

Table 8-25
Variable Annuity GMDB Provision
Base Case DAC Assumptions

Period	(1) Premium	(2) M&E Charges	(3) Surrender Charges	(4) Deferrable Acquisition Expenses	(5) Maintenance Per Policy	(6) Mortality Rate	(7) Surrender Rate	(8) Gross Appreciation Rate
1	20,000	1.50%	6.00%	7.00%	35	0.0036	1%	-2.00%
2	-	1.50%	5.00%	0.00%	35	0.0039	2%	5.00%
3	-	1.50%	4.00%	0.00%	35	0.0043	3%	4.00%
4	-	1.50%	3.00%	0.00%	35	0.0046	4%	8.00%
5	-	1.50%	2.00%	0.00%	35	0.0050	5%	8.00%
6	-	1.50%	1.00%	0.00%	35	0.0054	6%	8.00%
7	-	1.50%	0.00%	0.00%	35	0.0058	30%	8.00%
8	-	1.50%	0.00%	0.00%	35	0.0064	10%	8.00%
9	-	1.50%	0.00%	0.00%	35	0.0070	10%	8.00%
10	-	1.50%	0.00%	0.00%	35	0.0076	100%	8.00%

Table 8-26 lists the additional *SOP 03-1*-related assumptions. Analogous to the DAC assumptions, the first three years' assumptions are based on historical experience while the remaining years' assumptions are best estimates as of the end of year 3. Note that the average gross appreciation rate is equal to the gross appreciation rate used for EGPs.

Table 8-26				
Variable Annuity GMDB Provision				
Base Case SOP Specific Assumptions				
Period	(9)			(10)
	Gross Appreciation Rate			Average Gross
	Scenario A	Scenario B	Scenario C	Appreciation Rate
1	-2.00%	-2.00%	-2.00%	-2.00%
2	5.00%	5.00%	5.00%	5.00%
3	4.00%	4.00%	4.00%	4.00%
4	3.00%	9.00%	12.00%	8.00%
5	7.00%	-5.00%	22.00%	8.00%
6	-12.00%	18.00%	18.00%	8.00%
7	9.00%	4.00%	11.00%	8.00%
8	15.00%	9.00%	0.00%	8.00%
9	2.00%	7.00%	15.00%	8.00%
10	9.00%	2.00%	13.00%	8.00%

Table 8-27 Variable Annuity GMD B Provision Base Case Policy Level Experience for SOP 03-1 Additional Liability Calculation					
			Death Benefit Account Balance	Excess Death Benefit Inforce	

$i_t = ((1)_{t-1} + \text{Table 8-25 column (1)}) \times (1 + \text{Table 8-26 column (9)} - \text{Table 8-25 column (2)})$
 (2) Premium + 5% Interest (2) $((2)_{t-1} + \text{Table 8-25 column (1)}) \times 1.05$.
 (3) Death Benefit Account Balance = maximum $((2)_t)$.
 (4) Excess Death Benefit Inforce (4) $(3)_t - (1)_t$.
 (5) Average Death Benefit Inforce (5) Average of (4) Scenarios A, B, C.

8.2.5.6 GMAB

Tables 8-34 through 8-38 provide a base case example of a single premium variable deferred annuity with a GMAB provision. This example illustrates a method of calibrating the required profit margin at issue and how a liability valuation formula is derived. The GMAB rider benefit is a return of premium at the end of 10 years and the rider charges are specified.

Table 8-34 lists the best estimate non-economic assumptions, and Table 8-35 lists the economic assumptions, all as of the issue date. In this example, the average of the scenario-specific gross appreciation rate assumptions equals the risk-free forward interest rates, implying that the assumptions are market consistent. (In practice, the volatility of returns should also calibrate to the implied volatility observed in the market.)

Table 8-34					
Variable Annuity GMAB Provision					
Base Case Best Estimate Assumptions					
Period	(1) Premium	(2) M&E Charges for Base Policy	(3) Charges for GMAB	(4) Mortality Rate	(5) Surrender Rate
1	20,000	1.50%	1.00%	0.0036	1%
2	-	1.50%	1.00%	0.0039	2%
3	-	1.50%	1.00%	0.0043	3%
4	-	1.50%	1.00%	0.0046	4%
5	-	1.50%	1.00%	0.0050	5%
6	-	1.50%	1.00%	0.0054	6%
7	-	1.50%	1.00%	0.0058	30%
8	-	1.50%	1.00%	0.0064	10%
9	-	1.50%	1.00%	0.0070	10%
10	-	1.50%	1.00%	0.0076	100%

