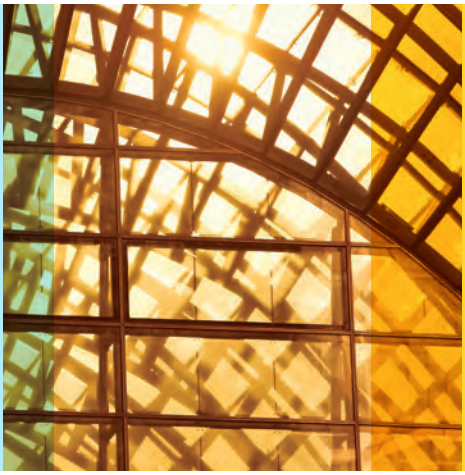

NEW FRONTIERS OF RISK: REVISITING THE 360° MANAGER

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OUR KEY COLLABORATOR IN DEVELOPING THIS RESEARCH PAPER: DR. HARRY MARKOWITZ PH.D., 1990 NOBEL PRIZE IN ECONOMICS

In collaboration with Nobel Prize winning economist, Dr. Harry Markowitz, BNY Mellon's Investment Services and Investment Management groups have combined resources with HedgeMark International, LLC to provide an inside look into the institutional investment risk management field.

In our previous white paper, which also included valuable input by Dr. Markowitz, we found that pension funds and non-profits were just starting to take a more serious look at risk management. Now, some eight years later and post the 2008 financial crisis, our 2013 survey shows that risk management is more critical than ever. Among our major findings:

The 2008 Financial Crisis – A New Awakening of Risk Awareness: The 2008 financial crisis caught many institutional investors off guard. The risk management procedures then in place were widely perceived to be insufficient for a crisis of such magnitude. The drive for more effective, holistic risk management was soon on.

No More Chasing Alpha: It's down with alpha and up with targeted returns. Institutional investors are placing greater emphasis on achieving absolute return targets as opposed to outperforming a market benchmark. Risk budgets, matching liabilities and avoiding downside risk all play an important role in this shift.

Increased Use of Alternatives: Survey respondents have expanded their use of alternative investments to improve diversification and potentially help with downside risk. Institutional investors plan to increase their allocations to alternatives over the next five years.

Analytical Tools on the Front Lines of Risk Management: Analytical tools based upon risk-return analysis and performance attribution continue to be the most commonly used to model, analyze and monitor investments. Total plan/enterprise risk reporting tools are on the rise to encompass traditional and alternative investments, as well as liabilities.

Avoidance of Unintended Bets: A desire to avoid unintended leverage and to better understand underlying investments has grown markedly since the 2008 financial crisis and appears to be driving institutional investors toward solutions offering greater investment transparency.

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BNY MELLON

FOR THE INSTITUTIONAL INVESTOR:

This white paper provides an inside view into the formidable risk pressures that institutional investors are up against.

Risk management is a puzzling proposition for institutional investors. Just as we develop meaningful controls to manage the underlying risks associated with the last market crisis, new risks keep emerging and old ones keep evolving. To help you better understand and manage the ever-changing nature of risk, I am pleased to present the latest in BNY Mellon's thinking, New Frontiers of Risk: Revisiting the 360° Risk Manager.

This white paper provides an inside view into the formidable risk pressures that institutional investors are up against. From new regulations, to transparency concerns, to investment risks across the board, we look into the attitudes and actions of institutional investors to find what has worked for them and what hasn't. To that end, we surveyed over 100 institutional investors, including pension funds and endowment & foundations, with approximately $1 trillion in aggregate assets under management. What they told us has led to some surprising findings, especially when it comes to generating alpha, as shown in the pages and charts that follow.

At the start of this study, we turned once again to the expertise of Dr. Harry Markowitz, the pioneer of Modern Portfolio Theory (MPT), 1990 Nobel Prize winner in economics, and longtime friend of BNY Mellon. Dr. Markowitz collaborated with us on our first risk white paper in 2005, New Frontiers of Risk: The 360° Risk Manager. Back then, the need for more structured and holistic risk management was just beginning to be recognized. Now, almost a decade later and in the wake of the 2008 financial crisis, risk management is a foremost priority of just about every institutional investor.

I would like to extend my personal thanks to all of our clients and prospects who participated in this survey. And to Dr. Markowitz, whose contributions in the field of risk management are as relevant and valuable as ever, we are proud to work with such an esteemed luminary. Together, we are advancing our way through the new frontiers of risk.

Regards,

Debra Baker
Head of Global Risk Solutions
BNY Mellon Asset Servicing

FOREWORD – HARRY MARKOWITZ, PH.D.

A long time ago in a galaxy far, far away—or at least it seems that way as compared to the risk control procedures now practiced by institutional investors, as reported herein based on BNY Mellon's risk practices surveys of 2005 and 2013. Actually, it was sometime in 1950 while reading John Burr Williams *Theory of Investment Value* (Williams, 1938, 1989, 1997) in the library of the University of Chicago's GSBA (now called the Booth School in honor of a benefactor who made his fortune in what might be called the MPT industry) that it struck me that the financial theory of the day did not adequately account for portfolio risk. I am of course delighted to see from the two surveys that MPT continues to be used as a major tool in portfolio management, and that the ideas that came to me almost exactly in the middle of the last century are still referred to as *Modern* Portfolio Theory. Multiplying the percentages reported in the surveys times the size of the institutional investment management industry; let's say it is up to $30 trillion, suggesting that tens of *trillions* of institutional AUM (assets under management) are managed with the aid of MPT.

I will not try to summarize the results of the two surveys. The paper that follows does an excellent job of that. Rather I will share with you some thoughts about the lessons learned since our 2005 white paper, and express some concerns about where we are heading.

WAS 2008 REALLY THAT SHOCKING?

"I personally am shocked that the industry found 2008 so shocking." – *Dr. Harry Markowitz*

The survey makes it clear that the industry was shocked by 2008. I, personally, am shocked that the industry found 2008 so shocking. Based on historical returns since 1926, large cap stocks fell about 2-1/2 standard deviations below their long term average return. If annual returns were normally distributed (mind you, I did not say they are, just if they were normally distributed) then a downward move of two standard deviations or more would happen roughly two and half percent of the time. That is one year in forty. Since I have been in this business for over sixty years, I was overdue for a one year in forty event.

The following specific morals can be drawn from the fact that once-in-forty-years events happen from time to time: The survey reports an increased interest in a portfolio's Value at Risk (VaR). I have no objection to using VaR as one way to characterize a mean-variance efficient portfolio's risk exposure; but I hope top management understands that VaR (at the 5% level) is not the most a portfolio can lose, but the least it will lose five percent of the time. Since five percent is one period in twenty, losses somewhat in excess of the 5% VaR point (say, between the 1% and 5% probability levels) should be considered routine events in portfolio management.

In late 2007 through early 2009 in particular, pension funds that stayed with an old-fashioned 60-40, or 70-30 or 50-50, or such, mix of stocks and bonds (including an efficient mixture of asset classes such as large cap, small cap, developed markets, emerging markets, and long-term, short-term and high yield bonds, for example) rebalanced near the market's nadir while those who were too clever by half suffered tragically.

THE DANGER OF USING ALTERNATIVES FOR DIVERSIFICATION

"The goal of diversifying a portfolio by adding exotic asset classes has sometimes proved quite disappointing, and predictably so." – *Dr. Harry Markowitz*

The 2013 survey reports an increased use of alternative investments with diversification rather than enhanced expected return as the principal motivation. The goal of diversifying a portfolio by adding exotic asset classes has sometimes proved quite disappointing, and predictably so. The formula for the volatility of a portfolio is rather complicated. Depending on lots of different correlations between the returns of a proposed security or asset class with those of others in a portfolio, the adding of a more volatile security or asset class may or may not reduce the portfolio's volatility. Estimating volatility of illiquid investments can complicate risk calculations, and some alternative investments intend to reduce beta rather than increase beta. However, if an investor is exposed to exotic high beta alternative investments, the result may be that the exotic security or asset class goes down in flames at the same time traditional asset classes are struggling. The institution then says that portfolio theory with its touted diversification benefits (as represented by some sell-side quant) has failed.

The solution here is simple. The institution should have a trusted quant team make *forward looking estimates* of means, variances and covariances involving this security or asset class, perhaps with the help of the factor model of their choice. These estimates, along with such estimates for traditional securities or asset classes, should be presented to the MPT optimizer along with the institution's legal, institutional, turnover, liquidity, multiple objectives, client preferences and other constraints. The efficient frontier generated by the optimizer from these inputs may or may not have portfolios that use the proposed security or asset class. So be it.

The trusted quant team in the previous paragraph is presumably either that of the institution or a consultant, depending on who regularly produces the institution's efficient frontier. As the survey notes, sometimes such matters are done in-house and sometimes are farmed out. If the trusted team errs too badly too often, the institution should hire or develop a different trusted team.

USING THE APPROPRIATE MEASURE OF RISK

The survey notes that many pension funds, especially private as compared to public pension funds, have switched from performance-versus-a-benchmark to asset-returns-versus-liabilities as their objective. The moral here is that an MPT optimizer is quite flexible with respect to such matters. The institution needs to identify its objectives and share them with the optimizer. For example, in advising an individual investor a CFA or CFP should usually use the total volatility of the client's portfolio as its risk measure; whereas a money manager who is paid to outperform some index should use tracking error as its risk measure; and a pension fund should naturally use the volatility of asset values minus liability values as its measure of risk.

As noted in a comment in the survey, if the volatility of assets-minus-liabilities is the correct risk measure for a particular portfolio, such as a firm's pension fund, that doesn't mean that its portfolio should be immunized. That would be the minimum risk solution for such a portfolio. But the MPT view is neither to minimize risk nor always maximize return, but to consider the possible trade-off between them.

ALL CRISES ARE DIFFERENT

"The moral here is that one will never be able to put the portfolio selection process on automatic." – *Dr. Harry Markowitz*

The crisis of 2008 was different. So was the crisis that started in March of 2000 with the bursting of the tech bubble. So will be the next crisis, as were all the colorful crisis reported in Mackay's *Extraordinary Popular Delusions and the Madness of Crowds* (Mackay, 1841, 1852, 1980). The moral is that one will never be able to put the portfolio selection process on automatic. The trusted quant team needs to constantly evaluate the current situation. It should also make sure that higher management understands what assumptions are being made, how and by whom any exotic asset classes being used have been evaluated, and what are the vulnerabilities of the general approach being taken.

Furthermore, the push to integrate risk-control at the enterprise level, rather than at the individual portfolio level, should be continued. More generally, this white paper's many charts, tables, revealed trends and the comments on them concerning both investment risks and operational risks in the surveys reported below should be given the most serious consideration.

ABOUT THE SURVEY

The 2013 Survey comprised over 100 institutional investors from around the world. 53% of the respondents are in the United States, 17% in Canada, 27% in Europe, the Middle East and Africa, and 3% in Asia. For purposes of comparability with the 2005 survey, this paper focuses on 88 respondents, 36% of which were corporate pensions, 32% were public pensions, 16% were endowments/foundations and the remaining 16% consisted of other types of institutional investors. A significant majority of these respondents, approximately 92%, were responsible for managing over $1 billion in assets, with 48% managing between $1 and $5 billion, 18% managing between $5 and $10 billion, and 26% managing more than $10 billion in assets. Another 15 sovereign wealth funds and central banks that participated in surveys and interviews are described separately in the appendix.

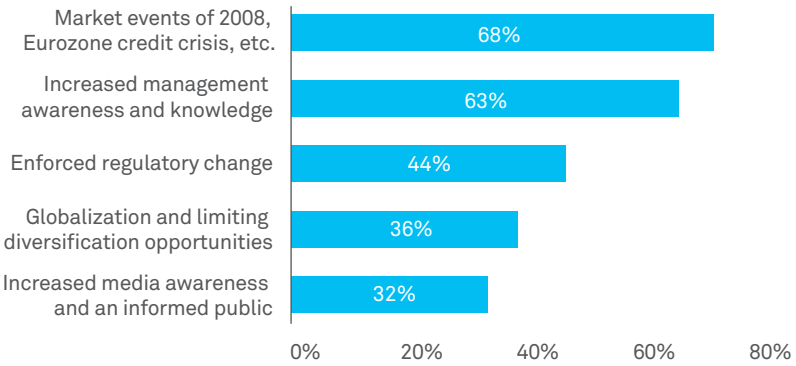
RISK MANAGEMENT NOW

For the purposes of this paper, we are classifying institutional risk management into three broad categories: Investment Risk, Operational Risk and Political Risk. Investment Risk relates to asset returns, valuations and expectations, and includes currency, interest rate, liquidity and beta risks. Operational Risk refers to risks related to internal and external processes, people and systems that facilitate or may influence the investment management process. And lastly, Political Risk is the exposure to political processes or events, including regulatory change, local country operating conditions, political corruption and war. Some of these risks may influence either investment performance or operating effectiveness.

The 2005 and 2013 surveys both indicated the role of risk had grown in importance over the prior five years. Respondents indicated the market events surrounding the 2008 financial crisis and subsequent recession represented their biggest motivator. And over 60% said increased management awareness of the growing field of risk management caused their firm to institute risk management practices as shown in the chart below.

The 2008 financial crisis was a significant motivator for better risk management.

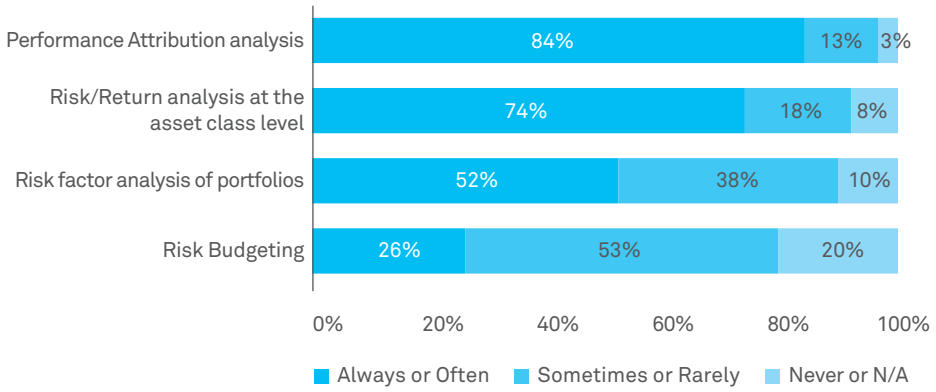
Factors Influencing the Implementation of Risk Management



CONDUCTING RISK ANALYSIS

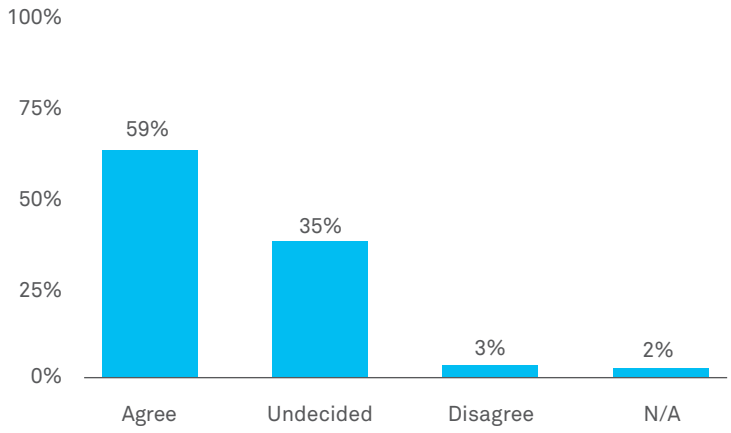
Mathematical and computer-based investment analysis, which ultimately earned Dr. Markowitz a Nobel Prize in 1990, is very frequently used by institutional investors to manage investments, with attribution analysis and asset class risk/return analysis the most common of the categories provided. Risk factor analysis is commonly used, and risk budgeting, a newer form of risk management, is being used by a significant number of investors.

The Use of Mathematical/Computer-Based Analysis



Over the last five years, 59% of respondents felt their firms had benefited through the evolution of risk management, however, many remained undecided about the impact. To a large degree, our results indicated the largest area of reservation related to the cost and impact of regulation. Interestingly, we encountered very different results by region with 53% of respondents from Europe/Middle East/Africa (EMEA) indicating the costs of meeting regulatory changes have outweighed the broader business benefits, whereas only 25% of respondents in both the US and Canada felt the same way. Also, 62% of respondents in both the US and Canada indicated their organizations benefited through the evolution of the risk management practice, only 38% from EMEA felt the same.

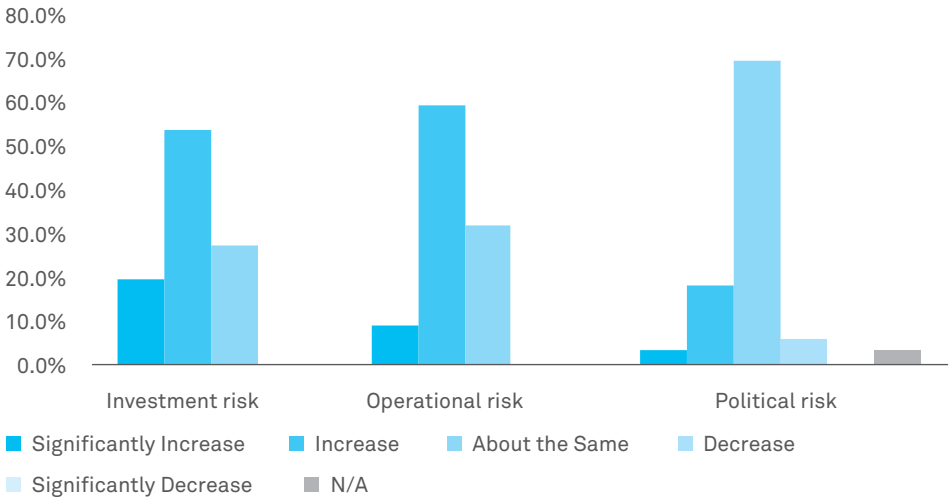
The Evolution of Risk Management Has Brought Benefits



MORE TIME BEING SPENT ON RISK MANAGEMENT

Over the next five years, 73% of institutional investors expect to spend more time on investment risk issues and 68% expect to spend more time on operational risk issues, yet only 25% of respondents had a Chief Risk Officer. No respondents expect to spend less time on investment or operational risk. Most respondents expect to spend the same time on political risk in the future.

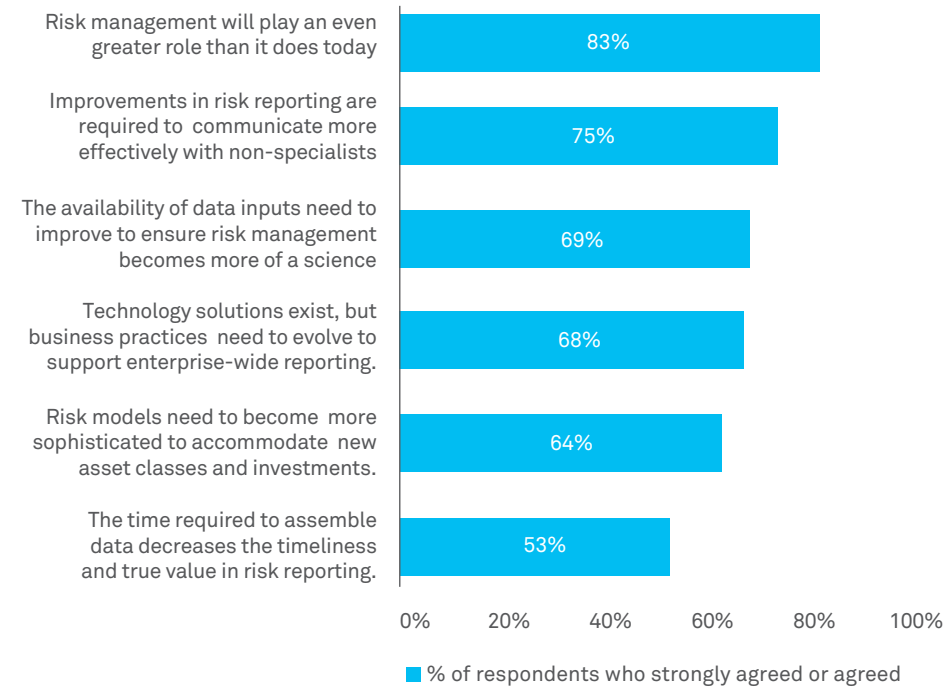
Next 5 Years: Amount of Time Allocated to Risk Management



As the following chart demonstrates, looking forward, 83% percent of the 2013 respondents expect risk management to play an even greater role in the investment decision process in the future. Respondents also helped prioritize areas in need of further improvement within the risk management field. In particular, participants highlighted the importance of being able to communicate results effectively with senior management and non-specialists; the availability of useful data inputs and the need to utilize existing technology to produce meaningful enterprise-wide risk reporting. Approximately half of the respondents indicated that the time spent preparing the risk analysis reduces the value of the results.

Our participants want to communicate risk management results with candor to senior management.

The Future of Risk Management



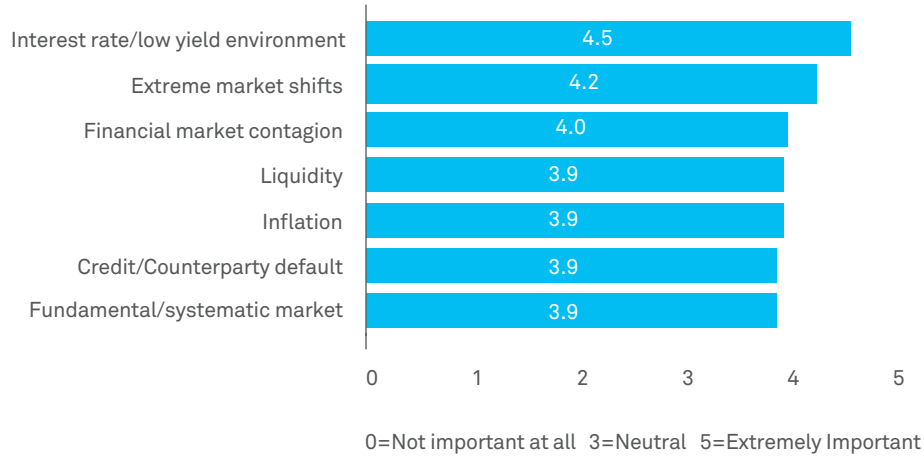
INVESTMENT RISK

Low interest rates and low yields are the most critical market risks right now.

MARKET RISK

Survey responses suggested the 2008 financial crisis and subsequent recession not only increased institutional investors' desire to implement risk management practices, but directly influenced their priorities and the kinds of risk management practices implemented. For example, the low yield environment, extreme market shifts, financial market contagion and liquidity responses were rated as the most important market risks facing institutional investors in the 2013 Risk Survey. In fact, 100% of pension funds rated "the interest rate and current yield environment" to be either an important or extremely important market risk. The market risk categories whose importance increased most since the 2005 survey were "derivatives volatility, extreme market shifts, liquidity, financial market contagion and credit/counterparty default risks," all emblematic of the 2008 financial crisis.

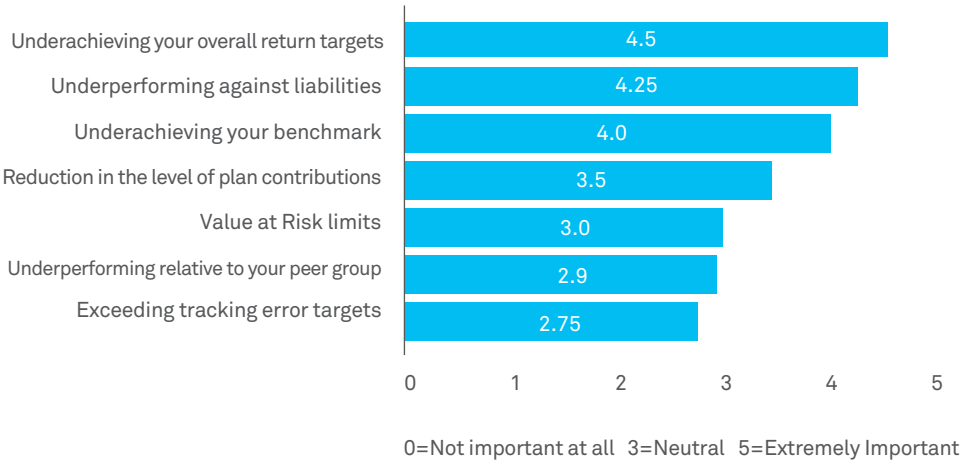
The Most Important Market Risks



INVESTMENT RISK MEASURES

In a significant shift since our 2005 Survey, respondents to the 2013 Survey rated "under-achieving overall return targets" and "underperforming versus liabilities" as their two most important risk policy measures. Between the 2005 and 2013 risk surveys, these two measures increased more than any other response within this section. If one considers liabilities as a form of performance target, the general shift in the focus of risk management from relative-to-benchmark to relative-to-target outcome becomes even more apparent. The "reduction in the level of plan contributions; VAR; and exceeding tracking error targets" all support the importance of achieving objectives relative to targets.

Rating Investment Policy Risk Measures



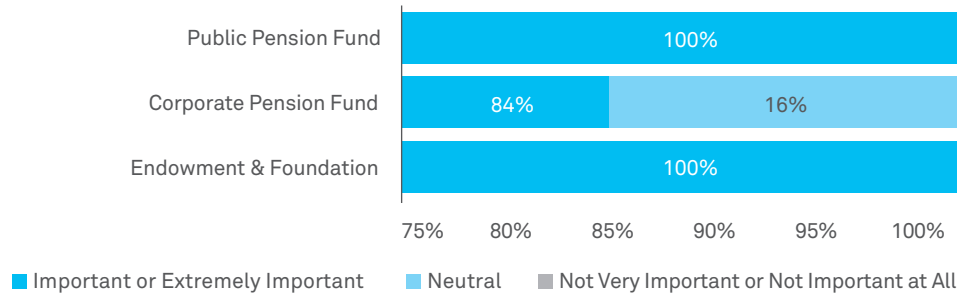
Drilling into the detail, we can see that 100% of public pension funds and 100% of endowments/foundations said "under achieving overall return targets" was "important or extremely important"; 84% of corporate pension funds indicated the same. None of the endowments/foundations, public pensions or corporate pensions indicated underachieving return targets was unimportant. In some cases, achieving return targets also implies avoiding down-side risk.

One pension fund respondent described their policy objective as, "the objective is to ensure we meet/ exceed the surplus targets."

Another pension fund investor said, "our focus on risk has changed dramatically. We now focus on downside risk, we want to make the pension risk less cyclical and want less asset class risk."

A manager with an endowment focused on downside risk exposure said, "The idea is, don't dent the car. We would love to capture 75% of the up-side and experience less than half of the downside loss."

