



**PERSPECTIVES
THAT DRIVE
ENTERPRISE
SUCCESS**



FEBRUARY 23, 2021

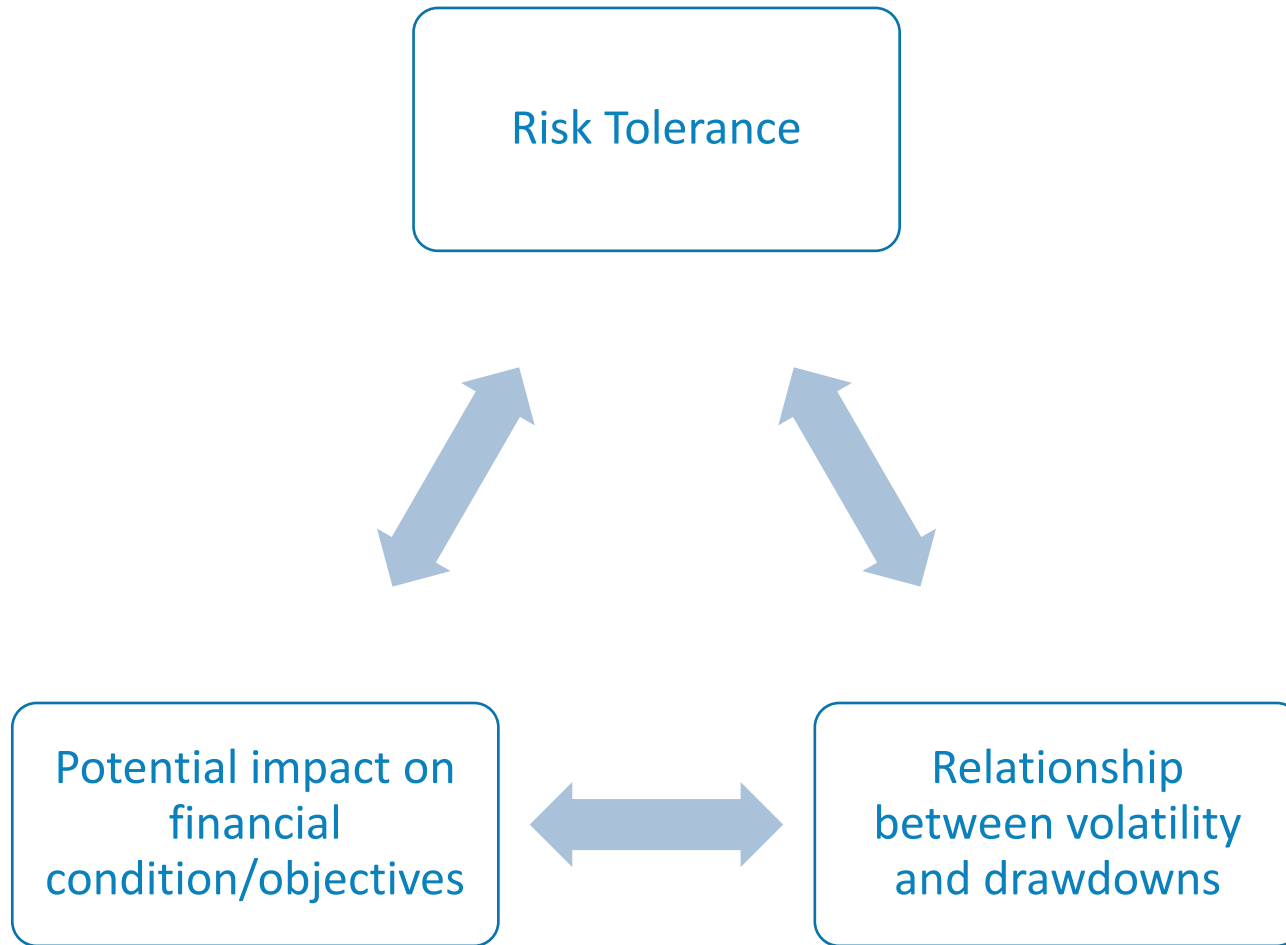
Risk Allocation Study

City of San Jose Federated Employees' Retirement System

Summary

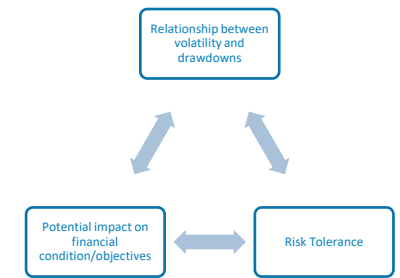
- Risk limits were established by the board by analyzing the relationship between:
 - Risk tolerance
 - Volatility and drawdowns
 - Potential impact on financial conditions and plan objectives
- Versus current strategic asset allocation, the set of asset allocation mixes being considered today:
 - Fall within the limit for Board risk as defined in IPS except for portfolio with higher growth allocation
 - Increases in volatility come from taking more equity risk as demonstrated by equity beta
 - Duration risk is not a significant risk among mixes considered as it is relatively short across all mixes
 - None of the mixes provide very different outcomes in stress scenarios or shocks

