2023 Long-Term Capital Market Assumptions

Invesco Investment Solutions I Japanese yen (JPY) I Q2 Update

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Executive Summary

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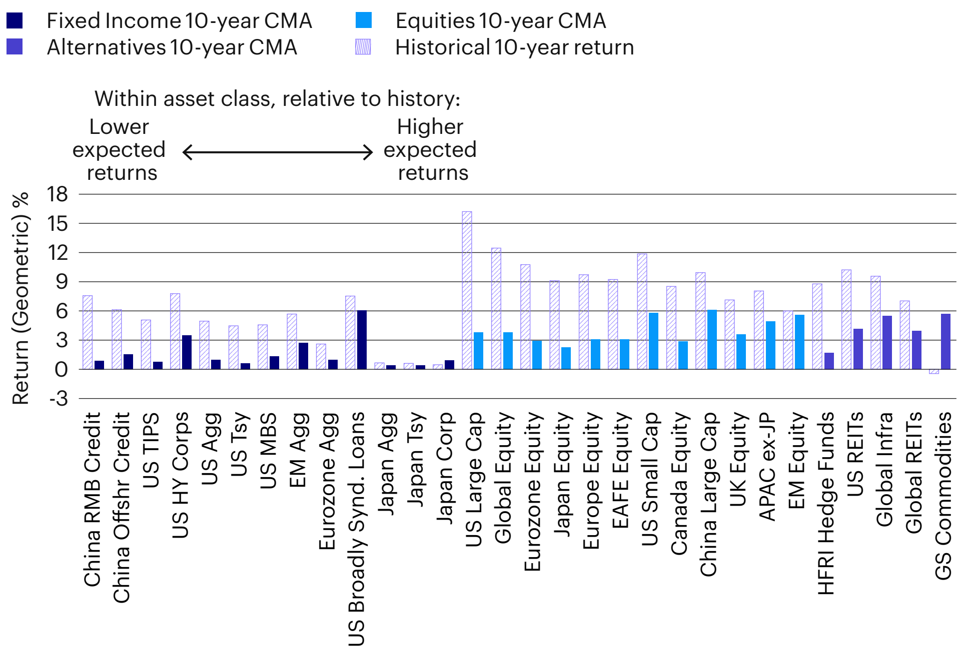
- While our team at Invesco Investment Solutions (IIS) is critically aware of the potential damage a recession can have on the economy, markets, and portfolios, we aim to invest through multiple business cycles with the understanding that the risk of a recession is one of many risks that a portfolio is exposed to over the long term. Cash is often not the answer over our time horizon.
- We are by no means calling for a recession, however given the very real probability assigned to one by credible market participants, we would like to use this note to explain how a recession could impact capital market assumptions (CMAs). By utilizing our building block framework, we can dissect some of the implications of a negative growth shock in a forward-looking lens.
- 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.

Figure 1: Expectations relative to historical average (JPY)



Source: Invesco, estimates as of March 31, 2023. Proxies listed in **Figure 8**. These estimates are forward-looking, are not guarantees, and they involve risks, uncertainties, and assumptions. Please see page 9 for information about our CMA methodology. These estimates reflect the views of Invesco Investment Solutions, the views of other investment teams at Invesco may differ from those presented here.

Invesco Investment 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.

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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

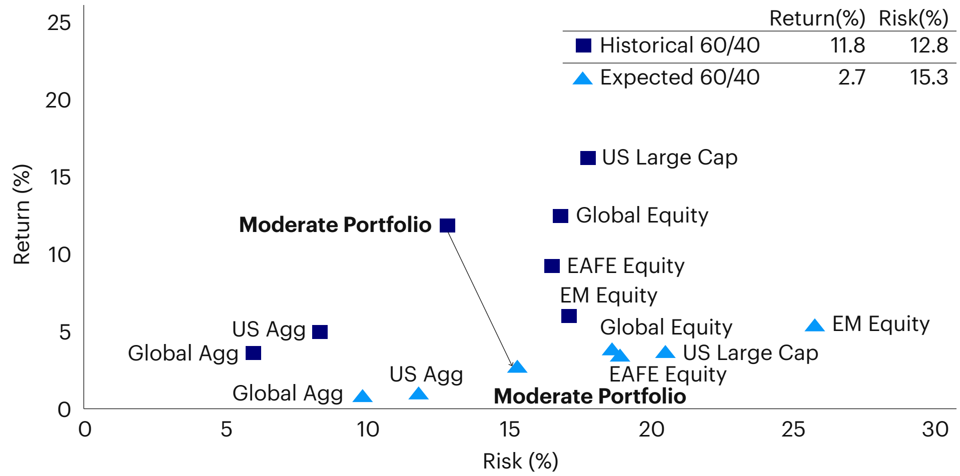
"The recession has yet to arrive" is not as catchy a headline as many that have filled financial media as of late. Nearly halfway through 2023, a multitude of professional forecasters are assigning a probability of recession over the next year at well over 50%[1] (and it should be noted that many have been for the past year as well). Investors have been left waiting for an economic collapse, preparing their proverbial bunkers by raising cash balances and accepting a negative real return to hedge this growth risk. Meanwhile, global equities have outperformed both cash and gold year to date[2]. While our team at Invesco Investment Solutions (IIS) is critically aware of the potential damage a recession can have on the economy, markets, and portfolios, we aim to invest through multiple business cycles with the understanding that the risk of a recession is one of many risks that a portfolio is exposed to over the long term. Cash is often not the answer over our time horizon.

