Discussion of:

"Insurers as Asset Managers and Systemic Risk"

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In a nutshell

- U.S. life insurance industry provides variable annuity (VA) guarantees $\Rightarrow$ akin to writing a put option.

$\Rightarrow$ δ-hedging implies short stocks, long bond position.

- Since expected returns on stocks are higher that expected returns on bonds, δ-hedging reduces portfolio expected returns.

$\Rightarrow$ guarantees providers twist portfolios toward illiquid bonds to "reach-for-yield" (in the model and in the data – but no causality for the latter).

- Negative shocks cause fire-sale of illiquid bonds (and other assets).

$\Rightarrow$ systemic externality of fire-sale due to large price impact of illiquid assets.

- Model calibrated using (great!) insurer level data $\Rightarrow$ large shocks can wipe out 20-70% of insurers' equity capital.

Overall: very good idea and interesting paper.

The Model

- 3 periods: $t = 0, 1, 2$

$t = 0$

- Insurer "wakes up" with δ-hedging need: short $h|\delta|g$ stocks, and long bonds by same amount.
- Two bonds, I and L, and $\mathbb{E}r_S > \mathbb{E}r_I > \mathbb{E}r_L$
- Risk neutral insurer chooses portfolio, $\alpha_S, \alpha_I, \alpha_L$ to maximize expected returns conditional on:
  1. (linear) fire-sale policy (and exogenous probability) $\Rightarrow$ i.e. sub-optimal.
  2. amount (not expectation) and price impact of fire-sale s: no effect on S and L, but externality on I.
  3. current (but not future) capital-adequacy-ratio constraint:

$$E/A \geq \rho\left(\alpha_S \gamma_S + \alpha_I \gamma_I\right), \quad \gamma_i = \text{risk weight and } \gamma_L = 0$$

But: when the shock comes, $t = 1$ constraint causes de-leveraging...

  4. current (but not future) hedging constraints: $\alpha_L + \alpha_I \geq h|\delta|g$

$\Rightarrow$ mix of "myopia" & "perfect foresight" $\Rightarrow$ not REE $\Rightarrow$ better microfoundation needed.

Solution: given returns ranking and myopia (and parameter restrictions), portfolio weights = corner solution of constraints plus max α_S.

The Model cont'd

$t = 1$ economy wide asset shock ε and de-leveraging-induced (total) fire-sale of S bonds at discount c_0, and $s = (\varepsilon + \alpha_I c_0 S)\frac{A-E}{E}$ (direct+price impact effects)

Note:
1. effect of α_I on s (and S) ignored at time 0? Myopic wrt both individual and equilibrium effects.
   $\Rightarrow$ overexposure to fire-sale shock wrt non-myopic solution.
2. ignores post-shock required change in δ-hedging.
   $\Rightarrow$ overestimate fire-sale of bond, since adjusting the hedge would require buying more bonds after negative shocks ($\uparrow g$ & δ)

$t = 2$ assets deliver expected returns (unaffected by shock – only portfolio composition is).

- Model carefully calibrated to quantify equity effect of time 1 shocks.

Comments & Doubts: I. Pricing Effect

I. Similar setting to portfolio insurance models / δ-hedging & Black Monday: Grossman (1988), Grossman & Villa (1989), Brennan & Schwartz (1989), Grossman & Zhou (1996), Basak (1995, 2002) ...

$\Rightarrow$ Insurer's δ-hedging changes everything: asset volatility and IV, risk premia, market price of risk, etc. both unconditionally and conditionally

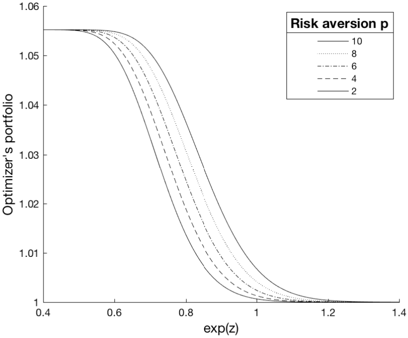
$\Rightarrow$ shocks have price impact and change expected returns.

But: paper rules out any such effect. Is it a good approximation?

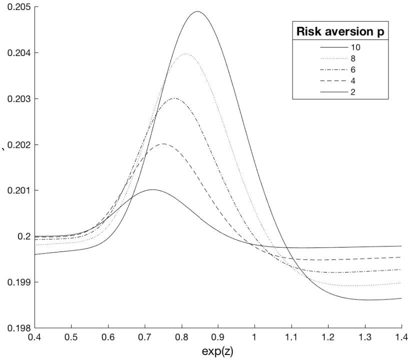
Check: simplified version of Danilova, Julliard and Stoev (2018):

1. Lucas tree, finite horizon economy & GBM log fundamental, z.
2. CRRA Lucas household/optimizer: maximizes expected utility of final wealth.
3. Insurer trades continuously to hedge dynamically the short put position.

$\Rightarrow$ calibrate to relative magnitudes in the paper and in the market. Key: size of insurers hedging needs relative to total market size.



