

# Subprime mortgage lending: recognising its potential and managing its risks

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## Risks and opportunities in subprime mortgage lending

Subprime mortgage lending offers many opportunities for growth and profitability. While this market is already well developed in the US and the UK, in the rest of Europe there is still a low availability of non-standard mortgage offers. However, recent research suggests there is a significant untapped demand for this type of product in Europe. Many lenders are therefore trying to enter this market by expanding their product offering to reach a wider customer base.

To be successful in this market though, lenders will need to address the issues of funding and risk management. Many lenders, in fact, underestimate the higher risks in subprime lending and its proper management, ending up with losses. This article presents an outline of a quantitative approach to risk evaluation and risk based pricing as an effective tool to deal with regulatory compliance and risk management. This type of approach brings many benefits when correctly implemented, although it does present some difficulties in its practical implementation especially to entrants to the subprime mortgage market.

## What are subprime mortgages?

The term subprime (also called non-conforming or non-standard) defines a specific lending market sector where borrowers are considered as posing a higher than standard credit risk (as revealed,

for example, by their credit history) and that do not qualify therefore for the prime market. The availability of subprime products is not limited to mortgages but it includes other typical retail products such as personal loans and credit cards.

Considering mortgage products, subprime loans are offered to borrowers who represent a higher level of risk with respect to standard mortgage underwriting guidelines. These loans are characterised by interest rates (and fees) higher than the standard prime rate that is available in the market at a given point in time. The most common categories of applicants who fall into the subprime mortgage segment are:

- Borrowers with a poor credit history (previous credit problems);
- Borrowers asking for high Loan to Value (LTV) mortgages;
- Borrowers with a high Debt to Income ratio;
- Borrowers who cannot document all of the underwriting information in their application.

Statistics show that loans to this type of borrower are characterised by high default rates (borrowers falling into arrears which cannot be recovered) and high loss rates (lender's loss after repossession compared to original loan amount) and are therefore considered as posing significant risk.

Subprime loans are offered with higher than standard interest rates, as the lender needs to cover higher credit losses and overhead costs (related to underwriting, servicing,

and collecting the loans) compared to prime loans. The difference [1] is generally in the order of 3 to 4.5 per cent over the base rate. Given the higher risk implied by such loans, usually subprime lenders try to cover the higher related costs through [1]:

- frequent use of early redemption charges;
- frequent requirement for Mortgage Insurance;
- higher commission fees (with differences compared to prime loans up to 1% of the credit facility).

## An overview of the European subprime mortgage market

Recent research [2] indicates that there is a significant demand in Europe for high risk mortgage loans. This has been valued as ranging from 400 billion euros to over 1,200 billion euros in the medium term. This forecast growth depends on future house prices and on regulatory issues.

Currently, the availability of high risk products in Europe is fairly limited, especially compared to the US and UK. For example, in most European countries it is very difficult for borrowers to succeed in obtaining a mortgage with a loan to value higher than 80%. Other examples are loans to people with poor credit histories, self-certified income or for older age applicants. All of these products are generally not easily available although there is quite a difference among countries with the UK being recognised as the most developed European mortgage market. Estimates of the subprime market in the UK indicate a

share in the order of 10% of total mortgage market value [3]. In the US instead, the market share of subprime loan originations was approximately 20% of the total mortgage market in 2004, and subprime mortgages originations have been growing at an average annual rate equal to 25% from 1994 to 2003 [4].

There are however many factors that justify expectations for a likely expansion of the European subprime mortgage market. First of all, a general widespread growth in credit use (not limited to mortgages) is evident. The demand for mortgage credit has been increasing in particular among non-traditional borrowers. A typical example of this class of borrower is immigrants, whose share of the European population is becoming more and more substantial. Immigrants are generally considered as subprime borrowers as they are characterised by limited credit histories, low incomes and are likely to apply for high loan to value mortgages. Moreover, the growth in self-employment or in flexible working arrangements (with less certain and regular income streams) has also somehow modified the "traditional" consumer landscape, pushing further the demand for innovative mortgage products that do not rely on standard underwriting practices.