We are by no means calling for a recession, however given the very real probability assigned to one by credible market participants, we would like to use this note to explain how a recession could impact capital market assumptions (CMAs). By utilizing our building block framework, we can dissect some of the implications of a negative growth shock in a forward-looking lens:

1. Recessions mostly impact the returns of equities by lowering their expected levels of growth in the near term and on average recessions lower earnings by around 30%[3]. It takes time for an economy to recover to average trend earnings growth as unemployment and bankruptcies mount, thus slowing sales relative to costs. It is clear that equity prices fall as recession risks rise. Equity assets that are more growth sensitive, like small caps and Emerging Markets tend to fall the most in these periods.
2. In response to the downward pressure on both price and earnings, valuations also fall, reverting to lower, more attractive levels, where additional capital invested purchases more of a company's earnings than it did prior to the recession. Valuations are a key predictor of forward-looking returns over the long run and lower multiples tend to be positive for prices 5-to-10 years in the future. This compression is most evident in high growth sectors which command high multiples pre-recession. Dividend yields also rise as the denominator falls, paying out more to shareholders and incentivizing investment.
3. Along with growth rates, inflation tends to fall as well. Nominal rates of return converge with real returns, lowering the hurdle for investing in general. Many argue what is the root cause of inflation, however it is well accepted that slowing an economy (often with the lagged effects of interest rate hikes) also slows inflation.
4. Yields fall across the curve, mostly on the short end as base rates are lowered to stimulate the economy, boosting long duration bond prices. The fall in yields does unfortunately reduce forward returns for fixed income investments, particularly floating rate instruments. It is here that the desired negative correlation between fixed income and equities becomes more acute. The yield curve steepens and often un-inverts, becoming a healthier shape where roll yield is positive.
5. Credit spreads start to widen prior to a recession and accelerate within the first half of a recession, often predicting a wave of defaults. As stimulus is made more readily available, credit spreads tighten, reducing the expected returns of below-investment-grade fixed income. Lending standards are then loosened to entice risk taking as capital becomes cheaper and the likelihood of repayment is higher.
6. "Safe haven" currencies like the US Dollar, Euro, and Yen, increase in value relative to more cyclical currencies like the Yuan, Australian Dollar, or Canadian Dollar. Our framework for currency investing looks beyond near-term dislocations and focuses on interest rate parity.

[1] Recession models for the next 12 months from the Conference Board are at a 99% probability, the Cleveland Fed at 80%, Bloomberg Economics at 80%, consensus forecasts at 65%, as of May 30, 2023.
[2] Bloomberg, as of May 30, 2023.
[3] NBER, Bloomberg, as of May 30, 2023.

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



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2Q23 CMA Observations (10Y, USD):

Equities: US and global equities are expected to return around 7% with slightly lower expected returns in Europe (6.3%) and higher returns in Emerging Markets (EM) (9%). Most equity CMAs were lower this quarter (-0.3% for global equities) due to higher valuations from the Q1 rebound in market prices. EU and Japan fell more than average while small caps and EM fell less. Inflation was mostly flat as a contributor, with China being an exception as expected inflation rose 0.4%.

Fixed Income: All CMAs for fixed income assets are projected to be above the past 10 years of historical return. Global aggregate bonds are expected to return about 4%, in line with Treasuries, with longer duration fixed income expected to underperform shorter duration as many regional yield curves are inverted. Broadly syndicated loans are expected to return around 9.2% with a risk/return ratio of 1.15, one of the highest returning CMAs among the universe of assets we cover with relatively low expected risk. Loans are significantly more attractive in our framework than high yield which has a 6.7% return and 0.7 risk return ratio. Fixed income CMAs are mostly lower than last quarter outside of HY munis with lower average (of current and expected) yields. Loans fell less (0.1%) than other fixed income assets (~0.3%). Investment grade corporate bonds only provide a slight premium to Treasuries with a slightly higher level of risk.

