BANK INTEREST RATES AND LOAN DETERMINANTS*

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1. INTRODUCTION

The analysis of changes in bank interest rates and credit aggregates is of great significance both in terms of monetary policy and financial stability. Knowledge of how the monetary authority is able to influence bank interest rates is crucial to a proper assessment of the macroeconomic impact of changes in their official intervention rates, both in terms of final magnitude as in respect of the path leading to this adjustment. In turn, credit contributes to a more efficient allocation of resources in the economy, while assuming particular importance for the activity of banks. This reinforces the need for a conceptual framework permitting an assessment on which of the developments observed are in line with the determinants commonly identified in the literature, in terms of volume of credit granted and interest rates associated with operations. This article aims to make a contribution to this analysis.

Sections 2 and 3 present the methodology and the main results of the econometric modelling of outstanding loans and bank interest rates. These results are then used to illustrate the adjustment dynamics to a change in the money market interest rate and to discuss the importance of the explanatory variables on the evolution of interest rates and bank loans. Taking the results of the most recent period into account and, particularly since the outbreak of financial crisis, we have endeavoured to highlight the impact of variables associated with the conduct of banking institutions as factors determining the evolution of interest rates and bank loans.

2. MODELLING BANK INTEREST RATES

2.1. Theoretical determinants

The evolution of bank interest rates in different credit segments reflects a diversified set of factors. A first factor is the global cost of funding for institutions. Most of the literature which studies the determination of bank interest rates assumes that banks operate under an oligopoly market, which means that a bank does not act as a "price taker", but has some market power in setting prices.[1] Bank interest rates can therefore adjust with a lag and not in full to changes in the cost of funding, which is the main component of the cost of borrowing and which, in the relevant literature, is usually approximated

to the short-term interest money market rate.[2] In turn, the determination of this latter rate is generally linked to its reaction to changes (observed or anticipated) in the official interest rates, central to most central banks in their implementation of monetary policy.[3]

The intensity and speed of transmission of money market to bank lending rates may, therefore, vary over time, particularly reflecting issues related to the level of competition in the financial sector, risk of operations and financial innovation. A factor of relevance in the setting of bank interest rates is therefore credit risk, particularly aggregate credit risk, which is associated with the state of the economy. Another important factor is associated with the exposure of banks to interest rate risk. Since financial institutions have to cope with unsynchronized demand for loans and supply of deposits, they often turn to the money market to manage their liquidity position. Volatility of interest rates in the money market is sometimes considered in determining interest rate margins (note that this volatility decreased with the introduction of the euro in January 1999). Another important factor lies not only in increased competition within the banking and financial system as a whole, which made it possible to widen the range of funding opportunities and investment, but also in the increase in financial innovation, that have supported changes in risk management and brought down the costs of doing business. Increased competition and financial innovation are closely linked to the liberalization of financial markets and, more recently, to full participation in the euro area.

2.2. Interest rate estimating

To estimate bank interest rates, three single equation models with an error correcting mechanism were considered, one for each segment: loans to non-financial corporations, residential mortgages and households for consumption and other purposes.[4] The explanatory variables identified are in line with those usually considered in the literature, i.e., the money market interest rate and a variable that proxies credit risk were considered as determinants for each interest rate, in the latter case the default flow in the portfolio of loans to the non-financial sector.[5] A dummy variable intended to capture the effect of the participation of Portugal in the euro area was also considered. The different treatment between the pre and post participation period in the euro area is a common feature in the literature, with several differences in the transmission of interest rates in the two regimes having been identified.[6]

The single equation approach cannot capture second-round effects, which could only be considered in a context of general equilibrium. However, since the intention is to study not only the evolution of

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(2) The most important components of the overall funding of the institutions are, in general, deposits and debt securities, a significant part of whose respective interest is at a variable rate. However, as these components remunerations are closely related to the rates prevailing in the money market, in the empirical literature, the cost of funding of institutions is approached by this latter variable. See Kauko (2005). For the Portuguese case, see Boucinha and Ribeiro (2009).

(3) The recent financial crisis has illustrated that risk premiums may occasionally affect this relationship.

(4) The interest rate on outstanding amounts apply to all operations at each moment, within the considered segments. The choice of the interest rates was associated, in particular, with their importance in the context of the models used for economic analysis and projections by Bank of Portugal.

(5) Other variables were also tested, in the light of economic theory, such as the volatility of interest rates, although these variables have not proved significant in determining changes in bank interest rates.

(6) For instance, De Bondt (2005) concludes that the transmission of money market rates to the rates charged by banks on lending to customers has changed since the introduction of the euro, becoming faster.

interest rates in different segments but also the evolution of bank lending in light of its specific deter-minants, an "integrated" approach would become too complex because of the number of endogenous variables. The use of single equation models, in the case of several variables, therefore has the ad-vantage of being simple in terms of econometric estimating, while the economic interpretation of the parameters tends to be very appealing.[7]

The data used correspond to quarterly series for the period beginning in the first quarter of 1990 and extending up to the last quarter of 2009 (Chart 1).[8] The interest rates series is based on the Monetary and Financial Statistics. The default flow in the portfolio of loans to the non-financial private sector is based on an estimate of the flow of new overdue loans and other non-performing loans as a percentage of loans.[9] The choice of the rate of money market interest rate fell to the three-month Euribor rate, given that in Portugal interest rates on the major proportion of loans to bank customers are strongly associated with short-term money market rates.

The existence of a well-defined, long-term relationship between endogenous variables and regres-sors firstly requires the variables in question to have the same order of integration. It was therefore ascertained, using the augmented Dickey-Fuller (ADF) test, if the variables were stationary around a linear trend or stochastic trend. The results indicate that the null hypothesis of the existence of a unit root in the series under analysis cannot be rejected. For the series in first differences, this hypothesis is clearly rejected, suggesting that the series can be treated as integrated of order 1, I(1).

In order to study the cointegration properties of the series, two types of tests were performed: the

Chart 1

MONEY MARKET AND BANKS' INTEREST RATES
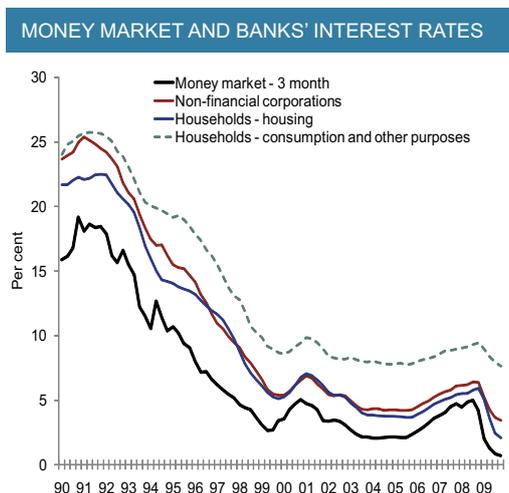
Source: Banco de Portugal.
Note: Quarterly averages.

