Section 5.G - Calculating Prices for Current Market Index ARMs

Schedule CMR Line Numbers

The lines used to report these instruments on Schedule CMR are displayed below.

ASSETS

ADJUSTABLE-RATE SINGLE-FAMILY FIRST MORTGAGE LOANS & MORTGAGE-BACKED SECURITIES	Current Market Index ARMs By Coupon Reset Frequency			Lagging Market Index ARMs by Coupon Reset Frequency	
	6 Mo or Less	7 Mo to 2 Yrs	2+ Yrs to 5 Yrs	1 Month	2 Mo to 5 Yrs
Teaser ARMS					
Balances Currently Subject to Introductory Rates	141 $	142 $	143 $	144 $	145 $
WAC	146 . %	147 . %	148 . %	149 . %	150 . %
Non-Teaser ARMs					
Balances of All Non-Teaser ARMs	156 $	157 $	158 $	159 $	160 $
Wtd Avg Margin	161 bp	162 bp	163 bp	164 bp	165 bp
WAC	166 . %	167 . %	168 . %	169 . %	170 . %
WARM	171 months	172 months	173 months	174 months	175 months
Wtd Avg Time Until Next Payment Reset	176 months	177 months	178 months	179 months	180 months
Total Adjustable-Rate Single-Family First Mortgage Loans & Mortgage-Backed Securities					185 $

MEMO ITEMS FOR ALL ARMS (Reported at CMR185):	Current Market Index ARMs By Coupon Reset Frequency			Lagging Market Index ARMs by Coupon Reset Frequency	
	6 Mo or Less	7 Mo to 2 Yrs	2+ Yrs to 5 Yrs	1 Month	2 Mo to 5 Yrs
ARM Balances by Distance to Lifetime Cap					
Bal. W/Coupon Within 200 bp of Lifetime Cap	186 $	187 $	188 $	189 $	190 $
Wtd Avg Distance from Lifetime Cap	191 bp	192 bp	193 bp	194 bp	195 bp
Bal. W/Coupon 201-400 bp from Lifetime Cap	196 $	197 $	198 $	199 $	200 $
Wtd Avg Distance from Lifetime Cap	201 bp	202 bp	203 bp	204 bp	205 bp
Bal. W/Coupon Over 400 bp from Lifetime Cap	206 $	207 $	208 $	209 $	210 $
Wtd Avg Distance from Lifetime Cap	216 bp	217 bp	218 bp	219 bp	220 bp
Balances Without Lifetime Cap	211 $	212 $	213 $	214 $	215 $
ARM Cap & Floor Detail					
Balances Subject to Periodic Rate Caps	221 $	222 $	223 $	224 $	225 $
Wtd Avg Periodic Rate Cap (in basis points)	226 bp	227 bp	228 bp	229 bp	230 bp
Balances Subject to Periodic Rate Floors	231 $	232 $	233 $	234 $	235 $
MBS Included in ARM Balances	241 $	242 $	243 $	244 $	245 $

Description of Instruments

This category includes adjustable-rate mortgage loans tied to a current market rate index[1] with a coupon that resets at least every five years. Also included are participations in such loans and pass-through securities backed by such loans.

[1] A current market rate index is one that adjusts quickly to changes in market interest rates. Examples include rates on Treasury securities, and the London Interbank Offered Rate (LIBOR).

Pricing Methodology

Method

For each adjustable-rate mortgage instrument included in the price tables, prices are estimated for all seven interest rate scenarios using the option-based approach. The following description of how that approach is implemented assumes the reader has a general familiarity with the way the option-based approach is used in the NPV Model (see Section 5.A for a description).

Cash Flows

The NPV Model calculates a stream of monthly cash flows along each of 200 randomly generated interest rate paths representing 200 possible sequences of future Treasury rates based on a beginning mortgage balance of $100. Each cash flow stream consists of interest, scheduled principal, and prepaid principal less estimated servicing costs, as discussed below.

Scheduled Principal and Interest

Scheduled payments of principal and interest are calculated along each rate path by amortizing the balance remaining in each month over the remaining maturity, using the simulated coupon rate in effect for the month along that path.

In the first month, the ARM has a given coupon that will remain in effect for a specified number of months before being reset.[2] The month in which the ARM s payment is scheduled to change, a new coupon is determined for each of the rate paths as described below. In each of the months until the second scheduled reset, these coupons are used to calculate their respective path s scheduled principal, interest, and — in conjunction with a prepayment equation (described below) — prepaid principal. After the first scheduled reset, each path s coupon and payment are reset at regular intervals, subject to any rate caps or floors, until the loan matures.

Resetting the Coupon

Within the category Current Market Index ARMs, Schedule CMR does not distinguish among particular indexes, so the NPV Model treats all balances reported in this category as though they were indexed to Treasury yields. Those reported in the first column are assumed to be indexed to the 6-month Treasury yield; those in the second column to the 1-year yield; and those in the third column to the 3-year yield. That is:

Balances Reported in:	Are Assumed to be:
CMR141 and CMR156	6-month Treasury ARMs
CMR142 and CMR157	1-year Treasury ARMs
CMR143 and CMR158	3-year Treasury ARMs

The Model estimates prices for all Treasury-indexed ARMs by assuming that payments reset with the same frequency as coupons. Coupons are assumed to reset with the same frequency as the maturity of the index,

[2] In simulating the first month's cash flows, all 200 rate paths have the same scheduled payment, because the coupon, starting balance, and remaining maturity are the same on all paths. Thereafter, even if the coupon has not changed, scheduled payments will differ across paths, because prepayments — and, thus, balances — are dependent on the simulated mortgage refinancing rate, which differs across paths. That is, balances will differ across paths, since each path's prepayment rate will depend on that path's sequence of randomly generated interest rates.

(e.g., 3-year Treasury ARMs reset every 3 years[3]). It also assumes that new payments are based on coupons which are determined two months before the new payment is due to be received.[4]

The level to which an ARM s new coupon will be set (unless constrained by a rate cap or floor) is referred to as the fully-indexed rate and is the sum of the index (i.e., the yield of the appropriate maturity Treasury security) and the margin. Treasury yields used as ARM indexes are approximated in the Model by adding a spread to the simulated 1-month rate. That is, for a given path, n, and month, t, the yield of the Treasury security having a maturity of j months is:

Equation 5.G.1 - Projection of Treasury ARM Index

$$\text{index}_{j,n,t} = f_{n,t} + \text{basis}_j$$

where:

$\text{index}_{j,n,t}$ = Treasury yield of maturity j along path n for month t

$f_{n,t}$ = simulated 1-month Treasury yield for that path and month

basis_j = average historical spread between the 1-month yield and the yield on j-month Treasury securities observed at the last 12 quarter-ends

Thus, if an ARM tied to the j-month Treasury index has a given margin and is scheduled for a payment reset in month t, the fully-indexed rate on path n will be:

Equation 5.G.2 - Calculation of Fully-Indexed Rate for Treasury ARMs

$$\text{fully\_indexed\_rate}_{n,t} = \text{margin} + \text{index}_{j,n,t-2}$$

<u>Periodic Rate Caps and Floors</u>

Periodic interest rate caps and floors limit the amount by which the ARM s coupon may change at any reset date along any rate path. Both are defined with respect to the coupon that is in effect on that path prior to a scheduled rate reset. For example, suppose an ARM whose price is being estimated has a periodic cap of 100 basis points, a periodic floor of 100 basis points, and has neither a lifetime rate cap nor floor. Furthermore, since coupons evolve independently along different interest rate paths, suppose that on rate path number 1 the coupon is 7% and on path number 2 it is 6.33%. At the next rate reset, the coupon on path 1 can rise to no more than 8% and fall to no less than 6%. For rate path 2, the next coupon is limited to no more than 7.33%, and no less than 5.33%.

<u>Lifetime Rate Caps and Floors</u>

Current market index ARMs can have lifetime interest rate caps and floors. The coupon in any month on any interest rate path cannot exceed the ARM s lifetime rate cap or fall below its lifetime floor. The Model assumes that ARMs having lifetime rate caps will also have lifetime rate floors. Those without lifetime caps are assumed not to have lifetime floors. For ARMs tied to current market rate indexes, the Model assumes that the lifetime rate floor, if any, is 12 percentage points (i.e., 1200 basis points) less than the lifetime cap.

Mathematically, when a new coupon, c, is set to go into effect for a given path, n, in month, t, it is determined as:

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3 The only exceptions are teaser 3-year Treasury ARMs, which are assumed to reset one year after origination. Thereafter, they reset every three years.

4 For example, if a new payment is due to be received July 1, the NPV Model assumes for each path that the coupon that generates the new payment is determined using the relevant Treasury yield as of April 30. This timing sequence allows for one month of prior notice before interest starts accruing at the new rate and one month of interest accrual, at the end of which the new payment is due.

Equation 5.G.3 - Calculation of Coupon Constrained by Caps and Floors

$$c_{n,t} = MAX\left\{\left[MIN\left(fully\_indexed\_rate_{n,t}, c_{n,t-1} + period\_cap, life\_cap\right)\right], c_{n,t-1} - period\_floor, life\_floor\right\}$$

Prepaid Principal

Prepayments of all ARMs are calculated for each month along each rate path using the prepayment equations described in Step 2b of Section 5.A. The equation for the refinancing factor (refi) for ARMs is:

Equation 5.G.4 - Refinancing Factor for ARMs

$$refi_{n,t} = 0.2006 - 0.0950 \cdot \arctan\left[2.401 \cdot \left(1.021 - \frac{c_{n,t}}{m_{nt-3}}\right)\right]$$

where: $c_{n,t}$ = coupon of the ARM in month t along rate path n

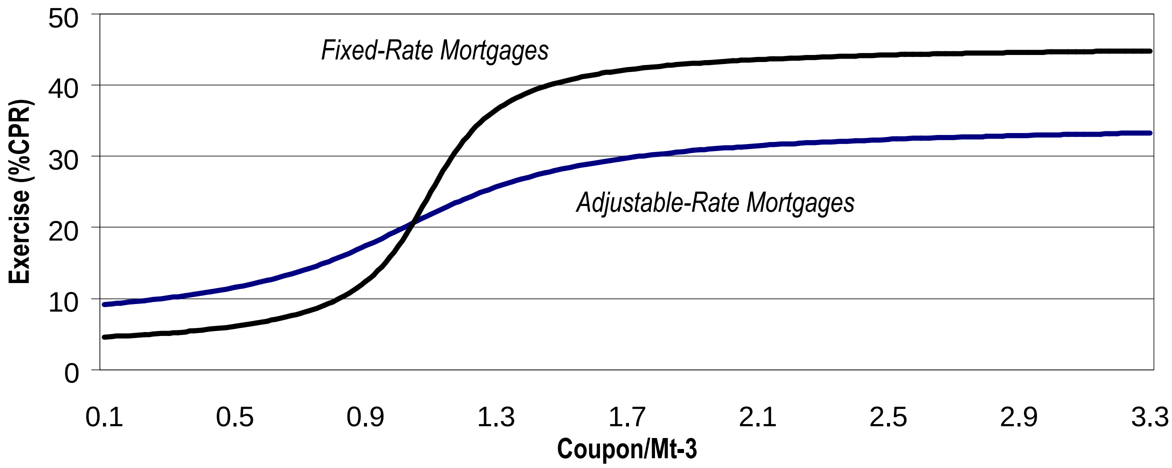
$m_{n,t-3}$ = simulated mortgage refinancing rate (lagged three months)

arctan = arctangent function

Note that the values of the coefficients in Equation 5.G.4 is subject to periodic revision. Current values may be obtained from *Selected Asset and Liability Price Tables* available at http://www.ots.treas.gov/quarter.html.