Another driver of subprime loans growth worth highlighting is the increasing popularity in Europe of mortgage insurance. This allows the lender to transfer part of the risk to the insurer. If the borrower defaults on his payments and the loan is subsequently written off, part of the lender's loss is covered by the insurance underwriter. With mortgage insurance, many lenders are willing to offer higher risk products. In Italy for example, mortgages with a loan to value up to 100% are becoming popular thanks to mortgage insurance, as generally regulatory requirements would not allow banks to offer housing loans with an LTV higher than 80%.

Two important aspects in which European mortgage lenders are lagging behind their US counterparts regard data capture and analysis. In the US, credit-scoring agencies can access 80–90 per cent of people's

credit history [1]. In the UK, the most developed European mortgage market, the corresponding percentage is much lower. Furthermore, in the US there is wider availability of historical data on subprime loans on which robust quantitative analysis can be based. Regarding analysis, European lenders have obviously learned from the US business model in terms of risk management. However, many lenders still lack the necessary know-how and expertise to develop sophisticated pricing models necessary to handle the risk in subprime mortgages.

#### The high risk in subprime mortgages

The increased risk in subprime lending needs to be carefully assessed and managed. Clearly, a lender who decides to enter the subprime mortgage market has to be prepared to deal with higher delinquency rates than those relative to standard prime mortgages. An analysis of a real portfolio showed that for subprime loans serious delinquency rates [4] can be 20 times higher than for prime loans. Apart from high delinquency rates, lenders should also expect higher than average loss rates from their subprime portfolio. The combination of high delinquency rates and high loss rates may result in risk that could be unmanageable. This is why within the subprime segment it is necessary to distinguish among different classes of customers in terms of risk. These range from lower risk customers (near prime), through medium risk, and to high risk customers. While the majority of lenders will only target the first two groups, the highest risk group is generally the target of specialized lenders, prepared to cope with the greater risks implied by such loans or who aim to profit through the repossession of the collateral (equity lending).

The reality is that many lenders try to enter the subprime market without the necessary requisites. As recognised by the US Comptroller of the Currency [5]: *"A number of institutions have incurred significant losses and other problems because of poorly structured subprime lending programs. Generally, these institutions underestimated the higher default rates and*

*loss-on-default rates involved with subprime lending, as well as the higher overhead costs. Moreover, they frequently lacked the management expertise, business planning processes, and risk management processes necessary to manage these risks in a safe and sound manner."*

#### Pricing is the key to a successful subprime lending business

It is evident then that the most crucial element for a sub-prime lender is the assessment and the pricing of risk. This includes both a careful evaluation of the customer's riskiness at application and effective methods of dealing with loans that start to fall into arrears. An objective assessment of risk at application allows the lender to reject applicants whose higher risk cannot be offset by higher interest rates (considering obvious practical and legal constraints) and that are profitable only for lenders engaged in equity lending. Accepted applicants are then assigned an interest rate that reflect their risk.

Although all subprime lenders have a methodology to adjust the price on the basis of the borrower's risk, there are clearly different levels of sophistication. Many lenders, in fact, employ a fairly basic calculation, based on a coarse risk segmentation of their subprime customers, denoted by letters such as A- (the least risky category), B, C, or D (the riskiest category). Borrowers within each category are generally charged the same interest rate with minor differences among borrowers in the same risk group due to the negotiating ability of the borrower or the mortgage broker, and certain risk indicators such as property type or ability to document income. The risk segmentation, however, is often based on a limited set of risk drivers (eg LTV) that may not result in risk being homogeneous among each class. This causes lower risk customers within a class to be overcharged, effectively subsidising the higher risk customers within the same class who are being undercharged.

The segmentation may also be the result of expert judgment that, although it is an important element in all business decisions,

lacks the objectivity and consistency of quantitative analysis. As for the correct pricing for each level of perceived risk, this is a task that requires a significant effort in terms of data collection and analysis. Many lenders employing simplified pricing criteria find themselves incurring higher than expected losses.

