A floorlet is the counterpart of a put on the floating interest rate and pays the amount max(*rf – rL,*0) at expiry, where we assume that actual floating rate is the underlying spot interest rate, i.e *rL = r* and *rf* is the floor rate. Typically, a floorlet might be purchased by an investor who has to make a stream of payments based on a floating interest rate such as LIBOR, the London InterBank Offer Rate, and who wishes to protect himself against sharp decrease in interest rates. Thus it follows that a floorlet is an insurance against low rates. These interest rate derivatives can be used individually or combined into portfolios: a portfolio of floorlets being known as a floor.

To price interest rate derivatives, it is necessary to model the behaviour of interest rates. It is usual to assume that the spot interest rate *r* obeys the stochastic differential equation,

*dr* = *u*(*r, t*)*dt* + *w*(*r, t*)*dX,*

where *dX* is normally distributed with zero mean and variance *dt* and *w* is the volatility.

Constructing a risk neutral portfolio leads us to the following partial differential equation (PDE) for the price *V* (*r, t*) of an interest rate derivative,

where*λ*(*r, t*) is the market price of interest rate risk, and *u − λw* is the risk adjusted drift. This equation is valid for times *t ≤ T*, where *T* is the expiry of the derivative. Considering Vasicek model, for which *u−λw* = and *w* = *σ*, with η, γ and *σ* constants rather than functions of time, so that becomes

This model is mean-reverting to a constant level, which is a desirable property for interest rates.

This equation must be solved together with the pay-off at expiry of *V* (*r, T* ) = max(*rf − r,* 0) for a floorlet, which lead to modified Vasicek equation for floorlet

Alternatively, we can express the floorlet as a European call on a zero-coupon bond. Let the

underlying zero-coupon bond have maturity date TB . It’s time *t* price is denoted *Z(r, t; TB) = 1.* It is assumed that prices of bond and its derivative securities depend on *r* as the only state variable.

Consider a European call option with strike price K and maturity date TC ≤ TB written on this zero-coupon bond. Its time *t* price is denoted *V(r, TC).* At maturity its payoff or boundary condition is

*V(r, TC) = max[Z(r, t; TB) – K, 0]*

If at maturity, the zero – coupon bond’s price exceeds the strike price K, then the call option is said to be *in-the-money*. In this circumstance, the holder of the call will exercise this right (option) to the purchase the underlying bond for K dollars. The value of the call is then the value of underlying zero-coupon bond less the purchase price, *Z(r, t; TB) – K.* Alternatively, if at maturity the zero-coupon bond’s price is less the strike price, the call option is *out-of-the-money.* In this circumstance, the holder of the call does not exercise the option to purchase, and the option expires worthless.