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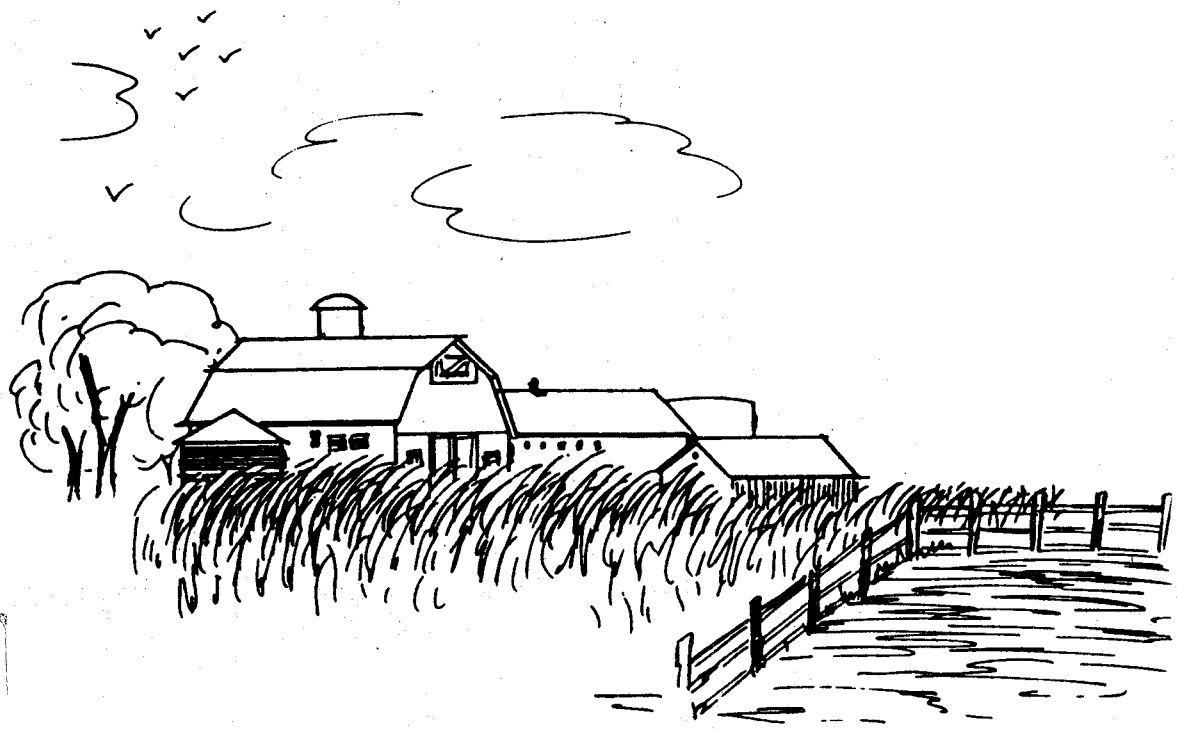

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METHODOLOGY IN ALLOWANCE FOR LOAN LOSS DETERMINATION

Martin Fischer and Glenn Pederson*

Generally accepted accounting principles (GAAP) require that an allowance for losses be established when (a) it is probable that an asset has been impaired, and (b) the amount of loss can be reasonably estimated. Concerning loan loss allowances for banks and other lenders, the 1983 Industry Audit Guide **Audits of Banks** states:

> A bank should maintain a reasonable allowance for loan losses applicable to all categories of loans through periodic charges to operating expenses. The amount of the provision can be considered reasonable when the allowance for loan losses, including the current provision, is considered by management to be adequate to cover estimated losses inherent in the loan portfolio [1, p.2].

Methods for estimating "losses inherent in the loan portfolio" are of great practical importance to lenders. A major challenge for the Farm Credit System (FCS) during the mid 1980s was to establish allowances in an environment where history and experience offered little useful evidence concerning the future level of loan losses. Elsewhere in the financial community, similar problems arose in connection with loans to developing countries and to energy-related sectors [2].

