**Probably true, but not that funny anymore**

In the last post, we thought about whether Maity is doing himself or his fellow travellers any favours, by carrying the second bomb with him on the flight. He clearly would not, both from a probabilistic perspective, and of course the whole unethical aspect too.

However, we breezed over quite a few heavy concepts, without really bothering to define them.

Let’s begin.

**Random process –** This is an ensemble of random variables (coming to that in a bit), indexed by another variable. Think of the price of oil; the data you have been observing for over 20 years now. The trajectories of oil prices are evolving over time, but you have no clue how, since their evolution is uncertain. This is an example of a random process. It is a process, which when repeated numerous times, can give you different (uncertain) outcomes. Note that **time** is not important to this definition, it is just a variable that indexes the oil prices (think - serial number).

Sample space is defined as the set of ALL possible values of a random process.

Formally, a random process is a mapping of each element 𝜔, in the sample space 𝛺, to a function given by X(𝜔, .) : t → ℝ, and t here may be a continuous or a discrete set.

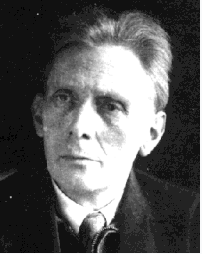
Consider the table below. This table outlines a random process. Each row is an element of the sample space, which is indexed by the variables T1, T2, and so on. The randomness in the process is generated by each element 𝜔.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | T1 | T2 | T3 | T4 | T5 | T6 | … | Tn |  |
| Xw1 | a11 | a12 | a13 | . | . | . | … | a1n |  |
|  |  |  |  |  |  |  |  |  |  |
| Xw2 | a21 | a22 | a23 | . | . | . | … | a2n |  |
|  |  |  |  |  |  |  |  |  |  |
| Xw3 | a31 | a32 | a33 | . | . | . | … | a3n |  |
| .  .  . | . | . | . | . | . | . | … | . |  |
| Xwn | an1 | an2 | an3 | . | . | . | … | ann |  |

𝜔

Each row (follow red arrow) is a ***realization*** of the random process, where 𝜔 is fixed, and X(𝜔, t) is called a *deterministic function* of t. Each column (follow blue arrow) represents a scenario where t is fixed, and the resulting X(𝜔, t) is a called a ***random variable***.

**Who in the world had the time to think of this?!**



**Aleksandr Ya Kinchin (Soviet mathematician)**

It is important to meet people. In person is always good for pleasantries, but sometimes, a face often leaves a longer impression than just a name. Let’s meet [Aleksandr Ya. Kinchin](https://en.wikipedia.org/wiki/Aleksandr_Khinchin), who laid the foundation for stochastic processes. He would have been 126 years, in July 2020!

**Okay, but where does probability come in all of this?**

Let us take look at the simplest model of probability. A model all of us are familiar with, where we “select an object at random”. Probability is essentially us trying to arrive at some *likelihood of the occurrence of a set of outcomes*. This set of outcomes belong to the sample space, 𝛺 that we defined a while back. This set of outcomes are also called ***events***. Note that **not all** elements of the sample space need to be events. Also note, it is to these events that we assign probabilities.

It is the description of these events, and their probabilities – essentially three components, the sample space, a subset of the sample space that are events, and the probability measure – that constitute what is known as a ***probability space*.**

**Now, who was it this time? (a more interesting person perhaps)**



**Antoine Gombaud, a** [**philosophical gambler**](https://www.britannica.com/science/probability)

In the next post, Maity with the bomb, will be back to explore what *choosing at random* means, and of course what probabilistically is wrong with carrying the other bomb on the plane.