(7) The single equation approach is also reflected in the literature, for example, in De Bondt (2005), Kauko (2005), Nieto (2007) and ECB (2007).
(8) The choice of sampling period was dependant on the availability of time series.
(9) This variable is defined in the manner set out in the Banco de Portugal's Financial Stability Report.

Shin test, which assumes the existence of cointegration as a null hypothesis and the augmented Dickey-Fuller (ADF) test, which posits the absence of cointegration as a null hypothesis.[10] The existence of a cointegration relationship between bank and money market interest rates and the default flow in the portfolio of loans to the non-financial private sector was tested. The Shin test is indicative of the non rejection of the null hypothesis, the existence of cointegration, for most of the leads and lags considered. It may therefore be considered that there is a long-term relationship on which the interest rates charged by banks in transactions with their customers depend positively on the money market interest rate and default flow.

The empirical model is based on the following long-term relationship,

$$stn\_i_t = \alpha_0 + \alpha_1 stn\_mm_t + \alpha_2 pbd_t + d\_euro_t + \varepsilon_t \tag{1}$$

in which stn_i_t is the interest rate for the three segments mentioned above, stn_mm is the three-month Euribor rate, pdb is the default flow on the loans portfolio to the non-financial private sector,[11] and d_euro is the variable that captures the effect of Portugal's participation in the euro area.[12]

Table 1 presents the results obtained for the estimating of equation (1). The evidence obtained indicates that the long-term transmission from money market interest rates to interest rates on loans to non-financial corporations and for residential mortgages is complete, but slightly lower in the case of the interest rates on loans to households for consumption and other purposes. The variable d_euro appears significant, indicating that participation in the euro area has had a negative impact on the level of interest rates on bank loans (which is consistent, inter alia, with the reduction in spreads between these rates and the money market interest rate).

The dynamic relationship includes lags of the endogenous variable, exogenous variables and the error-correction term. The results of the estimating of the dynamic equations on interest rates in the various segments are also presented in Table 1. The estimated coefficients suggest that the interest rates charged by banks respond positively to changes in money market interest rates and changes in default rates.[13]

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(10) Ogaki and Park (1997) argue that the tests assuming as null hypothesis the absence of cointegration are known to be underpowered to identify a false null hypothesis, so that, with a high level of probability, fail to reject the null hypothesis although the variables are cointegrated. Ogaki and Park argue that when the economic model postulates the existence of a long-term relationship between variables, as is the case, it is more appropriate to test the null hypothesis that there is cointegration test instead of testing the absence thereof.

(11) Although not presented in this article, the default flow has also been modelled, as a positive function of the level of bank lending rates and negative on the growth in economic activity.

(12) This variable takes the value 0 in the period before 1999 and 1 thereafter. Differences in coefficients associated with the long-term determinants between the two periods have proved significant.

(13) We tested for the existence of asymmetries in the adjustment of bank interest rates to money market interest rates, whether they increase or decrease. However, in the context of the adopted specification, the data did not support the existence of significant asymmetries in the transmission of interest rates in Portugal.

Table 1

INTEREST RATE ESTIMATE RESULTS			
Segment	**Non-financial corporations**	**Households - housing**	**Households - consumption and other purposes**
Cointegration relations for bank interest rates	**Levels**		
constant	0.014	0.015	0.052
money market interest rate - 3 month	1.000	1.000	0.849
default flow	1.000	0.426	0.914
d_euro	-0.020	-0.022	-0.030
Short-term dynamics	**First difference**		
Δendogenous_1	0.298	0.524	0.535
	(5.07)	(9.31)	(8.59)
Δmoney market interest rate - 3 month	0.364	0.253	0.146
	(10)	(8.78)	(4.89)
Δmoney market interest rate - 3 month_1	0.279	0.066	0.133
	(7.54)	(2.21)	(3.79)
Δunemployment rate_1	0.197	-	0.224
	(2.57)		(2.65)
ECM_1	-0.097	-0.122	-0.076
	(-2.11)	(-4.42)	(-2.52)
Standard deviation	0.0014	0.0015	0.0017
R^2	0.893	0.877	0.807
AR 1-5 test:	0.472	2.499	1.314
	(0.7561)	(0.0401)	(0.2699)

Source: Authors' calculations.

3. MODELLING OF BANK LOANS TO NON-FINANCIAL CORPORATIONS AND HOUSEHOLDS

3.1. Theoretical determinants

The evolution of bank lending theoretically results from the interaction between demand and supply factors. However, the variables that help to explain the dynamics of the loans sometimes affect both demand for and supply of credit, and it is not always, accordingly, possible to empirically identify the two channels. There are usually variables of scale, variables related to financing conditions, variables related to the position of households and corporations and factors related to structural changes in the banking sector and other variables.[14]

In the case of scale, an expense aggregate, an income aggregate or a variable that proxies economic activity is usually considered. In the case of households, bank loans are usually taken out to finance

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[14] For more details, see ECB (2007).

consumer spending or investment, which agents are unable or unwilling to fund with current income and/or savings. Lifecycle hypothesis [Modigliani and Brumberg (1954)] establishes that households rely on loans in order to smooth their consumption expenditure over the life cycle, according to the present value of its future expected return. Variables of scale, such as economic activity or disposable income, accordingly reflect the ability of households to contract debt, since the expectation of higher levels of income, permitting a higher debt burden to be serviced, leads to higher indebtedness. Corporations, usually take out loans out to finance investment. Moreover, robust economic growth, translated into higher current results, make it possible to support higher debt levels, therefore financing investment through bank loans. Additionally, expectations of increased activity and productivity may lead to an increase in capacity and/or to a higher volume of projects that become profitable, therefore creating more demand for loans.

A second set of relevant factors relates to financing conditions, which include not only the cost of credit but also other contractual features, such as loan maturities. Higher costs reduce the availability and capacity of economic agents to incur and support debt and have a negative effect on demand for bank loans.

A third factor relates to the financial position of the borrower, which influences the assessment of its solvency and respective ability to raise new loans. For example, an increase in wealth (particularly in housing wealth) can increase its borrowing capacity, facilitating the acquisition of loans, since it reduces the problems of asymmetric information. This mechanism is similar to the one usually reported for corporations, as documented, for example, in Bernanke and Blinder (1988) and Bernanke and Gertler (1989). In this context, the level of existing debt will be a factor that is also likely to influence the demand for loans. More specifically, the higher the level of debt, the higher the sensitiveness to shocks that may affect debt servicing capacity.

