FRANKLIN TEMPLETON INVESTMENTS

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PERSPECTIVES

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The Art and Science of Risk Management

Risk is a common enough term, but few people seem to share a common understanding of it. Many investors view risk in its most absolute and adverse terms—the possibility they will lose money. Others take a more relative tack toward the negative—the chance an investment will perform poorly compared to a peer or benchmark. For active investment managers, though, risk is to some extent a precondition of all outcomes: Participation in nearly every area of the financial markets entails some risk exposure.

Risk becomes a problem when it is unintended, misunderstood or uncompensated—all of which come to light in any gap between investor expectations and actual performance. We believe the basic job of risk management, then, is not to eliminate all risk. It is to close that expectations gap by trying to ensure that risk is intended, understood and compensated.

During the depths of the 2008/9 financial crisis, professional and individual investors witnessed markets plummeting across the board and certain asset classes collapsing altogether, and we believe that today, a perspective on risk management has rarely been more important. This paper provides an overview of risk management's origins, primary metrics and role in portfolio management. It also profiles the integrated risk management approach Franklin Templeton has developed.

Figure 1: Global Locations of the Franklin Templeton Performance Analysis and Investment Risk Group
As of March 31, 2013

FROM STATS TO QUANTS

To manage risk, you must be able to quantify it. For this reason, the origins of risk management are found in the earliest attempts to measure outcomes and assign probabilities to them. Risk management subsequently grew into a distinct discipline with twentieth century breakthroughs in financial theory and information technology.

QUANTIFYING CHANCE

Long before that, though, there was gambling. With a potent set of built-in motivators, gambling spurred Renaissance-era mathematicians to begin looking at the frequency of past events and developing the first notions of probability. Subsequent efforts in the 1700s discovered that the probabilities associated with a large group of observations—such as the results in games of chance—were distributed around their average value, forming a curve. Values similar to the average were likely to occur more frequently, and those much higher or lower were less prevalent, tapering off the farther from the average. The mathematical expression of this dispersion of data around its mean (or average) is called standard deviation and can be visualized as the area underneath the curve.

Later contributions to the developing field of statistics centered on heredity. In the late 1800s, statisticians working on questions about heredity developed a formula to express the "co-relation" between two variables, such as the height of a parent and their child. Correlation, as it came to be known, is calculated by dividing the covariance between a series of results by their respective deviations and is often noted as "R."

Standard deviation and correlation are just two of the many measures developed for the purpose of describing the probability of certain outcomes. In later years, metrics with an absolute view of risk—such as value at risk and expected shortfall—were joined by metrics associated with relative risk and the probability of underperformance—such as tracking error, Sharpe ratio, information ratio, alpha and beta (see Appendix for definitions). These expressions provided the mathematical language for financial theories ultimately aimed at better understanding and managing portfolio risk.

ENTER THE ECONOMISTS

Financial risk management acquired an academic framework with the development of modern portfolio theory in the 1950s, the capital asset pricing model in the 1960s and the options-pricing model in the 1970s.

Correlation and standard deviation are fundamental to the work of the financial economists (most notably Harry Markowitz) who developed modern portfolio theory (MPT). By considering an investment's volatility of returns (standard deviation) and the relationship between its returns and those of other investments (correlation), MPT demonstrated the potential benefit of asset allocation. It demonstrated (based on historical data) that assets could be mixed in such a way to enhance the blended portfolio's performance potential for a given level of volatility, or that the portfolio's overall volatility potentially could be reduced in pursuit of a given level of return.[1]

Markowitz's work and an emphasis on a particular risk measure—beta—led to the development of the capital asset pricing model (CAPM) by William Sharpe and others. According to Sharpe's work, unsystematic (or idiosyncratic) risk, meaning the risk specific to a particular asset, can be reduced by diversification, but systematic risk cannot. Consequently, systematic risk (beta) should have a central role in determining the risk premium for a security or a portfolio, which is what CAPM attempts to model.

Pricing was also the goal of work done by Fischer Black, Myron Scholes and Robert Merton focusing on options. Their model captured data for time, prices, interest rates and volatility to value options. The calculation that came to be known as the Black-Scholes formula also has wide applicability across other financial products. It has played a crucial role in the dramatic growth of derivatives and their use to hedge risk exposures or simply speculate.

Of course, it should always be remembered that any financial or risk measurement model is a tool based on historical data and the statistical probability of certain outcomes based on that historical data. As is often repeated in the investment world, past performance does not guarantee future results.

LEVERAGING COMPUTATIONAL CAPACITY

As the twentieth century wore on, the marriage of quantitative risk measures and academic theory was transformed by the digital revolution.

