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Travelers Mortgage Securities CMO

On February 17, 1984, Maureen Golden, a portfolio manager for the life insurance division of Pacific Life and Casualty Insurance, Inc., was reviewing a preliminary prospectus for a series of collateralized mortgage obligations (CMOs) to be issued by a wholly-owned finance subsidiary of the Travelers Corporation. As Ms. Golden reviewed the terms of the offering, she realized that this deal warranted special attention. While CMOs had been introduced some eight months earlier, in June 1983, Pacific Life and Casualty had yet to include CMOs in its portfolio of mortgage-related securities. Given the positive reception afforded CMOs by a wide range of fixed-income investors since their introduction, she was determined to understand the CMO structure and to prepare a recommendation on CMO investments for Pacific Life and Casualty's Investment Policy Committee.

In addition, Ms. Golden was intrigued that this CMO series was to be issued by a subsidiary of a large, diversified insurance company. Most CMOs to date had been issued by the Federal Home Loan Mortgage Corporation (FHLMC, or Freddie Mac) or by investment banks. She wondered why Travelers, an insurance company active in both the life and property/casualty markets, had chosen to issue this security. Recognizing the similarities between Travelers' asset management objectives and her own, Ms. Golden was anxious to understand the value of collateralized mortgage obligations to issuers as well as investors.

Insurance Industry Background

Life insurance companies have long been major investors in fixed-income instruments, including corporate bonds and mortgages. Before 1980, the principal business of life insurers was to sell and administer whole-life insurance policies. Whole-life policies combined insurance against an early death with a savings provision. As annual payments, or "premiums," were received, the insurer accumulated a pool of savings, called the policy's cash surrender value, on behalf of the policyholder. Simultaneously, various reserves were accrued on the liability side of the insurer's balance sheet to provide for the future liabilities of the policies, including death benefits and

Associates Fellow Sally E. Durdan prepared this case under the supervision of Professor Scott P. Mason as the basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

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payment of cash surrender values in the event of policy termination. Because these liabilities were long-term and, in the aggregate, had a fairly predictable nominal value, most of an insurer's funds were invested in long-term financial assets yielding relatively certain nominal returns. Accordingly, many of a typical insurer's funds were invested in illiquid assets such as private placements, real estate, and commercial mortgages.

Asset-liability management for life insurers was complicated by the inclusion of "policy loan" options in many life insurance policies. Policyholders were given an option to borrow against the cash surrender value of their policies at predetermined fixed rates. In periods of high interest rates, policyholders capitalized on these advantageous rates and insurers experienced disintermediation as policy loans expanded sharply.

The problem of disintermediation was particularly threatening to insurers in the high-inflation, high-interest environment of 1979-1982. During this period, increasingly sophisticated consumers became dissatisfied with the terms of whole-life policies. Inflation had severely eroded the value of whole-life death benefits, and the meager 3.5%-4.0% (tax-free) earnings paid on the savings portions of the policies were uncompetitive with rates offered on money market instruments. As individuals terminated whole-life policies and withdrew accumulated cash balances at unprecedented rates, insurers were faced with the prospect of liquidating long-term, fixed-rate assets at substantial losses.

As the whole-life business deteriorated, insurers introduced new interest-sensitive insurance products, such as universal life, which combined low-cost insurance coverage with savings pegged to short-term interest rates. At the same time, they expanded their involvement in a number of other financial service businesses. By 1984, life insurance companies were selling a wide range of annuity contracts, which provided a continuous income stream to the purchaser in exchange for a lump-sum payment. As an example, a pension plan sponsor could purchase an insured pension fund agreement to provide a continuous stream of specified benefits to its employees. Similarly, insurers sold various financial contracts, often to pension funds or other large investment pools, guaranteeing a certain future sum in return for a current lump-sum payment or stream of payments. Many of these were known as Guaranteed Investment Contacts (GICs). In most states, life insurance companies were also allowed to manage investment accounts for pension funds, separate from or without respect to the regulatory restraints imposed on their other businesses.

In response to their experience with depressed profitability and disintermediation, insurers began to adopt more sophisticated asset-liability management techniques in the early 1980s. Increasingly, insurers looked for liquidity in prospective investments. The accurate matching of asset and liability durations and the introduction of new, shorter-duration insurance products resulted in a shortening of the maturities of many insurers' asset portfolios.

Mortgage-Backed Securities

Among the instruments to which insurers directed their investment in the early 1980s were mortgage-backed securities. Insurers and other institutional investors had historically been relatively inactive in the residential mortgage market, holding only 13% of the residential mortgage debt outstanding in 1970. Although they had purchased some government-insured Federal Housing Authority and government-guaranteed Veterans Administration (FHA/VA) mortgages, investors had been reluctant to purchase "whole loans" because of the cumbersome

documentation required to transfer title to individual loans and the relative illiquidity of the whole-loan market. Instead, residential mortgage capital had been provided by thrift institutions and commercial banks who originated, serviced, and funded fixed-rate mortgages by keeping them on their balance sheets. However, as mortgage-related securities offering homogeneous terms and an active secondary market were introduced during the 1970s, a broad range of investors, including insurance companies, expanded their involvement in the residential mortgage market.

Government agencies and quasi-agencies, such as the Government National Mortgage Association (GNMA, or Ginnie Mae), the Federal National Mortgage Association (FNMA, or Fannie Mae), and the Federal Home Loan Mortgage Corporation (FHLMC or Freddie Mac), were charged with providing broader and more stable sources of capital to the residential mortgage market. These agencies pioneered the securitization of mortgage assets by purchasing home mortgage loans from local lenders and guaranteeing securities backed by pools of residential mortgages. As a result, these agencies expanded the volume of funds available for housing and helped to redistribute mortgage funds from capital-surplus to capital-deficit regions.

Although a variety of mortgage-backed security structures had been introduced by 1984, *pass-through securities* had dominated the mortgage securities market since its inception. An issuer created a pass-through security by placing a pool of mortgages, comprising one to several thousand individual mortgage loans of similar term, interest rate, and quality, in trust with a bank. In return, the issuer received pass-through certificates representing pro rata ownership interests in the pooled mortgages. The pass-through certificates were then sold to investors either directly by the issuer or, more commonly, by a securities dealer.

The trustee holding title to the pooled mortgages oversaw the orderly distribution of principal and interest flows from the underlying mortgages, less servicing and guarantee fees, to investors. Although the issuance of pass-through securities represented a sale of the underlying mortgage assets, thus removing the pooled mortgages from the issuer's balance sheet, the loan originator continued to administer the mortgages and therefore continued to receive servicing fees over the life of the securities (see **Exhibit 1**).

