

How Pension Funds Manage Investment Risks: A Global Survey

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This 2009 survey-based study describes how large global funds manage investment risk from strategy to implementation. In total, fifty-eight funds with assets aggregating to almost U\$2 trillion participated in the survey. Almost all large funds (over U\$25 billion) use some form of risk budgeting, whereas smaller funds are less likely to do so. Most funds (88%) manage active management risk (usually through controlling tracking error), whereas only 48% of funds manage balance sheet (surplus) risk. The sample size is perhaps too small to draw firm conclusions, but preliminary indications suggest that funds that believe in managing both active and surplus risk have generated better risk / reward tradeoffs. Per dollar invested, American corporate and public funds have the lowest average number of staff dedicated to risk management, whereas Australia / New Zealand and Canada have the highest.

Keywords: Governance, Liability, Pension Fund, Risk, Surplus, Tracking Error

The Study: A Survey of Risk Management Practices

The market upheaval of 2008 was the catalyst for this study by CEM Benchmarking Inc. (CEM)¹ of risk management practices across its client base of global pension funds. After this difficult period, a number of clients expressed an interest in benchmarking their risk measurement and management practices beyond the information provided through CEM's standard survey-based databases. In particular, this required understanding how funds measure their risks in order to benchmark them going forward. The focus was on how successful funds have been in managing risk, on documenting the range of risk practices used, and on identifying risk measures that might be useful for ongoing benchmarking.

Participation was global and represented nearly U\$2 trillion in assets, with an average fund size of U\$32 billion. More public than corporate defined benefit (DB) funds participated, as well as a handful of sovereign wealth and defined contribution (DC) funds. For example, none of the Australia / New Zealand funds were DB funds, and of the thirteen European funds, four had no specifically-defined liabilities. Table 1 provides a profile of the participating funds.

The focus of this study is on the specific portfolio risks related to

active management (usually expressed as tracking error) and to balance sheet surplus / deficits. It also focuses on the risks expected to be the largest, and that link best to CEM's existing database. This permits estimating the effects of managing these risks on the returns generated. We are especially interested in how funds integrate the monitoring of these risks through their governance structures into their strategies. Although we found that 78% of the respondents measure counterparty risk and 64% measure liquidity risk, this study does not focus on those risks. See Box 1 for definitions of these risks.

Most funds (85%) have a framework for managing risk. Examples of frameworks include asset / liability studies, investment policy statements that incorporate risk indirectly into asset allocation ranges, credit risk limits, etc. The 15% of funds without a framework were smaller, averaging U\$13 billion in size. The proportion of assets managed internally by the survey participants grows from an average of 6% of the total for funds that are U\$5 billion in size or smaller, to 49% of the total for funds greater than U\$50 billion in size. We found that the approach to risk for funds with more internal assets tends to be more intense and complete across the key measures. For example, they are more likely to believe in surplus management, have a group dedicated to risk, do risk budgeting, and manage counterparty and liquidity risk. The exception to this is large American public sector funds, which are less likely to engage in risk budgeting, or to manage liquidity risk.

Table 1: CEM Risk Survey Participants

				Number by Type of Fund		
	# of Funds	Total Assets (U\$B)	Average Assets (U\$B)	Corporate Pension	Public Pension	No Defined Liabilities *
Canada	18	271	15	4	14	0
United States	24	919	38	12	12	0
Australia / New Zealand	3	30	10	0	1	2
Netherlands	7	180	26	4	3	0
Europe ex-Netherlands	6	433	72	0	2	4
Total	58	1,834	32	20	32	6

* Funds with 'no defined liabilities' are either defined contribution or sovereign wealth funds.

Source: CEM Benchmarking Inc. Study (2009).

Box 1: Definitions Used in This Study

Active Management Risk

Active management risk, technically tracking error or standard deviation of value-added, arises when funds invest some or all of their assets in portfolios that differ from their policy mix and its benchmarks.

Surplus Risk

This risk arises through asset / liability mismatch, with assets and liabilities both marked to market. Funds differ in the way that they define and manage this risk, primarily whether or not they compare their policy portfolios to their liabilities and how their liabilities are measured.

Counterparty Risk

Counterparty risk represents the size of the financial exposures to counterparties of different financial strengths. Funds have different ways of measuring this risk, based on credit qualities or internal measures.