Another set of factors that play a predominant role, especially in the supply of loans, is related to factors, mainly structural in nature, that affect the banking sector. An important example is the financial liberalization that took place in Portugal in the second half of the 80s and early 90s. Increased competition in the banking sector, which was accentuated by financial integration in Europe, undoubtedly played a role in the financing conditions for households and corporations. Increased competition led to a wave of innovation and a significant increase in the supply of new products in the financial sector (by increasing loan maturities, securitization, inter alia), which has had serious consequences not only in terms of amounts and conditions of credit supply but also in terms of raising funds and risk management by financial institutions.

Other factors that may also be important in the determination of the loans to households are related, for example, to demographic issues. The increase in households' debt may be related to the effects of demographic composition, owing to an increase in the number of agents with greater propensity to take on debt.

Empirical literature on the identification of determinants of bank loans usually focuses on variables more closely associated with demand. The fact that the non consideration of factors typically associ-

ated with supply may be acceptable in most situations, adds to their general measuring difficulties. However, in episodes such as the recent financial crisis, this may limit the explanatory power of adopted specifications, since there is evidence that credit institutions' supply has been affected in a number of dimensions, including inter alia, fees, amounts, maturities and collateral requirements, which factors are also relevant in determining the equilibrium quantities.

3.2. Bank loans estimating

The methodology used is roughly in line with the approach adopted by Calza, Gartner and Sousa (2003), when presenting an analysis for the private sector in the euro area and by Fritz and Reiss (2008), who study the evolution of credit to households in Austria. In line with other studies, these authors demonstrate that the development of loans can be roughly explained by aggregate macroeconomic variables and find evidence of a long term relationship between lending, GDP and interest rates.[15]

In the study now presented for Portugal, several loan series to the non-financial private sector were considered, broken down into three segments, as presented for estimating interest rates (loans to non-financial corporations, residential mortgage loans and loans to households for consumption and other purposes). These segments comprise the most relevant credit activities of resident banks, and therefore play a relevant role in the model for the Portuguese economy used by the Banco de Portugal for analysis and forecasting purposes. Three single equation econometric models with an error-correction mechanism (ECM) were estimated separately in two steps, using OLS, with each model corresponding to a credit segment. For each segment, a relatively limited set of explanatory variables was considered as long-term determinants, similarly to what is usually found in the literature, i.e., a cost of credit variable and a variable of scale. A dummy variable transversal to the three segments was also included, aiming to capture the change of economic regime occurring with Portugal's participation in the euro area.[16]

Quarterly series are used in Portugal for the period between the first quarter of 1990 and the last quarter of 2009 (Chart 2). All series except interest rates are expressed in logarithms. As mentioned above, for each segment the corresponding expense aggregate was chosen.[17] In the case of loans to non-financial corporations, corporate investment was chosen, in the case of residential mortgage loans, investment in housing was considered and, finally, in the case of loans to households for consumption and other purposes, private consumption of durable goods was used.

The series on outstanding loans for the different segments considers bank loans from resident and non-resident banks. The series on interest rates is obtained from the Monetary and Financial Statistics. The housing prices are based on data from the Confidencial Imobiliário real estate Index.

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(15) In Fritz and Reiss (2008), the inflation rate is also considered in the long-term relationship as a factor explaining the evolution of loans to the private sector.

(16) This dummy has the value 0 in the period before 1999, reaching a value of 1 in mid-2007, when the international financial crisis changed the context of financial integration that had been deepening since the beginning of participation in the euro area.

(17) In the literature of bank loans is is usually considered as a scale variable the GDP instead of its components. This should be linked to the fact that tipically it is also considered the aggregate lending, due to difficulties in obtaining disaggregated series.

Chart 2

BANK LOANS
Year-on-year growth rate
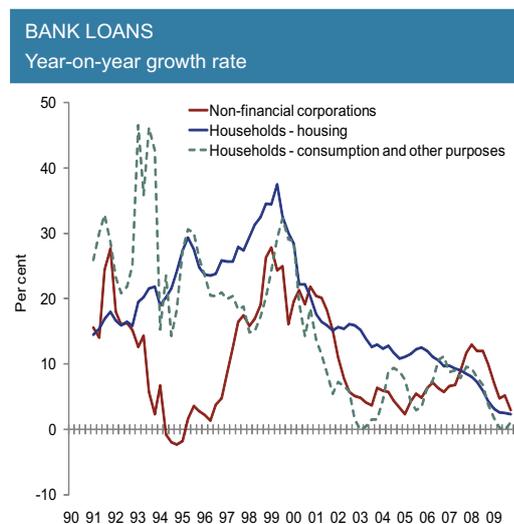
Source: Banco de Portugal.

Finally, the series on expenditure corresponds to an update of the quarterly series for the Portuguese economy published in the Banco de Portugal, Economic Bulletin, June 2009.

The results of the unit root tests indicate that the null hypothesis of the existence of a unit root cannot be rejected. For the series in first differences, this hypothesis is clearly rejected, suggesting that the series in question can be treated as integrated of order 1, I (1). The series on residential mortgage loans is an exception, as the hypothesis of a unit root in the series in differences cannot be rejected for the sample considered. However, for residential mortgage loans in real terms, the ADF test indicates that we are very close to accepting the stationarity of the series in first differences. In this context, and given also the reasonableness of such a theoretical option, it is assumed that the real stock of these loans is I (1).[18]

As beforehand, we implemented two types of tests to study the cointegration of the series (the Shin test and the Dickey-Fuller test). The existence of a cointegrating relationship between each credit aggregate, the corresponding expenditure variable and the cost of credit variable were therefore tested. For the ADF test, we can conclude that for a test with a 5 per cent significance level, the absence of cointegration is rejected only in the specification for residential mortgage loans. However, in the case of the Shin test, the null hypothesis of the existence of cointegration is not rejected in any case, regardless of the number of leads and lags considered. The existence of a long-term relationship in which credit depends positively on aggregate spending and the dummy variable and negatively on the cost of raising funds is not, accordingly, rejected.

