

ENTERPRISE RISK MANAGEMENT

ERM

Symposium

Where Cutting Edge Theory Meets State of the Art Practice

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Comprehensive Assessment of Risks

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Agenda

- Overview of Section III of the ICAAP E-19 Guideline
- The Big Three Risks that Require Your Focus
- Addressing the Risks that are Not Captured by Traditional Metrics – the Other Risks
- Addressing Concentration Risks in an Equity Portfolio
- Credit Risk & Jump-to-Default Risk
- Identification through Heteroscedasticity – Useful Methodology for Calibrating Scenario Shocks
- Assessing Systemic Risks
- Conclusions

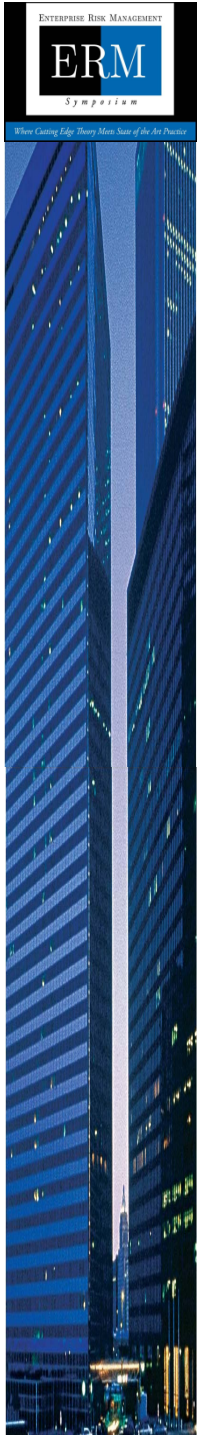


Overview

- The ICAAP should address **all material risks faced by the institution** as they relate to the adequacy of capital, including all risks explicitly captured in minimum regulatory capital requirements **as well as risks that are not fully captured under minimum regulatory capital requirements.** The techniques used in assessing material risks should be commensurate with the scope and complexity of the institution's risk taking activities.
- Institutions should account for the known unknowns, as well as, the **unknown unknowns.**

Overview - Comprehensive Assessment of Risks

- Credit Risk
- **Risk Concentration**
- **Risk Diversification**
- Securitization
- Cross Border Lending
- Operational Risk
- **Market risk**
- Interest Rate Risk in the Banking Book
- **Liquidity Risk**
- **Other Risks**



Overview of Risk Management Problems that Arose During the Crisis – The Big Three (Liquidity Risk, Gap Risk & Complexity Risk)

- Failure to adequately account for liquidity risk: Many standard risk and factor models make assumptions related to the ability to enter and exit a given exposure that were not consistent with the actual liquidity observed during the crisis.
 - As with correlation and volatility, liquidity can also be highly stochastic. When evaluating the risk associated with our portfolios, we need to account for the highly variable nature of liquidity.
 - Bid-Ask spreads and volumes observed during most normal market conditions are not a good indication of the liquidity risk that we need to account for in our risk assessments.
 - Volumes on complex instruments tended to be negatively correlated with valuation during stressed market conditions



Overview of Risk Management Problems that Arose During the Crisis – The Big Three (Liquidity Risk, Gap Risk & Complexity Risk)

- Most market risk metrics, such as Value-at-Risk (VaR) actually detract attention from gap risk. The lower left-hand tail of the distribution can often be quite distant from the calculated VaR.
- Traded products that are characterized by complexity tended to be accompanied by significant volatility in their realized liquidity during the crisis and by gap risk, that was not well captured by industry-standard risk metrics.
 - Due to their complexity, risk metrics can be more susceptible to measurement error and their marking is more susceptible to manipulation.
- Correlation across liquidity risk, gap risk, and complexity risk tended to be very high in a manner underappreciated by many risk managers.

Stochastic Liquidity – A Case Study

- Distribution of traded volumes for Max Petroleum from Jan. 1, 2007 through Jan. 31, 2010

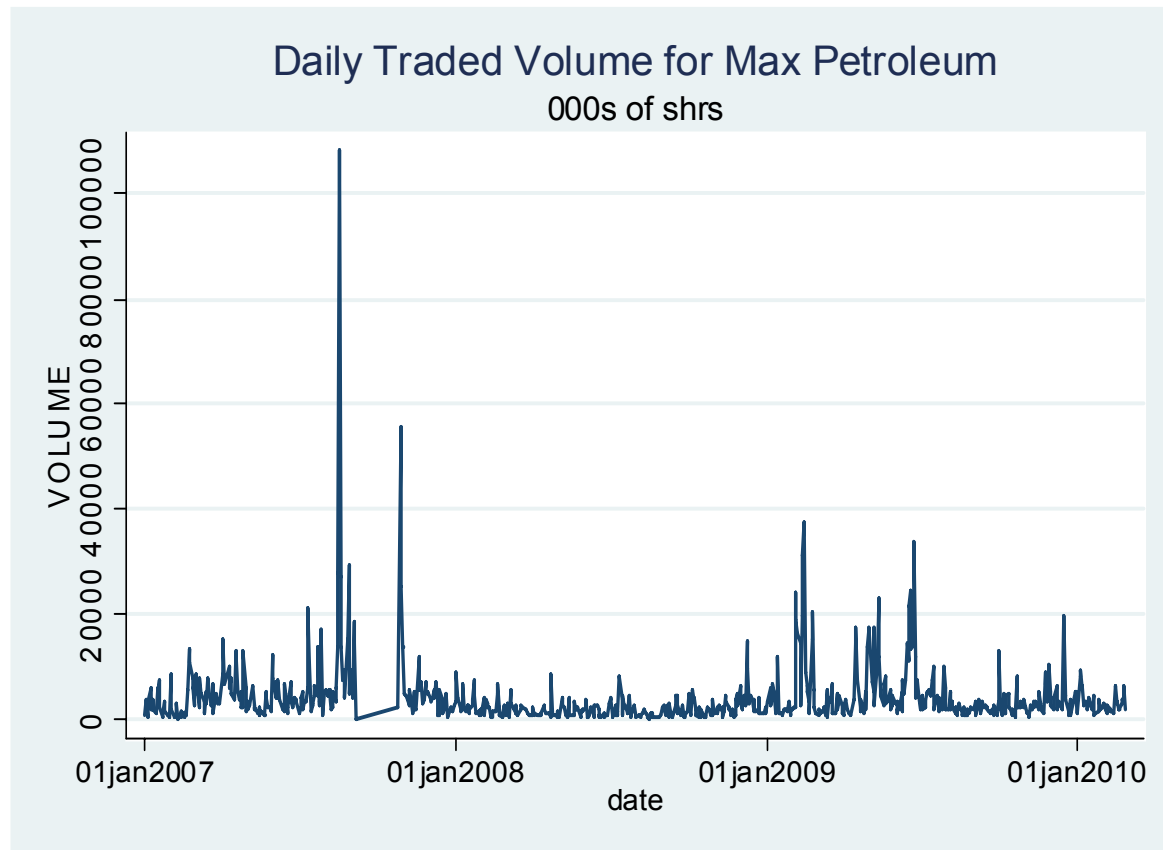
| <u>Traded Volume</u> | | | | | |
|----------------------|----------|-------------|-----------------|-----------------|-----------|
| Percentiles | | Smallest | | | |
| 1% | 276437 | <u>3789</u> | | | |
| 5% | 523588 | 107790 | | | |
| 10% | 720124 | 189059 | Obs | | 765 |
| 25% | 1381598 | 205475 | | | |
| 50% | 2458025 | | Mean | | 4,069,271 |
| | | Largest | Std. Dev. | | 6,192,614 |
| 75% | 4570253 | 3.39e+07 | | | |
| 90% | 7939379 | 3.77e+07 | Variance | 3.83e+13 | |
| 95% | 1.38e+07 | 5.58e+07 | Skewness | 8.240639 | |
| 99% | 2.71e+07 | 1.08e+08 | <u>Kurtosis</u> | <u>116.3561</u> | |

