the review of income and wealth

Review of Income and Wealth
Series 58, Number 1, March 2012
DOI: 10.1111/j.1475-4991.2011.00472.x

BANK OUTPUT MEASUREMENT IN THE EURO AREA: A MODIFIED APPROACH

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Banks do not charge explicit fees for many of the services they provide, bundling the service payment with the offered interest rates. This output therefore has to be imputed using estimates of the opportunity cost of funds. We argue that rather than using the single short-term, low-risk interest rate as in current official statistics, reference rates should match the risk characteristics of loans and deposits. This would lower euro area imputed bank output by, on average, 28–54 percent compared with the current methodology, implying that euro area GDP (at current prices) is overstated by 0.11–0.18 percent. This adjustment also leads to more plausible shares in value added of income from fixed capital in the banking industry.

JEL Codes: E01, E44, O47

Keywords: bank output, FISIM, risk, loan interest rates, deposit interest rates

1. Introduction

Banks do not charge explicit fees for many of the services they provide.[1] Instead, the payment for the services is usually bundled with the interest rates charged on loans and paid on deposits. Any complete measure of bank output should take this into account by estimating what part of bank interest rates is a payment for services and what part is the cost of funds. This is often referred to as

Note: This research was supported by the European Commission, Research Directorate General as part of the 7th Framework Programme, Theme 8, "Socio-Economic Sciences and Humanities" and is part of the project "Indicators for evaluating international performance in service sectors" (INDICSER). The views expressed in this paper are solely those of the authors and do not necessarily reflect the opinion of the European Central Bank. The work has benefited from useful comments and suggestions by Henning Ahnert, Giacomo Carboni, Jean-Marc Israël, Steven Keuning, Christoffer Kok Sørensen, Reimund Mink, and Christina Wang. We would also like to thank three anonymous referees for many useful comments.

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[1]Where we talk about banks, we refer to the group of other Monetary Financial Institutions (MFIs), which mainly includes credit institutions and money market funds (MMFs); for more information, see Regulation ECB/2008/32. The bias from including MMFs is marginal; MMFs loans and deposits vis-à-vis non-MFI euro area residents were on average 0.03 percent of MFI loans and deposits for the period 2007–10.

the "user cost" methodology and is widely adopted by statistical agencies.[2] In this paper, we argue that the methodology that is currently used in the euro area (and in many other economies) is flawed because it does not take into account the risk characteristics of loans and deposits. We present new euro area estimates based on our proposed methodology and compare them with results based on the current methodology.[3]

The key point of contention in estimating bank output is identifying the opportunity cost of funds. In current European National Accounts methodology, the inter-bank rate is used as the cost of funds for all loans and deposits.[4] However, in recent theoretical work, Wang *et al.* (2009) show that profit-maximizing banks would not use such an interest rate as a measure of the opportunity costs of funds. Instead, they would use an interest that reflects the (systematic) risk associated with each loan or deposit, so taking into account the risk of default and any term premium.[5] Recently, the Wang *et al.* (2009) methodology has been applied for U.S. commercial banks in Basu *et al.* (2011). They find that current methodologies overestimate U.S. imputed bank output by 45 percent. The contribution of this paper is to apply the Wang *et al.* (2009) methodology to the euro area to establish whether or not the large overestimation is a common feature across countries.

It is important to have an accurate and appropriate measure for imputed bank output. First, it is part of bank output (in addition to fees and commissions) and insofar as banks serve households, government or foreign demand, imputed bank output contributes to overall GDP. Additionally, the interest margin is part of the price of bank output, so how this price is measured will affect overall producer and consumer prices. In this paper, we match bank interest rates with market interest rates with comparable risk characteristics and compare our new bank output estimates to those under the current methodology. Our findings imply that, on average, imputed bank output is overestimated by 28–54 percent and euro area GDP (at current prices) is overestimated by between €8.8bn and €14.7bn or 0.11–0.18 percent. The higher numbers are estimated using the same conceptual approach as Basu *et al.* (2011), so we conclude that euro area bank output is overestimated to the same degree as U.S. bank output.

Our proposed methodology would be a conceptual improvement, because it strengthens the internal consistency of the System of National Accounts (SNA). By excluding the compensation for risk-bearing from bank output, the financing mix of a firm (bonds versus bank loans) would no longer affect firm value added and bank output would no longer change if the bank decides to securitize and sell loans rather than keep those loans on the balance sheet. This represents a modest

[2]The user cost approach has its origin in the theoretical work of Diewert (1974) and Barnett (1978). Applications in an academic context are, amongst others, Fixler and Zieschang (1993) and Begg *et al.* (1996); an accessible discussion of the implementation in a statistical context is found in Fixler *et al.* (2003).

[3]This paper concentrates on estimates of output at current prices. For details on the methodology for FISIM volume measures, see Eurostat (2001), Basu and Wang (2006), and Inklaar and Wang (2011).

[4]This is consistent with the recommendations of the System of National Accounts; see *1993 SNA*, paragraph 6.128 (United Nations *et al.*, 1993).

[5]The arguments are based on financial intermediation theory, such as discussed in Bhattacharya and Thakor (1993), Allen and Santomero (2001), and Levine (2005).

adjustment to the SNA, but it is certainly not the only possible adjustment to improve consistency.[6] Households could be credited with risk-bearing output from holding bonds and equity and the output of insurance firms could be set equal to gross premiums, rather than premiums minus expected losses, to reflect risk-bearing output. This would require an expansion of the set of inputs recognized under SNA: not only labor, fixed capital, and intermediate inputs (i.e. the output of other industries) would provide income, but also financial capital. In turn, the value from risky activities, such as investing in new ventures, would shift from where it is created to where the income from it ends up. We do not argue that such an alternative system would be conceptually better or worse, merely that it would require a much more drastic adjustment to the current system than our proposed adaptation to the measurement of bank output.

The rest of the paper is organized as follows. Section 2 describes the current methodology for estimating bank output in European statistics; Section 3 deals with our proposed methodology, presenting both its conceptual framework and the empirical set-up. The estimates from the new methodology are presented in Section 4 for the euro area[7] as a whole and compared to imputed bank output derived according to the current European methodology.[8] Finally, we offer some concluding remarks.

2. Imputed Bank Output: Current Methodology

Imputed bank output is commonly referred to as Financial Intermediation Services Indirectly Measured (FISIM) in official statistics. FISIM are the financial services that other MFIs and Other Financial Intermediaries (excluding insurance corporations and pension funds, OFIs) provide to their customers but which are not directly invoiced. For depositors, these services generally include the management of the accounts, the provision of accounts statements, and fund transfers between accounts. Banks may charge explicit fees for deposit accounts, but in addition, the interest rate received on these accounts is typically lower than what customers could have obtained by lending their money directly on the market. For borrowers, these financial services include the screening and monitoring of their creditworthiness, financial advice, the smoothing over time of repayments, and the recording of the repayments for accounting purposes. They are paid by an increase of the interest rates charged by banks.

In contrast, there is no intermediation service for debt securities: to the extent that a bank was involved in issuing or placing these securities, they will have received an upfront fee and to the extent that they bought these in the secondary market, they have not provided services.

[6]For a more general discussion on different approaches to accounting for the output of bank services in National Accounts, see Diewert *et al.* (2011).

[7]All estimates in the paper refer to the moving composition of the euro area, i.e. data prior to January 2007 do not include Slovenia and similarly, data prior to January 2008 do not include Cyprus and Malta.