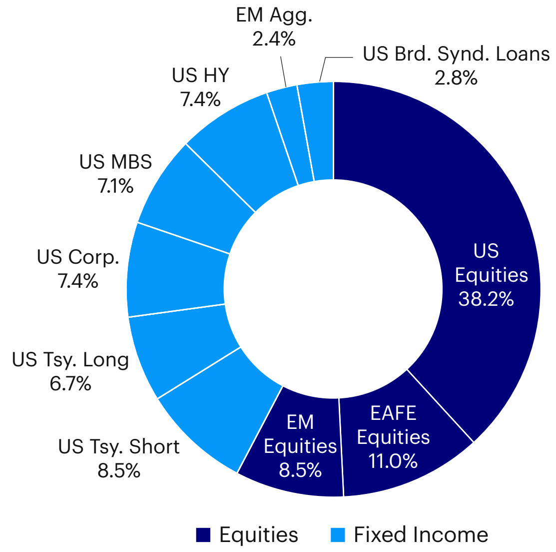
Alternatives: Unlevered core real estate's CMA has risen this quarter (+0.6%) to 7.5% as expected valuations have improved as 10Y yields have fallen slightly relative to cap rates. There has also been a rebound for listed US REITS (+0.8%) from higher expected real earnings. Private equity has fallen in line with global equities (-0.3%) to 12.05% IRR mostly due to lower expected growth.

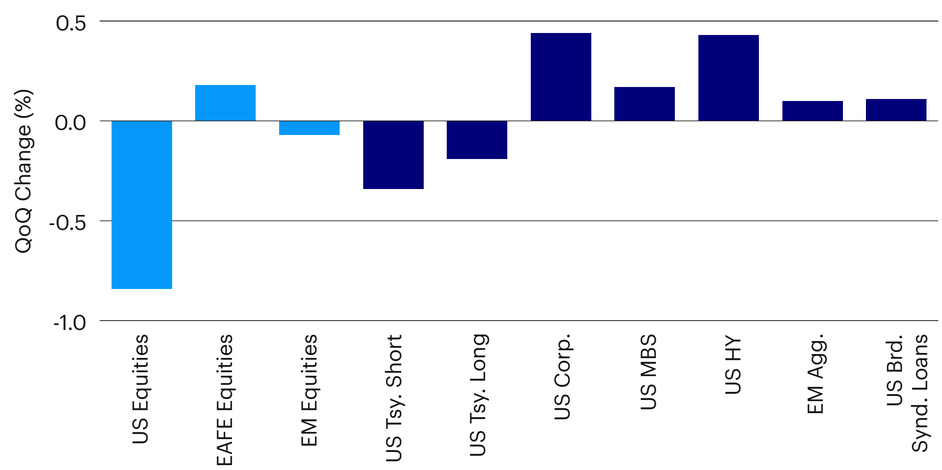
The strategic asset allocation (SAA) displayed here is denominated in USD and is representative of our CMA's applied in a hypothetical portfolio context for global investors.

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 Investment Solutions representative.

Strategic Asset Allocation Trends:

Figure 3: 2023 Q2 SAA Rebalance (USD)





Source: Invesco Investment Solutions, as of March 31, 2023. Proxies listed in **Figure 8**. These estimates reflect the views of Invesco Investment 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..

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2023 Capital Market Assumptions

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

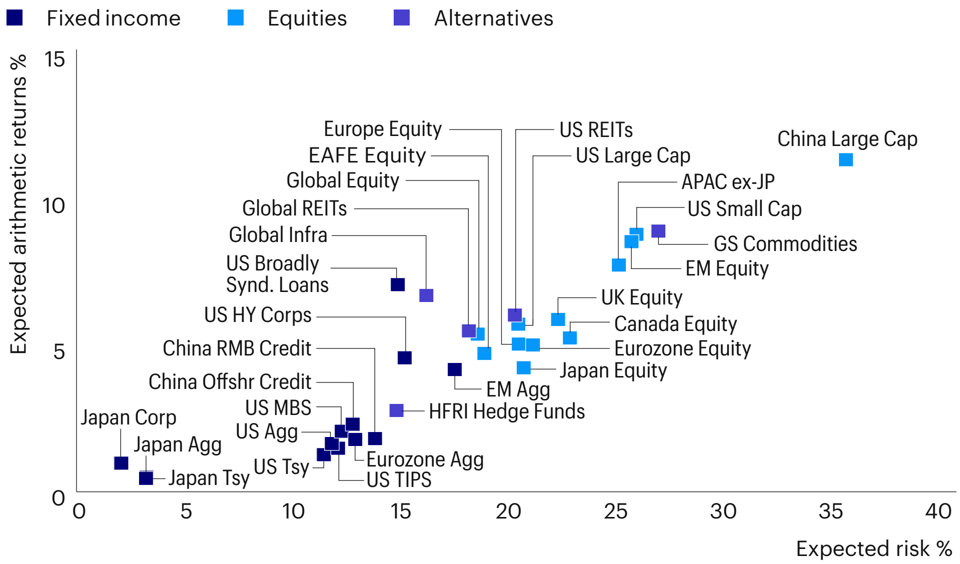

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Figure 5: CMA difference: 5-year minus 10-year assumptions (JPY)

