TASEP

1) \( \frac{d<z(t)>}{dt} = \text{flux (moving)} - \text{flux (exit)} \)
   \( = <z(t-1) - (t-2)> - <z(t-1) - (t-2)> \)

2) Select a particle randomly (and uniformly)
   loop
   if the right side is empty move the particle
   if not the particle stays on the site
   update time

3) Stationary flux [all sites are equivalent]
   \( z(t) = N \) once chosen \( 1 - z(t) = 1 - \frac{N-1}{L-1} \)
   when \( N \to \infty \) (L \to \infty) \( \frac{N}{L} (1 - \frac{N-1}{L-1}) = \rho_0 (1 - \rho_0) \)

4) Insert the following instructions in the loop
   if the site \( t \) and the site \( t+1 \) are empty
   move the particle if a uniform random number \( \eta < r \)

5) \( f = \rho_0 (1 - \rho_0) \)

6) Because the acceptance for a move is equal to \( r \)
   \( 1 < z(t-1) \) \( \Rightarrow f = \rho_0 (1 - \rho_0) \)

7) \( f = \rho_0 (1 - \rho_0) \)
   since \( \rho_1 = 1 - \rho_0 \) \( \Rightarrow \rho_1 = \frac{r}{1+r} \) and \( \rho_0 = \frac{1}{1+r} \)

8) \( \rho_0 = 0.3 \) 
   Sum over results \( \rho_0 = 0.70 \)
   \( \rho_1 = 0.26 \)
   \( \rho_1 = 0.30 \)
   The mean field approach underestimates the high density and overestimates the lowest density.

9) The mean density \( \rho_0 = \frac{1}{2} \)
   \( \rho_0 = \rho_0 (1 - z(t)) + \rho_1 (z(t)) \frac{1}{L} \)
   where \( x \) in the formula
   \( \frac{2}{L} = \left( \frac{1}{2} \rho_0 \right)^{\frac{1}{L}} = \frac{1}{2} \)
\[ p_o = \frac{1}{r+h} + 2 \left( \frac{r+1}{r+h} \right) \Rightarrow \left| p_o - \frac{1}{2} \right| = \frac{1-r}{2(1+r)} \left( 2 - \frac{2}{L} \right) \Rightarrow \left| p_o - \frac{1}{2} \right| \leq \frac{1-r}{2(1+r)} \]