized for relying on models that fail to consider how shocks from the financial sector spillover into the real economy. Unfortunately, it is too soon to rely upon a 'synthesis' model, likely to be accepted by the vast majority of economists, to describe how these links actually function.

The cost of borrowing is not only reflected in the interest rate. There exist non-price elements in borrowing or lending costs (eg, transactions costs, monitoring costs). One expects a positive correlation between lending standards and interest rates, since banks are expected to tighten the non-price element of loans contracts when interest rates rise. However, the financial crisis in the United States especially has raised the possibility that standards need not keep pace with interest rates if supervision is poor or if other incentives exist to maintain lax standards. It is not surprising then that a growing number of central banks survey loan officers as a means of determining how monetary conditions might be reflected in the overall supply of credit.

As noted above the ECB is a relative newcomer in surveying lending conditions with publicly available data available only since 2003 (or 2009 in the case of some Eurozone members such as Cyprus and Slovenia). Nevertheless, as explained in the next section, what the ECB data lacks in one respect is made up through the scope of the survey and its attempt to identify demand from supply side considerations in determining credit standards. This is potentially important because the loan officer surveys in the United States or Canada do not explicitly make the distinction between these separate factors. As the ECB's attempts since 2012 have centered on easing credit conditions the ability to identify conditions that affect the availability of funds as opposed to funding needs by firms and households is important. Put differently, a tightening of credit standards can produce a fall in loans that may contribute to an economic slowdown. Alternatively, a reduction in loan demand may well-represent a response to an ongoing economic slowdown. Whether the problem is an economically significant one is, of course, an empirical question.

Of course, all surveys suffer from biases. Lown *et al.* (2000), however, argue that the Fed's survey is informative in spite of the potential biases. While central banks, such as the Fed and the Bank of Canada have explicitly stated that these surveys are useful in their policy rate deliberations (see Murray, 2012), the information collected is qualitative in nature, the samples of institutions covered can be small, and there may well be some reporting biases. Nevertheless, the balance of the evidence (eg, Lown *et al.*, 2000; Lown and Morgan, 2006) is that the surveys fairly reflect credit supply conditions. Evidence from the Eurozone also supports this interpretation. Equally important,

inclusion of loan office survey data in conventional macro models improves the forecasting performance of these models.[5] Finally, as we shall show below, there is a strong correlation between the information content of such surveys and economic growth forecasts.

Conventional macroeconomic models assume that the variables of interest are endogenous and temporally related in the following manner

$$\mathbf{y}_t = \mathbf{A}_0 + \mathbf{A}_1\mathbf{y}_{t-1} + \varepsilon_t \tag{1}$$

where $\mathbf{y}$ is a vector of variables that include the macroeconomic time series that summarize the key economic relations of interest to policymakers. Typically, the contents of the vector would consist of real GDP, the price level or inflation, commodity or oil prices, and the central bank's policy rate. Equation 1 also makes clear that the past history of each one of the variable in $\mathbf{y}$ affects all the other variables in the model, with a lag.

The drawback with the standard macro-model formulation is that, when the financial sector is believed to have macroeconomic consequences, Equation 1 will produce misleading inferences as it omits variables, such as the volume of loans and the loan officer survey indicator of tightness or ease in credit conditions that define credit conditions. If we add these omitted variables to the standard model we can rewrite Equation 1 as follows

$$\mathbf{y}_t^* = \mathbf{A}_0 + \mathbf{A}_1\mathbf{y}_{t-1} + \mathbf{A}_2\mathbf{z}_{t-1} + \varepsilon_t \tag{2}$$

where Equation 1 augmented by a separate set of variables, the vector $\mathbf{z}$, that are believed to represent credit conditions. Hence, $\mathbf{y}_t^* = [\mathbf{y}_t, \mathbf{z}_t]'$. Equation 2 is then the core model that captures the essence of real-financial links in the economy.

As pointed out above a peculiar constraint faced in estimating relationships such as (2) above in the Eurozone context is that the available span of data is rather short in duration while VAR type specifications can easily use up precious degrees of freedom. Solutions are, however, available. Suppose that we can take all the relevant time series and reduce them to two series that capture real and financial factors in the Eurozone. Under these conditions the dimension of VARs such (1) or (2) can be significantly reduced. This is accomplished by estimating the first two principal components of the vector $\mathbf{y}^*$, or one like it, and establishing that the resulting series actually mimic real and

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[5] A recent strand of the literature takes the position that the connection between lending practices and credit conditions should be investigated with bank level data. More disaggregated data are certainly useful to understand the myriad non-price factors that can impact credit conditions as well as the effects of micro-prudential standards on bank behavior. However, central banks set monetary policy on the basis of forward-looking views of aggregate economic outcomes. Also, the global financial crisis raised the profile of macro-prudential attempts to influence credit conditions. Understanding the impact of these types of policies require a macro perspective on the state of credit conditions.

financial conditions in the Eurozone. More formally, we can estimate the relationship between the factors in a VAR framework which yields

$$\Gamma_t^j = A(L)\,\Gamma_{t-1}^j + \eta_t^j \tag{3}$$

where $\boldsymbol{\Gamma}$ is the vector of real and financial factors for the Eurozone. Equation 3 is a dynamic factor VAR.

