United States District Court
Northern District of New York

Ulico Casualty Company, Plaintiff, v. Clover Capital Management, Inc., Defendant.	3:00-CV-773 (TJM/GLS)

Expert Report of Martin R. Holmer

October 15, 2001

Contents

1 Introduction and Opinion Summary

This report contains my opinions in connection with the complaint filed in the United States District Court for the Northern District of New York (the "Complaint") by the plaintiff, Ulico Casualty Company ("Ulico") against the defendant, Clover Capital Management, Inc. ("Clover").

Background. The Complaint grows out of a series of events during the 1990s involving three pension plan funds: Laborers International Union of North America Local Union No. 35 Pension Fund (the "Local 35 Fund"), Carpenters Local No. 120 Pension Plan (the "Local 120 Fund"), Laborers International Union of North America Local Union No. 322 Pension Fund (the "Local 322 Fund") (collectively, the "Funds"). During the middle of the 1990s when these events occurred, the trustees of the Funds were: Sam Marchio, *et al.* (the "Local 35 Trustees"), Carl Spatol, *et al.* (the "Local 120 Trustees"), and Sam Agati, *et al.* (the "Local 322 Trustees") (collectively, the "Trustees"). Ulico provided fiduciary liability insurance to the Trustees and the Funds during this period.

From late 1988 until February 13, 1995, the Trustees retained W.J. Nolan & Company, Inc. ("Nolan"), a broker dealer in mortgage-backed securities, to invest on the Funds' behalf in fixed income securities. When interest rates began to rise in early 1994, most of the Funds' investments purchased by Nolan consisted of Z bonds, a class of security created as part of a collateralized mortgage obligation or real estate mortgage investment conduit issued by one of two government-sponsored enterprises. The rise in interest rates during 1994 caused the market value of these Z bonds to decline, resulting in substantial investment losses that were reported in detail as part of the Funds' Form 5500 submissions to the United States government for 1994. Form 5500 information is processed by the Department of Labor, the Internal Revenue Service, and the Pension Benefit Guaranty Corporation.

In late 1994 the Trustees began searching for investment managers to replace Nolan. In early 1995 the Trustees replaced Nolan with three investment managers: Loomis Sayles and Company, LP; HGK Asset Management, Inc.; and Clover. Clover agreed to facilitate this transition by selling the Nolan securities, at no charge to the Trustees, in order to raise the cash requested by the other two investment managers and to implement the investment strategy that the Trustees retained Clover to pursue. Clover conducted auctions of the Z bonds on five different days during 1995: February 15, March 3, March 8, May 8, and May 9.

On June 12, 1998, Alexis M. Herman, the Secretary of the United States Department of Labor ("DOL"), filed lawsuits under the Employee Retirement Income Security Act ("ERISA") against the Trustees of each of the Funds (the "DOL Lawsuits"). The DOL Lawsuits were captioned *Herman v. Marchio, et al.* 98-CV-932, *Herman v. Spatol, et al.* 98-CV-931, and *Herman v. Agati, et al.* 98-CV-930. The DOL Lawsuits sought, among other things, the recovery of losses associated with imprudent investments in Z bonds. The DOL Lawsuits were discontinued when, during September 1999, the Trustees entered into consent decrees with DOL that called for the Trustees to make payments to the Funds of $3,000,000. In addition, DOL assessed ERISA penalties of 20% of the settlement amount, or $600,000, against the Trustees. Ulico paid the $3,000,000 to the Funds and paid the $600,000 in penalties under its fiduciary liability insurance policies.

The Complaint. The Complaint alleges in paragraph 29 that "[b]y virtue of the breaches of fiduciary duty described in paragraph 28, Clover caused the investment losses [on the Z bonds purchased by Nolan], which in turn precipitated the DOL Lawsuits." The alleged breaches of fiduciary duty are described in paragraph 28 of the Complaint as follows:

> 28. Clover breached its fiduciary duties to the Funds, in violation of Section 404(a)(1)(B) of ERISA, 29 U.S.C. §1104(a)(1)(B), by, *inter alia*:
>
> (a) selling all of the Z-Bonds within a short period of time, when a proper investigation would have revealed that:
>
> (i) the Funds stood to achieve a much better investment return by retaining the Z-Bonds;
>
> (ii) retaining the Z-Bonds posed no immediate or long-term risk to the Funds, since they were reliable investments that, if held to maturity, would pay their stated interest and return principal;
>
> (iii) the Funds had no immediate or even intermediate need to sell the Z-Bonds to generate cash since there were adequate liquid assets and sources of income available to pay benefits for the foreseeable future; and

(iv) even if Clover had determined to sell the Z-Bonds in the near-term, proper investment considerations militated in favor of selling them gradually, over a period of time, particularly given the extremely small market for these securities.

and

(b) selling the Z-Bonds at prices that were unreasonably low, when compared to the listed market prices at that time.

Opinions. I have been asked to opine on (1) whether it was imprudent for Clover to comply with the Trustees' request to sell the Z bonds and (2) whether Clover's execution of the Z bond auctions was imprudent.

My study of the Z bond sales consists of a sale decision analysis and a sale execution analysis, in addition to the preparation of a chronology of events that occurred before the Z bonds were sold in early 1995. Exhibit A on page 44 includes a list of the documents I reviewed during the preparation of this report.

The opinions expressed herein are based on my professional skills, training, and experience, as well as on the findings from the sale decision analysis and the sale execution analysis. See Exhibit B on page 45 for more on my qualifications and experience, and Exhibit C on page 56 for information on my compensation for this work and involvement in prior cases.

Chronology of Events Before Z Bond Sale. The chronology of events shows that the investment losses on the Z bonds purchased by Nolan occurred during 1994 as a result of the rise in interest rates that occurred during that year. Given that pension investments are monitored by DOL on a mark-to-market basis, the losses implied by end-of-1994 prices were going to be reported on Form 5500 to DOL during May or June of 1995 no matter what decision Clover and the other two new investment managers made regarding the Z bonds. The allegation in paragraph 29 of the Complaint that the sale of the Z bonds caused the investment losses, "which in turn precipitated the DOL Lawsuits" appears to be based on the faulty notion that pension investment losses occur only when realized (that is, only when securities are actually sold at a loss).

Furthermore, the chronology of pre-sale events shows that the 1994 decline in the value of of the Z bonds caused a reduction in the market value of the Funds' assets that was big enough to adversely affect the the Funds' actuarial and regulatory funding status.

Analysis of Decision to Sell Z Bonds. The sale decision analysis examines not only the expected returns from investing in Z bonds, but also the risks associated with the substantial uncertainty concerning the timing of Z bond cash flows. The analysis concludes that Z bonds are risky investments for pensions, given that the value of their investments are recorded on a market-value basis, rather than on a book-value basis.

Also, the sale decision analysis finds no evidence for the allegation in the plaintiff's expert report (Carron 2001, paragraphs 29–36) that it was imprudent to sell the Z bonds in early 1995 because the mortgage securities market was still disrupted from the 1994 run up in interest rates, and therefore, Z bonds were selling at temporarily depressed prices that were well below their economic value. In fact, there is evidence that Z bond prices moved in tandem with longer-term Treasury bond prices during this period, indicating that Z bond price volatility was caused by the intrinsic characteristics of Z bonds, not some abnormal market condition for Z bonds.

After considering the allegations in the Complaint and in the plaintiff's expert report, as well as the findings of my sale decision analysis, I conclude that Clover was prudent in selling the Nolan Z bonds in early 1995 and using the proceeds to fund the other two new investment managers at the Trustees' direction, and to implement its own pension asset investment strategy. It would seem that the fact that neither the three new investment managers nor DOL thought that a portfolio concentrated in Z bonds was a desirable way to invest pension assets in early 1995, could be interpreted as prima-facie evidence against the argument that it was imprudent to sell Z bonds in early 1995 to implement an alternative investment strategy.

Analysis of Z Bond Sale Execution. The sale execution analysis examines the five auctions of Z bonds conducted by Clover over the period from February 15 to May 9, 1995. The analysis draws a distinction between actual Z bond transaction prices and price indications, or model prices. Model prices are generated daily by complex computer models that simulate the uncertain cash flows generated by Z bonds under a wide range of future interest rate scenarios and attempt to assign a present value to those uncertain simulated cash flows. The analysis quantifies the substantial disagreement between the two only sources of model prices available on the Bloomberg information system. In addition to this disparity in model prices there are other factors that cause uncertainty over the future resale value of a Z bond. When these uncertainties interact with a trader's concerns about the financial consequences of winning an auction with a bid that overestimates the resale value (called the "winner's curse" in scientific studies of auctions), both scientific theory and experimental evidence show that traders will bid significantly below their best estimate of the Z bond's value.

In addition, the most recent experimental evidence on sealed-bid auctions shows that, contrary to the unsupported allegation in the plaintiff's expert report (Carron 2001, paragraph 66), asking more traders to participate in the auction causes the seller's revenue to rise. This is a significant issue because Clover asked more traders to bid on the Z bonds than they normally ask to participate in a sale, indicating the prudence with which they executed the Z bond sales.

After considering the allegations in the Complaint and in the plaintiff's expert report, as well as the findings of my sale execution analysis, I conclude that Clover was prudent in its execution of the Z bond sale. No evidence has been presented that shows Clover sold the Z bonds for less than actual transaction prices on those days. And the uncertainty over the resale value of the Z bonds plus every trader's interest in avoiding the "winner's curse" provides a plausible explanation for why the bids in the Clover auctions were generally below the two model prices.

2 Chronology of Events Before Z Bond Sale

In this section of the report, I present historical information about the size and composition of the Nolan portfolio of investments for the Funds, the losses experienced on this portfolio during 1994, and the pension funding consequences for the Funds of these 1994 losses. This section concludes with a discussion of the events in late 1994 and early 1995 that resulted in the replacement of Nolan with three new investment managers.

Both this chronology of events and the report's subsequent analysis require an understanding of certain features of mortgage securities, especially the Z bonds that are the focus of the allegations in the Complaint. The following introduction to mortgage-backed securities is no longer than required by the complexity of the issues surrounding the Z bonds.

2.1 Introduction to Z Bonds

This introduction works its way through the basic information on mortgage-backed securities that is required to understand the investment return and risk properties of Z bonds. It quotes extensively from two investor guides published by the Public Securities Association (PSA 1993, PSA 1994).

What are mortgage-backed securities? Mortgage securities represent an ownership interest in mortgage loans made by financial institutions (savings and loans, commercial banks, or mortgage companies) to finance the borrower's purchase of a home or other real estate. Mortgage securities are created when these loans are packaged, or pooled, by issuers or servicers for sale to investors. As the underlying mortgage loans are paid off by the homeowners, the investors receive payments of principal and interest.

Investors may purchase mortgage securities when they are issued or afterward in the secondary market. Investments in mortgage securities are typically made by large institutions when the securities are issued. These securities may ultimately be redistributed by dealers in the secondary market.

The most basic mortgage securities, known as pass-throughs, participation certificates (PCs), or simply MBS, represent a direct ownership interest in a pool of mortgage loans. (PSA 1993, p. 1).

How do MBS differ from other fixed-income securities? With fixed-income securities such as corporate bonds, an investor effectively lends money to the bond issuer in return for a stated rate of interest (coupon rate) over the life of the bond. The investor receives a repayment of the principal, namely the face value of the bond, in a single lump sum when the bond matures.

Investors in MBS also earn a coupon rate of interest, but they receive repayments of their principal in increments over the life of the MBS, as the underlying mortgage loans are paid off, rather than in a single lump sum at maturity.

Because the timing and speed of principal repayments may vary, the cash flow on MBS is irregular. If homeowners whose mortgages are in a pool sell their homes, refinance their loans to take advantage of lower interest rates, prepay their mortgages for some other reason, or default on their loans, the principal is distributed on a pro rata basis to investors in MBS. When this happens, the MBS principal outstanding is reduced by the amount of the prepayments. Because the principal is reduced over the life of the MBS, the dollar amount of interest income paid to investors also decreases.

MBS are sold and traded in terms of their assumed average life rather than their maturity dates. The average life is the average amount of time that each principal dollar in the pool is expected to be outstanding. However, some mortgage loans could remain outstanding for the entire life of the original loans — typically 30 years.

As with any fixed-income security, the yield on an MBS investment depends on the purchase price in relation to the coupon rate and the length of time the principal is outstanding.

To compare the value of an MBS with other fixed-income investments, some prepayment assumptions, based on historic prepayment rates, are factored into the price and yield. The more accurate the prepayment projections, the more realistic the yield estimates.

While most bonds pay interest semiannually, mortgage securities usually pay interest and principal monthly depending on the terms of the issue. Pass-through MBS provide monthly payments.

MBS also tend to carry higher coupon rates than United States Treasury securities. In part, this is because the interest rates charged on mortgage loans are higher than the interest rates charged by the government. But the higher rates on MBS also reflect the level of investment risk created by the prepayment uncertainty. Investors in MBS may have their principal returned to them sooner (or later) than they expect when they make their investment. (PSA 1993, pp. 4–6).

How are mortgage prepayment speeds measured? The realization of the average life and yield estimates for an MBS depends on the accuracy of the prepayment assumptions used to evaluate the MBS at the time of its purchase. Different standard and proprietary prepayment rate models exist, but one of the most common ways of expressing prepayment rates is in terms of the PSA Standard Prepayment Model. Developed by the Public Securities Association in 1985, the PSA model assumes that new mortgage loans are less likely to be prepaid than somewhat older, more seasoned mortgage loans. Projected and historical prepayment rates are often expressed as percentage of PSA (*e.g.*, 150% PSA). (PSA 1994, p. 8).

