

Table 6-z
Monte Carlo Simulation of Ten Binomial Paths for Six-Month One Period Treasury Zeros;
Initial Zero Rate of 7% with 10% Binomial Rate Changes*

Semi-Annual Period	Short-term One Period Zero Paths									
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
1	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
2	7.7	7.7	7.7	6.3	6.3	6.3	7.7	6.3	7.7	7.7
3	8.5	6.9	6.9	6.9	5.7	5.7	8.5	5.7	8.5	8.5
4	7.6	6.2	6.2	7.6	5.1	6.2	9.3	6.2	9.3	9.3
5	6.9	6.9	5.6	8.4	4.6	6.9	8.4	6.9	8.4	8.4
6	7.5	7.5	5.1	9.2	4.1	6.2	7.5	7.5	7.5	7.5
7	8.3	8.3	4.5	10.1	4.5	5.6	6.8	8.3	6.8	6.8
8	9.1	9.1	5.0	11.2	5.0	5.0	6.1	9.1	6.1	6.1
9	10.0	10.0	5.5	12.3	5.5	4.5	5.5	8.2	6.7	6.7
10	9.0	9.0	6.1	13.5	6.1	4.1	5.0	7.4	6.1	7.4
11	9.9	8.1	6.7	12.2	6.7	4.5	4.5	8.1	5.4	6.7
12	8.9	8.9	7.3	10.9	7.3	4.0	4.0	8.9	4.9	6.0
13	8.1	9.8	8.1	9.8	8.1	4.4	3.6	9.8	4.4	5.4
14	8.9	8.9	7.2	8.9	7.2	4.0	3.2	10.8	4.0	4.9
15	9.7	8.0	6.5	8.0	6.5	4.4	2.9	9.7	4.4	5.3
16	8.8	7.2	7.2	8.8	7.2	3.9	3.2	10.7	4.8	4.8
17	7.9	6.5	7.9	9.6	7.9	3.5	3.5	9.6	5.3	4.3
18	7.1	7.1	8.7	10.6	8.7	3.2	3.9	10.6	5.8	4.8
19	7.8	7.8	7.8	11.7	9.6	2.9	4.3	11.7	6.4	5.2
20	8.6	7.0	8.6	10.5	8.6	3.2	4.7	12.8	7.0	4.7

*Each interest rate in a given path is the (annualized) 6 month zero coupon interest rate simulated for that path. Each value is calculated by randomly multiplying the interest rate for the previous period by either ($1.1 = 1 + .1$) or ($.9 = 1 - .1$). Each path provides a different random result for the six month interest rate process.

Table 6-y
Calculated Treasury Spot Rates for the Ten Paths in Table 6-z*

Semi-Annual Period	1	2	3	4	5	6	7	8	9	10
1	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
2	7.35	7.35	7.35	6.65	6.65	6.65	7.35	6.65	7.35	7.35
3	7.72	7.21	7.21	6.74	6.32	6.32	7.72	6.32	7.72	7.72
4	7.70	6.97	6.97	6.96	6.02	6.30	8.12	6.30	8.12	8.12
5	7.53	6.95	6.69	7.25	5.73	6.41	8.17	6.41	8.17	8.17
6	7.53	7.05	6.42	7.57	5.46	6.37	8.07	6.60	8.07	8.07
7	7.64	7.22	6.15	7.94	5.33	6.26	7.89	6.84	7.89	7.89
8	7.83	7.46	6.01	8.34	5.29	6.10	7.66	7.13	7.66	7.66
9	8.07	7.75	5.95	8.77	5.31	5.92	7.42	7.25	7.56	7.56
10	8.17	7.88	5.96	9.24	5.39	5.73	7.17	7.26	7.41	7.54
11	8.33	7.90	6.02	9.51	5.50	5.62	6.93	7.34	7.23	7.46
12	8.38	7.99	6.13	9.62	5.65	5.48	6.68	7.48	7.03	7.34
13	8.36	8.13	6.28	9.64	5.84	5.40	6.44	7.66	6.83	7.19
14	8.39	8.18	6.35	9.59	5.94	5.30	6.21	7.88	6.63	7.02
15	8.48	8.17	6.36	9.48	5.98	5.24	5.99	8.01	6.47	6.91
16	8.50	8.11	6.41	9.43	6.05	5.15	5.82	8.17	6.37	6.78
17	8.46	8.01	6.50	9.45	6.16	5.06	5.68	8.26	6.31	6.63
18	8.39	7.96	6.62	9.51	6.30	4.95	5.58	8.39	6.28	6.53
19	8.36	7.95	6.68	9.62	6.47	4.84	5.51	8.56	6.28	6.46
20	8.37	7.90	6.78	9.67	6.58	4.76	5.47	8.77	6.32	6.37

