

### Appendix C: On the impossibility of using stock prices as a resolution indicator

In this Appendix, we want to illustrate how seemingly reasonable public interventions in financial markets may produce catastrophic results if they do not respect some basic property rights.

Let's suppose that a Liquidator of Last Resort has the right to nationalize a bank with no indemnity for the shareholders whenever its stock market value appears to be too low. This rule seems quite reasonable since the stock market value should reflect how the community of investors assesses the true value of the company. Moreover, the ability of a firm to tap its shareholders and reconstitute its depleted capital depends on its market value. And last but not least, shareholders have an incentive to "gamble for resurrection" when a firm has little value left: they have little to lose if new investments turn wrong, while they benefit from the upside. A zombie bank with a low market value is quite a dangerous institution!

So let's say that the bank has to finance  $A$  of assets on its balance sheet and that it will be seized if its stock market value  $V$  is below the level  $\alpha A$ .

Let's also assume that the bank's fundamental market value based on a reasonable assessment of future profits and the normal discount rate is  $VF$ .  $VF$ , based for example on analysts' forecasts, is supposed to follow a random walk with a drift equal to the discount rate.

So  $dVF = (r + \pi)VFdt + \sigma_{VF}VFdz$ , with  $r$  the risk free short-term interest rate and  $\pi$  the required risk premium.

Without the threat of the Liquidator of Last resort, the actual stock market value  $V$  would be  $VF$ . But, with the possibility of nationalization, it will be below  $VF$  since the public authorities have the right to seize bank assets in some circumstances. What should be the discount  $V/VF$  required by rational investor to be compensated for the nationalization risk in case of bad news (i.e. when  $V$  is too low to be tolerated by the Liquidator of Last Resort)? And, second related question, when the nationalization actually takes place (highest level  $VF^n$  which triggers the resolution of the bank, i.e.  $V < \alpha A$ )?

It is easy to show that  $VF^n$  is independent of  $\alpha$  and is infinite: even with a very low threshold for nationalization, there is no possible market for the banks' share and the nationalization will take place immediately independently of the fundamental value of the bank.

This is proved by the fact that for any potential candidate for  $VF^n$ , nationalization will also take place for  $VF^n + \varepsilon$ . So the only possible  $VF^n$  definitely is the infinite.

Let's look at the function  $V(VF)$  which described how the market value of the bank depends on its fundamental value. By construction,  $V(VF^n) = 0$  since there is nationalization at this level. The function  $V$  is necessarily continuous: it is impossible to have a jump in the market value for an infinitesimal change in the fundamental value, otherwise there would be a free arbitrage at this specific point. So  $V(VF^n + \varepsilon)$  necessarily tends towards 0 when  $\varepsilon$  tends towards 0. So when  $\varepsilon$  is small enough,  $V(VF^n + \varepsilon) < \alpha A$ , which means that there will be nationalization. In other words, if the market believes that there will be nationalization at  $VF^n$ , the price will be so low at  $VF^n + \varepsilon$  that nationalization will in fact take place at  $VF^n + \varepsilon$ . And step by step, the risk of nationalization drives the market value towards 0 whatever the level of  $VF$  is and nationalization is bound to happen.

This is quite a stunning result since the inevitable fall of the price towards 0 and nationalization does not depend of the threshold chosen for nationalization. Here we meet a well-known mechanism: public authorities should be very cautious in using market prices to determine their policy since prices themselves may depend on the public decisions and may as a result lose most of their information content, if not all (see Bond, Goldstein and Prescott (2009) for a general analysis of market-based corrective actions). But prices are easy to observe and not subject to discussion, so that the temptation to use them is quite strong.... Obviously, this strong result should not be over-interpreted. The Liquidator of Last Resort is likely to be cautious if it seems clear that prices are much below any reasonable estimate of the fundamental value (but this is not that easy to assess in times of crisis!). Moreover, if there are some (very) deep pocket investors (Warren Buffet...), they can take the control of the bank before it is nationalized.

Despite these caveats, one can wonder if the very large instability observed in some banks' share prices during the worst period of the 2008-2009 winter was not partly due to the kind of unstoppable vicious circle we described: investors fearing a valuation induced expropriation when the share prices were declining and, as a result, selling even more the companies considered at risk.