As shown in Figure 5.G.1, the prepayments produced by the refi equation for ARMs resemble those for conventional 30-year fixed-rate mortgages. However, the ARM prepayment rates reach neither the same high nor low levels reached by FRM prepayments.

Figure 5.G.1.
"Refi" Equation for ARMs vs. FRMs



Servicing Costs

Securities: An investor in an ARM security does not receive the entire cash flow generated by the pool of mortgages underlying the security since servicing and guarantee fees are deducted before the payment is passed through to the investor. In simulating cash flows for ARM securities, therefore, the NPV Model deducts a servicing spread of 75 basis point per year from cash flows generated by the underlying mortgage pool.

Loans: In constructing the price tables, whole loans are assumed to be serviced by the reporting institution. The Model, therefore, reduces the cash flows generated by adjustable-rate mortgage loans by an assumed cost of servicing of 38 basis points per year.[5]

Discount Factors

The present value of the stream of mortgage cash flows along each of the 200 simulated interest rate paths is calculated by multiplying each monthly cash flow by the discount factor appropriate to that path and month. That is, for any month, t, along any given rate path, n, the discount factor is:

Equation 5.G.5 - Discount Factor for ARMs

$$df_{n,t} = \frac{1}{\left[\left(1+f_{n,1}+oas\right)\left(1+f_{n,2}+oas\right)\ldots\left(1+f_{n,t}+oas\right)\right]}$$

where: $f_{n,t}$ = simulated 1-month rate on path n for month t

oas = option-adjusted spread.

Option Adjusted Spread

The option-adjusted spread (OAS) is calculated as described in Section 5.A for representative 6-month, 1-year, and 3-year Treasury-indexed ARM securities. In estimating prices for a particular type of Treasury-

5 If an institution reports (in CMR588) that it owns adjustable-rate mortgages serviced by others, the economic value of its mortgages is adjusted by an amount that depends on the servicing fee it pays the servicer (reported in CMR589). See Section 5.M, Mortgages Serviced By Others.

indexed ARM, cash flows are discounted using the OAS of the appropriate benchmark security (e.g., prices of 1-year Treasury ARMs are estimated using the OAS of the benchmark 1-year Treasury ARM security).

Securities: In estimating prices of a given ARM security, the discount factors are calculated using the OAS of the appropriate benchmark security, without further adjustment. The same OAS is used to estimate prices in all seven interest rate scenarios.

Loans: When used to estimate prices of whole loans, the benchmark OAS must be adjusted. The benchmark security differs from unsecuritized ARM loans in that it carries an agency guarantee against credit risk and is generally more liquid than an unsecuritized mortgage loan. The discount factors for ARM loans must, therefore, be adjusted for the extra risk they carry relative to securities. In calculating the discount factors for whole loans, the Model adds an annualized 25 basis points to the OAS. Again, the same (adjusted) OAS is used to estimate prices in all seven interest rate scenarios.

Price Tables

For each mortgage or MBS in the price table, the average of the 200 discounted cash flows represents the Model s estimate of the price, expressed as a percentage of the outstanding principal, in the interest rate scenario being evaluated. Prices are calculated in all seven interest rate scenarios for each instrument. As described in detail in Section 5.I, prices are stored in separate price tables for 6-month, 1-year, and 3-year Treasury ARMs and ARM securities, where each table provides prices for 2,700 different combinations of WAC, margin, WARM, time until next reset, rate caps, and floors.

Section 5.H - Calculating Prices/Lagging Market Index ARMs

Schedule CMR Line Numbers

The lines used to report these instruments on Schedule CMR are displayed below.

ASSETS

ADJUSTABLE-RATE SINGLE-FAMILY FIRST MORTGAGE LOANS & MORTGAGE-BACKED SECURITIES	Current Market Index ARMs By Coupon Reset Frequency			Lagging Market Index ARMs by Coupon Reset Frequency	
	6 Mo or Less	7 Mo to 2 Yrs	2+ Yrs to 5 Yrs	1 Month	2 Mo to 5 Yrs
Teaser ARMS					
Balances Currently Subject to Introductory Rates	141 $	142 $	143 $	144 $	145 $
WAC	146 . %	147 . %	148 . %	149 . %	150 . %
Non-Teaser ARMs					
Balances of All Non-Teaser ARMs	156 $	157 $	158 $	159 $	160 $
Wtd Avg Margin	161 bp	162 bp	163 bp	164 bp	165 bp
WAC	166 . %	167 . %	168 . %	169 . %	170 . %
WARM	171 months	172 months	173 months	174 months	175 months
Wtd Avg Time Until Next Payment Reset	176 months	177 months	178 months	179 months	180 months
Total Adjustable-Rate Single-Family First Mortgage Loans & Mortgage-Backed Securities					185 $

MEMO ITEMS FOR ALL ARMS (Reported at CMR185):	Current Market Index ARMs By Coupon Reset Frequency			Lagging Market Index ARMs by Coupon Reset Frequency	
	6 Mo or Less	7 Mo to 2 Yrs	2+ Yrs to 5 Yrs	1 Month	2 Mo to 5 Yrs
ARM Balances by Distance to Lifetime Cap					
Bal. W/Coupon Within 200 bp of Lifetime Cap	186 $	187 $	188 $	189 $	190 $
Wtd Avg Distance from Lifetime Cap	191 bp	192 bp	193 bp	194 bp	195 bp
Bal. W/Coupon 201-400 bp from Lifetime Cap	196 $	197 $	198 $	199 $	200 $
Wtd Avg Distance from Lifetime Cap	201 bp	202 bp	203 bp	204 bp	205 bp
Bal. W/Coupon Over 400 bp from Lifetime Cap	206 $	207 $	208 $	209 $	210 $
Wtd Avg Distance from Lifetime Cap	216 bp	217 bp	218 bp	219 bp	220 bp
Balances Without Lifetime Cap	211 $	212 $	213 $	214 $	215 $
ARM Cap & Floor Detail					
Balances Subject to Periodic Rate Caps	221 $	222 $	223 $	224 $	225 $
Wtd Avg Periodic Rate Cap (in basis points)	226 bp	227 bp	228 bp	229 bp	230 bp
Balances Subject to Periodic Rate Floors	231 $	232 $	233 $	234 $	235 $
MBS Included in ARM Balances	241 $	242 $	243 $	244 $	245 $

Description of Instruments

This category includes adjustable-rate mortgage loans that are tied to a lagging market rate index[1] with a coupon that resets at least every 5 years. Also included are participations in such loans and pass-through securities backed by such loans.

Pricing Methodology

Method

For each adjustable-rate mortgage instrument included in the price tables, prices are estimated for all seven interest rate scenarios using the option-based approach. The following description of how that approach is implemented assumes the reader has a general familiarity with the way the option-based approach is used in the NPV Model (see Section 5.A for a description).

Cash Flows

The NPV Model calculates a stream of monthly cash flows along each of 200 randomly generated interest rate paths representing 200 possible sequences of future Treasury rates, based upon a beginning mortgage balance of $100. Each cash flow stream consists of interest, scheduled principal, and prepaid principal less estimated servicing costs, as explained below.

Within the category, Lagging Market Index ARMs, Schedule CMR does not distinguish among particular indexes, so the Model treats all balances reported in this category as though they were indexed to the 11th District Cost of Funds Index (COFI). Those reported in the fourth column of the page (i.e., CMR144 and CMR159) are assumed to be 1-month COFI ARMs, while those in the fifth column (i.e., CMR145 and CMR160) are assumed to be 1-year COFI ARMs.

Simulating the Cost of Funds Index

The Model projects the COFI for a particular month on a given rate path as a weighted average of that path s COFI in the previous month and the simulated 1-year Treasury rate for that path in the current month. (The Model approximates the 1-year Treasury rate by adding a spread to the simulated 1-month Treasury rate, where the spread is the average quarter-end spread between 1-month and 1-year Treasury yields over the last 12 quarters.) Thus, the COFI on any path, n, for the month t is calculated as:

Equation 5.H.1 - Projection of COF Index

$$\mathrm{cofi}_{n,t} = 0.9041 \cdot \mathrm{cofi}_{n,t-1} + 0.0959 \cdot \left(f_{n,t} + \mathrm{basis}_{12}\right)$$

where: $f_{n,t}$ = simulated 1-month Treasury yield for path n in month t

basis_{12} = average historical spread between 1-month yield and yield on 1-year Treasury securities observed at last 12 quarter-ends

Resetting the Coupon Rate

Coupons of 1-month COFI ARMs reset monthly, while those of 1-year COFI ARMs reset annually.[2] Unless constrained by an interest rate cap or floor, the level to which an ARM s coupon will change on any sched-

[1] A lagging market rate index is one that adjusts to changes in market interest rates more slowly than the current market indexes such as rates on Treasury securities, the London Interbank Offered Rate (LIBOR), etc. Examples of lagging market indexes are the various published FHLB cost-of-funds indexes and the National Average Contract Rate for the Purchase of Previously Occupied Homes.

uled reset date is referred as the fully-indexed rate. The fully-indexed rate is equal to the COF Index plus the ARM s margin. Thus, a COFI ARM with a given margin whose coupon is to be reset in month t will have the following fully-indexed rate on path n:

Equation 5.H.2 - Calculation of Fully-Indexed Rate for COFI ARMs

$$\text{fully\_indexed\_rate}_{n,t} = \text{margin} + \text{cofi}_{j,n,t-2}$$

Interest will accrue according to this coupon during month t[3] unless the rate is outside of the range permitted by the ARM s rate cap(s) and floor(s), if any.

Periodic Rate Caps and Floors

1-month COFI ARMs: The Model assumes that 1-month COFI ARMs have neither periodic interest rate caps nor periodic floors. It does assume, however, that such ARMs have a cap of 7.5% on the amount by which the scheduled payment is permitted to increase at any (annual) payment reset date. It does not, conversely, assume a limitation on payment decreases.

1-year COFI ARMs: The Model assumes that 1-year COFI ARMs can have periodic interest rate caps and floors. Such caps and floors function in the same way as those that apply to Treasury-indexed ARMs (see Section 5.G). That is, they limit the amount by which the coupon on any given path may change at any (annual) reset date.

Lifetime Rate Caps and Floors

Both 1-month COFI and 1-year COFI ARMs may have lifetime interest rate caps and floors, which limit the level of the ARM coupon on all rate paths during the entire life of the mortgage. The Model assumes that ARMs having lifetime rate caps will also have lifetime rate floors. Those without lifetime caps are assumed not to have lifetime floors. For COFI ARMs that have both a lifetime rate cap and floor, the Model assumes that the floor is 10 percentage points (i.e., 1000 basis points) lower than the cap.

Scheduled Principal and Interest

The way the Model estimates prices for 1-month and 1-year COFI ARMs differs primarily in the way their scheduled principal and interest are calculated, as discussed below.

