KDS Bid Price Machine Learning Algorithm

MScore

MScore is a convex combination of a pool's PScore, DScore, RScore, BScore, QScore, spread, percentage of refine, number of loan, factor and WAM.

$$MScore = \lambda_1 PScore + \lambda_2 DScore + \lambda_3 RScore + \lambda_4 BScore + \lambda_5 QScore$$
$$+ \lambda_6 f_6(spead) + \lambda_7 f_7(refi) + \lambda_8 f_8(nloan)$$
$$+ \lambda_9 f_9(factor) + \lambda_{10} f_{10}(WAM)$$

Where $\lambda_i > 0, \sum_i \lambda_i = 1$ and $f_j, j = 6 \ldots 10$ are linear or nonlinear functions which make sure their range lie in $[100,999]$. For example:

$$f_7(x) = 6 * x + 400$$

$$f_8(x) = {}^{1000}/_{1 + exp^{-1*x/400}}$$

Score to CPR

The scores are intended to predict the probabilities of consumer behavior and it is calibrated across a series of models according to a loan's agency, purpose, channel, balance, LTV and so on. We translate score to CPR using the following formula:

$$CPR_x = \frac{100}{1 + exp^{(offset\_x + (PScore\_x - uCPR\_const)/uCPR\_Slope)}}$$

Where $uCPR\_const$ and $uCPR\_Slope$ are the model parameters, i.e. constants of the model which a loan belongs to, $PScore\_x$ is the loan's $PScore\_x$ for the current month, and $offset\_x$ is the scaling value that needs to be calibrated.

KDS Bid price must follow the conditions below:

KDS Bid price is not a randomly distributed classical Newtonian particle described by Brownian motion.

KDS Bid price is rational but driven by fear, uncertainty and greed to reflect:

1). CLC Eigenvalue
2). Demand and Supply
3). Market Index Returns

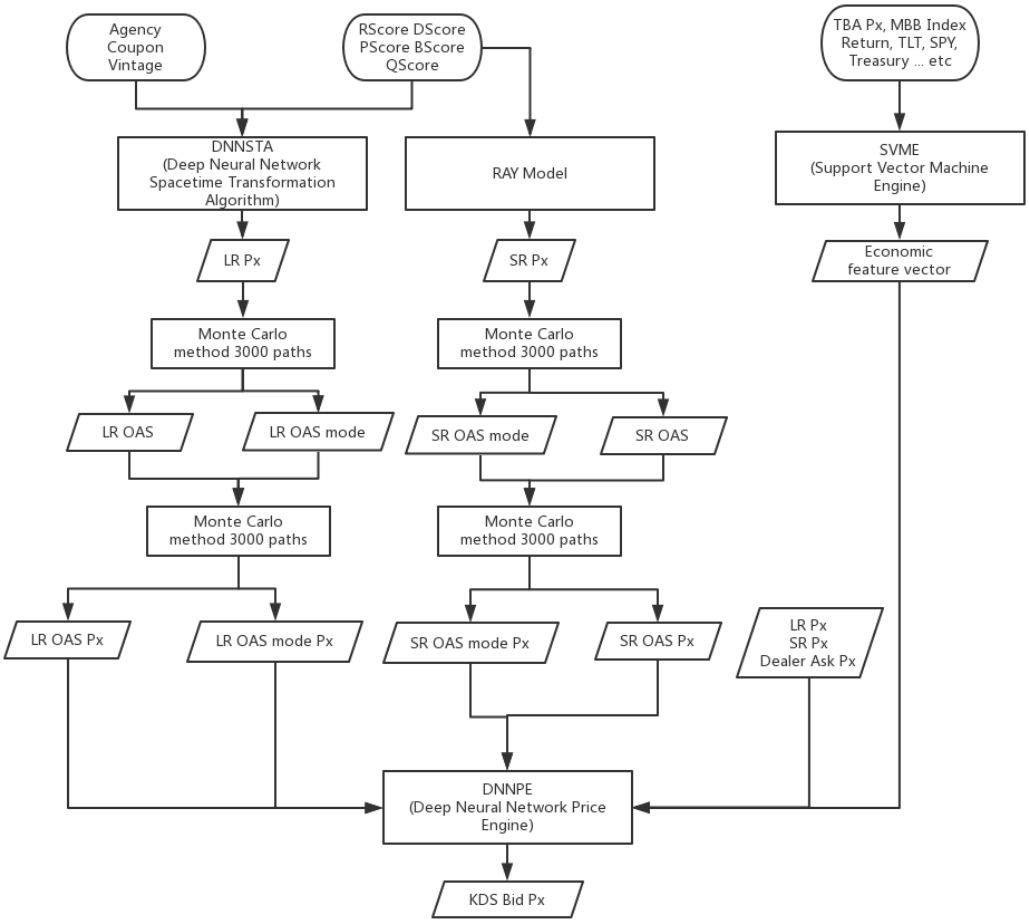
4). Liquidity and Volatility

Trading strategy

Buy low and sell high with respect to MBS market index returns Both bid (buy side) and ask (sell side) will win.

Basic design

1. Long-Range Price (LR Px) and Short-Range Price (SR Px) reflects the CLC Eigenvalue.
    a) Long-Range Price is computed from the CNNPE (Convolutional Neural Network Prepayment Engine) where the inputs are R, D, P, Q, B scores and basic collateral data.
    b) Short-Range Price is computed from the RAM™ Model and R, D, P, Q, B scores as input. (For more about RAM™ Model , please refer to the white paper on www.kdsglogal.com.)
2. Economic feature vector reflects the basic market conditions which include supply and demand, index returns, liquidity and volatility.
3. We will track TBA Price, MBB Index Return, VXX, XIV, SPY TLT, TBT, Treasury Yield Curve Rates and Credit Default Swap, using SVM (Support Vector Machine) algorithm to do feature extraction. This economic feature vector consists of mean, variance, trend, trend of speed, period etc.
4. Use DNNPE (Deep Neural Network Price Engine), LR Px, SR Px, and Economic feature vector to get Execution Price (Execution Px).


Agency
Coupon
Vintage
RScore DScore
PScore BScore
QScore
TBA Px, MBB Index
Return, TLT, SPY,
Treasury ... etc
DNNSTA
(Deep Neural Network
Spacetime Transformation
Algorithm)
RAY Model
SVME
(Support Vector Machine
Engine)
LR Px
SR Px
Economic
feature vector
Monte Carlo
method 3000 paths
Monte Carlo
method 3000 paths
LR OAS
LR OAS mode
SR OAS mode
SR OAS
Monte Carlo
method 3000 paths
Monte Carlo
method 3000 paths
LR OAS Px
LR OAS mode Px
SR OAS mode Px
SR OAS Px
LR Px
SR Px
Dealer Ask Px
DNNPE
(Deep Neural Network Price
Engine)
KDS Bid Px