In most cases, the loans underlying pass-through securities were fixed-rate mortgages on one- to four-family homes carrying maturities of approximately 30 years. The cash flows from these traditional mortgages differed from those of standard fixed-income instruments in several respects. While a simple bond investment provided an investor with a fixed, semiannual flow of coupon payments and a single repayment of principal at maturity, traditional mortgages were repaid in level monthly installments of principal and interest. Payments made early in the life of the mortgage consisted primarily of interest on the outstanding principal balance. However, the principal portion increased over time until, at maturity, the payment was almost entirely principal (see **Exhibit 2**). In addition, traditional mortgages offered generous prepayment provisions to the mortgagor (the homeowner). A mortgagor had the right at any time to make a payment in excess of the amount currently due. These "prepayments" were applied to the outstanding mortgage balance, thus reducing the amount of the loan. Prepayments usually resulted from a sale of the mortgaged property,[1] destruction of the property (in which case the mortgage was repaid from the insurance proceeds), or a decline in interest rates, which prompted the homeowner to refinance his mortgage at more attractive current rates.

1. Many conventional residential mortgages contained "due-on-sale clauses" which required that a mortgage be repaid in full in the event of a sale or transfer of the mortgaged property. In contrast, FHA/VA loans were assumable by the purchaser of a mortgaged property.

Given the unique cash flow characteristics of mortgages, mortgage-backed securities embodied several classes of risk. In addition to cash flow uncertainty, or "prepayment risk," mortgage securities were subject to the interest rate, liquidity, reinvestment, and default risks typical of any fixed-income instrument. The credit quality of a mortgage pass-through was determined by the characteristics of the mortgages in the pass-through pool, including the terms of the pooled mortgages, the creditworthiness of the pool's mortgagors, the number of mortgages in the pool, and the geographic diversity of the mortgage portfolio.

Mortgages have historically been considered secure instruments because of homeowners' reluctance to risk foreclosure on their homes by defaulting on mortgage payments. In addition, private mortgage insurance was often used by lenders to reduce default risk on mortgages with high loan-to-value (i.e., leverage) ratios. Such policies provided coverage against default up to some percentage of the initial mortgage balance. Nevertheless, it was difficult for investors in pass-through securities to adequately evaluate the credit risks of the many small mortgages in a pool. As a result, issuers used guarantees and/or pool insurance to elevate the credit of pass-throughs above that of whole loans.

Pass-Through Issuers

The activities of GNMA, FNMA, and FHLMC differed in the types of underlying mortgages, the issuing structure, and the nature of the guarantees. The creator and, through 1984, the largest guarantor of pass-through securities, was a wholly-owned U.S. Government Corporation within the Department of Housing and Urban Development (HUD). GNMA pass-throughs were issued by private mortgage institutions (principally mortgage bankers) and were backed by pools of newly issued FHA/VA single-family mortgages. GNMA guaranteed the timely payment of scheduled monthly principal and interest on GNMA pass-throughs. Such guarantees represented full faith and credit obligations of the U.S. Government.

The FHLMC, a corporate instrumentality of the United States, purchased primarily uninsured or privately insured conventional loans and loan participations (50%-95% ownership interests in loans) from thrifts and banks. The FNMA, a private corporation, purchased both FHA/VA loans and conventional loans from mortgage banks, thrifts, and commercial banks. In some cases FHLMC and FNMA compensated mortgage originators with cash, holding purchased loans in portfolio or pooling them for issuance as pass-throughs. Under their guarantor programs, FNMA and FHLMC "swapped" mortgages for pass-through securities, which originators held in portfolio or reissued publicly.

FHLMC and FNMA pass-through securities, called FHLMC Participation Certificates (PCs) and FNMA Mortgage Pass-through Certificates (FNMAs), differed from GNMA securities in several respects. First, FHLMC PCs and FNMAs were issued directly by the FHLMC and FNMA, not the loan originator. In addition, FHLMC and FNMA issued securities backed by seasoned discount mortgages as well as newly originated mortgage product. Although FHLMC and FNMA guaranteed payment of principal and interest on their pass-through securities, such guarantees did not represent direct obligations of the U.S. Government. As a result, FHLMC PCs and FNMAs traded at yields at least 10-15 basis points over yields on comparable GNMA securities. (See **Exhibit 3** for a comparison of issuers.)

Since 1977 a variety of private issuers (commercial banks, savings and loans, and mortgage banks) had issued pass-throughs backed by conventional loans. Private "pool insurance" covering

homeowner defaults up to approximately five percent of the initial principal amount of a mortgage pool was typically used to guarantee private pass-throughs.

Innovations In The Mortgage Securities Market

By February 1984, approximately $300 billion of the $1.2 trillion of residential mortgage debt outstanding had been securitized. Secondary market trading volumes in mortgage securities had grown rapidly, although turnover ratios remained far lower than those of Treasury securities (see **Exhibit 4**). This growth in the issuance and trading of mortgage securities was accompanied by a number of changes in the structure of mortgages and mortgage securities.

In 1981 regulators authorized mortgage lenders to issue adjustable-rate mortgages (ARMs). Although an inverted yield curve made ARMs unattractive to borrowers in 1981-1982, ARM volume grew to 38% of total residential mortgage originations when the yield curve assumed a positive slope in early 1983. Unlike fixed rate mortgages, ARMs had not yet been successfully securitized. Because they were designed as portfolio investments for the savings institutions originating them, ARMs lacked the standardization of terms required for securitization. In addition, most ARMs featured complex terms, including rate caps and low initial "teaser" rates, that complicated their valuation. In February 1984 it was estimated that ARMs would represent two-thirds of 1984 mortgage originations. The dominance of ARMs was expected to hinder GNMA pass-through issuance, which was reliant on originations of fixed-rate mortgages, and spur the development of an ARM security.

By 1984, a variety of debt securities collateralized by fixed-rate mortgages or pass-through securities had been introduced. These new securities differed from pass-throughs primarily in the nature and allocation of key risk components. *Mortgage-backed bonds*, which were debt obligations collateralized by mortgage loans, assigned prepayment risk to the issuer, who retained ownership of the collateral portfolio. These bonds usually had a stated maturity of 5 to 12 years and paid interest semiannually. The credit quality of a mortgage-backed bond was determined by the credit of the issuer, the quality of the collateral used, and a required collateralization level.

Collateralization levels, expressed as a percentage of the par value of a mortgage-backed bond, were designed to ensure that, in the event of a default, proceeds from the liquidation of the collateral would be sufficient to redeem the mortgage-backed bond at par plus accrued interest. Although collateral values were reevaluated at pre-specified dates, usually once per quarter, over-collateralization levels as high as 150%-200% were deemed necessary by rating agencies to protect investors against declines in collateral market values between evaluation dates. Such declines could result from increases in market interest rates, defaults, or declines in the outstanding balance of the mortgage collateral. Thus, while bond issuance enabled mortgage portfolio investors, such as thrifts, to raise long-term funds at attractive fixed rates, it was a relatively inefficient use of mortgage collateral.

Pay-through bonds were hybrids of the mortgage-backed bond and pass-through structures. Like mortgage-backed bonds, pay-throughs were debt obligations collateralized by pass-through securities or whole-loan portfolios. However, unlike mortgage-backed bonds, all collateral principal flows, including prepayments, flowed through to investors as received. As a result, pay-through issuance enabled mortgage investors, such as banks or thrifts, to liquify "under-the-water" portfolios while avoiding the extensive over-collateralization required in structuring mortgage-

backed bonds. Thus, pay-through bonds shifted prepayment risk to the investors and a more efficient disposal of mortgages for the issuers.