Table 8-35					
Variable Annuity GMAB Provision					
Base Case GMAB Economic Assumptions					
Period	Forward Rate Curve Scenario A	(6) Gross Appreciation Rate		(7) Average Gross Appreciation Rate	(8) Risk-free Forward Rate
		Scenario B	Scenario C		
1	2.25%	-4.75%	9.25%	2.25%	2.25%
2	-1.00%	-3.50%	12.00%	2.50%	2.50%
3	1.50%	3.50%	2.50%	2.50%	2.50%
4	-2.00%	4.00%	7.00%	3.00%	3.00%
5	1.25%	-9.25%	17.75%	3.25%	3.25%
6	-16.50%	13.50%	13.50%	3.50%	3.50%
7	4.75%	-0.25%	6.75%	3.75%	3.75%
8	11.00%	5.00%	-4.00%	4.00%	4.00%
9	-1.75%	3.25%	11.25%	4.25%	4.25%
10	3.50%	-1.50%	11.50%	4.50%	4.50%

Table 8-40							
Policy Transactions, EGP and DAC for 5 Year Point to Point EIA Contract							
Contract Duration							
		0	1	2	3	4	5
Selected Items from Table 8-39							
(A)	Vesting	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
(B)	Index level	1,500	1,350	1,620	1,377	1,652	1,818
(C)	Fair value of hedge	12,237	7,480	11,132	4,193	6,412	6,253
Policy values before deaths and surrenders							
(D)	Guaranteed value	90,000	92,700	95,481	98,345	101,296	104,335
(E)	Index account before vesting	100,000	100,000	104,000	100,000	105,080	110,588
(F)	Index account after vesting						110,588
(G)	Host contract guaranteed annual growth rate	3.520%					
(H)	Value of host contract	87,763	90,852	94,050	97,360	100,787	104,335
(I)	Fair value of embedded derivative	12,237	7,480	11,132	4,193	6,412	6,253
(J)	Death benefit available		92,700	95,481	98,345	101,296	104,335
(K)	Surrender benefit available		92,700	95,481	98,345	101,296	104,335
EGP and DAC Calculation net of deaths and surrenders							
(L)	Value of host contract	87,763	89,424	90,145	89,886	91,412	93,830
(M)	Value of Embedded Derivative	12,237	7,363	10,670	3,871	5,816	5,624
(N)	Index account						99,454
(O)	Guaranteed value	90,000	91,243	91,517	90,796	91,874	93,830
(P)	Death benefit paid		535	596	658	718	799
(Q)	Surrenders Paid		922	1,868	2,808	928	
Income							
(R)	Bond earned income		6,143	6,251	6,278	6,270	6,357
(S)	Gain on Hedge		(4,757)	3,652	(6,939)	2,220	(159)
Expenses							
(T)	Interest credited on Host Contract		3,089	3,148	3,173	3,164	3,218
(U)	Increase in Value of Embedded Derivative		(4,874)	3,307	(6,799)	1,945	(192)
(V)	Death benefit in excess of Host Released		11	9	7	4	0
(W)	Surrender benefit in excess of Host Released		18	28	28	5	
(X)	Maintenance expense beginning of year		50	49	48	46	45
(Y)	Estimated Gross Profit		3,093	3,362	2,882	3,326	3,127
(Z)	Present value of EGP	13,671.30					
(AA)	DAC	5,000	4,119	3,095	2,196	1,089	
EGM presentation net of deaths and surrenders							
(BB)	Premium Income	100,000					
(CC)	Investment Income		1,386	9,903	(661)	8,489	6,198
(DD)	Benefits Paid		1,457	2,464	3,466	1,646	799
(EE)	Increase in Host Contract	87,763	1,662	720	(259)	1,526	2,418
(FF)	Increase in Value of ED	12,237	(4,874)	3,307	(6,799)	1,945	(192)
(GG)	Expenses		50	49	48	46	45
(HH)	EGM		3,093	3,362	2,882	3,326	3,127

