

When Will Residential Mortgage Underwriting Come of Age?

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Abstract

Residential mortgage underwriting practice has serious shortcomings, including fixation on the present rather than the future. Accept-reject decisions reflect some unknown interaction among implicit macro projections, implicit micro projections, and implicit policy toward assuming risk, and there is no way to relate the decision process to its components. As a result, there is no satisfactory way for a lender to incorporate a particular macro-economic outlook into its underwriting standards. Further, different mortgage designs often carry markedly different degrees of risk. Most critically, accountability for underwriting decisions is obscured.

This paper proposes a fundamentally new approach to underwriting that makes full use of new technology. Under this approach, macro and micro projections of the future and the lender's policy toward risk are explicitly specified. The accept-reject decision is automatic and transparent. Each of the parties responsible for the components of underwriting decisions can be held accountable, with the underwriter responsible only for micro projections.

Introduction

Despite many pronouncements referring to new underwriting procedures, speedier decisions, and use of artificial intelligence, the essential characteristics of the underwriting process are little different today than before the technological revolution. Relative to what is now feasible, the process has serious shortcomings, including fixation on the present as opposed to the future, inconsistencies in standards between different mortgage designs, and (probably most important) lack of accountability. The decision process has been speeded up in recent years, but it has not been improved.

The industry could perhaps afford these deficiencies when real estate prices were steadily rising, defaults were few, and most loans remained in the portfolios of originators. In a world where bad underwriting decisions will not be bailed out by inflation and where the ultimate risk taker is further and further removed from the underwriter, the cost imposed by an ineffective system has become excessive.

This paper proposes a fundamentally new approach to underwriting that makes full use of the new technology. The first section conceptualizes the underwriting process in a world that has much better information than the world we know in order to delineate the essential features of an optimal system. The next section describes the way underwriting is actually done in the United States and identifies the basic shortcomings of the model. Later the paper explains why attempts to apply artificial intelligence to underwriting have so far met with little success. Finally the paper describes a proposed new approach to underwriting and how this approach deals with the shortcomings of the existing system.

Underwriting conceptualized

Underwriting is the process of assessing the riskiness of a proposed loan in the light of prior experience and making an accept-reject decision. It may also include, in cases of rejects, possible modification of the loan characteristics to a form that meets an acceptable level of risk.

In order to delineate the essential features of an optimal underwriting system, it is helpful to make some simplifying assumptions about default risk, and about the kind of information that is available to assess default risk. The assumptions are as follows:

1. The risk of a loan is entirely determined by the time path of the ratio of the loan balance to the property value. The loss associated with any balance/value path is assumed to be known.
2. The lender's economist can specify a complete set of time paths for house prices covering the region in which the subject property is located, and the probability of every such path.
3. The underwriter can specify a complete set of paths of deviation between the price of the subject house and the average price in the region, and the probability of every such path.
4. The time path of the loan balance is predetermined on all nonindexed loans. On indexed loans, the economist can specify a complete set of paths for the interest rate index to which the loan rate is tied, and the probability of every such path. This generates a complete set of paths of the adjustable-rate mortgage (ARM) loan balance, and the probability of every such path.

Given these assumptions, the expected loss on any individual loan expressed as a percentage of the original loan balance can be calculated by simulating every possible combination of regional price, parcel deviation, and rate index paths. The loss rate would be directly comparable with the default risk premium incorporated in the loan yield.

How would an efficiently managed lender make accept-reject decisions on individual applications in this kind of world? Given the projections and the calculated expected loss rate for a loan in question, the decision would be made automatically through the application of a policy-determined algorithm. If the lender was risk neutral, the algorithm would simply accept (reject) if the default risk premium that had been incorporated into the loan rate was more than (less than) the expected loss. If the lender was risk averse, the risk premium would have to be higher than the expected loss by an amount that would depend in part on the distribution of the possible outcomes as well as the mean. The algorithm would be more complicated in this case, but it would still be determined as a matter of firm policy, and once determined the decision in the individual case would be automatic.