For example, 100% PSA means that the rate of prepayment of mortgage loans is: 0.2 percent per annum of the unpaid principal during the first month after the mortgages are originated; an additional 0.2 per annum higher in each month thereafter until the 30th month (*e.g.*, 1.0 percent in the fifth month); and 6.0 percent per annum of the unpaid mortgage principal beginning in the 30th month after origination and in each month thereafter.

Given this definition, 0% PSA implies no mortgage prepayments and 200% PSA implies a mortgage prepayment rate of 12.0 percent per annum on the unpaid principal beginning thirty months after origination.

Who issues MBS? The majority of MBS are issued and/or guaranteed by an agency of the U.S. government, the Government National Mortgage Association (GNMA or Ginnie Mae), or by government-sponsored enterprises such as the Federal National Mortgage Association (FNMA or Fannie Mae) and the Federal Home Loan Mortgage Corporation (FHLMC or Freddie Mac). Ginnie Mae is a government-owned corporation within the Department of Housing and Urban Development. Fannie Mae and Freddie Mac are chartered by Congress, and regulated by the Office of Federal Housing Enterprise Oversight, but owned by stockholders. These agencies buy qualified mortgage loans from the financial institutions that originate them, securitize the loans (*i.e.*, pool them into MBS), and distribute the MBS securities through the dealer community. (PSA 1993, p. 2).

What are the default risks of MBS? Issuers of MBS are typically selective in choosing the mortgages that make up their pools. Beyond the basic security of the mortgage loans themselves, MBS issued by Ginnie Mae, Fannie Mae, and Freddie Mac carry additional guarantees that enhance their creditworthiness.

Ginnie Mae guarantees the timely payment of principal and interest on all of its pass-through MBS, and its guarantee is backed by the full faith and credit of the U.S. government. This means that holders of MBS issued by Ginnie Mae will receive their payments promptly each month, whether or not mortgage payments are collected, and they will receive full repayment of principal even if mortgages in the pool default.

Fannie Mae guarantees timely payment of both principal and interest on its MBS, whether or not the payments have been collected from the borrower.

Freddie Mac also guarantees the timely payment of both principal and interest on its MBS.

Nether Fannie Mae's nor Freddie Mac's guarantees are backed by the full faith and credit of the U.S. government. However, the credit markets consider the securities of both entities to be nearly equivalent to those issued by agencies which have the full-faith-and-credit guarantee. (PSA 1993, pp. 11–12).

What are the interest-rate risks of MBS? MBS are often priced at a higher yield than Treasury and corporate bonds because of the greater uncertainty in their cash flow. They may be sold in the secondary market at par, or at a premium or a discount, to their face value. As with other fixed-income securities, MBS prices fluctuate in response to changing interest rates: when interest rates fall, prices rise, and vice versa.

Interest rate movements have an additional impact on MBS because they affect prepayment rates, which in turn affect yields. When interest rates decline, prepayment speeds generally accelerate because homeowners refinance their mortgages at a lower interest rate and thus reduce their monthly obligation. Rising interest rates generally decrease the prepayment speed. The impact on yield will depend on whether the MBS was purchased at a premium or a discount. Investors who may wish to sell their mortgage securities prior to maturity should take care to understand how the direction of interest rates might affect the value of their MBS holdings. This admonition applies equally to institutions such as pension funds that are required to use market prices to account for the value of their assets. The use of *market-value accounting* causes unrealized gains and losses to be recognized as equivalent to gains and losses on securities that are actually sold before maturity.

MBS also have implied call and extension risks, which are sometimes referred to as *negative convexity*. The implied call risk means that investors may have their principal returned to them sooner than expected, because of accelerated (*i.e.*, higher because interest rates have fallen) prepayment speeds. In this case, investors may be forced to reinvest the returned principal at lower interest rates. On the other hand, the average life of the MBS may turn out the be longer than anticipated because prepayment rates are slower (*i.e.*, lower because interest rates have risen), creating an implied extension risk. In this situation, investors might miss an opportunity to earn higher prevailing rates of interest on their principal.

In general, before investing in an MBS, investors should consider the expected performance of that security if interest rates should rise, fall, or remain the same. (PSA 1993, pp. 13–14).

What are MBS derivatives? Beginning in the mid-1980s, MBS began to be used to create other mortgage securities that have different characteristics than the MBS from which they are derived. MBS serve as collateral for these "synthetic" (PSA 1994, p. 4) or derivative securities, supplying the monthly interest and principal payments used to make monthly payments on the derivatives. By far the largest category of MBS derivative is the CMO.

What are CMOs? The CMO (collateralized mortgage obligation, also known as a real estate mortgage investment conduit or REMIC) is a multiclass bond backed by pool of mortgage pass-through MBS. Note that the terms CMO and REMIC are used interchangeably here, as they are in both the PSA documents.

CMOs are usually collateralized by Ginnie Mae, Fannie Mae, or Freddie Mac pass-through MBS. In structuring a CMO, an issuer distributes cash flow from the underlying MBS collateral over a series of classes (called tranches) that comprise the bond issue. Each CMO is a set of two or more tranches, each having average lives and cash-flow patterns designed to meet specific objectives. The average life expectancies of the different tranches in a four-tranche sequential-pay CMO, for example, might be 2, 5, 7, and 20 years. Some CMOs have been structured with more than 50 tranches.

As the payments on the underlying MBS collateral are collected, the CMO issuer first pays the coupon rate of interest to the bondholders in each tranche. All scheduled and unscheduled principal payments generated by the collateral, as mortgage loans are repaid or prepaid, go first to investors in the high-priority tranches. Investors in lower-priority tranches do not start receiving principal payments until the higher-priority tranches are paid off. This basic type of CMO is known as a sequential-pay CMO. Any collateral remaining after the final tranche has been paid is known as a residual.

Sometimes CMOs are structured so that the prepayment and/or interest-rate risks are transferred from one tranche to another. Prepayment stability is improved in some tranches because other tranches absorb more of the risk of prepayment variability. Therefore, it is important to know the characteristics of other tranches in the CMO before selecting a tranche as an investment. (PSA 1993, pp. 7–8).

Each CMO tranche has an estimated first payment date on which investors can expect to begin receiving principal payments and an estimated last principal payment (or maturity) date on which they can expect their final dollar of principal to be returned. The period before principal payments begin in the tranche, when investors receive only interest payments, is known as the lockout period. The period during which principal repayments are expected to occur is called the window. Both first and last principal payment dates are estimates based on prepayment assumptions and can vary according to actual prepayments made on the underlying mortgage loans. (PSA 1994, p. 11).

The type of CMO tranche that is most relevant to this report is a kind of accrual tranche commonly known as a Z bond.

What are Z-bond CMO tranches? A Z bond tranche has a stated coupon rate of interest, but during its lockout period the interest earned on the Z bond is not paid in cash, but is instead added to the principal amount of the Z bond. This accretion of interest payments to the principal of a Z bond during its lockout period is why Z bonds are sometimes referred to as accrual bonds. Following the lockout period, when Z bond principal payments begin, this accrual behavior ends and interest payments begin to be made in cash at the stated coupon rate.

The use of the letter Z to denote the tranche emphasizes that in most CMOs the Z bond tranche is the last CMO tranche to receive principal and interest payments from the underlying MBS collateral. This means that in a simple sequential-pay CMO the Z bond's first payment date is no earlier than last payment date for all the other tranches in the CMO; only after all the other CMO tranches have been retired, does the Z bond's interest accrual stop and cash payments of principal and interest begin.

The unusual cash-flow features of Z bonds are quite useful in constructing a multi-class CMO because "the presence of a Z-tranche can stabilize the cash flow in *other* tranches" of the CMO (The Bond Market Association 2001, p. 14, emphasis added). This reduction in the interest-rate volatility of cash flow from other CMO tranches, of course, causes the cash flow from the Z bond to be more volatile. The ability of a Z bond to stabilize other CMO tranches is important to designers of CMO, and therefore, most CMOs include a Z bond tranche. Although exact data are difficult to find, it seems likely that, out of the many hundreds of billions of dollars of CMOs issued through 1994, several tens of billions of dollars of Z bonds were issued.

What are the interest-rate risks of Z bonds? If interest rates do not change much over the life of a Z bond, the lockout period tends to be relatively long — the first payment date is often fifteen years after origination when the CMO's collateral consists of thirty-year mortgages — and the last payment date is usually thirty years after CMO origination.

Because of the possibility of MBS prepayments, the length of time for a Z bond to return an investor's principal is unknown, in sharp contrast to a conventional (*i.e.*, non-callable) Treasury bond that has a known time until all the principal is repaid at maturity. Given an assumed PSA prepayment speed and a particular CMO structure, it is possible to predict the average length of time required for each CMO tranche to repay its principal to investors. This standard statistic is called the weighted average life of a CMO tranche.

The weighted average life of Z bonds are typically about twenty years under the assumption of no change in interest rates and MBS prepayment speeds. If interest rates rise and MBS prepayment speeds fall, the weighted average life of a Z bond increases beyond twenty years. But if interest rates fall and MBS prepayment speeds rise as homeowners refinance their mortgages, the weighted average life of a Z bond decreases. Depending on the structure of the CMO and the magnitude of the increase in mortgage prepayments, the weighted average life of a Z bond could fall to one-half or one-third its former value. A Z bond's highly variable weighted average life is an example of negative convexity (see discussion on page 10).

It is also important to stress that, despite decades of academic and industry research on the factors that influence homeowners' decisions to refinance mortgages, the exact quantitative relationship between changes in interest rates and changes in prepayment speeds is not known with certainty. This is true, in part, because homeowners move, and consequently prepay their mortgage in full, for reasons that are often unrelated to interest rates movements (Becketti and Morris 1990, Mattey and Wallace 1998, Mattey and Wallace 1999, for example).

All this means that a typical Z bond has considerable interest-rate risk. The market price of a Z bond, like that of any other long-maturity bond, is very sensitive to changes in interest rates, even if its weighted average life does not change. But a Z bond's negative convexity adversely affects investors whenever interest rates change. When interest rates fall, Z bonds return principal relatively quickly just when investors do not want to be forced to reinvest money that had been earning a relatively high interest rate at the lower current rate. On the other hand, when interest rates rise, Z bonds return principal more slowly than anticipated delaying the time when investors are repaid and can reinvest their money at the higher current rate. (The Bond Market Association 2001, p. 9). And the uncertainty created by negative convexity is compounded by the fact that predicting how mortgage prepayments respond to changes in interest rates is not an exact science.

All these issues are considered in a Federal Reserve "manual [that] seeks to provide the examiner with guidance for reviewing capital-markets and trading activities at all types and sizes of financial institutions" (Federal Reserve Board of Governors 1999, Preface, p. 1). After a discussion of mortgage prepayments and CMO structures, the manual summarizes the situation in a section entitled "Price Volatility of High-Risk CMOs" (Federal Reserve Board of Governors 1999, Section 4110.1, p. 12) as follows:

> When the cash flow from pass-through securities is allocated among CMO tranches, prepayment risk is concentrated within a few volatile classes, most notably residuals, inverse floaters, IOs and POs, Z bonds, and long-term support bonds. These tranches are subject to sharp price fluctuations in response to changes in short- and long-term interest rates, interest-rate volatility, prepayment rates, and other macroeconomic conditions. ...
>
> These high-risk tranches, whether held by dealers or investors, have the potential to incur sizable losses (and sometimes gains) within a short period of time. Compounding this price risk is the difficulty of finding effective hedging strategies for these instru-

ments.

It is clear that the combination of negative convexity and uncertainty about the exact relationship between changes in interest rates and MBS prepayment speeds, means that a Z bond has more interest-rate risk than a fixed-maturity (*i.e.*, non-callable) Treasury bond with a similar weighted average life. Of course, Z bonds have higher coupon interest rates than do comparable Treasury bonds. This means that investors, when considering the range of possible future interest rates changes, are faced with a trade-off between the desirable higher average returns on Z bonds and the undesirable higher variability of returns on Z bonds.

Judging the desirability of investing in Z bonds, therefore, involves making a *subjective decision* about risk: investors are forced to weigh the value of the relatively higher return on Z bonds when interest rates don't change much against the relatively lower returns on Z bonds when interest rates do change substantially. The decision is subjective in at least two different ways. First, the decision involves developing expectations about the likelihood of interest rates changing by different amounts in the future. And second, the decision involves attitudes toward risk because it involves choosing among securities whose future investment returns are uncertain. The subjectivity of the decision about whether or not to invest in Z bonds means that two competent investors could easily make different decisions because their expectations differed, or their attitude towards risk differed, or both.

This completes the report's introduction to mortgage-backed securities and Z bonds. Given this background, I now present the chronology of events occurring before the sale of the Z bonds in early 1995.

2.2 Size and Composition of Nolan Portfolio in 1994

The portfolio of securities purchased for the Funds by Nolan represented a sizable fraction of the Funds' total assets in 1994. As shown in Table 1 on the next page, the Nolan portfolio constituted from slightly more than a third to almost one half of total assets across the three Funds.

The composition of the Nolan portfolio was heavily weighted toward Z-bond tranches of CMOs. Table 2 on the following page shows that Z bonds represented about 90 percent of all the Nolan-purchased securities at the end of 1994 for each of the three Funds. Not only were the Nolan securities concentrated in one particular class of security, but the Z bond holdings were

Table 1: ***Book Value of Aggregate Portfolio Investments and Nolan Portfolio Investments for the Funds at End of 1994.*** *Book value of investments expressed both in millions of dollars (**$m**) and as percent of book value of all investments in aggregate portfolio (**%**).*

Local 35 Fund	Local 120 Fund	Local 322 Fund
Aggregate portfolio investments:		
$15.836m	$13.635m	$23.859m
100.0%	100.0%	100.0%
Nolan portfolio investments:		
$7.844m	$6.440m	$8.496m
49.5%	47.2%	35.6%

Source: The Funds' 1994 Form 5500 submissions to DOL.

