THC Financial Engineering
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Risk Modeling Bulletin Issue 15

CMOs

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This issue focuses on CMO valuation, using a CMO issued by Freddie Mac as an illustration. The Feature Article describes the cashflows of the CMO; Market Perspective shows the CMO valuation result.

Feature Article: CMO Cashflows

Consider the cashflows of the tranches of a Freddie Mac issue. Figure 1 depicts the simulated cashflows of all the tranches of the CMO described below on May 1, 2006, under an interest scenario.. Cashflows were calculated with the following Structuring Ranges: Type Ⅰ PAC: 100% PSA – 250% PSA; Type Ⅱ PAC: 112% PSA – 250% PSA.

Note that Type Ⅰ PAC bonds (PH, PQ, PK, PL, PM, PN) cashflows are more stable than those of Type Ⅱ PAC bond (DA). Table 1 presents the characteristics of the underlying mortgage. Table 2 describes the PAC bonds and their support tranches, with 15 tranches in total. Table 3 presents the rules of the waterfall.

FIGURE 1

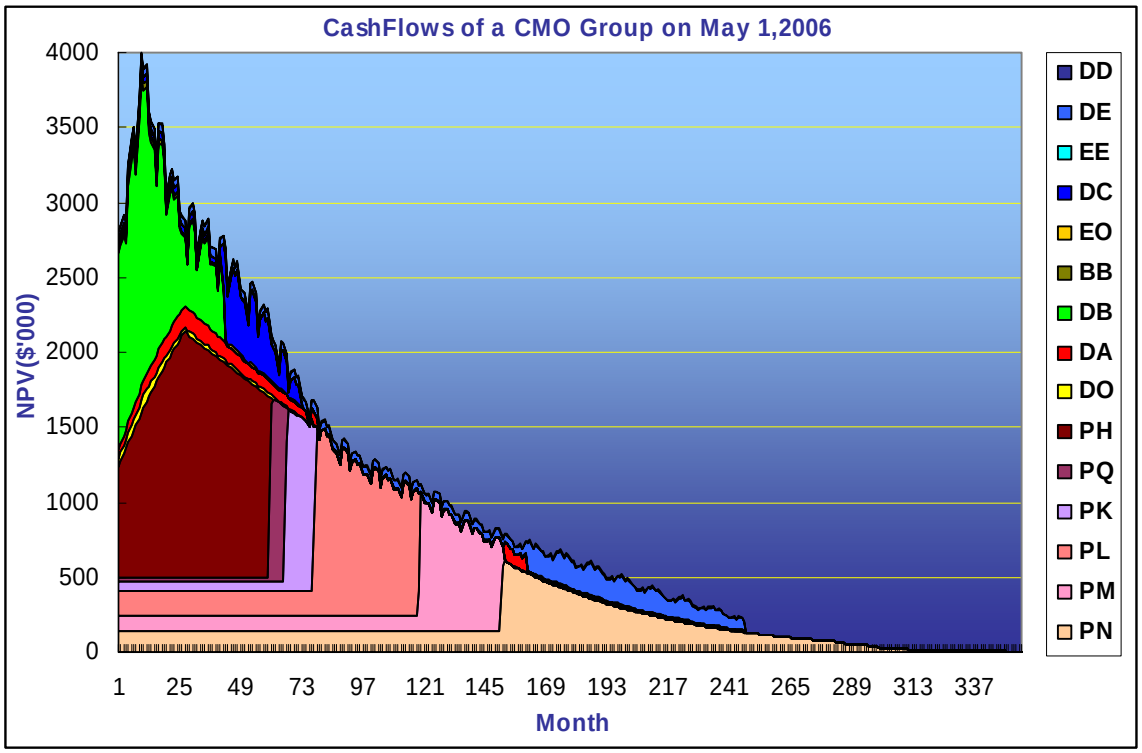

Table 1: Underlying Mortgage Characteristics (as of May 1, 2006)

