Invesco

2021 Long-Term Capital Market Assumptions

Annual Outlook and Methodology

Invesco Investment Solutions | Japanese yen (JPY)

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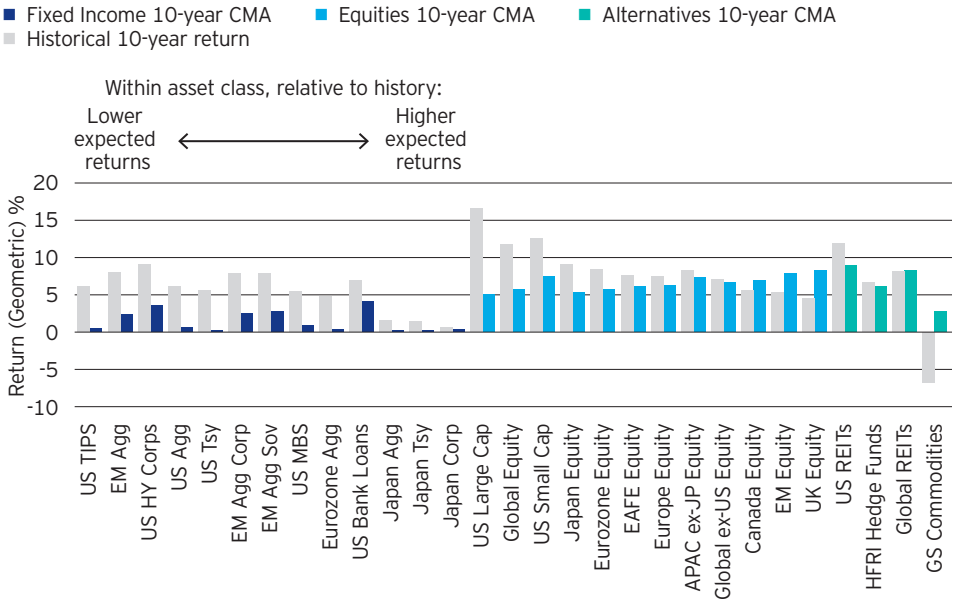
Executive Summary

Duy Nguyen
CIO, Invesco Investment Solutions

+ **Strategic Perspective.** If we take the perspective of a mountain climber, our outlook this time last year felt like we were looking out at the end of a long climb. We were at a high peak and, from that vantage, it was difficult to see how we could climb any higher. Approaching 2021 feels like we are just starting an ascent and very rarely have we seen such large improvements across the 170+ assets we cover **(Figure 1)**. Aided by stimulus, advancements in medical technology and the evolution of the economy, we expect this to be a rapid, steep grade when compared to the economic recovery coming out of the Global Financial Crisis (GFC). Presently, we are shifting this update of the Capital Market Assumptions (CMAs) closer towards our Upside (Bull) scenario, as we are anticipating a recovery six months earlier, in the middle of '21. This strategic perspective is reflected in the data as we model long term asset behavior for 2021 and beyond, embedding our views in diverse, risk-aware portfolios.
+ **Tactical View.** The probability of a double-dip recession in Q4 2020 is certainly increasing across multiple regions, but it does not need to translate into the same economic and financial shock experienced with the first wave. Our forward-looking measures of economic activity and market sentiment continue to suggest the global economy should remain in a **recovery regime**. We maintain a **higher risk posture** than our benchmark[1] in our Global Tactical Asset Allocation model, sourced through an overweight exposure to equities, with a tilt towards emerging markets (EM), and credit at the expense of government bonds.
+ **Global Market Outlook.** Changes in the policy, economic and financial environment, we believe, along with the increasing diversity of economic performance and reaction to the pandemic, to lockdowns and re-openings, as well as gradual structural change, calls for geographic and sectoral diversification in asset allocation, as opposed to concentration strategies that have worked well lately. We also believe that political trends across most major economies, including both developed and emerging economies, point to limited and gradual policy change rather than radical reform, supporting financial stability and smoother adjustments in relative valuations, as opposed to recent episodes of high volatility amid uncertainty.

Figure 1: Expectations relative to historical average (JPY)



Source: Invesco, estimates as of Sept. 30, 2020. Proxies listed in **Figure 13**. These estimates are forward-looking, are not guarantees, and they involve risks, uncertainties, and assumptions. Please see page 16 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.

1 Global 60/40 benchmark (60% MSCI ACWI / 40% Bloomberg Barclays Global Agg USD Hedged).

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Asset Allocation Insights

Jacob Borbidge
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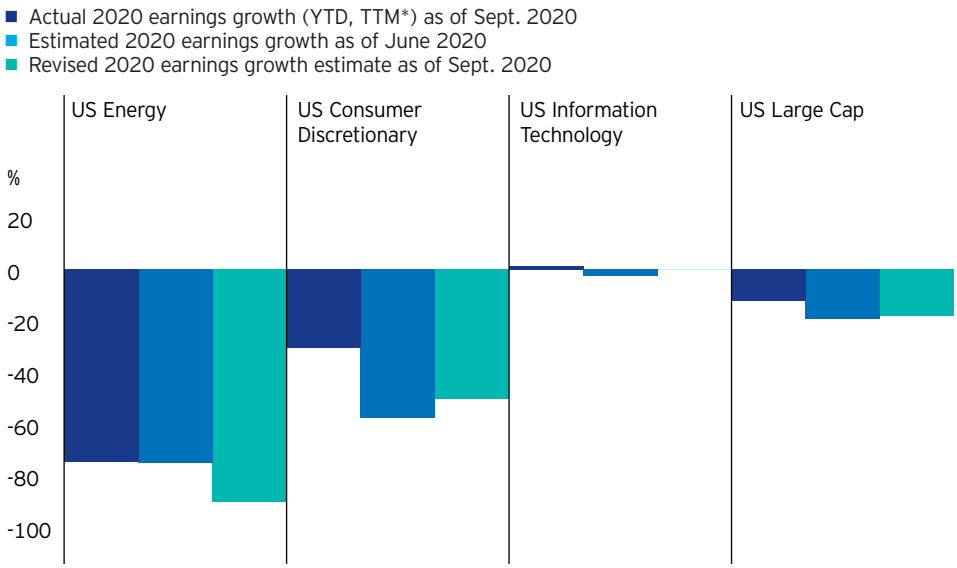
For further details on our process for defining scenarios and adjustments, please refer to section 14 of the paper.

Strategic perspective

If we take the perspective of a mountain climber, our outlook this time last year felt like we were looking out at the end of a long climb. We were at a high peak and, from that vantage, it was difficult to see how we could climb any higher. Approaching 2021 feels like we are just starting an ascent. Aided by stimulus, advancements in medical technology and the evolution of the economy, we expect this to be a rapid, steep grade when compared to the economic recovery coming out of the Global Financial Crisis (GFC). This strategic perspective is reflected in the data as we model long term asset behavior for 2021 and beyond, embedding our views in diverse, risk-aware portfolios. Our team at Invesco Investment Solutions produces a vast set of Capital Market Assumptions (CMAs) over multiple time horizons, providing return and risk forecasts that span over 170 major asset classes in 20 different currencies. We're proud to present the 2021 edition of our CMAs to assist in developing both strategic and tactical asset allocations.

While there are many layers of uncertainty clouding annual outlooks, the goal of our CMAs is to look beyond that fog and focus on historic drivers of asset prices. US elections, Brexit, and rising inflation are some notable risks adding anxiety to an already difficult year for most. As the world battled with a once-in-a-century pandemic from COVID-19, we sought to provide optionality for our estimates of the virus' impact through scenario analysis. Our objective is not to identify the most likely scenario and position the portfolio accordingly for the next twelve months; rather, it is to evaluate the most likely range of market outcomes, their associated risks and investment implications. Our **Central (Base)** scenario assumed that there would be a snap-back in demand, and thus earnings, for most economies. Fits and starts in the direction of the recovery were foreseen in the later part of the year due to questions about further stimulus or viral treatments, overall shaping up to be reminiscent of a "U". Presently, we are shifting this update of the CMAs closer towards the Upside (Bull) scenario, as we are anticipating a recovery six months earlier, in the middle of '21, driven by the availability of a vaccine, improved treatment methods and greater ability to reopen businesses safely. On a sector level, earnings adjustments have proven accurate year-to-date, tracking the potential economic shock well **(Figure 2)**. Not all sectors have fared the same globally, and to illustrate how we are approaching these real time shifts, in the US, for example, we have raised our manually adjusted estimates overall while the details on a sector level are mixed. Energy earnings have been downgraded due to a reduced consensus outlook, while we have upgraded consumer discretionary in the US as we've witnessed a larger than anticipated demand for online shopping.

Figure 2: Adjustments for Earnings due to COVID-19 shock in US Sectors



Source: Invesco Investment Solutions Proprietary Research, FactSet, Sept. 30, 2020. TTM stands for "Trailing Twelve Months". US Sectors are based on the GICS Sectors of the S&P 500.

2021 CMAs: A rapid, steep climb, one building block at a time

+ **Equities:** Very rarely have we seen such rapid increased throughout our forecasts. Earnings growth expectations positively outweighed any increased valuations. Regionally, the largest increases have been noted in developed markets (DM) ex-US, led by Canada. A sector analysis of this region highlights a skew towards financials and energy, both hit hard by the recession and expected to recover from an earnings standpoint by '22. Overall, US large cap equities remain one of our lowest CMAs and emerging markets (EM) remains one of the highest, contrasting their respective performance over the past decade. Within the US, small caps standout and are poised to perform well should a recovery unfold. Most equity assets are anticipated to perform very well in the medium term, noted by our 5-year CMA, relative to the 10-year CMA.
+ **Fixed Income:** Yields are low and are likely to stay that way. For that reason, we see higher expected returns in credit assets over government bonds. Spreads continue to tighten as economies work through COVID-19. Losses within high yield (HY) have tracked slightly lower than expectations so far, buoyed by unprecedented stimulus globally. In both investment grade (IG) and HY, credit spreads are tighter than their historical average, characteristic of the recovery underway. There is still plenty of room for spreads to tighten further as it took a decade for them to bottom after the GFC. Bank loans, despite being the biggest detractor year over year, is one of the highest fixed income CMAs, especially relative to their historical returns. While EM debt spreads are also much lower than the highs witnessed earlier in the year, we anticipate further USD weakness to drive spread contraction. Yield curves have steepened anticipating higher growth on the long end, while rates futures have been mostly lower.
+ **Alternatives:** REITs have experienced a large increase in their CMAs from the growth building block due to the pickup in economic activity and attractive financing environment. However, given the transition to working from home and migration out of urban areas, there may be headwinds in the near term for the asset class. Within the hedge fund space, one with attractively low expected correlations to risk assets and high risk/return ratios, market neutral funds improved due to their beta to liquid asset classes, while macro hedge funds' CMAs fell due to exposure to fixed income and a historically shrinking alpha term.
+ **Infrastructure:** We have converted infrastructure equity model to a building blocks based approach with the intent of bringing this forecast more closely in line with other equity asset classes. With the assistance of the Invesco Real Assets team we now model infrastructure growth and valuation ratios at the sub-sector level to better estimate how this asset class is evolving over time. Continued buildout of our telecom infrastructure and a resurgence in spending on transportation help to support our improved outlook for infrastructure going forward.
+ **Private assets:** Generally speaking, stress in public markets can create opportunity for private market investors. As businesses struggle, private equity buyout strategies can potentially apply their skill in picking winners and expertise in restructuring companies. On the credit side, higher cost and greater scarcity of capital has created demand for private debt at more attractive rates than would otherwise be available. As such our return forecasts have trended higher compared to last year for most private asset classes.

Regarding the risks mentioned earlier, here's how we anticipate they may affect our CMAs:

+ **US Election:** At the time of writing, the election's outcome and acceptance of said outcome is uncertain. At the time of this paper's print, we will most likely know both. Using the data being collected and published currently, there may be a new president in the White House next year. Economically, a new president could result in an adjustment to our growth forecasts as the new administration attempts to undo or reverse Trump tax cuts, but those cuts might be balanced by further infrastructure spending and fiscal stimulus.
+ **Brexit:** Other than indirectly through asset prices and observations on COVID-19 shutdowns, there is no explicit adjustment in our treatment of Brexit on the UK economy and beyond. Most likely, this will create a more drawn out economic recovery in the UK versus other developed regions and provide a justification for the current market discount placed on the country. At the moment, the UK is our "cheap for a reason" equity region.
+ **Inflation Spike:** While benign currently, there are potential inflation tailwinds worth noting. Fed policy is now more loosely connected to inflation and there are potential future inflation credits being built up given the low inflation we are experiencing today. Populism and the desire for sovereigns to own supply chains defies the deflationary effects of globalization. This could drive prices higher through reduced specialization and efficiency. Finally, while we have not seen much life in the Phillips Curve, there may be potential upside due to rapid compression of labor through the recovery, something not seen in the aftermath of the Global Financial Crisis (GFC).

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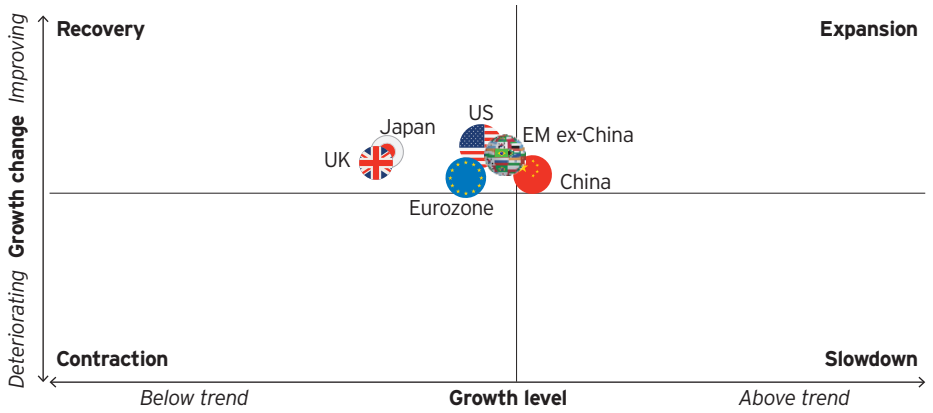
For further details on our macro regime framework, please refer to section 11 of the paper.

Tactical view

The return of the virus across Europe and the Americas represents an important risk factor for the global economic recovery. We contemplated this risk back in the spring and outlined a baseline scenario of a meaningful second wave of COVID-19 infections across the northern hemisphere upon the return of colder temperatures. The probability of a double-dip recession in Q4 2020 is certainly increasing across multiple regions, but it does not need to translate into the same economic and financial shock experienced with the first wave. A combination of ample monetary and fiscal policy support, together with economic adjustments and measures implemented over the past seven months, are likely to reduce the uncertainty associated with this second wave compared to the first. While it is certainly too early to draw definitive conclusions, as the situation remains very fluid, our forward-looking measures of economic activity and market sentiment continue to suggest the global economy should remain in a **recovery regime** in the near term **(Figure 3)**.

Figure 3: Leading economic indicators and market sentiment suggest the global economic recovery continues, with emerging markets moving to an expansion regime.

Current Leading Economic Indicators (LEIs)



Sources: Bloomberg L.P., Macrobond as of Oct. 31, 2020. Invesco Investment Solutions research and calculations. Proprietary leading economic indicators of Invesco Investment Solutions.

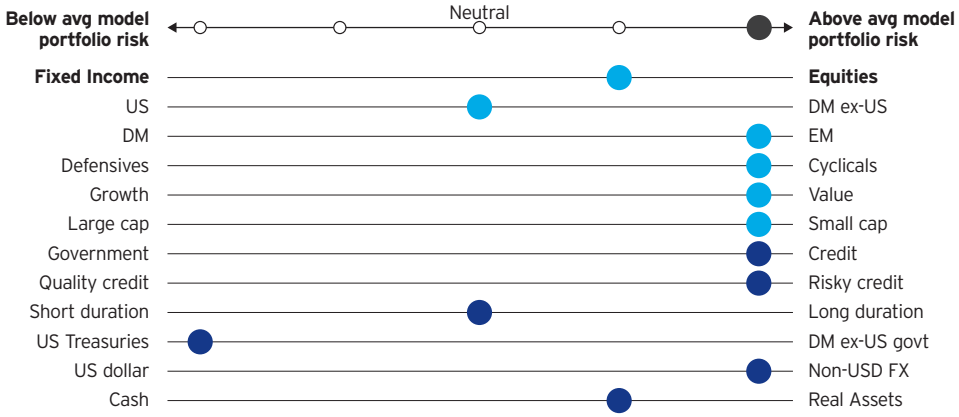
The speed of the recovery is flattening across regions as the V-shaped rebound begins to normalize and most economies begin to approach trend-growth rates. Notably, the relative growth momentum between the United States and other developed markets has tilted in favor of the former, as a result of catch-up effects and the anticipation of new, selective lockdown measures implemented in the Eurozone and the UK. Emerging markets, particularly Asia, continue to lead the cycle and, according to our framework, have now entered an expansion regime with growth above-trend and improving. Despite recent underperformance in equity markets and increased volatility, our measure of global market sentiment suggests some resilience and confidence in the marketplace on the global recovery for now. Current events ranging from the US election to the evolution of the pandemic will drive the path of investor confidence and growth expectations over the next couple of months. The latest news on a potential vaccine breakthrough could boost investor, business and consumer confidence alike, despite renewed lockdowns and record infections around the globe, feeding expectations for a sustained recovery into next year. On the US election front, given the inconclusive results for the Senate, it is too early to say whether the market can price-in a blue wave and associated probabilities on large infrastructure spending. However, a change in the White House should provide marginal support in favor of emerging markets growth expectations in the anticipation of more coordinate global trade policy. We will closely monitor the evolution of our framework and reposition our investment strategies accordingly.

Investment Positioning

We have implemented one change this month, closing our overweight exposure to developed market equities outside the US. While local market and currency valuations remain supportive, their relative growth momentum is weakening, leading us to a neutral stance between the two regions (**Figure 4**). We maintain a **higher risk posture** than our benchmark[2] in our Global Tactical Asset Allocation model, sourced through an overweight exposure to equities and credit at the expense of government bonds. In particular:

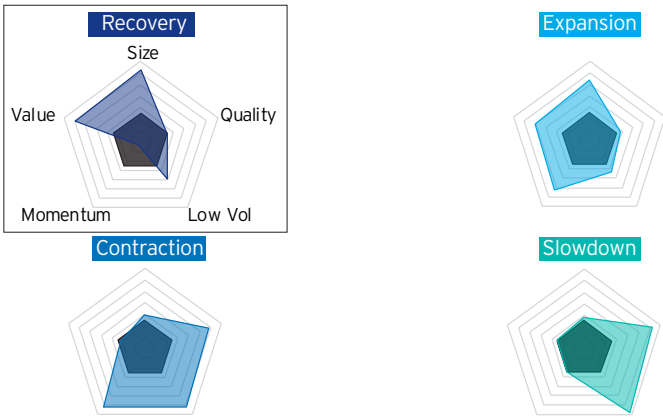
- Within **equities** we hold large tilts in favor of emerging markets compared to developed markets, driven by favorable cyclical conditions, improving risk appetite, attractive local asset valuations and an expensive US dollar. We continue to hold a large underweight to quality and momentum stocks, given our tilts in favor of value and (small) size factors, which have recently begun to outperform as the global earnings cycle bottoms out and bond yields marginally increased over the past few months (**Figure 5**).
- In **fixed income** we maintain an overweight exposure to US high yield credit, emerging markets sovereign dollar debt, and event-linked bonds at the expense of investment grade corporate credit and government bonds, particularly in developed markets outside the US. Overall, we are overweight credit risk[2] and neutral duration versus the benchmark.
- In **currency markets** we maintain an overweight exposure to foreign currencies, positioning for long-term US dollar depreciation. Within developed markets we favor the Euro, the Canadian dollar and the Norwegian kroner. In emerging markets, we favor the Indian rupee, Indonesian rupiah and Russian ruble.

Figure 4: Relative Tactical Asset Allocation Positioning



Source: Invesco Investment Solutions, Oct. 31, 2020. For illustrative purposes only.

Figure 5: Regime Dependent Factor Exposures – Dynamic (shaded) vs. Benchmark (black)



Source: For illustrative purposes only. Invesco, Benchmark (Russell 1000 Index), Dynamic (US Large Cap Dynamic Multifactor Model), Jan. 31, 1989 to June 30, 2020. Spider plots for the four regime portfolios, reflecting the factor exposures for their excess returns versus the benchmark.

2 Credit risk defined as DTS (duration times spread).

03

Global Market Outlook

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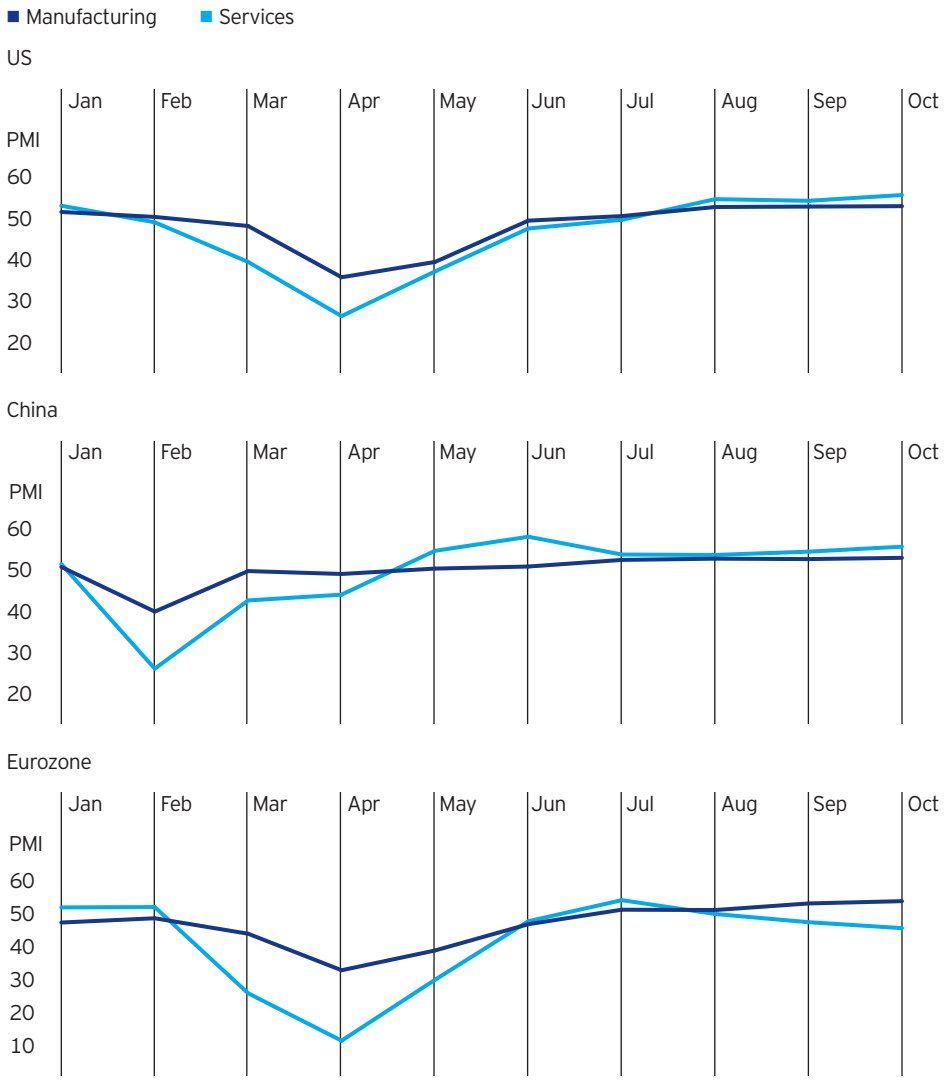
The Interplay of Policy, Cyclical Growth and Structural Economic Change

In the run-up to 2021, investors, businesses, households and governments all face unprecedented challenges as well as opportunities. Changes in the policy, economic and financial environment, we believe, along with the increasing diversity of economic performance and reaction to the pandemic, to lockdowns and re-openings, as well as gradual structural change, calls for geographic and sectoral diversification in asset allocation, as opposed to concentration strategies that have worked well lately.

The global economy and markets face clear and present dangers. The virus is resurgent in the west; still proliferating in many emerging markets; though under control in China and parts of East Asia. The resulting return of lockdowns in Europe comes amid political uncertainty, especially the US election, as well as ongoing geopolitical and geo-economic friction.

Yet the positives are arguably supportive enough to offset or even overcome the threats. Rapid progress in vaccine research sustains hope of re-opening, rebound and recovery. Renewed lockdowns, even where national (as in the UK and France for example) are more limited and targeted than in Q2, suggesting a more moderate economic downturn. We expect fiscal and monetary policy support to continue and to be augmented as needed, averting the risk of financial system stress, even though idiosyncratic bankruptcies, defaults and restructurings are likely; and easy financial conditions would assist cyclical recovery, while avoiding financial stress would reduce pressures on trend growth.

Figure 6: Services more heavily affected by COVID-19 lockdowns/re-openings than Manufacturing (PMIs)



Source: Bloomberg, Markit, Invesco. Data as at Oct. 28, 2020.

The wider global context of somewhat higher barriers to trade and investment, along with the wide diversity of national experiences of the pandemic and differences in the role of manufacturing and services in activity and employment, point to increasingly differentiated macroeconomic performance. As a result, cyclical positions have already diverged during the pandemic and are once again doing so as new lockdowns take place in some economies. Trend growth rates may also be affected directly if there are structural shifts in employment, business investment or consumer preferences.

US and Global Politics and Policy: Incremental rather than Radical Reform
We also believe that political trends across most major economies, including both developed and emerging economies, point to limited and gradual policy change rather than radical reform, supporting financial stability and smoother adjustments in relative valuations, as opposed to recent episodes of high volatility amid uncertainty. We read this general preference for gradual policy change in the US election results; in China's policy choices; in the UK-EU Brexit process as well as EU integration efforts; and in India's reforms to name a select few.

At the time of writing, Vice President Joe Biden seems very likely to be declared President-Elect. The lawsuits may well continue, but we expect the process to follow legal precedents and practices. We note that though the rhetorical challenges have extended to claims of fraud, the actual demands for surveillance of vote counts or conduct of recounts have been restrained. We therefore expect a peaceful transfer of power, rather than severe financial market disruption due to US political risks.

Looking ahead, we see the general election results as pointing to limited and gradual policy change. The US Senate will likely remain under Republican control, possibly with probable Vice-President Elect Kamala Harris holding a tie-breaking vote as President of the Senate. Neither party is likely to command the filibuster-proof majority needed for extensive or rapid economic reform.

For the short term, we expect this to translate into a much more modest fiscal support package in the hundreds of billions, instead of the trillions of dollars expected under a Democratic sweep. A smaller than expected fiscal package probably points to easier Fed policy and a larger balance sheet perhaps tilted less heavily toward Treasuries and possibly more towards mortgages and credit. This result would also point to easier global financial conditions, through a weaker dollar. Over the long haul, reversals of deregulation or corporate tax cuts are likely to be slower and more modest than perhaps feared. We believe the combination should be supportive of financial markets and over time, of renewed corporate capex and overall growth recovery.

Around the world, major developed and emerging economies are embarking on or continuing major programs of structural reform, in addition to the prospect of evolutionary reforms in US policies reflected in the US election. First and foremost, China is devising a "Dual-Circulation" framework to promote domestic development and economic rebalancing from trade and heavy investment to some degree in favour of domestic demand and further growth in the interior (as opposed to the already highly developed coasts). We expect the strong desire of global investors to increase their portfolio exposure to China's attractive growth rates and the diversification benefits of its growth model to maintain a strong flow of financial investment, despite ongoing international tensions.

The Brexit transition will end at the start of 2021, marking the first meaningful reduction in the size of the EU single market after multiple expansions since Western European economic integration started in 1957. Once out, the UK may pursue economic liberalization and policies to encourage investment and growth outside London, but such policies are likely to be gradual, since the immediate focus is the pandemic and the urgent need to restore growth. We acknowledge the continuing high risk of a no-deal Brexit, which could disrupt EU and UK goods trade and thereby recovery, but we continue to expect some sort of arrangement, such as "skinny-deals" by sector, to avoid full-blown disruption. The EU is exploring approaches to deeper fiscal and other forms of economic integration – which are proceeding and helping to fend off the risk of another sovereign debt crisis – though integration will take years or decades rather than months. India is undertaking much-needed reforms of agriculture and liberalization of labour markets that could attract significant foreign investment if well designed.

We expect this diversity of cyclical changes, structural shifts and the differentiated impact of the pandemic and lockdowns across national economies to strengthen the case for diversification in strategic asset allocation and selectivity in tactical asset allocation. Concentration has been paying off because the pandemic and lockdowns were a systematic shock to many economies in quick sequence, to which a common policy response of monetary and fiscal support was applied, and which accentuated the pre-existing trends in favor of technology and against "old-economy" sectors. We would expect these pressures for macro differentiation to unfold over time, despite the persistent, significant outperformance of say China or the US over other economies, technology or growth over other sectors, both before and in the wake of the lockdowns and macro policy support.

