DURATION

BY RON FERGUSON

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DISCUSSION BY STEPHEN D'ARCY

Ron Ferguson has performed a valuable service to the CAS by encouraging actuaries to focus one eye on the investment side of insurance operations while keeping the other eye (hopefully the good one) on familiar underwriting terrain. Bond duration is an important component of investment performance and actuaries should be familiar with this concept. The explanations, examples, formulae, and references included in the paper provide the reader with a grasp of the fundamentals of duration and adequately achieve the objectives of this work. This discussion will expand on some of the weaknesses of the duration concept, propose an alternative investment strategy, and develop a procedure for calculating the duration of loss reserves.

Whereas an understanding of duration is essential to understand bond portfolio management, use of duration in practice does not assure investment success. Ferguson discusses some of the drawbacks of applying duration to immunize an investment portfolio, including the absence of long duration bonds; the need for continuously rebalancing the portfolio as time elapses and interest rates change; and the complications and costs introduced by call features, sinking funds, transaction costs, and taxes. A further, and more serious, disadvantage of duration results from the motivating factor behind duration. Duration is a useful concept when an investor's objective is to achieve a targeted nominal wealth position in the future regardless of interim interest rate changes. If interest rates fall so that cash flows generated by the investment are reinvested at lower-than-expected interest rates, then the value of the initial investment immediately rises to reflect the market value of an investment producing a stream of income above the new interest rate. This premium over the face value of the bond gradually reduces as the bond approaches maturity. However, since the bond matures after the time the wealth is needed under a duration-based investment strategy, the premium at that time is sufficient to offset the lower reinvestment returns. Conversely, an interim rise in interest rate produces greater reinvestment returns than expected, but those gains are offset by the discount from face value of the bond that remains at the time the wealth is needed. Under either condition, the terminal wealth position is at or near the target level.

For insurers, though, the amount of wealth required at a future date is not always independent of economic conditions. The value of losses payable in the future may be determined in part by the inflation rate prior to the time losses are paid. Inflation, which affects interest rates, may also affect the wealth needed. An investment strategy based on duration is intended to preserve nominal wealth, and not real wealth or purchasing power. Duration is a useful investment strategy only when the terminal wealth target is invariant with inflation. Although this is the case for some situations, such as total losses on stated value contracts, losses in excess of policy limits, and claim payments being processed for repairs already settled, not all loss settlements are independent of inflation that occurs subsequent to the date of loss and prior to the claim payment. The following situation describes the opposite extreme under which inflation has a direct effect on the loss settlement value.

Consider a simple example in which an insurer is reserving a claim for a class action suit against a drug manufacturer involving a product alleged to cause unintended side effects. The insurer estimates the cost of settlement (excluding interim loss adjustment expenses) at \$10,000,000 and expects the claim to be settled in five years. Under current accounting procedures the insurer would establish a loss reserve of \$10,000,000 for this claim. However, if management wanted to know how much cash had to be set aside now to cover the claim, a lower figure would be determined. Assuming the insurer wanted to minimize default risk by investing in U.S. Treasury issues and ignoring taxes (which may not be unreasonable in light of current tax loss carry forwards), the insurer could face a yield curve as illustrated in Table 1. The interest rate available on five year Treasury issues is 13.5 percent. If the insurer were to make the naive assumption that an investment in Treasury bonds that have a maturity of five years would alleviate all investment concerns, a problem arises in determining the proper discount rate. Discounting the claim at 13.5 percent for five years produces a present value of the claim of \$5,309,097 ($10,000,000/(1.135)^5$). However, if the insurer followed what will be termed the maturity investment strategy of investing the present value of the claim in a five year issue, and reinvesting the interest payments when received for the time remaining in the five year period, the company will not achieve a \$10,000,000 wealth position in five years if interest rates remain at current levels. The actual wealth position of the insurer in five years is shown in Table 2. For this calculation the convention used in Ferguson's paper, that interest is paid annually at the end of each year, is adopted. Interest received on the initial investment and subsequent reinvestments are invested at yields below 13.5 percent since the current yield curve is upward sloping (as it normally is), as shown in Table 1.