Table 8-40 Continued	
Policy Transactions, EGP and DAC for 5 Year Point to Point EIA Contract	
Legend:	
(A)	From Table 8-39, (H).
(B)	From Table 8-39, (N).
(C)	From Table 8-39, (Z).
(D)	$(D)_t = (D)_{t-1} \times [1 + (C)_0]$ from Table 8-39; initial value $(D)_0 = (A)_0 \times [1 - (B)_0]$; (A), (B) and (C) are from Table 8-39.
(E)	$(E)_t = \text{Max} [(A)_0, (A)_0 \times \{1 + (F)_0 \times [(N)_t / (N)_0 - 1]\}]$; initial value $(F)_0 = (A)_0$; (A), (F) and (N) are from Table 8-39.
(F)	$= (E)_t \times (A)_t$
(G)	$= \{[(R)_0 / (H)_0]^{(1/5)}\} - 1$; $(R)_0$ is from Table 8-39.
(H)	$(H)_0 = (A)_0 - (Y)_0$; $(H)_t = (H)_{t-1} \times [1 + (G)_0]$ for $t = 1$ to 5. (A) and (Y) are from Table 8-39.
(I)	From Table 8-39, (Y).
(J)	$= (D)_t$
(K)	$= (D)_t$
(L)	$= (H)_t \times (L)_t$; (L) is from Table 8-39.
(M)	$= (I)_t \times (L)_t$; (L) is from Table 8-39.
(N)	$= (F)_t \times (L)_t$; (L) is from Table 8-39.
(O)	$= (D)_t - (L)_t$; (L) is from Table 8-39.
(P)	$= (J)_t \times (L)_{t-1} \times (J)_t / 1000$; (L) and second (J) are from Table 8-39.
(Q)	$= [(K)_t \times (L)_{t-1} \times (1 - J_t / 1000)] \times (K)_t$; (L) and second (K) are from Table 8-39.
(R)	$= [(L)_{t-1} + (M)_{t-1} - (C)_{t-1}] \times (G)_0$ where (G) is from Table 8-39.
(S)	$= (C)_t - (C)_{t-1}$.
(T)	$= (L)_{t-1} \times (G)_0$.
(U)	$= (M)_t - (M)_{t-1}$.
(V)	$= [(J)_t - (H)_t] \times (L)_{t-1} \times (J)_t / 1000$; (L) and second (J) are from Table 8-39.
(W)	$= [(K)_t - (H)_t] \times (L)_{t-1} \times (J)_t / 1000 \times (K)_t$; (L), (J) and second (K) are from Table 8-39.
(X)	$= (D)_0 \times (L)_{t-1}$ from Table 8-39.
(Y)	$= (R)_t + (S)_t - (T)_t - (U)_t - (V)_t - (W)_t - (X)_t$.
(Z)	Present value of the EGP (Y) at issue date discounted at earned rate $(G)_t$ less 200 basis points, where (G) is from Table 8-39.
(AA)	$= (AA)_{t-1} \times [1 + (G)_0 - 0.02] - (Y)_t \times (AA)_0 / (Z)_0$; $(AA)_0 = (A)_0 \times (E)_0$ where (A), (E) and (G) are from Table 8-39.
(BB)	= Table 8-39 $(A)_t$
(CC)	$= (R)_t + (S)_t$
(DD)	$= (P)_t + (Q)_t$
(EE)	$= (L)_t - (L)_{t-1}$.
(FF)	$= (M)_t - (M)_{t-1}$; $(FF)_0 = I_0$.
(GG)	$= (X)_t$
(HH)	$= (BB)_t + (CC)_t - (DD)_t - (EE)_t - (FF)_t - (GG)_t$.

Table 8-41 displays the resulting balance sheet and income statements for the product. For the sake of clarity, the bonds are assumed to be classified as held to maturity and are therefore reported at amortized cost. Their value has been diminished by cash needed to pay maintenance expenses, death claims, and surrenders.

Earnings are volatile because they are affected by the changing value of the index each year. The major contributing factor to this volatility is the unequal amounts in the early years of hedge and embedded options.

Table 8-41							
Balance Sheet and Income Statement for 5 Yr Point to Point EIA Contract							
		Contract Duration					
		0	1	2	3	4	5
Items from Table 8-39							
(A)	Deposit	100,000					
(B)	Zero-coupon bond rate	7.00%					
Items from Table 8-40							
(C)	Index account						99,454
(D)	Guaranteed value	90,000	91,243	91,517	90,796	91,874	93,830
(E)	Premium Income	100,000					
(F)	Investment Income for EGP		1,386	9,903	(661)	8,489	6,198
(G)	DAC	5,000	4,119	3,095	2,196	1,089	
(H)	Estimated Gross Profit		3,093	3,362	2,882	3,326	3,127
Balance Sheet							
Assets							
(I)	Bonds held to maturity	82,763	87,046	90,623	93,449	98,295	104,327
(J)	Fair value of hedge	12,237	7,480	11,132	4,193	6,412	6,253
(K)	DAC	5,000	4,119	3,095	2,196	1,089	
(L)	Total assets	100,000	98,645	104,850	99,838	105,796	110,581
Liabilities							
(M)	Value of host contract	87,763	89,424	90,145	89,886	91,412	93,830
(N)	Value of embedded derivative	12,237	7,363	10,670	3,871	5,816	5,624
(O)	Total liabilities	100,000	96,787	100,815	93,757	97,228	99,454
Equity							
(P)	Equity		1,858	4,035	6,080	8,568	11,126
(Q)	Change in equity		1,858	2,177	2,045	2,488	2,558
Income Statement							
Revenues							
(R)	Investment income on bonds	0	5,790	6,090	6,340	6,538	6,877
(S)	Gain on Hedge		(4,757)	3,652	(6,939)	2,220	(159)
(T)	Total revenues	0	1,033	9,742	(599)	8,758	6,718
Expenses							
(U)	Interest credited on host contract	0	3,089	3,148	3,173	3,164	3,218
(V)	Death benefit in excess of Host Released		11	9	7	4	0
(W)	Surrender benefit in excess of Host Released		18	28	28	5	0
(X)	Maintenance cost	0	50	49	48	46	45
(Y)	Acquisition cost expense	0	881	1,024	899	1,107	1,089
(Z)	Increase in Value of Embedded Derivative		(4,874)	3,307	(6,799)	1,945	(192)
(AA)	Total expenses	0	(825)	7,565	(2,644)	6,270	4,160
(BB)	Net income	0	1,858	2,177	2,045	2,488	2,558

