2023 Long-Term Capital Market Assumptions

Invesco Solutions | Japanese yen (JPY) | Q3 Update

1

Executive Summary

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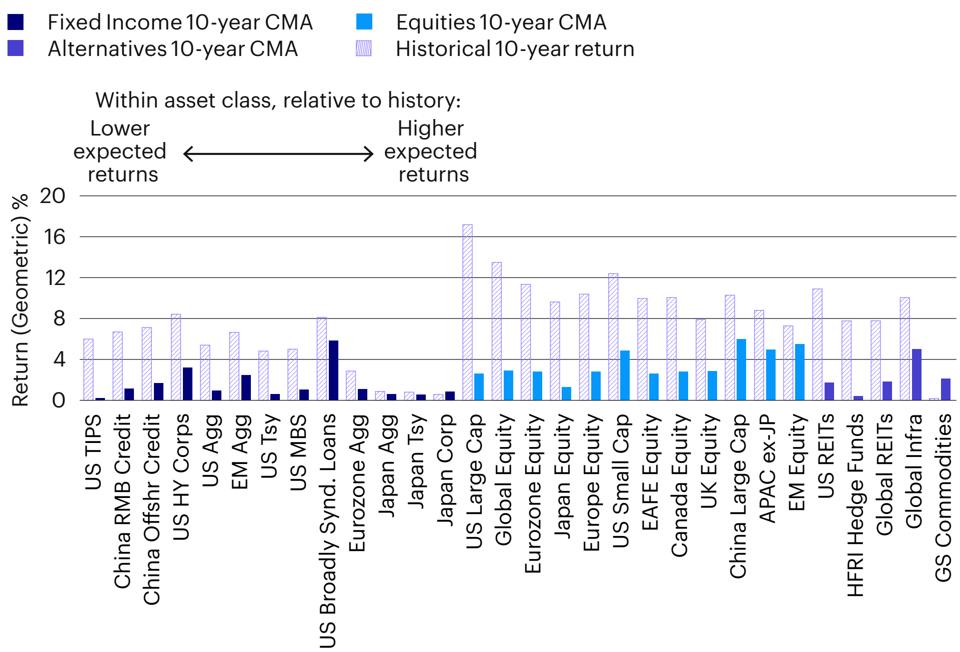
Invesco Solutions provides forecasts for 170+ assets in over 20 currencies, including 10 private assets. For additional CMA data, views, or analysis, please reach out to your Invesco representative.

- Markets have outperformed expectations heading into this year, with equities rebounding significantly (quality inside the US and value outside of the US being the two dominant factors) from the lows of 2022 and credit outpacing government bonds.
- September and the most recent Federal Reserve (Fed) meeting dashed some of this wishful thinking. With interest rates steepening past prior critical levels, namely the 10-year Treasury rate above 4.5%, and expectations for the federal funds rate to remain near 4% until year-end of 2025, there may be further challenges as the long and variable lags of these policies creep into the economy, potentially slowing credit creation and growth.
- Compared to a global 60/40 benchmark, our strategic portfolio (5-10Y) is slightly overweight fixed income relative to equities. Overall, our portfolio has not shifted significantly into or out of any asset classes this quarter.
- Our team at Invesco Investment Solutions remains quite positive on our long-term capital market assumptions (CMAs). Most of the 170+ assets we cover are expected to return more in the coming decade than in the last decade.

Figure 1: Expectations relative to historical average (JPY)



Source: Invesco, estimates as of June 30, 2023. Proxies listed in **Figure 8**. These estimates are forward-looking, are not guarantees, and they involve risks, uncertainties, and assumptions. Please see page 11 for information about our CMA methodology. These estimates reflect the views of Invesco Solutions; the views of other investment teams at Invesco may differ from those presented here.

2

Asset Allocation Insights

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For further details on our process for defining scenarios and adjustments, please refer to our CMA Methodology paper.

Strategic perspective

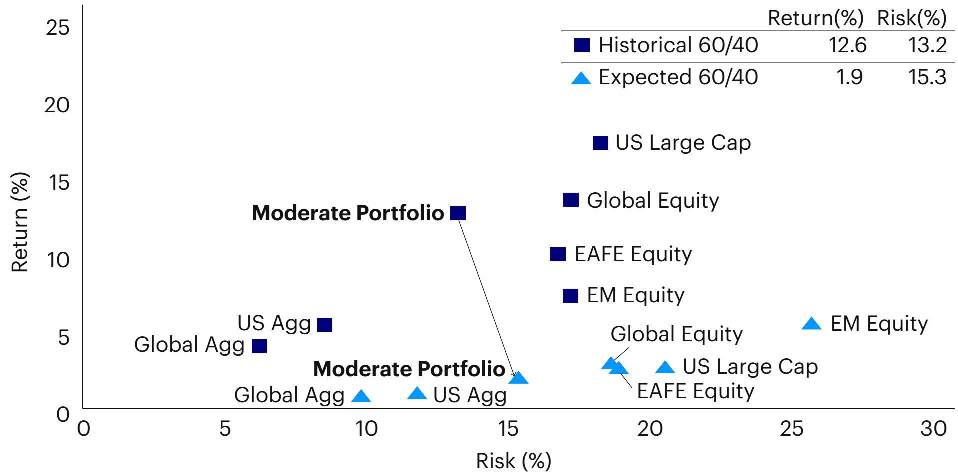
The investment narrative of 2023 so far has been one of hope. Hope that the recession fears were overblown as earnings have outperformed expectations and growth has surprised to the upside. Hope that the inflation fight is over, as current readings are well off their peaks globally. Hope that central banks will soon begin cutting rates. And finally, hope that 2022, as equities and fixed income were correlated to the downside, does not happen again. For the most part, this hope has materialized into a set of conditions where markets have outperformed expectations heading into this year, with equities rebounding significantly (quality inside the US and value outside of the US being the two dominant factors) from the lows of '22 and credit outpacing government bonds.

