Buying a Pair of Jeans

Bonus extension to homework 5.

a. Plot graphs to simulate the probability of the Fashion stat

Weak Ties. An acquaintance or expert in Fashion may influence agent \( i \) in making his choices. This may be modeled as a "weak" tie. Let us refer to it as expert or agent \( k \) not in \( N_i \).

\[
P_{ik}(\text{Fash}(i, x, t)|\text{Fash}(k, x, t - 1)) = \frac{1}{Z_{Wik}} e^{-\beta_{ij} |S_{\text{Fash}(i,x,t)} - S_{\text{Fash}(k,x,t-1)}|^{B_{ik}}} \tag{39}
\]

Assume the weak tie member, agent \( k \), to be in some state \( \hat{S}_{\text{Fash}(k,x)} \) through all times, \( t \). You choose a state (for each brand \( x \)). Now, we multiply, as a new method/expert, to the formula (37) (from homework 5) to obtain

\[
P_i \left(\text{Fash}(i, x, t) \big| \text{Adv}(x, t) \right) =
\]

\[
= \frac{1}{Z_{\text{Fash}}} e^{-\beta_{ij} |S_{\text{Fash}(i,x,t)} - \hat{S}_{\text{Fash}(k,x)}|^{B_{ik}}}
\]

\[
\times \left\{ \sum_{S_{\text{Fash}(i,x,t-1)}=0}^{4} e^{-\left[\text{Adv}(i,x,t) \big| S_{\text{Fash}(i,x,t)} - \min(S_{\text{Fash}(i,x,t-1)}+1, 4) \right]^{A_{ix}+A_{ix}}} \right\}^{\text{Adv}(x, t-1)}
\]

\[
\times P_i \left(\text{Fash}(i, x, t - 1) \big| \text{Adv}(x, t - 1) \right) \right\}
\]

\[
\times \left\{ \prod_{j=1}^{N_i} \sum_{j \neq i}^{4} e^{-\alpha_{ij} |S_{\text{Fash}(i,x,t)} - S_{\text{Fash}(j,x,t-1)}|^{A_{ij}}} \right\} \times P_i \left(\text{Fash}(j, x, t - 1) \big| \text{Adv}(x, t - 1) \right)
\]
From this subroutine, you can iterate in time to estimate a sequence of probabilities

\[ P_t \left( Fash(i, x, t) \middle| Adv(x, t) \right) \]

over time and for each agent \( i \) and each pair of jeans \( x \).

Plot these probabilities, over time, for each state \( Fash(i, x, t) \) (different colors to show different states, so there are five plots per graph, per brand).