In the early 1980s issuers sought to expand the market for mortgage securities by designing an instrument that offered improved call protection and a broader menu of maturities to mortgage investors. In June 1983, Freddie Mac, with the help of its investment banker, First Boston, accomplished these objectives with the successful introduction of the first *collateralized mortgage obligation (CMO)*. A CMO was a pay-through bond collateralized by pass-through securities or whole-loan portfolios segmented into a series of two or more maturity classes. Collateral principal payments flowed through to investors in order of maturity, such that no principal payments were made on the second class until the first had been fully retired, etc. Most CMO series included a discount zero-bond, or "Z-bond," as the longest maturity class. Interest on Z-bonds was accrued, but not paid, until all previous maturity classes had been fully retired. Interest accrued in this manner was applied to principal payments on the shortest maturity class outstanding.

A CMO was usually issued by a limited purpose finance subsidiary to ensure that the issue would be rated solely on the basis of its collateralization, without regard for the credit of its parent. The parent was required, for tax purposes, to invest equity in the issuing subsidiary equal to 2% of the subsidiary's total assets. IRS regulations also required that CMOs be structured so as to differentiate the bonds being issued from the collateral underlying them. As a result, CMOs paid interest quarterly or semiannually while collateral interest accumulated monthly. (See **Exhibit 5** for CMO issuance activity.)

Innovations In Mortgage Securities Pricing

Estimating mortgage prepayment experience was the central issue in valuing mortgage securities, as this would allow one to project cash flows to the investor. Early in the evolution of the mortgage securities market, dealers adopted the convention of quoting mortgage yields to a 12-year fully prepaid life. This convention simplistically assumed that 100% prepayment would occur in a lump-sum payment at the end of 12 years, the average life of a typical 30-year mortgage. As the mortgage securities market developed, more sophisticated prepayment models were developed using actual prepayment experience statistics compiled by HUD as actuarial data for the FHA's insurance activities.

A prepayment rate was defined as the percentage of outstanding mortgages in a pool that terminated in a given year of mortgage life. Because the terms of most mortgage securities provided for immediate repayment of principal in the event of a mortgagor default, prepayment rates reflected mortgage defaults as well as voluntary prepayments. "FHA experience" tables of prepayment rate estimates were developed using statistics on FHA-insured and VA-guaranteed mortgages endorsed between 1957 and 1981. For each year of a mortgage's life, HUD tabulated the percentage of loans that terminated at that age during the period 1957-1981, regardless of when the experience took place. As a result, statistics for each later year of mortgage life incorporated data from one less calendar year. Since the actual data did not cover the entire 30-year life of the mortgages, prepayment rates for the later years were projected by HUD (see **Exhibit 6a**).

In 1984 recently issued (i.e., current coupon) pass-through securities, whose yields were relatively insensitive to prepayment assumptions, continued to trade at prices reflecting quoted

yields to a 12-year life. However, mortgage securities dealers had begun to price seasoned pass-throughs and CMOs on the basis of cash flow yields. Seasoned pass-throughs were generally assumed to prepay at constant annual rates, such as 2%, 4%, or 6% of outstanding principal per year. In contrast, CMOs were priced at prepayment assumptions expressed as a percentage of FHA experience statistics, which modeled changes in prepayment rates over the life of a mortgage pool. Recognition that prepayment rates were usually slowest early in the life of a mortgage pool was critical to providing buyers of the shortest maturity class in a CMO series with an adequate return. In pricing a new CMO issue, a prepayment assumption (i.e., 75% or 100% FHA) was chosen on the basis of actual prepayment experience on the securities collateralizing the CMO over the 12 months preceding the issue date (see **Exhibit 6b**).

Prices of seasoned pass-throughs and CMOs were computed by discounting estimated cash flows at a yield equal to a spread over a comparable maturity Treasury security. Although there was no greater credit risk in a GNMA pass-through than in a comparable maturity government security, large spreads had historically been demanded as compensation for the prepayment uncertainty inherent in mortgage investments (see **Exhibit 7**). Furthermore, 60% of all fixed-income investors were inactive in the mortgage securities market in 1984.

The Travelers Mortgage Securities Corporation CMO

The Travelers Mortgage Securities Corporation GNMA/FNMA-Collateralized Obligations offered in February 1984 consisted of four classes of securities aggregating $1,250,000,000 in principal:

Class	Original Principal Amount ($)	Interest Rate (%)	First Mandatory Principal Payment Date[a]	Stated Maturity[a]	Price to Public[b,c] (%)
A	270,000,000	10.625	September 1, 1984	March 1, 1987	99.9375
Z-1	455,000,000	12.000	September 1, 1987	September 1, 1997	100.0000
C	375,000,000	12.000	March 1, 1998	September 1, 2000	96.4062
Z-2	150,000,000	12.000	March 1, 2001	March 1, 2014	84.5000

[a]The "stated maturity" of each bond class was the date by which the entire principal amount was to be fully paid, assuming no prepayments on the GNMA and FNMA certificates and reinvestment at the assumed reinvestment rate (defined below).
[b]Plus accrued interest, if any, from March 1, 1984.
[c]The underwriting discount was to vary by class, totaling $4,653,750, or .384% of the aggregate price to the public. Aggregate proceeds to the issuer, before deducting expenses of $770,000, were to total $1,208,450,938.

The bonds were to be issued in fully registered form in minimum denominations of $1,000. The sole underwriter of the bonds was to be Salomon Brothers, Inc. The issuer, Travelers Mortgage Securities Corporation, was a wholly-owned limited-purpose finance subsidiary of the Travelers Corporation. Neither the Travelers Corporation nor any other affiliate of the issuer had guaranteed or was otherwise obligated with respect to the bonds. The issuer was to apply the net proceeds of the sale of the bonds toward the purchase of the GNMA and FNMA Certificates pledged as collateral. The prospectus indicated that all the Class Z-1 Bonds were to be purchased by The Travelers Insurance Company, an affiliate of the issuer.

Interest on the Class A and Class C Bonds was to be paid semiannually on each March 1 and September 1, beginning September 1, 1984. The Class Z-1 and Z-2 Bonds were compound-interest bonds. Interest on the Class Z-1 Bonds was to accrue but not be paid until the Class A Bonds had been fully retired. Accrued interest was to be added to the principal of the Class Z-1 Bonds on each semiannual payment date. Interest on the Class Z-2 Bonds was to accrue in a similar fashion until the Class A, Class Z-1, and Class C Bonds had been paid in full.

Principal payments on the bonds were to be made on each semiannual payment date in an amount equal to the sum of (1) interest accrued but not paid on the Class Z-1 and Z-2 Bonds over the previous six months, and (2) the applicable "bondholders' percentages" of all distributions of principal on the GNMA/FNMA collateral received since the last payment date. Principal payments were to be applied to the classes of bonds in order of maturity, such that no payment was to be made on a class until all earlier classes had been fully retired.

