Disastrous Defaults
by
C. Gouriéroux, A. Monfort, S. Mouabbi, J.-P. Renne
Discussion

Pierre Collin-Dufresne
SFI@EPFL and CEPR

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Equity and Credit puzzles

- **Equity Premium Puzzle** (Mehra-Prescott (1985)
  - Average excess stock returns are too high given the low volatility of consumption growth (and standard expected utility representative agent model)

$\Rightarrow$ **Rare consumption disasters** one solution (Rietz (1988)-Barro (2006))

- Consumption disasters $\rightarrow$ stock markets crashes $\rightarrow$ high ex-ante risk-premium

- **Credit Spread Puzzle** (Huang-Huang (2002))
  - Corporate bond yield spreads are too high given historical average loss rate (and standard structural credit risk model)

$\Rightarrow$ **Default Clustering** in recessions one solution (Chen-CD-Goldstein (2009))

- While rare, defaults occur mostly in bad states $\rightarrow$ high ex-ante credit spread

$\Rightarrow$ One way to generate clustering is **contagion** or **frailty** using **Hawkes (1971)** process (Jarrow and Yu (2001), Goldstein et al. (2003), Duffie et al. (2009), Benzoni et al. (2015))

- default of **systemic** entities increase the PD of surviving firms $\rightarrow$ default clustering despite low ex-ante PDs.

- This paper combines rare consumption disasters with top-down credit contagion in a model where defaults of systemic firms:
  (i) increase the PD of surviving firms, and **(ii)** trigger a consumption disaster.

$\rightarrow$ Generates default clustering in bad macro-states to fit both puzzles.

The Model

- The model for aggregate consumption growth:

$$\Delta c_t = \mu_{c,0} + \mu_{c,x} x_t + \mu_{c,y} y_t + \mu_{\mathbf{c,w}} \mathbf{w_t} + \sigma_c \epsilon_t^c$$

  - x, y are standard AR1 business cycle variables
  - **Consumption disaster** $\mu_{c,w} w_t < 0$ with probability $1 - e^{-\zeta n^s_{t-1}} \approx \zeta \mathbf{n^s_{t-1}}$ and 0 else.
  - n^s_{t-1} is the number of systemic firms that default at $t-1$
  - Defaults are Poisson distributed with **default intensity** $\beta_j y_t + \mathbf{c_j n^s_t}$
  - **Contagion** if $c_j > 0$: PD of sector j firms increase with systemic defaults
- Assume representative agent with Epstein-Zin utility and $EIS = 1$
  → Bansal-Yaron (2004) **long-run risk** exponential affine pricing kernel.
  → **Exponential affine pricing** of equity, options, CDS, CDO tranches,...
- Kalman-Filter estimation of (most) model parameters using Euro Stoxx50 equity options, iTraxx credit index and tranche bi-monthlydata from 2006 to 2017
- Find empirical evidence for
  - **credit contagion** $c_j > 0$: one systemic firm default increases expected number of defaults by 0.76 within 2-months.
  - **consumption disasters** $\mu_{c,w} < 0$: one systemic firm default triggers 3% drop in aggregate consumption within 2-months.

Too systemic-to-fail and disastrous defaults?

- If a handful of (known) systemic firms' defaults are responsible for macro-economic consumption disasters, then shouldn't government bail them out to:
  - Eradicate consumption disasters and improve welfare.
  - Equity premium and credit spread puzzles would disappear!
  - (Assuming induced moral hazard cost $<$ cost of 3% drop in aggregate consumption).
- Kelly, Lustig, Van Nieuwerbrugh (2016) suggest that 'too-systemic-to-fail' firms have lower option-implied tail risk due to high bailout probability priced in by market.

But Bai, Goldstein, Yang (2019) disagree.

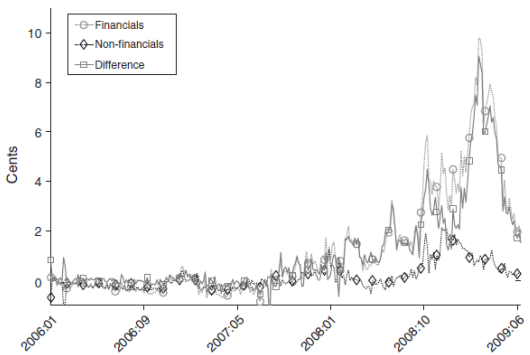

FIGURE 2. BASKET-INDEX SPREAD (*Puts Minus Calls*) ACROSS SECTORS

Notes: Basket-index spreads (puts minus calls) for the financial sector (marked by circles), the nonfinancial sector (marked by diamonds), and their difference (financials minus nonfinancials, marked by squares). Units are cents per dollar insured. Delta is 25 and time to maturity is 365 days.