1-month COFI ARMs: The Model assumes that the rate at which a 1-month COFI ARM accrues interest changes monthly, but that its scheduled payment resets annually. The first month's scheduled payment of principal and interest is calculated by amortizing the starting balance of a homogeneous pool of ARMs over the remaining maturity, using a particular payment coupon. In simulating the first month's cash flows, all 200 rate paths have the same scheduled interest and principal, because the coupon, starting balance, and remaining maturity are the same on all paths.

For each ARM in the pool, that initial scheduled payment remains unchanged until the first payment reset date. For the pool as a whole, however, scheduled payments start to decline beginning in the second month, as a result of prepayments. Moreover, because accrual rates and prepayment rates differ across paths (in response to each path s randomly generated interest rates), scheduled payments differ across paths, even be-

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[2] Teaser 1-month COFI ARMs are assumed to have a coupon that resets for the first time 3 months after origination and then monthly thereafter. Teaser 1-year COFI ARMs are assumed to reset for the first time 6 months after origination, reset again at their first anniversary, and annually thereafter.

[3] In practice, COFI is announced with a one month lag (e.g., the COFI announced at the end of April was calculated based upon the cost of funds in March). That lag structure is reflected in the Model. For example, in the equation for cofi_{nt}, above, the fully-indexed rate at which interest would accrue during June is based on the March COFI announced at the end of April. That index is simulated based on the simulated 1-month Treasury rate for March and COFI for February.

fore the first payment reset date is reached. Given the scheduled monthly payment on any rate path, n, the pool s scheduled interest and principal for that path in any month, t, are calculated as:

$$interest_{n,t} = B_{n,t} \cdot c_{n,t}$$

$$sched\_principal_{n,t} = sched\_payment_{n,t} - interest_{n,t}$$

where:

$interest_{n,t}$	=	scheduled interest on path n in month t
$B_{n,t}$	=	balance remaining on rate path n after prior month s scheduled and unscheduled principal payments
$c_{n,t}$	=	rate at which interest accrues on path n during month t
$sched\_payment_{n,t}$	=	scheduled monthly payment on path in month t
$sched\_principal_{n,t}$	=	amount of scheduled monthly payment devoted to paying principal

After the scheduled payment and all prepaid principal are received in month t, the pool s remaining balance on path n is:

$$B_{n,t+1} = B_{n,t} + interest_{n,t} - sched\_payment_{n,t} - prepayment_{n,t}$$

In the month when the ARMs payments are scheduled to change, the balance remaining on each path is re-amortized, using the remaining maturity and the new accrual rate for that path.[4] At the time of reset, the payment on any given path is permitted to increase by no more than 7.5 percent.[5] For each ARM in the pool, the new scheduled payment remains in effect for that path during the next twelve months, although, again, the pool s aggregate scheduled payment is adjusted downward each month to reflect prepayments.

This process is repeated annually until the pool of ARMs reaches maturity. The only variation to the sequence described is that, every fifth year, payments on all paths are reset to amortize fully, without regard to payment caps. This feature is typical of these mortgages.

1-year COFI ARMs: The Model estimates prices for 1-year COFI ARMs following the same procedure used for 1-year Treasury ARMs (described in Section 5.G, above), except that the coupon is reset using the COF index, as described earlier in this section.

Prepaid Principal

The Model calculates prepayments of lagging market rate index ARMs using the same prepayment equation that it uses for Treasury-indexed ARMs (see Section 5.G).

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[4] That is, if a new payment is scheduled to be received July 1, that payment is based upon the March COF index, announced at the end of April. The Model uses the simulated 1-month Treasury rate for March and the February COFI to simulate the March COFI.

[5] For 1-month COFI ARMs, the rate at which interest is being accrued generally differs from the interest rate used to determine the monthly payment. This creates the possibility for negative amortization during those months when the rate of interest accrual exceeds the interest rate used to set the payment.

Servicing Costs

Securities: In simulating cash flows for ARM securities, the Model deducts a servicing spread of 75 basis point per year from each cash flow generated by the underlying mortgage pool (see Section 5.G for more details).

Loans: In constructing the price tables, whole loans are assumed to be serviced by the reporting institution. The Model, therefore, reduces the cash flows generated by adjustable-rate mortgage loans by an assumed cost of servicing of 38 basis points per year.[6]

Discount Factors

The present value of the stream of mortgage cash flows along each of the 200 simulated interest rate paths is calculated by multiplying each monthly cash flow by the discount factor appropriate to that path and month. The Model calculates discount factors, including the option-adjusted spread, for COF-indexed ARMs in the same way that it does for Treasury-indexed ARMs. See Section 5.G for a description of that process.

Price Tables

For each mortgage or MBS in the price table, the average of the 200 discounted cash flows represents the Model s estimate of the price, expressed as a percentage of the outstanding principal, in the interest rate scenario being evaluated. Prices are calculated in all 9 interest rate scenarios for each instrument. As described in detail in Section 5.I, below, prices are stored in separate price tables for 1-month teaser, 1-month non-teaser, and 1-year COFI ARMs and ARM securities.[7] Each table provides prices for 2,700 different combinations of WAC, margin, WARM, time until next reset, rate caps, and floors.

6 If an institution reports (in CMR588) that it owns adjustable-rate mortgages serviced by others, the economic value of its mortgages is adjusted by an amount that depends on the servicing fee it pays the servicer (reported in CMR589). See Section 5.M, Mortgages Serviced By Others.

7 Separate tables are needed to store 1-month teaser and non-teaser COFI ARM prices because the coupon is fixed for several months in the former, but changes monthly in the latter.

Section 5.I - Dimensions of ARM Price Tables

Unlike fixed-rate mortgages, whose prices can be estimated with information about loan type, WAC, and WARM, adjustable-rate mortgages require information about several additional characteristics — notably, the rate index, margin, reset frequency, months until next reset, and periodic and lifetime rate caps and floors. The ARM price tables must, therefore, be able to deal with a much larger number of combinations of characteristics. To illustrate this, an excerpt from the price table for ARMs indexed to the 1-year Treasury rate appears in Table 5.I.1 and is explained below.

The NPV Model produces tables for ARMs indexed to each of the following types of index: 6-month, 1-year, and 3-year Treasury rates, and the 11th District Cost-of-Funds Index (separately for teaser and non-teaser ARMs with 1-month and for 1-year rate adjustment periods). Separate tables are produced for loans and securities for each type of ARM.

Table 5.I.1
Excerpt from Price Table for 1-Year Treasury ARM Loans
(As a Percent of Outstanding Balance)

WARM	Mrgin	WAC	Rset	Pcap	PFlr	LCap	LFlr	Interest Rate Shock (bp)						
(mo)	(bp)	(bp)	(mo)	(bp)	(bp)	(bp)	(bp)	-300	-200	-100	0	+100	+200	+300
330	200	500	2	100	none	0	1200	97.03	92.93	88.40	84.08	80.06	76.34	72.91
330	200	500	2	100	none	200	1000	100.35	99.24	96.16	92.15	88.09	84.16	80.44
330	200	500	2	100	none	400	800	100.53	100.36	98.67	95.63	92.06	88.30	84.58
330	200	500	2	100	none	1000	200	100.53	100.42	98.98	96.50	93.65	90.54	87.31
330	200	500	2	100	none	none	none	100.53	100.42	98.98	96.51	93.65	90.55	87.33
330	200	500	2	100	100	0	1200	97.03	92.93	88.40	84.08	80.06	76.34	72.91
330	200	500	2	100	100	200	1000	100.35	99.24	96.16	92.15	88.09	84.16	80.44
330	200	500	2	100	100	400	800	100.53	100.37	98.67	95.63	92.06	88.30	84.58
330	200	500	2	100	100	1000	200	100.53	100.42	98.99	96.52	93.67	90.56	87.32
330	200	500	2	100	100	none	none	100.53	100.42	98.99	96.52	93.67	90.57	87.34
330	200	500	2	200	none	0	1200	97.03	92.93	88.40	84.08	80.06	76.34	72.91
330	200	500	2	200	none	200	1000	100.69	99.41	96.83	93.15	89.11	85.18	81.46
330	200	500	2	200	none	400	800	100.89	100.75	100.28	98.28	95.00	91.32	87.62
330	200	500	2	200	none	1000	200	100.89	100.82	100.70	99.77	98.10	96.08	93.76
330	200	500	2	200	none	none	none	100.89	100.82	100.70	99.77	98.11	96.11	93.86
330	200	500	2	200	200	0	1200	97.03	92.93	88.40	84.08	80.06	76.34	72.91
330	200	500	2	200	200	200	1000	100.69	99.41	96.83	93.15	89.11	85.18	81.46
330	200	500	2	200	200	400	800	100.89	100.75	100.28	98.28	95.00	91.32	87.62
330	200	500	2	200	200	1000	200	100.89	100.82	100.70	99.77	98.11	96.09	93.77
330	200	500	2	200	200	none	none	100.89	100.82	100.70	99.77	98.11	96.12	93.87
330	200	500	2	none	none	0	1200	97.03	92.93	88.40	84.08	80.06	76.34	72.91
330	200	500	2	none	none	200	1000	100.70	99.41	96.83	93.15	89.11	85.18	81.46
330	200	500	2	none	none	400	800	100.90	100.77	100.30	98.92	96.63	93.26	89.60
330	200	500	2	none	none	1000	200	100.90	100.84	100.75	100.64	100.53	100.38	100.16
330	200	500	2	none	none	none	none	100.90	100.84	100.75	100.64	100.54	100.42	100.30

The first column in each price table reports the remaining maturity. Three maturities are included in each table: 200, 330, and 360 months.

The second column contains the margin (which is added to the index to calculate a new interest rate when the ARM s coupon resets). Three margins are presented in each price table: 100, 200, and 350 basis points.

The third column contains the weighted average coupon (WAC). Each table provides four different WAC values which are adjusted quarterly to provide adequate coverage in the table for the coupons likely to be reported by institutions that quarter. For example, in June 1999, the WACs in the price table for 1-year Treasury ARMs ranged from 4.50% to 10.00%.

The fourth column contains the number of months until the next scheduled payment reset. Each price table contains three different ones. The number of months to reset provided in each table are as follows:

Price Table	Months to Next Payment Reset
6-month Treasury ARMs	2, 3, 6
1-year Treasury ARMs	2, 12, 24
3-year Treasury ARMs	2, 18, 60
1-month COFI ARMs (teaser)	2, 2, 2
1-month COFI ARMs (non-teaser)	2, 6, 12
1-year COFI ARMs	2, 12, 36

The fifth column contains three different possible values for the periodic interest rate cap: 100 and 200 basis points and no periodic cap.

The sixth column contains the periodic rate floor. It is assumed that an ARM will not have a periodic floor unless it also has a periodic cap, although the reverse is possible. It is also assumed that the periodic floor, if any, will be symmetrical with the periodic cap. The price tables, thus, contain five different combinations of periodic rate caps and floors[1]:

	Periodic Cap	Periodic Floor
1.	100 bp	none
2.	100 bp	100 bp
3.	200 bp	none
4.	200 bp	200 bp
5.	none	none

[1] An exception to this are the 1-month COFI ARMs. These ARMs typically have an annual cap on the amount by which the payment can change, rather than periodic caps or floors on the coupon. In the Model it is, thus, assumed that all 1-month COFI ARMs have a 7.5% payment cap, but no periodic rate caps or floors.

The seventh and eighth columns contain various distances to lifetime rate caps and floors. Like the periodic caps and floors, these are expressed in the tables in relation to the mortgage s coupon.[2] (For example, if an ARM has a lifetime rate cap of 12% and its coupon is currently 6%, the distance to the lifetime cap is 600 basis points.) Five lifetime cap distances are provided: 0, 200, 400, and 1000 basis points, and no lifetime cap. The Model assumes that ARMs with lifetime rate caps will also have lifetime floors; those without lifetime caps will, similarly, not have lifetime floors. For the Treasury-indexed ARMs, the Model assumes the distance between the lifetime cap and floor to be 1200 basis points and for COF-indexed ARMs, to be 1000 basis points. Thus, for each lifetime cap distance there is a unique lifetime floor distance (or no lifetime floor) and, therefore, the tables contain five combinations of lifetime caps and floors for each type of ARM:

	Distance from Lifetime Cap	Distance from Lifetime Floor Treasury ARMs	Distance from Lifetime Floor COFI ARMs
1.	0 bp	1200 bp	1000 bp
2.	200 bp	1000 bp	800 bp
3.	400 bp	800 bp	600 bp
4.	1000 bp	200 bp	0 bp
5.	none	none	none

In each ARM table, therefore, prices are provided for 2,700 combinations of characteristics.[3] That is:

2,700	=		3	maturities
		x	3	margins
		x	4	coupons
		x	3	number of months until next reset
		x	5	combinations of periodic caps and floors
		x	5	combinations of lifetime caps and floors

The method used to estimate prices for each combination of characteristics was described in Sections 5.G and 5.H.

[2] Note that this differs from the way that lifetime caps are reported in the excerpts of the price tables that OTS publishes quarterly in *Selected Asset and Liability Price Tables*. For simplicity, the published tables list the level of the lifetime cap, rather than the distance between the cap and the current coupon.

[3] Loans or securities having some of the combinations of characteristics for which prices are provided in the tables may not actually exist in any given quarter.

Section 5.J - Disaggregating the Data Reported on Schedule CMR

Space limitations require that Schedule CMR collect information about ARMs in an aggregated form, with the characteristics necessary for estimating prices (e.g., coupon, margin, caps, etc.) reported as weighted averages or in some other aggregate form. Rather than treat a reported ARM balance as a single balance with the reported characteristics — some of which may be inconsistent with one another or which may otherwise mask important features — the NPV Model divides each balance into a number of sub-balances. These sub-balances have characteristics which, individually, are more plausible than the weighted average characteristics that are reported, yet, collectively (on a weighted-average basis), their characteristics are consistent with the reported weighted averages.

For example, instead of assuming that the $100 million of ARMs reported by an institution in a particular column all have the weighted average periodic rate cap reported in that column (say, 133 basis points), the Model allocates the reported balance into two sets of sub-balances: $66.7 million with a periodic cap of 100 basis points and $33.3 million with a periodic cap of 200 basis points. Though both assumptions are consistent with the reported data, periodic rate caps of 100 or 200 basis points are more commonly observed in the market than ones of 133 basis points. Making judicious assumptions about the composition of an institution s reported balances is particularly important when the characteristics involve embedded options, such as caps and floors.

The process of disaggregating the reported balances follows a tree-like sequence of steps, illustrated in Figure 5.J.1. At each level of that process, the balances determined in the prior level are divided into finer sub-balances according to a particular characteristic. For example, Level 1 of Figure 5.J.1 shows the teaser ARM balance that is reported on Schedule CMR. At Level 2, that balance is divided into four sub-balances having different lifetime cap characteristics.

The process will be described using the hypothetical data shown in Table 5.J.1. Because these data are reported in the column for Current Market Index ARMs (with 7 month to 2 year coupon reset frequency) on the single-family ARMs page of Schedule CMR, the Model treats them all as 1-year Treasury-indexed ARMs. The disaggregation process is carried out first for the teaser ARM balance[1] reported in CMR142 and then for the non-teaser balance reported in CMR157.

Teaser ARM Balance

Figure 5.J.2 illustrates the process by which the teaser ARM balance in the example (in CMR142) is disaggregated. The $200 balance, which is shown at Level 1 of Figure 5.J.2, will ultimately be split into 40 sub-balances (some of which may be zero) with different combinations of characteristics.

Level 2: Proximity of Coupon to Lifetime Cap

Level 2 of the process involves splitting the reported teaser balance into four sub-balances on the basis of the proximity of their coupons to their lifetime rate caps. The first step is to calculate the fraction of ARMs (teaser and non-teaser) that have lifetime rate caps. That fraction is:

$$f\_cap = \frac{(CMR187 + CMR197 + CMR207)}{(CMR187 + CMR197 + CMR207 + CMR212)}$$

[1] In the NPV Model, a teaser ARM is an adjustable-rate mortgage that was originated with an introductory interest rate below the fully-indexed rate (where the fully-indexed rate is determined by adding the contractual margin of the ARM to the index rate), where the introductory rate was scheduled to last 12 months or less, and where the interest rate has not yet reset.

Figure 5.J-1
Disaggregating ARM Balances

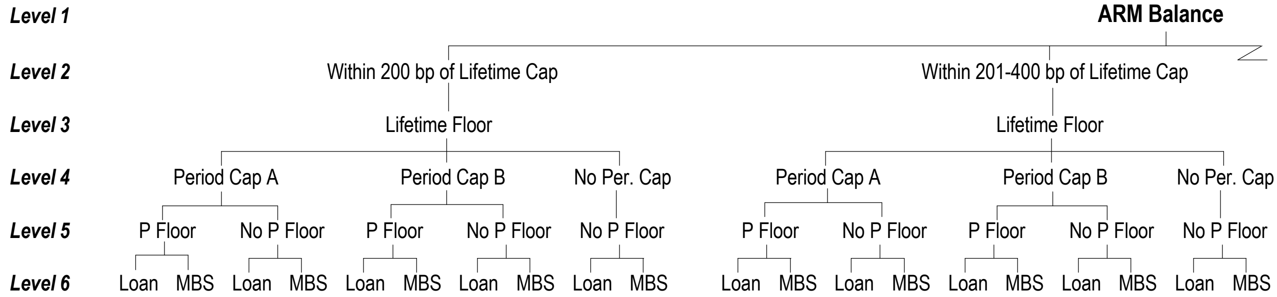
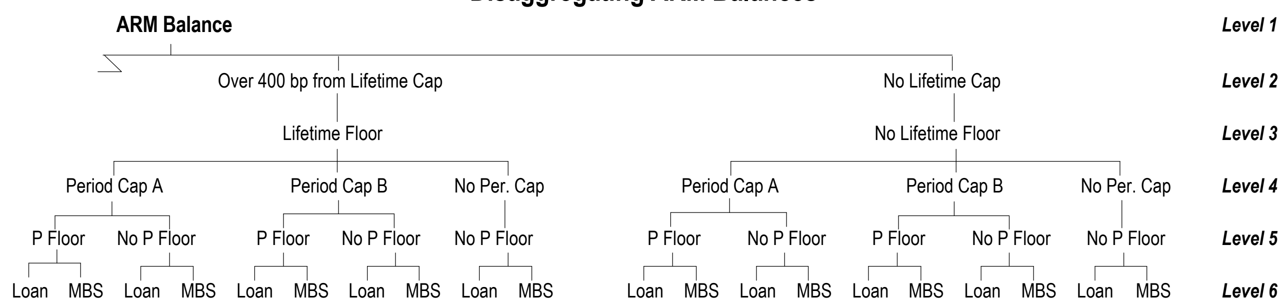


Figure 5.J-1 - continued
Disaggregating ARM Balances



The basic assumption used in the Model is that teaser ARMs and non-teaser ARMs have lifetime caps in the same proportions. Hence, the dollar amounts of teaser ARMs with and without lifetime caps are calculated as:

With Lifetime Cap = CMR142 · f_cap

No Lifetime Cap = CMR142 · (1 – f_cap)

The amount No Lifetime Cap is one of the four sub-balances to be calculated in Level 2. The remaining three sub-balances are calculated by subdividing the amount With Lifetime Cap into three lifetime cap ranges. Because teaser ARMs are very young mortgages, reported teaser balances are not likely to fall into either the Within 200 bp of Lifetime Cap or Within 201-400 bp of Lifetime Cap sub-balances. Instead of dividing the amount proportionally among the three sub-balances, therefore, the Model uses the following decision rules:

(a) If the reported Balances with Coupon Over 400 bp from Lifetime Cap (e.g., CMR207) exceeds the amount of teaser balances with lifetime caps (calculated above as, With Lifetime Cap), then it is assumed that all teaser ARMs with caps are in the Over 400 bp from Lifetime Cap sub-balance.

(b) In the unlikely event that the reported Balances with Coupon Over 400 bp from Lifetime Cap (e.g., CMR207) is less than the amount of teaser balances with lifetime caps (calculated above as, With Lifetime Cap), some teaser ARMs must have coupons that are closer to their lifetime caps than 400 bp. If so, the balances in With Lifetime Cap are first allocated to the Over 400 bp from Lifetime Cap sub-balance to the extent any balances are reported in CMR207. Then to the extent CMR197 has a non-zero balance, any remaining amount in With Lifetime Cap is allocated to the Within 201-400 bp of Lifetime Cap sub-balance, and if necessary, to the Within 200 bp of Lifetime Cap sub-balance.

ASSETS

ADJUSTABLE-RATE SINGLE-FAMILY FIRST MORTGAGE LOANS & MORTGAGE-BACKED SECURITIES	Current Market Index ARMs By Coupon Reset Frequency			Lagging Market Index ARMs by Coupon Reset Frequency	
	6 Mo or Less	7 Mo to 2 Yrs	2+ Yrs to 5 Yrs	1 Month	2 Mo to 5 Yrs
Teaser ARMS					
Balances Currently Subject to Introductory Rates	141 $	142 $200	143 $	144 $	145 $
WAC	146 . %	147 4.00 %	148 . %	149 . %	150 . %
Non-Teaser ARMs					
Balances of All Non-Teaser ARMs	156 $	157 $800	158 $	159 $	160 $
Wtd Avg Margin	161 bp	162 245 bp	163 bp	164 bp	165 bp
WAC	166 . %	167 5.50 %	168 . %	169 . %	170 . %
WARM	171 months	172 330 months	173 months	174 months	175 months
Wtd Avg Time Until Next Payment Reset	176 months	177 6 months	178 months	179 months	180 months
Total Adjustable-Rate Single-Family First Mortgage Loans & Mortgage-Backed Securities					185 $

