

3. Banking sector's exposure to mortgage loans: analysis of LTV and LTI/DSTI and implications for financial stability

Summary

A number of factors explain the importance of the real estate sector for financial stability. The fact that construction and real estate purchases are mainly financed through bank credit, with real estate being given as a guarantee, implies that disturbances in the real estate market may expose the banking sector to credit risk, with major repercussions on its financial situation. In turn, financing conditions are crucial to developments in the real estate market, thereby creating a close connection between the two sectors with a potentially systemic impact.

Moreover, the weight of housing in household wealth and the fact that mortgage loans usually represents the main source of household indebtedness implies that changes in real estate prices or mortgage credit conditions may have significant impact on household balance sheets as well as on consumption and investment decisions. In addition, taking into account the importance of the construction sector for economic activity, developments in the real estate market may also have major implications for economic activity.

Indeed, risks stemming from the real estate market have triggered several financial crises. Speculative bubbles originated in this market have been observed in several countries in the period immediately before the crisis, leading to abrupt price corrections and a sharp increase in borrowers' default. In Portugal, despite the high growth of mortgage loans in the pre-crisis period, house prices remained in line with fundamentals (see Lourenço and Rodrigues, 2015). Although the level of borrowers' default is currently higher than in the period before the crisis it is far lower than in other credit segments and in other countries. This may be explained by the fact that mortgage loans in Portugal are usually granted at a variable rate²⁰ and with long maturities, which in the current environment of very low interest rates has helped

contain the debt burden of borrowers. Lending conditions before the onset of the economic and financial crisis may also explain lower default levels. According to Costa (2012) – who estimated the probability of default according to household characteristics – mortgage loans were mainly concentrated in households with lower probability of default, contrasting with consumer credit. However, despite the containment of default, banks' portfolios have a significant volume of real estate repossessed due to non-performing mortgages.

The Portuguese banking system's high exposure to mortgages,²¹ the weight of housing in household wealth,²² the risk of interest rate hikes, even if gradual, and their implications for borrowers' default highlight the need to monitor and evaluate resulting risks. This analysis is made through the LTV (loan-to-value) and the LTI/DSTI (loan-to-income/debt service-to-income) indicators, frequently used to characterise risks resulting from this exposure.

Definition of the indicators and information source

The LTV, LTI and DSTI indicators are useful to assess credit risk associated with bank exposure to mortgages. The LTI/DSTI may signal the borrower's default probability, by correlating the loan's amount/monthly instalment with the borrower's income. In turn, the LTV, by relating the amount of the loan with the value of the asset given as collateral, provides information on potential losses for the financial system in the event of the borrower's default (being also likely to affect the probability of default²³).

These indicators may be calculated for the mortgage loan at origination and subsequently updated. Although current values are more relevant to characterise risks resulting

from exposure to mortgages, their value at origination makes it possible to monitor the evolution of banks' behaviour regarding risk at the time credit is granted. The value of these variables at origination is also a relevant benchmark for macroprudential policy, as the imposition of limits on LTV, LTI or DSTI falls on the values of these variables when new loans are granted. The information on individual credit contracts allows the analysis of these indicators, not only in aggregate terms, but also regarding their distribution, making it possible to detect higher risk segments. Thus, the usefulness of this information for analysis and to support macroprudential policy decisions can be considerably increased.

The indicators analysed were calculated on the basis of information on credit contracts relating to immovable property outstanding on 31 December 2015, reported to Banco de Portugal by the eight major banking groups.²⁴ These credit contracts account for nearly 98% of the total number of outstanding loans in December 2015 and almost 92% of the total amount of mortgage loans.

Most credit outstanding at the end of 2015 was granted after the end of the 1990s, reaching a peak just before the financial crisis. The stock of loans granted by the resident financial system for house purchase has declined since 2013, reflecting the net repayment of this type of debt. However, the annual flow of new loans for house purchase has been increasing since 2013 (Chart 1).