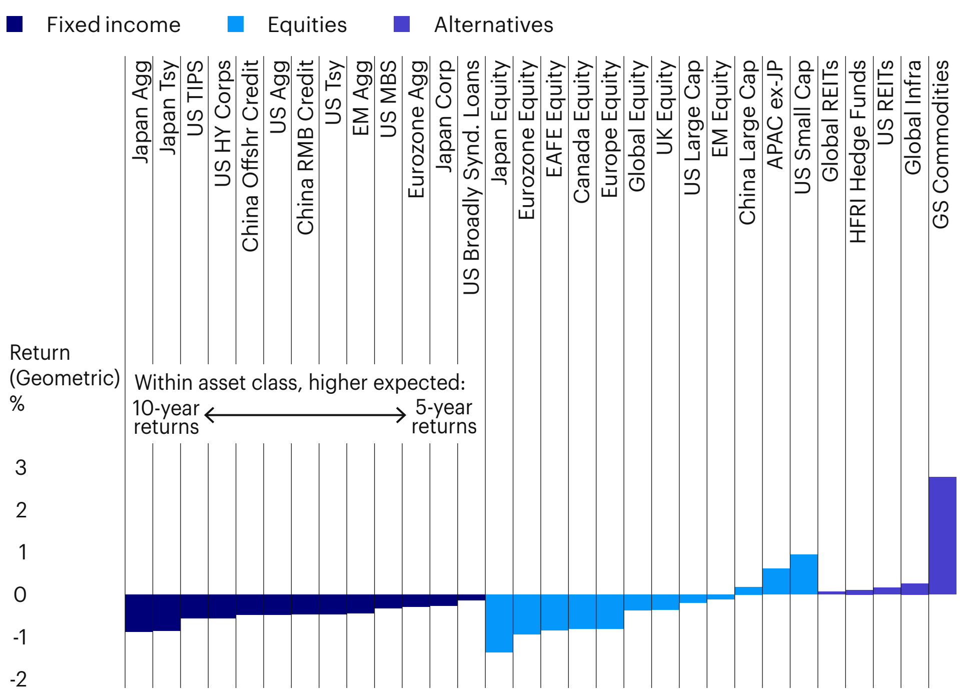

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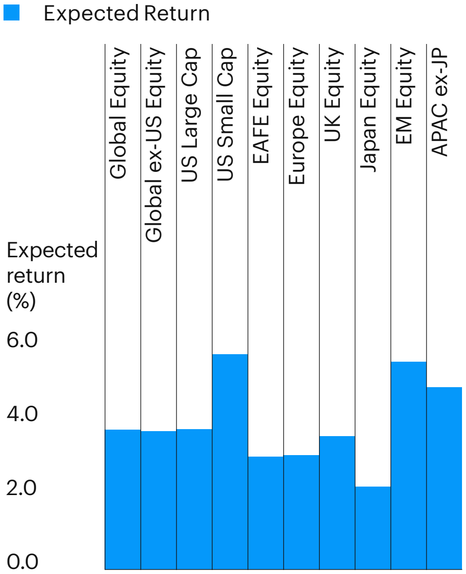
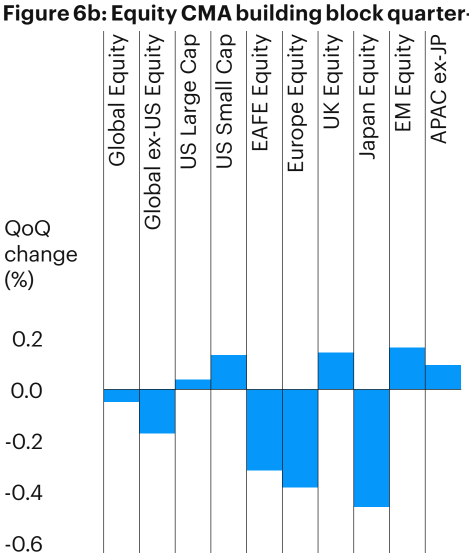
Figure 6a: Equity CMA building block contribution (JPY) (%)



