

## Managing central branch risk networks using spectrally negative Lévy models and scale functions

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### SUMMARY

This paper is motivated by the study of one of the simplest risk networks, which models the interaction between a central branch (CB) and several subsidiary companies. Naturally, since multi-dimensional first passage problems are considerably harder than one dimensional ones, very few exact answers are available, and they pertain mainly to networks using proportional reinsurance. However, we make the case that these few exact results provide already interesting approximation methods and insights.

Two examples of questions addressed below are:

1) Deciding whether the existence of a CB is justified, as opposed to splitting its assets between the subsidiaries. For valuating a CB, i.e. assigning a numeric value to its performance, we propose, following de Finetti, Modigliani-Miller, and recent results of Azcue, Muler and Palmowski, to use the expected optimal discounted cumulative dividends until ruin.

2) The need of a central branch to evaluate its subsidiaries, and identify the moment when they stop being profitable and should be liquidated, i.e. refused further bailouts.

**Keywords:** risk network, spectrally negative Lévy process, scale functions, optimal dividend barrier, capital injections, Parisian reflection, optimal stopping, two classes of claims

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