You are lazing on the sands next to your beachside villa, with picturesque rolling cliffs behind you, reflecting on how perfect life is, when a magnitude 8.1 earthquake hits.

When the ground has stopped shaking, you are unscathed, but worried about the possibility of a powerful aftershock. Should you:

a) Stay away from your villa and remain out in the open, in case the villa has suffered structural damage and collapses from an aftershock,

or

b) Take refuge inside your villa, in case an aftershock unleashes a rock avalanche from the sides of the cliff onto the beach below?

Think about it, and see the footnote for a possible answer.

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1 While both the cliff and the villa could pose dangers, your most pressing danger could come not from the earthquake, which is over, but from the tsunami that will hit the beach in a few minutes. Thus your least risky course might be to climb up the cliff.
Like a massive earthquake, the kind of turmoil we have witnessed in the financial markets over the past year has left a swath of visible destruction in its wake. It poses special challenges even for sophisticated investors who use intelligent risk management systems. Multiple risks arise simultaneously during crises, forcing investors to choose the lesser among evils at a time when the grounds are shifting precariously beneath them. Such events also understandably shake investors’ confidence in prevailing models, in system capabilities, and in their own judgment. But perhaps most telling, such crises, together with the collective response to them, alter the course of events to a degree sufficient enough to transform existing risks and to introduce new ones.

What, then, do the events of the past year tell us about the correct approach to risk management today, given that much of its most valuable application is likely to occur on shifting ground? To illustrate the nature and range of discontinuities that render risk managers’ jobs more difficult, we consider the challenges faced in three specific areas that surfaced during the credit crisis of 2007-08. In each case, a traditional framework used to measure and manage risk has been found wanting. Market participants who proactively upgrade their risk systems and practices in response stand to gain a significant advantage.

1. Fat Tails and Serial Correlation

The first area of risk management that appeared to fall short during the most recent crisis is in the failure to anticipate fat tails and serial correlations in the spread movements of certain fixed income sectors.

Fat tails occur when large moves in financial assets are observed more frequently than predicted by standard distributions such as the Normal (Gaussian) distribution. Serial correlation refers to several drops in an asset’s price that are strung together, violating models that assume that up and down price changes are equally likely from one period to the next. Both phenomena appeared after the market went into stress in late July 2007, causing the popular press and its pundits to promptly decry the failure of risk measures based on the Normal distribution. But despite the widespread chest-beating and wailing, there has been relatively scant analysis of the reasons behind the phenomena. So let us take a closer look. We will use as an example the behavior of AA corporate credit spreads illustrated in Figure 1 below.

![Figure 1. AA Credit Sector Spreads August 2000 – July 2008](source: Prudential Fixed Income Management, as of July 22, 2008.)

2 The magnitude of the moves is typically measured in multiples of standard deviations of the distribution that such moves are expected to follow. For example, if spread moves are normally distributed with a daily standard deviation of 1 bp, a widening of 3 bps or more in a given day should be a very unlikely event, occurring once every 714 days on average. The fat tail is a reference to the two ends of the probability density function, whose thickness indicates the probability of such large moves.
Using approximately seven years of daily data from August 2000 to July 2007, (this is the portion of the data series to the left of the vertical line in Figure 1) we find that the daily standard deviation ($\sigma$) of spread changes was 1.26 bps. A Gaussian model, in which spread changes follow a normal distribution, would have predicted that 0.54% of trading days would see spread changes of $3+\sigma$ (3.78 bps or more). In the actual data set, 18 trading days had such moves – slightly over 1%, indicating mildly fat tails. Of those, 12 experienced spread widening, indicating modest negative skew.

However, now consider the behavior of the same series during the crisis period (starting on July 26, 2007, the period to the right of the vertical line) and continuing until the present. During this period, there have been no fewer than 35 days of $3+\sigma$ moves out of 249 trading days, 13 times the frequency experienced during the preceding seven years. Of these, 29 were spread widening episodes.

Furthermore, in the 14-day trading period from February 28, 2008 to March 18, 2008 (the run-up to the Bear Stearns takeover), the AA credit spread widened in 13 out of 14 sessions, and six of those moves were $3+\sigma$. This illustrates so-called “serial correlation”, which is the tendency for successive daily changes to be positively correlated rather than independent. Over any “normal” 14-day interval, the standard deviation of cumulative spread changes should have been only 4.7bps, assuming daily moves are independent of each other. By this measure, the 51 bps (or 29%) move in AA credit spreads during this 14-day period represented a $10.7\sigma$ move in spreads. Now that’s one heck of a fat tail!