The most advanced lenders rely on automated underwriting systems and on quantitative analysis for price setting. Automated underwriting systems evaluate applications using algorithms based on statistical analyses of historical data containing previous applicants' characteristics and their performance in terms of debt repayment. This is generally referred to as credit scoring. Credit scoring techniques are recognised as being more accurate and consistent than manual underwriting in determining the riskiness of individual loan applications. An accurate estimation of risk allows a more sophisticated quantitative approach to pricing to be taken, which in turn allows a lender to define clear and objective goals such as profit maximisation or volume increase.

**An objective risk evaluation of subprime borrowers**

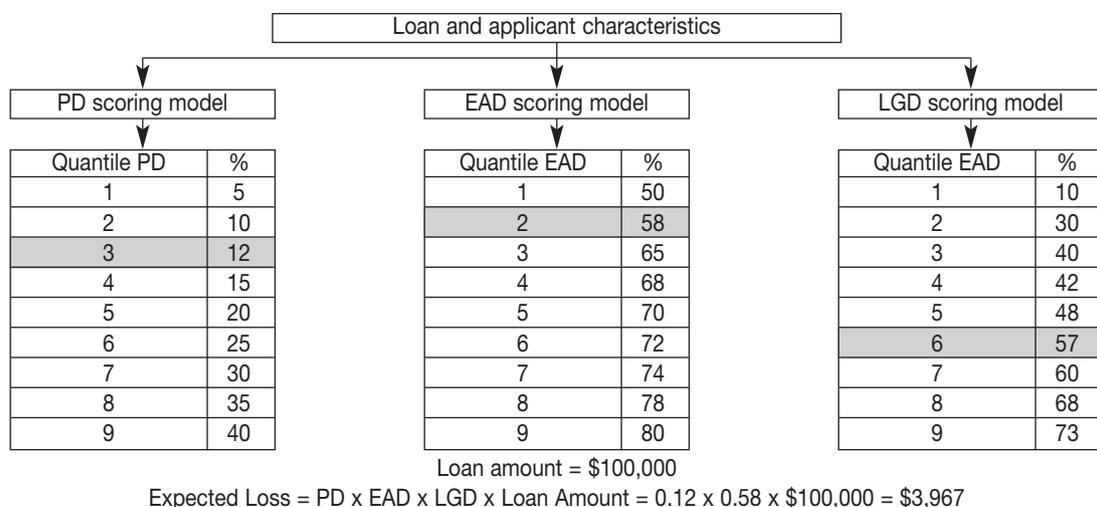
Scoring can be defined in general as a statistical technique to predict, at a specific point in time with the available information,

the probability of a future event. Credit scoring is an instrument widely used by companies for the internal processes of portfolio risk measurement and management. It allows a lender to estimate the probability of future insolvency of a person requesting credit or of an existing customer. The profile is calculated on the basis of the information available at the moment of the decision. Application scoring estimates, at the moment of the request, the level of risk associated with each application before it is effectively approved. In practice, credit scoring results in the definition of a table listing the characteristics that provide the most predictive information, together with the associated attributes and weightings. A total score is obtained as the sum of the points in each characteristic. The total score corresponds to an estimate of the probability of default.

Even though scoring models have traditionally been used only to assess the default probability of a client, the true risk of a loan is given by its expected loss. Not every client with the same default probability has the same potential loss. Two clients with the same default probability can react differently to collection procedures and generate very different losses for the lender. The product of three different elements gives the expected loss: probability of default (PD), loss given default (LGD) and exposure at default (EAD). The

PD is the likelihood that a client will default on his repayments in a given timeframe. The EAD is the value of the bank's exposure at the time of the borrower's default. This can be expressed either in absolute terms or in terms of a percentage of the loan exposure at origination. The LGD is the loss on a credit instrument after the borrower has defaulted. It is therefore a percentage of the exposure at default that takes into account not only the amounts recovered but also the associated direct and indirect costs. By building scoring models for each of these three parameters, a lender is able to have an objective and accurate estimation of the expected loss of a prospective client at the application stage. An example of the estimation of the expected loss using scoring models is given in the figure below. A given applicant would be associated to a different level of PD, LGD and EAD (expressed as a percentage of the original exposure) using the output of three scoring models. The product of the resulting values of these three parameters with the requested loan amount results in the estimate of the expected losses.

