

The Quarterly Review Of Interest Rate Risk

Office of Supervision,
Economic Analysis Division



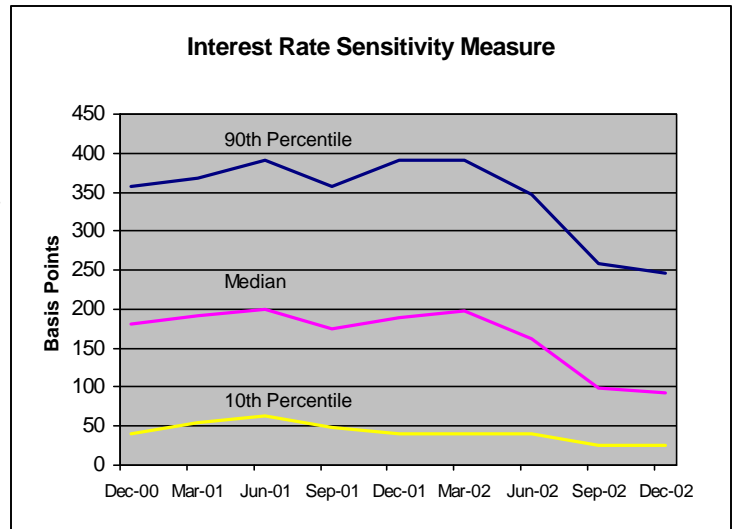
Special points of interest:

- 30-yr mortgage rate flat
- Yield curve steepens in fourth quarter
- Fourth quarter median interest rate sensitivity remains stable
- Asset duration falls slightly
- Feature Article on Mortgage Banking and OTS's Net Portfolio Value Model

Median Sensitivity Remains Stable in the Fourth Quarter

Median thrift sensitivity remained relatively unchanged, improving to 93 basis points in the fourth quarter, from 95 basis points in September. This slight improvement reflects the net effect of a fall in short-term interest rates coupled with an increase in long-term interest rates in the fourth quarter.

Both the median pre-shock and post-shock Net Portfolio Value (NPV) ratios fell in the fourth quarter. The number of thrifts with significant risk rose to two, up from one thrift in the previous quarter.



(See details inside, starting on page 4.)

Mortgage Banking and OTS's Net Portfolio Value Model

With mortgage rates remaining at historically low levels for the past several quarters, borrowers have been refinancing their existing higher-coupon mortgage loans at a record pace. Needless to say, business is booming at financial institutions, such as thrifts, that specialize in mortgage banking.

Of course, along with this dramatic surge in refinancing activity precipitated by the persistent low-rate environment comes a host of concerns that thrifts must address, chief among them being interest rate risk.

OTS's Net Portfolio Value (NPV) Model provides important insight into how

well thrifts manage the interest rate risk associated with their mortgage banking activities, given that the various exposures are accurately reported on Schedule CMR.

Our experience, however, suggests that this does not always happen. Many of the CMR reporting errors stem from a fundamental misunderstanding of how the NPV model values mortgage-banking exposures.

As pointed out in the feature article of the previous issue of the *Quarterly Review of Interest Rate Risk*, the development of negative duration gaps is to be expected at typical traditional thrifts during a protracted

period of declining interest rates. In order to correctly measure the sign and size of duration gaps and sensitivity measures at thrifts, it is important that all exposures associated with mortgage-banking activity be correctly reported on Schedule CMR.

This is particularly true in the current historically low interest rate environment and given the record pace of mortgage refinancing activity.

Mortgage Banking

Mortgage banking involves the buying, selling,

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Mortgage Banking and OTS's Net Portfolio Value Model (continued)

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originating, and servicing of mortgage loans. These loans are secured by either residential or commercial real estate. Such activities result in off-balance sheet contracts which generate exposures that thrifts must consider when evaluating their overall interest rate risk exposure.

The NPV Model provides valuations for each of these off-balance sheet positions, but the valuation process for each exposure varies depending on the nature of the particular financial instrument.

Many thrifts have chosen to undertake mortgage banking activities as a profitable addition to their mortgage portfolio lending activity. This has been particularly true recently with the tremendous surge in refinancings by homeowners as interest rates have continued to fall during the past two years.

By originating all or some of their mortgages, thrifts can increase profits from additional fee income, thereby reducing dependence on portfolio spreads for earnings.

The move into mortgage banking, however, can present a host of risks for thrifts. Thrifts heavily engaged in mortgage banking activities must confront pipeline risk, prepayment risk, operational cost risk, operational flexibility risk, and liquidity risk.

Pipeline risk refers to the interest rate risk that a thrift confronts from the time of locking in the interest rate on a mortgage

in the pipeline and the time the mortgage is sold in the secondary market.

Prepayment risk involves the danger that servicing will pay off before expected, resulting in unamortized mortgage servicing assets that must be partially or fully charged off. In addition, rapid prepayments reduce the amount of servicing fee income and the market value of originated mortgage servicing rights or retained servicing.

Operational cost risk is the risk that servicing expenses will rise faster than expected, producing a decline in income and possible long-term losses.

Operational flexibility risk refers to the risk inherent in allocating a large percentage of a thrift's resources to mortgage origination or servicing during cyclical downturns in such activities. It also refers to the risk of structuring operating costs with overhead costs that cannot be lowered as readily as variable costs.

Finally, liquidity risk is the risk that, as depositors demand the withdrawal of funds, a thrift may have insufficient liquid resources on hand. As a result, the thrift may be forced to make a quick sale of relatively illiquid assets on which it might be forced to accept a discount.

Originating Mortgages

In the mortgage origination process, when a thrift agrees to make a mortgage loan, it undertakes what is known as a loan commitment. This

commitment obligates the thrift to loan the potential borrower a specific amount of money at a particular interest rate within a certain period of time.

In the mortgage industry, these commitments are commonly referred to as rate locks. In order to provide correct valuations using the NPV Model, the thrift must correctly report whether these positions are optional or firm commitments to originate mortgages. Both types of commitments are used in originating either fixed-rate or adjustable-rate mortgages.

By definition, an optional commitment to originate a mortgage is one where the borrower does not incur a penalty for failing to take the loan. That is, an optional commitment provides the potential borrower with the option not to close on the mortgage.

In contrast, with a firm commitment to originate a mortgage, the potential borrower incurs a substantial penalty for failing to take the loan. In this case, the potential borrower has an obligation to close on the mortgage, and it is expensive for the borrower to exercise the option not to close.

Generally speaking, if a thrift collects a non-refundable application fee from the borrower prior to closing on the loan, the commitment is classified as a firm commitment to originate a mortgage; otherwise, it is considered an optional commitment to originate a mortgage.

The terminology asso-

ciated with these instruments is standard in mortgage banking parlance. With both optional and firm commitments, it is, of course, the lender that has the commitment to originate a mortgage.

Valuing Firm Commitments to Originate Mortgages

The process for valuing firm commitments to originate mortgages is straightforward in the NPV Model. Using the aggregation rules specified in the CMR instructions, thrifts must report the type of firm commitment to originate (e.g., a 30-year, fixed-rate mortgage), the total notional value of all firm commitments of the particular type (i.e., the aggregate loan amount) the weighted-average coupon, and the total amount of fees collected in connection with the transaction.

Fees are generally limited to discount points and origination fees, and do not include fees for such items as applications and appraisals.

With this information, the NPV Model then uses a two-step process to value the exposure of the firm-commitments to originate mortgages.

First, the model calculates the value of the underlying mortgage loan in the base case interest rate scenario and in each of the alternative interest rate scenarios, assuming a cost-of-carry of 10 basis points.

The Model then compares this value to the ag-

(Continued on page 3)

Mortgage Banking and OTS's Net Portfolio Value Model (continued)

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gregate loan balance reported on Schedule CMR for the firm commitments plus all fees collected in connection with the transaction less 40 basis points for each loan. (The NPV Model currently assumes that it costs 40 basis points to originate a mortgage loan.)

It should be pointed out that in valuing firm commitments to originate mortgages, the NPV Model assumes that changes in interest rates have no effect on the aggregate notional mortgage loan balance. That is, it is assumed that all mortgage loans close, and that there is no fall-out of these loans from the mortgage pipeline.