Table 2: ***Book Value of Nolan Portfolio Investments for the Funds at End of 1994.*** *Book value of investments expressed both in millions of dollars (**$m**) and as percent of book value of all investments in Nolan portfolio (**%**).*

Local 35 Fund	Local 120 Fund	Local 322 Fund
All investments in Nolan portfolio:		
$7.844m	$6.440m	$8.497m
100.0%	100.0%	100.0%
All Z bonds in Nolan portfolio:		
$6.955m	$5.915m	$7.889m
88.7%	91.8%	92.8%
Four largest Z bonds in Nolan portfolio:		
$4.083m	$3.980m	$5.162m
52.0%	61.8%	60.8%

Source: Fleet Investment Services, Nolan custodial account statements for 12/31/94.

concentrated in just a few large Z bonds. Table 2 also shows that the percent of all Z bonds invested in the four largest Z-bond holdings varied from 50 to 60 percent across the three Funds at the end of 1994.

Such a heavy concentration of Fund assets in a one, particularly volatile, type of security (with the additional concentration in just of few issues of that kind of security) represents a dramatic rejection of the time-tested, risk-reduction principle of asset diversification.

2.3 Losses on Nolan Portfolio in 1994

As interest rates rose during the course of 1994, the market value of the Nolan-purchased Z bonds fell sharply. The market-value decline was caused by falling Z bond prices, which were to be expected given their interest-rate risk profile. By the end of 1994, the gap between the book value of the Z bonds (reflecting their purchase price) and the market value of the Z bonds (reflecting their market price at the end of 1994) had grown relatively large, as shown in Table 3 on the next page.

The sharp decline in the market value of Z bonds caused the market value of all Nolan-purchased securities to decline by more than did the market value of all the non-Nolan securities held by the Funds. As shown in Table 4 on the following page, the gap between book value and market value at the end of 1994 was much larger for Nolan-purchased securities than for non-Nolan securities.

In the case of Local 35 Fund, the market value of non-Nolan assets had fallen 4.9 percent below their book value, while the market value of Nolan assets were 26.6 percent below their book value.

The market value of non-Nolan assets for Local 120 Fund at the end of 1994 was actually 3.1 percent above their book value, while the market value of Nolan assets for that fund was 13.9 percent below their book value.

And the experience of Local 322 Fund was similar to that of Local 35 Fund, according to Table 4. The market value of non-Nolan assets was about 2.6 percent below book value at the end of 1994, while the market value of Nolan assets were 25.8 percent below their book value on the same date.

2.4 Consequences of 1994 Nolan Portfolio Losses

The decline in the market value of the Funds' assets, which was heavily concentrated in the Nolan-purchased Z bonds, had significant effects on the

Table 3: ***Difference Between Market Value and Book Value of Z Bonds Purchased by Nolan for the Funds at End of 1994.*** *Market value and book value of Z bond investments, and their difference, all expressed in millions of dollars (***$m***).*

	Local 35 Fund	Local 120 Fund	Local 322 Fund
All Z bonds in Nolan portfolio:			
book value	$6.955m	$5.915m	$7.889m
market value	$4.904m	$4.838m	$5.487m
difference	$–2.051m	$–1.077m	$–2.402m

Source: Fleet Investment Services, Nolan custodial account statements for 12/31/94.

Table 4: ***Difference Between Market Value and Book Value of Non-Nolan Portfolio Investments and Nolan Portfolio Investments for the Funds at End of 1994.*** *Market value and book value of investments, and their difference, all expressed in millions of dollars (***$m***).*

	Local 35 Fund	Local 120 Fund	Local 322 Fund
All investments in non-Nolan portfolios:			
book value	$7.992m	$7.195m	$15.363m
market value	$7.599m	$7.421m	$14.970m
difference	$–0.393m	$+0.226m	$–0.393m
All investments in Nolan portfolio:			
book value	$7.844m	$6.440m	$8.497m
market value	$5.760m	$5.544m	$6.308m
difference	$–2.084m	$–0.896m	$–2.189m

Source: The Funds' 1994 Form 5500 submissions to DOL.

Table 5: ***Decline in Adequacy of Pension Funding Associated with 1994 Portfolio Losses.*** *Funding ratio defined as market value of pension assets divided by pension liability. Funding ratio calculated using two different concepts of liability:* ***termination liability****, or current vested liability, which is actuarial present value of vested benefits that must be paid in future even if pension is immediately terminated; and* ***ongoing liability****, or accrued liability, which is actuarial present value of benefits that are expected to be paid in the future as the pension plan continues to operate. Assets expressed in millions of dollars (***$m***); funding ratio expressed as percent (***%***).*

	Local 35 Fund	Local 120 Fund	Local 322 Fund
Funding adequacy on January 1, 1994:			
market value of assets	$15.368m	$15.218m	$24.361m
termination funding ratio	109%	91%	112%
ongoing funding ratio	93%	78%	91%
Funding adequacy on January 1, 1995:			
market value of assets	$13.548m	$13.210m	$21.567m
termination funding ratio	88%	75%	95%
ongoing funding ratio	73%	64%	75%

Source: The Funds' 1994 and 1995 Form 5500 submissions to DOL.

adequacy of pension funding. Form 5500 submissions from the Funds to DOL show that the two most common measures of pension funding adequacy fell sharply over the course of 1994. The magnitude of the decline in the market value of assets and the resulting declines in the funding adequacy measures are shown for each of the Funds in Table 5.

A comparison of the magnitude of the one-year declines in the termination funding ratio shown in Table 5 with the distribution the that ratio across all multi-employer pension plans (Pension Benefit Guaranty Corporation 1998, Table M-12, p. 69) indicates that the declines in funding adequacy caused by the losses on the Z bonds represent a substantial decline in the Funds' percentile ranking among all multi-employer pension plans. Note that the data presented in Table 5 are drawn from Form 5500 submissions from the Funds to DOL, and are based on asset values at the end of 1993 and at the end of 1994, which is before Clover and the other two new investment managers were retained by the Trustees of the Funds.

2.5 Replacement of Nolan in Early 1995

As awareness of the losses on the Nolan-purchased Z bonds spread among the Trustees during 1994, they began efforts that eventually led to the early 1995 replacement of Nolan with three new investment managers: Loomis Sayles and Company, LP; HGK Asset Management, Inc.; and Clover. Each of the new investment managers made presentations to the Trustees concerning the investment strategy that they would pursue if given funds to manage by the Trustees.

Signatures were affixed to the investment agreements between the new investment managers and the Trustees and during February and March of 1995. To facilitate the implementation of the switch from the unorthodox Nolan investment strategy to those proposed by the three new managers, Clover agreed to sell the Nolan securities, at no charge to the Trustees, in order to raise the cash requested by the other two investment managers and to implement the investment strategy that they had presented to the Trustees. Clover conducted auctions of the Nolan-purchased Z bonds on five different days during 1995: February 15, March 3, March 8, May 8, and May 9. And a portion of the proceeds of these sales was transfered to each of the other two new investment managers on March 22, 1995.

3 Analysis of Decision to Sell Z Bonds

This section of the report contains the findings from my sale decision analysis. The findings are related to three topical themes raised by the Complaint and by the plaintiff's expert report.

First, I show that the portfolio of Z bonds purchased by Nolan was too price volatile to be a sensible investment for the Funds. And consequently, the Clover strategy of reducing the volatility of investment returns was prudent. Neither the Complaint nor the plaintiff's expert report argues that it was imprudent to reduce the volatility of the Funds' assets.

Second, I show that there is no evidence of disruption in the Z bond market during early 1995 when Clover sold the Z bonds, contrary to allegations in the plaintiff's expert report. In fact, the movement of Z bond prices and similar-duration Treasury bond prices was similar, indicating the drop in Z bond prices was caused by the intrinsic features of Z bonds. In addition, the magnitude of the Clover sales were small relative to the volume of Z bonds outstanding, contrary to allegations of an "extremely small market for these securities" in the Complaint (paragraph 28-a-iv as quoted on page 3).

And third, I show that, when the volatility of a Z bond's investment return is considered from the perspective of a prudent investor, the prospective risk-adjusted return on a Z bond does not necessarily provide "a much better investment return" than do other investments, as alleged in the Complaint (paragraph 28-a-i as quoted on page 2).

3.1 Why Is a Z Bond Portfolio Risky for a Pension?

To understand why a large portfolio of Z bonds is not a sensible investment for a pension fund, one must first remember that pensions are subjected to market-value accounting. No matter how attractive a security's yield to maturity — a measure of investment return that ignores fluctuations in a security's price before it matures — if its annual return is highly volatile, adverse annual returns can affect the adequacy of pension funding as reported to the government every year on Form 5500. And if the adequacy of funding falls low enough, government regulations force pension sponsors to contribute more to the pension fund than they anticipated.

This description of the Funds position is substantially different from that described in the plaintiff's expert report. That report presents each Z bond's yield to maturity (Carron 2001, Exhibit 6) without mentioning that pension funds are subject to market-value accounting, and therefore, yield to maturity is of limited relevance to an analysis of the prudence of pension investments. And that report also conjures up the specter of a reduction in pension benefits being caused by lower than expected investment returns (Carron 2001, paragraph 47), apparently unaware of the fact that government pension regulation focuses on higher contributions from pension sponsors (*i.e.*, employers) as the solution to underfunding, not lower benefits for pension participants (*i.e.*, employees).

Given the regulatory environment in which pensions operate, a large portfolio of Z bonds is risky for a pension because it is likely to cause pension assets to be more volatile than pension liabilities. The total liability of a pension is the actuarial present value of future pension benefits.

Duration and Duration Matching. Roughly matching the price volatility of assets and liabilities is a widely recognized principle of portfolio management (Dattatreya and Fabozzi 1989, for example). In the argot of the financial community, *duration* is the term used to describe the degree of price volatility of a fixed-income security. A security is said to have a duration of, say, five years if its price volatility — the percentage change in market price caused by a change in interest rates of one percentage point — is the same as that of a five-year Treasury STRIP, a zero-coupon Treasury bond whose only payment is at maturity in five years. (Note: STRIP is an acronym that stands for Separate Trading of Registered Interest and Principal.) Given this meaning of duration, one can see why this principle of portfolio management is often called duration matching.

The appeal of the principle of duration matching is based on the fact that assets whose duration is close to that of the liabilities they are funding will experience price changes that are about the same size as experienced by the liabilities, thus leaving the value of assets minus liabilities (*i.e.*, net worth, or "surplus" in the pension context) roughly unchanged. If the principle is not followed, net worth will fluctuate. When assets have a longer duration than liabilities, a rise in interest rates causes a decrease in net worth (because the market value of assets drops by more than that of liabilities) and a fall in rates causes an increase in net worth. On the other hand, if assets have a shorter duration than liabilities, a rise in interest rates causes an increase in net worth (because the market value of assets drops by less than that of liabilities) and a fall in rates causes a decrease in net worth. So, roughly

Table 6: ***Duration of Pension Liability for the Funds at End of 1994.*** *Duration is estimated by dividing the dollar sensitivity of pension liability shown in plaintiff's expert report (Carron 2001, Exhibit 7) by the end-of-1994 pension liability implied by the termination funding ratio and pension asset value shown in Table 5 on page 18.*

Local 35 Fund	Local 120 Fund	Local 322 Fund
9.6 years	7.1 years	6.7 years

Source: Carron (2001, Exhibit 7) and Table 5 on page 18; methodology described in caption above.

equating the duration of a pension's assets with the duration of its liabilities is a way to stabilize that pension's net worth (or surplus) across future scenarios that may involve either a rise or a fall in interest rates.

Duration of Assets and Liabilities. What is the duration (*i.e.*, price volatility) of a Z bond, and how does Z-bond duration compare with the duration of the Funds' pension liabilities? Estimates of the duration of the Funds' pension liability are shown in Table 6. At the end of 1994, the duration of the Funds' pension liabilities ranged from 6.7 years to 9.6 years. Weighting these individual duration estimates by the magnitude of the Funds' pension liability produces an average liability duration of 7.6 years. This means that the interest-rate sensitivity of the Funds' pension liabilities was the same as the price volatility of a Treasury STRIP bond with a maturity of 7.6 years.

In contrast to the duration of the Funds' pension liability, the duration of a typical Z bond is roughly twenty years. The duration of a Z bond can be approximately estimated from information on weighted average life (see discussion on page 12) because Z bonds provide no interest payments before the first payment of principal. The weighted average life statistic weights by the amount of the principal payments, not by the present value of all cash flow (principal and interest) as done in a (Macaulay) duration calculation, so the the duration of a Z bond is slightly less than its weighted average life.

Consider, for example, three CMO Z bonds: Fannie Mae 93-G25-Z, Freddie Mac G24-ZB, and Freddie Mac 1562-Z. Nolan purchased for the Funds nearly $6.5 million dollars of these three Z bonds (Rumeld 1999), an amount that represents nearly one-third of the Funds' total Z bond holdings as shown in Table 2 on page 15. According to the Fannie Mae and Freddie Mac offering prospectus for each of these three CMOs, the weighted average life of these Z bonds, assuming the rate of mortgage prepayments used to price the bonds, was 20.2 years, 21.3 years, and 21.6 years, respectively. As mentioned above, the duration of a Z bond is somewhat less than its average weighted life, but the difference is not large given that interest payments do not start until the first principal payment date (*i.e.*, after the lockout period). Clearly, the duration of a Z bond must be greater than the lockout period, and in most cases, much more than the lockout period because Z bond principal and interest is paid until the CMO fully matures about 30 years after being issued. The offering prospectus for each CMO shows that these three Z bonds had a lockout period, again assuming the rate of mortgage prepayments used to price the bonds, of about 11 years, 17 years, and 17 years, respectively. In all three cases, the principal and interest payments were anticipated to continue until the CMO fully matured after 30 years.