**Figure 1 – Calculation of expected losses**



There are three main drivers of risk for mortgages: LTV (there is in fact significant evidence that default rates rise sharply when the LTV is higher than 80%), debt to income ratios (DTI, measuring the ratio between instalment and monthly income) and credit bureau scores (accounting for experiences with other institutions for a more comprehensive assessment of the applicants' creditworthiness). These variables represent the key information used by credit scoring models to assess the PD and the LGD. Socio-demographic information (age, residential status, etc) of the applicant is also used to increase the accuracy of the models. As for the EAD, the main driver is the maturity of the loan. It is very rare for borrowers to default soon after they have received credit (unless fraud is involved) and when they have nearly completed the repayments. Estimating the time of default and knowing the repayment amount enables the lender to estimate the exposure at the time of default.

New entrants to the subprime segment are likely to have some difficulties in developing scoring models. Scoring models allow accurate predictions when they are developed on the basis of historical data that is representative of the characteristics of the target population. Therefore models developed for prime borrowers should not be used for risk assessment of subprime borrowers. Institutions should instead build models on data representative of the targeted subprime borrowers. However new entrants to the subprime segments will not have this data available, given that mortgage defaults appear generally several years after origination. In this case it may be possible for them to rely on external data. It is also possible to infer the behaviour of risky customers from an existing portfolio of prime customers by incorporating prior assumptions regarding the relationship between risk and risk drivers. For example, a portfolio of prime loans may not have customers with LTV > 80%. A possibility is then to assume a relationship between default rates and LTV for LTV values higher than 80%, using for example available evidence from the US market. This enables the subprime lender to build a scoring model for an extended range of LTV values

while retaining all the evidence available in the existing portfolio (for example regarding the correlation between the variables).

Another issue which affects the estimation of risk for mortgages in general is that collateral risk can have a greater impact on loss than default risk. Credit risk estimation techniques are limited by the difficulty in forecasting changes in collateral values, regardless of their accuracy in assessing the creditworthiness of individual borrowers. Experience shows that collateral risk is difficult to measure [6] and, even more so, it is difficult to forecast over the typical life of a mortgage.

Some lenders, while recognising that credit scoring is a valuable tool, do not think that it can be applied to subprime lending. This is because the risk in subprime mortgages is driven by many qualitative factors. Therefore it is argued that an individual approach to underwriting is necessary. However qualitative evaluation criteria can always be combined to the results of the quantitative evaluation performed by the scoring model to increase the quality of the risk estimation. This approach is also taken for the credit risk assessment of small businesses (SME) and corporate clients where there are a lot of qualitative aspects (such as the quality of the management or the business perspective of the market sector where the company operates) used to integrate the quantitative risk evaluation.

**A quantitative approach to risk based pricing for subprime lending**

Risk based pricing (RBP) is the practice of charging different interest rates depending on the risk of the loan. A basic approach to the determination of the interest rate is based on identifying costs and then adding the required rate of return to determine pricing. An example of this approach, in its simplified version, is given in the following figure.

Cost of funding	4.50%
Operating costs	1.25%
Expected loss allowance	2.50%
Desired return	2.00%
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Final price	10.25%

**Figure 2 – Cost model for interest rate determination**

This cost model incorporates all the items that should be taken into consideration in determining the price:

- a) Cost of funds: the interest rate at which the lender can borrow money;
- b) Operating costs: rate increase to include costs to originate, service and terminate the loan;
- c) Expected Loss Allowance: rate increase to take into account the expected loss rate (PD x EAD x LGD) that can be estimated using scoring models as described above;
- d) Desired return: takes into account the target return on the investment and should be such as to adequately remunerate the cost of the economic capital (for example, as from Basel II advanced internal rating approach or from any value at risk model) employed by the financial institution (also known as the cost of risk).

In a more comprehensive view of the approach, there are other items that can be considered such as relationship and competition adjustments. Relationship adjustments take into account the relationship and value of existing customers in terms, for example, of potential additional revenues to the lender in the form of a purchase of additional products or the introduction of additional clients. More valuable customers can be offered a higher discount. Competition adjustments allow lenders to take into consideration existing market conditions with a price adjustment that makes sure that the final price is competitive. Whilst the latter is quite usual, the former is more difficult to estimate given the several difficulties that have to be faced when dealing with the estimation of future

cross- (or up-) selling opportunities or the evaluation of the value of new customers potentially introduced by the applicant.