September and the most recent Fed meeting dashed some of this wishful thinking. The Fed kept rates unchanged; however, policymakers increased their views on near-term growth and pushed the expectation of rate cuts further out into 2024. While a soft landing is implied by their unemployment projections, it certainly was not felt that way in capital markets as longer duration fixed income and equity sectors (consumer discretionary, technology and REITs), quickly sold off. Growth equities are still vastly outpacing value year to date (25.3% versus 2.7%, as of September 22, 2023), with only a small part of that lead reversing since the meeting. However, with interest rates steepening past prior critical levels, namely the 10-year Treasury rate above 4.5%, and expectations for the federal funds rate to remain near 4% until year-end of 2025, there may be further challenges as the long and variable lags of these policies creep into the economy, potentially slowing credit creation and growth.

While this data has not yet been reflected in our most recent mid-year 2023 CMAs, we can posit how Invesco Solutions' long-term capital market assumptions (CMAs) may react to some of the longer-term shifts given this change in projections.

- **Growth:** A near-term shift up in GDP growth is unlikely to affect our 5 to 10-year real earnings growth forecasts as the longer-term view is anchored near 2% for the US, 1.5% for developed markets outside the US (DM ex-US), and emerging markets (EM) around 3.5%. Inverted yield curves could be signaling a forthcoming recession, which may impact future growth prospects but remains to be seen.
- **Interest rates:** Higher rates affect our fixed income expectations significantly as current (and future) interest rates are a large part of our capital market assumption model for the asset class. This shift will likely result in higher fixed income CMAs for longer, as we have seen a shift up in both current and projected yields across the curve.
- **Inflation expectations:** There are certainly arguments to be made about the direction of inflation in the future, given recent spikes and forecasting errors, with forces like demographics and near-shoring looming in the background. It appears long-term inflation expectations are anchored near 2% for the US; however, the path to get there may be slower than initially laid out by policymakers, meaning inflation may be persistently higher for longer than what was previously expected. Our preferred method of sourcing inflation expectations is from the Cleaveland Fed. The data have been rising as of late and are hovering near 2.2%, similar levels to May of this year, after briefly dipping in the summer months. Market-implied, forward breakeven yields are rising quickly; however, that is only one of the measures that the Cleveland Fed model uses, which includes other measures of inflation forecasting, such as surveys and inflation risk.
- **Credit spreads:** Credit spreads have been contained; however, they have diverged significantly from surveys of bank lending standards, which are often tightly correlated. Significant spread widening, while not currently estimated in our CMAs, could lead to additional market volatility should bankruptcies and credit losses start to increase.

Figure 2: Historical returns for the 60/40 have fallen amid recent sell-off while expected returns are improving (JPY)



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3Q23 CMA observations (10Y, USD):

Equities: Global equities are still expected to return 6.3%; however, the relative expected outperformance between equities and fixed income continues to shrink, especially when adjusting for risk. US equities are slightly lower at 6%, European equities are at 6.2%, and EM at 6.9%. Japan is 4.7%. Our US small-cap CMA is 8.3%. In general, equity CMAs are lower on a year-over-year basis (-1.5% global equities, -1% for US). China is the exception, up +0.6% to 9.4%. The US large-cap CMA is down nearly 1% on the quarter from lower expected inflation and higher valuations, while DM ex-US was relatively flat. Our small-cap CMA is 0.7% lower this quarter, with less of a valuation drag compared to large caps. The valuation building block change was mostly positive outside the US, offsetting lower inflation numbers and boosting real returns. Canada, China, and EM return expectations increased over the quarter from higher earnings growth.

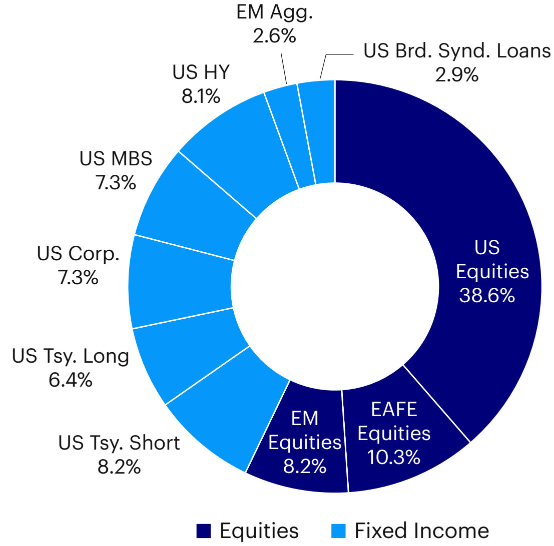
Fixed income: CMAs for most FI asset classes are significantly higher than historical returns. Some higher yielding credit assets are expected to outperform even the riskier parts of the equity market at much lower levels of risk. Higher current and expected yields have driven up average yields (0.44% for aggregate bonds). The US Treasury CMA is 4% and is expected to continue to trend higher, given further expected increases in benchmark rates. TIPS are slightly lower at 3.6%.

