ANDREW DAVIDSON & Co., INC. the Pipeline

Consulting Corner

A Framework for Market-Implied Defaults

by Anne Ching

In the corporate bond sector, statistical measures such as *zeta* scores have been used for quantifying credit and default risk for over three decades. Ten years ago Moodys KMV introduced the EDF credit measure, which represents an implied measure of default taken from market information about equity prices and respective price volatility. Also, Hull and White (2005) recently demonstrated how the future price distribution of actively traded CDOs could be implied from market quotes with the use of copulas[1]. In the mortgage sector, the use of market information for forecasting expected defaults has not been widespread as in other financial sectors, but is emerging as an important methodology in mortgage analytics.

Andrew Davidson & Co., Inc. has developed a market-implied framework for estimating default probabilities for subprime transactions. The key insight underlying the framework is that market spreads for bond classes within the same transaction can be used to imply the likelihood of default of the underlying collateral. Since there are typically multiple bonds within a transaction, there are multiple data points on which to extract the likelihood of default. Moreover, if we make assumptions about the probability distribution, we can recover the distribution of defaults of the underlying collateral.

Let us consider the transaction below. Table 1.0 shows market prices for an Option One home equity loan deal (OO2006-01) as of March 23, 2006. We then compute prices for each of the bond classes using the AD&Co. OAS model. Typically in an OAS framework, one would simulate interest paths and forecast prepayment speeds for each of the paths to generate respective cash flows. One would then compute the OAS or single spread when added to each of those rate paths equates the average net present value of the cash flows to market prices. Under the market-implied framework, we introduce a dimension of default by applying a uniform default vector to each of the simulated rate paths under each scenario. We considered ten scenarios in all.

Table 1.0

OOHE 2006-01	
Class	Price
IA1	100.246
IIA1	99.957
IIA2	100.625
IIA3	100.227
IIA4	101.383
M1	100.141
M2	100.184
M3	100.227
M4	100.234
M5	100.313
M6	100.395
M7	100.309
M8	100.883
M9	100.695

The baseline default and loss severity vectors that we applied in our analysis are presented in Figure 1.0 below. We assume that baseline defaults ramp over thirty months to a peak of 5 CDR and remain constant thereafter. We also assume a constant loss severity of 40%. We then scale the baseline default and loss severity for each scenario by the multiples presented in Table 2.0. The default multiples range from zero to 10, while loss severity multiples range from zero to 1.5 the base case. Notice that the prepayment multiples decline as default multiples rise, reflecting a more limited opportunity for borrowers to prepay as defaults increase and visa versa.