Liquidity Risk

This risk relates to a fund's ability to liquidate assets to meet unexpected cash needs, such as covering derivative exposures during a downturn.

Surplus Risk is Materially Greater than Active Management Risk

To understand the difference in magnitude between marked-to-market surplus and active management risks, we consulted the CEM database of fund history, which includes all database participants, and not just the funds that participated in the risk study. For all funds with five year database histories, we measured the following:

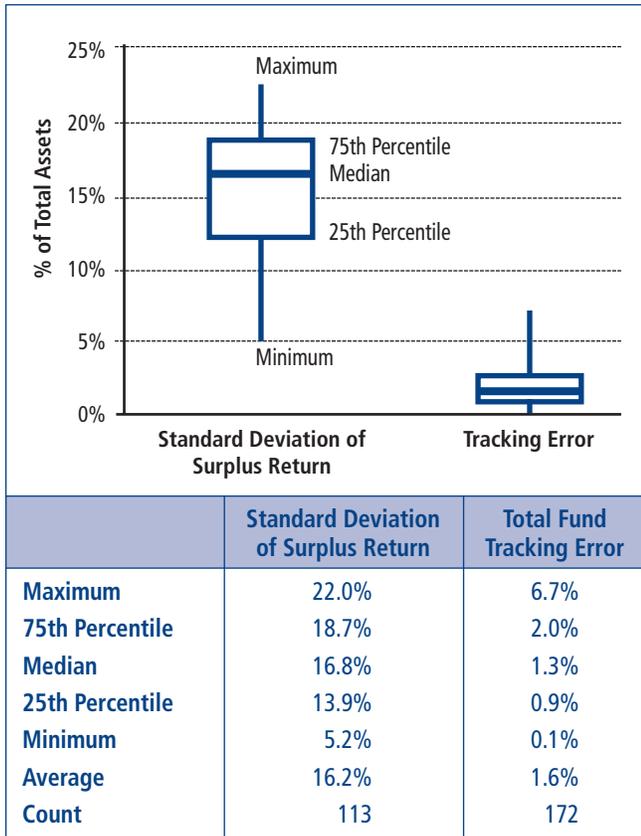
- Five-year surplus risk for 113 funds. We calculated the standard deviation of the surplus return, which is the total fund return less the liability proxy return. The liability proxy return was calculated on an asset mix that matches the liabilities, either using a CEM estimate of liabilities or a

more accurate liability mix provided by the fund participants.² Funds that do not measure liabilities were excluded from this analysis.

- Five-year total fund active management risk (tracking error) for 172 funds. The volatility of value-added at the total fund level.

Figure 1 shows that the median variability of surplus return as a percentage of total assets is ten times the variability of value-added. The much larger size of surplus return variability demonstrates the large impact of the variability of markets and interest rates versus the much smaller size and variability of active management. In short, surplus risk exposures tend to be materially greater than active management risk exposures.

Figure 1: Five-Year Risk (2004-2008)



Source: CEM Benchmarking Inc.'s investment benchmarking database.

Approach to Risk Measurement and Management is Driven by Regulation

Global differences in regulation regarding balance sheet risk measurement and management have a major impact on how funds view the importance of surplus risk. For example, Dutch and Scandinavian regulations require funds to be marked-to-market in order to calculate reserve ratios. As well, the Financial Accounting Standards Board, which regulates financial reporting in the United States, requires corporate funds to use marked-to-market valuations of their liabilities in their financial statements. Not surprisingly, Table 2 shows that American corporate and European DB plans do materially more monitoring of marked-to-market surplus risk than do other types of funds. Overall, 88% of funds measure active management risk and 48% measure surplus risk.

Recall that active management risk is the volatility of value-added, either as a standard deviation or as a value at risk (VaR) calculation. Absolute risk is the return volatility of total or market returns. In addition to investigating which risks funds monitor, we also asked funds which metrics they use. Of the fifty-one funds that measure active management risk, 88% use volatility of value-added (i.e., tracking error) and 43% use VaR. Just over half of the VaR funds use the historical method to calculate VaR, as opposed to variance / covariance or Monte Carlo methods.