As mentioned above, the indicators under analysis can be calculated at loan origination to characterise the conditions practiced by banks when they grant credit and updated on a reference date, as indicators of risk associated with these credit contracts.

LTV at origination is calculated as the ratio between the initial loan amount and (i) the purchase price (LTVop) or (ii) the value of the first appraisal (LTVoa) of the real estate pledged as collateral.

LTV at 31 December 2015 (LTV) is calculated as the ratio between the amount of credit

overdue on that date and the value, updated on the same date, of the latest bank valuation of the real estate pledged as collateral.²⁵

LTI at origination (LTIo) corresponds to the ratio between the initial loan amount and the borrower gross annual income at origination.

LTI at 31 December 2015 (LTI) is given by the ratio between the total amount of credit overdue on that date and the latest borrower's gross annual income reported by the credit institution.²⁶

DSTI at origination (DSTIo) is calculated as the ratio between the monthly instalment at origination (including charges such as interest and commissions excluding insurance) and the value of the borrower's gross monthly income at origination.

DSTI at 31 December 2015 (DSTI) corresponds to the ratio between the monthly instalment at that date and the value of the latest information on the borrower's monthly gross income reported by the credit institution.

The analysis of the reported information made it possible to identify a number of questions with implications for the calculation of the indicators concerned. These are chiefly related to: (i) the existence of multiple credit contracts secured by the same real estate property (e.g. related loan contracts²⁷ and other contracts provided they are secured by the same real estate property); and (ii) the existence of credit contracts for house purchase secured by multiple real estate properties.

To address these issues and to better reflect the intended purpose of this analysis, the following was considered:

- For the numerator of LTV and LTI the total amount of loans secured by the same real estate was aggregated (in the case of the DSTI numerator the corresponding monthly instalments were aggregated);²⁸
- Where the same credit contract is secured by several real estate properties, their value was aggregated to calculate the total value of the collateral securing the loan (LTV denominator).

In addition, a number of observations with extreme values in some variables (outliers) were excluded from the analysis, to avoid biased results where the information had little consistency.

Analysis of the LTV and LTI/DSTI indicators

Situation at 31 December 2015

Table 1 illustrates the average values at origination for the indicators under review (for total credit contracts for house purchase and related loan contracts outstanding at 31 December 2015 and for those originated in 2015) and the size of the sample considered for their calculation.

As it can be seen, the average values of the indicators at origination of loans granted in

2015 are far lower than those of total credit in the portfolios of banks at the end of this year, reflecting tighter credit conditions. LTI and LTV at origination relating to mortgages granted in 2015 stood at 4% and 78% respectively (when calculated on the basis of the purchase price of the real estate, or 71.2%, when calculated on the basis of the first appraisal).

Although in aggregate terms, the values at origination of credit outstanding at the end of 2015 of the indicators do not seem to show significant risks regarding bank exposure to mortgage loans, the analysis of the distribution of mortgage loans per percentile indicates the existence of a significant number of mortgage loans with a higher degree of risk (e.g. 25% of mortgages had LTVop above 100 or LTIo above 6).

Table 1 • Indicators at origination and representativeness of the respective sample

Indicators at origination	Total loans		Total loans, per percentile			Loans granted in 2015	
	Average	Sample (%)	p25	p50	p75	Average	Sample (%)
LTVop (%)	88.9	24.5	74.5	94.7	100	78	37.9
LTVoa (%)	82.3	92.8	56.5	78.6	90	71.2	87.7
LTIo (Number of times)	4.6	58.8	2.1	3.8	6	4	80.5
DSTIo (%)	34.7	26.3	11.3	21.3	34.8	27.8	49.3

Source: Banco de Portugal.

Note: The sample corresponds to the percentage of credit contracts for which it was possible to calculate the indicators, taking into account data availability.