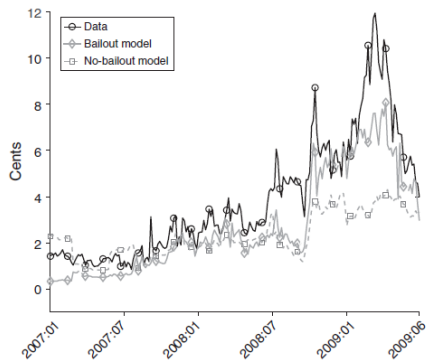

FIGURE 6. BASKET-INDEX SPREADS IN BAILOUT MODEL

Notes: Basket-index put spreads for the financial sector in the data (marked by circles) and in the MJ model with bailouts (marked by diamonds) and without bailouts (marked by squares). Fits for each model are based on the jump parameters estimated from options data and are reported in the main text. Delta is 25 and time to maturity is 365 days. Units are cents per dollar insured.

$\rightarrow$ KLN suggest systemic firms have **lower** credit spreads $\neq$ this paper's predictions!

$\rightarrow$ An example: the CDS of Lehman rose to only around 350bps in the summer of 2008.

A general comment on disaster models

- Equity premium puzzle was established by Mehra & Prescott in **(1983)**
- The out of the money put premium appeared in **1987** (Rubinstein (1994))

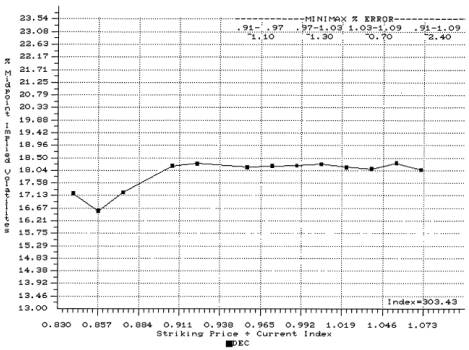

Figure 1. Typical precrash smile. Implied combined volatilities of S&P 500 index options (July 1, 1987; 9:00 A.M.).

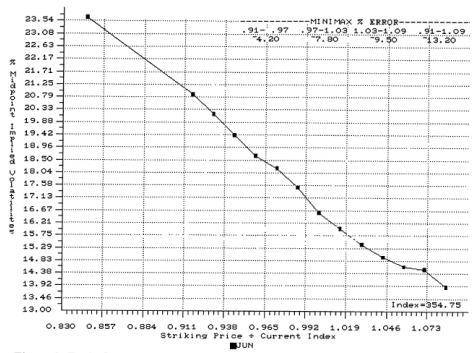

Figure 2. Typical postcrash smile. Implied combined volatilities of S&P 500 index options (January 2, 1990; 10:00 A.M.).

$\Rightarrow$ M&P could not have explained the puzzle with disasters calibrated to options! **Why?**

A1 Disasters were not the right explanation for the puzzle before 1987. Are they now?

A2 Disasters were the right explanation, but

- Option and stock markets were segmented and options incorrectly priced tail risk, or
- Both markets are learning the distribution of disasters and updating has more dramatic effects on options (Benzoni et al. (2011)).

- Consistent with learning, one sees "regime-shifts" and repricing also in CDO tranche markets (e.g., around GM-Ford downgrade, LEH default . . .).

$\rightarrow$ Intepretation of stationary distribution implied ex-post from time series of derivatives?

$\rightarrow$ Would be nice to test predictions around actual systemic defaults (LEH, Bear. . .).

Concluding comments

- Nice paper, impressive model, and useful closed-form solutions for all kinds of derivatives (stock, options, CDS, CDO tranches. . .)
- Careful empirical analysis using the Kalman-Filter that finds support for **disastrous defaults**:
  → Systemic firms lead to default contagion and 3% drop in consumption.
- How to think about the **"to-systemic-to-fail"** issue?
  → Systemic firms are the one most likely to be bailed out, which would reduce the probability of contagion and of consumption disasters.
- **Implied distributions** from derivative markets, especially in their early days, don't seem stationary as **markets learn** about the distribution of risks that are 'payoff-relevant' for these markets.