Homework Set 3
Credit Default Swap on BSABS 2006-HE3
Due: September 19, 2016

Develop a valuation framework for a credit default swap written on the performance of the Class M-2 and the Class M-5 bonds in BSABS 2006-HE3 as of June 30, 2009. The original and current waterfall structure is reported in Table 1.

Table 1
BSABS 2006-HE3 - Waterfall, Balances, and Coupons

Bond Class	Bond Principal March 27, 2006 ($000)	Bond Principal June, 30, 2009 ($000)	Spread To Libor	CUSIP
A1	396,254	Prepaid in Full	0.08	07387UHP9
A2	171,485	107,769	0.18	07387UHQ7
A3	24,954	24,954	0.28	07387UHR5
M1	38,481	38,481	0.36	07387UHS3
M2	30,150	30,150	0.38	07387UHT1
M3	18,646	18,646	0.39	07387UHU8
M4	16,265	16,265	0.51	07387UHV6
M5	15,075	15,075	0.55	07387UHW4
M6	13,488	13,488	0.62	07387UHX2
M7	13,092	13,092	1.15	07387UHY0
M8	11,505	619	1.4	07387UHZ7
M9	9,124	0	2.25	07387UJA0
M10	10,315	0	2.25	07387UJB8
CE Certificates	24,597	0	0	BCC0PMI39
R1	0	0	0	BCC0PMHZ9
R2	0	0	0	BCC0PMI05
R3	0	0	0	BCC0PMI13
RX	0	0	0	BCC0PMI21

The principal composition of the underlying mortgages in BSABS 2006-HE3 is presented in Table 2. To simplify the valuation exercise, you may assume that there are two types of mortgages held in the trust: Fixed Rate Mortgages and Adjustable Rate Mortgages that fully amortize each month at their coupon rate. The contract structures for the two types of mortgage are presented in the Table 2.

Table 2
Mortgage Composition of BSABS 2006-HE3

	FRM	ARM
Original Principal: (3/27/06)	$79,036,000	$714,395,000
Current Principal: (6/30/09)	$52,416,155	$226,122,657
Year of Origination:	2006	2006
Weighted Aver. Coupon	7.419%	
Spread on Index		5.50%
Orig. WALA: (3/27/06)	6	6
Orig. WARM: (3/27/06)	354	354
Current LTV (6/30/09)	85.6%	85.6%
Original LTV (3/27/06)	81%	81%
LOL Cap (Per annum)		14.288%
Periodic Cap (per annum) – Floor and Ceiling cap		1.406%
ARM Index and Adjustment		1 Month LIBOR
Prepayment penalities	Simplified to zero	

Although you have been provided with a full prospectus for BSABS 2006-HE3 as part of your analysis materials, you may assume the following payout structure for the principal and interest distributions on the bonds over time. In the original deal there was a swap agreement to support potential interest payment mismatches between the underlying collateral and the bonds, we will assume that the swap agreement has been cancelled as of June, 2009. For ease of calculations, you may ignore the step-down and trigger dates that permit contingent allocations of over-collateralization to accelerate the retirement of the mezzanine bond principal in the original deal. Instead, you may assume that the principal and interest allocations are as defined below:

Principal distributions:

- To the Class A certificates, the principal distribution amount for each end-of-month distribution date shall be made sequentially to the Class A-1, Class A-2, Class A-3 Certificates in that order, until the certificate principal balances are each reduced to zero.

- To the Class M certificates, the principal distribution amounts of principal remaining after payments to the A bond shall be paid sequentially to the Class M-1, Class M-2, Class M-3, Class M-4, Class M-5, Class M-6, Class M-7, Class M-8, Class M-9, Class M-10 shall be paid sequentially until the certificate principal balances are each reduced to zero.

Interest distributions: On each distribution date, distributions from the interest payments of the underlying mortgages will be distributed as follows:

- To the Class A-1, Class A-2, and Class A-3 Certificates, the current interest will be distributed pro rata if there is sufficient interest payments, otherwise, the bonds will be paid sequentially starting with the A-1 bond.
- From the remaining interest funds, interest payments will be paid sequentially to the Class M-1, class M-2, Class M-3, Class M-4, Class M-5, Class M-6, Class M-7, Class M-8, Class M-9 and Class M-10 in that order, the current interest owed to each class.

The CE, R1, R2, R3 and RX bonds are not sold, so you can ignore them. They have highly specialized distributions related to prepayment penalties and rights to sell all of the bonds if the overall mortgage balance falls to less than 10% of the original mortgage balance.