Of course, real and financial factors are unobservable while policy variables (eg, policy rates) are observable. In another variant we can instead estimate the following relationship

$$\begin{bmatrix} \Gamma_t \\ \mathbf{X}_t \end{bmatrix} = B(L) \begin{bmatrix} \Gamma_{t-1} \\ \mathbf{X}_t \end{bmatrix} + \zeta_t^j \tag{4}$$

where $\boldsymbol{\Gamma}_t^j = \{\phi_t^R, \phi_t^F\}$ are the real (R) and financial (F) factors, exclusive of observable policy variables, while $\mathbf{X}_t$ represent the observable policy variable for the Eurozone, namely the ECB's policy rate. Equation 4 is a factor augmented VAR (FAVAR) model.[6]

DATA AND STYLIZED FACTS

All data are quarterly for the sample 2000Q1 to 2014Q1, inclusive. Real GDP, prices, the volume of credit, the ECB's policy rate as well as other interest rates, were obtained from the ECB's Statistical Warehouse (http://sdw.ecb.europa.eu/). Some interest rate data (ie, the long-term interest rate and a short-term interest rate) were collected from the IMF's *International Financial Statistics* (August 2014 CD-ROM version). [7] The proxy for commodity prices is oil prices as measure by the per barrel price of West Texas Intermediate (WTI) crude oil.[8] This series is obtained from FRED II, the data base of the Federal Reserve Bank of St. Louis (http://research.stlouisfed.org/fred2/).[9] Real GDP growth forecasts also play an important role in the analysis. Monthly data, from Consensus Economics, were converted into the quarterly frequency via simple arithmetic averaging. Finally, since the sample being investigated is, arguably, a fairly turbulent one, I also consider an indicator of policy uncertainty based on the measure originally

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[6] In the foregoing expressions we exclude other exogenous variables. These can easily be added without jeopardizing the thrust of the discussion so far.

[7] The long-term interest rate in the euro zone economies less the Euribor (3 month euro interbank offer rate) is used to measure the term spread. The latter series are widely used short-term interest rate indicators for the euro zone.

[8] The ECB does publish commodity price series of various kinds for a shorter sample. The behavior of their series is not out of line with the WTI series.

[9] The US data referred to below is also from FRED II. See also Siklos and Lavender (2015) for additional details.

Table 1: Correlations: Loan surveys, demand, supply, and GDP growth forecasts

A. Pairwise correlations of lending standards with germany and within the eurozone

Economy	Demand	Supply
Austria	0.35*	0.61*
Spain	0.43*	0.46*
France	0.20	0.49*
Ireland	0.24	0.52*
Italy	0.39*	0.57*
Netherlands	0.28+	0.70*
Portugal	0.14	0.38*
Eurozone-wide[a]	0.68*	−0.26+

B. Correlations between real GDP growth forecasts and BLS Survey

Country	Demand	Supply
Germany	0.40*	−0.31*
Austria	0.62*	−0.46*
Spain	0.57*	−0.12
France	0.41*	−0.18
Ireland	0.47*	−0.18
Italy	0.57*	−0.27+
Netherlands	0.68*	−0.42*
Portugal	0.15	−0.31*

[a]correlation is between Eurozone-wide lending standards and real GDP growth forecasts (proxy for expected future economic conditions).
Notes: Simple correlation coefficient. Loan Survey, 3 months forward for enterprises, GDP growth forecast is the one year forecast for real GDP growth in the respective economies considered. * Means statistically significant at least at the 5% level of significance (+, 10% level).

developed for the United States by Baker *et al.* (2013). They have constructed a version for Europe (http://www.policyuncertainty.com/europe_monthly.html).

In what follows the frictions resulting from imperfect information are proxied by the standards for lending as viewed from the perspective of the bank lending survey conducted by the ECB in individual eurozone countries since 2003 (http://sdw.ecb.europa.eu/browse.do?node=9484577).

The euro area's the Bank Lending Survey (also see Berg *et al.*, 2005; De Bondt *et al.*, 2010) is comparable to the ones conducted in Canada and the United States but, arguably, more comprehensive. For example, over 80 institutions in the euro area have been surveyed since 2003. Initially, 40% of the euro area was covered by the survey. Given differences in banking structures and relative sizes, the distribution of the survey is not uniform and the individual euro zone member country data are weighted (see Berg *et al.*, 2005; Tables 1 and 2).

