

## Tail Risk at Banks<sup>1</sup>

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In order to address the risk of systemic crises it is of paramount importance to have advance information about banks' exposures to large (negative) shocks. In this paper we develop a forward-looking measure of bank tail risk. We define a bank's (systemic) tail risk as its exposure to a large negative market shock. We measure this exposure by estimating a bank's share price sensitivity to changes in far out-of-the-money put options on the market, correcting for market movements themselves. As these options only pay out in very adverse scenarios, changes in their prices reflect changes in the perceived likelihood and severity of market crashes. Banks that show a high sensitivity to such put options are hence perceived by the market as being severely affected should such a crash materialize. As this sensitivity reflects perceived exposures to a hypothetical crash, it is truly forward-looking in nature. This property is important to the extent that bank risks change quickly and hence historical tail risk exposures become less informative. Another advantage of this method is that it does not require the actual observation of any crashes, as the method relies on changes in their perceived likelihood.

We use our methodology to estimate tail risk exposures of U.S. bank holding companies. We find that the estimated exposures are inversely related to their CAPM beta. This seems a very interesting result with potentially important implications for financial regulation as it suggests that banks that appear safe in normal periods actually tend to be the banks that are most exposed to crashes. This may be because such banks follow tail risk strategies. We also compare our measure to a common measure of bank tail risk: the tail risk beta, which is obtained through quantile regressions. We find that both measures are fairly uncorrelated and hence provide different information. A potential explanation for this lies in the backward-looking nature of the tail risk beta and the fact that its estimation relies on observing (rare) tail risk events.

We also use our methodology to characterize the main drivers of bank tail risk. Understanding these drivers is important for regulators as it gives them information about which activities should be encouraged and which not. Our main findings are that variables which proxy for traditional banking activities (such as lending) are associated with lower perceived tail risk. Several non-traditional activities, on the other hand, are perceived to contribute to tail risk. In particular, we find securities held for-sale, trading assets and derivatives used for trading purposes are associated with higher tail risk. These findings are consistent with observed experience in the current crisis. Interestingly, securitization, asset sales and derivatives used for hedging are not associated with an increase in tail risk exposure. This indicates that a transfer of risk itself is not detrimental for tail risk, but that non-traditional activities that leave risk on the balance sheet are. On the liability side we find that leverage itself is not related to tail risk but that large time deposits (which are typically uninsured) are. We also find that perceived tail risk falls with size, which is indicative of bail-out expectations due to too-big-to-fail policies. [Read full paper.](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1523894)

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