04

2021 Capital Market Assumptions

Figure 7: 10-year asset class expectations (JPY)

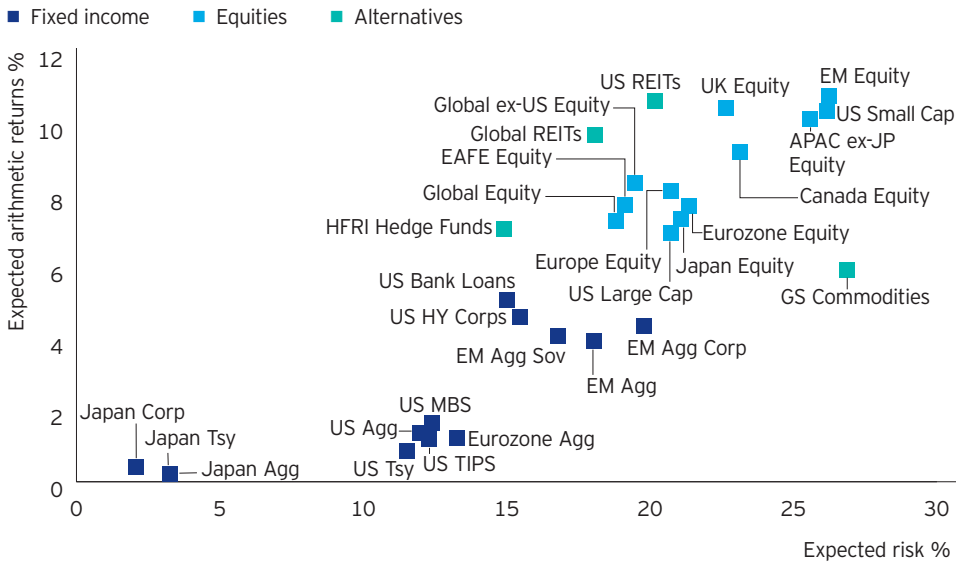


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Figure 8: CMA difference: 5-year minus 10-year assumptions (JPY)

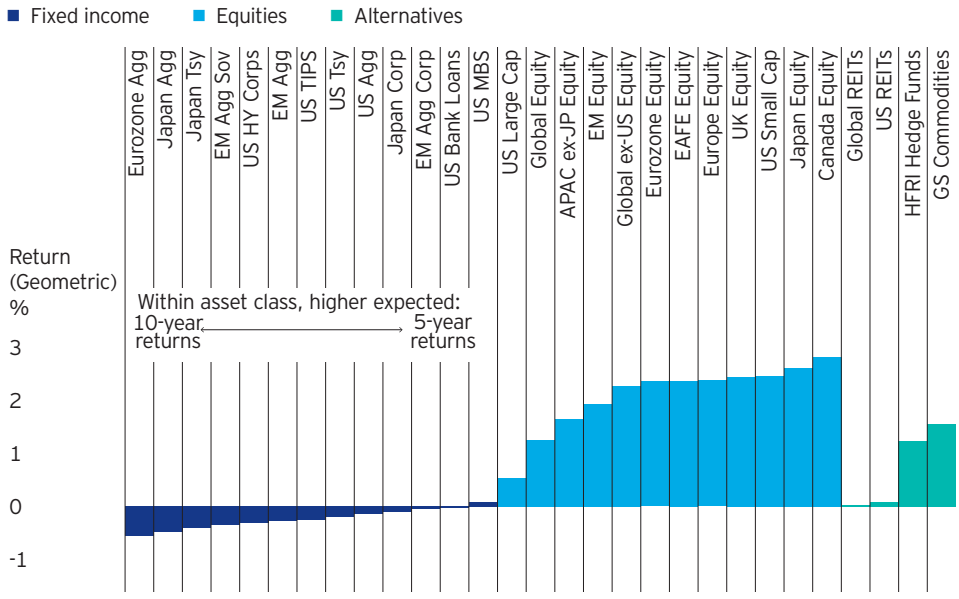

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Figure 9: Equity quarter-over-quarter change (JPY)

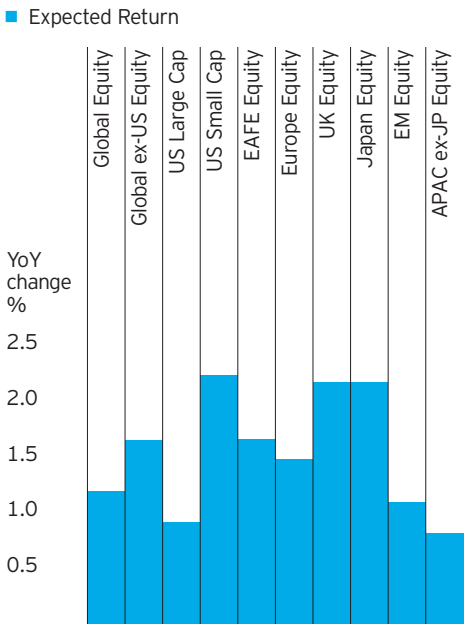

Figure 10: Fixed income quarter-over-quarter change (JPY)

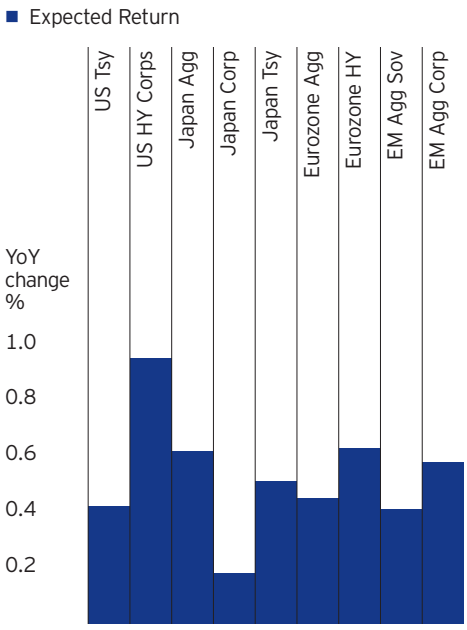

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Figure 11: Equity quarter-over-quarter change attribution (JPY)

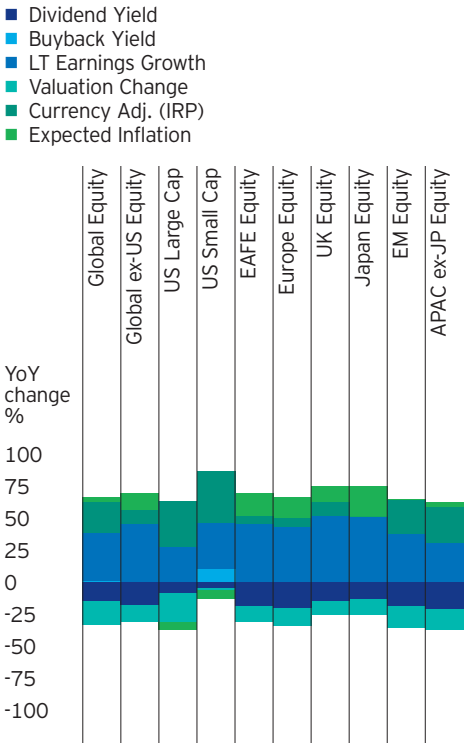

Figure 12: Fixed income quarter-over-quarter change attribution (JPY)

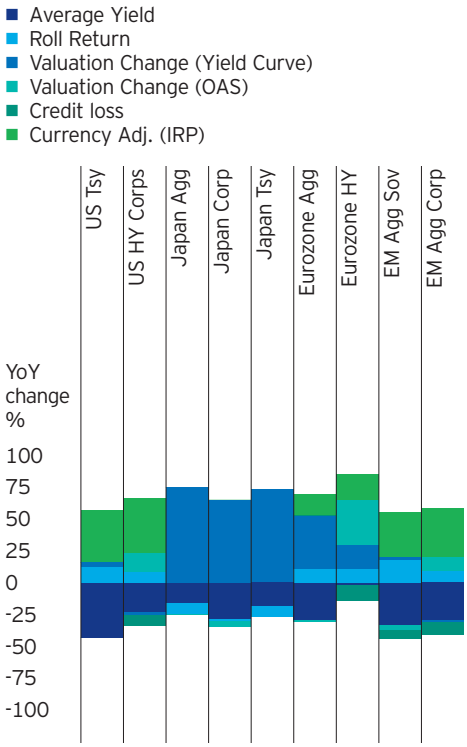

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Figure 13: 10-year asset class expected returns, risk, and return-to-risk (JPY)

	Asset class	Index	Expected geometric return %	Expected arithmetic return %	Expected risk %	Arithmetic return to risk ratio
Fixed income	US Tsy Short	BBG BARC US Tsy Short	-0.3	0.5	12.1	0.04
	US Tsy IM	BBG BARC US Tsy IM	-0.1	0.5	11.4	0.05
	US Tsy Long	BBG BARC US Tsy Long	-0.1	0.9	14.0	0.06
	US TIPS	BBG BARC US TIPS	0.5	1.2	12.3	0.10
	US Bank Loans	CSFB Leverage Loan	4.0	5.1	15.0	0.34
	US Agg	BBG BARC US Agg	0.6	1.3	12.0	0.11
	US IG Corp	BBG BARC US IG	1.1	1.9	12.7	0.15
	US MBS	BBG BARC US MBS	0.9	1.6	12.4	0.13
	US Preferred Stocks	BOA ML Fixed Rate Pref Securities	2.3	3.3	14.7	0.22
	US HY Corps	BBG BARC US HY	3.5	4.6	15.5	0.30
	UK Linker	BofA ML UK Inflation-Linked Gilt	0.2	1.2	14.1	0.09
	UK Gilts	BBG BARC Sterling Agg Gilts	-0.1	0.7	12.0	0.05
	UK Corp	BBG BARC Sterling Agg Non-Gilts Corp	0.9	2.3	17.1	0.14
	Global Agg	BBG BARC Global Agg	0.9	1.4	10.0	0.14
	Global Agg ex-US	BBG BARC Global Agg ex-US	1.0	1.5	9.4	0.16
	Global Tsy	BBG BARC Global Tsy	0.8	1.1	8.3	0.14
	Global Sov	BBG BARC Global Sov	1.0	1.8	12.9	0.14
	Global Corp	BBG BARC Global Corp	1.1	2.0	13.5	0.15
	Global IG	BBG BARC Global Corp IG	1.1	2.1	14.7	0.14
	Eurozone Corp	BBG BARC Euro Agg Credit Corp	0.8	1.9	15.3	0.12
	Eurozone Tsy	BBG BARC Euro Agg Gov Tsy	0.6	1.4	12.9	0.11
	Asian Dollar IG	BOA ML AC IG	1.3	2.3	14.5	0.16
	EM Agg	BBG BARC EM Agg	2.4	3.9	18.0	0.22
	EM Agg Sov	BBG BARC EM Sov	2.7	4.1	16.8	0.24
	EM Agg Corp	BBG BARC EM Corp	2.5	4.4	19.8	0.22
	EM Agg IG	BBG BARC EM USD Agg IG	1.3	2.4	15.0	0.16
Equities	Global Equity	MSCI ACWI	5.7	7.3	18.8	0.39
	Global ex-US Equity	MSCI ACWI ex-US	6.6	8.4	19.5	0.43
	US Broad Market	Russell 3000	5.2	7.3	21.4	0.34
	US Large Cap	S&P 500	5.0	6.9	20.7	0.34
	US Mid Cap	Russell Midcap	5.9	8.3	23.2	0.36
	US Small Cap	Russell 2000	7.4	10.4	26.2	0.40
	EAFE Equity	MSCI EAFE	6.1	7.7	19.1	0.40
	Europe Equity	MSCI Europe	6.2	8.1	20.7	0.39
	Eurozone Equity	MSCI Euro ex-UK	5.7	7.7	21.4	0.36
	UK Large Cap	FTSE 100	8.1	10.4	22.5	0.46
	UK Small Cap	FTSE Small Cap UK	9.8	13.0	27.5	0.47
	Canada Equity	S&P TSX	6.9	9.2	23.1	0.40
	Japan Equity	MSCI JP	5.3	7.3	21.1	0.35
	EM Equity	MSCI EM	7.8	10.8	26.2	0.41
	APAC ex-JP Equity	MSCI APXJ	7.3	10.1	25.6	0.40
	Pacific ex-JP Equity	MSCI Pacific ex-JP	7.2	10.3	26.8	0.39
Alternatives	US REITs	FTSE NAREIT Equity	8.9	10.6	20.2	0.53
	Global REITs	FTSE EPRA/NAREIT Developed	8.2	9.7	18.1	0.54
	HFRI Hedge Funds	HFRI HF	6.0	7.1	14.9	0.47
	GS Commodities	S&P GSCI	2.7	5.9	26.9	0.22
	Agriculture	S&P GSCI Agriculture	-1.8	1.0	24.2	0.04
	Energy	S&P GSCI Energy	4.9	11.3	39.5	0.29
	Industrial Metals	S&P GSCI Industrial Metals	2.5	5.5	25.7	0.21
	Precious Metals	S&P GSCI Precious Metals	1.1	2.8	19.0	0.15

Source: Invesco, estimates as of Sept. 30, 2020. These estimates are forward-looking, are not guarantees, and they involve risks, uncertainties, and assumptions. Please see page 16 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. Agg = Aggregate, Infra = Infrastructure, Corp = Corporate, DJ = Dow Jones, HY = High Yield, Muni = Municipals, Tsy = Treasury, IM = Intermediate, ML = Merrill Lynch, Sov = Sovereign, EM = Emerging Markets, IG = Investment Grade, APAC = Asia Pacific, Gov = Government, MBS = Mortgage Backed Securities, TIPS = Treasury Inflation Protected Securities.

Figure 14: 10-year correlations (JPY)

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

		Fixed income																										
	Asset class	US Tsy Short	US Tsy IM	US Tsy Long	US TIPS	US Bank Loans	US Agg	US IG Corp	US MBS	US Preferred Stocks	US HY Corps	UK Linker	UK Gilts	UK Corp	Global Agg	Global Agg ex-US	Global Tsy	Global Sov	Global Corp	Global IG	Eurozone Corp	Eurozone Tsy	Asian Dollar IG	EM Agg	EM Agg Sov	EM Agg Corp	EM Agg IG
Fixed income	US Tsy Short	1.00																										
	US Tsy IM	0.96	1.00																									
	US Tsy Long	0.42	0.62	1.00																								
	US TIPS	0.82	0.87	0.60	1.00																							
	US Bank Loans	0.83	0.73	0.19	0.78	1.00																						
	US Agg	0.93	0.97	0.65	0.92	0.80	1.00																					
	US IG Corp	0.80	0.82	0.56	0.89	0.85	0.92	1.00																				
	US MBS	0.97	0.98	0.56	0.88	0.79	0.98	0.85	1.00																			
	US Preferred Stocks	0.53	0.50	0.23	0.58	0.63	0.58	0.69	0.53	1.00																		
	US HY Corps	0.71	0.62	0.16	0.74	0.92	0.72	0.84	0.69	0.69	1.00																	
	UK Linker	0.56	0.57	0.37	0.72	0.68	0.66	0.72	0.59	0.54	0.69	1.00																
	UK Gilts	0.64	0.65	0.44	0.72	0.63	0.71	0.71	0.67	0.48	0.62	0.88	1.00															
	UK Corp	0.57	0.53	0.20	0.67	0.74	0.63	0.75	0.58	0.58	0.75	0.84	0.91	1.00														
	Global Agg	0.81	0.84	0.51	0.88	0.78	0.89	0.89	0.85	0.62	0.77	0.79	0.83	0.80	1.00													
	Global Agg ex-US	0.59	0.60	0.31	0.70	0.64	0.67	0.73	0.62	0.55	0.69	0.77	0.80	0.82	0.93	1.00												
	Global Tsy	0.73	0.78	0.54	0.82	0.66	0.83	0.81	0.78	0.56	0.67	0.78	0.82	0.76	0.98	0.95	1.00											
	Global Sov	0.75	0.77	0.46	0.86	0.80	0.85	0.90	0.80	0.63	0.83	0.77	0.75	0.78	0.96	0.89	0.92	1.00										
	Global Corp	0.75	0.75	0.40	0.85	0.85	0.85	0.94	0.78	0.70	0.87	0.80	0.80	0.87	0.96	0.90	0.91	0.95	1.00									
	Global IG	0.75	0.75	0.42	0.86	0.84	0.85	0.95	0.79	0.70	0.86	0.80	0.80	0.87	0.96	0.89	0.91	0.95	1.00	1.00								
	Eurozone Corp	0.54	0.52	0.17	0.64	0.65	0.60	0.69	0.55	0.57	0.71	0.72	0.72	0.80	0.88	0.97	0.89	0.85	0.88	0.88	1.00							
	Eurozone Tsy	0.55	0.58	0.31	0.64	0.55	0.62	0.65	0.59	0.48	0.60	0.69	0.72	0.71	0.89	0.97	0.93	0.84	0.82	0.83	0.96	1.00						
	Asian Dollar IG	0.86	0.89	0.54	0.93	0.86	0.95	0.95	0.91	0.61	0.82	0.72	0.73	0.72	0.91	0.74	0.84	0.92	0.91	0.92	0.70	0.68	1.00					
	EM Agg	0.69	0.67	0.32	0.80	0.84	0.78	0.88	0.73	0.63	0.90	0.70	0.63	0.73	0.84	0.75	0.76	0.91	0.89	0.89	0.74	0.67	0.89	1.00				
	EM Agg Sov	0.66	0.65	0.33	0.78	0.81	0.76	0.86	0.70	0.61	0.87	0.69	0.62	0.71	0.82	0.74	0.75	0.91	0.87	0.87	0.72	0.67	0.86	0.99	1.00			
	EM Agg Corp	0.69	0.66	0.27	0.82	0.86	0.77	0.89	0.72	0.62	0.91	0.71	0.65	0.75	0.85	0.77	0.77	0.90	0.91	0.91	0.77	0.69	0.91	0.97	0.94	1.00		
	EM Agg IG	0.76	0.77	0.47	0.88	0.84	0.86	0.93	0.81	0.66	0.88	0.73	0.69	0.73	0.89	0.77	0.83	0.95	0.93	0.93	0.74	0.70	0.95	0.96	0.95	0.95	1.00	
Equities	Global Equity	0.56	0.45	-0.01	0.57	0.76	0.54	0.67	0.52	0.66	0.85	0.61	0.58	0.75	0.70	0.72	0.63	0.74	0.78	0.78	0.74	0.63	0.64	0.79	0.77	0.81	0.74	
	Global ex-US Equity	0.50	0.39	-0.04	0.54	0.72	0.49	0.64	0.47	0.64	0.82	0.62	0.57	0.75	0.69	0.74	0.63	0.74	0.78	0.77	0.78	0.66	0.62	0.78	0.76	0.80	0.72	
	US Broad Market	0.59	0.48	0.01	0.58	0.77	0.56	0.67	0.55	0.66	0.84	0.58	0.55	0.70	0.67	0.65	0.59	0.71	0.75	0.74	0.67	0.56	0.64	0.76	0.74	0.77	0.72	
	US Large Cap	0.60	0.49	0.02	0.58	0.77	0.57	0.67	0.56	0.66	0.83	0.58	0.55	0.70	0.68	0.65	0.60	0.71	0.75	0.74	0.67	0.56	0.65	0.75	0.73	0.77	0.72	
	US Mid Cap	0.56	0.45	0.01	0.57	0.78	0.54	0.68	0.52	0.66	0.86	0.59	0.54	0.70	0.66	0.65	0.58	0.71	0.76	0.75	0.67	0.56	0.64	0.77	0.75	0.78	0.73	
	US Small Cap	0.55	0.43	-0.03	0.52	0.74	0.51	0.62	0.49	0.62	0.81	0.53	0.51	0.65	0.61	0.59	0.53	0.65	0.70	0.68	0.62	0.50	0.59	0.71	0.69	0.72	0.67	
	EAFE Equity	0.53	0.42	-0.02	0.54	0.72	0.51	0.64	0.49	0.64	0.82	0.62	0.59	0.76	0.70	0.74	0.64	0.74	0.78	0.77	0.78	0.67	0.62	0.77	0.76	0.79	0.72	
	Europe Equity	0.51	0.41	-0.03	0.52	0.70	0.50	0.63	0.48	0.62	0.80	0.62	0.59	0.76	0.70	0.76	0.65	0.74	0.77	0.76	0.79	0.69	0.61	0.76	0.75	0.78	0.71	
	Eurozone Equity	0.49	0.39	-0.03	0.50	0.68	0.48	0.61	0.46	0.61	0.79	0.60	0.56	0.72	0.69	0.75	0.65	0.73	0.76	0.75	0.79	0.69	0.59	0.75	0.73	0.76	0.70	
	UK Large Cap	0.54	0.43	-0.04	0.54	0.74	0.52	0.64	0.51	0.61	0.81	0.64	0.64	0.80	0.70	0.73	0.63	0.72	0.77	0.76	0.76	0.64	0.62	0.76	0.74	0.77	0.70	
	UK Small Cap	0.46	0.34	-0.09	0.48	0.73	0.44	0.61	0.42	0.59	0.81	0.62	0.60	0.80	0.62	0.67	0.55	0.65	0.73	0.72	0.71	0.57	0.57	0.72	0.70	0.75	0.65	
	Canada Equity	0.43	0.32	-0.06	0.51	0.70	0.43	0.60	0.40	0.58	0.79	0.57	0.51	0.69	0.61	0.65	0.54	0.66	0.71	0.70	0.68	0.55	0.56	0.73	0.71	0.76	0.67	
	Japan Equity	0.52	0.42	0.01	0.50	0.65	0.48	0.57	0.48	0.57	0.70	0.50	0.47	0.62	0.57	0.55	0.50	0.60	0.64	0.64	0.57	0.48	0.56	0.65	0.63	0.69	0.61	
	EM Equity	0.39	0.30	-0.06	0.47	0.62	0.40	0.56	0.37	0.56	0.76	0.54	0.49	0.66	0.60	0.67	0.55	0.65	0.69	0.68	0.70	0.58	0.54	0.73	0.72	0.74	0.66	
	APAC ex-JP Equity	0.43	0.34	-0.01	0.49	0.62	0.44	0.58	0.41	0.57	0.75	0.52	0.50	0.66	0.61	0.65	0.56	0.65	0.69	0.69	0.68	0.57	0.56	0.71	0.69	0.73	0.66	
	Pacific ex-JP Equity	0.43	0.34	-0.02	0.52	0.66	0.45	0.61	0.41	0.60	0.77	0.56	0.52	0.71	0.65	0.71	0.59	0.69	0.74	0.73	0.73	0.61	0.58	0.75	0.74	0.76	0.70	
Alternatives	US REITs	0.39	0.34	0.15	0.49	0.61	0.46	0.59	0.40	0.61	0.71	0.54	0.47	0.57	0.57	0.57	0.53	0.63	0.64	0.63	0.55	0.48	0.55	0.66	0.66	0.65	0.65	
	Global REITs	0.41	0.35	0.10	0.54	0.68	0.48	0.65	0.42	0.67	0.78	0.62	0.56	0.71	0.65	0.68	0.61	0.71	0.74	0.73	0.68	0.59	0.61	0.75	0.74	0.75	0.71	
	HFRI Hedge Funds	0.83	0.74	0.18	0.77	0.92	0.79	0.84	0.79	0.67	0.90	0.68	0.67	0.77	0.83	0.72	0.73	0.83	0.88	0.87	0.72	0.64	0.84	0.85	0.82	0.85	0.84	
	GS Commodities	0.38	0.28	-0.16	0.43	0.60	0.33	0.43	0.33	0.39	0.60	0.49	0.41	0.54	0.48	0.53	0.43	0.53	0.55	0.54	0.58	0.47	0.45	0.55	0.54	0.58	0.50	
	Agriculture	0.26	0.22	-0.08	0.27	0.31	0.23	0.27	0.24	0.29	0.36	0.27	0.25	0.30	0.35	0.39	0.33	0.35	0.36	0.35	0.40	0.36	0.31	0.35	0.33	0.38	0.34	
	Energy	0.31	0.21	-0.18	0.35	0.55	0.26	0.37	0.25	0.33	0.54	0.44	0.33	0.48	0.40	0.45	0.35	0.48	0.48	0.46	0.50	0.40	0.38	0.49	0.49	0.51	0.44	
	Industrial Metals	0.40	0.31	-0.11	0.42	0.55	0.35	0.42	0.35	0.40	0.58	0.43	0.41	0.51	0.51	0.56	0.47	0.52	0.55	0.54	0.58	0.49	0.46	0.55	0.52	0.56	0.49	
	Precious Metals	0.11	0.14	0.11	0.30	0.17	0.18	0.24	0.15	0.07	0.23	0.32	0.31	0.31	0.32	0.37	0.33	0.34	0.32	0.32	0.36	0.34	0.27	0.34	0.34	0.35	0.31	

Source: Invesco, estimates as of Sept. 30, 2020. Proxies listed in **Figure 13**. These estimates are forward-looking, are not guarantees, and they involve risks, uncertainties, and assumptions. Please see page 16 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.

Figure 14: 10-year correlations (JPY)

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

		Equities																Alternatives							
	Asset class	Global Equity	Global ex-US Equity	US Broad Market	US Large Cap	US Mid Cap	US Small Cap	EAFE Equity	Europe Equity	Eurozone Equity	UK Large Cap	UK Small Cap	Canada Equity	Japan Equity	EM Equity	APAC ex-JP Equity	Pacific ex-JP Equity	US REITs	Global REITs	HFRI Hedge Funds	GS Commodities	Agriculture	Energy	Industrial Metals	Precious Metals
Fixed income	US Tsy Short																								
	US Tsy IM																								
	US Tsy Long																								
	US TIPS																								
	US Bank Loans																								
	US Agg																								
	US IG Corp																								
	US MBS																								
	US Preferred Stocks																								
	US HY Corps																								
	UK Linker																								
	UK Gilts																								
	UK Corp																								
	Global Agg																								
	Global Agg ex-US																								
	Global Tsy																								
	Global Sov																								
	Global Corp																								
	Global IG																								
	Eurozone Corp																								
	Eurozone Tsy																								
	Asian Dollar IG																								
	EM Agg																								
	EM Agg Sov																								
	EM Agg Corp																								
	EM Agg IG																								
Equities	Global Equity	1.00																							
	Global ex-US Equity	0.98	1.00																						
	US Broad Market	0.98	0.91	1.00																					
	US Large Cap	0.97	0.91	1.00	1.00																				
	US Mid Cap	0.96	0.91	0.98	0.97	1.00																			
	US Small Cap	0.91	0.86	0.95	0.93	0.97	1.00																		
	EAFE Equity	0.97	0.99	0.91	0.91	0.90	0.85	1.00																	
	Europe Equity	0.96	0.98	0.90	0.90	0.89	0.84	0.99	1.00																
	Eurozone Equity	0.95	0.97	0.89	0.89	0.88	0.83	0.98	0.99	1.00															
	UK Large Cap	0.94	0.95	0.88	0.88	0.87	0.82	0.96	0.97	0.93	1.00														
	UK Small Cap	0.89	0.91	0.84	0.83	0.86	0.82	0.91	0.90	0.88	0.90	1.00													
	Canada Equity	0.90	0.90	0.86	0.85	0.89	0.84	0.87	0.85	0.83	0.86	0.83	1.00												
	Japan Equity	0.82	0.83	0.77	0.77	0.76	0.73	0.85	0.77	0.76	0.76	0.76	0.70	1.00											
	EM Equity	0.89	0.93	0.81	0.80	0.82	0.77	0.88	0.86	0.86	0.84	0.83	0.87	0.71	1.00										
	APAC ex-JP Equity	0.88	0.91	0.80	0.80	0.81	0.76	0.86	0.84	0.83	0.81	0.81	0.82	0.71	0.97	1.00									
	Pacific ex-JP Equity	0.91	0.93	0.84	0.84	0.85	0.81	0.91	0.88	0.87	0.87	0.85	0.87	0.72	0.92	0.91	1.00								
Alternatives	US REITs	0.74	0.71	0.75	0.73	0.79	0.77	0.71	0.69	0.69	0.67	0.67	0.67	0.59	0.64	0.63	0.70	1.00							
	Global REITs	0.85	0.85	0.82	0.81	0.85	0.81	0.85	0.82	0.81	0.81	0.81	0.79	0.70	0.79	0.78	0.86	0.94	1.00						
	HFRI Hedge Funds	0.88	0.84	0.88	0.88	0.88	0.85	0.84	0.82	0.80	0.84	0.80	0.80	0.75	0.76	0.76	0.78	0.63	0.73	1.00					
	GS Commodities	0.61	0.63	0.56	0.55	0.59	0.56	0.62	0.61	0.58	0.66	0.60	0.69	0.51	0.58	0.53	0.59	0.38	0.50	0.63	1.00				
	Agriculture	0.40	0.42	0.36	0.35	0.35	0.33	0.41	0.41	0.40	0.41	0.37	0.41	0.30	0.41	0.39	0.44	0.28	0.36	0.37	0.43	1.00			
	Energy	0.53	0.56	0.49	0.48	0.53	0.51	0.55	0.54	0.51	0.59	0.53	0.62	0.45	0.50	0.44	0.51	0.33	0.44	0.55	0.98	0.29	1.00		
	Industrial Metals	0.65	0.67	0.61	0.60	0.62	0.59	0.64	0.63	0.61	0.65	0.62	0.70	0.50	0.68	0.66	0.68	0.46	0.57	0.63	0.61	0.38	0.50	1.00	
	Precious Metals	0.27	0.31	0.22	0.21	0.24	0.20	0.27	0.27	0.26	0.28	0.25	0.40	0.16	0.37	0.33	0.33	0.19	0.25	0.27	0.31	0.22	0.25	0.39	1.00

Source: Invesco, estimates as of Sept. 30, 2020. Proxies listed in **Figure 13**. These estimates are forward-looking, are not guarantees, and they involve risks, uncertainties, and assumptions. Please see page 16 for information about our CMA methodology. Please reference the CMA methodology paper for additional CMA information. These estimates reflect the views of Invesco Investment Solutions, the views of other investment teams at Invesco may differ from those presented here.

05

Methodology Overview

Returns in the methodology are presented in USD and are geometrically linked, but are also developed arithmetically and in most currencies.

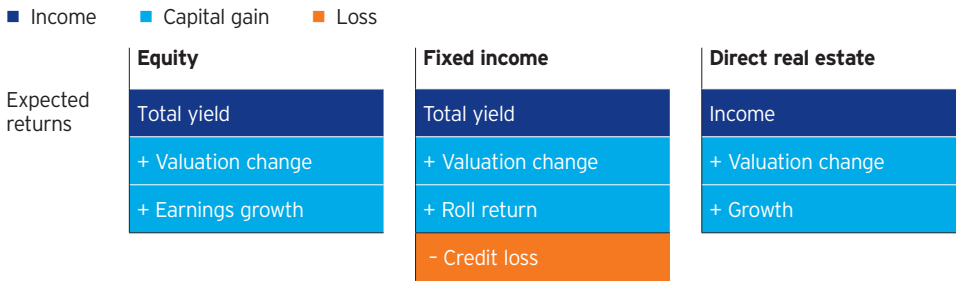
Estimating returns for asset classes: A building block approach

We employ a fundamentally based "building block" approach to estimating asset class returns. Building blocks represent a "bottom-up" approach in which the underlying drivers of asset class returns are used to form estimates (**Figure 15**).

First, these sources of return are identified by deconstructing returns into income and capital gain components. Next, estimates for each driver are formed using fundamental data such as yield, earnings growth and valuation, and combined to establish estimated returns.

By incorporating fundamental data, our approach allows for the relative attractiveness of asset classes to vary over time. Other approaches based on historical relative returns can provide relatively static risk-premiums through time in which certain asset classes contain constant return advantages. The following sections will detail and present the estimates across various equity, fixed income and alternative asset classes.

Figure 15: Our building block approach to estimating returns



For illustrative purposes only.

06	Equities	Discussion of building blocks, CMA accuracy, and assets beyond US Large Cap
07	Fixed Income	Building blocks and non-US assets
08	Alternatives: Private Assets	Public vs Private Assets, Leveraged Buyouts, Direct Real Estate, Infrastructure Equity and Debt
09	Alternatives: Hedge Funds and Listed Real Assets	Regression-based alternatives and commodities returns
10	5-year vs 10-year CMAs	Long-term CMAs and their intermediate-term counterparts
11	Tactical Asset Allocation	Using macroeconomic signals within cycles to inform asset allocation
12	Volatility and Correlation	Estimating long-term risk and co-movement
13	Currency Adjustments, Expected Returns and Compound Returns	Interest rate parity and arithmetic vs. geometric returns
14	Adjustments	Scenario based changes to the CMAs amid shocks to forecast path

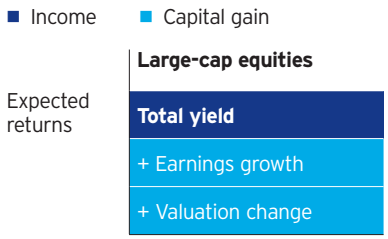
06

Equities

To reflect the impact of both dividend yield and buybacks, we base the estimate for total yield on the 10-year average total yield ratio.

The building block methodology reflects a total return approach to equities – accounting for both income and capital appreciation (i.e., the change in price over time). The building blocks, therefore, consist of estimates for yield (as a driver of income) and earnings growth and valuation change (as drivers of capital appreciation). We begin by looking at large-cap US equities.

Total yield

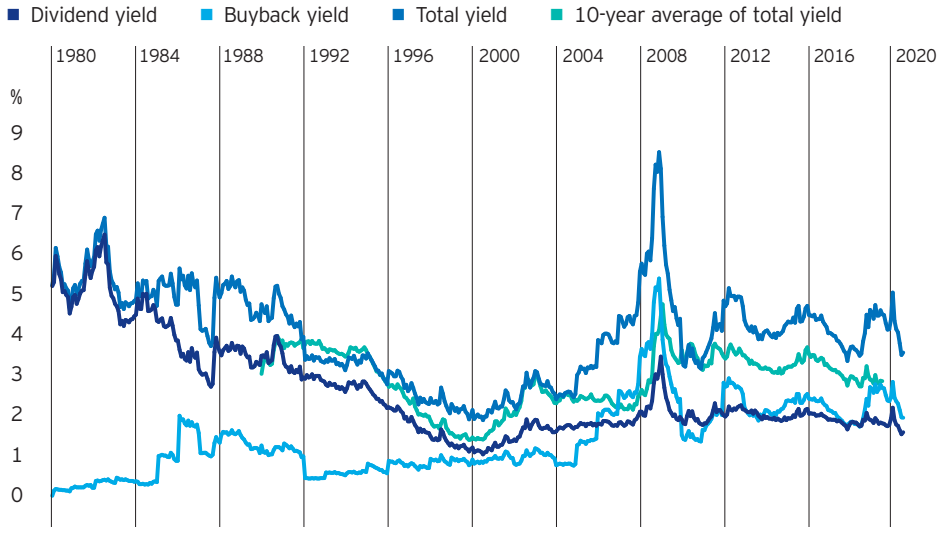


For illustrative purposes only.