Respondents are asked to provide an answer to questions about lending standards and the availability of funds on a scale from 'tightened considerably' to

Table 2: Factor loadings for principal components analysis

A. Demand and supply loan standards

Country	Demand standards	Supply standards
Austria	0.72	0.62
Germany	0.46	0.90
Spain	0.90	0.84
France	0.56	0.91
Ireland	0.75	0.60
Italy	0.47	0.68
Netherlands	0.65	0.64
Portugal	0.34	0.74

B. Real and financial factors

Observable	Real factor	Financial factor
Real GDP growth	0.77	0.08
Inflation	0.28	0.46
Oil prices	0.37	−0.05
Policy rate	0.76	0.62
Real GDP growth forecasts	0.99	0.01
Volume of bank loans	0.15	0.75
Term spread	−0.46	−0.84
Policy uncertainty	−0.30	−0.49

Note: The top table shows the factor loadings for the first principal component for the demand and supply standards series, respectively. The series in the bottom table are used to extract the first 2 principal components. Figure 5 plots the resulting real and financial factors.

'eased considerably'. In addition to loans to enterprises the survey asks similar questions concerning loans to finance the purchase of housing and for the provision of household credit. While the series broadly parallel each other (results not shown), the evidence presented below relies on the survey that covers enterprises. The survey also asks about loan officers' expectations of lending conditions over the next 3 months. As this version of the question is forward looking and, therefore, more compatible with economic explanations of possible real-financial links, in what follows, I rely exclusively on this version of the survey.

There is an important limitation with this data. While data for the economically most important euro zone members are published those from key periphery members are not.[10] The ECB make available BLS data since

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[10] As loan officers must revise their views in real-time, an assessment of credit standards relying on real-time data may well provide a different interpretation of the role of non-price elements in lending than would be obtained if revised data are used. Again, as the ECB makes available vintages of data (http://sdw.ecb.europa.eu/browse.do?node=9484612) we could investigate the real time role of the bank lending surveys. Space limitations prevent further analysis along this line. See, however, Siklos and Lavender (2015) for an example relying on the United States and Canadian data.

2003 for only eight Eurozone economies. They are: Austria, Germany, Spain, France, Ireland, Italy, the Netherlands, and Portugal. Data for a few other economies (eg, Cyprus, Slovenia) are only available since 2009 or later and, hence, are too short to be useful for estimation purposes. As this study investigates the impact of credit conditions in the Eurozone the individual demand and supply indexes are separately aggregated by estimating the first principal component for the respective series.[11] Finally, the difference between Supply and Demand measures of the ease or tightness of credit standards and the availability of funds is used to proxy financial frictions in the Eurozone.

Although all of the estimates reported below are, generally speaking, the same when I rely on the shorter sample relying on BLS data, there is a strong correlation between the proposed financial frictions proxy and one year ahead forecasts of real GDP growth (see below). This allows me to report results for the full sample which is less affected by events since 2008, dominated by the GFC, soon followed by the 2010–2012 sovereign debt crisis in the Eurozone.

Bank loans in euros are deflated by the harmonized index of consumer prices (HICP) to obtain a real measure of the volume of credit. Growth rates are obtained by evaluating the log difference of the variables in question (eg, prices) and multiplying the result by 100. The BLS data, and the volume of credit, are assumed to capture credit conditions in the Eurozone.

Figure 1 illustrates some of the potential sources of differences between the United States and the Eurozone as far as credit conditions are concerned.[12] The volume of loans since 1999 is plotted in the top portion of the figure while the bottom portion displays the policy rates for the ECB and the US Federal Reserve. Whereas the volume of loans in the United States has recovered somewhat from the depths reached in the aftermath of the GFC loans in the Eurozone display a downward trend from the peak reached in 2008. This is briefly interrupted twice as the world economy began to emerge from the GFC in 2009 only to experience another shock as the 2010 Eurozone sovereign debt crisis took hold. The bottom portion of the Figure reveals that while the pattern of policy rate setting is comparable across both central banks the US Federal Reserve appears to have been more aggressive both in raising interest rates before the onset of the GFC and in lowering them relatively more quickly in reaching the zero lower bound by 2008 where they have remained unchanged ever since. In contrast, the ECB not only raised policy rates as the crisis in Europe erupted but did not reduce its policy rate to near zero until early 2015.