* Annualized semi-annual zero coupon interest rates calculated from the one period zeros in Table 6-z by assuming the local expectations hypothesis and observing that the hypothesis implies: $z_{t, t+1} = f_{t, t+1}$.

Tables 6-w and 6-v
Refinancing Rate Paths
and Callable Bond Cash Flow for Each Refinancing Path*

Semi-annual	Refinancing rate paths									
Period	1	2	3	4	5	6	7	8	9	10
1	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
2	8.7	8.7	8.7	7.3	7.3	7.3	8.7	7.3	8.7	8.7
3	9.5	7.9	7.9	7.9	6.7	6.7	9.5	6.7	9.5	9.5
4	8.6	7.2	7.2	8.6	6.1	7.2	10.3	7.2	10.3	10.3
5	7.9	7.9	6.6	9.4	5.6	7.9	9.4	7.9	9.4	9.4
6	8.5	8.5	6.1	10.2	5.1	7.2	8.5	8.5	8.5	8.5
7	9.3	9.3	5.5	11.1	5.5	6.6	7.8	9.3	7.8	7.8
8	10.1	10.1	6.0	12.2	6.0	6.0	7.1	10.1	7.1	7.1
9	11.0	11.0	6.5	13.3	6.5	5.5	6.5	9.2	7.7	7.7
10	10.0	10.0	7.1	14.5	7.1	5.1	6.0	8.4	7.1	8.4
11	10.9	9.1	7.7	13.2	7.7	5.5	5.5	9.1	6.4	7.7
12	9.9	9.9	8.3	11.9	8.3	5.0	5.0	9.9	5.9	7.0
13	9.1	10.8	9.1	10.8	9.1	5.4	4.6	10.8	5.4	6.4
14	9.9	9.9	8.2	9.9	8.2	5.0	4.2	11.8	5.0	5.9
15	10.7	9.0	7.5	9.0	7.5	5.4	3.9	10.7	5.4	6.3
16	9.8	8.2	8.2	9.8	8.2	4.9	4.2	11.7	5.8	5.8
17	8.9	7.5	8.9	10.6	8.9	4.5	4.5	10.6	6.3	5.3
18	8.1	8.1	9.7	11.6	9.7	4.2	4.9	11.6	6.8	5.8
19	8.8	8.8	8.8	12.7	10.6	3.9	5.3	12.7	7.4	6.2
20	9.6	8.0	9.6	11.5	9.6	4.2	5.7	13.8	8.0	5.7

	Cash Flow Paths									
Period	1	2	3	4	5	6	7	8	9	10
1	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
2	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
3	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
5	4.4	4.4	4.4	4.4	107.4	4.4	4.4	4.4	4.4	4.4
6	4.4	4.4	4.4	4.4	0.0	4.4	4.4	4.4	4.4	4.4
7	4.4	4.4	107.4	4.4	0.0	4.4	4.4	4.4	4.4	4.4
8	4.4	4.4	0.0	4.4	0.0	4.4	4.4	4.4	4.4	4.4
9	4.4	4.4	0.0	4.4	0.0	107.4	4.4	4.4	4.4	4.4
10	4.4	4.4	0.0	4.4	0.0	0.0	4.4	4.4	4.4	4.4
11	4.4	4.4	0.0	4.4	0.0	0.0	107.4	4.4	4.4	4.4
12	4.4	4.4	0.0	4.4	0.0	0.0	0.0	4.4	107.4	4.4
13	4.4	4.4	0.0	4.4	0.0	0.0	0.0	4.4	0.0	4.4
14	4.4	4.4	0.0	4.4	0.0	0.0	0.0	4.4	0.0	4.4
15	4.4	4.4	0.0	4.4	0.0	0.0	0.0	4.4	0.0	4.4
16	4.4	4.4	0.0	4.4	0.0	0.0	0.0	4.4	0.0	4.4
17	4.4	4.4	0.0	4.4	0.0	0.0	0.0	4.4	0.0	4.4
18	4.4	4.4	0.0	4.4	0.0	0.0	0.0	4.4	0.0	4.4
19	4.4	4.4	0.0	4.4	0.0	0.0	0.0	4.4	0.0	4.4
20	104.4	104.4	0.0	104.4	0.0	0.0	0.0	104.4	0.0	104.4