Table 2: Risks Monitored by Region

	% of Funds that Monitor				Total # of Funds
	Active Management Risk	Absolute Risk	Marked-to-Market Surplus Risk	None **	
Canada	78%	22%	44%	17%	18
US Corporate	92%	17%	75%	0%	12
US Public	100%	50%	17%	0%	12
Europe	92%	15%	69%	0%	13
Australia / New Zealand	67%	67%	0%	33%	3
No. of Funds that Monitor *	51	16	28	4	58
% of Total *	88%	28%	48%	7%	100%

* The sum of the parts adds to more than 100% because some funds monitor multiple metrics.

** "None" includes funds that do not measure either active, absolute or surplus risk. These funds might monitor other risks such as counterparty and liquidity risk.

Source: CEM Benchmarking Inc. Study (2009).

Table 3: Survey Ranking Results (based on agreement of statement)

	No. of Responses	Strongly Disagree 1	2	3	4	Strongly Agree 5
1. Pension liabilities are long-term and should not be marked-to-market.	52	27%	19%	27%	17%	10%
2. Not comfortable or satisfied with current models of marked-to-market liabilities.	53	21%	23%	36%	15%	6%
3. Our strong funded status allows us to ignore liabilities.	53	74%	21%	4%	0%	2%
4. Pension liabilities change with market forces and we believe we should measure and manage this impact.	52	12%	10%	13%	37%	29%

Source: CEM Benchmarking Inc. Study (2009).

Investment Beliefs Drive Risk Measurement and Management Behavior

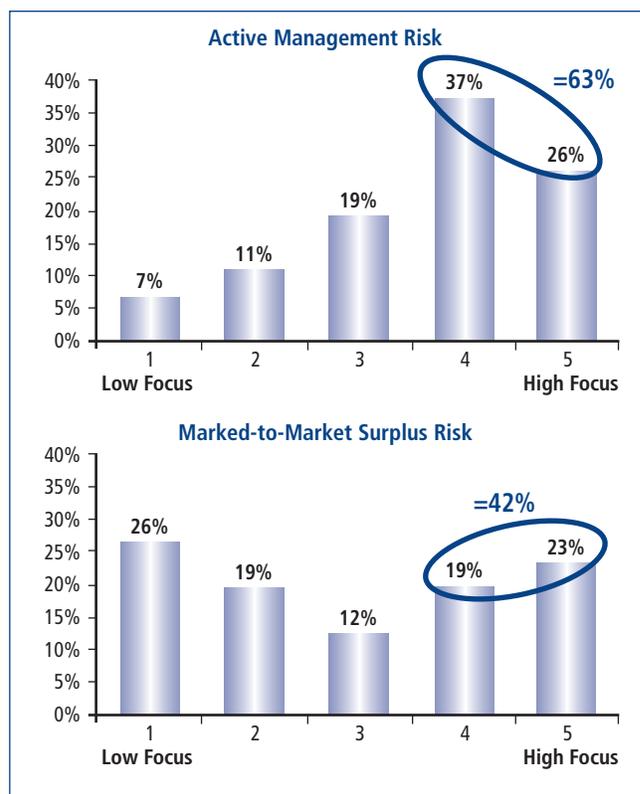
We asked survey participants about their investment beliefs and discovered that regulation is not the only driver of fund behavior. Investment beliefs also play a role. Table 3 demonstrates that investment beliefs vary quite widely in the pension industry. For example, 66% of participants agree or strongly agree that pension liabilities change with market forces and that they should measure and manage this impact. This compares to 48% of participants who actually monitor marked-to-market surplus risk as shown in Table 2. The 22% of funds that disagreed or strongly disagreed with question 4 in Table 3 were, for the most part, either American government funds or funds with no obvious liabilities. Note however, that 27% of respondents also agreed, or strongly agreed, with the statement that pension liabilities are long-term and should not be marked to market.

We also asked about the intensity of each fund’s investment strategy focus on active management risk and surplus risk. The intensity of focus is a subjective qualitative assessment that reflects the importance of the risk defined by the fund’s leadership and how that is understood by the survey respondent. Despite the larger impact of surplus return variability and the belief that surplus risk should be measured and managed, Figure 2 shows that more survey participants have a higher focus on monitoring active management risk than surplus risk.