Table 8-41 Continued
Balance Sheet and Income Statement for 5 Yr Point to Point EIA Contract

Legend	
(A)	From Table 8-39, (A).
(B)	From Table 8-39, (G).
(C)	From Table 8-40, (N).
(D)	From Table 8-40, (O).
(E)	From Table 8-40, (BB).
(F)	From Table 8-40, (CC).
(G)	From Table 8-40, (HH).
(H)	From Table 8-40, (Y).
(I)	$(I)_t = [(I)_{t-1} - (X)_t] \times [1 + (G)_0] - (P)_t - (Q)_t$; initial value $(I)_0 = (A)_0 \times [1 - (E)_0] - (Z)_0$ where (A), (E), (G) and (Z) come from Table 8-39; (X), (P) and (Q) from Table 8-40.
(J)	$= (C)_t$, from Table 8-40.
(K)	$= (G)_t$, from Table 8-41.
(L)	$= (I)_t + (J)_t + (K)_t$.
(M)	$= (L)_t$, from Table 8-40.
(N)	$= (M)_t$, from Table 8-40.
(O)	$= (M)_t + (N)_t$.
(P)	$= (L)_t - (O)_t$.
(Q)	$= (P)_t - (P)_{t-1}$.
(R)	$= [(I)_{t-1} - (X)_t] \times (B)_0$ where (X) is from Table 8-40.
(S)	$= (S)_t$, from Table 8-40.
(T)	$= (R)_t + (S)_t$.
(U)	$= (T)_t$, from Table 8-40.
(V)	$= (V)_t$, from Table 8-40.
(W)	$= (W)_t$, from Table 8-40.
(X)	$= (X)_t$, from Table 8-40.
(Y)	$= (AA)_{t-1} - (AA)_t$, from Table 8-40.
(Z)	$= (U)_t$, from Table 8-40.
(AA)	$= (U)_t + (V)_t + (W)_t + (X)_t + (Y)_t + (Z)_t$.
(BB)	$= (T)_t - (AA)_t$.

8.3.4.2 Annual Ratchet EIA Product

The following tables will illustrate how *SFAS 133* accounting can be applied to an annual ratchet product. They start with many of the same basic experience assumptions used in the point-to-point example in Section 8.3.4.1 and show results through the first five calendar years after issue. Tables 8-42, 8-43, and 8-44 are determined at the beginning of year 1 ($t = 0$). Tables 8-45, 8-46, and 8-47 are determined at the beginning of year 2 ($t = 1$) and reflect the impact of the first-year option benefits expiring in the money. Only a single deposit at issue is assumed for all of the tables.

Table 8-42 illustrates basic features of the ratchet EIA contract. The Capital Markets section shows the expected budgeted amounts (the amounts available to provide call options to the policyholders based upon pricing). Budgeted amounts are assumed to be fully available at the beginning of each year. Assumptions used for Black-Scholes calculations are also presented. At issue, the assumed participation rate of 41.15% has been scaled so that the initial option equals the budget.

The strike price for the option is equal to the initial index value. The at-the-money nature of the option reflects the fact that projected guaranteed benefits at the end of year 1 don't exceed the index value from the beginning of the year.

Table 8-43 Continued
Policy Transactions, EGP and DAC for Annual Ratchet EIA Contract (Valuation Date $t = 0$)

Legend:

- (A) From Table 8-42, $(S)_t$.
- (B) From Table 8-42, $(R)_t$.
- (C) From Table 8-42, For $t = 0$, $(Y)_t$; For $t > 0$, $(Z)_t$.
- (D) $(D)_t = (B)_t - (B)_{t-1} - (A)_t$; $(A)_t$ is from Table 8-42.
- (E) $(E)_t = (B)_t$.
- (F) $(F)_t = (B)_t$.
- (G) $(G)_t = (B)_t \times (K)_t$; $(K)_t$ is from Table 8-42.
- (H) $(H)_t = (A)_t \times (K)_t$; $(K)_t$ is from Table 8-42.
- (I) $(I)_t = (E)_{t-1} \times (K)_{t-1} \times (H)_t / 1000$; $(K)_t$ and $(H)_t$ are from Table 8-42.
- (J) $(J)_t = (F)_{t-1} \times (K)_{t-1} \times [1 - (H)_t / 1000] \times (I)_t$; $(K)_t$, $(H)_t$ and $(I)_t$ are from Table 8-42.
- (K) $(K)_t = (G)_t \times (L)_t$; $(L)_t$ is from Table 8-42.
- (L) $(L)_t = [(I)_t + (J)_t + (K)_t] \times (H)_{t-1} / (G)_{t-1}$.
- (M) $(M)_t = [(I)_t + (J)_t + (K)_t] - (L)_t$.
- (N) $(N)_5 = 0$; For $t = 4$ to 0 , $(N)_t = [(N)_{t+1} + (M)_{t+1}] / [1 + (P)_t]$; $(P)_t$ is from Table 8-42.
- (O) Internal rate of return based on Host Cash Flow $(P)_0$ through $(P)_5$.
- (P) For $t = 0$, $(P)_0 = (A)_0 - (N)_0 - (L)_0$; $(A)_0$ is from Table 8-42; For $t > 0$, $(P)_t = -(L)_t$.
- (Q) For $t = 0$, $(Q)_0 = (P)_0$; For $t > 0$, $(Q)_t = (Q)_{t-1} \times [1 + (O)_0] + (P)_t$.
- (R) $(R)_t = [(N)_{t-1} + (Q)_{t-1} - (C)_{t-1} \times (K)_{t-1}] \times (G)_0$; $(G)_0$ and $(K)_{t-1}$ are from Table 8-42.
- (S) $(S)_t = [(Z)_t - (Y)_t] \times (K)_{t-1}$; $(Z)_t$, $(Y)_t$ and $(K)_{t-1}$ are from Table 8-42.
- (T) $(T)_t = (J)_t \times (J)_t$; $(J)_t$ is from Table 8-42.
- (U) $(U)_t = (Q)_t \times (O)_0$.
- (V) $(V)_t = (N)_t - (N)_{t-1} + (M)_t$.
- (W) $(W)_t = (D)_0 \times (K)_{t-1}$; $(D)_0 \times (K)_{t-1}$ are from Table 8-42.
- (X) $(X)_t = (R)_t + (S)_t + (T)_t - (U)_t - (V)_t - (W)_t$.
- (Y) Present value of the EGP $(X)_t$ at issue date discounted at earned rate $(G)_t$ less 250 basis points; $(G)_t$ is from Table 8-42.
- (Z) $(Z)_t = (A)_t \times (E)_t$; $(A)_t$ and $(E)_t$ are from Table 8-42.
- (AA) $(AA)_0 = (Z)_0 / (Y)_0$.
- (BB) $(BB)_0 = (Z)_0$; For $t > 0$, $(BB)_t = (BB)_{t-1} \times [1 + (G)_t - 0.025] + (Z)_t - (AA)_0 \times (X)_t$; $(G)_t$ is from Table 8-42.
- (CC) $(CC)_t = (A)_t$; $(A)_t$ is from Table 8-42.
- (DD) $(DD)_t = (R)_t + (S)_t$.
- (EE) $(EE)_t = (I)_t + (J)_t + (K)_t - (T)_t$.
- (FF) $(FF)_t = (Q)_t - (Q)_{t-1}$.
- (GG) $(GG)_t = (N)_t - (N)_{t-1}$.
- (HH) $(HH)_t = (W)_t$.
- (II) $(II)_t = (CC)_t + (DD)_t - (EE)_t - (FF)_t - (GG)_t - (HH)_t$.

Table 8-44 displays the resulting balance sheet and income statements.

Table 8-44							
Balance Sheet and Income Statement for Annual Ratchet EIA Contract (Valuation Date $t = 0$)							
		Contract Duration					
		0	1	2	3	4	5
Items from Table 8-42							
(A)	Deposit	100,000					
(B)	Zero-coupon bond rate	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Items from Table 8-43							
(C)	Index account	100,000	103,124	105,210	106,175	109,281	113,527
(D)	Guaranteed value	90,000	91,243	91,517	90,796	91,874	93,830
(E)	Premium Income	100,000					
(F)	Investment Income		6,955	7,166	7,312	7,385	7,600
(G)	DAC	5,000	4,152	3,188	2,110	1,070	0
(H)	Estimated Gross Profit	0	2,343	2,512	2,666	2,478	2,441
Balance Sheet							
Assets							
(I)	Bonds held to maturity	90,500	95,310	99,568	103,129	108,792	2,066
(J)	Fair value of hedge	4,500	4,770	4,919	5,019	5,065	5,213
(K)	DAC	5,000	4,152	3,188	2,110	1,070	0
(L)	Total assets	100,000	104,231	107,675	110,257	114,927	7,279
Liabilities							
(M)	Value of host contract	85,314	87,680	89,172	89,758	92,137	0
(N)	Fair value of embedded derivative	14,686	15,410	16,023	16,481	17,199	0
(O)	Total liabilities	100,000	103,090	105,196	106,239	109,336	0
(P)	Equity	0	1,141	2,479	4,018	5,591	7,279
(Q)	Change in equity		1,141	1,338	1,539	1,572	1,688
Income Statement							
Revenues							
(R)	Investment income on bonds		6,331	6,677	6,979	7,233	7,623
(S)	Gain on Hedge		270	278	284	287	295
(T)	Surrender Charge		99	205	313	105	0
(U)	Total revenues		6,701	7,161	7,577	7,625	7,918
Expenses							
(V)	Interest credited on host contract		3,780	3,885	3,951	3,977	4,082
(W)	Maintenance cost		50	49	48	46	45
(X)	Acquisition cost expense		848	964	1,078	1,040	1,070
(Y)	Increase in Value of Embedded Derivative		881	925	961	989	1,032
(Z)	Total expenses		5,560	5,823	6,038	6,052	6,229
(AA)	Net income		1,141	1,338	1,539	1,572	1,688