Table 2 illustrates that interest of \$716,728 (.135 × 5,309,097) will be received at the end of the first year and reinvested at 13.3 percent for four years. At the end of the second year interest of \$812,053 (.135 × 5,309,047 + .133 × 716,728) will be received and reinvested at 13.2 percent. The total amount available to the insurer at the end of five years is \$9,956,402—and not \$10,000,000—as a result of reinvestment of interest at rates lower than 13.5 percent. This \$43,598 shortfall can be eliminated by investing \$5,332,346 under the maturity investment strategy and, if current rates hold, \$10,000,002 will be available in five years (Table 3). The proper discount rate should reflect the knowledge that the reinvestment rates are lower than the initial investment rate.

A naive duration strategy, without any rebalancing as time passes, can be adopted to eliminate the shortfall illustrated in Table 2 without any additional initial investment. If the insurer invests \$5,309,097 in Treasury issues with a duration of five years rather than a maturity of five years, and reinvests each interest payment for the balance of the five year period,[1] the wealth position at the end of the five year period will be \$10,021,098 (Table 4). The insurer initially purchases a 7.13 year issue, currently yielding 13.5 percent, which produces the same interest income stream as shown in Table 2. However, the initial investment would be worth \$5,373,793 after five years as it represents a 2.13 year to maturity issue yielding 13.5 percent when the rate for this maturity issue is 12.85 percent (interpolated from the yield curve).[2]

Thus, duration can be used to assure the targeted wealth position if the yield curve does not shift. However, the motivating factor for duration is to assure that the targeted position is achieved despite changes in interest rates. For example, assume that interest rates increase across the entire yield curve by 7.5 percentage points immediately after the initial investment is made, and remain at the higher levels for the entire claim settlement period. Under the naive duration investment strategy, portfolio adjustments are not made despite the higher interest rates. Although this investment is not immunized against further changes in the interest rates, this example is only concerned with the effect of one sudden interest rate shift. The results are shown in Table 5.

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[1] The insurer could take advantage of the interest reinvestments to rebalance the duration closer to the remaining number of years in the claim period, but this method would complicate the example without much additional benefit.

[2] The formula for the price of a bond is

$$P = \sum_{t=1}^{n} \frac{CF_t}{(1 + y)^t}$$

The insurer would reinvest the interest at rates higher than expected, earning greater interest on interest. However, the value of the initial investment at the end of five years declines to $4,731,419 since it is paying below market rates for the remaining 2.13 years. The effects tend to cancel out, but leave the insurer slightly ($119,728) above the target. A maturity investment strategy would perform better than the duration strategy under increasing interest rates (and worse under declining rates) since the initial investment matures at the end of the five years avoiding the capital loss, whereas the reinvested interest would earn the higher than expected rates. As shown in Table 6, an investment of $5,332,346 for a five year term generates a terminal wealth position of $10,744,254 if interest rates were to increase 7.5 percentage points.

If the only goal of an insurer's investment policy were to generate a targeted wealth level at a given time, duration would be a useful strategy. However, for most situations insurers face the risk of claim settlement amount and time. For the example of the class action suit, the $10,000,000 loss reserve includes consideration of expected inflation over the settlement period. The final settlement will likely consist of specific damages, primarily medical costs, and general damages. Both values tend to increase with inflation, although obtaining an index to measure and project these changes has proven difficult.[3] Prior research has incorporated a proportional value between 0 and 1 that represents the inflation-sensitive component of loss reserves.[4] This value varies by line of business and over time. This review illustrates the extreme case under which inflation in claim costs is the same as the general rate of inflation. Based on finance theory, short term nominal interest rates are highly correlated with expected inflation rates. A good fit has been obtained for a 2 to 2.5 percentage point differential between short term U.S. Treasury issues and expected changes in the consumer price index.[5] However, expected inflation rates do not always correspond with experienced inflation rates, and substantial year to year variation from the normal differential occurs.

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[3] Norton E. Masterson, "Economic Factors in Property/Liability Insurance Claim Costs," *Best's Review Property/Casualty Insurance Edition*, Vol. 85, No. 2 (June, 1984), pp. 68–70.

[4] Robert P. Butsic, "The Effect of Inflation on Losses and Premiums for Property-Liability Insurers," *Casualty Actuarial Society Discussion Paper Program*, 1981, pp. 58–102; H. R. Folger, "Bond Portfolio Immunization, Inflation, and the Fisher Equation," *Journal of Risk and Insurance*, Vol. LI, No. 2 (June, 1984), pp. 244–264.