Firm commitments to originate mortgages are reported in the Off-Balance Sheet section of Schedule CMR using contract codes from 2202 to 2216. See the *Thrift Financial Report Instruction Manual* for details.

Valuing Optional Commitments to Originate Mortgages

In the OTS NPV Model, the valuation of optional commitments to originate mortgages is somewhat more complicated than the valuation of that for valuing firm commitments to originate.

This is because the Model uses a two-step process to estimate the fall-out rate. The fall-out rate is the degree to which mortgages in the pipeline do not go to closure. The largest contributing factor to fall-out is

generally considered to be changes in interest rates.

First, the NPV Model assumes that 15 percent of the notional mortgage loan balance is insensitive to rate changes because potential borrowers are so close to final loan approval. For this mortgage loan balance, the NPV Model assumes a closure rate of 93 percent.

The NPV Model then assumes that the remaining 85 percent of the notional mortgage loan balance is rate-sensitive, and to this balance it applies a closure rate that varies from 64.1 percent in the negative interest rate shock scenarios to 78.9 percent in the positive interest rate shock scenarios.

Once pipeline fall-out rates have been calculated, the NPV Model uses a process for valuing the exposure of optional commitments to originate that is similar to that for valuing firm commitments to originate mortgages.

Optional commitments to originate mortgages are reported in the Off-Balance Sheet section of Schedule CMR using contract codes from 1002 to 1016. See the *Thrift Financial Report Instruction Manual* for details.

Valuing Firm Commitments to Purchase or Sell Mortgages and MBS

Other firm-commitment contracts include firm commitments to purchase or sell mortgages and mortgage-backed securities (MBS). The exposures associated

with these contracts are valued in the NPV Model using a slightly modified version of the process described above for firm commitments to originate mortgages.

The only difference in the two valuations is the cost assumption. Firm commitments to buy and sell mortgage loans and MBS do not include a cost to originate of 40 basis points.

Firm commitments to purchase or sell mortgages are reported in the Off-Balance Sheet section of Schedule CMR using contract codes 2002 through 2036 (with servicing rights retained) and contract codes 2102 through 2136 (with servicing rights released). Firm commitments to purchase or sell MBS are reported using contract codes 2042 through 2076. See the *Thrift Financial Report Instruction Manual* for details.

Valuing Optional Commitments to Purchase or Sell Mortgages and MBS

Finally, we turn our attention to optional commitments to purchase and sell mortgages and MBS. These contracts have been the source of considerable confusion to many CMR filers during the past several quarters owing to the substantial increase in mortgage refinancing activity.

Often these transactions involve arrangements where a thrift has agreed either to purchase from a correspondent lender, or to sell to a third

party such as Freddie Mac, a specific number of mortgages on a specified date using so-called best efforts delivery arrangements.

The process for valuing these exposures in the NPV model is fundamentally different from that used for firm commitments to purchase and sell mortgages and MBS. In short, the NPV Model considers these exposures as options and values them using the Black model, a variation of the Black-Scholes option-pricing model.

The NPV Model provides assumed values for most of the inputs for the option-pricing model. On Schedule CMR, thrifts simply report the particular contract code for the optional commitment, the specified interest rate, the agreed upon price, and when the optional commitment expires.

When dealing with optional commitments to buy and sell mortgages and MBS, thrifts should not make any adjustments for expected fall-out from the mortgage pipeline.

It should be stressed that the key to obtaining the correct value for the exposure associated with these optional commitments is to correctly report the contract code on CMR. The contract code specifies who actually holds the option in exercising an optional commitment to purchase or sell the mortgages or MBS. For example, consider the situation where a particular thrift has agreed to purchase a

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Mortgage Banking and OTS's Net Portfolio Value Model (continued)

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specified amount of 30-year, fixed-rate mortgage loans from a correspondent lender within a specified period of time using best efforts.

In this case, the thrift has actually sold an option to the correspondent lender to sell mortgages to the thrift. That is, it is the correspondent lender who holds the option. The thrift has an obligation to purchase, should the correspondent lender exercise its option to sell.

It should be noted that the pricing of a best-efforts optional commitment to purchase or sell mortgages and MBS is not the same as the pricing of a firm commitment to purchase or sell mortgages and MBS. The difference in price reflects the cost of the option.

According to the CMR instructions, this optional commitment position

should be reported on Schedule CMR using contract code 3074, which is a short option to sell mortgages. Identifying the contract in this manner might seem counter-intuitive to those not accustomed to thinking of their mortgage-banking exposures in terms of option pricing theory.

Optional commitments to purchase or sell mortgages and MBS are reported in the Off-Balance Sheet section of Schedule CMR using contract codes that specify whether the thrift has a long or a short position in the optional commitment.

These positions are reported using contract codes 3002 through 2076 depending on the option position. See the *Thrift Financial Report Instruction Manual* for details.

Summary

It is hoped that this discussion of the NPV Model's valuation of mortgage banking positions will increase the accuracy of CMR reporting, and hence, the accuracy of its results. More importantly, it also should improve the overall quality of the interest rate exposure measures produced by the NPV Model and reported back to the institutions.

Other questions related to mortgage banking can be answered by referring to Chapter 7 of the *NPV Model Manual*. In addition, the Economic Analysis Division has just published a release, *Common Reporting Errors on Schedule CMR*. This document discusses many of the most common Schedule CMR reporting errors and how to avoid making them.

Interested readers can obtain a copy from the OTS web site at www.ots.treas.gov in the Risk Management documents section.

Median Sensitivity Remains Stable in the Fourth Quarter (continued)

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Treasury rates fell for shorter-term maturities, but rose for longer-term maturities. Short-term rates for maturities of about three years or less fell, while rates for maturities greater than three years rose in the fourth quarter.

The Federal Reserve cut the federal funds rate by 50 basis points, down to 1.25 percent, in November 2002. The combination of short-term and long-term rate changes in the fourth quarter produced a more steeply sloped yield curve. The 30-year mortgage rate de-

clined to 5.93 percent at the end of the fourth quarter from 5.98 percent in the previous quarter.

The twisting of the yield curve at the three-year point affected thrift profitability. Profitability remained healthy for the industry; however, the average return on assets (ROA) fell slightly to 1.20 percent in the fourth quarter from the record 1.22 percent in the prior quarter. ROA is a key measure of profitability.

Although short-term rates fell and long-term rates rose, average net interest margin fell from 302 basis points in Sep-

tember to 295 basis points in December. This occurred because the declines in yields on repricing shorter-term assets exceeded the declines in funding costs of repricing shorter-term liabilities. Median net interest margin also declined, falling from 320 basis points in the third quarter to 313 basis points in the fourth quarter.