Table 8-44	
Balance Sheet and Income Statement for Annual Ratchet EIA Contract (Valuation Date $t = 0$)	
Legend:	
(A)	From Table 8-42, $(A)_t$.
(B)	From Table 8-42, $(G)_t$.
(C)	From Table 8-43, $(G)_t$.
(D)	From Table 8-43, $(H)_t$.
(E)	From Table 8-43, $(CC)_t$.
(F)	From Table 8-43, $(DD)_t$.
(G)	From Table 8-43, $(BB)_t$.
(H)	From Table 8-43, $(X)_t$.
(I)	For $t = 0$, $(I)_0 = (A)_0 \times [1 - (E)_0] - (J)_0$; For $t = 1$, $(I)_t = (A)_t \times [1 - (E)_t] + (I)_{t-1} + (R)_t - (I)_t - (J)_t - (K)_t + (T)_t - (W)_t$ For $t > 1$, $(I)_t = (A)_t \times [1 - (E)_t] + (I)_{t-1} + (R)_t - (I)_t - (J)_t - (K)_t + (T)_t - (W)_t + (J)_{t-1} - (Y)_t \times (K)_{t-1}$ where $(E)_t$, $(Y)_t$ and $(K)_{t-1}$ are from Table 8-42; $(I)_t$, $(J)_t$, $(K)_t$ and $(T)_t$ are from Table 8-43.
(J)	For $t = 0$, $(J)_0 = (C)_0$; For $t > 0$, $(J)_t = (C)_t \times (K)_{t-1}$; $(K)_{t-1}$ is from Table 8-42; $(C)_t$ from Table 8-43.
(K)	$(K)_t = (G)_t$.
(L)	$(L)_t = (I)_t + (J)_t + (K)_t$.
(M)	$(M)_t = (Q)_t$ from Table 8-43.
(N)	$(N)_t = (N)_t$ from Table 8-43.
(O)	$(O)_t = (M)_t + (N)_t$.
(P)	$(P)_t = (L)_t - (O)_t$.
(Q)	$(Q)_t = (P)_t - (P)_{t-1}$.
(R)	For $t = 1$, $(R)_t = [(I)_{t-1} - (W)_t] \times (B)_t$; For $t > 1$, $(R)_t = [(I)_{t-1} - (W)_t + (J)_{t-1} - (Y)_t \times (K)_{t-1}] \times (B)_t$ where $(Y)_t$ and $(K)_{t-1}$ are from Table 8-43.
(S)	$(S)_t = (S)_t$ from Table 8-43.
(T)	$(T)_t = (T)_t$ from Table 8-43.
(U)	$(U)_t = (R)_t + (S)_t + (T)_t$.
(V)	$(V)_t = (U)_t$ from Table 8-43.
(W)	$(W)_t = (W)_t$ from Table 8-43.
(X)	$(X)_t = (G)_{t-1} - (G)_t$.
(Y)	$(Y)_t = (V)_t$ from Table 8-43.
(Z)	$(Z)_t = (V)_t + (W)_t + (X)_t + (Y)_t$.
(AA)	$(AA)_t = (U)_t - (Z)_t$.

Table 8-45 updates the information in Table 8-42 to the beginning of year 2 and reflects the impact of the first-year option benefit expiring in the money. The restated participation rate for the beginning of year two has been shown and is scaled to the value of the budget. Since the option budget and the assumptions used to price the option haven't changed from those used at the beginning of year 1, the restated participation rate is the same as the rate at the beginning of year one, or 41.15%.