[8]The FISIM estimates presented in this paper are not based on national official statistics but have been derived by the ECB simulating this methodology.

FISIM is valued on the basis of the difference between the actual rates of interest payable on deposits and receivable on loans vis-à-vis other sectors (including the rest of the world) and a "reference" rate of interest. For loans, it is measured as the difference between the effective interest rate charged on loans and the amount that would be paid if a reference rate were used. For deposits it is measured by the difference between the interest they would receive if a reference rate were used and the effective interest they actually receive.

In turn, the reference rate is defined as the average interest rate at which FISIM-producer sectors lend money to each other.[9] In particular, the *1995 ESA* (European Council, 1996) distinguishes between an internal reference rate, to be used for transactions among residents, and an external reference rate, to be used for the business between residents and the rest of the world, with the possibility of compiling different external reference rates according to currencies of denomination and counterpart areas.

The current approach has various shortcomings. The method does not appropriately capture the differences between the various types of loans and deposits: for instance, whereas the inter-bank business is mainly short term with low default risk premium, deposits and loans from/to other sectors may have completely different maturity structures with sometimes high default risk. Within the current methodological framework, compensation for term premium and default risk is treated as a productive service, while recent economic theories argue against this.

3. The New Methodology

3.1. *The Conceptual Framework*

A measure of bank output cannot be estimated without a description of the financial services that customers buy. This is also the starting point of the model developed in Wang *et al*. (2009) and this section is based on their arguments. It goes too far in an empirical paper like this to provide a full exposition of their general equilibrium model, so this section will focus on the main arguments and empirical implications of their model. The key conclusion of Wang *et al*. (2009) and the earlier Wang (2003) studies is that the value of bank services output depends on the interest charged and the corresponding, risk-adjusted opportunity costs of funds. To impute the cost of funds on any such risky financial instrument, one should use the rate of return on (debt) securities subject to the same risk, but without any services attached. Total income net of the pure costs of funds then measures the true value of bank services implicitly charged for. This conclusion is summarized in Figure 1, which shows graphically how we impute the value of bank services related to loans (Y^A) and deposits (Y^D) using data on the interest rate paid on deposits (r^D), the interest rate charged on loans (r^A), and market interest rates on risk-free securities (r^F) and risky securities (r^M).

[9]The reference rate is computed as a weighted average of money market rates that reflects the currency and maturity composition of the financial intermediaries' lending market. The positions vis-à-vis the central banks are excluded from this computation. It also follows that when comparing reference rates for different reference areas, the average inter-bank rates may differ due to the currency and maturity composition of the market. As financial intermediaries include banks and OFIs, the reference rate may also diverge from the average inter-bank rate depending on the relative size of OFIs.

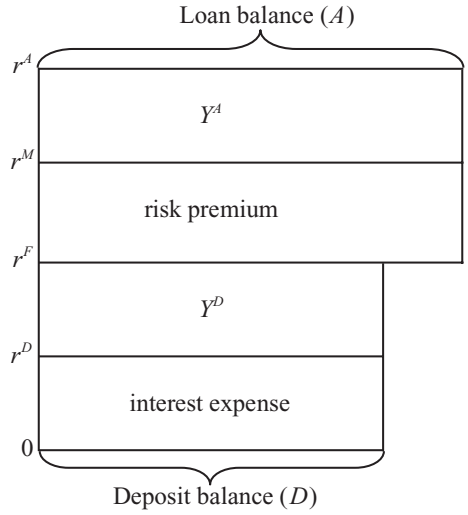

Figure 1. Decomposition of a Bank's Interest Flows (simplified version)

Notes:
r^A: (Average) interest rate received on loans.
r^M: Expected rate of return required on market securities with the same (systematic) risk characteristics as the loans.
r^F: Risk-free rate.
r^D: (Average) interest rate paid on deposits.
Y^A: Nominal output of bank services to borrowers.
Y^D: Nominal output of bank services to depositors.
For a more detailed decomposition, see Wang (2003).

As implied by the figure, the output associated with loans is calculated as:

$$Y^A = \left(r^A - r^M\right) A, \tag{1}$$

and the output associated with deposits as:

$$Y^D = \left(r^F - r^D\right) D. \tag{2}$$

The output related to loans, Y^A, is associated with information services, such as screening the creditworthiness of new borrowers and monitoring their behavior over the duration of the loan. The output related to deposits, Y^D, is related to the transaction services a bank provides to depositors: ready access to funds through ATMs, easy payment through credit and debit cards, and electronic fund transfers. Here we follow the financial intermediation literature, such as discussed in Bhattacharya and Thakor (1993) and Allen and Santomero (2001), and summarized in Levine (2005), on the functions that banks provide.

In imputing the output related to deposits, we argue that households could choose an alternative investment, rather than putting money in a deposit account. Since most deposit accounts are insured, they are (close to) default risk free, though they are still exposed to term risk. So when a depositor accepts a lower

return than the default risk-free rate, he must be receiving transaction services with the same value in return. Although a truly default risk-free investment alternative may not be available in practice, an AAA-rated government bond would come closest.[10] Likewise, a borrower would be willing to pay a higher interest rate on a loan than he would have to pay to investors in the financial markets only if the borrower receives information services of the same value from the bank. Especially smaller firms would not usually have the option to borrow directly from investors, but even for those firms, banks would take into account the systematic risk associated with lending to such a firm in determining the opportunity costs of its funds.

Figure 1 illustrates the difference between the current methodology and our proposed methodology. The current methodology imputes bank services related to loans using r^F, so bank output includes the risk premium, while we argue that it should be excluded. To give the main intuition for this argument, consider a firm that can choose to borrow from a bank or can issue a bond. This firm would need to pay r^M to its bondholders or r^A to the bank. Under the accounting approach in the SNA, any interest paid would count as a transfer of income, while a service payment would be considered a purchase of intermediate services. Value added of the borrowing firm will thus depend on how much of r^A is considered an interest payment and how much a service payment. Under the current methodology, if the firm borrows from a bank only r^F is considered an interest payment while if the firm issues a bond, the interest payment is r^M. We propose a symmetric treatment of bank and bond borrowing: in both situations the firm is credited with the same interest payment of r^M.

Our proposed methodology would also make bank output invariant to whether the bank chooses to keep a loan on its balance sheet or whether it securitizes and sells it to other investors. In both cases, the bank determines the creditworthiness of the borrower and ensures the borrower pays the interest. In other words, the banks provide the same services.[11] The investors that buy the securitized loan would require a rate of return of r^M, leaving Y^A as the fee for originating and servicing the loan. Under the current methodology, a bank that securitized all its loans would have an output of Y^A while if the same bank kept all loans on its balance sheet, it would have an output of Y^A plus the risk premium. Since there is no difference in the financial services the bank provides to its customers, the borrowers, we would argue there should be no difference in the value of its output.

Of course, this is not the only internally consistent accounting system; see more in Diewert *et al*. (2011) on accounting for financial services within the framework of National Accounts. One could alternatively decide to classify risk bearing as a productive service, but this would require farther-reaching adjustments to the SNA than what we propose here. For instance, bondholders should then also be credited with output equal to the risk premium. Likewise, the output of an insurance firm should no longer be equal to gross premiums minus expected losses, but

[10]Moreover, since the government treasury is usually the ultimate guarantor of deposit insurance schemes, the default risk on deposit accounts would be related to the default risk on government bonds.

