

A Renewed Focus on Risk Management at US Public Pensions

A Client Case Study: Massachusetts Pension Reserves Investment Management Board

Doug Slater, CFA
douglas.slater@msci.com

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About PRIM

Massachusetts Pension Reserves Investment Management Board (PRIM) is a defined benefit pension plan with \$54 billion in assets under management. Over its 29 year history, the PRIM Board has distinguished itself as a global leader among public pension funds.

Since joining PRIM as Executive Director in 2010, one of Michael Trotsky's primary goals has been to refine PRIM's approach to managing the pension in the post global financial crisis era – an era that PRIM describes as likely having elevated volatility in the global financial markets. In this “New Normal” environment, PRIM's focus is on maximizing the return of the PRIT Fund while minimizing a variety of risk exposures (Trotsky, 2012). To better achieve this objective, PRIM embarked on a strategic initiative in 2011 to enhance its total plan risk management program.

With a renewed focus on risk management, PRIM conducted an extensive review of service providers to identify one that could best enable its investment staff to achieve its strategic objectives. PRIM selected BarraOne as its risk management system primarily due to the quality of its risk models and data. In addition, PRIM's selection was based on BarraOne's insight into decision making for long-term institutional investors around central risk management, asset allocation, risk budgeting and investment manager analysis.

In the past two years, PRIM has integrated BarraOne as a central part of its risk management program and accomplished several of its targeted goals. Specifically, PRIM's investment staff has been successful at educating its constituents on risk management, incorporating risk management within its investment decision making framework and achieving a greater understanding of how its portfolio may behave in a variety of stressed environments.

Educating PRIM's Constituents on Risk Management

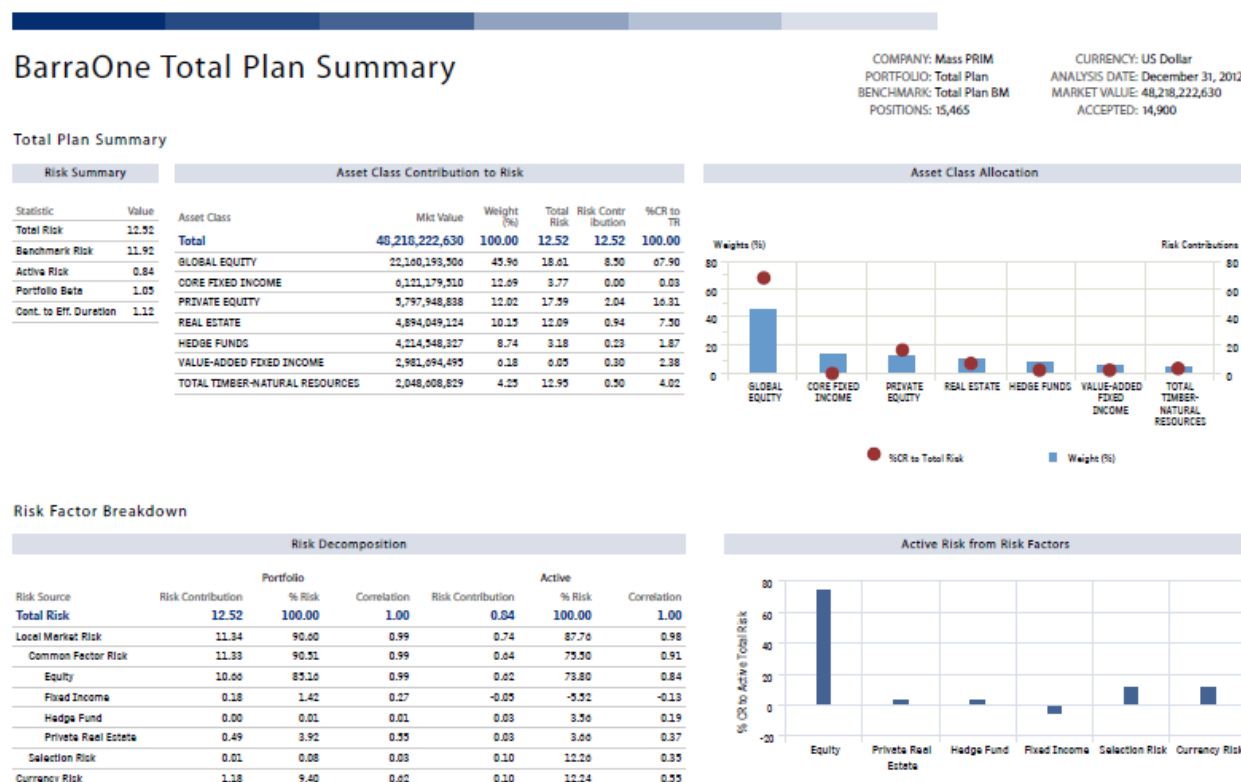
Over the past two years, PRIM's investment staff has embraced risk management as a central component of its investment decision making process. Risk is now at the forefront in regular discussions with the plan's Board of Directors, Investment Committee and investment managers. The PRIM staff has integrated a variety of ex ante risk metrics from BarraOne for deeper insights into its investment decisions across both public and private asset classes.

