Some questions about investment policies

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In this talk we present some problems concerning optimal investment policies, that we propose to analise using a real options approach.

In the first situation we suggest a model to determine the optimal investment policy for a company that has an established product in the market and wants to launch a distinct, more appealing and innovative product. Considering that the demand for a product is modelled by GBM, we look for the optimal quantities for each product and the most suitable moment to introduce the new one. We extend the model on the basis that the new product creates a cannibalization effect, which reflects the devaluation that the established product endures when the new one is commercialized. On the other hand, we also acknowledge that the company may have a delay in the implementation of its decisions. Therefore the company may not adjust to the new information from the market, not reacting fast enough, being subject to a delay of Δ time units.

In the second situation we derive the optimal investment policy of investment in the HSR project. We assume that the HSR demand follows a geometric brownian motion with random jumps. We assess the impact of these shocks in the demand threshold, along with the investment opportunity value and option to differ. We consider several distributions for these jumps, and we compare with the no-jumps case.

Finally, the third situation contributes to the literature of technology adoption. In most of models it is assumed that after the arrival of a new technology the probability of the next arrival is constant. We extend this approach by assuming that after the last technology jump the probability of a new arrival can change. Right after the arrival of a new technology the intensity equals a specific value that switches if no new technology arrival has taken place within a certain period after the last technology arrival. We look at different scenarios, dependent on whether the firm is threatened by a drop in the arrival rate after a certain time period or expects the rate of new arrivals to rise. We analyze the effect of variance of time between two consecutive arrivals on the optimal investment timing and show that larger variance accelerates investment in a new technology in case the arrival rate increases if no new arrival takes place within a specific time period after the last arrival. For the case that the arrival rate is supposed to decrease, increasing variance has a non-monotonic effect on investment timing. We find that firms often adopt a new technology a time lag after its introduction,

which is a phenomenon frequently observed in practice. Regarding a firm's technology releasing strategy we explain why clear signals set by regular and steady release of new product generations stimulates customers buying behavior. Depending on whether the arrival rate is assumed to change or be constant over time, the optimal technology adoption timing changes significantly. In a further step we add an additional source of uncertainty to the problem and assume that the length of the time period after which the arrival intensity changes is not known to the firm in advance. Here, we find a counterintuitive result that increasing uncertainty accelerates investment.

These topics that we present in this talk are result of a joint work with members of the team of Research Project SANAF, students from the MMA (master degree in mathematics, from IST), Verena Hagspiel (from Tilburg University and from IST), Peter Kort (Tilburg University) and Kuno Huisman (Tilburg University).