What Explains the Dramatic Changes in Market Behavior Over the Past Year?

What explains these dramatic changes in market behavior? In Figure 2, we illustrate a typical elasticity curve for credit spreads. Typically, as fundamental and technical conditions in a normal bond market fluctuate, credit spreads widen and narrow in a continuous fashion that can be mostly captured by Gaussian or other models using one or more continuous variables. In such a continuous framework, the equilibrium would remain on a curve such as the one depicted in Figure 2 below, moving, say, between points P1 and P2 when there is a marginal increase in supply.

Figure 2. Spread Dynamics in the US Fixed Income Markets “Normal” Conditions vs. Crisis Conditions

[Diagram showing the change in spread dynamics from normal to crisis conditions]

Source: Prudential Fixed Income Management

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1 The period included the stock market meltdown of 2000-2001, the Enron and Worldcom crises, and the credit recession experienced in 2002. Thus it incorporates a significant degree of economic cyclicality.

4 We will continue to use the Aug 2000-July 2007 statistics (in particular, standard deviations) in analyzing the behavior of spreads for the post-July-2007 period; thus the observed moves would be “out-of-sample”.

5 $1.26\sqrt{14}$, since standard deviation increases are proportional to the square root of time.
Such equilibria are stable in the sense that they are self-correcting. For example, a *gradual* increase in spread would draw marginal buyers, until supply matched demand once again. As another example, the perception of improving fundamentals could shift demand gradually to a lower spread point, until the spread exactly compensates for the perceived lower risk level. When more than one independent factor is required to explain spread changes, a multi-factor model\(^6\) with continuous variables can be used to capture the moves. In a multifactor framework, the curve would be replaced by a surface in the relevant dimensions.

During 2000-2007, balance sheet capacity in the financial sector was plentiful and changed only gradually. So the spread of most AA bonds was low, because perceived credit risk was small, and because financial institutions, which have historically been major holders of AA-rated risk, could finance and leverage these holdings cheaply.

But over the past year, both technical and fundamental changes occurred that were both large and sudden. A major technical change occurred when financial institutions, needing to reduce balance sheets urgently, began *deleveraging* rapidly by selling their AA-rated bonds, which were no longer economical to hold, yet had the necessary liquidity to be sold. Suddenly everyone was going the same way. Simultaneously, the fundamental credit risk of those same AA-rated bonds, which were also issued predominantly by financial institutions, deteriorated abruptly as well. The fear that some of these financial institutions might fail introduced event, or “jump”, risk, previously negligible, into their spreads as well.

These abrupt technical and fundamental changes, occurring together, could not be accommodated by the credit spread curve or surface described by the previous seven years of data. So the previously established supply-demand curve itself began to shift abruptly upwards. This is illustrated in Figure 2 by the shift in equilibrium from P1 to P3. This kind of shift can only be explained by introducing new so-called “jump” factors into the spread dynamics – factors that had lain dormant and thus had not been reflected in the previous seven years of historical data. When these “jumps” occur over just a few trading sessions, serial correlation and multiple standard deviation moves (fat tails) are the result.

**The Bottom Line:**

A risk model based on historical experience alone and without such jumps cannot possibly account for event risk that causes jumps in spread. Such risks can only be captured beforehand with *scenario analysis* or *stochastic jumps* that posit the conditions similar to those causing the event. In this way, fat tails and serial correlations can be hypothesized and anticipated. Exposures can then be tailored to limit portfolio losses in the event of such a jump, such as by buying CDS protection on certain names\(^7\).

Despite such precautions, we are unlikely to anticipate every such fat tail. So monitoring short-term performance and risk data is necessary as well -- to catch them as they occur. One must then determine whether the exceptional change is transitory, suggesting a quick return to normalcy, or whether it implies a change in the ground rules. In the latter case, risk models and budgets need to be updated to incorporate the new data and reflect the new reality.

In the case of AA credit spreads, the fundamental and technical changes that occurred in the financial sector are likely to be long-lasting, pending the recapitalization of the industry and the working out of the fundamental risks that still reside on its balance sheets. The narrowing of AA spreads will therefore likely be gradual, and the risk of jumps due to credit events and sudden deleveraging will persist. The fact that Uncle Sam may consider certain key institutions “too big to fail” complicates the picture further. Therefore, using appropriate scenarios or stochastic-jump-based risk limits to incorporate fatter tails for leveraged financial names is necessary, although

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\(^6\) For example, such a model might incorporate independent factors representing both technical (liquidity or supply-demand) and fundamental (default risk) variables.