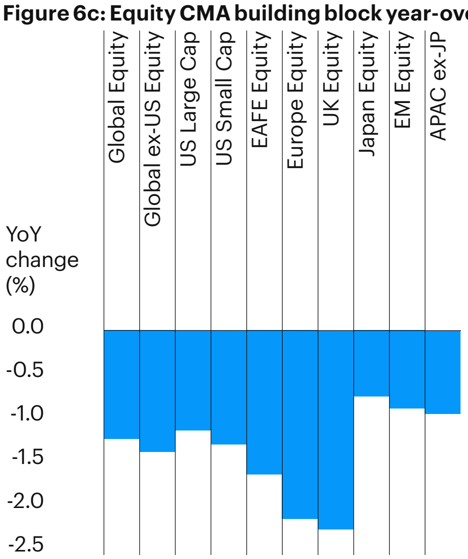
	Dividend Yield	Buyback Yield	LT Earnings Growth	Expected Inflation	Valuation Change	Currency Adj. (IRP)
Global Equity	2.21	0.74	1.76	2.10	-0.24	-2.85
Global ex-US Equity	3.17	0.00	1.70	1.78	-0.60	-2.34
US Large Cap	1.59	1.23	1.80	2.31	0.00	-3.17
US Small Cap	1.56	0.81	3.15	2.31	1.08	-3.17
EAFE Equity	3.20	0.00	1.22	1.44	-0.96	-1.87
Europe Equity	3.26	0.00	1.18	1.92	-1.01	-2.27
UK Equity	4.01	0.00	1.46	2.25	-0.95	-3.20
Japan Equity	2.52	0.00	1.16	-0.56	-0.90	0.00
EM Equity	3.17	0.00	2.92	2.53	0.31	-3.39
APAC ex-JP	2.76	0.00	2.33	2.49	0.56	-3.28

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	-0.03	-0.01	-0.06	0.04	-0.22	0.24
Global ex-US Equity	0.04	0.00	-0.07	0.04	-0.36	0.18
US Large Cap	-0.07	-0.02	-0.06	0.03	-0.13	0.28
US Small Cap	0.03	0.02	-0.04	0.03	-0.20	0.28
EAFE Equity	0.06	0.00	-0.07	0.02	-0.46	0.13
Europe Equity	0.11	0.00	-0.05	0.01	-0.57	0.11
UK Equity	0.19	0.00	-0.05	0.05	-0.08	0.04
Japan Equity	-0.07	0.00	-0.06	-0.03	-0.33	0.00
EM Equity	-0.01	0.00	0.00	0.11	-0.14	0.21
APAC ex-JP	-0.07	0.00	-0.03	0.11	-0.18	0.27

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	0.05	-0.01	-0.31	-0.13	-0.47	-0.36
Global ex-US Equity	0.14	0.00	-0.40	-0.24	-0.62	-0.28
US Large Cap	-0.01	-0.02	-0.25	-0.07	-0.37	-0.42
US Small Cap	0.10	0.00	-0.34	-0.07	-0.57	-0.42
EAFE Equity	0.04	0.00	-0.32	-0.10	-0.71	-0.56
Europe Equity	0.02	0.00	-0.37	-0.11	-0.82	-0.89
UK Equity	0.02	0.00	-0.51	-0.27	-0.39	-1.12
Japan Equity	0.03	0.00	-0.13	-0.20	-0.46	0.00
EM Equity	0.31	0.00	-0.39	-0.47	-0.33	0.00
APAC ex-JP	-0.02	0.00	-0.39	-0.35	-0.23	0.05

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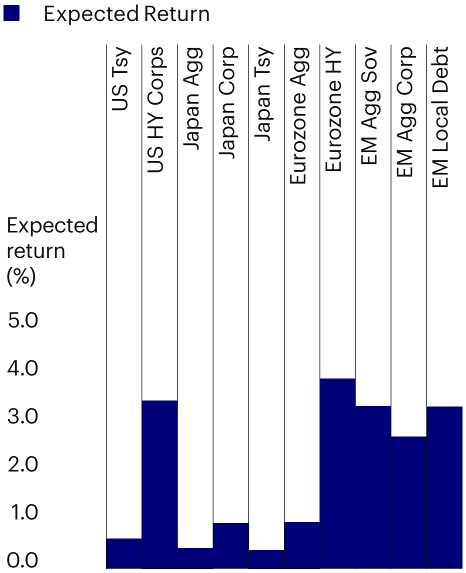
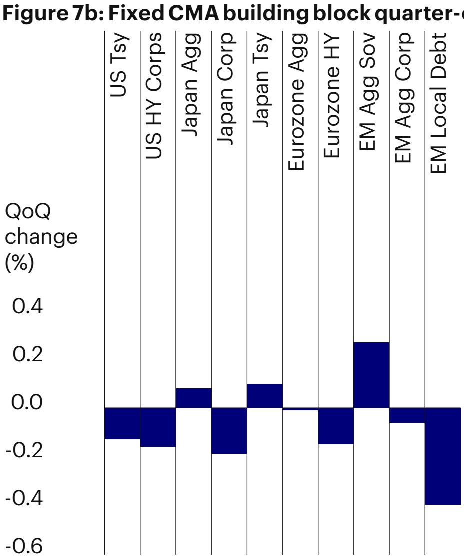
Figure 7a: Fixed CMA building block contribution (JPY) (%)