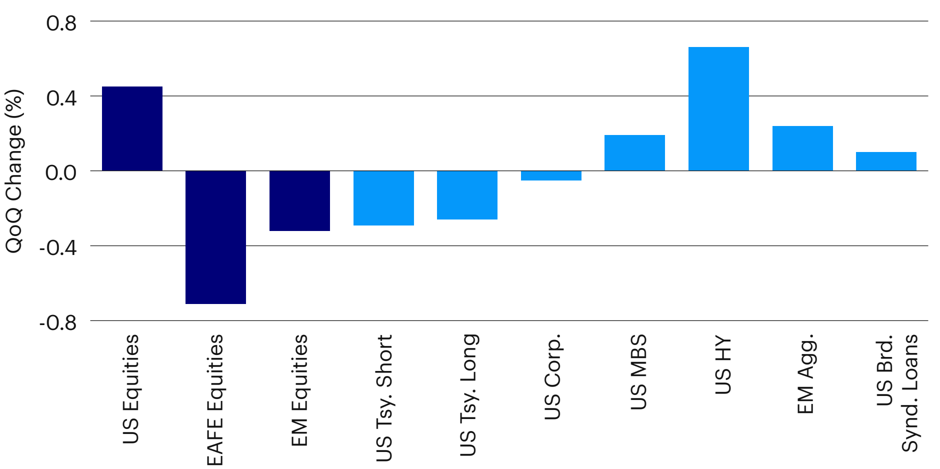
The strategic asset allocation (SAA) displayed here is denominated in USD and is representative of our CMA's applied in a hypothetical portfolio context for global investors.

There are many considerations for investors beyond CMA's when it comes to asset allocation decisions. To learn more about our investment process or discuss your own portfolio needs, please reach out to your Invesco Solutions representative.

Strategic asset allocation trends:

Figure 3: 2023 Q3 SAA rebalance (USD)





Source: Invesco Solutions, as of June 30, 2023. Proxies listed in **Figure 8**. These estimates reflect the views of Invesco Solutions; the views of other investment teams at Invesco may differ from those presented here. References to overweights and underweights are relative to a 60% global equity and 40% global aggregate fixed income benchmark.

- **Portfolio level:** Compared to a global 60/40 benchmark, our strategic portfolio (5-10Y) is slightly overweight fixed income relative to equities. Overall, our portfolio has not shifted significantly into or out of any asset classes this quarter.
- **Within equities:** We are overweight EM and US large-cap equities while underweight DM ex-US equities due to a lower expected risk/return ratio.
- **Within fixed income:** Presently overweight, both Treasuries and risky credit. Neutral duration compared to our benchmark.

3

2023 Capital Market Assumptions

Figure 4: 10-year asset class expectations (JPY)

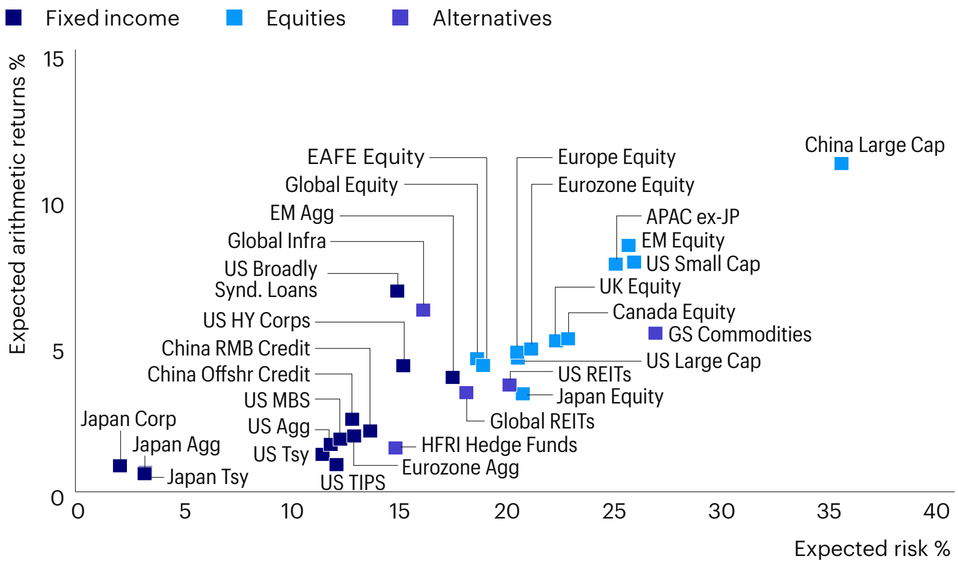


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Figure 5: CMA difference: 5-year minus 10-year assumptions (JPY)