Balance($'000)	WARM(month)	Loan Age(month)	Per Annum Interest Rate(%)	Per Annum Interest Rate of Related PCs(%)
250,000	356	3	6.00	5.50

Table 2: CMO characteristics

	Original Balance($'000)	Principal type	Class Coupon(%)	Interest type	Final Payment Date
BB	1000.000	SUP/RTL	5.75	FIX	2035-4-15
DA	7311.960	PAC Ⅱ	5.75	FIX	2036-5-15
DB	38745.014	SUP	5.75	FIX	2035-4-15
DC	9196.415	SUP	6	FIX	2035-10-15
DD	620.000	SUP/RTL	6	FIX	2036-5-15
DE	10474.282	SUP	6	FIX	2036-5-15
DO	3125.074	SUP	0	PO	2036-5-15
EE	500.000	SUP/RTL	6	FIX	2036-5-15
EO	903.944	SUP	0	PO	2036-5-15
PH	68884.765	PAC Ⅰ	5.5	FIX	2026-3-15
PK	12958.441	PAC Ⅰ	5.5	FIX	2028-10-15
PL	37394.795	PAC Ⅰ	5.5	FIX	2032-7-15
PM	22251.810	PAC Ⅰ	5.5	FIX	2034-5-15
PN	29348.309	PAC Ⅰ	5.5	FIX	2036-5-15
PQ	7285.191	PAC Ⅰ	5.5	FIX	2027-3-15

Table 3: Rule of the Waterfall

Type Ⅰ PAC	★1. To PH, PQ, PK, PL, PM and PN, in that order, until reduced to their Aggregate Targeted Balance.
	★2. Concurrently
Support	★★a. 4.3478268733% to DO, until retired
	★★b. 95.6521731267% as follows:
Type Ⅱ PAC	★★★ ① To DA, until reduced to its Targeted Balance
Support	★★★② To BB and DB, pro rata, until retired
	★★★③ Concurrently:
	★★★★(1) 4.166695476% to EO, until retired
	★★★★(2)95.8333304524% as follows:
	★★★★★(a) To DC, until retired
	★★★★★(b) To DD, DE and EE, pro rata, until retired
Type Ⅱ PAC	★★★ ④ To DA, until retired
Type Ⅰ PAC	★3. To PH, PQ, PK, PL, PM and PN, in that order, until retired

Market Perspective: CMO Valuation

To value a CMO bond, we first generate cashflows of all the tranches under different interest rate scenarios simulated with an arbitrage-free interest rate model. Then we use the Linear Path Space methodology to determine the values.

Consider the following simulation. Figure 2 depicts the performance profiles of the above CMO group on May 1, 2006. Table 4 presents the key rate durations, effective durations and WAL numbers of the CMO group and the underlying pool.