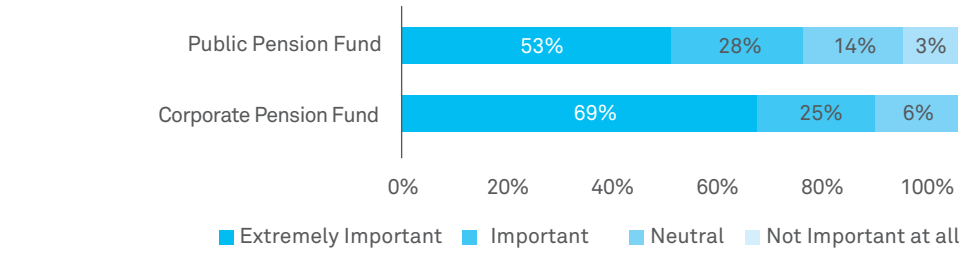
Rating the Importance of Not Achieving Your Return Targets.



PERFORMANCE VS. LIABILITIES

Looking more closely at performance vs liabilities responses, we can see that 94% and 82% of corporate pensions and public pensions also indicated underperforming against liabilities was either extremely important or important. The lower response from public plans relative to corporate plans is consistent with the differentiating characteristics of each investor type, in particular, accounting and regulatory differences and the differing sources of sponsor capital that, at the margin, encourages a different risk management perspective.

Rating the Importance of Underperforming Against Liabilities



"NO MORE CHASING ALPHA"

After surviving the tumultuous events following the 2008 market crisis, many asset owners grew to painfully understand the implications a full blown recession. The combination of losing over ten years of equity growth, inflated liabilities and a weak economy created very difficult circumstances for pension funds, whose underlying businesses faced challenges making larger pension contributions during a recession.

Corporate pension funds realized they could not risk their companies over pension fund volatility and other institutional investors came to similar conclusions. As a result, institutional investors focused on their ultimate goal, which in the case of pensions, was to meet their liabilities and avoid severe losses that might jeopardize their underlying mission. Other types of asset owners with material allocations to alternative investments also shifted their focus away from public market benchmarks. As a result, achieving target returns displaced alpha as institutional investors' #1 investment objective.

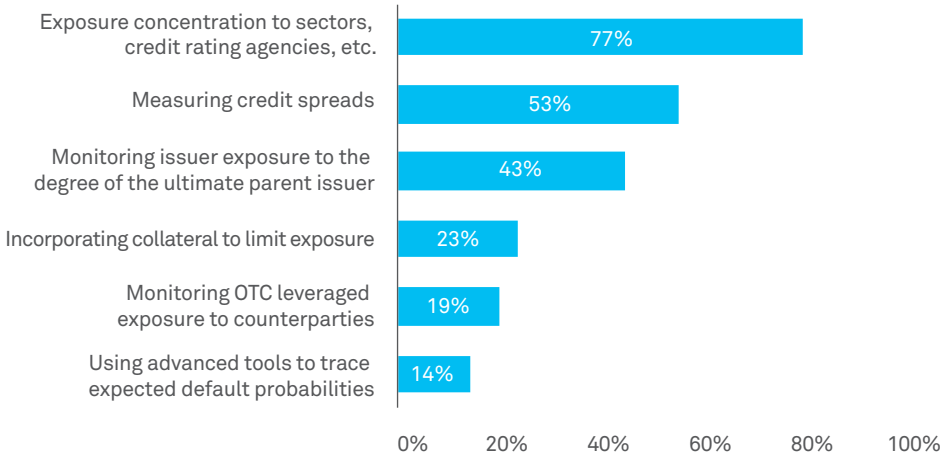
In 2005, "Underachieving Your Benchmark" was the most important market measure. Also, relative to the 2005 Survey, "underachieving your benchmark" and "exceeding tracking error targets" dropped in importance more than any other response in this section. In contrast, only 50% of public pension funds and 39% of corporate pension funds said that "underachieving your benchmark" was "extremely important." This represents an important finding because it shows a shift in approach away from chasing alpha and toward achieving specific targets since 2005.

CREDIT RISK MANAGEMENT

Credit risk can be defined as the risk of loss caused by the failure of a borrower to meet its financial obligations to a lender. Because credit defaults played a central role in the 2008 financial crisis, credit risk has grown substantially in importance among institutional investors, but investors must still rely on others to ensure their investments are credit worthy and their information is reliable.

Basel II and Dodd Frank have taken steps to reduce the kinds of credit default risks we saw in 2008 and institutional investors are now taking a closer look at their credit risks using a variety of techniques. For example, 77% percent of participants indicated they measured exposure concentration to sectors as well as their aggregate credit ratings, while 53% indicated they measured credit spread. 43% of survey respondents indicated they are now monitoring issue exposure down to the ultimate issuer and over 23% are incorporating collateral into their manager limit exposures. 19% are monitoring OTC leveraged exposure to counterparties. Only about 6% of respondents use advanced tools to trace expected default probabilities or monitor OTC leveraged exposure to counterparties.

% Using Various Credit Risk Monitoring Tools



DESIRED INDUSTRY IMPROVEMENTS

When asked what credit related improvements survey participants would like to see in the industry, the most common responses were:

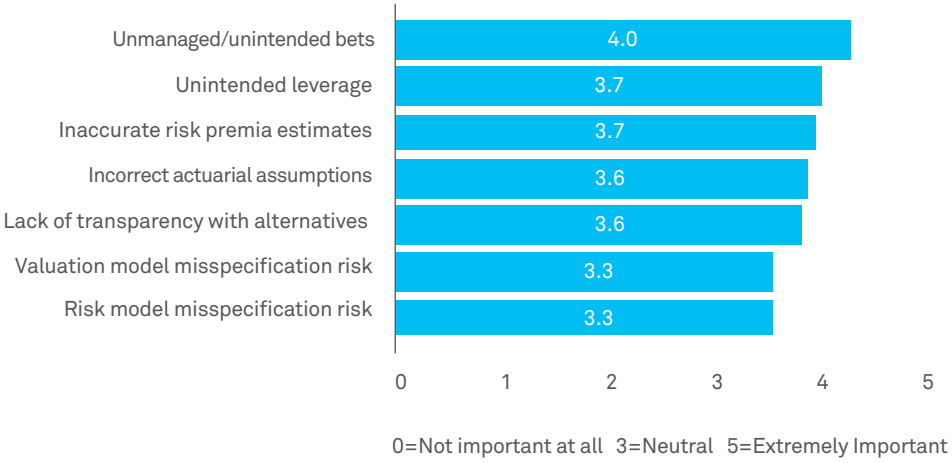
- Improved trustworthiness or independence of major credit rating agencies (by far the most common response)
- Better tools to assess credit risk or standardized credit risk measures (second most common)
- Increased transparency (third most common)

CONCERNS ABOUT UNINTENDED INVESTMENT RISKS

When provided a list of potential unintended risks that might be assumed by institutional investors, unmanaged/unintended bets, unintended leverage and inaccurate risk premia estimates rated as the three most important concerns. Again, all three of these leading responses suggest institutional investors are determined to closely monitor the kinds of risks that led to sizable losses from the 2008 market crisis.

Institutional investors are determined to closely monitor the kinds of risks that led to sizable losses from the 2008 market crisis.

Rating Investment Policy Risk Measures



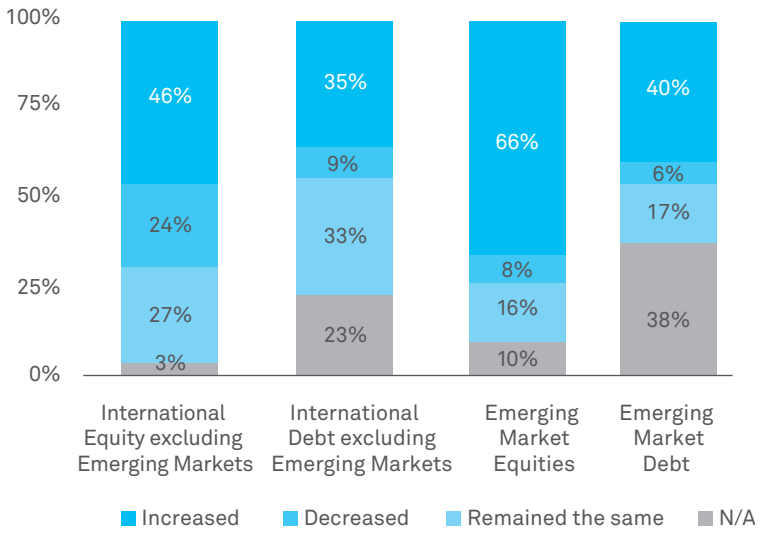
EMERGING MARKETS AND INTERNATIONAL INVESTING

Over the past five years, investors reflected an increased willingness to expand their exposures to include international equities, international debt, emerging market equities and emerging market debt. Allocations to emerging market equities experienced the greatest increase according to the surveys. These results demonstrate investors' willingness to expand their allocations to new investment categories.

REGIONAL DIFFERENCES IN DEBT INVESTING

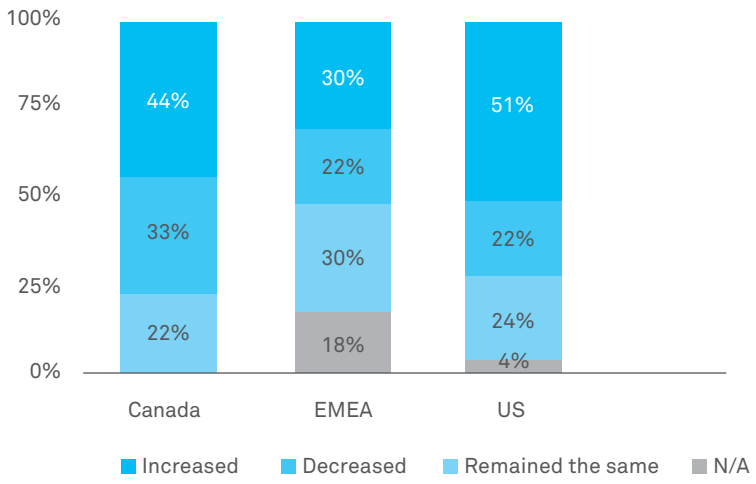
Drilling down into the detail by region, we can see wide disparities between US, EMEA's and Canada's allocations to international debt and emerging market debt. Additional research could determine if these differences are due to total return vs. LDI strategies; preferences to invest money in the local country's economy or perhaps the nature of different regions' risk profiles.

Global Investment Allocations During the Past 5 Years

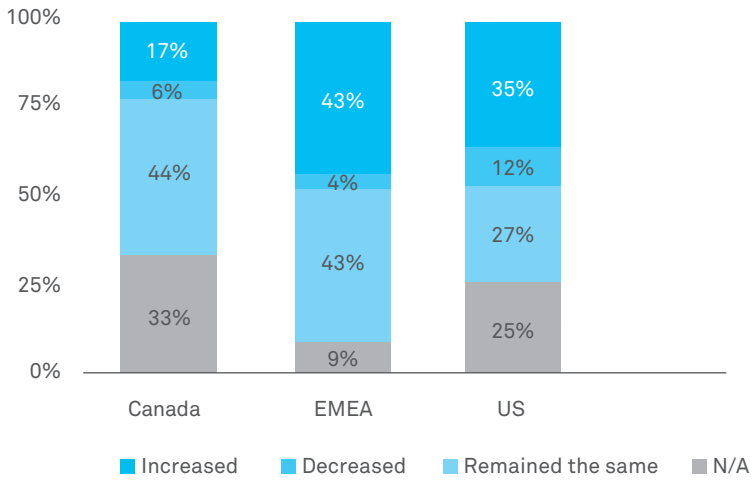


ASSET ALLOCATION BY REGION

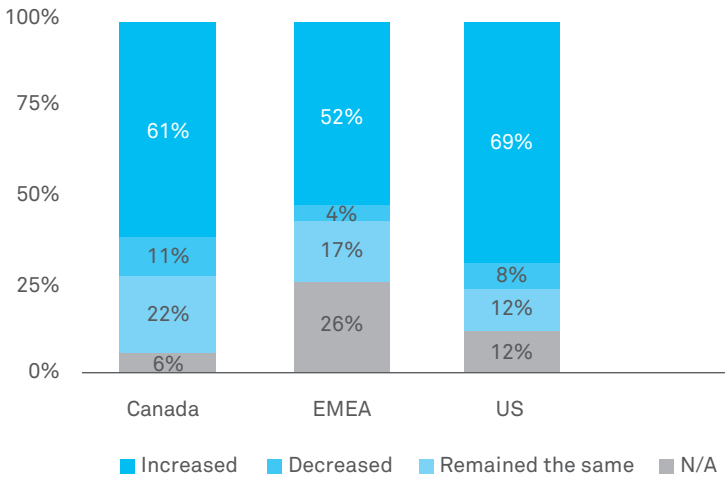
International Equity Investing (excluding Emerging Markets)



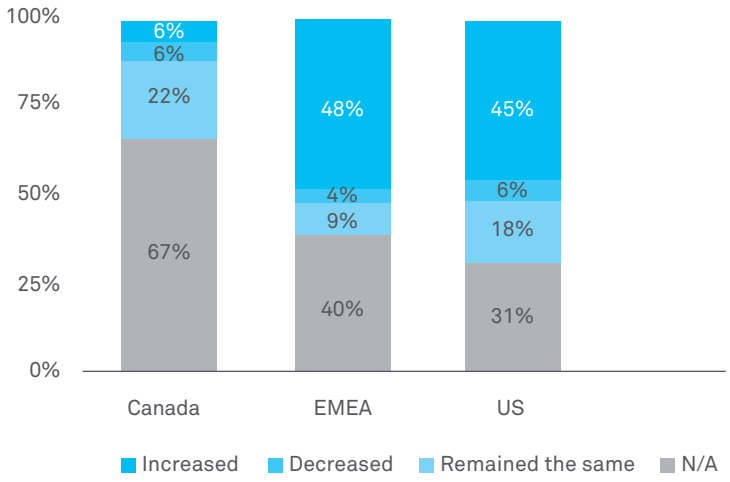
International Debt (excluding emerging markets)



Emerging Market Equities



Emerging Market Debt

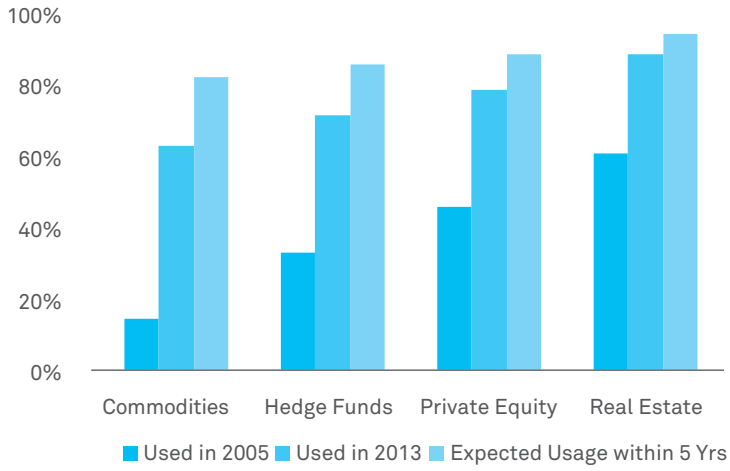


ALTERNATIVE INVESTMENTS

Pensions, as well as endowments/foundations have notably increased their use of alternative investments since 2005. Respondents also anticipate further increases in each of the following alternative investments over the next five years.