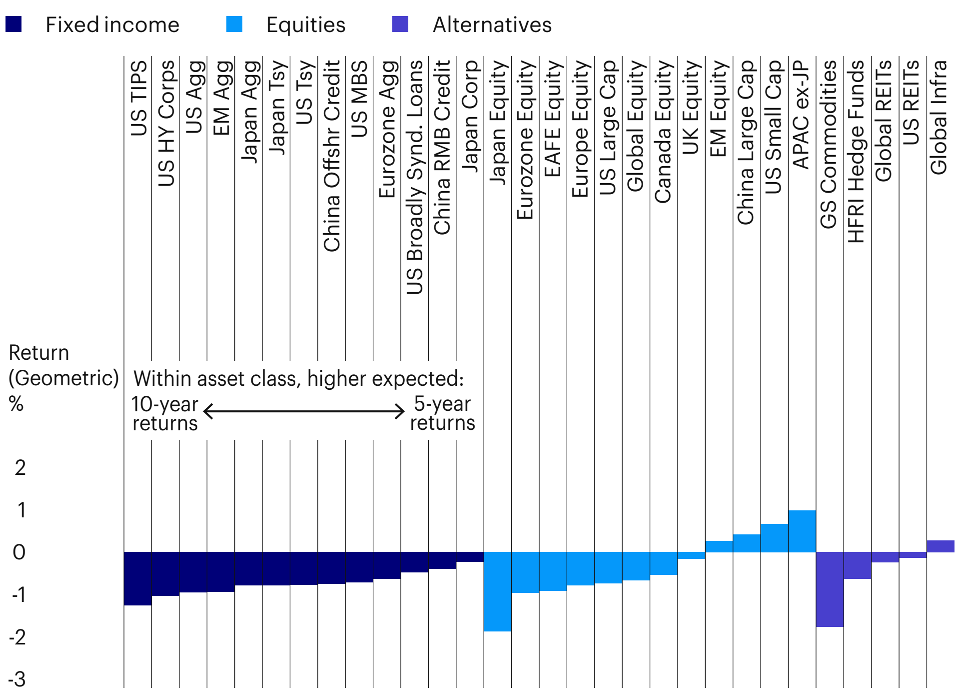

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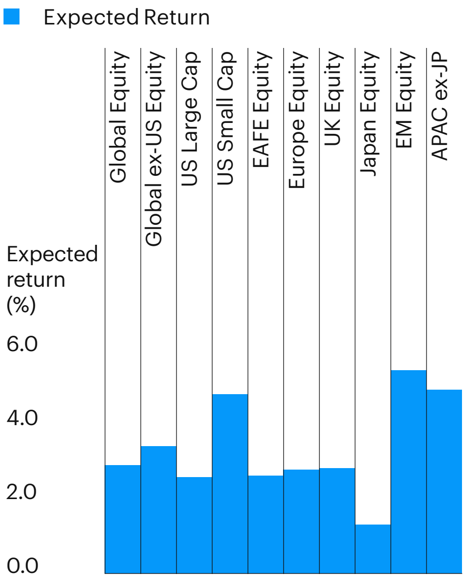
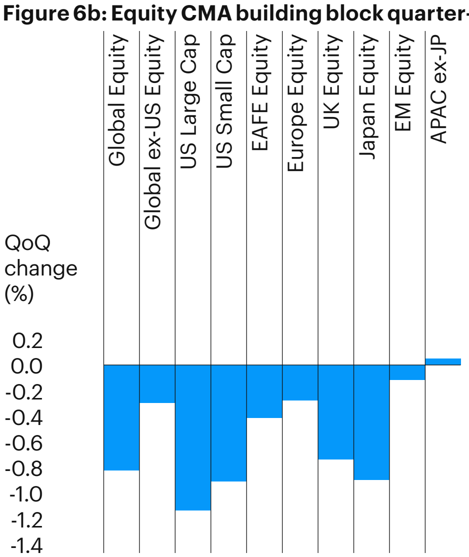
Figure 6a: Equity CMA building block contribution (JPY) (%)



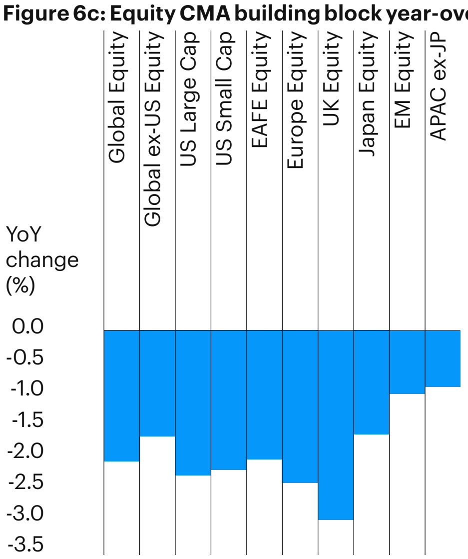
	Dividend Yield	Buyback Yield	LT Earnings Growth	Expected Inflation	Valuation Change	Currency Adj. (IRP)
Global Equity	2.10	0.77	1.92	1.47	-0.30	-3.07
Global ex-US Equity	3.14	0.00	1.97	1.15	-0.36	-2.49
US Large Cap	1.47	1.23	1.89	1.66	-0.26	-3.42
US Small Cap	1.57	0.79	3.11	1.66	1.08	-3.42
EAFE Equity	3.17	0.00	1.37	0.89	-0.77	-2.03
Europe Equity	3.29	0.00	1.47	1.28	-0.77	-2.47
UK Equity	4.11	0.00	1.61	1.45	-0.31	-4.02
Japan Equity	2.23	0.00	0.74	-0.66	-0.99	0.00
EM Equity	3.12	0.00	3.46	1.70	0.61	-3.46
APAC ex-JP	2.76	0.00	3.11	1.69	0.79	-3.45

Figure 6b: Equity CMA building block quarter-over-quarter change and contribution (JPY) (%)



	Dividend Yield	Buyback Yield	LT Earnings Growth	Expected Inflation	Valuation Change	Currency Adj. (IRP)
Global Equity	-0.11	0.02	0.16	-0.63	-0.07	-0.22
Global ex-US Equity	-0.03	0.00	0.27	-0.63	0.23	-0.15
US Large Cap	-0.12	0.00	0.09	-0.65	-0.26	-0.25
US Small Cap	0.00	-0.02	-0.03	-0.65	0.01	-0.25
EAFE Equity	-0.03	0.00	0.15	-0.55	0.17	-0.16
Europe Equity	0.03	0.00	0.29	-0.64	0.23	-0.19
UK Equity	0.10	0.00	0.15	-0.80	0.61	-0.82
Japan Equity	-0.29	0.00	-0.43	-0.10	-0.12	0.00
EM Equity	-0.05	0.00	0.54	-0.83	0.30	-0.07
APAC ex-JP	0.00	0.00	0.79	-0.80	0.25	-0.17

