Probability and Statistics: To p, or not to p?

Module Leader: Dr James Abdey

1.1 The Monty Hall problem

You are taking part in a gameshow. The host of the show, who is known as Monty, shows you **three outwardly identical doors**. Behind one of them is a prize (a sports car), and behind the other two are goats.

You are asked to **select, but not open, one of the doors**. After you have done so, Monty, who knows where the prize is, opens one of the two remaining doors.

He always opens a door he knows will reveal a goat, and randomly chooses which door to open when he has more than one option (which happens when your initial choice contains the prize).

After revealing a goat, Monty gives you the **choice of either switching to the other unopened door or sticking with your original choice**. You then receive whatever is behind the door you choose. What should you do, assuming you want to win the prize?

Rationale

The famous 'Monty Hall' problem is a classic example of **decision making under uncertainty**. In week 2, we will solve this problem formally, but for now appreciate that at each round of the game you, as the player, do not know where the sports car is.

To begin with, the only certainty you have is that the sports car *must* be behind one of the *three* doors. You may, or may not, initially chose the 'correct' door (assuming you want to win the prize!) but there is no certainty in your choice.

Upon revealing a goat behind one of the doors you did not choose, you still face uncertainty – the only certainty you have is that the sports car *must* be behind one of the *two* unopened doors.

The 'controversy' arose over the American game show **'Let's Make a Deal'**, and the *New York Times* (among others) devoted two pages to the problem, readers' letters etc.

Bewildered game show players wrote to Marilyn vos Savant, an advice columnist for *Parade Magazine*, and asked for her opinion in her 'Ask Marilyn' column. Savant – who is credited by the Guinness Book of Records as having the highest IQ of any woman in the world – gave her decision. She said, **'you should change your choice'**. There then followed a long argument in the correspondence columns, some supporting Savant's decision and others saying that it was nonsense.

What do you think, and why?

To be continued. . .