In communication with key stakeholders, PRIM's investment team has focused on establishing consistent dialogue around the risks inherent in its portfolio. PRIM and MSCI have collaborated on a new risk management dashboard that is delivered to PRIM's investment staff on a monthly basis. This dashboard is used as a starting point to evaluate the PRIM Fund's overall level of risk, drivers of risk from various asset classes and the change in risk levels over time. PRIM's team has refined this approach by engaging with stakeholders on a series of topics and has developed a specialized approach for evaluating the risk level of its various strategies and managers.

PRIM's New Risk Management Dashboard

This monthly report set includes risk metrics such as total risk, active risk, beta and duration. It is used to identify the riskiest asset classes within the portfolio along with specific risk factors that are driving volatility at both the asset class and portfolio level. PRIM's staff utilizes this framework to move from static risk measurement to a more dynamic approach to risk management, evaluating decisions based upon changes in risk levels over time. In addition, PRIM's investment team applies BarraOne's interactive framework to simulate portfolio performance under different stress scenarios and more accurately monitor manager performance and strategy implementation.

Exhibit 1: BarraOne Total Plan Summary



Monitoring Risk Budgets

In addition to its board level summary report, PRIM's investment staff employs BarraOne's reporting infrastructure to establish risk budgets at the total plan, asset class and manager level. In the example below, PRIM regularly monitors a variety of metrics including contribution to total risk and active risk, beta and monte-carlo value at risk.

