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Definition

American barrier options are modified forms of standard call or put American options that characterized by strike price, barrier level and a cash rebate associated to crossing the barrier level.

The four main types of barrier options are:

- Down and In
- Down and Out
- Up and In
- Up and Out

- Approximate $C_j(S_j)$ using $\{e_1(S_j), e_2(S_j), \ldots, e_m(S_m)\}$, the first m basis function:

$$C_j(S_j) = \sum_{i=1}^{m} \alpha_i(S_j) e_i(S_j) = \alpha^m(S_j).e^m(S_j)$$

$\alpha^m(S_j) = (\alpha_1(S_j), \alpha_2(S_j), \ldots, \alpha_m(S_j))$ and
$e^m = (e_1, e_2, \ldots, e_m)$.