(a) household holding of stock

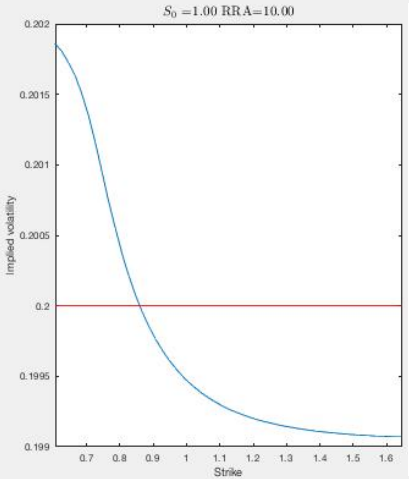


(b) return volatility

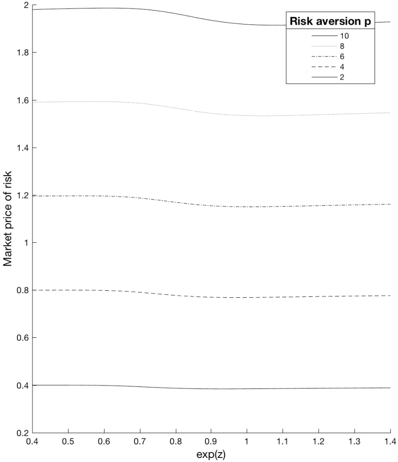
- Insurer shorts more and more as fundamental worsen.

But: (a) magnitude of reallocation is small due to relatively small hedging needs $\Rightarrow$ (b) small effect on volatility

Comments & Doubts: I. Pricing Effect con't



(a) implied volatility



(b) market price of risk

- Generates smirk and time varying MPR (and risk premia)

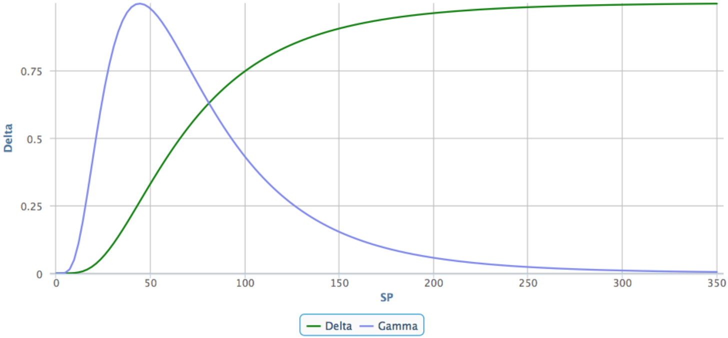
But: quantitatively very small effect due to "small" hedging needs.

⇒ the **no-stock-spillover assumption is not bad in this case**

II. Note that after a stock shock ε_S:

$$\delta_1 = \delta_0 + \Gamma\varepsilon_S, \quad \Gamma \geq 0$$

$\varepsilon_S < 0 \Rightarrow$ **buy** $\Gamma|\varepsilon_S|$ bonds $\rightarrow$ reduce bond fire-sale (sell $\Gamma|\varepsilon_S|$ of stock $\rightarrow$ spillover to stock market... but small effect).



$|\hat{\delta}| \approx 0.6^*$ large over-estimate of bond fire-sale effects (amplification via externality)

$\Rightarrow$ should account and calibrate for Γ effect.

Comments & Doubts: II. δ-hedging cont'd

Note: similar effect for other shocks, but via g:
$\downarrow A \Rightarrow \uparrow g \Rightarrow$ **buy** $h|\delta|\Delta g$ **more bonds**.

Vega: large shocks normally come with and increase in volatility.

- But an increase in volatility increases the value of a Put option ($Vega_{PUT} > 0$)

$\Rightarrow$ if $\uparrow$ vol $\Rightarrow \uparrow g \Rightarrow$ buy more bonds.

- By and large, **rebalancing the δ-hedge of a put after negative shocks** pushes toward selling stocks and **buying bonds**.

Baseline: disregarding the δ-hedging rebalancing channel cause an over-estimate of fire-sale costs.

Comments & Doubts: III. Myopia

III. Assumed myopia causes over-estimate of fire-sale costs.

- At least 3, mutually amplifying, channels:
  1. The ignored expectation of $t = 1$ capital-adequacy-ratio constraint would increase the $t = 0$ equity ratio

     $\Rightarrow$ reduction in both probability and severity of $t = 1$ fire-sale.

     freebie: discontinuous – jump like – effect of shocks.
  2. insurer disregards the effect of α_I on s (and on S and next period constraint), hence she over-invests in illiquid bonds.

     $\Rightarrow$ magnifies fire-sale pressure on these asset.
  3. unconstrained optimal fire-sale is not linear, it's sequential:
     - i. sell stock to rebalance δ-hedge.
     - ii. sell liquid bond (lowest yield/selling cost) up to short-selling constraint.

       Note: illiquid bond holding might actually increase (δ-hedge constraint)
     - iii. sell illiquid bond and stock to equalize marginal fire-sale costs.

       But: if δ-hedge constraint not satisfied, sell more stocks to buy illiquid bonds.

     $\Rightarrow$ linear fire-sale biased toward illiquid assets $\Rightarrow \uparrow$ fire-sale costs.

Comments & Doubts: IV. Cheap shots

1. The insurer "wakes up" with a δ-hedging need.

But: the quantity of VA insurance, and hence the hedging need, should also be part of the portfolio choice.

⇒ current exercise mid-way between "perturbating the snapshot" (e.g. Greenwood, Landier, Thesmar (2015)) and model calibration...

Note: VA insurance providers, in the data, are very different insurers: what drives the selection?

2. Koijen and Yogo (2017) provides a good framework, that can be formally estimated, to analyze the questions asked in this paper.
   Why should one prefer the current model cum calibration?

3. Use the sampling distribution of the calibrated parameters to estimate confidence intervals for the insurers' equity reduction following a shock.

Baseline

(+) good, natural, and relevant question to ask.

(+) careful data work for calibration, in the hope of accurate <u>quantitative</u> predictions.

(−) modeling has many shortcuts that seem to generate (mostly) one directional bias.

$\Rightarrow$ cast doubts on quantitative accuracy.

Maybe: keep the current model for illustration purposes, but solve numerically a 3 periods, no-shortcuts, rational expectation, model for quantitative predictions/robustness check.