Financial modeling got an early boost from an unlikely source. In the 1940s, physicists working on nuclear weapons projects at the Los Alamos National Laboratory coined the term Monte Carlo to describe a computational algorithm that relies on repeated random samplings to produce results. The use of randomness and the repetitive nature of the process are analogous to the activities of casinos (like the Casino de Monte-Carlo in Monaco) where roulette, dice and slot machines exhibit random behavior. The Monte Carlo technique is particularly useful for modeling phenomena characterized by uncertainty. As applied to an investment portfolio, it uses historical risk and return data to create multiple trial runs, called simulations, for the purpose of estimating the probabilities associated with certain outcomes.

1. Diversification does not guarantee a profit or protect against a loss.

As mathematical models grew increasingly sophisticated, technology rose to the challenge. The publication of the Black-Scholes article was quickly followed by the release of hand-held calculators that could compute these values. The power to manipulate data and model complex portfolio strategies later exploded with the development of computers that could perform complex calculations in thousands of iterations. New faces subsequently joined Wall Street's ranks—these academics with math expertise or programming skills came to be known as "quants." Their influence on modern risk management is visible today in the software most firms use to model potential portfolio outcomes.

RISK AND PORTFOLIO MANAGEMENT

Modern risk managers harness the metrics described earlier and an array of modeling software to analyze portfolios. The interaction between risk management and portfolio management determines whether risk analytics inform and assist, or whether they fall by the wayside.

TOP-DOWN VS. BOTTOM-UP VIEWPOINTS

Differences between the disciplines of risk and portfolio management can have a significant impact on this relationship. Risk management, with its foundation in modern portfolio theory, concerns itself with the price behavior of securities, industries, sectors and countries. It quantifies their contribution to returns and the portion of returns attributable to differences between the portfolio and a benchmark. Risk models are designed to identify areas of overconcentration and underdiversification. This discipline essentially ignores the entities behind individual securities.

A company's competitive advantages, quality of management, balance sheet strength and many other details are instead the concern of portfolio managers and analysts. Their approach to individual security analysis and valuation, particularly if their portfolios rely on bottom-up security selection, can lead to a natural tension with risk management's top-down viewpoint. Franklin Templeton believes that combining both perspectives can form a powerful risk management structure, provided both groups communicate across their differences.

RECENT RISK CHALLENGES

The market crisis of 2008/9 will be remembered for many hazards—subprime securities, real estate bubbles and historic bank failures, to name a few. We believe that underlying many of these events is a common theme: a lack of effective risk management. The period's headlines threw a harsh spotlight on those firms where controls failed, and several specific examples illustrate challenges at an industry, portfolio and security level. The financial services industry was a mainstay of the period's headlines, providing ample evidence that risk management deficiencies can have an impact market-wide and beyond. Massive government support was required to keep many companies afloat—most notably in the US and Europe. The factors that ultimately led to this intervention were numerous and involved not only the main actors but also a wide range of businesses, investors, governments and markets around the world. We think one significant weakness was the flawed risk management structures and associated models in use. Some firms relied on proprietary models that predicted few losses on the highest-rated tranches of collateralized debt obligations (CDOs). Based on those models, firms priced and sold billions of dollars of credit protection in the form of credit default swaps (CDS).

As the housing bubble burst, defaults on subprime mortgages rose far higher than predicted by many models and the losses on CDS contracts grew. In combination with additional factors, this left some firms without adequate capital reserves. Few appear to have been using models that sufficiently encompassed worst-case scenarios or provided early indicators of what was to come.

At the portfolio level, ineffective risk management becomes evident in the gap between investor expectations and actual performance. Certain managers of municipal bond funds found this to be true after underestimating the potential downside risk of large allocations to low-rated, unrated or illiquid municipal securities (munis). Some funds had established these allocations to enhance yield and total return within the historically sedate muni marketplace, and when markets were more sanguine—prior to September 2008—such allocations helped lift peer group rankings.

Risk statistics based solely on historical data, like value at risk, would have supported such a strategy until events took a dramatic turn with the September 2008 failure of Lehman Brothers. Credit markets froze, and the value of muni portfolios using these strategies plummeted. Investors who had expected steady, relatively safe returns from these funds were surprised by the magnitude of the losses, and lawsuits quickly ensued. Once again, managing portfolio risk for all market conditions—not just "normal" markets—and striving to keep portfolios aligned with investor risk/return expectations are critical elements of an effective risk management program.

