ANDREW DAVIDSON & Co., INC. the Pipeline

Valuation Commentary

First Steps in Credit OAS (part II)

By Alex Levin

Last month's Valuation Commentary introduced the concept of valuation under concurrent prepayment and default modeling. The main idea is to use stochastic home price index as an additional modeling factor and pass it to the LoanDynamics™ Model (LDM). The LDM then responds by projecting CPR, CDR and losses, among many other outputs, for each market scenario.

This month's article draws on these ideas and discusses valuation of sub-prime deals containing thousands of loans. We take a look at a Countrywide deal, CW0708, as a case study. This deal has 4,304 (1,756 fixed rates and 2,548 ARMs) sub-prime, first-lien, mostly new loans. We will focus on measuring "price of losses", the expected present value of the lost cashflow stream. This value points to the expected provision for losses that a bank has to set aside.

Smart Monte-Carlo

With the required analytics in place, how would we process a large inventory? This issue is faced by anyone who would like to set-up Monte-Carlo runs for portfolios containing multiple positions, loans or securities. In order to make the right choice, we must ask ourselves: "Do we really need to assess the value of each position accurately, or are we more interested in an accurate summary?" In most practical cases, the answer will be the latter, rather than the former. Indeed, when accurate valuation results are required for trading purposes, focus is made on a few positions, the trade candidates and their hedges. Residential loans are almost never traded separately, so the focus of a portfolio run is likely to be the portfolio's summary.

In this case there exists a simple and effective method: use a few Monte-Carlo paths per position and start each position's run from random seed. It turns out that, from the portfolio's standpoint, this approach is equivalent in accuracy to a lot of independent Monte-Carlo runs. The efficiency depends on the homogeneity of the loans. Imagine, for example, that collateral consists of 1,000 perfectly identical loans. Running 2 random paths per loan seeded randomly is equivalent to running 2,000 random paths, from the portfolio's standpoint. In contrast, running 2 random, but the same, paths per loan, is no different than running only 2 paths for the portfolio.

Unless positions need to be accurately valued against each other (e.g. asset versus hedge, specified pool versus TBA), using the same paths for every position is never advantageous. Even if loans are somewhat heterogeneous, using random seeding will be as accurate for each loan and more accurate for the portfolio's summary than same-seeding. Furthermore, if the collateral was made of 1M loans (rather than 1K), we could even extend our faith in Monte-Carlo and, instead of running 2 randomly seeded paths for each loan, apply them to a few thousand of the largest loans.

In Exhibit 1, we demonstrate that using just a few paths per loan, different for each loan, allows assessing the price of losses to be in the ballpark for both fixed-rate and ARM groups of CW0708. Using a few same paths for each loan leads to a large error.

Exhibit 1. Monte-Carlo convergence (price of losses using +0.7% HPI equilibrium rate)

	Fixed-rate loans		**Adjustable-rate loans**	
Accurate	6.928		6.107	
	Random seed	Same seed	Random seed	Same seed
100 paths per loan	6.933	6.901	6.111	6.074
20 paths per loan	6.977	6.857	6.122	6.069
10 paths per loan	6.983	6.727	6.139	5.936
2 paths per loan	6.876	5.495	6.068	5.301

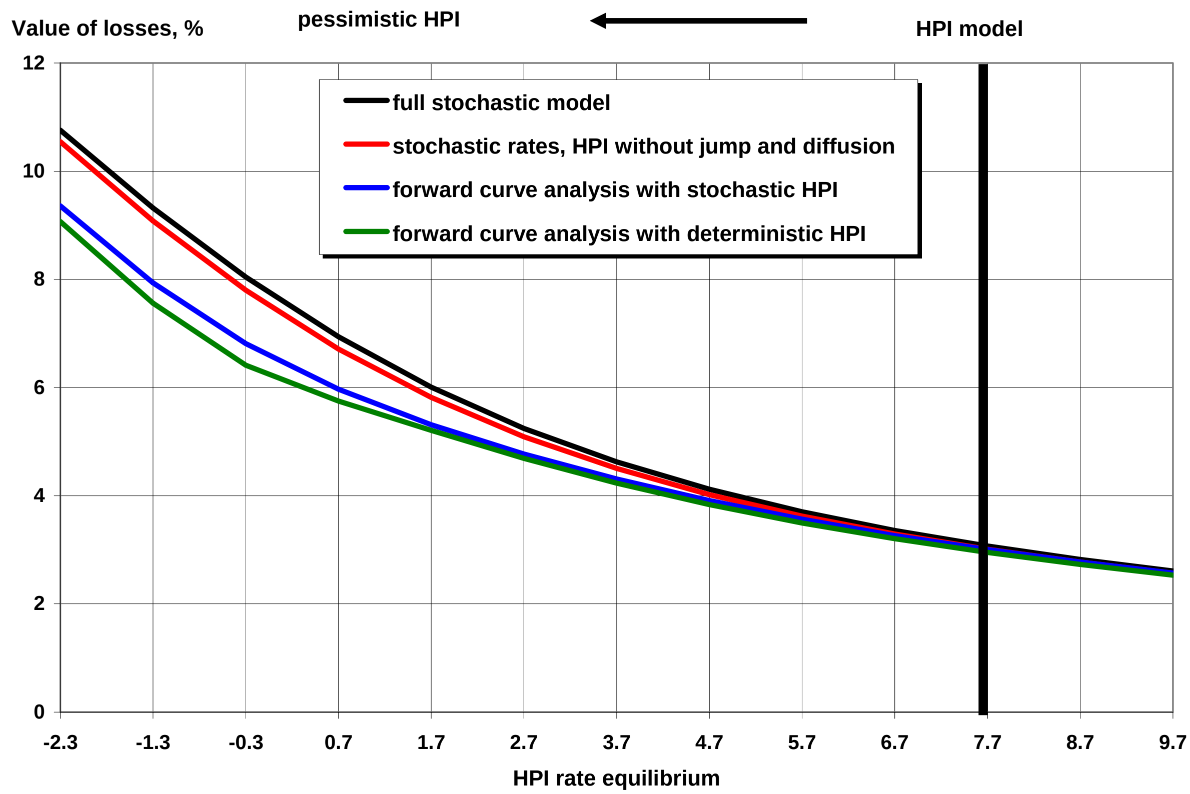
This few-paths-random-seeds method benefits from error diversification - much like investing in many independent stocks. It also suggests that a typical senior management's dream of seeing every position priced "consistently" against the same set of paths will likely reduce accuracy in risk measurements, without benefits. When measuring duration, convexity and other Greeks, we must keep the initial seed unchanged, but should change it going from one position to another.