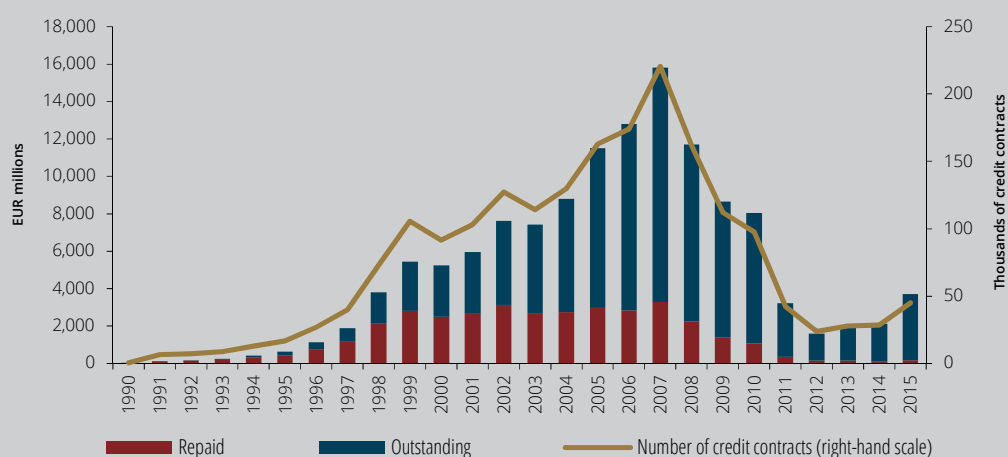


Chart 1 • Amount of credit outstanding and number of mortgage loans at 31 December 2015, broken down by year of origin

Source: Banco de Portugal.

However, the values of the indicators at the end of 2015 (3.6% for LTI and 59.8% for LTV) are lower than the values at origination for

total credit (Table 2), mainly reflecting the fact that part of the loan has already been repaid.

Table 2 • Indicators at 31 December 2015 and representativeness of the respective sample

Indicators at 31 December 2015	Total loans			Total loans, per percentile		
	Average	Sample (%)	Weighted average	p25	p50	p75
LTV (%)	59.8	96.7	77.0	29.9	54.3	77.0
LTI (Number of times)	3.6	60.5	5.5	1.1	2.6	5.0
DSTI (%)	20.1	60.4	25	9.1	15.9	25.8

Source: Banco de Portugal.

It should be noted that the treatment given to data (aggregation of loans) and some caveats to reported information restrict the number of observations available for the calculation of the indicators. The representativeness of the sample is more reduced regarding the LTV at origination, based on the purchase price, and the DSTI at origination, given that information reported on the price of the real estate property and the first monthly instalment was limited.

The indicators in 2015 weighted by the amount of credit overdue are far higher, indicating that credit with higher values in these indicators are associated with larger amounts of credit.

In so far as the LTI chiefly conditions the loan repayment capacity, and the LTV affects the losses incurred by banks in the event of default (even though it may also affect the probability of default), risk associated with a mortgage loan largely arises from the combination of the two indicators. Indeed, when the borrower's

income is reduced compared with the amount of the loan (high LTI), this may not represent a significant risk for the institution if credit is secured by a real estate property whose value is far higher than the amount of the loan outstanding (low LTV).

For illustrative purposes, Table 3 highlights, the various categories of risk combining sets of the two indicators. Loans with higher risk (marked in dark shade) are the credit contracts simultaneously characterised by LTV above 100% and LTI above 6. Loans classified in the following category of higher risk (marked in medium shade) were defined as the remaining credit contracts with LTV above 80% and LTI above 4. Credit contracts with LTV below 80% and LTI below 4 (marked in light shade) have the lowest risk. As illustrated, the category with the highest risk corresponds to 7.6% of the amount of credit outstanding and the category with medium risk corresponds to 53.7% of credit.

Table 3 • Credit outstanding at 31 December 2015, broken down by intervals of LTV/LTI | Per cent

LTV	LTI					Total
	<= 2]2 - 4]]4 - 6]]6 - 8]	>8	
<= 30	6.0	1.7	0.5	0.2	0.2	8.6
]30 - 60]	8.2	9.9	4.9	2.2	2.6	27.8
]60 - 80]	3.4	9.5	7.8	4.2	5.4	30.4
]80 - 100]	1.2	4.6	5.7	3.7	5.5	20.7
]100 - 120]	0.2	0.8	1.0	0.8	1.8	4.6
>120	0.5	1.2	1.2	2.7	2.2	7.9
	19.6	27.7	21.1	13.9	17.7	100.0
	38.7		53.7		7.6	

Source: Banco de Portugal.

Conditions of credit granted in 2015 were, on average, less permissive, with higher risk credit representing around 2% of the total (Table 4).

Table 4 • Credit granted in 2015, broken down by intervals of LTV/LTI | Per cent

LTVoa	LTlo					Total
	<= 2]2 - 4]]4 - 6]]6 - 8]	>8	
<= 30	1.4	0.7	0.3	0.1	0.1	2.6
]30 - 60]	5.5	6.6	3.3	1.3	2.0	18.8
]60 - 80]	8.8	17.1	12.0	5.1	5.6	48.6
]80 - 100]	2.3	6.9	7.6	3.5	3.6	24.0
]100 - 120]	0.2	0.4	0.5	0.4	0.4	2.0
>120	0.2	0.5	2.0	1.0	0.4	4.1
	18.5	32.2	25.8	11.4	12.1	100.0
	40.1		57.7		2.2	

Source: Banco de Portugal.

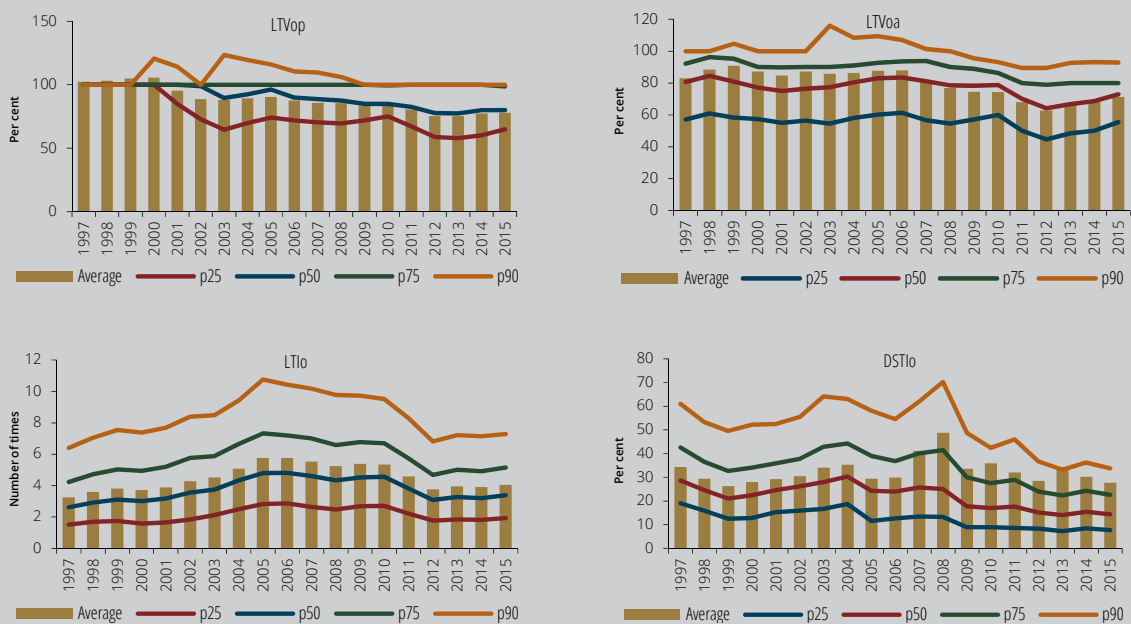
Evolution of indicators at origination

Given that the current banking exposure to mortgage loans results from loans taken out during the last two decades, an analysis of the LTV and LTI/DSTI indicators at origination, throughout this period, provides information on the banking practices that gave rise to the current risks.

