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Measuring background and systemic risk using financial time series

General discussion:

Introducing $\kappa = 8\%$, a measure of regulatory liquidity, d_{it} the debt of a firm i at time t and w_{it} for its equity, following Acharya et al. future capital shortfall, the amount a bank needs to find to comply with regulatory constraints in case of a crisis, is defined as

$$CS_{it+T} = E[\kappa(d_{it+T} + w_{it+T}) - w_{it+T}|Crisis_{t+T}].$$

Existing work, assuming constancy of debt of a financial firm during stress decomposes this measure as

$$CS_{it+T} = \left\{ \kappa(l_{it} - 1) - (1 - \kappa E \left[\frac{w_{it+T}}{w_{it}} | Crisis_{t+T} \right] \right\} w_{it}.$$

where l_{it} is a mesure of leverage. The index t denotes current time and T is a moment in the future when financial hardship might take place. The nice feature of the existing literature is that capital shortfall gets decomposed into a measure of leverage, l_{it}, size, w_{it}, and a measure of how the given firm is exposed to market wide shocks given by conditional expected shortfall $E\left[\frac{w_{it+T}}{w_{it}}|Crisis_{t+T})\right]$. All components are easy to interpret and have economic meaning.

This literature then defines SRISK as some monetary amount that needs to be injected which is the case if $CS_{it+T} > 0$, yielding

$$SRISK_{it} = \max(CS_{i,t+T}, 0).$$

The main contribution of this paper is to re-interpret SRISK as a 'put.'

$$SRISKNew_{it} = E_t[max(CS_{i,t+T}, 0)|Crisis_{t+T}].$$

This new measure therefore indicates the current cost of potential refinancing a financial firm. Whereas capital shortfall can be negative (a sign of particular good health of a firm), here the measure is an expectation covering only positive values.

Within this setting, the paper provides various, mostly theoretical definitions what can be done with this re-interpretation of SRISK. The literature behind those measures is actuarial (Furman and Zitikis. 2010 and Choo and De Jong, 2010) and may not be familiar to the audience at large.

Main concerns:

- At first reading it is hard to understand what is achieved in this paper. For instance in the Abstract we find that this paper proposes as a refinement to SRISK methodology "to define Systemic Risk in terms of a put..." Now, to define SRISK in terms of a put, hardly seems to be a refinement. Then the Abstract proceeds with a discussion of background risk and systemic risk. Now, background risk in the literature refers typically to a second risk source behind and in addition to a main source, see Franke et al. (2004). The definition here, that background risk is defined as unconditional expectation of the put, comes therefore as a surprise. To summarize this referees requests concerning the abstract: please render the abstract comprehensible to an economic and finance audience and explain in intuitive words what you are doing and not by referring to possible unknown concepts.

- The methodology is applied only to Australian banks. To apprehend the usefulness of the proposed extension it would have been nice to have a comparison with say American firms. For such firms risk measures are available (see Rob Engle's VolLab SRISK page) and can be used as benchmarks.

- On page 7, the paper makes the same counterfactual assumption as the literature that in case of a stress a bank has constant debt. This is of course counterfactual since depositor will withdraw their funds. This should be refined.

- Similarly, later on it is assumed that the prudential parameter $\kappa = 8\%$ is the same for all firms. Banks with riskier asset structure should have a different κ than banks with relatively safe investments. This should be incorporated too.

- There are sentences which are hard to understand. For instance, on page 2 we find: 'we take the stressed expectation of the put value.' First of all, this does not tell the regulator why this measure is important for him. Second, in a purely mathematical sense, the value of a put is a positive real number - a price. Taking a stressed expectation of such a number is meaningless. Do you mean: we take the stressed expectation of an expression which is alike the payoff of a put?

- Still on page 2, a few lines down, we find: 'We decompose SRISK into background stress and imposed system stress.' However, since both components are not defined it is sort of hard to follow what is meant in the following discussion. There, one

is also promised a 'sharper focus on the incremental impact of further market conditions.' This promise is not really fullfilled.

- On page 11 we find that the expectation of the payoff similar to a put could be evaluated under a risk neutral measure and not under the projection of the actual measure. To this referee it seams that what matters to the regulator and the taxpayers is the actual amount that the firm would need and not the risk neutral one. Also, since there is no duplication strategy, markets are not complete, it is not clear that even if one were to price a put in a finance sense that to go risk neutral is the right thing to do.

Minor concerns:

• The reference to the Giglio et al paper (2015) is provided below but should have figured in the paper. • Use the same notations for capital shortfall (formula (1) etc, as in Brownlees and Engle, 2010, 2015). This would really simplify reading the paper for someone with knowledge of the earlier literature.

References

[1] Guenter Franke, Richard C. Stapleton, Marti G. Subrahmanyam, (2004), Background risk and the demand for state-contingent claims, Economic Theory, 321-335.

[2] Stefano Giglio, Bryan Kelly, Seth Pruitt, (2015), Systemic Risk and the Macroeconomy: An Empirical Evaluation, University of Chicago Booth School of Business Working paper.