The term "bondholders' percentage" referred to the ratio of the aggregate principal of the bonds issued to the aggregate principal of the collateral securities (see **Exhibit 8a**). The bonds were to be secured by excess collateral in order to meet the collateralization guidelines required for AAA rating of the issue. Rating agency standards required that an issuer demonstrate that scheduled monthly distributions on the GNMA and FNMA Certificates securing the bonds, together with earnings on the reinvestment of such distributions accrued during the six-month periods between bond payment dates, would be sufficient to make timely payments of interest on the bonds, begin payment of principal of each class of bonds not later than its First Mandatory Principal Payment date, and retire each class not later than its Stated Maturity. Such demonstrations of collateral adequacy were calculated assuming no prepayment of principal and intraperiod reinvestment at very conservative rates: 5% the first year, 4% the second year, and 3% each year thereafter.

The Travelers issue was to be subject to special redemption, in whole or in part, on the first day of any month, at 100% of the unpaid principal amount of the bonds redeemed plus accrued interest, if, as a result of substantial payments of principal of the underlying mortgages and low reinvestment yields, it was determined that insufficient cash would be available on the next payment date to make required payments on the bonds. A special redemption of the bonds would not shorten the maturity of any class of bonds by more than five months. In addition, the Class Z-2 Bonds were callable at 100% of the unpaid principal amount plus accrued interest on any payment date on or after March 1, 2009, or on any earlier payment date on or after March 1, 2004 if the principal amount of the bonds outstanding was less than $250 million.[2]

The bonds were to be secured by GNMA and FNMA Certificates having aggregate principal balances of $1,295,681,394, a weighted average pass-through rate of approximately 11.66%, and a weighted average remaining term to maturity of approximately 28.5 years. (Some of the conventional loans underlying the FNMA Certificates, and all of the FHA/VA loans underlying certain of the FNMA Certificates and all of the GNMA Certificates, did not contain "due-on-sale clauses" and, accordingly, were not subject to acceleration upon a transfer of the mortgaged property.)

All distributions on the GNMA and FNMA Certificates were to be remitted directly to a collection account administered by Texas Commerce Bank, N.A. As trustee, Texas Commerce

2. Although the initial principal of the Class Z-2 Bonds totaled only $150,000,000 the Z-2 principal was to grow to $408,500,000 by 1996 (assuming prepayment at 75% FHA) as a result of the accrual of interest at a rate of 12.0%.

was to be empowered to invest the collection account funds in any of a variety of high-grade investments maturing no later than the day before the next semiannual payment date, including Treasury bills, AAA-rated commercial paper, certificates of deposit, and guaranteed investment contracts. Unless an event of default had occurred and was continuing, amounts remaining in the collection account after a semiannual payment date would be paid to the issuer and, upon such payment, would be free from the lien of the bond indenture. Such residual cash flows were referred to as the issuer's "spread."

Holders of the compound interest bonds (Classes Z-1 and Z-2) and any other bond classes issued with an original issue discount were to be subject to tax on the amortization of original issue discount over the life of the bonds. Although it was unclear at the time of the issue, it was possible that bondholders would be required to periodically recompute the original issue discount in recognition of prepayments of principal of earlier classes of bonds. (See the **Appendix** for brief outline of a collateralization process associated with CMOs.)

Maureen Golden's Analysis And Decision

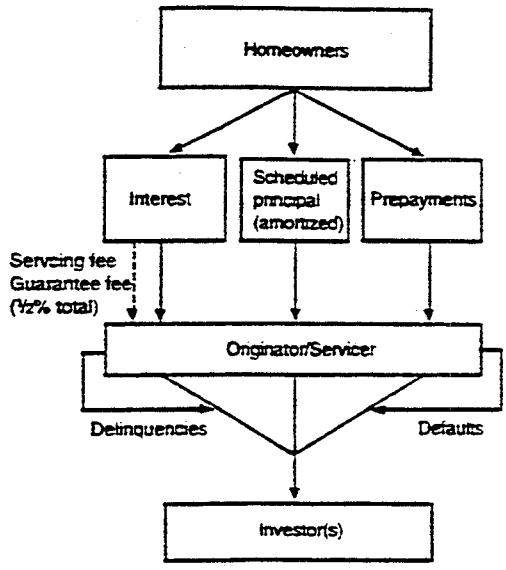
As Maureen Golden studied the Travelers CMO prospectus, she compared the investment characteristics of CMOs with those of standard pass-through securities. She also evaluated the pricing of the Travelers offering by analyzing current levels of interest rates and assessing the credit quality and cash flow uncertainty of the four securities offered (see **Exhibits 8b, 9, 10,** and **11**).

In the course of investigating the Travelers Mortgage Securities offering, Ms. Golden learned that Travelers had an interest beyond the purchase of the Class Z-1 Bonds. Travelers had owned the $500 million of GNMA 11.5s included in the CMO collateral pool at the time the deal was structured. She believed the GNMAs, which were yielding 12.89% (assuming prepayment at 75% FHA) in February 1984, had been held in a portfolio backing five-year GICs. These contracts obligated Travelers to pay pension clients a fixed sum in five years' time. Maureen also reviewed Travelers financials (see **Exhibit 12**) and noted the growth of "pension deposit funds" on their balance sheet and surmised that these were related to the GICs.

The FNMA securities to be used as collateral were to be purchased on the open market. Ms. Golden was unsure how the inclusion of FNMA collateral would influence the credit quality of this issue. To date, most CMO issues brought to market had been collateralized exclusively by GNMAs (see **Exhibits 5, 8a,** and **12**).

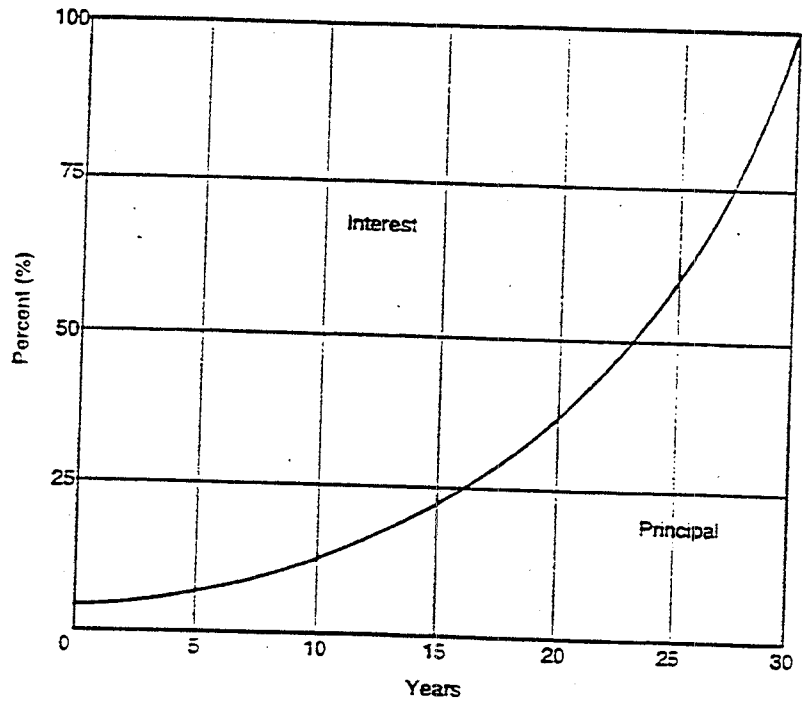
As Ms. Golden began to analyze Travelers' motivations in issuing this CMO, several questions ran through her mind. Why did Travelers choose to liquidate its GNMA portfolio? Given the decision to liquidate, why hadn't Travelers merely sold the GNMAs and reinvested in another five-year maturity rather than issuing an instrument as complex as the CMO? Maureen suspected that CMO issuance provided Travelers with something more than a convenient vehicle for liquidating its pass-through portfolio.