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[11] Although, the restriction of a single principal component is imposed separate estimation which asks how many principal components exists, using maximum likelihood estimation, yields the same answer.
[12] Siklos (2014) investigates the implications of these differences in greater detail.
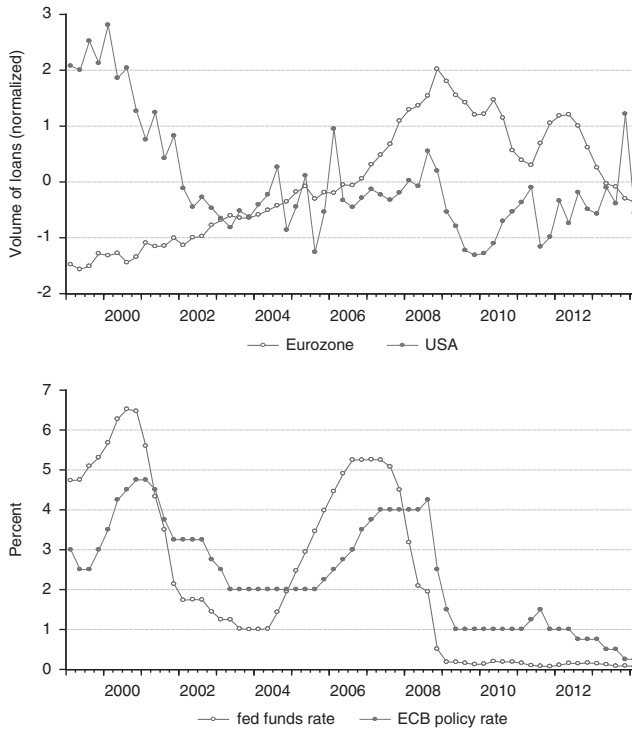
Figure 1: Volume of Loans and Central Bank Policy Rates: ECB and the US Fed.
Source: ECB Statistical Warehouse, FRED II. Loans deflated by HICP for the Eurozone, the PCE deflator for the United States. The ECB policy rate is the main rate of refinancing operations.

Figure 2 provides some illustrations from the ECB's BLS. Data from Germany, Cyprus, and Italy serve to motivate the usefulness of the demand and supply survey measures.[13] The plots reveal the extent to which credit demand and supply conditions are balanced in the three economies considered. It is clear that credit conditions experience persistent imbalances. In Germany's case demand conditions were perceived to be noticeably tighter than supply roughly from 2005 to 2007 and again during the Eurozone's sovereign debt crisis of 2010–2012. The extent to which credit frictions rise significantly is also apparent in Cyprus in 2012 and continue to date. Of course, Cyprus' case is notable not only for its debt crisis but thanks to the imposition of capital controls. It is visually apparent how supply conditions tighten sharply beginning in 2010 while demand for loans begin to soften around the

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[13] Cyprus only serves to illustrate the potential of the BLS to reveal underlying credit conditions. As the data are only available since 2009 they were not included in the econometric estimates reported below.
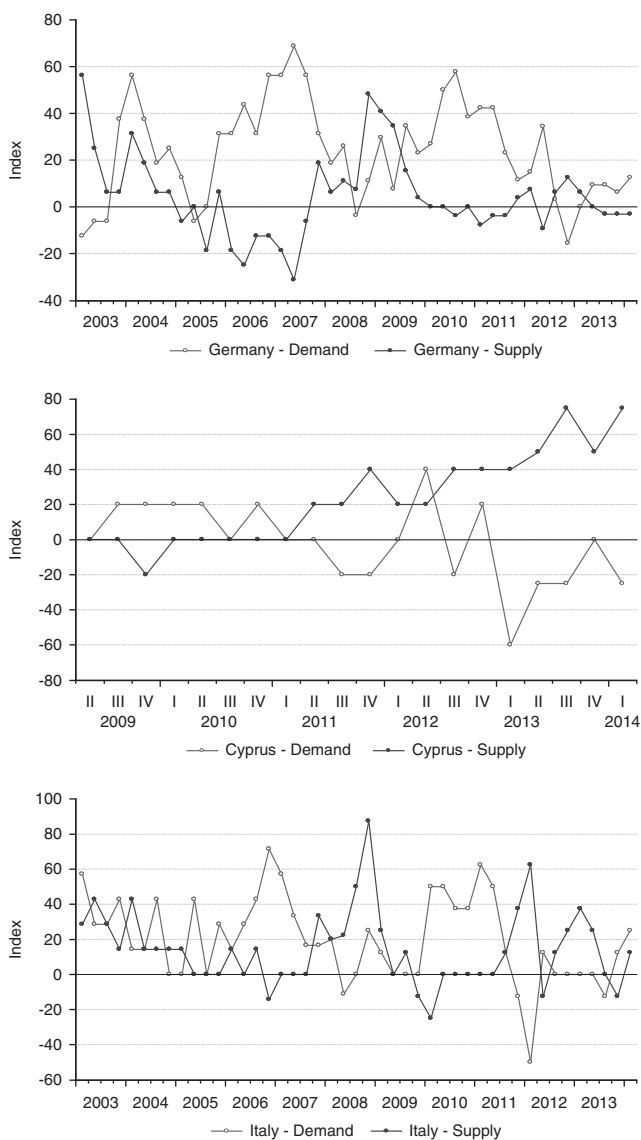
Figure 2: Illustrating Loan Standards Conditions in the Eurozone.
Source: ECB Statistical Warehouse, Bank Lending Survey. Demand refers to the survey's question about standards 3 months into the future for loan demand. Supply is the same indicator for loan supply conditions

same time. Finally, In Itay's case imbalances do not appear to persist and credit conditions do not appear to either tighten or loosen very much throughout much of the sample. This is perhaps a reflection of that country's low economic growth trap.