Pensions, as well as endowments/ foundations, have notably increased their use of alternative investments since 2005.

Growing Use of Alternatives

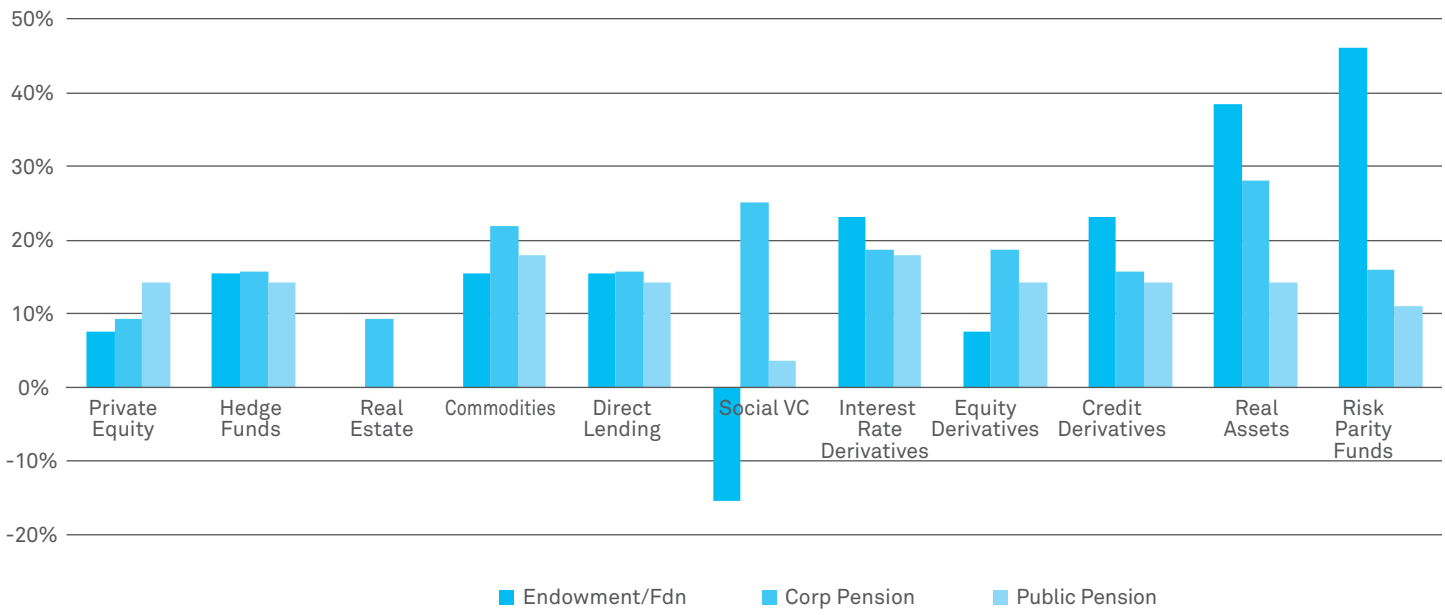


When we take a deeper look at the data, we can see that across a wide spectrum of alternative assets, investors anticipate larger allocations to virtually every category of alternative investment. As shown by the "Future Use" table, endowments/ foundations lead the way by anticipating the greatest usage of alternatives, followed by corporate pension funds. One manager of an endowment said: "We are virtually all non-traditional investments, which includes hedge funds and private equity."

	NOW			FUTURE		
	Use Following Investments?			*Foresee Using in Next 5 Years*		
	Endow-Foundn	Corp Pension	Public Pension	Endow-Foundn	Corp Pension	Public Pension
Private Equity	92%	75%	75%	100%	84%	89%
Hedge Funds	85%	75%	54%	100%	91%	68%
Real Estate	100%	84%	96%	100%	94%	96%
Commodities	77%	59%	54%	92%	81%	71%
Direct Lending	46%	53%	43%	62%	69%	57%
Social VC	46%	28%	21%	31%	53%	25%
Interest Rate Derivatives	77%	78%	57%	100%	97%	75%
Equity Derivatives	92%	75%	71%	100%	94%	86%
Credit Derivatives	77%	81%	64%	100%	97%	79%
Real Assets	62%	59%	71%	100%	88%	86%
Risk Parity Funds	23%	31%	21%	69%	47%	33%

The only alternative investment not expected to grow was Social/Community Venture Capital Investments, probably due to concerns about lower expected returns. These investments are intended to generate local community benefits and not necessarily the maximum risk adjusted returns, so they should not be considered a typical investment vehicle.

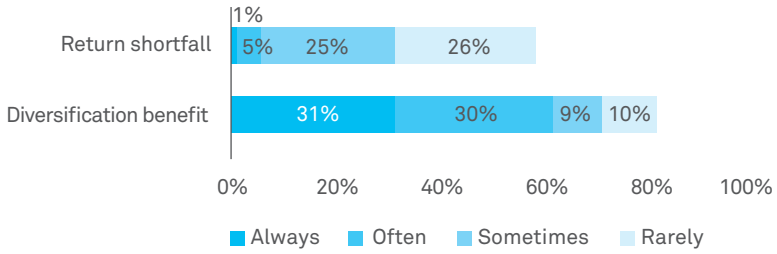
Anticipated Increased Usage of Alternatives over Next 5 Years
By Investor Type



DIVERSIFICATION VS. RETURNS

When asked why they invested in alternative investments, the majority of participants indicated their objective was to increase diversification benefits, not to address return shortfalls. 69% of respondents indicated they always or often use alternatives for diversification benefits, while only 6% indicated they used alternatives for compensate for return shortfalls. Increasing diversification benefits could have included increasing expected return at the same level of risk, whereas attempting to overcome a return shortfall would imply increasing expected return at a higher level of risk.

Reason for Using Alternative Investments



A CLOSER LOOK AT THE REGIONS

Looking at our detailed results on a regional basis, Canada and the US used more private equity, hedge funds and real estate than the Europe, Middle East and Africa (EMEA) region. EMEA investors, however, used more credit derivatives and interest rate derivatives than US and Canadian investors. This may be because over 90% of the EMEA respondents were corporate pension funds (central banks and sovereigns were not included within this portion of the analysis), compared to just 38% and 25% for the US and Canada respectively. We encountered similar results when we asked about each region's plans to invest in these alternative assets in the future.

Also interesting, 56% of Canadian investors indicated they always invest in real assets (infrastructure, project finance, etc.) compared to just 17% from EMEA and 20% from the US. This may have to do with Canada's large oil reserves and other natural resources.

LIABILITY DRIVEN INVESTMENT STRATEGIES (LDI)

Liability Driven Investing (LDI) seeks to ensure assets meet liabilities, both in the present and the future, and is most popular with defined benefit plans. Many different LDI strategies exist. Typically, for example, a liability investment strategy involves some level of hedging against an organization's pension liabilities including changes in interest rates and inflation. Historically, bonds were the primary means of partially hedging this risk because bonds' sensitivity to interest rates parallel those of a pension fund, but in more recent years, use of swaps and other derivatives have become more commonplace and have added flexibility (McDaniel, 2011).

Some strategies will utilize a "glide path," which strives to reduce interest rate liability risk and accumulate sufficient assets over time (Lins, 2013). LDI strategies have become more popular in the US and the UK, partially as a result of more recent regulations requiring the display of corporate pension funded positions on their balance sheets. Research by William Sharpe and Lawrence Tint (Sharpe and Tint, 1990) indicated investors should minimize the variance of assets minus liabilities, substituting volatility for surplus risk, as opposed to using benchmark risk when pursuing an LDI strategy.

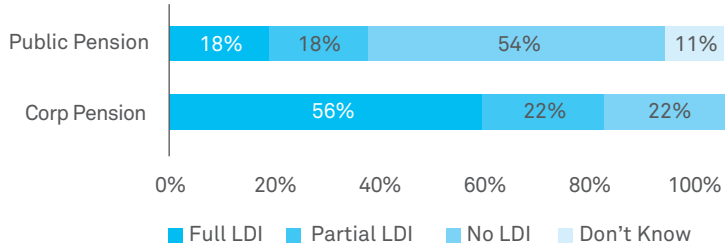
"ALTERNATIVES... ALTERNATIVES... ALTERNATIVES...."

As indicated in our survey, across each major category, the use of alternatives has increased. One of the negatives resulting from an increasingly global economy has been the high correlations we have witnessed during periods of market upheaval. For those not pursuing an LDI strategy, given the current low yield environment and an expectation of increasing rates, many are turning to alternative investments to increase returns and diversify risks. However, given Institutional investors' increasing sensitivity to accepting risks they do not understand, newer solutions are emerging to provide investors with some degree of transparency, thus improving their ability to communicate with their investment committees and manage their aggregate risk.

Liability Driven Investing (LDI) seeks to ensure assets meet liabilities, both in the present and in the future.

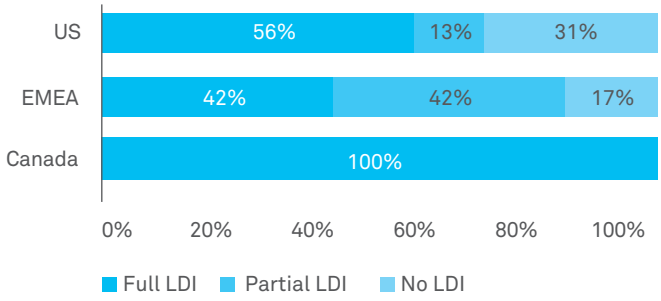
A significant difference could be seen between Corporate Pension Plans and Public Pension Plans. Of the Corporate Pension Funds, 78% indicated they were following an "LDI or partial LDI/liability aware" investment strategy, while only 36% of Public Pensions responded they were doing the same.

Implementing a Liability Driven Investment Strategy



Looking at responses by region for just Corporate Pension Funds below, we found that 100% of the Canadian funds had implemented a full LDI strategy vs 56% of US Corporate Pension Funds and 42% of EMEA funds. Although a larger percent of US corporate pension funds had implemented a full LDI strategy, 84% of EMEA corporate pension funds had implemented a full or partial LDI strategy, compared to 69% of US corporate plans. We should point out; the sample size for Canadian Corporate Pension funds was relatively small, with just 4 respondents, vs 16 US and 12 EMEA corporate pension plans.

Comparison of Corporate Pension Funds by Region
Full vs. Partial vs. No LDI Strategy



LDI EXTENT BY REGION

The survey results have shown a significant increase in the importance of risk management in the minds of institutional investors. However, one should not assume this has, in and of itself, perpetuated a dramatic shift in the composition of all institutional investors' policy portfolios. Migrating to a relative-to-liabilities perspective has not in all cases been accompanied by the wholesale adoption of LDI oriented investment strategies.

LDI strategies generally involve significant investment in long duration fixed-income securities

In general, LDI strategies involve significant investment in long duration fixed income securities, either physically or synthetically via interest rates swaps, to increase the interest rate sensitivity of the overall portfolio. Embedding market risk characteristics into the overall portfolio that mimic those present in the liability stream is an effective way of managing the funded status risk but is not without its own risks.

For many with underfunded liabilities, locking in their deficits through the purchase of fixed income securities at historically low nominal interest rates is costly and places too high a financial burden on the sponsor via increased short term contributions. So, while almost all public and corporate pension plans now consider their liabilities as their primary reference point for market risk, the unique circumstances of each investor have been a pivotal factor in determining the degree to which this has translated into wholesale portfolio allocation changes.

A DIFFERENT AND DISTINCT APPROACH TO LDI

As referenced earlier, accounting, regulations and plan sponsor differences explain the variation in LDI approaches between public and corporate pension plans. Furthermore, differences in the typical terms and conditions of corporate defined benefit plans across geographic regions have also led to significant differences in the approach distinct regions have taken to managing risks relative to liabilities. For example, UK defined benefit pension liabilities, in contrast to US liabilities, are typically inflation linked, requiring LDI strategies to incorporate inflation as well as nominal interest sensitivities. In conjunction, UK LDI strategies make significantly greater use of derivative instruments relative to their US counterparts. A corollary of this approach is the greater significance of counterparty risk management techniques for UK Corporate plans relative to the typical US plan.

Much of the market collapse in 2008 could be traced to a lack of operational controls along different points in the investment process.

OPERATIONAL RISK

Operational risk has taken on newfound significance in light of the spectacular failures in the financial industry during the 2008 financial crisis. Although operational risk is not a new field, arriving at its definition can be challenging due to its complex nature. For our Risk Survey, BNY Mellon defined operational risk as the risk of loss from inadequate or failed internal processes, people and systems or from external events.

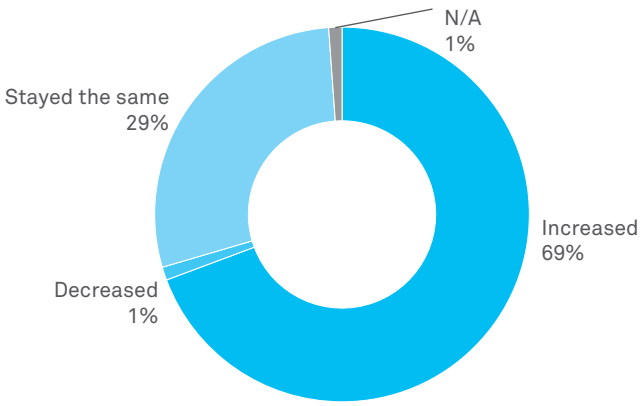
The Lehman Brothers' collapse represented an excellent example of operational risk controls failing to identify underlying risks, specifically, the full extent of their subprime mortgage exposure, which quickly contaminated the whole financial market. Widely publicized trading losses, hedge fund scandals and, in general, much of the market collapse in 2008 could be traced to a lack of operational controls along different points in the investment process.

A close look at the events surrounding the 2008 crisis reveals the potential complexity of operational risk. Institutional investors will need to utilize a number of different solutions to safeguard their organizations to internal and external threats. These solutions need to combine qualitative and quantitative tools to tackle the different aspects of the industry's operational risk challenges.

One fund executive said, "Now this issue has a seat at the table."

Another said, "We expect to see risk management efforts continue to expand."

Shift in focus on Operational Risk During the Past 5 Years



One institutional investor said: "This is a risk we are not being compensated for, but it is especially important in the hedge fund space."

Another said, "The focus has absolutely changed in the last 5 years, and our program has been broadened to capture the focus on operational risk."

Another said, "Catastrophic event planning is reviewed for each manager."

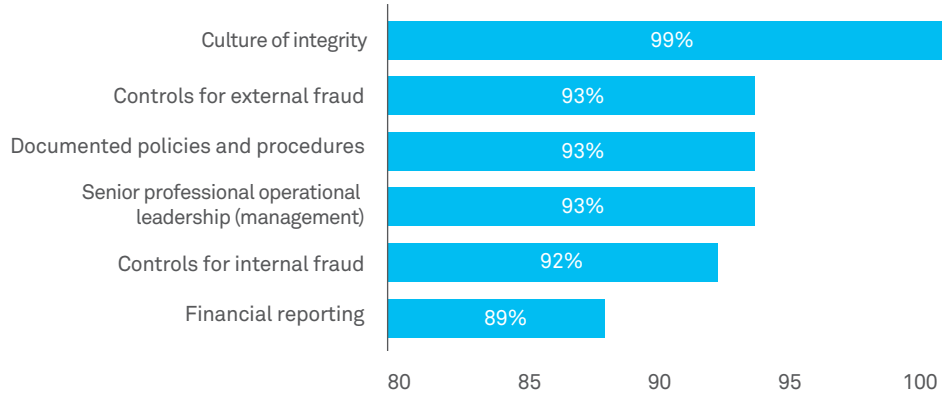
A corporate investor said: "We have something like a six sigma process in place that flows across the organization."

Another said: "We are too lean and mean. We have no coverage if someone leaves."

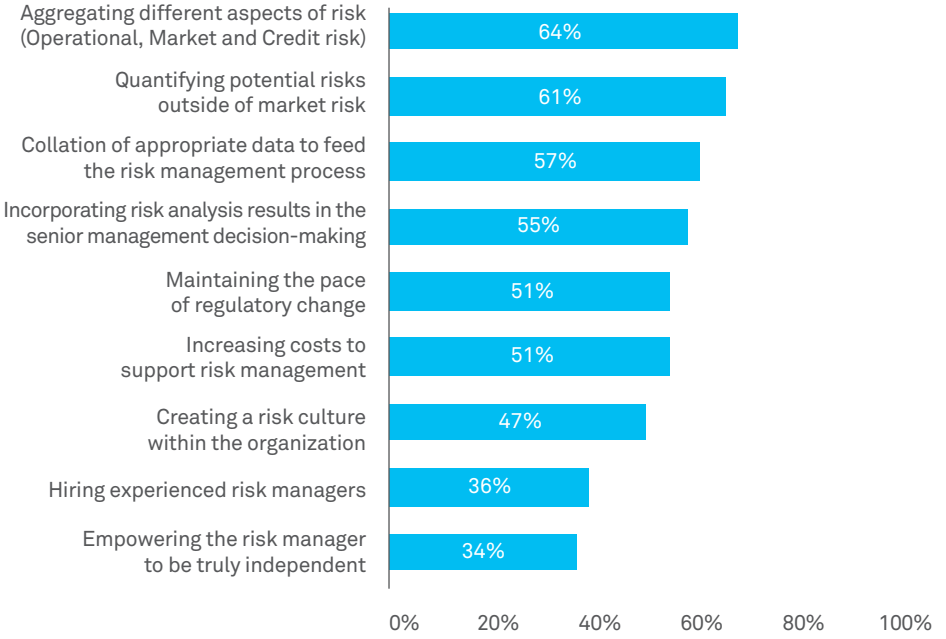
OPERATIONAL RISK MANAGEMENT CONTROLS

The survey respondents utilize a number of different controls to monitor operational risk in their organizations, varying from culture of integrity, to internal and external fraud controls, to financial reporting. All the categories scored very high, demonstrating an understanding of the importance, complexity and resources needed to mitigate operational risk.

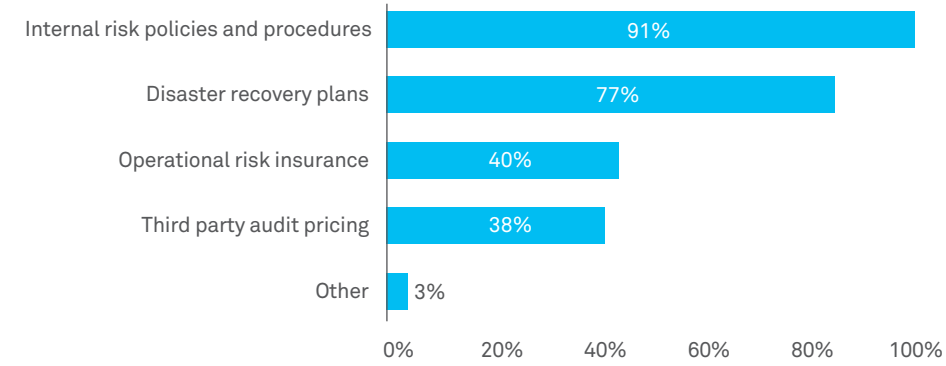
The Most Important Operating Risk Controls (% rated important or extremely important)



Rating the Following Operating Risks (% rated as Challenging or Extremely Challenging)



Evaluating Outside Vendors: The Most Important Factors



Balance sheet strength and credit rating were the two most highly rated important risk factors when evaluating global custodians. Interestingly, stress test and SIFI status did not receive high ratings, possibly suggesting the 2008 banking concerns are now well behind us.

OPERATIONAL RISK INSURANCE

Although the percentage of respondents actually utilizing operational risk insurance went down from 35% to 26%, the number who ruled out operational risk insurance dropped much more and the number contemplating operating risk insurance rose from 5% to 18%. Furthermore, the number of respondents that now require operational risk insurance from vendors rose dramatically, from 7% to 23% since the 2005 Survey.

DO YOU CARRY OPERATIONAL RISK INSURANCE?

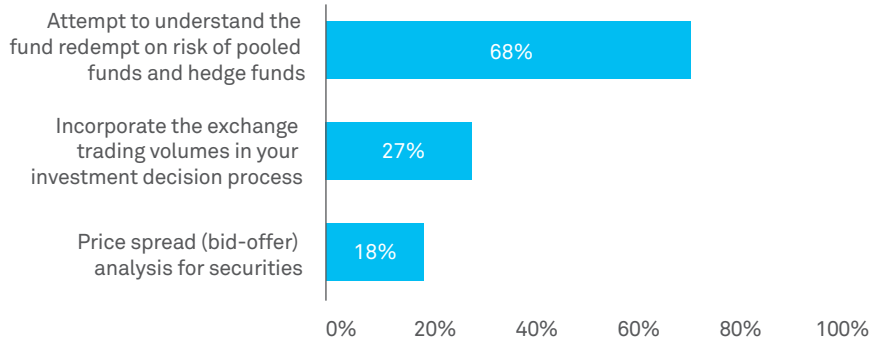
	2013 Responses	2005 Responses
Yes	26%	35%
No, and we do not plan to	33%	50%
No, but we are contemplating it	18%	5%
No, but require it from vendors	23%	7%
No	88	72

LIQUIDITY RISK

Our survey defined liquidity risk as the risk that a position in the portfolio cannot be sold, liquidated or closed out in a reasonable time-frame without incurring unreasonable costs. Respondents indicated they were primarily focused on satisfying the redemption requirements of their pooled funds and hedge funds. For this reason, we classified liquidity risk under operational risk, as opposed to market risk, given that institutional investors must follow detailed procedures to ensure they are able to meet their liquidity requirements.

One respondent said, "We put everything in buckets and add up the buckets."

Techniques Used to Reduce Liquidity Risk



POLITICAL RISK

In our survey, we defined political risk as the risk that an investment's returns could suffer as a result of political changes or instability in a country where instability affecting investment returns could stem from a change in government, legislative bodies, other foreign policy makers, or military control. Recent examples, such as the Eurozone bailouts, the US debt ceiling debate, and the Arab Spring protests, all had far-reaching and unintended implications to well-managed portfolios.

POLITICAL RISK AS THE TRIGGER

Political risks can also manifest themselves in the form of regulatory changes or improper government oversight of laws. These events are sometimes thought of as one-off events that cannot be measured or predicted and do not rank as highly as market or operational risks in the minds of institutional investors, even though many political events have driven the volatility of markets. In fact, recent studies have shown that the most volatile trading days in US stock markets have been triggered by political events. For those operating in less developed countries, political risk may be predominantly operational in nature.

The most volatile trading days for US stock markets have been triggered by political events.

Referring back to our survey, 8% of respondents are not influenced at all by political risk when making an investment decision, and only 6% are extremely influenced. The focus on political risk has increased somewhat since 2005, where the average response has moved from 2.7 in 2005 to 3.1 (on a scale to 5) in 2013. Interview responses suggested this was because the respondents felt political risk, from an investment perspective, was primarily the investment manager's responsibility.

Only 22% of respondents believe time spent on political risks will increase over the next 5 years, and 75% believe it will remain the same or decrease, which shows that political risks are not thought to be a growing area of concern. On the other hand, exposure to emerging markets (where political risks are thought to be highest) has increased, with 66% increasing their exposure to emerging market equities and 39.8% increasing exposure to emerging market debt over the last 5 years.

Political risks can manifest themselves in the form of regulatory changes or improper government oversight of laws.

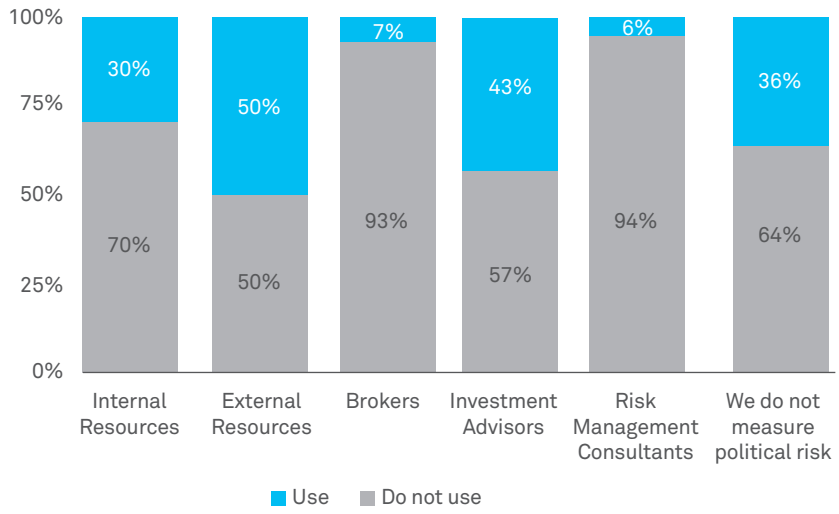
MEASURING POLITICAL RISK

Survey respondents largely rely on external resources (50%) and investment advisors (43%) to measure their political risk, with 36.4% stating they do not measure political risk at all. Political events can be difficult to predict and quantify. So with political risks not high on the agenda, but exposures to emerging markets and regulatory changes increasing, do we have the balance right? Many respondents indicated these decisions normally were the responsibility of the investment managers, but do they also have the right controls in place, or are the additional political risks taken by the investment manager offset by the larger alphas they gain?

Given the influence politics and political events have had on: market returns; credit ratings; regulatory enforcement; reserve requirements; leverage limits; transparency; business practices in areas such as the sub-prime lending market; and the ability of companies to compete on a level playing field, not to mention more serious turmoil that can up-end markets, it appears institutional investors are well advised to pay greater attention to political risks going forward. Institutional investors may want to, for example, spend more time evaluating their investment managers' and advisors' understanding of political risks as part of their normal due diligence and selection process and request regular reports from managers and consultants as part of their investment management process.

For example, one respondent said: "Political risk is something we let our asset managers worry about and manage." Another said, "we have a strategic system in place to look at their weights and their views, so that internally they can look at political and social risks, and adjust the portfolio."

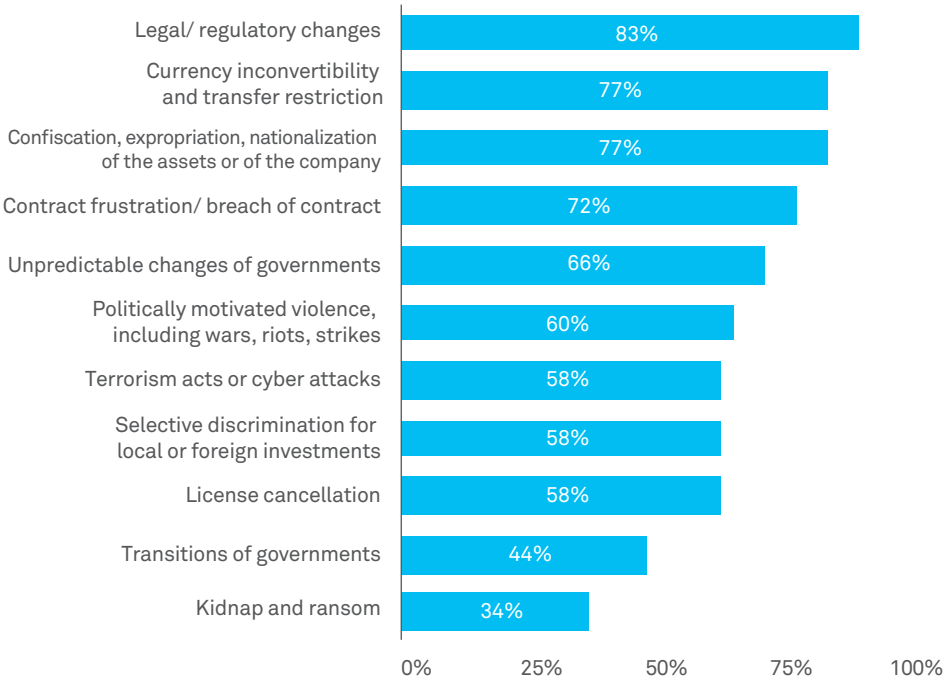
Resources Used to Measure Political Risk



Legal and regulatory risks ranked the highest concerning political risk for survey respondents with 83% of respondents ranking it as important or extremely important, as they did in 2005, with currency inconvertibility and transfer restriction and confiscation, expropriation, nationalization of the assets or of the company following closely.

Legal and regulatory risks ranked the highest among political concerns.

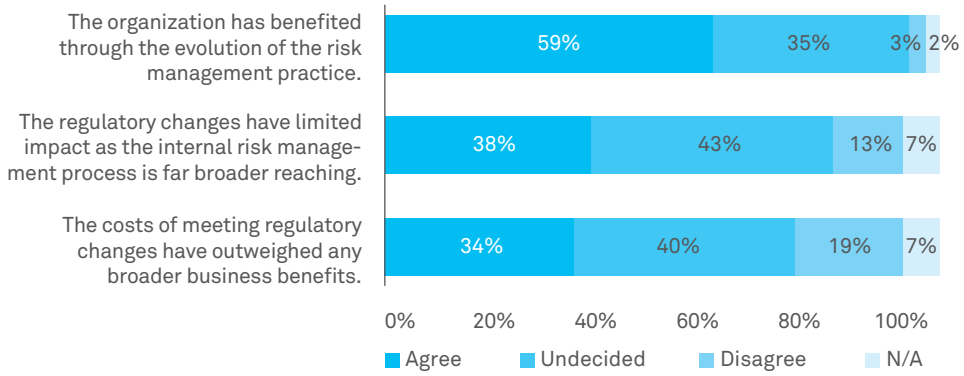
Political Risks (% Responding Important or Extremely Important)



UNCERTAINTY SURROUNDING REGULATORY CHANGE

Looking more closely at regulatory changes, we can see only 34% feel the costs of meeting regulatory changes have outweighed the broader business benefits, while 40% are undecided and 19% disagree with this statement. Meanwhile, 38% believe the regulatory changes have had a limited impact and that implementing a risk management process had broader reaching benefits, with 43% undecided about this question. On the other hand, a larger percent, 59%, believe the organization has benefited through the evolution of risk management practices, as opposed to regulatory requirements.

The Level of Agreement About Risk Management During the Past 5 Years



Looking at results by region, the survey showed that institutional investors from North America felt the cost of regulation was more justified when compared to investors from EMEA. Also, 22% of EMEA investors said enforced regulatory change was extremely influential in their decision to implement a risk management practice, compared to just 6% in the US and 6% in Canada, which may explain the differences in opinion regarding the cost of meeting regulatory change.

For example, some EMEA Investor comments included:

- *"Risk Management is their cross to bear"*
- *"Markets are over-regulated."*
- *"Are we killing the market with too much regulation/cost and not enough returns?"*
- *"Regulators make us pay high fees to bail out other companies"*

However, in the US, we heard responses such as:

- *"I am a big proponent of Dodd Frank"*
- *"Anything that increases transparency is good"*
- *"Transparency is good and decreases costs"*
- *"I disagree with the industry's efforts to eviscerate regulation"*
- *"I can see more pressure on the hedge fund industry to be more transparent"*

In general, globally, asset owners seemed to be saying

- *"It is hard to measure the benefits so far"*
- *"Most of the risk is with the banks and underlying managers"*
- *"I don't believe the risks are with asset owners and our new regulatory burden is bigger than it should be"*

BEST PRACTICES

Although managing investment risk continues to be paramount, operational risk and political risk have grown substantially in importance and respondents believe the field of risk management will continue on this path into the future.

Based upon client survey responses, Modern Portfolio Theory (MPT) continues to be relevant from both an investment and risk management perspective. Similarly, we have concluded that many of the best practices followed at the time of our 2005 Survey continue to be of value. However, a number of new, powerful practices have emerged, many as a result of the 2008 Market Crisis. It is predominantly these newer practices that are identified and discussed in this document.

The revolution that began in 1952 with Dr. Markowitz's original research paper continues today as investors and researchers find new ways to adapt to the market's increasingly complexity with increasingly sophisticated tools.

When seeking to strengthen risk management practices, the most general take-away from the survey tells institutional investors to develop a holistic view of risk, evaluating investment, operational and other types of risks to support top-down strategic decision making. Also, ensure the risk management function has sufficient resources to implement, monitor and communicate relevant risk measures. More specific best practice recommendations are summarized below.

INVESTMENT RISK BEST PRACTICES

Total Plan / Enterprise Risk Reporting

Implement Enterprise Risk Management to estimate forward-looking investment risk measures relative to specific objectives, using sophisticated software and leveraging available expertise to incorporate alternative investments and manage complex data requirements. Specific objectives may be investment policy benchmarks, required spending targets or estimated liabilities, or other measures appropriate to the firm. Incorporating enhanced tail risk measures requires investors to use an Enterprise Risk Model that uses simulations, either historical or Monte Carlo, in order to capture potential return distributions that are not normally distributed. During Dr. Markowitz's interviews with BNY Mellon, he said:

"One of the things that has become popular lately is to use Monte Carlo simulations to see the consequences of picking off the frontier that way. That's the way it should be done."

Risk Budgeting

Traditional asset allocation models are increasingly being supplemented by some form of a risk budgeting process. This approach uses forward looking risk measures (VAR, Stress Testing, and Scenario Analysis) to move beyond traditional market value weighted allocations by incorporating the total capital at risk into the asset allocation decision process. Risk budgeting can serve a useful purpose, but investors should remain focused on achieving an optimum allocation, given their constraints and objectives, even in the case of an LDI strategy (Sharpe and Tint, 1990). Dr. Markowitz, during his interview indicated,

"If you now say, 'I'm going to risk budget,' and that leads you to inefficient portfolios, that's like burning money; if you throw away 10 percent of your money and use the remaining 90 percent efficiently."

Automate Investment Policy Guideline Monitoring

Include operational risk monitoring expectations in making decisions for hiring and continuing vendor relationships. Ensure the investment policies are being maintained, both at month end and intra month. By automating the monitoring process consistently across managers, it ensures policies are being properly executed and managers are complying with their guidelines. Automated compliance monitoring reduces the risk of managers taking inappropriate risks intra-month and

structuring their investment process to only comply with investment guidelines at month end. Managers will be especially mindful to comply with the investment policy guidelines once they have been notified of breaches.

Performance vs. Holdings Based Risk Measures
An interesting observation from the responses to the above question is that standard risk return analysis and performance attribution are used significantly more than risk factor analysis and risk budgeting. Why? Likely it goes to two main factors: understanding and implementation. Performance analysis only requires a series of monthly returns – information that is readily available for all investments. The shift to risk factor analysis and risk budgeting generally requires a shift to models that use positions for the analysis. The use of these more complex models, coupled with the higher data demands makes implementing those tasks more difficult. Should more investors seek to make the shift? While there is no definitive answer, at the time of our 2005 Survey, the use of Risk Budgeting was not deemed to be common enough to be included in the survey. Now, by comparison, the use of risk budgets has become relatively common.

Not knowing can be the worst risk of all. Eliminating surprise is a fundamental aspect of risk management.

Unintended Risks
Not knowing can be the worst risk of all. As investors indicated above, the unmanaged/unintended bet is the worst risk of all. In 2008, what shocked many investors was not just the losses, but the magnitude of the losses and the sources as well. In many cases, investors realized after the fact that they did not properly understand their exposures. Eliminating surprise is a fundamental aspect of risk management. While investors will never be able to eliminate the disappointment associated with losses, they can use the latest risk tools to help them understand all of their exposures, and hopefully mitigate future surprises.

Counter-Party Risk Monitoring
While the focus and discussion of counter-party monitoring continues to rise, increasingly, institutional investors find themselves challenged when it comes to understanding their true counter-party exposure. The increased use of derivatives, along with investments held away from the primary custodian (private equity and hedge funds), means that accurately assessing counter-party risk has become more difficult. Fortunately, increased transparency in alternative investments, combined with improved models and reporting tools, allow those seeking to follow best practices to have access to the information and analytics necessary for total plan, counter-party reporting.

Monitor Credit Default Swap Exposure
Understand the extent to which Credit Default Swaps are being used to hedge risk versus providing income while accepting additional risk. Also, monitor the credit worthiness of the underlying insurer, as well as potential risk exposure to your fund by manager.

When used properly, derivatives provide a relatively efficient and cost-effective way to obtain desired exposures or hedges.

Ensure Credit Risks are Understood
Ensure the manager clearly communicates the precise nature of portfolio's credit risk and the means by which this credit risk is being independently monitored and evaluated. Identifying and aggregating the exposure to the ultimate issuer and understanding their credit risk is essential.

Derivatives Monitoring
The use of derivatives continues to expand within more traditional funds and many hedge fund portfolios. Used properly, derivatives provide a relatively efficient and cost effective way to obtain certain desired exposures or hedges. Additionally, derivatives provide a mechanism by which the total portfolio distribution of returns can be shifted to provide a desirable positive skew. However, if used improperly, derivatives can magnify leverage and exacerbate losses during larger market moves. Consequently, Institutional Investors must have the processes and systems in place to monitor the role of derivatives in their portfolios.

Monitor Leveraged Exposures
Determine degree of notional exposure on a Gross (long + short) and Net (long – short) basis and incorporate hedge fund investments.

Evaluate the Expanding Universe of Investable Assets
Optimize the plan's asset allocation strategy by evaluating a larger number of asset categories, with the objective of achieving superior risk-adjusted returns.

Normalize Private Equity Exposures
Private equity holdings should be normalized to match public equity sectors and industries to allow institutional investors to evaluate total exposures by country, sector and industry on a levered and unlevered basis.

Evaluate Private Equity Exposures at the Holdings Level
Evaluate private equity company positions to determine if the portfolio inadvertently holds over concentrations to specific positions, which can occur from firms collaborating in large or popular deals. Also, verify market values of positions to ensure valuations are consistent between holders and reasonable.

Transparency
Increase transparency expectations, with respect to alternative investments, commingled vehicles and derivatives, as a means to improving the calculation and understanding of risk exposures. Monitor mid-level data for hedge funds and, where possible, use an intermediary or establish a private account with Hedge Fund managers to understand underlying risks and aggregate exposures. These exposures should then be appropriately incorporated into your overall enterprise level risk analysis. Examples of increased detail that drives effective risk monitoring include derivative notional exposures, counterparty and ultimate issuer concentrations and credit ratings, and private equity holdings valuation differences.

Hedge Fund Managed Accounts
Consider hedge fund investment structures, such as fund of one or managed account structures, to increase ability to monitor and control transparency, liquidity and governance of alternative investments. As hedge fund allocations continue to increase in size within institutional portfolios, the need for institutions to understand the structure of these investments has increased. Managed Accounts are designed to provide these investors with an improved framework for managing their hedge fund investments, including independent control (a manager's focus would be on trading only), daily (t+1) position-level transparency, oversight, independent pricing/administration and high-frequency performance/risk reporting. Managed accounts offer an approach to hedge fund investing consistent with emerging best practices by providing investors with improved transparency, liquidity, control, and governance of their hedge fund investments.

Perform Look-through on Commingled Funds
Achieve a top down view of investment characteristics, sector exposures and holdings positions by having your manager send month end holdings feeds to your provider in order to achieve a top down, strategic view of your exposures.

Optimizing LDI Investment Strategy
Institutional investors may seek to maximize their utility by seeking to take into account the full or partial consideration of their liabilities or other assets in their portfolio. Instead of pursuing an asset only or a full surplus only strategy, a mean variance optimization can be used to identify an investment strategy that best meets the funds priorities (Sharpe and Tint, 1990).

Managed accounts can provide investors with improved transparency, liquidity, control, and governance of their hedge fund investments.

Risk culture needs to be designed at the top level of the organization and embraced by all employees in their daily work.

OPERATING RISK BEST PRACTICES

Operational risk controls need to be designed to allow a two-way communication in the organization, from top to bottom and vice versa. The risk culture needs to be designed at the top level of the organization and embraced by the employees in their daily work and interaction with colleagues and clients. This risk culture can never be implemented and amended without the right information and feedback from the bottom of the organization to the top. Consequently, a culture of integrity plays a crucial role in establishing a strong risk management environment.

Evaluating Operational Risk should be an Integral Part of Vendor Selection — For example, vendors should be asked if they have disaster recovery plans, insurance for operational risk, and risk management programs that can be described. One investor said: "As part of our due diligence process, we meet with vendors' operational groups."

Consider Establishing Partnerships with Third Parties to Bolster Risk Management Capabilities — Only 25% of respondents have a Chief Risk Officer and many indicated understaffing represented a challenge in their workplace, suggesting the potential benefits of partnering with third parties. Taking a partnership view of vendor arrangements can enable regular discussions about service expectations, including operational risk monitoring, to foster mutually beneficial relationships.

Computer-based systems should provide a holistic view of risk, extending across specialties, to incorporate investment, operational and other types of risk, to support top down strategic decision making. Investors should be very careful about using historical returns, standard deviations or correlations to structure future investments, data for future investment decisions. Dr. Markowitz indicated,

"When I published my article, Portfolio Selection, in 1952, I didn't say that the world worked in a particular way. What I said was you should make forward-looking estimates."

Manage risk on an exception basis, using thresholds and visual images to oversee a large volume of detailed, disparate risks, thus avoiding information overload and facilitating creative, insightful decision making. The increased use of technology has greatly expanded the amount of performance and risk data produced for every fund and plan. Top investment officers recognize that anticipating problems and reacting quickly to new information is much more important than searching for interesting information.

Instill a culture of integrity with employees and vendor relationships, as a means of managing operational risk and enabling long-term successful partnerships. When it comes to risk management, taking the long view is the best approach. One of the best risk management policies may be to hire motivated employees and ensure they remained engaged with the organization.

Grouping operational risks as either "high frequency, low impact" (HFLI) or "low frequency, high impact" (LFHI) can clarify the course of action needed to mitigate operational risk. For instance, HFLI risks, such as minor accounting errors, can be measured and mitigated through simple data mining. A LFHI event, however, is more complicated to mitigate. Also, consider a quantitative scoring approach to create a common methodology for weighting and ranking all risks.

Consider Transferring Risk to Insurance Companies, the Capital Markets or Third Parties — With insurance projected to play an increasing role in mitigating operational risk and capital markets expected to take on more operational risk via specialized debt instruments and derivatives, a certain amount of operational risk can be transferred to entities or markets better able to mitigate it. Also, institutional investors should ask if vendors carry operational risk insurance as part of your vendor due diligence process.

Use Liquidity Buckets — To facilitate liquidity management. Understanding fund redemption risk for hedge and pooled funds represented institutional investors' highest cash management priority. Client interviews demonstrated this was typically done by using spreadsheets and placing investments in different liquidity baskets such as one day, two days, one week, one month, etc. Consider the creation of a liquidity cash account if needed. Also consider risk management system that incorporates liquidity management.

Develop a liquidity policy that states you want to be able to liquidate X% of the portfolio in a specific number of trading days. Once this is stated, it is then possible to calculate the cost of liquidation under hypothetical scenarios, including transaction costs.

Institutional Investors' responsibilities include a wide spectrum of risks, including service level risks, reputational risks and headline risks, all of which can impact an organizations' ability operate effectively, maximize risk adjusted returns and achieve its objectives, underscoring the importance of maintaining a comprehensive view of risk.

POLITICAL RISK BEST PRACTICES

Recognize the importance of Political Risk, which can range from regulatory risk to market risk... Political and regulatory risk can have a profound impact on market returns, so institutional investors should make sure their focus is not limited to evaluating quantitative data, to ensure an appropriate evaluation of political risk as part of their managers' selection process and as part of their own asset allocation process. Just like in other areas of investing, the asset owners' responsibility is to understand their risks and exposures, and this should include political risk, even though managers may in fact be the ones making the underlying decisions.

Political risk can profoundly impact market returns, so institutional investors should not limit their focus to evaluating quantitative data.

Consider Developing an Approved Countries List for investing by working with investment managers or consultants to identify countries whose risks or politics may be outside the boundaries of the institutions tolerances.

Socially Responsible Investing (SRI) can be of relevance to institutional investors in multiple ways, may it be headline risk, the risk of appearing inconsistent with one's stated values or simply in terms of investment performance. Given the sizable number of investors in the survey that have adopted SRI in some form suggests the visibility of these investments has grown considerably. Also, performance of selected SRI investments suggests embracing SRI need not imply a willingness to accept lower returns for moral purposes. Given its variety of implications, it appears institutional investors need to be knowledgeable about the issues surrounding SRI investing, whether they ultimately choose to adopt these strategies or not.

Review and assess legislative changes to ensure the portfolio is best positioned and, where appropriate, to ensure the best interests of the portfolio are properly represented through managers or elected officials.

CONCLUSION

Looking at the results from both the 2005 and 2013 surveys, it is evident that risk management has grown substantially in importance. Overseeing operational risk of vendors, managers and internal operations has become a centrally important component of institutional investors' risk management responsibilities. Our 2013 study confirmed the conclusion of the 2005 white paper, that institutional investors should not limit themselves to evaluating investment risk, but should maintain a 360º view of risk. As Dr. Markowitz indicated, "the push to integrate risk-control at the enterprise level, rather than at the individual portfolio level, should be continued."

Our 2013 risk survey feedback has highlighted a number of key areas of importance for institutional asset owners to consider when creating an effective risk management framework. We have summarized key best practices designed to guide both risk and investment practitioners and other interested parties through the present and future headwinds which are inherent in today's world. However beyond our findings there is an important question that remains: what does the future hold for effective risk management? Is there a magic formula?

Having established that informal risk practice is now much broader than market risk and includes a whole spectrum of other risks (political, legal, operational etc.) about which there are many views and opinions, what seems to be missing is a collective risk management framework that incorporates each of these areas of risks, considering not only the individual contribution of each, but also the impact they have on each other and the overall investment program.

As we look back to our 2005 white paper and further than that still, to the establishment of MPT, we have seen a steady evolution of risk management practices and accompanying framework designed to help evaluate risk more accurately and guide institutional investors. From what we have found in creating this paper, and the many discussions and feedback we have received from institutional investors across the globe, is that the way risk is understood and evaluated also continues to evolve.

We are now at the point where there is an undoubted acceptance that risk includes many components which we have already discussed, but there is a challenge about how to collectively evaluate these risks either because of differences of opinion on methodology or a lack of data. These debates will continue for some time. However a second consideration to data and methodology, and perhaps an answer to the question above about whether there is a magic formula, relates to how these risks combine as part of a single collective framework.

There is a unique opportunity for academics and the industry to review the interaction of these many other risks alongside market risk, and consider whether it makes sense as part of the next phase of developing effective risk management practices, for a new, broader risk model to emerge, perhaps one that incorporates some form of quantitative scoring. Such a model would effectively promote the market risk frontier towards a much broader risk frontier which would include each of the underlying areas of operational and other risks as components within a much wider model, while perhaps building on some of the principles within MPT. This is not an easy task and aside from debates about methodology, there are undoubtedly numerous data challenges. However is it something that we should do?

If we accept that an effective risk management framework should serve as a proxy for how the real world behaves, then the answer would be yes. Furthermore, developing risk management along these lines would help pave the way for the next generation of risk systems, models and debate, and in doing so might guide investors and risk practitioners in much of the same way that MPT, as first put forth by Dr. Harry Markowitz, has helped guide many of us since the 1950s.

APPENDIX

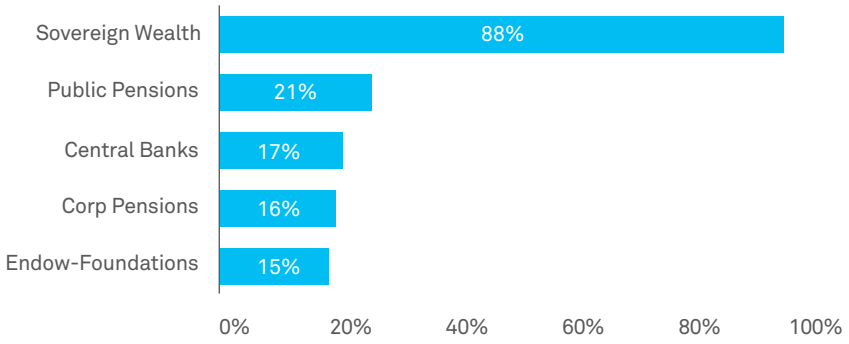
MAJOR FINDINGS INCORPORATING SOVEREIGN WEALTH MANAGER AND CENTRAL BANKS

SURVEY PARTICIPANTS FOR THIS ANALYSIS

13 Endowments/Foundations
32 Corporate Pensions
28 Public Pensions
6 Sovereign Wealth Funds
6 Central Banks

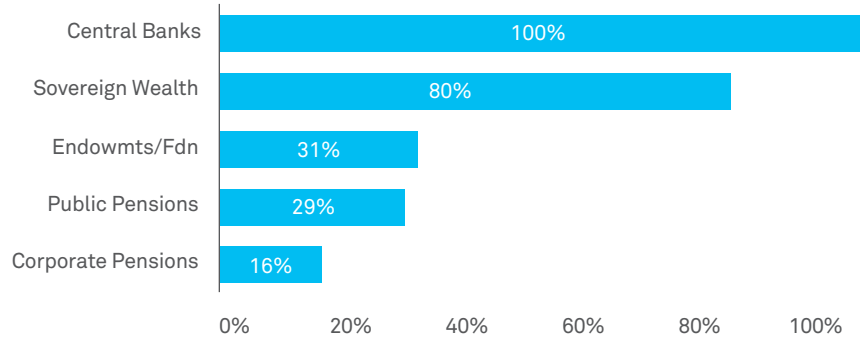
SOVEREIGN WEALTH MANAGERS MUCH MORE COMMONLY HAVE CHIEF RISK OFFICERS

Do you have a Chief Risk Officer?



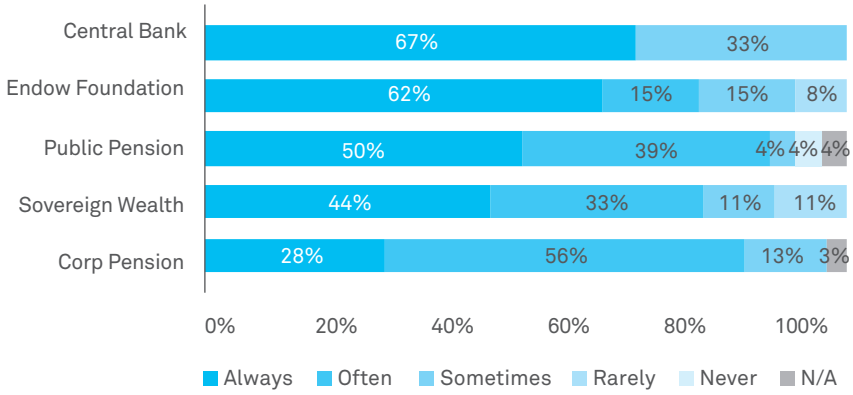
CENTRAL BANKS AND SOVEREIGNS MUCH MORE FREQUENTLY MANAGE MONEY INTERNALLY

Do you Manage Funds Internally?

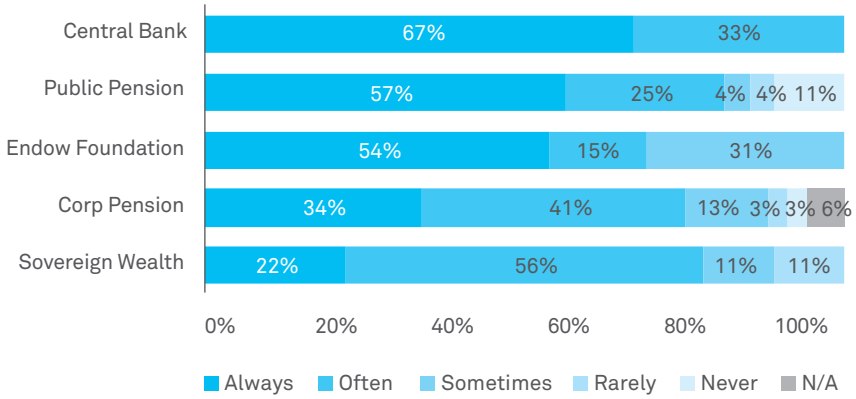


ALL CATEGORIES OF INSTITUTIONAL INVESTORS UTILIZE ATTRIBUTION AND RISK RETURN ANALYSIS HEAVILY

How often do you perform Performance Attribution Analysis?