Risk limit framework



The board has used the following framework to determine the appropriate level of portfolio volatility

Volatility, drawdowns and risk tolerance



Risk Tolerance

← Aggressive

→ Conservative

Portfolio Volatility	95% VaR	95% CVaR	99% VaR	99% CVaR	Average 3 worst scenarios
8% Risk	-14%	-17%	-18%	-20%	-19%
9% Risk	-15%	-18%	-19%	-22%	-21%
10% Risk	-16%	-19%	-21%	-24%	-23%
11% Risk	-18%	-22%	-24%	-27%	-28%
12% Risk	-20%	-25%	-27%	-31%	-32%
13% Risk	-22%	-28%	-30%	-34%	-36%
14% Risk	-24%	-29%	-31%	-36%	-39%
15% Risk	-25%	-31%	-33%	-38%	-40%

Risk Tolerance

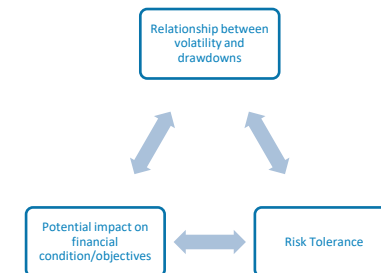
↑ Conservative

↓ Aggressive

The board's risk tolerance determines the appropriate level of risk and how expected drawdowns will be estimated

Actuarial projections

Potential impact on financial condition/objectives



Based on discussions with Verus and Cheiron the board determined there were three actuarial metrics to include in the formulation of their risk limits: Funded Ratio, City Contributions, and Interest cost. Applying drawdowns in 5% increments ranging from 20% to 40%, we can determine the impact on the three metrics.

		Funded Ratio	City Contributions	Interest Cost	Funded Ratio change	City Contributions change	Interest Cost Change
		Single Year	Baseline	53%	\$ 235	\$ 111	0%
	-20%	45%	\$ 292	\$ 143	-8%	\$57	\$32
	-25%	42%	\$ 303	\$ 149	-11%	\$67	\$38
	-30%	40%	\$ 313	\$ 155	-13%	\$78	\$45
	-35%	37%	\$ 324	\$ 162	-16%	\$89	\$51
	-40%	35%	\$ 335	\$ 168	-18%	\$99	\$58

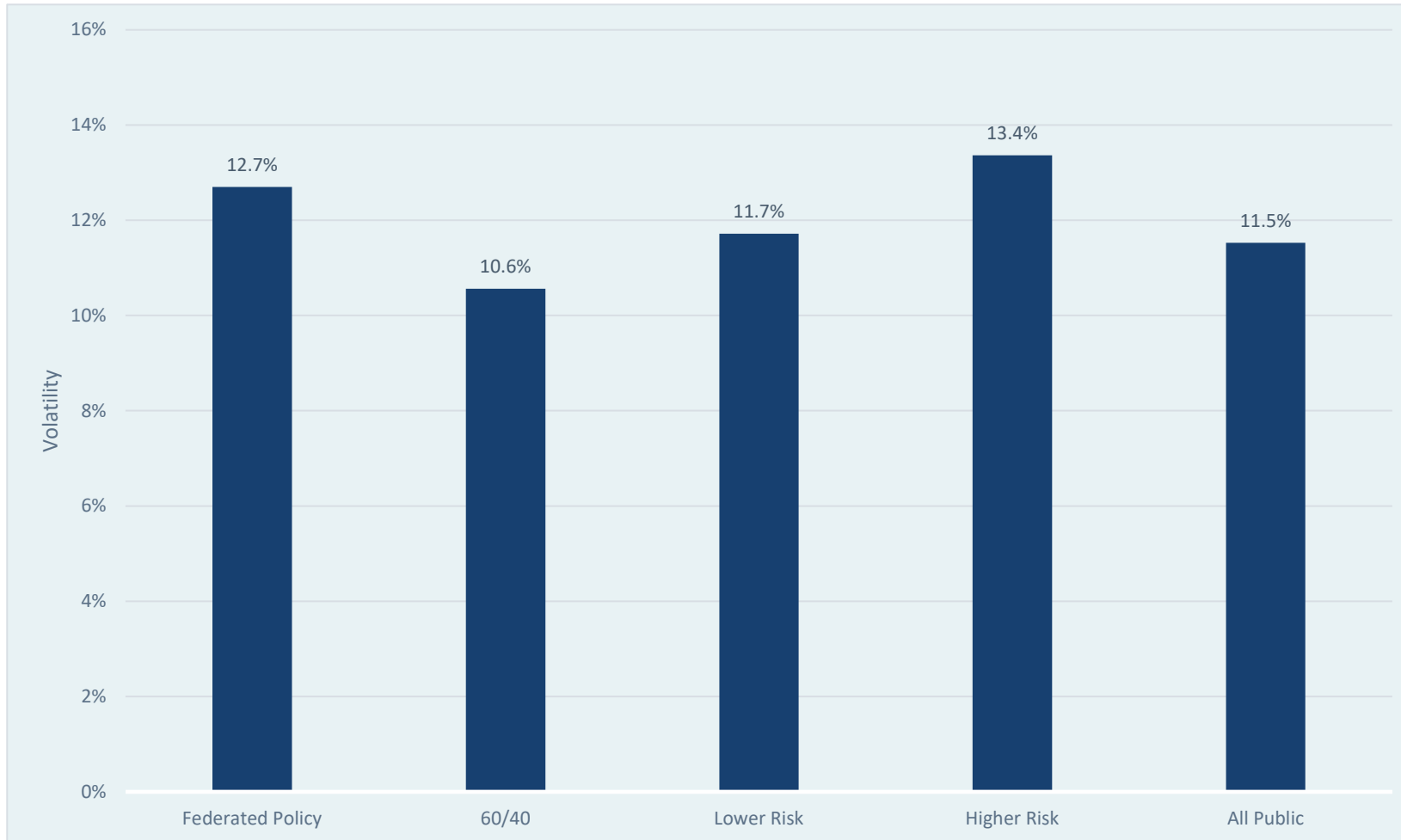
The Single Year table identifies the maximum or minimum for each category.