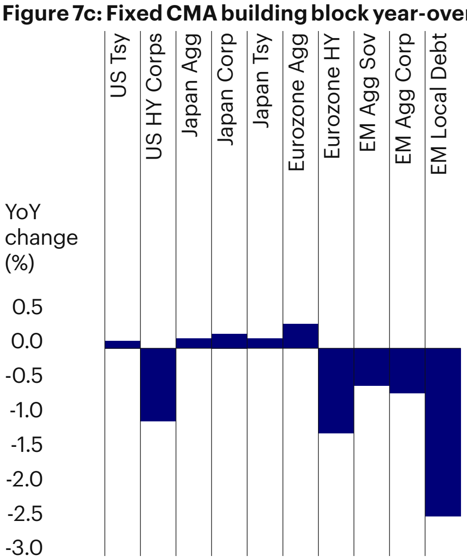
	Average Yield	Roll Return	Valuation Change (Yield Curve)	Valuation Change (OAS)	Credit Loss	Currency Adj. (IRP)
US Tsy	3.96	-0.01	-0.15	0.00	0.00	-3.17
US HY Corps	8.79	-0.14	-0.02	-0.20	-1.78	-3.17
Japan Agg	1.11	0.68	-1.34	-0.02	0.00	0.00
Japan Corp	1.18	0.46	-0.51	0.10	-0.29	0.00
Japan Tsy	1.05	0.68	-1.34	0.00	0.00	0.00
Eurozone Agg	3.32	0.02	0.01	-0.02	-0.35	-2.00
Eurozone HY	7.43	-0.18	0.07	-0.06	-1.32	-2.00
EM Agg Sov	7.57	0.05	-0.32	0.42	-1.19	-3.17
EM Agg Corp	7.84	-0.10	-0.08	-0.12	-1.65	-3.17
EM Local Debt	7.03	0.33	-0.45	0.00	0.00	-3.56

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	-0.36	-0.07	0.02	0.00	0.00	0.28
US HY Corps	-0.37	-0.03	0.00	-0.05	0.01	0.28
Japan Agg	-0.30	0.14	0.25	0.00	0.00	0.00
Japan Corp	-0.22	-0.06	0.09	0.00	0.00	0.00
Japan Tsy	-0.29	0.14	0.25	0.00	0.00	0.00
Eurozone Agg	-0.24	-0.01	0.13	-0.01	0.00	0.11
Eurozone HY	-0.25	-0.04	0.08	-0.06	0.00	0.11
EM Agg Sov	-0.23	-0.02	0.06	0.20	-0.02	0.28
EM Agg Corp	-0.35	-0.01	0.01	0.01	0.00	0.28
EM Local Debt	-0.16	-0.18	-0.12	0.00	0.00	0.06

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	0.62	-0.24	0.14	0.00	0.00	-0.42
US HY Corps	-0.01	-0.29	0.21	-0.45	-0.08	-0.42
Japan Agg	0.16	0.17	-0.18	0.00	0.00	0.00
Japan Corp	0.16	0.12	-0.05	0.06	-0.08	0.00
Japan Tsy	0.15	0.17	-0.18	0.00	0.00	0.00
Eurozone Agg	1.04	-0.14	0.35	-0.10	0.06	-0.85
Eurozone HY	0.35	-0.45	0.29	-0.50	-0.06	-0.85
EM Agg Sov	0.20	-0.06	0.20	-0.51	0.05	-0.42
EM Agg Corp	0.23	-0.24	0.14	-0.43	0.08	-0.42
EM Local Debt	-0.41	-0.28	-0.07	0.00	0.00	-1.67