A few additional insights about the usefulness of BLS data are relegated to Table 1. The top portion of the Table provides some insights into the challenges faced in implementing a single monetary policy across diverse Eurozone members. The correlations indicate some fragmentation in loan demand conditions between Germany and the other Eurozone economies as perceived by senior loan officers. For example, tightness or ease of loan demand in Germany is uncorrelated with those in France, the Eurozone's second largest economy, as well as those of Ireland and Portugal. The latter is unsurprising given that both of these countries were directly implicated in the sovereign debt crisis. Elsewhere, the correlations are statistically significant but hardly very high. Turning to the correlations in supply conditions all the correlations shown are statistically significant. The results combine to suggest that there is a bigger mismatch on supply conditions than in demand conditions, and this reflects the fact that there are local factors as well as Eurozone-wide factors in explaining credit conditions. The bottom portion of Table 1 highlights the strong correlation between loan demand conditions and 1 year ahead forecasts of real GDP growth in the Eurozone, at least for the largest Eurozone economies. In contrast the correlations on the supply side are weak to insignificant. Both of these results combine to support the notion that real GDP growth forecasts can serve as a useful proxy of credit conditions paralleling those reported in the BLS. As there is better data availability for the forecast series the results reported below take advantage of this stylized fact.

ECONOMETRIC ESTIMATES

A principal components analysis is used to extract the common, or Eurozone-wide, feature of loan demand and supply conditions. The difference between the two serves then as the proxy for financial frictions which, alongside the volume of loans, defines credit frictions in the Eurozone. The top portion of Figure 3 depicts the results of this analysis. Financial frictions, shown in the bottom portion of Figure 3, are seen to be at their lowest in the years preceding the GFC, that is, in the dying days of the so-called Great Moderation. There is a sharp rise in frictions during the GFC which dwarfs that experience during the height of the Eurozone sovereign debt crisis. It is worth recalling that policy-makers in Europe at the time felt that the GFC would have few repercussions
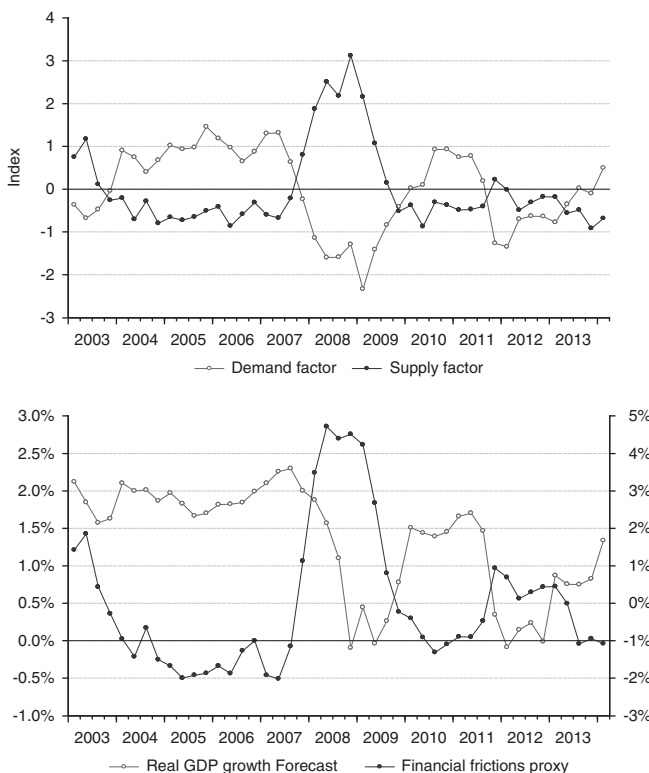
Figure 3: Proxy for Loan Standards Demand and Supply Conditions for the Eurozone.
Note: The top figure is the first principal component of the demand and supply indicators (also see Figure 2) based on data since 2003 from eight Eurozone economies (list provided in the text). The bottom figure is the proxy for financial frictions = Supply less Demand factor. Real GDP growth forecasts are one year ahead real GDP growth forecasts from Consensus Economics for the Eurozone.

on Europe.[14] Moreover, and in spite of the sovereign debt crisis, the ECB did intervene, albeit some felt belatedly, and this may partially explain the fact that financial frictions rose sharply in 2010–2012 but not to the same degree as in 2008–2009. It is also notable that frictions only begin to fall to levels reached in 2004–2006 after Mario Draghi, the ECB President, made his now famous announcement in 2012 referred to above.