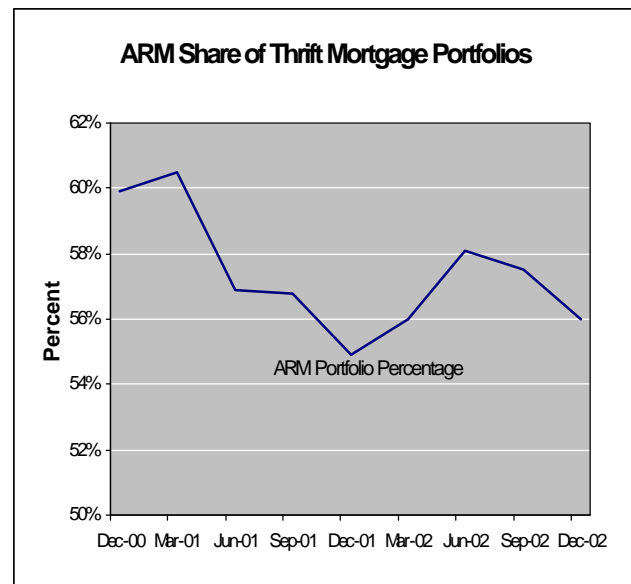
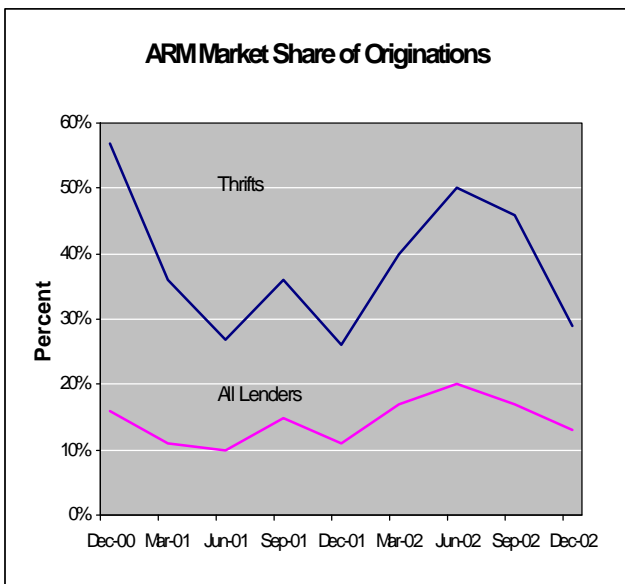
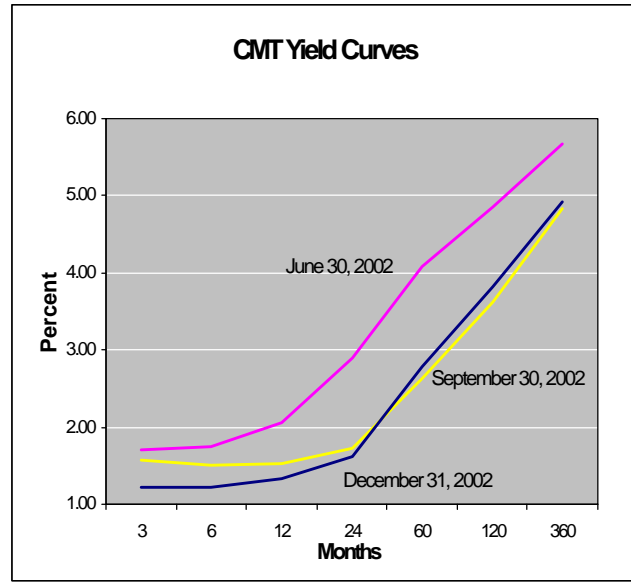
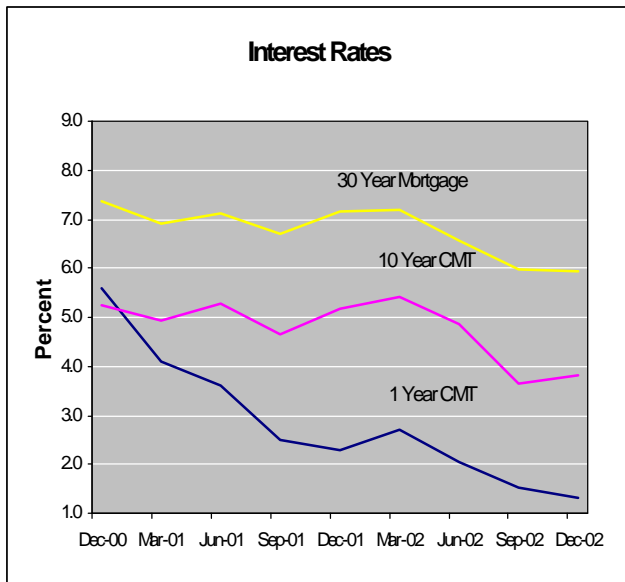
Aggregate thrift industry earnings were \$2.97 billion in the fourth quarter, remaining unchanged from the third quarter. While the net interest margin compressed in the fourth quarter,

earnings continued to remain strong and were unchanged in the fourth quarter. This was due to increases in income from sources unrelated to interest rates, such as retail banking fees, mutual fund and annuity sales commissions, and loan servicing income from nonmortgage loans.

The ARM share of total thrift mortgage originations fell to 29 percent, down from 46 percent in the prior quarter. Along with the relative fall in ARM originations, the ARM share of total 1-4 family mortgages held in

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Interest Rates and ARM Market Share



Median Sensitivity Remains Stable in the Fourth Quarter (continued)

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 portfolio fell to 56 percent from 57.5 percent in the third quarter. The fourth quarter saw mortgage originations rise due to a higher rate of refinancings. Fourth-quarter 1-4 family mortgage originations by thrifts stood at a record level of \$159.1 billion, up from \$122.4 billion in the third quarter. Total mort-

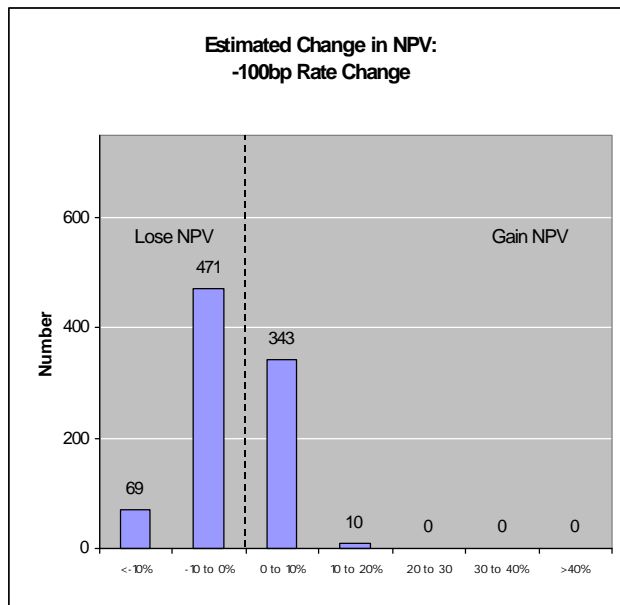
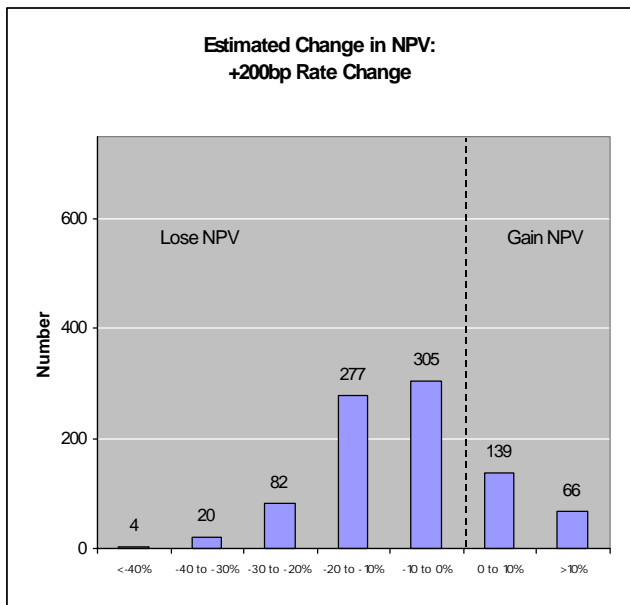
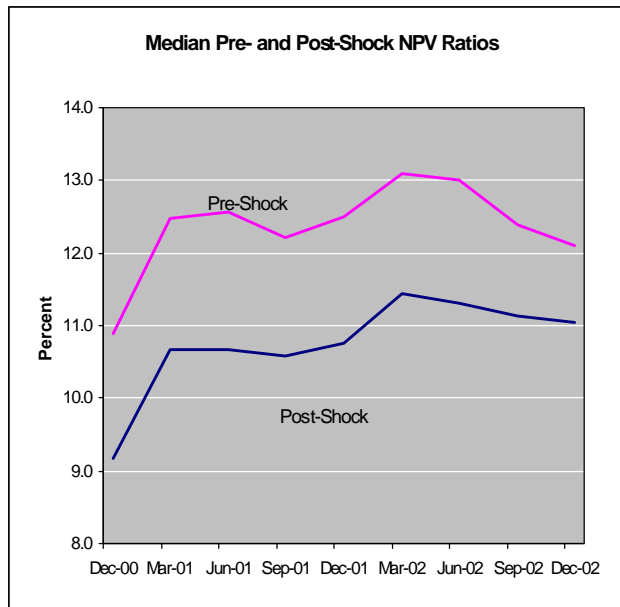
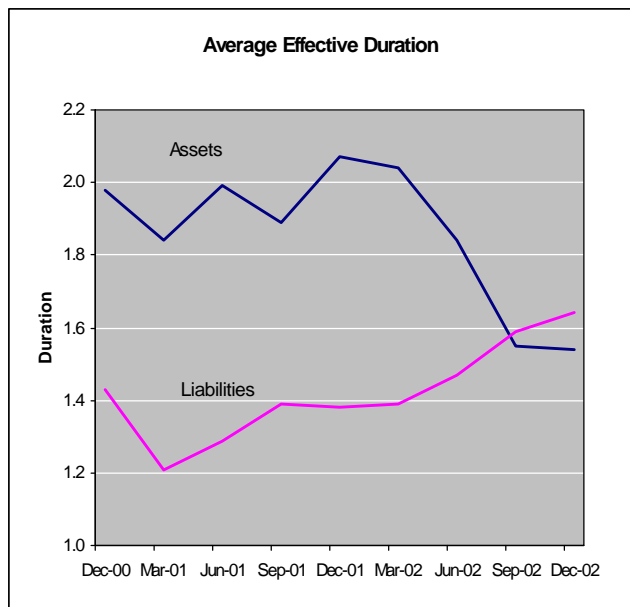
gage originations in the fourth quarter were \$176.9 billion, up from \$138.3 billion in the third quarter. Thrifts' share of all 1-4 family originations was 23.1 percent in the fourth quarter, up from 18.5 percent in the third quarter. The fourth quarter witnessed a slight increase in the rate of U.S. homeownership, rising to 68.3 per-