Lastly, the performance of so-called "structured notes" helps illustrate the importance of a comprehensive view of risk for individual security analysis. Structured notes were issued by securities firms in growing numbers leading up to 2008. They typically promised participation in the upside of an index, with some level of protection for the principal invested. The principal protection component, which was occasionally represented to be "100% principal protection," was backed by the credit of the issuing institution. However, some firms sold structured notes

issued by other investment banks, and with the collapse of Bear Stearns and Lehman Brothers, notes thought to have 100% principal protection proved to be unsecured debt tied to these failed companies. In these instances, counterparty credit risk, an important but frequently overlooked investment risk, included the possibility of steep losses.

RISK MANAGEMENT AT A CROSSROADS

In the wake of the 2008/9 market crisis, the underpinnings of risk management came under fire. The basic assumptions of MPT and all the metrics tied to it—that investors behave rationally, that markets operate efficiently, that financial outcomes fall into neatly symmetrical bell curves—endured a blistering critique. The short-term limitations of diversification were plainly obvious during 2008 when nearly every global asset class retreated sharply. Problems inherent in those models that relied on a limited history of optimistic results also became painfully clear.

Risk management has subsequently found itself at a crossroads. Financial innovation and new software tools seem likely to reassert themselves as the dust settles. In the meantime, the profession must find a way forward recognizing that risk remains a necessary part of active management, but that using the past to model the future can be inexact, particularly in the short term.

Consistent with our conservative corporate philosophy, Franklin Templeton uses a comprehensive, integrated risk management approach designed to determine whether investment risks are:

- Recognized—Risks should be recognized and understood at the security, portfolio and operational levels.
- Rational—Risk decisions should be an intended and a rational part of each portfolio's strategy.
- Rewarded—Every risk should have commensurate long-term reward potential.

INTEGRATED MANAGEMENT OF RISK AND INVESTMENTS

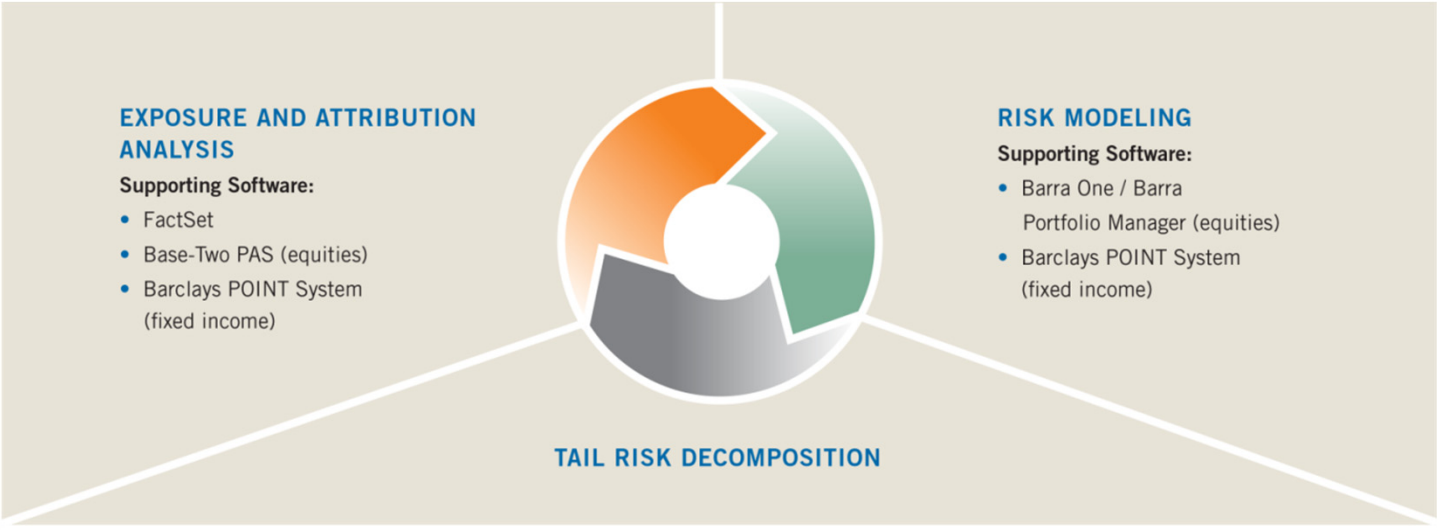
Investment risk management is fundamental to how Franklin Templeton manages assets and involves all aspects of the organization. There exists a healthy collaboration between the portfolio managers and support groups within the organization that contributes to how we operate our business. Unifying the entire organization is a common set of core values of putting clients first, building relationships, striving for quality results and working with integrity. Years prior to this latest crisis, Franklin Templeton established an integrated approach to risk that is part of every step in our investment management lifecycle.

