Indicative solution of the DSB Bank Run case (EN)

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An exploratory SD model of a concerted bank run was developed on 1 October 2009, right after Pieter Lakeman's call for a run on the DSB Bank. This small, simple, high-level, fast-to-simulate model was used at that time for the purpose of exploration, more precisely, to quickly foster understanding about the possible mechanisms and dynamics of concerted bank runs, to test high-level policies to prevent such bank runs from succeeding, and to test and teach SD students. The model is explained and explored in depth in (Pruyt and Hamarat 2010), is available and can be simulated at `http://forio.com/simulate/simulation/e.pruyt/dsb`, and is used briefly for ESDMA in (Pruyt 2010).

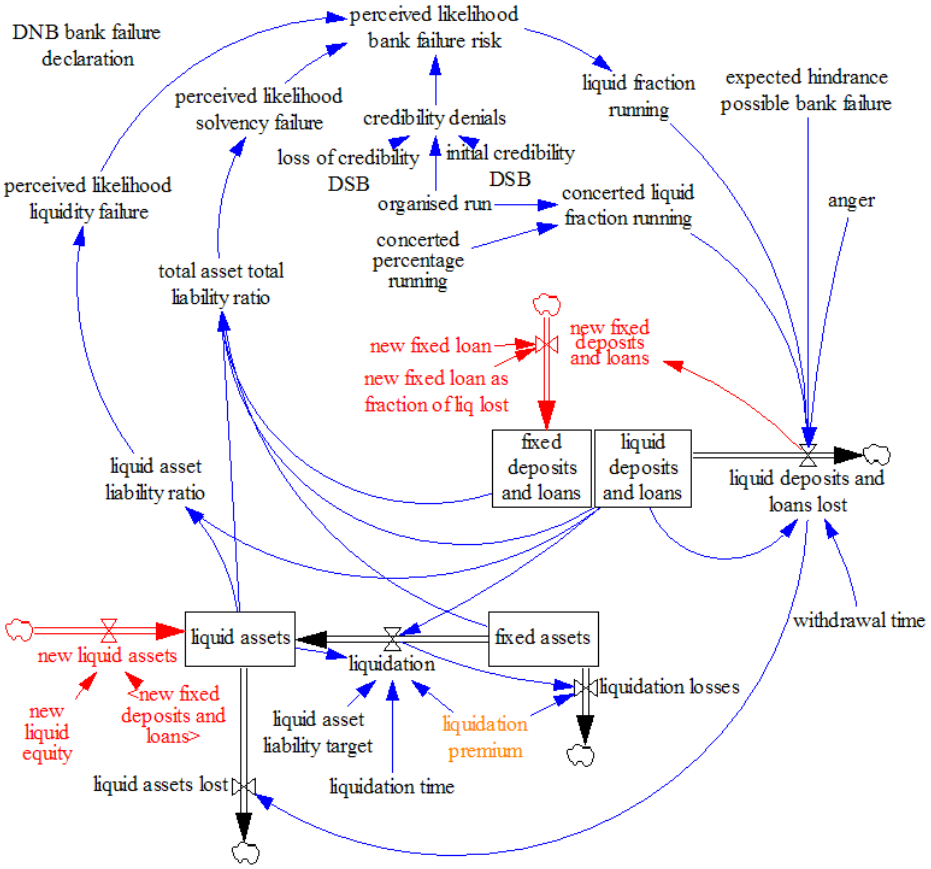

Figure 1: Aggregated structure of a 'concerted bank run' SD model

[Case question 1:] First, students need to make a simulation model based on the case description. The SFD of the SD model is displayed in Figure 1. Since the model is a short-term crisis

model, it is assumed that (i) there is no change in assets due to profit accumulation, (ii) fixed and guaranteed deposits and loans do not come at terms, (iii) there are no net shifts from liquid to fixed assets, nor from liquid to fixed deposits and loans. Note that soft –but possibly important– aspects like anger and expected hindrance from bank failures are explicitly modelled.