\(^7\) In the case of AA credit spreads, protection was indeed very cheap prior to the crisis, with many spreads in the financial sector trading at 10 bps-20 bps.
the lack of historical precedents and the “too-big-to-fail” backstop from Uncle Sam in selected cases make the calibration of those risks problematic. Those making these improvements to their risk systems, as well as related ones to counterparty risk measurement, are much better positioned to survive the ongoing process of financial deleveraging.

2. Valuation Model Risks

The second area of risk management that appeared to fail during the most recent crisis, and which has come under intense scrutiny since, is the validity of valuation models.

It must be acknowledged that many valuation models failed miserably during the credit crisis of the past 18 months. There is no better illustration of this than US mortgage credit models. With regard to sub-prime mortgage models, valid criticisms include: a) default assumptions on the collateral that were too optimistic, having been based mainly on years when home prices were steadily rising, b) the models’ failure to acknowledge changes in underwriting and lending behavior, which had become very lax by 2006, and c) inadequate modeling of newly developed structures such as ABS CDOs (Asset-Backed Security Collateralized Debt Obligations), which were too complex for existing frameworks to handle. Rating agency models for structured products, in particular, have proven especially poor in predicting the safety of high-rated securities.

Today, more than a year after the start of the crisis, modelers face, if anything, even larger challenges than before. To illustrate some of the key issues, Figure 3 below shows sub-prime cumulative loss projections (for the popular ABX indexes) from the models of four sell-side firms at three successive points over the course of a six month period: February, May, and July of 2008.

![Figure 3. Recent Revisions in Projected Cumulative Losses for Selected ABX Indexes Projected By Wall Street Firms February, May, and July 2008](source: Prudential Fixed Income Management)

As we can see, although scarcely two to three months had passed between projections, each dealer increased its cumulative loss projections substantially. Indeed, these loss projections have been ratcheting up consistently, from negligible levels in early 2007. The models have had to be continually revised because of very high and rising
delinquency levels in incoming remittance data, as well as further declines in home prices. It is not surprising that everyone’s model projections are moving the same way. Still, given the huge move in expected losses, it is striking how similar to each other these consistently wrong projections have been, as indicated by their narrow range. The clustering of default projections perhaps reflects a desire to be consistent with the herd, while their relentless rise reflects capitulation to the facts on the ground.

But the main lesson we should take away from the rapidly changing data is how incomplete most investors’ understanding of the underlying mortgage collateral has been. There remain three key variables that complicate accurate projections of sub-prime mortgage pool losses. First is the uncertainty regarding the degree of prospective housing price declines, which will be a function of the real economy as well as the extent of tightening of mortgage credit. The second variable is the behavior of borrowers who were allowed to take out home equity loans, especially as there is only limited data on how those borrowers behave when they realize they have negative equity in their homes. The sheer scale of the problem exacerbates this: when a sufficiently large fraction of housing is under water, homeowner behavior could well be different than when a statistically small number of mortgages are in trouble. Finally, governmental efforts in the form of monetary, fiscal, and legislative responses provide countervailing influences whose extent and impact are as yet unknown. The data now coming in, however, is helping to clarify the picture on all three of these fronts.

**The Bottom Line:**

Despite these unknowns, modern financial markets and instruments cannot function without valuation models, especially in the wake of such a crisis. Models are now more important – and the sub-prime mortgage market is no exception – precisely because there is no historical precedent for current conditions. The fear and loathing in the sub-prime market has created unprecedented opportunities in distressed mortgage credit that cannot be taken advantage of without projecting a range of outcomes.

It is important to distinguish between changes in model output due to changes in input (housing price deterioration, reduced availability of mortgage credit) and changes to the specifications of the models themselves. As the US undergoes its biggest housing crisis in a half-century, many of the assumptions underlying housing and sub-prime models must themselves be questioned. Furthermore, the effect of self-reinforcing feedback loops is inherently unpredictable. This implies that the probability of a base case or a stress case is itself harder to pin down. That is, we are uncertain, not just about the outcomes, but even about the shape and range of the distribution of outcomes. A modeler should pay homage to this uncertainty by projecting a broader range of economic outcomes.

