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# Leverage causes fat tails and clustered volatility

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Abstract

We build... funds us... systema... price flu... across... bank... permit... their we... fluctuati... causes t... moveme... losses. T... are dominant, they damp volatility, and after the crash, when they suffer severe losses,

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volatility is high. This leads to power-law tails, which are both due to the leverage-induced crashes and due to the clustered volatility induced by the wealth dynamics. This is in contrast to previous explanations of fat tails and clustered volatility, which depended on 'irrational behavior', such as trend following. A standard (supposedly more sophisticated) risk control policy in which individual banks base leverage limits on volatility causes leverage to rise during periods of low volatility, and to contract more quickly when volatility becomes high, making these extreme fluctuations even worse.

Keywords: Systemic risk Clustered volatility Fat tails Crash Margin calls Leverage

JEL Classification: E32 E37 G01 G12 G14

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## Notes

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‡The failure of Long Term Capital Management in 1998 was an example of a near-crisis caused by the precise mechanism discussed here. Some other types of investment strategies, such as trend-following or portfolio insurance, cause nonlinear feedback in prices, which is further amplified by leverage.

†Using a positive survival threshold for removing funds avoids the creation of 'zombie funds' that persist for long periods of time with almost no wealth.

‡Some of the references that document or discuss the flow of investors in and out of mutual funds include Chevalier and Ellison ([1997](#)), Remolona et al. ([1997](#)), Sirri and Tufano ([1998](#)), Busse ([2001](#)) and Del Guercio and Tka ([2002](#)).

†We measured  $\gamma$  using a Hill estimator (Hill [1975](#)) based on the largest 10% of the returns. The value of  $\gamma$  when  $\lambda = 1$  should be infinite, in contrast to the measured value. Large values of  $\gamma$  are difficult to measure correctly, whereas small values are measured much more accurately.

†This actually happened when the Bear-Stearns hedge funds went out of business; the bank attempted to sell the underlying assets, but the liquidity was so low that they gave up and simply held them.

†There are two reasons why aggressive funds grow faster than passive funds. The

superior management of aggressive funds grows faster than passive funds. Aggressive funds can drive the market to a point where they can use them to their advantage. Aggressive funds are less likely to shrink.



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