1. Pricing CDSs
   1. Pricing a CDS requires evaluating 3 quantities: loss leg, coupon leg and accrued on default, if the product specification requires that. The original valuation is described in “On Cox Processes and Credit Risky Bonds” by David Landon 1994/1995; loss leg and accrued are covered by Type 3 integral and coupon leg by Type 1 integral. A particular model for rates, defaults and the recovery processes will determine the ways these integrals are compute.

The most critical assumption is independence of rates and the hazard rate processes. This effectively turns survival curve into a market observable. A special case of this model is a doubly-deterministic model, where both rates and survival curves are assumed deterministic. The in

CDS market is fundamentally incomplete, if the CDS value is modelled in terms of the default event and recovery rate. For historical reasons, recovery rate is usually assumed at least independent from the other two processes. This, effectively, completes the market and allows assuming recovery deterministic, at lest for the purpose of pricing CDSs.

Historically, there were 3 recovery models: recovery of treasury, of notional and of market value. Recovery of notional is now market standard and in the case of stochastic recovery the marked recovery of notional is usually assume the expected recovery.

When credit and rates models are dynamic, CDS can be valued analytically only in a few special cases, e.g. piecewise constant or linear forward interpolators of both curves. This is usually not the case at least in the case of the interest rate curve, hence pricing is usually done by numerical integration.

* 1. Implemented as a single Python file. The key assumption is spot pricing, i.e. accrued interest (not to be confused with accrued on default) is always zero. This can be easily generalized.  
       
     Only piecewise flat constant forward curve interpolators are implemented for the rates and credit curves.  
       
     Both credit and rates curves are assumed deterministic, and so is recovery.
  2. Added to implementation
  3. This request is not entirely clear, actually. I assumed it means pricing a given CDS by overriding the curve’s recovery. In this case, from the “credit triangle” it is know that the dependency is negative linear, cds ~ (1-R)\*hazardRate.

1. Credit curve stripping
   1. The purpose of the survival curve stripping is to determine the parameter of the hazard rate (or integrated hazard rate aka “compensator”) interpolator, such that when the curve is used in pricing the set of targets their required values are reproduced.  
        
      Stripping is usually done by consecutively bootstrapping the sections of the curve by calibrating to the next CDS with increasing maturity. The most frequently used interpolators are piecewise constant or piecewise linear hazard rate, which both allow pure bootstrapping and do not experience the spillover effect.

One must stress that, as opposed to most discount curves, survival curves are not market observable and are strongly model dependent. For example, survival curves obtained using a model with dynamics intensity and interest rates with non-zero correlation between the two will produce different survival probabilities from those obtained under the assumption of independence.

* 1. A simple implementation is provided. As only a single CDS is quoted, it is reasonable to assume that a single flat forward hazard rate is to be calibrated, which is done in this case. It would be possible in the case of both interest rate and hazard rate (piecewise) flat to value all three CDS components entirely analytically, but this is not done for this protype.