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[14] It is not too difficult to find examples where policy makers in Europe underestimated the internal difficulties that would eventually erupt in 2010. For example, from a speech by Jürgen Stark in 2008 celebrating the first 10 years of the euro: 'In these demanding times, some widely-recognized core principles have helped the ECB to weather the storm. … The ECB has demonstrated its ability to act even under extraordinary circumstances – without compromising its price stability mandate. This has strengthened the ECB's credibility.' See http://www.ecb.europa.eu/press/key/date/2008/html/sp081114_1.en.html.
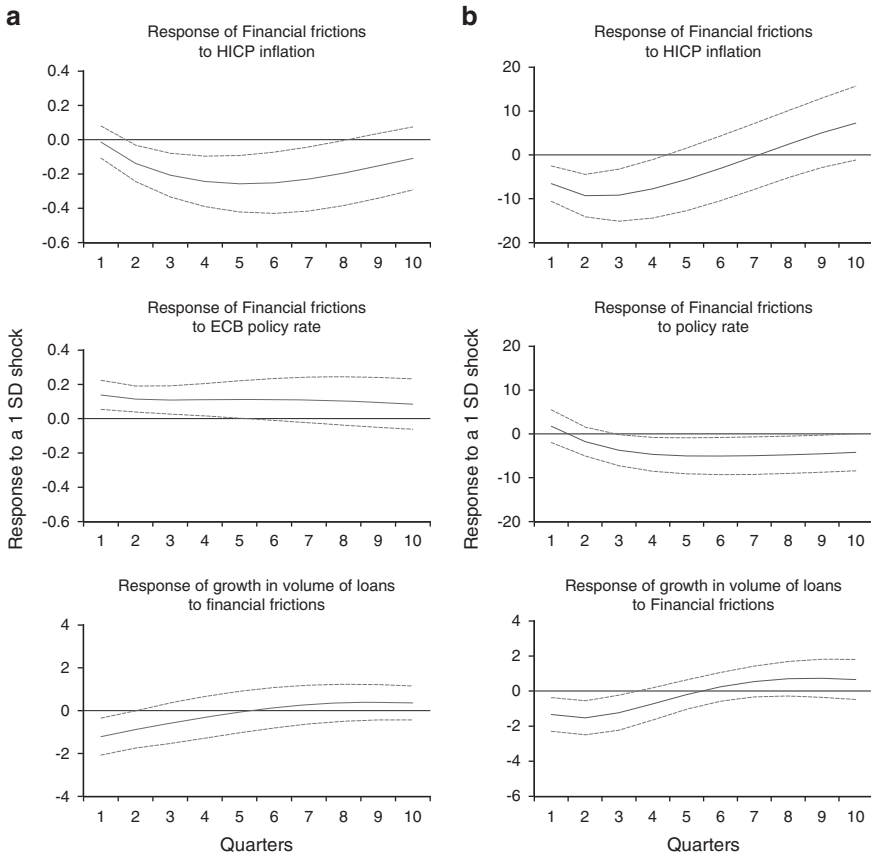
Figure 4: Impulse responses:.
(a) Real GDP Growth Response To a Selection Of Shocks
(b) Real Gdp Growth Response To A Selection of Shocks – counterfactual
Note: On the basis of Equation 2. The VAR is estimated with 1 lag. There are a total of 36 impulse responses (six variables) but only a selection is shown. Confidence bands are analytical.
Note: Same specification as in Figure 4(a) except that the frictions proxy for Ireland replaces the one constructed for the eurozone.

Figure 4 (a) shows a selection of impulse response functions linking inflation or financial frictions to the growth rate of real GDP in the Eurozone. The results are based on estimates of Equation 2 which augments the standard macro VAR with variables that proxy credit conditions.[15] The plots, and the confidence bands[16]

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[15] There are potentially 36 such impulse response functions since the estimated VAR contains six series.

[16] In VAR analysis these confidence bands are pseudo standard errors. The ones plotted are generated from an analytical expression for an approximation of a 95% confidence interval.