The empirical model is based on the following long-term relationship, specified in a semi log-linear:

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(18) As will be discussed below, from the viewpoint of the estimate it is irrelevant to estimate the long-term relation in nominal or real terms, since the existence of a unit coefficient on the variable expense is not rejected.

$$cdn\_i_t = \alpha_0 + \alpha_1 desp\_i_t + \alpha_2 stn\_i_t + d\_euro_t + \varepsilon_t \tag{2}$$

in which *cdn_i* is the logarithm of the nominal stock of credit (end of period) in the three segments mentioned above, *stn_i* and *desp_i* represent, respectively, the interest rate and the logarithm of the nominal expenditure variable associated with each segment and *d_euro* is the variable that captures the effect of Portugal's participation in the euro area.

In estimating the parameters associated with long-term relationships (Table 2), static homogeneity in the expenditure variables was imposed, i.e. a unit coefficient.[19] This restriction is verified by the data, since the estimate for the free coefficient associated with these variables is not statistically different from 1. As regards the coefficient on the interest rate, the sign obtained in the long-term relationship is negative, i.e. an increase in the interest rate implies a reduction in credit. For the sample considered, this effect appeared to be clearly more significant for the stocks of loans to households than for the loans to non-financial corporations.

The dynamic relationship for the credit aggregates is given by lags of the endogenous variable and of exogenous variables and by the error-correction term. In the case of residential mortgage loans, changes in house prices are also considered. Table 2 presents the results of the estimating of the dynamic equations for the various loan segments. The coefficients obtained are statistically significant and have the expected sign.

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(19) This restriction aims to ensure the necessary long-term properties, noting that these relations are used for the medium to long term projection exercises carried out in the context of the Bank of Portugal's quarterly model. In particular, this ensures that real equilibrium is not affected by changes in the level of nominal variables.

Table 2

BANK LOANS ESTIMATING RESULTS			
Segment	Non-financial corporations	Households - housing	Households - consumption and other purposes
Cointegration relations for bank loans	**Levels**		
constant	2.661	3.715	2.695
expense aggregate for the segment	1.000	1.000	1.000
bank interest rate for the segment	-1.154	-8.219	-7.065
d_euro	0.431	1.061	0.372
Short-term dynamics	**First difference**		
Δendogenous_1	0.163	0.452	-
	(1.78)	(4.94)	
Δendogenous_2	0.423	-	0.195
	(5.18)		(2.45)
Δendogenous_4	-	0.281	-
		(3.61)	
Δexpense aggregate for the segment	0.146	-	-
	(2.04)		
Δexpense aggregate for the segment_3	-	-	0.264
			(3.5)
Δhousing prices_2	-	0.187	-
		(2.51)	
Δbank interest rate for the segment	-	-0.799	-2.886
		(-2.99)	(-3.62)
Δbank interest rate for the segment_3	-	-0.768	-
		(-2.25)	
ECM_1	-0.046	-0.017	-0.053
	(-1.88)	(-1.68)	(-2.03)
Standard deviation	0.017	0.008	0.021
R^2	0.631	0.853	0.688
AR 1-5 test:	1.445	0.579	1.679
	(0.22)	(0.72)	(0.15)

Source: Authors' calculations.

4. PASS-THROUGH OF MONEY MARKET INTEREST RATES TO BANK INTEREST RATES AND BANK LOANS

This section examines the pass-through of money market interest rates to bank lending rates and bank loans, based not only on the equations presented above, but also on the above-mentioned equation for the default flow. Thus, a shock on the money market interest rate is implemented. This variable can be considered more conclusive since the beginning of participation in the euro area, as exogenous to the Portuguese economy, at least in economic terms[20].

With regard to bank interest rates, the results suggest that banks adjust their lending rates in line with developments in money market rates, although the pass-through process is not immediate. In the short-term several lags in the pass-through are observed, in line with other studies. It is also conclud-

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[20] In econometric terms this may not be the case, to the extent that, on the whole, a synchronicity between the developments in the Portuguese economy and throughout the euro area could be revealed.

Table 3

BANK INTEREST RATES ADJUSTMENT TO A 1 P.P. CHANGE IN THE MONEY-MARKET INTEREST RATE			
	Long-term impact	Adjustment (per cent)		
	(p.p.)	After 3 months	After 6 months	After 1 year
Non-financial corporations	1.09	74	88	94
Households - housing	1.04	52	72	94
Households - consumption and other purposes	0.93	44	63	83

Source: Authors' calculations.

ed that the speed of adjustment is different depending on the segment considered. Table 3 shows the long-term cumulative impact after a unit percentage change in the money market rate and the proportional adjustment of bank interest rates of up to one year. It is estimated that the pass-through is not complete in the case of interest rates on loans to households for consumption and other purposes, but is still higher than 90 percent. It should be noted that the long-term impact on bank interest rates is affected by developments in the default flow, thus justifying the fact that long-term impacts on different segments are higher than the long-term coefficients presented in Table 1. It is also estimated that the interest rates on loans to non-financial corporations were those that adjusted quickly to changes in money market interest rates, in the period under analysis. These were followed by the interest rates on residential mortgage loans and finally by the interest rates on loans to households for consumption and other purposes. This difference in the speed of adjustment may reflect a higher level of competition in the market for loans to non-financial corporations.

In terms of interest rate spreads, the results indicate that an increase in the money market interest rate, is followed by an immediate compression of spreads in all segments. It is estimated that the largest reduction occurs in the segment of interest rates on loans to households for consumption and other purposes and the lowest in the non-financial corporations segment (Chart 3). However, twelve months after the change in the money market interest rate the transmission is almost complete, and it is estimated that the spreads are close to their initial values (with the above-mentioned exception of the consumption and other purposes segment).

With regard to bank loans, it can be concluded that the segment with the highest sensitivity in the long term to changes in the money market interest rate is in residential mortgage loans with the least sensitive segment being lending to non-financial corporations. It should be noted however, that this result was largely conditioned by the sample period considered. This was characterized by a considerable expansion of credit to households, particularly in the 90s, in a context of strong decline in interest rates, with loans to non-financial corporations, despite this context, exhibiting a more definite cyclical pattern.