One can mitigate valuation model risk through the use of distributions of outcomes that reflect a broad range – for example, through the use of both base-case and stress-case scenarios, and by keeping a close watch on incoming information (in this case regarding housing, collateral performance, and new data regarding availability of mortgage credit and federal corrective measures). In part due to model risk, spreads on sub-prime bonds are at historically wide levels, and technical factors dominate. Consequently, the market often does a poor job of distinguishing bonds with a high risk of impairments from others with very low risk of losses. Even with the previous caveats, participants with the modeling expertise and a sophisticated and up-to-date system capable of distinguishing loan-level behavior will find plenty of relative value opportunities.
3. Liquidity Premia and Basis Risks

The third development over the past year has been the appearance of large, volatile, and systemic liquidity premia and basis risks across a range of spread assets. While the term liquidity premium may be interpreted in various ways, we will define it as that portion of the spread that remains after the components attributable to credit and optionality risk have been subtracted. By this definition, the liquidity premium is inherently model-dependent, since there are no absolute or market-traded measures of the components of spread.

If that is the case, how do we know that liquidity premia have increased recently, or even that they exist at all? One answer is that we can look at the spreads of simple instruments with no (or minimal) default or optionality risk at all. One good example is the spread between two similar Treasury bonds; such a spread, between the richest and the cheapest Treasury bonds combined to neutralize interest rate risk, is illustrated in Figure 4 below. Another way to isolate a liquidity premium is to use a variety of models (or paths from a stochastic model) to produce a range of estimates of credit and option adjustments. If there is a premium even after subtracting the highest of these adjustments, there is a high probability that the residual is a liquidity premium. We include two examples in Figure 4 drawn from ABS and CMBS, both of which show no losses even under stressed scenarios in our models.

A concept very similar to liquidity premium is a basis spread -- the spread between two offsetting instruments with very similar risk profiles, such as between cash instruments and derivatives that replicate their risk. A canonical example would be the basis between a Treasury note and a Treasury future, or the basis between corporate bonds and their corresponding CDS (Credit Default Swaps). Like a liquidity premium, a basis is not a “pure” concept, because there may be some fundamental and technical differences between the offsetting instruments. Nonetheless, the basis spread does serve as an indicator of market dislocation. In Figure 4, we also include pre- and post-crisis snapshots of a basis spread for the CDX investment grade corporate index.

**Figure 4.**
Selected Liquidity and Basis Premia Over Six Month Periods Pre- and Post-Crisis

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<tr>
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<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Max</td>
</tr>
<tr>
<td>IG CDX Cash-CDX Basis</td>
<td>1.7 bps</td>
<td>6 bps</td>
</tr>
<tr>
<td>Treasury Rich vs. Cheap Basis*</td>
<td>14.5 ticks</td>
<td>16.4 ticks</td>
</tr>
<tr>
<td>ABX 06-1 AAA</td>
<td>14.5 bps</td>
<td>36 bps</td>
</tr>
<tr>
<td>CMBX 06-2 AAA</td>
<td>~5 bps</td>
<td>NA</td>
</tr>
</tbody>
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* Based on proprietary optimal portfolio fundamental value and representing value difference between matched portfolios of cheap and rich Treasuries. Source: Prudential Fixed Income Management and Lehman Brothers.

The low levels and volatilities of these spreads in the first half of 2007 is an indication that the market did not consider these instruments or basis trades to have much, if any, risk. Our fundamental understanding of CDX and Treasury basis trades, which represent very closely matched and offsetting risks, confirms that the primary risk of these positions arises from technical market conditions rather than fundamentals. In the case of the ABX and CMBX tranches shown, running them through a wide range of economic scenarios and with a range of possible model parameter settings suggest that they carry minimal credit risk.

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8 Except for the Treasury Rich versus Cheap basis, which is expressed in ticks, or 1/32 seconds of 1%, of fundamental value.
Yet the credit crisis has caused all these instruments to trade at extraordinarily wide spreads that indicate a high level of fundamental value. This is indicated in Figure 4 by the 2008 first-half mean and maximum levels. However, the volatility of these spreads has also been quite extreme, as Figure 4 shows. This volatility acts as a deterrent to investors with limited appetite for mark-to-market risk or with short investment horizons. Financing has also been scarce in some sectors, limiting the liquidity to put on convergence trades in size. Perhaps the biggest issue is that of bid-offer spreads and poor flow volumes, which limit execution opportunities and expose levered funds to liquidation costs due to withdrawal of financing or redemption requests from their investors.