To summarize, the following critical features of this decision process will be useful both as a benchmark for assessing existing underwriting practices and as a guide for developing a better approach:

1. Projections of the future are an explicit part of the underwriting decision process.
2. There are separate macro and micro projections, with the underwriter involved only in the latter.
3. The characteristics of the mortgage that bear on future loan balances (such as the rate, term, and repayment provisions) are an integral part of the projections.
4. Given the projections and the lender's required margin over the expected loss rate, which is policy determined, the accept-reject decision is automatic and transparent. Because the process is decomposable into three major components—macro projections, micro projections, and required yield margin—each of the parties responsible for the components can be held accountable.

The underwriter in particular is not a policy maker in the firm nor an expert in general economic forecasting. The underwriter's

expertise is in the prospects for the individual parcel, and the underwriter would be held accountable only for those prospects.

Traditional underwriting

In practice, underwriting in the United States is divided into two largely unrelated parts. The first part is the specification of qualification requirements, which are objectively definable standards that a borrower must meet to qualify for a loan. They include maximum and minimum loan amounts, maximum loan-to-value ratios, maximum housing expense-to-income ratios, the rate used in qualifying the borrower, maximum seller contributions, minimum income, and mortgage insurance requirements.

Qualification requirements are specified by the lender or by the investor to whom the lender intends to sell the loan. They are specified independently of the particulars of a loan transaction¹ and are largely outside the purview of individual underwriters, who take them as givens.²

The second part of the process is what is commonly referred to as “underwriting.” If a loan applicant meets the qualification requirements, a file is developed on the prospective borrower that contains information bearing on the riskiness of the transaction.³ The file includes information on the property, including an appraisal, a credit report on the borrower, and verification of information provided earlier by the borrower on income and assets. On the basis of the information in this file, the underwriter accepts or rejects the loan.

The separation between qualification and underwriting has two important advantages. First, borrowers quickly can be given a preliminary judgment regarding their acceptability while they await a final decision from the underwriter, which depends on completion of

¹ They may, however, include modifications for objectively definable categories of borrowers or properties. For example, the requirements may differ for properties in different areas, for condominiums as opposed to single-family houses, or for borrowers who are purchasing for investment as opposed to occupancy.

² A minor exception is that individual underwriters may have discretion to adjust maximum expense-to-income ratios if they can justify doing so.

³The process of collecting and collating this information is referred to as loan “processing.”

the required file of information. Second, the separation enhances the integrity of the system because the person doing the qualification is likely to profit personally if the loan goes through, while the underwriter will not.

On the other hand, traditional underwriting has some marked weaknesses relative to what is possible in the computer age. These weaknesses can be identified most clearly by comparing the process with the idealized version described earlier.

1. Projections of the future are not an explicit part of the process. Qualification requirements apply to conditions as they exist at the time of the loan application.⁴ The closest the underwriter comes to a projection is to judge that there are no compelling reasons to believe that the borrower's current income will not continue.
2. Since there are no explicit projections, the macro-micro distinction is completely obscured. Even if the firm wants to incorporate a macro outlook into its underwriting practices, there is no satisfactory way to do this.
3. Since qualification requirements are defined in terms of current values, different mortgage designs subject to the same qualification requirements may carry markedly different degrees of risk. Usually, adjustments in qualification requirements are not made to reflect these design differences until default experience dictates making them. A lot of money may be lost before these adjustments occur,⁵ and then there is no way to determine exactly how much of an adjustment is needed. Individual underwriters are not expected to consider mortgage design in their judgments at all.
4. The accept-reject decision is made by the underwriter, and it comes out of the proverbial black box. The decision reflects some unknown interactions among implicit macro projections, implicit micro projections, and implicit policy toward assuming risk.

⁴ An unimportant exception is that the payment rate used to qualify borrowers on some ARMs may reflect a prespecified future rate (such as the maximum possible rate at the first rate adjustment) rather than the initial rate.

⁵ The payment rate qualification rule on ARMs cited in the preceding note, for example, was not adopted until many years of default experience had indicated the folly of qualifying borrowers using the initial rate.

5. Because the underwriter's decision process cannot be separated into its components, accountability is obscured.

These deficiencies might be irrelevant in a world of continually rising real estate prices, or they might be irremediable in a world in which information was processed manually. It is generally recognized that neither of these worlds exists any longer, prompting the search for better approaches.

