Lesson 8. Drafting a Fantasy Basketball Team

Example 1. You're preparing for your upcoming fantasy basketball draft. You wonder: what is the best possible team you can draft? You have the following data:

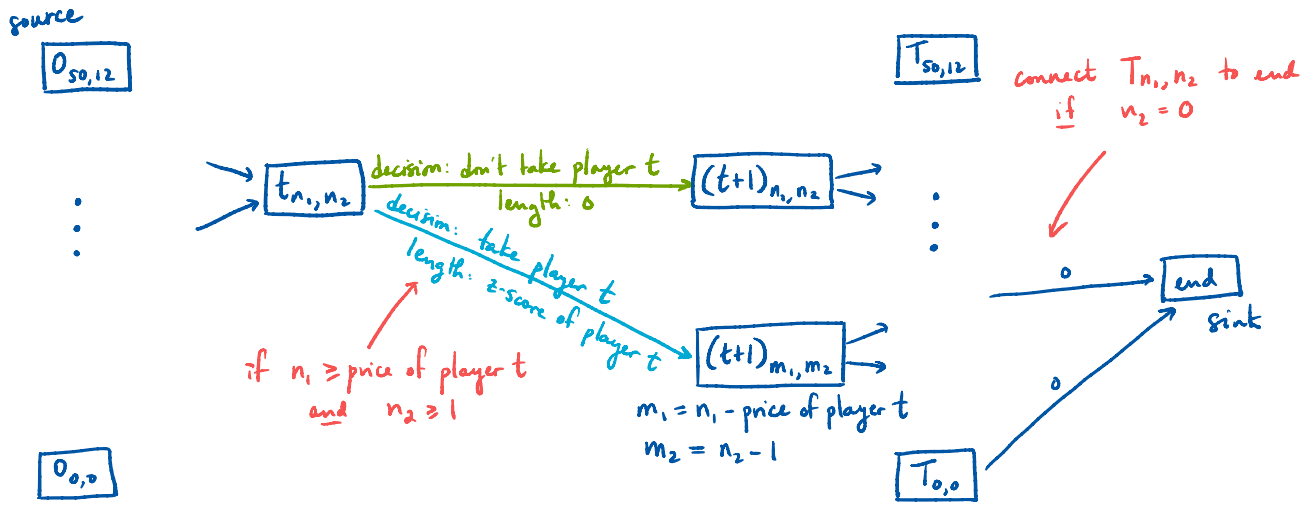
- Projected **auction prices** for each player in the NBA.
- The **z-score** for each player: the sum of the number of standard deviations above the mean in the following 9 categories:
  1. points per 36 minutes
  2. 3 point field goals made per 36 minutes
  3. number of rebounds per 36 minutes
  4. number of assists per 36 minutes
  5. number of steals per 36 minutes
  6. number of blocks per 36 minutes
  7. *negative* of the number of turnovers per 36 minutes
  8. field goal percentage
  9. free throw percentage

Your roster must have exactly 12 players, and you have a budget of \$50. You want to maximize the total z-score of your team. Formulate this problem as a dynamic program by giving its shortest/longest path representation.

Stage t $\leftrightarrow$ consider player t $(t = 0, 1, \ldots, T-1)$
$\leftrightarrow$ end of decision-making process $(t = T)$

Node t_{n_1,n_2} $\leftrightarrow$ n_1 remaining budget and n_2 remaining roster spots at stage t $(n_1 = 0, 1, \ldots, 50;\ n_2 = 0, 1, \ldots, 12)$

Find longest path:



A Problems

Problem 1 (Airlift planning)**.** You are in charge of determining which subset of the following requirements should be shipped on the next C-17 to another base:

Requirement	Capability Value	Weight (tons)	Volume (m^3)
Large munitions	50	43	250
Small munitions	30	17	130
Food	80	26	370
Medical supplies	40	4	180
Repair parts	70	35	400

The C-17 has a weight capacity of 80 tons, and a volume capacity of 700 m^3. The goal is to maximize the total capability value of the requirements shipped.

Formulate this problem as a dynamic program by giving its shortest/longest path representation.

Problem 2 (Solving the airlift planning problem)**.** See the accompanying Jupyter Notebook for this lesson.