The annual average LTV at origination calculated on the basis of the purchase price for the period

1997-2015 stood above 100% during the first years revealing less tight conditions regarding the granting of credit for house purchase (Chart 2). From 2000 onwards there has been a progressive decline in this indicator, which recorded a slight reversal in the most recent years. The indicators calculated on the basis of the bank appraisal are lower, resulting from the fact that the appraisal amount systematically exceeds the purchase price of real estate property.²⁹

Chart 2 • Indicators, broken down by origination year of credit contracts (average values and percentiles)



Source: Banco de Portugal.

The annual average LTI at origination of credit contracts between 2004 and 2010 recorded annual average values above 5. It should be noted that the LTI started a downward trend after the LTV, translating a rise in the purchase price of real estate property higher than the borrowers' income levels.

As to the DSTI, the growth of this indicator in the initial period was less significant. Although the samples underlying the calculation of the various indicators do not fully coincide, the different evolution of the DSTI, compared with the LTI, is partly attributable to the rise in the average maturity of mortgage, diluting the effect of the increase in credit on the monthly instalment.

As it can be seen through the analysis by percentile, the distribution of the LTI and DSTI is characterised by high dispersion around the average (as compared to the LTV).

Although developments in the indicators analysed reflect tighter credit standards on loans for house purchase in the most recent periods, the analysis of histograms of new credit contracts in 2015 reveals the existence of a still significant number of contracts with

quite high values for the various indicators (Chart 3).

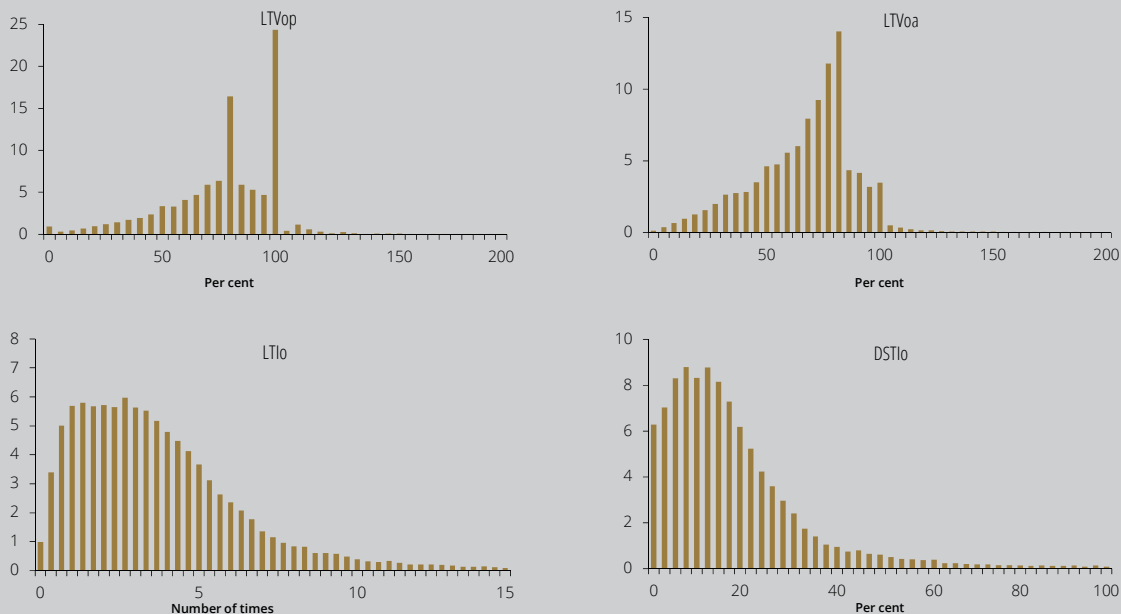
The information provided by credit institutions on banking practices regarding mortgage loans, confirm tighter credit standards on loans for house purchase in the last few years. The analysis of credit risk is based on solvency criteria and collateral valuation. However, there is higher flexibility in the assessment of the LTV, in particular in lending for the purchase of real estate property held in banks' portfolios and real estate property held by construction companies financed by the same credit institution and also when the loan is also secured by a financial collateral. These factors are also taken into consideration to calculate the loan spread.