This paper addresses methodology in allowance for loan loss determination. Background issues relating to provision and allowance for losses in the FCS are reviewed, and impacts of FASB-15 accounting for restructured loans are discussed. A model of future loan losses of a Federal Land Bank (FLB) is developed. The model views future loan losses as a random variable, and yields estimates of the mean and variance of the distribution of future loan losses. The estimated mean of the probability distribution is presumably a reasonable estimate of "losses inherent in the loan portfolio." However, recognizing the uncertainty surrounding future losses, and in deference to the accounting principle of conservatism, management may prefer to establish an allowance in excess of the expected value of future losses. We propose that the allowance should be considered adequate if the probability that losses will exceed the allowance is acceptable (i.e., "small enough" for the comfort of management and auditors).

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Provision and Allowance Issues In the Farm Credit System 1/

The FCS has had considerable experience establishing allowances for losses in recent years. In 1985 and 1986, FCS incurred combined provisions for losses of $3.253 billion and $2.031 billion, respectively. These expenses were among the most visible factors underlying FCS net losses of $2.689 billion and $1.913 billion in those years. The flow of red ink stopped in 1987, as $184 million of prior years' provision expense was **reversed** (added back to income), and the FCS essentially broke even. The System has reversed $341 million of allowance through midyear 1988, and posted net income of $336 million. Provision for loss expense in the St. Paul District of the Farm Credit System paralleled the nationwide experience of FCS. The St. Paul District provision totalled $629 million in 1985 and $429 million in 1986, but in 1987 an $80 million reversal of provision expense occurred. Reversal of provision expenses continued in the St. Paul District in 1988, with reversals of $65 million taken through June 30.

The timing and magnitude of provision for loss has materially influenced the financial positions of system entities. Under Capital Preservation Agreements which existed prior to the third quarter of 1986, healthy System banks paid direct financial assistance to banks whose capital stock or participation certificates would otherwise have been impaired. Intra-system financial assistance accrued to $1.108 billion under these agreements between fourth quarter 1985 and third quarter 1986. Accrued assistance through the second quarter of 1986 was essentially cashed out by December 31, 1987. Financial assistance accrued in the third quarter of 1986 became the subject of several legal actions between contributing and receiving banks. One issue was that the financial viability of contributing banks could be jeopardized by providing assistance. Another issue was the "reasonableness" of provision for loss expenses accrued by recipients. Contributing banks did not wish to contribute if the provision expenses of recipient banks were excessive.

Ultimately, the Agricultural Credit Act of 1987 resolved the dispute over third quarter 1986 financial assistance: $415 million of payables accrued under the Capital Preservation Agreements in the third quarter of 1986 were assumed by the Financial Assistance Corporation (FAC). A $179 million assistance receivable accrued by the St. Paul Federal Land Bank in the latter half of 1986 was not cashed out by the FAC until July of 1988. If the St. Paul FLB had accrued its 1986 provision expenses in the first half of 1986 rather than the second half, it might have avoided contributing $70.8 million of assistance to other districts. It might also have received its assistance in cash at an earlier date. Clearly, the timing of provision expenses was important -- especially in 1986.

1/ This section is based on references [3] through [6].

Another issue relating to amounts paid under Capital Preservation Agreements is the treatment of negative provisions for loan losses (reversals) by receiving banks. Negative provisions could result in receiving banks being required to refund certain amounts previously received.

Allowances for loan losses are of interest to FCS banks and associations contemplating mergers. Depending on the particulars of the merger agreement, allowances for losses could influence the ownership interests -- and claims against future earnings or losses -- of banks and associations involved in mergers. One can envision a scenario in which overallowed bank "A" merges with bank "B" which is not overallowed. Future reversals of provision expense in the merged entity could benefit the former owners of bank B. Likewise, merger of an underallowed bank with another bank that is not underallowed could ulimately harm the stockholders of the latter bank.

Some FCS entities entered the era of "at risk stock" in a position of high leverage. Members of these entities may be concerned about the adequacy of existing allowances for loan losses, because loan losses in excess of existing allowances could result in loss of members' capital stock.

The FAC presumably takes an interest in allowances for loan losses when it evaluates requests for financial assistance. The amount of financial assistance provided to a recipient would likely depend on expected future charge-offs, provision expenses, and reversals -- in short, on the adequacy of the allowance for loan losses.

