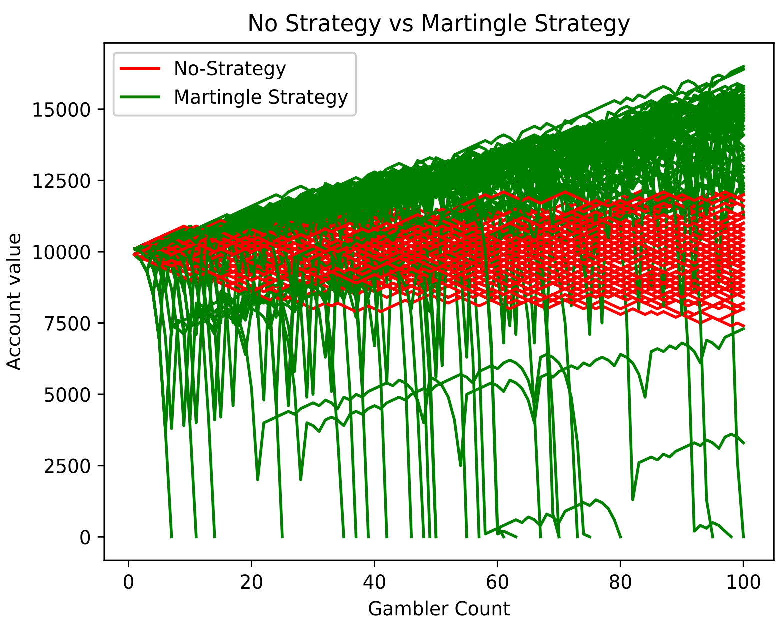
Investment Strategies

Introduction

There are two betting strategies that I want to examine using Monte Carlo Simulation. Martingale Strategy which is well known and the second one is a random sizing strategy using equations describing Predator–Prey interaction. Monte Carlo is just a random variable generator and it can be used to generate different outcomes such as rolling a dice.

Martingale Strategy

Martingale strategy suggests that a bettor loses a bet, they should should double their bet size in the next round. Other the hand, the Reverse Martingale system calls for doubling on after a win. Why and under which circumstance would this strategy work? For this strategy to come into effect, you must have a significant amount of fund and there is no limit on bet size in the game. The idea relies in the mean reversion theory and that in a series of bets, bets cannot lose every single time. With the martingale strategy, every time that we loss we double our bet and we see that if you have only 50% chance of winning then this is not a good strategy. There is an argument that the martingale strategy is not a great betting strategy in reality and I use Monte Carlo simulation to assess its performance.



Predator–Prey Strategy

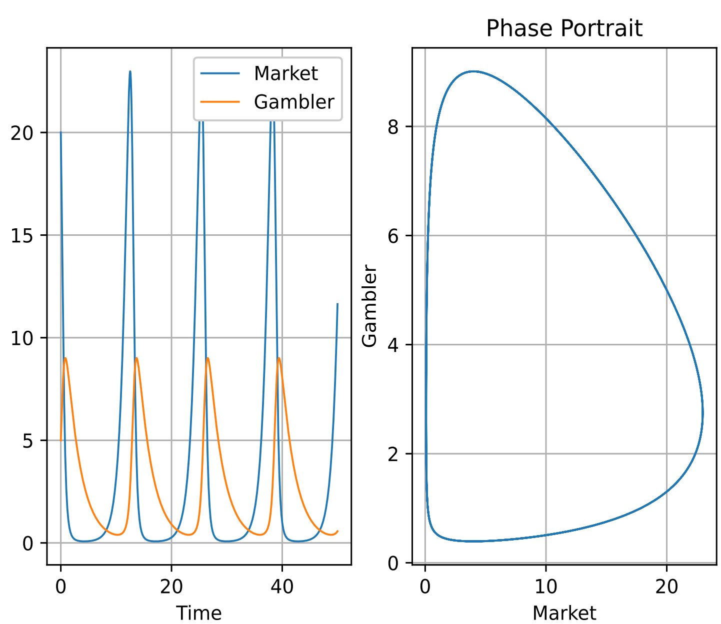
Instead of doubling our bet size we could use a different method to to determine it. First we introduce a parameter called multiplier and to determine this parameter, first I use the idealised and deterministic Predator–Prey equations. Then I will introduce stochastic into the equations to assess whether it has any positive effects on our strategy. The Predator–Prey system is defined as

$$\frac{dx}{dt} = \alpha x - \beta xy,$$
$$\frac{dy}{dt} = \delta x - \gamma y,$$

where

- $\frac{dx}{dt}$ is growth rate of market bets.
- $\frac{dy}{dt}$ is growth rate of player bets.
- x is market volume and y is our strategy volume or multiplier.
- α growth rate of market's bet number.
- β decline rate of market due to the strategies (predation) of the players in the market.
- γ decline rate in our betting activity unrelated to the market.
- δ factor describing how many winning bets lead to a profitable strategy.

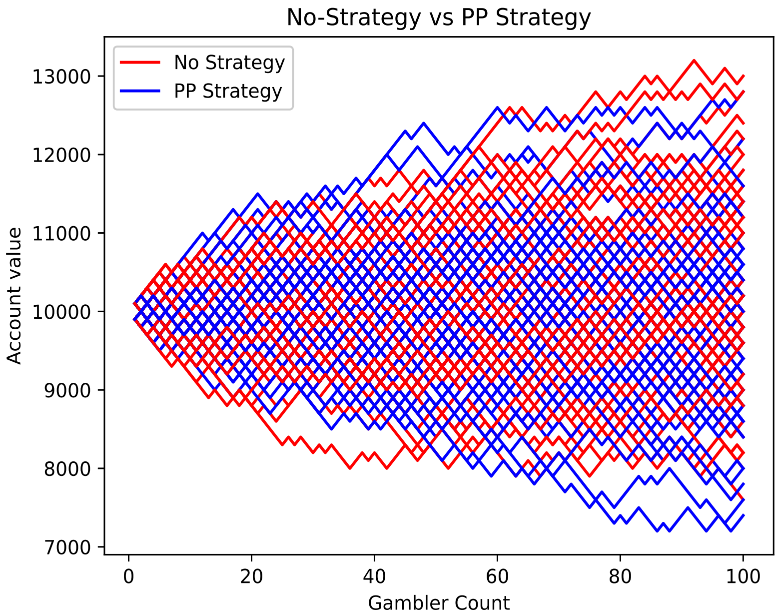
This model assumes that the investors y have unlimited appetite for investment which is not a realistic assumption. I only consider this for simplicity however I shall modifies this in next chapters. The general solution to the PP model is presented in the Figure 3.



The assumption is that we have found a signal that predicts the market has a periodic movement for a certain time interval and then we set our multiplier parameter the the market oscillation.

Comparison

If we start with no strategy to play a with 50% chance of winning, we can see that as we increase the number of players then there are more losers than the winners. Gamblers Fallacy, there is a



belief that things will even-out when you player a game such as flipping a coin, but this ignores the fact that outcomes of flipping a coin are independent events. Monte Carlo generator helps to show the flaw of the Gamblers fallacy.

Next Chapter

In the next chapter I will conduct a full analysis on the performance of these strategies. Here we have different parameters such as number of players, probability of wining, starting bet size and etc. In the next chapter I will show which strategy is the best method for different values of parameters.

Further, I will use Kelly Criterion strategy and introduce randomness to PP Strategy with a very simple uniform distribution where the mean is zero. It is important End game strategy focus on the fact that you should know your exit point before starting the game. Additionally, I shall add a exit threshold to PP Strategy.