Conditions of loan contracts

The developments in the various variables characterising credit contracts for house purchase shows some regular banking practices applied to lending.

After a substantial fall in the wake of the financial crisis, the interest rate on new loans started to increase from 2010 onwards. These

Chart 3 • Histograms of credit contracts granted in 2015, by indicator



Source: Banco de Portugal.

developments were chiefly due to a rise in spreads to counterbalance the sharp fall in the interest rate index (6-month Euribor). From 2012 interest rates declined, initially due to a fall in the index as a reflection of monetary policy and, subsequently, as a result of the reduction in spreads mirroring greater competition between institutions. These developments have also been influenced by the recovery of economic activity (Chart 4). Reflecting tighter credit conditions, the average maturity of credit contracts decreased from 35.5 years in 2006 to 32.5 years in 2015, remaining however at a higher level than in the 1990s (Chart 5). This variable is important to calculate the risk associated with a credit contract, as in a loan with a shorter period, maturity can be extended

to facilitate loan restructuring in the event of repayment difficulties by the borrower.

Conclusion

The analysis of the LTV, LTI and DSTI indicators since 1997 has shown the existence of less tight conditions for the expansion of mortgage loans towards the end of the 1990s and in the beginning of this century. In fact, for a number of years, credit granted exceeded the loan collateral value and exceeded more than five times the annual income of the borrower.

This situation changed gradually after the onset of the financial crisis, with the indicators analysed recording a significant reduction. The past few years seem to indicate some reversal

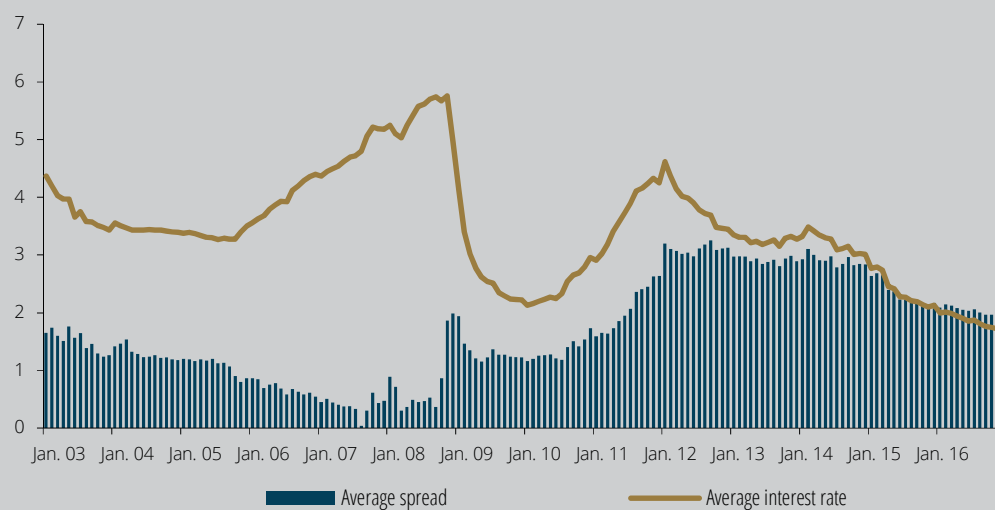


Chart 4 •
Interest rate and
spreads of new
loans for house
purchase | Per cent

Source: Banco de Portugal.
Note: Average spread calculated as the difference between the average interest rate of new bank loans for house purchase with an initial rate fixation period of up to one year and 6-month Euribor.