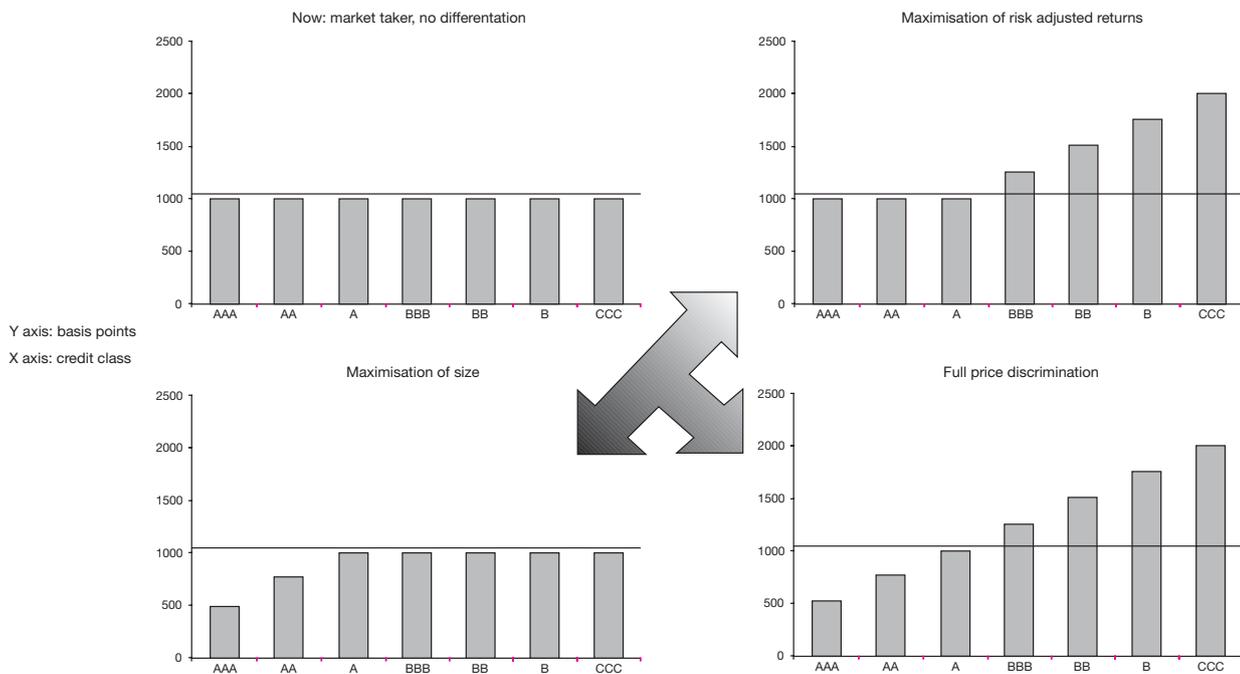
Given that under a risk-based pricing framework the price is more sensitive to risk, financial institutions adopting it can avoid the adverse selection effect. Adverse selection can affect lenders not applying risk-based pricing in a market where other lenders are. Higher risk customers will be offered higher rates by lenders operating a risk-based pricing strategy and will potentially migrate to those lenders offering a flat rate as this will offer them better value.

Flat rate lenders could then face a significant issue since, over a period of time, the profile of the portfolio could change with a lower proportion of good quality customers and an altered risk profile, which can significantly change the financial exposure of the organisation (as offered prices would be in fact more attractive to risky borrowers).

Another benefit of a quantitative RBP approach is that it allows for a differentiated set of strategies to be implemented. The following figure illustrates three possible strategies that can be adopted with a variable interest rate compared to a flat

pricing strategy. With no differentiation, the interest rate is independent of the risk of the applicant (denoted in the figure as AAA for the less risky, to the more risky CCC). By charging a lower interest rate to low risk applicants it is possible to improve the volume of applications (maximisation of size) while still being profitable. A maximisation of risk adjusted returns results in a flat price for the lower risk grades and an increase in price for the higher risk applicants. A combination of the two previous approaches results in a full price discrimination with a trade off between volume and profitability.