cent from 68.0 percent in the prior quarter. Refinancing accounted for 55 percent of thrift originations of single-family mortgages in the fourth quarter, up from 44.7 percent in the third quarter. This increase is consistent with the refinancing activity of all lenders, where the rate rose to 65 percent in the fourth

quarter, up from 60 percent in the prior quarter. The net effect of the fall in short-term rates and the rise in long-term rates was to increase asset duration for the industry. The industry's average effective duration of assets fell slightly from 1.55 to 1.54 between the third and fourth quarters.

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Duration and NPV Sensitivity Measures



Median Sensitivity Remains Stable in the Fourth Quarter (continued)

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With the persistently low interest rates in previous quarters, the NPV model predicts an increase in mortgage prepayments, which lowers mortgage duration and, therefore, assets duration.

The industry's average effective duration of liabilities rose from 1.59 to 1.64 in the fourth quarter. The

fall in the industry's average effective duration of assets combined with the increase in the industry's average effective duration of liabilities means that the negative duration gap for the thrift industry as a whole widened in the fourth quarter.

The median pre-shock NPV ratio for the industry fell during the fourth quarter

from 12.4 percent to 12.1 percent due to the fall in rates combined with the shortening of assets duration and lengthening of liabilities duration.

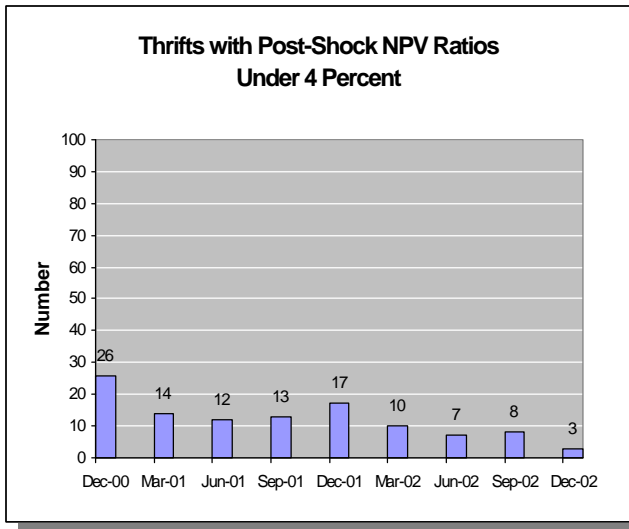
Along with this fall in the median pre-shock NPV ratio, the median post-shock NPV ratio also fell slightly, moving from 11.3 percent at the end of the third quarter down to 11.1

percent at the end of the fourth quarter. This was due to the drop in the median pre-shock NPV ratio.

At the end of the fourth quarter, a 200 basis point increase in rates would produce a net portfolio value loss for 688 thrifts, while 205 thrifts would see their net portfolio values rise.

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Interest Rate Risk Measures



	NPV as % of PV of Assets		% Change in NPV	
	Sep-02	Dec-02	Sep-02	Dec-02
+300	9.86%	8.79%	-10%	-15%
+200	10.47%	9.51%	-3%	-7%
+100	10.75%	9.94%	0%	-1%
Base	10.64%	10.01%	0%	0%
-100	10.46%	9.89%	-1%	-1%
-200	N/A	N/A	N/A	N/A
-300	N/A	N/A	N/A	N/A

	Under 100bp	101-200bp	201-400bp	Over 400bp	Total
Over 10%	299	154	118	8	579
6% to 10%	155	95	43	5	298
4% to 6%	13	6	8	0	27
Below 4%	2	5	0	1	8
Total	469	260	169	14	912

Minimal Moderate Significant High

	Under 100bp	101-200bp	201-400bp	Over 400bp	Total
Over 10%	289	154	105	7	555
6% to 10%	165	102	33	1	301
4% to 6%	16	8	10	0	34
Below 4%	1	0	2	0	3
Total	471	264	150	8	893

Minimal Moderate Significant High

Median Sensitivity Remains Stable in the Fourth Quarter (continued)

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If rates fell by 100 basis points, 540 thrifts would see their net portfolio values decrease, while 353 thrifts would see an increase in their net portfolio values.

The number of thrifts with a post-shock NPV ratio below 4 percent fell to three from eight in the previous quarter. With a 200

basis point increase in interest rates, the thrift industry would lose 7 percent of its net portfolio value. This is up from 3 percent in the previous quarter.

The percentage of thrifts with a post-shock NPV ratio over 6 percent decreased between the third and fourth quarters. In the fourth quarter, such