Exhibit 2: PRIM's Risk Budgeting Framework for Investment Managers

Global Equity Limits Analytics 12/31/2012		Mgr Weight (Total Plan)		Mgr Weight (Asset Class)		Total Risk		%CR to Total Tracking Error (asset class)		%CR to Total Risk (asset class)		%CR to Total Tracking Error (total plan)		%CR to Total Risk (total plan)		MC VaR 95% 1 mo		Active Total Risk		Beta (Bmk)	
	Dates	Dec	Nov	Dec	Nov	Dec	Nov	Dec	Nov	Dec	Nov	Dec	Nov	Dec	Nov	Dec	Nov	Dec	Nov	Dec	Nov
GLOBAL EQUITY	GLOBAL EQUITY	43.9%	44.0%	100.0%	100.0%																
Domestic Equity	Investment Manager 1	4.2%	4.2%	9.6%	9.6%	21.55	21.55	54.53%	54.53%	10.41%	10.41%	36.44%	36.44%	7.18%	7.18%	11.97%	11.97%	0.17	0.17	1.00	1.00
	Benchmark 1																				
	Investment Manager 2	0.0%	0.0%	0.0%	0.0%	0.00	0.00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00	0.00	0.00	0.00
	Benchmark 2																				
	Investment Manager 3	1.6%	1.6%	3.7%	3.7%	17.27	17.27	1.55%	1.55%	3.01%	3.01%	-0.55%	-0.55%	2.08%	2.08%	9.55%	9.55%	1.68	1.68	0.99	0.99
	Investment Manager 4	1.3%	1.3%	3.0%	3.0%	22.47	22.47	3.65%	3.65%	3.04%	3.04%	12.71%	12.71%	2.11%	2.11%	12.42%	12.42%	5.53	5.53	1.29	1.29
	Investment Manager 5	12.1%	12.3%	27.5%	27.9%	17.66	17.66	2.21%	2.21%	24.55%	24.55%	-15.82%	-15.82%	16.92%	16.92%	9.79%	9.79%	0.49	0.49	1.02	1.02
	Benchmark 3					17.37	17.37									9.75%	9.75%			1	1
International Equity	Investment Manager 6	3.4%	3.3%	7.6%	7.5%	18.80	18.80	7.79%	7.79%	7.11%	7.11%	13.90%	13.90%	4.78%	4.78%	10.47%	10.47%	3.91	3.91	0.91	0.91
	Investment Manager 7	4.6%	4.6%	10.5%	10.4%	18.19	18.19	0.16%	0.16%	9.67%	9.67%	8.04%	8.04%	6.49%	6.49%	10.02%	10.02%	2.96	2.96	0.89	0.89
	Investment Manager 8	1.3%	1.3%	3.0%	2.9%	19.75	19.75	-1.01%	-1.01%	2.94%	2.94%	1.86%	1.86%	1.97%	1.97%	10.84%	10.84%	4.25	4.25	0.95	0.95
	Benchmark 4																				
	Investment Manager 9	8.4%	8.3%	19.1%	18.9%	19.91	19.91	11.84%	11.84%	20.43%	20.43%	-27.69%	-27.69%	13.73%	13.73%	10.95%	10.95%	0.25	0.25	0.99	0.99
	Benchmark 5																				
Emerging Market	Investment Manager 10	1.0%	1.0%	2.2%	2.2%	23.54	23.54	4.30%	4.30%	2.70%	2.70%	5.44%	5.44%	1.81%	1.81%	12.91%	12.91%	3.30	3.30	1.03	1.03
	Investment Manager 11	1.1%	1.1%	2.5%	2.5%	23.03	23.03	3.52%	3.52%	2.98%	2.98%	4.26%	4.26%	2.00%	2.00%	12.57%	12.57%	3.38	3.38	1.00	1.00
	Investment Manager 12	1.1%	1.1%	2.6%	2.5%	21.66	21.66	3.19%	3.19%	2.86%	2.86%	4.00%	4.00%	1.92%	1.92%	12.06%	12.06%	3.17	3.17	0.95	0.95
	Benchmark 6																				
	Investment Manager 13	3.5%	3.5%	8.0%	7.9%	22.53	22.53	-3.29%	-3.29%	9.36%	9.36%	-5.34%	-5.34%	6.29%	6.29%	12.27%	12.27%	0.50	0.50	1.00	1.00
	Benchmark 7					22.58	22.58									12.34%	12.34%			1	1
	Investment Manager 14	0.1%	0.1%	0.3%	0.3%	22.45	22.45	0.81%	0.81%	0.34%	0.34%	0.68%	0.68%	0.23%	0.23%	12.32%	12.32%	4.08	4.08	0.99	0.99
	Investment Manager 15	0.3%	0.3%	0.6%	0.6%	19.35	19.35	1.29%	1.29%	0.61%	0.61%	1.17%	1.17%	0.41%	0.41%	10.56%	10.56%	6.10	6.10	0.84	0.84
	Benchmark 8					20.02	20.02									11.35%	11.35%			1	1

Incorporating Risk Management Into the Investment Decision Making Process

August 2011 Asset Allocation Recommendation

"PRIM's Board of Directors recognize that over the long-term, asset allocation is the single greatest contributor of return and risk to the PRIT Fund" (PRIM Investment Policy). PRIM's Strategic Asset Allocation is designed to achieve the fund's legislatively mandated eight percent return while maintaining appropriate risk tolerances. This plan is implemented through a diversified allocation across global equities, fixed income, real estate and other alternative asset classes. PRIM's investment team then enhances this allocation through more granular investments across various sub-asset classes and investment managers.

In 2011, the run-up in global equity markets led to a banner year for PRIM. The PRIT Fund's 22.3 percent fiscal year return was its second best mark since inception. In late 2011, PRIM implemented a new asset allocation designed to reduce the fund's overall risk. To achieve this objective, PRIM reduced its exposure to global equities from 49% to 43% and increased its exposure to both alternative asset classes and value-added fixed income. The revised allocation was highlighted by a four percent reduction in developed international equities, primarily in Europe (Trotsky, 2012).

In its evaluation of this change, PRIM's investment staff utilized BarraOne to model the risk profile of a series of prospective allocations to help determine its final recommendation. PRIM incorporated forward looking risk statistics from Barra's multi-asset class risk model in conjunction with a variety of other quantitative and qualitative metrics. In finalizing its new asset allocation, PRIM was successful in reducing its projected annual volatility by 1.25 percent while boosting five to seven year expected annual returns from 7.7 to 7.9 percent.