		Funded Ratio (end of period)	City Contributions	Interest Cost	Funded Ratio change	City Contributions change	Interest Cost Change
		10-year (cumulative)	Baseline	67%	\$ 2,111	\$ 1,038	0%
	-20%	55%	\$ 2,431	\$ 1,346	-12%	\$320	\$308
	-25%	53%	\$ 2,491	\$ 1,403	-14%	\$380	\$366
	-30%	51%	\$ 2,550	\$ 1,461	-17%	\$439	\$423
	-35%	48%	\$ 2,610	\$ 1,518	-19%	\$499	\$481
	-40%	46%	\$ 2,670	\$ 1,576	-21%	\$559	\$538

The 10-year Cumulative table identifies the end of period financial situation and total dollar amount for each category

Source: Actuarial metrics provided by Cheiron. Dollar amounts in millions

Board risk operating zone limit

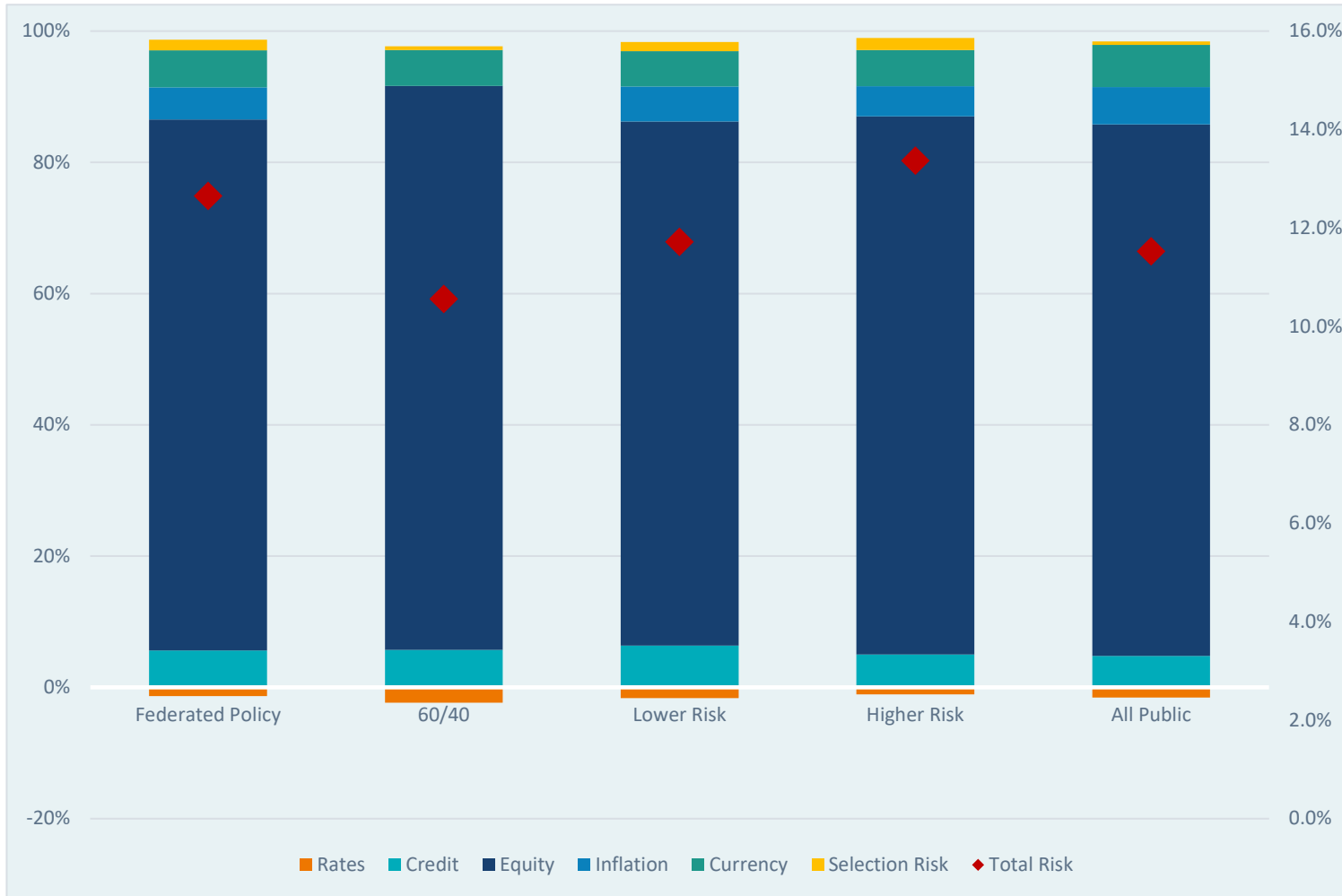


From IPS, Board risk operating zone limit is when portfolio forecast risk is >12%.

The current policy falls modestly outside of this limit as current volatility is elevated versus one year ago when the policy was adopted.

Data from MSCI BarraOne, 303XL model. All Public is based upon InvestorMetrics Public Funds >\$1B fund universe.

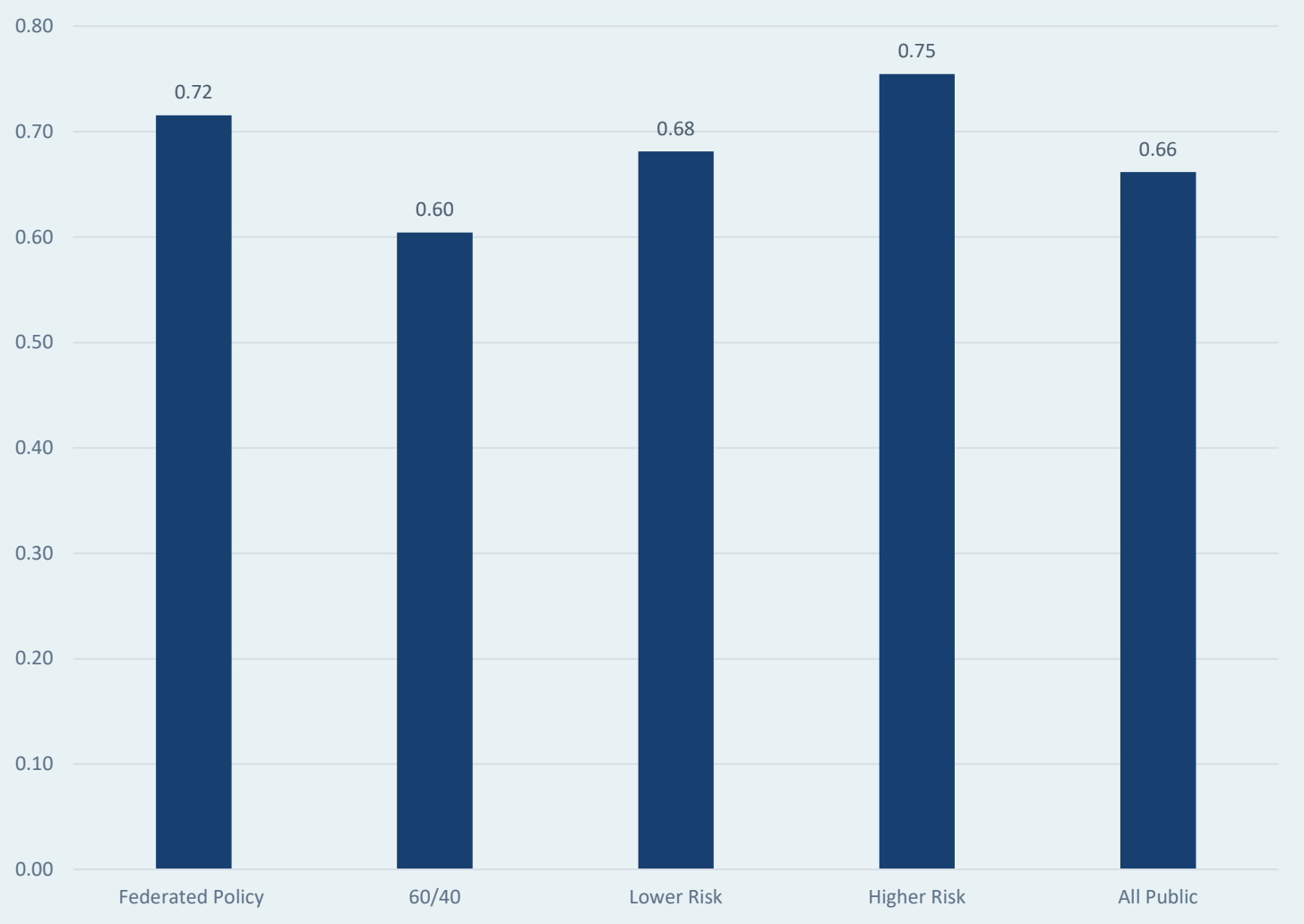
Risk decomposition



Equity factor risk remains the largest contributor to volatility across all the mixes considered. We see marginal differences in credit, inflation, and currency factors.