Our approach to estimating yield is based on the 10-year average total yield ratio, which reflects the impact of both dividends paid and shares repurchased by the firm. Estimating the former is relatively straightforward, using current dividend yield – dividend per share divided by the price. Repurchased shares, also known as buybacks, involve a company purchasing some of its outstanding shares, thereby reducing the number available on the open market. We believe it's important to capture the impact of buybacks, particularly in the US, given the structural changes in the US tax code dating back to the 1990s. These changes resulted in a dramatic increase in share buybacks in place of dividends over the past 20 years, which benefited returns in the form of capital gains over income. While buybacks themselves do not generate income, they represent an alternative way for firms to return capital to shareholders. Given the dramatic decrease in payout ratio due to buyback activity, we account for the effect of buybacks in our yield calculation to provide more meaningful return estimates. We estimate using the 10-year average of the total yield ratio to bridge the gap in terms of how capital is transferred (**Figure 16**).

Total yield = Dividend yield + Buyback yield

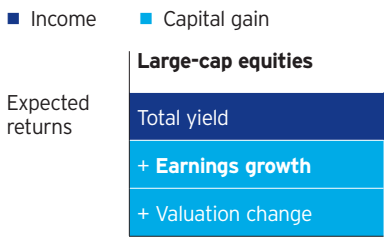
Figure 16: We apply the 10-year average real total payout to current real price to proxy total yield



Source: FactSet Research Systems Inc. from Jan. 31, 1980 to Sept. 30, 2020. Based on S&P 500 Index. **Past performance does not guarantee future results.**

Real GDP per capita provides a stable signal over time to estimate earnings growth.

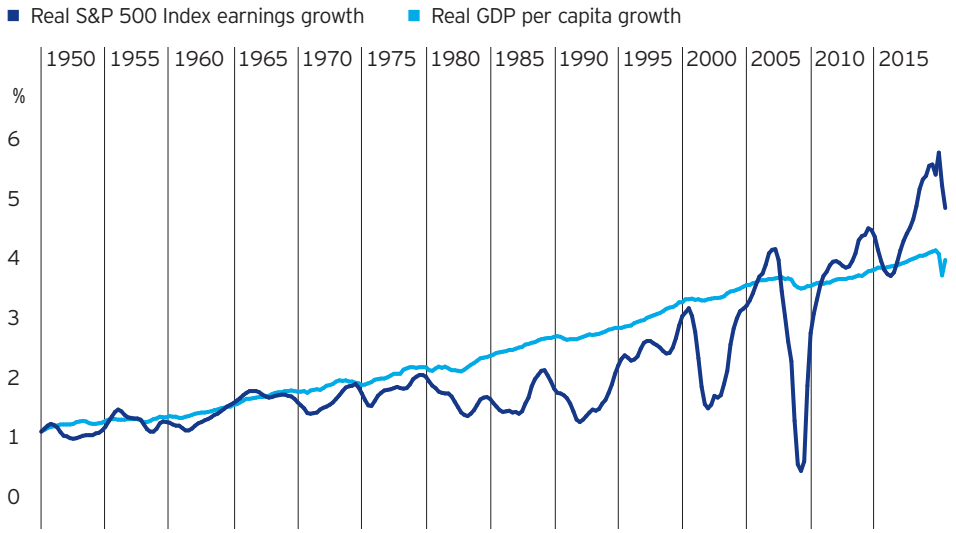
Earnings growth



For illustrative purposes only.

Growth of earnings per share is one of two significant drivers of capital appreciation in stock returns. Although past earnings could provide important insight into estimating the growth of future earnings, this approach is not well-suited due to the volatility in earnings levels that arises from market fluctuations and accounting charges. Given our longer-term outlook, we prefer a more stable estimate of earnings growth through time. Historically, there has been a strong relationship between real US gross domestic product (GDP) per capita growth and real S&P 500 Index earnings growth (**Figure 17**). Consequently, we use real GDP per capita – which also appears to have been a more stable signal over time – to estimate earnings growth in the model and apply future inflation expectations to that estimate to forecast nominal earnings growth. We use the long-term average because we believe that in the case of developed economies, they are less likely to deviate significantly from their "steady state" growth levels.

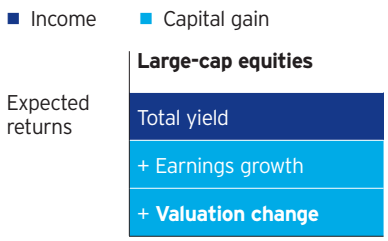
Figure 17: Over the long run, real S&P 500 Index earnings growth has tracked real US GDP per capita growth



Sources: Robert Shiller Yale Data; FactSet Research Systems Inc. and St. Louis Federal Reserve from Jan. 31, 1950 to Sept. 30, 2020.

The first step to estimating valuation change is calculating a long-term mean for the P/E ratio.

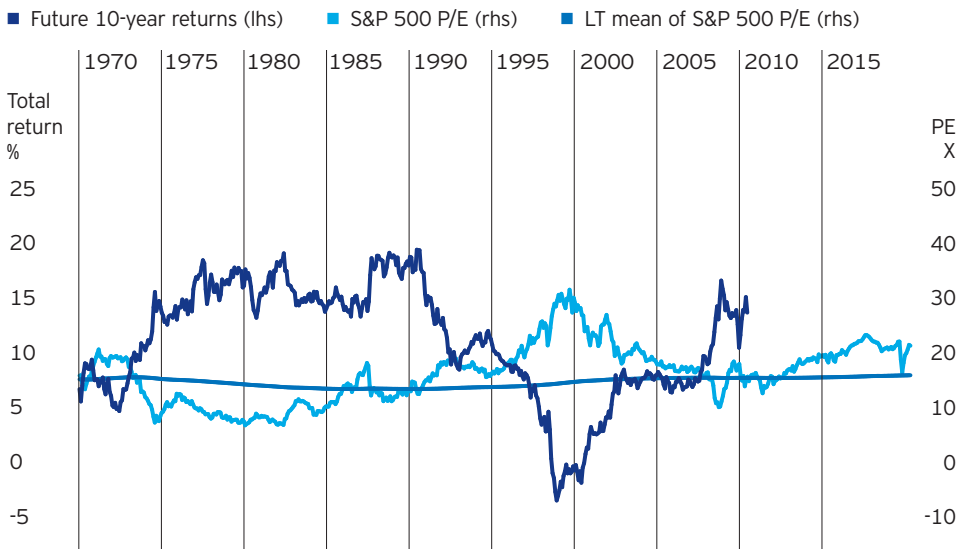
Valuation change



For illustrative purposes only.

The second significant driver of capital appreciation in stock returns is the change in equity valuation – in terms of the ratio of price to earnings (P/E) – over time. In estimating P/E, we recognize existing research (Campbell and Shiller, 1998), which suggests that over time, the P/E ratio should revert to its long-term mean. In other words, if equities are currently considered "cheap," which means that the current P/E is lower than the long-term average, there should be a catalyst to revert the P/E back to the mean (**Figure 18**).

Figure 18: The P/E ratio of the S&P 500 Index has tended to revert to the mean



Sources: Robert Shiller Yale Data; FactSet Research Systems Inc. from Feb. 28, 1970 to Sept. 30, 2020. These estimates are forward-looking, are not guarantees, and they involve risks, uncertainties, and assumptions. These estimates reflect the views of Invesco Investment Solutions, the views of other investment teams at Invesco may differ from those presented here.

Therefore, our first step in estimating the change in equity valuation is to calculate a long-term mean of the P/E ratio. Consistent with academic literature (Lee, Myers and Swaminathan, 1999), we found that the long-term mean of the P/E ratio is a function of prevailing macroeconomic conditions, including the interest rate environment and inflation, as these affect how much an investor would be willing to pay for equities. We model the mean of the long-term P/E ratio through regression analysis, using monthly data.

Figure 19: Estimating the long-term mean of the P/E ratio using regression analysis

1. A regression of monthly data (January 1970–September 2020) yielded the following coefficients:

   $P/E = a + bRF + c\,\pi$

2. To determine the long-term mean of the P/E ratio, we use the results of the regression analysis along with the figures for the risk-free rate and inflation, which as of Sept. 30, 2020, totaled 0.68% and 1.32%, respectively:

   $P/E = 20.72 + (-0.51 \times 0.68) + (-0.60 \times 1.32) = 19.58$

3. Looking at this empirical data, we found that P/E is negatively related to the risk-free rate and inflation because investors require higher returns as they increase.

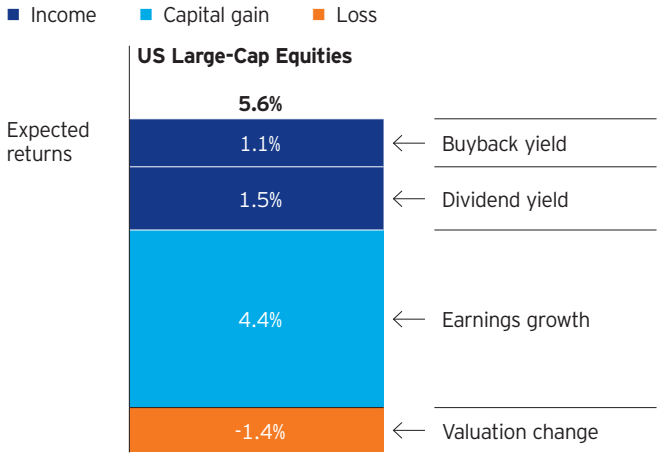
4. Next, to estimate the potential for valuation change, we look at current valuation relative to a rolling average P/E, as estimated in the above regression analysis. The change in valuation is then annualized, or amortized, over the 10-year time horizon, so that it can be either added to or discounted from the total return estimate:

$$\text{Valuation change} = \left(\frac{\widehat{P/E}}{P/E\ \text{Current}}\right)^{1/10} - 1$$

Source: Federal Reserve Bank of St. Louis. As of Sept. 30, 2020. This is over a five-year rolling period based on the S&P 500 Index. RF = Risk free rate; Ⓟ = Inflation; a = 20.80; b = -0.52; c = -0.60

We then include a scaling factor to account for dislocation in valuation. In other words, extreme dislocations in P/E (high or low versus the average) have a larger impact on estimated returns.

Figure 20: Putting it all together: Building blocks of US Large-Cap Equities



Source: Invesco as at Sept. 30, 2020. US Large-Cap Equity is represented by the S&P 500 Index. These estimates are forward-looking, are not guarantees, and they involve risks, uncertainties, and assumptions. These estimates reflect the views of Invesco Investment Solutions, the views of other investment teams at Invesco may differ from those presented here.

Beyond US large cap: Consistent approach across all equity classes

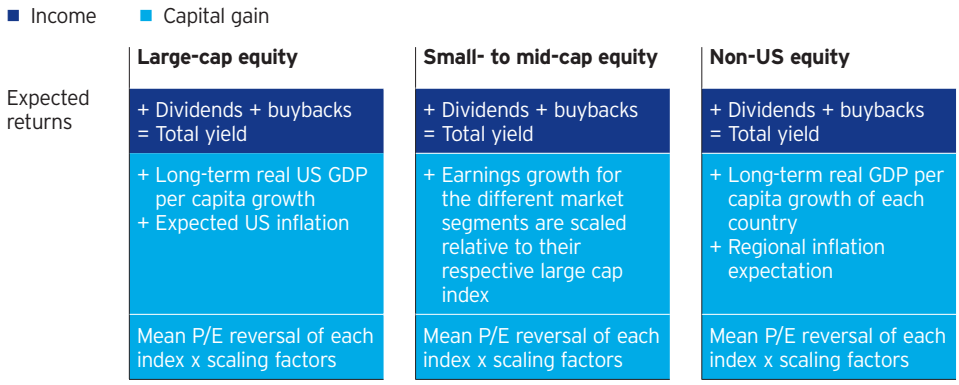
In terms of estimating returns for other equity sub-asset classes, one of the benefits of the building block approach is that it's very "portable" – meaning, it can be applied uniformly across all segments of equities including size (mid and small cap), style (growth/value), and geography (non-US developed, emerging markets).

Let's take a closer look at some examples:

+ **US small-cap equities.** US small-cap equities share the same drivers of return as large-cap equities – yield, earnings growth and valuation change. We estimate return for small-cap equities by looking at those drivers in the context of the US small-cap benchmark, the Russell 2000 Index.
+ **Non-US equities.** Our research indicates that, with the exception of the impact of share repurchases on estimating yield (as previously discussed), non-US equities share the same drivers of return as US equities, but are evaluated in the context of the representative benchmark (e.g., MSCI EAFE Index, MSCI World Index).

Figure 21 highlights our approach for estimating returns for the various segments of the market.

Figure 21: Applying building block methodology to equity sub-asset classes



Source: Invesco. For illustrative purposes only.

Figure 22: 10-year estimated equity market total returns (USD)

Asset class	Index	Estimated return %		Yield %	Earnings growth %	Valuation change %	Currency adjustment %
Emerging market	MSCI EM	8.46	=	2.28	+7.04	+0.07	-0.93
Developed ex-US	MSCI World Ex-US	7.31	=	2.48	+4.95	-0.37	+0.25
US large-cap	S&P 500	5.65	=	2.61	+4.43	-1.38	0

Source: Invesco, estimates as of Sept. 30, 2020. All total returns data is annual. For illustrative purposes only. These estimates are based on our capital market assumptions which are forward-looking, are not guarantees, and they involve risks, uncertainties and assumptions.

Developed markets versus emerging markets equity CMAs

Emerging market (EM) economies are structurally different than developed markets (DM), leading to differences in the way their CMA building blocks are estimated. Even amongst the broad EM category are economies different enough to justify individual marginal adjustments. Some EM economies, like Korea and Taiwan, are more mature in their economic development, are export-oriented, and have similar characteristics to DM economies. China, however, is a high growth economy, driven by credit and money growth, that is moving to more long-term sustainable growth levels and is much more oriented to domestic growth.

Emerging Market Building Blocks (including Hong Kong, as more than half of market capitalization of Hong Kong-listed firms are Chinese companies) :

Emerging Market Building Blocks:

+ **Yield.** For Korea and Taiwan, our yield approach is the same as DM (ex-US). Hong Kong's market focuses on recurring trailing dividend yield. With many Hong Kong-listed firms being family or state-owned, non-recurring special dividends can occur, so we exclude special dividends from our analysis to prevent outliers within our yield estimates.
+ **Earnings growth.** For Taiwan and Korea, we follow the same process as for DM. China used to be a high growth market and is now slowing down. Because of this, we adjust the historical average growth by calculating the decline of other Asian economies that have been in similar economic positions and deduct that figure from China's 10-year average real GDP growth.
+ **Valuation change.** Similar to DM, we assume valuation such as the price-to-book ratio will return to the long-term mean after adjusting for macroeconomic variables. For Taiwan and Korea, exports make up more than 60% and 40% of GDP, respectively. As export-driven economies, currency (FX) has a bigger impact than inflation on valuation change. For Hong Kong, growth is influenced by inflation in China. As the HK$ is pegged to the USD, we do not look at FX but look at the HK "risk-free" rate as liquidity conditions are influenced by the HK$ peg and, therefore, the US Fed's monetary policy.

Figure 23: Relative valuation adjustments of EM economies based on their economic characteristics

Classification	Inflation	Rates	FX	TSF growth	Applies to
Developed markets	✓	✓			Regional CMAs Hong Kong (USD peg)
Export oriented mature emerging economies		✓	✓		Taiwan, Korea
Domestic oriented emerging economies	✓			✓	China

Source: Invesco, as of Sept. 30, 2020.

To test the accuracy of our CMAs we review the realized versus predicted returns of US large cap, developed ex-US, and emerging markets. All possible estimate history available is presented.

Any asset class' accuracy chart can be provided upon request. Please reach out to the IIS Global Client Solutions contact on the last page of the document.

Figure 24: US large cap: CMA returns vs actual returns (S&P 500 Index)

Source: Invesco. Data from Jan. 31, 1973-Sept. 30, 2020. An investment cannot be made directly into an index. Capital market assumptions are forward-looking, are not guarantees and they involve risks, uncertainties and assumptions. These estimates reflect the views of Invesco Investment Solutions, the views of other investment teams at Invesco may differ from those presented here.

Figure 25: DM ex-US: CMA returns vs actual returns (MSCI World ex-US Index)

Source: Invesco. Data from Jan. 31, 2000-Sept. 30, 2020. An investment cannot be made directly into an index. Capital market assumptions are forward-looking, are not guarantees and they involve risks, uncertainties and assumptions. These estimates reflect the views of Invesco Investment Solutions, the views of other investment teams at Invesco may differ from those presented here.

Figure 26: EM: CMA returns vs actual returns (MSCI EM Index)

Source: Invesco. Data from Jan. 31, 2001-Sept. 30, 2020. An investment cannot be made directly into an index. Capital market assumptions are forward-looking, are not guarantees and they involve risks, uncertainties and assumptions. These estimates reflect the views of Invesco Investment Solutions, the views of other investment teams at Invesco may differ from those presented here.

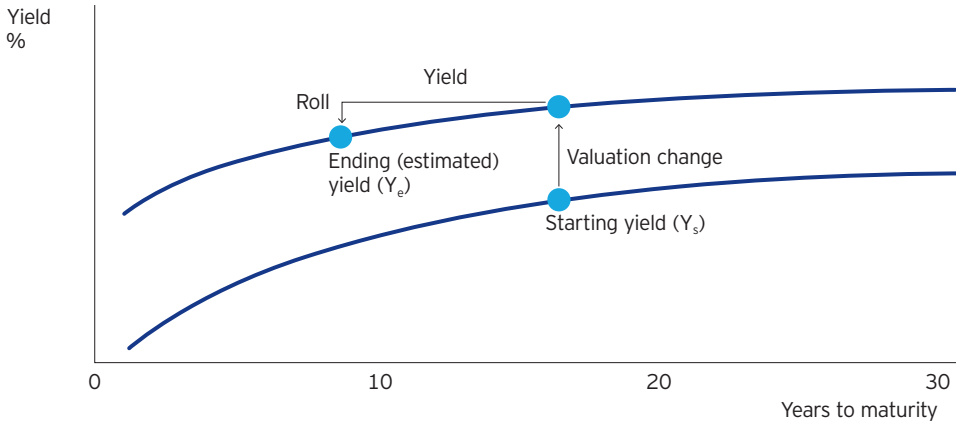
07

Fixed Income

The estimate for total yield reflects the impact on income from changes of the yield curve over time.

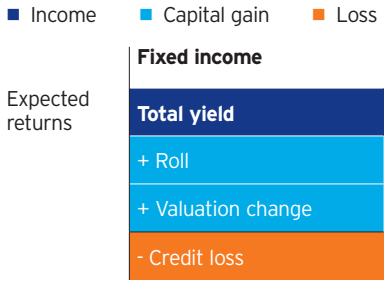
Within fixed income, we also utilize the building block methodology, seeking to isolate and identify the individual drivers of the specific asset class risk premium. As with equities, the drivers of return for fixed income are income (yield) and appreciation (roll return, valuation change, and credit loss).

Figure 27: Single-period return decomposition



Source: Invesco. For illustrative purposes only.

Total yield



For illustrative purposes only.

Yield reflects the average income expected to be received from an investment in a fixed income security throughout its life. For the purposes of our CMAs, yield is calculated using an average of the starting (current) and ending (estimated) yield levels.

To calculate the ending (estimated) yield (Y_e), we examine how the current (starting) yield curve (Y_s) could move over time as a result of changes in Treasury interest rates and in the credit spreads over US Treasury interest rates.

$$Y_e = Y_s + \Delta Y_{TSY} + \Delta OAS$$

←YTSY = Changes in Treasury interest rates (at a given duration); *←OAS* = Changes in credit spreads over US Treasuries

For non-US assets, we use the yield curve estimates for that region.

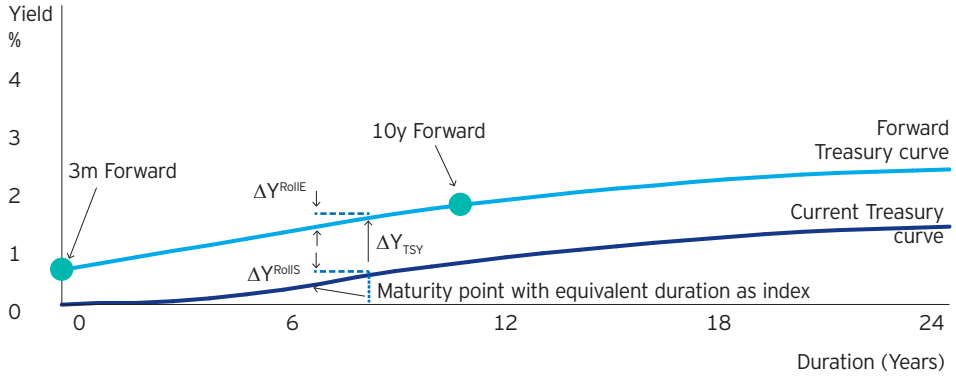
Changes in Treasury interest rates $\Delta YTSY$
As suggested in the relevant academic research (Litterman and Scheinkman, 1991), changes in Treasury interest rates have the potential to affect the position and shape of the future Treasury yield curve, in terms of its level and slope relative to the starting (current) yield curve.

Charting the future Treasury yield curve involves:
+ Identifying the yield for three-month Treasury bills and the yield for 10-year Treasury notes, as two specific points which help determine the level (intercept) and slope (**Figure 28**).
+ Polynomial interpolations is then applied using these two data points, which are sourced from the US forward rate curve, to generate the estimated future yield curve.
+ For the purposes of estimating the impact of changes in Treasury interest rates on estimated yield $\Delta YTSY$, we take the difference in yields at a specific duration between the current and estimated future yield curves.

$$\Delta Y_{TSY} = i_{estimated} - i_{current}$$

←YTSY = Changes in Treasury interest rates (at a given duration); ←OAS = Changes in credit spreads over US Treasuries

Figure 28: Treasury curve estimate based on the US forward rate curve



Source: Invesco. For illustrative purposes only.

Changes in credit spreads ΔOAS
Another factor impacting the direction of estimated future yield involves movement in credit spreads, which historically have exhibited mean-reverting properties (Prigent et al., 2001). This means, for example, that if spreads are currently very wide relative to the mean, our forward expectations are for spreads to narrow, and for that contraction to have a positive impact on pricing.

We estimate the changes in that spread by looking at the relationship between current credit spreads and their 10-year rolling average (**Figure 29**). We cap the potential movement in credit spreads to 10% in order to mitigate the impact of extreme credit events (e.g., the global financial crisis).

$$\Delta YOS = OAS_{current} - OAS_{10\text{-}year\ average}$$

←*YTSY* = Changes in Treasury interest rates (at a given duration); ←*OAS* = Changes in credit spreads over US Treasuries

Figure 29: High-yield credit spreads revert to the long-term (10-year) average

Source: FactSet Research Systems Inc. from Jan. 31, 2001 to Sept. 30, 2020. Option-adjusted spreads (OAS) account for bonds with embedded options, such as callable bonds.

Figure 30: Estimating total yield

Maturity = 4 years
Starting yield = 5.77%

Estimated yield
Movement in interest rates
- *Interest rates at a maturity of six years on the current yield curve = 0.21%*
- *Interest rates at a maturity of six years on the future yield curve = 1.13%*

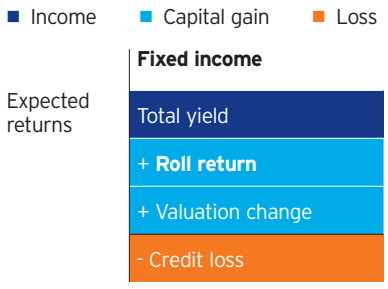
Movement in credit spreads
- *Current credit spread = 5.17%*
- *Rolling 10-year credit spread = 5.31%*

Ending yield = 5.77% + (0.21% – 1.13%) + (5.17% – 5.31%) = 6.83%

Yield estimate = (6.83% + 5.77%)/2 = 6.30%

Source: Invesco Investment Solutions Research. Data as of Sept. 30, 2020.

Roll return



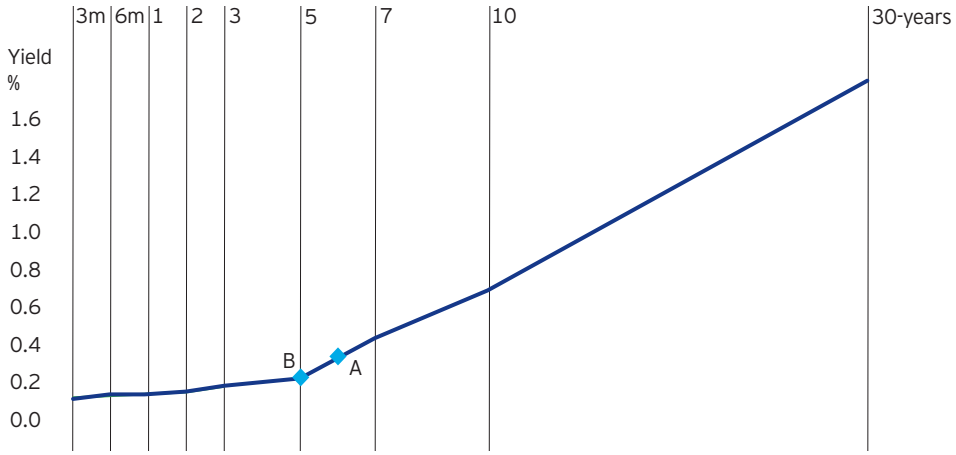
For illustrative purposes only.

Roll return reflects the impact of movement along the curve – over the passage of time – on the potential return of a fixed income security (i.e., appreciation). Specifically, it looks at the impact on price, all else being equal (i.e., no movement of the yield curve), as a bond nears maturity. If the yield curve slopes upward, movement along the curve (toward maturity) will make a positive impact on returns.

Roll return reflects movement along the yield curve – the impact on price from holding a bond over time.

Let's take a closer look at how this works (**Figure 31**). Consider the current upward sloping yield curve of "on-the-run" (i.e., the most recently issued) US Treasuries with maturities extending from zero to 30 years. Assume that we purchase a two-year US Treasury note (point A), which yielded 0.28% on Sept. 30, 2020. Assuming no changes to the yield curve, a year from now, the maturity of the note would have decreased to one year, which corresponds to a yield (on the current yield curve, which has not changed/moved) of 0.21% (point B). Given the inverse relationship between the price and yield on bonds, in order for the yield on the note we purchased to increase, the price of the note needs to decrease – which represents the capital gain.

Figure 31: Roll return reflects the impact on yield and price as a bond is held over time



Source: Bloomberg L.P., as of Sept. 30, 2020. At Maturity = t, the roll return is calculated as follows: Roll return = -(t - 1) x-y; -y = Interest rate$_{t-1}$ - Interest rate$_t$

Figure 32: Estimating roll return

In order to determine the roll return, for methodological simplicity, we choose to focus only on the roll impact along the Treasury curve. Similar to the yield computation, we again rely on the average of the starting and estimated future roll and compute the roll return as follows.

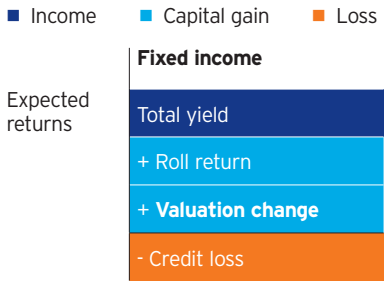
Interest rate on current yield curve at:
6-year maturity = 0.28%
5-year maturity = 0.21%

Interest rate on future yield curve at:
6-year maturity = 1.24%
5-year maturity = 1.13%

Current roll return = -5 x (0.21% - 0.28%) = 0.35%
Future roll return = -5 x (1.13% - 1.24%) = 0.55%
Roll return = (0.35% + 0.55%)/2 = 0.45%

Source: Invesco. Data as of Sept. 30, 2020.

Valuation change



For illustrative purposes only.

Valuation change reflects the impact on price from movement of the yield curve.

If roll return incorporates the impact on the price of movements along the curve, valuation change reflects the impact on price from movement of the curve. Another way to think about valuation change is that it examines the same dynamic we explored in defining the building block to estimate the return from yield (see **Figure 33**) but looks at this movement's impact on price, rather than income. As discussed above in the context of returns from yield, this comprises movement due to changes in interest rates and credit spreads, respectively.

Figure 33: We estimate the impact of this change as follows:

For Maturity = t

$$\textit{Valuation change} = 1 - [1 - t \times (Y_e - Y_s)]^{1/10} - 1$$

From the total yield calculation we know that:

$$Y_e - Y_s = \Delta Y_{TSY} + \Delta OAS$$

In other words, the change in yield reflects changes in duration and credit spreads:

$$\textit{Valuation change} = [1 - t \times (\Delta Y_{TSY} + \Delta OAS)]^{1/10} - 1$$

Figure 34: Estimating valuation change

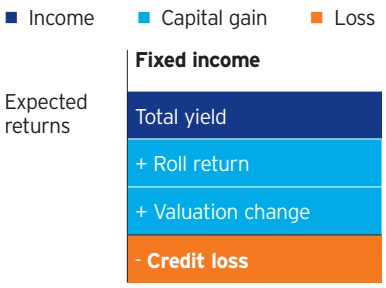
Maturity = 4 years
Current yield = 5.77%
Ending yield = 6.83%

$$\textbf{\textit{Valuation change} = [1 - 4 \times (6.83\% - 5.77\%)]^{1/10} - 1 = -0.43\%}$$

Source: Invesco Investment Solutions Research. Data as of Sept. 30, 2020.

Credit loss

The estimated impact on return from:
+ Bond migration = option-adjusted spread x 40% "haircut"
+ Estimated default loss = 10-year median of annual default rates x Average 40% recovery rate



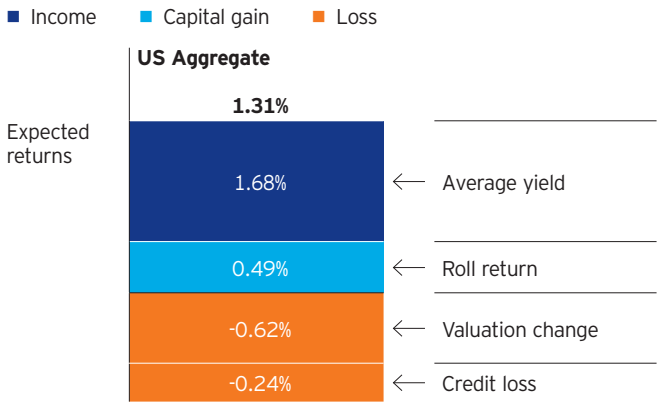
For illustrative purposes only.

