Box 1.3
CREDIT STANDARDS AND MORTGAGE DEFAULT RISK

Royal Decree-Law 22/2018 equipped the Banco de España with a broad range of macroprudential tools, including borrower-based measures. These instruments, which will be applicable to, inter alia, the mortgage portfolio, will focus on limiting the debt service burden of mortgage payments for borrowers, or on reducing the level of leverage with respect to the available collateral. They will thus contribute to improving borrower solvency, since experience has shown that when loan terms ease and leverage increases or a greater debt service burden falls on borrowers, the risk of default usually increases.

This box summarises the results of a study analysing the effect of credit standards (and of their interactions) on the level of mortgage credit risk.[1] The exercise takes the terms and conditions of loans at their origination date and applies a battery of econometric models to estimate the probability of mortgage foreclosure proceedings or, alternatively, of a loan becoming non-performing. This analysis starts out by defining the indicators which other studies have found to be important[2] for determining

default risk. Thus, to measure leverage, two ratios were calculated which compare the loan amount with the house value: the loan-to-value (LTV) ratio, the denominator of which is the house appraisal value, and the loan-to-price (LTP) ratio, the denominator of which is the registered price of the house purchase transaction. The financial burden of borrowers is proxied by the loan service-to-income (LSTI) ratio, which is the proportion of a borrower's annual income used for loan repayments at the origination date. Lastly, other characteristics of mortgages are examined, such as maturity, house type and location, borrower charac- teristics including employment status, and loan purpose.

Data from the Association of Registrars were used to develop a model to calculate the probability of mortgage foreclosure proceedings. Chart 1 shows that this probability tends to increase with increasing LTV and LTP ratios. However, the LTV ratio does not seem to show an effective association with higher risk for values above 80%. This is not so with the LTP ratio, for which risk grows more

Chart 1
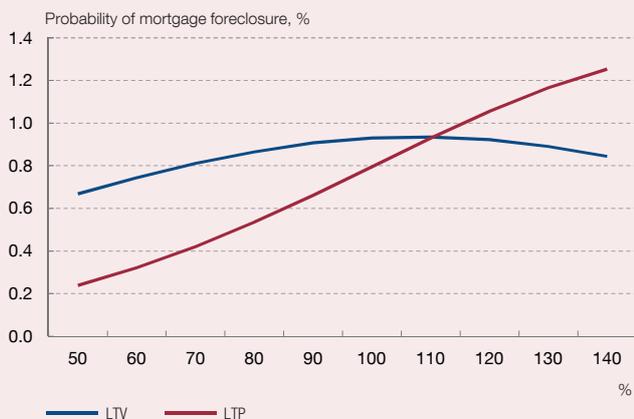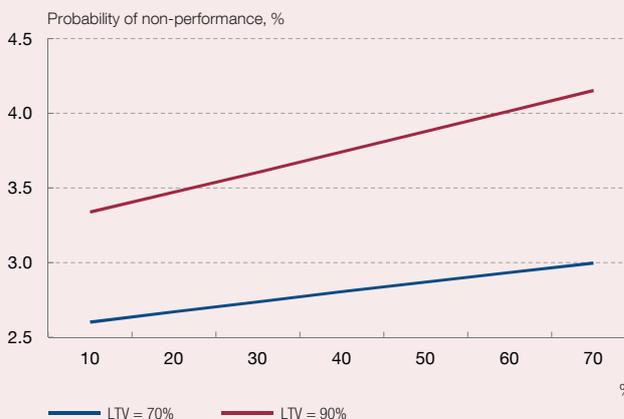LTV, LTP AND PROBABILITY OF MORTGAGE FORECLOSURE (a)

Chart 2
INTERACTION BETWEEN LSTI AND LTV AND PROBABILITY OF NON-PERFORMANCE (a) (b)

SOURCES: Spanish Association of Registrars *(Colegio de Registradores)* and European DataWarehouse.

a The probability of occurrence of the stress event (mortgage foreclosure or non-performance) is estimated for loans which in theory have the same characteristics and which only change in the value of their LTV, LTP, maturity or LSTI, depending on the chart. Except in the case where the LTV ratio is above 80%, the confidence intervals of these estimates are small, so the changes in probability are statistically significant.
b The LTP ratio is plotted on the horizontal axis.

1   See Galán, J.E. and M. Lamas (2019). Beyond the LTV ratio: new macroprudential lessons from Spain. Working Paper 1931. Banco de España.

2   Us was made of two databases which contain a sample of loans and include the individual information on characteristics of mortgages at origination. First, we took information from the Association of Registrars, which identifies all mortgages taken out in Spain since before the crisis Second, we supplemented this information by that from a repository of securitisation data, namely the European DataWarehouse. In both cases, the information refers to house mortgages granted to individuals.