Data from MSCI BarraOne, 303XL model.

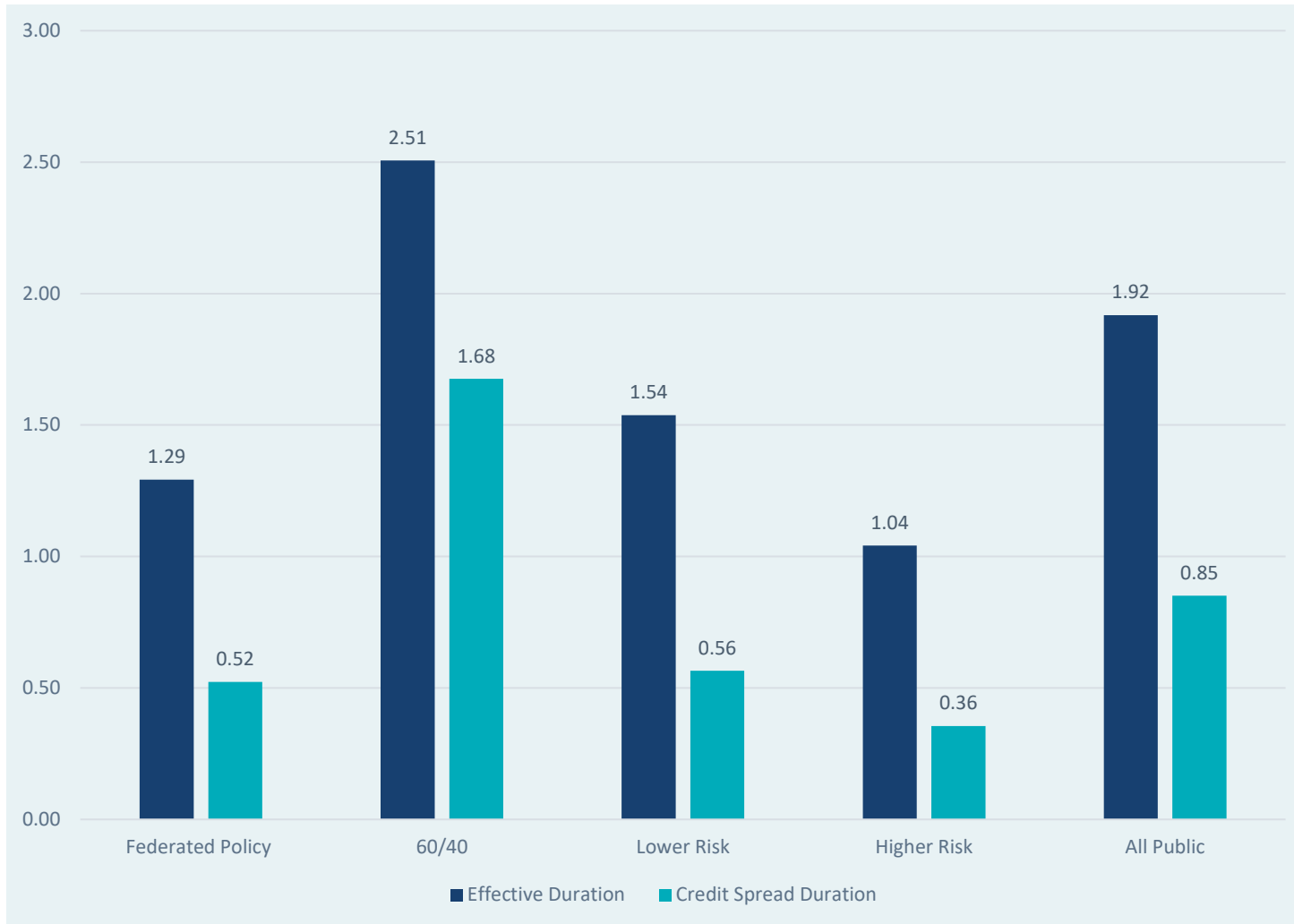
Equity Beta



The highest risk mix has slightly higher equity beta than the current Federated policy. The lower risk mix would slightly reduce equity beta (.04 years).

Equity beta is measured relative to the MSCI ACWI IMI index.