Credit loss captures the potential impact on returns from a downgrade in credit ratings (i.e., bond migration) and from a debt default. Let's examine each of these potential sources of loss:

+ **Bond migration.** For investment-grade bonds, downgrades – particularly those that place a security below investment grade level – could have a negative impact on returns, as these bonds entail a higher yield, which would drive down prices. The estimated impact on return from this process can be estimated by multiplying the option-adjusted spread (OAS) – which measures the spread between a fixed income security and the risk-free rate of return, which is adjusted to account for an embedded option – by the "haircut," a reduction in the stated value of an asset. Our rationale for this methodology is based on observations of historical data, which indicate that loss from credit migration increases as the OAS widens. Also, based on historical data, we use a static 40% as the haircut estimate.
+ **Estimated default loss.** For riskier fixed income instruments such as high yield, floating rate, preferred stocks and emerging market bonds, default is a more significant driver of potential credit loss. The estimated default loss is a function of the estimated default rate, which is based on the 10-year median of annual default rates published by Standard & Poor's, and the average recovery rate – the proportion of bad debt that can be recovered – for those securities, which we assume is 40% based on historical observations of high- yield recovery rates. An exception to this standard recovery rate rule are bank loans, which have been observed to have a higher recovery rate than high yield debt, and so we apply a 67% rate.[3]

3 The average recovery rate for the floating rate debt after the Global Financial Crisis has been 67%. Source: JPM, March 2020.

Figure 35: Based on the building blocks above, the estimated return for US aggregate bonds is derived as follows:



Source: Invesco. US aggregate bonds are represented by the BBG BARC US Agg Bond Index. These estimates are forward-looking, are not guarantees, and they involve risks, uncertainties, and assumptions. These estimates reflect the views of Invesco Investment Solutions, the views of other investment teams at Invesco may differ from those presented here.

Figure 36: 10-year estimated fixed income market total returns (USD)

Asset class	Index	Expected Return %		Average yield %	Roll return %	Valuation change %	Credit loss %	Currency adjustment %
EM aggregate	BBG BARC EM Aggregate	3.05	=	4.62	+0.63	-0.79	-1.40	0
Eurozone aggregate	BBG BARC Euro Aggregate	1.02	=	0.48	+0.35	-0.77	-0.24	+1.21
Global aggregate	BBG BARC Global Aggregate	1.55	=	1.44	+0.63	-0.79	-0.20	+0.47
US HY corporates	BBG BARC US High Yield	4.15	=	6.30	+0.23	-0.43	-1.95	0
US Treasury	BBG BARC US Treasury	0.88	=	0.98	+0.63	-0.72	0	0

Source: Invesco, estimates as of Sept. 30, 2020. All total returns data is annual. These estimates are based on our capital market assumptions which are forward-looking, are not guarantees, and they involve risks, uncertainties and assumptions.

Figure 37: US Aggregate Bond Index: CMA returns vs actual returns

Source: Invesco. Data from Jan. 31, 2000-Sept. 30, 2020. An investment cannot be made directly into an index. Capital market assumptions are forward-looking, are not guarantees and they involve risks, uncertainties and assumptions. These estimates reflect the views of Invesco Investment Solutions, the views of other investment teams at Invesco may differ from those presented here.

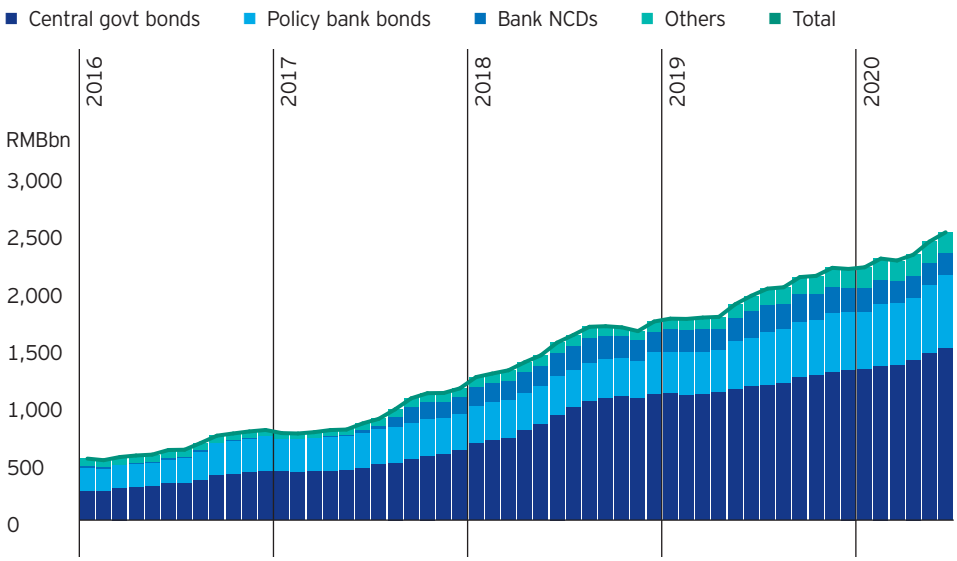
Additional information on our approach to China fixed income can be found in our 2020 paper, "Capital market assumption: China fixed income methodology"

China's fixed income market

The launch of the Chinese Interbank Bond Market (CIMB) in 2016 and the Bond Connect initiative in 2017 marked significant milestones in the opening of China's Onshore bond market in addition to the QFII and RQFII[4] programs. As China's fixed income market opens further, investors are likely to increase their allocation to Chinese bonds. In this section, we discuss how we formulate CMAs for both the China onshore fixed income market, composed of government bonds and corporate issues, and the offshore fixed income markets, which primarily are corporate in nature.

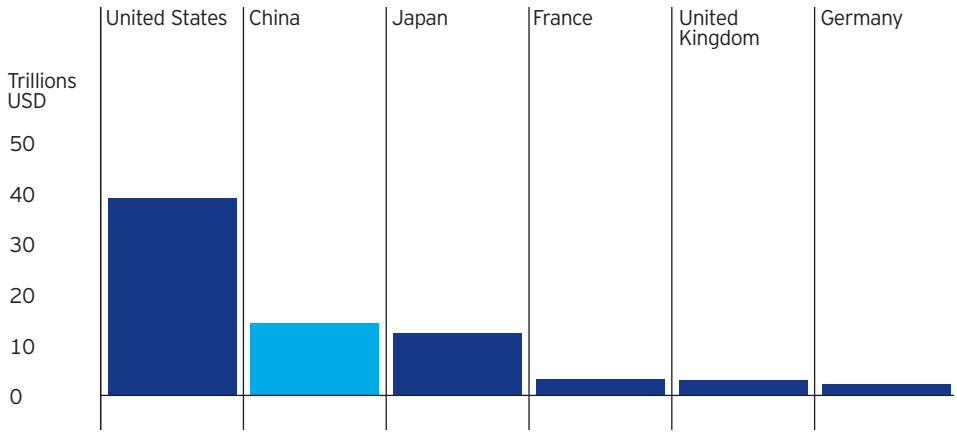
Stable economic growth, financial-system reforms and the move to a market-oriented exchange rate for the renminbi (RMB) have made China's financial markets more appealing to foreign investors, resulting in large increases in the amount of foreign bond holdings and trading volumes. As shown in **Figure 38** below, foreign holdings of China onshore bonds have more than quadrupled since 2016, to about RMB2.5 trillion as of June 2020. In a nod to the growth of the Chinese onshore bond market and its opening up, major global index providers have included Chinese onshore bonds in their flagship indices, with their index weighting expected to grow over time. As of Q1 2020, China's onshore bond market totaled RMB99.7 trillion (USD14.2 trillion)[5] in notional amount of bonds outstanding. It is now the second largest bond market in the world, behind the US, but ahead of Japan, the UK and other European countries **(Figure 39)**.

Figure 38: Foreign holdings of China onshore bonds



Source: CEIC, Invesco, as of end June 2020 . Bank NCDs are Negotiable Certificates of Deposit.

Figure 39: China's domestic bond market is the second largest in the world



Source: Bloomberg, Banks for International Settlemets and Invesco, as of March 2020

4 QFII stands for Qualified Foreign Institutional Investor. RQFII stands for Renminbi Qualified Foreign Institutional Investor

5 Bank of International Settlements, 2020

Onshore treasuries take on a similar approach to our other government estimates, using the local forward yield curve to estimate the direction of rates, roll, and valuation change. For the China offshore USD-denominated market, we have followed our global framework to build Capital Market Assumptions, for corporates only due to the lack of appropriate benchmark for Chinese treasuries and policy bank bonds which come from insufficient new issues. Being 40x larger than the offshore market[6], China's onshore market includes more corporate issuers and offers direct exposure to the dynamics of China's domestic economy, primarily financial services, industrials and materials. Offshore credit has a more diversified exposure, composed of technology and energy issues **(Figure 40a and 40b)**.

Figure 40a: Bloomberg Barclays China Corporate Index (CNY)

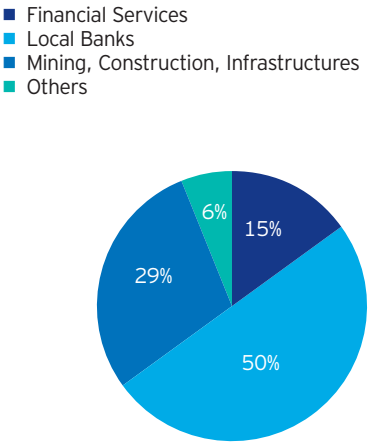
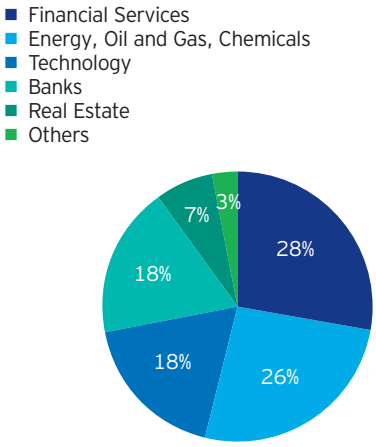


Figure 40b: Bloomberg Barclays Asia ex Japan Credit China IG (USD)



Source: Bloomberg and Invesco, as of June 2020.

In our global model, we assume a percentage of spread as the expected credit migration loss from rating downgrades in investment grade bonds. Historically in China, credit rating migration has been uncommon, and occasionally, we observe IG going straight to default. However, for the credit loss component of Chinese onshore credit, we assume that the Chinese credit market will continue to evolve to become more mature, and that it will see more credit rating migrations in years to come. We believe the entry and expansion of international rating agencies in China, as well as credit events that we witnessed in the past several years will expedite the development.

Figure 41: 10-year estimated China fixed income total returns (USD)

Asset Class	Benchmark	Estimated Return %	Yield %	Roll Return %	Valuation Change %	Credit Loss %	Currency Adjustment %
Onshore Treasury	BBG BARC China Treasury Total Return CNY	0.88 =	3.35	+0.33	-0.35	-0	-2.45
Onshore Policy Bank + Treasury	BBG BARC China Policy Bank and Treasury Total Return CNY	1.40 =	3.54	+0.73	-0.29	-0.12	-2.45
Onshore Credit	BBG BARC China Corporate CNY	1.78 =	4.53	+0.40	-0.35	-0.35	-2.45
Offshore Credit	BBG BARC Asia ex Japan USD Credit China IG	1.84 =	2.68	+0.34	-0.43	-0.75	0

Source: Invesco, estimates as of Sept. 30, 2020. All total returns data is annual. These estimates are based on our capital market assumptions which are forward-looking, are not guarantees, and they involve risks, uncertainties and assumptions.

6 Source: Wind, as of February 2018

08

Alternatives: Private Assets

A significant, and increasing, number of institutional portfolios contain private or alternative assets[7]. This trend is likely due to shrinking expected returns and yields in traditional public assets. Private asset market capitalization has grown to $5.8T globally in 2019[8], Private Equity, a large subset, has experienced 7.5x growth since 2002 compared to 3x in public markets[8]. Composed of a broad array of heterogeneous investments, private assets are anything but standardized. As the space is evolving to include new assets and creates unique challenges to investors, we attempt to assess the economics of some common types of investments. In this portion of the CMA methodology we will present our views on; Private Equity, specifically Leveraged Buyouts (LBO), Private Debt, Private Direct Real Estate (DRE), and both Private Infrastructure Equity and Debt. To properly introduce private assets into a portfolio, we suggest taking a building blocks based approach to understand and forecast return, which we will address in detail in the following sections.

Notable differences between public and private assets are:

+ **Illiquidity.** Should one sell a private asset before its maturity, there are likely capital market frictions and significant penalties resulting in loss of principal. For this exercise, we assume all assets are held until their deal's expiration date and are calculated as a single period internal rate of return, differing from our approach to public markets, which represent the average of multiple periods of underlying investments.
+ **Leverage.** Private asset firms add leverage to portfolio assets to fund any required restructuring. This additional funding acts as a multiplier to any traditional capital gains or losses, accelerating the change in earnings and multiple expansion. Additionally, we estimate the unlevered versions of private assets.
+ **Fees.** Cost of financing from a leveraged buyout debt issuance and performance-based ("2 & 20") management fees are examples of large negative detractors to final return that do not typically exist in public assets. All of our private CMAs include an estimate net of fees, some explicitly and some implicitly. Since fees vary tremendously in private assets, we model it as an assumption that can be adjusted from client to client.

Model flexibility and the private benchmark problem

While an investor in public assets can simply buy an index of an asset class, own a portion of the universe, and experience average results, an investor in private assets cannot. To align our private CMAs with our public CMAs, but still provide the custom nature private asset classes require, we built enough flexibility into our private asset models to analyze the whole market, an individual fund, or a single deal.

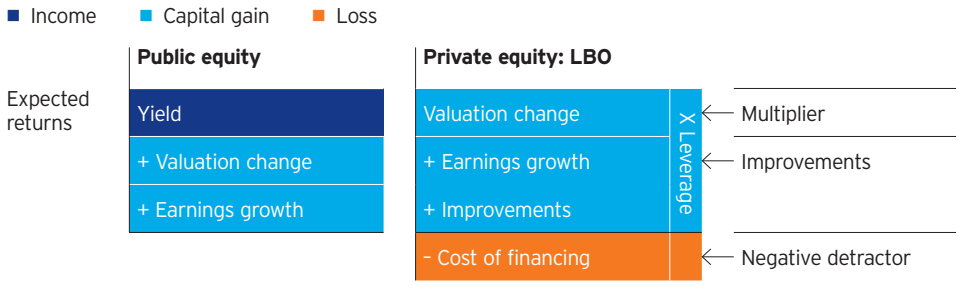
To emphasize the underlying reason for a customizable private model, there is simply no investable benchmark for private assets. These assets are unlisted on any tradeable market, provide at-best quarterly reporting or tender dates, and lack transparency of the underlying investments required to create a proper benchmark.

7 Lerner 2018
8 McKinsey; Preqin, 2019

Private equity: Leveraged buyouts

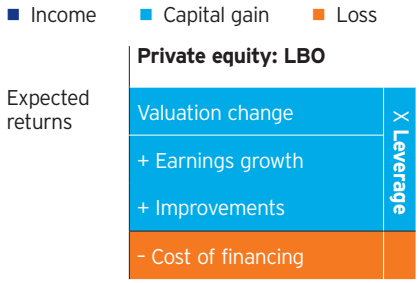
Our LBO estimates model the expected performance of a private equity (PE) firm in purchasing a public market company and taking it private through the realization of the investment over a 10-year investment horizon. Our estimates reflect an Internal Rate of Return (IRR) to a Limited Partner (LP) in the fund, while a General Partner (GP) would experience returns gross of fees. We derive our inputs from both the public markets for valuation multiples and fundamental corporate data as well as from peer-reviewed academic studies (Hooke et al., 2016, and Axelson et al., 2013) regarding deal structures, operational improvements, and firm leverage.

Figure 42: Comparing the building blocks of private assets to public assets



For illustrative purposes only.

Leverage



For illustrative purposes only. LBO = Leveraged buyouts

Embedded in the name of a leveraged buyout is the leverage component that PE firms use to finance deals. Once a debt-to-equity ratio, or leverage level, is targeted, firms maximize the debt used over the life of their deal, achieving that ratio. We assume PE firms have a target debt level of nearly 4x times the pre-takeout leverage for portfolio companies of, around 70-90% debt to value (Axelson et al. [2010], Jonathan Cohn [2013], Axelson et al. [2007a], Guo et al. [2008]). This additional leverage increases the value of the tax shield as well as the cost of financing.

We estimate the amount of additional leverage a firm can use in the take-out in order to achieve the targeted leverage ratio. This added leverage changes the value of debt as a percentage of the enterprise value as well as the interest expense as a component of the full firm's earnings.

References:
Jeffrey Hooke, Ken C. Yook, and Stephen Hee. The performance of mostly liquidated buyout funds, 2000-2007 vintage years. Available at SSRN, April 2016.

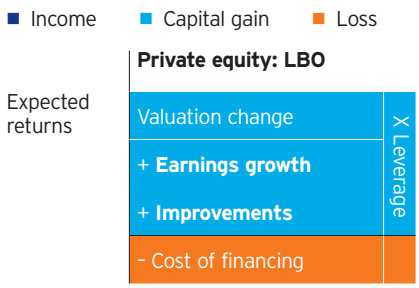
Steven Kaplan and Per Stromberg. Leveraged buyouts and private equity. Journal of Economic Perspectives, Volume 22, Number June 4, 2008.

Ulf Axelson, Tim Jenkinson, Per Stromberg, and Michael S Weisbach. Borrow cheap, buy high? the determinants of leverage and pricing in buyouts. Working Paper 15952, National Bureau of Economic Research, April 2010.

Erin Towery Jonathan Cohn, Lillian Mills. Evolution of capital structure and operating performance after leveraged buyouts: Evidence from us corporate tax returns. Available at authors website, McCombs School of Business, UT Austin, April 2013.

Shourun Guo, Edie S Hotchkiss, and Weihong Song. Do buyouts (still) create value? Working Paper 14187, National Bureau of Economic Research, July 2008.

Earnings growth and Improvements



For illustrative purposes only. LBO = Leveraged buyouts

Our private markets earnings estimate model differs meaningfully from our public markets approach. Implicit in our public market models is that the capital structure does not meaningfully change from the moment an asset is purchased through the investment horizon. However, LBOs immediately violate this assumption, so our LBO earnings model is also different.

We estimate the full-firm earnings (EBITDA) fundamentally by decomposing EBITDA into its components:

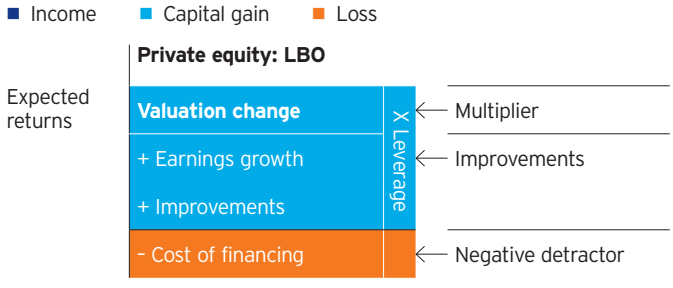
EBITDA = Net Income + Tax Expense + Interest Expense + Depreciation/Amortization

---

Using a subsample of the public market universe, we estimate the current Net Income multiple and US corporate tax rates for the tax expense. By incorporating the PE firm's target capital structure into our estimates for the interest expense, we account for the leverage passed on to LBO targets; the estimate is a combination of the debt-to-equity ratio, expected interest rate from our CMAs and ROE estimates. The depreciation/amortization estimate is based on a straight-line depreciation and public-market tangible asset data.

We assume PE firms improve a company's operations above comparable public firm's, which leads to improved earnings growth. This measurement includes the effects of an increase in the value of the tax-shield resulting from added leverage. Behind the scenes, the purchasing firm's new management can influence a company's restructuring. Firms can write down the value of impaired assets and implement or other strategic initiatives to unlock untapped value. We include an increase of 10% (Kaplan and Stromberg [2008], Guo et al. [2008]) over public-market CMA earnings growth estimates, on top of any tax-shield related benefits due to added leverage.

Valuation change



For illustrative purposes only. LBO = Leveraged buyouts

References:
Steven Kaplan and Per Stromberg. Leveraged buyouts and private equity. Journal of Economic Perspectives, Volume 22, Number June 4, 2008.

Shourun Guo, Edie S Hotchkiss, and Weihong Song. Do buyouts (still) create value? Working Paper 14187, National Bureau of Economic Research, July 2008.

PE firm investments are subject to market valuation movements in the same manner as public investments as private valuations reflect their public market counterparts. While certain investments may be particularly attractive to PE firms (companies with high earnings yield and stable cash flows, for example), firms entering investments when valuations are high can suffer a drag on their performance as multiples return to more normal levels. We model this effect by estimating an expected multiple from trailing historical data.

$$\text{Valuation change} = \left(^{EV}/_{EBITDA_F} - {}^{EV}/_{EBITDA_C}\right) \times \text{Expected EBITDA}$$

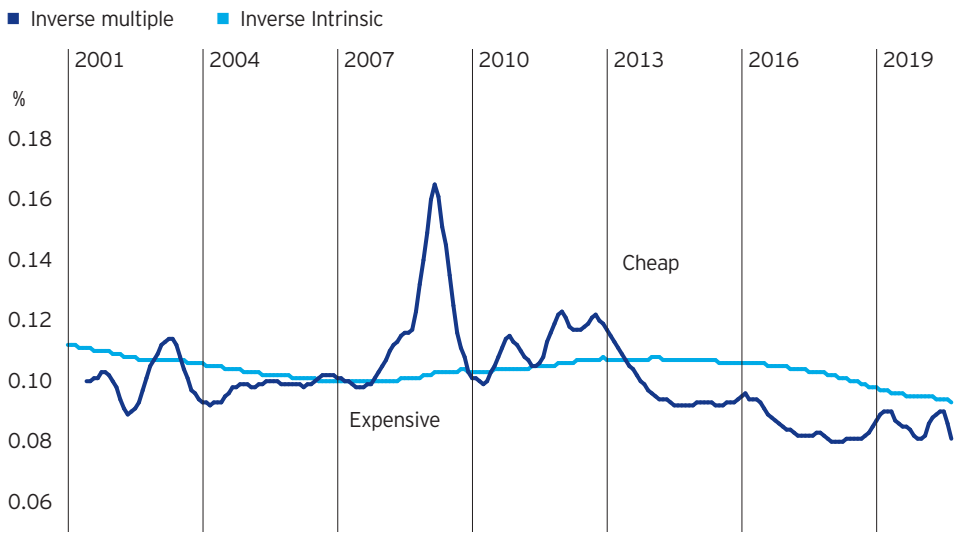
EBITDAc = Current public market valuation (subsample from the Russell 3000); EBITDAf = Trailing 10-year average of the Current Multiples; Expected EBITDA = We estimate this value from fundamental data.

Notably our multiples for private firms differ from our public CMAs in that we use full firm multiples (EV/EBITDA) of a publicly available universe of likely buyout targets (a subset of firm in the Russell 3000), rather than equity valuations (Price / Equity) to account for the total ownership of the portfolio company.

LBO valuations are mean-reverting, and when current multiples are high, like at the end of 2008, multiple contractions should be expected. High current multiples or overpayment lead to a reduction in future returns when the portfolio company is finally sold.

We also incorporate an adjustment to public market equity multiples to account for a takeout premium of the equity in order for the PE firm to acquire the target. Our estimate of 25% above public value is rooted in academic research of historical deal premia (Kaplan and Stromberg 2008). This adjustment biases our valuation changes downward to account for a premium at purchase but unnecessary when the portfolio company is either resold or relisted in public markets.

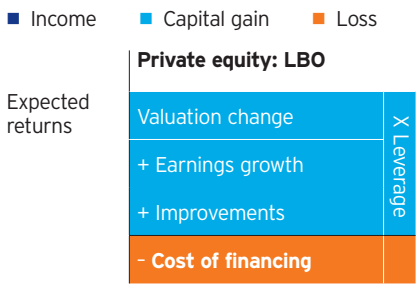
Figure 43: Mean-reverting nature of LBO multiples compared to their intrinsic value



Source: Invesco Investment Solutions Proprietary Research, FactSet, Sept. 30, 2020

References:
Steven Kaplan and Per Stromberg. Leveraged buyouts and private equity. Journal of Economic Perspectives, Volume 22, Number June 4, 2008.

Cost of financing



For illustrative purposes only. LBO = Leveraged buyouts

The cost of financing, or fair value of leverage, is modeled as the product of book yield, applied leverage, and return on debt. Other than the mechanics of a changing capital structure from added debt, the current cost to borrow versus the future cost to borrow can impact a firm's ability to add debt when needed, and thus the underlying deal. Higher current costs relative to future yields are a drag on expected returns. We use expected yields from our public CMA estimates of US high yield bonds to estimate current and prevailing borrowing rates.

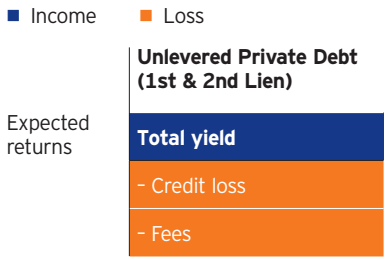
Figure 44: 10-year estimated Private Equity LBO market total returns (USD)

Asset class	Estimated return %	Earnings growth + improvement %	Valuation change %	Cost of financing %
Private Equity: LBO	12.39	26.85	-1.1	-8.71

Source: Invesco, estimates as of Sept. 30, 2020. All total returns data is annual. These estimates are based on our capital market assumptions which are forward looking, are not guarantees, and they involve risks, uncertainties and assumptions.

Private Debt

Post global financial crisis, facing low yields and tight lending standards from traditional banks, investors searched for new ways to access capital. Investors have flocked to private debt as a means of reaching yield targets, with yields averaging around 10%[9] over the past eight years compared to 5.5%[9] for bank loans. Private debt is typically issued by non-banks as a means of lending to business, often directly and organized through various tranches, with various covenants on the assets to limit losses. After issuing the debt, funds organize loans into portfolios for investors and may apply leverage to optimize returns per unit of risk. While private debt is not necessarily a new asset class (as leveraged loans have been investable for over three decades), the 4x growth of AUM to over $800B[10] globally within the past ten years, along with increasingly sophisticated investment strategies, justifies further research into the drivers of return. A large portion of non-bank loans are sourced from investment managers known as Business Development Companies (BDCs), who collectively manage over $100B[11] in loans, often to companies in the "middle-market" with less than $100m in EBITDA. Given growing demand for private debt in institutional portfolios, Invesco Investment Solutions have formed a building block approach to estimating our CMAs, comparable to both our fixed income and private asset methodologies.



For illustrative purposes only.

Yield

While the yield of a BDC is relatively simple to find, as many of them are public companies, this is not the case for their individual loans. The private, often bespoke, nature of a BDC's loans requires a bit of digging to identify their characteristics. Public BDCs, of which we have roughly 20 in our sample, publish their outstanding book of loans on a quarterly basis in SEC filed 10K's and Q's[12]. To aggregate the data, we have developed a bottoms-up method of scraping this loan data to create weighted average yields of the fair market value for both first and second lien debt. In practice it is recommended to blend this current yield estimate with historical average yields to provide a longer-term view of what an investor may experience in terms of yield as they deploy capital. The return forecasts below are based on current observation but would be muted by capital deployment schedule and deal availability in practice.. As expected, the riskier debt of second lien issues carries a significantly higher yield to compensate investors.

In general, this yield calculation is the primary driver of positive expected return for the private debt asset class due to the floating rate nature of these bonds. Because most of these loans are held to maturity, there is no need to provide building blocks for either roll or valuation change, which require more distant between maturity points on the yield curve.

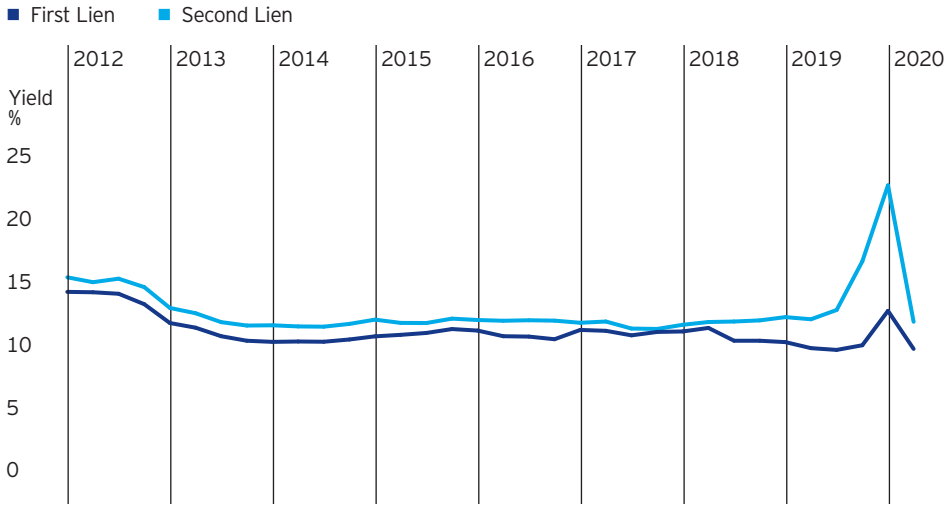
Figure 45: Scraping BDC filings to generate a weighted average yield

			Unobservable Input		
Asset Category	Fair Value	Primary Valuation Techniques	Input	Estimated Range	Weighted Average Yield
First lien senior secured loans	$5,836	Yield analysis	Market yield	5.4% - 17.1%	9.2%

First Lien (FL) Yield = (BDC_a Fair $Value_{FL}$ x $Yield_{FL}$) / Total BDC Market $Value_{FL}$

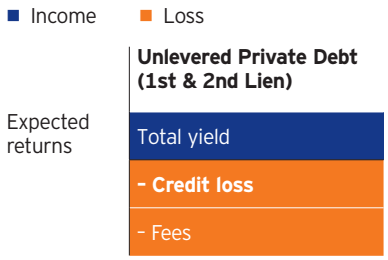
9 Invesco, SEC, Sept. 30 2020. Private debt unlevered first lien yields are sourced directly from BDC 10K and Qs then asset weighted.
10 Preqin, 2019 Global Private Debt Report
11 Deloitte, S&P Capital IQ, 2018
12 10K's and Q's are annual and quarterly filings of public companies in the United States.

Figure 46: Building blocks of unlevered private debt (1st and 2nd lien)



Source: Invesco Investment Solutions Proprietary Research, SEC, Sept. 30, 2020

Credit Loss



For illustrative purposes only.

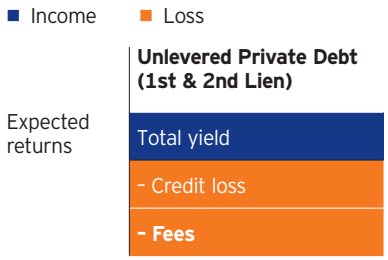
By researching prior defaults within the private debt space, we can determine a level of credit losses that BDCs have experienced on average for their various tranches. Our global credit loss model for bank loans, places the average loss at around 1.1%[13]. Recovery rates are slightly lower for first lien private debt, 60.5% compared to 67% for loans, accounting for the difference between the two rates. Private debt's historical average recovery rate is 60.5% for first lien and 32.5% for second lien, while the default rate for both is 3.49%. Based on our research of the private debt market, total credit losses are expected to be 1.37% for first lien and 2.36% for second lien[14] debt.

