

Beyond “The Right Answers to The Wrong Questions”
Risk, Missed Opportunities and Financial Crises
Dr. Ana Cascon and Dr. William F. Shadwick
Omega Analysis Limited

As in 1929, the current financial crisis involved irrational exuberance and leverage. Banks were badly exposed this time as well, although not through direct equity investments. They were also very highly levered, even in comparison to 1929.

In retrospect, one of the consequences was obvious. There was a bubble in financial industry stocks worldwide and in bank stocks in particular. Many large equity portfolios were exposed to severe losses as this bubble burst.

This week we turn to the question of what our Extreme Value Theory based Expected Shortfall technology would have told an investor about the downside risk in his share holdings in two large Canadian banks, CIBC and RBC, from January 2005 through July 2010.

We'll use expected shortfall as a common risk measure to compare the two. Our EVT technology is used to estimate the 1-day 99% Value at Risk (VaR) and the 1-day 99% Expected Shortfall (ES). All of our estimates are based on end of day returns from the previous year of trading—so the results are available daily at market close and can be acted upon during the following market day.

As a test of the reliability of the 99% EVT VaR estimates, we should see 1 VaR violation per 100 days out of sample. There were 1395 days out of sample and each bank had 15 VaR violations in that period—so there is a very good fit between our predictions and the observations.

Figure 1 shows the 1-day 99% ES levels for the two banks from January 2005 through July 2010. Over most of this period RBC has presented significantly less downside risk than CIBC by this measure. In particular, CIBC risk levels increased dramatically in the autumn of 2007 so there is also a good fit between our predictions and the ensuing market events.