The portfolio evaluation step relies on analytics prepared by the Franklin Templeton global risk management team, which is called the Performance Analysis and Investment Risk (PAIR) Group (see Figure 1). It currently consists of over 80 individuals, including three separate directors aligned with fixed income, equities and local asset management entities. Supporting these directors are risk managers and analysts, half of whom are located in offices outside the US.

Reports produced by PAIR seek to provide a clear understanding of absolute and relative risks and align those risks with the portfolio managers' investment convictions. The portfolio evaluation process (see Figure 2) is the forum in which PAIR communicates potential risk issues to portfolio managers:

- **Exposure and Attribution Analysis** examines relative and absolute portfolio weightings and how past investment decisions have impacted portfolio returns.
- **Risk Modeling** utilizes co-variant risk models to analyze and communicate the sensitivity of the portfolio to key risk factors.
- **Tail Risk Decomposition** seeks to provide a clear understanding of the potential impact of significant market events on the portfolio.

Figure 2: The Franklin Templeton Portfolio Evaluation Process



Source: Franklin Templeton Investments. For illustrative purposes only.

The PAIR approach to risk management permits each investment manager to implement risk management techniques that are consistent with their investment style and philosophy, but risk must be considered. The major factors that differentiate each group's collaboration with PAIR are degree of integration and frequency of reporting. We use the terms Benchmark Agnostic, Benchmark Aware and Benchmark Informed to categorize these differences.

BENCHMARK AGNOSTIC

Franklin U.S. Value Group and Mutual Series

These equity managers rely almost exclusively on bottom-up, fundamental research about individual holdings, and they do not attempt to position portfolios vis-à-vis indexes.[2] Additionally, their management practices have tended to produce lower levels of portfolio turnover, which has lessened the need for repetitive, "top-down" portfolio risk reporting. On a monthly basis, the managers receive a standardized review package containing performance attribution data and analysis of diversification, sector concentration and security weightings. On a quarterly basis, they participate in portfolio review meetings attended by the chief investment officer, the lead and/or co-portfolio manager and PAIR risk managers.

BENCHMARK AWARE

Franklin Equity Group®, Local Asset Management Groups, Templeton Emerging Markets Group and Templeton Global Equity Group®

These equity managers are not driven by benchmark or risk model exposures, but they seek to remain cognizant of benchmark composition and weightings and therefore require additional analytics. They receive a standard monthly review package, plus a quarterly set of multi-factor risk modeling reports, which utilize Barra Aegis risk decomposition data. Ed Jamieson, chief investment officer of the Franklin Equity Group, notes, "These analytics are geared toward showing portfolio characteristics, biases in stock selection and risks in our portfolios that are otherwise difficult to observe. They help to distinguish between intended and unintended risk, and they allow the portfolio team to reassess portfolio investments from a different perspective on risk." The reports are discussed at quarterly portfolio review meetings with PAIR, which are attended by the chief investment officer, the lead and/or co-portfolio manager and PAIR risk managers.

BENCHMARK INFORMED

Franklin Templeton Fixed Income Group® and Franklin Templeton Multi-Asset Strategies®

Franklin Templeton's fixed income managers are highly integrated with the PAIR team and utilize daily, ongoing risk reporting and portfolio risk decomposition. PAIR generates nightly risk reports for these portfolio managers using the Barclays POINT System, and PAIR's risk managers participate in bi-weekly meetings with fixed income portfolio managers and analysts to review current portfolio positioning compared to current investment strategy and policy. Additionally, the full Franklin Templeton Fixed Income Group attends the quarterly portfolio review meetings, where quarterly results and risk positioning are discussed across the team. Chris Molumphy, chief investment officer of the Franklin Templeton Fixed Income Group, adds, "The PAIR team ensures that our managers have accurate risk information available when they make portfolio decisions. PAIR's independent perspective is an important element of our investment process."

CREATING A FOUNDATION FOR THE LONG TERM

Between the ever-evolving nature of the financial industry and the possibility that regulatory changes will alter the industry's landscape, it is impossible to predict where risk management is headed. We at Franklin Templeton, with our multi-faceted view of risk, are moving through this challenging period by embracing continual development. By adding new layers of risk analysis several years ago, we believe the efforts outlined below were particularly effective in helping the firm act on early signs of financial-sector troubles.