Figure 1.0

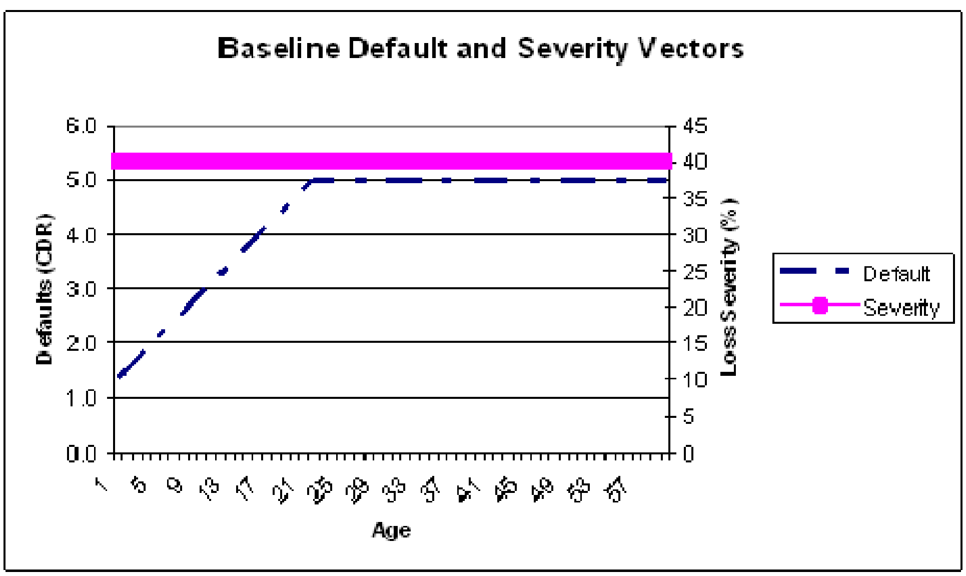


Table 2.0

Scenario Multiples

Scenario	default rate/ multiple	severity rate/ multiple	prepay multiple
1	0.00	0.00	1.00
2	0.25	1.00	0.95
3	0.50	1.00	0.90
4	1.00	1.00	0.85
5	1.50	1.00	0.80
6	2.00	1.10	0.75
7	4.00	1.20	0.70
8	6.00	1.30	0.65
9	8.00	1.40	0.60
10	10.00	1.50	0.50

Table 3.0 presents the expected prices we computed for each of the bonds of this transaction for each of the ten scenarios. In a standard OAS methodology, a single expected price would be computed. Under the AD&Co. market-implied default framework, we compute an expected price under each of the ten scenarios and determine a weighted-average price across all ten scenarios. We determine those weights by assuming a probability distribution.

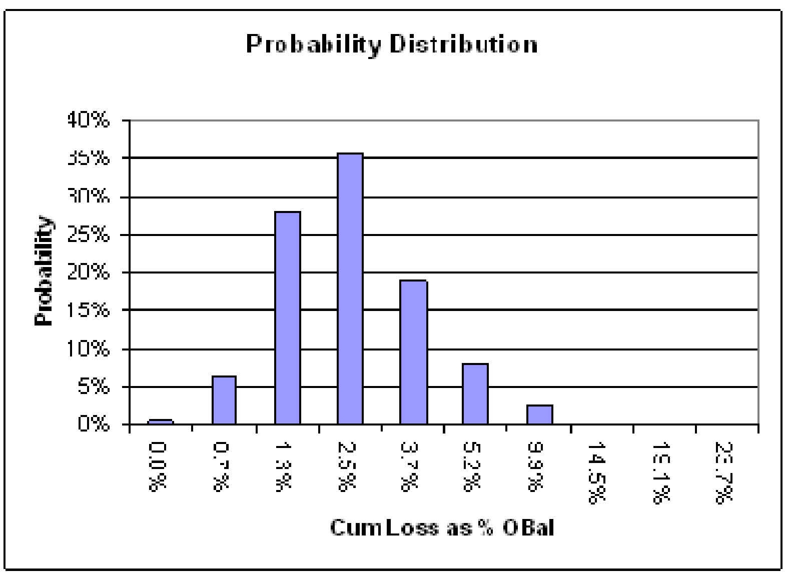
In this example, we chose to apply the Vasicek closed-form distribution of losses because of its skewed shape and fat tails, which is consistent with our expectations of a loss distribution. By optimizing parameters, we imply a probability distribution that minimizes the differences between market prices and probability-weighted prices of each of the bond classes. The actual shape of the distribution is depicted in Figure 2.0 below. The x-axis shows the cumulative losses as a percent of the original balance while the y-axis shows the probability of occurrence. The expected cumulative losses of the underlying collateral is $82 million or 2.7% of the original balance.

Table 3.0 Scenario Prices by Class

Scenario	COLLAT	IA1	IIA1	IA2	IIA3	IIA4	M1	M2	M3
1	102.686	99.839	99.889	99.864	99.933	98.615	99.403	100.065	100.349
2	102.047	99.865	99.890	99.864	99.934	98.894	99.369	100.102	100.398
3	101.432	99.889	99.892	99.864	99.935	99.153	99.282	100.109	100.413
4	100.268	99.929	99.894	99.865	99.937	99.577	99.069	100.059	100.373
5	99.178	99.993	99.897	99.866	99.938	100.174	100.369	99.017	98.536
6	97.724	99.975	99.896	99.841	99.898	100.110	100.267	100.313	100.444
7	93.030	99.975	99.902	99.845	99.897	100.110	100.273	100.329	100.337
8	88.421	99.973	99.905	99.847	99.896	100.129	100.265	79.463	17.937
9	83.817	99.764	99.907	99.847	99.893	98.535	25.247	10.962	8.909
10	70.178	94.010	[illegible]	99.846	90.687	79.204	0.392	7.720	6.706
Expected Price	100.105	99.931	99.894	99.862	99.932	99.580	99.523	99.898	100.010