- Liquidity for this stock is strongly correlated with returns, i.e., sharp down days are characterized by significant drops in traded volumes and widening of bid-ask spreads.
- For a holding of 5 million shares, using the average volume over our sample period, we could exit our position in well under two days with relatively little slippage. During the stress periods, this two-day exit period jumps to 46 days!



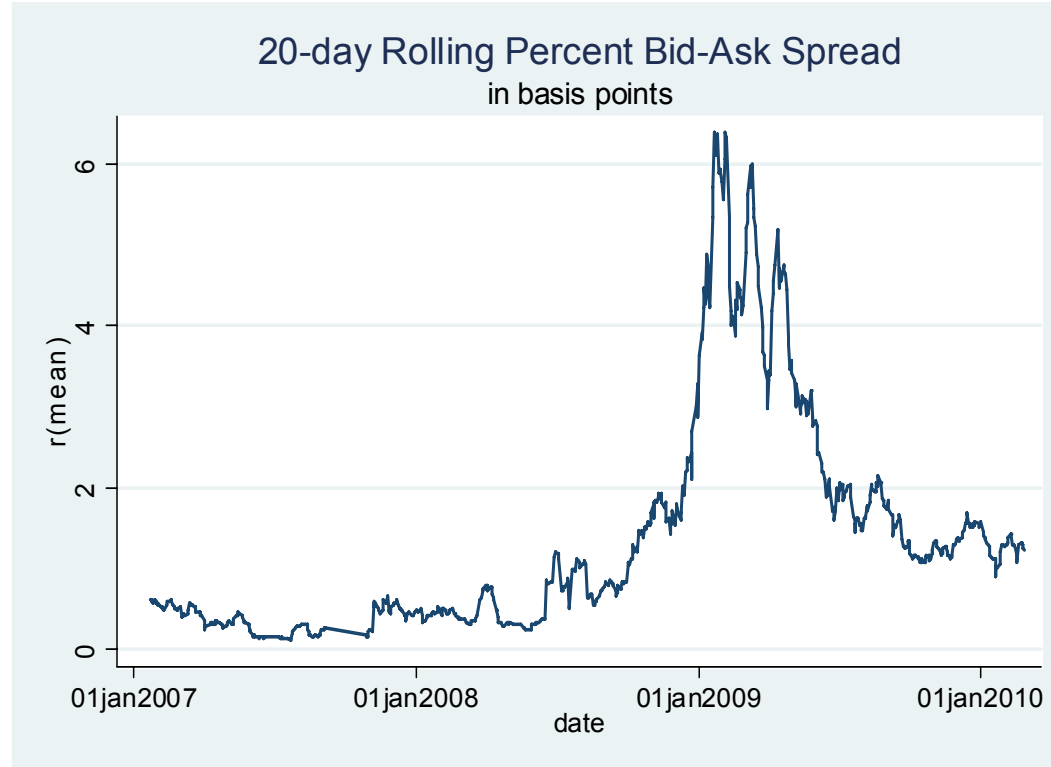
Stochastic Liquidity – A Case Study

- Trading was temporarily suspended for a period in late 2007, visible on the graph below, with very sharp jumps in volumes prior and after the trading suspension, which corresponded to significant negative returns in the stock. Liquidity as represented by daily traded volumes is a non-stationary process.



Stochastic Liquidity – A Case Study

- The percent bid-ask spread for Max Petroleum varied from a low of 8 bps to as high as 15.4% or 1,540 bps in early 2009.
- Smoothing out the proportional bid-ask spread over 20-day rolling periods yields the view below.