around the point estimates indicate how a shock, defined as a one percent (or one standard deviation) rise in either inflation or the proxy for financial frictions described above affects real GDP growth over a 10 quarter period. The top plot illustrates the negative connection between inflation and real GDP growth, reflecting both central bankers and academic views of the trade-off between these two variables. The bottom two plots show that a rise in the ECB's policy rate leads to a rise in financial frictions although the effect appears significant only over 4 quarters. The bottom plot reveals that a rise financial frictions equivalent here to a tightening of lending standards has a negative impact on real GDP growth in the Eurozone. Note, however, that the impact is short-lived since, after 2 quarters the impulse responses no longer appear to be significant. In any event, there is a clear empirical link between credit conditions and economic activity that conventional models (ie, such as Equation 1) would have missed. As I am unable to provide separate estimates for the core versus the periphery economies in the Eurozone a second best solution is to perform the following counterfactual experiment. Suppose that the frictions proxy for the entire Eurozone is replaced with one constructed for Ireland, a country severely impacted by the crisis. This experiment is not entirely satisfactory as the other variables in the model are assumed to remain unchanged. Nevertheless, the results shown in Figure 4(b) reveal that frictions would be far more sensitive to inflation under this scenario than under the one that relies for data from the entire Eurozone. It is conceivable then that a loosening of frictions, via higher inflation, would have a more beneficial impact on the financially hardest hit Eurozone economies. The remaining impulse responses are broadly similar to the ones shown in Figure 4(a) although a policy rate rise appears to modestly loosen frictions while frictions have a slightly longer lasting negative impact on lending when Irish standards are applied. The latter result illustrates the potential for frictions to severely curtail lending while the former result opens the possibility for traditional policy tightening to be decoupled, albeit briefly, from frictions.

One may well-wonder how resilient the foregoing results are to alternative models, especially since samples are short. As a result, I examine models where factors replace some of the observables in the relationships of interest. Table 2 and Figure 5 provide details of the extraction of real and financial factors from the data set. Table 2 provides the factor loadings based on the individual country estimates of lending standards. As the latent variable represents credit conditions the factor loadings essentially reveal the strength of the relationship between our Eurozone proxy and individual country conditions. In the case of both demand and supply factors the connection is fairly strong although the loadings are clearly higher on the supply side than on the demand side. However, since it is the supply side that can be problematic
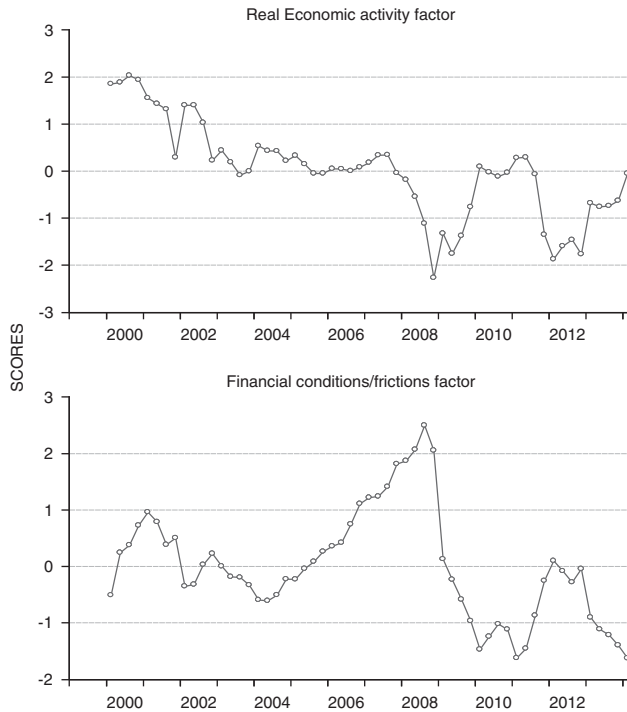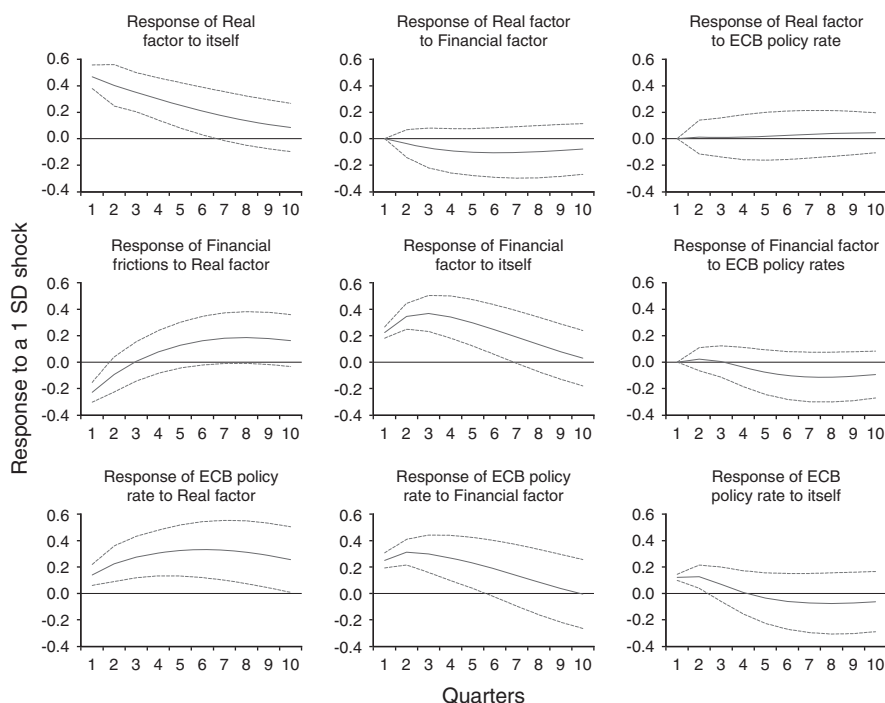
Figure 5: Real And Financial Factors In The Eurozone.
Note: The first two principal components for the series included in Equation 2 are estimated. See also Table 2 for the factor loadings.