Chart 3

IMPACT ON BANK INTEREST RATES AND BANK LOANS OF 1 P.P. NCREASE IN THE MONEY MARKET
INTEREST RATE
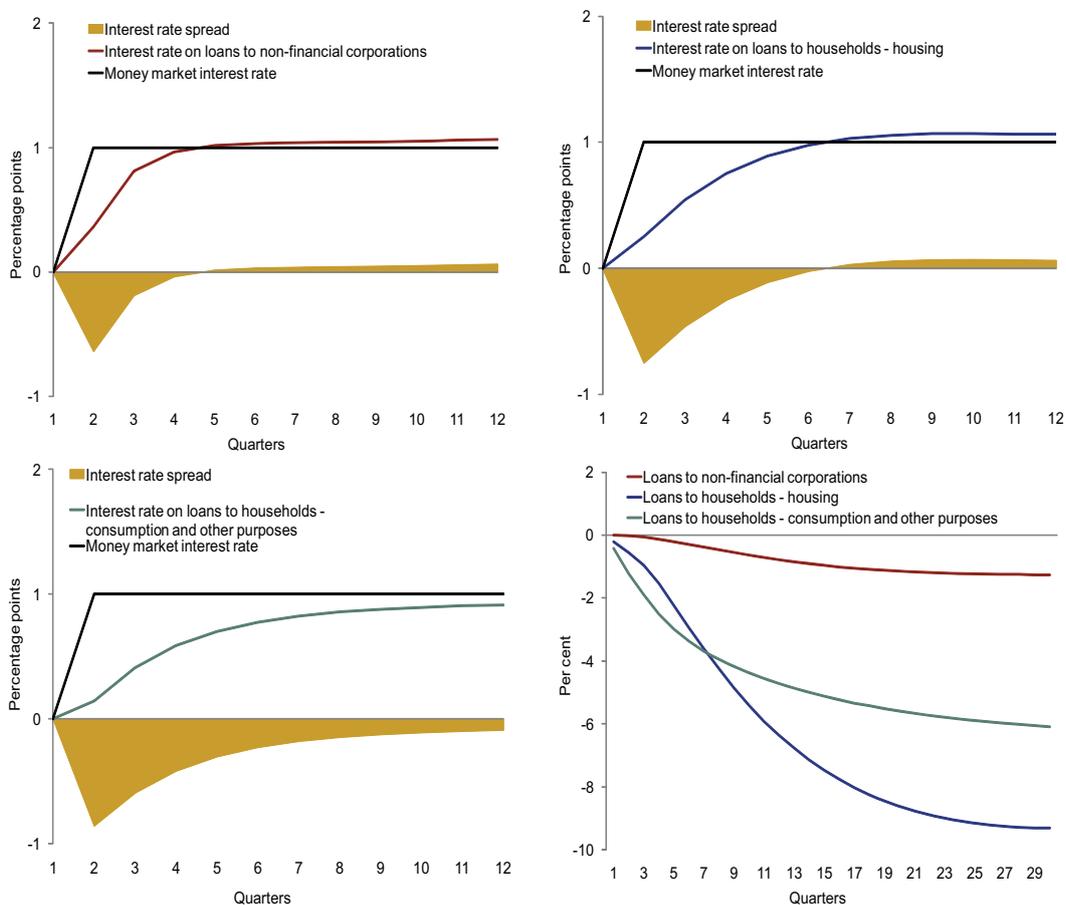
Source: Authors' calculations.

5. CONTRIBUTIONS ANALYSIS

The estimating of the econometric models presented in the previous section enables the impact of key determinants in the dynamics of loans and of the corresponding interest rates over the last decade to be quantified. For the above purpose, we calculated contributions to the growth of loans and the change in interest rates of the adopted explanatory variables. Reference should be made to the limitations inherent in the approach taken in the analysis, namely the fact that it is based on partial equilibrium models. In this context, it should be noted that one of the main limitations of this type of analysis is the inability to properly assess the importance of a structural shock, since several of the variables considered are endogenous and the possible feedback effects are not considered.

In dynamic specifications such as those used, the lagged endogenous variable is also a function of the explanatory variables. The lagged endogenous variables are therefore replaced recursively, with the result that the contribution of the change of variable X to the change in endogenous variable C_t^X in period t is calculated as:

$$C_t^X = \sum_{j=0}^{J} \theta_j^X X_{t-j}$$

(3)

in which X_{t-j} is the change in the explanatory variable in period *t-j* and θ_j^X is the impact on the change in endogenous variable j periods after a shock of 1 per cent/percentage point in the variable *X* in period *t*, calculated from regressions (1) and (2). Thus, the rate of change of each credit aggregate (change in interest rate) results from a weighted average of past rates of change (changes) in determinants. [21]

Based on the methodology presented, it can be seen that the trajectory of money market interest rates has been the major determinant of changes in bank interest rates over the last decade (Charts 4, 5 and 6). It should also be noted that that there are several lags in transmission, justifying increases/decreases in spreads on lending rates, in periods of significant decreases (increases) of the money market rate. It should be noted that in Portugal, the prices of a major proportion of bank loans to customers are very closely related to money market interest rates, primarily for two reasons: firstly, there are segments in which contracts are primarily arranged on the basis of variable rates or in which the term for interest rate refixing is up to one year (with residential mortgages being a prime example). On the other hand, there is a significant share of transactions with a maturity not exceeding one year, namely transactions with non-financial corporations. Developments in money market interest rates therefore had an obvious effect on the interest rates of banks' operations with customers.

Additionally, risk (proxied by the unemployment rate and/or the flow of new defaults) has also contrib-

Chart 4

INTEREST RATE ON OUTSTANDING LOANS -
NON-FINANCIAL CORPORATIONS
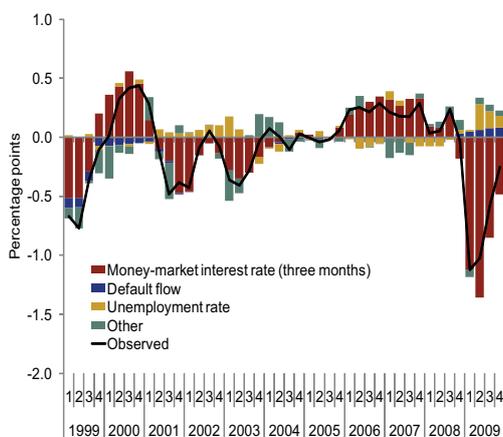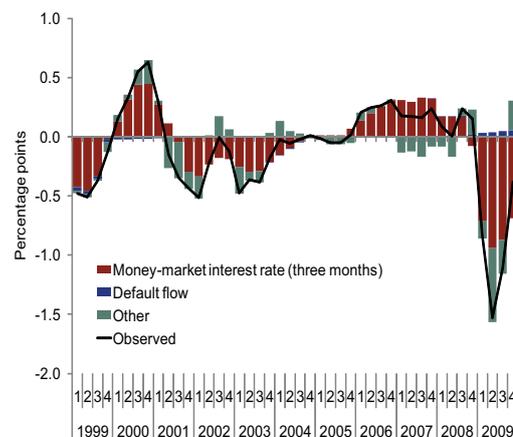Quarterly change rate and contributions of some
determinants

Chart 5

INTEREST RATE ON OUTSTANDING LOANS -
HOUSEHOLDS FOR HOUSE PURCHASE
Quarterly change rate and contributions of some
determinants

Source: Banco de Portugal.

