Table 3-18
Check of Survived Account Value Rollfowrard

Policy Dur$_t$	(1) Termination Rate	(2) Survivorship to BOY	(3) Premium Deposit (BOY)	(4) Acct Value BOY	(5) Interest Credited	(6) Persistency Bonus	(7) AV Released	(8) Acct Value EOY
1	2.00%	1.00000	1,000.00	1,000.00	45.00		20.90	1,024.10
2	3.00%	0.98000	935.90	1,960.00	88.20		61.45	1,986.75
3	3.50%	0.95060	865.05	2,851.80	128.33		104.30	2,875.83
4	3.50%	0.91733	976.96	3,852.78	173.38	183.47	147.34	4,062.29
5	3.50%	0.88522	894.96	4,957.25	223.08	265.57	190.61	5,255.28
6	3.50%	0.85424	724.40	5,979.68	269.09		218.71	6,030.06
7	3.50%	0.82434	1,389.02	7,419.07	333.86		271.35	7,481.58
8	3.50%	0.79549	1,268.81	8,750.38	393.77		320.05	8,824.10
9	3.50%	0.76765	1,155.31	9,979.41	449.07		365.00	10,063.49
10	100.00%	0.74078	1,788.98	11,852.47	533.36		12,385.83	-

Legend:
(1) Given
(2) $(2)_{t-1} \times (1 - (1)_{t-1})$
(3) (2) × [Table 3-17, col (3)]
(4) $(8)_{t-1} + (3)_t$
(5) (4) × (4.5%)
(6) (2) × [Table 3-17, col (6)]
(7) (1) × [(4) + (5) + (6)]
(8) (4) + (5) + (6) – (7)

Table 3-19
Gross Profit (Cash Flows minus Change in Account Value)

Policy Dur$_t$	(1) Surrender Charge Scale	(2) Surr. Values Paid	(3) Investment Income	(4) Premium Income	(5) Change in Reserve	(6) Maintenance Expenses	(7) EGP
1	0.07	19.44	62.50	1,000.00	1,024.10	10.00	8.96
2	0.06	57.76	122.50	935.90	962.65	9.80	28.19
3	0.05	99.09	178.24	865.05	889.07	9.51	45.62
4	0.04	135.28	240.80	976.96	1,009.42	9.17	63.89
5	0.03	175.87	309.83	894.96	936.72	8.85	83.34
6	0.02	214.33	373.73	724.40	774.77	8.54	100.48
7	0.01	268.64	463.69	1,389.02	1,451.52	8.24	124.30
8	0	320.05	546.90	1,268.81	1,342.53	7.95	145.18
9	0	365.00	623.71	1,155.31	1,239.39	7.68	166.96
10	0	12,385.83	740.78	1,788.98	(10,063.49)	7.41	200.01

Legend:
(1) Given
(2) [Table 3-18, col (1)] × [Table 3-18, col (4) + col (5)] × [1 – (1)]
(3) (6.25%) × [Table 3-17, col.(4)] × [Table 3-17, col (2)]
(4) Table 3-18, col (3)
(5) [Table 3-18, cols$\{(8)_{t-1} + (3)_t\}$] × (1.045) × [1 – (Table 3-18, col (1))] – [Table 3-18, col$(8)_{t-1}$]
(6) \$10.00 × [Table 3-17, col (2)]
(7) (3) + (4) – (2) – (5) – (6)

Table 3-20
Gross Profits by Source, Bonus Asset & Total DAC Asset

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
									PB Asset Generation	
Policy Dur$_t$	Interest Margin	Surrender Charges	Expense Charges	EGP	Basic DAC Asset	Persistency Bonus	PB Liability	Capitalization	Pres.Value	PB Asset
1	17.50	1.46	10.00	8.96	392.28		29.80	29.80	28.52	25.15
2	34.30	3.69	9.80	28.19	394.77		88.01	56.87	52.08	68.53
3	49.91	5.22	9.51	45.62	388.00		172.43	80.46	70.51	128.41
4	67.42	5.64	9.17	63.89	371.10	183.47	109.89	112.91	94.68	213.96
5	86.75	5.44	8.85	83.34	342.98	265.57	-	150.45	120.73	330.81
6	104.64	4.37	8.54	100.48	304.37		-	-	-	293.57
7	129.83	2.71	8.24	124.30	251.22		-	-	-	242.30
8	153.13	-	7.95	145.18	184.44		-	-	-	177.89
9	174.64	-	7.68	166.96	102.94		-	-	-	99.29
10	207.42	-	7.41	200.01	(0.00)		-	-	-	(0.00)
	Present Value of EGP at Crediting Rate:			706.536		**Present Value of PB Capitalization:**			366.51	
	DAC Amortization Factor (k1%)			53.78%		**PB Asset Amortization Rate (k2%)**			51.87%	

Legend:

(1) [Table 3-19, col (3)] – [Table 3-18, col (5)]
(2) [Table 3-18, col (1)] × [Table 3-19, col (1)] × [Table 3-18, col (4) + Table 3-18, col(5)]
(3) $10.00 × [Table 3-17, col (2)]
(4) (1) + (2) – (3)
(5) For t = 1, (DAE) × (1.045) – (k1%) × (4)
For t > 1, $(5)_t = (5)_{t-1} \times (1.045) - (k\,1\%) \times (4)$
(6) Table 3-18, col(6)
(7) Table 3-17, col(10)
(8) $(7)_t - (1.045) \times (7)_{t-1} + (6)_t \times$ [Table 3-18, col(1)] × (1 – [Table 3-19, col(1)]) + $(6)_t \times$ (1 – [Table 3-18, col(1)])
(9) (8) / (1.045^t)
(10) $(10)_{t-1} \times (1.045) + (8)_t - (k\,2\%) \times (4)_t$

3.12 Worksheet Approaches to DAC Calculation

Formulas for benefit reserves, including their maintenance components, and formulas for DAC for specific SFASs are covered in the following chapters. This section presents the features of the worksheet approach to capitalizing and amortizing DAC. The worksheet can be used for a variety of coverages and situations. Chapters 4 (traditional life) and 10 (individual health) address the development of formula-based reserves that are used for factor and first-principles reserve generation. To develop reserves, values are determined per unit and applied to the appropriate units in force on the valuation date. A comparable approach for DAC is known as a worksheet methodology.

The worksheet facilitates the exact period deferred acquisition expense to be applied. There is never a question about implied versus actual acquisition expense, as there can be under the formula-based methodology.

The worksheet approach operates well with respect to noncommission acquisition expenses. If a worksheet is used for commissions, the level of subsequent heaped renewal commissions must be estimated for each future duration. Depending on the amount of bonuses included in capitalized commissions in the first year, the relationship between the heaped levels and the first-year excess amount deferred can vary and consequently affect the DAC amortization.

The worksheet approach can be divided into two types, static and dynamic.

3.12.1 Static Worksheets

Table 3-21 illustrates the calculation process for the static worksheet approach. The expense to be deferred is introduced at the beginning of the table. A schedule using mortality and lapse rates is then used to develop an expected in force schedule at future dates. A terminal duration is selected, at which point the DAC will be amortized to zero.

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

	(9) Gross Appreciation Rate			(10) Average Gross Appreciation Rate
Period	**Scenario A**	**Scenario B**	**Scenario C**	
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 shows the policy level development of the scenario-specific account balance and excess death benefit in force, which will be used in the *SOP 03-1* liability determination.

Similarly, Table 8-28 shows the policy level development of items, which will be used for EGP determination. Note that the account balance in Table 8-28 is based on the deterministic EGP assumptions, but the excess death benefit in force is based on the scenario-specific *SOP* liability assumptions, which is consistent with the numerical example provided with *SOP 03-1*.

Table 8-27
Variable Annuity GMDB Provision
Base Case Policy Level Experience for SOP 03-1 Additional Liability Calculation

	(1) Account Balance			(2) Premium +	(3) Death Benefit Account Balance			(4) Excess Death Benefit Inforce			(5)
Period	**Scenario A**	**Scenario B**	**Scenario C**	**5% Interest**	**Scenario A**	**Scenario B**	**Scenario C**	**Scenario A**	**Scenario B**	**Scenario C**	**Average**
1	19,300.00	19,300.00	19,300.00	21,000.00	21,000.00	21,000.00	21,000.00	1,700.00	1,700.00	1,700.00	1,700.00
2	19,975.50	19,975.50	19,975.50	22,050.00	22,050.00	22,050.00	22,050.00	2,074.50	2,074.50	2,074.50	2,074.50
3	20,474.89	20,474.89	20,474.89	23,152.50	23,152.50	23,152.50	23,152.50	2,677.61	2,677.61	2,677.61	2,677.61
4	20,782.01	22,010.50	22,624.75	24,310.13	24,310.13	24,310.13	24,310.13	3,528.11	2,299.62	1,685.37	2,504.37
5	21,925.02	20,579.82	27,262.82	25,525.63	25,525.63	25,525.63	27,262.82	3,600.61	4,945.81	-	2,848.81
6	18,965.14	23,975.49	31,761.19	26,801.91	26,801.91	26,801.91	31,761.19	7,836.77	2,826.42	-	3,554.40
7	20,387.53	24,574.88	34,778.50	28,142.01	28,142.01	28,142.01	34,778.50	7,754.48	3,567.13	-	3,773.87
8	23,139.85	26,418.00	34,256.83	29,549.11	29,549.11	29,549.11	34,256.83	6,409.26	3,131.11	-	3,180.13
9	23,255.54	27,870.98	38,881.50	31,026.56	31,026.56	31,026.56	38,881.50	7,771.02	3,155.58	-	3,642.20
10	24,999.71	28,010.34	43,352.87	32,577.89	32,577.89	32,577.89	43,352.87	7,578.18	4,567.55	-	4,048.58

Legend:

(1) Account Balance $(1)_t = ((1)_{t-1} + \text{Table 8-25 column } (1)_t) \times (1 + \text{Table 8-26 column } (9)_t - \text{Table 8-25 column } (2)_t)$.