Figure 6c: Equity CMA building block year-over-year change and contribution (JPY) (%)



	Dividend Yield	Buyback Yield	LT Earnings Growth	Expected Inflation	Valuation Change	Currency Adj. (IRP)
Global Equity	-0.06	0.01	-0.15	-0.77	-0.54	-0.59
Global ex-US Equity	0.11	0.00	-0.13	-0.87	-0.38	-0.42
US Large Cap	-0.12	-0.02	-0.16	-0.71	-0.64	-0.67
US Small Cap	0.11	-0.02	-0.38	-0.71	-0.55	-0.67
EAFE Equity	0.01	0.00	-0.17	-0.65	-0.53	-0.72
Europe Equity	0.04	0.00	-0.08	-0.74	-0.59	-1.08
UK Equity	0.12	0.00	-0.36	-1.07	0.22	-1.94
Japan Equity	-0.26	0.00	-0.55	-0.30	-0.57	0.00
EM Equity	0.26	0.00	0.15	-1.30	-0.03	-0.06
APAC ex-JP	-0.02	0.00	0.39	-1.15	0.02	-0.13

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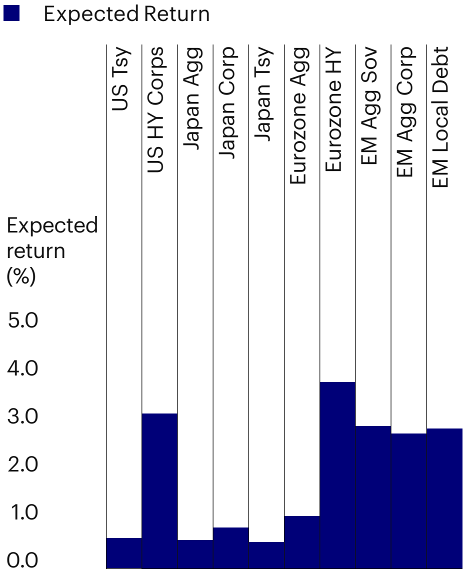
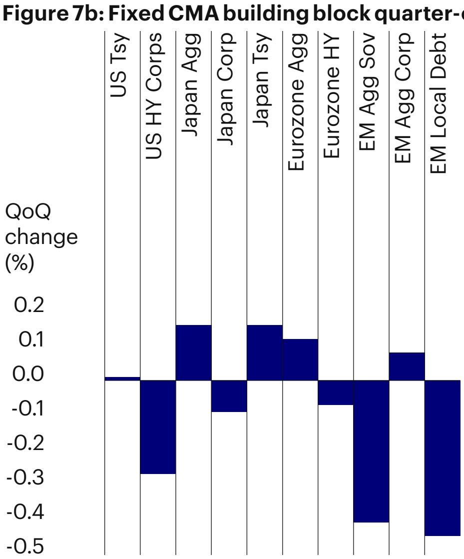
Figure 7a: Fixed CMA building block contribution (JPY) (%)



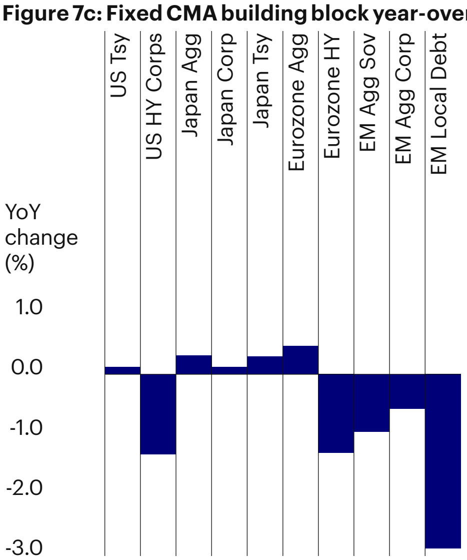
	Average Yield	Roll Return	Valuation Change (Yield Curve)	Valuation Change (OAS)	Credit Loss	Currency Adj. (IRP)
US Tsy	4.41	-0.31	-0.05	0.00	0.00	-3.42
US HY Corps	8.93	-0.26	0.12	-0.46	-1.69	-3.42
Japan Agg	1.00	0.76	-1.15	-0.02	0.00	0.00
Japan Corp	1.13	0.39	-0.51	0.08	-0.24	0.00
Japan Tsy	0.94	0.76	-1.15	0.00	0.00	0.00
Eurozone Agg	3.58	-0.06	-0.04	-0.03	-0.34	-2.02
Eurozone HY	7.55	-0.39	0.12	-0.15	-1.26	-2.02
EM Agg Sov	7.75	-0.10	-0.25	0.12	-1.16	-3.42
EM Agg Corp	8.07	-0.24	0.05	-0.30	-1.36	-3.42
EM Local Debt	6.68	0.31	-0.37	0.00	0.00	-3.72

Figure 7b: Fixed CMA building block quarter-over-quarter change and contribution (JPY) (%)



	Average Yield	Roll Return	Valuation Change (Yield Curve)	Valuation Change (OAS)	Credit Loss	Currency Adj. (IRP)
US Tsy	0.46	-0.30	0.10	0.00	0.00	-0.25
US HY Corps	0.14	-0.12	0.13	-0.26	0.09	-0.25
Japan Agg	-0.11	0.07	0.19	0.00	0.00	0.00
Japan Corp	-0.05	-0.07	0.00	-0.02	0.04	0.00
Japan Tsy	-0.11	0.07	0.19	0.00	0.00	0.00
Eurozone Agg	0.25	-0.07	-0.05	-0.01	0.01	-0.01
Eurozone HY	0.12	-0.20	0.05	-0.08	0.06	-0.01
EM Agg Sov	0.18	-0.15	0.07	-0.30	0.04	-0.25
EM Agg Corp	0.24	-0.15	0.14	-0.18	0.28	-0.25
EM Local Debt	-0.34	-0.02	0.08	0.00	0.00	-0.17