Box 1.3

CREDIT STANDARDS AND MORTGAGE DEFAULT RISK (cont'd)

Chart 3
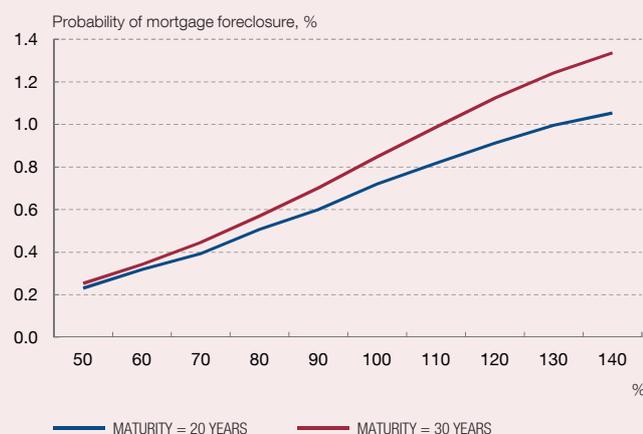INTERACTION BETWEEN LTP AND MATURITY AND PROBABILITY OF MORTGAGE FORECLOSURE (a) (b)

Probability of mortgage foreclosure, %

MATURITY = 20 YEARS   MATURITY = 30 YEARS

Chart 4
MORTGAGE-DEBT-AT-RISK INDEX (c)

2004 = 100   %

INDEX

NPL RATIO IN THE HOUSING MARKET (right-hand scale)

SOURCES: Spanish Association of Registrars *(Colegio de Registradores)* and European DataWarehouse.

a   The probability of occurrence of the stress event (mortgage foreclosure or non-performance) is estimated for loans which in theory have the same characteristics and which only change in the value of their LTV, LTP, maturity or LSTI, depending on the chart. Except in the case where the LTV ratio is above 80%, the confidence intervals of these estimates are small, so the changes in probability are statistically significant.
b   The LTP ratio is plotted on the horizontal axis.
c   The index expresses the risk of new mortgage lending having regard to the volume of credit granted and to credit standards. The NPL ratio is that of loans for house purchase and renovation. The last year of this sample is 2017.

markedly over the whole distribution. In this connection, the LTP ratio seems to be better at distinguishing the risk of mortgage transactions. This suggests that house values estimated through appraisals should be supplemented by the effective transaction value.

Additionally, other models were estimated using a database containing information on securitised loans and on borrowers' main characteristics, including their income (European DataWarehouse). The results demonstrate the importance of taking into account the interactions between different measures of credit standards to explain the behaviour of troubled loans. In particular, Chart 2 shows the impact on the probability that loans will become non-performing for different LSTI ratios and for two LTV ratios (70% and 90%). It can be seen that not only does risk increase as the borrower debt service burden rises, but also that the more highly leveraged loans (i.e. higher LTV

ratio) are associated with a higher level of risk (and that it also rises more sharply). The probability of becoming non-performing in Chart 2 is higher than the probability of mortgage foreclosure in Chart 1, since the stress event considered is different.[3]

Chart 3, in which once again information from the database of the Association of Registrars is used, plots the changes in the probability of mortgage foreclosure as a function of the LTP ratio for two mortgage maturities (20 and 30 years). It can be seen that maturity starts to become an additional determinant of risk for high leverage values. From the standpoint of use of regulatory instruments, these results indicate that the simultaneous activation of limits on various credit standards would be more effective than the implementation of just one of them.

Lastly, the quantitative results of the study allow the construction of indicators to monitor the mortgage risk

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3   In the securitised loan database (European DataWarehouse), all inflows into NPLs form part of the sample of troubled loans. In the Association of Registrars, the sample of troubled loans is constructed from the mortgages subject to foreclosure proceedings. This, along with the differing coverage of troubled loans in the two databases, explains the higher probability of the stress event in the securitised loan database.

Box 1.3

CREDIT STANDARDS AND MORTGAGE DEFAULT RISK (cont'd)

related to the credit standards at the mortgage origination date. Thus Chart 4 depicts the behaviour of a mortgage-loan-at-risk index, reflecting the variation over time of future troubled loans, given the credit standards at the origination date and the amount of credit granted each year.[4] In general, the expected value of loans at risk was observed to increase significantly before the crisis, basically due to the worsening credit standards. These

results contrast with the behaviour of the NPL rate of this portfolio, which remained low until the crisis, at which time it began to climb rapidly. The decrease in the risk indicator after the outbreak of the crisis seemed to be due to the sharp contraction in new mortgages and to the tightening of credit standards. These results suggest that the estimated index may be useful as a leading indicator of vulnerability in the mortgage market.

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4 To construct the mortgage-loan-at-risk index, the probability of default estimated by the model for the loans originated each year is multiplied by the total value of the mortgages granted in that year. It is thus a measure of the expected value of the mortgages originated in a given year which would be at risk of future default given the credit standards at the origination date. An increase (decrease) in this index may reflect an increase (decrease) in the probability of default in the year the loan was granted (which in turn depends on the credit standards, including the LTV, LTP and LSI ratios), an increase (decrease) in the value of the mortgages granted that year, or an increase (decrease) in both. During the years of the sample assessed, on average 75% of the changes in the index were attributable to changes in the probability of default and 25% of them to changes in the value of the mortgages granted.