[11]This assumption may not hold in general, but finds support in Benmelech *et al*. (2011).

equal to gross premiums instead since it is also bearing risk. Moreover, since this risk-bearing output is not "produced" using labor, intermediate inputs, or fixed capital, a different class of inputs, perhaps "financial capital", should be distinguished.[12] In our view, such a system of national accounts would not be better or worse, but merely very different from the system we have now. We therefore propose a comparatively modest change to the current accounting rules to improve its internal consistency.

3.2. *The Empirical Set-Up*

Figure 1 illustrates the type of data we need to implement both the current and proposed methodology, namely bank interest rates, market interest rates, and loan and deposit balances. For the bank interest rates, we make use of the MFI interest rate (MIR) statistics.[13] These statistics provide a harmonized and comprehensive coverage of the interest rates charged by euro area banks to households and non-financial corporations on euro-denominated loans and deposits on a monthly basis since 2003. These data are available at the national and euro area level, and distinguish between the interest rate on new business, i.e. newly negotiated interest rates during the period, and average rates on outstanding amounts. Detailed breakdowns are provided by both maturity and type of deposit, while for loans the data are broken down by maturity/period of rate fixation and, in the case of households, by purpose of the loan, i.e. consumer credit, loans for house purchases and other credit.

The first proposed improvement is to take into account the maturity structure of loans and deposits using the government bond yield curve[14] and, for short maturities, money market rates; in this paper we use the euro area government bond yield curve derived by Thomson Reuters Datastream based on AAA government bonds issued in the euro area. In the absence of detailed information on the average maturity/period of rate fixation for each category of loans and deposits for households and non-financial corporations, the reference rates have been selected based on the estimation of a pass-through equation in an error-correction framework. The market rate that provides the best-fitting model is used as reference rate.[15]

Bank loan rates are also higher because of default risk. Data on the yield on bonds, specifically indices of non-financial corporate bonds and of covered bonds

[12]To see why, consider what traditional inputs it would take to start bearing risk on corporate bonds: the purchase of the bond, i.e. the provision of financial capital, itself is enough to start bearing risk.

[13]The requirements for MIR statistics are laid down in Regulation ECB/2009/7. In particular, the reporting scheme defined in the Regulation applies only to other MFIs, thus excluding central banks and MMFs. For further information, see http://www.ecb.europa.eu/stats/money/interest/interest/html/index.en.html.

[14]The government bond yields are based on (notional) zero-coupon bonds, so the duration of these bonds is equal to its maturity. Most bank loans will have regular interest payments, so the duration of those loans will be smaller than their maturity. For most maturities, this distortion is likely to be small. Assuming annual interest payments of a 5 percent interest rate, the duration will be on average 10 percent of a year shorter than the maturity for the maturity bracket of one to five years.

[15]Appendix 2 discusses this approach and shows the estimation results.

are used to take this into account.[16] The indices we use are compiled by Merrill Lynch, which provides information on the average yield of the bonds after adjusting for option-like features of these bonds. For those indices Merrill Lynch also provides the average residual maturity of the underlying bonds, allowing us to take into account the difference in maturity structure of the bond indices compared to the loan categories; see Section 3.2.2 for more details.

For the other sectors, as well as for cross-border positions, some working assumptions are applied due to missing basic data; in Section 3.2.3 we will argue that this approach is likely to lead to more sound estimates compared to the current framework.

We estimate interest margins using bank interest rates and reference rates. We consider two sets of margins, namely one set where the reference rates account for the term risk of the corresponding bank interest rates (see Table A1 in Appendix 1) and one set where the reference rates account for both term and default risk (see Table A2 in Appendix 1). To estimate FISIM, we follow a two-step procedure. First, we calculate a weighted average margin for each instrument across different maturities/periods of rate fixation. The weight on each maturity/period of rate fixation category is given by the amount of new loans and deposits, since information about total outstanding amounts does not follow the same categories (see Section 3.2.1). The margin for each instrument is then multiplied with outstanding loans and deposits from the ECB data on MFI balance sheets to calculate bank output.[17] For a given loan instrument, this can be summarized as:

$$Y^A = A\sum_i s_i^N \left(r_i^A - r_i^M\right) \tag{3}$$

where $s_i^N = A_i^N \Big/ \sum_i A_i^N$ is the share of maturity/period of rate fixation category i in total new loans of that instrument and A is the total amount of loans outstanding of that instrument.

In our analysis, we abstract from differences in tax treatment of interest earnings and in accounting rules. This is because we are primarily interested in comparing FISIM including and excluding compensation for risk bearing. Tax laws and accounting rules would affect FISIM, but we have no reason to believe they would affect the difference between the FISIM measures.

3.2.1. Bank Interest Rates for Households and Non-Financial Corporations

As indicated above, an important question is whether to use the "new business" (NB) or "outstanding amounts" (OA) bank interest rates. The estimated

[16]Another way of indirectly performing the correction would be to use data on loan provisions which may be collected for financial stability purposes by national authorities; in practice this approach may lead to incomparable results due to the lack of harmonization of statistics on loan provisions across countries and this would not allow for identification of *systematic* risk.

[17]This approach could overestimate bank output as some of the services on loans are provided only at the time of agreeing on or renegotiating the terms. This bias should be small for non-financial corporations as most of these loans have initial rate fixation below one year, but could be more problematic for households. Still, this approach looks more sound than relying on new business volumes only, thus neglecting those services that are provided over the life span of deposits and loans.

margin should be relevant for the entire portfolio of bank loans, arguing for OA rates. A drawback of this approach is that the correct reference rate is difficult to define as many loans have interest rates that were agreed some years before. Ideally, the reference rate should then be a weighted average of past bond yields, where the weights reflect the share of loans from each period in the past that are still on banks' balance sheets. However, such weights are unavailable.

In addition, current definitions of NB and OA interest rates are not homogeneous for different maturities. NB rates are categorized according to the initial period of rate fixation while OA rates are categorized according to the original time to maturity of the loan.[18] Hence, for instance, if a loan has an original maturity of seven years, but rates are renegotiated annually, it would be more appropriate to compare the interest rate on this loan to the yield on a bond with a time to maturity of one year rather seven years. Given these considerations, we will rely on the NB rates to calculate the interest margins. This differs from the current methodology, which uses OA rates.[19]

3.2.2. Reference Rates for Loans to Non-Financial Corporations and Households

The proposed method requires data on the current market yield of different types of debt securities with a broad coverage of the euro area market. Therefore, bond indices are preferred over individual bonds. By using bond indices, we assume that the *systematic* risk associated with this group of bonds is representative for the corresponding bank loans. Bank loans may default at a higher rate than bonds and individual loans may have considerable idiosyncratic risk, but the Wang *et al.* (2009) theory implies that the opportunity cost of funds covers only systematic risk.

Merrill Lynch publishes a range of bond indices[20] for non-financial corporations broken down by rating category or broken down by maturity band. We choose the bond index broken down by maturity band as it allows us to identify the term risk reasonably well, by comparing the yield on this index to the yield on government bonds with comparable maturity. This does imply that we assume that the systematic default risk on bonds in this index, with average rating between BBB and A, is representative for bank loans to non-financial corporations.

Figure 2 compares the interest rate on new business loans to non-financial corporations with a period of rate fixation between one and five years with the corresponding corporate bond yield and government bond yield. As expected, the loan rate is higher than the (adjusted) corporate bond yield, which in turn is higher than the government bond yield. Corporate bond yields did exceed loan rates

[18]For a detailed discussion of the MIR statistics, see ECB (2003).