Figure 7c: Fixed CMA building block year-over-year change and contribution (JPY) (%)



	Average Yield	Roll Return	Valuation Change (Yield Curve)	Valuation Change (OAS)	Credit Loss	Currency Adj. (IRP)
US Tsy	1.08	-0.54	0.24	0.00	0.00	-0.67
US HY Corps	0.13	-0.41	0.34	-0.71	0.01	-0.67
Japan Agg	0.06	0.24	0.01	0.00	0.00	0.00
Japan Corp	0.11	0.05	-0.04	0.05	-0.04	0.00
Japan Tsy	0.04	0.24	0.01	0.00	0.00	0.00
Eurozone Agg	1.29	-0.21	0.30	-0.11	0.06	-0.86
Eurozone HY	0.47	-0.65	0.33	-0.59	0.00	-0.86
EM Agg Sov	0.38	-0.21	0.27	-0.81	0.09	-0.67
EM Agg Corp	0.46	-0.39	0.27	-0.61	0.36	-0.67
EM Local Debt	-0.75	-0.30	0.01	0.00	0.00	-1.84

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Figure 8: 10-year asset class expected returns, risk, and return-to-risk (JPY)

	Asset class	Index	Expected geometric return %	Expected arithmetic return %	Total Yield %	Expected risk %	Arithmetic return to risk ratio
Fixed income	US Tsy Short	BBG US Tsy Short	1.2	1.9	1.9	12.1	0.16
	US Tsy IM	BBG US Tsy IM	0.8	1.4	1.1	11.3	0.12
	US Tsy Long	BBG US Tsy Long	-0.3	0.6	0.6	13.9	0.04
	US TIPS	BBG US TIPS	0.2	0.9	0.6	12.0	0.08
	US Broadly Synd. Loans	CSFB Leverage Loan	5.8	6.8	7.5	14.9	0.46
	US Agg	BBG US Agg	0.9	1.6	1.4	11.8	0.14
	US IG Corp	BBG US IG	1.2	2.0	2.1	12.4	0.16
	US MBS	BBG US MBS	1.0	1.8	1.4	12.2	0.15
	US Preferred Stocks	BOA ML Fixed Rate Pref Securities	1.6	2.6	3.6	14.5	0.18
	US HY Corps	BBG US HY	3.2	4.3	5.1	15.2	0.28
	UK Linker	BofA ML UK Inflation-Linked Gilt	0.7	1.7	0.8	14.7	0.12
	UK Gilts	BBG Sterling Agg Gilts	1.2	1.9	0.7	12.1	0.16
	UK Corp	BBG Sterling Agg Non-Gilts Corp	1.4	2.7	2.6	16.5	0.16
	Global Agg	BBG Global Agg	0.8	1.2	1.2	9.8	0.13
	Global Agg ex-US	BBG Global Agg ex-US	0.7	1.1	1.2	9.2	0.12
	Global Tsy	BBG Global Tsy	0.8	1.1	1.0	8.2	0.14
	Global Sov	BBG Global Sov	0.8	1.5	1.5	12.7	0.12
	Global Corp	BBG Global Corp	1.3	2.2	2.2	13.1	0.16
	Global IG	BBG Global Corp IG	1.4	2.3	2.3	14.1	0.16
	Eurozone Corp	BBG Euro Agg Credit Corp	1.7	2.7	2.4	14.8	0.18
	Eurozone Tsy	BBG Euro Agg Gov Tsy	1.2	1.9	1.2	12.6	0.15
	Asian Dollar IG	BOA ML AC IG	1.7	2.7	2.5	14.3	0.19
	EM Agg	BBG EM Agg	2.5	3.9	4.1	17.5	0.22
	EM Agg Sov	BBG EM Sov	2.9	4.2	4.3	16.3	0.26
	China Policy Bk & Tsy	BBG China PB Tsy TR	1.0	1.8	0.3	13.0	0.14
	China RMB Credit	BBG China Corporate	1.2	2.1	0.9	13.6	0.15
Equities	Global Equity	MSCI ACWI	2.9	4.5	-0.2	18.6	0.24
	Global ex-US Equity	MSCI ACWI ex-US	3.4	5.1	0.7	19.2	0.27
	US Broad Market	Russell 3000	2.6	4.7	-0.7	21.1	0.22
	US Large Cap	S&P 500	2.6	4.6	-0.7	20.5	0.22
	US Mid Cap	Russell Midcap	3.5	5.9	-0.5	22.9	0.26
	US Small Cap	Russell 2000	4.8	7.8	-1.1	25.9	0.30
	EAFE Equity	MSCI EAFE	2.6	4.3	1.1	18.9	0.23
	Europe Equity	MSCI Europe	2.8	4.8	0.8	20.5	0.23
	Eurozone Equity	MSCI Euro ex-UK	2.8	4.9	1.0	21.1	0.23
	UK Large Cap	FTSE 100	2.5	4.7	0.2	22.1	0.21
	UK Small Cap	FTSE Small Cap UK	3.4	6.7	-0.3	27.2	0.25
	Canada Equity	S&P TSX	2.8	5.2	0.2	22.8	0.23
	Japan Equity	MSCI JP	1.3	3.3	2.2	20.7	0.16
	EM Equity	MSCI EM	5.5	8.4	-0.3	25.7	0.33
	China Small Cap	CSI 500	5.9	11.8	-0.5	37.7	0.31
	Pacific ex-JP Equity	MSCI Pacific ex-JP	4.3	7.3	0.9	26.2	0.28
Alternatives	US REITs	FTSE NAREIT Equity	1.7	3.6	0.7	20.1	0.18
	Global REITs	FTSE EPRA/NAREIT Developed	1.8	3.4	1.4	18.1	0.19
	HFRI Hedge Funds	HFRI HF	0.4	1.5	-	14.8	0.10
	GS Commodities	S&P GSCI	2.1	5.4	-	26.9	0.20
	Agriculture	S&P GSCI Agriculture	0.4	3.2	-	24.1	0.13
	Energy	S&P GSCI Energy	3.8	10.2	-	39.3	0.26
	Industrial Metals	S&P GSCI Industrial Metals	1.9	4.8	-	25.4	0.19
	Precious Metals	S&P GSCI Precious Metals	-3.8	-2.0	-	18.6	-0.11

