

## 2.2 Growth, clowns and reinforcing feedback

Reinforcing feedback is an engine of growth. Whenever you are in a situation where things are growing you can be sure that reinforcing feedback is at work somewhere.

Examples of reinforcing feedback are all around us, so much so that we find them in many common expressions such as a “vicious circle”, a “death spiral” or “word of mouth”. Anywhere that small changes snowball into large effects there is reinforcing feedback.

Let’s illustrate this with an example. Last year in France there was a spate of clown attacks. Pranksters dressed up as creepy looking clowns and ran around scaring people. It was generally harmless fun but it got people so scared that videos of clown attacks were widely shared on social media. As more people talked and shared videos and stories of attacks, the media started reporting on them and other aspiring clowns thought that it might be fun to dress up too and scare passers-by. As the number of clown attacks increased so too did the level of public anguish and the media coverage of the attacks. Within four weeks the number of clown attacks had increased sixteen-fold! This is an example of a “reinforcing feedback”.

The structure of a reinforcing loop is quite simple. It has two main elements: a growing action and a performance variable. Here the performance variable was the number of attacks and the growing action that was pushing the performance variable was the media coverage.

We can also include a third variable called a “compounding fraction” to explain how much the performance variable affects the growing action. For example, a compounding fraction of 0.1 means that an increase in the performance variable of 100 results in an increase in the growing action of 10, that is 100 times 0.1. The bigger the compounding fraction is, the quicker the growth. In the case of population growth the compounding fraction is the “birth rate” and when you invest money in a savings account, the compounding fraction is the interest rate.

Reinforcing feedback is responsible for a large number of natural and social phenomena. One common example of reinforcing feedback is the propagation of a virus. As more people are infected with the virus, more healthy people become infected. The compounding fraction is known as the “basic reproductive rate” or,  $R$ -naught. It is the number of uninfected people one sick person infects and it depends on the type of virus. For example, someone with Ebola infects between 1.5 and 2.5 people whereas the  $R$ -naught for measles is between 12 and 18 people. Obviously, the contagion will stop when there are no more people left to infect in the “healthy population”.

Panic, runs and stampede behavior are other examples of positive feedback with a similar structure to that of a virus. Have you ever noticed just how contagious fear or panic is? Just ask John Wayne ...

As more cows begin to run the overall level of panic increases until the entire herd is stampeding.

In the business world there are also many examples of positive feedback. Word of mouth sales, rumors, and viral marketing are all based on the same propagation structure as that of a virus. We have all seen cases where positive feedback creates rapid publicity for a product, a song or a personality. Does this sound familiar?

In July 2012, Gangnam Style was uploaded to YouTube. Within 5 months it was the most watched YouTube video and became the first video to reach 1 billion views by December of the same year. This chart shows the growth in the number of views. The song’s success was fuelled by the buzzing of social media. Video sharing was the major growing action that pushed the growth in views as we can

see from this YouTube chart. Can you see how they both have the same shape? A small increase in sharing leads to a small increase in views. The more the clip was viewed, the more it was shared, and so on.

Be careful though, reinforcing feedback can also turn against you. When a negative message, event or slip-up is amplified by a reinforcing loop it can lead to accelerated decline or decay. On social media, that is when the buzz turns bad.