Franklin Templeton's Counterparty Credit Committee assesses the risk posed by counterparties, or those banks and brokerages that act as our trading partners. Counterparty risk is generally not compensated in the marketplace and therefore must be carefully monitored. The fact that this committee was already in place prior to 2008 is one of the notable reasons Franklin Templeton avoided counterparty exposure to two large investment banks that collapsed that year. The committee was able to utilize a customized metric developed by PAIR (based on CDS spreads) that helped to anticipate the potential demise of a major counterparty and caused us to eliminate this exposure prior to that firm's bankruptcy. The Counterparty Credit Committee continues to meet on a monthly basis at a minimum and more often as needed.

Franklin Templeton's Complex Securities Review Committee (CSRC) addresses the more esoteric, or newly developed, areas of the securities markets. This committee works to help us understand the risks we may be taking before any portfolio manager initiates a position in such products. For example, the committee helped portfolio managers avoid certain complex investment vehicles that proved so problematic in the market crisis. Established in 2008 prior to the crisis, the CSRC continues to meet twice a week, vetting all derivatives positions in Franklin Templeton accounts globally.

2. An index is unmanaged. One cannot invest directly in an index.

No control environment is capable of fully mitigating risks related to the topics above, and both our clients and organization will continue to face risk of loss due to events in these areas. The approach Franklin Templeton has taken is to identify potential events that may negatively affect clients or the organization and establish an internal control environment that seeks a reasonable level of protection. The importance of these committees has been shown not only through policies and procedures, but also through the awareness and actions of management as well as their alignment with our values and philosophy.

APPENDIX

The Metrics of Risk Management

All risk management programs rely on certain metrics that can be divided according to the two views of risk—absolute and relative.

Standard deviation, explained earlier, is the most basic measure associated with absolute risk and the probability of loss. Additional examples include:

Value at Risk (VaR): A measure of the maximum cash loss a portfolio could endure over a short-term period (such as a day) given a certain level of confidence, say 95% or 99%. VaR is easiest to grasp in terms of the bell curve typically used to illustrate standard deviation. VaR is concerned with the outcomes at the curve's left tail, two or three standard deviations from the mean.

Conditional VaR: A calculation of the average of all the outcomes under the bell curve's left tail. In visual terms, conditional VaR (also known as "expected shortfall") attempts to do a better job of capturing the extreme events located at the far end of the tail.

Far more prevalent are the metrics associated with relative risk and the probability of underperformance such as the following:

Sharpe Ratio: A measure of an investment's risk-adjusted returns. It is calculated by dividing an investment's returns in excess of the risk-free rate (i.e., Treasury bill rates) by the investment's standard deviation. Positive values indicate that a manager is generating incremental returns for the risk they have taken on. Negative values indicate a manager has underperformed the risk-free rate.

Tracking Error: A measure of the degree of deviation between a portfolio and an index or composite. Historical tracking error is calculated by subtracting the benchmark return from the portfolio return for each monthly period and finding the population standard deviation of the resulting series.

Information Ratio (IR): An assessment of the value generated by active management of the portfolio. It is calculated by subtracting the benchmark return from the portfolio return and dividing by the tracking error. A manager that did not add value would be expected to have an IR of zero. Any IR above zero means that the portfolio manager has outperformed the benchmark and has not taken undue risks relative to that index.

Alpha: A measure of risk-adjusted performance, or the value added by a portfolio manager. It is calculated as the difference between the portfolio's historical performance for a time period and its expected performance (defined as the return of a diversified market portfolio at the same level of systematic risk over that period). A positive alpha indicates that a portfolio has performed better than a given level of systematic risk (beta) would predict. In contrast, negative alpha indicates that a portfolio has underperformed given the expectations set by beta.

Beta: A measure of an investment's sensitivity to market movements; it is used to assess market-related, or systematic, risk.

WHAT ARE THE RISKS?

All investments involve risks, including possible loss of principal. Stock prices fluctuate, sometimes rapidly and dramatically, due to factors affecting individual companies, particular industries or sectors, or general market conditions. Interest rate movements will affect a fund's share price and yield. Bond prices generally move in the opposite direction of interest rates. Thus, as the prices of bonds in a fund adjust to a rise in interest rates, a fund's share price may decline. These and other risk considerations are discussed in the appropriate fund prospectus.

IMPORTANT LEGAL INFORMATION

This article reflects the analysis and opinions of the authors as of June 14, 2013, and may differ from the opinions of other portfolio managers, investment teams or platforms at Franklin Templeton Investments.

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Investors should carefully consider a fund's investment goals, risks, charges, and expenses before investing. To obtain a summary prospectus and/or prospectus, which contains this and other information, talk to your financial advisor, call us at (800) DIAL BEN/342-5236, or visit ***franklintempleton.com****. Please carefully read a prospectus before you invest or send money.*

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