

# **Neural Network Architecture for Efficient Deep Hedging**

**No-Transaction Band Network**

# Hedging Optimization

$$P = -Z + \sum_{t=0}^{T-1} (\delta_t \Delta S_t - c |\Delta \delta_t| S_t)$$

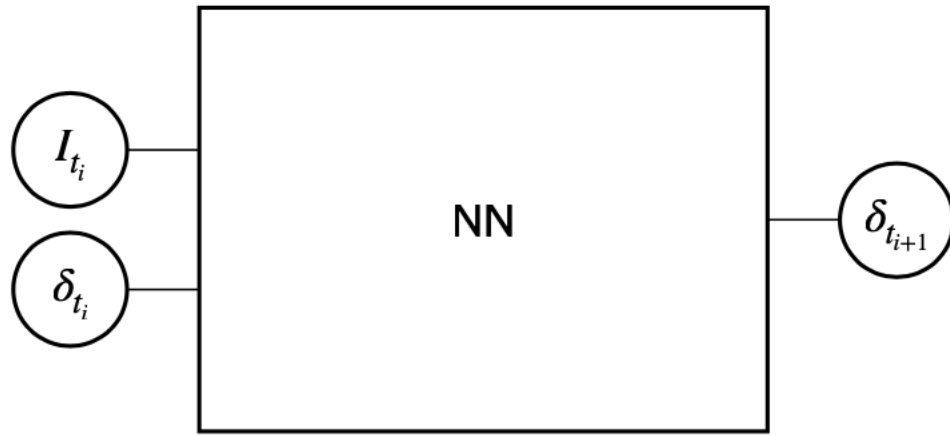
$Z$  : Terminal value of the derivative

$\delta$  : A unit of stocks hold at each time step

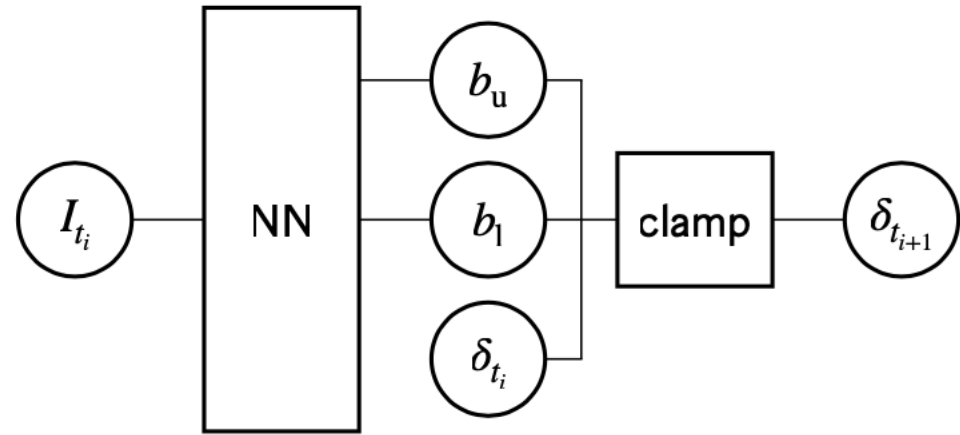
$S$  : Stock price

$c$  : Transaction cost rate

# Architecture



(a) Feed-forward network.



(b) No-transaction band network.

If  $\delta_t$  smaller than  $b_{low}$ ,  $\delta_{t+1} = b_{low}$

If  $\delta_t$  greater than  $b_{up}$ ,  $\delta_{t+1} = b_{up}$

Else  $\delta_{t+1} = \delta_t$  (No-transaction)

Between  $b_{low}$  and  $b_{up}$  is no-transaction-band

# Advantages

- **Neural network's inputs do not depend on the current position:**  
This feature overcomes the difficulty of position-dependence to facilitate training.
- **Neural network encodes an efficient strategy:**  
Strategy using a band is cost-effective because it never transacts inside the band. A Neural network encodes this wisdom as an “induction bias.

# Numerical Experiment