Exhibit 1 The Pass-Through Process for GNMA Securities



Source: Frank J. Fabozzi and Irving M. Pollack, editors. *The Handbook of Fixed Income Securities*, Dow Jones-Irwin, Homewood, Illinois, 1983.

Exhibit 2 Monthly Mortgage Payments-Interest/Principal (30-year, 10% conventional loan)



Source: Frank J. Fabozzi and Irving M. Pollack, editors. *The Handbook of Fixed Income Securities*, Dow Jones-Irwin, Homewood, Illinois, 1983.

Exhibit 3 Issuers of Pass-Through Securities

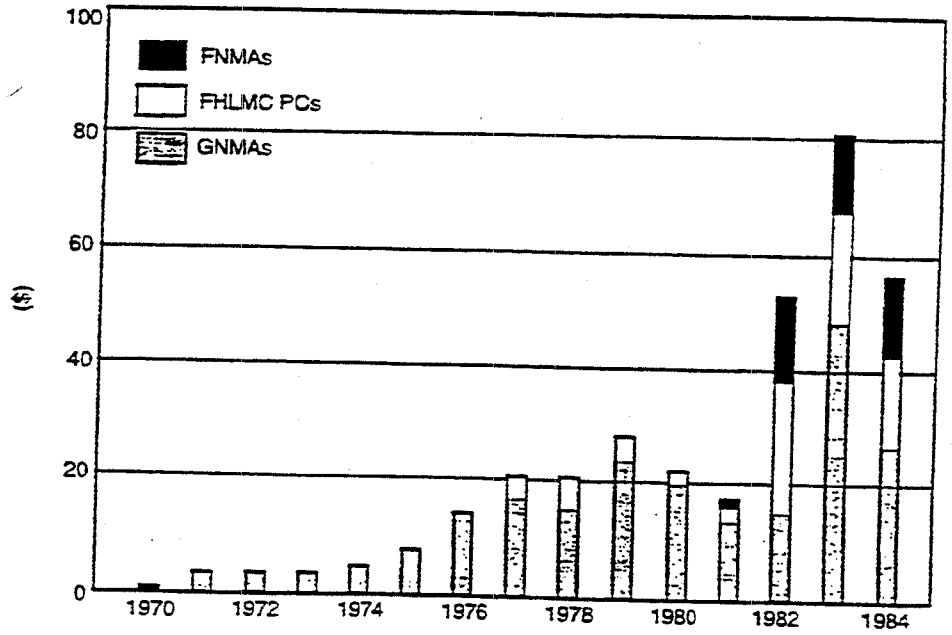
	Component Mortgages	Guarantees[a]	Pool Insurance	Programs	Minimum Pool Size	Geographic Distribution
GNMA (Pass-Throughs)	Newly-issued FHA/ VA single family	Fully modified pass-through	No	GNMA I	$1 Million	Narrow (Single Issuer)
				GNMA II	Jumbo Pools (size varies)	Broad (Multiple Issuers)
FHLMC (Participation Certificates)	Conventional, fixed-payment mortgages on 1-4 family homes (95% less than one-year old)	Modified pass-through (Guarantees payment of principal within one year of due date)	No	Guarantor	$1 Million	Narrow
				Porttfolio	$50 Million	Broad (National)
FNMA (Mortgage Pass-Through Certificates)	Conventional, fixed payment mortgages on 1-4 family homes (seasoned as well as newly issued)	Fully modified pass-through	No	Swap	$2 Million	Narrow
				Portfolio	$100 Million	Variable (Multistate)
Private Issuers (Pass-Throughs)	Conventional mortgages	None	Yes		Varies	Variable

Source: Frank J. Fabozzi and Irving M. Pollack, editors. *The Handbook of Fixed Income Securities*, Dow of Fixed-Income Securities, Dow Jones-Irwin, Homewood, Illinois, 1983.

[a]Fully Modified–Guarantee of timely payment of interest and scheduled principal amortization, Modified–Guarantee of timely payment of interest.

Exhibit 3 (continued)

Issuance of GNMAs, FNMAs, and FHLMC PCs, 1970–1984



Source: GNMS, FNMA, and FHLMC.

Exhibit 4 Liquidity of Mortgage Pass-Throughs vs. Treasuries: Secondary Market Activity (Trades in Billions of Dollars)

	Whole Mortgage Loans		Mortgage Pass-Throughs		Treasury Securities	
	Trades	Turnover Ratio[a]	Trades	Turnover Ratio[a]	Trades	Turnover Ratio[a]
1981	49	.05	131	.95	6,224	8.02
1982	100	.09	230	1.37	8,140	9.34
1983	163	.15	506	2.14	10,609	9.70
1984[b]	146	.13	734	2.62	12,600	10.27

Source: HUD, Federal Reserve Bank of New York.

[a]Dollar volume of trades divided by dollar volume of outstanding issues.
[b]Estimated.

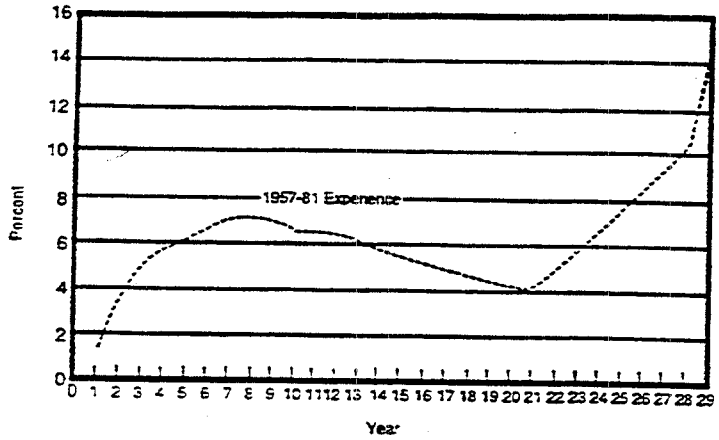
Exhibit 5 Publicly Offered CMOs by Issuer, Collateral and Maturity Class, June 1983[a]-February 1984 (dollars in billions)

Parent of Issuer	June-Dec. 1983	Jan.-Feb. 1984	Total	Jan. 1983-Feb. 1984 Percent of Total
FHLMC	1.69	.53	2.22	29.7
Investment Bankers	1.50	.50	2.00	26.8
Home Builders	.95	.75	1.70	22.8
Mortgage Bankers	.44	1.10	1.54	20.7
Insurance Companies	–	–	–	–
Commercial Banks	–	–	–	–
S&Ls	–	–	–	–
Collateral				
GNMAs	2.90	1.92	4.82	64.7
Conv. Mortgage Loans	1.68	.88	2.56	34.3
FNMAs/FHLMC PCs	–	.08	.08	–
Maturity Classes				
Three	1.79	–	1.79	24.0
Four	1.79	2.88	4.67	62.6
Five	.50	–	.50	6.7
Six or More	.50	–	.50	6.7
Collateral Coupon Rate				
10% or Less	.01	.53	.54	7.2
10.1%-12%	1.66	1.70	3.36	45.0
12.1%-14%	1.35	.65	2.00	26.9
14.1% or More	1.56	–	1.56	20.9

Source: Salomon Brothers, Inc.