The magnitude of Z bond duration suggested by this information is consistent with the assumption of the plaintiff's expert report that "the Z bonds had a duration of 20 years at the time Clover assumed responsibility" for part of the Nolan portfolio (Carron 2001, paragraph 63).

Managing the Duration Mismatch. These estimates of the duration of the Funds' pension liability and the duration of the Funds' Z bond holdings indicate that the Nolan portfolio had a duration (or price sensitivity) that was more than than twice that of pension liability. As interest rates rose during 1994, the Trustees became acutely aware of the consequences of this duration mismatch. For example, during a Local 322 Fund Trustees meeting on August 10, 1994, the fund's consulting actuary, Stephen Thomas, reminded the trustees that it was misleading to focus on the Z bonds' yield to maturity because the relevant issue was the market value of assets measured relative to the present value of pension benefits (Trustees of Local 322 Fund 1994, p. 5).

It was this enormous mismatch that apparently lead the Trustees to tell Clover that its investment management performance would be judged against the Lehman Brothers Intermediate Government/Corporate Bond Index. This index is composed of bonds whose price volatility is roughly equivalent to those of five year Treasury STRIP bonds. Clover, which has a long history of managing fixed-income portfolios of any duration specified by clients, reacted to this proposed performance index by announcing to the Trustees that it would require a reduction in asset duration of the Nolan portfolio. After the Trustees accepted Clover's proposal and retained Clover as an investment manager, Clover accomplished this reduction in asset duration by selling the Z bonds and replacing them with a mixture of shorter duration non-CMO bonds and corporate stocks.

The Complaint and the plaintiff's expert report allege that Clover was imprudent in selling the Z bonds (an allegation that will be examined below), but do not allege that Clover was imprudent to lower the duration of pension assets. In fact, under the heading "Alternative means of achieving shorter duration," the plaintiff's expert report discusses a range of strategies for lowering asset duration without selling all the Z bonds (Carron 2001, paragraphs 56–59). The desirability of doing this, rather than selling the Z bonds, is not established. There is no discussion of how much it would cost to buy super-floater CMO bonds or interest rate options, or whether adding these highly volatile securities to the Z bond portfolio would effectively reduce the price volatility of the Z bonds. The question of effectiveness is a particularly important omission given the well-known difficulties in hedging volatile CMO tranches (Federal Reserve Board of Governors 1999, as quoted on page 13). And the question of cost is a highly significant omission given that buying interest rate options — securities that in many situations expire worthless without having paid any cash flow — is one suggested strategy for reducing asset duration without selling all the Z bonds (Carron 2001, paragraph 59).

Having established the desirability of reducing the duration of the assets, I turn now to an examination of the allegation that Clover was imprudent because it ignored the distressed condition of the Z bond market in early 1995 when it sold the Z bonds.

3.2 What Was the Z Bond Market Like in 1995?

The Complaint and the plaintiff's expert report make two different arguments about why Clover's sale of the Z bonds in early 1995 was imprudent.

Was the Z Bond Market Illiquid? The Complaint argues that Clover sold the bonds too rapidly "given the extremely small market for these securities" (see quotation from the Complaint on page 3). The allegation is that selling the Z bonds in an illiquid market produced depressed sale prices. The plaintiff's expert report does not develop that argument, although it does allege that Clover conducted the auctions in an imprudent manner, a charge that will be examined below. There is mention of the fact that "$70 billion in Z bonds were issued" during the twelve years ending in 2000 (Carron 2001, paragraph 22), but there is no explanation about why selling a total of roughly $20 million of Z bonds over the course of five separate auctions would put any pressure on the allegedly "extremely small market for these securities."

In reality, these sales represented a tiny fraction of all the Z bonds that were part of CMOs that had been issued through 1994, and even represented a small fraction of the face value of the Z bonds issued in the specific CMO tranches purchased by Nolan. For example, considering the same three Z bonds whose duration was discussed above, information on original issue amount in the offering prospectus of each CMO and on the size of Nolan's original purchase (Rumeld 1999) indicate that the three Funds together held 13.2% of the Fannie Mae 93-G25-Z tranche, 7.1% of the Freddie Mac G24-ZB tranche, and 7.2% of the Freddie Mac 1562-Z tranche. And as shown above, these three investments were among the very largest holdings in the Nolan portfolio.

Given the unsubstantiated nature of the allegation that there was an "extremely small market for these securities," I turn to the other allegation about the nature of the market for Z bonds in early 1995.

Was the Z Bond Market Disrupted? Although not mentioned in the Complaint, the plaintiff's expert report alleges that the rise in interest rates during 1994 caused a "disruption in the market [for] Z bonds" that "persisted through mid-1995" (Carron 2001, paragraph 36 and paragraph 35). And therefore, "it was an inappropriate time to sell" because CMO Z bond "prices were depressed relative to other market instruments" (Carron 2001, paragraph 36 and paragraph 29). The report states that "it was apparent to professional investment managers that the market for Z bonds and many other kinds of CMOs was in disarray" (Carron 2001, paragraph 30).

Two lines of argument are developed to support this market disruption allegation. The first recounts the unexpected rise in interest rates that occurred during 1994, the collapse of Askin Capital in March-April, 1994, and summarizes the situation by quoting *Wall Street Journal* articles published on April 7 and April 8 of 1994. I do not challenge the notion the the market for "certain mortgage-backed securities" (*Wall Street Journal*, April 8, 1994) was disrupted in April of 1994, but note that the report does not present any evidence that the market for Z bonds was disrupted then.

The second line of argument consists of the assertion that "these [disrupted market] conditions persisted through mid-1995" (Carron 2001, paragraph 35). The only evidence offered for this assertion is Exhibit 5, which allegedly demonstrates that the Z bonds sold by Clover during early 1995 "were trading at depressed prices" because there had been a "decline in value between . . . Z bonds and U.S. Treasury strips of comparable maturity," which "are immune from any contagion affecting the mortgage securities sector" (Carron 2001, paragraph 36).

The problem with this second line of argument is that Exhibit 5 compares the Z bonds, which have a duration of approximately twenty years, with a Treasury STRIP bond that has a five year duration (Carron 2001, Exhibit 5). This is an apples-to-oranges comparison. It is no surprise that a long-duration security experiences a larger price decline than does a short-duration security during a period of rising interest rates. All this shows is that, by definition, the long-duration security is more price volatile than a short-duration security. It says nothing about the conditions of the markets in which the two securities trade. The price of the long-duration security is "depressed" relative to the short-duration security because of the difference in the price sensitivity of the two securities. The difference in the magnitude of the price declines reflects a difference in the intrinsic features of the two securities, not a difference in market conditions.

This critique of the Exhibit 5 in the plaintiff's expert report is developed further by reconstructing Exhibit 5's four graphs to show not only the information included in Exhibit 5, but also the information that should have been included if Z bonds had indeed been compared with a Treasury STRIP bond of "comparable duration." Figures 1–5 on pages 27–31 show the relative price of four Z bonds that together represented about 40% of the Nolan Z-bond portfolio. (There are five figures because one reconstructs the Exhibit 5 graph with an alternative methodology in order to show that the results are robust to different methods of handling the bond price data.) These figures also show the relative price of the 5-year Treasury STRIP bond (included in Exhibit 5) and the relative price of the 20-year Treasury STRIP bond (excluded from Exhibit 5). In every figure, each security's monthly price is expressed relative to the same security's monthly price in a reference month,

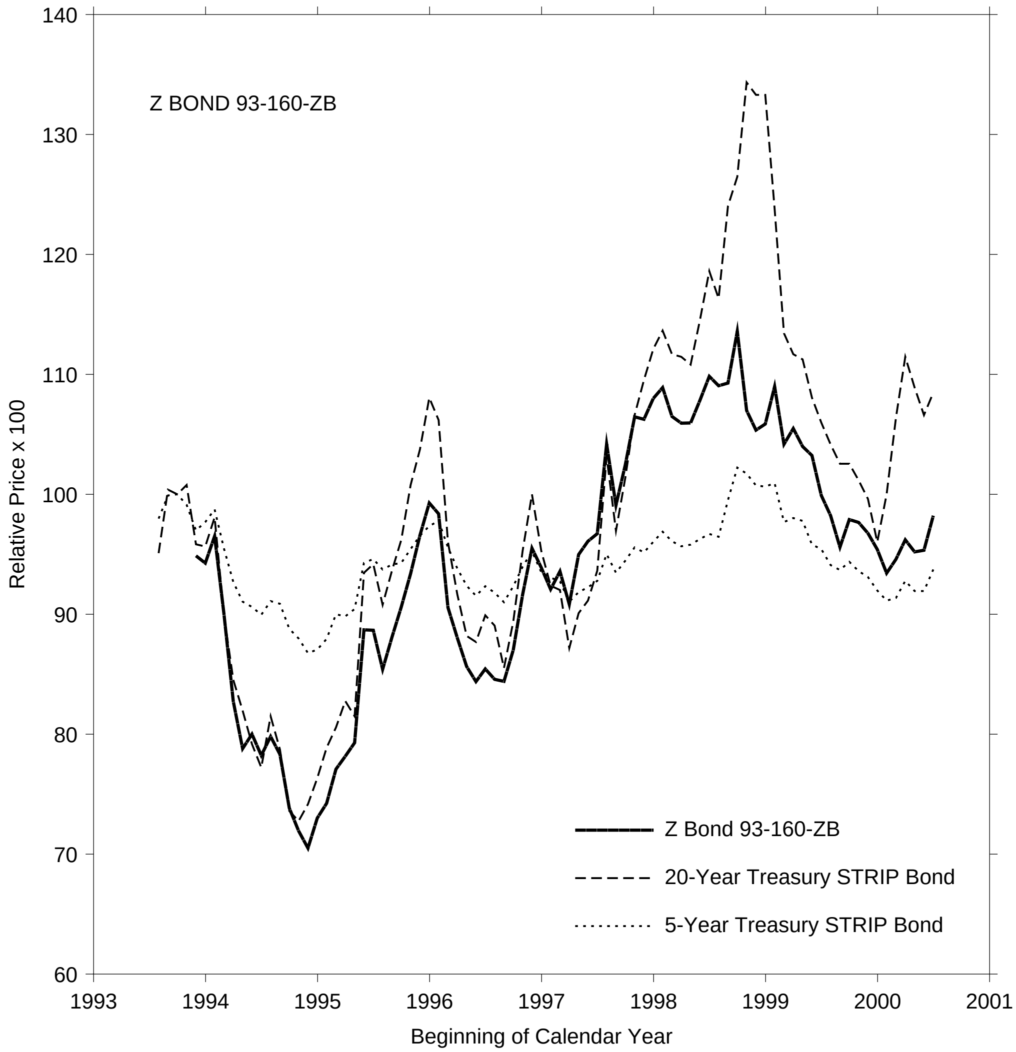

Figure 1: ***Relative Prices of 5-Year Treasury STRIP Bond, 20-Year Treasury STRIP Bond, and Z Bond 93-160-ZB during 1993–2000 Period***. *Z bond issued as part of Fannie Mae REMIC Trust 1993-160 in September, 1993. Z bond prices normalized so that relative price is 70.5 in November, 1994, as in Carron (2001, Exhibit 5, p. 1 of 4). Treasury STRIP bond prices normalized so that their relative prices are 100.0 in September, 1993, when Z bond was first purchased.*