[19]In this paper we do not take into consideration interest rate statistics on bank overdrafts that are available in the context of MIR statistics. Before June 2010 this category was indistinguishable from revolving loans (including those obtained through a line of credit) and credit card debt. The difficulty of matching the resulting interest rates with reference rates reflecting maturity and risk characteristics of these instruments leads us to leave them out of the scope of the paper.

[20]See www.mlindex.ml.com for these data as well as the bond index rules and definitions. Merrill Lynch does not produce country-specific bond indices as most national debt markets within the euro area are not deep enough for the derivation of reliable and meaningful bond indices.

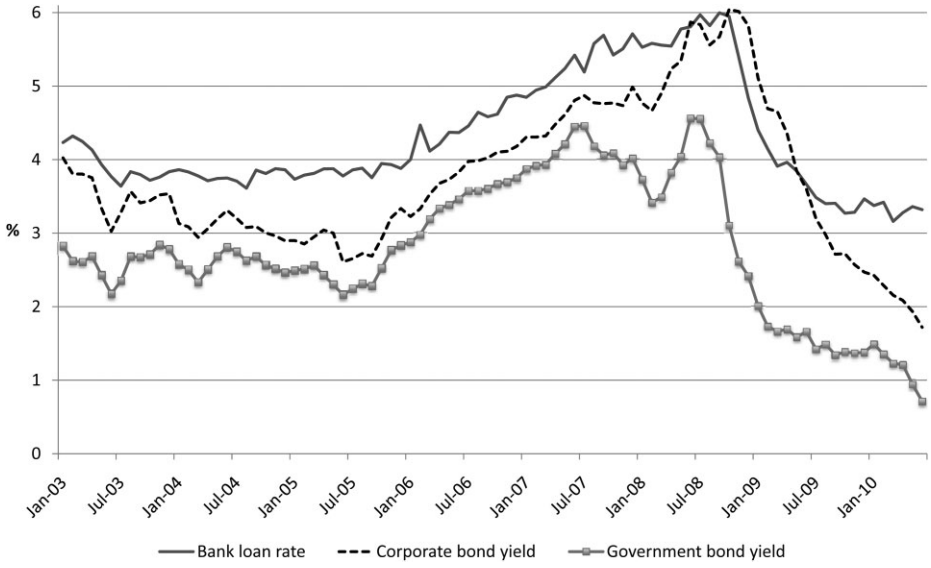

Figure 2. Interest Rate on Non-Financial Corporations Loans Compared to Corporate and Government Bonds (%), January 2003–June 2010

Notes: All series for the euro area. Bank loan rate refers to loans to non-financial corporations with an initial rate fixation between 1 and 5 years. Government bond yield is the 2-year constant maturity bond yield. Corporate bond yield is the spread of the Merrill-Lynch bond index for non-financial corporation bonds with a remaining maturity between 1 and 5 years over the 3-year constant maturity government bond yield, plus the (2-year constant maturity) government bond yield. See Tables A1 and A2 for further details.

Source: ECB (MIR interest rates), Thomson Reuters Datastream (Government bonds), Merrill Lynch (Corporate bonds).

during the depth of the financial crisis from late 2008 through early 2009. As the more complete analysis below will demonstrate, negative spreads occur in other instances as well and we will discuss possible reasons for negative margins in theory and in practice. More broadly, the difference between the corporate bond yield and the government bond yield widened considerably over the period, from, on average, 0.55 percent before the financial crisis that started in mid-2007 to 1.55 percent since then.

This illustrates the unappealing choice for statisticians in troubled financial times: one could either rely on government bond yields and see a sharp widening of interest margins or use corporate bond yields and see a contracting interest margin. Using government bonds probably overstates margins by more in the recent period: why would loans that used to require a service margin of about 1.2 percentage points before the financial crisis suddenly require up to 2.0 percentage points? On the other hand, a negative margin is likewise problematic. One explanation for the observed pattern in the later months of the sample is that banks are compensating their negative margins from 2008–09 with larger positive margins since mid-2009.

For loans to households, it is more challenging to identify reference rates since households do not generally raise funds directly from financial markets. The most

comparable securities are mortgage-backed securities (MBS) and covered bonds. For both types of securities, the interest payments by households are passed on to the buyers of the securities, with a servicing fee for the originating bank. The difference is that loans that are part of MBS are taken off bank balance sheets while covered bonds remain on bank balance sheets as investors still have recourse to the bank in case of losses. In both cases though, the yield on these securities represents a market rate of return on the underlying mortgages and indeed, this yield has been broadly similar for most of the period. The yield on covered bonds was somewhat lower, presumably because investors have greater recourse to the originating bank in case of defaulting borrowers.

In choosing between the MBS index and the covered bond index, the comparative size of the market is an important factor, since a larger market is more likely to be a representative benchmark for banks in determining the opportunity costs of funds. Based on this criterion, we use the covered bond index since this is based on around 750 underlying bonds, while the MBS index covers only around 30 bonds.[21] Moreover the yield developments of the MBS index after September 2008 suggest serious liquidity problems specific to those securities, since these developments are not mirrored in the covered bonds index. As the Merrill Lynch covered bond index has an average residual maturity of around four years, the spread over the four-year government bond index for each fixation period band is applied for the matching.

Figure 3 shows the interest rate on household loans for housing purposes with a period of rate fixation between one and five years compared to the covered bond index and the government bond yield with the same maturity. The interest margin for this type of loans varies more than the corporate margins as the inertia of bank interest rates seems greater. On the other hand, the interest margin stays positive throughout the period, with the exception of June and July 2008.

3.2.3. The Treatment of Other Sectors

Loans and deposits of non-financial corporations and households represent about 80 percent of outstanding loans and deposits involving the non-financial sector. Loans and deposits of other domestic sectors, i.e. the government and insurance companies and pension funds, represent another 11 percent while loans and deposits from the rest of the world make up the remaining 9 percent.[22] Little is known about these loans and deposits except their overall size; especially data on corresponding interest rates are not available. This means the methodology we apply for non-financial corporations and households cannot be followed for these other sectors.

[21]By comparison, the corporate bond index is based on about 700 bonds. Similar indices for the U.S. cover around 3000 corporate bonds and 1500 RMBS or collateralized mortgage obligations (CMOs).

[22]These shares are based on the average balance sheet composition over the period from January 2003 to June 2010. Loans and deposits of financial institutions are omitted, as under the current FISIM regulation, a sector can be either an FISIM producer or user, not both. As the focus of this analysis is on different margin estimates, we stay comparable in the coverage of sectors.

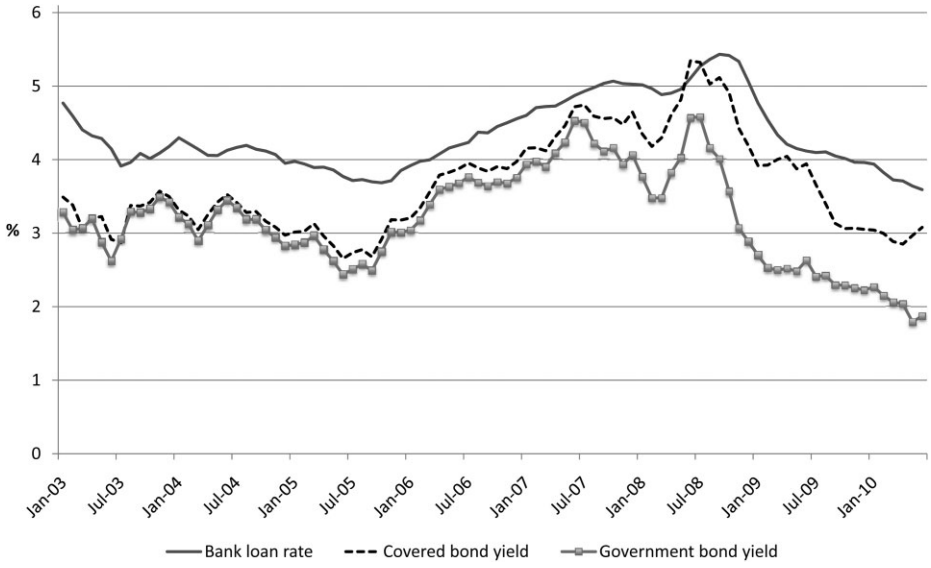

Figure 3. Interest Rate on Housing Loans Compared to Covered Bonds and Government Bonds (%), January 2003–June 2010

Notes: All series for the euro area. Bank loan rate refers to loans to households for house purchases with an initial rate fixation between 1 and 5 years. Covered bond yield is the yield on the Merrill-Lynch bond index for covered bonds (average residual maturity of 4 years). Government bond yield is the 4-year constant maturity bond yield.

Source: ECB (MIR interest rates), Thomson Reuters Datastream (Government bonds), Merrill Lynch (covered bonds).

In the case of other domestic sectors, we assume that the interest margins are the same as for non-financial corporations. This differs from the current approach, where the margin is calculated as the differences between (assumed) sectoral interest rates on loans and deposits and the common reference rate.[23] Here we assume constant margins, thus allowing the (implicit) reference rates to be different. Our approach is justifiable on various grounds. First, loans and deposits to non-financial corporations likely involve similar financial services as those to the government[24] and insurance companies and pension funds. Second, in many countries, banks' business with these sectors (mainly insurance corporations) has a very long maturity and negative margins may result in the framework of the current FISIM methodology. Third, given the lack of data on interest rates and flows for these sectors, the current FISIM method seems to involve a higher degree of estimation than the alternative proposed.

[23]For the purpose of simulating FISIM results under the current methodology, interest rates on loans to the general government and insurance corporations and pension funds are estimated using financial market data, while the corresponding interest rates on deposits are assumed to be the same as for NFCs.

[24]For the government sector this may not be the case as transactions are likely to be automated and involve high volumes, thus implying small service components. On the other hand, this sector makes up a small share of deposits and loans, implying a small impact on the final estimates.

When deriving euro area estimates for residents in the rest of the world, we assume that they buy, and pay for, the same services as euro area residents. This may be not fully correct as, for example, screening costs incurred by banks may be higher for non-resident borrowers. Still, this assumption seems more plausible than using, for example, foreign margins (if those were available) as, presumably, foreign customers buy financial services from euro area banks rather than their own banks only if their cost appears reasonable to them. As no breakdown by sector is available in MFI balance sheet statistics for positions vis-à-vis (private, non-bank) residents of the rest of the world, we use a weighted average of euro area margins based on the sectoral composition of cross-border balances of loans and deposits within the euro area.

Using the margins on services provided to residents for services to non-residents (i.e. exports) is an approach that also differs from current methods. Currently, an external reference rate is compared to market interest rates on cross-border positions within the euro area and for the rest of the world.[25] In view of the lack of reliable and detailed sectoral data on interest rates and margins for the positions with extra euro area residents, the proposed method has the advantage of conceptual clarity and is more appealing from our point of view since it focuses on the services provided, rather than trying to estimate the service margin as a residual based on two sets of statistics, possibly involving a high degree of estimation, that are neither complete nor consistent.

4. FISIM Calculations

4.1. *Interest Margins*

This section discusses the interest margins estimated in our framework. For loans, the interest margin is calculated as the excess interest rate a borrower has to pay compared to the market rate to compensate the bank for the information services provided (equation (1)). For deposits, it is the opposite: how much less a depositor is willing to accept than the market rate in return for the transaction services the bank provides (equation (2)).

Table 1 shows the average interest margin on different loans and deposits for the euro area.[26] Our analysis uses monthly data from January 2003 to June 2010, thus covering 90 months. We compare three sets of interest margins. The first set is calculated by simulating the current approach where implicit interest margins are obtained by comparing MIR rates on outstanding amounts to the internal reference rate, based on (short-term) inter-bank rates. The second set takes into account that for longer-term financial assets a term premium is paid, so the

[25]In our simulation of the current FISIM official methodology, the external reference rate and cross-border interest rates are based on estimated interest flows which are derived from inter-bank rates (EURIBOR, LIBOR) for the inter-bank component, from MIR rates for the intra-euro area positions vis-à-vis non-banks, and from balance of payment statistics for the positions vis-à-vis extra euro area non-bank residents.

[26]There are no MIR statistics on deposits redeemable at notice placed by non-financial corporations. We assume non-financial corporations receive the same interest rate as households on these deposits.

TABLE 1

EURO AREA INTEREST MARGINS ON LOANS AND DEPOSITS USING DIFFERENT REFERENCE RATES (WEIGHTED AVERAGE ACROSS MATURITIES, JANUARY 2003–JUNE 2010)

	Average (%)			Standard Deviation (%)			Number of Negatives		
	I	II	III	I	II	III	I	II	III
Loans									
Loans to non-financial corporations	1.83	1.09	0.29	0.45	0.27	0.42	0	0	12
Loans for house purchases	2.02	0.96	0.63	0.84	0.30	0.33	0	0	3
Consumer credit	3.92	4.18	3.71	0.77	0.61	0.49	0	0	0
Other household loans	3.92	1.62	1.30	0.77	0.36	0.34	0	0	0
Non-financial corporation deposits									
Overnight	1.58	1.20		0.47	0.71		0	12	
With agreed maturity	–0.20	0.05		0.34	0.18		62	18	
Redeemable at notice	0.20	0.11		0.42	0.68		27	49	
Household deposits									
Overnight	1.94	1.56		0.73	0.96		0	12	
With agreed maturity	–0.23	–0.05		0.72	0.56		57	25	
Redeemable at notice	0.56	0.48		0.65	0.94		18	21	
Non-financial corporation and household deposits									
Repurchase agreements	0.21	0.00		0.23	0.13		9	27	

Notes: Interest margins are calculated as the difference between the relevant interest rate minus a reference rate.

Reference rates:

I Current methodology: euro area internal reference rate, based on inter-bank rates.

II Adjusted for term premium: government bonds used as reference rates.

III Adjusted for term and default risk premium: in addition to II, an adjustment is made for the higher risk of bank loans using bond index yield spreads.

Interest rates:

I: interest rates on outstanding amounts.

II and III: interest rates on new business.

Interest margins shown are weighted averages of the margins derived for the different maturities and periods of initial interest rate fixation. The weights used reflect the outstanding amounts (case I) or the volumes of new business (cases II and III).

See Tables A1 and A2 in Appendix 1 for further details.

reference rates are based on government bond yields with comparable maturity. For loans, we also calculate a third set, where the reference rates are based on corporate and covered bonds, taking into account the systematic default risk as well. A weighted average margin is calculated across loans and deposits with different maturity periods, using the shares in new business volumes as weights. For each set of margins, we compare the average over the period, the standard deviation, and the number of negative margins.