The focus on monitoring surplus risk is polarized between high and low. We have already noted that beliefs appear to be aligned with the regulatory environment, possibly implying that fund managers’ beliefs adapt to the behavior required by their environment. All the European funds with defined liabilities rated their focus either four or five with respect to surplus risk.

Of the eleven American government funds that answered the question, half rated the focus either one or two, whereas American corporate funds were evenly distributed between three, four and five. Of the seventeen Canadian funds who responded, almost all indicated a surplus risk focus rated a four or five.

Figure 2: Percentage of Participants with Intensity of Focus on These Risks

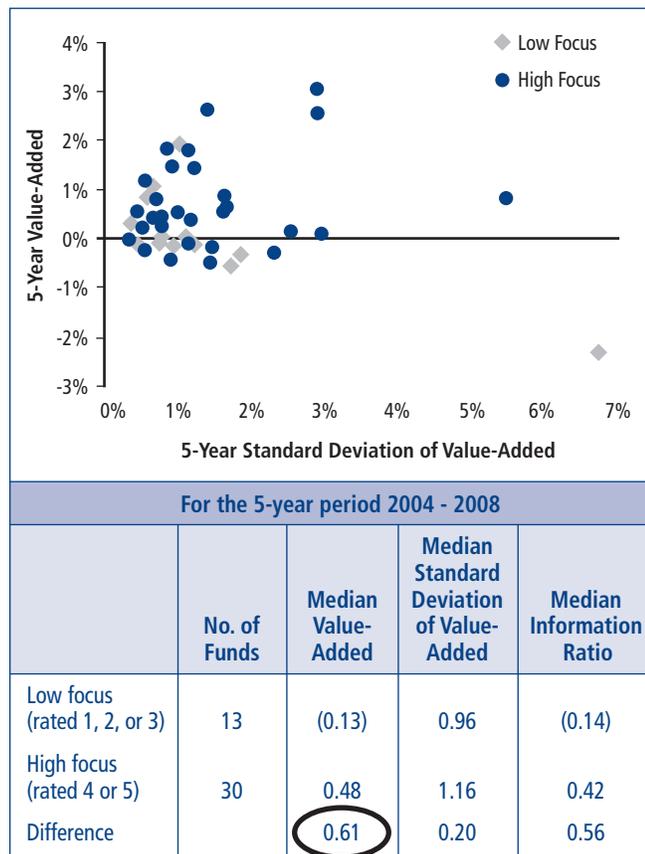


Source: CEM Benchmarking Inc. Study (2009).

Areas of High Focus Appear to Perform Better

Going back to the CEM database, we checked to see how well participants managed tracking error and marked-to-market surplus return variability relative to their investment beliefs. Figure 3 shows that the thirty funds with a high focus on active management and for which CEM has a five-year-history to December 31, 2008 generated a median value-added 61 basis points higher than the thirteen funds with a low focus. We also found no statistically significant difference in the standard deviation of value-added (tracking error) between the two groups. The median information ratios³ indicate that the funds with a high focus tended to generate a higher value-added per unit of volatility.

Figure 3: Active Management: Five-Year Value-Added and Standard Deviation



Source: CEM Benchmarking Inc., Investment Benchmarking database (2004-2008)

Given the extreme market conditions at the end of 2008, the alternative asset classes (hedge funds, private equity, and real assets) may have skewed value-added for the year ended 2008 due to lagging valuations and / or benchmark misspecification. For that reason, we checked the value-added within only the public stock and bond asset classes for the five years ended

December 31, 2008. We regressed the funds' focus on active management against their value-added to see if there is a relationship. Results are shown in Table 4.

Table 4: Regression of Focus on Active Management versus Types of Value-Added

	Regression Coefficient	T-statistic	Implied Confidence Level
Total fund value-added	0.69	2.3	95%
Value-added for all stocks	0.50	1.6	80%
Value-added for all bonds	(0.06)	(0.2)	0%

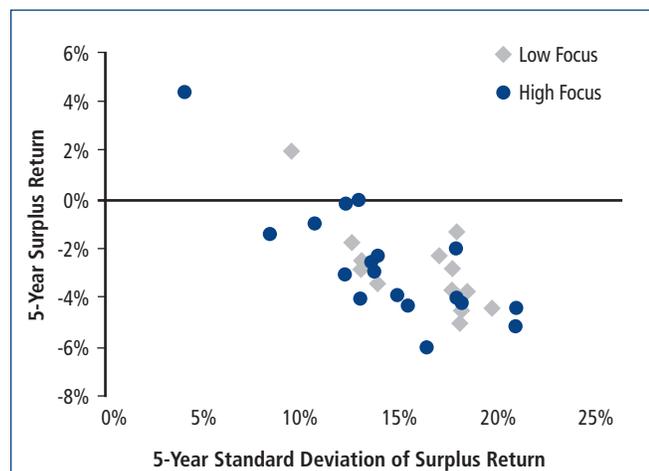
Source: CEM Benchmarking Inc. Study (2009).