MEMO ITEMS FOR ALL ARMS (Reported at CMR185):	Current Market Index ARMs By Coupon Reset Frequency			Lagging Market Index ARMs by Coupon Reset Frequency	
	6 Mo or Less	7 Mo to 2 Yrs	2+ Yrs to 5 Yrs	1 Month	2 Mo to 5 Yrs
ARM Balances by Distance to Lifetime Cap					
Bal. W/Coupon Within 200 bp of Lifetime Cap	186 $	187 $ 10	188 $	189 $	190 $
Wtd Avg Distance from Lifetime Cap	191 bp	192 165 bp	193 bp	194 bp	195 bp
Bal. W/Coupon 201-400 bp from Lifetime Cap	196 $	197 $ 90	198 $	199 $	200 $
Wtd Avg Distance from Lifetime Cap	201 bp	202 325 bp	203 bp	204 bp	205 bp
Bal. W/Coupon Over 400 bp from Lifetime Cap	206 $	207 $700	208 $	209 $	210 $
Wtd Avg Distance from Lifetime Cap	216 bp	217 500 bp	218 bp	219 bp	220 bp
Balances Without Lifetime Cap	211 $	212 $200	213 $	214 $	215 $
ARM Cap & Flor Detail					
Balances Subject to Periodic Rate Caps	221 $	222 $800	223 $	224 $	225 $
Wtd Avg Periodic Rate Cap (in basis points)	226 bp	227 125 bp	228 bp	229 bp	230 bp
Balances Subject to Periodic Rate Floors	231 $	232 $700	233 $	234 $	235 $
MBS Included in ARM Balances	241 $	242 $700	243 $	244 $	245 $

For the example data shown in Table 5.J.1, the calculations described above are:

$$\text{f\_cap} = \frac{(\text{CMR187} + \text{CMR197} + \text{CMR207})}{(\text{CMR187} + \text{CMR197} + \text{CMR207} + \text{CMR212})} = \frac{10 + 90 + 700}{10 + 90 + 700 + 200} = 0.80$$

With Lifetime Cap = CMR142 · f_cap

= \$200 · 0.80 = \$160

No Lifetime Cap = CMR142 – With Lifetime Cap

= \$200 – \$160 = \$40

Figure 5.J-2

Disaggregation of Teaser Balances

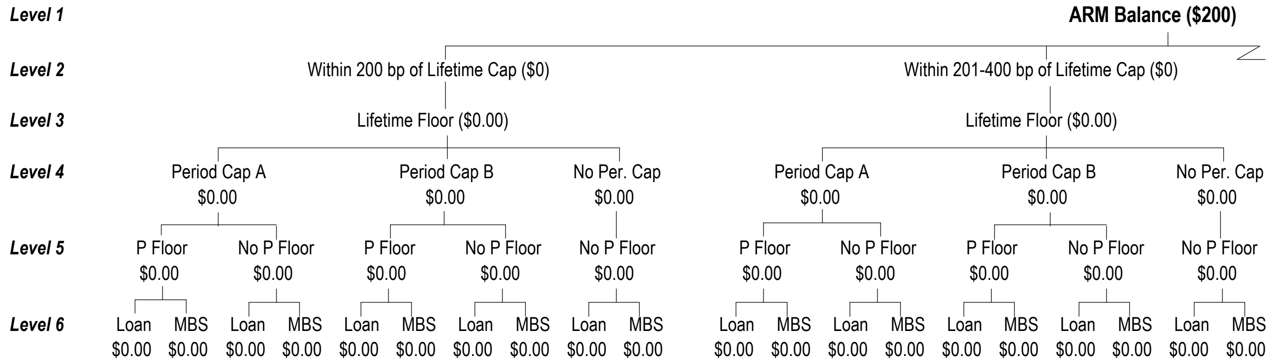
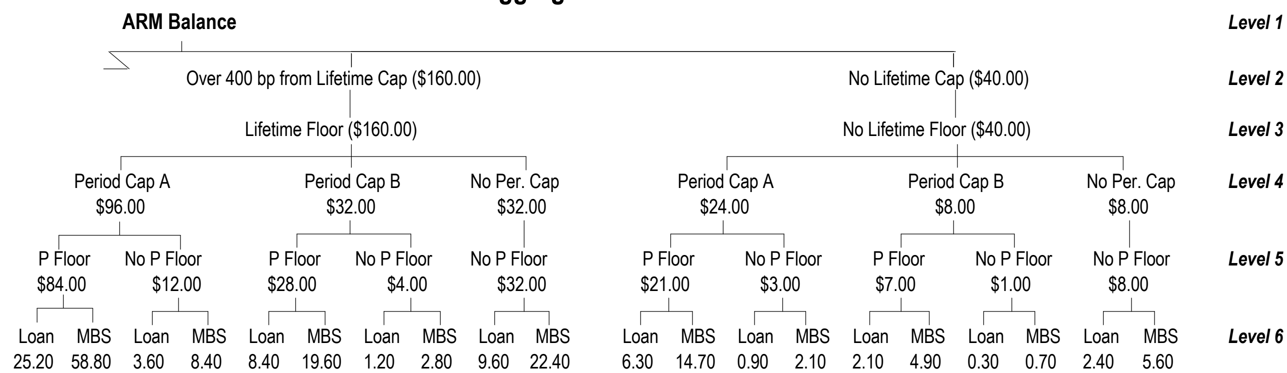


Figure 5.J-2 - continued

Disaggregation of Teaser Balances



Thus, $40 of the reported $200 in teaser balances is allocated to the No Lifetime Cap sub-balance. The remaining $160, which is assumed to have lifetime rate caps, is divided according to the decision rules described above. Because the amount reported in CMR207 (i.e., $700) exceeds the amount calculated for With Lifetime Cap (i.e., $160), decision rule (a) places the entire $160 into the Over 400 bp from Lifetime Cap sub-balance. Thus, the reported teaser ARM balance of $200 has been split into the four sub-balances shown in Figure 5.J.2. Note that no teaser ARM balances have been allocated to the sub-balances that have coupons Within 200 bp of Lifetime Cap or Within 201 - 400 bp of Lifetime Cap. Consequently, all sub-balances that branch off below those sub-balances will also be zero.

Level 3: Existence of Lifetime Rate Floor

Because the Model assumes only ARMs that have lifetime rate caps will have lifetime rate floors (and vice versa), the sub-balances on Level 2 of Figure 5.J.2 are passed through to Level 3 without any changes.

Level 4: Periodic Rate Cap

The next stage in the process is to construct the 12 sub-balances shown in Level 4 of Figure 5.J.2 by splitting each of the four sub-balances from Level 3 into three finer sub-balances reflecting the existence and size of periodic interest rate caps. The Model assumes that all ARMs either: (1) have a periodic rate cap of 100 basis points, (2) have a periodic rate cap of 200 basis points, or (3) have no periodic rate cap.

The first step in this part of the process is to calculate the fractions of total balances (teaser and non-teaser) that are subject to periodic rate caps (as reported in CMR222) and those that are not:

$$\text{pcap} = \frac{\text{CMR222}}{\text{CMR142} + \text{CMR157}}$$

no_pcap = 1 – pcap

Because the Model assumes the periodic rate cap can be only one of two values (i.e., 100 or 200 basis points), the second step is to use the weighted average periodic rate cap (reported in CMR227) to calculate the fraction of balances having each of those periodic caps. The fractions of teaser balances having periodic caps of 100 and 200 basis points, respectively are:

$$\text{cap}_{100} = \frac{(200 - \text{CMR227})}{100}$$

$$\text{cap}_{200} = 1 - \text{cap}_{100}$$

The four fractions are then used to divide up the four sub-balances from Level 3.

(a) To calculate the four sub-balances that have periodic caps of 100 basis points, the Model multiplies each of the Level 3 sub-balances by the product of pcap and cap_{100}.

(b) To calculate the four sub-balances that have periodic caps of 200 basis points, the Model multiplies each of the Level 3 sub-balances by the product of pcap and cap_{200}.

(c) To calculate the four sub-balances on Level 4 that have no periodic caps, the Model simply multiplies each of the Level 3 sub-balances by the fraction no_pcap.

At this point, the reported teaser ARM balance has been split into the 12 sub-balances shown on Level 4 of Figure 5.J.2: 4 with periodic caps of 100 basis points, 4 with periodic caps of 200 basis points, and 4 with no periodic caps.

In the example, the fractions of balances with and without periodic caps are:

$$\text{pcap} = \frac{\text{CMR222}}{\text{CMR142} + \text{CMR157}} = \frac{800}{200 + 800} = 0.80$$

no_pcap = 1 – pcap = 1 – 0.80 = 0.20

and the fractions that have periodic caps of 100 and 200 basis points, respectively, are:

$$\text{cap}_{100} = \frac{(200 - \text{CMR227})}{100} = \frac{200 - 125}{100} = 0.75$$

$$\text{cap}_{200} = 1 - \text{cap}_{100} = 1 - 0.75 = 0.25$$

Therefore, the sub-balances on Level 4 are determined as follows:

- 6 sub-balances have balances of zero because their parent sub-balances had balances of zero.
- The Level 3 sub-balance containing \$160 (Over 400 bp from Lifetime Cap, Lifetime Floor) is

split into three sub-balances:

- $96 (= $160 · 0.80 · 0.75) is allocated to the “100 bp Periodic Cap” sub-balance;
- $32 (= $160 · 0.80 · 0.25) is allocated to the “200 bp Periodic Cap” sub-balance; and
- the remaining $32 (= $160 · 0.20) is allocated to the No Periodic Cap sub-balance.

- The Level 3 sub-balance No Lifetime Cap, No Lifetime Floor containing $40 is divided up as follows:
  - $24 (= $40 · 0.80 · 0.75) is allocated to the “100 bp Periodic Cap” sub-balance;
  - $8 (= $40 · 0.80 · 0.25) is allocated to the “200 bp Periodic Cap” sub-balance; and
  - the remaining $8 (= $40 · 0.20) is allocated to the “No Periodic Cap” sub-balance.

Level 5: Existence of Periodic Rate Floor

The total amount of ARMs in the column that are subject to periodic floors is reported in CMR232. In the next stage of the process, each of the sub-balances in Level 4 of Figure 5.J.2 is sub-divided into two sub-balances reflecting the presence or absence of periodic rate floors. The Model assumes that ARMs that have no periodic caps will, likewise, not have periodic floors. Thus, the Model first constrains the balance of ARMs with periodic rate floors to be no greater than the reported balance with periodic rate caps. That is:

With Periodic Floor = MIN (CMR232, CMR221)

Next, the four sub-balances from Level 4 that have no periodic caps are likewise assumed to have no periodic floors. This creates four teaser sub-balances on Level 5 that have neither periodic caps nor floors.

Balances that do have periodic caps may, or may not, also have periodic floors. To split the remaining eight sub-balances from Level 4 (all of which have periodic caps) on the basis of periodic floors, the Model calculates the ratio of total balances (teaser and non-teaser) with periodic floors to total balances with periodic caps:

$$\text{pflrs\_to\_pcaps} = \frac{\text{CMR232}}{\text{CMR222}}$$

Then, each of the remaining eight sub-balances from Level 4 is split, pro rata, into two finer sub-balances — one with periodic floors and the other without.

At this point, the reported teaser ARM balance has been split into the 20 sub-balances shown on Level 5 of Figure 5.J-2. There are 8 sub-balances with both a periodic cap and periodic floor; 8 with a periodic cap but no periodic floor; and 4 with neither periodic cap nor floor.