In the case of loans, accounting for the term premium and default risk decreases margins. Note that when comparing column I to columns II and III, the reference rates change to reflect the risk of the loans but also the interest rates change from those on outstanding amounts to interest rates on new business. In general, the changes in methodology have the largest effect on loans, where margins decrease by up to 2.4 percentage points. In addition, the variability of the margins decreases as variations in the yield curve and default risk are taken out of the interest margins. Despite the large reductions in average margins, the margins

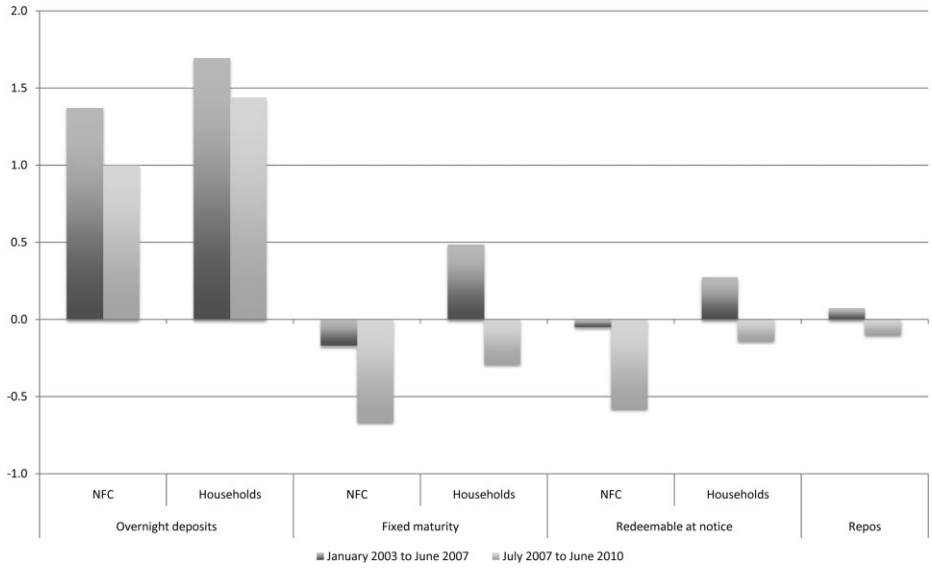

Figure 4. Euro Area Interest Margins on Deposits by Instrument, 2003–07 vs. 2007–10

Notes: NFC: non-financial corporations. Repos: repurchase agreements. Interest margins shown are weighted averages of the margins derived for the different maturities and periods of initial interest rate fixation. The weights used reflect volumes of new business.

on loans remain positive in (almost) all months, with the financial crisis as the main exception.

The adjustment to the average margins is smaller for deposits as most deposits are short-term. The effect on variability is also less uniform. Interest margins are negative in many months, under both the current approach and our suggested alternative. Margins for the sizeable deposit categories (overnight and with agreed maturity) are less prone to being negative. Also, as Figure 4 shows, the negative margins are more pronounced in the period since the financial crisis compared with the 2003–07 period.

There are both conceptual and practical reasons that may explain negative interest margins. First, banks may accept small or even negative margins if a borrower or depositor brings in income from deposits or fees for other services. The analogy with a supermarket is useful here: they often price visible brand-name products at or below cost to draw in customers, who then spend on other goods. Second, long-term business relationships may also play a role: in times of rising market interest rates, banks may choose not to raise their loan interest rates in return for more favorable margins in periods of lower market rates. There may be some support for this in the data as many of the loan interest rates are less volatile than the corresponding reference rates. This is in general indicative of imperfect pass-through of market interest rates to retail bank interest rates. Our finding of more negative interest margins for deposits than for loans is also consistent with the pass-through literature, where deposit rates are generally found to be more

inelastic.[27] An additional reason for the negative deposit margins is balance sheet constraints: especially since 2007, banks face more difficulties in attracting funds in equity or public debt markets. Paying higher rates on deposit accounts would then be an attractive source of funding, even if they pay more than a risk-free rate. Indeed, the negative margins are particularly prominent in longer-term deposits, which make better substitutes for market-based financing.

A more practical reason for some of the negative margins may be shortcomings in the available data, such as mismatches between interest rates and bond indices in terms of maturities and risk profiles. For example, the negative values shown in Figures 2 and 3 occur when the reference rates show sharp increases that are not matched in the interest rate data. Similarly, for deposits with an agreed maturity of more than two years we have selected five-year government bonds as the reference rate for households. However, in Germany deposits are on offer with much longer maturities so that a ten-year government bond might have been a more representative security. In some countries bank loans to highly creditworthy firms may also be more prevalent, making a corporate bond index with a higher credit rating a better choice. Another reason for the observed negative margins may be sampling error in the MIR survey. The evidence for this is somewhat circumstantial, but the interest rates of relatively uncommon loans and deposits tend to be more volatile. In short, negative margins for certain instruments and years do not invalidate the basic approach. Negative margins for long periods of time, though, can imply that a different security is needed to reflect country-specific circumstances.

In Figure 5, we show how the average loan margin varies by band of initial fixation periods for the different types of loans for the euro area, calculated using reference rates that account for both the term premium and default risk, i.e. case III in Table 1. In general, margins are lower on loans with a longer period of initial rate fixation. The main exception is consumer credit with a fixed interest rate for more than five years. The pattern is clearer for housing loans, where the margin on loans with a fixation period of less than a year is 0.94 percent while loans with a fixation period of more than ten years have a margin of only 0.21 percent.

One possible reason for this pattern is that the screening of new borrowers is an important part of the financial services provided to borrowers. As this screening process only takes place before the loan is agreed upon, the associated costs are spread over the life of the loan. Alternatively, it could reflect higher administration costs for loans with variable interest rates. This is likely to be a factor for loans to non-financial corporations: only 12 percent of new loans have a fixed rate for more

[27]See, for instance, Hannan and Berger (1991), Berger and Udell (1992), Elsas and Krahnen (1998), Berlin and Mester (1999), Boot (2000), Mojon (2001), De Bondt (2005), and De Graeve *et al*. (2007). Besides relationship banking, other factors can contribute to the sluggishness of bank interest rate pass-through. For example, customer-switching costs for retail bank products can make demand inelastic to price changes (Calem *et al*., 2006). In addition, when banks set their interest rates they take into account the fixed costs of adjusting their retail rates and they may opt for no adjustments especially when changes in policy rates are perceived as temporary or are minor (see, e.g. Hannan and Berger, 1991; Hofmann and Mizen, 2004). Banks also tend to react differently depending on whether policy rates are moving up or down (i.e. the so-called asymmetric pass-though; see, e.g. Mester and Saunders, 1995; Sander and Kleimeier, 2004; Gropp *et al*., 2007). Furthermore, a higher degree of competition is expected to have a positive impact on the speed and degree of the pass-through (Sander and Kleimeier, 2004; Van Leuvensteijn *et al*., 2008).