Some approaches to improved underwriting

There has been a great deal of dissatisfaction in the trade with the traditional approach to underwriting. But in contrast to the concerns voiced here, which focus on how decisions are reached and on the allocation of responsibilities for making these decisions, the prevailing dissatisfaction has focused on the time it takes to complete the underwriting process and on the high costs involved. Remedial efforts have thus focused on speeding up the flow of information and on automating the decision process. Whereas one can hardly quarrel with the former effort, automating a process that is so inherently flawed just makes no sense.

The approach to automated underwriting that seems to have attracted the greatest interest is artificial intelligence (AI). AI refers to the process of converting an evaluation decision process into a set of programmable algorithms so that a computer program will make the same decision as an expert given the same information. When Campbell Soups realized that the employee who had seasoned its tomato soup for 35 years would soon be retiring, it sat the employee down with a systems analyst and worked out a set of programmable rules that would allow a computer to replicate the process of determining exactly what seasonings were needed when.

The reason AI has no applicability to underwriting as it is presently constituted is that, unlike the Campbell's seasoner, whose decisions were validated by his superiors and by consumers for many years, *there are no demonstrably expert underwriters*. Given the existing approach to underwriting, there is no valid way to test an underwriter's performance! We can test knowledge, and we can test whether a neophyte's decisions are similar to those of a veteran, but we cannot know whether the veteran's judgments are any good because we do not know what "good" means.

As noted earlier, an underwriter's decisions under existing arrangements reflect some unknown interactions among implicit macro

projections, implicit micro projections, and implicit policy toward assuming risk. Because the components of the decision are not explicit, there is no way to evaluate them separately. To be sure, we can track the performance of approved loans, but that really does not tell us what we want to know. If the underwriter's loan file shows a low level of problem loans, he or she may have been the beneficiary of rising real estate prices or may have rejected too many loans. A high level of problems, in contrast, may have resulted from a deflation in house prices. We cannot fault the underwriter for this situation unless we expect him or her to forecast real estate prices, which makes no sense. Senior management may have faith in some of their senior underwriters, but the foundations of this faith lie elsewhere than in demonstrated success in underwriting.

Clearly, if we cannot define exactly what we mean by intelligent underwriting, we are going to have great difficulty teaching a computer how to do it.

Another approach toward automated underwriting

This section sets out an alternative approach toward automated underwriting that is a close approximation of the idealized version described earlier. It is easily implemented with current technology. But it requires lenders and investors to "bite the bullet" in terms of projecting the future.

Like the idealized version, the proposed system involves explicit macro and micro projections, with the underwriter responsible only for the latter. Furthermore, in both cases the characteristics of the mortgage that bear on default are an integral part of the projections, and the accept-reject decision is automatic once all the relevant information has been entered in the system.

There is one major difference, however. In the idealized version, it was assumed that the future could be defined in probabilistic terms, so that projections were strictly a technical exercise. In the proposed system, we must come to terms with the fact that we cannot define the future in this way, and therefore the projections must be part of the lender-investor's policy toward risk. Specifically, the lender-investor defines risk policy in terms of a set of maximum (or minimum) values of selected risk variables plus a set of macro projections. These factors will be considered in turn.

Table 1. Example of How Limiting Values of Risk Variables are Set

Balance/ Value	(Housing Expense)/Income	(Total Expense)/Income
95	26	33
90	28	35
85	31	39
80	38	46

Setting limiting values of risk variables

The limiting values of risk variables defined in the proposed approach resemble qualification requirements under the existing system, but there is an important difference. Under existing arrangements, the limiting values of risk variables are compared with actual values in month zero, whereas in the proposed approach they are also compared with projected values in every month thereafter until term.

An illustration of how limiting values of risk variables would be specified, covering three variables, is shown in table 1.

The requirements are defined as “and’s” among the rows and as “or’s” among the lines. That is, the loan must meet every requirement on the first line, or every requirement on the second, third, or fourth lines.⁶ Using an automated system, any number of ratios can be entered. The three shown above might be supplemented, for example, by the ratio of balance to adjusted value, in which some percentage of seller contributions is deducted from the appraised value, and the ratio of uninsured balance to value (or adjusted value) in which insurance coverage is deducted from the balance.