13 Invesco, Mar. 31 2020. Average 10-year credit loss estimate calculated using data from 1992 to 2020.

14 Fitch, 2017. Loan data within the report are from 2007 to 2016

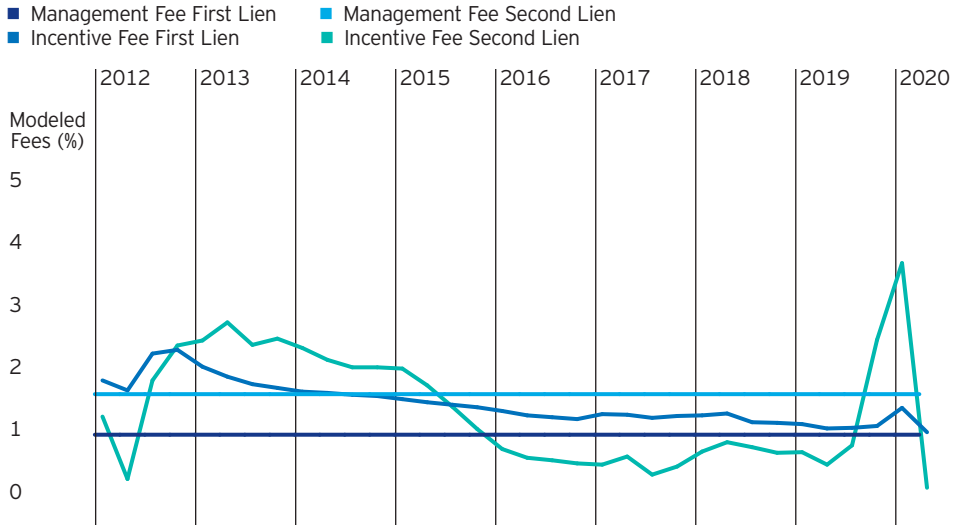
Fees

As with most of our private asset estimates, the typical way to access the underlying private securities are through funds rather than investing in the securities directly. Fees generated off private debt funds often significantly detract from expected returns. Like most private assets, there are management fees and incentive fees which vary by fund, tranche, and individual loan. From the largest BDC, we estimate first lien fees to be 0.85% and 1.5% for second lien. Incentive fee structures are often embedded with a hurdle rate that limits payouts if IRRs for the fund fall below it and, from our research, we have found the average to be 5% for first lien and 8% for second lien. Carried interest of profits to General Partners (GPs) in the form of a percentage is determined to be 12.5% for first lien and 20% for second lien. Finally, a catch-up provision, where GPs split excess profits with Limited Partners (LPs) after a predetermined level (often the hurdle rate), is observed to be 50%.



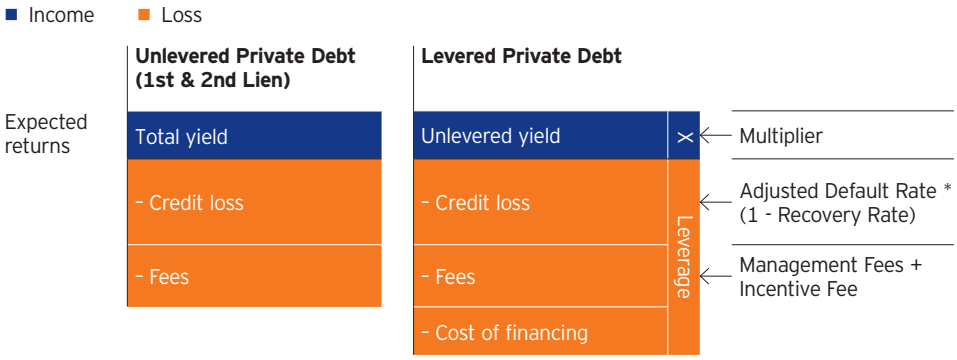
For illustrative purposes only.

Figure 47: Modeling private debt incentive and management fees for 1st and 2nd liens



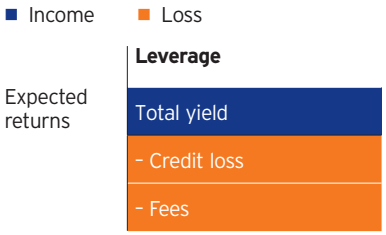
Source: Invesco Investment Solutions Proprietary Research, June 30, 2020. Latest data available.

Figure 48: Comparing building blocks of unlevered private debt to levered private debt



For illustrative purposes only.

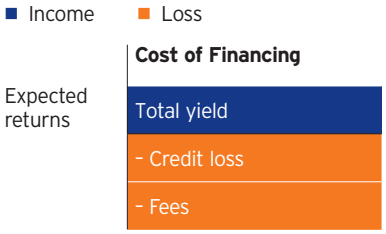
Leverage



For illustrative purposes only.

Leverage is common in private debt funds and usually it is applied to first lien debt. We assume an industry standard debt to equity ratio of 100%, or 1x leverage, is applied to both the unlevered yield and credit losses. Incentive fees are further amplified as they are derived from the fund's performance, should it be greater after adding leverage and subtracting losses. As there are many bespoke deals within the private debt space, by applying our methodology and building block approach, leverage can be adjusted depending on any given fund, altering the rest of the leveraged CMA.

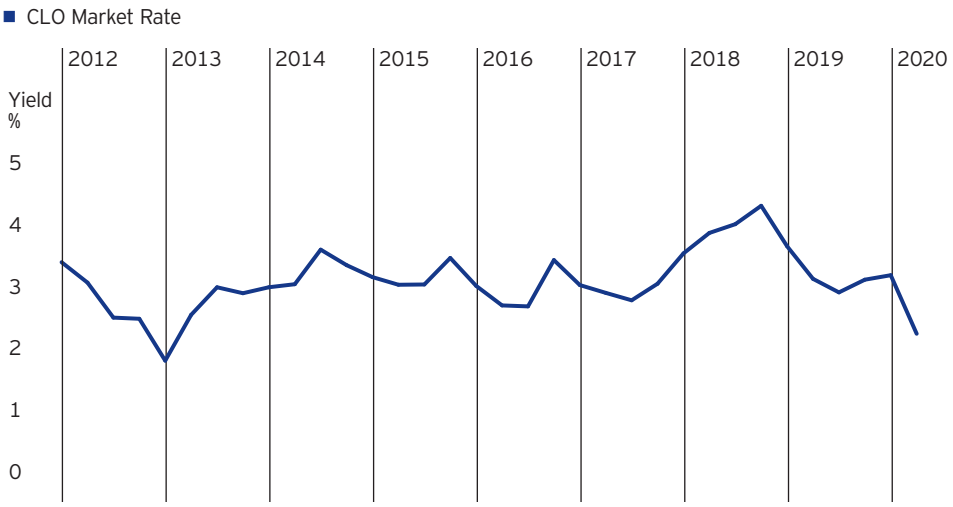
Cost of Financing



For illustrative purposes only.

As private debt funds lever their portfolios, they are typically funded at present market rates for Senior CLOs. This extra cost to apply leverage is a detractor from overall expected returns.

Figure 49: Estimating the cost of debt for levered private debt using Senior CLOs



Source: Invesco Investment Solutions Proprietary Research, June 30, 2020

Figure 50: 10-year estimated Private Debt total returns (USD)

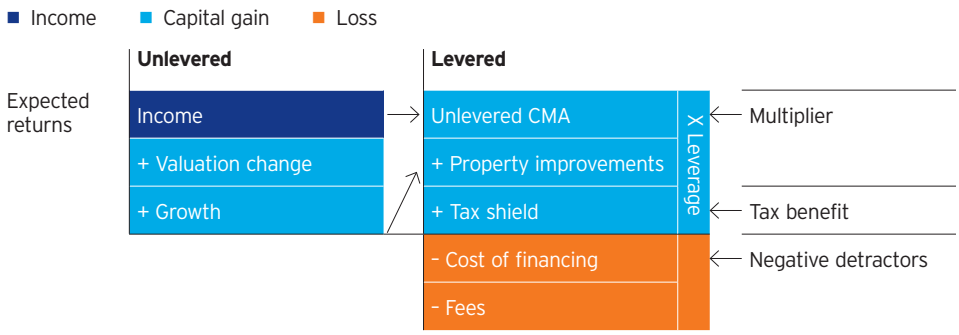
Asset class	Estimated return %	Total Yield %	Credit Loss %	Fees %	Cost of financing %
Unlevered Private Debt: 1st Lien	6.24 =	9.35	-1.37	-1.74	0
Unlevered Private Debt: 2nd Lien	7.65 =	11.51	-2.36	-1.50	0
Levered Private Debt	11.36 =	18.7	-2.74	-2.47	-2.13

Source: Invesco, estimates as of June 30, 2020. All total returns data is annual. These estimates are based on our capital market assumptions which are forward-looking, are not guarantees, and they involve risks, uncertainties and assumptions.

Private Direct Real Estate

The structure of Direct Real Estate (DRE) investments differ from their public counterpart in Listed REITs, in that REITs trade similarly to listed equity and have been shown empirically to show a positive correlation to listed equities over time with similar levels of volatility. On the contrary, private Real Estate exhibits a lower correlation to listed equity along with lower volatility. Listed REITs will often use leverage to amplify returns, which also amplifies volatility. We model private real estate on an unlevered basis first and then allow leverage to enter the equation after we have determined the return associated with the unlevered asset. A building block framework for CMAs that focuses on income and capital appreciation makes the unlevered DRE asset class model comparable to that of other asset classes, then easily scales to the levered version once one accounts for leverage, cost of financing, and tax benefits.

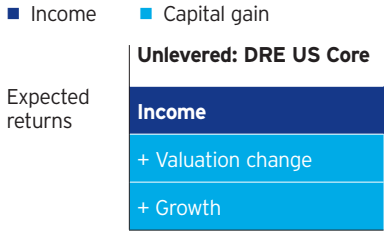
Figure 51: Comparing the building blocks of Unlevered Private Direct Real Estate (DRE) to Levered DRE



For illustrative purposes only.

Unlevered: Direct Real Estate US Core

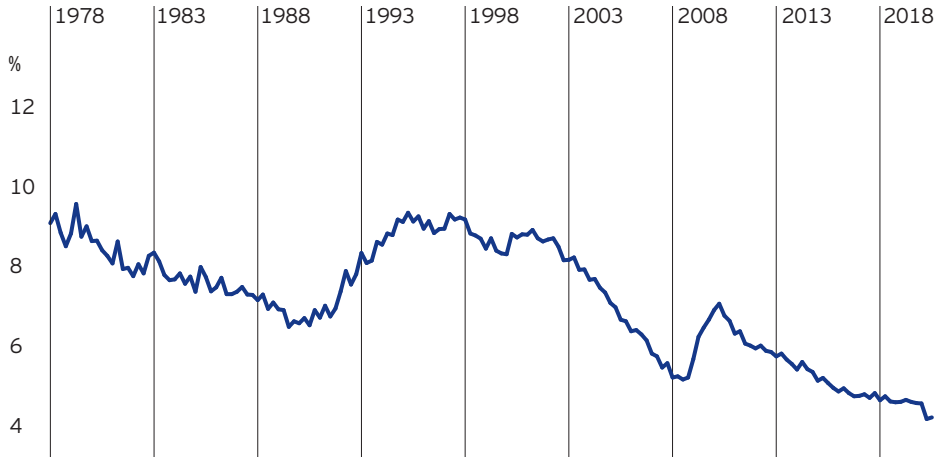
Income



For illustrative purposes only.

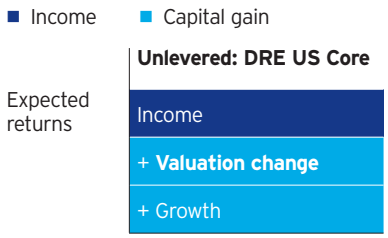
Starting with the capitalization rate (cap rate), a proxy for rental income from the NCREIF Property Index (NPI), we subtract expected capital expenditures required to maintain a property, of 1.5%, which is slightly less than the 2% reported in academic research (Gosh and Petrova, 2017). Cap rates for US Core Real Estate have been similarly falling since the 1980's in a similar fashion to most yields globally, from 9.5% to 4.5% today.

Figure 52: NCREIF Property Index Cap Rate from 1978 to 2020



Source: Invesco, estimates as of Sept. 30, 2020.

Valuation Change



For illustrative purposes only.

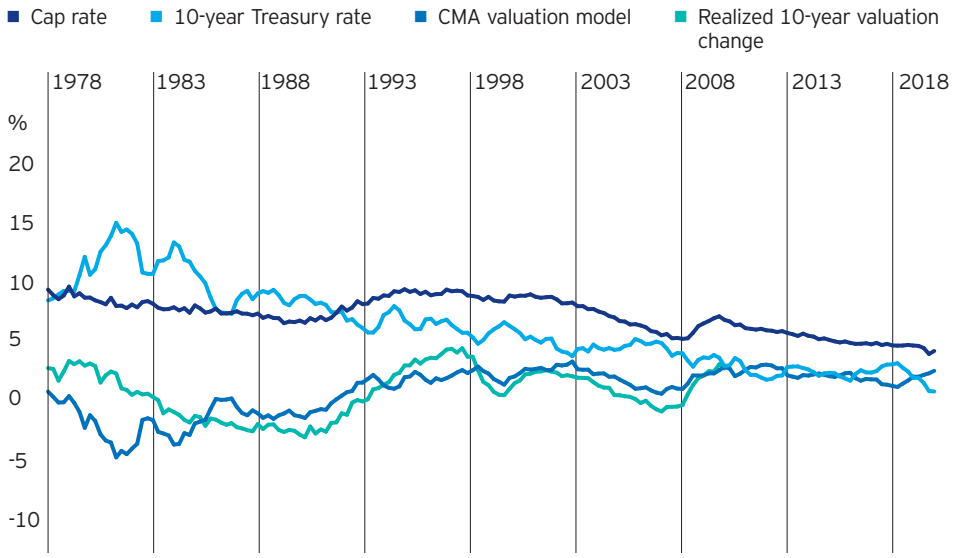
To isolate US Core Real Estate's valuation change, we start with the NCREIF capital return index and remove Capex, real NOI growth and inflation. We found a relationship between valuations, cap rates, and US rates as follows, especially using the data after 1990.

Valuation model: $\hat{V}_{t \to t+t+10} = 0.70 \times (RF_{Cap,t} - \widetilde{RF}_t)$

RF_{Cap} = Cap rate; $\widetilde{RF}$ = 10-year Treasury nominal rate

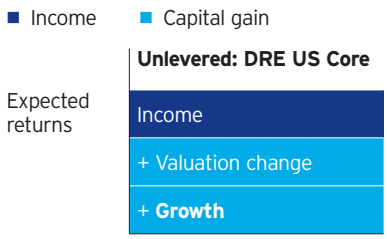
References:
Ghosh and Petrova 2017, The impact of capital expenditures on property performance in commercial real estate, The Journal of Real Estate Finance and Economics 55, 106-133

Figure 53: Predicted US core direct real estate valuation change model and inputs



Source: Invesco, estimates as of Sept. 30, 2020.

Growth



For illustrative purposes only.

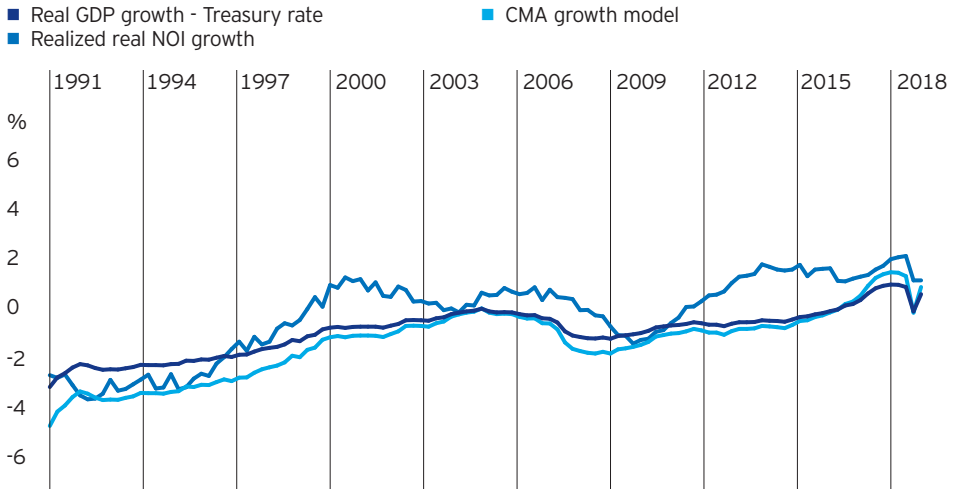
To identify expected real rental income growth, or net operating income, we multiply the difference of expected real GDP growth with that of US interest rates by 1.5, the Beta we identified of the model's inputs to future income growth. The coefficient is estimated by studying the relationship between realized NOI growth in NPI index with realized GDP growth and treasury rate. We also use the NOI growth number in the NCREIF-ODCE index as a robustness check.

Growth model: $\hat{G}_{NOI,t} = 1.5 \times (G_{GDP,t} - RF_t)$

$G_{GDP,t}$ = Real GDP growth rate; RF_t = 10-year Treasury real rate

Finally, to get a nominal growth rate, we add inflation expectations estimated by the Cleveland Fed.

Figure 54: Real NOI growth model and inputs



Source: Invesco, estimates as of Sept. 30, 2020.

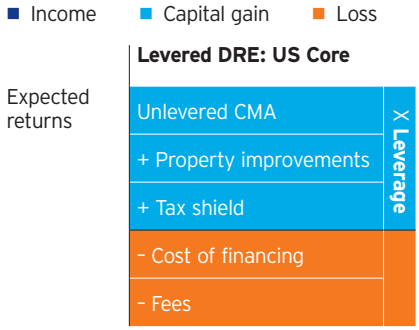
Figure 55: 10-year estimated US core direct real estate unlevered market total returns (USD)

Asset class	Estimated return %	Income %	Valuation change %	Growth %
US Core Direct Real Estate Unlevered	8.83 =	2.56	2.37	3.90

Source: Invesco, estimates as of Sept. 30, 2020. All total returns data is annual. These estimates are based on our capital market assumptions which are forward looking, are not guarantees, and they involve risks, uncertainties and assumptions.

Levered: Direct Real Estate US Core

Leverage



For illustrative purposes only.

Starting with the unlevered return and adding in a property improvement assumption of 2% as this term captures the value add or alpha a manager provides in DRE (Lee, Shilling, and Wurtzebach 2016), we can begin to estimate a levered version of the DRE US Core model. Once a loan is financed, we use the loan-to-value (LTV) ratio to estimate the amount of leverage being applied and use it to scale the unlevered return CMA. As taxes are paid only on the real estate's value but not on the loan, we add back in a tax benefit based on current tax rates and amount of leverage applied to the loan. The current corporate tax rate of 21% is applied to derive the size of the benefit. Finally, we subtract a cost of capital which, we estimate from our commercial mortgage-backed securities (CMBS) CMA with a duration of around five years. As financing costs increase, the difference between the levered and unlevered return shrinks.

References:
Lee, Jin Man, James D. Shilling, and Charles Wurtzebach. "A New Method to Estimate Risk and Return of Commercial Real Estate Assets from Cash Flows: The Case of Open-End (Diversified) Core Private Equity Real Estate Funds." (2016).

Given a certain leverage level, the levered CMA return is calculated as follows:

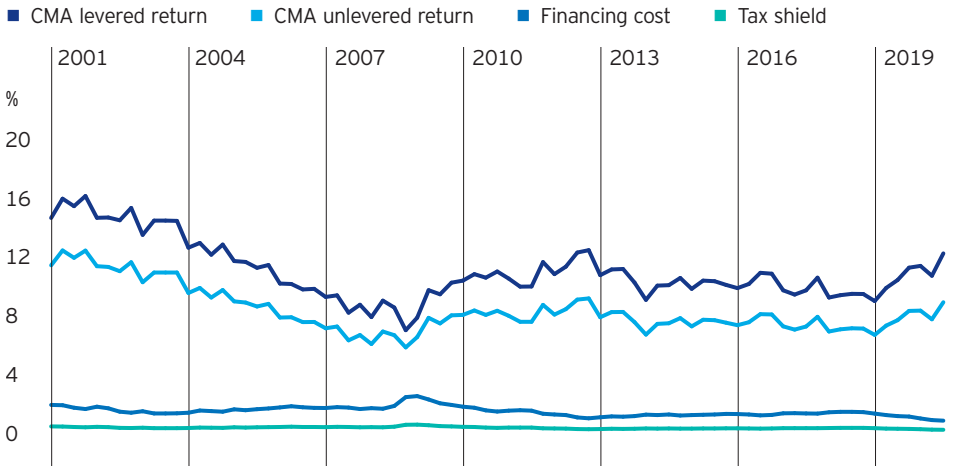
$$R_{DRE,\ Levered} = (R_{DRE,\ Unlevered} + Property\ Improvement)\ x \frac{1}{1 - LTV} - R_{Cost\ of\ Capital}\ x\ \frac{LTV}{1 - LTV} + Tax\ shield - Fees$$

$R_{DRE,Levered}$ = Levered CMA return; $R_{DRE,\ Unlevered}$ = Unlevered CMA return; Property Improvement = Assumed to be 2%; LTV = Loan to value ratio assumed to be 22.5%; $R_{Cost\ of\ Capital}$ = Expected (CMBS) rate from public CMA;

Tax Shield = $R_{Cost\ of\ Capital}$ x $\frac{LTV}{1 - LTV}$ x Corporate Tax Rate (21%);

Fees = Assumed management fee of 1.2% (Source: Invesco GDRE).

Figure 56: US Core DRE CMA Return with leverage and without (%)



Source: Invesco, estimates as of Sept. 30, 2020. Past performance is not a guide to future returns.

Figure 57: 10-year estimated US core direct real estate levered market total returns (USD)

Asset class	Estimated return %	Unlevered return %	Property improvement %	Tax shield %	Cost of financing %[15]	Fees %
US Core Direct Real Estate Levered	12.15 =	8.83	+2.00	+0.16	-0.78	-1.20

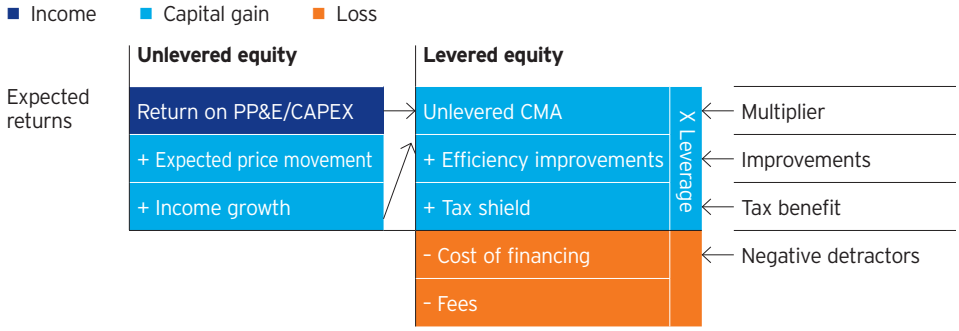
Source: Invesco, estimates as of Sept. 30, 2020. All total returns data is annual. These estimates are based on our capital market assumptions which are forward looking, are not guarantees, and they involve risks, uncertainties and assumptions.

15 Cost of Financing = $R_{Cost\ of\ Capital}$ * LTV / (1-LTV)

Private Infrastructure: Equity

Over the past two decades, the degree in which private capital is able to participate in the financing and operation of public infrastructure developments has grown substantially (Preqin, 2019). Due to expectations around growing populations, the enhanced infrastructure of previously less developed economies, and the replacement of aging assets globally this asset class is expected to continue its growth pattern over the next decade (IMF, 2019). As a result, we expect an expanding number of investors to show an interest in the infrastructure space.

Figure 58: Comparing the building blocks of Unlevered Private Infrastructure Equity to Levered Private Infrastructure



For illustrative purposes only.

The building blocks for Private Infrastructure equity - levered are:

+ **Return on PP&E.** A property's income is its return on property plant and equipment (PP&E), which is calculated as Net Operating Income (NOI) divided by Net PP&E, or how much income is generated for every dollar invested in the asset. Our universe is the Dow Jones Brookfield Global Infrastructure Index. We subtract out estimated Capital Expenditures (Capex), found by identifying the median net useful life of properties outstanding in our universe, of 26 years, and from there estimate the median maintenance costs.

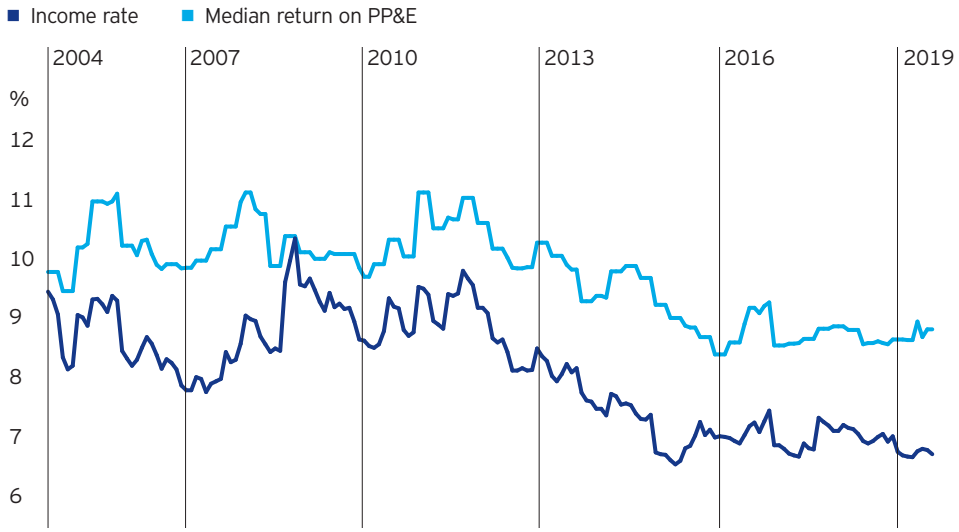
The formula for Return on PP&E for the median infrastructure property is stated as follows:

Return on PP&E (book value of property) = Operating Income/Net PP&E

Operating Income = Gross Income -Operating Expenses; Net PP&E = Gross PP&E + Capex -Accumulated Depreciation

A market value adjustment (Enterprise Value/Assets Ratio) is applied to discount PP&E to a new value, the Income Rate, which is the market value of the property (**Figure 35**).

Figure 59: Comparing median infrastructure PP&E to income rate



Source: Invesco, estimates as of June 30, 2020.

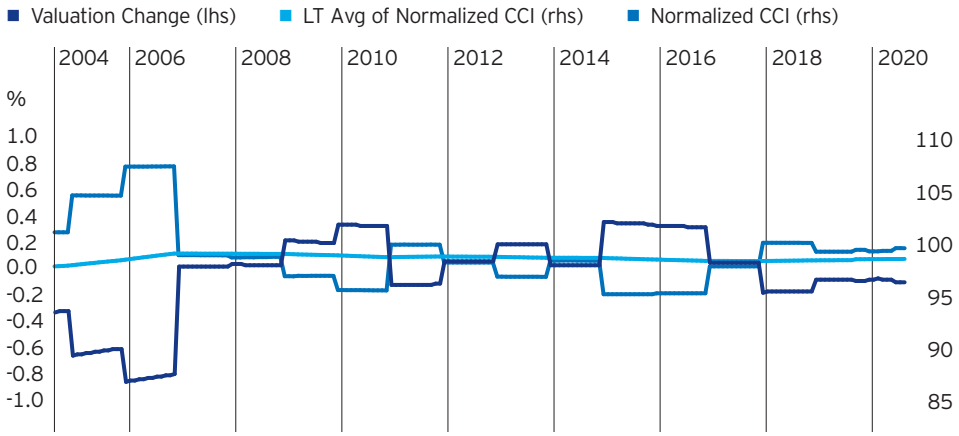
References:
International Monetary Fund. 2019. World Economic Outlook: Global Manufacturing Downturn, Rising Trade Barriers. Washington, DC, October.

+ **Valuation change.** We expect asset prices to rise with the cost of construction, which we model by normalizing the Construction Analytics' Construction Cost Index (CCI) by GDP. Overvaluation, represented by positive deviations from the long-term average, represents potential decreases in future returns.

One can calculate Valuation change using the following formula:

Valuation change = (long-term average of normalized CCI / current normalized CCI)$^{(1/10)}$ – 1

Figure 60: Expected price movement for Private Infrastructure modeled by normalized CCI



Source: Invesco, estimates as of Sept. 30, 2020.

+ **Income Growth.** US infrastructure properties NOI growth is estimated by nominal GDP.

Figure 61: 10-year estimated private infrastructure equity – unlevered market total returns (USD)

Asset class	Estimated return %	Income %	Valuation change %	Growth %
Private Infrastructure Equity – Unlevered	7.07 =	2.99	-0.10	+4.18

Source: Invesco, estimates as of Sept. 30, 2020. All total returns data is annual. These estimates are based on our capital market assumptions which are forward looking, are not guarantees, and they involve risks, uncertainties and assumptions.

The building blocks for Private Infrastructure equity, levered, are similar to that of Private Direct Real Estate.

Given a certain leverage level, the levered CMA return is calculated as follows:

$$R_{DRE,\ Levered} = (R_{DRE,\ Unlevered} + Efficiency\ Improvements) \times \frac{1}{1 - LTV} - R_{Cost\ of\ Financing} \times \frac{LTV}{1 - LTV} + Tax\ shield - Fees$$

Where:

+ **Efficiency improvements.** Private asset managers are assumed to improve Return on PP&E from median to the third quintile level in the infrastructure universe.
+ **Leverage.** Once a loan is financed, we use the loan-to-value (LTV) ratio of 33%, the median leverage of the universe, to estimate the amount of leverage being applied and use it to scale the unlevered return CMA.
+ **Tax Shield.** The tax rebate on assets purchased by debt applies to all levered assets.
+ **Cost of financing.** Like that of private equity or direct real estate, the cost of financing is a negative component of expected returns for levered private infrastructure. The CMA yield on private investment-grade global infrastructure debt (**Figure 62** in the following section) is our choice to estimate the current cost to fund these assets.
+ **Fees.** Management fees are calculated as a flat fee of 150 bps, the median of the funds within the private global infrastructure category from Preqin, and 20% carried interest.

Figure 62: 10-year estimated private infrastructure equity – levered market total returns (USD)

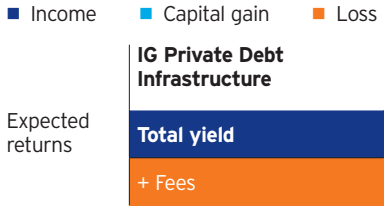
Asset class	Estimated return %	Unlevered return %	Property improvement %	Tax shield %	Cost of financing %	Fees %
Private Infrastructure Equity - Levered	8.37 =	7.07	+1.41	+0.26	-1.24	-3.37

Source: Invesco, estimates as of Sept. 30, 2020. All total returns data is annual. These estimates are based on our capital market assumptions which are forward looking, are not guarantees, and they involve risks, uncertainties and assumptions.

Private Infrastructure: Debt

The building blocks for Private Infrastructure Debt - Investment Grade are:

Total yield



For illustrative purposes only.

Like a public bond, a yield estimate (**Figure 63**) is the key driver of return for private infrastructure debt. The major difference is that the current yield is the spread of global infrastructure yield over global treasuries plus LIBOR, as most of the debt is floating rate. Structurally, unlisted debt is not traded and thus not exposed to yield curve movements like rolldown or valuation changes.

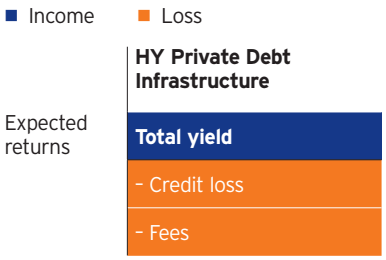
Figure 63: 10-year estimated Private Infrastructure Debt IG market total returns (USD)

Asset class	Estimated return %		Total yield %	Roll return %	Valuation change %	Credit loss %	Currency translation %
Private Infrastructure Debt IG	2.14	=	1.62	0	0.18	0	0.33

Source: Invesco, estimates as of Sept. 30, 2020. All total returns data is annual. These estimates are based on our capital market assumptions which are forward looking, are not guarantees, and they involve risks, uncertainties and assumptions.