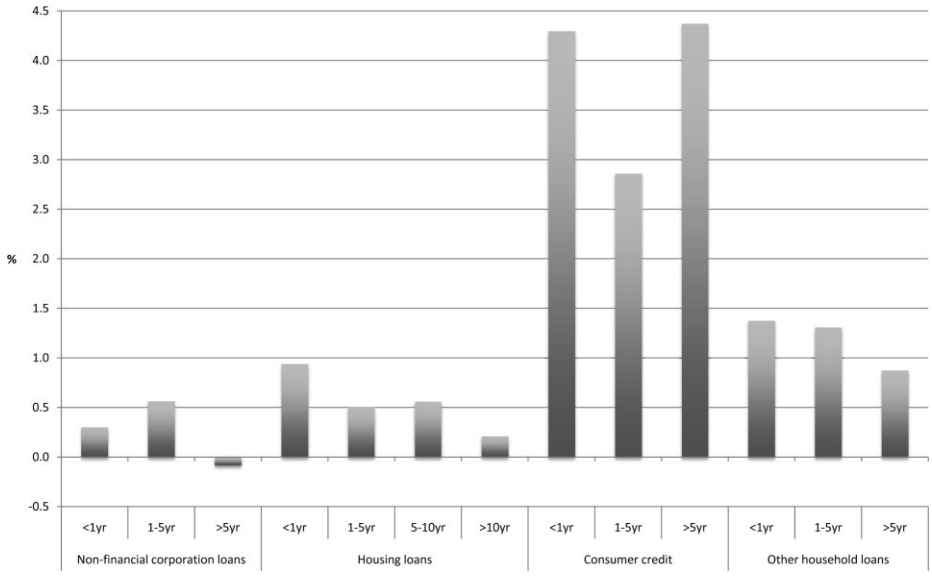

Figure 5. Euro Area Interest Margins on Loans by Instrument and Period of Initial Rate Fixation, Average January 2003–June 2010

than one year, but 70 percent on the outstanding loans have an (original) maturity of more than one year. This implies that most loans to non-financial corporations have (fairly) flexible rates and a long maturity. Another explanation could be that only low-risk borrowers receive a fixed rate for longer periods of time, while our reference rates assume the same default risk across maturities. This would imply that our default risk adjustment is overdone for loans with long-term fixed rates.

When comparing margins on the different financial instruments, a few observations stand out. First, the estimated margins for consumer credit and, to some extent, other household loans are very high compared to the other instruments, regardless of the approach taken. This could reflect high information and processing costs, but could also indicate that a more effective method to account for the higher risk associated with these loans should be developed. The frequent absence of collateral for such loans can be used to argue both ways: the lack of collateral makes the loan riskier but might also induce more screening and monitoring activities by banks. Without further information on the risk of bank portfolios, it is hard to make a more definitive assessment but our approach seems to (at least) improve the current methodology.

The margins on loans to non-financial corporations are noticeably lower than those on loans to households; only the margins on loans for housing purposes are close. An explanation could be that amounts lent to households are generally smaller so that banks provide more services per euro lent and need to charge a higher relative price to cover their fixed costs. Also, the risk associated with corporate loans may be easier to gauge than that of loans to households. This would be the case if non-financial corporations tended to have standardized financial reports compared to less standardized or less detailed financial information

provided by households. Non-financial corporations (in particular large ones) may also be better informed and have more bargaining power than households. In addition, large corporate loans are often collateralized. Loans to non-financial corporations with a fixation period of more than five years even show negative average margins, mostly driven by the financial crisis period, but these loans account for only about 6 percent of total loans to non-financial corporations.

4.2. *FISIM Results for the Euro Area*

With a complete set of interest margins, the implications for imputed bank output (FISIM) can be shown. The interest margins discussed in the previous section are applied to outstanding amounts of loans and deposits, following equations (1) and (2). Since we only have margins for households and non-financial corporations, we apply the margins estimated for non-financial corporations to loans and deposits of insurance corporations and pension funds and general government. For an estimate of exported financial services, we use a weighted average of the relevant domestic margins, using the share in intra-euro-area cross-border positions.

The top panel of Table 2 shows three estimates of FISIM by sector: (I) following the current FISIM methodology; (II) when the term premium is removed from the interest margins; and (III) when the default risk premium for

TABLE 2

Imputed Bank Output (FISIM) and Interest Margins in the Euro Area by Sector, Current Regulation and Modified Approaches (average 2003Q1–2010Q2)

	I Current Methodology	**II** Adjusted for Term Premium	**III** Adjusted for Term and Default Risk Premium
FISIM (€bln)			
Total	235.7	170.6	108.2
Non-financial corporations	81.0	51.2	19.0
Households	147.5	94.5	78.4
Insurance companies & pension funds	–2.5	1.8	1.2
Government	9.9	11.5	4.3
Exports	–0.2	11.6	5.3
Interest margin (%)			
Total	1.3	1.0	0.6
Non-financial corporations	1.6	1.0	0.4
Households	1.7	1.1	0.9
Insurance companies & pension funds	–0.4	0.3	0.2
Government	0.9	0.9	0.4
Exports	0.0	0.7	0.3

Notes: FISIM is calculated as the interest margin of each type of loan and deposit times the outstanding balance. The interest margins in the bottom panel are weighted averages of loan and deposit margins. Current regulation FISIM uses interest rates on outstanding amounts and reference rates, which mainly represent weighted averages of inter-bank interest rates. The two alternatives use interest rates on new business. When adjusting for the term premium, the government bond yield with the most closely matching maturity is used as reference rate. When also adjusting for the default risk premium, yields on corporate and covered bonds are used. See Tables A1 and A2 in Appendix 1 for details.

loans is also removed. This mirrors the three sets of interest margins from Table 1. The bottom panel shows the weighted average interest margin for each sector, based on the underlying margins for deposits and loans.

The differences are substantial. Both alternatives show lower FISIM than the current approach: average annual bank output is €170.6bn after adjusting for the term premium and €108.2bn after adjusting for the default risk premium as well. This implies that bank output is between 28 and 54 percent lower than under the current methodology. This implies an overestimation of, on average, €14.7bn or 0.18 percent of euro area GDP at current prices, if both default and term risk are removed from FISIM.[28] If only term risk is removed, euro area GDP is overestimated by €8.8bn or 0.11 percent.

While the current methodology implies an average interest margin of 1.3 percent, this falls to 1 and 0.6 percent under the two alternatives. The impact differs across sectors, with the largest drop in the margin for non-financial corporations and a more moderate adjustment in the household sector. As Table 1 showed, for nearly all types of loans and deposits the margins paid by corporations are lower than for households, even when a short-term interest rate is used. Any downward adjustment will therefore represent a relatively larger part of the margin.

Non-financial corporations and households are the main contributors to total FISIM and are derived on the basis of reliable sets of statistics. The proposed alternatives for the other sectors are based on assuming constant margins and as a result, there is no negative average FISIM for any of the sectors under either of the two alternative approaches, unlike the current estimates of FISIM that show frequent and steady negative results.

Figure 6 provides a summary overview of euro area FISIM over time. The bottom two areas show depositor and borrower services, calculated using interest margins from which both the term premium and default risk have been eliminated. The top two areas show the compensation for bearing default and term risk, both of which are included in current-practice FISIM. The term risk compensation follows the yield curve: widening between 2003 and 2006, narrowing in 2007 and 2008, before expanding sharply in 2009. Depositor services follow the reverse pattern, with negative FISIM since 2009Q1. As discussed earlier, these negative margins can be understood from the literature on relationship banking or that banks may find that subsidizing deposits is a cheaper source of funds than equity or bond markets. The default risk compensation was fairly stable through 2007, before dramatically widening. In 2009Q1 and Q2, this even led to negative borrower services, which have since been partly compensated by much higher borrower services.

4.3. *Plausibility of the Results*

One of the consequences of lowering bank output is a lower operating surplus: since labor costs and intermediate inputs are given,[29] any reduction in bank output

[28]This assumes FISIM from consumer and other household loans, household deposits, government loans and deposits, and exported loans and deposits are deliveries to final demand. The remainder of FISIM is assumed to be intermediate consumption.

[29]An exception is intermediate purchases of bank output by banks. In what follows, we adjust for this.

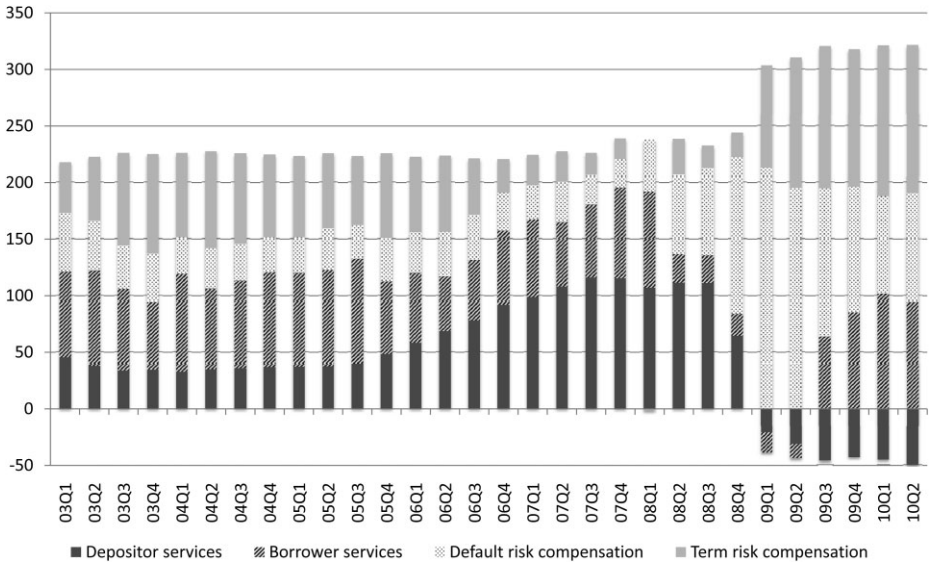

Figure 6. Euro Area Imputed Bank Output (FISIM) and the Value Of Default and Term Risk Premia (annualized data, billions of euros), 2003Q1–2010Q2

TABLE 3

Share of Capital Income in Value Added in the Market Economy, Retail Trade, and Banking, Average 2003–08 (%)

	Euro Area	United States
Market economy	32	42
Retail trade	13	40
Banking		
I Current methodology	41	59
II Adjusted for term premium	29	53
III Adjusted for term and default risk premium	13	41

Source: Market economy, retail trade and production structure of banking: EU KLEMS, supplemented with OECD STAN, National Accounts through Eurostat and Supply-Use tables through Eurostat. Information on fee and commission income for banking: ECB Statistics on Consolidated Banking Data, supplemented by OECD Banking Statistics before 2007/2008. United States is from Basu *et al.* (2011) and refers to 2003–07. Market economy for the United States refers to the private economy.

translates to a smaller income for the owners of fixed capital. Table 3 therefore compares the share of capital income in value added in banking to that in the overall market economy and in retail trade for the euro area and the U.S. For banking, we present three alternatives: the capital share as based on the National Accounts and two adjusted versions, mirroring Tables 1 and 2, removing the term risk compensation and additionally the default risk compensation from bank output. The market economy, which excludes the real estate, government, health

and education industries, is included as the broadest reference. A drawback is that the market economy also includes more capital-intensive industries, such as metalworking and utilities. We therefore also include retail, as it is an intermediation industry like banking.

To arrive at capital income and value added for banking, we first add fee and commission income to the FISIM estimates, estimated based on the ECB Statistics on Consolidated Banking Data and OECD Banking Statistics. The overstatement of FISIM can then be translated into estimates of overstatement in total bank output. These overstatement estimates are then used to adjust national accounts data on gross output, value added, and capital income from EU KLEMS. The period 2003–08 was chosen in part because industry national accounts statistics for 2009 are not yet fully available but also because the financial crisis had its most devastating effects on bank output in 2009 (cf. Figure 6). Comparing the capital income share of the airline industry in 2001 and 2002, in the wake of the 9/11 terrorist attacks, would likewise bias the results compared to more "normal" periods.

The table shows that in the euro area the fully adjusted capital income share is almost identical to that in retail trade, while the original capital income share is much higher than even the capital income share of the market economy. Indeed, only mining, utilities and the (petro)chemical industry have higher capital income shares than the original banking share. This mirrors the results for the United States, drawn from Basu *et al*. (2011). They also show that with the much lower capital income share, the internal rate of return on fixed capital in banking is much closer to that in the market economy, while this rate was amongst the highest of all industries before adjustment. The lack of sufficiently detailed capital data for the euro area precludes such an analysis here. Still, the more realistic capital income share already provides useful support for the argument that our alternative methodology is more consistent with the rest of the System of National Accounts by allocating the compensation for bearing risk not to the provider of funds but to the industries where this risk originates.

5. Concluding Remarks

Banks do not charge explicit fees for many of the services they provide, so the value of those services needs to be imputed by comparing bank loan and deposit rates to reference rates that serve as a measure of opportunity costs of funds. This paper has shown how euro area banking output (FISIM) would change if the compensation for bearing risk were removed from output. The current statistical methodology includes compensation for bearing risk in bank output, but this leads to various inconsistencies: firm output changes depending on the source of funding and bank output changes depending on whether loans are held on the balance sheet or sold to outside investors. We have argued that removing the compensation for bearing risk from bank output may not be the only solution, but it would be the least invasive solution to such inconsistencies. What remains of bank output would compensate the bank for screening, monitoring and transaction services, i.e. the services provided using "traditional" inputs, such as fixed capital (e.g. branches, ATMs), labor (loan officers), and intermediate inputs (software consulting).

Our empirical application of the risk-adjusted bank output model covers the euro area from the first quarter of 2003 to the second quarter of 2010. The results show that if we only remove the term premium, bank output is on average 28 percent lower than under the current methodology. If we also remove the default risk premium, bank output is on average 54 percent lower. In other words, the choice of reference rate is crucial and the empirical impact of this choice is substantial. This also has an effect on GDP, to the extent that bank services are part of final demand; our new estimates imply a GDP level (at current prices) that is up to, on average, 0.2 percent lower. Comparable work for the United States by Basu *et al*. (2011) has shown an adjustment to banking sector output of a similar magnitude, so our findings for the euro area do not depend on specific data or assumptions. Our results also imply a more plausible (fixed) capital income share in value added than based on the current methodology.

Beneath these headline results, a number of issues remain. The financial crisis of 2007–09 in particular illustrates the challenges: overall output to depositors has turned negative since 2009 and borrower services have also been negative for two quarters. This raises practical issues, such as whether we have adequately matched loan and deposit categories to financial market yields; or whether institutional differences between euro area countries, such as in tax laws or accounting regulations, have a substantial impact. There are also conceptual questions, such as whether the current accounting scheme of the System of National Accounts is best suited to capture financial services. In particular activities to manage risk would seem to be central to the banking business but do not show up in the national accounts. These questions also arise under the current methodology, though. Since our proposed methodology is more consistent with the rest of the SNA, interest margins are more stable and our final bank output estimates imply a more plausible capital income share, we would argue that removing compensation for bearing risk improves bank output measurement.

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Supporting Information

Additional Supporting information may be found in the online version of this article:

Appendix 1: Reference rate choices
Table A1: Bank Loan and Deposit Instruments and Reference Rates: Term Premium Adjustment
Table A2: Bank Loan and Deposit Instruments and Reference Rates: Default Risk and Term Premium Adjustment
Appendix 2: Modeling Interest Rates into an Error-Correction Framework
Table A3: Retail Interest Pass-Through Process Within Error-Correction Framework: Maturity Selection
Table A4: Retail Interest Pass-Through Process Within Error-Correction Framework: Estimation Results

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