In the example, the ratio of total balances with periodic floors to total balances with periodic caps is:

$$\text{pflrs\_to\_pcaps} = \frac{\text{CMR232}}{\text{CMR222}} = \frac{700}{800} = 0.875$$

The sub-balances on Level 5 are then determined as follows:

- 10 sub-balances have balances of zero because their parent sub-balances had balances of zero.
- The Level 4 sub-balance containing $96 (Over 400 bp from Lifetime Cap, Lifetime Floor, 100 bp Periodic Cap) is split into two sub-balances:
  - $84 (= $96 · 0.875) is allocated to the “With Periodic Floor” sub-balance; and

> – $12 (= $96 · 0.125), to the "No Periodic Floor" sub-balance.
>
> - The Level 4 sub-balance containing $32 (Over 400 bp from Lifetime Cap, Lifetime Floor, 200 bp Periodic Cap) is split into two sub-balances:
>   - $28 (= $32 · 0.875) is allocated to the "With Periodic Floor" sub-balance; and
>   - $4 (= $32 · 0.125), to the "No Periodic Floor" sub-balance.
> - The Level 4 sub-balance Over 400 bp from Lifetime Cap, Lifetime Floor, No Periodic Cap also contained $32. That entire balance is passed to a single sub-balance, since the Model assumes ARMs without periodic caps will not have periodic floors. That No Periodic Floor sub-balance, therefore, is allocated the entire $32.
> - The remaining sub-balances are calculated in the same way. The balance allocated to each is shown in Figure 5.J.2.

Level 6: Loans versus MBS

The final stage of the process for this column s teaser ARMs is to split each of the 20 sub-balances from Level 5 into a loan and a security sub-balance. The Model does this by first calculating the proportion of MBS balances to total (teaser and non-teaser) balances:

$$\text{mbs} = \frac{\text{CMR242}}{\text{CMR142} + \text{CMR157}}$$

Then each of the 20 sub-balances from Level 5 is divided into a loan and a security sub-balance on a pro rata basis. The final number of teaser sub-balances is now 40, although many of those balances will be zero — particularly those with coupons that are less than 400 bp from their lifetime rate caps.

In the example, the ratio of MBS balances to total balances is:

> $$\text{mbs} = \frac{\text{CMR242}}{\text{CMR142} + \text{CMR157}} = \frac{700}{200 + 800} = 0.7$$
>
> The sub-balances on Level 6 are then determined as follows:
>
> - 20 sub-balances have balances of zero because they are successors of sub-balances that had balances of zero.
> - The Level 5 sub-balance containing $84 (Over 400 bp to Lifetime Cap, Lifetime Floor, 100 bp Periodic Cap, With Periodic Floor) is split into two sub-balances:
>   - $58.80 (= $84 · 0.70) is allocated to the "MBS" sub-balance; and
>   - $25.20 (= $84 · 0.30), to the "Loan" sub-balance.
> - The remaining sub-balances are calculated in the same way. The balance allocated to each is shown in Figure 5.J.2.

Non-Teaser ARM Balance

After the teaser balance reported in the column has been disaggregated into its various sub-balances, a similar process is used to disaggregate the reported non-teaser ARM balance (e.g., CMR157). In fact, because only the first step of the process differs from what is performed for teaser ARMs, only that step will be described here. The non-teaser sub-balances that result from the example in Table 5.J.1 are shown in Figure 5.J.3.

Level 2: Proximity of Coupon to Lifetime Cap

The Model splits the reported non-teaser ARM balance into four sub-balances on the basis of their proximity to their lifetime rate caps (shown as Level 2 in Figure 5.J.3). This is done simply by assigning to the appropriate non-teaser sub-balance any balances reported in the distance to lifetime cap cells (e.g., CMR212, CMR207, CMR197, and CMR187) that were not allocated to teaser ARM sub-balances.

In the example, none of the balances reported in CMR187 or CMR197 were allocated to teaser balances. Hence, the non-teaser sub-balances Within 200 bp of Lifetime Cap and Within 201-400 bp of Lifetime Cap receive the entire amount reported in those cells ($10 and $90, respectively). Of the $700 reported in CMR207, $160 has already been allocated to teaser balances, so the remaining $540 is allocated to the Over 400 bp from Lifetime Cap non-teaser sub-balance. Finally, of the $200 reported in CMR212, $40 was allocated to teaser balances, so the remaining $160 is allocated to the No Lifetime Cap non-teaser sub-balance.

The amounts allocated to the remaining sub-balances are shown in Figure 5.J.3. They were calculated using the same procedures described for teaser ARMs, above.

Figure 5.J-3

Disaggregation of Non-Teaser Balances

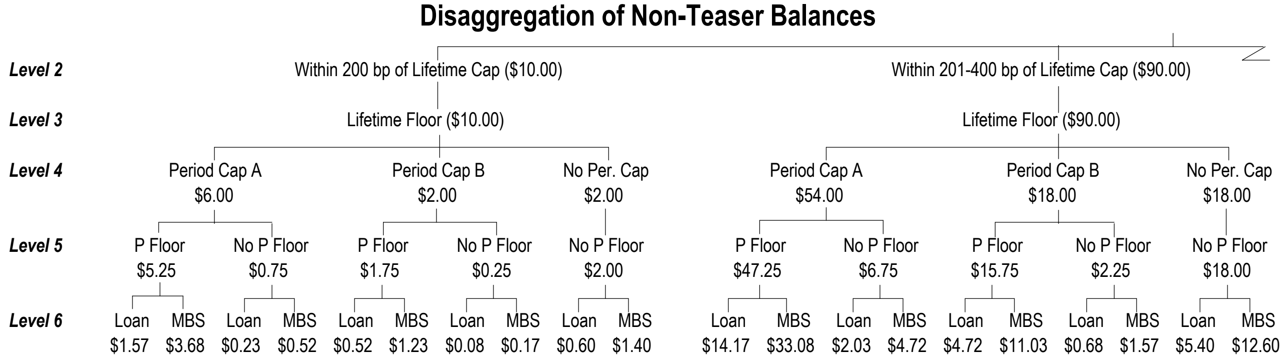
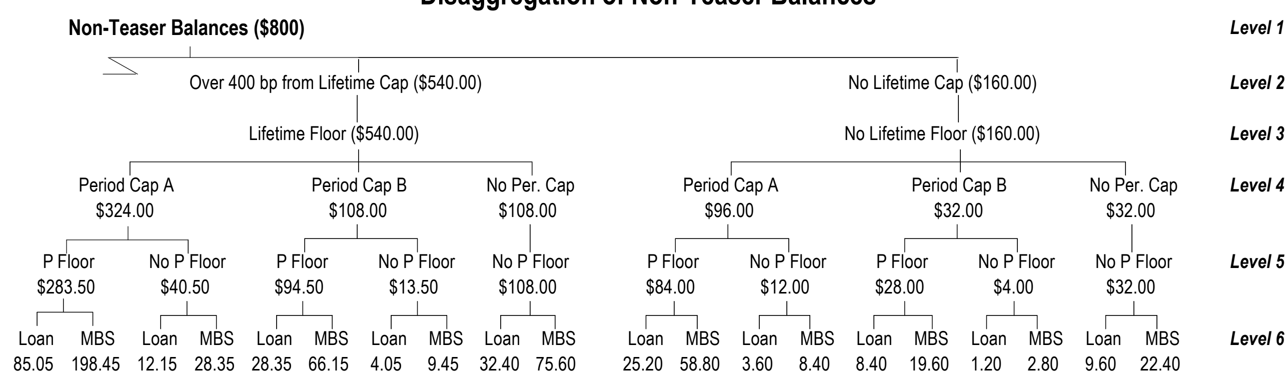


Figure 5.J-3 - continued

Disaggregation of Non-Teaser Balances



Assigning Numerical Values to Characteristics of Sub-balances

Once the teaser and non-teaser balances reported in a given column of Schedule CMR have been disaggregated into the various sub-balances described above, the Model must determine what numerical values to ascribe to each of the characteristics of those sub-balances. For example, for the sub-balances whose coupon is between

200 and 400 basis points from the lifetime interest rate cap, exactly how far from the cap is the coupon? Numerical values must be assigned to five characteristics of each sub-balance so that prices may be looked up[2]:

1. Weighted average remaining maturity (WARM),
2. Weighted average margin,
3. Weighted average coupon (WAC),
4. Weighted average months until next reset,
5. Level of the applicable lifetime rate cap and floor.

Those five characteristics are determined as follows.

WARM. All teaser ARM sub-balances are assumed to be half-way through their introductory rate period, which differs in length for each type of ARM. The introductory period is assumed to be 6 months for 6-month Treasury-indexed ARMs and 1-year COF-indexed ARMs. The weighted average remaining maturity of those types of teaser sub-balances is, therefore, assumed to be 357 months. For the 1-year and 3-year Treasury-indexed ARMs, the introductory period is assumed to be 12 months long. The WARM of such teaser balances is, therefore, assumed to be 354 months. The introductory period for 1-month COFI ARMs is assumed to be 3-months long, so the WARM of such teaser balances is assumed to be 358 months. The WARM of all non-teaser sub-balances is reported on Schedule CMR (e.g., CMR172).

Margin. The margin reported on Schedule CMR (e.g., CMR162) is a blend of loan margins and security margins. That is, for ARM loans, institutions report the full contractual weighted average margin to be paid by the mortgagors. An investor in an ARM security, however, does not receive the entire contractual margin. Servicing and guarantee fees are deducted from the gross margin paid by the mortgagors, so only a net margin is passed through to the investor. Institutions owning ARM securities report this net margin on Schedule CMR. Hence, the reported margin must be grossed up to the extent that it consists partly of margins on ARM securities.

The Model assumes that: (1) the margin of the institution s whole loans and of the loans underlying its ARM securities are the same, and (2) the net margins of ARM securities are 75 basis points less than the gross margins of the loans underlying those securities. Using these assumptions, the Model adjusts the reported margin as follows:

$$\text{margins}_{\text{loans}} = \text{margin}_{\text{mbs}} = \text{margin}_{\text{reported}} + \text{mbs} \cdot 75$$

where $\text{margin}_{\text{reported}}$ is the weighted average margin reported on Schedule CMR (e.g., CMR162), $\text{margin}_{\text{loans}}$ is the margin of the institution s whole ARM loans, and $\text{margin}_{\text{mbs}}$ is the margin of the loans underlying its ARM securities (all expressed in basis points), and mbs is the proportion of securities in the reported (teaser and non-teaser) balance (see description of Level 6, above, for an example of its calculation). Once the reported margin has been adjusted in this way, the Model assigns $\text{margins}_{\text{loans}}$ to all teaser and non-teaser sub-balances.

WAC. The WAC (reported for teaser balances in, e.g., CMR147 and for non-teasers in, e.g., CMR167) is a blend of mortgage note rates and mortgage security pass-through rates, and so requires an adjustment similar to that performed on the reported margin. Using the same two assumptions that are used to adjust the margin, the Model adjusts the reported teaser and non-teaser WACs (e.g., CMR147 and CMR167, respectively) as follows:

$$\text{WAC}_{\text{loans}} = \text{WAC}_{\text{mbs}} = \text{WAC}_{\text{reported}} + \text{mbs} \cdot 75$$

where $\text{WAC}_{\text{reported}}$ is the coupon reported on Schedule CMR, $\text{WAC}_{\text{loans}}$ is the WAC of the institution s whole ARM loans, and WAC_{mbs} is the WAC of the loans underlying its ARM securities, all expressed in basis points.

2 To locate prices in the pricing table, the size of any applicable periodic interest rate cap and floor must also be known. That determination was already made, however, during the sub-balance disaggregation process (in Levels 4 and 5). As part of that process, the Model calculated the proportions of 100 and 200 basis point periodic caps (and floors), based upon the magnitude of the reported weighted average periodic cap (e.g., CMR227).