Structuring the limiting value of risk variables in this way captures the potential interaction of payment risk and property risk.

⁶ Sometimes qualification requirements are interpreted to mean that expense ratios are dependent on the initial loan-to-value ratio, but in fact no dependence is implied. Each line represents a set of mutually dependent requirements that must be met, and the loan flunks if it cannot meet all the requirements specified for any one of the lines.

Payment risk is the risk that the borrower at some point will be unable to meet the required payment. Property risk is the risk that at some point the value of the property will fall below the loan balance. The borrower's inability to meet the payment may not cause significant loss to the lender or insurer if the loan balance is amply covered by property value. Similarly, borrowers who can maintain their payments without strain may well continue to do so despite negative equity in their property.⁷ The greatest default risk is associated with an overlap of high property risk and high payment risk, and the method of specification shown above provides complete flexibility in accounting for this interaction.

Where would the actual limiting values come from? From the same places that qualification requirements come from: experience, intuition and "gut feelings" in the short run, and, it is hoped, from careful research on default experience in the long run.

Defining and quantifying scenarios

The crux of the underwriting system is a set of projections of future values of all the risk variables for which limiting values are set. The underlying premise is that what really matters is what happens to risk variables in the future.

The standard objection to this view is that current values can be established with some degree of certainty whereas projections are strictly guesswork.⁸ This statement is true, but the inference that guesses should be avoided does not follow. Since it is the future that is relevant, an informed guess about the future is better than certainty about the present. To argue otherwise is akin to arguing that the hunter should shoot at the tree rather than the deer because the tree is easier to hit.

Assumptions about the future cannot really be avoided, because that is where it is happening; loans rarely default in the first month. The refusal to make explicit projections is tantamount to

⁷ This situation reflects some combination of high transaction costs, lethargy, and disinclination to default on an obligation.

⁸ Another objection is that making projections over the entire life of a loan would be excessively costly. This might conceivably have been true at one time, but in the computer age it certainly is not true.

making implicit projections, which causes the underwriter to make macro forecasts of house prices and decide how much risk the lender should be taking. Since underwriters for the most part have tended to assume that house prices would rise in the future as they had in the past, the system worked well enough during the decades when the market was validating this assumption. It is not workable today.

Depending on the risk variables employed, projections probably will be needed for the following:⁹

1. Property value
2. Borrower income
3. Nonhousing debt
4. Taxes and insurance
5. Interest rates (for ARMS only)

Each of these projections has three components: definitions of alternative scenarios, quantification of each scenario, and selection of the particular scenario that will be used in the individual case. The lender-investor is responsible for the first two and the underwriter for the third.

Possible definitions of property value scenarios, for example, are shown in table 2.

An example of how these scenarios might be quantified is shown in table 3.

The same approach is used for borrower income, nonhousing debt, and taxes and insurance. For all of these, the underwriter has only the task of placing the transaction in the appropriate category, based on the particulars of the individual case. The underwriter does not even need to know the scenario magnitudes.

⁹The loan balance is not included because it is derivable from the characteristics of the loan.

Table 2. Property Value Scenarios

Individual Parcel Stability	Property Value Appreciation in Area		
	Average	Above Average	Below Average
Average	1	4	7
Above Average	2	5	8
Below Average	3	6	9

Table 3. Quantification of Several Hypothetical Property Value Scenarios

Scenario	Percent Change Per Year		
	First Year	Next 3 Years	Thereafter
1	1	-4	1
2	1	-2	1
3	1	-6	1
4	3	-8	3
5	3	-4	3
6	3	-12	3
7	0	-2	0
8	0	-1	0
9	0	-4	0

In quantifying any of these scenarios, the lender might use different numbers for different parts of the country. It would be plausible, for example, to incorporate greater variability in property value scenarios in regions that have enjoyed exceptionally high rates of appreciation.

In the case of ARMs, interest rate scenarios would be specified by the lender, reflecting a policy decision regarding the rate environment with which the lender believes borrowers should be able to cope. Only one scenario is needed, and the underwriter has no role. The lender might choose any of the following types of scenarios:

1. *No change.* The index rate to which each ARM is tied stays at the level prevailing at the time the loan commitment was made.