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Figure 9: 10-year correlations (JPY)

- Greater than 0.70
- 0.30 to 0.70
- Less than 0.30

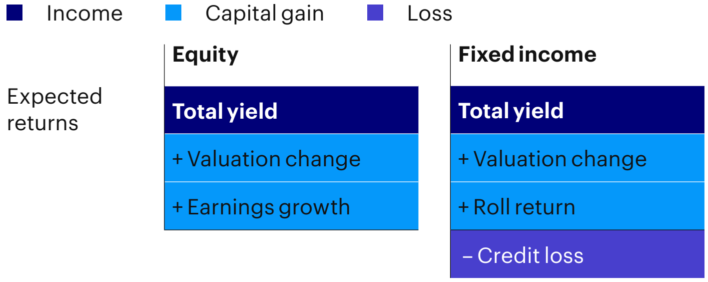
		Fixed income												Equities										Alternatives			
	Asset class	US Tsy IM	US TIPS	US Broadly Synd. Loans	US Agg	US IG Corp	US HY Corps	US Muni	US HY Muni	Global Agg	Global Agg ex-US	EM Agg	China RMB Credit	Global Equity	China Large Cap	US Large Cap	US Mid Cap	US Small Cap	EAFE Equity	UK Large Cap	Canada Equity	Japan Equity	EM Equity	Global REITs	Global Infra	GS Commodities	HFRI Hedge Funds
Fixed income	US Tsy IM	1.00																									
	US TIPS	0.67	1.00																								
	US Broadly Synd. Loans	-0.28	0.27	1.00																							
	US Agg	0.87	0.79	0.09	1.00																						
	US IG Corp	0.59	0.75	0.44	0.88	1.00																					
	US HY Corps	0.01	0.50	0.82	0.39	0.68	1.00																				
	US Muni	0.58	0.63	0.30	0.77	0.76	0.48	1.00																			
	US HY Muni	0.31	0.53	0.56	0.57	0.65	0.57	0.82	1.00																		
	Global Agg	0.70	0.75	0.18	0.84	0.80	0.50	0.65	0.50	1.00																	
	Global Agg ex-US	0.57	0.67	0.20	0.71	0.70	0.49	0.55	0.43	0.98	1.00																
	EM Agg	0.31	0.64	0.62	0.63	0.81	0.81	0.63	0.64	0.69	0.65	1.00															
	China RMB Credit	0.29	0.29	0.08	0.37	0.32	0.19	0.27	0.23	0.46	0.47	0.28	1.00														
Equities	Global Equity	-0.05	0.39	0.64	0.28	0.54	0.81	0.32	0.40	0.49	0.52	0.69	0.25	1.00													
	China Large Cap	0.01	0.15	0.28	0.19	0.30	0.34	0.16	0.23	0.28	0.30	0.38	0.32	0.43	1.00												
	US Large Cap	-0.06	0.36	0.60	0.25	0.49	0.76	0.28	0.36	0.40	0.42	0.60	0.20	0.96	0.36	1.00											
	US Mid Cap	-0.11	0.34	0.68	0.23	0.50	0.81	0.29	0.39	0.38	0.40	0.63	0.20	0.94	0.36	0.95	1.00										
	US Small Cap	-0.18	0.24	0.62	0.12	0.38	0.73	0.19	0.30	0.27	0.30	0.53	0.17	0.87	0.34	0.89	0.95	1.00									
	EAFE Equity	-0.02	0.36	0.60	0.28	0.53	0.78	0.34	0.40	0.52	0.56	0.70	0.27	0.96	0.43	0.87	0.87	0.79	1.00								
	UK Large Cap	-0.10	0.30	0.61	0.19	0.45	0.73	0.28	0.39	0.44	0.49	0.63	0.25	0.90	0.41	0.82	0.82	0.74	0.95	1.00							
	Canada Equity	-0.10	0.38	0.67	0.22	0.50	0.77	0.27	0.40	0.44	0.48	0.66	0.23	0.89	0.41	0.83	0.87	0.80	0.85	0.85	1.00						
	Japan Equity	0.02	0.31	0.48	0.28	0.46	0.64	0.29	0.32	0.42	0.44	0.58	0.26	0.79	0.35	0.71	0.70	0.66	0.83	0.71	0.65	1.00					
	EM Equity	0.00	0.37	0.58	0.30	0.53	0.72	0.32	0.42	0.53	0.57	0.73	0.35	0.85	0.57	0.72	0.74	0.67	0.84	0.78	0.80	0.69	1.00				
Alternatives	Global REITs	0.06	0.48	0.64	0.39	0.61	0.79	0.41	0.50	0.53	0.54	0.72	0.25	0.85	0.32	0.81	0.84	0.77	0.84	0.79	0.79	0.66	0.73	1.00			
	Global Infra	0.10	0.49	0.58	0.40	0.60	0.75	0.44	0.49	0.55	0.56	0.70	0.23	0.83	0.33	0.79	0.79	0.68	0.82	0.81	0.82	0.62	0.72	0.84	1.00		
	GS Commodities	-0.29	0.14	0.52	-0.11	0.12	0.48	0.01	0.23	0.13	0.21	0.34	0.10	0.52	0.17	0.45	0.50	0.47	0.53	0.62	0.66	0.36	0.49	0.42	0.51	1.00	
	HFRI Hedge Funds	-0.19	0.30	0.73	0.15	0.47	0.78	0.25	0.44	0.35	0.39	0.64	0.25	0.89	0.46	0.82	0.88	0.85	0.85	0.83	0.88	0.70	0.82	0.77	0.73	0.62	1.00