* Refinancing rate paths are determined by adding 100 basis points to the one period Treasury zero paths in Table 6-z. Cash flow for each refinancing path is for an 8.8% semi-annual coupon 10 year corporate bond callable at 103. The call rule used is that if the refinancing rate falls to 5.8% or less and bond has at least three years to maturity then the bond is called on the coupon payment date at 103 to produce a payment of $103 + 4.4 = 107.4$

Table 6-u
Present Value of Each Path and Average Present Value Using Various Spreads

Trial	Present Value of Path										Average PV
OAS	1	2	3	4	5	6	7	8	9	10	
40 bp	100.6	103.5	107.5	93.73	108.5	111.5	107.9	100.4	107.7	112.4	105.4
50 bp	100.0	102.9	107.3	93.14	108.3	111.1	107.4	99.77	107.2	111.6	104.9
60 bp	99.35	102.2	107.0	92.55	108.0	110.7	106.9	99.13	106.7	110.8	104.3
70 bp	98.70	101.5	106.7	91.97	107.8	110.3	106.5	98.49	106.2	110.1	103.8
80 bp	98.06	100.8	106.4	91.40	107.5	109.9	106.0	97.86	105.7	109.3	103.3
90 bp	97.43	100.2	106.1	90.83	107.3	109.5	105.5	97.24	105.3	108.6	102.8
100 bp	96.80	99.58	105.9	90.26	107.1	109.1	105.1	96.62	104.8	107.9	102.3
110 bp	96.18	98.93	105.6	89.70	106.8	108.7	104.6	96.00	104.3	107.1	101.8
120bp	95.56	98.29	105.3	89.14	106.6	108.3	104.2	95.39	103.8	106.4	101.3

Table 6-t
Option-Adjusted Spreads for Various types
of Bonds with Embedded Options*

Callable Bonds (9/88)

Issuer	S&P Rating	Maturity	Next Call Date	Next Call Price	Curr. Price	Coupon (%)	Yield	Treasury. Yield Spread	OAS at Volatility of		
									10%	15%	20%
ITT Fin.	A	07/01/92	07/01/89	100.00	101.58	10.800	10.27	168	57	30	-4
Marriot	A-	02/01/96	02/01/93	100.00	99.59	9.625	9.70	85	65	50	37
GMAC	AA-	07/15/07	now	104.00	84.19	8.000	9.86	82	71	54	41

Mortgage Backed Pass Through (PT) vs. Fixed Coupon Agency (6 /88)

Security	Price	Term to Maturity	Avg. Life	Yield	Treasury Spread	OAS at Volatility			
						10%	15%	20%	
FNMA 9% PT	95.3125	28.05	9.80	9.98	115	104	84	64	
FNMA 9.35%	101.1875	7.7	7.70	9.13	38	38	38	38	

GNMA 9 and Collateralized Mortgage Obligations (5/88)

Class	Par Amt	Price*	Coupon.	Avg. Life	Yield	Treasury Spread	OAS at Volatility of			
							10%	15%	20%	
GNMA 9	100	92.656	9.0	11	10.48	123	104	88	71	
A	35.1	98.378	8.0	2	9.10	100	67	48	21	
B	19.0	95.508	8.5	5	9.85	115	83	59	25	
C	18.0	94.748	9.0	7	10.27	125	103	80	52	
Z	27.9	80.999	9.0	17	10.87	150	102	79	52	

* Callable bond values are based on closing prices and Treasury rates on September 20, 1988. The MBS values are based closing prices on June 29, 1988. All prices shown in decimal form. The GNMA 9 is assumed to have a remaining term to maturity of 28 years; the CMO is priced at 100 percent PSA. This table is adapted from Hayre and Lauterbach (1991).