

**VaR and Stress Tests:  
The Impact of Fat-Tail Risk and Systemic Risk on  
Commercial Banks in Hong Kong and China**

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**Summary**

This study proposes to use the stable Paretian distribution to replace stress tests in estimating Value-at-Risk (VaR) and extreme risk. We show that “fat-tail” risk requires more capital than the “normal tail” risk estimated by the conventional VaR, which assumes normal distribution. Our results could explain why most banks in Europe and Asia maintained higher capital levels than required by regulators before the 2008 financial crisis. Banks and financial companies held more capital to protect their institutions against abnormal risk that might reflect off-balance sheet activities, rather than regulations. Their behaviour therefore was rational and the “high” capital level was not “excessive” after considering fat-tail risk.

Our empirical results confirm that the stock returns of the banks in Hong Kong and Mainland China were fat-tailed and had time-varying systemic risk. The difference between the aggregate Total Risk Tolerance (TRT) and the probability of Extreme Market Losses (EMLs) with stable and normal distributions were significant statistically from 2007 to 2009 and from 2011 to 2013. We believe they were related to the US subprime mortgage crisis and its “spill-over” effect to the European countries. We found that only Hang Seng Bank had sufficient capital to overcome all crises between 2007 and 2016. Another large bank, HSBC, had relatively low TRT. Off-balance sheet activities and leverage were higher for smaller commercial banks in Mainland China. Larger policy banks in Mainland China were relatively healthy financially.

The findings of this paper have significant implications for policy making and risk management. The micro-prudential policy that attempts to discipline shareholders against excessive risk seeking should be modified to address fat-tail risk, which can influence the “social” optimal level of diversification of individual banks. Macro-prudential policy, which controls counterparty risk and contagion, must also consider the statistical properties of risk. If the fat-tail statistical properties cannot be changed, regulators may have to set up policies to restrict the investments and/or assets of financial companies. Re-regulation, rather than de-regulation, may be necessary. Note that the bill to repeal Dodd-Frank was passed in June of 2017. Another Great Recession may therefore appear after five to ten years.