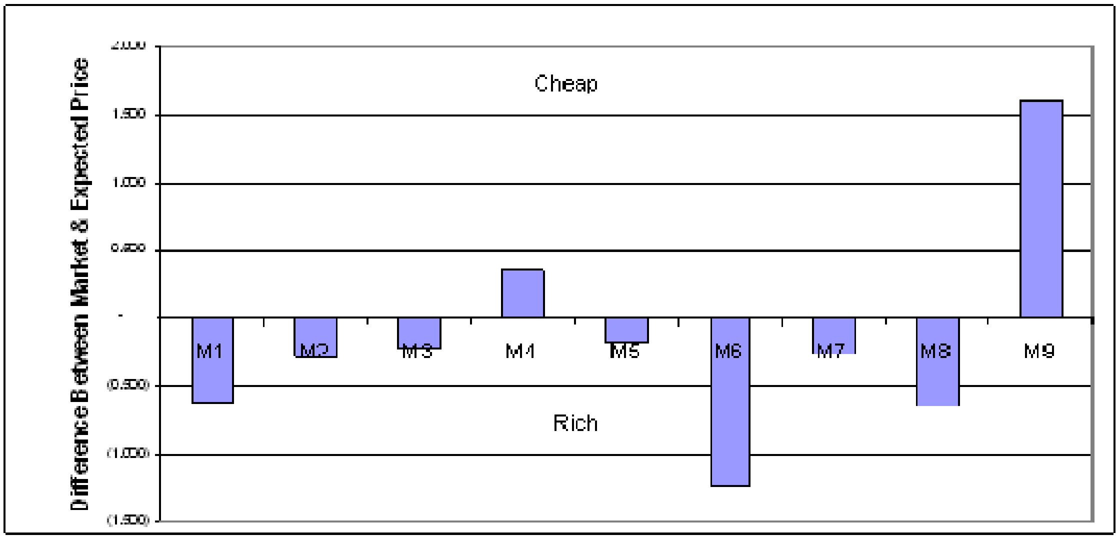
Scenario	M4	M5	M6	M7	M8	M9	M10	M11
1	100.695	100.842	101.162	102.870	103.674	106.498	107.009	106.825
2	100.741	100.883	101.202	102.895	103.687	106.484	106.972	106.734
3	100.747	100.871	101.154	102.788	103.513	106.184	106.543	106.198
4	100.675	100.743	100.953	102.441	102.554	104.022	103.092	101.627
5	100.414	100.839	100.409	101.496	101.209	103.580	103.175	104.548
6	100.723	100.774	100.926	102.625	103.255	106.861	103.375	83.496
7	99.790	77.643	37.687	17.956	14.482	12.502	10.446	8.813
8	12.535	10.240	8.853	8.491	7.890	7.323	6.533	5.594
9	7.877	6.982	6.330	6.212	5.783	5.353	4.786	4.034
10	6.119	5.433	4.982	4.855	4.522	4.192	3.673	3.069
Expected Price	100.594	100.137	99.160	100.043	100.241	102.301	101.772	99.760

Figure 2.0



There are two practical uses of this framework. First, the results provide the market's view of future credit losses of the underlying collateral, which can serve as an important benchmark for validating default assumptions used for valuing subordinated and residual tranches. Second, the framework allows one to analyze the relative value between the bond classes within the transaction. In this particular deal, Figure 3.0 shows the relative value of a handful of bonds in the transaction. The bonds above the x-axis are undervalued (i.e. market prices are below expected prices) and bonds below the x-axis are overvalued.

Figure 3.0 Relative Value of Subordinate Tranches



[1]Hull, John, Alan White, "The Perfect Copula," Rottman School of Management, University of Toronto, November 2005.