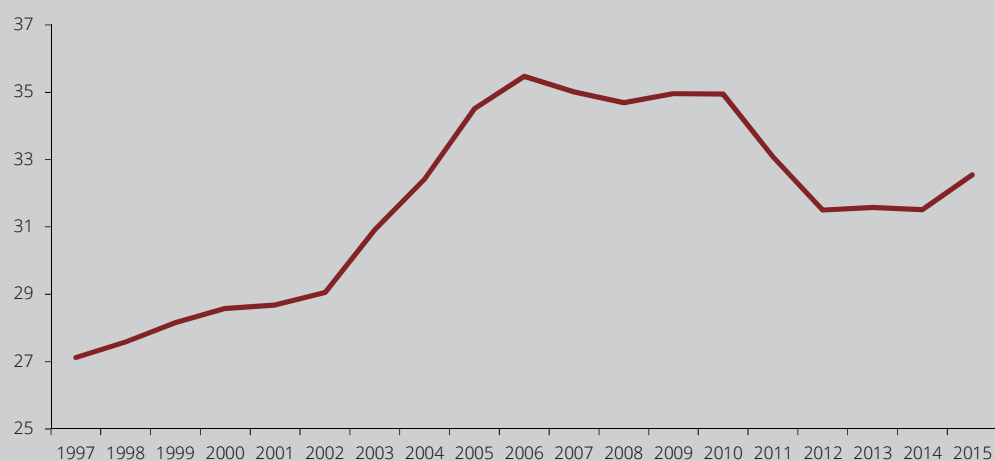


Chart 5 •
Maturity of credit
contracts for house
purchase | Number
of years

Source: Banco de Portugal.

of this trend, with the average LTV and LTI at origination recording a slight rise from 2014 onwards. Equally significant is the fact that the distribution of mortgage loans still shows a considerable number of loans with very high values in the indicators analysed. However, the percentage of mortgages that combine the two indicators in the intervals with higher risk is relatively low.

Although in Portugal developments in mortgage loans have not given rise to significant disruption in financial stability, the high exposure of the banking sector to this market warrants continued monitoring of the risk associated with mortgages. The current environment of higher economic growth, rising real estate prices and higher competition between institutions may imply some easing of credit standards. The indicators analysed, by correlating the amount of the loan with the value of collateral and the borrower's financial capacity, are particularly relevant for assessing credit risk associated with the exposure to mortgage loans.

References

Costa, S., 2012, "Households' default probability: an analysis based on the results of the HFCS", *Financial Stability Report*, November 2012, Banco de Portugal.

Lourenço, R. e Rodrigues, P. (2015), "House prices: bubbles, exuberance or something else? Evidence from euro area countries", *Working Paper*, Banco de Portugal.