Source: Invesco, estimates as of June 30, 2023. Proxies listed in **Figure 8.** These estimates are forward-looking, are not guarantees, and they involve risks, uncertainties, and assumptions. Please see page 11 for information about our CMA methodology. These estimates reflect the views of Invesco Solutions; the views of other investment teams at Invesco may differ from those presented here.

About our capital market assumptions methodology

We employ a fundamentally based “building block” approach to estimating asset class returns. Estimates for income and capital gain components of returns for each asset class are informed by fundamental and historical data. Components are then combined to establish estimated returns (Figure 10). Here, we provide a summary of key elements of the methodology used to produce our long-term (10-year) estimates. Five-year assumptions are also available upon request. Please see Invesco’s capital market assumption methodology whitepaper for more detail.

Figure 10: Our building block approach to estimating returns



For illustrative purposes only.

Fixed income returns are composed of:

- **Average yield**: The average of the starting (initial) yield and the expected yield for bonds.
- **Valuation change (yield curve)**: Estimated changes in valuation given changes in the Treasury yield curve.
- **Roll return**: Reflects the impact on the price of bonds that are held over time. Given a positively sloped yield curve, a bond’s price will be positively impacted as interest payments remain fixed, but time to maturity decreases.
- **Credit adjustment:** Estimated potential impact on returns from credit rating downgrades and defaults.

Equity returns are composed of:

- **Dividend yield:** Dividend per share divided by price per share.
- **Buyback yield:** Percentage change in shares outstanding resulting from companies buying back or issuing shares.
- **Valuation change:** The expected change in value given the current Price/Earnings (P/E) ratio and the assumption of reversion to the long-term average P/E ratio.
- **Long-term (LT) earnings growth**: The estimated rate of the growth of earnings based on the long-term average real GDP per capita and inflation.

Currency adjustments are based on the theory of Interest Rate Parity (IRP), which suggests a strong relationship between interest rates and the spot and forward exchange rates between two given currencies. Interest rate parity theory assumes that no arbitrage opportunities exist in foreign exchange markets. It is based on the notion that, over the long term, investors will be indifferent between varying rates of returns on deposits in different currencies because any excess return on deposits will be offset by changes in the relative value of currencies.

Volatility estimates for the different asset classes, we use rolling historical quarterly returns of various market benchmarks. Given that benchmarks have differing histories within and across asset classes, we normalize the volatility estimates of shorter-lived benchmarks to ensure that all series are measured over similar time periods.

Correlation estimates are calculated using trailing 20 years of monthly returns. Given that recent asset class correlations could have a more meaningful effect on future observations, we place greater weight on more recent observations by applying a 10-year half-life to the time series in our calculation.

Arithmetic versus geometric returns. Our building block methodology produces estimates of geometric (compound) asset class returns. However, standard mean-variance portfolio optimization requires return inputs to be provided in arithmetic rather than in geometric terms. This is because the arithmetic mean of a weighted sum (e.g., a portfolio) is the weighted sum of the arithmetic means (of portfolio constituents). This does not hold for geometric returns. Accordingly, we translate geometric estimates into arithmetic terms. We provide both arithmetic returns and geometric returns, given that the former informs the optimization process regarding expected outcomes, while the latter informs the investor about the rate at which asset classes might be expected to grow wealth over the long run.

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Invesco Solutions

Invesco Solutions is an experienced multi-asset team that seeks to deliver desired client outcomes using Invesco's global capabilities, scale and infrastructure. We partner with you to fully understand your goals and harness strategies across Invesco's global spectrum of active, passive, factor, and alternative investments that address your unique needs. From robust research and analysis to bespoke investment solutions, our team brings insight and innovation to your portfolio construction process. Our approach starts with a complete understanding of your needs:

- We help support better investment outcomes by delivering insightful and thorough analytics.
- By putting analytics into practice, we develop investment approaches specific to your needs.
- We work as an extension of your team to engage across functions and implement solutions.

The foundation of the team's process is the development of capital market assumptions — long-term forecasts for the behavior of different asset classes. Their expectations for returns, volatility, and correlation serve as guidelines for long-term, strategic asset allocation decisions.

Assisting clients in North America, Europe, and Asia, Invesco's Investment Solutions team consists of over 75 professionals with 20+ years of experience across the leadership team. The team benefits from Invesco's on-the-ground presence in 25 countries worldwide, with over 150 professionals to support investment selection and ongoing monitoring.

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