Finally, these liquidity premia carry substantial systemic risk. That is, they are positively correlated with one another, despite the fact that they originate from instruments carrying fundamentally very different risks. Why? Because they are all indicators of market participants in distress, and because all such trades tend to attract the attention of a certain set of “smart” investors. When those investors’ risk appetite, access to financing, and capital base are affected, all these trades tend to move together. In short, their correlation stems from behavioral rather than fundamental commonalities. Therefore, unrelated though these spreads might be to each other fundamentally, their technical correlation poses real risks of a systematic, albeit short-term nature.

The Bottom Line:

The bottom line is that these premia, despite the caveats, represent money-making opportunities, because they are mispriced fundamentally. However, they require deep pockets, long time horizons, the ability to trade in all instrument types, and the patience to absorb significant near-term losses. The list of investors with all those characteristics is small, but they stand to reap big rewards. Such investors are being compensated with a justifiably high premium for being one of the few left standing to be in a position to take advantage of such mispricings. They are also signing up for significant P&L volatility, which is exacerbated in a deleveraging environment. Being a liquidity provider at times like these can be rewarding for those that can stomach some short-term volatility. Despite these caveats, 2008 represents a rich field of relative value opportunities.

Several observations are in order, however, before we run out and get long these spreads. First, we emphasize once again that these premia are to some degree model-dependent, although we have chosen instances to minimize that dependency. For example, a more draconian ABS model might indeed project some credit losses for the ABX 06-1 AAA tranche. Second, there are still a few other remaining risks that we have explicitly not captured and removed – for example, financing risks and costs on the cash-CDS basis. Third, this premium is volatile – this volatility could require significant compensation depending on how much of it is systematic, and on the length of the investor’s horizon. Fourth, capturing the premium efficiently generally requires leverage and financing, so only investors with access to both can take advantage of it.

“Principle” Lessons – What Isn’t New?

So far, our discussion has focused on the unusual and surprising features of the market dislocation over the past year, and on the unique nature of the current challenges to risk management practices. It is easy to conclude from the discussion so far that one should throw out or rethink all our conventional risk management machinery – but nothing could be further from the truth.

Risk management is a challenge precisely because it calls for a balance between intelligent long-range planning and agile short-term improvisation. Leaning too far in either direction is a prescription for failure. At one extreme is the example of VaR models based on trailing three-year volatility. Their use of such a short-term time frame encourages procyclical tendencies: to layer on the risk in good times, and then be forced to pull back exactly when markets are dislocated and relative value opportunities abound. At the other end of the spectrum are rigidly

\[\text{Financing and leverage is required to different degrees, depending on the nature and level of the spread an investor needs to earn. Simplistically, an investor who can borrow at LIBOR flat must leverage L+300 bps instrument 4 times to achieve L+1200 bps returns. To trade a basis spread, the investor must either short instruments or be benchmarked to them.}\]

8
designed long-term risk frameworks that pay no attention to market conditions, and which could thus be oblivious to tectonic shifts that fundamentally alter the extent and nature of risk (as with the sub-prime market), and may not pick up on systemic and event-based risks either (e.g. the collapse of Bear Stearns and the housing-related troubles of Fannie Mae and Freddie Mac).

Experience through the past two decades of periodic market crises around the world (and the centuries-long dismal records of financial manias, panics and crashes) suggests that a successful long-term approach to risk management would be based on certain fundamental tenets that make it robust and flexible and enable it to avoid both opportunism and doctrinal rigidities. Here are some of these key tenets.

**Long-Term Planning:** Experience in war and markets both confirm Helmuth von Moltke’s famous dictum that “no battle plan survives contact with the enemy.” Yet the most cursory study of Moltke’s career would reveal that he was a detailed planner who allowed for a vast multitude of expediencies (scenario analysis in modern parlance). A careful and comprehensive risk budget based on long-term data is the indispensable backbone for any risk management framework. For example, a fixed income risk budget should cover elements of interest rate, credit, currency and structural risk and should be capable, at least in principle, of withstanding an entire market cycle.

**Integral Risk and Investment Process:** A bolt-on risk management process is a pretty good way to ensure its failure. The risk process is inseparable from the investment process and must engage the ultimate investor, the portfolio manager, and the risk manager in an ongoing dialogue that begins before the investment process itself has begun and never ceases. By making the team simultaneously internalize risk and return objectives, and by always considering every instrument in terms of its incremental return and risk contribution, risk management can be made integral to the daily process of portfolio management, rather than a matter of checking the box. Or much worse, gaming the system.