[a]Inception of CMO issuance.

Exhibit 6a FHA Experience Prepayment Rates
(30-Year Term FHA-Insured Home Mortgages)



FHA Experience Prepayment Rates (30-Year Term)
1957-1981

Year	Rate (%)	Year	Rate (%)
1	1.13	16	5.34
2	3.77	17	5.10
3	5.17	18	4.88
4	5.73	19	4.65
5	6.21	20	4.39
6	6.80	21	4.12
7	7.12	22	4.97
8	7.23	23	5.82
9	7.00	24	6.72
10	6.68	25	7.65
11	6.59	26	8.57
12	6.42	27	9.49
13	6.11	28	10.39
14	5.86	29	14.47
15	5.60		

Source: Salomon Brothers, Inc.

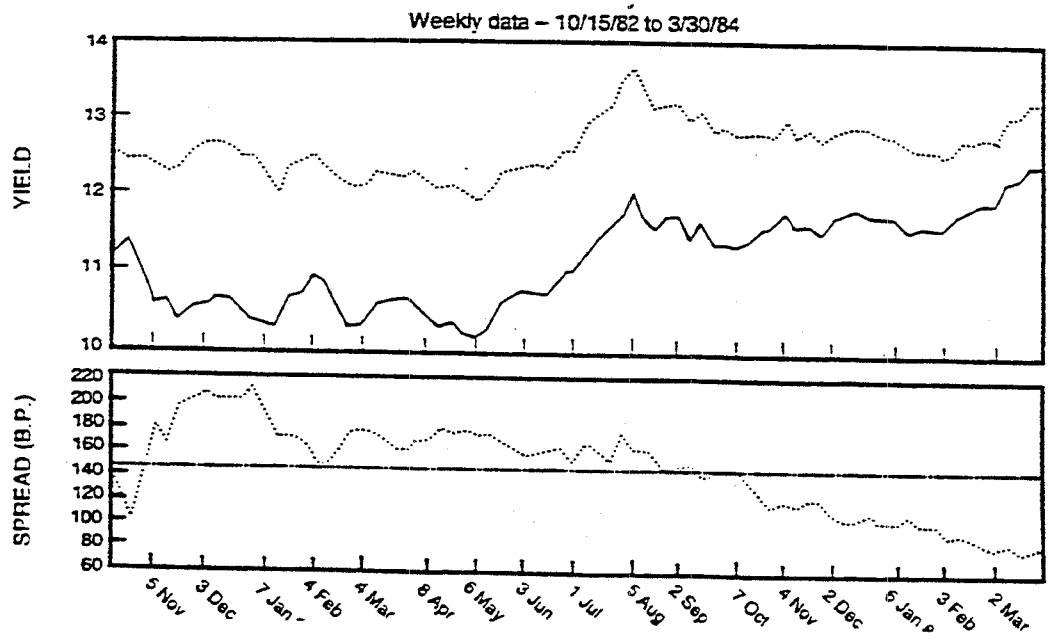
Exhibit 6b Sensitivity of Pass-Through Duration to Changes in Principal Prepayment Rates 11% GNMA/FNMA Certificates (30-year term)

Prepayment Rates as a % of FHA Experience	Average Life (yrs.)	Duration[a] (yrs.)
0	22.3	8.2
50	16.3	6.9
75	14.2	6.4
100	12.4	6.0
125	11.0	5.6
150	9.8	5.3
200	8.1	4.7

Source: Salomon Brothers, Inc.

[a]At par.

Exhibit 7 Yield Profile GNMA 12s Versus 10-Yr. Treasuries, Weekly Data—October 15, 1982 to March 30, 1984



Source: Salomon Brothers, Inc.

Exhibit 8a Description of GNMA/FNMA Collateral Securities Backing Travelers Mortgage Securities CMO

	GNMA/FNMA Coupon Group[a]	Approximate Outstanding Principal Amount[b]	Approximate Weighted Average Remaining Term to Stated Maturity	Approximate Attributable Bond Value	Bondholders' Percentage
GNMA	11.50%	$505,519,907	29.3	$485,042,490	95.9492362%
FNMA	12.75	28,000,000	30.0	28,000,000	100.0000000
FNMA	12.50	170,367,264	29.4	170,367,264	100.0000000
FNMA	12.25	12,000,000	29.5	12,000,000	100.0000000
FNMA	12.00	124,799,798	29.3	124,799,798	100.0000000
FNMA	11.75	5,626,382	29.5	5,511,101	97.9510784
FNMA	11.50	291,317,858	26.8	279,391,795	95.9061679
FNMA	11.00	145,768,625	27.1	133,858,860	91.8296788
FNMA	10.75	12,281,559	30.0	11,028,695	89.7987970
Totals		$1,295,681,393		$1,250,000,000	

[a]Each coupon group contained GNMA or FNMA certificates bearing the same pass-through coupon.
[b]Approximately one-half of the mortgages underlying the FNMA collateral securities were FHA/VA mortgages. The remaining mortgages were conventional.

Exhibit 8b GNMA/FNMA—Collateralized Obligations, Series 1984-1, Yield Table at Indicated Prepayment Rates

Prepayment Rate As a % of FHA Experience	Class A			Class Z-1			Class C			Class Z-2		
	Yield (%)	A/L (yrs.)	Duration (yrs.)	Yield ((%)	A/L (yrs.)	Duration (yrs.)	Yield (%)	A/L (yrs.)	Duration (yrs.)	Yield (%)	A/L (yrs.)	Duration (yrs.)
0%	10.66%	1.83	1.68	12.00%	9.48	7.43	12.54%	15.18	7.19	12.84%	24.26	21.21
50	10.67	1.49	1.40	12.00	6.62	5.58	12.59	11.91	6.52	12.97	22.14	18.41
75	10.68	1.37	1.30	12.00	5.72	4.98	12.62	10.68	6.19	13.04	21.04	17.13
100	10.68	1.27	1.21	12.00	5.08	4.51	12.66	9.66	5.87	13.12	19.83	15.96
125	10.68	1.21	1.15	12.00	4.64	4.13	12.69	8.82	5.59	13.20	18.52	14.90
150	10.69	1.14	1.09	12.00	4.21	3.82	12.73	8.13	5.33	13.28	17.32	13.95
200	10.69	1.02	0.99	12.00	3.61	3.35	12.79	7.05	4.88	13.44	15.11	12.33
Initial Purchase Price	99.9375%			100.0000%			96.4062%			84.5000%		

Source: Salomon Brothers, Inc.