Allowance for loan losses was $2.567 billion or 4.8 percent of loan volume for the System on June 30, 1988. The St. Paul District had $453 million of allowance for loan loss or 6.9 percent of loan volume. Whether these allowances were inadequate, adequate, or excessive is of interest to borrowers, bondholders, the Financial Assistance Corporation, and management.

Impact of FASB-15

It is commonly understood that an allowance for loan losses is a reserve against future charge-offs of loan principal. However, in the present accounting and regulatory environment, FCS loan losses are more likely to be realized in the form of reduced future interest income than as charge-offs. This is especially true of restructured loans, which are accounted for under FASB-15, Standard No. 15 of the Financial Accounting Standards Board [8, Section 40].

Under FASB-15, a charge-off on a restructured loan would not be taken if the total of anticipated future cash receipts under the terms of the restructure agreement equals or exceeds the principal balance of the loan (provided that future cash receipts

are probable and reasonably estimable). A charge-off would be taken if anticipated future cash receipts are less than the principal balance.

Interest income on FASB-15 restructured loans is recognized at an effective rate which equates the present value of future cash receipts to the recorded (pre-restructure) principal. The effective rate is usually below market rates. For example, in the most common loan restructure circumstances in the St. Paul District, the borrower receives an interest rate concession and/or foregiveness of principal. Anticipated future payments under the terms of the restructure typically exceed the pre-restructure principal balance, so zero charge-offs are taken. The effective interest rate, however, is commonly reduced to between 8 and 9 percent, which is 2 or 3 percentage points less than normal lending rates.

The loss of future interest income on restructured loans is clearly a "loan loss" in an economic sense. Likewise, the value of a restructured loan is clearly impaired when its effective yield is reduced below market interest rates. The following issue needs to be debated and resolved: What should be included in management's estimate of "losses inherent in the loan portfolio?" Should allowance for loan losses cover only anticipated charge-offs, or, should reductions in future interest revenue below market levels on restructured loans also be covered?

The Agricultural Credit Act of 1987 requires the FCS to restructure loans when restructuring is less costly than foreclosure. Regulations of the Farm Credit Administration require FCS to use FASB-15 on restructured loans. Charge-offs within the FCS could therefore be considerably smaller than was anticipated when existing allowances were established. Resolution of the allowance cum FASB-15 issue would seem imperative if consistent allowance for loss methods and interpretations are to be achieved among FCS entities.

Existing Allowance Methods

Existing allowance methods used by FCS entities are compatible with methods described in a study by the AICPA, **Auditing the Allowance for Credit Losses of Banks** [1]. While non-authoritative, the study offers practical advice on establishing allowances. Allowances are comprised of two parts: (1) A specific portion, which covers losses on specific loans, pools, or categories of loans, and (2) a general portion, to cover losses inherent in the portfolio which are not specifically identified or allowed for.

In the St. Paul FLB, specific allowances have been established loan-by-loan on all loans classified nonaccrual, vulnerable, or loss. The specific allowance is determined as follows:2/

$$(1)\quad \text{Specific allowance} = \text{loan amount} - \left[\text{collateral value} - \text{selling costs}\right]$$

$$\text{if} > 0, \text{ otherwise} = 0$$

In essence, this procedure assumes a probability of loss equal to 1.0 on all nonaccrual, vulnerable, and loss loans, and a probability of loss equal to zero on other classes of loans. Furthermore, the procedure values collateral at its current value, so no consideration is given to the probability of alternative collateral value scenarios.

Besides the specific allowance, a general allowance is maintained against such contingencies as land value decreases, portfolio quality deterioration, and other risks theoretically not covered by the specific allowance.

If specific allowance understates the needed total allowance, this can be "corrected" by increasing general allowance. However, the reverse is not true: Too large of a specific allowance cannot be offset by a negative general allowance. In any case, one cannot know what "corrections" to the specific allowance are needed without first knowing how large the total allowance needs to be. In this regard, the ongoing debate about what constitutes a specific versus general allowance seems rather pedantic, and the effort devoted to "general" versus "specific" allowance for loss determination may be excessive. The real issue remains: How large should the total allowance be?

Model

The model presented here was developed and applied to the St. Paul FLB using December 1987 data. At that time the allowance was interpreted as covering future charge-offs only. Accordingly, "loan losses" are interpreted as charge-offs.