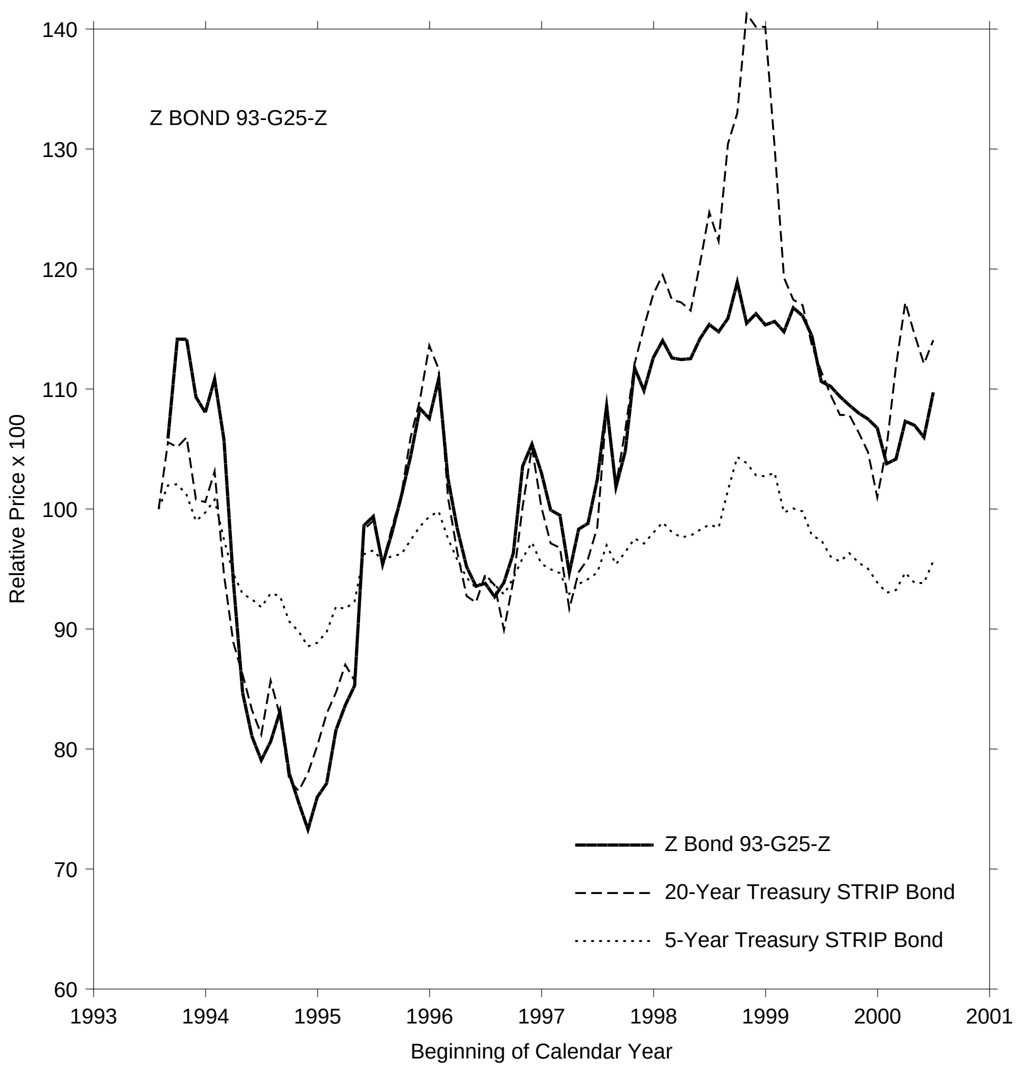

Figure 2: ***Relative Prices of 5-Year Treasury STRIP Bond, 20-Year Treasury STRIP Bond, and Z Bond 93-G25-Z during 1993–2000 Period***. *Z bond issued as part of Fannie Mae REMIC Trust 1993-G25 in July, 1993. Z bond prices normalized so that relative price is 73.3 in November, 1994, as in Carron (2001, Exhibit 5, p. 2 of 4). Treasury STRIP bond prices normalized so that their relative prices are 100.0 in July, 1993, when Z bond was purchased.*

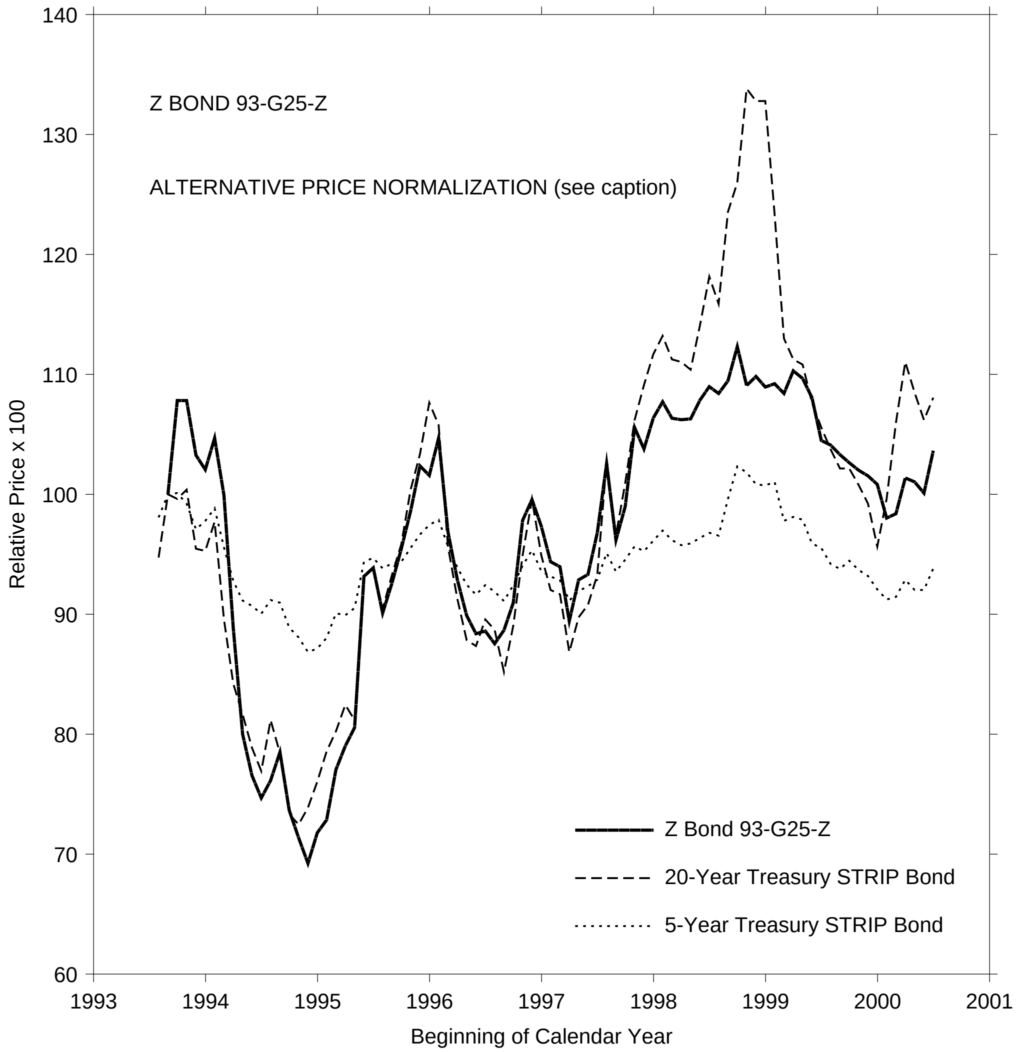

Figure 3: ***Alternative Representation of Relative Prices of 5-Year Treasury STRIP Bond, 20-Year Treasury STRIP Bond, and Z Bond 93-G25-Z during 1993–2000 Period***. *Z bond issued as part of Fannie Mae REMIC Trust 1993-G25 in July, 1993. Treasury STRIP bond prices and Z bond prices normalized so that relative price is 100.0 in August, 1993, one month after CMO was issued and Z bond purchased.* ***Compare with Figure 2 on the preceding page***.

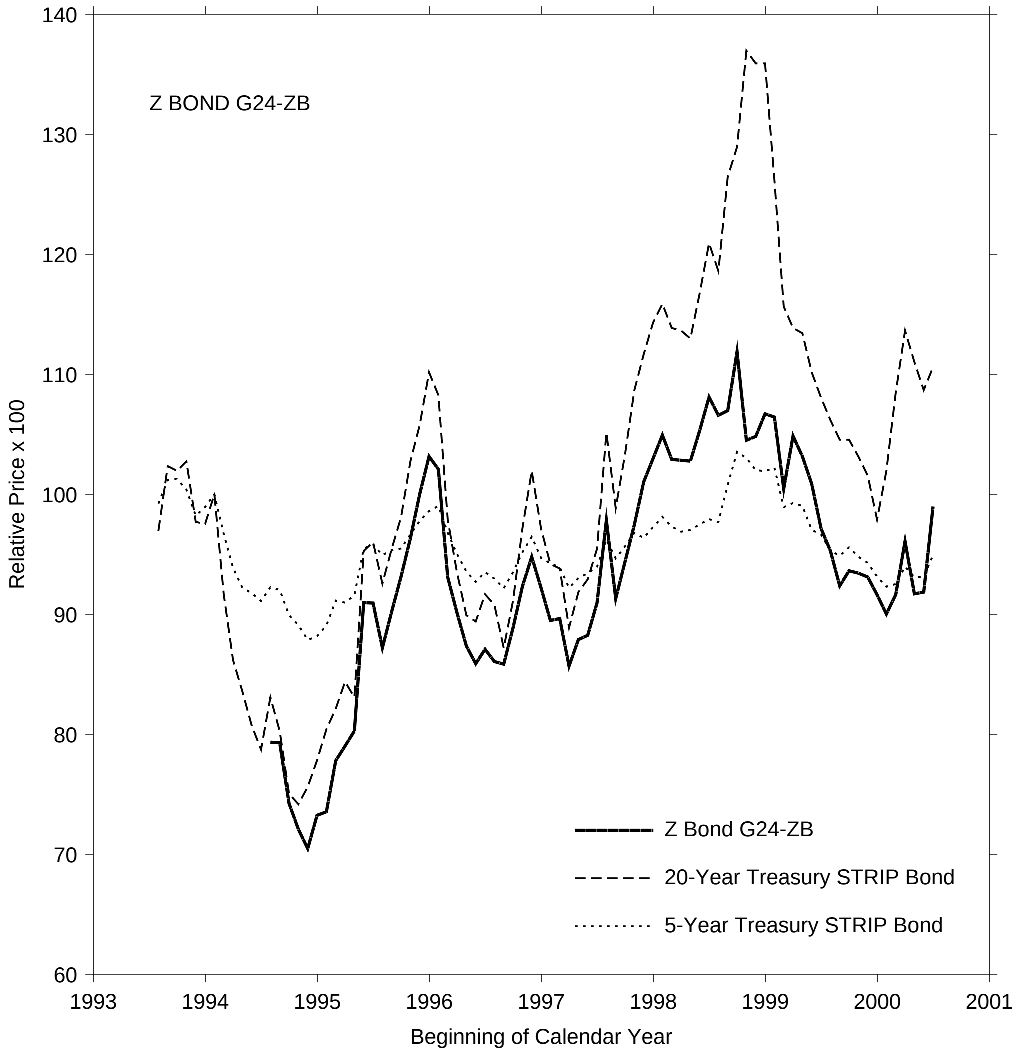

Figure 4: ***Relative Prices of 5-Year Treasury STRIP Bond, 20-Year Treasury STRIP Bond, and Z Bond G24-ZB during 1993–2000 Period***. *Z bond issued as part of Freddie Mac Multiclass Mortgage Securities, Series G024, in November, 1993. Z bond prices normalized so that relative price is 70.5 in November, 1994, as in Carron (2001, Exhibit 5, p. 3 of 4). Treasury STRIP bond prices normalized so that their relative prices are 100.0 in January, 1994, when Z bond was purchased.*

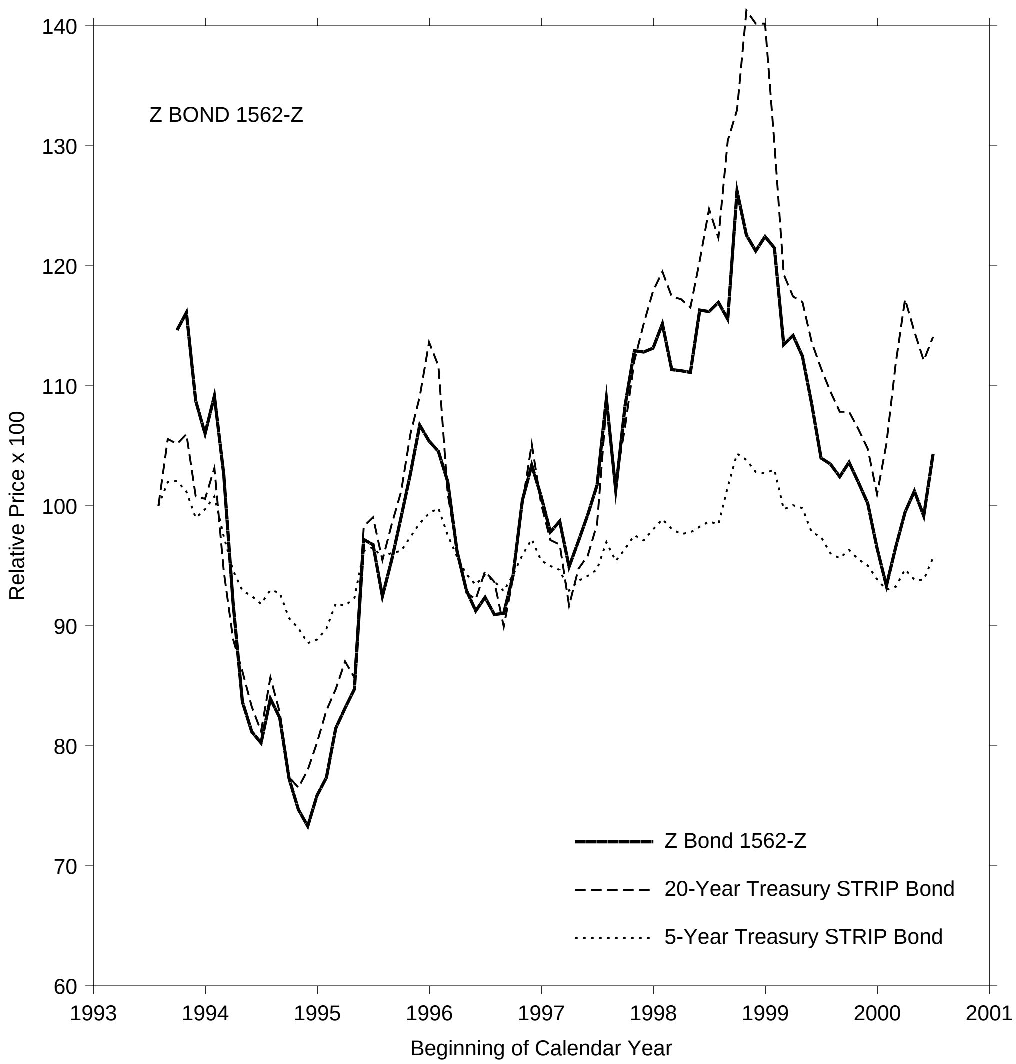

Figure 5: ***Relative Prices of 5-Year Treasury STRIP Bond, 20-Year Treasury STRIP Bond, and Z Bond 1562-Z during 1993–2000 Period**. Z bond issued as part of Freddie Mac Multiclass Mortgage Participation Certificates, Series 1562, in July, 1993. Z bond prices normalized so that relative price is 73.3 in November, 1994, as in Carron (2001, Exhibit 5, p. 4 of 4). Treasury STRIP bond prices normalized so that their relative prices are 100.0 in July, 1993, when Z bond was first purchased.*

thus allowing easy comparison of the magnitude of price decreases and increases. The three relative prices are charted starting sometime in 1993 or 1994 and ending in June, 2000, in every figure. This time period is the same length as promised in the titles of Exhibit 5's graphs ("1993–2000"), but is longer than the period actually shown in Exhibit 5's graphs, which ends with June, 1997.