Example: The cash flow yield, initial average life, and initial duration on Class A Bonds purchased at 99.9375% on March 1, 1984, assuming a 75% FHA experience prepayment rate, are 10.68%, 1.37 years, and 1.30 years, respectively.

Exhibit 9 Selected FNMA Financial Data

The following selected financial data for the years 1978 through 1982 have been summarized or derived from FNMA's audited financial statements. The financial data for the nine months ended September 30, 1982 and 1983 are unaudited and include, in the opinion of FNMA's management, all adjustments (consisting only of normal recurring accruals) necessary for a fair presentation.

Condensed Statements of Operations[a] (dollars in millions, except per share amounts) December 31

	For the Year Ended December 31					Nine Months Ended September 30	
	1978	1979	1980	1981[b]	1982	1982	1983
Interest margin	369	322	(21)	(463)	(506)	(429)	(60)
Commitment, guaranty, and other fees	106	60	68	125	301	231	190
Gain (loss) on sales of mortgages	–	(2)	–	–	44	26	77
Other expenses	(75)	(81)	(63)	(22)	(96)	(65)	(92)
Income (loss) before federal income taxes and extraordinary item	400	299	26	(360)	(257)	(237)	115
Provision for federal income taxes	191	137	12	(170)	(123)	(109)	53
Income (loss) before extraordinary item	209	162	14	(190)	(134)	(128)	62
Extraordinary item: gain on early retirement of debt[c]	–	–	–	–	29	29	–
Net income (loss)	209	162	14	(190)	(105)	(99)	62
Earnings (loss) per share:							
Before extraordinary item:							
Primary	3.81	2.81	.24	(3.22)	(2.20)	(2.16)	.94
Fully diluted	3.47	2.68	.23	(3.22)	(2.20)	(2.16)	.93
Net:							
Primary	3.81	2.81	.24	(3.22)	(1.72)	(1.67)	.94
Fully diluted	3.47	2.68	.23	(3.22)	(1.72)	(1.67)	.93
Cash dividends per share	1.15	1.28	1.12	.40	.16	.12	.12

Condensed Balance Sheet[a] (dollars in millions)

	At December 31					At September 30	
	1978	1979	1980	1981[b]	1982	1982	1983
Assets							
Mortgage portfolio, net	42,010	49,655	55,742	59,846	69,714	66,987	72,789
Other assets	1,355	1,424	2,426	2,052	3,753	4,491	2,821
Total assets	43,365	51,079	58,168	61,898	73,467	71,478	75,610
Liabilities							
Bonds, notes and debentures:							
Due within one year	9,018	13,087	15,542	17,365	25,781	25,604	23,841
Due after one year	31,826	35,116	39,338	41,186	43,833	42,234	47,417
Other liabilities	1,159	1,375	1,831	2,104	2,650	2,429	3,089
Total liabilities	42,003	49,578	56,711	60,655	72,264	70,267	74,347
Stockholder's equity	1,362	1,501	1,457	1,243	1,203	1,211	1,263
Total liabilities and stockholders' equity	43,365	51,079	58,168	61,898	73,467	71,478	75,610

Exhibit 9 (continued) Condensed Statements of Changes in Financial Position (dollars in millions)

	Nine Months Ended September 30	
	1982	1983
Funds Provided		
Operations	(270)	54
Extraordinary gain[c]	–	–
Proceeds from issuance of debentures and bonds	15,314	14,947
Mortgage repayments, less discount amortized	930	5,057
Sales of mortgages, excluding gains and losses	542	3,869
Net increase in stockholders' equity resulting from debt exchange and debenture conversion	103	5
Other items	329	215
Total funds provided	16,948	24,147
Funds Applied		
Debentures and bonds retired	8,727	10,672
Mortgage purchases including refinancings, less discount	9,064	12,163
Mortgage refinancings	(482)	(108)
Decrease (increase) in short-term notes	(2,687)	2,646
Dividends paid	7	8
Total funds applied	14,629	25,381
Increase (decrease) in cash and marketable securities	2,319	(1,234)
Beginning balance, cash and marketable securities	1,066	2,453
Ending balance, cash and marketable securities	3,385	1,219

Source: Salomon Brothers, Inc.

[a]Data for years 1978 through 1981 have been reclassified to achieve comparability.
[b]Results for the year ended December 31, 1981 include a $42.0 million reduction in the allowance for loan losses effected in the second quarter. There was also a decrease in the rate of providing for losses on conventional loans that resulted in a reduction in the loss provision of $8.3 million during the last three quarters of 1981. Exclusive of these reductions, the 1981 loss would have been $217.0 million or $3.67 per share.
[c]In September 1982, FNMA entered into a nontaxable transaction that resulted in the issuance of 6.3 million shares of its common stock in exchange for $101 million of its long-term debentures, which were retired. This transaction had no funds effect.

Exhibit 10 Selected Short-, Intermediate-, and Long-Term Yields, February 17, 1984

Maturity	Instrument	Yield (%)
1-Year	T-Bill	10.190
2-Year	Governments	10.854
4-Year	CATS	11.810
5-Year	Governments	11.601
	Federal Agency Securities	11.800
	New Industrials (Aa)	12.550
	New Financials (Aa)	12.250
6-Year	CATS	11.980
7-Year	Governments	11.808
	Federal Agency Securities	12.050
8-Year	CATS	12.130
10-Year	Governments	11.902
15-Year	Governments	11.820
17-Year	CATS	12.000
19-Year	CATS	11.920
20-Year	Governments	12.044
25-Year	Governments	12.015

Source: Salomon Brothers, Inc.

Exhibit 11 CMO Spreads over Comparable Maturity Treasuries (February 1984)

1. Current-Coupon CMOs (GNMA Collateral)

Approximate CMO Weighted Average Life[a] (years)	Spread over Comparable Maturity Treasuries (basis points)
2	40
5	55
10	70
20	105

2. Current-Coupon CMOs (FNMA, FHLMC, and Conventional Mortgage Collateral)

Approximate CMO Weighted Average Life[a] (years)	Spread over Comparable Maturity Treasuries (basis points)
2	52
5	75
10	88
20	124

Source: Salomon Brothers, Inc.

[a]Weighted average life assuming prepayment at 75%-100% FHA.