Exhibit 3: 2011 Asset Allocation Recommendation

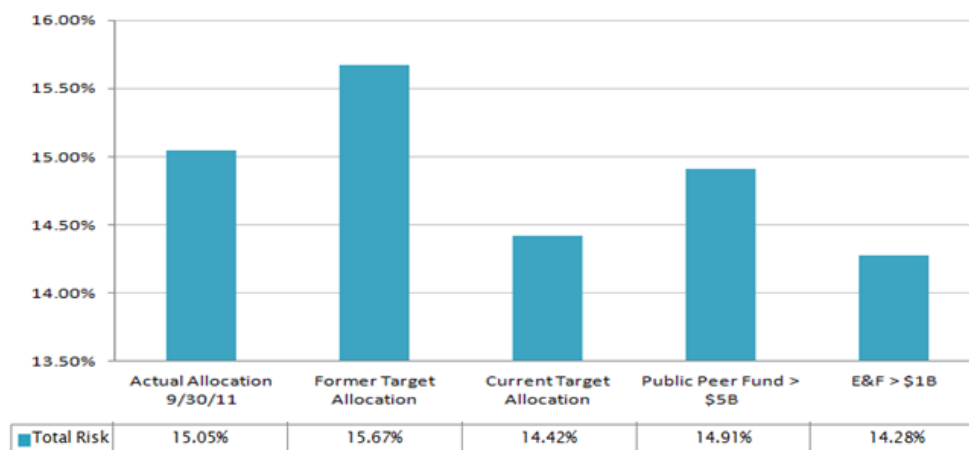
Asset Class	Actual Allocation 9/30/11	Former Target Allocation	Current Target Allocation Approved August 2011	Average Public Pension Fund > \$5 B	Average Endowment & Foundation > \$1 B
Global Equity	45.3%	49%	43%	50.3%	36.7%
Core Fixed Income	15.1%	13%	13%	27.4%	18.4%
Value-Add Fixed Income	6.5%	6%	10%	1.5%	1.9%
Private Equity	12.1%	10%	10%	7.6%	16.1%
Real Estate	9.1%	10%	10%	6.4%	5.1%
Hedge Funds	7.5%	8%	10%	3.6%	15.9%
Timber/ Natural Resources / Other	4.0%	4%	4%	3.2%	5.9%

Key Asset Allocation differences:

- **PRIM portfolio positioned between Public Peers and Endowment & Foundation**
 - Lower Equity allocation than Public Peers & higher Equity allocation than E&F
 - Lower allocation to Fixed Income than Public Peers
 - Higher allocation to Alternatives than Public Peers and lower allocation to Alternatives than E&F

Exhibit 4: 2011 Asset Allocation Peer Comparison

What does this mean? How does MA PRIM stack against its benchmark and peers?



Manager Selection

In 2012, PRIM's investment team initiated a policy requiring finalist RFP investment managers to provide position level detail at multiple points in time for analysis within BarraOne. PRIM's investment team now evaluates each prospective manager along several dimensions both on an individual basis and within the context of PRIM's broader manager allocation. Managers are analyzed based upon traditional measures such as volatility and active risk alongside specific factor dimensions. The PRIM team is focused on ensuring that each manager is adhering to its role within the portfolio while also complying with its individual strategy mandate.

In 2012, PRIM's Board approved two emerging markets equity small capitalization investments, allocating \$200 million between two managers. PRIM utilized BarraOne's factor analytics to identify its specific exposure to consumer focused securities, a conviction viewed by the PRIM staff as a potential outperforming sector over the medium term (Trotsky, 2012). PRIM's investment staff adjusted its prior approach of allocating an equal amount to both of its new managers by using BarraOne's optimization capabilities to develop the optimal risk adjusted combination of the two managers.

In the prior year, the PRIM Board approved its first emerging markets debt (local currency) investments, allocating \$900 million across three managers. PRIM utilized BarraOne to identify an effective combination of managers that enhanced the plan's risk return portfolio and increased its perspective on the portfolio's exposure to credit and duration.

Utilizing Stress Testing to Evaluate Event Risk

A third area of focus at PRIM has been simulating the performance of the pension's portfolio under a variety of stressed conditions. PRIM has leveraged BarraOne's analytics, including an analysis of a series of historical scenarios in addition to more customized scenarios designed by PRIM's investment staff.