2/ Subsequent changes in the credit classification system necessitated changes in the procedure. Nevertheless, essentially all loans that were nonaccrual, vulnerable, or loss at the time of conversion to the new credit classification system had a specific allowance calculated as in (1) as of December 31, 1987. During 1987, a feature was added which permitted loan officers to assign a "factor" between zero and one to a loan for purposes of establishing specific allowances. Assigning a factor of 0.5, for example, causes the allowance to be established at half the amount given by (1). Allowance factors have been left at zero or one on nearly all loans.

Commodity market conditions, government policies, weather, management decisions of the FLB (restructure versus foreclosure), accounting rules, and the quality of the loan portfolio will influence future loan losses of an FLB. Many of these factors are interrelated, so the underlying process through which loan losses are generated is complex. Our model provides a simplified representation of this complex process. We view loan losses as dependent on future land values, credit quality, and loss exposure.

We assume that loan losses will depend on farmland values, which are an indicator of (and proxy for) general economic conditions in the farm sector. Losses depend on land values in two ways. First, the FLB's "loss exposure" (defined below) depends directly upon land values. Second, because of the presumed relationship between land values and farm sector economic conditions, the probability of a loss occuring (or, "loss rate") on loans of a particular quality depends on land values. For example, a strong farm economy with higher land values may result in a lower probability of loss, but a weak farm economy with lower land values will likely result in a higher probability of loss.

Changes in farmland values vary regionally, reflecting differences in commodity mix and nonfarm influences. For example, the St. Paul District has different views of the outlook for dairy land versus corn/soybean land. Future land values in each of the 23 service centers (territories) of the St. Paul District are underlying random variables in the model.

Credit quality of the existing portfolio is expected to influence future loan losses. The model assumes that the probability that a particular loan will fail depends on its current classification, and on future conditions in the farm economy (as manifested in land values). The probability of a loss is lower on better quality loans. For loans of a particular current quality, the probability of a loss increases if land values decrease.

The St. Paul FLB portfolio consists of a large number of loans, so it is neither practical nor desirable to identify probabilities of default on a loan-by-loan basis. Instead, loans are grouped into 12 discrete credit quality categories. The conditional probability of loan failure given land values is assumed identical for all loans within each category. The credit quality categories are as follows:3/

3/ Penetration refers to the ratio of loan amount to collateral value. Accruing loans are either performing, restructured, or high risk. A high risk accruing loan is one that is either delinquent or highly penetrated, or for which the borrower is current but has questionable repayment capacity.

1)	Accruing Performing	≤100%	penetrated
2)	Accruing Performing	>100%	penetrated
3)	Accruing Restructured	≤100%	penetrated
4)	Accruing Restructured	>100%	penetrated
5)	Accruing High Risk	≤100%	penetrated
6)	Accruing High Risk	>100%	penetrated
7)	Nonaccruing Unrestructured	≤100%	penetrated
8)	Nonaccruing Unrestructured	>100%	penetrated
9)	Nonaccruing Restructured	≤100%	penetrated
10)	Nonaccruing Restructured	>100%	penetrated
11)	Nonaccruing Unrestructured Cash Flag	≤100%	penetrated
12)	Nonaccruing Unrestructured Cash Flag	>100%	penetrated

Loss exposure (z) on a loan is defined as the loss that would be incurred under default, foreclosure, and acquisition and disposal of collateral by the FLB. It is calculated as follows:

$$(2)\quad z = \text{loan amount} - (\text{collateral value} - \text{selling costs})$$
$$\text{if } > 0, \text{ otherwise} = 0$$

Loss exposure is computed loan-by-loan for eight alternative land value scenarios by valuing collateral at 80, 85, 90, ... 115 percent of current value. Selling costs are estimated at 10 percent of collateral value. This yields a conservative measure of loss exposure for given land values.