Table 8-46 Continued	
Policy Transactions, EGP and DAC for Annual Ratchet EIA Contract (Valuation Date $t = 1$)	
Legend:	
(A)	From Table 8-45, $(T)_t$.
(B)	From Table 8-45, $(S)_t$.
(C)	From Table 8-45, For $t = 0$, $(Z)_1$; For $t > 0$, $(FF)_t$.
(D)	$(D)_t = (B)_t - (B)_{t-1} - (A)_t$; $(A)_t$ is from Table 8-45.
(E)	$(E)_t = (B)_t$.
(F)	$(F)_t = (B)_t$.
(G)	$(G)_t = (B)_t \times (K)_t$; $(K)_t$ is from Table 8-45.
(H)	$(H)_t = (A)_t \times (K)_t$; $(K)_t$ is from Table 8-45.
(I)	$(I)_t = (E)_{t-1} \times (K)_{t-1} \times (H)_t / 1000$; $(K)_t$ and $(H)_t$ are from Table 8-45.
(J)	$(J)_t = (F)_{t-1} \times (K)_{t-1} \times [1 - (H)_t / 1000] \times (I)_t$; $(K)_t$, $(H)_t$, and $(I)_t$ are from Table 8-45.
(K)	$(K)_t = (G)_t \times (L)_t$; $(L)_t$ is from Table 8-45.
(L)	$(L)_t = [(I)_t + (J)_t + (K)_t] \times (H)_{t-1} / (G)_{t-1}$.
(M)	$(M)_t = [(I)_t + (J)_t + (K)_t] - (L)_t$.
(N)	$(N)_5 = 0$; For $t = 4$ to 1 , $(N)_t = [(N)_{t+1} + (M)_{t+1}] / [1 + (Q)_t]$; $(Q)_t$ is from Table 8-45 $(N)_0 = (N)_5$ from Table 8-43.
(O)	Internal rate of return based on Host Cash Flow $(P)_0$ through $(P)_5$.
(P)	For $t = 0$, $(P)_0 = (A)_0 - (N)_0 - (L)_0$; $(A)_0$ is from Table 8-45; For $t > 0$, $(P)_t = -(L)_t$.
(Q)	For $t = 0$, $(Q)_0 = (P)_0$; For $t > 0$, $(Q)_t = (Q)_{t-1} \times [1 + (O)_0] + (P)_t$.
(R)	$(R)_t = [(N)_{t-1} + (Q)_{t-1} - (C)_{t-1} \times (K)_{t-1}] \times (G)_0$; $(G)_0$ and $(K)_{t-1}$ are from Table 8-45.
(S)	$(S)_t = [(FF)_t - (Z)_t] \times (K)_{t-1}$; $(FF)_t$, $(Z)_t$ and $(K)_{t-1}$ are from Table 8-45.
(T)	$(T)_t = (J)_t \times (J)_t$; $(J)_t$ is from Table 8-45.
(U)	$(U)_t = (Q)_t \times (O)_0$.
(V)	$(V)_t = (N)_t - (N)_{t-1} + (M)_t$.
(W)	$(W)_t = (D)_0 \times (K)_{t-1}$; $(D)_0 \times (K)_{t-1}$ are from Table 8-45.
(X)	$(X)_t = (R)_t + (S)_t + (T)_t - (U)_t - (V)_t - (W)_t$.
(Y)	Present value of the EGP $(X)_t$ at issue date discounted at earned rate $(G)_t$ less 250 basis points; $(G)_t$ is from Table 8-45.
(Z)	$(Z)_t = (A)_t \times (E)_t$; $(A)_t$ and $(E)_t$ are from Table 8-45.
(AA)	$(AA)_0 = (Z)_0 / (Y)_0$.
(BB)	$(BB)_0 = (Z)_0$; For $t > 0$, $(BB)_t = (BB)_{t-1} \times [1 + (G)_t - 0.025] + (Z)_t - (AA)_0 \times (X)_t$; $(G)_t$ is from Table 8-45.
(CC)	$(CC)_t = (A)_t$; $(A)_t$ is from Table 8-45.
(DD)	$(DD)_t = (R)_t + (S)_t$.
(EE)	$(EE)_t = (I)_t + (J)_t + (K)_t - (T)_t$.
(FF)	$(FF)_t = (Q)_t - (Q)_{t-1}$.
(GG)	$(GG)_t = (N)_t - (N)_{t-1}$.
(HH)	$(HH)_t = (W)_t$.
(II)	$(II)_t = (CC)_t + (DD)_t - (EE)_t - (FF)_t - (GG)_t - (HH)_t$.

Table 8-47 shows the restated balance sheets and income statements. The balance sheet at $t = 1$ and the income statement for year 1 are actual. The items for the remaining periods are projected.