Figures 1–5 show that the relative price declines of the Z bonds during 1994 was quite comparable to the relative price declines experienced by the 20-year Treasury STRIP bond. This evidence indicates that these two, comparable-duration securities experienced roughly the same relative price drop during 1994. Hence, the prices of Z bonds were not significantly depressed relative to 20-year Treasury STRIP bonds. It is true that in early 1995 Z bond prices were depressed relative to 5-year Treasury STRIP prices, but this says nothing about the condition of the market for Z bonds. To suggest that a comparison of prices between two securities with such different durations indicates anything about market conditions is absurd. Making such an argument would be about as sensible as concluding that the market for 30-year Treasury STRIP bonds was disrupted because a rise in interest rates had caused the relative price of a 30-year Treasury STRIP bond to fall much more than the relative price of a 1-year Treasury STRIP bond. Indeed, the price declines would be very different, but they would represent evidence that the intrinsic features of the two STRIP bonds were very different (*i.e.*, that the duration of one bond is thirty years and the duration of the other bond is one year), not that the market for 30-year Treasury STRIP bonds was disrupted.

Figures 1–5 reveal a second important point. Notice that during 1998, when the prices of both Z bonds and Treasury STRIP bonds were rising in response to falling interest rates, the prices of Z bonds did not rise nearly as much as those of the 20-year Treasury STRIP bond. This is an illustration of the adverse consequences of the negative convexity feature of Z bonds (see discussion on page 10). As interest rates fall and mortgage prepayment rates rise, the duration of Z bonds drops, making their price sensitivity less (just when investors would like the price sensitivity to remain high). It is not clear why the graphs in Exhibit 5 of the plaintiff's expert report stop in the middle of 1997 when the title of each graph claims price data will be presented through 2000. Perhaps it is a typo; but perhaps it is related to the fact the report never mentions the undesirable negative convexity feature of Z bonds. This is a glaring omission in a report that focuses on the issue of whether an investment manager was prudent in selling Z bonds. Investment managers with even the slightest knowledge of Z bonds know that not only do they have high price volatility, but that the volatility is greater when prices are dropping than when prices are rising. This widely understood fact of asymmetric Z bond price volatility (higher when it hurts an investor and lower when it could help an investor) is at the root of why Clover did not hesitate to sell the Z bonds.

This part of the sale decision analysis has shown that there is no evidence that the market for Z bonds was illiquid or disrupted during early 1995 when Clover sold the Z bonds. In fact, the evidence presented here indicates that Z bond prices were down in early 1995 by an amount that reflected their intrinsic features. And the evidence of Z bond prices falling relative to 20-year Treasury STRIP prices during 1998 illustrates the adverse consequences for investors of Z bonds' negative convexity, and why Z bonds did not offer a better prospective return in 1995, as alleged in the Complaint.

3.3 Did Z Bonds Offer a Better Prospective Return?

Without defining what is meant by better investment return, the Complaint alleges that "the Funds stood to achieve a much better investment return by retaining the Z bonds" (see quote from Complaint on page 2).

The plaintiff's expert report calculates yields to maturity for each Z bond (Carron 2001, Exhibit 6) and compares them to the yields to maturity for Treasury STRIP bonds of some unknown maturity (footnote 1 in Exhibit 6, which presumably specifies the maturity, does not appear on any three of the pages comprising Exhibit 6).

Under the heading "Balance of risk and return," the plaintiff's expert report also describes the findings of an analysis of the distribution of five-year holding period returns on the Z bonds across alternative future interest rate scenarios beginning in early 1995 (Carron 2001, paragraphs 41–48). That analysis compares the distribution of five-year holding period returns on the Z bonds with the return distribution on 5-year Treasury STRIP bonds. It concludes that the Z-bond return distribution is the more desirable, even though the return on the 5-year Treasury STRIP bonds would "have turned in a better performance [i.e., five-year holding period return] than the Z bonds that were sold" in about one-third of the prospective interest rate scenarios (Carron 2001, paragraph 46).

In this final part of my sale decision analysis, I examine these arguments in more detail. First, I show why the yield to maturity measure is misleading for a U.S. pension fiduciary. And second, I extend the return distribution analysis to recognize that there is a range of informed expectations about the volatility of future interest rates, and that there is a range of considered attitudes towards risk, that together imply considerable variation in opinions among prudent investors about the attractiveness of Z bonds as pension investments.

Why Are Yields to Maturity Misleading? As shown above, pension accounting and government regulation of pension funding adequacy both focus a pension fiduciary on annual holding period returns, rather than on yield to maturity. The annual holding period return is an investment return concept that recognizes unrealized annual gains and losses in the market value of a security as part of the return. On the contrary, the yield to maturity is an investment return concept that ignores all gains and losses in the market value of a security and assumes the security is held until maturity.

Given the pension regulatory environment in the United States, it would be risky to invest in pension assets in securities that were very price volatile, even though they had a relatively high yield to maturity. This is because regulatory sanctions of various types come into play when the annual holding period return is low enough to bring the pension's funding ratio below certain levels. And it is not possible to avoid these sanctions by arguing that the securities whose prices declined so much will provide a high yield to maturity. These government sanctions include requiring the pension to pay a higher pension insurance premium to the Pension Benefit Guaranty Corporation and requiring the pension sponsors to contribute more to the pension fund.

Even a cursory understanding of the United States pension regulatory regime exposes the absurdity of the allegation that "retaining the Z-Bonds posed no intermediate or long-term risk to the Funds, since they were reliable investments that, if held to maturity, would pay their stated interest and return principal" (Complaint, paragraph 28-a-ii as quoted on page 2).

Why Do Some Think Z Bonds Provide Worse Returns? Before developing my argument in response to this question, it is important to recognize that many prudent investors arrive at the conclusion that Z bonds provide a very unattractive prospective return distribution without explicitly conducting the kind of analysis used in the plaintiff's expert report. They know that Z bonds are inappropriate investments for their purposes based on what they have learned from hearing presentations at conferences, from reading articles and books, and from talking with other investors about their experiences with Z bonds. Clover was acutely aware of the Z bonds' long duration and the complications caused by their negative convexity. Just because Clover did not conduct an elaborate computer simulation analysis to estimate the prospective return distribution does not make them procedurally imprudent investment managers.

This is especially true because the results of such a computer simulation analysis depend critically on expectations about the range of movement in future interest rates and on attitudes towards the risk of losses. Such expectations and attitudes are inherently subjective, and therefore, expectations and attitudes vary substantially among prudent investors. These variations can cause differences in judgment about the desirability of the prospective return distribution offered by the Z bonds in early 1995. There can be honest disagreement among prudent investors about what a Z bond's prospective return distribution actually looks like. Such disagreements arise from different expectations about how much interest rates might change in the future and from different expectations about how much mortgage prepayment rates will change in response to changing interest rates. And even if two prudent investors happened to agree on the exact nature of a Z bond's prospective return distribution, they could disagree about whether those uncertain returns were preferable to the uncertain return distribution offered by another security. These differences in assessing the relative attractiveness of two uncertain return distributions arise from differences in investors' subjective attitudes towards the risk.

None of this real-world variation in expectations and attitudes is mentioned in the plaintiff's expert report. It would have been likely that some prudent investors had expectations in early 1995 that implied a broader range of interest rates movements than suggested by the implied volatility derived from the price of an option on bond futures (Carron 2001, paragraph 45). The bond futures option price may indicate a "consensus view" about the range of future interest rate movements, but it is always true that some investors think that a price is too high and others think that it is too low, indicating a broader range of expectations than the "consensus view." It could be argued that expectations of higher volatility than the "consensus view" was highly prudent in early 1995 given that "[t]he financial markets did not anticipate the speed and magnitude of [the 1994] increases" in interest rates (Carron 2001, paragraph 45).

Expectations of interest rate volatility that are higher than the "consensus view" increase expected Z bond price volatility and return volatility. Expectations of higher volatility, therefore, imply a greater chance of Z bonds providing worse returns than alternative investments.

Using this "consensus view" on expectations about interest rate volatility and comparing Z bonds to 5-year Treasury STRIP bonds, the Z bonds were found to provide a worse five-year holding period return in about one-third of the future interest rate scenarios. Using a one-year holding period return, which is more appropriate for pension assets given the regulatory environment, and using expectations of higher volatility, together would increase the one-third, perhaps by a significant amount.

In addition to ignoring differences in expectations among prudent investors, the fact that attitudes towards risk can vary among prudent investors is not recognized in the plaintiff's expert report. When investors choose between securities that offer uncertain return distributions, subjective attitudes toward risk come into play. Risk averse investors often sell a security and buy another even though the average (or mean) of the sold security's prospective return distribution is higher than the mean return of the bought security; they do this because the variance (or volatility) of sold security's return distribution is higher than that of the bought security. This subjective judgment of risk (variance) and expected return (mean) is involved in virtually every financial transaction.

There is no doubt that the Z bond return distribution in early 1995 had a higher mean return and a higher return variance than did the return distribution of a 5-year Treasury STRIP bond. To have no aversion to risk, and therefore, retain the Z bonds solely because their mean return was higher (without giving any weight to their greater return variance) would have been clearly imprudent. On the other hand, an investor who sold Z bonds when faced with this choice was simply averse to risk. Neither the Complaint nor the plaintiff's expert report argue that there is an upper limit to prudent risk aversion.

4 Analysis of Z Bond Sale Execution

This section of the report contains the findings from my sale execution analysis. My analysis describes the five auctions conducted by Clover and examines the allegations concerning the conduct and outcome of those auctions in the Complaint and in the plaintiff's expert report.

4.1 Were Too Many Bonds Auctioned At One Time?

Clover auctioned Z bonds with a total of roughly $20 million face value over the course of five auctions conducted on February 15, March 3, March 8, May 8, and May 9, 1995. As indicated in my discussion of Z bond market liquidity (pages 24–25), this volume of sales was tiny by comparison to the total number of Z bonds outstanding at the time, and furthermore, even some of the Funds' largest Z bond holdings represented only a small fraction of their own CMO tranche.

I conclude that there is no reason to believe that Clover offered too many Z bonds at any one of the five auctions.

4.2 Were Too Many Traders Asked to Bid?

It is true that Clover asked more traders (including Nolan) to bid than usual, thinking that it would be important to get the best execution of the Z bond auctions for the Trustees. The plaintiff's expert report characterizes this behavior as being contrary to the "accepted approach" of "dealing with only three or four dealers" and thus "would have impaired Clover's ability to obtain the highest price" for the Z bonds (Carron 2001, paragraph 66). It is clear that each trader has a strong competitive incentive to tell a seller that fewer bidders are better than more bidders, but what is the truth? The plaintiff's expert report, written by a long-time employee of the Wall Street firms who employ the traders, says the same thing that traders would say, but offers no support for this view other than asserting it is the "accepted approach."

The latest theoretical and experimental research results on the economics of auctions provides a scientific view on this matter. The scientific literature that is relevant to this case focuses on sealed-bid auctions where the auctioned item is being purchased for resale, and therefore, has what is called a common value (as opposed to a private use value). If all bidders know for certain the resale (or common) value of the item (net of transaction and holding costs which are private values), the bidding strategy is clear: bid the known resale value of the item. It gets much more complicated for the bidders if the resale value of the item is not certain. In this case, a bid equal to the bidder's best estimate of the item's resale value is risky. The risk is that the bidder will win the auction only to find the that estimated resale value was too high, and therefore, lose money on the resale. This outcome is called the "winner's curse" in the auction research literature that has developed over the past several decades (Goeree and Offerman forthcoming, see the dozen or more field studies and experimental studies of this concept cited in footnote 3).

The latest experimental findings from research on common-value, sealed-bid auctions provide results that speak to the issue of low bids (which I examine below) and to the issue of the optimal number of bidders for a seller to ask to participate in an auction. Empirical results from a large series of experimental (first-price, sealed-bid, common-value) auctions, which are scheduled for publication in the prestigious *American Economic Review*, show that the revenue received by the seller rises as the number of bidders increases, regardless of the degree of uncertainty about the resale (or common) value of the auctioned item (Goeree and Offerman forthcoming).

4.3 Were Auction Bids Unreasonably Low?

The Complaint (paragraph 28-b as quotes on page 3) alleges that the five Clover auctions produced Z bond "prices that were unreasonably low, when compared to the listed market prices at that time." And the plaintiff's expert report repeats this allegation — "[i]n most instances, the price received by Clover was below the market price" (Carron 2001, paragraph 69) — and attributes the low prices to shortcomings in Clover's conduct of the auctions.