Duration

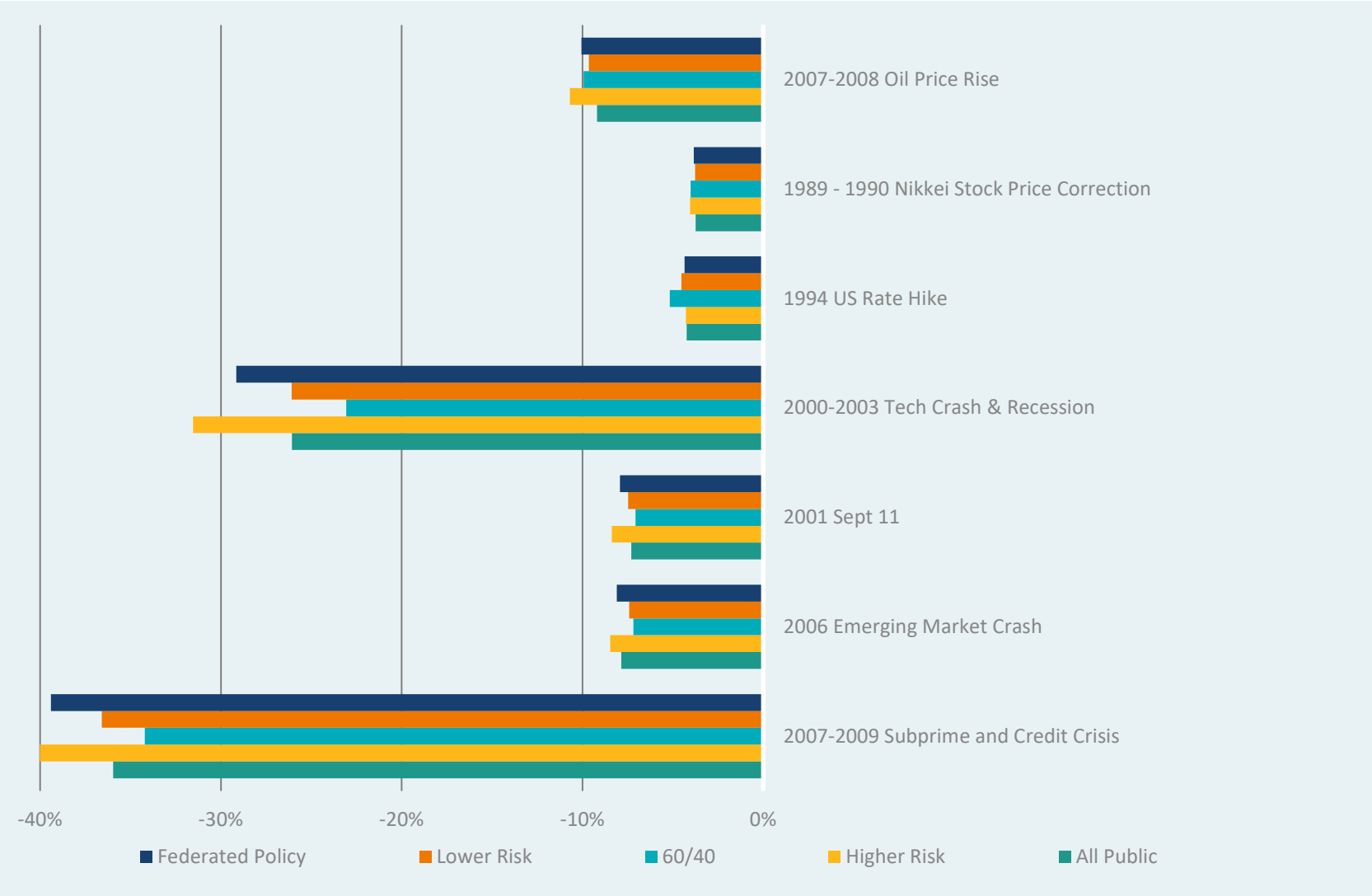


The 60/40 portfolio has the highest effective and credit spread duration among the mixes.

The higher risk mix reduces portfolio duration by 0.25 years.