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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	1.0	1.7	1.6	12.1	0.14
	US Tsy IM	BBG US Tsy IM	0.5	1.1	0.7	11.3	0.10
	US Tsy Long	BBG US Tsy Long	-0.1	0.9	0.6	13.9	0.06
	US TIPS	BBG US TIPS	0.8	1.5	0.8	12.0	0.12
	US Broadly Synd. Loans	CSFB Leverage Loan	6.1	7.1	7.6	14.8	0.48
	US Agg	BBG US Agg	1.0	1.6	1.2	11.8	0.14
	US IG Corp	BBG US IG	1.3	2.0	2.0	12.4	0.16
	US MBS	BBG US MBS	1.3	2.0	1.3	12.2	0.17
	US Preferred Stocks	BOA ML Fixed Rate Pref Securities	2.0	3.0	3.8	14.5	0.21
	US HY Corps	BBG US HY	3.5	4.6	5.4	15.1	0.30
	UK Linker	BofA ML UK Inflation-Linked Gilt	0.0	1.1	0.7	14.8	0.07
	UK Gilts	BBG Sterling Agg Gilts	0.9	1.6	0.5	12.1	0.14
	UK Corp	BBG Sterling Agg Non-Gilts Corp	1.8	3.1	2.5	16.6	0.19
	Global Agg	BBG Global Agg	0.8	1.3	1.1	9.8	0.13
	Global Agg ex-US	BBG Global Agg ex-US	0.8	1.2	1.1	9.2	0.13
	Global Tsy	BBG Global Tsy	0.8	1.1	0.8	8.1	0.13
	Global Sov	BBG Global Sov	0.9	1.7	1.6	12.6	0.14
	Global Corp	BBG Global Corp	1.4	2.2	2.1	13.1	0.17
	Global IG	BBG Global Corp IG	1.4	2.3	2.2	14.1	0.17
	Eurozone Corp	BBG Euro Agg Credit Corp	1.3	2.4	2.2	14.8	0.16
	Eurozone Tsy	BBG Euro Agg Gov Tsy	1.0	1.8	1.0	12.6	0.14
	Asian Dollar IG	BOA ML AC IG	1.6	2.5	2.4	14.3	0.18
	EM Agg	BBG EM Agg	2.7	4.2	4.2	17.5	0.24
	EM Agg Sov	BBG EM Sov	3.4	4.6	4.5	16.3	0.28
	China Policy Bk & Tsy	BBG China PB Tsy TR	0.8	1.6	0.2	13.1	0.12
	China RMB Credit	BBG China Corporate	0.9	1.8	0.8	13.8	0.13
Equities	Global Equity	MSCI ACWI	3.8	5.4	0.1	18.5	0.29
	Global ex-US Equity	MSCI ACWI ex-US	3.7	5.4	0.8	19.2	0.28
	US Broad Market	Russell 3000	4.0	6.0	-0.3	21.1	0.29
	US Large Cap	S&P 500	3.8	5.7	-0.4	20.4	0.28
	US Mid Cap	Russell Midcap	4.4	6.7	-0.3	22.9	0.29
	US Small Cap	Russell 2000	5.8	8.8	-0.8	25.9	0.34
	EAFE Equity	MSCI EAFE	3.1	4.7	1.3	18.9	0.25
	Europe Equity	MSCI Europe	3.1	5.0	1.0	20.5	0.25
	Eurozone Equity	MSCI Euro ex-UK	2.9	5.0	1.0	21.1	0.24
	UK Large Cap	FTSE 100	3.1	5.4	0.9	22.2	0.24
	UK Small Cap	FTSE Small Cap UK	5.0	8.2	0.4	27.3	0.30
	Canada Equity	S&P TSX	2.9	5.2	0.4	22.8	0.23
	Japan Equity	MSCI JP	2.2	4.2	2.5	20.7	0.20
	EM Equity	MSCI EM	5.6	8.5	-0.2	25.7	0.33
	China Small Cap	CSI 500	6.4	12.3	-0.9	37.9	0.33
	Pacific ex-JP Equity	MSCI Pacific ex-JP	4.3	7.4	1.1	26.3	0.28
Alternatives	US REITs	FTSE NAREIT Equity	4.1	6.0	0.9	20.3	0.30
	Global REITs	FTSE EPRA/NAREIT Developed	4.0	5.5	1.6	18.1	0.30
	HFRI Hedge Funds	HFRI HF	1.7	2.8	-	14.8	0.19
	GS Commodities	S&P GSCI	5.7	8.9	-	27.0	0.33
	Agriculture	S&P GSCI Agriculture	1.3	4.0	-	24.1	0.17
	Energy	S&P GSCI Energy	8.3	14.5	-	39.4	0.37
	Industrial Metals	S&P GSCI Industrial Metals	5.2	8.0	-	25.5	0.32
	Precious Metals	S&P GSCI Precious Metals	3.1	4.7	-	18.7	0.25

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Figure 9: 10-year correlations (JPY)