**Figure 3 – Implementation of different strategies for risk based pricing**



The adoption of risk-based pricing brings benefits not only to lenders but also to consumers. Lower risk consumers are rewarded for their good financial performance and can benefit from increased choice and competitive rates. For higher risk consumers, the gap between mainstream and alternative finance sources can be significant. Organisations that previously would not have lent to these high risk consumers are now lending at an appropriate price, so risk-based pricing brings more of the population into the mainstream lending process.

Some limitations of risk-based pricing arise from constraints set by regulators. One example is the need to advertise interest rates. In the UK, for example, lending organisations must give the advertised rate, or a better rate, to 66% of applicants. This is simple when using a flat rate; however it becomes much more difficult with risk-based pricing, where there needs to be accurate portfolio information to determine the advertised rate. Another example is caps on interest rates set by regulators. This means that if risk-based pricing is used there may need to be a cut-off level based

on interest rate, beyond which customers have to be declined.

Although the RBP practice is not without criticism, it allows lenders to set prices in an objective and transparent manner. This is very important in the subprime market where there are many concerns regarding fair lending. An objective assessment of client risk allows reputable lenders to offer fairly priced product to individuals who have difficulties in obtaining finance on standard terms and conditions. Serious lenders can therefore differentiate

themselves from predatory lenders [1] who instead attempt to make a profit in the subprime segment by:

- a) marketing loans explicitly at those in debt;
- b) offering loans with limited or no enquiries about income;
- c) being interested in the value of the collateral rather than the borrower's credit-worthiness ('equity lending');
- d) charging high brokers' or other advance fees;
- e) charging very high interest rates not commensurate with the real risk of the applicant;
- f) charging increasing interest when a loan is in arrears.

A key issue for the development of the subprime loan market is funding. While banks can raise money from savers to offer mortgage loans, smaller players, who may have no branch network, cannot rely on deposits to finance their lending. These institutions can raise funds for further lending by selling part of their loans (their assets) to institutional investors. This practice, called securitisation, is becoming more widely used for subprime lending. The credit risks are passed from the original lender to the institutional investor while the originator retains the loan servicing rights. An objective and consistent assessment of risk through quantitative analysis is therefore a key aspect of these transactions. This is particularly critical for the whole loan sale market. In a whole loan sale, an originator will sell a pool of loans directly to another institution, rather than through securitisation. The buyer pays an originator face value plus a premium for this pool. While in the US this type of fund raising is widespread, the European market has only recently reached a level of structuring sophistication and an understanding of fundamentals of the credit risk, liquidity, and relative value pricing to embrace the whole loan sales market [7]. A strong whole loan sales market is likely to be a key driver of growth for the European subprime mortgage market.

The evaluation of risk is a critical task for institutions purchasing subprime loans securities from other lenders. Purchasers

must assess all costs needed to service these assets and the expected losses that will impact on profits. Some subprime lenders, in fact, charge borrowers high up-front fees that allow them to originate a high volume of loans that include very high risk customers, and this can put purchasers at a disadvantage. Furthermore, subprime loans, especially those purchased from outside the institution's lending area, are particularly at risk of fraud or misrepresentation (ie, the quality of the loan may be lower than the loan documents indicate).

One issue not to be overlooked regards the impact of an economic downturn. Adverse macro economic conditions have a particularly relevant impact on the less financially stable subprime borrowers. However, mortgage products have developed considerably in the last decade, without related risks being tested in times of economic stress. The need for stress testing required in the Basel II framework is therefore particularly relevant for subprime lenders who should test the effect of economic downturns on the creditworthiness of their portfolio.

### Conclusions

There is a growing demand in Europe for higher risk mortgage products. This market offers many opportunities for profitability but it also involves considerable risk. Some prime and near prime lenders have already approached the market directly or through other companies they control or with which they have ad hoc agreements for the sale of subprime credit products. A quantitative approach to risk evaluation and more tailored pricing strategies can provide the competitive edge that will enable the first movers to acquire a dominant position in these markets.

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