PRIM's team collaborated with MSCI's Applied Research group to better understand the pension's exposure to a series of real time events, including the Greek Default Crisis, Breakup of the Eurozone, US Fiscal Cliff and Rising Inflation. The resulting analysis allowed for more proactive communication with the PRIM Board and Investment Committee on both near term risks that the pension faces and possible implications for PRIM's portfolio.

This analysis facilitated active debate among PRIM's staff on several topics, including the potential need for tactical overlay strategies as a short-term approach to mitigate increasing volatility. In addition, PRIM's staff effectively engaged with its constituents on the inherent level of risk in PRIM's asset allocation required to meet its eight percent targeted return.

Using the example below, PRIM was able to effectively model several historical scenarios in BarraOne and communicate the 15 to 20 percent "Event Risk" inherent in its current asset allocation.

Exhibit 5: PRIM 2011 Stress Testing Analysis

	2008 September- November	2000 - 2002 Argentine Economic Crisis	2001 Dot-com Slowdown	2009 January - March	2002 Accounting Scandals and WorldCom
PRIM - Former Target	↓ -23.08%	↓ -19.30%	↓ -18.53%	↓ -14.43%	↓ -11.99%
PRIM - Current Target (Aug. 2011)	↓ -20.62%	↓ -17.33%	↓ -16.05%	↓ -12.74%	↓ -10.54%
Public Peer Group > \$5 B	-22.47%	-18.96%	-17.22%	-13.81%	-11.41%
E&F > \$1B	-18.92%	-15.79%	-14.70%	-11.67%	-9.68%

The exhibit below illustrates the BarraOne interface and the analytics employed by PRIM's staff to generate a customized Greece default scenario generated in BarraOne:

Exhibit 6: BarraOne Stress Testing Analytics

BarraOne

Analysis | Simulation | Performance | Portfolio Admin | Data Admin | Import | Export | Accounts | My Profile

Setup | Reports

Greek Default

Scenarios

- 2000 Tech Bubble
- 2002 Accounting Scandals and
- 2003 Iraq War
- 2010 Irish Debt Crisis
- European Unrest (Jan. 25-Mar. 2)
- Greek Default
- New Irish Debt Crisis

HVaR Profiles

MCVaR Profiles

VaR Views

Create/Modify Scenario

Expand All | Collapse All

Mode

- ☒ Use correlated shocks methodology. [Click here for details on correlated shocks methodology.](#)
- ☐ Use full revaluation for structured assets. [Click here for details on full revaluation of Structured Assets.](#)
Note: Full revaluation could result in a long processing time.
- ☒ Use relative Interest Rate shocks. [Click here for details on relative Interest Rate shocks.](#)
Note: Units of Change for relative shocks is percent of IR on analysis date and for absolute is basis points.
- ☐ Use relative Spread shocks. [Click here for details on relative Spread shocks.](#)
Note: Units of Change for relative shocks is percent of Spread on analysis date and for absolute is basis points.

Equity(1)

Country	Index Portfolio	Market Data	Change	Edit	Delete
Greece	Est Universe	Price	-30.00 %	edit	x

[Add Shock](#)

Interest Rate(3)

Currency	Market Data	Curve Type	Change	Edit	Delete
DEM	Shape	Treasury	0.00/0.00/0.00/0.00/50.00/0.00/0.00/0.00/0.00/0.00	edit	x
GRD	Shape	Treasury	0.00/0.00/0.00/0.00/5000.00/0.00/0.00/0.00/0.00/0.00	edit	x
ITL	Shape	Treasury	0.00/0.00/0.00/0.00/1000.00/0.00/0.00/0.00/0.00/0.00	edit	x

[Add Shock](#)

Foreign Exchange(1)

Foreign/Domestic Currency	Market Data	Change	Edit	Delete
EUR/USD	Rates	-20.00 %	edit	x

[Add Shock](#)

Conclusion

PRIM's emphasis on risk management and its application of BarraOne may be relevant for other long-term institutional investors including pensions, foundations and endowments. The PRIM investment team has utilized BarraOne to develop a framework for decision making around central risk management, asset allocation, risk budgeting and investment manager analysis. This study illustrates how this public plan sponsor has leveraged this framework in its efforts to reduce portfolio volatility, improve risk-adjusted returns and enhance communication with its constituents.

References

- Trotsky, M. (2012), "Letter of Transmittal to the PRIM Board", Pension Reserves Investment Trust, Comprehensive Annual Financial Report, For the Year Ended June 30, 2012
- Pension Reserves Investment Trust, Investment Policy Statement, 2012

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