Notes

1. Ricardo Martinho, João Oliveira e Vitor Oliveira (2017), Bank Profitability and Macroeconomic Factors. Mimeo.
2. As presented in the Special issue 2 "Efficiency of the Portuguese banking system", *Financial Stability Report*, November 2016.
3. In parallel to banks' situation, the relatively high levels of profits were not translated in a higher level of savings nor in higher capitalisation levels of non-financial corporations, as a result of the dividend distribution policies followed before the financial and economic crisis.
4. In particular, between 2000 and 2010, the weight of loans for house purchase in total loans increased from 36% to 46% and of loans to non-financial corporations for construction and real estate activities increased from 12% to 15%.
5. The marginally positive level observed in 2015 was supported by the high contribution of non-recurrent items, namely the results of financial operations, following the broad-based decrease in sovereign bond yields.
6. In any case, it is worth highlighting that part of the increase in customer resources was the result of the transfer from off-balance sheet resources which was facilitated by the context of greater risk aversion and preference of bank customers for products less exposed to market developments.
7. Defined as 300 basis points over the reference rate of interbank market for the relevant maturity (see Instruction of Banco de Portugal No 28/2011).
8. The benchmark cost-to-income corresponds to the 20th percentile of the cost-to-income distribution in September 2016 for SSM countries.
9. This value was adjusted to reflect recent changes in the consolidation perimeter of some banking groups.
10. <http://www.eba.europa.eu/documents/10180/16460/EBA+BS+2011+173+Recommendation+FINAL.pdf/b533b82c-2621-42ff-b90e-96c081e1b598>
11. <https://www.bportugal.pt/page/medidas-macropprudenciais?mliid=859>
12. Changes are also envisaged in hedge accounting, but these are not addressed in this document.
13. Unless the institution opts for measurement at fair value.
14. This is mitigated by the recognition of impairment losses known as Incurred But Not Reported (IBNR).
15. Terminology used to indicate the calculation of losses considering at least one full economic cycle instead of a given timing.
16. Terminology used to characterise impairment calculation at a given timing.
17. In the past, the institutions using the standardised approach underwent an adjustment in own funds resulting from general provisions. However, the difference between general and specific provisions is not relevant in the current context because, on the one hand, Notice of Banco de Portugal No 3/95 (implementing the IAS 39) has been revoked and, on the other hand, impairments assessed under the IAS 39 are, as a whole, deemed to be adjustments for specific credit risk. However, taking into account the dual treatment of impairments between institutions opting for the standardised approach and those opting for the internal ratings-based approach, in the context of discussing the impacts of the IFRS 9, the Basle Committee (BCBS, 2017) has decided to maintain the distinction between specific and general provisions, recommending regulators to issue guidelines to classify the impairments resulting from an expected credit loss model under specific and general losses, in order to ensure the consistency of treatment among institutions.
18. As, for instance, the introduction of the leverage ratio in order to mitigate model's risk in the calculation of the minimum capital requirements.
19. It should be recalled that the IAS 39 already implied the calculation of impairment losses known as IBNR. However, given the model for the new standard (prospective), this value of the losses associated with financial assets allocated to stage 1 is expected to be higher than that resulting from the IBNR.
20. Indexed to money market interest rates.
21. Mortgage loans account approximately for 80% of credit granted to households and virtually half of total credit granted by the banking sector.
22. In Portugal the percentage of households owning their own homes is 75%, compared with an average of 70% in the European Union.
23. A low LTV (higher value real estate property compared to a given amount of credit) may be a higher incentive to repay the loan, as default, implying the loss of the real estate property pledged as collateral, brings about higher costs for the borrower.
24. Information reported by the eight major banking groups (Novo Banco, Banco BPI, Banco Santander Totta, Millennium BCP, Caixa Geral de Depósitos, Montepio Geral, Banco Nacional do Funchal – BANIF – and Grupo de Crédito Agrícola) pursuant to Circular Letters No 107/2015/DSC and No 6/2016/DES.
25. Given that in many cases the latest appraisal of the real estate property was made before December 2015, and in order for the indicator to reflect adequately the risk associated with the credit in question, the appraisals used for the calculation of the denominator were updated on the basis of a ratio calculated from developments in the Housing Price Index compiled and disclosed by Statistics Portugal (Instituto Nacional de Estatística).
26. Although in many cases the latest update of the borrower's income value was made well before 2015, no correction was made, considering the difficulty in selecting an adequate indicator for the purpose – the consumer price index or the average change in disposable income would not take into account the evolution of individual income over the borrower's life cycle which should be considered given the maturity of mortgage loans.
27. A related loan contract is a credit contract secured by a mortgage, totally or partially on a real estate property that simultaneously also secures a credit contract for house purchase concluded with the same credit institution, under the terms laid down in Article 1 (2) of Decree-Law No 51/2007 of 7 March 2007.
28. In the case of the LTV and LTI (and DSTI) at origination, aggregation only included the amounts (or instalments) of loans secured by the same real estate property where such loans had been contracted on the origination year of the main contract. In fact, where the second mortgage has been granted several years after the first, it would make no sense to aggregate the new loan to the previous loan amounts, as when the new loan is granted, the first has already been partially repaid. Moreover, it would make no sense to consider the new loan on the origination date of the first loan.
29. This differential, which may have resulted from the existence of tax incentives for the undervaluation of the purchase price, may also reveal a tendency to overvaluation of the appraisal, particularly marked in years of less tight credit conditions.