[5] W. E. Gibson, "Interest Rates and Inflationary Expectations: New Evidence," *American Economic Review*, Vol. 57 (December, 1972), pp. 854–865.

Accepting the accuracy of inflation expectations and the normal yield-inflation differential, the current short term interest rate of 9.7 percent for one month Treasury issues translates into an expected inflation rate of approximately 7.5 percent. The $10,000,000 loss reserve should embody an inflation rate of 7.5 percent. If interest rates were to increase by 7.5 percentage points, the shift would most likely be caused by an equal increase in the expected inflation rate. The claim settlement would increase to $14,010,282 ($10,000,000 \times (1.15)^5/(1.075)^5$). Under this circumstance, the naive duration strategy would generate a shortfall of $3,890,554 since the "target" increased $4,010,282. The maturity investment strategy performs only marginally better, with a shortfall of $3,266,028.

Insurers can reduce the risk of inflation-driven claim settlements increasing beyond the level of funds dedicated to compensate them by adopting an alternative investment strategy. If the insurer were to invest all the initial capital to pay the claim short term, rather than for 5 or 7.13 years, all the proceeds could be reinvested at the current interest rates when rates change. This strategy outperforms the other investment strategies when investment rates rise and underperforms when the interest rates fall. However, rising or falling interest rates are likely to correspond with similar changes in the claim settlement value.

As short term rates yield 9.7 percent, the insurer would have to set aside $6,294,582 ($10,000,000/(1.097)^5$) to generate $10,000,000 in five years. This amount exceeds the maturity investment strategy by $962,236 and the naive duration strategy by $985,485, since one month Treasury rates are below longer term rates. The results of an instantaneous increase in interest rates by 7.5 percentage points immediately after the initial one month investment is made are illustrated in Table 7. The shortfall from the claim settlement inflated at a 15 percent rate is $162,638, which is much less than the shortfall under the other investing strategies. This shortage occurs in part ($71,256) since the insurer is locked into the initial 9.7 percent rate for one month with the remainder caused by the relationship between the increase in inflation and interest under a constant differential. Inflation increased 100 percent (7.5 to 15) whereas interest rates increased 77.3 percent (9.7 to 17.2).

Although the author believes a large increase in interest rates is more likely than a large decline, an interest rate drop is not inconceivable. For balance, the results of maturity, naive duration, and short term investing strategies under an instantaneous reduction in interest rates and inflation of 7.5 percentage points are shown in Tables 8, 9, and 10. The naive duration strategy produces both the highest terminal wealth position, $10,164,134, and the one closest to

\$10,000,000. Short term investing produces the lowest wealth, \$7,059,331. However, if inflation were to decline 7.5 percentage points, the expected inflation rate would be 0, thus producing a claim settlement of \$6,965,586 $(10{,}000{,}000/(1.075)^5)$. Thus, the short term investing strategy would produce a position closest to the final claim settlement.

The three investment strategies are compared on Table 11. Short term investing requires the greatest initial outlay of capital but always produces the terminal wealth position closest to the claim settlement. It is the most profitable investment strategy only if interest rates increase. The naive duration strategy requires the lowest initial outlay and produces the terminal wealth position closest to \$10,000,000 if interest rates change, and produces the greatest wealth position if interest rates remain level or decline. However, this strategy produces the lowest terminal wealth if interest rates increase.

The other loss settlement risk faced by insurers is the timing of the settlement. Under the short term investing strategy, capital is always readily available. Under longer term investing if the claim is settled prior to the expected time, the bonds would have to be sold (or other capital diverted from investment) for which a capital gain or loss could occur depending on the direction in the change of interest rates. An early settlement coupled with higher interest and inflation rates would require the insurer to assume a capital loss on the initial investment simultaneously with a loss settlement in excess of the expected level.

Both the original paper and this review have concentrated on the use of duration for specific large claims. A far more common consideration for insurers is the development of an investment strategy to apply to the entire loss reserve. The formula for duration is:

$$\text{Duration} = \frac{\displaystyle\sum_{t=1}^{n} \frac{tCF_t}{(1+y)^t}}{\displaystyle\sum_{t=1}^{n} \frac{CF_t}{(1+y)^t}}$$

where CF_t = cash flow in year t
y = discount rate
t = year of cash flow
n = last year of cash flow

This formula can be applied to cash outflows (loss payments) just as readily as to cash inflows (investments).