Stochastic Liquidity – A Case Study: Correlation of Underlyer Returns and Liquidity as a Predictor of Underlyers that are Prone to Liquidity Risk

- How do we identify those holdings that may be most prone to stochastic liquidity?
- Instead of simply monitoring the average daily trading volume, the ubiquitous ADTV, and bid-ask spreads, add the correlation between underlyer returns versus these two liquidity metrics.
- In studies of underlyers exhibiting significant jumps in bid-ask spreads during the crisis, two very good predictors of potential liquidity risk ex ante, are ***the rolling correlation of returns versus volumes & bid-ask spreads.***
- Tracking these additional metrics on a cross-sectional basis and over time are ***valuable for highlighting emerging or embedded liquidity risks for holdings in your portfolio.***

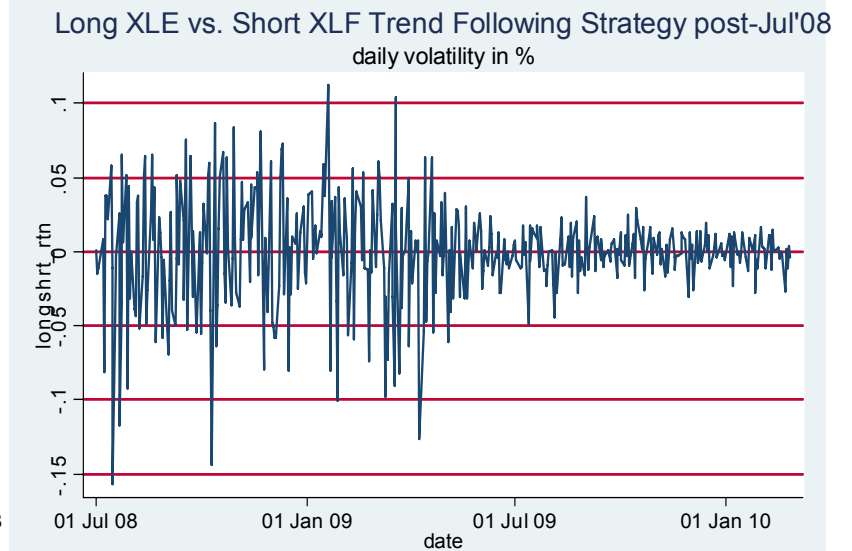
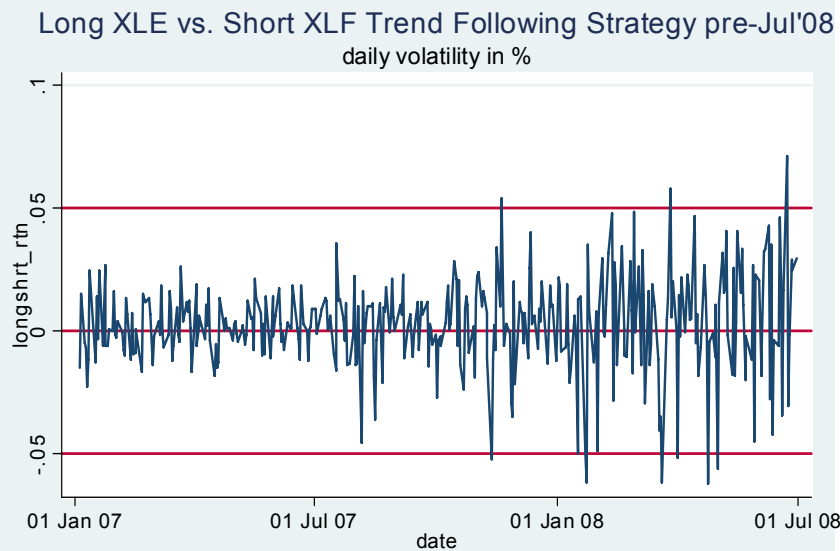


Major Challenges to Standard VaR Risk Metrics

- Assuming the industry standard VaR calculation using an agreed period of historical time-series such as two or three years to represent portfolio risk, VaR has tended to be overused due to its simplicity and the emphasis of the regulators on its use through the Basel Accords.
- VaR can distract risk managers from the “Big Three” risks that are not well-captured in VaR: liquidity risk, gap risk & complexity risk.
- VaR can suffer from the “irrelevant history problem”, i.e., using a three-year time-series history for VaR, most interest rate moves have tended to be large rate cuts in 2007 – 2008. For a bond portfolio, the biggest risk looking forward may not be from rate cuts, but from potential rate hikes.
- VaR can give risk managers a false sense of security. When one sees all of those precise numbers being generated for your portfolio on a regular basis, one can begin to believe that they are accurately portraying all of the risks relevant for the portfolio. This leads to the potential problem of being “precisely wrong, rather than approximately correct” with respect to risk measurement.
- Relevant variance/covariance matrices for portfolio returns are non-stationary.

VaR's Irrelevant History Problem: Financials vs. Energy in 2008

- In 2008, there were many momentum trading strategies that pointed towards shorting financials and buying energy names. A reasonable summary of this trade is the relative performance of the sector ETFs, the XLF vs. the XLE. The two graphs below indicate daily volatility before and after July 2008.



Other Important Indicators Not in VaR Presaging XLF/XLE Unwind

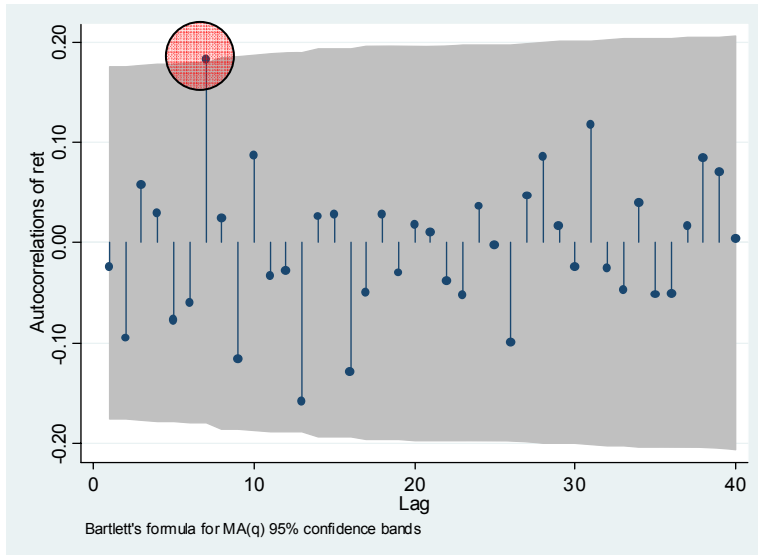
- Rate of growing short interest prior to the reversal - Costs of borrow on financials becoming noticeably higher in late June 2008 was indication of a “crowded trade.”
- Sharp increase in the returns to the strategy in the second half of June of 2008 as measured by serial correlation in returns was another indication of a “crowded trade.”



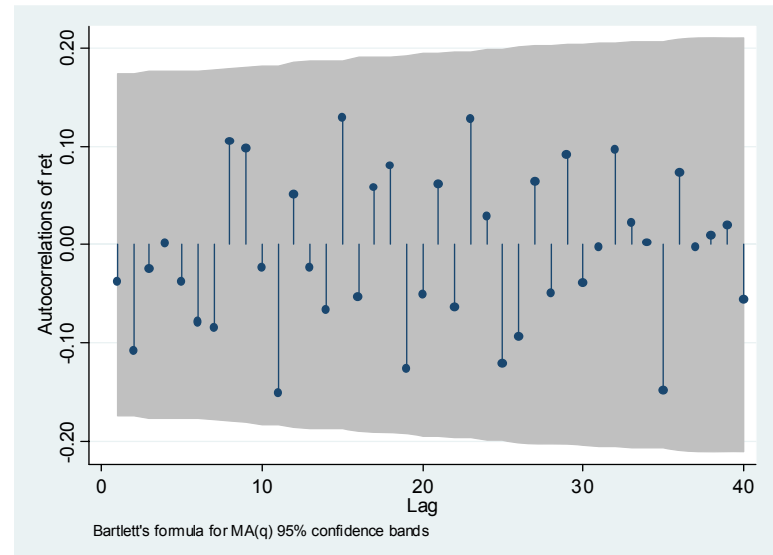
Using Autocorrelation to Signal Increased Risk

- Consistent with lessons learned from the Quant sell-off of Aug. 2007, we observe spikes in serial correlation in strategy returns prior to shifting into a riskier trading regime. Autocorrelations spike above 20% in June '08 for the Long XLE/Short XLF strategy.

Autocorrelations Significantly Higher Pre-Jul'08



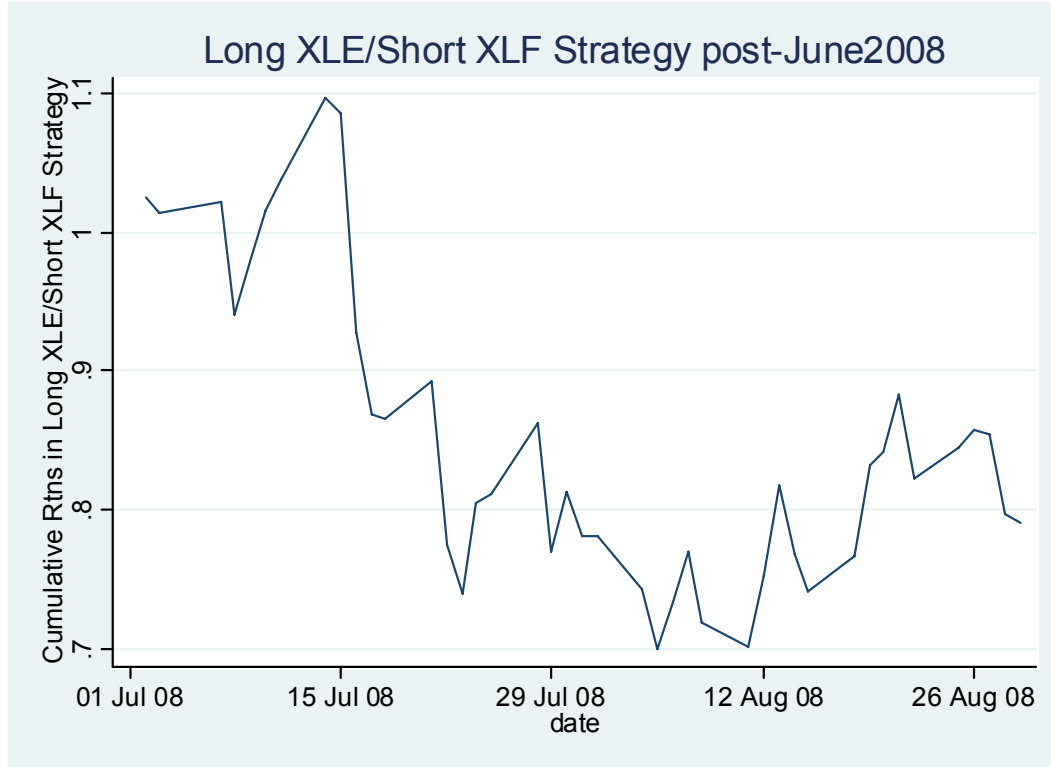
Autocorrelations Post-Jul'08 Come Back to Normal



Reference: “An econometric model of serial correlation and illiquidity in hedge fund returns,” by Getmansky, Lo, and Makarov (2004).

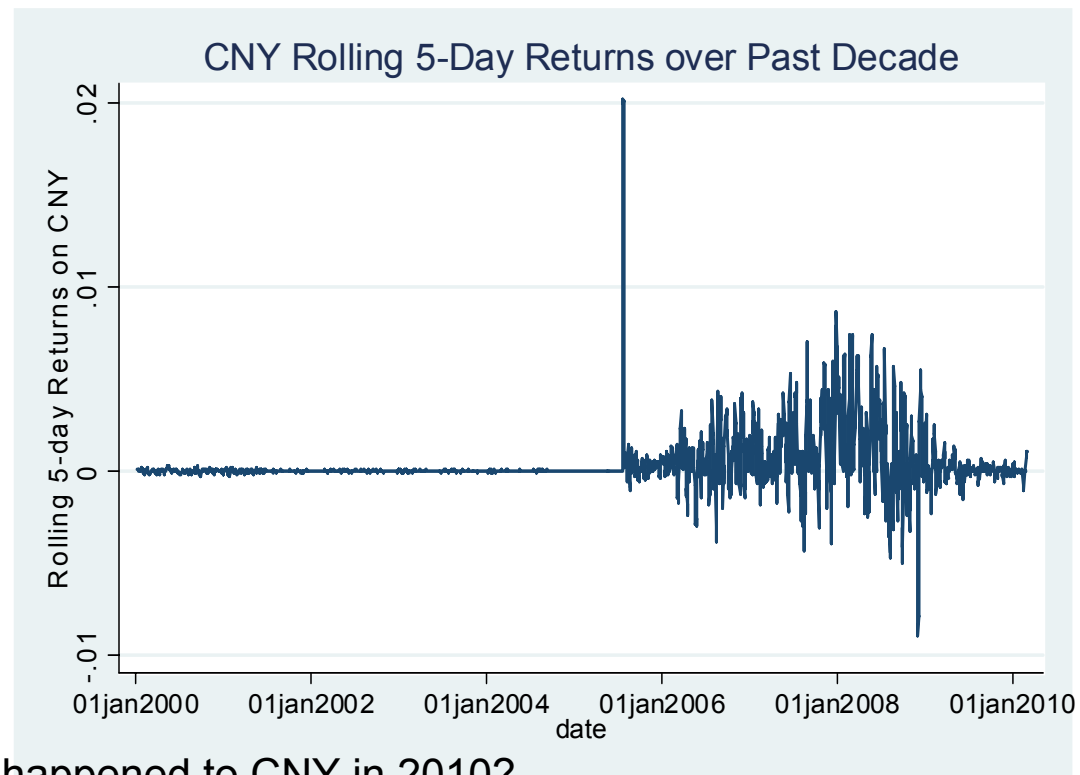
What happened after the spike in autocorrelation?

- A 40% drawdown in a period of approximately 10-days, as the long XLE vs. short XLF trade was unwound, due to the market response to the SEC enforcement of the naked short-selling ban.



A Forward Looking/Dynamic Approach for Managed Currencies

- One traditional problem with evaluating risks associated with managed currencies is that past history is not indicative of potential future market moves. Take the Chinese Yuan, for example, due to the large level of reserves and the incentive to combat domestic inflation, there may be an increased probability of a CNY revaluation in 2010. How might we model this?



- What happened to CNY in 2010?

A Forward Looking/Dynamic Approach for Managed Currencies

- Since there is a relatively active options market for USD/CNY, we can obtain implied volatilities and the skew from traded options to estimate the probability density function of possible moves in the CNY on a forward-looking basis.
- Reference Breeden and Litzenberg (1978) regarding the original work related to this approach.
- Using OTC quotes for traded CNY options, we are able to generate a simulation for USD/CNY risk on a forward looking basis.
- With implied volatility of about .0005 going forward three months and a noticeable positive skew, we get positive tail shock similar to past revaluations +.02%, but with relatively low probability of less than 0.5%.
- This method is dynamic since it can be updated with the latest market implied volatilities and skew on a daily basis.

Concentration Risk in Equities

➤ Risk Measures:

➤ Price risk – Delta/Gamma →

- Slides for prices up/down 5, 10 , and 20 percent
- Volatility risk – Kappa → Implied volatility up/down 20%/40%/100%
- Interest rate risk – Rho
- FX risk

➤ Historical Benchmark Data:

- Price – Use a global daily factor model developed jointly with (APT), which assumes

$$R_{it} = \sum_{j=1}^{50} \beta_{ij} f_j + \varepsilon_i$$

- Essentially redefine risk of the equity portfolio to exposures to 50 uncorrelated APT factors plus residual idiosyncratic risk

Concentration Risk in Equities

- APT provides $\beta_{ij}, \sigma_{\epsilon i}$ and the history of f_j
- Updated monthly
- If an underlying is not covered
 - It appears in a daily Exception report
 - Default mappings – Mapped to a transformation of the suitable regional index to reflect the risk characteristics of an “average stock” in the index
 - Overrides – For material position, if default mapping is deemed unsuitable, an override based on empirical analysis is conducted.



Systematic vs. Specific Risk Measures

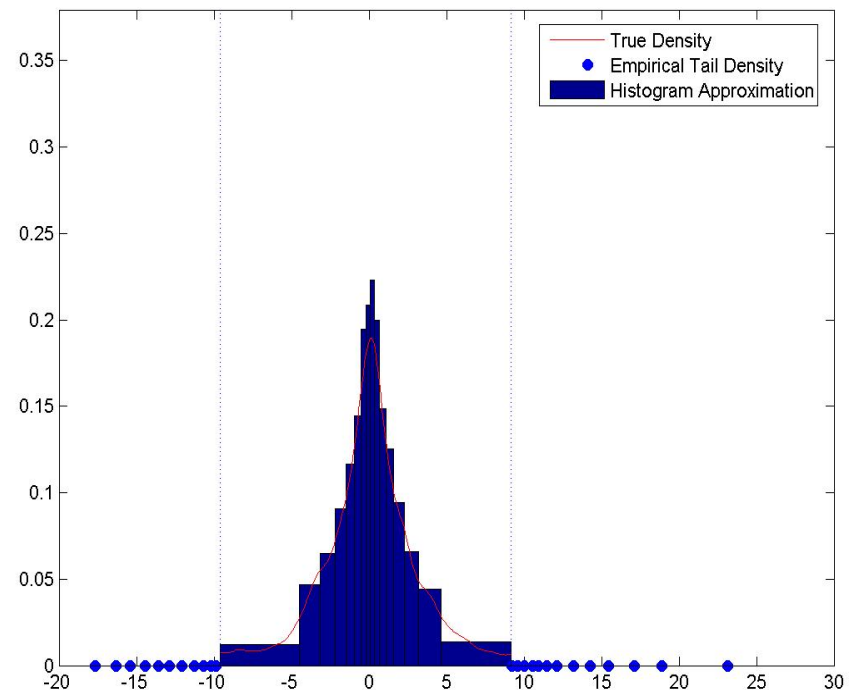
- Systematic risk cannot be diversified away, but idiosyncratic, specific, or issuer-specific risk can be diversified away.
- One way to conceptualize specific risk is to think about it as the residual risk associated with a given equity or credit exposure that cannot be attributed to systematic risk factors within a comprehensive risk model, which includes all relevant systematic risk factors.
- A standard approach for measuring this type of risk is to assume that each issuer in the portfolio experiences an independent idiosyncratic shock for every day of your historical simulation.
- The relevant distribution of issuer-specific shocks can be extracted from historical returns time series using resampling with replacement methods referred to as bootstrapping.