Source: MSCI BarraOne

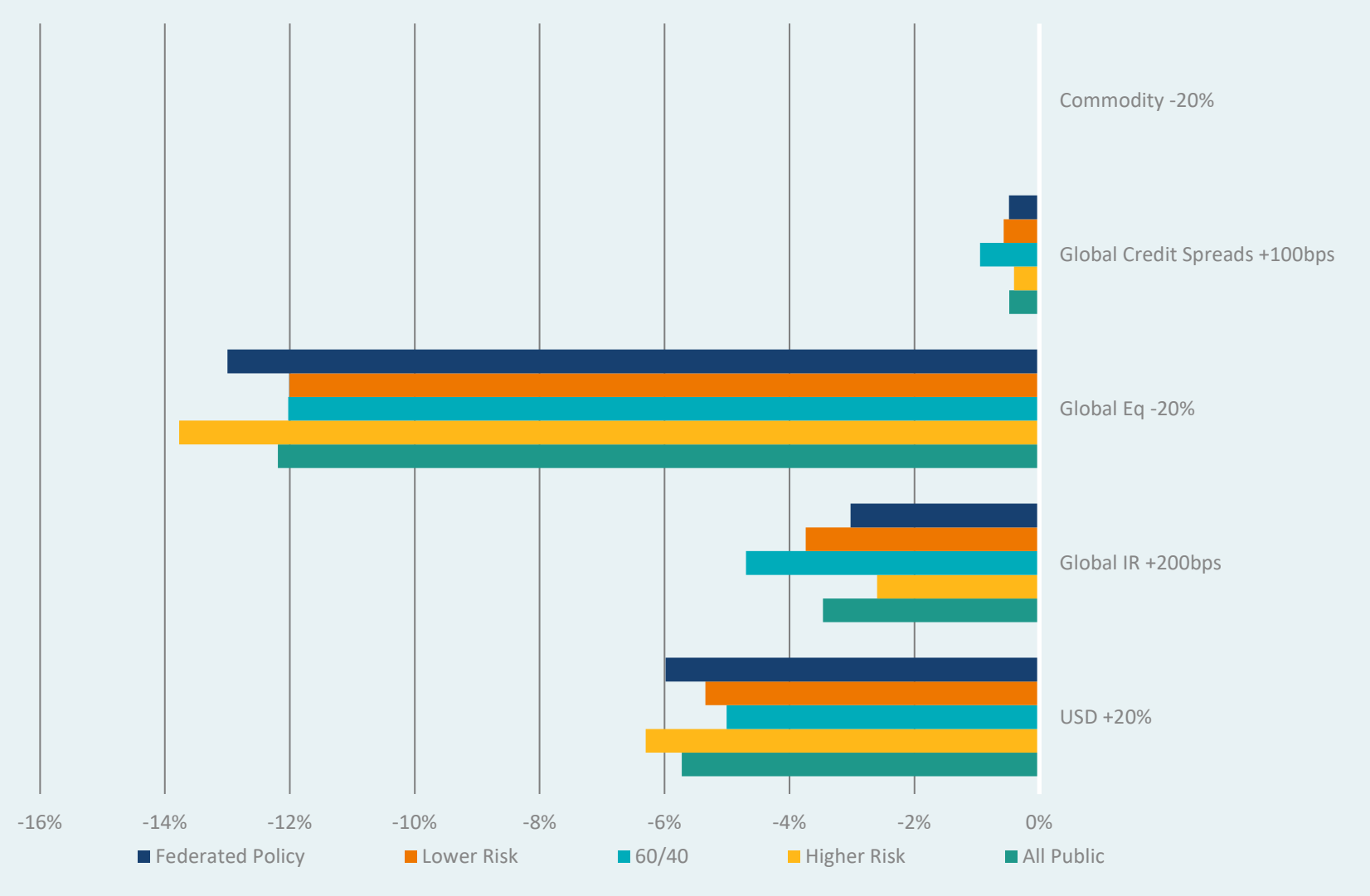
Scenario analysis



We see the largest differences in tail risk in the tech crash and subprime crisis.

Data from MSCI BarraOne.

