Models where moves don't occur simultaneously but have a leader-follower structure are called *Stackelberg* games. It can be shown that the first mover in a Stackelberg game has an advantage under certain scenarios [195].

To analyze repeated games, we need a refinement of the Nash equilibrium concept known as a *subgame-perfect equilibrium.* Roughly, a subgame-perfect equilibrium is one in which the initial equilibrium is simultaneously a Nash equilibrium for any subgame (the game from any subsequent stage assuming all the information on actions from the previous stages) of the initial game.

The idea is best illustrated by an example. Consider a T period, two-player, Bertrand pricing game where prices are the strategic variables. Then $[(p^1(1), p^2(1)), \ldots, (p^1(T), p^2(T))]$ is subgame-perfect equilibrium if (i) it is a Nash-equilibrium and (ii) for all $1 < t \leq T$, the decisions $[(p^1(t), p^2(t)), \ldots, (p^1(T), p^2(T))]$ is a Nash equilibrium for the subgame starting from period t to period T.

The subgame-perfect equilibrium refinement allows one to restrict attention to strategies that only contain credible threats or promises. For instance, in a two-player, two-period Bertrand pricing game, suppose firm one adopts a strategy of pricing high in period one and promises to continue to price high in period two provided the other firm does not undercut its price in period one. While this may result in a Nash equilibrium with both firms pricing high in each period, it does not constitute a subgame-perfect equilibrium because once the firms reach period two, it is in firm 1's interest to deviate from it's announced strategy and undercut its rival's price. Thus, the promise to continue to price high is not credible.

Infinitely repeated games (called *supergames*) provide a richer set of results than do finite repeated games. The assumption of infinite interaction may seem excessive, but in situations where there are many opportunities for frequent interactions or when the end of a game is uncertain, it is a reasonable modeling assumption.