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(21) The weighting factors associated with each 'dependent variable – determining factor' combination vary in line with the segment considered, so that although the long-term impact may be similar, the adjustment path can differ markedly.

Chart 6

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INTEREST RATE ON OUTSTANDING LOANS -
HOUSEHOLDS FOR CONSUMPTION AND OTHER
PURPOSES

Quarterly change rate and contributions of some
determinants

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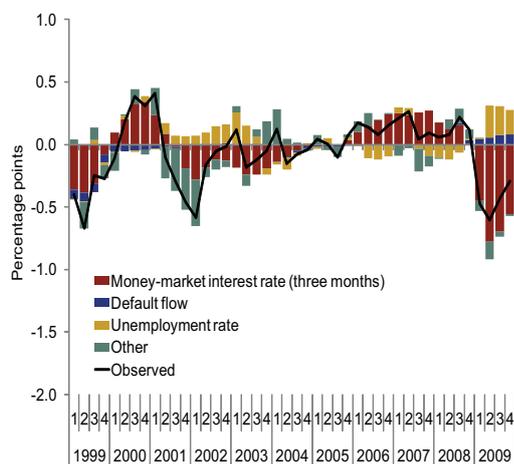
Source: Banco de Portugal.

uted to the determination of bank interest rates, and is particularly visible during periods of recession. In particular for the most recent period, this has assumed some importance in the segments of loans to non financial corporations and to individual borrowers for consumption and other purposes. The

change in this factor contributed towards the mitigation of the reduction of interest rates on loans since the beginning of the year, given the underlying demand for a higher return on credit risk. The non-repercussion of credit risk in the change of interest rates on outstanding amounts in the residential mortgage loans segment during the period considered is related to the fact that operations for extended periods are predominant in this segment and that the terms are defined for the life of the operation, with banks therefore not being able (in general) to change the previously agreed contractual conditions. Moreover, this effect was also conditioned, in the most recent period, by the historically low growth rates recorded by the credit aggregate, with only a tiny fraction of outstanding loans being negotiated in the context of the difficult conditions imposed by banks after the outbreak of the crisis in international financial markets. It should also be noted that the increase in the default flow in this segment was much less pronounced than that observed in the loans to households for consumption and other purposes and non-financial corporations segments, in which the values of such flows were clearly higher than in the previous recession.[22]

Charts 7, 8 and 9 illustrate the evolution of bank interest rates since 1999, and the levels derived from the estimated long-term relationships. It can be seen that between 2005 and 2008, actual interest rates were consistently lower than those implied in the identified determinants (resulting in a gap

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(22) For an analysis of credit risk, see section 4.4 Credit Risk of the text "The Portuguese banking system during 2009", Banco de Portugal, *Economic Bulletin*, Autumn-2009.

Chart 7

INTEREST RATE ON OUTSTANDING LOANS TO
NON-FINANCIAL CORPORATIONS
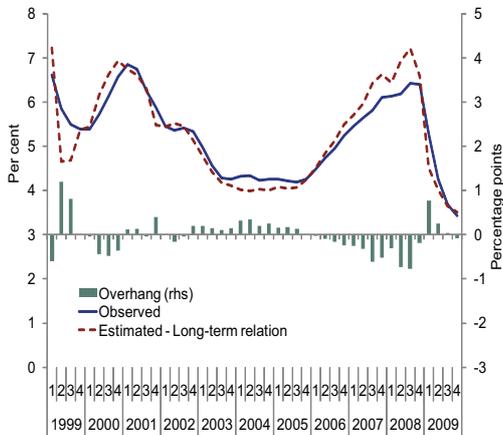
Chart 8

INTEREST RATE ON OUTSTANDING LOANS TO
HOUSEHOLDS FOR HOUSE PURCHASE
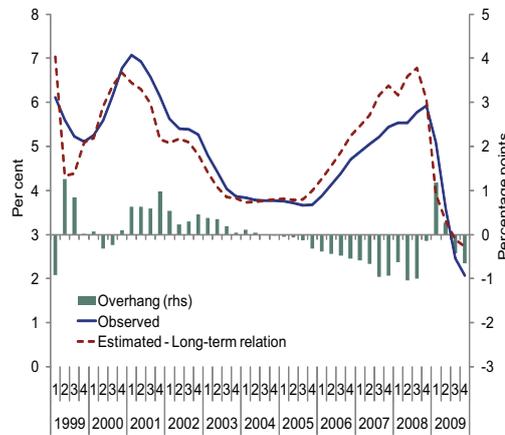

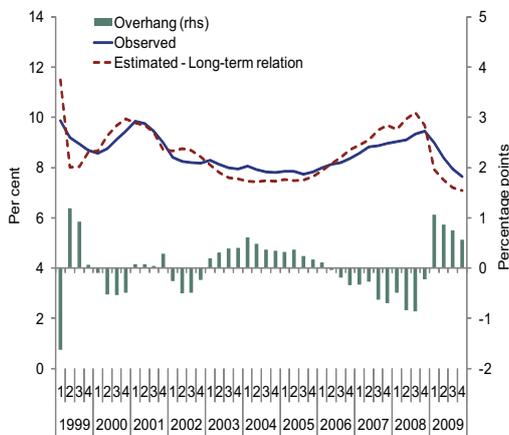**Source:** Banco de Portugal.

Chart 9

INTEREST RATE ON OUTSTANDING LOANS TO
HOUSEHOLDS FOR CONSUMPTION AND OTHER
PURPOSES

Source: Banco de Portugal.

in the graph, the so-called overhang[23]). This reflected, to a certain extent, the already-mentioned gradual nature of the process of adjustment of bank interest rates to changes in money market interest rates. It also reflected competition in the considered markets, a factor which, according to the results of the Bank Lending Survey, realised during this period a progressive narrowing of bank interest rate margins on lending to customers. Note that there is some evidence that this trend had already begun, to the extent that the process of financial liberalization and privatization of the Portuguese banking system has induced a competitive environment, powered by technological innovation, in

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(23) Expression commonly used in economics to describe an excess/difference between observed trends and estimates of value of long-term equilibrium.

terms of products and channels. Interest rates on credit translated into a compression of intermedia-tion margins, which were also influenced by the progressive decrease in cross-subsidization in retail banking. In early 1990 most services were provided without making an explicit related costs charge, which tended to be offset by higher net interest income. This has been changing, with fees assuming increasing importance in terms of income generation for Portuguese banks. These characteristics tend to affect not only the level of bank interest rates but their adjustment dynamics to shocks.