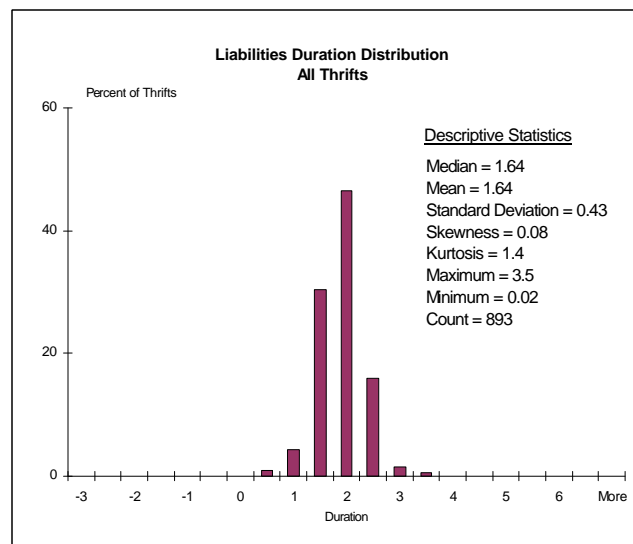
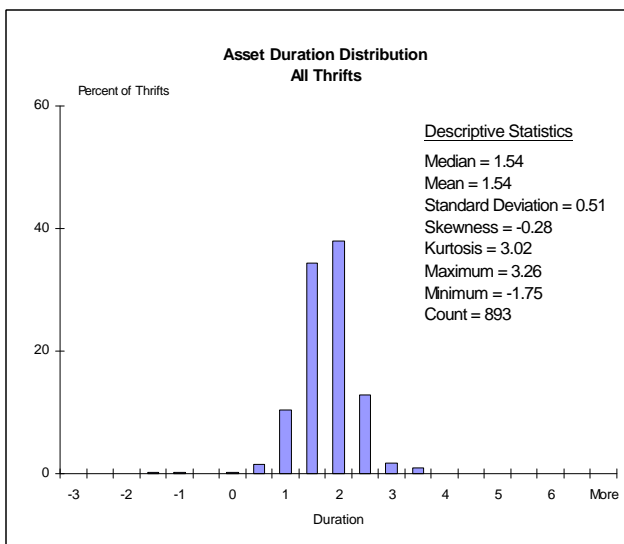
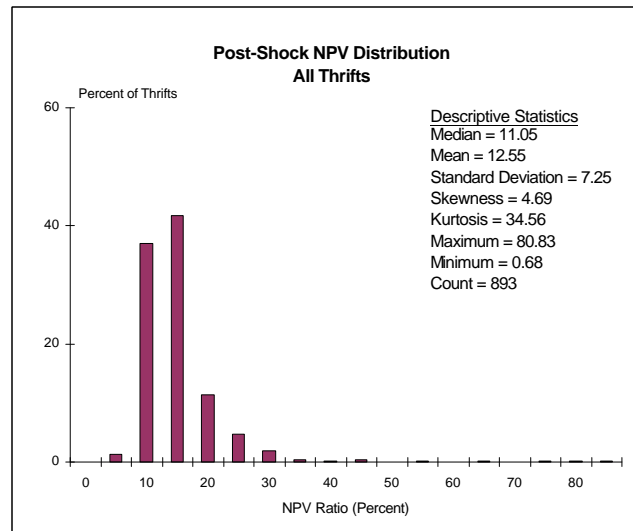
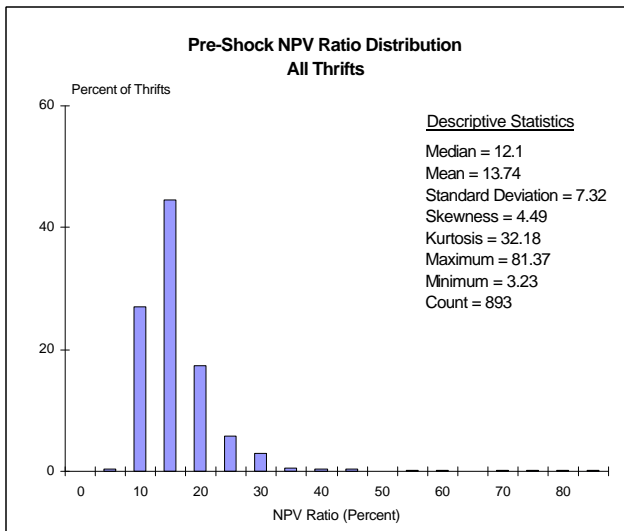
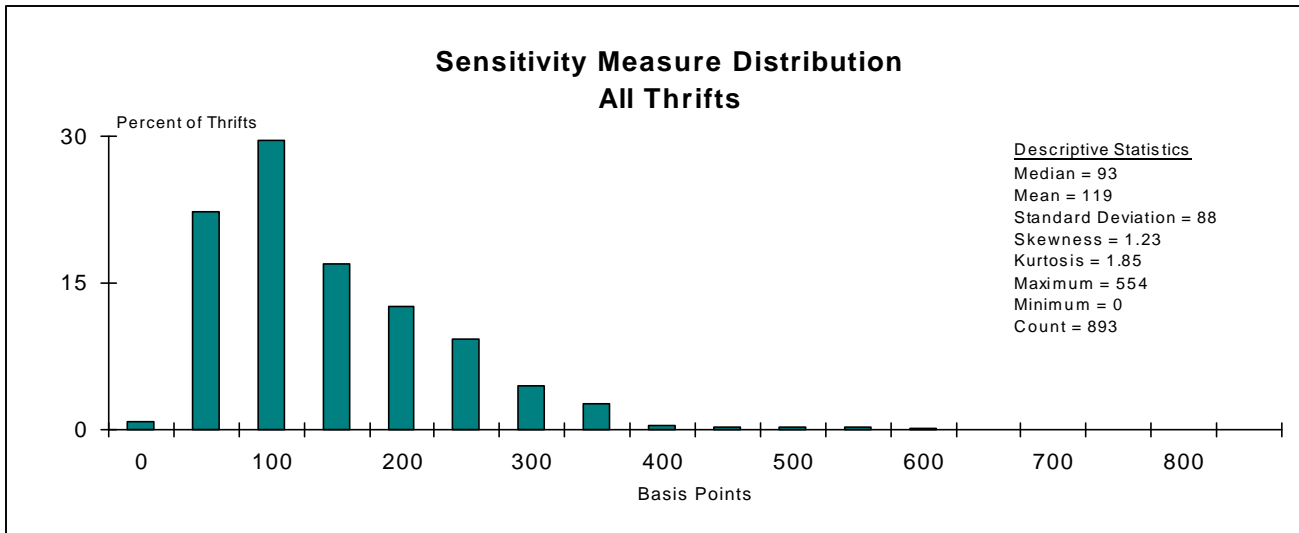
thrifts comprised 95.8 percent of the industry compared to 96.1 percent in the prior quarter.

The number of thrifts with a post-shock NPV ratio below 6 percent rose to 37 in the fourth quarter, up from 35 in the third quarter. This result is consistent with the somewhat larger drop in the median pre-shock NPV ratio com-

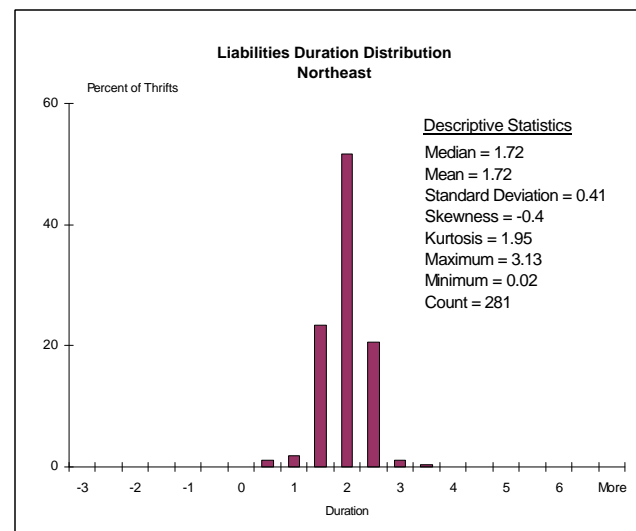
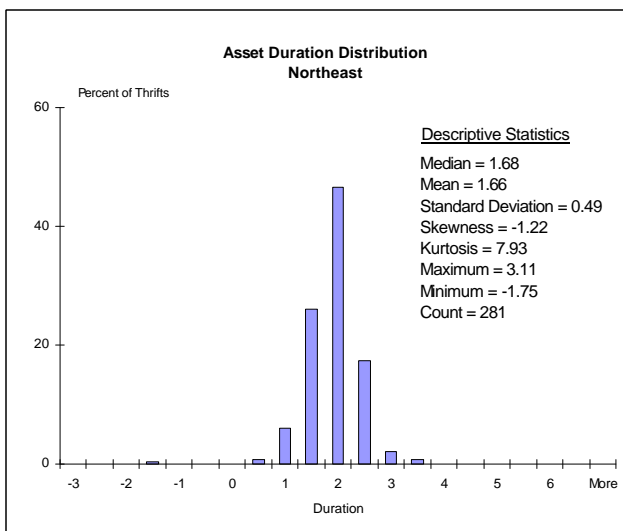
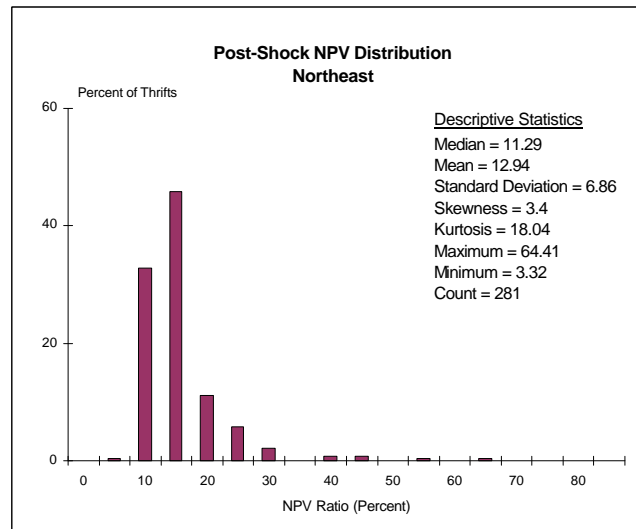
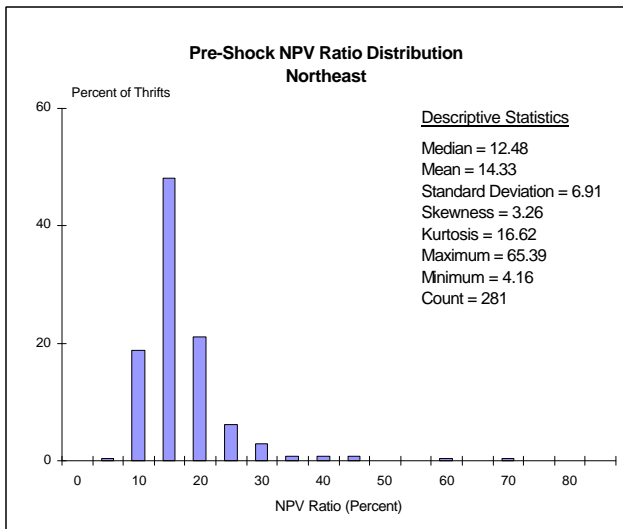
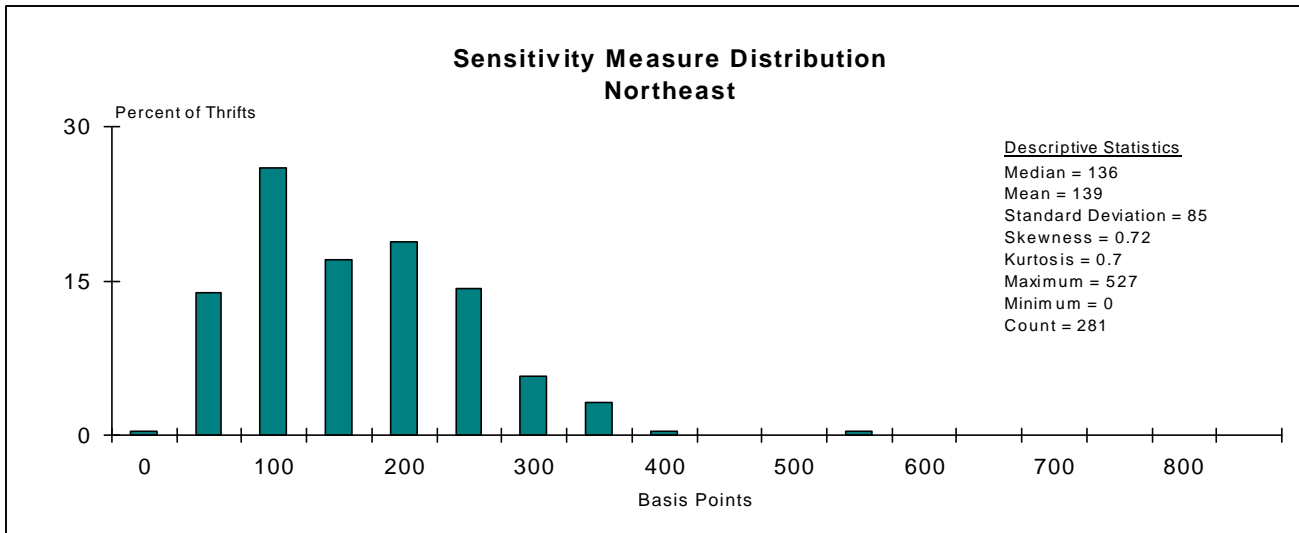
pared to the slight fall in median sensitivity.