But what exactly are the "market prices" that were above the winning auction prices? They are prices listed on the Bloomberg information system for each Z bond on the day it was sold (Carron 2001, paragraph 68 and Exhibit 15). As part of my sale execution analysis, I have gathered these "market prices" from Bloomberg, and have discovered the following information about them.

First, there are only two sources of "market prices" for the Z bonds in question during early 1995: Merrill Lynch and FT Interactive Data, a subsidiary of the Financial Times group of companies.

Second, these "market prices" are not transaction prices (*i.e.*, actual

Table 7: ***Model Prices for Selected Z Bonds Sold by Clover in 1995***. *Merrill Lynch model price listed under heading "ML Price" and "FT Price" heading is for model price from FT Interactive Data. Price difference is shown in two ways: the ML price minus the FT price and the percentage difference between the ML price and the FT price.*

CMO Issuer & Z Bond Tranche	Sale Date	ML Price	FT Price	Price Difference
Fannie Mae 93-160-ZB	Mar. 3	75.094	70.344	+4.750 / +6.8%
Fannie Mae 93-G25-Z	Mar. 8	72.531	68.734	+3.797 / +5.5%
Freddie Mac G24-ZB	Feb. 15	71.719	66.773	+4.946 / +7.4%
Freddie Mac 1562-Z	Feb. 15	74.844	70.375	+4.469 / +6.4%

Source: Bloomberg information system.

prices paid when a Z bond is bought and sold), but rather model prices: what FT Interactive Data calls "price evaluations" (FT Interactive Data 2001) and Merrill Lynch calls simply "evaluations" (Merrill Lynch Securities Pricing Service 2001). These model prices are generated every day by complex computer models that simulate a CMO bond's cash flow using a number of assumptions regarding investors' expectations about the future and attitudes toward risk. These models and their required assumptions are sufficiently complex to lead both these firms to post on their web sites detailed technical papers that describe their "[e]valuation methodology" (Merrill Lynch Securities Pricing Service 2001, FT Interactive Data 2001).

Third, in most cases there was a substantial difference between these two firms' model prices for a Z bond on its auction day, with the FT Interactive Data price almost always below the Merrill Lynch price. See Table 7 for model prices quoted on the four Z bonds whose relative prices are graphed in Figures 1–5 on pages 27–31.

Given this information concerning the "market prices" used in the plaintiff's expert report, a number of things become immediately clear.

First, and most important, no evidence has been presented to show that the winning bids in the five Clover auctions were substantially below actual transaction prices. Even the firms supplying these model prices are careful to distinguish them from actual transaction prices. Consider the following quotation that appears under the heading "LIMITATIONS" in one of the technical papers on model prices (FT Interactive Data 2001):

> The Interactive Data Corporation CMO/ABS model contains mathematical algorithms which compute theoretical approximations of value for certain corporate and government bonds. Interactive Data Corporation makes no representation or warranty that its bond evaluations are error-free, that input data supplied to or by Interactive Data Corporation for use in its evaluations is free from errors or omissions, or that approximations of value generated by the bond model and evaluation methodologies necessarily correspond to the actual traded price which could be obtained on any given day for any particular security.

In addition to the potential problems mentioned in this quotation, there other reasons why actual transactions prices for the Nolan Z bonds could be expected to be lower than their model prices. For example, the Z bond holdings of each Fund were quite small by the standards of the financial markets, putting them in the "odd lot" category. And odd lots tend to be sold at lower prices than larger blocks in most securities markets. It is also unclear whether or not the model prices were intended to estimate higher ask prices or lower bid prices: its the the lower bid price that a seller can expect in an actual transaction. In other markets, like that for Treasury STRIP bonds, the bid-ask spread is relatively small, but the market for Z bonds routinely exhibits bid-ask spreads that are considerably wider.

And there is another important reason why actual transaction prices for the Z bonds could be expected to be lower than their model prices. This reason focuses on uncertainty over the resale value of the Z bonds, which is revealed by the considerable variation in the two sources of model prices quoted on Bloomberg. The scientific literature on auctions shows that uncertainty over the resale value of an item leads rational bidders to submit bids below their best estimate of the item's value. I develop this explanation below.

One of the controlled differences across the hundreds of auctions conducted in the experimental study described above, is the degree of uncertainty over the item's resale value. I have used information about the design of the auction experiments (Goeree and Offerman forthcoming, Table 1) to compute for each experimental treatment the resale value's coefficient of variation, which is the standard deviation of the distribution of uncertain resale

Table 8: ***Relationship Between Resale Value Uncertainty and Underbidding in Auction Experiments****. Experimental treatment describes number of bidders in auction, number of auctions conducted, and level of resale value uncertainty. Uncertainty in resale value expressed as coefficient of variation. Degree of underbidding expressed as percentage difference between average bid and mean resale value.*

Experimental Treatment bidders/auctions/uncertainty	Resale Value Uncertainty (c.v.)	% Degree of Underbidding
Inexperienced Bidders:		
3 / 200 / LOW	0.051	5.2
3 / 200 / HIGH	0.204	13.7
6 / 160 / HIGH	0.129	8.8
Experienced Bidders:		
3 / 120 / LOW	0.051	5.2
3 / 120 / HIGH	0.204	10.2
6 / 60 / HIGH	0.129	11.6

Source: Goeree and Offerman (forthcoming, Table 1 and Table 3).

values divided by the mean of the distribution of uncertain resale values. And I have used information about the average submitted bid under each experimental treatment (Goeree and Offerman forthcoming, Table 3) to compute the degree of underbidding, measure as the percentage difference between the average bid and the mean resale value.

The results of these calculations are shown in Table 8. The results indicate a increasing degree of underbidding as uncertainty about the resale value of the auctioned item rises. This is clearly caused by the fact that with greater resale value uncertainty, the bidders risk greater losses from the "winner's curse."

How large was the degree of uncertainty about the resale value of the Z bonds sold at the five Clover auctions? And, given the scientific results from experimental auctions discussed above, is it plausible to think this degree of uncertainty about the resale value of the Z bonds was large enough to explain why the bids in the Clover auctions were below the mean of the two model prices? Consider the four large Z bond holdings whose model prices are presented in Table 7 on page 39. The coefficient of variation in the model prices and the percent by which the sale price was below the mean of the model prices was 0.046 and 5.9%, respectively, for the Fannie Mae 93-160-ZB bond sold on March 3. For the Fannie Mae 93-G25-Z bond sold on March 8, these two statistics are 0.038 and 1.4%. For the Freddie Mac G24-ZB bond sold on February 15, 0.051 and 7.4%. And for the Freddie Mac 1562-Z bond sold on February 15, the coefficient of variation of the two model prices and the percent by which the sale price was below the mean model price is 0.044 and 5.7%, respectively.

It seems likely that the degree of Z bond resale price uncertainty facing the bidders in the Clover auctions was more than indicated by the coefficient of variation in the two model prices on the day of the auction, primarily because of the possibility of changes in interest rates in the days between the purchase and resale of the Z bond. In addition, the consequences of the "winner's curse" for the bidders in the Clover auctions (who could incur financial losses for their firms, lose bonuses for themselves, or even lose their jobs) was more severe than for the bidders in the experimental auctions (who simply dropped out the experiment at bankruptcy, losing the opportunity for winnings from the experiment). More severe consequences would lead to more cautious bidding aimed at reducing the likelihood of the "winner's curse."

Given this comparison of the results of the experimental auctions and the Clover auctions, I think it is entirely plausible that uncertainty about the resale value of the Z bonds was the cause of the Clover sale price being below the mean of the two model prices.

5 Conclusions

My conclusions are based on the findings of the analysis described above, on my consideration of the Complaint and plaintiff's expert report (Carron 2001), and on my perusal of a large number of documents provided to me by Clover.

5.1 Prudence in Deciding to Sell Z Bonds

I conclude that Clover was prudent in making the decision to sell the Z bonds inherited from the Nolan portfolio. Clover's decision to sell the Z bonds evidenced (1) a knowledge of the extreme price volatility of Z bonds, (2) a knowledge of the investment complications caused by the negative convexity of the Z bonds, (3) a knowledge of mismatch between the long duration of the Z bonds and the shorter duration of the Funds' pension liabilities, and (4) a knowledge of the undesirability of that duration mismatch.

And furthermore, findings from the sale decision analysis show that the allegations made in the Complaint and in the plaintiff's expert report concerning the sale decision are unsubstantiated.

5.2 Prudence in Auctioning Z Bonds

I conclude that Clover was prudent in auctioning the Z bonds inherited from the Nolan portfolio. Clover's conduct of the five auctions evidenced (1) an awareness of the desirability of having more than the usual number of bidders, and (2) an awareness of what Z bond transaction prices could be reasonably expected at the time.

And furthermore, findings from the sale execution analysis show that the allegations made in the Complaint and in the plaintiff's expert report are unsubstantiated.

______________________________ ____________

Martin R. Holmer Date
Policy Simulation Group

A Documents Reviewed

During the preparation of this report, I reviewed a large number of documents in addition to those mentioned in the text or cited in the References section beginning on page 57. These additional documents and material include the following:

Complaint, "Ulico Casualty Company, Plaintiff, vs. Clover Capital Management, Inc., Defendant," 3:00-CV-773 (TJM/GLS), May 18, 2000.

Plaintiff's Expert Report, "Expert Report of Andrew S. Carron," February 8, 2001.

Deposition transcripts of Paul W. Spindler and Richard J. Huxley, August 7–8, 2001.

Complaint, "Herman vs. Marchio, et al.," 98-CV-932 (FJS/GLS), Federal District Court for Northern District of New York.

Complaint, "Herman vs. Spatol, et al.," 98-CV-931 (HGM/GLS), Federal District Court for Northern District of New York.

Complaint, "Herman vs. Agati, et al.," 98-CV-930 (FJS/DRH), Federal District Court for Northern District of New York.

Local 35/120/322 Fund End-of-Year Custodial Reports, Fleet Investment Services, 1994–1995.

Local 35/120/322 Fund Actuarial Valuation Reports, O'Sullivan Associates Consulting Actuaries, 1994–1996.

Local 35/120/322 Fund U.S. Government Form 5500 Submissions to DOL, IRS, and PBGC, 1994–1995.

B Expert's Qualifications and Résumé

Mr. Holmer earned a Ph.D. in mathematical and financial economics at the Massachusetts Institute of Technology. Following an economic research career in the federal government, Mr. Holmer began a career in asset-liability management with a special emphasis on mortgage-backed securities.

As vice-president for mortgage securitization at E.F. Hutton during 1986 and 1987, he developed the computer software necessary for Hutton to enter the collateralized mortgage obligation (CMO) business. The software simulated the financial mechanics of any specified CMO, thereby enabling Hutton to design a CMO's structure, produce information required to obtain an S&P rating, produce required prospectus information, and produce pricing and financial performance information used in marketing the CMO.

While at Fannie Mae from 1987 to 1992, Mr. Holmer created the system used to manage the retained mortgage portfolio, a very large collection of mortgage assets (over $291 billion) that are mostly debt financed (OFHEO 1997, p. 42). The high degree of financial leverage in this portfolio requires careful interest-rate risk management to ensure profitability in a wide range of future interest-rate environments. His work at Fannie Mae involved the development and computer implementation of an asset-liability management system that used computer simulation of uncertain future financial environments to provide the information necessary to optimize the asset and debt composition of the portfolio to obtain the the desirable combination of expected profitability and risk (Holmer 1994).

After leaving Fannie Mae, Mr. Holmer was a lecturer and research associate at the Wharton School of the University of Pennsylvania during 1992 and 1993. His research there focused on advanced methods of optimizing portfolios whose values are sensitive to interest-rate changes and on practical methods of implementing asset-liability management techniques in financial institutions (McKendall, Zenios, and Holmer 1994, Holmer and Zenios 1995, Golub, etal. 1995, Holmer 1998, for example).

Mr. Holmer's current consulting practice at the Policy Simulation Group includes several engagements with foreign mortgage-finance institutions that focus on asset-liability and risk management issues, as well as participation in several World Bank housing finance missions to the Philippines. He was also selected by the Social Security Administration to perform quantitative risk analysis of the implications of investing social security trust funds in equities (Holmer and Bender 1996).

A number of U.S. government agencies, including the Social Security Administration and the General Accounting Office, as well as several large, non-profit organizations, lease and use SSASIM, a social security policy simulation model developed by Mr. Holmer, to analyze the risks involved in reforms that introduce individually-managed investment accounts into the social security program (Holmer 2001).

Since 1997, Mr. Holmer has been the lead researcher on a project, funded by the U.S. Department of Labor's Pension and Welfare Benefit Administration, to develop a policy simulation model that will permit the analysis of investment risks associated with defined-contribution pension plans, among other policy issues related to employer-sponsored pension plans.