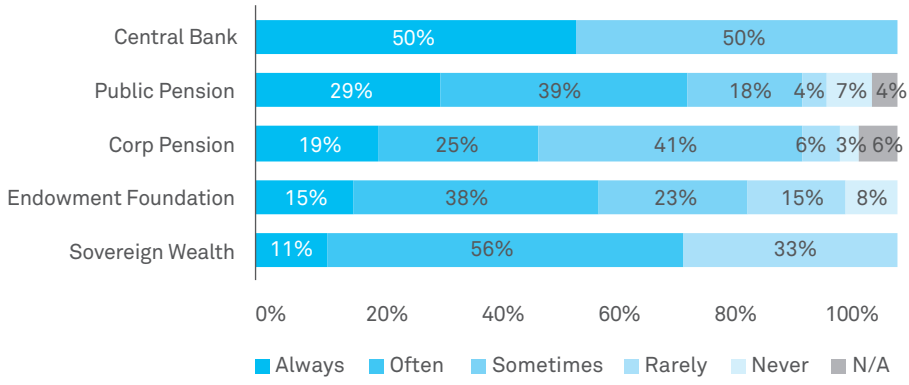


How often do you use Risk Return Analysis?



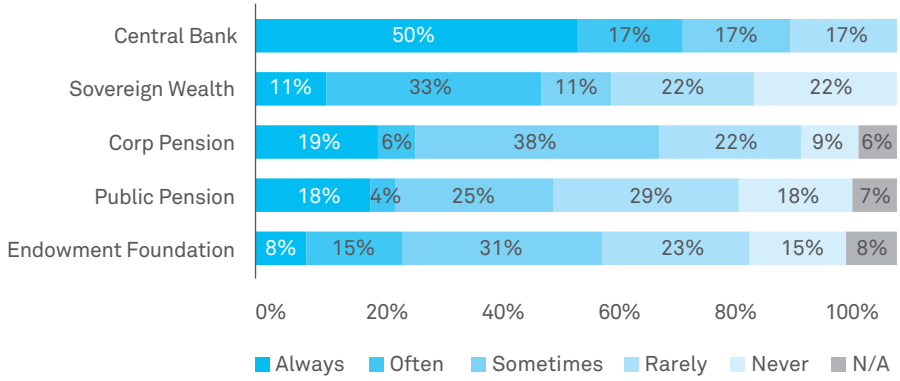
ABOUT HALF THE RESPONDENTS IN EACH CATEGORY INDICATED THEY USED RISK FACTOR ANALYSIS "ALWAYS OR OFTEN"

How often do you perform Risk Factor Analysis?



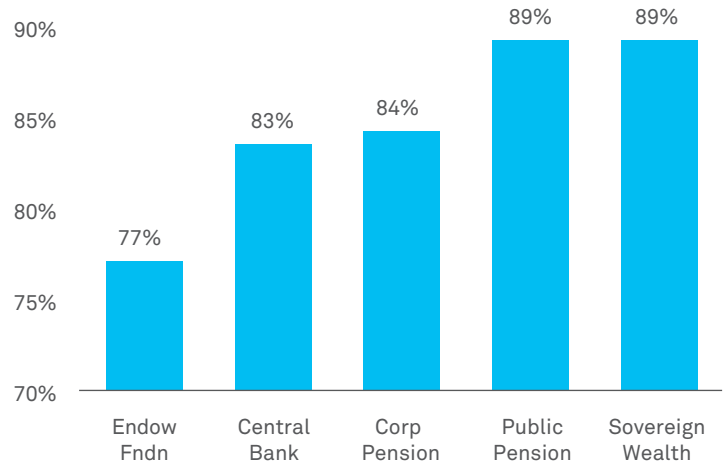
CENTRAL BANKS APPEAR TO BE MORE ACTIVE USERS OF RISK BUDGETING

How often do you perform Risk Budgeting?



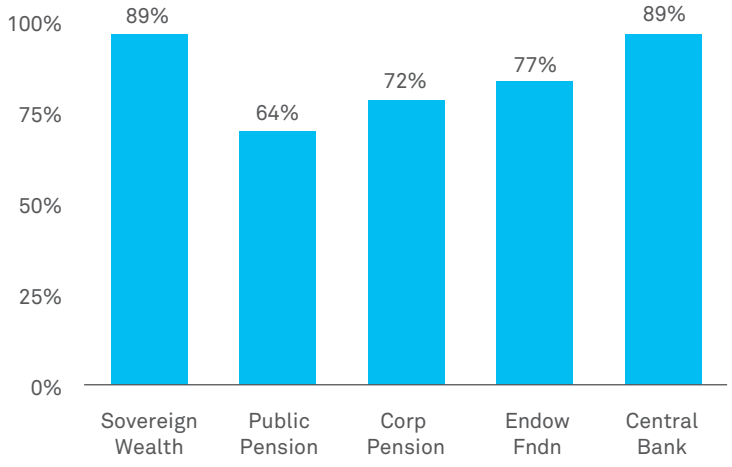
ALL GROUPS OF RESPONDENTS INDICATED RISK MANAGEMENT WILL PLAY AN EVEN GREATER ROLE IN THE FUTURE THAN IT DOES TODAY.

Do you agree Risk Management will play an even greater role than it does today?



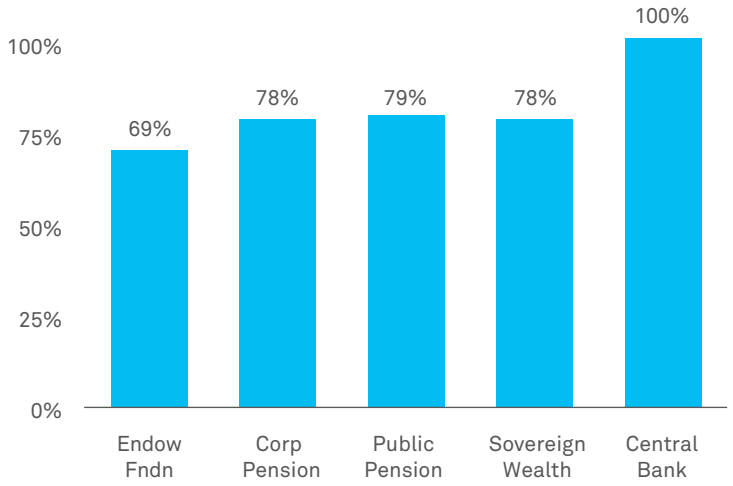
THE MAJORITY OF RESPONDENTS FELT THE AVAILABILITY OF MARKET DATA AND INFORMATIONAL INPUTS NEED TO IMPROVE

Do you agree availability of Market Data and Informational Inputs needs to improve?



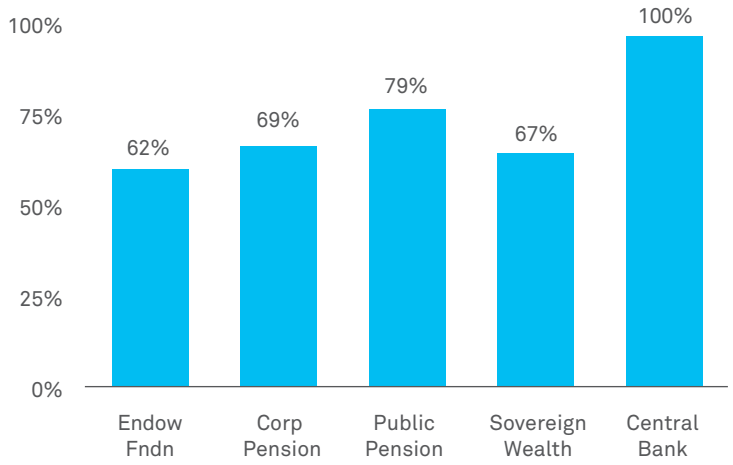
THE MAJORITY OF RESPONDENTS, FROM ALL CATEGORIES, BELIEVE THAT RISK REPORTING NEEDS TO IMPROVE TO MORE EFFECTIVELY COMMUNICATE WITH NON-RISK SPECIALISTS

Do you agree improvements in Risk Reporting are required to communicate more effectively with Non Specialists?



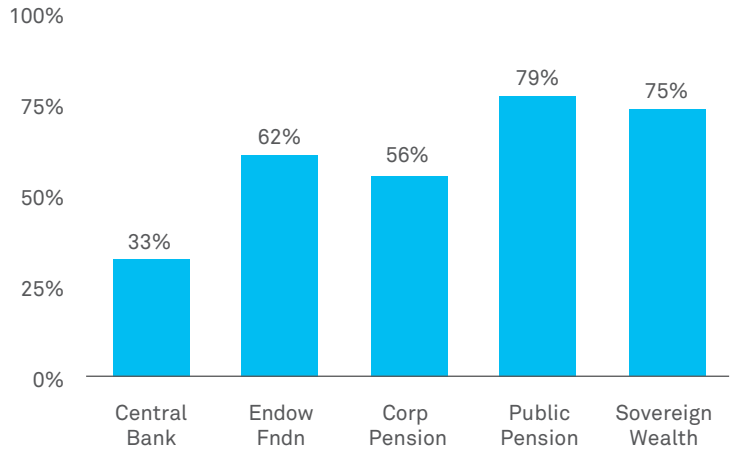
THE MAJORITY OF RESPONDENTS BELIEVE THE TECHNOLOGY IS IN PLACE, BUT RISK BUSINESS PRACTICES NEED TO IMPROVE

Do you agree that Technology exists, but Business Practices need to improve?



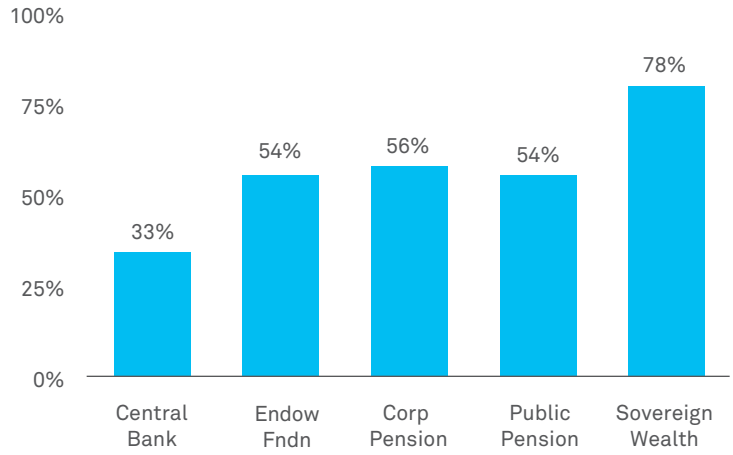
CENTRAL BANKS DID NOT FEEL AS STRONGLY ABOUT RISK MODELS NEEDING TO IMPROVE TO ACCOMMODATE NEW ASSET CLASSES OR INVESTMENTS

Do you agree Risk Models need to become more sophisticated to accomodate new investments?



MOST AGREED IT TAKES TOO LONG TO SCRUB DATA FOR RISK SYSTEMS, BUT THE SOVEREIGNS FEEL THE MOST STRONGLY ABOUT THIS ISSUE

The time taken to collate and scrub data decreases the timeliness and true value in risk reporting.



AUTHORSHIP

We would like to acknowledge the contribution made by our collaborators, including Dr. Harry Markowitz, HedgeMark LLC, and our BNY Mellon colleagues. Please find a listing of the experts who made this paper possible:

Harry Markowitz, Ph.D., 1990 Nobel Prize in Economics

Dr. Markowitz has applied computer and mathematical techniques to various practical decision making areas. In finance: in an article in 1952 and a book in 1959, he presented what is now referred to as MPT, "modern portfolio theory." This has become a standard topic in college courses and texts on investments, and is widely used by institutional investors for asset allocation, risk control and attribution analysis. In other areas: Dr. Markowitz developed "sparse matrix" techniques for solving very large mathematical optimization problems. These techniques are now standard in production software for optimization programs. Dr. Markowitz also designed and supervised the development of the SIMSCRIPT programming language. SIMSCRIPT has been widely used for programming computer simulations of systems like factories, transportation systems and communication networks.

In 1989, Dr. Markowitz received The John von Neumann Award from the Operations Research Society of America for his work in portfolio theory, sparse matrix techniques and SIMSCRIPT. In 1990, he shared The Nobel Prize in Economics for his work on portfolio Theory.

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3M Company

Air Canada

Alaska Permanent Fund Corporation

Alcoa Inc.

Archdiocese of New York

Arkansas Public Employees Retirement System

Baptist Foundation of Texas

Canadian Medical Protective Association

Carleton University

Casey Family Programs

Central Bank of the Republic of Azerbaijan

Chrysler Group

College of Applied Arts & Technology (CAAT)

EmblemHealth Services Company

Enstar

Father Flanagan's Boys Home

Fire and Police Pension Assoc. Of Colorado (FPPA)

Florida State Board of Administration

Fondation Lucie et Andre Chagnon

Government of Newfoundland

Hydro One

Imperial Tobacco Corporation

Indiana Public Employees Retirement Fund

Lloyd's Register Group

Los Alamos National Labs

McGill University

McMaster University

Missouri State Employee's Retirement Board (MOSERS)

NEBF Investments

Nevada Public Employees Retirement System

Nova Scotia Pension Agency

Pennsylvania Municipal Retirement System

Pool Re

PPG Industries, Inc.

Public Employee Retirement System of Idaho

Public School Employees' Retirement System

Saskatchewan Healthcare Employees Pension Plan (SHEPP)

Siemens

Southern California Edison Company

Syngenta

Teachers' Retirement Allowances Fund

Tennessee Valley Authority

Tennessee Valley Authority Decommissioning Trust

Textron, Inc.

The Cleveland Clinic Foundation

The Leona M. and Harry B. Helmsley Charitable Trust

The Ministers and Missionaries Benefit Board

The William & Flora Hewlett Foundation

Thomas Jefferson University

Total Pensions

UNC Management Company, Inc.

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