



About stock prevision

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September 24th, 2008

I had recently an interesting conversation with David Louapre, from Saint Gobain (France) about mathematical methods which might be used for stock prevision. Since the problem might interest everyone, let me describe it here. We had a contract, two years ago, with the French Ministry of Energy (DGEMP) about the French stocks for natural gas.

Assume you deal with some good, and you have a stock of this good. At some time, the stock falls below a certain level, and you must re-order the good, from some wholesale company. The question is : when should you re-order ? Of course, there is a certain time (not completely deterministic) before the new supply arrives, and meanwhile, you will sell some quantities of the good. This, also, is non deterministic.

What people do in general is to assume that they have a well defined probability law upon the consumption (for instance gaussian) and the same for the date of delivery. From these two laws, they compute an "optimal" date for reorder.

But this approach is not correct, since these two probability laws are fictitious.

The correct approach is as follows.

You do not work directly on the stock, but on the consumption. Using an history of the consumption of this good, you can build a probability law : this is what the consumption may be at date  $d$ ,  $d + 1, \dots$ . This probability law may depend on various factors, such as the season (as we saw for the gas). This way, you build a probability law for the consumption over an extended length of time (one week, one month, and so on).

Knowing the level of your stock today, you deduce a probability law on the level of your stock within a week, a month, and so on.

Using a history, you also build a probability law on the supply : how often does the supplier deliver in two days ? in one week ?

Combining both, you can find the probability to have negative stock at a fixed date (for instance in a month) : this will happen if a) the consumption is above a certain value, b) the supplier takes time to deliver. Then, you fix the date for your order according to this probability law : you do not want, for instance, this to happen with a probability above 5%.

One word of caution : these two probability laws are not independent ; in fact, the supplier is often late when the consumption is important, because he has many deliveries to satisfy at the same time.