Table 4 shows that the average 0.69% total fund greater value-added for those funds with a high focus versus those with a low focus on active management was statistically significant at the 95% confidence level. In particular, stock portfolios among the funds with a high focus on active management generated 0.50% more value-added on average than those with a low focus.

Similarly, for the funds where CEM has five years of data to December 31, 2008, using the standard deviation of marked-to-market surplus return, we reviewed the results of those with a high focus on managing surplus risk. Figure 4 shows that although median surplus returns were similar between the two groups, the median standard deviation of returns was lower for funds with a higher focus (13.8%) than those with a low focus (17.7%). However, the two groups generated similar median information ratios.

When examining the results for both active management risk and surplus risk, we caution that the standard deviations calculated in Figures 3 and 4 are based on annual observations, making them less statistically rigorous than monthly data. As well, the small number of funds with a five year history and their overlapping results makes it difficult to draw clear conclusions. The medians provide some indication of characteristic differences between the two groups. In both cases, the funds with a high focus generated better risk / return tradeoffs. Our results do not permit us to argue that investment beliefs and metrics *cause* better results, but there appears to be a relationship between those that focus on and measure these risks and their results. CEM is considering using monthly data for these standard deviation calculations in the future.

Figure 4: Surplus Management: Five-Year Value-Added and Standard Deviation



For the 5-year period 2004 - 2008

	No. of Funds	Median Surplus Return	Median Standard Deviation of Surplus Return	Median Information Ratio
Low focus (rated 1, 2, or 3)	13	(3.1)	17.7	(0.18)
High focus (rated 4 or 5)	17	(3.0)	13.8	(0.22)
Difference		0.1	3.9	0.04

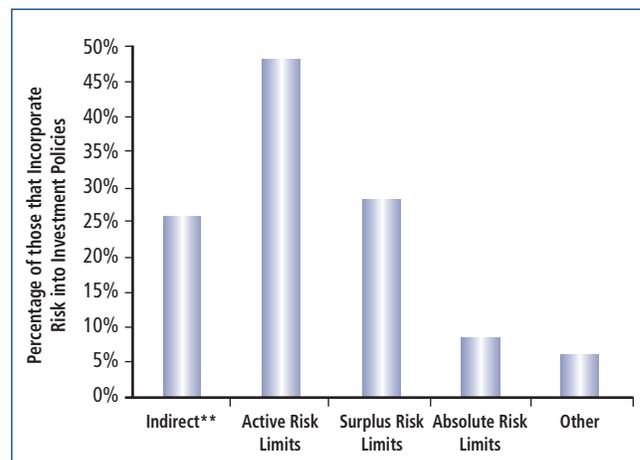
Source: CEM Benchmarking Inc., Investment Benchmarking database (2004-2008)

Risk Monitoring is Widespread but not Universal

Two-thirds of respondents have documented Board-approved risk levels and half include a risk appetite statement that is integrated with their investment policy and / or that specifies procedures in case of a breach. For the funds that have risk appetite statements, Figure 5 shows that approximately half specify active management risk, whereas, despite its much larger potential impact, surplus risk is specified for fewer funds.

For approximately half the respondents, the Board provides risk approval only at the total fund level. However, for 38% of respondents, the Board goes as low as specifying the risk level for individual asset classes. For 5% the Board specifies permissible risk levels for individual managers (internal or external). In terms of reporting, 67% of participants report active management risk to the Board and 55% report surplus risk. Within both groups, approximately two-thirds report quarterly, and 30% more frequently. Table 5 shows the tracking error statistics that are reported. The nature of surplus statistics reported is too varied to tabulate.