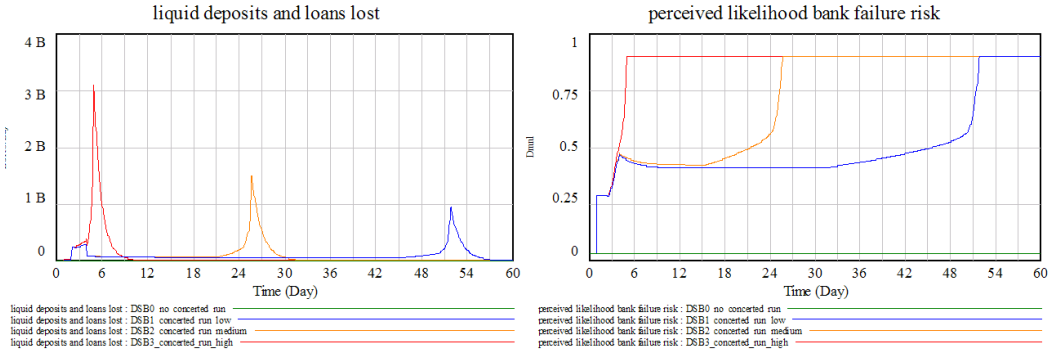

Figure 2: Behaviour of different scenarios for the 'concerted bank run' model

[Case questions 2, 3, 4:] Then students need to use to model to simulate distinct scenarios. Figure 2 shows the behaviours of 4 scenarios on two important variables: the *liquid deposits and loans lost* and the *perceived likelihood of a bank failure*. The DSB0 scenario (displayed in green) shows that –with this model and these parameter values (*anger* amounting to 50%, *expected hindrance of a bank failure* to 50%, and a *liquidation premium* of 15%)– nothing happens without a call for a bank run. The DSB1 scenario (displayed in blue) shows that with a concerted bank run lasting two days, 50% *anger*, 50% *expected hindrance of a bank failure*, and a *liquidation premium* of 15%, the initial concerted run is followed by a relatively long period of *liquid deposits and loans losses* reducing the *liquid assets* (being replenished by *liquidation* of *fixed assets*), before the bank suddenly collapses. The DSB2 scenario (displayed in orange) shows that this collapse occurs sooner with a *liquidation premium* of 25%. And the DSB3 scenario (displayed in red) shows that the concerted bank run is followed immediately by a full collapse of the bank in case of 100% *anger*, 100% *expected hindrance of a bank failure*, and a *liquidation premium* of 25%.

Although the modelled bank seems to collapse sooner or later after an initial perturbation of sufficient amplitude, the delay with which the second run follows upon the concerted run makes a big difference for those involved: in scenarios DSB1 and DSB2 there seems to be some time for strategies/policies and anticipative crisis management, but not in scenario SDB3, in which the second run follows immediately upon the first run, in which case there may only be time for reactive crisis management or an 'emergency measure' to place the bank under legal restraint.

The strange –at least for continuous systems models– peaks in *liquid deposits and loans lost* arise because the stock of *liquid deposits and loans* is depleted.

[Case questions 6 and 7:] After briefly validating the model, students need to draw a causal loop diagram to communicate the main feedback loops and explain the link between structure and behaviour: the positive liquidity and solvency loops in Figure 3 make that –unless actively stopped– the likelihood of a bank failure keeps on increasing until the bank effectively collapses.

[Case question 8:] Finally, students need to design and test policies to prevent the bank from collapsing. Possible policies include inflows into *deposits and loans*, especially into the *fixed deposits and loans*, generated (for example) by raising the interest rate on those products, or by attracting new liquid assets through new equity (both policies are depicted in red in Figure 1).

Building blocks addressed in this case include stock-flow modelling and causal loop diagramming of highly aggregated structures, formulating special functions (lookup functions, time series and/or double step functions, MIN/MAX functions, well-thought-out flows), and exploring different scenario and policy behaviours.

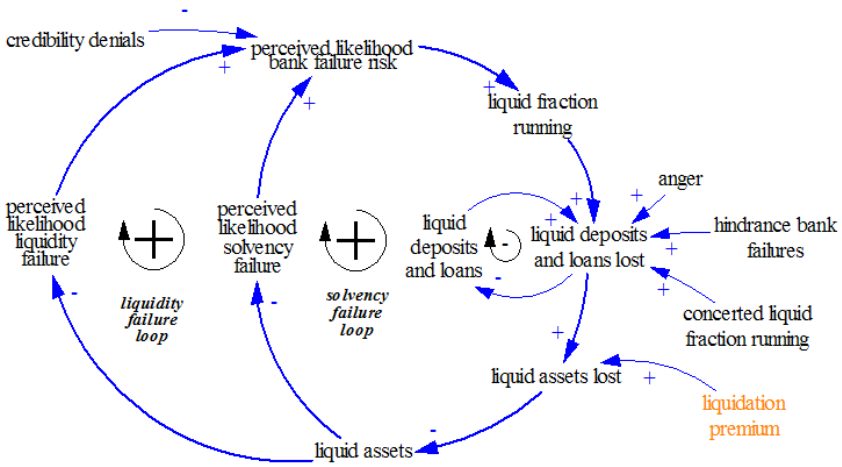

Figure 3: (Aggregated) Causal-Loop Diagram of the concerted DSB Bank Run Case

References

Pruyt, E. (2010, July). Using Small Models for Big Issues: Exploratory System Dynamics for Insightful Crisis Management. In *Proceedings of the 28th International Conference of the System Dynamics Society*, Seoul, Korea. International System Dynamics Society. `http://systemdynamics.org/conferences/2010/proceed/papers/P1266.pdf`. 1

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