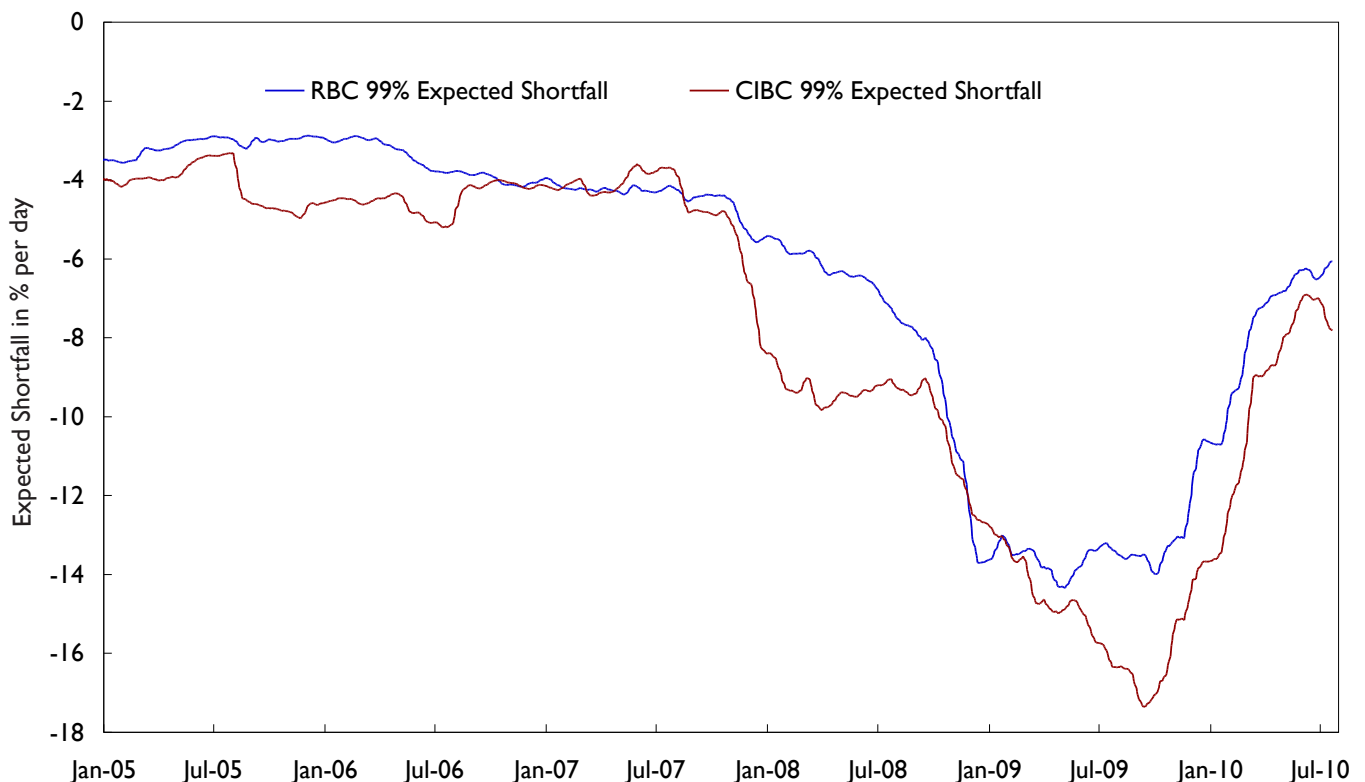


Figure 1. One-day 99% Expected Shortfall levels for CIBC and RBC January 2005 - July 2010.

Although both banks had dramatic losses before making strong recoveries in 2009, the peak to trough loss in RBC was less than CIBC (53% compared with 62%).

While counting VaR violations gives a good indication of the accuracy of the VaR estimate, we cannot judge the ES estimates in the same way. On the other hand, we know that the tails of the EVT distributions are highly asymmetric so there should be significantly more area between the 99% VaR and the 99% ES than there is to the left of the 99% ES. (See Figure 2). This means that we can treat the ES as though it were an approximate lower bound.

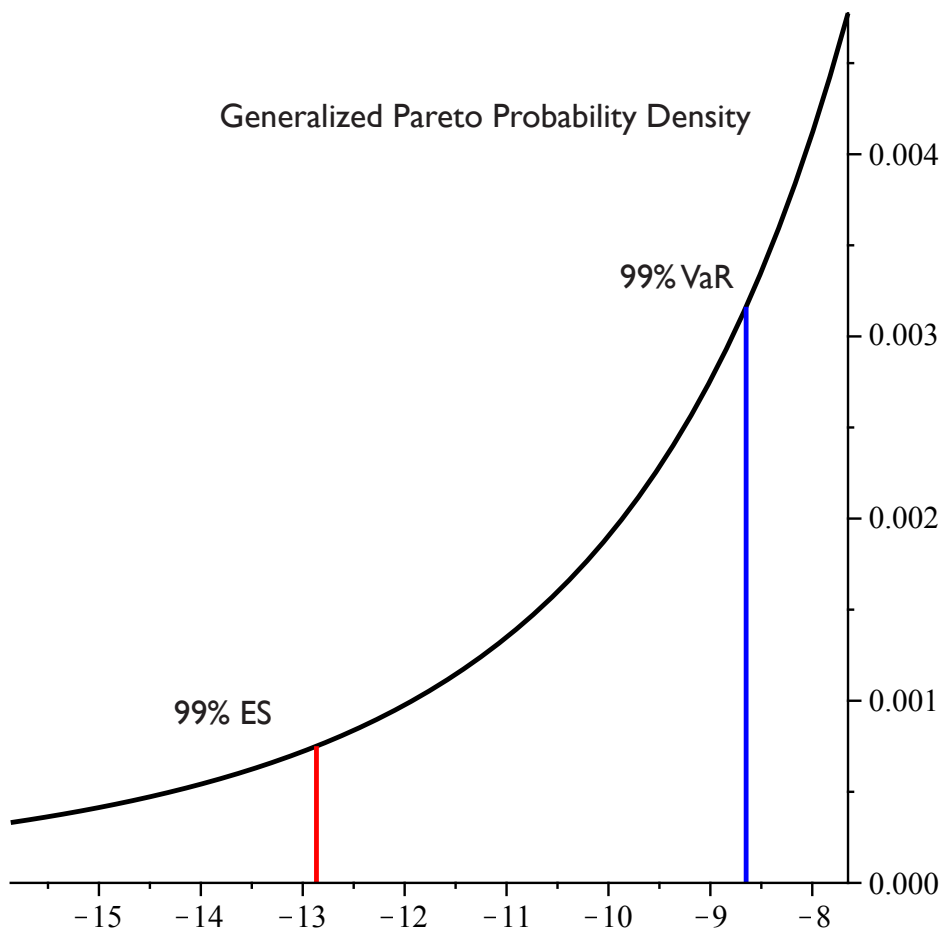


Figure 2. A Generalized Pareto tail. In this example, the probability of a return below the 99% ES level is less than half of the probability of a return between the 99% VaR and 99% ES levels.