Table 1 shows estimated loss exposure for the St. Paul FLB as of December 31, 1987. Aggregate loss exposure (Z) is shown for 8 land value scenarios and for 12 loan categories. Total loss exposure ranges from $978.6 million if collateral is valued at 80 percent of current value to $332.3 million if collateral is

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A loan is placed in nonaccrual status if any portion of the loan is believed not fully collectible with respect to principal and/or interest according to its original or restructured terms. Nonaccrual unrestructured cash flag loans are loans on which payments unexpectedly continued after the loan was placed in nonaccrual status, and a reassessment shows the loan is likely to be collected. This is a temporary status.

valued at 115 percent of current value. When collateral is valued at (100 percent of) December 1987 value, loss exposure is $521.3 million. Of this loss exposure, $208 million is on highly penetrated performing accruing loans, and $138 million is on highly penetrated high risk accruing loans.

Conditional expected loss for a loan in a particular quality category, given land values, is simply the conditional probability of loss for loans in that category, multiplied by the loss exposure on the loan under the particular land value scenario.

$$(3) \quad E(loss_i|v) = PL_{c|v} \cdot z_{iv} \qquad i \varepsilon c$$

where $E(loss_i|v)$ = expected loss on loan i given land value scenario v.

$PL_{c|v}$ = probability of a loss occurring on category c loans given land value scenario v.

z_{iv} = loss exposure on loan i under land value scenario v.

The expected loss on the loan is the weighted sum of conditional expected losses across land value scenarios (the weights being the probabilities of the various land value scenarios):

$$(4) \quad E(loss_i) = \Sigma_v \; P_v \; . \; E(loss_i|v)$$

where $E(loss_i)$ is unconditional expected loss on loan i and P_v is probability of land value scenario v.4/

In estimating expected losses for the St. Paul FLB, subjective conditional probabilities of loss were provided by the Vice Presidents of Audit and Reviews, and by the Director of Special Assets, resulting in three sets of conditional probabilities. In the interest of conservatism in estimating expected losses, the largest conditional probability (of the three probabilities provided for each category and land value scenario) was used for estimation.

Managing appraisers provided subjective probability distributions for land values three years into the future for 23 territories in the St. Paul District. Another set of territory specific land value probability distributions was

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4/ Expected losses can be summed by category or territory to determine expected losses for any category or territory.

provided by the district senior appraisers. The land value distribution having the lowest mean value was used in subsequent estimations in the interest of conservatism. The district-wide volume-weighted expected change in land values was -1.99 percent. The volume-weighted subjective probability of a negative change in land values was .401.

District-wide loan losses are the sum of losses in each territory. The variance of loan losses for the entire district is

$$(5) \qquad VAR(L) = \Sigma_i \Sigma_j \; r_{ij} \; SD(loss_i) \; SD(loss_j)$$

where i and j are subscripts for territories, r is correlation between loan losses in territories i and j, and SD(loss) is standard deviation of loss. Because of joint dependence of losses in each territory on similar underlying economic phenomenon (government policy, commodity prices, exchange rates, etc.), the correlation of loan losses between territories is expected to be high. However, differences in commodity concentration and other portfolio characteristics between territories would result in less than perfect correlation in losses between territories. A correlation of .75 was assumed in the St. Paul application.

Estimates of standard deviations of losses within territories were obtained by assuming that conditional losses (losses in given land value scenarios) for service centers are known, i.e., have zero variance. Under the assumptions of the model, the only variability in conditional losses would be due to different specific loans failing. Simulations in which different loans were randomly chosen to fail showed minor variability due to different specific loans failing. The number of loans is large enough -- 65,000 -- that conditional loan loss has a tight distribution.

The assumption of zero variance in conditional losses is expected to have a minor impact on the estimate of variance. The assumption implies the following:

$$VAR(L_t) = \Sigma_v P_{vt} \cdot [Loss_{tv} - E(Loss_t)]^2$$

where t is a subscript for territory and P_{vt} is probability of land value scenario v in territory t.

Application of Chebyshev's Theorem

Using the estimated mean and variance from the probability distribution of future loan losses, Chebyshev's Theorem may be invoked to provide upper bound estimates of the probabilities of losses exceeding various amounts. Chebyshev's Theorem states:

> If μ and σ are, respectively, the mean and the standard deviation of the distribution of the random variable x, then for any positive constant k the probability that x will take on a value which is at most $\mu - k\sigma$ or at least $\mu + k\sigma$ is less than or equal to $1/k^2$ [7, p. 149].

