**Original calculation of Probability of Informed Trading (PIN):**

The first term of the likelihood denotes no new information day, the second term is bad event day and the third term is good event day.

Where:

B is total number of buy

S is total number of sell

θ = is parameter vector

The likelihood function over P days is:

Where are the day i trades and is the data set

**Because of factorial problem of large numbers of buy (B) or sell (S) cause the system to overflow easily, so the maximization estimation is changed into:**

Where: , , ,

*Key elements of the model:*

1. *Information events occur independently on a daily basis, (2) there is at most one information event per day, (3) informed investors act on these events the very same day that they occur, (4) arrival rates of informed and uninformed traders follow independent Poisson processes.*

Information event occurs with probability α

Information event does not occur with probability (1-α)

Signal low (bad news) with probability δ

Signal high (good news) with probability (1- δ)

Buy arrival rate:

Sell arrival rate:

Sell arrival rate: (µ +)

Sell arrival rate:

Buy arrival rate: (µ +)

Buy arrival rate: