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DYNAMICS OF A STOCHASTIC E-RUMOR MODEL

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Abstract. The phenomenon of propagation of rumors on social networks is recent but very dangerous and random. In this paper, we propose a deterministic dynamical system in order to model it, in which we add then the randomness of this evil. From this last one, we determine the thresholds of extinction and persistence of the spreaders density. Then we compare the deterministic and stochastic cases on a numerical example in order to highlight the benefit of this stochastic study.

Keywords. Deterministic and stochastic e-rumor models, Brownian motion, Itô's formula, extinction, persistence in the mean.

AMS (MOS) subject classification: 60H10, 60H30, 34D20.

1 Introduction

These last years, with the new tools of communication like Facebook, Twitter, WhatsApp, social networks became new kinds of propagation of rumors. In particular in the case of fake news, this phenomenon is very dangerous for our societies, from an economic as well a political point of view. The first mathematical works on this subject highlighted a similarity between propagation of rumors and epidemics. The reader could refer to [7, 8, 9, 19, 20, 21] for more details. In the epidemic case, the population is in general divided into three groups, the one of susceptibles, the one of infected and the one of removed, whereas in the case of rumors, the population of a network contains the ignorants, the spreaders and the stiflers, that is those who know the rumor but do not spread it for the moment.

In previous works, we begun with a model found in [11] for which the authors divided the group of stiflers into two sub-categories, that is stiflers accepting the rumor and stiflers under the rumor and proposed randomned and targeted immunization strategies. With their model, S. Bernard et al modified