(2) Premium + 5% Interest $(2)_t = ((2)_{t-1} + \text{Table 8-25 column } (1)_t) \times 1.05$.

(3) Death Benefit Account Balance = maximum $((1)_t, (2)_t)$.

(4) Excess Death Benefit Inforce $(4)_t = (3)_t - (1)_t$.

(5) Average Death Benefit Inforce $(5)_t$ = Average of $(4)_t$ 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 Scenario B	Scenario C	(7) Average Gross Appreciation Rate	(8) Risk-free Forward Rate
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
(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 8-42
Annual Ratchet EIA Product Design and Pricing Assumptions (Valuation Date t = 0)

		Contract Duration					
		0	**1**	**2**	**3**	**4**	**5**
Contract Design and Pricing Assumptions							
(A)	Deposit	$100,000					
(B)	Policy load	10.00%					
(C)	Guaranteed interest rate	3.00%					
(D)	Maintenance expense	$50.00					
(E)	Acquisition cost as percentage of premium	5%					
(F)	Participation rate	41.15%					
(G)	Zero-coupon bond rate	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
(H)	Mortality rate per 1,000		5.77	6.35	6.98	7.68	8.45
(I)	Lapse rate		1.00%	2.00%	3.00%	1.00%	0.00%
(J)	Surrender charge		10.00%	10.00%	10.00%	10.00%	10.00%
(K)	Contracts persisting (prior to maturity)	1.00000	0.98429	0.95848	0.92323	0.90698	0.89932
(L)	Maturity rate		0.00%	0.00%	0.00%	0.00%	100.00%
Capital Markets							
(M)	Option budget		4.50%	4.50%	4.50%	4.50%	4.50%
(N)	Index level	1,500					
(O)	Implied volatility	22.0%					
(P)	Risk-free rate	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
(Q)	Dividend rate	1.25%					
Calculation of Account, Guaranteed, and Option Values							
(R)	Index account	100,000	104,770	109,768	115,003	120,489	126,236
(S)	Guaranteed value	90,000	92,700	95,481	98,345	101,296	104,335
	BOY						
(T)	Strike price for annual hedge		1,500				
(U)	Time to expiry for annual hedge		1.0000000				
(V)	D1		0.33				
(W)	D2		0.11				
(X)	Black-Scholes price		164.03				
(Y)	Fair value of hedge		4,500	4,715	4,940	5,175	5,422
	EOY						
(Z)	Fair value of hedge		4,770	4,998	5,236	5,486	5,747

Legend:

(A) to (F) Policy features and assumptions.

(G) to (I) Experience assumptions.

(J) Annual Surrender Charge.

(K) $(K)_0 = 1$; For $t > 0$, $(K)_t = (K)_{t-1} \times [1 - (H)_t / 1000] \times [1 - (I)_t]$.

(L) to (Q) Assumptions

(R) $(R)_0 = (A)_0$; For $t = 1–5$, $(R)_t = (R)_{t-1} + (Z)_t$.

(S) $(S)_t = [1 - (B)_0] \times (A)_0 \times [1 + (C)_0]$ ^ t.

Beginning of Year Hedge Values

(T) $(T)_t = (O)_{t-1}$

(U) One-year hedge purchased at the beginning of the year.

(V) Black-Scholes Parameter D1 = $(V)_t = [ln[(N)_{t-1} / (T)_t] + [(P)_{t-1} - (Q)_{t-1} + (O)_{t-1}$ ^ 2 / 2] × $(U)_t] / [(O)_{t-1} \times (U)_t$ ^ 0.5].

(W) Black-Scholes Parameter D2 = $(W)_t = (V_t) - (O)_{t-1} \times (U)_t$ ^ 0.5.

(X) $(X)_t = (N)_{t-1} \times EXP[-(Q)_{t-1} \times (U)_t] \times NORMDIST[(V)_t] - (T)_t \times EXP[-(P)_{t-1} \times (U)_t] \times NORMDIST[(W)_t]$.

(Y) For $t = 1$, $(Y)_t = (R)_{t-1} \times (F)_0 \times (X)_t / (N)_{t-1}$; For $t = 2–5$, $(Y)_t = (R)_{t-1} \times (M)_t$.

Year Hedge Values

(Z) $(Z)_t = (R)_{t-1} \times (M)_t \times [1 + (P)_t]$.

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 $t = 0$, $(Y)_1$; 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 $(N)_0 = (N)_0$ 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)	$(AA)_t = (U)_t - (Z)_t$.