Losses and the randomness

As the valuation of sub-prime deals using a full-blown OAS framework is still uncommon, there is the question of how much it adds to the single-scenario loss analysis. Since the default is an option, volatility of home prices should enter into this problem. Furthermore, defaults coupled with prepayments constitute a compound option that inflates losses in a volatile world even if volatility comes only from interest rates. This is because AD&Co's HPI model is interest rate dependent and predicts lower HPI (hence, higher default rates) when interest rates are high and prepayments slow down. Cumulative losses will have higher increments when interest rates rise and lower decrements when they fall. Therefore, valuation of losses is strongly convex and the interest rate volatility effect is expected to be material.

Exhibit 2, drawn against the "HPI equilibrium rate" as the independent variable (read the end-note disclosure) illustrates that, without interest rate volatility, losses will be understated. The stochastic HPI generator (diffusion and jumps) adds to that, but moderately. Of course, the magnitude of these two factors may well depend on a particular HPI model.

Exhibit 2. Valuation of losses in CW0708 (fixed-rate loans only)



A very interesting observation stemming from Exhibit 1 is the comparison of losses for fixed-rate and adjustable-rate loans. It seems plausible to assume that, given all are identical, ARMs should experience comparable or somewhat larger losses because of their reset-related payment shock. The static loss measures seem to be close indeed, but, once rate volatility is considered, fixed-rates start looking worse. The default/prepay compound effect is obviously stronger for fixed-rate loans since their prepay speed is more rate-dependent.

Another point to keep in mind is that the static analysis would understate the cumulative loss to an even larger extent than it understates its price: volatile discount rates serve as a dampening factor.

To cohort or not to cohort?

By running a few random paths per loan with different initial seeds, we seem to have a solution in hand. Would aggregating a large loan portfolio first be even a better method? Averaging works better when factors have a linear effect on value and fail when they are non-linear. Averaging FICO, LTV or lien position (1, 2) is a bad idea because these factors produce highly non-linear losses or can't be averaged. Revisit exhibit 2 of last-month's article where we show loss profiles quickly expanded with original LTV > 80. Coupon rate is another important non-linear variable, as we know well from prepayment modeling (i.e. the average speed of a 5% pool and a 9% pool will not be close to the speed of a 7% pool).

We computed the value of losses using the same +0.7% equilibrium rate assumption for the fixed-rate part of CW0708:

(A) Loan-level data; result = 6.928 (as seen in Exhibit 1).

(B) Grand-total single repline; result = 6.426.

(C) 483 replines stratified by FICO (step of 50), LTV (step of 5) and coupon (step of 0.5); result = 6.594.

We can conclude that even seemingly reasonable cohorting has lead to material accuracy deterioration, without computational benefits (we compensated the lack of groups by increasing the number of Monte-Carlo paths per group).

Disclosure on HPI modeling assumptions and HPI equilibrium rate. All analyses described in this article and the previous month's article employed the AD&Co stochastic HPI rate model. Exhibits are drawn against "HPI equilibrium" tuning as an independent variable.

1. The HPI equilibrium rate is a long-term average rate. Even if interest rates are constant, the HPI equilibrium rate cannot be directly found in the HPI process due to other stochastic components, called diffusion and jump.

2. The AD&Co HPI model's physical equilibrium rate depends on the interest rate level and is equal to 7.7% assuming rates will stay where they are. The historical OFHEO HPI rate's average is 5.9%; it was 7.1% when the 10-yr CMT was below 6%, and 8.3% when the 10-yr CMT was below 5%.

3. When pricing instruments exposed to the HPI rate, a risk-neutral rather than a physical HPI model should be employed. If home prices were traded assets, the risk-neutral rate of total return would be equal to the risk-free rate. When transitioning to the physical world and estimating the HPI growth rate, one should subtract the "dividend rate" (cost-saving from real estate ownership) and add various prices of real estate risk (including risk of liquidation). A realistic risk-neutral HPI growth rate may be 3%-6% below its physical level.

The HPI equilibrium rate is a convenient tuning knob. To reflect the price of HPI modeling risk, to explore sensitivity to the HPI long-term forecast, or simply to express one's disagreement with the model - turn this knob.

William Searle and Daniel Swanson have contributed to this article.