Variable Rate Mortgage-Backed Security Introduction

The Canada Housing Trust ("CHT") will raise funds by issuing Canada Mortgage Bonds and use the proceeds to purchase VRMBS's from Approved Sellers. For each VRMBS purchased CHT will also enter into a swap, where it pays the MBS interest and reinvestment income to the swap counterparty and receives fixed coupon cashflows, which are used to service the CMB. CHT will also pay CMHC an up-front guarantee fee for each CMB issuance. In return CMHC provides a guarantee for the CMB's.

The purpose of the first calculator is to determine the fair value of a VRMBS that is eligible for the new CMB program. This calculator will be used to assist the CHT when purchasing a VRMBS.

The purpose of the second calculator is to estimate CHT's credit exposure to a swap counterparty. In particular, it estimates the maximum loss should a swap counterparty default, as well as the expected loss based on the probability of default. This calculator will be used by CMHC when setting the guarantee fee for the CMB's issued by CHT.

It is important to note that the approach used by the Credit Risk Calculator works, only because it is estimating the credit risk of an interest rate swap with no option-like features, such as caps, floors, or cancellation option. Variable rate mortgages commonly contain such features, and therefore so would the associated swap. The approach used by the Credit Risk Calculator would not be suitable for estimating the credit risk of such a swap.

We recommend that the choice of yield curve to use for discounting the VRMBS cashflows be investigated further. Two possibilities have already been proposed, the CMB yield curve and the Approved Seller's cost of funds curve (ref. https://finpricing.com/lib/IrInflationCurve.html)

The CMB yield curve is a bullet bond curve that does not account for the additional undiversifiable risks inherent in a mortgage-backed security. It is likely to overprice the VRMBS.

The method used for pricing a VRMBS should be consistent with the pricing of a fixed rate NHA MBS in the existing CMB program. In particular, the same yield curve should be used for discounting cashflows for both securities.

On the other hand, using an Approved Seller's cost of funds curve would violate the Law of One Price, since different banks have different funding curves.

By displaying the both the formulas and numbers involved in the calculations (cashflows, forward rates, discount factors) explicitly on the spreadsheet, the models underlying the calculators become more transparent, more easily validated, and therefore more easily adopted by market participants.

The purpose of the VRMBS Valuation Calculator ("Pricing Calculator") is to compute the fair value of a VRMBS that is eligible for the CMB Program. The scope of this study is restricted to a VRMBS that has no option-like features such as caps, floors, or cancellation options. Also, since the MBS coupon is floating, it is reasonable to assume that prepayment speeds are relatively insensitive to interest rate movements.

The Pricing Calculator models the VRMBS cashflows using forward rates computed using fixed spreads off the Canada BA (swap) curve. Prepayments due to turnover, default, and conversions are modeled using constant speeds. The VRMBS cashflows are discounted using a valuation yield curve, whose definition is left unspecified.

The Pricing Calculator accurately models the cashflows of a VRMBS and uses an accepted method for computing its fair value. The only unresolved issue is the choice of the valuation yield curve.

For each VRMBS purchased by CHT, CMHC receives from CHT an up-front guarantee fee and provides in return a guarantee of the associated CMB cashflows. The dominant risk is the default of a swap counterpary; the corresponding loss is the cost of entering into a replacement swap.

The VRMBS Credit Risk Calculator ("Credit Risk Calculator") computes for a given confidence level the maximum possible loss for a single swap. The Calculator uses for a given volatility and confidence level, an appropriate downward shift in the swap curve over time. It then computes the future cashflows, including the reinvestment income, of the swap. The projected fair values of the swap are computed by discounting the cashflows using the downward shifted yield curve.

For simplicity the Credit Risk Calculator uses only one tranche of mortgages (unlike the Pricing Calculator, which uses six tranches corresponding to the maturity dates of the mortgages) and ignores the 14 day delay in the MBS cashflows relative to the mortgage cashflows. These simplifications do not materially affect the results of the Calculator.

In particular, the expected loss computed by the Calculator does not capture effectively the risk faced by CHT, if it has many swap contracts with only a few swap counterparties.

The approach used by the Credit Risk Calculator is suitable only for a VRMBS with no option-like features. A similar calculator for VRMBS's with option-like features would require a different design.