An accurate ES estimate can be exploited for ‘risk timing’. We can adjust the size of a position so that its expected shortfall is controlled to a pre-assigned level. The objective is to maintain a constant risk exposure by moving money from shares to cash when risk exceeds the tolerance level. When the downside risk is low, borrowing increases exposure to maintain the target level.

We can judge the accuracy of the ES estimates by how well this risk timing process controls the future downside exposure. The risk threshold has been set at a one-day loss of 4% in our examples.

The results are shown in Figures 3 and 4. The risk timing proved very successful for both the CIBC and RBC share holdings with only rare breaches of the risk threshold.

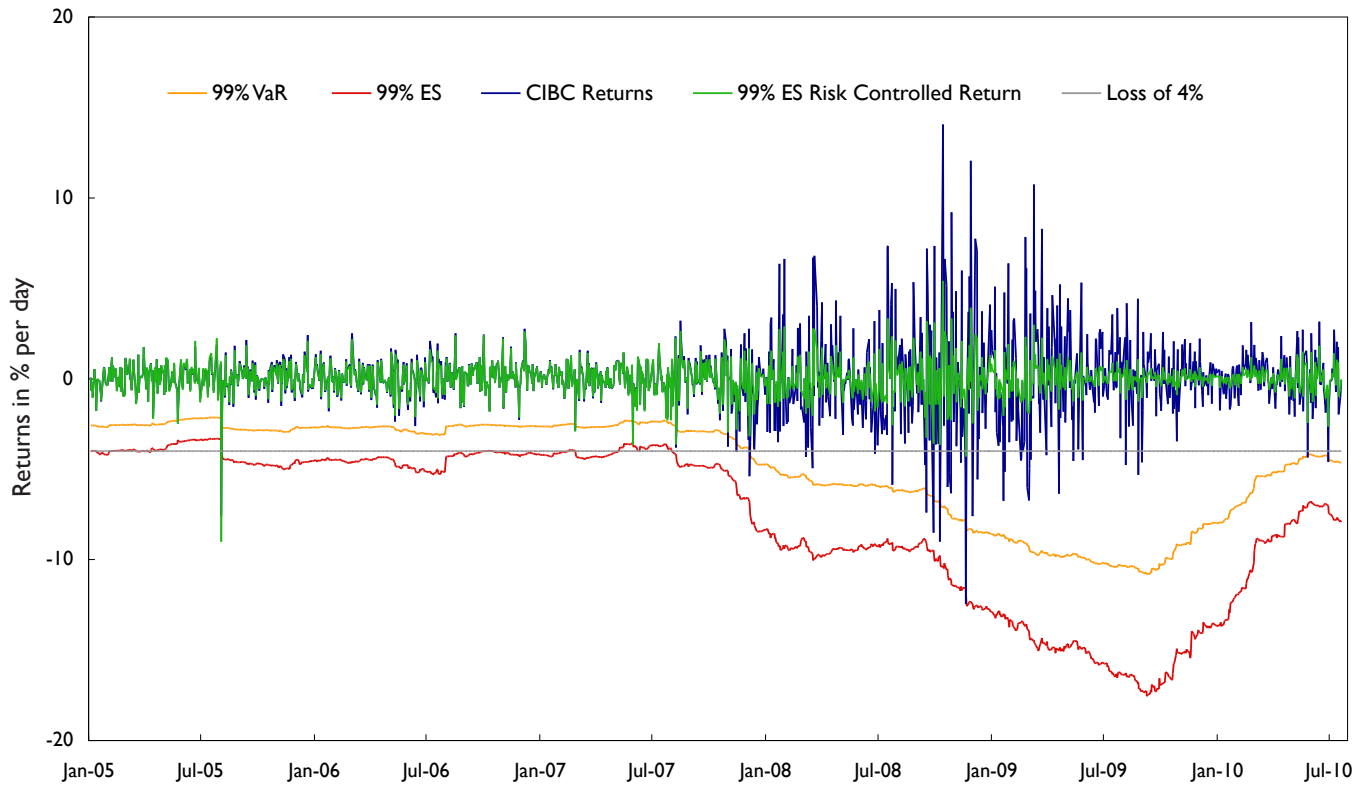


Figure 3. CIBC returns with and without risk control. January 2005 - July 2010.