**Common Analytics for Risk, Relative Value, and Performance:** Often, traders are given access to more sophisticated models than those used for risk management, while performance reporting becomes an afterthought or a marketing exercise. This is the equivalent of upgrading your car’s engine while neglecting your brakes and steering. When the same models are used to determine relative value, calculate risk, and attribute return, the potential to arbitrage one with the other is removed, and discrepancies between measured and experienced risk become visible and can be corrected. For example, if a sophisticated default model is used to trade relative value among mortgages, the same model should be used to distinguish the risk of different bonds.

**Risk - Return Feedback Loop:** When the behavior of certain instruments or asset classes depart from historical norms, return attribution begins to depart significantly from the risk budget. This is when a yellow flag should go up, and an effort made to pinpoint investments that warrant additional analysis. Such analysis should be used to decide whether the deviation observed is explained by one-off or mean-reverting factors, or whether it signifies a fundamental shift in behavior requiring a reexamination of the underlying risk model.

**Conduct Extensive Scenario Analysis:** The purpose of scenario analysis is to cover a plausible outcome that the typical distribution assumed by the main risk model assigns a low probability to, but which would result in a potentially harmful investment outcome. There are typically two useful types of scenarios: historical and hypothetical. The former is both useful and accepted; the latter is more controversial because of the need to posit the values of large number of variables (prices and co-movements). Nevertheless, when there is a plausible risk case to be made, a hypothetical scenario analysis can be critical. Uncertainty about how to construct a scenario should not keep one from trying to get one’s arms around a key risk. It is also useful to think about what market participants are not already factoring in. For example, inflation has been a favorite doomsday scenario in the investment press for most of 2008, whereas deflation, which was the favorite topic of 2003, is nowhere to be seen. From a risk manager’s perch, neither should be neglected as scenarios.

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10 Helmuth Karl Bernhard von Moltke was a famous 19th century Prussian war strategist and general responsible for the military unification of the German Empire under Bismarck. The quote is sometimes mistakenly attributed to George Patton or even Colin Powell.
Acknowledge Known Unknowns: Finally, it is important for risk processes to acknowledge the limits of current knowledge and models. For example, it is common sense to put less faith in the calculated risk parameters of new asset classes or those whose characteristics have recently changed significantly. ABS is a good example of this, but in fact, rapid changes in technology and economic conditions can make even relatively familiar assets such as leveraged loans less predictable than they once were. For example, slowly deteriorating loan underwriting standards and the lessening of formerly strong covenant protections at the very least call historical default and recovery rate assumptions into question. As mentioned previously, model risks should be acknowledged, and where possible, incorporated into risk budgets. For example, a lower bound on loan recovery value assumptions can be determined by an analysis of “covenant-lite” provisions. The bottom line is that measured risk is always a subset of the total risk, and sometimes it is possible to discern the size of the gap.

While the first three elements have long been part of best practice in risk-management, the last three principles have arguably been historically neglected. The key lesson from the crisis of 2007-2008 is to give them a more prominent role in the process going forward.

Leaving the Comfort of the Lamplight

In conclusion, risk management is not just or even primarily about probability distributions and detailed tracking error exception reports, although these are its tools, any more than making money is about using your Bloomberg (referring to the software application, not the mayor of New York City).

Risk is like a truant child, subject to some rules some of the time. Our responsibility is to take each investment safely through its childhood through to its maturity, using not blindly applied rules but a combination of rules, judgment, and intuition. In this regard, it is simply the other face of successful portfolio management. Experienced asset managers do this intuitively -- they meld their objective, quantitative skills with their subjective (“gut”) talents to arrive at well-reasoned, intuitively sound judgments on the types and nature of appropriate risk. The current environment makes this ability even more valuable than before. Each crisis exposes us to losses, but also gives us a richer set of experiences to draw on. It behooves us to learn lessons from these experiences, but not to let them throw us off the long-term path we are on. The most important job of a risk manager is to serve as a meta-model, to intuit and compensate for the lack of data and models. We must constantly refresh our projections in the heat of the battle, as Moltke warned us over a century ago. We must look beyond the lamplight for what our detailed systems won’t or can’t tell us, we must create scenarios for contingencies not represented in the historical data, and we must seek qualitative understanding where quantitative analysis cannot go. We are not here to analyze the last earthquake, but to prepare for the tsunami that sometimes can follow.
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