Table 8-47							
Balance Sheet and Income Statement for Annual Ratchet EIA Contract (Valuation Date $t = 1$)							
		Contract Duration					
		0	1	2	3	4	5
Items from Table 8-45							
(A)	Deposit	100,000					
(B)	Zero-coupon bond rate	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Items from Table 8-46							
(C)	Index account	100,000	102,479	104,552	105,511	108,598	112,817
(D)	Guaranteed value	90,000	91,243	91,517	90,796	91,874	93,830
(E)	Premium Income	100,000					
(F)	Investment Income		6,300	7,166	7,268	7,340	7,553
(G)	DAC	5,000	4,168	3,186	2,109	1,069	0
(H)	Estimated Gross Profit	0	2,302	2,548	2,658	2,472	2,434
Balance Sheet							
Assets							
(I)	Bonds held to maturity	90,500	95,310	98,914	102,450	108,075	2,013
(J)	Fair value of hedge	4,500	4,115	4,888	4,987	5,033	5,180
(K)	DAC	5,000	4,168	3,186	2,109	1,069	0
(L)	Total assets	100,000	103,593	106,988	109,546	114,177	7,194
Liabilities							
(M)	Value of host contract	85,314	87,680	89,172	89,758	92,137	0
(N)	Fair value of embedded derivative	14,686	14,796	15,389	15,833	16,524	0
(O)	Total liabilities	100,000	102,476	104,562	105,591	108,661	0
(P)	Equity	0	1,117	2,427	3,955	5,517	7,194
(Q)	Change in equity		1,117	1,310	1,528	1,562	1,677
Income Statement							
Revenues							
(R)	Investment income on bonds		6,331	6,633	6,933	7,185	7,572
(S)	Gain on Hedge		(385)	277	282	285	293
(T)	Surrender Charge		99	204	311	105	0
(U)	Total revenues		6,046	7,114	7,527	7,575	7,866
Expenses							
(V)	Interest credited on host contract		3,780	3,885	3,951	3,977	4,082
(W)	Maintenance cost		50	49	48	46	45
(X)	Acquisition cost expense		832	982	1,077	1,040	1,069
(Y)	Increase in Value of Embedded Derivative		267	888	923	950	991
(Z)	Total expenses		4,929	5,804	5,999	6,013	6,189
(AA)	Net income		1,117	1,310	1,528	1,562	1,677

Table 8-47 Continued
Balance Sheet and Income Statement for Annual Ratchet EIA Contract (Valuation Date $t = 1$)

Legend:

- (A) From Table 8-45, $(A)_t$.
- (B) From Table 8-45, $(G)_t$.
- (C) From Table 8-46, $(G)_t$.
- (D) From Table 8-46, $(H)_t$.
- (E) From Table 8-46, $(CC)_t$.
- (F) From Table 8-46, $(DD)_t$.
- (G) From Table 8-46, $(BB)_t$.
- (H) From Table 8-46, $(X)_t$.
- (I) For $t = 0$, $(I)_0 = (A)_0 \times [1 - (E)_0] - (J)_0$; For $t = 1$, $(I)_t = (A)_t \times [1 - (E)_t] + (I)_{t-1} + (R)_t - (I)_t - (J)_t - (K)_t + (T)_t - (W)_t$
 For $t > 1$, $(I)_t = (A)_t \times [1 - (E)_t] + (I)_{t-1} + (R)_t - (I)_t - (J)_t - (K)_t + (T)_t - (W)_t + (J)_{t-1} - (Z)_t \times (K)_{t-1}$
 where $(E)_t$, $(Z)_t$ and $(K)_{t-1}$ are from Table 8-45; $(I)_t$, $(J)_t$, $(K)_t$ and $(T)_t$ are from Table 8-46.
- (J) For $t = 0$, $(J)_0 = (C)_0$; For $t > 0$, $(J)_t = (C)_t \times (K)_{t-1}$; $(K)_{t-1}$ is from Table 8-45; $(C)_t$ from Table 8-46.
- (K) $(K)_t = (G)_t$.
- (L) $(L)_t = (I)_t + (J)_t + (K)_t$.
- (M) $(M)_t = (Q)_t$ from Table 8-46.
- (N) $(N)_t = (N)_t$ from Table 8-46.
- (O) $(O)_t = (M)_t + (N)_t$.
- (P) $(P)_t = (L)_t - (O)_t$.
- (Q) $(Q)_t = (P)_t - (P)_{t-1}$.
- (R) For $t = 1$, $(R)_t = [(I)_{t-1} - (W)_t] \times (B)_t$; For $t > 1$, $(R)_t = [(I)_{t-1} - (W)_t + (J)_{t-1} - (Z)_t \times (K)_{t-1}] \times (B)_t$
 where $(Z)_t$ and $(K)_{t-1}$ are from Table 8-46.
- (S) $(S)_t = (S)_t$ from Table 8-46.
- (T) $(T)_t = (T)_t$ from Table 8-46.
- (U) $(U)_t = (R)_t + (S)_t + (T)_t$.
- (V) $(V)_t = (U)_t$ from Table 8-46.
- (W) $(W)_t = (W)_t$ from Table 8-46.
- (X) $(X)_t = (G)_{t-1} - (G)_t$.
- (Y) $(Y)_t = (V)_t$ from Table 8-46.
- (Z) $(Z)_t = (V)_t + (W)_t + (X)_t + (Y)_t$.
- (AA) $(AA)_t = (U)_t - (Z)_t$.