If the probability of losses exceeding the existing allowance is "too large" ("too small"), then the FLB may be considered underallowed (overallowed).

Summary and Conclusions

In recent years, the size and timing of provisions for loan losses have dramatically affected the financial performance of FCS entities. Substantial allowances remain as a reserve against future loan losses. Whether these allowances are adequate, inadequate, or excessive is of concern to regulators, borrowers, bondholders, the Financial Assistance Corporation, and management.

In large measure, the adequacy of existing allowances depends on how FASB-15 is interpreted and applied. FASB-15 changes the way losses are realized on restructured loans. Instead of taking losses immediately in the form of charge-offs when the loss is known, FASB-15 allows losses on restructured loans to be spread over the life of the loan and realized in the form of reduced interest income. Should the allowance for loan losses cover only charge-offs, or should the losses of interest income on restructured loans be covered as well? The principle of conservatism in stating assets on the balance sheet would seem to argue for allowances covering future losses of interest income on restructured loans, because the value of these assets is impaired. Common understanding, however, is that the allowance should cover only future charge-offs.

Besides FASB-15, future losses of the FCS will depend on economic conditions in the farm sector, the quality of existing loans, and collateral values. A model was developed for characterizing the probability distribution of future losses of an FLB. The model yields estimates of the mean and variance of the distribution of losses. Using Chebyshev's Theorem, upper-bound estimates of the probability that losses will exceed the allowance are derived.

The model requires probabilities of loss, and of future land value scenarios. These are necessarily subjective and leave results open to challenges regarding these parameters. However, any allowance method uses parameters which are subjective and open to the same criticism. We believe that by relying on credit, review, and appraisal experts to provide these probabilities and using the most conservative

probabilities provided, the method generated reasonable estimates of expected loss, the variance of loss, and the probability of losses in excess of the St. Paul FLB's allowance.

We conclude with a plea for adoption of consistent methods for setting allowances for losses. Consistency in allowance methods is imperative if interested parties are to have confidence that allowances of System entities have a similar interpretation.

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Table 1 - Loss Exposure - Z Value - With Collateral Valued at 80 to 115 Percent of Current Value in Increments of 5 Percent, St. Paul Federal Land Bank

December 31, 1987

*** Key for Loan Categories *** a/

1 = Accruing Performing < 100% Penetrated
2 = Accruing Performing => 100% Penetrated
3 = Accruing Restuctured < 100% Penetrated
4 = Accruing Restructured => 100% Penetrated
5 = Accruing High Risk < 100% Penetrated
6 = Accruing High Risk => 100% Penetrated
7 = Nonaccruing Unrestructured < 100% Penetrated
8 = Nonaccruing Unrestructured => 100% Penetrated
9 = Nonaccruing Restructured < 100% Penetrated
10 = Nonaccruing Restructured => 100% Penetrated
11 = Nonaccruing Cash Flag < 100% Penetrated
12 = Nonaccruing Cash Flag => 100% Penetrated

Category	Z80	Z85	Z90	Z95	Z100	Z105	Z110	Z115
				(Million Dollars)				
01	119.8	79.5	48.5	26.4	11.6	3.2	0.0	0.0
02	284.6	265.5	246.3	227.2	208.0	188.9	169.7	151.8
03	31.5	22.6	15.0	8.7	3.9	1.1	0.0	0.0
04	83.6	76.7	69.9	63.1	56.3	49.5	42.6	36.2
05	55.4	39.1	25.3	14.5	6.6	1.8	0.0	0.0
06	205.6	188.9	172.1	155.4	138.7	121.9	105.2	89.2
07	35.9	26.4	18.1	11.1	5.5	1.7	0.0	0.0
08	62.8	57.1	51.5	45.8	40.2	34.5	28.9	23.8
09	26.8	18.6	11.8	6.6	3.0	0.9	0.0	0.0
10	58.0	53.4	48.9	44.4	39.9	35.4	30.9	26.7
11	4.5	3.0	1.9	1.0	0.5	0.1	0.0	0.0
12	10.3	9.5	8.7	7.9	7.1	6.3	5.5	4.8
	978.7	840.5	718.1	612.1	521.3	445.4	383.1	332.3

a/ Penetration equals loan amount/collateral value