Figure 5: Approved Risks Incorporated into Investment Policy*



* The sum of these parts adds to more than 100% because some funds incorporate more than one risk.

** Indirect means the investment policy statement specifies risk through a Board-approved asset allocation usually using ranges.

Source: CEM Benchmarking Inc. Study (2009).

Table 5: Level of Tracking Error Reported to Board

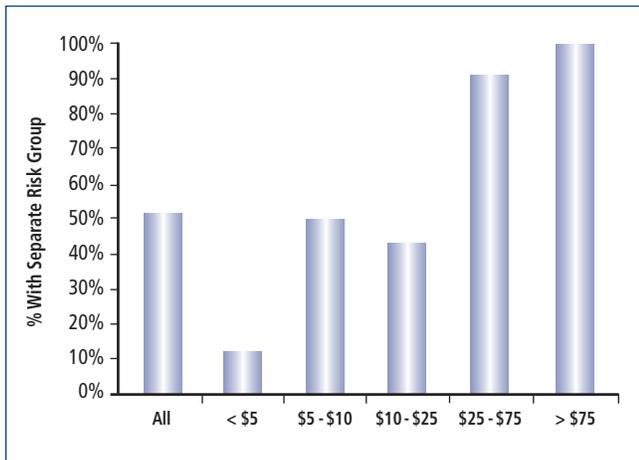
	% of Funds that Report to Board
Total Fund	70%
Asset Classes or Categories	58%
Managers	47%

Source: CEM Benchmarking Inc. Study (2009).

The Approach to Risk Monitoring is Related to Fund Size

The survey asked whether funds have a separate group that monitors risk and whether they use risk budgeting. Risk budgeting allows funds to determine which risks to take and how to allocate them across the asset classes and managers. It establishes objectives for specific individuals and groups as well as for the entire organization. In this way, returns and value-added for different asset classes and managers can be compared to the risks taken to achieve them. Once a budget is allocated, monitoring informs fund leadership as to how much actual risk diverges from the budget. We found that larger funds are more likely to have more risk monitoring activity. Figure 6 shows that almost all funds larger than US\$25 billion and approximately half the funds between US\$5 and \$25 billion have a separate risk group.

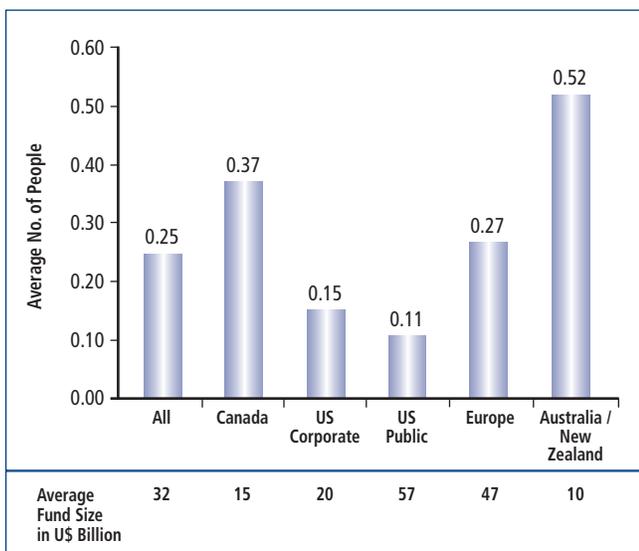
Figure 6: Percentage of Funds with Separate Risk Groups (by fund size in U\$billions)



Source: CEM Benchmarking Inc. Study (2009).

On average, the funds in the survey have approximately five full-time staff dedicated to managing risk. Of course, this varies by size, ranging from one person for funds under U\$5 billion to eleven or more people for the very large funds. Figure 7 shows that relative to the global average, American funds have approximately half the staff dedicated to risk management per dollar invested. Even taking their larger size into account, American public sector funds have the smallest size staffs dedicated to risk management. As we did not study the reasons for this difference, we can only speculate. It is possible that, given the difficult financial situation of many American states, state pension funds may be receiving less funding for staff than funds in other parts of the world.

Figure 7: Staff Dedicated to Risk Management (per U\$1billion in assets)



Source: CEM Benchmarking Inc. Study (2009).