The evolution of bank interest rates has been one of the most visible expressions of the significant change in the framework of the Portuguese economy over the last two decades. This change had major implications on the behaviour of economic agents and on their financial situation. The elimina-tion of the exchange risk premium, has significantly relieved the restriction on shortage of capital, si-multaneously increasing economic agents' portfolio diversification possibilities. Therefore, there was an adjustment process to a higher equilibrium level of debt for the non-financial private sector and, in parallel, a portfolio diversification of financial instruments by residents (both in terms of instrument and originating sector).

Over the last two decades, liquidity constraints have been alleviated for a large number of house-holds and corporations, enabling them to access the credit market, together with a broadening of the purposes covered. Increased competition in the banking sector, the adoption of new methods for the assessment of credit risk by banks or the sophistication of corporations regarding the use of credit instruments have also facilitated the expansion of credit.

Chart 10 shows the year-on-year growth rate of loans to non-financial corporations and the contribu-tion of the main determinants identified. In the early participation in the euro area, loans to the sector registered an extremely high growth rate, reflecting strength of corporate investment and, to a lesser

Chart 10

LOANS TO NON-FINANCIAL CORPORATIONS
Year-on-year growth rate and contributions of some determinants
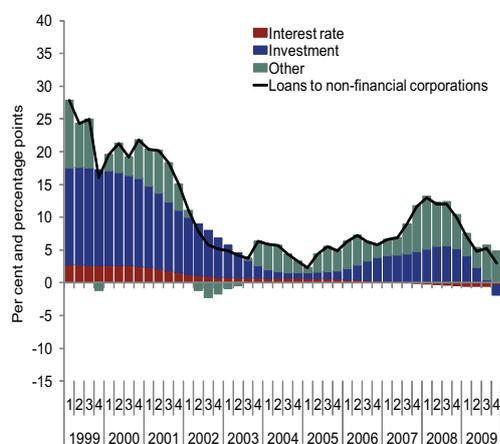
Source: Banco de Portugal.

extent, the significant reduction observed in bank interest rates on loans to the sector. However, the dissipation of the impact of these changes and the reduction of investment during the 2003 recession led to a slowdown in loans to the sector. The subsequent recovery of investment (which resulted in growth rates still well below those observed in 1997-1998) coexisted with a cycle of rising interest rates, which have mitigated the positive impact on the evolution of the loans.

In recent years, developments in respect of loans to non-financial corporations exceeded (incrementally until early 2008) that underpinning the behaviour of the determinants considered. This occurred in the context of a significant increase in the sector's borrowing requirements, reflecting a decrease in their savings, in line with the higher income paid by the sector as return on invested capital, and relatively stable investment (as a percentage of GDP). In global terms, and despite the slight increase in investment, the development of loans was primarily associated with inventory finance and working capital requirements and with situations of debt restructuring. In this context, it should be noted that following the outbreak of the crisis in international financial markets in the summer of 2007, the growth rate of bank loans to non-financial corporations remained relatively sustained in 2008. In a context of adverse conditions in international financial markets, this suggests that Portuguese banks have continued to demonstrate an ability/willingness to accommodate to some extent corporate borrowing requirements, given the strong and unexpected fall in demand, allowing for additional credit support in comparison to that historically observed at low stages of the cycle. However, during 2009, loans to non-financial corporations slowed markedly, owing to the significant contraction of investment. Overall, this pattern of change in loans to non-financial corporations is in line with the historical regularities existing in Portugal and the euro area, i.e., the growth of loans to non-financial corporations tends to have a gap (of about a year) in comparison to the evolution of economic activity.[24]

There was a gradual acceleration in bank loans for residential mortgages throughout the 90s, to growth rates of more than 30 percent (Chart 11) in 1999. Together with a number of factors already mentioned, with a relatively transversal impact on the operational segments considered, several other factors have affected this sector more specifically, such as the existence of the system of subsidized loans, which have accentuated the combined effect of reduced liquidity restrictions and lower interest rates, demographic trends over the 90s, leading to an increase in demand in the housing market and the malfunctioning of the rental market. Over the next decade, residential mortgage loans slowed, evolving more in line with the determinants considered and therefore reflecting lower contributions by changes in interest rates since the mid 90s and the trend decline in housing investment. Growth observed between 2005 and 2008, however, systematically exceeded the growth associated with the evolution of the determinants considered. A part of the explanation of this trend appears to be associated with the fact that, in the context of the rising trend in ECB interest rates (in late 2005 and the third quarter of 2008), banks offered their customers credit agreements tailored to their debt servicing capacity. This translated into longer maturities, an increase in loan-to-value and the introduction of payment plans to alleviate the burden on families over the short term. These trends

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(24) In this regard, see BOX 1 - Loans to the non-financial private sector over the business cycle in the euro area, European Central Bank, Monthly Bulletin, October 2009.

Chart 11

LOANS TO NON-FINANCIAL CORPORATIONS
Year-on-year growth rate and contributions of some determinants
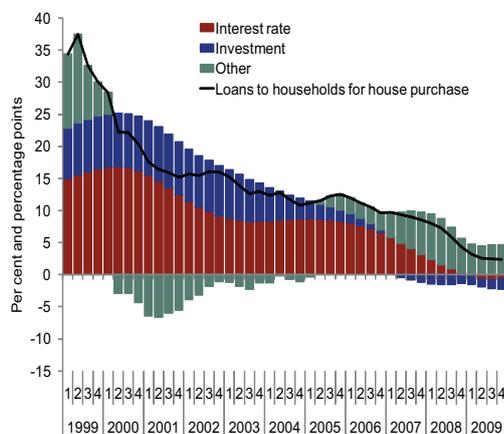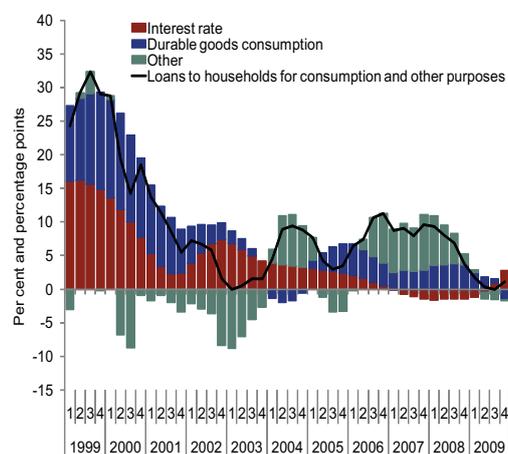

Source: Banco de Portugal.

reflected the competitive environment existing in credit operations and the particularly favourable context prevailing in international financial markets. Later, in the context of an intensifying financial crisis, this situation gradually changed.