The number of thrifts with a sensitivity of 200 basis points or less increased to 735 in the fourth quarter, from 729 in the third quarter. The number of thrifts with over 400 basis points in sensitivity fell to eight, from 14 in the prior quarter.

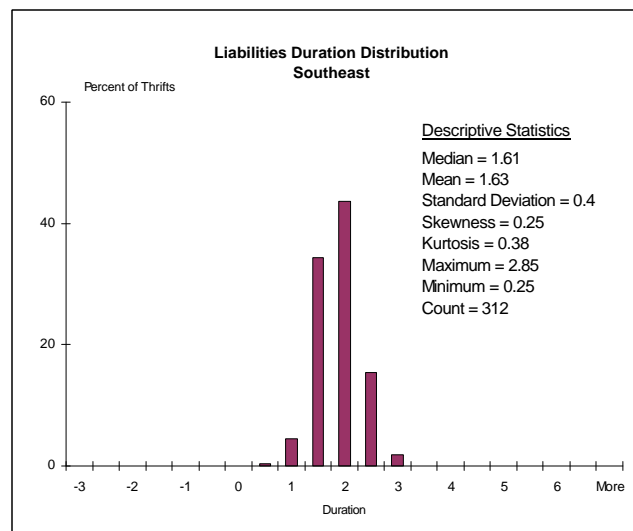
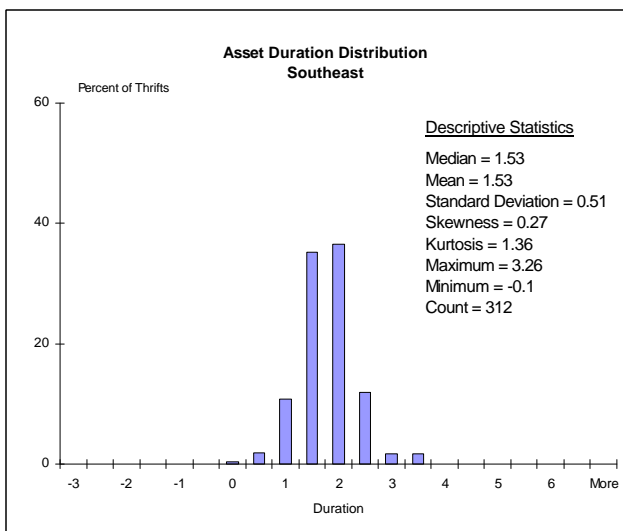
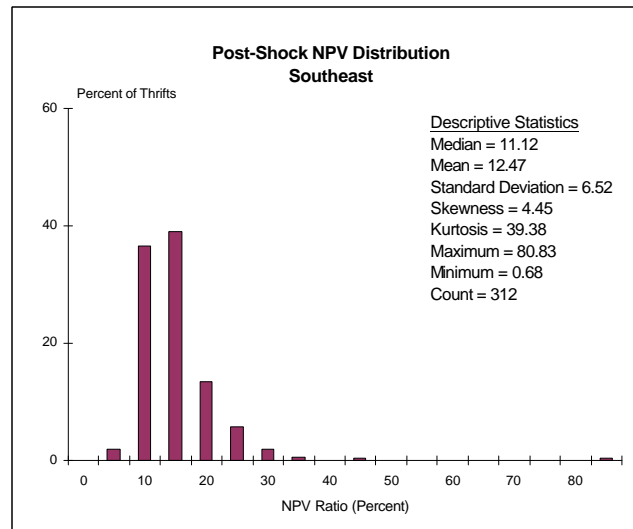
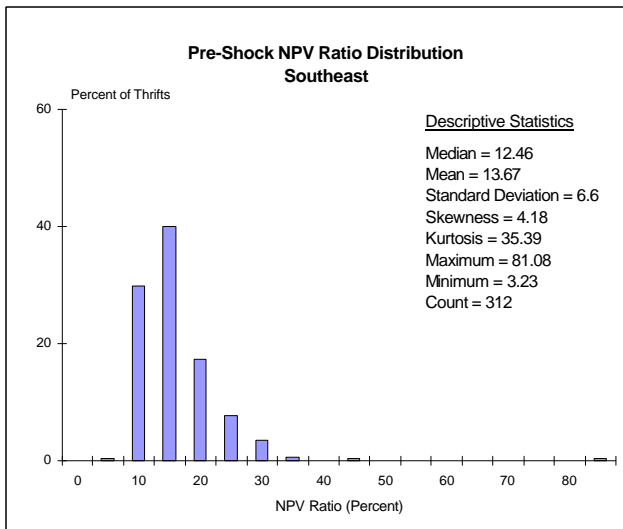
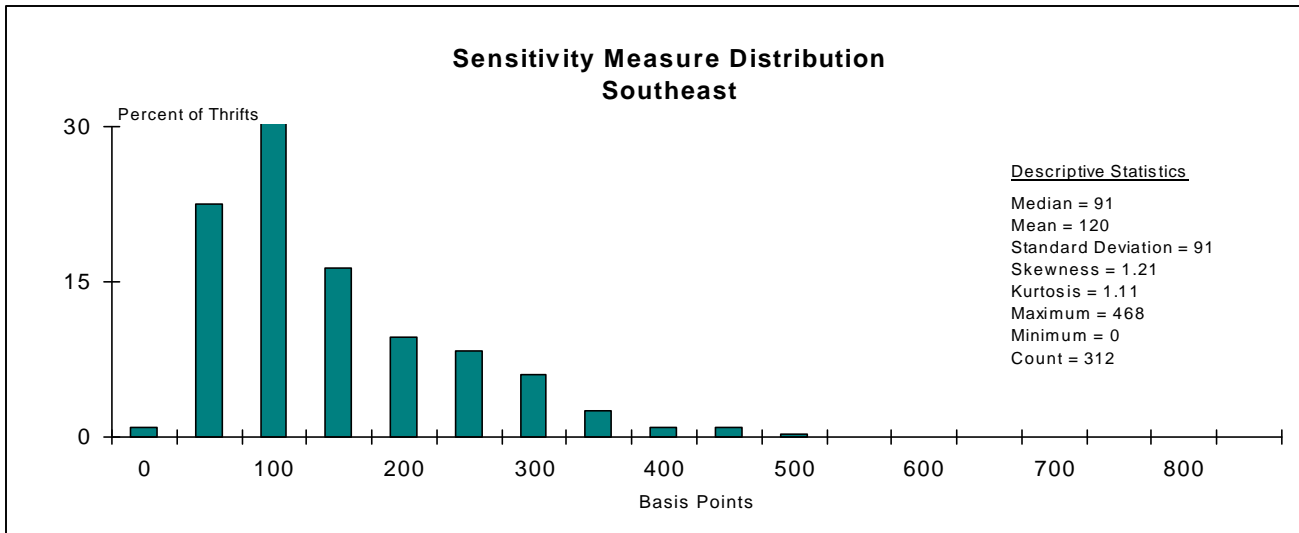
Appendix A – All Thrifts