The duration of a loss reserve will vary by insurer depending upon line of business mix and loss payment patterns. An example for automobile liability, the major component of loss reserves for the industry, is illustrated below. The payout ratios are derived from aggregate data published by Best's on Schedule P development for 200 representative insurers.[6] Based on the aggregate data, extrapolated until all losses are paid, the automobile liability payment development pattern is illustrated in Table 12. The current estimates of ultimate incurred losses by accident year are shown in Table 13.

The following notation is adopted for calculating the duration of the loss reserve:

P_i = percentage of ultimate incurred losses paid at the end of development year i

$\rho_i = P_i - P_{i-1}$ = percentage of ultimate incurred losses paid in development year i

L_x = ultimate incurred losses for accident year x

CF_t = cash flow (paid losses) in year t

a = latest accident year

y = discount rate

The future claim payments paid by year are projected as follows:

$$CF_{a+i} = \sum_{i=1}^{7} \sum_{j=1}^{7} L_{a+i-j}\rho_{i+j}$$

To determine the claims to be paid in 1983, sum the products of the 1982 accident year incurred losses multiplied by the percentage of incurred losses paid in development year 2, plus the 1981 accident year incurred losses multiplied by the percentage of incurred losses paid in development year 3, and so forth, through the 1976 accident year incurred losses multiplied by the percentage of incurred losses paid in development year 8. To determine claims to be paid in 1984, sum the product of the 1982 accident year losses multiplied by the percentage of incurred losses paid in development year 3, plus the 1981 accident year incurred losses multiplied by the percentage of incurred losses paid in development year 4, and so forth, through the 1977 accident year losses

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[6] A. M. Best Company, "Casualty Loss Reserve Development," *Best's Insurance Management Reports Statistical Studies Property/Casualty*, Release Number 2 (January 23, 1984), p. 3.

paid in development year 8. Similarly, claims paid in 1985 through 1989 are determined. Performing these calculations produces the following cash flow:

Year	Cash Flow
1983	$12,249,322
1984	6,658,051
1985	4,022,837
1986	2,305,210
1987	1,274,849
1988	649,402
1989	257,541
Total	$27,417,212

The duration of this cash flow depends on the discount rate selected. Since the losses paid in a given year are not paid at the end of the year, as is assumed for bond investments, but paid throughout the year, the formula for determining the duration of this cash flow is:

$$\text{Duration} = \frac{\displaystyle\sum_{t=1}^{7} \frac{(t - \tfrac{1}{2})CF_t}{(1 + y)^{t-1/2}}}{\displaystyle\sum_{t=1}^{n} \frac{CF_t}{(1 + y)^{t-1/2}}}$$

The durations for automobile liability loss reserves for various discount rates are shown on Table 14. The longest duration, assuming a 0 percent discount rate, is only 1.65 years. Therefore, even a duration investing strategy for automobile liability reserves would suggest investing in relatively short maturity bonds.[7]

At the end of 1982, the property-liability insurance industry held 54.2 percent of its assets in bonds, and 58.6 percent of these bonds, or 31.8 percent

[7] A duration of 1.65 years can be achieved either by purchasing bonds with a maturity of approximately two years (the exact maturity depends on the interest rate) or by selecting a portfolio of bonds with different maturities such that the income generated by interest and maturing bonds matches the liabilities as these come due. Ferguson describes the latter case as cash flow matching. Both approaches depend on the liability not changing with inflation, as well as the other limitations of duration described by Ferguson and on the first page of this discussion.

of total assets, had maturities of over ten years.[8] This long term investment strategy has a high degree of risk. An increase in interest rate levels would reduce the market value of the bond portfolio. Loss reserves would either be unchanged, if inflation after the loss is reported does not affect the settlement, or increase in some proportion to the inflation rate. This discussion illustrates the situation where losses increase directly with inflation. If an insurer expects that its loss reserve estimates are adequate to pay all claims incurred to date regardless of future inflation rates, the company should adopt a duration investment strategy to avoid this potential risk. If claim settlements on these losses can be affected by future inflation, a short term investing strategy should be adopted. Under either condition, maturities should be reduced unless the insurer is willing to bet its solvency on the belief that interest rates and inflation will not increase.

[8] A. M. Best Company, "1982 Property/Casualty Bond Holdings," *Best's Insurance Management Reports Statistical Studies Property/Casualty*, Release Number 23 (December 19, 1983), p. 1.