FIGURE 2

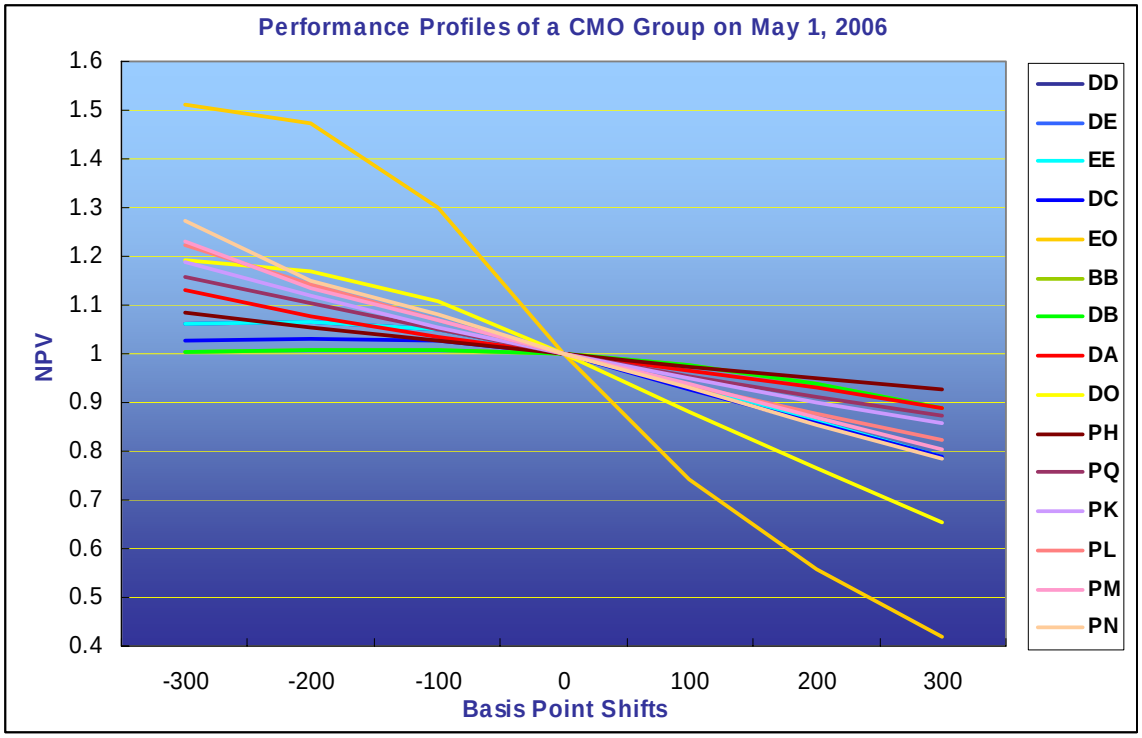

Table 4: Key Rate Durations, Effective Durations and WALs of the CMO Bonds

	Key Rate Durations									Effective Duration	WAL
	0.5	1	2	3	5	7	10	20	30		
DD	0.01	0.15	0.11	0.22	0.94	2.07	0.27	2.14	0.06	6.44	11.01
DE	0.01	0.15	0.11	0.22	0.94	2.07	0.27	2.14	0.06	6.44	11.01
EE	0.01	0.15	0.11	0.22	0.94	2.07	0.27	2.14	0.06	6.44	11.01
DC	-0.11	-0.26	0.05	2.37	2.39	2.26	-1.85	-0.05	-0.06	5.38	5.73
EO	-1.14	-3.92	-3.29	6.34	11.32	22.15	-6.67	1.90	-0.55	34.51	8.68
BB	0.19	0.33	0.18	0.21	0.31	0.24	-0.09	-0.02	0.00	1.30	1.42
DB	0.19	0.33	0.18	0.21	0.31	0.24	-0.09	-0.02	0.00	1.30	1.42
DA	0.09	0.34	0.44	0.30	-0.18	0.73	1.04	0.74	0.20	3.42	4.72
DO	-0.30	-0.95	-0.27	3.34	3.77	5.31	-0.78	0.14	-0.11	11.45	4.02
PH	0.05	0.18	0.46	0.97	0.88	0.05	0.00	-0.01	0.00	2.55	2.85
PQ	0.02	0.05	0.06	-0.01	3.47	1.11	0.18	-0.08	0.00	4.74	5.44
PK	0.02	0.05	0.04	-0.09	2.18	3.02	0.56	-0.13	0.00	5.55	6.30
PL	0.03	0.10	0.16	0.22	0.01	2.46	3.89	0.23	0.11	6.96	9.12
PM	0.06	0.22	0.35	0.48	0.38	-1.50	4.32	2.27	0.69	6.42	10.59
PN	0.06	0.20	0.32	0.44	0.58	-0.76	2.10	3.88	0.92	7.36	12.36
POOL	0.06	0.17	0.28	0.53	0.73	0.74	1.20	0.54	0.01	**4.14**	6.07
Weighted Average Duration of the CMO										**4.46**	--

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Contact us if you have any questions, suggestions or comments

support@thomasho.com Voice: 1-212-732-2878 Fax: 1-212-608-1233
Http://www.thomasho.com 55 Liberty Street, 4B, New York, NY 10005-1003 USA