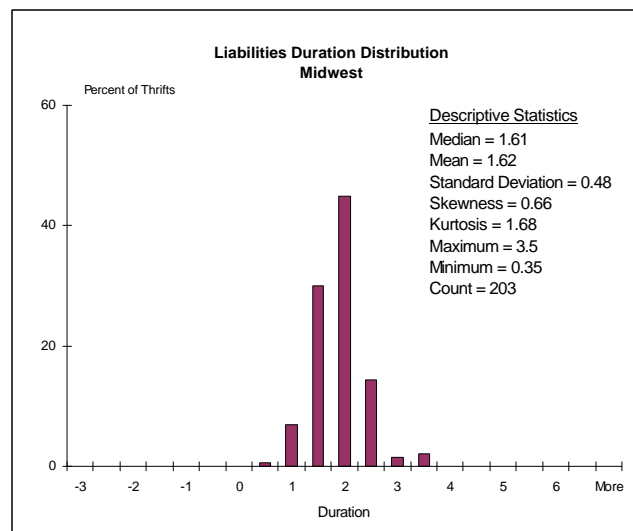
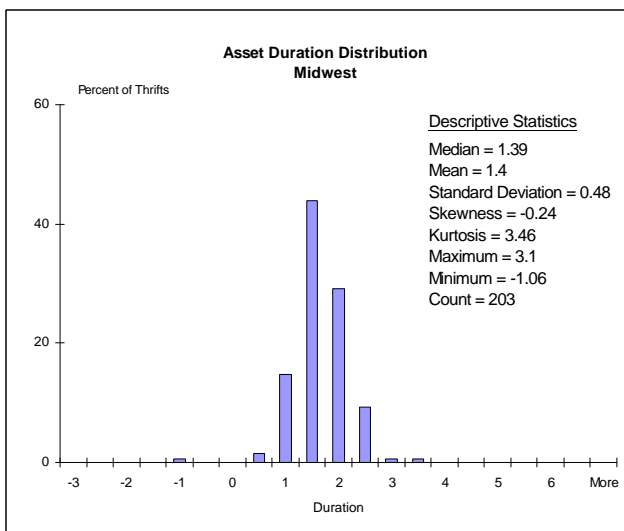
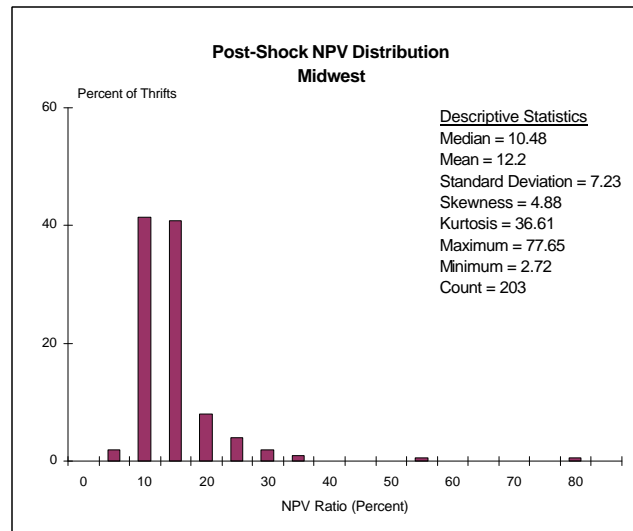
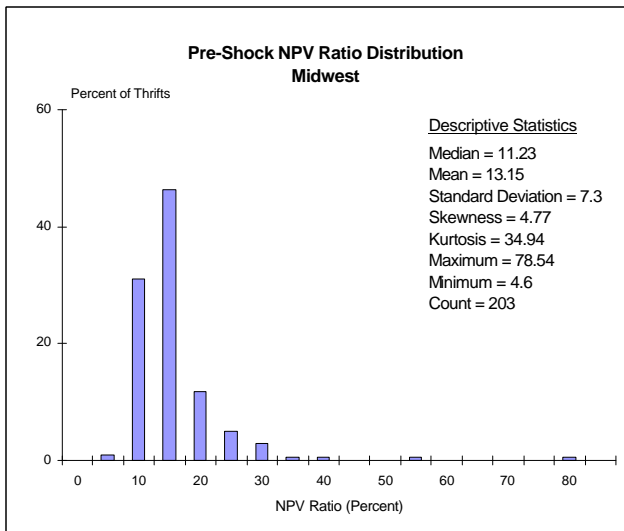
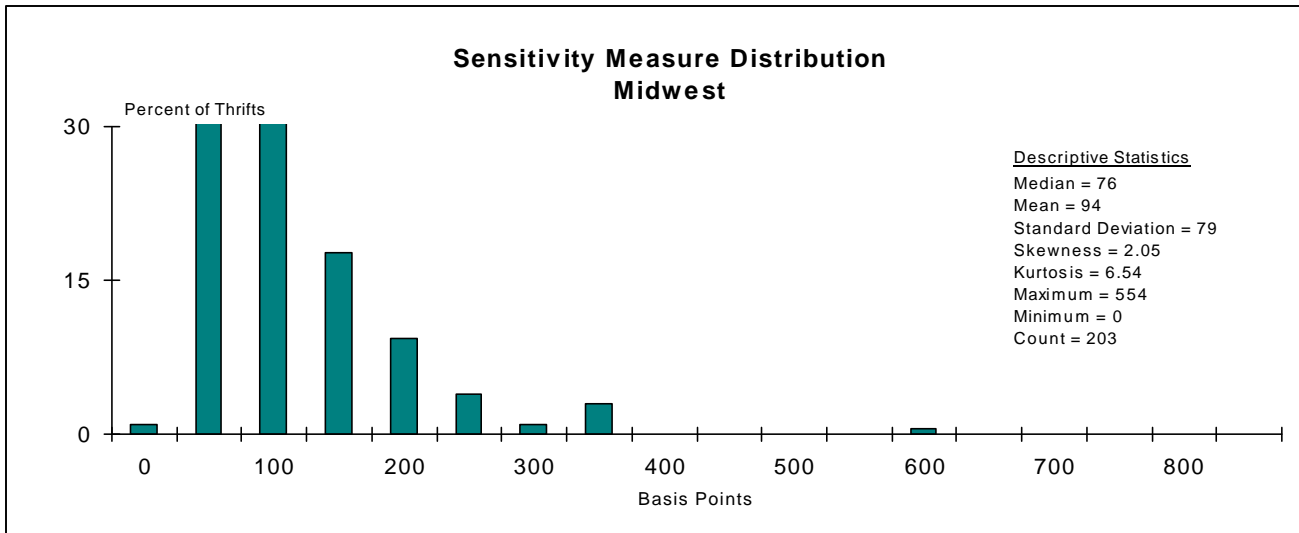
Appendix B – Northeast Region