TABLE 1

REPRESENTATIVE YIELD CURVE
U.S. TREASURY ISSUES IN JUNE, 1984

Investment Period	Yield
1 month	9.7%
3 months	10.0
6 months	11.3
9 months	11.9
1 year	12.1
1½ years	12.7
2 years	12.8
2½ years	13.0
3 years	13.2
3½ years	13.3
4 years	13.3
4½ years	13.5
5 years	13.5
6 years	13.5
7 years	13.5
8 years	13.5
9 years	13.5
10 years	13.5
20 years	13.5

Source: *Wall Street Journal,* "Treasury Issues/Bonds, Notes & Bills" (June 13, 1984), p. 37.

TABLE 2

MATURITY INVESTING—LEVEL INTEREST RATES
$5,309,097 INVESTED AT 13.5% FOR FIVE YEARS

Year	Interest Received		Reinvestment Period	Reinvestment Rate
1	$ 716,728		4 years	13.3%
2	812,053		3 years	13.2
3	919,244		2 years	12.8
4	1,036,907		1 year	12.1
5	1,162,373		—	—
	5,309,097	Initial investment		
	$9,956,402	Terminal wealth		

TABLE 3

MATURITY INVESTING—LEVEL INTEREST RATE
$5,332,346 INVESTED AT 13.5% FOR FIVE YEARS

Year	Interest Received		Reinvestment Period	Reinvestment Rate
1	$ 719,867		4 years	13.3%
2	815,609		3 years	13.2
3	923,269		2 years	12.8
4	1,041,448		1 year	12.1
5	1,167,463		—	—
	5,332,346	Initial investment		
	$10,000,002	Terminal wealth		

TABLE 4

NAIVE DURATION INVESTING—LEVEL INTEREST RATES
$5,309,097 INVESTED AT 13.5% FOR 7.13 YEARS

Year	Interest Received		Reinvestment Period	Reinvestment Rate
1	$ 716,728		4 years	13.3%
2	812,053		3 years	13.2
3	919,244		2 years	12.8
4	1,036,907		1 year	12.1
5	1,162,373		—	—
	5,373,793*	Initial investment		
	$10,021,098	Terminal wealth		

$$* P = \frac{716,728}{1.1285} + \frac{716,728}{(1.1285)^2} + \frac{.13(716,728)}{(1.1285)^{2.13}} + \frac{5,309,097}{(1.1285)^{2.13}}$$

TABLE 5

NAIVE DURATION INVESTING-INTEREST RATES INCREASE 7.5 POINTS
$5,309,097 INVESTED AT 13.5% FOR 7.13 YEARS

Year	Interest Received		Reinvestment Period	Reinvestment Rate
1	$ 716,728		4 years	20.8%
2	865,807		3 years	20.7
3	1,045,029		2 years	20.3
4	1,257,170		1 year	19.6
5	1,503,575		—	—
	4,731,419*	Initial investment		
	$10,119,728	Terminal wealth		

$$* P = \frac{716,728}{1.2035} + \frac{716,728}{(1.2035)^2} + \frac{.13(716,728)}{(1.2035)^{2.13}} + \frac{5,309,097}{(1.2035)^{2.13}}$$

TABLE 6

MATURITY INVESTING—INTEREST RATES INCREASE 7.5 POINTS
$5,332,346 INVESTED AT 13.5% FOR FIVE YEARS

Year	Interest Received		Reinvestment Period	Reinvestment Rate
1	$ 719,867		4 years	20.8%
2	869,599		3 years	20.7
3	1,049,606		2 years	20.3
4	1,262,676		1 year	19.6
5	1,510,160		—	—
	5,332,346	Initial investment		
	$10,744,254	Terminal wealth		

TABLE 7

SHORT TERM INVESTING—INTEREST RATES INCREASE 7.5 POINTS
$6,294,582 INVESTED AT 9.7% FOR ONE MONTH

Year	Amount Available for Reinvestment		Reinvestment Period	Reinvestment Rate
1	$ 7,339,483*		1 month	17.2%
2	8,601,874		1 month	17.2
3	10,081,396		1 month	17.2
4	11,815,396		1 month	17.2
5	13,847,644		1 month	17.2
	$13,847,644	Terminal wealth		

*Assumes one month at 9.7%, 11 months at 17.2% for 16.6% average during initial year.

TABLE 8

Maturity Investing—Interest Rates Decline 7.5 Points
$5,332,346 invested at 13.5% for five years

Year	Interest Received		Reinvestment Period	Reinvestment Rate
1	$ 719,867		4 years	5.8%
2	761,619		3 years	5.7
3	805,031		2 years	5.3
4	847,698		1 year	4.6
5	886,692		—	—
	5,332,346	Initial investment		
	$9,353,253	Terminal wealth		

TABLE 9

Naive Duration Investing—Interest Rates Decline 7.5 Points
$5,309,097 invested at 13.5% for 7.13 years

Year	Interest Received		Reinvestment Period	Reinvestment Rate
1	$ 716,728		4 years	5.8%
2	758,298		3 years	5.7
3	801,521		2 years	5.3
4	844,002		1 year	4.6
5	882,826		—	—
	6,160,759*	Initial investment		
	$10,164,134	Total wealth		

$$* \; P = \frac{716{,}728}{1.0535} + \frac{716{,}728}{(1.0535)^2} + \frac{.13(716{,}728)}{(1.0535)^{2.13}} + \frac{5{,}309{,}097}{(1.0535)^{2.13}}$$

TABLE 10

Short Term Investing—Interest Rates Decline 7.5 Points
$6,294,582 invested at 9.7% for one month

Year	Amount Available for Reinvestment	Reinvestment Period	Reinvestment Rate
1	$6,470,830*	1 month	2.2%
2	6,613,188	1 month	2.2%
3	6,758,678	1 month	2.2%
4	6,907,369	1 month	2.2%
5	7,059,331	1 month	2.2%
	$7,059,331 Terminal wealth		

*Assumes one month at 9.7%, 11 months at 2.2% for 2.8% average during initial year.

TABLE 11

COMPARISON OF ADEQUACY OF TERMINAL WEALTH POSITIONS

Investment Strategy	Amount Invested	Level Rates Claim = $10,000,000		7.5 Point Increase Claim = $14,010,282		7.5 Point Decline Claim = $6,965,586	
		Terminal Wealth	Wealth-Claim	Terminal Wealth	Wealth-Claim	Terminal Wealth	Wealth-Claim
Maturity	$5,332,346	$10,000,002	$2	$10,744,254	−$3,266,028	$9,353,253	$2,387,667
Naive Duration	5,309,097	10,021,098	21,098	10,119,728	−3,890,554	10,164,134	3,198,548
Short Term	6,294,582	10,000,000	0	13,847,644	−162,638	7,059,331	93,745

TABLE 12

INDUSTRY PAYMENT DEVELOPMENT PATTERN—AUTOMOBILE LIABILITY

Year of Payment	Symbol	Percentage of Ultimate Losses Paid
Accident year	ρ_1	36.80%
AY + 1	ρ_2	28.76
AY + 2	ρ_3	13.93
AY + 3	ρ_4	8.93
AY + 4	ρ_5	5.30
AY + 5*	ρ_6	3.18
AY + 6*	ρ_7	1.91
AY + 7*	ρ_8	1.19
Total		100.00%

*Projected at 60 percent of prior year's factor.

Source: A. M. Best Company, "Casualty Loss Reserve Development," *Best's Insurance Management Reports Statistical Studies Property/Casualty*, Release Number 2 (January 23, 1984), p.3.

TABLE 13

CURRENT ESTIMATE OF ULTIMATE INCURRED LOSSES—AUTOMOBILE LIABILITY

Accident Year	Ultimate Losses
1982	$21,642,097
1981	19,835,157
1980	17,460,403
1979	16,296,350
1978	14,490,255
1977	12,742,717
1976*	11,337,903

*Prior year estimated.

Source: A. M. Best Company, "Casualty Loss Reserve Development," *Best's Insurance Management Reports Statistical Studies Property/Casualty* Release Number 2 (January 23, 1984), p. 3

TABLE 14

DURATIONS OF AUTO LIABILITY
LOSS RESERVES UNDER DIFFERENT
DISCOUNT RATES

Year	Cash Flow
1	$12,249,322
2	6,658,051
3	4,022,837
4	2,305,210
5	1,274,849
6	649,402
7	257,541
Total	$27,417,212

Discount Rate	Duration
0%	1.65 years
5	1.56
10	1.48
15	1.41
20	1.35