Exhibit 12 The Travelers Corporation and Subsidiaries—Life Business Combined Balance Sheet (at December 31, in millions)

	1979	1980	1981	1982	1983
Assets					
Fixed maturities					
Bonds	4,902.7	5,511.2	6,490.3	8,518.3	9,940.4
Redeemable preferred stocks	45.1	49.5	53.0	52.7	51.5
Equity securities					
Common stocks	41.9	46.7	43.4	56.0	33.8
Nonredeemable preferred stocks	21.1	21.7	16.7	19.0	18.6
Mortgage loans	5,524.3	6,069.2	6,417.2	6,717.6	8,425.2
Investment real estate	87.2	84.1	128.0	210.3	334.2
Other investments	104.2	149.5	191.3	236.3	319.8
Total long-term investments	10,726.5	11,931.9	13,339.9	15,810.2	19,123.5
Cash and short-term securities	111.9	322.7	359.9	583.8	492.2
Policy loans	337.6	401.4	470.0	496.9	489.2
Total cash and invested assets	11,176.0	12,656.0	14,169.8	16,890.9	20,104.9
Investment income accrued	224.3	267.4	308.1	397.5	521.6
Premium balances receivable	459.9	436.5	547.0	590.6	680.1
Deferred acquisition cost	194.8	205.6	228.6	252.6	253.3
Company-occupied real estate	106.9	107.1	96.1	102.3	107.0
Separate and variable account assets	798.6	1,134.5	1,324.8	1,705.5	2,102.6
Other assets	89.2	128.6	166.4	194.8	411.8
Total assets	13,049.7	14,935.7	16,840.8	20,134.2	24,181.3
Liabilities					
Future policy benefits					
Life insurance	2,181.6	2,221.6	2,288.8	2,540.6	2,735.4
Annuities	5,562.5	6,320.7	6,710.5	7,250.0	8,032.9
Accident and health	36.1	31.8	31.3	35.6	71.3
Policy and contract claims	1,079.3	1,064.4	992.9	1,057.6	944.0
Commercial paper	—	—	—	16.9	150.8
Provision for experience rating refunds	740.8	708.8	801.0	820.3	1,189.1
Pension deposit funds	790.7	1,465.7	2,460.0	4,254.7	5,980.4
Other policyholder funds	363.0	376.4	357.8	355.3	399.0
Accrued expenses	127.9	124.4	134.3	137.4	140.3
Separate and variable account liabilities	798.3	1,134.2	1,324.7	1,704.7	2,102.2
Other liabilities	337.3	335.5	431.4	550.5	918.6
Total liabilities	12,017.5	13,783.5	15,532.7	18,723.6	22,664.0
Equity					
Common stock	107.6	106.6	106.6	106.6	104.1
Additional paid-in capital	25.4	25.5	25.6	25.6	79.8
Unrealized investment gains (losses)	(16.7)	(21.6)	(24.1)	(18.9)	(23.9)
Retained earnings	915.9	1,041.7	1,200.0	1,297.3	1,357.3
Total equity	1,032.2	1,152.2	1,308.1	1,410.6	1,517.3
	13,049.7	14,935.7	16,840.8	20,134.2	24,181.3

Exhibit 12 (continued)

Combined Statement of Sources and Uses of Cash—Life Business (for the year ended December 31, in millions)

	1979	1980	1981	1982	1983
Source of Cash					
Net income	190.8	199.8	213.6	201.3	175.9
Change in noncash items					
Insurance reserves and accrued expenses	1,279.2	1,431.0	1,506.3	2,745.3	3,107.3
Deferred acquisition costs	(6.4)	(10.8)	(23.0)	(24.0)	1.2
Investment income accrued	(34.1)	(43.1)	(40.7)	(89.4)	(124.9)
Premium balances receivable	(14.7)	23.4	(110.5)	(43.6)	(94.3)
Other	47.4	(2.9)	23.1	11.4	179.1
Cash provided by operations	$1,462.2	$1,597.4	$1,568.8	$2,801.0	$3,244.3
Investment repayments					
Fixed maturities	189.8	243.5	331.4	316.4	956.9
Mortgage loans	246.9	289.7	237.7	292.9	283.0
Cash provided by operations and investment repayments	$1,898.9	$2,130.6	$2,137.9	$3,410.3	$4,484.2
Carrying value of investments sold					
Fixed maturities	8.0	11.7	36.1	55.9	1,682.8
Equity securities	39.3	55.7	91.9	104.6	113.8
Mortgage	–	–	–	–	127.4
Investment real estate	21.9	18.9	1.7	5.6	6.9
Issuance of commercial paper, net	–	–	–	16.9	133.9
Other, net	25.5	(47.2)	41.6	34.5	(32.5)
Total cash provided	$1,993.6	$2,169.7	$2,309.2	$3,627.8	$6,516.5
Uses of Cash					
Dividends to parent company	$97.0	$58.0	$64.5	$124.0	$80.0
Investments in:					
Fixed maturities	778.4	871.6	1,365.8	2,399.9	4,059.0
Equity securities	42.3	64.6	87.9	111.6	96.1
Mortgage loans	1,102.7	842.6	606.5	574.2	2,135.1
Investment real estate	17.9	11.3	33.6	105.7	126.3
Policy loans, net	40.0	63.8	68.6	26.9	(4.4)
Other	21.8	47.0	45.1	61.6	116.0
Total cash used	$2,100.1	$1,958.9	$2,272.0	$3,403.9	$6,608.1
Net Change in Cash and Short-term Securities	$(106.5)	$210.8	$37.2	$223.9	$(91.6)

Appendix A

Travelers Mortgage Securities CMO

Description of Collateralization Process

CMOs were collateralized by:

1. segmenting the collateral securities into groups of pass-throughs with similar coupons.

2. computing the "bond value" of each coupon group by discounting the scheduled collateral principal and interest flows, plus reinvestment earnings at the assumed rate (5/4/3), at the highest coupon rate offered on any of the CMO classes. This process ensured that debt service on the CMOs would be fully funded by scheduled collateral distributions even after lower-coupon CMO classes had been retired.

3. limiting these bond values (per coupon group) to a maximum value of par. Bond values were subject to a "par cap" to ensure that the CMO principal could be fully repaid even if the collateral securities prepaid in full immediately upon issuance of the CMO.

The maximum amount of CMO principal issuable against a collection of collateral was then determined by summing the bond values of the collateral coupon groups.

The bond value of a collateral security would be less than its market value (resulting in "over-collateralizaton") if:

1. intraperiod reinvestment rates (5/4/3) were lower than the market yields-to-maturity on the collateral.

2. premium collateral were used.

3. coupons on the CMO classes were not uniform, or

4. discount collateral were used and the market assumed prepayment at a rate greater than 0%. If discount coupon pass-throughs were used to collateralize current coupon CMOs, the collateral principal amount would exceed the CMO principal, and some portion of the collateral principal flows would fund CMO interest payments.

Once collateralizatoin requirements were determined using the "bond value" method described above, the issuer capitalized the issuing finance subsidiary at a rate of 2% of assets to meet IRS regulations (and preserve the tax-deductibility of CMO interest). If the net proceeds of the issue were less than the cost of the CMO collateral, the issuing subsidiary's balance sheet would appear as follows:

Assets		Liabilities	
Collateral securities (at cost, or current MV)	$100	Collateralized mortgage obligations	$98
		Net worth	
		Shareholders' equity	2

The issuer would have contributed $2 to the vehicle to fund the purchase of the collateral securities. In the event that the CMO proceeds exceeded the cost of the collateral, the issuer would merely contribute cash, securities, or a demand note to the finance subsidiary to meet the IRS's net worth requirement.