The building blocks for Private Infrastructure Debt – High Yield are:

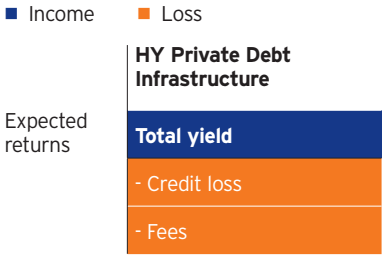
Total yield



For illustrative purposes only.

Taking a similar approach as investment-grade private infrastructure debt in estimating total yield, the only difference is the current yield where global infrastructure high-yield spreads are taken over global AAA yields.

Credit loss



For illustrative purposes only.

Minimal losses are anticipated even in high-yield infrastructure as an estimated 2.5% of all issues default with a 73% recovery rate. This is a higher rate than traditional high yield due to the asset backed nature of the debt.

Figure 64: 10-year estimated Private Infrastructure Debt HY market total returns (USD)

Asset class	Estimated return %	Total yield %	Roll return %	Valuation change %	Credit loss %	Currency translation %
Private Infrastructure Debt HY	4.29 =	4.42	0	+0.30	-0.68	+0.25

Source: Invesco, estimates as of Sept. 30, 2020. All total returns data is annual. These estimates are based on our capital market assumptions which are forward looking, are not guarantees, and they involve risks, uncertainties and assumptions.

09

Alternatives: Listed Real Assets and Hedge Funds

Estimating returns for alternative investments is more complex than evaluating equities and fixed income, as the range of alternatives ("alts") available runs the entire spectrum of risk.

Real assets, commonly used for inflation hedges, include a broad category of diversifying alternatives and the even the sources of the hedge are often different. Listed REITs and Infrastructure tend to have equity-like growth characteristics, while commodities like materials and livestock are a part of producer and consumer price indices. To make matters even more complicated, commodities are composed of both pro- (industrial metals) and counter-cyclical assets (i.e. precious metals), some of which trade like currencies or even interest rates, with their own unique supply and demand curves.

Hedge funds, another set of diversifying alternatives, vary widely in terms of their risk characteristics as well. Managers source risk from various investment strategies in their portfolio and look to deliver either well timed beta or pure alpha. Portfolios in this asset class are often composed of multiple asset classes or securities with discretion to dial risk up or down and often use leverage to reach their objectives.

When searching for uncorrelated risk to diversify a traditional equity and fixed income portfolio, investors may be able to find options in the broad array of alternative assets. In the following section, we outline our approach to developing CMAs for real assets, like REITs and Infrastructure, as well as commodities and hedge funds, all relying on unique drivers of return. To provide some level of consistency in the alternatives space, we once again turn to our building block approach to clearly identify comparable expected return sources within asset classes.

US REITs

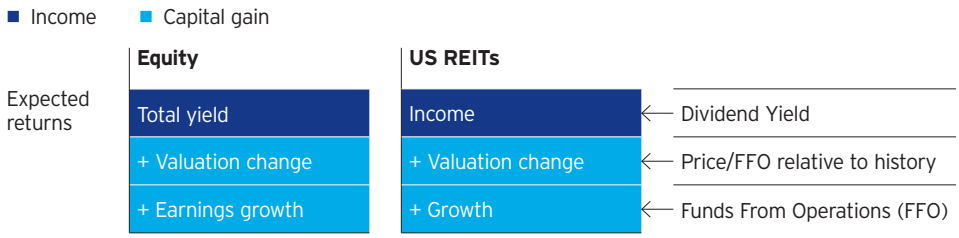
REITs, or real estate investment trusts, are companies that own or finance income-producing real estate across a range of property sectors. Common equity REITs are commercial and residential buildings, but also include industrials and newer, growing, sub-sectors like data centers and self-storage. Investors in US REITs are entitled to a special pass-through tax deduction as long as the REIT distributes at least 90% of their earnings to shareholders as dividends. REITs' tax benefits are in place to reduce double taxation and incentivize investor exposure to real estate income.

At year-end 2019 there were 158 publicly traded equity REITs, excluding mortgage REITs, operating in the United States with an equity market capitalization totaling over $1 trillion (USD) compared to $30 trillion for S&P 500. Having been a part of the Financials sector of the S&P 500 since 2001, and their own GICS sector since 2016, REITs have become a large part of many portfolios investing in market-cap-weighted US large-cap assets. Long-term performance from their inclusion has been impressive, as the REITs sector has outperformed the broad US index by over 4% with a 3% higher dividend yield[16]. Diversification benefits for REITs exist as well. Correlations between US REITs and equities (US, EM and DM ex-US) have been between 0.5 and 0.7, meaningfully below their correlations to each other[16].

Compared to public equities, our CMAs for REITs are fairly similar, focusing on income, valuation change, and growth **(Figure 65)**. The underlying economics of the building blocks between the two assets differ in that REITs grow from expanding their funds from operations (FFO) while equities grow their earnings. Additionally, REITs' valuation ratios reflecting FFO as the fundamental denominator are used instead of earnings as well.

16 Source: Invesco Investment Solutions, FactSet. Dates measured for total returns, correlation, and dividend yield are from Jan. 2000 to Sept. 2020. Past performance is not a guide to future returns.

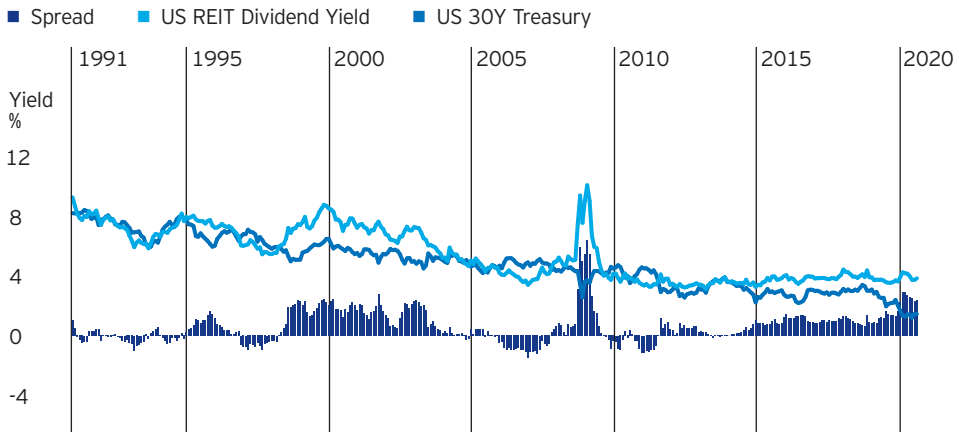
Figure 65: Comparing the building blocks of Equities and REITs



For illustrative purposes only.

Dividends are the primary way that REITs distribute cash to shareholders because of their special tax status. This also leads to higher overall yields than equities if one just compares the size of their respective dividends. Equities have more flexibility on how to return cash and more frequently have tended to do so with buybacks instead of dividends **(Figure 66)**. Due to COVID-19 adjustments, we slightly lowered our dividend yield expectations relative to present market yields as the asset class has experience significant downward pressure in certain sectors like offices, resorts, and retail.

Figure 66: Equity REITs dividend yields spread to long maturity bonds



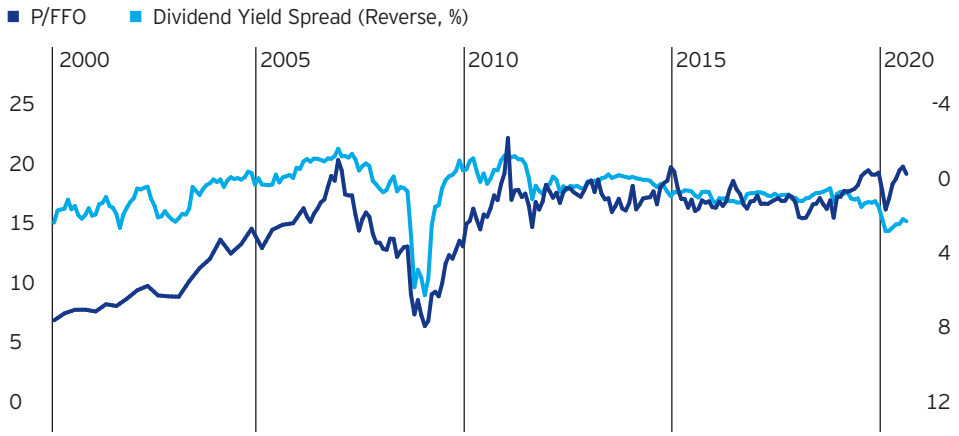
Sources: Invesco Investment Solutions, FactSet from Jan. 31, 1991 to Sept. 30, 2020.

To model the future fundamental value of a REIT compared to its own historical pricing, we start with the drivers of return for REITs, dividend yield spread and term spread. Both of these metrics rely heavily on the shape of the yield curve.

As a long duration asset which borrows far out onto the yield curve to source debt and invest in properties, REITs' yields have correlated highly to that of a 30-year treasury, trading fairly in line or slightly above the bonds due to excess risk premia. The spread between REIT dividend yields and the 30 year-treasury is what we define as the dividend yield spread. Starting with dividend yield spread and comparing that to the P/FFO ratio, one can clearly see a strong inverse relationship **(Figure 67)**. P/FFO increases as property values go up, and dividend yield spread decreases as the cap rate spread goes down. This is supported by academic literature from Lui and Mei (1992)[17] where they find that equity REITs returns can be predicted by cap rates and T-bills.

17 Liu, C. H., and J. Mei. (1992). "The Predictability of Returns on Equity REITs and Their Co-movement with Other Assets," Journal of Real Estate Finance and Economics 5, 401-418.

Figure 67: Observing the inverse relationship between equity REITs dividend yield spread and valuations

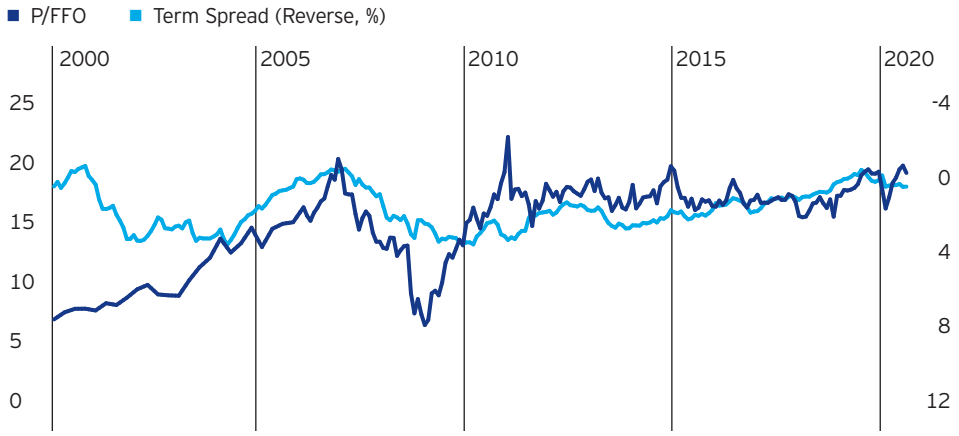


Source: Invesco Investment Solutions, FactSet and NAREIT, from Jan. 31, 2000 to Sept. 30, 2020.

The second component of our REIT valuation model involves the yield curve, otherwise known as the term spread. Chen, Hsieh, Vines and Chiou (1998)[18] found that shocks to the term spread significantly explained equity REITs returns. Our intuition approaching this component was that when the yield curve is inverted or flat (lower term spread), investors tend to seek investment vehicles with stable incomes, such as REITs, because of the weak economic growth outlook; in turn, P/FFO is higher due to the higher demand of REITs.

Further, low long-term interest rates tend to provide attractive financing conditions for real estate investments. After plotting this component with P/FFO, a reasonably strong inverse relationship was found **(Figure 68)**.

Figure 68: Second model component, the term spread, compared to equity REIT valuations



Source: Invesco Investment Solutions, FactSet and NAREIT, from Jan. 31, 2000 to Sept. 30, 2020.

Our final model to determine valuation change relative to a long-term mean using these two components resulted in a strong fit as measured by an R^2 of 0.32, significant t-stats of less than -4, and low collinearity between independent variables (of .01). As single variable regressions, both the dividend yield spread and term spread provide high explanatory power, and both improve the R^2 of the model when added together **(Figure 69)**.

18 Chen, S. J., Hsieh, C., Vines, T., & Chiou, S. (1998). Macroeconomic variables, firm-specific variables, and returns to REITs. Journal of Real Estate Research, 16(3), 269-277

Figure 69: Final valuation change model and results

Final REIT Valuation Model: P/FFO = a + b1* Div Yld Spread + b2* Term Spread

	Intercept	Div Yld Spread	Term Spread
Coefficients	17.88	-0.51	-0.93
T-stat	61.26	-4.33	-7.16
R^2	0.32		

Date	Rolling 5Y Fitted P/FFO	Observed P/FFO	Valuation Change (%)
Sept. 30, 2020	16.33	18.86	-0.01%

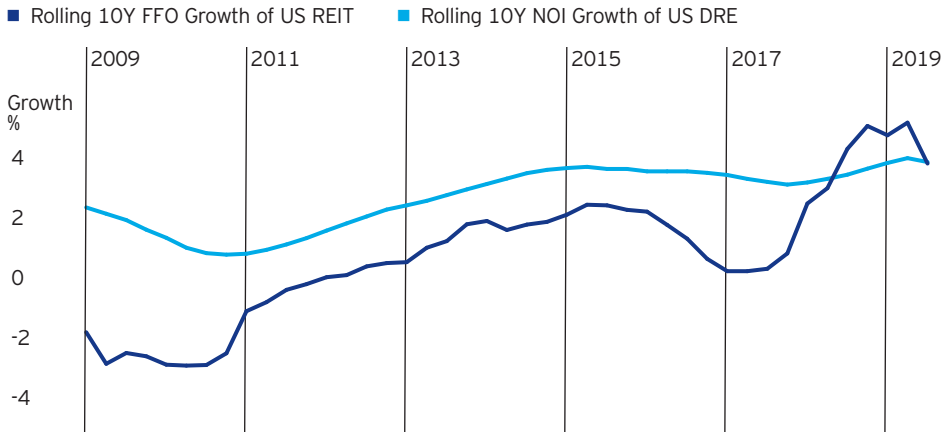
Source: Invesco Investment Solutions, FactSet and NAREIT, from Mar. 31, 2000 to Sept. 30, 2020.

In a similar fashion to our yield adjustments, we lowered our expectations for FFO in US equity REITS, slightly raising our expected P/FFO valuation ratio.

Growth

Net Operating Income (NOI) for direct real estate is a great starting point for estimating FFO for REITs as most of REITs income comes from property rents. NOI is often deemed similar to EBITDA in equity markets, as it is pre-interest, tax, and depreciation, and it is the primary metric when estimating the value of a private asset. FFO contrasts this as it excludes the full value of the business and only focuses on the equity portion of the assets, which is valuable for a publicly traded company. The loan-to-value ratio of REITs is around 30% in US, after considering the financing costs, we use 1.2X as our leverage multiple to derive an final, levered, expected FFO growth.

Figure 70: Real estate fundamental metrics, annualized rolling growth of FFO and NOI



Source: Invesco, estimates as of Sept. 30 2020.

Figure 71: 10-year estimated US REIT total returns (USD)

Asset class	Index	Expected Return (%)	Yield (%)	Expected Growth (%)	Valuation Change (%)
US REITs	FTSE NAREIT Equity	9.51 =	3.84	+6.56	-0.89

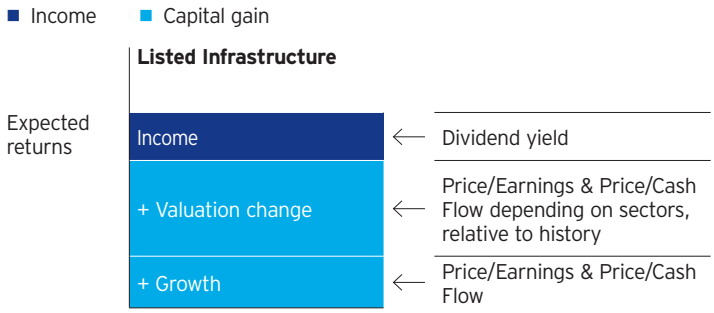
Source: Invesco, estimates as of Sept. 30, 2020. All total returns data is annual. For illustrative purposes only. These estimates are based on our capital market assumptions which are forward-looking, are not guarantees, and they involve risks, uncertainties and assumptions.

As the world undergoes massive levels of urbanization, we expect demand for infrastructure will only increase. Similar to REITs, listed infrastructure is composed of publicly traded companies that own or operate physical assets which provide services to billions in the form of airports, railroads, utilities, telecoms, and pipelines. Many of these companies engage with local governments to develop and maintain these properties in public-private partnerships. Though infrastructure firms' assets are fairly heterogenous, they operate similarly as cash generators based on overall utilization. Busy, well maintained, airports or railway lines will likely generate larger amounts of cash than their unpopular or deteriorating competition.

Listed Infrastructure

The firms or funds that invest in infrastructure properties trade somewhere between the actual private underlying contracts and equity instruments, generating less stable income or inflation-hedging than the property, with more equity-like volatility, in exchange for daily liquidity, management expertise, diversification of projects, and lower fees. Another tradeoff when considering public or private infrastructure involves the level of control of the project. Owning listed infrastructure limits the amount of direct influence on the actual property or choosing how to allocate capital expenditures towards improvements or efficiencies. A benefit of the public option is the potential to spot mispricings relative to their underlying value as they are listed on exchanges.

Overall, given demand for listed infrastructure, we sought to provide investors with reasonable estimates of their return drivers that connect to both our CMAs for equities and private infrastructure equities; yield, growth, and valuation change.



+ **Yield:** Like REITs, dividend yield represents a large portion of the way listed infrastructure firms pay out cash to investors. The yield for most infrastructure sectors hovers around 3.5% with some variation depending on price pressure; across geographies (for example, in Utilities, they are slightly lower in China and higher in Europe), sectors (higher in mid-stream energy than telecoms), or within individual subsectors (like Telecom, where yields are lower in towers and higher in satellites).
+ **Growth:** Infrastructure sectors are often slightly different in terms of how they source economic growth and require a more nuanced, bottoms-up approach to formulate forecasts compared to equities. Our estimates for sector weights in the market and growth are reviewed annually and provide a basis for identifying long term trends. Take for example, telecoms, which in 2003 were less than 3% of the index, now they're 23%,[16] while the exact opposite picture has played out for transportation. Since we do not consider telecom's growth trend sustainable, we average the five- and ten-year growth numbers to generate a more realistic estimate of the growth path's deceleration. Along with variable growth rates, the metrics which we use to estimate growth differ as well; similar to our equity CMAs, utilities use economic projections from their various regions, a measure highly correlated to earnings growth as they have minimal depreciation expenses, this differs with our approach for all other sectors, like airports or railroads, which mirror our growth building block for REITs where we use the long term average growth of cash-flows.
+ **Valuation Change:** Consistent with the reversion of valuations from both equity and REIT CMAs, we expect listed infrastructure's sectors, once weighted, to eventually return to its long-term average. This change determines if the market is over- or under- priced relative to our expectations.

See Section 14 for further details on our scenario based process of adjusting CMAs

When facing an uncertain path due to economic shocks, presently COVID-19 related, we provide similar fundamental adjustments for listed infrastructure as the rest of our CMAs. By nowcasting each individual sector based on consensus estimates and subjective judgements from the Investment Solutions team, we are able to create path dependent estimates of all of our building blocks.

Figure 72: 10-year estimated Listed Infrastructure total returns (USD)

Asset	Index	Expected Return (%)	Dividend Yield (%)	Expected Growth (%)	Valuation Change (%)
Listed Infrastructure	DJ Brookfield Global Infrastructure Index	9.52 =	3.39	+6.85	-0.71

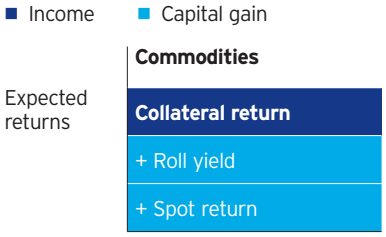
Source: Invesco, estimates as of Sept. 30, 2020. All total returns data is annual. These estimates are based on our capital market assumptions which are forward looking, are not guarantees, and they involve risks, uncertainties and assumptions.

Commodities

To estimate commodities returns we analyze the futures curve, which is a graphical representation of commodity contracts (agreements to buy or sell a predetermined amount of a commodity at a specific price on a specific date in the future) that expire at different maturities. As with other asset classes, we apply the building block approach to the futures curve to identify yield (collateral return) and appreciation (roll return and spot return) as the main constituents of total return.

Within the asset class, we apply this methodology consistently across the individual commodity sectors that make up the main commodity indices, the S&P GSCI Index and the Bloomberg Commodity Index including Agriculture, Energy, Industrial metals, Livestock, and Precious metals.

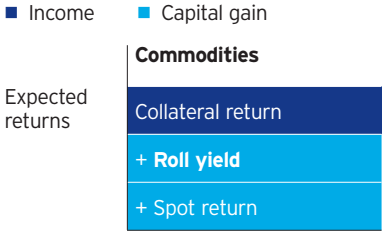
Collateral return



For illustrative purposes only.

Collateral return is meant to reflect the value of the return on cash, which is needed as collateral for trading in commodity futures. The return is a function of the fixed income instrument in which the cash is invested – for example, short-term US T-bills. We use an average of the current US three-month T-bill interest rate and 10-year forward US three-month interest rate from the US forward rate curve to estimate this value.

Roll yield



For illustrative purposes only.

Roll yield reflects the return from rolling the commodity futures forward – in other words, from wanting to maintain exposure to a commodity after the contract has expired. It reflects the potential return from the movement in the price of the futures contract toward the spot price over time. We estimate roll yield through the difference between historical excess returns, which includes roll return and the historical spot return, which measures only the price return.

Hedge Funds

Long/short strategies, for example, behave differently than global macro. And for any alternative category, it can be a challenge to know how much of the return is true, uncorrelated alpha, and how much can be attributed to broad market exposures (e.g., S&P 500 Index). In fact, academic research (Hasanhodzic and Lo, 2007; and Fung and Hsieh, 2004) suggests that a significant portion of hedge fund returns is attributable to conventional asset class and factor risks. Leaning into this research, we construct linear models using available market indexes from our traditional asset class CMAs and measure the proportion of the estimated returns and volatility that are attributable to them.

Our capital market assumptions consider hedge fund asset classes ranging from Market Neutral, to Macro, Commodity Trading Advisors (CTAs), and Event Driven. For each of these, we perform a regression-based analysis that seeks to decompose returns as follows:

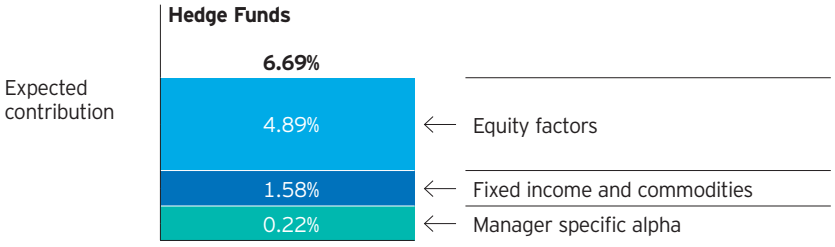
Figure 73: Decomposed hedge fund returns through a factor model

$$Hf_i = a + \sum_j bX_i$$

i = hedge fund index; j = market/conventional asset class risk factor; *j* = US Large Cap, US Mid Cap, US Small Cap, International Developed Equities, Emerging Market Equities, US Treasuries, US Investment Grade Bonds, US High Yield Bonds, International Fixed Income, Emerging Market Bonds, and Commodities.

All returns are orthogonalized based on Chow and Klein (2013), which examines the impact of individual market exposures on the return variation of risky assets. Coefficients are estimated using rolling 84-month Stepwise regressions. The regression results decompose hedge fund index returns into systemic risk (beta) and idiosyncratic risk (manager-specific alpha).

Figure 74: Estimating contribution to hedge fund returns



Source: Invesco Investment Solutions Research, Sept. 30, 2020.

Figure 75: 10-year estimated hedge fund total returns (USD)

Asset	Index	Expected return %	Systematic return %	Alpha %
CISDM CTA	CISDM CTA Index	4.66 =	2.24	+2.42
CISDM Global Macro	CISDM Global Macro Index	2.23 =	0.75	+1.48
CS Managed Futures	Credit Suisse Managed Future Index	0.99 =	1.09	-0.10
Hedge Funds	HFRI HF Index	6.69 =	6.47	+0.22
HF Event Driven	HFRI Event Driven Index	8.34 =	7.07	+1.27
HF Market Neutral	HFRI Equity Market Neutral Index	3.07 =	1.68	+1.40

Source: Invesco, estimates as of Sept. 30, 2020. All total returns data is annual. These estimates are based on our capital market assumptions which are forward looking, are not guarantees, and they involve risks, uncertainties and assumptions.

10

5-year vs 10-year CMAs

In order to facilitate our efforts to engage in more "active-strategic" portfolio management, which involves the potential to actively position our strategic portfolios within the business cycle, we expanded our CMA methodology to support a shorter time horizon of five years. While still drawing on the building block approach that underpins the 10-year time horizon, the methodology for the five-year time horizon incorporates estimating elements that are appropriate for understanding the behavior of asset classes over a shorter holding period.

Equities: 5-year versus 10-year expected returns

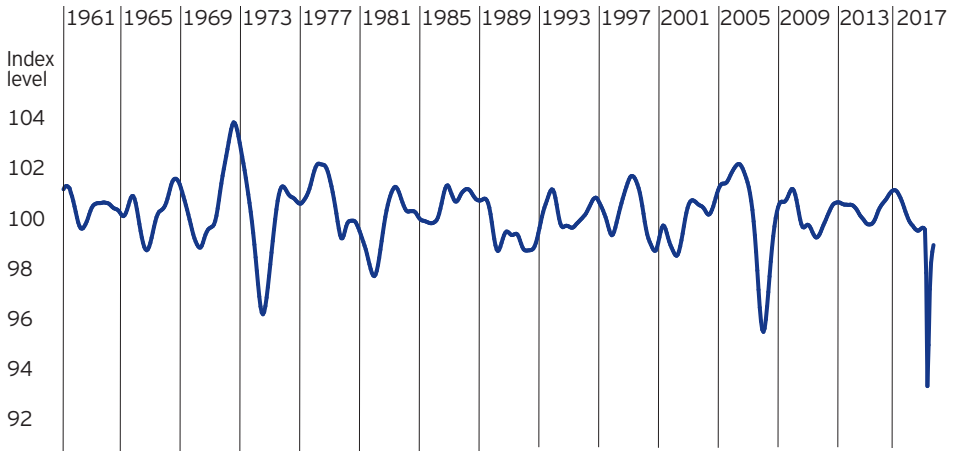
The building blocks for estimating equity returns for a five-year time horizon are generally the same as those identified for the 10-year time horizon – yield, earnings growth and valuation. However, the way in which each of these building blocks is constructed may change to better reflect shorter-term market dynamics.

+ **Yield.** Yield is estimated for the 10-year time horizon using the 10-year average total yield ratio, which reflects the impact of both dividend yield and buybacks. The same measure is used to estimate yield for the five-year time horizon.
+ **Earnings growth.** Long-term real GDP per capita provides a stable signal over time to estimate earnings growth across a 10-year time horizon. For a shorter time horizon, it needs to be adjusted to reflect a short-holding period.

Earnings growth = Long-term real GDP growth + Real GDP growth adjustment + Five-year expected inflation

According to academic research (Pritchett and Summers, 2014), economic growth rates globally have mean-reverting properties – meaning that future growth rates move in the opposite direction to current growth rates. This is particularly important in a five-year time horizon since we are not looking across the full economic cycle. We use the OECD Composite Leading Indicator (CLI) to gauge these short-term trends in economic growth. The CLI is designed to provide early signals of turning points in business cycles showing fluctuations of economic activity around its long-term potential level (which is normalized at 100).

Figure 76: Composite leading indicator (CLI) – OECD



Source: OECD. Data through Sept. 30, 2020.

Five-year real GDP growth = Long-term real GDP growth – b x (CLI - 100)

b = Relationship between short-term economic movements and forward five-year real GDP growth

For the regression run as of Sept. 30, 2020, US data indicated that short-term economic movements have led to an adjustment down of 0.30% in the forward five-year real GDP growth. Globally, we would expect that the pace of mean-reversion for each country would depend on its level of economic development. In other words, for countries that are considered "mature" or "developed" economies, and for which the rate of long-term growth is stable, we would expect a quicker reversion to the mean – and vice versa for emerging economies. For example, we expect that for Japan, which is considered a mature, slow-growing economy, short-term economic movements would revert more quickly to the long-term average. At the same time, we expect that in emerging markets, whose long-term growth rates are still evolving, short-term economic movements would revert less quickly to their amorphous long-term averages (see **Figure 77**). Although we expect these relationships to remain stable over the medium-term, we re-run the regressions and review the resulting data quarterly.

Figure 77: We expect the pace of mean-reversion to depend on a country's level of economic development

Region/Country	Pace of mean-reversion
United States	0.30
United Kingdom	0.31
Japan	0.52
Eurozone	0.42
Pacific Ex JP	0.33
Canada	0.34
Emerging markets	0.28
Asia Pacific ex-Japan	0.29

Source: OECD, Invesco as of Sept. 30, 2020.

+ **Valuation change.** Across a full business cycle, valuation change involved in estimating the potential for the current P/E level to revert to an estimated long-term average over a 10-year time horizon. Over a shorter time frame, we look at the potential for the P/E to revert back to the long-term average in five years' time.

Figure 78: Five-year vs 10-year capital market assumptions for US large-cap equities

Time horizon	Estimated return %		Yield %	Earnings growth %	Growth adjustment %	Valuation change %
10 years	5.65	=	2.61	+4.43	0	-1.38
5 years	5.92	=	2.61	+5.36	+0.69	-2.74

Source: Invesco, estimates as of Sept. 30, 2020. All total returns data is annual. These estimates are based on our capital market assumptions which are forward looking, are not guarantees, and they involve risks, uncertainties and assumptions.

Fixed income: 5-year versus 10-year expected returns

As with equities, the building blocks for estimating fixed income returns over a five-year time horizon are the same as those identified for the 10-year time horizon – yield, roll return, valuation change and credit loss. However, how each of these building blocks is defined may need to change to better reflect shorter-term market dynamics.

+ **Yield.** Return from yield reflects an average of the starting (current) and an estimate of the ending yield. For a five-year time horizon, we use an estimate of the five-year yield curve to evaluate ending yield, instead of the 10-year yield curve that we used for the long-term time horizon. To estimate the future yield curve, we use the same process, evaluating two specific points on the futures curve to help determine its level and shape. For the estimated five-year yield curve, we use the yield for the three-month Treasury bills and the yield for five-year Treasury notes. As previously discussed, another factor impacting the direction of potential future yield involves movement in credit spreads, which we estimate by looking at the relationship between current credit spreads and their 10-year rolling average.
+ **Roll return.** As previously discussed, the estimate for roll return reflects an average of the roll return from the current yield curve and the roll return from the ending (estimated) yield curve. As with the return from yield, instead of the 10-year estimated yield curve, we use the five-year estimated yield curve to calculate the average roll return.
+ **Valuation change.** The same methodology is used to estimate valuation change over a five-year time horizon as was used over a 10-year time horizon. The main difference, however, is that the impact on price from the shift to the ending yield curve is amortized over five years.
+ **Credit loss.** No change from the estimate used for the 10-year time horizon.

