Amortizing and Accreting Floors Vaulation

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Summary

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- The Benefits of an amortizing and accreting floor
- Floorlet Payoff
- Valuation
- Practical Notes
- A real world example

Amortizing Floor

Amortizing and Accreting Floor Introduction

- An interest rate floor is a financial contract between two parties that provides an interest rate “floor” on the floating rate payments.
- An interest rate floor consists of a series of European put options (floorlets) on interest rates.
- An amortizing floor is an interest rate floor whose notional principal amount declines during the life of the contract.
- An accreting floor is an interest rate floor whose notional principal amount increases during the life of the contract.

Amortizing Floor

The Benefits of an amortizing or accreting floor

- An amortizing floor is primarily used to hedge loans whose principal declines on a scheduled basis.
- An accreting floor is primarily used to hedge construction loans whose principal increases on a scheduled basis to meet the expanding working capital requirements.
- Amortizing floors are frequently purchased by purchasers of floating rate debt where the loan principal declines during the life.
- Amortizing floors are frequently purchased by purchasers of floating rate debt where the loan principal increases during the life.
- The holders wish to protect themselves from the loss of income that would result from a decrease in interest rates.

Amortizing Floor

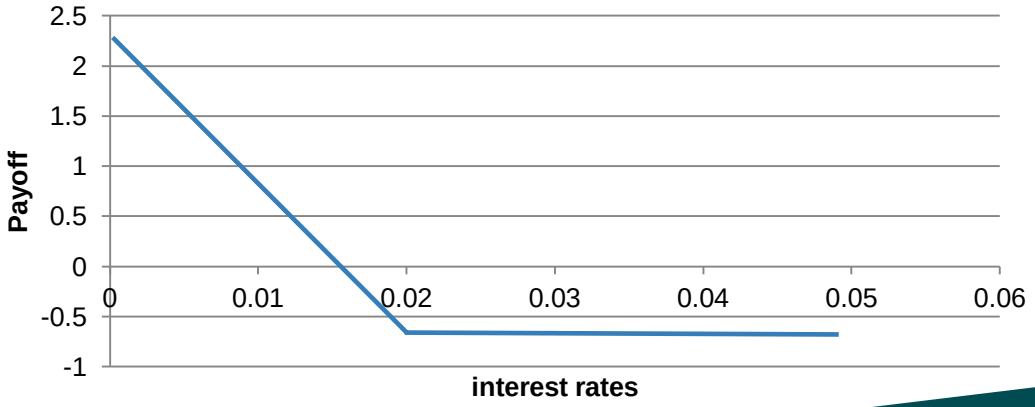
Floorlet Payoff

- The payoff of a floorlet is given by

$$Payoff = N * \tau * max(K - R, 0)$$

where N – notional; R – realized interest rate; K – strike; τ – day count fraction.

- Payoff diagram



Amortizing Floor

Valuation

- The analytics is similar to a vanilla floor except the principal amount used by each period may be different.
- The present value of a floor is given by

$$PV(0) = \sum_{i=1}^{n} N_i \tau_i D_i \left(K\Phi(-d_2) - F_i \Phi(-d_1) \right)$$

where

$D_i = D(0, T_i)$ – the discount factor;

$F_i = F(t; T_{i-1}, T_i) = \left(\frac{D_{i-1}}{D_i} - 1 \right) / \tau_i$ – the forward rate for period (T_{i-1}, T_i).

Φ – the accumulative normal distribution function

$$d_{1,2} = \frac{\ln(\frac{F_i}{K}) \pm 0.5\sigma_i^2 T_i}{\sigma_i \sqrt{T_i}}$$

Amortizing Floor

Practical Notes

- Amortizing and accreting floors are valued via the Black model in the market.
- The forward rate is simply compounded.
- The first key to value a floor is to generate the cash flows. The cash flow generation is based on the start time, end time and payment frequency, plus calendar (holidays), business convention (e.g., modified following, following, etc.) and whether sticky month end.
- Then you need to construct interest zero rate curve by bootstrapping the most liquid interest rate instruments in the market. The most common used yield curve is continuously compounded.

Amortizing Floor

Practical Notes

- Another key for accurately pricing an outstanding cap/floor is to construct an arbitrage-free volatility surface.
- The accrual period is calculated according to the start date and end date of a cash flow plus day count convention
- The formula above doesn't contain the last live reset cash flow whose reset date is less than valuation date but payment date is greater than valuation date. The reset value is

$$PV_{reset} = N * \tau * max(K - R, 0)$$

which should be added into the above present value.

Amortizing Floor

A Real World Example

Floor Terms and Conditions		Notional Schedule	
Buy Sell	Buy	8000000	2/6/2015
Strike	0.02	8100000	3/31/2015
Trade Date	2/6/2015	8200000	6/30/2015
Start Date	2/6/2015	8300000	9/30/2015
Maturity Date	2/4/2019	8400000	12/31/2015
Currency	USD	8500000	3/31/2016
Day Count	dcAct360	8600000	6/30/2016
Rate type	Float	8700000	9/30/2016
Notional	8000000	8800000	12/30/2016
Pay Receive	Pay	8900000	3/31/2017
Payment Frequency	1M	9000000	6/30/2017
Index Tenor	1M	9100000	9/29/2017
Index Type	LIBOR	9200000	12/29/2017
		9300000	3/30/2018

Thanks!

You can find more details at
http://www.finpricing.com/lib/IrAmortizingFloor.html