## Appendix 4—Technical Description of Supplemental Modules and Risk Weights

This appendix is intended to provide detailed information on the methods used to derive the risk weights used in the supervisory measurement system. Descriptions of the derivation of nonmortgage risk weights are provided, followed by the descriptions for fixed and adjustable-rate mortgage risk weights. Titles and locations of reference documents are also provided.

## I. Non-Mortgage Risk Weights

The non-mortgage risk weights were derived using hypothetical market instruments that are representative of the asset or liability category that is measured. Each weight approximates the percentage change in the price of the benchmark instruments given a 200 basis point, instantaneous and uniform shift in market interest rates. Separate risk weights are constructed for the rising and falling interest rate scenarios for the following categories:

- (1) Other amortizing assets;
- (2) Zero or low coupon assets;
- (3) All other assets;
- (4) Liabilities; and
- (5) Off-balance sheet.

A. Benchmark Instruments for Non-Mortgage Risk Weights

The benchmark instruments for each category of assets and liabilities, corresponding maturities, coupons and bond-equivalent yields are listed below.

(1) Other Amortizing Assets: For other (non-mortgage) amortizing assets, a benchmark monthly amortizing instrument with an original maturity equal to the end point of the specific time band; a remaining maturity equal to the midpoint of the time band; and a coupon and bond-equivalent yield equal to 7.50% was used.<sup>17</sup> No prepayments are assumed for this category of instruments.

(2) Zero- or Low-Coupon Assets: The risk weights for zero- or low-coupon instruments were calculated using the percentage change in the price of a zero-coupon instrument with an assumed maturity equal to the mid-point of each time band and a bond-equivalent yield of 7.50%.

(3) All Other Assets: The risk weights for the "All Other" category were calculated assuming semi-annual interest payments, a maturity equal to the mid-point of each time band, and an assumed coupon and yield equal to 7.50%. (4) *Liabilities:* The only set of risk weights used for liabilities is represented by the percentage price change for a semi-annual interest-bearing instrument with an assumed coupon and yield equal to 3.75%.<sup>18</sup>

(5) Off-Balance Sheet Positions: The risk weights for interest rate futures, forwards and swaps are the same as those applied to the "All Other" category. Off-balance sheet positions with amortizing features are assigned the same risk weights as the "Other Amortizing" category.

B. Derivation of Non-Mortgage Risk Weights

The prices and risk weights for each rate scenario were calculated in the following manner:

(1) The benchmark instruments were priced at par in the base case, or current interest rate environment. Using the coupon and maturity of the instruments and static discounted cash flow analysis, the bond-equivalent yields were calculated.

(2) Prices for the benchmark instruments were then calculated for the rising and declining rate scenarios by shifting the bond-equivalent yields up and down by 200 basis points. The present values of the expected cash flows in each scenario were then determined to arrive at the new price for each instrument.

(3) The percentage change in the price from the base case price of par represents the risk weight for the benchmark instrument in the corresponding rate scenarios. If the risk weight was determined to be less than 1 percentage point, it was expanded to the nearest 5 basis points interval. If the risk weight was greater than 1 percentage point, it was rounded to the nearest 10 basis points interval.

## II. Treatment of Fixed-rate Mortgages and Derivation of Risk Weights

Office of Thrift Supervision Pricing Information

Representative benchmark mortgage instruments used in the calculation of risk weights for Schedules 1 through 4 were based on instruments available in the Office of Thrift Supervision (OTS) Asset and Liability Price Tables as of September 30, 1994. Publicly available data on certain coupon ranges and weighted average remaining maturities (WARM) not specifically presented in the OTS Asset and Liability Price Tables were obtained from the OTS as part of a separate data request by the agencies.

Representative benchmark fixed-rate mortgage instruments for Schedule 1 were drawn from a combination of hypothetical mortgage pass-through instruments and mortgage pool securities listed in the OTS Asset and Liability Price Tables. The mortgage pool security price information contained in the OTS Asset and Liability Price Tables were calculated using the OTS Net Portfolio Value Model. A brief overview of the pricing methodology in The OTS Net Portfolio Value Model Manual, published in November 1994, states that "the model uses the options-based approach to determine the market value of 1 to 4 family mortgages. Cash flows consist of scheduled principal payments, interest, and prepaid principal. Prepayments are modeled using a prepayment equation that relates the prepayment rate for a particular period to, among other factors, the difference between the mortgage coupon rate and the current market interest rate. Scheduled principal and interest cash flows are estimated by amortizing the remaining balance in each period over its remaining term. To calculate market values in each of the alternate interest rate scenarios, cash flows for that scenario are discounted by the simulated Treasury rates for that scenario plus the option-adjusted spread." For additional detail and model specifications, refer to The OTS Net Portfolio Value Model, published by the OTS, Risk Management Division, Washington, District of Columbia. Copies of the aforementioned publication are available for review in the FDIC Reading Room, 550 North 17th Street, N.W., Washington, District of Columbia, and the in the OCC Library at 250 E Street SW., Washington, District of Columbia.

The OTS model projects prices for numerous fixed-rate and adjustable-rate mortgage securities with various weighted average coupons (WAC) and WARM given different interest rate scenarios. Price tables are provided for different types of mortgage pool securities. Each table contains mortgage pool security prices as a percentage of the underlying mortgage balance in the base case (current interest rates) as well as price projections for interest rate movements up and down 400 basis points in 100 basis point increments.

Fixed-rate residential mortgage assets have embedded options that make the value of the instrument more sensitive to interest rate changes than fixed maturity instruments. In order to more effectively analyze the impact of

<sup>&</sup>lt;sup>17</sup> For the third quarter of 1994, the average effective yield on earning assets at all commercial banks was approximately 7.50% on an annualized basis.

<sup>&</sup>lt;sup>18</sup> The 3.75% coupon approximates the effective cost of interest-bearing liabilities at all commercial banks for the third quarter of 1994 on an annualized basis.