Default and loss priorities: Loss protection is achieved by allocating any realized losses, first to reduce the amount of *"Excess Spread",* second to reduce the *"Overcollateralization Amount",* and third among the certificates, beginning with the class of subordinated certificates with the lowest payment priority, until the principal amount of that subordinated class has been reduced to zero. **"***Excess spread"* is the interest earned by the mortgage collateral at each time period minus the total coupon interest that is required to be paid to the bonds at each time period. The *"Overcollateralization Amount"* is defined as the aggregate Stated Principal Balance of the mortgage loans at time t minus the aggregate Certificate Principal Balances of all of the Class A Certificates at time t minus the aggregate principal balances of all of the Class M Certificates at time t. The default priority is handled in reverse order starting with the M-10 Certificates, then the M-9 Certificates, etc. until the M Certificate principal is extinguished. Once the M Certificates are extinguished losses of principal are borne again in reverse order starting with the A-3 Certificate, then the A-2 Certificate, and finally the A-1 Certificates.

A simplification for the distribution of excess spread and the overcollateralization provisions when losses are zero or small: Under defined conditions **"**Excess spread" can be applied as extra principal distribution amounts that are paid sequentially starting with the current senior bond. The level of *"Excess Spread"* that might be available to be distributed monthly is determined by the size of the end of month *"Overcollateralization Amount."* The *"Extra Principal Distribution Amount"* that may be available for distribution sequentially is equal to the **minimum** of: **1)** the *"Overcollateralization Target Amount"* at time t minus the "*Overcollateralization Amount"* at time t; **2)** the *"Excess Spread"* at time t. The *"Overcollateralization Target Amount"* is equal to the **maximum** of: **1)** 3.10% of the aggregate Stated Principal Balance of the mortgage loans at the deal origination date (i.e. t=0); **2)** the **minimum** of 3.10% of the aggregate Stated Principal Balance of the mortgage loans at the deal origination date or 6.20% of the current aggregate Stated Principal Balance of the mortgage loans at time period t; **3)** $3,967,158. If the difference between the *"Overcollateralization*

Target Amount" and the "*Overcollateralization Amount"* is less than or equal to zero, the difference is set to zero.

CDS payout structure: The CDS payout structure is Pay-as-you-go (PAUG), in which the fixed leg of the CDS requires a fixed monthly coupon payment from the protection Buyer to the protection Seller. The variable leg of the CDS requires the protection seller to compensate the protection buyer 100% of the shortfalls in interest and principal payments in that month. These payments will be made at the end of each month. Again for simplicity, we will assume that there is a 40% recovery rate that is recaptured from all defaulted principal at the end of each month (i.e. recapture occurs immediately). We also assume that there is a fixed premium payment made by the protection Buyer to the protection Seller at t=0, when the protection Buyer purchases the CDS. Table 3 summarizes the contractual structure of the CDS contracts. You should assume that you are seeking to insure 100% of the outstanding principal of the Class M-2 and the Class M-5 bonds.

Table 3
CDS Contract Provisions

	M-5 CDS	**M-2 CDS**
Up front premium (June 30, 2009) per $100 of principal.	$72.50	$33.50
Fixed coupon	44 bps (per annum)	17 bps (per annum)
Maturity	315 Months	315 Months

Hazard Modeling Information: You will find a loan-level data set of subprime mortgage performance data on *bspace* for this analysis. These data can be used to model the default and prepayment hazards that are needed to carry out the simulations for the mortgage cash flows and the cash flows to the CDS. For simplicity, you should estimate four independent hazards: ARM default; ARM prepayment; FRM default; and FRM prepayment. To simplify the modeling you may assume that the ARM and FRM mortgage pools that comprise BSABS 2006-HE3 are well diversified so that it would be appropriate to model the cash flows at the appropriate WAC and WARM of the respective pools of ARMs and FRMs.

Term Structure Data: You will find the needed swap and caplet data on *bspace* for June 30, 2009. You should fit a Hull and White model to these data.

House Price Dynamics: You should assume that house prices follow a GBM of the form,

$$dH_t = (r_r - q_H)H_r dt + \phi_H H_t dW_{H,t}$$

where,

r_t = riskless short rate,
q_H = .025 (the rental flow rate),
ϕ_H = .12 (volatility).

Deliverables from your analysis:

1. Calibrate the Hull and White Model for June 30, 2009 and report your results.
2. Fit the coefficient estimates for the four hazards and report the results.
3. Use the hazard estimates, the HW model of interest rates, and the asset price process to model the cash flows for the FRM and ARM pools (Note: For simplicity, we will model cash flows at the pool level). What price, as a percentage of par, do you find for the M-2 and M-5 bonds.
4. Assuming that you are the buyer of CDS written on M-2 and M-5 bonds, compute the NPVs for these positions assuming that you purchase the CDS on June 30, 2009 based on their quoted coupons and up-front premia (See Table 3). How would you interpret these results? Should you be long or short the CDS? What kind of valuation errors are you making by modeling at the pool-level?

Data Appendix: ARM and FRM loan files

Column 1 Loan id
Column 2 Loan "age"
Column 3 Spread squared
Column 4 Spread
Column 5 LTV
Column 6 Remaining balance
Column 7 Summer\Spring month indicator
Column 8 Default indicator
Column 9 Prepayment indicator