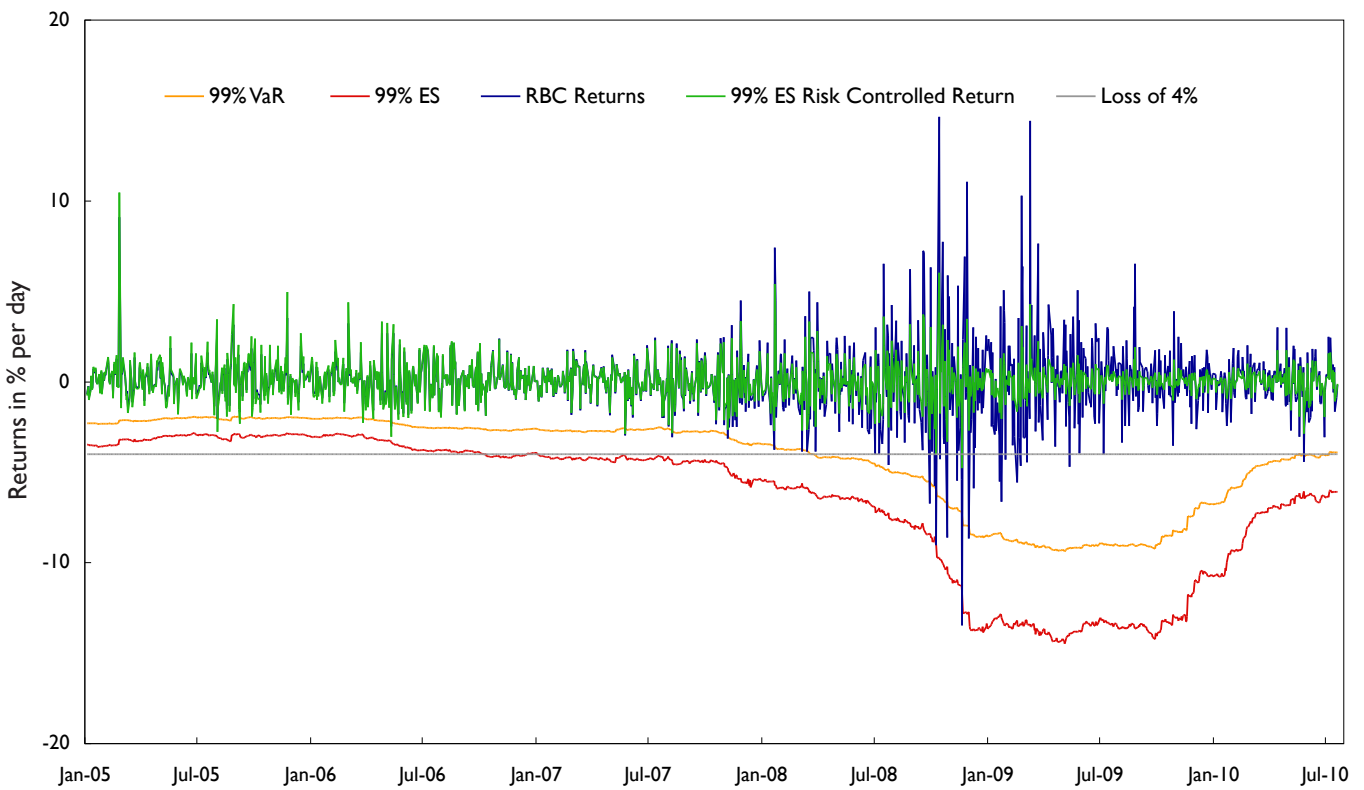


Figure 4. RBC returns with and without risk control. January 2005 - July 2010.

Prior to the summer of 2007, the downside risk was low, especially for RBC. This allowed some modest leverage in both share holdings. Following the summer of 2007, however, volatility exploded and losses well in excess of 4% became frequent in the raw returns. For CIBC there were 37 such losses with an average 5.65%. In the risk-controlled returns there was only 1– a loss of 4.2%. In the case of the RBC losses, 21 were in excess of 4% while in the risk-controlled returns there were only 2, with an average of 4.4%.

In this brief series of articles we have shown that statistical analysis provides a meaningful assessment of risk and that equity market risk can be modelled successfully using Extreme Value Theory and Expected Shortfall. Only lack of space prevents us from extending this account beyond equity markets. We have conducted numerous analyses of other financial instruments and the results are very similar.

While it is undoubtedly true that naive statistical methods are incapable of adequately assessing risk in financial markets, if appropriate statistical tools, EVT and ES, are used, the likelihood and severity of losses in these markets can be accurately estimated. As a result, the risks can be controlled.

Ana.Cascon@OmegaAnalysis.com William.Shadwick@OmegaAnalysis.com