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

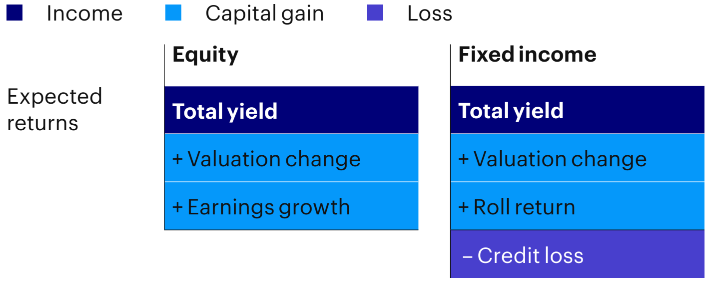
		Fixed income												Equities										Alternatives			
	Asset class	US Tsy IM	US TIPS	US Broadly Synd. Loans	US Agg	US IG Corp	US HY Corps	US Muni	US HY Muni	Global Agg	Global Agg ex-US	EM Agg	China RMB Credit	Global Equity	China Large Cap	US Large Cap	US Mid Cap	US Small Cap	EAFE Equity	UK Large 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	0.68	1.00																								
	US Broadly Synd. Loans	-0.28	0.27	1.00																							
	US Agg	0.88	0.79	0.09	1.00																						
	US IG Corp	0.59	0.75	0.44	0.88	1.00																					
	US HY Corps	0.01	0.49	0.82	0.39	0.67	1.00																				
	US Muni	0.59	0.63	0.30	0.78	0.76	0.48	1.00																			
	US HY Muni	0.32	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	0.49	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	0.28	0.28	0.10	0.36	0.32	0.19	0.27	0.24	0.46	0.47	0.29	1.00														
Equities	Global Equity	-0.04	0.39	0.63	0.29	0.54	0.81	0.32	0.40	0.49	0.52	0.69	0.27	1.00													
	China Large Cap	0.00	0.15	0.28	0.18	0.30	0.34	0.15	0.22	0.28	0.29	0.38	0.31	0.44	1.00												
	US Large Cap	-0.05	0.36	0.59	0.26	0.49	0.76	0.28	0.35	0.41	0.43	0.60	0.22	0.97	0.36	1.00											
	US Mid Cap	-0.10	0.35	0.68	0.23	0.50	0.81	0.29	0.39	0.38	0.40	0.64	0.22	0.95	0.36	0.96	1.00										
	US Small Cap	-0.16	0.25	0.62	0.13	0.39	0.74	0.19	0.30	0.28	0.31	0.53	0.19	0.87	0.34	0.89	0.95	1.00									
	EAFE Equity	-0.02	0.36	0.60	0.28	0.53	0.78	0.33	0.40	0.52	0.56	0.70	0.28	0.96	0.43	0.87	0.87	0.79	1.00								
	UK Large Cap	-0.11	0.30	0.61	0.19	0.45	0.73	0.28	0.39	0.43	0.49	0.63	0.25	0.91	0.40	0.83	0.82	0.75	0.95	1.00							
	Canada Equity	-0.09	0.38	0.66	0.22	0.50	0.77	0.27	0.40	0.44	0.48	0.66	0.24	0.89	0.41	0.84	0.87	0.80	0.85	0.85	1.00						
	Japan Equity	0.03	0.32	0.48	0.28	0.47	0.63	0.29	0.32	0.42	0.44	0.58	0.29	0.79	0.36	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	0.74	0.37	0.85	0.57	0.72	0.74	0.68	0.84	0.78	0.81	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	0.26	0.86	0.32	0.81	0.85	0.77	0.84	0.79	0.79	0.67	0.74	1.00			
	Global Infra	0.10	0.49	0.59	0.40	0.60	0.75	0.44	0.49	0.55	0.56	0.70	0.22	0.84	0.32	0.80	0.80	0.68	0.82	0.81	0.82	0.63	0.73	0.84	1.00		
	GS Commodities	-0.29	0.14	0.52	-0.12	0.11	0.47	0.01	0.23	0.13	0.21	0.33	0.10	0.51	0.16	0.44	0.49	0.46	0.52	0.61	0.65	0.36	0.48	0.41	0.50	1.00	
	HFRI Hedge Funds	-0.18	0.32	0.73	0.16	0.48	0.78	0.26	0.44	0.37	0.41	0.64	0.26	0.89	0.46	0.83	0.88	0.85	0.86	0.83	0.88	0.70	0.82	0.77	0.74	0.62	1.00

Source: Invesco, estimates as of March 31, 2023. Proxies listed in **Figure 8.** These estimates are forward-looking, are not guarantees, and they involve risks, uncertainties, and assumptions. Please see page 9 for information about our CMA methodology. These estimates reflect the views of Invesco Investment 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 in 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 rate 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 normalise 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 optimisation 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 optimisation 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 Investment Solutions

Invesco Investment 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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