The adjustment is made separately to the teaser and non-teaser WACs. Once the reported teaser and non-teaser WACs have been adjusted in this way, the Model assigns the appropriate WAC_{loans} to all sub-balances.

Months to Next Payment Reset. The Model assumes that the number of months until the next payment reset is 3 months for teaser sub-balances of 6-month Treasury-indexed and 1-year COFI ARMs. For teaser sub-balances of 1-year and 3-year Treasury-indexed ARMs, it is assumed to be 6 months. For teaser sub-balances of 1-month COFI ARMs the payment is assumed to reset in 10 months, though the rate of interest accrual is assumed to reset in 2 months. For all non-teaser ARM sub-balances, the number of months until next payment reset is reported on Schedule CMR (e.g., CMR177).

Distance to Lifetime Cap. The weighted average distance between the coupon and lifetime rate cap is reported on Schedule CMR:

- in CMR191 - CMR195, for balances whose coupons are within 200 basis points of their lifetime caps;
- in CMR201 - CMR205, for balances whose coupons are between 200 and 400 basis points of their lifetime caps; and
- in CMR216 - CMR220, for balances whose coupons are more than 400 basis points from their lifetime caps.

For balances in the first two categories, the Model simply applies the reported distance between the cap and the coupon to all sub-balances – teaser and non-teaser alike. The treatment is somewhat different for balances whose coupons are more than 400 basis points below their lifetime caps.

First, the Model tentatively assumes that the lifetime caps of teaser sub-balances of:

- Treasury-indexed ARMs are 600 basis points above their coupons,
- 1-year COF-indexed ARMs are 500 basis points above their coupons, and
- 1-month COF-indexed ARMs have a level of 12 percentage points.

Second, the Model tentatively calculates the distance between the lifetime cap and coupon of non-teaser sub-balances using the reported distance (i.e., CMR216 - CMR220) and the following formula:

$$\text{non-teaser distance} = \frac{\left[\text{reported distance} - \left(\text{teaser distance} \cdot \text{teaser fraction}\right)\right]}{\left(1 - \text{teaser fraction}\right)}$$

where: non-teaser distance = distance between lifetime rate cap and coupon of non-teaser ARMs whose coupons are more than 400 basis points below cap

teaser distance = assumed distance between teaser ARM lifetime caps and their coupons

teaser fraction = fraction of teaser ARM balances to total ARM balances

Finally, if the tentative distance to the cap produced by this formula turns out to be more than 400 basis points, then the Model accepts the tentative assumptions regarding both the teaser and non-teaser balances and uses them to value the respective sub-balances. If the formula produces a distance that is less than 400 basis points, then there has been either a reporting error or an error in the Model s assumptions. In such cases, the Model use the reported weighted average distance between the lifetime cap and coupon for **both** the teaser and non-teaser ARMs.

For the example data shown in Table 5.J.1, the Model would tentatively assume that all 10 teaser sub-balances (with a total balance of $160) have a weighted average distance of 600 basis points between their lifetime rate caps and coupons. The tentative distance between the lifetime rate caps and coupons of the non-teaser ARMs would be calculated as follows:

$$\text{teaser fraction} = \frac{\text{CMR142}}{(\text{CMR142} + \text{CMR157})} = \frac{\$200}{(\$200 + \$800)} = 0.20$$

$$\text{non} - \text{teaser distance} = \frac{[\text{reported distance} - (\text{teaser distance} \cdot \text{teaser fraction})]}{(1 - \text{teaser fraction})} = \frac{[500 - (600 \cdot 0.20)]}{(1 - 0.20)}$$

$$= \frac{(500 - 120)}{0.80} = \frac{380}{0.80} = 475$$

Since this tentative non-teaser distance exceeds 400 bp, the Model accepts the tentative assumptions. Therefore, for the sub-balances whose lifetime caps are more than 400 basis points above their coupons, the Model assumes the actual distance to be 600 basis points for the teaser sub-balances and 475 basis points for the non-teaser balances. For the sub-balances whose lifetime caps are between 200 and 400 basis points above their coupons, the Model assumes the actual distance to be 325 basis points (i.e., CMR202), and for the sub-balances whose lifetime caps are between 0 and 200 basis points above their coupons, the Model assumes the actual distance to be 165 basis points (i.e., CMR192).

Section 5.K - Determining Prices Using the ARM Price Tables

The ARM price tables are organized by their various characteristics, so that prices for a given loan or security can be easily retrieved by locating its particular combination of characteristics.

For example, suppose the NPV Model determines that an institution has a sub-balance containing $300 of 1-year Treasury-indexed ARMs with the following characteristics:

WARM	=	330 months
Margin	=	200 bp
WAC	=	5.00%
Months to Next Reset	=	2
Periodic Cap	=	200 bp
Periodic Floor	=	none
Lifetime Cap	=	15.00% (i.e., 1000 bp above WAC)
Lifetime Floor	=	3.00% (i.e., 200 bp below WAC)

Referring to the excerpt of the price table in Table 5.I.1, the estimated price for a 1-year Treasury ARM with this combination of characteristics was $99.77 per $100 of outstanding principal, in the base case. In the +100 basis point alternate rate scenario, the estimated price was $98.10. These prices imply that the value of the reported $300 balance was $299.31 (= $300 x 0.9977) and that the estimated value would have declined to $294.30 if market interest rates had been 100 basis points higher.

If the exact reported coupon and maturity do not appear in the price table, linear interpolation is used to determine the prices. Because the ARM price tables have a greater number of dimensions than the tables for fixed-rate mortgages, the interpolations must be performed in up to five dimensions. For example, suppose the mortgages in the example above had the following characteristics instead:

WARM	=	346 months
Margin	=	295 bp
WAC	=	6.40%
Months to Next Reset	=	4
Periodic Cap	=	200 bp
Periodic Floor	=	200 bp
Lifetime Cap	=	12.30% (i.e., 590 bp above WAC)
Lifetime Floor	=	0.30% (i.e., 610 bp below WAC)

The exact values of the periodic cap and floor are available in the price table, however, it does not contain exact values for any of the other characteristics. Interpolation must be performed for the WARM, Margin, WAC, Months to Next Reset, and the particular combination of Lifetime Cap and Floor. The Model does this by, first, identifying the pair of values in the table that most closely bracket the reported values of each of the five characteristics requiring interpolation. (For example, if the sub-balance has a coupon that is 590 basis points from its lifetime cap, the values that most closely bracket that cap distance in the excerpted price table in Table 5.I.1 are 400 and 1000 basis points.) Because there are two bracketing values for each of the five characteristics,[1] there are 32 different combinations ($32 = 2^5$) of bracketing values for each ARM sub-balance and the Model must locate these in the price table. They are:

[1] The combination of lifetime cap and floor distances is considered to be a single characteristic because of the assumption that, if a Treasury ARM has both a cap and a floor, they will be 1200 basis points apart.

Table 5.K.1

ARM Price is Calculated by Interpolating Between These Price Table Lines

1.	$WARM_{lower}$	$Margin_{lower}$	WAC_{lower}	$Reset_{lower}$	$LCap_{lower}$
2.	$WARM_{lower}$	$Margin_{lower}$	WAC_{lower}	$Reset_{lower}$	$LCap_{upper}$
3.	$WARM_{lower}$	$Margin_{lower}$	WAC_{lower}	$Reset_{upper}$	$LCap_{lower}$
4.	$WARM_{lower}$	$Margin_{lower}$	WAC_{lower}	$Reset_{upper}$	$LCap_{upper}$
5.	$WARM_{lower}$	$Margin_{lower}$	WAC_{upper}	$Reset_{lower}$	$LCap_{lower}$
6.	$WARM_{lower}$	$Margin_{lower}$	WAC_{upper}	$Reset_{lower}$	$LCap_{upper}$
7.	$WARM_{lower}$	$Margin_{lower}$	WAC_{upper}	$Reset_{upper}$	$LCap_{lower}$
8.	$WARM_{lower}$	$Margin_{lower}$	WAC_{upper}	$Reset_{upper}$	$LCap_{upper}$
9.	$WARM_{lower}$	$Margin_{upper}$	WAC_{lower}	$Reset_{lower}$	$LCap_{lower}$
10.	$WARM_{lower}$	$Margin_{upper}$	WAC_{lower}	$Reset_{lower}$	$LCap_{upper}$
11.	$WARM_{lower}$	$Margin_{upper}$	WAC_{lower}	$Reset_{upper}$	$LCap_{lower}$
12.	$WARM_{lower}$	$Margin_{upper}$	WAC_{lower}	$Reset_{upper}$	$LCap_{upper}$
13.	$WARM_{lower}$	$Margin_{upper}$	WAC_{upper}	$Reset_{lower}$	$LCap_{lower}$
14.	$WARM_{lower}$	$Margin_{upper}$	WAC_{upper}	$Reset_{lower}$	$LCap_{upper}$
15.	$WARM_{lower}$	$Margin_{upper}$	WAC_{upper}	$Reset_{upper}$	$LCap_{lower}$
16.	$WARM_{lower}$	$Margin_{upper}$	WAC_{upper}	$Reset_{upper}$	$LCap_{upper}$
17.	$WARM_{upper}$	$Margin_{lower}$	WAC_{lower}	$Reset_{lower}$	$LCap_{lower}$
18.	$WARM_{upper}$	$Margin_{lower}$	WAC_{lower}	$Reset_{lower}$	$LCap_{upper}$
19.	$WARM_{upper}$	$Margin_{lower}$	WAC_{lower}	$Reset_{upper}$	$LCap_{lower}$
20.	$WARM_{upper}$	$Margin_{lower}$	WAC_{lower}	$Reset_{upper}$	$LCap_{upper}$
21.	$WARM_{upper}$	$Margin_{lower}$	WAC_{upper}	$Reset_{lower}$	$LCap_{lower}$
22.	$WARM_{upper}$	$Margin_{lower}$	WAC_{upper}	$Reset_{lower}$	$LCap_{upper}$
23.	$WARM_{upper}$	$Margin_{lower}$	WAC_{upper}	$Reset_{upper}$	$LCap_{lower}$
24.	$WARM_{upper}$	$Margin_{lower}$	WAC_{upper}	$Reset_{upper}$	$LCap_{upper}$
25.	$WARM_{upper}$	$Margin_{upper}$	WAC_{lower}	$Reset_{lower}$	$LCap_{lower}$
26.	$WARM_{upper}$	$Margin_{upper}$	WAC_{lower}	$Reset_{lower}$	$LCap_{upper}$
27.	$WARM_{upper}$	$Margin_{upper}$	WAC_{lower}	$Reset_{upper}$	$LCap_{lower}$
28.	$WARM_{upper}$	$Margin_{upper}$	WAC_{lower}	$Reset_{upper}$	$LCap_{upper}$
29.	$WARM_{upper}$	$Margin_{upper}$	WAC_{upper}	$Reset_{lower}$	$LCap_{lower}$
30.	$WARM_{upper}$	$Margin_{upper}$	WAC_{upper}	$Reset_{lower}$	$LCap_{upper}$
31.	$WARM_{upper}$	$Margin_{upper}$	WAC_{upper}	$Reset_{upper}$	$LCap_{lower}$
32.	$WARM_{upper}$	$Margin_{upper}$	WAC_{upper}	$Reset_{upper}$	$LCap_{upper}$

where the subscript lower denotes the nearest value of the given characteristic available in the price table that is less than or equal to the value of the characteristic that the sub-balance actually has, the subscript upper denotes the nearest value of the characteristic available in the price table that is greater than or equal to the actual value, and LCap represents the distance between the coupon and lifetime rate cap.

