Chapter 18
Imperfect Information: Information Sets And Sub-Game Perfection

We consider games that have both simultaneous and sequential components, combining ideas from before and after the midterm. We represent what a player does not know within a game using an information set: a collection of nodes among which the player cannot distinguish. This lets us define games of imperfect information; and also lets us formally define subgames. We then extend our definition of a strategy to imperfect information games, and use this to construct the normal form (the payoff matrix) of such games. A key idea here is that it is information, not time *per se*, that matters. We show that not all Nash equilibria of such games are equally plausible: some are inconsistent with backward induction; some involve non-Nash behavior in some (unreached) subgames. To deal with this, we introduce a more refined equilibrium notion, called subgame perfection.

Formal Definition: An information set of player i is a collection of player i's nodes among which i cannot distinguish.

Perfect Information: All information sets in the tree contain just one node..
Imperfect Information: Not perfect information.

Definition: A pure strategy of player i is a complete plan of action. It specifies what i will do at each of i's information set.

Information matters and not time.

Definition: A subgame is a part of the game that looks like a game within the tree. It satisfies the following 3 properties.
1. It starts from a single node.
2. It comprises all successors to that node.
3. It does not break up any information sets.

Definition: A Nash equilibrium (s1*, s2*, …, sn*) is a subgame perfect equilibrium if it induces a Nash equilibrium in every subgame of a game.