Résumé of Martin R. Holmer

Professional Experience

1996–	Policy Simulation Group, Inc. President
1992–96	HR&A (Hamilton, Rabinovitz & Alschuler, Inc.) Principal and Head of HR&A Policy Simulation Group
1992–93	Wharton School, University of Pennsylvania Research Associate and Lecturer
1987–92	Federal National Mortgage Association (Fannie Mae) Vice President for Asset/Liability Strategy
1986–87	E.F. Hutton & Company Vice President for Mortgage Securitization
1984–86	U.S. Department of Health and Human Services Senior Economic Advisor to Deputy Assistant Secretary for Health Policy
1980–84	U.S. Department of Health and Human Services Director of Income Security Policy Research
1974–80	U.S. Department of Health and Human Services Senior Economist, Income Security Policy Research Office
1969–74	Emmanuel College, Boston, Massachusetts Instructor, Department of Economics

Educational Background

1975 Ph.D., Economics, Massachusetts Institute of Technology

Major: Mathematical Economics

Minors: Monetary Economics, Public Economics, Econometrics, International Economics

Honors: Woodrow Wilson Fellowship, U.S. Department of Labor Manpower Dissertation Fellowship

1967 B.A., Mathematics and Economics, University of Kansas

Honors: Phi Beta Kappa, Degree with Honors in Economics

Selected Technical and Managerial Capabilities

Stochastic Simulation Modeling of Social Security
Developed, for 1994–95 Social Security Advisory Council's Technical Panel on Assumptions and Methods (working with Social Security and Medicare actuaries), a conceptual framework and partial implementation of a long-run stochastic simulation model that provides quantitative estimates of the uncertainty facing the OASDI programs. Completed development of the simulation model under a competitively-awarded contract from the Social Security Administration and used the model to analyze for the Advisory Council the expected return and risk effects of policies that invest a fraction of OASI trust funds in equities rather than the customary special-issue Treasury bonds. Under a subsequent series of contracts from the Employee Benefit Research Institute, the AARP Public Policy Institute, and the General Accounting Office, the model, which is called SSASIM, has been extended to include lifetime cohort measures such as money's worth rate of return, individual account reform analysis capabilities, an embedded neo-classical economic growth model with links to the broader Social Security model, and an embedded micro model in which individuals in a birth cohort experience uncertain ages of disability onset and death enabling a realistic representation of survivors and disability benefits at the family level.

Asset-Liability Management Policy Analysis
Developed, for World Bank and a Philippine government-sponsored housing-finance and provident-saving agency, an assessment of current financial projection capabilities and plans for developing an enhanced model for assessing alternative asset-liability management policies. Developed for Fannie Mae a risk-based capital-adequacy model for use in assessing an existing government-sponsored mortgage insurance agency in the Philippines. Participated with World Bank and Fannie Mae staff in the planning for a secondary mortgage-market corporation in the Philippines.

Stochastic Simulation Modeling of Private Health Insurance Markets
Developed, for RAND as part of the Robert Wood Johnson Foundation's State Initiatives Program, a conceptual framework and computer implementation of a stochastic simulation model of health insurance market dynamics. The model provides the capability for analyzing market-oriented reforms by explicitly representing the uncertainty facing plans, establishments, and fam-

ilies as they make private health insurance decisions from year to year.

Stochastic Simulation Modeling of Lifetime Pension Coverage
Developed, for Department of Labor's Pension and Welfare Benefits Administration (PWBA), a microsimulation model of the impact of government policy on employer-sponsored pensions that characterizes the pension- and job-related behavior of both individuals and employers. In the current version of the model, which is called PENSIM, employers' behavior concerning job offerings and pension sponsorship interact in the model with individual job mobility behavior to determine lifetime pension coverage. The microsimulation methods used in PENSIM are similar to those being used at Statistics Canada in the LifePath model to extrapolate current patterns of behavior into lifetime statistics for a birth cohort. Data from both SIPP and PSID have been used to estimate hazard functions that are included in the model.

International Pension Reform Advice and Analysis
Advised Philippine government and international agencies on pension reform issues. Developed a microsimulation model of individual income tax policy and compliance behavior that interacts with a microsimulation model of defined-contribution pension plan policy and participation behavior to estimate the tax revenue implications of alternative tax treatments of the pension contributions. Model database is the 1997 Survey of Income and Expenditures.

Advised Republic of Yemen and IMF officials on pension reform issues. Developed actuarial projection model of Yemen's civil-service pension and used that model to estimate the long-run financial implications of various reform strategies.

Litigation Support and Expert Witness in a Mortgage Derivative Case
Provided, for U.S. Department of Labor's Office of the Solicitor, legal research and expert witness concerning the prudence of a pension fund's investment in risky mortgage derivative securities.

Stochastic Simulation Modeling of Pension Insurance
Developed, for U.S. government's Pension Benefit Guaranty Corporation (PBGC), a conceptual framework for estimating the present value of expected PBGC claims and premium income under alternative economic, actuarial, and policy assumptions. The conceptual framework has been implemented as a stochastic simulation model — the Pension Insurance Management Sys-

tem (PIMS) — that combines economic modeling of the incidence of corporate bankruptcy, actuarial modeling of pension obligations that recognizes moral hazard effects, and financial modeling of the effects of fluctuations in interest rates on corporate debt and pension assets and liabilities. PIMS is being used to support both policy analysis and accrual budgeting activities at PBGC.

Portfolio Optimization Modeling
Designed and implemented for Fannie Mae a portfolio optimization system to support asset-liability management of a large, highly-leveraged portfolio of mortgage securities. The Asset/Liability Management Strategy (ALMS) System combines binomial lattice and options-based methods to estimate security prices and holding-period returns with expected utility maximization methods to optimize portfolio composition. The ALMS System handles portfolios containing a variety of mortgage securities as well as non-callable and callable bonds, interest-rate swaps, caps and floors, and bond options. The System is implemented as a suite of client/server applications using Sybase relational database tools on a network of forty Unix workstations. This distributed implementation permits parallel processing of financial calculations with a virtually linear speed-up that reaches supercomputer throughput levels using only a dozen workstations. The ALMS System has been used to justify to top management and then shareholders an increased reliance on callable debt (from zero to forty percent in a few years) as a strategy for increasing the risk-adjusted return on equity. It has also been used to design and test portfolio hedging transactions.

Research Management
Experience managing staffs of technical professionals conducting intramural research as well as the design and execution of an extramural research program. This experience, which has been gained in both the public and private sectors, includes: developing, defending, and conducting federal government research programs; initiating and completing large corporate projects; and building from scratch a consulting practice consisting of domestic and international clients in both the public and private sectors.

Software Development
Extensive experience with both doing and managing the development of complex computer programs in Unix as well as PC environments. Designed and implemented an innovative distributed application using client/server tech-

niques on a network of Unix workstations that operates in a large corporate computing environment. Extensive experience with object-oriented design of simulation programs that are implemented in the C++ language.

Relational Database Modeling
Designed and implemented numerous relational database systems using both Unix and PC relational database management systems.

Cross-Section Econometric Estimation
Designed, estimated, developed, and utilized for U.S. Department of Health and Human Services a health insurance and services demand simulation model to assess the government cost and economic impact of alternative policies in the area of tax treatment of employer-sponsored health insurance. The model consists of two modules: a health-insurance demand model based on econometric estimates using a cross-section of experimental plan choice data and a health-services demand model based on econometric estimates of cross-section data on utilization and cost from the RAND Health Insurance Experiment. The model provides estimates of how a change in tax policy or available health insurance plans alters patterns of plan choice and services utilization in the population. It also produces estimates of health insurance plan premiums that are superior to conventional actuarial estimates because they recognize adverse selection and moral hazard effects. The model was used extensively to prepare the HHS Secretary's report to Congress on cafeteria plans and flexible spending accounts, and a mainframe variant has been used subsequently by RAND in various health policy research projects.

Times-Series Econometric Estimation
Designed and estimated for U.S. Social Security Administration a macroeconomic vector-autoregressive (VAR) model of cyclical fluctuations in interest, inflation, and unemployment rates, which is embedded in a long-run, stochastic policy simulation model of the OASI and DI programs. Designed and estimated for U.S. Department of Health and Human Services a multiple-equation quarterly time-series model to predict national AFDC program recipients and benefit costs as a function of economic conditions, demographic trends, and the nature of program policy. A state-specific variant of the forecasting model was used for annual budget projections by departmental staff.

Regional Input-Output Modeling
Developed for U.S. Department of Health and Human Services an economic simulation system that integrates a tax-transfer microeconomic simulation model of the household sector (based on Census sample survey data) with a multi-regional input-output model of the business sector to provide estimates of the direct and indirect economic effects of changes in tax, income-transfer, or expenditure policy. A grant to Boston College supported further development of the integrated system, which was subsequently used by the Joint Economic Committee of the U.S. Congress, and which led to an offer by Data Resources, Inc. (DRI) to buy the system from Boston College.

Selected Articles and Reports

"The Value of Social Security Disability Insurance," *AARP Public Policy Institute Issue Paper #2001-09*, Washington, DC: AARP, June 2001.

"Stochastic Simulation of Economic Growth Effects of Social Security Reform," in Olivia S. Mitchell (editor), *Prospects for Social Security Reform*, Philadelphia: University of Pennsylvania Press for the Pension Research Council, 1999.

"Integrated Asset-Liability Management: An Implementation Case Study," in William T. Ziemba and John M. Mulvey (editors), *World Wide Asset and Liability Modeling*, Cambridge University Press, 1998.

"Alternative Models of Choice Under Uncertainty and Demand for Health Insurance," with Susan Marquis, *Review of Economics and Statistics*, August 1996, *78*(3), pp. 421–427.

"Demographic Results from SSASIM, a Long-Run Stochastic Simulation Model of Social Security," in Report of the Technical Panel on Assumptions and Methods, in *Report of the 1994-1995 Advisory Council on Social Security, Volume II*, Washington, DC: U.S. Government Printing Office, 1996, Appendix A, pp. 183–222.

"Stochastic Simulation of Trust Fund Asset Allocation," with Christopher Bender in *Report of the 1994-1995 Advisory Council on Social Security, Volume II*, Washington, DC: U.S. Government Printing Office, 1996, pp. 431–

450.

"The Productivity of Financial Intermediation and the Technology of Financial Product Management" with Stavros Zenios, *Operations Research*, November-December 1995, *43*(6), pp. 970–982.

"A Stochastic Programming Model for Money Management" with B. Golub, et al., *European Journal of Operational Research*, September 1995, *85*(2), pp. 282–296.

"The Effects of Small Group Reform on Employers' Decisions to Offer Health Insurance: Some Preliminary Results" with Stephen Long and Susan Marquis, paper presented at American Economics Association meetings, Washington, DC, January 7, 1995.

"The Asset/Liability Management Strategy System at Fannie Mae," *Interfaces*, May-June 1994, *24*(3), pp. 3–21.

"Stochastic-Programming Models for Portfolio Optimization of Mortgage-Backed Securities: A Comprehensive Research Guide" with Raymond McKendall and Stavros Zenios in R.L. D'Ecclesia and S.A. Zenios (editors), *Operations Research Models in Quantitative Finance, Contributions to Management Science*, Springer-Verlag, 1994.

"Variance Reduction in Corporate Bankruptcy Simulation," paper presented at joint Institute of Management Science and Operations Research Society meetings, Phoenix, AZ, November 1, 1993.

"Designing Callable Bonds using Simulated Annealing" with Dafeng Yang and Stavros Zenios, Wharton Decision Sciences Report 93-07-02, July 1993.

"Simulating Health Expenditures Under Alternative Insurance Plans" with Joan Buchanan, Emmett Keeler, and John Rolph, *Management Science*, September 1991, *37*(9), pp. 1067–1090.

"Tax Policy Toward Health Insurance and the Demand for Medical Services" with Howard Chernick and Daniel Weinberg, *Journal of Health Economics*, March 1987, *6*(1), pp. 1–25.

"Choice Under Uncertainty and the Demand for Health Insurance" with

Susan Marquis, RAND Corporation N-2516-HHS, September 1986.

"A Federal Case Against Flexible Spending Accounts" with Stuart Schmid, *Business and Health*, March 1986.

"A Study of Cafeteria Plans and Flexible Spending Accounts" with Stuart Schmid, *Commerce Clearing House*, August 1985. (reprint of a DHHS study report mandated by Congress).

"Structure, Precision and Validity of a Health Insurance and Services Demand Model," Technical Appendix to DHHS *A Study of Cafeteria Plans and Flexible Spending Accounts*, April 1985.

"Tax Policy and the Demand for Health Insurance," *Journal of Health Economics*, December 1984.

"A Microeconomic Simulation Model for Analyzing the Regional and Distributional Effects of Tax-Transfer Policy: An Analysis of the Program for Better Jobs and Income" with Robert Haveman, Kevin Hollenbeck, and David Betson, in Haveman and Hollenbeck (editors), *Microeconomic Simulation Models for Public Policy Analysis, Volume 2: Sectoral, Regional, and General Equilibrium Models*, New York: Academic Press, 1980.

"Urban, Regional and Labor Supply Effects of a Reduction in Federal Income Tax Rates" in Norman Glickman (editor), *The Urban Impacts of Federal Policy*, Baltimore: Johns Hopkins University Press, 1980.

"The Urban and Regional Impact of the Carter Administration's 1979 Welfare Reform Proposal" with Howard Chernick, DHHS working paper, June 1979.

"Preliminary Analysis of the Regional Economic Effects of Federal Procurement," DHHS working paper presented at Committee on Urban Public Economics meetings, June 1977.

"Why Have Transfer Programs Grown So Rapidly?," DHHS working paper presented at Committee on Urban Public Economics meetings, October 1976.

"Reasons for the Growth in the Food Stamp Program," DHHS working paper presented at Western Economics Association meetings, June 1976.

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last updated October 2001

C Expert's Compensation and Prior Cases

This exhibit contains information about the rate of compensation for expert research and testimony on this case as well as information regarding prior cases in which the expert has testified.

C.1 Compensation for Study and Testimony

The Policy Simulation Group, Inc., is charging Clover Capital Management, Inc., $300 per hour for all work performed by Mr. Holmer on this case. This hourly rate does not include certain pre-approved non-labor costs related to data acquisition, travel, reproduction, delivery, etc., which are billed at cost as incurred.

C.2 Expert Testimony in Prior Cases

Mr. Holmer has served as an expert in one prior case, *Herman v. Hassenmiller, et al.* 396-CV-01514, filed by the U.S. Department of Labor in the U.S. District Court of Connecticut.

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