After locating the necessary 32 lines of prices, the interpolation process for ARMs is the same as that illustrated for fixed-rate mortgages in Section 5.A, except that instead of starting with four prices and performing two rounds of pair-wise interpolation on them, the process for ARMs starts with 32 prices and performs five rounds of pair-wise interpolations. Because the Model uses linear interpolation, the order in which the five rounds of interpolation are performed is immaterial. Prices are found in this way for each of the seven interest rate scenarios.

Section 5.L - Valuing the ARM Sub-Balances

As described in Section 5.J, the teaser and non-teaser ARM balances reported in a particular column of Schedule CMR are disaggregated into 40 sub-balances each. Each sub-balance is valued separately.

Nine prices are obtained from the price tables for each sub-balance, as described in Section 5.K, based on the relevant pricing characteristics (e.g., WAC, margin, WARM, months until next reset, rate caps, and floors), interpolating where necessary. The amount of outstanding principal in each sub-balance is multiplied by those prices to provide an estimate of its economic value in each of the seven interest rate scenarios.

The economic values of all sub-balances (teaser and non-teaser) for a particular column of Schedule CMR are aggregated by rate scenario and presented on page 2 of the Exposure Report in the line corresponding to the title of the CMR column (e.g., Current Market Index ARMs, 6 Month or Less Reset Frequency).

Section 5.M - Mortgage Loans Serviced by Others

Schedule CMR Line Numbers

The lines used to report these instruments on Schedule CMR are displayed below.

ASSETS

MEMORANDUM ITEMS

Mortgage Loans Serviced by Others		
Fixed-Rate Mortgage Loans Serviced	586	$
Wtd Avg Servicing Fee	587	bp
Adjustable-Rate Mortgage Loans Serviced	588	$
Wtd Avg Servicing Fee	589	bp

Description of Instruments

Institutions report mortgages serviced by others as two balances — one for fixed-rate mortgages (CMR586) and the other for ARMs (CMR588) — along with the weighted average servicing fee paid on each balance (CMR587 and CMR589). Insufficient detail is provided on the reporting form to identify specific types of mortgages being serviced (e.g., single-family, multifamily, etc.), so the Model assumes they are all single-family mortgages.

Valuation Methodology

Method

The Model values the single-family mortgage loans reported by an institution as though they are both owned and serviced by that institution. If, in fact, some of those loans are serviced by others, their estimated present value must be reduced (or increased) to the extent that the servicing fee paid by the institution is more than (or less than) the cost the Model assumes the institution incurs by servicing the loans internally. This adjustment is made by calculating the present value of the future fees to be paid to the servicer relative to the present value of the cost of servicing that balance internally.

The present value adjustment is calculated separately for fixed-rate and adjustable-rate mortgage balances using four steps. First, look-up tables are created that contain estimates of the present value of the Model's assumed internal cost of servicing (per $100 outstanding balance) for 30-year conventional fixed-rate mortgages and 5 different types of ARMs in the 9 interest rate scenarios. The elements of these tables will be referred to as "unit present values." The tables are created using the option-based approach, as described below. Second, the Model breaks the reported balances being serviced by others into a number of sub-balances having different characteristics (e.g., WAC, WARM, etc.). Third, it calculates the present value of internal servicing for each sub-balance in each scenario by locating the appropriate look-up table line (based on the characteristics of that sub-balance) and multiplying the amount of the sub-balance by each of the unit present values. Fourth, it calculates the multiple by which the actual servicing fee being paid by the institution exceeds or is less than the assumed cost of internal servicing and uses that multiple to scale the present values calculated in step three. The Model then aggregates across sub-balances, by scenario, the extra servicing cost or the cost saving that results from having its mortgages serviced by others.

The IRR Exposure Report presents the aggregate extra cost or the cost saving that results from the reported servicing by others, for each of the interest rate scenarios, on page 02 on the line titled "Value of Servicing on Mortgages Serviced by Others." This item is presented as a contra-asset, so positive (or negative) values on the line indicate that the servicing arrangements result in a reduction (or an increase) in the estimated value of the institution's mortgage portfolio. The steps in the process are described in more detail below.

Step 1: Creation of Look-Up Tables

Cash Flows

For each mortgage included in the look-up table, the Model calculates a stream of monthly servicing costs along each of the 200 randomly generated rate paths, based upon a beginning mortgage balance of $100 being serviced and an assumed servicing cost of 20 basis points per year for fixed-rate mortgages and 38 basis points for ARMs. In each subsequent month until maturity, each path's balance — and, thus, each path's servicing cost — is reduced to reflect amortization and prepayments. Prepayments are determined using the same prepayment equations that are used to estimate mortgage loan prices (see Sections 5.B, for fixed-rate mortgages, and 5.G, for ARMs).

Discount Factors

The present value of the stream of servicing costs along each of the 200 simulated interest rate paths is calculated by multiplying each monthly cost by the same set of discount factors used by the Model to estimate mortgage loan prices in the corresponding mortgage loan price table. (See Sections 5.B and 5.G.)

Each unit present value stored in the look-up table for mortgages serviced by others represents the average of the 200 discounted cash flows in the particular interest rate scenario that is being evaluated. Unit present values are calculated in all seven interest rate scenarios for 252 different combinations of WAC and WARM for fixed-rate mortgages and for 16,200 different combinations of ARM characteristics (i.e., 6 different indexes, 3 different maturities, etc.). They are stored in separate look-up tables.

Step 2: Assumed Characteristics of Reported Balances

The reported balance of fixed-rate mortgages serviced by others is assumed to consist entirely of 30-year conventional fixed-rate mortgages, broken into five sub-balances. Each sub-balance is calculated as the pro rata share of the 30-year fixed-rate mortgage loans reported by the institution in CMR001-CMR005, and has the same WAC and WARM characteristics as are reported for those balances.

The reported balance of ARMs serviced by others is assumed to consist of pro rata shares of the 400 possible sub-balances that the institution's ARM loan portfolio is broken into by the Model (see Section 5.J) and, thus, to have the characteristics (e.g., index, reset interval, caps, floors, etc.) of those sub-balances.

Step 3: Calculating the Present Value of the Assumed Internal Servicing Cost

The internal servicing cost of each of the sub-balances is valued separately. Unit present values for the 7 scenarios are retrieved from the look-up tables for each sub-balance, based upon the assumed characteristics (WAC, WARM, etc.) of the sub-balance. Interpolation among the lines of the look-up tables is performed where necessary.[1]

[1] The Model uses the same look-up and interpolation procedures that it uses to determine prices for mortgages. These are described in Section 5.A, for fixed-rate mortgages, and in Section 5.F, for ARMs.

Example: Assumed Characteristics of Reported Balances

Suppose an institution reports $3,000 of fixed-rate mortgages serviced by others (in CMR586) and a total of $15,000 of 30-year fixed-rate mortgages, as in the excerpt from Schedule CMR, below.

ASSETS

FIXED-RATE SINGLE-FAMILY FIRST MORTGAGE LOANS & MORTGAGE-BACKED SECURITIES	**Coupon**									
30-Year Mortgages and MBS:	Less Than 7%		7.00 to 7.99%		8.00 to 8.99%		9.00 to 9.99%		10.00% & Above	
Mortgage Loans	001	$ 5000	002	$ 4000	003	$ 3000	004	$ 2000	005	$ 1000
WARM	006	350 months	007	345 months	008	330 months	009	310 months	010	300 months
WAC	011	6.41 %	012	7.58 %	013	8.36 %	014	9.52 %	015	10.94 %
$ of Which Are FHA or VA Guaranteed	016	$ 0	017	$ 0	018	$ 0	019	$ 0	020	$ 0

The$3,000 of mortgages serviced by others represents 20 percent of the 30-year fixed-rate mortgage portfolio. It would be allocated into 5 sub-balances as follows. The first sub-balance would contain $1000 (= .20 x $5000) and would be assumed to have a WAC of 6.41% and a WARM of 350 months. The second sub-balance would contain $800 (= .20 x $4000 and would be assumed to have a WAC of 7.58% and a WARM of 345 months, and so on for the remaining three sub-balances.

By multiplying each unit present value by the amount of its corresponding sub-balance and dividing by 100, the Model calculates the present value of the cost of servicing that sub-balance under the servicing cost assumptions that were used to estimate the values of the mortgages (i.e., 20 and 38 basis points per year for FRMs and ARMs, respectively). The resulting present value costs are then aggregated by interest rate scenario, separately for all FRM and all ARM sub-balances.

Step 4: Calculating the Amount of the Present Value Adjustment

The present value adjustment reflects the difference between the reported servicing fees being paid by the institution and the assumed costs of internal servicing (i.e., 20 and 38 basis points for FRMs and ARMs, respectively). Before it can be calculated, the model calculates the multiple by which the reported servicing fee exceeds the assumed internal cost of internal servicing, separately for FRMs and ARMs.

For fixed-rate mortgages the multiple is:

$$\text{frm\_multiple} = \frac{(\text{reported\_ fee - 20 b.p.})}{\text{20 b.p.}}$$

and for adjustable-rate mortgages it is:

$$\text{arm\_multiple} = \frac{(\text{reported\_ fee - 38 b.p.})}{\text{38 b.p.}}$$

The dollar amount of the present value adjustment is then calculated as the product of the appropriate multiple and the present value costs for FRMs and ARMs that were calculated in Step 3. Finally, the present value adjustment for both types of mortgage are combined for each rate scenario and listed on the Exposure Report on the line, "Value of Servicing on Mortgages Serviced by Others."

Example: Calculating the Amount of the Present Value Adjustment

Suppose an institution reports it is paying a fee of 30 basis points to have its fixed-rate mortgages serviced by someone else. That servicing fee exceeds the 20 basis point servicing cost implicit in the Model's estimate of the value of the institution's fixed-rate mortgages. Thus, in each scenario, the present value cost of internal servicing from the price table is multiplied by the fraction,

$$0.50 = \frac{30\text{ b.p.} - 20\text{ b.p.}}{20\text{ b.p.}}$$

to determine the amount of the present value adjustment. This adjustment indicates the institution is paying half-again as much to have its mortgages serviced as the Model assumed it would cost to service them internally. The present value adjustment will result in a reduction in their estimated value.

If, instead, the institution reports a servicing fee of 20 basis points, the multiple equals zero, that is,

$$0.00 = \frac{20\text{ b.p.} - 20\text{ b.p.}}{20\text{ b.p.}}$$

In this case, each present value cost is multiplied by zero, implying that no adjustment is made to the estimated value of the institution's FRMs. This is appropriate, because the institution incurs the same cost to have its FRMs serviced as the Model assumed it would incur in servicing the mortgages internally.

Finally, if the institution's reported servicing fee is less than the assumed cost of internal servicing, the multiple becomes negative, implying that that fraction of the present value cost is added to the value of the institution's mortgages. Again, this is appropriate because the institution realizes a saving from the servicing arrangement.