Of the 88% of funds that measure active management risks, over half use risk budgeting. Larger funds are more likely to use risk budgeting than smaller ones. The average size of those that do is U\$45 billion versus U\$19 billion for those that do not. It is reasonable that larger funds do more risk budgeting because of the benefit of economies of scale. Of those that use risk budgeting, 62% allocate the budget down to the portfolio manager level. Of those with active management risk budgets, 71% measure the risk monthly or more often, and 75% of risk budgets incorporate forecasted active management risk. We found that size also explains which funds tie compensation to performance. Table 6 shows that the average size of funds that tie compensation to performance is larger.

Table 6: Larger Funds Tie Compensation to Performance

	# of Funds	Average Size in U\$ billion
Funds that tie compensation to performance	32	44.3
Funds that do not tie compensation to performance	15	10.1
	47	

Source: CEM Benchmarking Inc. Study (2009).

Key Observations

Table 7 summarizes the key findings of our study. One of the important lessons from the study is that funds must clearly define the issues that are important to them, and then agree on what that implies for risk measurement and management. Possibly the best example is the disparity between the pension industry treatment of active and surplus risk measurement and management. While the majority of funds appears to believe surplus risk is the more important risk to understand and control, active risk measurement and management seems to garner more resources and attention. Another important finding is the indication that funds with a high focus on active and surplus risk are producing higher risk-adjusted returns, though we caution that this finding is preliminary and requires further investigation.

In order to facilitate a deeper understanding of risk levels and global practices, CEM has incorporated some of the findings from this study into its annual investment benchmarking report. It now includes comparisons of surplus and active management risk, as well as asset risk (standard deviation of assets). A new report focused on risk is also in development and is intended to include a broader array of investment risk comparisons in more depth, including liquidity risk, credit quality, counterparty risk, and duration.

Table 7: Key Findings from the Risk Survey

Risk Findings from the Survey	
% with a framework for measuring risk:	
- Responses	85%
% of participants that measure the following risks:	
- Counterparty	78%
- Liquidity	64%
- Surplus	48%
- Active management	88%
I Of those that measure active management risk, % that:	
- Measure tracking error	88%
- Measure value at risk	43%
- Use risk budgeting	57%
I Of those that use risk budgeting, % that:	
- Allocate the budget to the portfolio manager level	62%
- Measure risk monthly or more often	71%
- Use forecasted risk	75%
For total fund value added, median information ratio for funds with:	
- A low focus on active management risk	(0.14)
- A high focus on active management risk	0.42
For surplus return, median information ratio on surplus return for funds with:	
- A low focus on surplus risk	(0.18)
- A high focus on surplus risk	(0.22)
Governance Findings from the Survey	
% of funds with:	
- Board approved risk levels	66%
- Risk appetite statement	53%
- Of those with risk appetite statements, % that specify:	
- Active management risk	49%
- Surplus risk	29%
% of funds where the lowest level the Board specifies risk is:	
- Total fund	45%
- Asset class	38%
- Manager	5%
% of funds that report risks to the board:	
- Quarterly	65%
- Monthly or more often	30%
Risk Statistics from the CEM Database used in the Survey⁴	
- Median 5-year standard deviation of surplus risk	16.8%
- Median 5-year tracking error	1.3%

Source: CEM Benchmarking Inc. Study (2009).

Endnotes

1. CEM Benchmarking Inc. is a Toronto-based global pension benchmarking firm whose sole focus is the objective measurement of the investment performance, service levels and costs of pension investments and administration. Founded in 1992, CEM now measures six hundred funds in fourteen countries, including many of the world's largest pools of capital and sovereign wealth funds.
 2. Where CEM estimates liabilities, the following inputs are used to create a liability proxy mix:
 - Inflation sensitivity of the liabilities is estimated taking into account:
 - Inflation protection provided to retired members on a contracted (not ad hoc) basis.
 - Inflation protection provided to active members based on the plan type.
 - The proportion of liabilities relating to retirees, or an estimate of this.
 - The duration relative to real and nominal yields.

The surplus return is the total fund return minus the return on the liability proxy mix. This return does not represent changes in funded ratios; it is simply the difference between the two returns.
 3. The information ratio is a measure of the risk-adjusted return of a fund and is defined as value-added (or surplus return) divided by the standard deviation of the value-added (or surplus return).
 4. The CEM database contains information collected from hundreds of global pension funds in annual surveys since 1992.
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