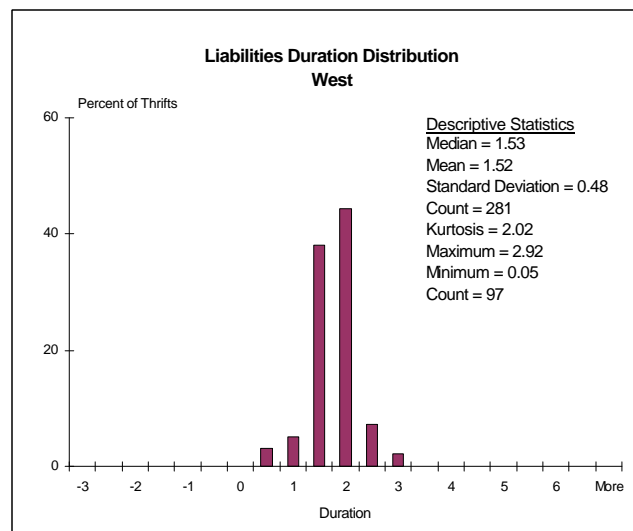
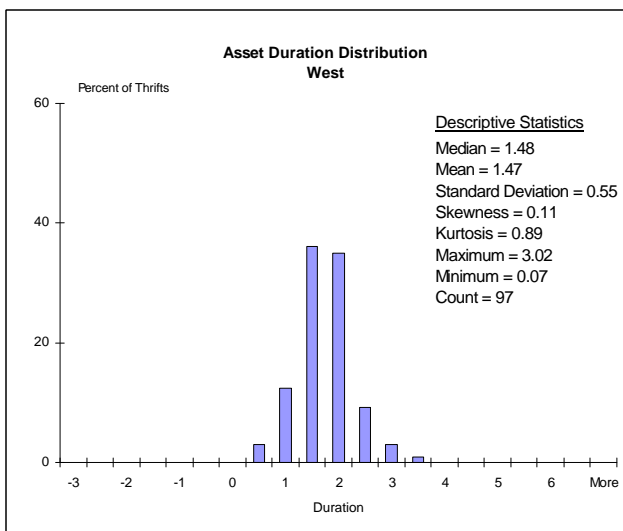
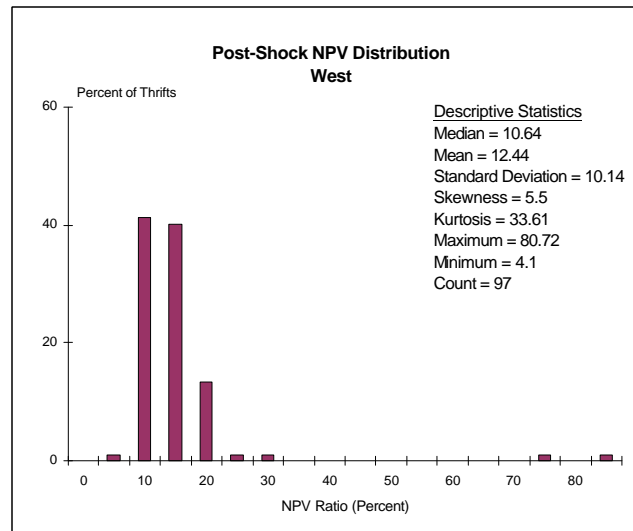
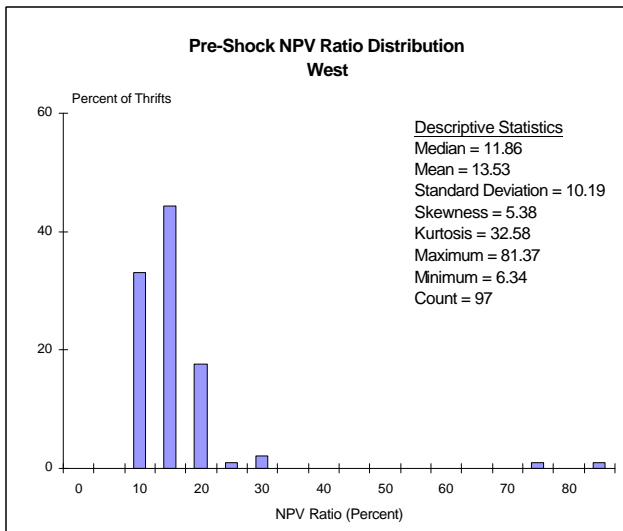
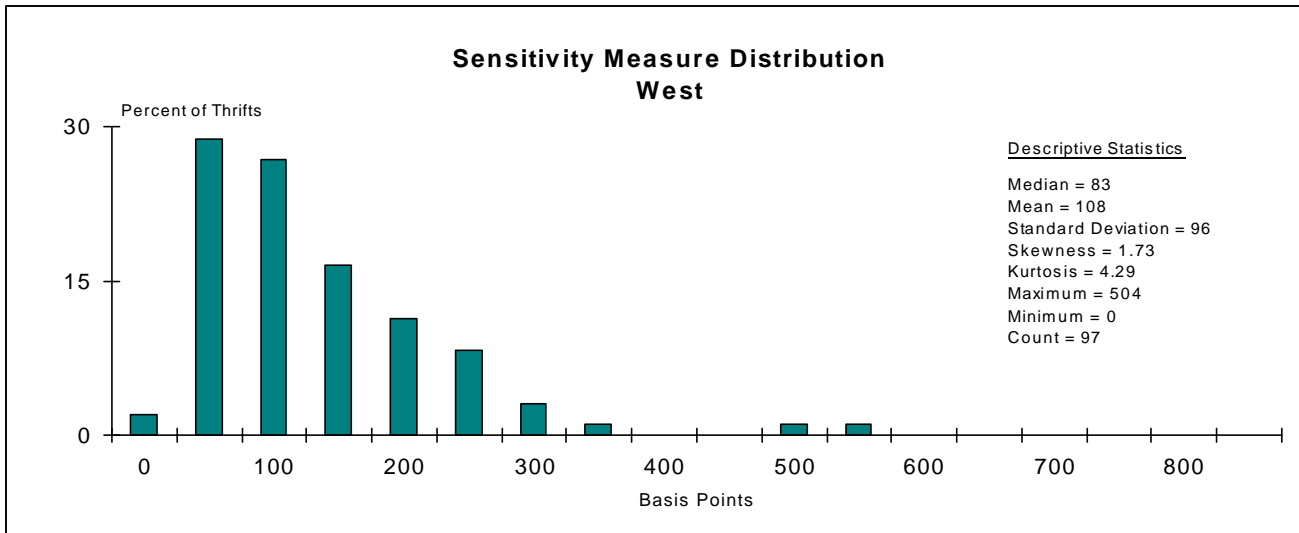
Appendix C – Southeast Region



Appendix D – Midwest Region



Appendix E – West Region



Glossary

Duration: A first-order approximation of the price sensitivity of a financial instrument to changes in yield. The higher the duration, the greater the instrument's price sensitivity. For example, an asset with a duration of 1.6 would be predicted to appreciate in value by about 1.6 percent for a 1 percent decline in yield.

Effective Duration: The average rate of price change in a financial instrument over a given discrete range from the current market interest rate (usually, +/-100 basis points).

Estimated Change in NPV: The percentage change in base case NPV caused by an interest rate shock.

Kurtosis: A statistical measure of the tendency of data to be distributed toward the tails, or ends, of the distribution. A normal distribution has a kurtosis statistic of three.

NPV Model: Measures how six hypothetical changes in interest rates (three successive 100 basis point increases and three successive 100 basis point decreases, assuming a normal interest rate environment) affect the estimated market value of a thrift's net worth.

Post-Shock NPV Ratio: Equity-to-assets ratio, following an adverse 200 basis point interest rate shock (assuming a normal interest rate environment), expressed in present value terms (i.e., post-shock NPV divided by post-shock present value of assets). Also referred to as the exposure ratio.

Pre-Shock NPV Ratio: Equity-to-assets expressed in present value terms (i.e., base case NPV divided by base case present value of assets).

Sensitivity Measure: The difference between Pre-shock and Post-shock NPV Ratios (expressed in basis points).

Skewness: A statistical measure of the degree to which a distribution is more spread out on one side than the other. A distribution that is symmetric will have a skewness statistic of zero.

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