for jump-starting growth in the Eurozone the results do suggest that the impact of constraints on the availability of credit because of the tightness of supply is widespread across the single currency area.

The bottom of the same Table asks which one of the observables contributes most to explaining our proxy for real and financial conditions in the Eurozone. It is immediately evident that some observables impact both the real and financial factors proxy shown in Figure 5. The ECB's policy rate, the volume of bank loans, the term spread, inflation and policy uncertainty all have a sizeable weight on determining financial conditions. Similarly, inflation, the policy rate, the term spread, policy uncertainty and, of course, real GDP growth are all critical determinants of real economic conditions in the Eurozone. Turning to Figure 5 the real factor captures quite clearly the double recession that impacted the Eurozone in 2008–2009 and again in 2011–2012. Similarly, we see from the bottom plot in Figure 5 that financial conditions were at their worst in 2008–2009 with another sharp rise in 2011–2012. The latter was not as pronounced as the one associated with the GFC. However, as

Figure 6: Impulse Responses: Real Gdp Growth Response To A Selection Of Shocks.
Note: Estimates based on the FAVAR, Equation 4. This is a VAR with the real and financial factors and the ECB policy rate as the observable variable.

noted above, the ECB did eventually act, on more than one occasion, to prevent further deteriorations in financial conditions.

Once the real and financial factors are obtained via principal components analysis we estimate the factor-augmented VAR, or FAVAR, represented by Equation 4. Figure 6 shows a selection of impulse response functions based on the FAVAR model. Figure 6 uses the observed ECB policy as the observable monetary policy variable.[17] There are several interesting findings from the impulse responses. First, there is some persistence in both factors and in the policy rate. This is to be expected as most macro factors are slow moving. Second, improvements in real economic conditions (ie, the real factor) results in an improvement of financial conditions.[18] Next, we see that neither real nor financial conditions respond to changes in the policy rate. This reflects the apparent deterioration in the usual channel of monetary policy that led the ECB, as did

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[17] When the observed policy rate is replace by the shadow rate the results (not shown) as virtually identical.
[18] Recall that a rise in the financial factor is equivalent to a deterioration in financial conditions.

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other central banks, to rely on unconventional means to influence the stance of monetary policy. Nevertheless, it is also the case that deteriorating financial conditions is positively associated with a rise in the ECB's policy rate. This suggests that monetary policy did not react appropriately to changing financial conditions. Whether this result reflects the criticism levelled at the ECB during 2011 when the policy rate was increased together with its gradual reduction until the zero lower bound is reached in mid-2014 (see Figure 1) is, of course, unclear. Nevertheless this is a plausible interpretation. Together, the above results make a strong case for an explicit recognition of financial conditions in a macroeconomic model.

CONCLUSIONS

By exploring how real and financial shocks from in the euro zone impacted real economic growth in the single currency area the present study highlights that models which fail to explicitly account for changing credit conditions miss an important channel through which aggregate economic conditions can change.

The present study offers some estimates of these effects. A small macroeconomic model for the eurozone that explicitly incorporates financial sector influences is estimated. Absent changes in the regulatory or general economic environment, together with present day limitations on the ability to offset shocks through fiscal or conventional monetary policy instruments, policy-makers can only hope to rely on more effective use of 'guidance' to manage expectations. Although some have argued that guidance is useful only in 'exceptional' times (eg, Carney, 2012) there is no reason, *a priori*, why should be the case. Whether times are normal or not, the central bank must explain itself. What it must avoid is to fall into the trap of sticking to an inflexible rule. Some of the results presented above suggest that it is possible that in 2011–2012 the ECB made financial conditions worse by not only raising the policy rate but thanks to a very gradual reduction in monetary conditions over the next 2 years.

Of course, the estimates shown above also face a number of challenges before they can be considered definitive. First, the sample considered is relatively short. Second, the preferred proxy for credit conditions, namely data from the ECB's Bank Lending Survey is not only available for a fairly short sample (a little over a decade for the core Eurozone economies) it is incomplete as there is no published data for several Eurozone member countries. Finally, even though a variety of specifications were considered the sample is simply too brief to reliably test for structural breaks or sub-sample estimation. These considerations must await future developments and research.

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