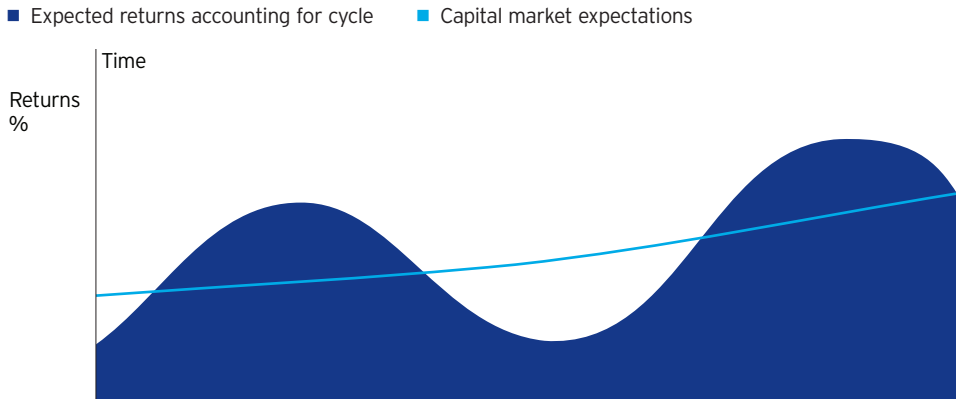
11

Tactical Asset Allocation

Strategic investors generally set asset allocation policy based on long-term expectations of asset class returns. However, asset prices do not evolve in a linear fashion. Instead, the performance of financial markets over the short-term is often driven by factors that may not be incorporated in the building blocks of a long-term CMA. For example, while long-term forecasts for growth and inflation inform CMAs, these variables exhibit pronounced cyclicality and fluctuations over the course of the business cycle, affecting asset prices in the short and medium-term. Similarly, while valuations provide long-term predictive power for asset returns, therefore informing long-term CMAs, evidence shows their performance as an indicator declines as the investment horizon shortens. As an example, using a common equities valuation measure such as earnings yield, or earnings divided by price, its predictive power over forward returns of S&P 500 shrinks from an R^2, as a measure of best fit, of 50% over 10 years, to only 11% over 3 years, and less than 1% over 1 month. In short, different information influences different investment horizons.

Investors with relevant information about short-term price deviations may have an opportunity to benefit from price dislocations, but they must be willing to tactically shift away from policy. In this section, we present Invesco's tactical asset allocation methodology as a complementary framework to our long-term CMAs. We detail a macro-regime framework, which combines information from leading economic indicators and global market sentiment, to inform tactical asset allocation decisions over shorter time horizons, potentially allowing investors to seek additional return opportunities or navigate near-term risks.

Figure 79: Cyclicality of expected returns



For illustrative purposes only.

Invesco Investment Solutions (IIS) macro regime framework

In our whitepapers, "Dynamic Asset Allocation through the Business Cycle" (*de Longis, 2019*) and "Market Sentiment and the Business Cycle" (*de Longis and Ellis, 2019*), we develop a macro regime framework to forecast the performance of asset classes in different stages of the business cycle and provide empirical evidence of how prices of global equities, credit and sovereign fixed income are driven primarily by the change, not the level of economic growth. Using our macro framework, historical analysis of the last 50 years shows asset returns vary significantly between regimes, with major implications for asset allocation decisions. Furthermore, our results are consistent across regions, with the relative performance between asset classes exhibiting very similar patterns across markets.

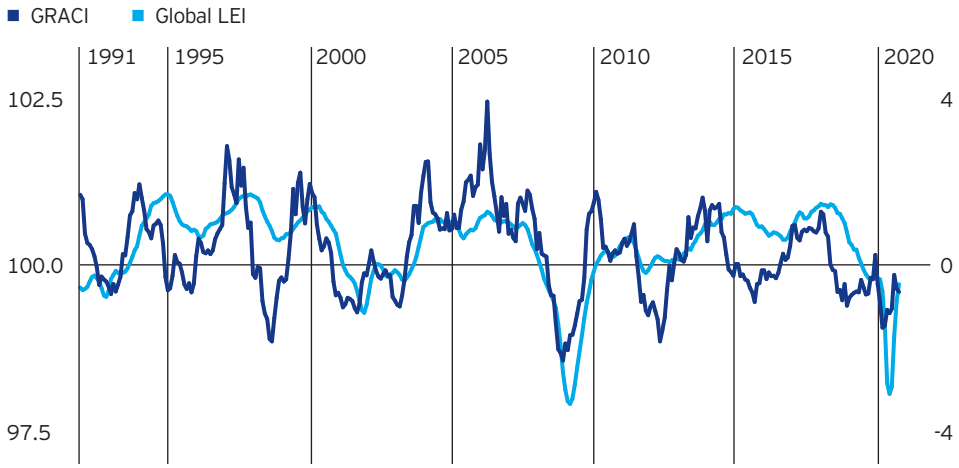
We define the four stages of the business cycle based on the expected level and change in economic growth:
+ Recovery, when growth is below trend and accelerating
+ Expansion, when growth is above trend and accelerating
+ Slowdown, when growth is above trend and decelerating
+ Contraction, when growth is below trend and decelerating

Traditionally, economists use indicators such as GDP, industrial production, or the unemployment rate to perform historical analysis of economic cycles. However, these measures are impractical for making investment decisions in real-time, given the substantial lag in the data release and their multiple rounds of revision over time. Therefore, by the time this information is available, it tells us something about the past, and it is not predictive of future asset price returns. Indeed, these reasons are often cited to justify the common skepticism about macro analysis and its usefulness for an investment decision process. To overcome these problems, we construct leading indicators of the business cycle using economic and financial data that are released in a timely manner, available at high frequency (at least monthly), and not subject to revisions. We repeat this process for a large set of countries and regions, covering about 90% of world GDP.

In "Market Sentiment and the Business Cycle" (*de Longis and Ellis, 2019*), we outline a framework to extract market participants' expectations about future economic regimes and illustrate how global risk appetite can be used as a leading indicator and a real-time proxy of the global business cycle.

Our global market sentiment indicator provides a measure of relative risk-adjusted performance between riskier and perceived safer asset classes (e.g., equities vs. government bonds). Specifically, it measures how much investors have been rewarded on average, for taking an incremental unit of risk in global financial markets on a trailing medium-term basis. A rising index value signals improving market sentiment (i.e., rising risk appetite). Conversely, a falling index value signals deteriorating market sentiment (i.e., falling risk appetite). While risk appetite is influenced by several factors, we believe that changing growth expectations are one of the primary drivers in global market sentiment. In fact, there is a strong positive correlation between our sentiment indicator and several proxy measures of the business cycle such as industrial production (.70 correlation), earnings per share momentum (.60) and our global leading economic indicator (.74), with lead times of 2-4 months and strong statistical significance **(Figure 80)**.

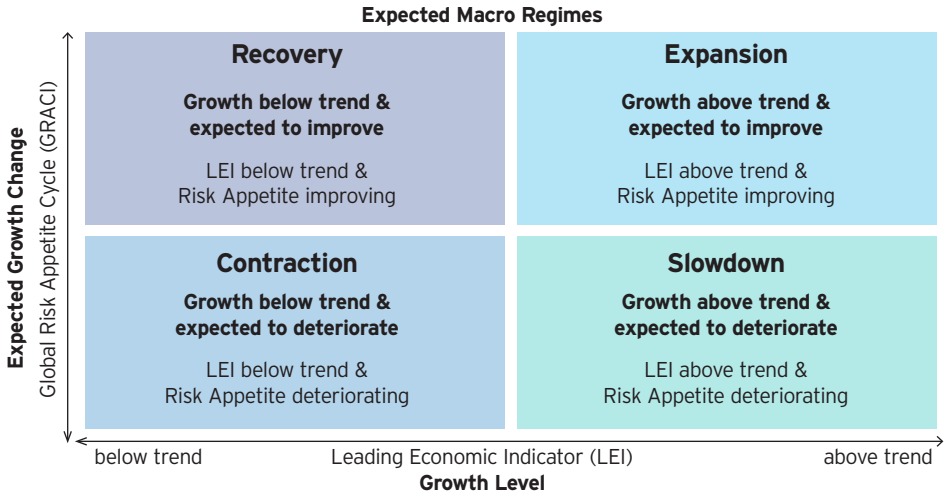
Figure 80: Global Risk Appetite Cycle Indicator (GRACI) and the Global Business Cycle



Sources: Bloomberg L.P., MSCI, Citi, Barclays, JPMorgan, Invesco Investment Solutions research and calculations, from Jan. 1992 to Oct. 2020. The Global Leading Economic Indicator (LEI) is a proprietary, forward-looking measure of the macroeconomic trend level. The Global Risk Appetite Cycle Indicator (GRACI) is a proprietary measure of the markets' risk sentiment. A level above (below) 100 on the Global LEI signals growth above (below) a long term average trend, while a GRACI number above (below) zero suggests above trend risk sentiment.

Therefore, global risk appetite can be used in conjunction with leading economic indicators to define expected macro regimes and guide tactical asset allocation decisions **(Figure 81)**.

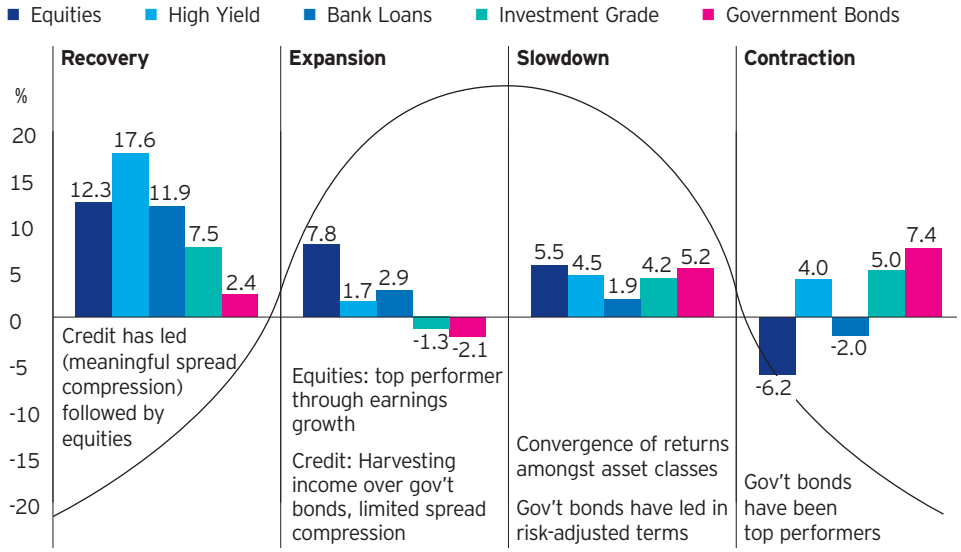
Figure 81: Invesco Investment Solutions (IIS) TAA macro framework



Source: Invesco Investment Solutions.

Figure 82 illustrates the performance of major asset classes across the four stages of the cycle, identified through our macro regime framework. On average, investors are compensated for taking extra risk (e.g., moving from safer to riskier asset classes) during a recovery or expansion phase of the cycle, when growth is accelerating. Conversely, in a slowdown regime, when growth is still above trend but begins to decelerate, the performance across asset classes starts to converge, with the equity risk premium still showing some compensation, albeit at lower magnitudes. In a contraction phase, investors are, on average, not rewarded for taking additional risk, and perceived safer assets such as government bonds typically offer attractive returns.

Figure 82: Historical excess returns across asset classes



Source: Invesco Investment Solutions' proprietary global business cycle framework and Bloomberg L.P. Index return information includes back-tested data. Returns, whether actual or back-tested, are no guarantee of future performance. Annualized monthly returns of the defined risk premia from Jan. 1973 – Oct. 2020, or since asset class inception if at later date. Asset classes excess returns defined as follows: Equities = MSCI ACWI - US T-bills 3-Month, High Yield = Bloomberg Barclays HY - US T-bills 3-Month, Bank loans = Credit Suisse Leveraged Loan Index - US T-bills 3-Month, Investment Grade = Bloomberg Barclays US Corporate - US T-bills 3-Month, Government bonds = US Treasuries 7-10y - US T-bills 3-Month. For illustrative purposes only. **See the appendix for asset class premium definitions and additional information on back-filled index data.**

To assist investors with the difficult task of monitoring the economy and analyzing market movements, we propose a consistent tactical asset allocation framework, using leading economic indicators and market sentiment to anticipate turning points in economic growth, and reposition portfolio exposures across asset classes and risk premia consistent with the changing macro environment. Using this tactical framework, we aim to provide signal amid market noise and help make informed decisions within a short-to-intermediate timeframe.

12

Volatility and Correlation

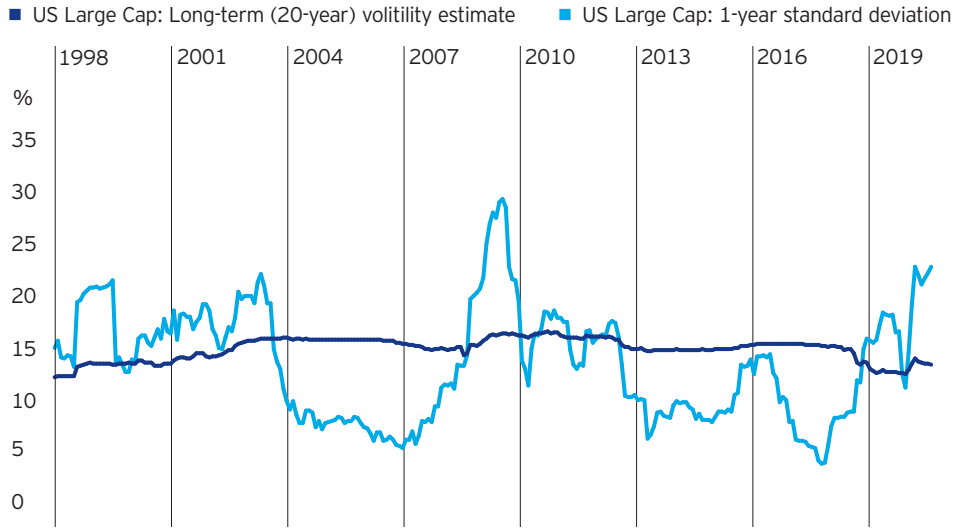
Volatility is estimated using rolling historical quarterly returns that are normalized for shorter lived benchmarks.

In order to construct multi-asset, goal-oriented portfolios that seek diversification and focus on specific investment outcomes, we also need to estimate the risk (i.e., volatility) of each asset class, as well as correlations between the different asset classes – how they move relative to each other. One commonly used methodology is to estimate risk and correlation directly from historical data.

Volatility

To estimate volatility for the different asset classes, we use rolling historical quarterly returns of various market benchmarks.

Figure 83: Mean reverting properties of short term volatility compared to long term estimate



Source: Invesco, Sept. 30, 2020.

Figure 84: Volatility is normalized for shorter lived benchmarks

$$\textit{US small cap volatility}^{20} = \frac{\textit{Russell 2000 Index volatility}^{19}}{\textit{S\&P 500 Index volatility}^{19}} \times \textit{S\&P 500 Index volatility}^{20}$$

19 Sample periods are overlapping periods of S&P 500 and US Small Cap.

20 Sample periods are 1970-2017

Since all of these benchmarks have differing histories within and across asset classes, we normalized the volatility estimates of the shorter-lived benchmarks to ensure that all series are measured over similar periods. We did this by designating one benchmark to represent the full history for an asset class (**Figure 85**). The sub-asset classes with shorter histories are then adjusted based on their relationship to the representative benchmark. For example, to estimate the volatility of US smallcap equities over the entire history of the asset class dating back to 1970, we look at the relationship between the Russell 2000 Index (the benchmark for US small-cap equity) and the S&P 500 Index, as the representative benchmark for US equity, during the period in which they overlapped.

Figure 85: Benchmarks designated to represent the full history for an asset class

Asset class	Representative Index	History
US equity	S&P 500 Index	1970
International equity	MSCI EAFE Index	1970
US government bonds	BBG BARC US Treasury Index	1976
Corporate and other bonds	BBG BARC US Aggregate Index	1976
Commodities	S&P GSCI Index	1970

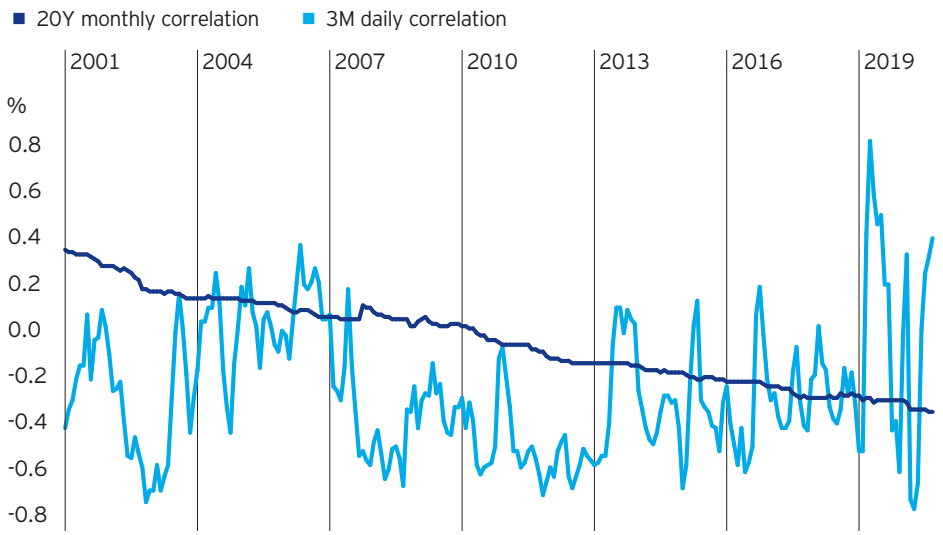
Full history dates shown include back-tested performance, which is hypothetical and subject to inherent limitations. The inception dates of the S&P 500 index, MSCI EAFE, BBG BARC US Treasury Index, BBG BARC US Aggregate Index, and S&P GSCI Index, respectively are; Mar. 31, 1957, Mar. 31, 1986, Jan. 31, 1973, Jan. 31, 1973, and Jan. 31, 1991.

Correlation

Correlation, or the extent to which asset classes move in the same direction, plays an important role in constructing a multi-asset portfolio that seeks to maximize the potential benefits of diversification. For our strategic capital market assumptions, we calculate correlation coefficients using the trailing 20 years of monthly index returns, which we believe is appropriate in covering a majority of asset classes while incorporating multiple business cycles.

A correlation coefficient is a statistical measure that can range in value from -1.0 (perfect negative correlation) to 1.0 (perfect positive correlation). It's important to recognize that correlations among asset classes can change over time. Since we believe 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.

Figure 86: Correlation trend persistance example for US Large Caps and US Treasuries



Source: Invesco, as of Sept. 30, 2020. US Large Caps defined as the S&P 500 Index and US Treasuries defined as the Bloomberg Barclays Aggregate US Treasury Index

13

Currency adjustments, expected returns and compound returns

Currency adjusted expected returns

Portfolios of an international or global nature will likely invest in financial instruments that are based in foreign currencies. For instance, a UK-based multi-asset portfolio manager will likely have an appreciable allocation to US large-cap equities based in USD. Since the UK-based manager wishes to consider his/her portfolio returns in terms of the local GBP currency, there is need to convert the forecasted returns for the US large-cap equity asset class from a USD-based perspective to a GBP-based perspective, especially for the purposes of optimal portfolio construction via mean-variance optimization or its robust counterpart.

For the UK-based portfolio manager, given an annualized expected return of μ_{USD} for the USD-based large-cap equities, and an annualized US government bond yield of i_{USD} and a similar annualized UK government bond yield i_{GBP} of our formulation for the annualized expected return in GBP is:

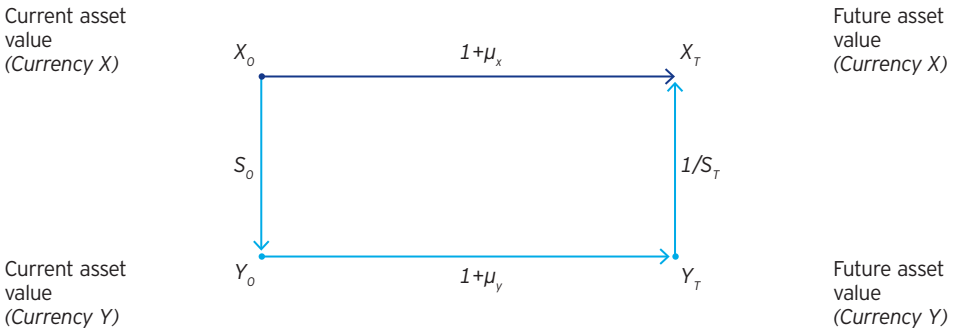
$$\mu_{GBP} = \mu_{USD} - i_{USD} + i_{GBP}$$

In what follows below, we provide the rationale for this return conversion.

At the core of our currency-based expected return conversion process is the concept of Interest Rate Parity. We utilize the basic concept that the future value of an asset denominated in currency X is equivalent to the foreign exchange rate-converted future value of the asset denominated in currency Y. **Figure 87** below graphically depicts such an equivalence.

Specifically, let X_0 denote the current value of an asset denominated in currency X and let X_T denote its future value. Then, assuming a single period return of the future value is simply $X_T = (1 + \mu_X) X_0$. (This is the top dark blue segment in **Figure 87**.)

Figure 87: Interest rate parity commutation diagram



Source: Invesco, BarraOne.

An alternative to going directly from the current value X_0 to the future value X_T (in terms its return μ_X in currency X) is to first convert the value of X_0 in currency X to the value Y_0 in currency Y. Such a conversion may be simply expressed as $Y_0 = S_0 X_0$, where S_0 is the current foreign exchange rate in going from currency X to currency Y. (This is the left-most segment of Figure 28.) Next, assuming a single period return of μ_Y, the future value in currency Y is simply $Y_T = (1 + \mu_Y) Y_0$. (This is the bottom segment of **Figure 87**.) Finally, the future value Y_T may be converted to the future value X_T through a similar foreign exchange rate conversion. Namely, $X_T = Y_T/S_T$ where $1/S_T$ is the future foreign exchange rate going from currency Y to currency X. (This is the right-most segment of **Figure 87**.)

Since the future value of the asset denominated in currency *X* should be the same as the foreign exchange rate-converted future value of the asset denominated in currency *Y*, so as to not violate arbitrage conditions, this means:

$$x_T = x_O\,(1 + \mu_x) = S_0 x_0\,(1 = \mu_y)\,(1/S_T)$$

If we perform the same analysis along the same paths, now in terms of two government bonds (whose returns we treat as certain), one denominated in currency *X* with yield i_x and the other in currency *Y* with yield i_y, then we will have:

$$\frac{1 + \mu_X}{1 = \mu_Y} = S_0 S_T = \frac{1 + i_X}{1 + i_Y}$$

Nothing that $(1 + \mu_X)\,(1 + \mu_Y)^{-1} \approx 1 + \mu_X - \mu_Y$, *and similarly that* $(1 + i_X)\,(1 + i_Y)^{-1} \approx 1 + i_X\,1 + i_Y$, *means*

$$\mu_Y = \mu_X - i_X + i_Y$$

Since our portfolio construction perspective is a strategic, long-horizon one, we use the annualized yields of the 10-year government bonds in currencies *X* and *Y* in the above return conversion formula and combine them with the annualized forecasted return in currency *X*. This is our estimate of the forecasted annualized return in currency *Y*. This modeling assumption leads to similar return estimates, whether we choose to hedge or not. Of course, from a risk perspective, currency hedging will have a meaningful impact.

Arithmetic versus geometric returns

In practice, asset returns are most commonly expressed in geometric terms. This is because the investors are most often concerned with either the rate at which an investment grew in the past or the rate it might be expected to grow in the future (or over the long term). The geometric mean return is the average rate of return per period when returns are compounded over multiple periods. Consider a time series of returns r_t, *for* $t = 1, 2, \ldots, T$ periods, and some initial investment amount W_0. The value of the investment at time T *is* $W_T = W_O \times (1 + r_1) \times (1 + r_2) \ldots \times (1 + r_T)$. The geometric return μ_g, or geometric mean, of such a time series is then:

$$\mu_g = \left(\prod_{t=1}^{T} (1 + r_t) \right)^{1/T} - 1$$

The geometric mean return is of interest to investors because it neatly expresses the periodic growth rate of a time series, (i.e., $W_T = W_O (1+\mu_g)^T$. This is of practical importance in terms of understanding the desirability of one investment over another. However, the geometric mean says nothing about risk, or rather, the variability of the returns an investor might actually receive from one period to the next. In fact, two assets can have the same geometric mean but exhibit substantially different variability of returns. To consider risk we must understand the expected value of the return we might receive in any period along with the variability around that expected value. This is where expressing returns in arithmetic terms is useful for investors.

The arithmetic mean μ_g is just the simple average of the periodic returns produced by an asset over a specified investment horizon and is calculated as:

$$\mu_a = \frac{1}{T} \sum_{t=1}^{T} r_t$$

This is particularly important for portfolio construction as it describes the probability-weighted return outcome (central tendency) of a return distribution, or rather, its expected return. If the returns provided by a particular return distribution were all equally likely, then the geometric mean could serve as our expectation. However, returns for most risky financial assets are not equally likely as they exhibit some degree of variability. This variability is most commonly expressed as a function of standard deviation. It can be shown that $\mu_a > \mu_g$ when the standard deviation of a return series is greater than zero. This highlights the fact that the volatility of a return series provides a link between the arithmetic return and the geometric return. Markowitz and Blay (2013) explore various mean-variance approximations to the geometric mean and find that the following approximation provides a reasonable generalization of this relationship:

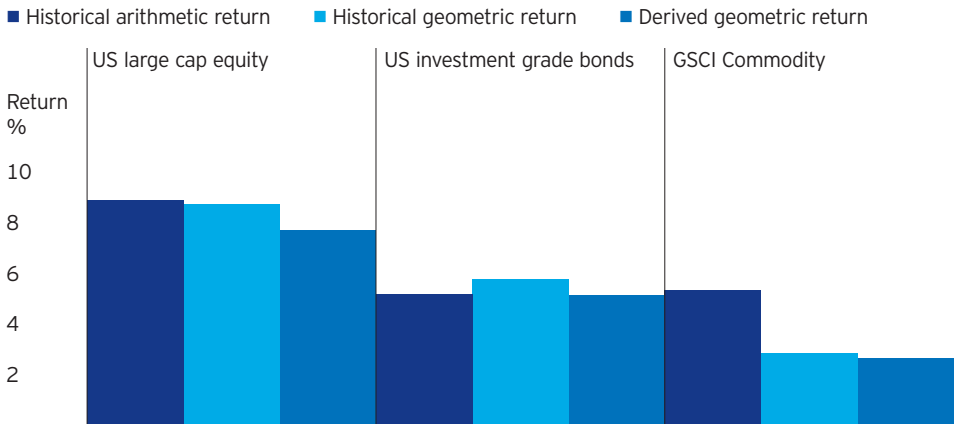
$$\mu_g = e^{\ln(1+\mu_a) - \frac{\frac{1}{2}\sigma^2}{(1+\mu_a)^2}} - 1 \approx \mu_a - \frac{1}{2}\sigma^2$$

This approximation allows investors to go back and forth between arithmetic and geometric returns as long as they know an asset's or portfolio's arithmetic mean μ_a and volatility σ. It should be noted that using the historical information (e.g., arithmetic means, standard deviations, and correlations) in a portfolio analysis will produce portfolios that will have likely performed well in the past. Expected returns should represent expectations for returns that are likely to be achieved in the future expressed in arithmetic terms. The approximation above can also be helpful in producing expected return estimates that are appropriate for use in a portfolio analysis as well as being aligned with intuition in geometric terms.

As an example of how well such a simple approximation can work, in **Figure 88**, we consider the historical arithmetic and geometric returns for three standard asset classes:
1. US Large-Cap Equity
2. US Investment-Grade Bonds and,
3. Commodities and compare the historical geometric return with one derived from the approximation above.

The two geometric returns are very close and differ by no more than 10.5 basis points in this example.

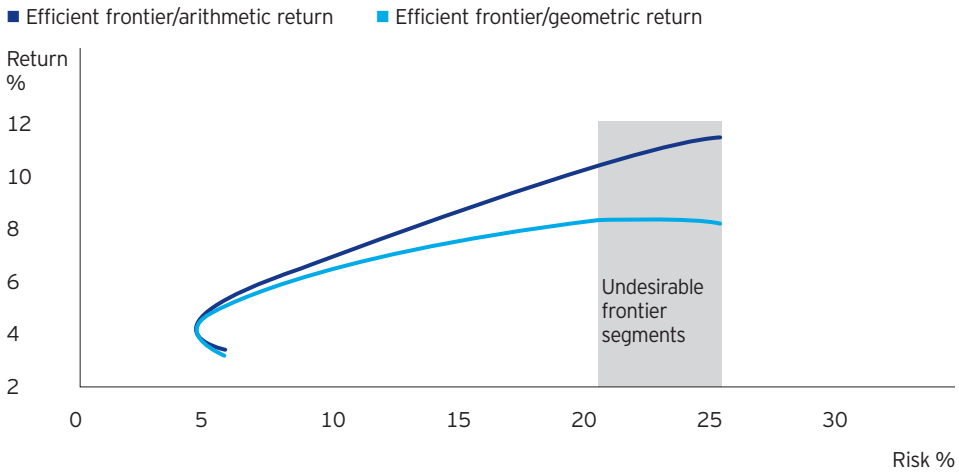
Figure 88: Historical arithmetic, geometric and derived geometric returns for select asset classes



Source: Invesco, Bloomberg L.P., Monthly return data period from Sept. 1, 1998 to Sept. 30, 2020. Note: The historical volatilities of the asset classes over the period are as follows: US Large Cap Equity 14.5%, US Investment Grade Bonds 3.5% and Commodities 22.5%. US Large Cap is represented by the S&P 500 Index, US Investment Grade Bonds is represented by the BBG BARC Aggregate Bond Index, and Commodities are represented by the BBG Commodities Index. **Past performance does not guarantee future results.**

The ability to effectively translate arithmetic returns to geometric returns (and vice versa) is of consequence to investors as the return inputs, or expected returns, used in a mean-variance portfolio optimization must necessarily be expressed in arithmetic terms. The reason for this is that the arithmetic means of a weighted sum (e.g., a portfolio) is the weighted sum of the arithmetic means (of the portfolio constituents). This does not hold for geometric returns. In other words, the weighted average of the arithmetic means of the assets included in a portfolio is equal to the arithmetic mean of the portfolio as a whole. This is not the case when geometric means are used. Since the expected return inputs of a portfolio analysis are required to be in arithmetic terms, the outputs of such an analysis are also in arithmetic terms and must be translated, through the use of the portfolio mean and standard deviation, into the more intuitive geometric terms that describe the expected growth rates provided by the efficient set of portfolios for portfolio selection. **Figure 89** presents an example of an efficient frontier presented in both arithmetic and geometric terms.

Figure 89: Efficient frontier presented in arithmetic and geometric terms



Source: Invesco. For illustrate purposes only.

Note that the efficient frontier expressed in terms of arithmetic returns sits well above the efficient frontier expressed in terms of geometric returns. This is so because the geometric returns are downward adjustments of the arithmetic returns. It is only when we view the efficient frontier expressed in this fashion that we can see how, at segments of the frontier where portfolio volatility is sufficiently large, pursuing portfolios with higher arithmetic returns can result in the likelihood of achieving lower long-term (geometric) returns than portfolios with lower risk.

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Adjustments

Considering the magnitude of change in 2020 due to COVID-19, we have incorporated some fundamental adjustments to the regular systematic update of our return forecasts, which we believe will more accurately capture the current market dynamics. While it is impossible to make predictions about COVID-19 related medical advancements, we focus our attention on possible scenarios pertaining to the duration of the pandemic and how its impact on economic data and growth expectations may drive our investment process. A brief narrative of the three scenarios (downside, central, and upside) relating to equities and fixed income is illustrated in **Figure 90.**

The pandemic was a major shock to markets and the global economy and, as prudent allocators of capital, we must prepare our investment process for other potential shocks, not just COVID-19. Accordingly, we will be using 2020 as a case study of how our expectations can be adjusted. We will discuss the impact of these scenarios to asset class returns and the specific adjustments we made to our strategic building blocks as the pandemic progressed in the following section.