Bank loans for consumption and other purposes, especially those for consumption, have grown rapidly over the last 20 years, but were based on a very low level (Chart 12). Households have increasingly resorted to this type of credit to meet the demand for consumer goods, particularly durable goods. According to the results of the 2006 edition of IPEF (a household survey on assets and debt), car purchases are the main factor associated with these operations. However, as noted above, the set of purposes acceptable was expanded over the years. In the segment under analysis, loans displayed greater sensitivity to changes in interest rates, in comparison to loans to non-financial corporations. This sensitivity was reflected in a significant contribution to the fluctuations in the growth rate of loans for consumption and other purposes. Similarly, the downward trend in the growth of consumption of durable goods and its cyclical sensitivity contributed decisively to the growth of loans to this sector/purpose. As in the case of the non-financial corporations segment, the trends observed between 2006 and 2008 also exceeded that underpinning the behaviour of the determinants considered in the case of loans to households for consumption and other purposes. This may have reflected the particularly favourable conditions of credit supply in force at the time, allowing a greater participation of families in this segment of the credit market, as documented in the IPEF's conclusions and in line with banks' increased supply of personal credit products for multiple purposes. This situation was later reverted.

As already mentioned, the specifications used in this article regarding loans mainly tend to reflect demand factors. However, conditions in the credit market have also changed in terms of supply (quantities and prices). In particular since participation in the euro area, Portuguese banks were able

Chart 12

LOANS TO HOUSEHODLS FOR CONSUMPTION AND OTHER PURPOSES
Year-on-year growth rate and contributions of some determinants

Source: Banco de Portugal.

to access a much broader financing market, with no exchange rate risk. At the first stage, through the euro interbank market, and latterly through bond issues (in the market for European Medium Term Notes) and loan securitisation operations, which have grown at a significant rate since 2000. Available evidence suggests that developments associated with technological and organizational changes have contributed to increased competition in the credit market, through the modernization of distribution channels and the introduction of new financial products. This has given credit institutions increased flexibility to respond quickly to fluctuations in demand. In periods of rising interest rates, banks were therefore able to adjust their practices in order to limit the pressure on the ability of households to continue to service their debt and sustain the demand for loans. Such adjustments translated, for instance, into the willingness to change contractual maturities (particularly through the adoption of grace periods on capital) and/or spreads associated with the transactions.[25] The change in the terms of the supply contributed to maintaining the growth rates of loans to the non-financial sector increasingly away from their equilibrium levels in relation to identified factors, a situation leading up to the early stages of the crisis in international financial markets. There was also a growing disparity in interest rates in relation to long-term determinants, which, in addition to the already documented existence of lags in the transmission of interest rates, reflected changes in supply conditions.

With the outbreak of crisis in international financial markets, and its intensification at the end of 2008, there was an across-the-board interruption to these trends as regards variables and segments, albeit somewhat heterogeneously. Accordingly, at the end of 2009, both bank interest rates and the change in lending aggregates stood at levels more consistent with their determinants. For interest rates, this interruption was particularly visible in the loans for consumption and other purposes segment, with

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(25) In this regard, see "Box 4.2 *The main characteristics of residential mortgage loans in Portugal*", Banco de Portugal, Financial Stability Report-2008.

interest rates in this segment being higher than those associated with the evolution of determinants, which were associated with significantly increased delinquency in the segment.[26] On the other hand, it was less pronounced in the housing segment, where delinquency, although rising, has not been of a similar magnitude, and where, due to the characteristics of the contracts, it is not (usually) feasible to aggravate contractual conditions, i.e. spreads on previously existing contracts. It should also be noted that the effect on the rates associated with outstanding amounts of the less favourable conditions in the new contracts is constrained by the (historically) low rates of change on loan rates.

In addition, residential mortgage loans and lending to non-financial corporations were significantly down, although growth rates have remained higher than those associated with the evolution of the determinants. It should, however, be noted that residuals in the corresponding equations, although positive, were lower in late 2009 than at the end of 2008. In the case of loans to households for consumption and other purposes, the slowdown was even more significant in light of the determinants, so that residuals in this segment changed sign, becoming negative.

The results obtained accordingly suggest that other factors may have assumed greater importance in determining the dynamics of lending and bank interest rates over recent quarters. Data from the Bank Lending Survey point to the importance of factors related to credit supply conditions.

The economic and financial crisis has created a change in the conditions of credit supply, in the segments considered. This process started in 2007, initially driven by constraints in the international wholesale funding markets, persisting and deepening further in the second half of 2008, when the risk assessment was particularly negative. In light of the results of the Survey, this change translated into a tightening of conditions for the banks' approval of credit to the non-financial sector. There were increases in spreads on bank interest rates and other restrictions (both in prices and quantities), mitigating the reductions in bank interest rates and contributing to a more significant slowdown of bank loans to households and non-financial corporations. It should be noted that this change in conditions is applicable to new business and/or renewals, and the full impact thereof on loan balances and corresponding interest rates will, accordingly, tend to emerge only gradually.

6. CONCLUSION

This article emphasises the importance of the existence of an analytical framework that permits, at any time, an assessment of the extent to which changes in interest rates and bank lending conform or not with a coherent set of factors with empirical and theoretical support. It also makes it possible to highlight the importance of the banking system as a factor that significantly conditions the pass-through of monetary policy impulses.

Over the past few years, interest rates and bank lending have remained closely associated with a relatively limited set of variables with theoretical support. After controlling these relationships for the impact of participation in the euro area, money market interest rate and several risk indicators

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(26) Note that the variable that controls the default flow in the loan portfolio considers the aggregate total portfolio, not distinguishing between the different segments.

were identified as key factors in interest rates on bank loans; in the case of bank loans, expenditure aggregates and cost variables turned out to be determinants. Based on the identified empirical models, there was an across-the-board decrease in the residuals of the estimated equations for the outstanding amounts of loans in 2009 in all segments, even turning negative in the case of loans to households for consumption and other purposes. Also in the case of interest rates, residuals exchanged sign in the latter segment (becoming positive). These developments may have been partly associated with the impact on Portuguese banks of the significant deterioration of the economic and financial framework. Recent studies also suggest that the slowdown in lending noted in the euro area reflected not only a reduction in demand but also, to a certain extent, supply factors.

The possibility (not yet verified) that the turbulence in financial markets resulted in structural changes on how the banks operate as financial intermediaries in the economy recommends the need to monitor the stability of the interest rates and bank loans models used for analysis and forecasting.

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