Non-parametric vs. Parametric Normal Representation of Specific or Concentration Risk in an Equity or Credit Portfolio

- In the tails (below the 1st percentile and above the 99th percentile), actual residuals from a factor model are available to be drawn in the representation of specific risk for a given issuer. The probability of sampling from the actual is 2%. Here we sample actual tail residuals with replacement.
- In the interior, we use a locally uniform approximation (box kernel smoothed density approximation) with up to 98 bins. The edge of the bins are selected so that each bin is equally probable. Conditional on selecting bin i , the density is uniform between the edges.
- For most stocks, the sample of residuals contains ~1043 obs. Some samples are short (IPOs, etc.) If the sample is too short, we keep the entire empirical sample, and sample with replacement using all available observations.
- Note that the non-parametric residual distribution here exhibits significantly “fatter-tails” than the super-imposed normal distribution in red.



Evidence for Non-Normality: Density Plots

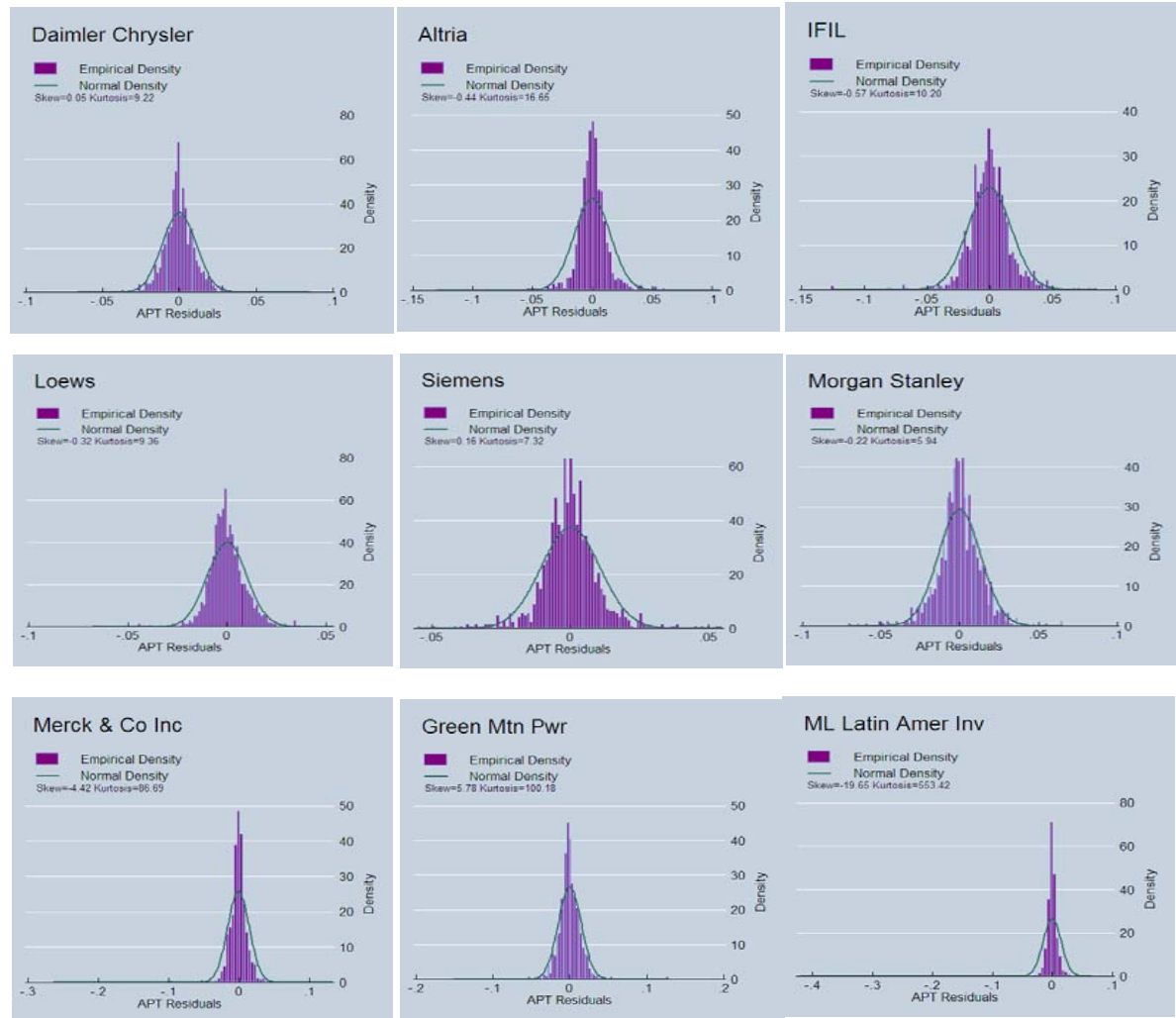
➤ Plots of residual densities show notable non-normality.

➤ Daimler-Chrysler, Altria, IFIL, Loews, Siemens are among the stand-out positions during the time of analysis.

➤ Merck and Green Mtn Pwr have largest skews and large kurtosis.

➤ ML Latin Amer Inv is the one with largest kurtosis and extreme residuals.

➤ Clearly, a normal distribution fails to capture *both* sharp-peakedness and fat-tailness.



... plus thousands more would tell the same story

A More Detailed Approach for Measuring Credit Spread Risk & Credit Concentration Risk

$$\begin{aligned} \Delta \text{Credit_Sprd}_{c,r,m,s,q} = & \beta_{1,q} * \Delta \text{Shift}_c + \beta_{2,q} * \Delta \text{Slope}_c + \beta_{3,q} * \Delta \text{Twist}_c \\ & + \beta_{4,q} * \Delta \text{MBI}_{c,r} + \beta_{5,q} * \Delta \text{SRI}_{c,r,s} + \beta_{6,q} * \Delta \text{SMI}_{c,m,s} + \sum_{i=1}^k \beta_{7(i),c} * \Delta \text{SwpVolPCA}_c + \beta_{8,q} * \% \Delta \text{Equity}_c \\ & + \beta_{9,q} * \% \Delta \text{EqSector}_{c,s} + \beta_{10,q} * \% \Delta \text{EqVol}_c + \beta_{11,q} * \Delta \text{CDS}_{c,r,m} + \varepsilon_{c,r,m,s,q} \end{aligned}$$

where the subscripts, c, r, m, and s denote different currency, rating, maturity and sector categories and the superscripts i and t denote i bonds at time t.