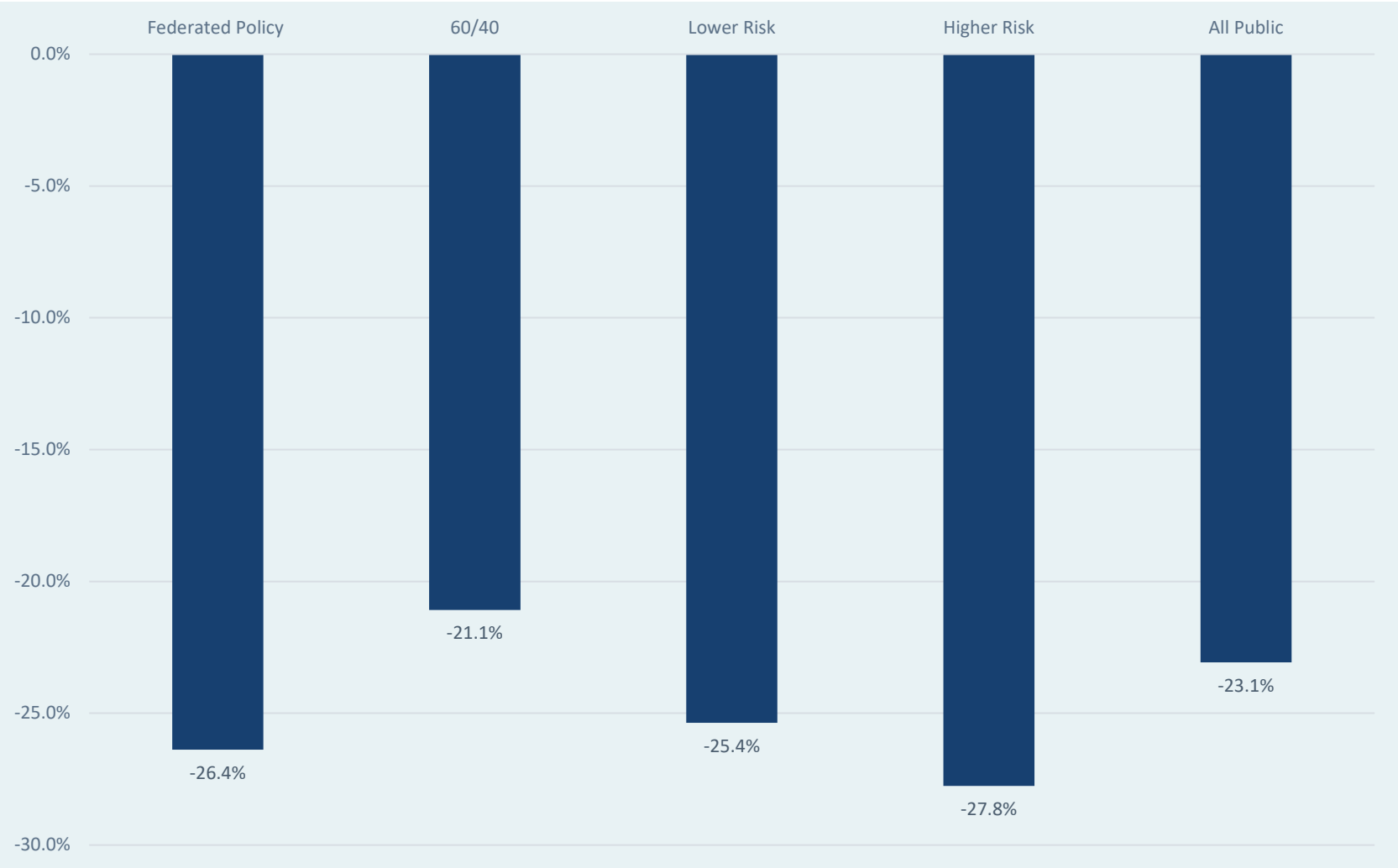
Stress tests



Of the stress tests considered, global equities falling 20% is the most severe, followed by the U.S. Dollar appreciating 20%.

Data from MSCI BarraOne.

COVID 19 Shock



If we experienced the COVID shock today, the higher risk mix is expected to lose 1.4% more than the current Federated Policy.

COVID 19 shock represents the peak to trough return from 2/19/2020 to 3/23/2020.

Appendix – Asset mixes

	Federated				
	Policy	60/40	Lower Risk	Higher Risk	All Public
Growth	75	60	70	79	66
Public Equity	49.0	60.0	46.0	51.0	57.0
Private Equity	12.0	0.0	10.0	14.0	0.0
Private Debt	3.0	0.0	3.0	3.0	0.0
Growth Real Estate	3.0	0.0	3.0	3.0	0.0
Private Real Assets	3.0	0.0	3.0	3.0	3.0
Emerging Market Bonds (Hard)	1.5	0.0	1.5	1.5	1.5
Emerging Market Bonds (Local)	1.5	0.0	1.5	1.5	1.5
High Yield Bonds	2.0	0.0	2.0	2.0	3.0
Low Beta	8	0	6	8	5
Market Neutral Strategies	3.0	0.0	1.0	3.0	0.0
Immunized Cash Flows	5.0	0.0	5.0	5.0	5.0
Other	17	40	24	13	29
US TIPS	2.0	0.0	2.0	2.0	4.0
Core Real Estate	5.0	0.0	5.0	5.0	8.0
Core Bonds	8.0	40.0	12.0	4.0	15.0
Commodities	0.0	0.0	2.0	0.0	0.0
Long-Term Government Bonds	2.0	0.0	3.0	2.0	2.0
Total Allocation	100	100	100	100	100

	Federated				
	Policy	60/40	Lower Risk	Higher Risk	All Public
Mean Variance Analysis					
Forecast 10 Year Return	5.7	4.1	5.4	6.0	4.8
Standard Deviation	13.0	10.5	11.9	14.0	12.0
Return/Std. Deviation	0.4	0.4	0.5	0.4	0.4
1st percentile ret. 1 year	-20.3	-17.5	-18.8	-21.8	-19.5
Sharpe Ratio	0.47	0.41	0.48	0.46	0.43

Appendix - Downside measures

We have discussed three methods of determining downside risk (or tail risk) for the investment portfolio.

Value at risk (VaR): VaR calculates the maximum loss expected over a 1-year period given a specified degree of confidence

Conditional Value at Risk (CVaR): CVaR measures the expected loss if VaR is exceeded. It takes the average of the tail observations

Average of three worst historical scenarios: We simulate the portfolio through historic scenarios to determine the three worst periods and take the average of those scenarios.

Risk Metric	Description
95% VaR	(95% Confidence) We don't expect the worst annual loss to exceed
99% VaR	(99% Confidence) we don't expect the worst annual loss to exceed
95% CVaR	(95% Confidence) If VaR is exceeded, the average expected loss
99% CVaR	(99% Confidence) If VaR is exceeded, the average expected loss
Avg. Scenario Drawdown	The average of the three worst historic scenarios measured in BarraOne

There are three methods to calculate VaR: Historic, Parametric, and Monte Carlo. VaR calculations are conducted in BarraOne using Monte Carlo VaR.