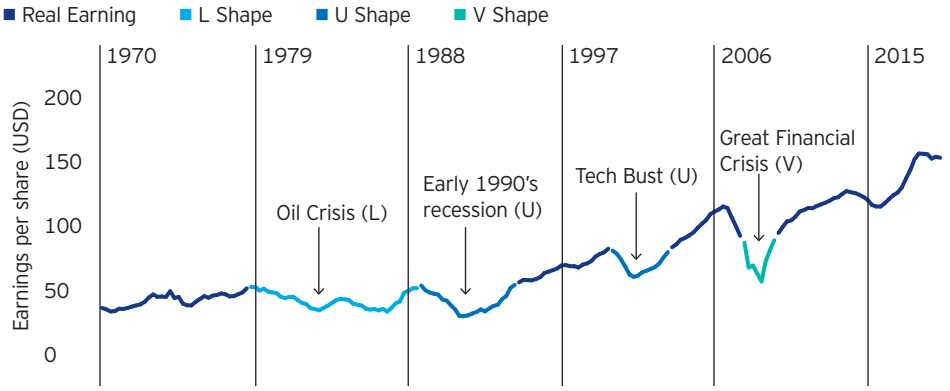
Figure 90: Scenario based estimates of economic growth and default

	Downside – L shaped	Base – U shaped	Upside – V shaped
Equities	+ Signals that we are in the beginning of a recession, we would expect negative growth over the next 2 years as well as potential recovery to start by 3rd year	+ The adjusted numbers for published CMAs in 2020 are based on this scenario + This scenario signals steady growth over the next 2 years and recovery by 3rd year	+ Signals rapid path to recovery; typically 2 years
Fixed Income	+ Expectation of higher default rates in 2020 and 2021 than Dec. 2019, as well as elevated levels of default thereafter + A subtraction of 25 BPS to forward yields	+ Expectation of higher default rates in 2020 than Dec. 2019, which leads to higher default probability estimation + Consistent with our global model, forward rates are used for both the 5y and 10y expected yield	+ No meaningful default expectations; we don't expect an increase in default rates in 2020, which leads to the same default probability estimation as Dec. 2019 + An added 25 BPS to forward yields

Equities

Our CMAs are composed of three building blocks used to model expectations for equities: earnings growth, yield, and valuation. Each of these could have varied significantly depending on the recovery path from the pandemic. In March of 2020, with incredible levels of uncertainty and volatility, we sought to understand prior recessions, their length, and the potential impact on our building blocks. **Figure 91** illustrates some historical observations within US equities which allowed us to outline our scenarios, leading us to add the letter shapes describing earnings growth patterns: "L" for a prolonged downside like the 1970's oil crisis, "U" from the '91 Gulf War and tech bust's slow recovery, and "V" representing the GFC, where earnings rapidly recovered. Initially, we embedded the expectation of a U-shaped recession and recovery as our "base" case, with earnings growth recovering by the end of 2021.

Figure 91: Recession Earnings Growth Patterns: US Large Cap Equity



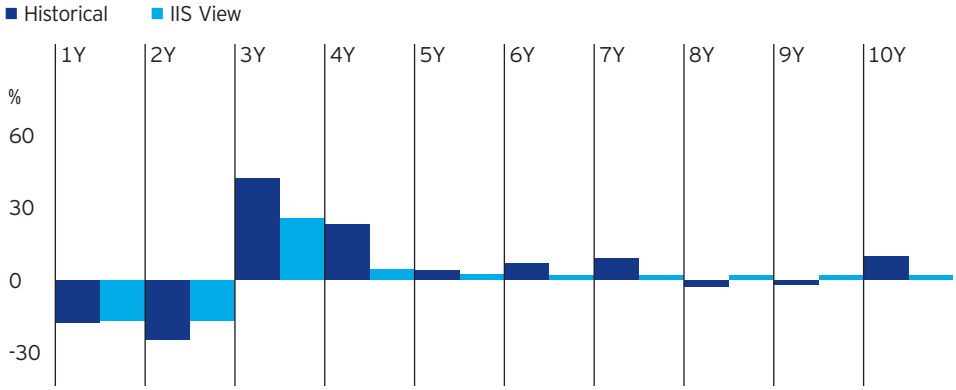
Source: Invesco Investment Solutions Proprietary Research, FactSet, Mar. 31, 2020.

Earnings Growth

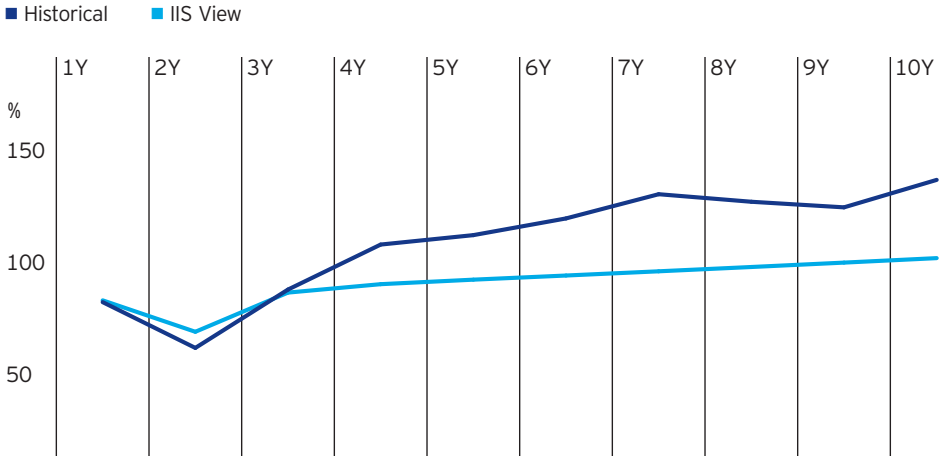
Beginning with our first building block, earnings growth, we modeled a typical business cycle's earnings and altered that pattern by numerically shifting growth rates per each scenario's forecast. This process can be visualized in our March estimates for the downside case in **Figure 92**. Year one represents our forecasts for earnings in 2020 derived from our own sector analysis and consensus estimates, while years two to 10 represent scenario-based projections. Our downside case in this example remains depressed relative to history as far as 10 years out, while our base and upside scenarios recover much quicker. It's important to note that all our scenarios predicted lower than average earnings growth over the cycle, however the pace at which they recover in the first five years varies significantly.

Figure 92: Downside scenario: S&P 500 earnings assumptions over the next 10-years

S&P 500 Historical Real Earnings vs. IIS Earnings Assumptions



S&P 500 Historical EPS vs. IIS Assumptions

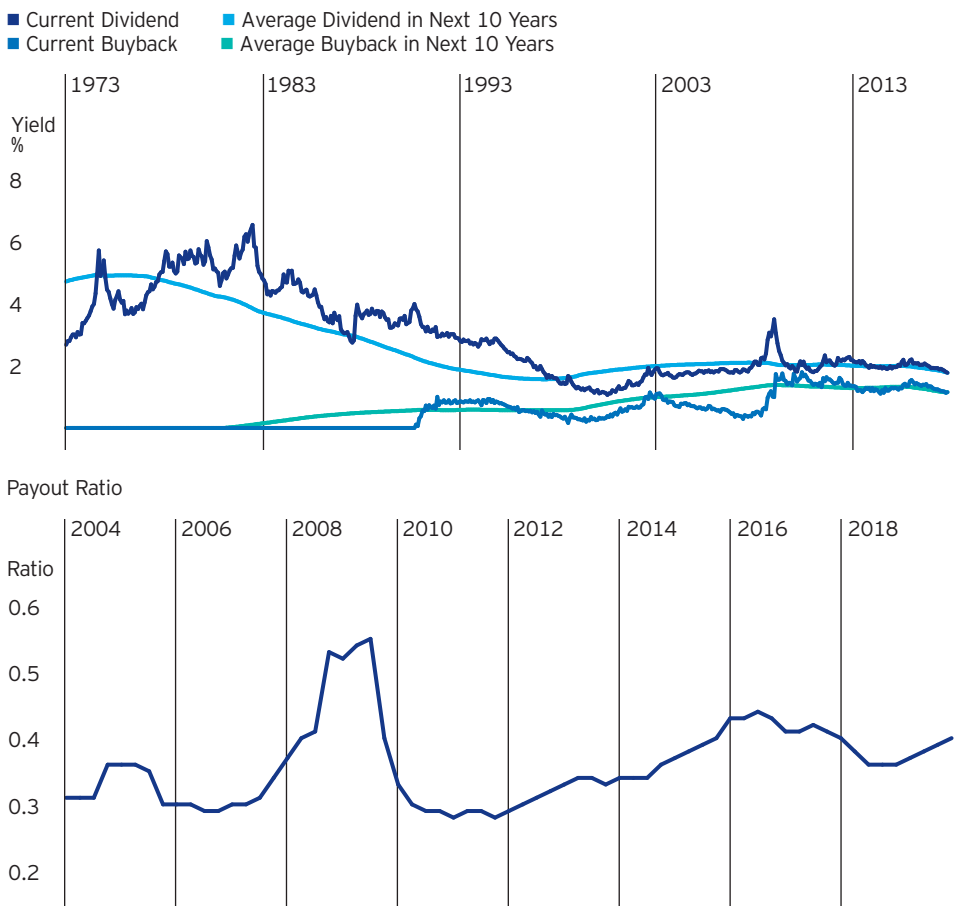


Source: Invesco Investment Solutions Proprietary Research, FactSet, Sept. 30, 2020.

Total Yield and Valuations

For our other equity building blocks, we determined that the impacts were highly dependent on our earnings forecasts. The components of total yield, dividends and buybacks did spike in the GFC, but quickly reverted to the mean **(Figure 93)**. As their payouts become more of a burden to earnings, companies are often reluctant to cut dividends, causing a lag that we correct by manually revising dividends downward. On average, the earnings payout ratio was stable over time, confirming our view that dividend and buyout cuts will be in line with earnings cuts **(Figure 93)**.

Figure 93: Dividends, Buybacks and Payout Ratio spiked during the GFC and quickly reverted to the mean



Source: Invesco Investment Solutions Proprietary Research, FactSet, Sept. 30, 2020.

To formulate each scenario's projected total yield, we took the forward growth assumptions from our earnings section and multiplied them by our standard methodology for estimating dividends and buybacks. Negative expected growth will cause total yield, which may be above average because of a smaller price denominator, to shrink in the short term.

$$Total\ Yield_{Adjusted} = Total\ Yield_{Standard} \times (1 + Growth_{FY1})$$

FY1 = Forward 1Y.

In times of crisis, prices adjust quickly and the impact on earnings will be observed with a lag due to reporting frequency and pace of economic contraction. This can create a disconnect between the numerator and denominator of valuation ratios that may lead to undervaluing assets that we know to be discounted for good reason. To correct for this dynamic, we discount the earnings component of our price to earnings ratio using a nowcast of consensus expectations for the next quarter. This discount is put in place to reflect the earnings contraction we expect to be happening concurrently with price movements.

$$Valuations_{Adjusted} = Valuations_{Standard} / (1 + Growth_{Q1})$$

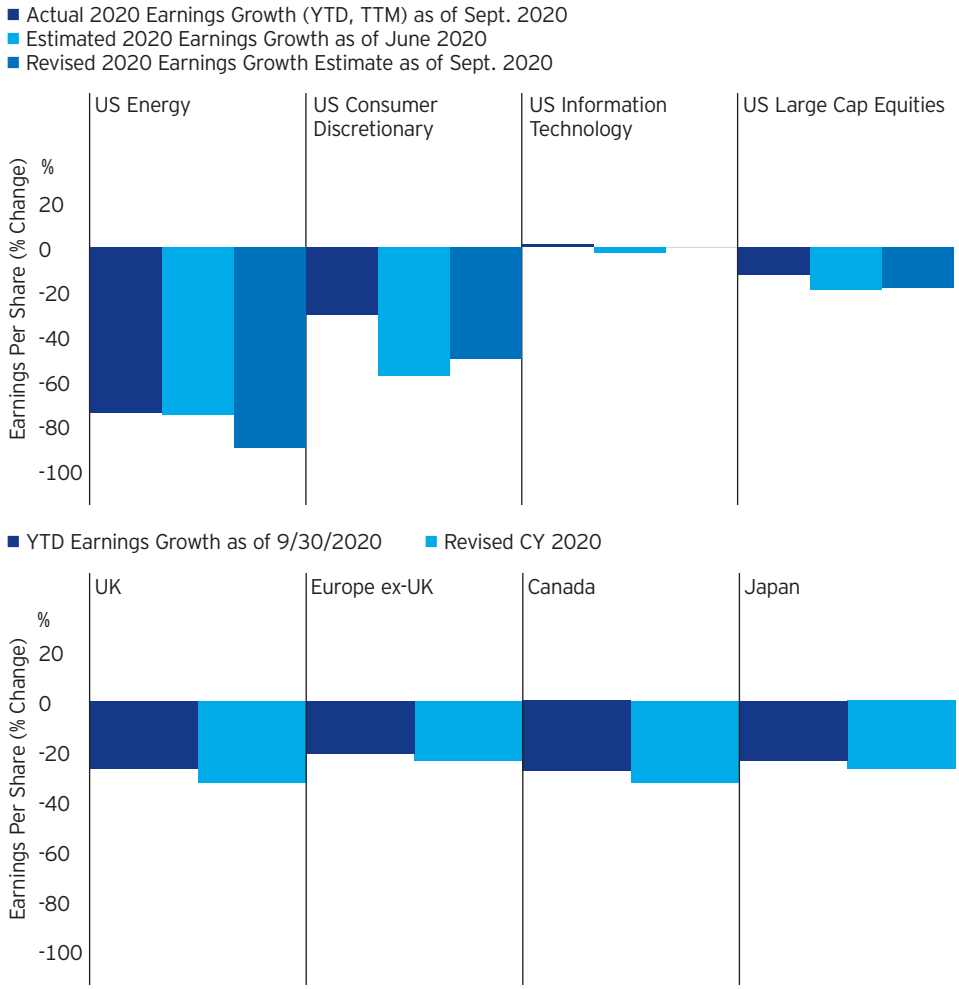
Q1 = Forward 1Q.

Within LBOs, we observed how valuation multiples lagged enterprise value and smoothed these variables to reflect the stickiness of deal prices. Natural mechanisms of the private equity industry justify such a change; deals often take months to put together, even at elevated multiples relative to current prices due to takeout premia, thus eventually finding an equilibrium valuation with likely business targets holding out for a rebound in their economic prospects.

Tracking the pandemic

As markets rebounded in the quarters to come, questions remained as to how sustainable the recovery would be. What started as a "V" could turn into a "square root" without further rounds of fiscal and monetary stimulus or progress within medical treatments. Peeling back the layers of the rebound pointed to stark contrasts between sectors. Technology and consumer discretionary sectors fared much better through the recession than energy and financials **(Figure 94)**. Applying our US adjustments to other developed markets (DM) required sector weighting our US sector estimates to each local market. Many developed nations outside of the US are more heavily weighted towards industrials, financials, and consumer staples, resulting in a bleaker outlook for earnings.

Figure 94: Estimating various US sectors' earnings growth



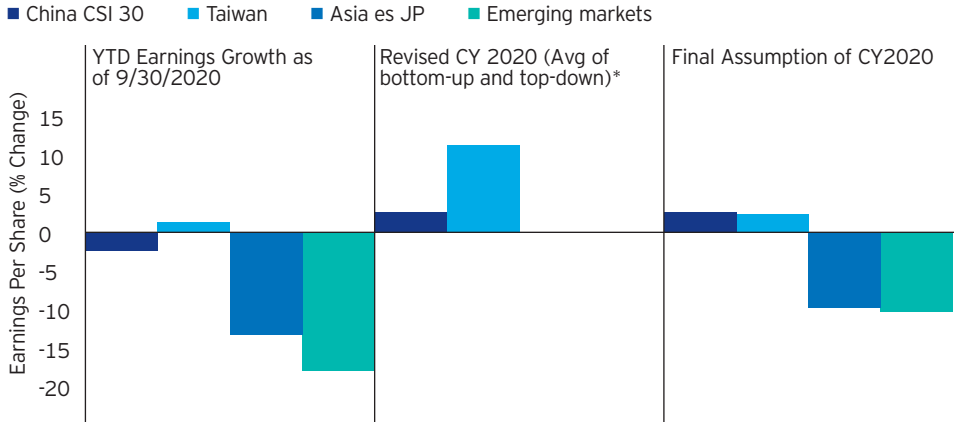
Source: Invesco Investment Solutions Proprietary Research, FactSet, Sept. 30, 2020. Proxies used for graphs are the S&P 500 for US sectors, the FTSE 100 for UK sectors, MSCI Euro ex-UK for Europe ex-UK, S&P TSX for Canada, and MSCI JP for Japan.

Realized growth data throughout the year closely matched our initial estimates, keeping us within our U-shaped central case and even allowing us to slightly upgrade our outlook, now assuming a recovery a half-year earlier in the middle of 2021. Major drivers of an early and sustained recovery, and our present leanings toward an upside scenario, include the availability of a vaccine, improved treatment methods and greater ability to reopen businesses safely. Given the rebound in growth expectations in the later part of 2020, DM economies that were hurt badly by COVID-19 received a boost to their expected returns. Realized earnings data for these economies have worsened over the past few quarters, providing us an indication that we are near the bottom of their respective earnings cycles.

Approaches for Emerging Markets

Due to limited information surrounding how individual regions were handling the outbreak of COVID-19 in the beginning of 2020, we approached emerging markets (EM) in a similar fashion to developed markets. As cases began to rise outside of just a few Asian markets, namely China, Korea and Taiwan, it became clear that a more nuanced method of handling positive growth scenarios, where nations isolated themselves, was required. To this effect, we introduced macroeconomic estimates for these markets to complement our bottom-up approach, taking the average of the two to reduce uncertainty. As there may be overly positive outliers from this new methodology, we put in place a control where regions with higher expected growth than our traditional process of estimating long-term earnings will revert to our long-term estimate. Taiwan, for example, remained relatively untouched by the virus and is expected to grow far above our global methodology; following our controls, we readjust its earnings estimate to the long-term average **(Figure 95).**

Figure 95: Estimating various Emerging Market regions' earnings growth

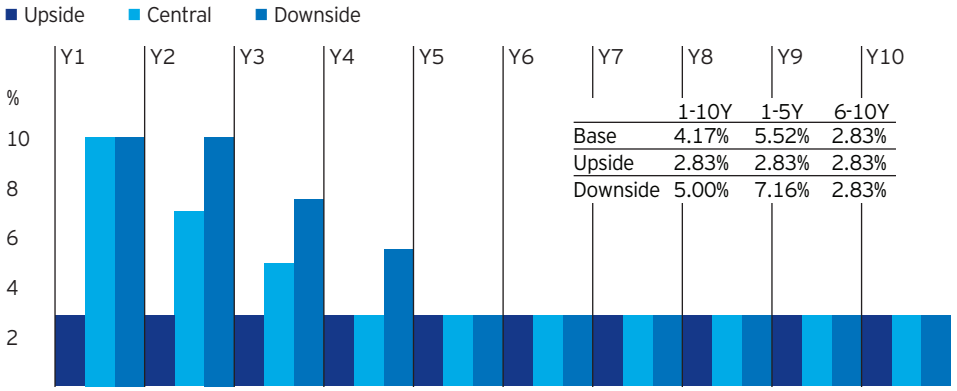


Source: Invesco Investment Solutions Proprietary Research, FactSet, Sept. 30, 2020.

Fixed Income and Alternatives

Credit instruments face a higher likelihood of default amid a recessionary environment relative to other fixed income assets. Higher default rates and credit losses are a part of our central view, with most of the losses occurring with the first five years post-shock. Events like the GFC kept default rates elevated for longer than it took earnings to recover. **Figure 96** presents our three scenarios developed in March of 2020. Our upside case assumes no credit losses above average, and all three converge to this average by year five. Recent research by our credit team has indicated lower expected defaults than what was implemented at the peak of the pandemic, thus lowering both our central and downside losses and increasing expected returns for credit assets.

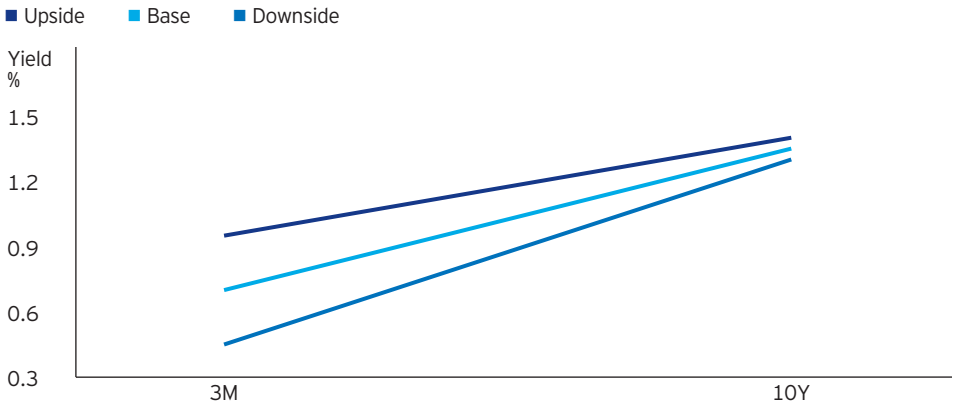
Figure 96: US HY Projected Default Rates



Source: Invesco Investment Solutions Proprietary Research, FactSet, Sept. 30, 2020.

A major enhancement in 2020 to our global model for estimating interest rates occurred when consensus estimates were too slow to update within the pandemic. As a means of reflecting the speed at which markets reevaluate economic prospects and price rates, we switched from the Philadelphia Federal Reserve Consensus Forecast, which is often lagged by weeks, to that of the treasury forward rate curve based on current market data. Modeling the forward yield curve relies on interpolating the 3M and 10Y rates from forward markets. From there, we shocked the forward yield curve for each scenario to best reflect our views. Our upside case assumed reflation, adding 25bps to the short end of the curve, while our downside scenario reflected a similar move downward **(Figure 97)**.

Figure 97: Adjusted yield curve with scenario shocks



Source: Invesco Investment Solutions Proprietary Research, FactSet, Sept. 30, 2020.

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Addendum

2021 Edition

Equities:
+ Poland: Added coverage of large caps and small caps.

Fixed Income:
+ All assets: To aid in timely collection of data in estimating the Treasury curve for future rate expectations, we departed from using the consensus estimates from the Federal Reserve of Philadelphia and began using the current forward market yield curves.
+ Bank Loans: Two changes were applied to the methodology for floating rate debt, affecting forecasts of spread and default loss. Our new estimates of spread are sourced from loan indices rather than a proxy derived from high yield bonds. As there are various starting dates to indices, we have linked three together: JPM Leveraged Loan Index from 2007 - Present, S&P Leveraged Loan Index from 1997 to 2006, and Credit Suisse Leveraged Loan Index from 1992 to 1997. Regarding default loss, we have increased the recovery rate of bank loans to better reflect their higher likelihood of recovery than high yield.
+ High Yield: For UK, Euro and global ex-US, we have swapped indices to ICE BofA Sterling High Yield Index, ICE BofA Euro High Yield Index, and Bloomberg Barclays Global HY Corporate Ex USD, respectively.
+ Added coverage:
  - China Fixed Income: Added coverage of China onshore treasury, as well as onshore and offshore credit
  - Global Catastrophe Bonds
  - Malaysia Aggregate
  - Danish Aggregate
  - Germany: Added coverage of aggregate, Treasury, and corporate bonds.
  - France: Added coverage of aggregate, Treasury, and corporate bonds.

Real Assets:
+ REITs: US REITs are now based on building blocks, rather than the previous methodology, a CAPM regression. Global REITs are still developed using a regression as a beta to the US REIT CMA.
+ Public Infrastructure Equity: industry-based building blocks

Private Assets:
+ Private Infrastructure: updated growth forecast
+ Added coverage: Private debt, levered and unlevered, as well as first and second lien.

Currency:
+ Added coverage: Myanmar Kyat (MMK)

Adjustments:
+ Considering the magnitude of change from the COVID-19 shock, we have incorporated some fundamental adjustments to the regular systematic update of our return forecasts, which we believe will more accurately capture the current market dynamics. Specifically, we have embedded the expectation of a U-shaped recession as our "Central" case, with well defined "Upside" and "Downside" scenarios to best estimate the path of building blocks. Both equities and high yield fixed income have been affected. This is now a framework that can be applied to any shock beyond a pandemic.

2020 Edition

Tactical Asset Allocation:
+ Added capability

Equities:
+ Added Coverage: France, Germany, Singapore, India, Indonesia, Thailand, Malaysia, Philippines, China CSI 500, China CSI 300, and Poland
+ Retired Coverage: China Shanghai A Share

Fixed Income:
+ Added Coverage:
  - Singapore Treasury, Taiwan Treasury, South Korea Aggregate, Thailand Aggregate, US Gov-Related, Global Gov-Related, Global Gov-Related ex-US
  - Canada: Treasury Long and Short
  - UK: Gilts Long and Short
  - Global Infrastructure Debt: IG and HY

Real Assets:
+ Global Infrastructure: Updated the underlying index to the Dow Jones Brookfield Global Infrastructure Composite Index from the S&P Global Infrastructure Index. Now based on building blocks, rather than the previous methodology, a CAPM regression.

Private Assets:
+ Added Coverage:
  - Direct Real Estate - US core, levered and unlevered
  - Private Equity - Leveraged buyouts
  - Private Global Infrastructure, levered and unlevered
  - Private Global Infrastructure Debt, IG and HY

Currency:
+ Added Coverage:
  - Indonesian Rupiah (IDR)
  - Thai Bhat (THB)
  - South African Rand (ZAR)
  - Polish Zloty (PLN)
  - Singapore Dollar (SGD)

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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.

About the Invesco Global Market Strategist office

The GMS office is comprised of investment professionals based in different regions, with different areas of expertise. It provides data and commentary on global markets, offering insights into key trends and themes and their investment implications.

マルチアセット運用戦略に関する投資リスク

- 当運用戦略は、国内外の株式、債券、ETF、REIT、債券、短期公社債、派生商品取引、および不動産、インフラ等の実物資産、プライベート・エクイティ等に投資する現ファンドなどを主要投資対象としますので、組み入れた国内外の株式、ETF、REIT、債券、短期公社債、派生商品取引、不動産、インフラなどの実物資産、プライベート・エクイティ等の価格変動などの影響により、損失を被ることがあります。
- したがって、投資家の皆様の投資元本は保証されているものではなく、組入れ資産価格の下落により、損失を被り、投資元本を割り込むことがあります。
- 運用機関の指図に基づく行為により生じた利益および損失はすべて投資家に帰属します。

当運用における主な投資リスクとして以下が挙げられます。

① 株価の変動リスク(価格変動リスク・信用リスク)、② 公社債価格の変動リスク(価格変動リスク・信用リスク)、③ REITの価格変動リスク、④ ETFにかかる乖離するリスク、⑤ 有価証券先物取引および有価証券指数等先物取引等にかかるリスク、⑥ 商品先物取引等にかかるリスク、⑦ 派生商品取引(通貨先物取引、金利先物取引、オプション、スワップ)等にかかるリスク、⑧ 不動産投資に伴うリスク、⑨ ベンチャー・キャピタル・ファンド投資に関する一般的なリスク、⑩ バイアウト・ファンド投資に関する一般的なリスク、⑪ 流動性リスク、⑫ デフォルト・リスク、⑬ カントリー・リスク、⑭ カウンターパーティ・リスク、⑮ コール・ローン等の相手先に関する信用リスク、⑯ 解約資金手当によるリスク、⑰ 原ファンドの評価価格に関するリスク、⑱ ファンドの資産に対して遡及される請求、⑲ マネジメント会社に関連するリスク、⑳ 各国法制度の法規制の対象となる可能性、㉑ キャピタルコールに伴うタイミングリスク、㉒ 投資家によるデフォルト、㉓ 資産配分に係るリスク、㉔ 訴訟リスク、㉕ 解約に係るリスク、㉖ フィーダー・ビークル等に係るリスク、㉗ 会計・監査報告書に関するリスク、㉘ 評価価格に関するリスク

マルチアセット運用戦略に関する費用と税金

直接投資の場合にご負担いただく報酬 ・費用	• 【投資一任契約に係る報酬】 投資一任契約に係る報酬などの総計は、現時点で、当戦略の報酬料率を決定していないため、表示することができません。 • 【特定(金銭)信託の管理報酬】 当該信託口座の受託銀行である信託銀行に管理報酬をお支払いいただく必要があります。具体的料率については信託銀行にご確認下さい • 【組入有価証券の売買時に発生する売買委託手数料　等】 当該費用については、運用状況や取引量等により変動するものであり、事前に具体的な料率、金額、上限または計算方法等を示すことができません • 【費用合計額】 上記の費用の合計額については、運用状況などによって変動するものであり、事前に料率、上限額などを表示することができません。

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※デリバティブに関するリスクについては、巻末のディスクレーマーを必ずご確認下さい。

オルタナティブ・ソリューション運用戦略に関する投資リスク

- 当運用戦略は、国内外の株式、債券、ETF、REIT、債券、短期公社債、派生商品取引、および不動産、インフラ等の実物資産、プライベート・エクイティ等に投資する現ファンドなどを主要投資対象としますので、組み入れた国内外の株式、ETF、REIT、債券、短期公社債、派生商品取引、不動産、インフラなどの実物資産、プライベート・エクイティ等の価格変動などの影響により、損失を被ることがあります。
- したがって、投資家の皆様の投資元本は保証されているものではなく、組入れ資産価格の下落により、損失を被り、投資元本を割り込むことがあります。
- 運用機関の指図に基づく行為により生じた利益および損失はすべて投資家に帰属します。

当運用における主な投資リスクとして以下が挙げられます。

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当資料ご利用上のご注意

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また、本書では、弊社のグループ関連会社が行う投資について説明している箇所がありますが、そこは、投資一任契約を通じてインベスコ・アセット・マネジメント株式会社（以下、「弊社」といいます。）がご提供する場合をそうていしたものです。また過去の運用実績は、将来の運用成果を保証するものではありません。本書はお客様ニーズを把握するためのサウンディング資料であり、特定のファンドや有価証券等についての言及は、あくまで参考情報として提供するものであり投資の推奨や勧誘する意図で提供するものではありません。本文で詳述した本書の分析は、一定の仮定に基づくものであり、その結果の確実性を表明するものではありません。分析の際の仮定は変更されることもあり、それに伴い当初の分析の結果と重要な差異が生じる可能性もあります。

本書はインベスコのグループ会社の行う投資手法ならびにプロセスを説明するために、過去の一時点における投資行動の具体例、または特定企業・銘柄に対する評価事例を掲示いたしますが、これをもって当該銘柄に対する投資を推薦、勧誘する意図はありません。ポートフォリオ特性値、組入れ銘柄などは、あくまで過去の一時点におけるデータに過ぎず、将来のポートフォリオが同様の傾向、組入れを継続する保証はございません。リスク情報につき、有価証券先物取引等のデリバティブ取引に係る事項の説明は、国内特定（金銭）信託口座に組入れるファンドにおいて行われるデリバティブ取引にかかるものです。実際の投資は日本国外のファンドで行い、国内特定（金銭）信託口座から日本国外のファンドに投資することを前提とします。国内特定（金銭）信託口座において、デリバティブ取引を行うことはございません。

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インベスコ・アセット・マネジメント株式会社

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