2. *Worst case.* The index rate rises to 100 percent in the second month, with the actual rate on the ARM determined by the rate caps on the particular instrument.
3. *Bad case.* The index rate rises according to some lender-defined scenario.
4. *Historical.* The index rate to which each ARM is tied changes from its start level according to the actual historical pattern of that particular index over a specified past period.

The role of the underwriter

Within this underwriting system the individual underwriter does not accept or reject loans. (An exception may be categorical rejections based on adverse credit reports, as noted below.) Neither does the underwriter make macro projections or decide how much risk the lender should assume. Rather, the underwriter operates within his or her expertise to select the appropriate category for each aspect of the transaction, where the categories have been defined.

Once these categorizations have been made, the computer projects all the risk variables, compares them every month with the limiting values specified by the lender, and if none of the limits has been breached, automatically approves the loan; otherwise the loan flunks.

If the loan flunks, the underwriter can ask the system to provide the data showing which risk variables were violated and when. With this information, the underwriter might decide to return the file to the loan officer, with suggestions as to how the loan might be recast so that it will pass. Recasting might involve, for example, buying down the rate, increasing the down payment, or shifting to another type of mortgage.

Nothing prevents the lender from giving the underwriter discretion to override a rejection decision made by the system. There is much to be said for allowing underwriters to raise maximum allowable expense-income ratios, for example, much as they can do now where circumstances warrant it. The logic of the automated system militates against such discretion, however.¹⁰ The objectivity of the

¹⁰The underwriter would retain discretion to overrule a favorable decision made by the system on the basis of an adverse credit report.

system would be better preserved if the underwriter classified the borrower's capacity to carry a housing expense burden, using standardized categories defined by the lender, *before the system made its decision*. The maximum allowable expense ratios might be adjusted according to a preset formula. For example, if the borrower's capacity to meet housing expenses was well above average, there would be a 4 percent adjustment to maximum allowable expense ratios. The adjustment would vary depending on the borrower's resources, so that a borrower with an above-average capacity to meet housing expenses would warrant a 2 percent adjustment in maximum expense ratios; borrowers with average capacity, no adjustment; and borrowers with below- or well below-average capacities, downward adjustments of minus 2 percent and minus 4 percent, respectively.

This approach to underwriting would enormously facilitate both the training of underwriters and the assessment of their performance. Each transaction would leave an objective trail of the underwriter's judgment on each of a number of features of the transaction that affect its risk. Each of these judgments is within the underwriter's expertise and is not contaminated by assumptions regarding macro developments or how much risk the lender should assume.

It remains the case that performance evaluations will involve subjecting the underwriter's judgment to what is presumably the better judgment of the evaluator. This is not as arbitrary as it sounds, however, because it is up to the lender-investor to define the general principles that the underwriter should employ in making the required categorizations, and it is up to the lender-investor (or agent) to determine how well this is being done.

Summary

This approach to underwriting incorporates all the critically important features of the model approach described earlier. Projections of the future are an explicit part of the underwriting decision process, with the lender-investor required to make relevant macro projections explicit. Underwriters would be required to make only the micro projections associated with the individual transactions, for which they could be held strictly accountable. The potential span of control exercised by secondary market purchasers could be expanded enormously.

The proposed system also provides consistency between different mortgage designs. Because limiting values of risk variables are defined in terms of projected future values, the implications of

alternative designs for future changes in these variables are automatically captured. A single set of requirements generates the same risk standard for all mortgage designs.

The proposed system may well eliminate the underwriter as a specialized type of employee. In the short run, the strict accountability provided by the system may make it possible to combine the underwriting function with the loan counseling function without fear of prejudicing the decision process.¹¹ In the long run, the categorizations for property value, borrower income, and the like that constitute the underwriting function could be automated as research revealed how different categorizations were related to different types of raw information in the file. Artificial intelligence could be applied to explain a spectrum of choices, separately for each of several aspects of the transaction. This application of AI has far better prospects for success than attempting to explain a single yes or no decision.

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¹¹ This would require that discretion be removed from the underwriter to make judgments about credit. This process could be automated from information provided by credit bureaus, and some lenders have already begun to do this. Merging underwriting and loan counseling using commissioned counselors should only be done with caution.