The additional subscript, q, is an indicator for spread level quartile. For example, q=1 for all spread observations in the lowest (first) quartile of the spread sample. q=0 corresponds to entire sample and serves as a default mapping when spread mark is unavailable from a risk exposure. The time interval over which we execute our estimation is one week to account for potential asynchronicity across risk factors and the relatively less liquidity inherent in bond trading.

$c \in (\text{USD}, \text{EUR}, \text{GBP}, \text{JPY})$

$r \in (\text{AAA}, \text{AA}, \text{A}, \text{BBB})$

$m \in (1-3 \text{ yrs}, 3-5 \text{ yrs}, 5-7 \text{ yrs}, 7-10 \text{ yrs}, 10 \text{ yrs}+)$

$s \in (\text{Default [00]}, \text{Energy[10]}, \text{Materials[15]}, \text{Industrials[20]}, \text{Consumer Discretionary[25]}, \text{Consumer Staples[30]}, \text{Health Care[35]}, \text{Financial:Banks[40]}, \text{Financial:Non-Banks[41]}, \text{Information Technology[45]}, \text{Telecommunications Services[50]}, \text{Utilities[55]})$

$q \in \{0, 1, 2, 3, 4\}$



Identification through Heteroskedasticity: A Technique for Estimating Event Risk with an application to the Iraq War

- In order to empirically measure the effects of event-related news on US financial markets we can use a “heteroskedasticity-based estimator” that allows us to identify the impact of event risk such as “war risk”, without having to directly observe that risk in the markets.
- The basic approach is to estimate the effects of event risk from the ***shift in the second moments of the financial variables*** on the day of event/war news, “as those variables should be more volatile due to their responses to the war news.” See Rigobon and Sack (2003, 2004).
 - It is important to note that the first moment on the heavy event news days may not be very informative since event related news may be either positive or negative.
 - This methodology avoids the need to observe the event or war risk directly. This is important, because estimating event risk impacts is often complicated by the fact that it is generally difficult to observe this risk directly and that other factors are continuously influencing asset prices as well.
- In the analysis of the Iraq War, for example, we can see that the volatility of a number of financial variables increased sharply on the “war days” and for many of these variables by a multiple.

Identification through Heteroskedasticity

Let $\delta(H, t)$ denote a dummy variable equal to 1 on the event/war days, and $\delta(L, t)$ a dummy variable equal to 1 on non-event/non-war days.

Define the variance-covariance matrices for the common factors on war and non-war days, Σ_H and Σ_L as follows:

$$\Sigma_H = E[z(t) * z'(t) | \delta(H, t) = 1]$$

$$\Sigma_L = E[z(t) * z'(t) | \delta(L, t) = 1]$$

The identification assumption that facilitates estimation here is that the difference between these variance-covariance matrices, $\Delta \Sigma$ is driven only by the change in the intensity of event/war-related news:

$$\Delta \Sigma = \Sigma_H - \Sigma_L = \lambda \mathbf{e1} * \mathbf{e1}'$$

where $\mathbf{e1}$ is the first column of the identity matrix with dimension equal to the number of factors in $z(t)$, and λ is the change in the variance of the war risk factor from non-war days to war days.

Days of high variance of war-related news

| <u>Date</u> | <u>Event</u> |
|-------------|--|
| 01-Sep-03 | UN inspectors report finding no chemical weapons |
| 16-Jan-03 | Reports that Saddam Hussein might consider exile UN weapons inspectors find empty chemical warheads |
| 17-Jan-03 | Saddam Hussein gives speech stating that Iraq is ready for war Blix report: "Iraq appears not to have come to a genuine acceptance of the |
| 27-Jan-03 | disarmament" |
| 29-Jan-03 | President Bush gives State of Union Address Secretary Powell says US would assist Saddam Hussein if he sought exile |
| 30-Jan-03 | President Bush comments on continued lack of Iraqi cooperation |
| 05-Feb-03 | Secretary Powell makes UN presentation in effort to build a broad coalition |
| 10-Feb-03 | Reports that Iraq will unconditionally allow surveillance flights |
| 12-Feb-03 | Secretary Powell says impasse has reached "moment of truth" |
| 13-Feb-03 | Rumors that President Bush set deadline to attack without resolution |
| 14-Feb-03 | Blix report interpreted as reducing chance of immediate war |
| 05-Mar-03 | Secretary Powell makes tough comments on Iraq |
| 07-Mar-03 | Reports that Saddam Hussein close to being captured |
| 10-Mar-03 | Turkey rejects US use of military bases |
| 13-Mar-03 | CNN reports that Iraq might surrender before conflict begins |
| 17-Mar-03 | President Bush expected to announce an ultimatum with a short deadline for war Change in terror alert from elevated to high (explicitly related to the prospect of war) |
| 21-Mar-03 | The war commences; early efforts appear very successful |
| 24-Mar-03 | Coalition forces face apparent setbacks over preceding weekend |
| 28-Mar-03 | Bush, Blair make comments suggesting a long war |
| 02-Apr-03 | Coalition forces approach Baghdad |
| 07-Apr-03 | Coalition troops enter central Baghdad |



Means and variances of changes in financial variables

| Variable | Means | | | Variances | | |
|-------------------------|-------------|----------------|-----------------|-------------|----------------|-----------------|
| | War Days(1) | Other Days (2) | Diff. (1) - (2) | War Days(3) | Other Days (4) | Diff. (3) - (4) |
| Two-year Treasury yield | 0.019 | -0.012 | 0.030* | 0.0063 | 0.0014 | 0.0050** |
| Ten-year Treasury yield | 0.025 | -0.013 | 0.039* | 0.0068 | 0.0016 | 0.0053** |
| Break-even inflation | 0.009 | 0.001 | 0.007 | 0.0012 | 0.0007 | 0.0005 |
| Liquidity premium | 0.001 | -0.001 | 0.002 | 0 | 0 | 0 |
| S&P 500 | 0.237 | -0.192 | 0.429 | 3.754 | 1.249 | 2.505** |
| BBB yield spread | -0.005 | -0.008 | 0.004 | 0.0005 | 0.0005 | -0.0001 |
| High-yield yield spread | -0.024 | -0.021 | -0.003 | 0.0138 | 0.0048 | 0.0090** |
| Oil futures price | -0.11 | 0.053 | -0.162 | 1.837 | 1.885 | -0.047 |
| Gold price | -0.571 | 0.092 | -0.663* | 2.459 | 1.201 | 1.254** |
| Dollar | 0.041 | -0.042 | 0.082 | 0.073 | 0.031 | 0.042** |

* Denotes significance at the 5% level and

** denotes significance at the 1% level.

While the first moments do not always exhibit significant changes, the variances do generally exhibit significant change. This feature allows us to generate the estimate of the relevant event risk summarized in the following tables.

Estimated impact of increase in war risk (Normalized to cause a 25 bp drop in two-year Treasury yield)

| Variable | IV (w/w1) | IV (w/w2) | GMM |
|-------------------------|--------------|--------------|--------------|
| Ten-year Treasury yield | -0.26 | -0.25 | -0.25 |
| | (14.52) | (14.41) | (12.69) |
| Break-even inflation | -0.09 | -0.03 | -0.08 |
| | (3.47) | (0.72) | (3.13) |
| Liquidity premium | 0 | -0.06 | 0 |
| | (0.71) | (0.45) | (0.24) |
| S&P 500 | -4.79 | -6.16 | -5.01 |
| | (4.65) | (3.89) | (2.91) |
| BBB yield spread | 0.06 | 0.07 | 0.06 |
| | (4.38) | (3.98) | (4.01) |
| High-yield yield spread | 0.34 | 0.32 | 0.34 |
| | (5.84) | (5.11) | (16.28) |
| Oil futures price | 2.86 | -0.6 | 2.58 |
| | (2.57) | (0.23) | (1.42) |
| Gold price | 1.71 | 7.96 | 1.73 |
| | (1.62) | (1.61) | (0.95) |
| Dollar | -0.58 | -1.03 | -0.6 |
| | (3.65) | (3.39) | (0.76) |

Proportion of variance explained by war risk (January 6, 2003–April 7, 2003)

| Variable | War days | All days |
|-------------------------|----------|----------|
| Ten-year Treasury yield | 79.2 | 53 |
| Break-even inflation | 53.5 | 24.8 |
| Liquidity premium | 2.7 | 1.2 |
| S&P 500 | 48.9 | 28.7 |
| BBB yield spread | 60.5 | 18.3 |
| High-yield spread | 68 | 39.2 |
| Oil futures price | 35.7 | 11.5 |
| Gold price | 9.5 | 4.8 |
| Dollar | 37.4 | 19.8 |



A New Method for Evaluating Systemic Risk

- A financial firm will be unable to function when the value of its equity falls to a sufficiently small fraction of its outstanding liabilities. In good times, such a firm will likely be acquired, may be able to raise new capital or may face an orderly bankruptcy. If this capital shortage occurs just when the financial sector is already financially constrained, then the government faces the question of whether to rescue the firm with taxpayer money as other avenues are no longer available. In the theoretical analysis of Acharya, Pederson, Phillipon and Richardson (2010), such a capital shortage is damaging to the real economy as the failure of this firm will have repercussions throughout the financial and real sectors. Consequently **a firm is systemically risky if it is likely to face a capital shortage just when the financial sector itself is weak.**
- <http://vlab.stern.nyu.edu/welcome/risk>





A New Method for Evaluating Systemic Risk

- Calculates the expected capital shortage faced by a firm in a potential future financial crisis. Conceptually this calculation is like the stress tests that are regularly applied to financial firms, however here it is done with only publicly available information and is quick and inexpensive to compute.
- This calculation takes three steps.
 - First, it estimates the daily drop in equity value of this firm that would be expected if the aggregate market falls more than 2%. This is called Marginal Expected Shortfall or MES. The measure incorporates the volatility of the firm and its correlation with the market, as well as its performance in extremes. These are estimated using asymmetric volatility, correlation and copula methods similar to those in other sections of VLAB.
 - In a second step this is extrapolated to a financial crisis which involves a much greater fall over a much greater time period.
 - Finally, equity losses expected in a crisis are combined with current equity market value and outstanding measures of debt to determine how much capital would be needed in such a crisis. A firm is assumed to require at least 8% capital relative to its asset value.

A New Method for Evaluating Systemic Risk

| TOP 10 | SRISK% | MES | LVG |
|------------------------------------|---------------|-------------|-------------|
| Bank Of America | 19.4 | 3.43 | 15 |
| Citigroup | 15.7 | 3.29 | 14.2 |
| JP Morgan Chase | 13.8 | 3.04 | 11.7 |
| Morgan Stanley | 8.1 | 3.81 | 18 |
| MetLife | 6.8 | 3.65 | 15.1 |
| Prudential Financial | 5.3 | 3.59 | 17.5 |
| Goldman Sachs | 4.2 | 2.71 | 10.3 |
| Wells Fargo | 4 | 3.16 | 7.63 |
| Hartford Financial Services | 3.8 | 4.59 | 25.3 |
| SLM Corporation | 2.3 | 3.19 | 26.4 |



Conclusions

- The identification through heteroscedasticity method can be applied to a sample related to the current sovereign debt crisis. This would be useful for answering the question: What kinds of losses might my portfolio incur in the case of a significant sovereign default?
- It is critical to apply methods for measuring and monitoring liquidity risks and gap risks, that can be exacerbated through crowdedness. We can monitor these risks by tracking less widely used measures such as:
 - Correlations of bid-ask spreads and trading volume with underlying returns
 - Significant moves and high levels of short interest and borrow costs, which can signal trade crowdedness
 - The level of serial correlation associated with returns, which can also flag trade crowdedness.
- Where possible, employ forward-looking analysis in order to estimate future variance-covariance matrices that might arise for your portfolio, rather than being overly dependent upon flawed VaR measures that simply point to historically observed variance-covariance matrices, which may not be relevant for your portfolio today.
- Increase your awareness of the known unknowns and try to reduce the possible unknown, unknowns, because what you don't know about your portfolio and the future may affect your portfolio in unpredictable and undesirable ways.



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<http://www.cboe.com/LearnCenter/pdf/characteristicsandrisk.pdf>

Because of the importance of tax considerations to many option transactions, the investor considering options should consult with his/her tax advisor as to how taxes affect the outcome of contemplated options transactions.

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